

Managing a complex risk landscape – Towards building a more resilient and decarbonized economy

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Approach to research: We identify, lead and implement **highly strategic forward-looking topics** through **industry-collaboration** and **cross-sectoral partnerships.**

As of February 2024, currently filling two board seats

Only in the last few years, the **climate change debate** has **evolved** **from** an **environmental, scientific** and **corporate social responsibility** **to** a key driver of **socio-economic development, energy security, technology** and **trade leadership** and a major concern for **financial resilience and stability**.

Two questions that are keeping me up at night

Question 1: With rising risks associated with extreme weather events, how to keep insurance affordable and accessible for home owners, industrial facilities and infrastructure systems looking ahead?

Question 2: Can re/insurers help unlock financing and expedite market readiness of a wide range of emerging climate technologies for energy transition and industrial decarbonization?

Question 1: How to keep insurance available and affordable in the market?

Setting the stage

- ⊙ **Rising frequency, severity and geographic scale** of extreme weather events (**acute**) and slow changing climatic trends (**chronic**)
- ⊙ **Rising exposure and vulnerabilities** with increasing concentration of people and assets in high risk zones, urbanization, development choices, aging infrastructure and supply chains
- ⊙ **Rising insured losses** from weather-related extreme events have more than **quintupled** over the past three decades, mostly driven by macroeconomic factors.
- ⊙ **Rising economic losses**, roughly three times insured losses and the gap is growing
- ⊙ **In the absence of risk reduction and risk prevention measures**, some risks may no-longer be insurable through the commercial insurance markets, requiring other interventions
- ⊙ **Cost of climate change adaptation will become prohibitive** in the absence of climate change mitigation

Complexities of climate risk landscape

- ⦿ Physical, transition and litigation climate risks and their interactions
- ⦿ Direct, indirect and compounding risks
- ⦿ Inherent uncertainties and stochastic nature of the transition
- ⦿ Past not a good estimation of future – move to forward-looking (exposure, vulnerability)

Need for next generation of forward-looking stochastic climate risk modelling methodologies!

How to keep insurance available and affordable in the market? (My next research)

- ⦿ **System-based approach** -
 - Who/how risks are being created (e.g. land zoning, permitting, standards to build)? who has the mandate or can manage risks? How to incentivise behaviour change towards risk reduction and risk prevention? How to address the residual risk?
- ⦿ **Risk-based approach** – Risk-based insurance premiums offer a signal to the level of risks that needs to be managed
- ⦿ **Assets’ life-cycle** – e.g. Housing, industrial facilities & infrastructure systems
- ⦿ **Enabling and incentivizing a holistic approach to risk management to reduce residual risks**
- ⦿ **Implications for the insurance business model**, products and services innovation, opportunities for PPPs
- ⦿ How can financial services regulatory bodies support?

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Geneva Association report series on bringing climate tech to market for Industrial decarbonization and the powerful role of insurance

Cross-sectoral partnership involved:

- 12 insurance and reinsurance companies
- 3 Managing General Agents
- Finance: Breakthrough Energy, HSBC
- Government: US DoE
- Engineering: Worley
- Industry: Mission Possible Partnership

Plus over 150 experts from climate tech hubs, associations, think tanks and academia



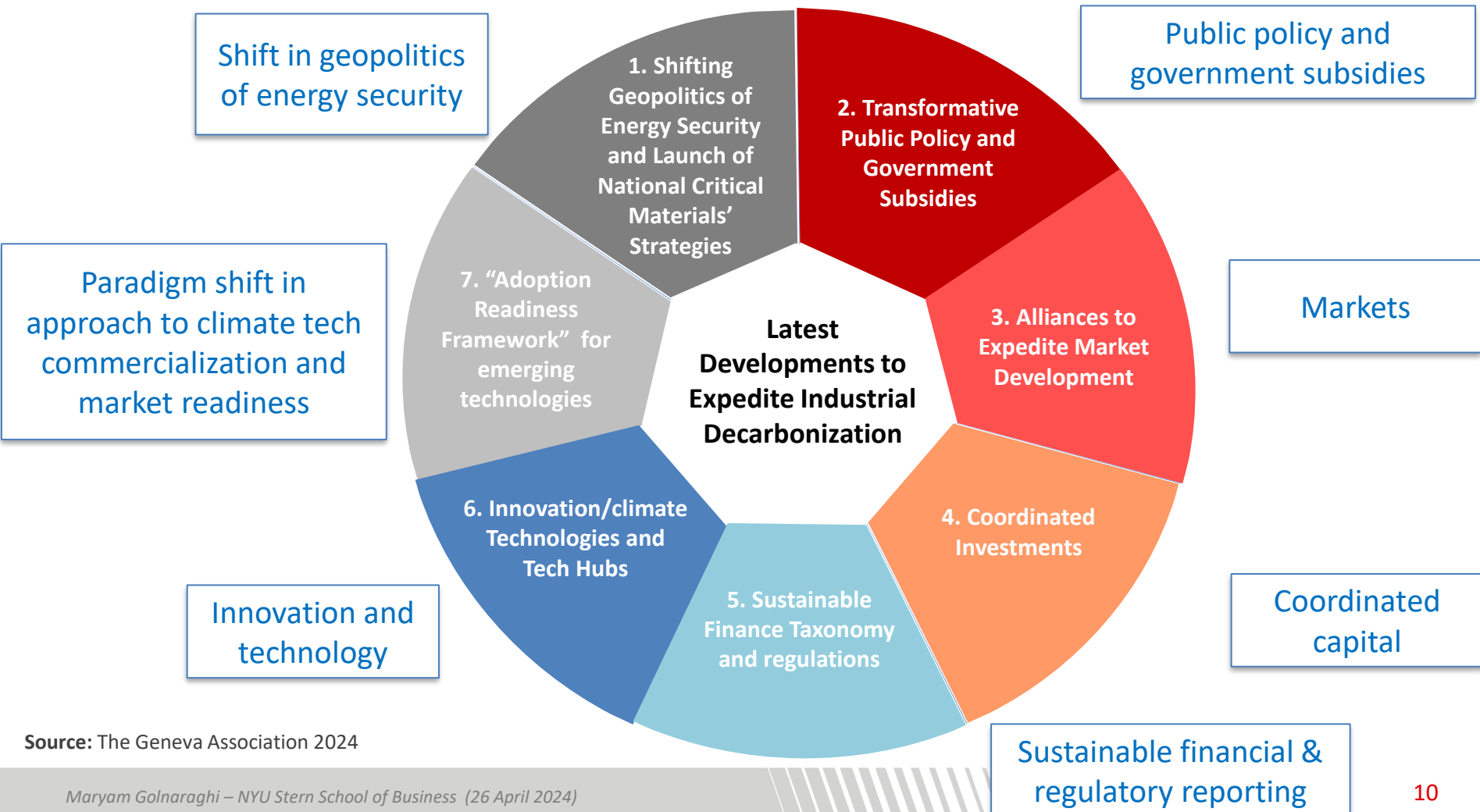
Report 1

Climate tech for industrial decarbonisation: What role for insurers?



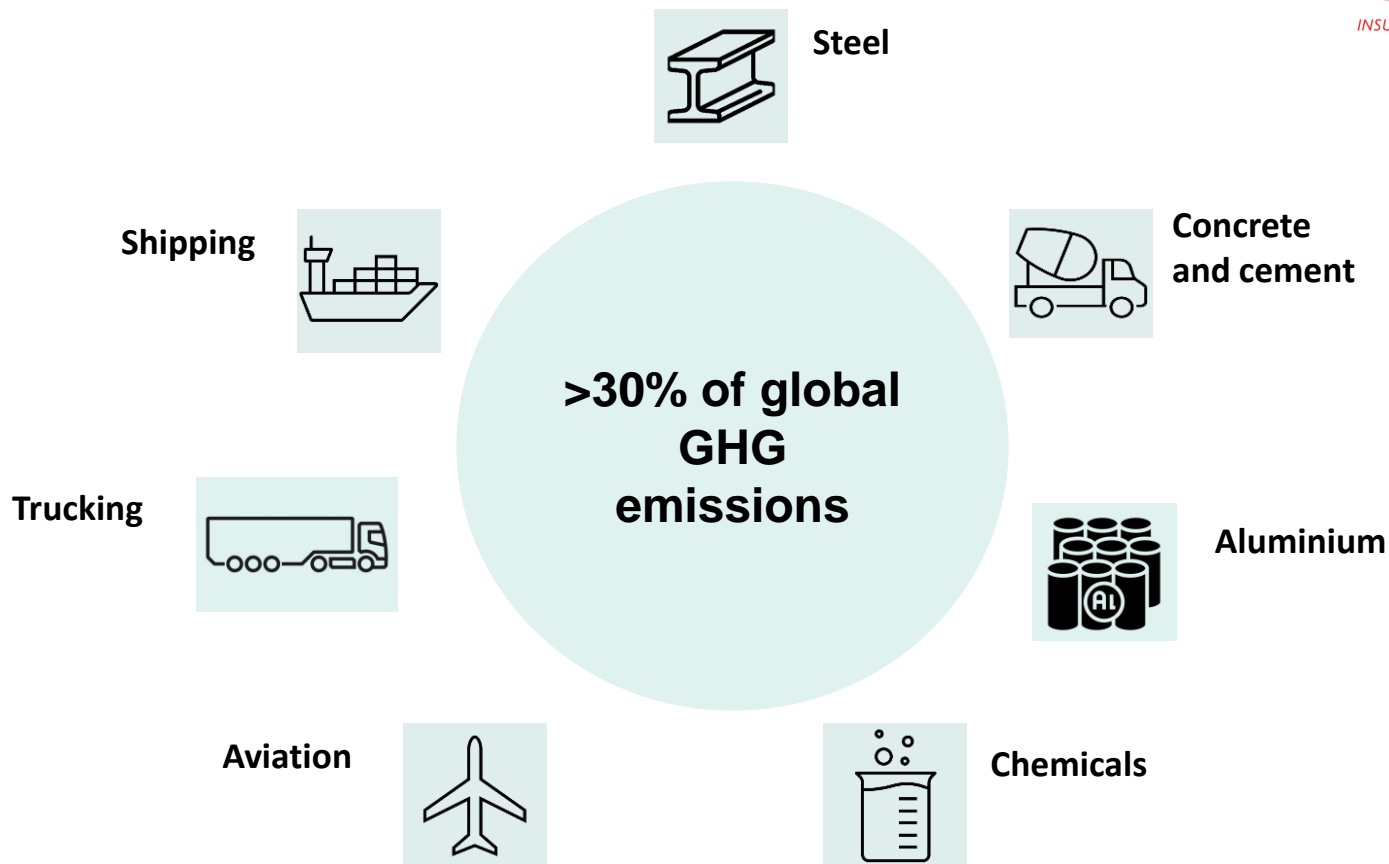
Report 2

Bringing Climate Tech to Market: The powerful role of insurance



Source: The Geneva Association 2024

Focus on expediting industrial decarbonization



Decarbonization targets in these sectors by 2030 (some examples)

Sectors



Aviation

Sustainable Aviation Fuel (SAF)

2024
0.24 Mt p.a.

In 2030
40 Mt p.a.



Steel

Green steel

1.2 Mt p.a.

170 Mt p.a.



Shipping

Net-zero emission fuel

24 ships

200 ships

Technologies

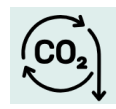


Hydrogen

Clean hydrogen (blue and green)

2 Mt p.a.

6.5 Mt p.a.
(of all green H₂)



Carbon Management

49 Mt p.a.

700 Mt p.a.

Mt p.a.: Million tonnes per annum

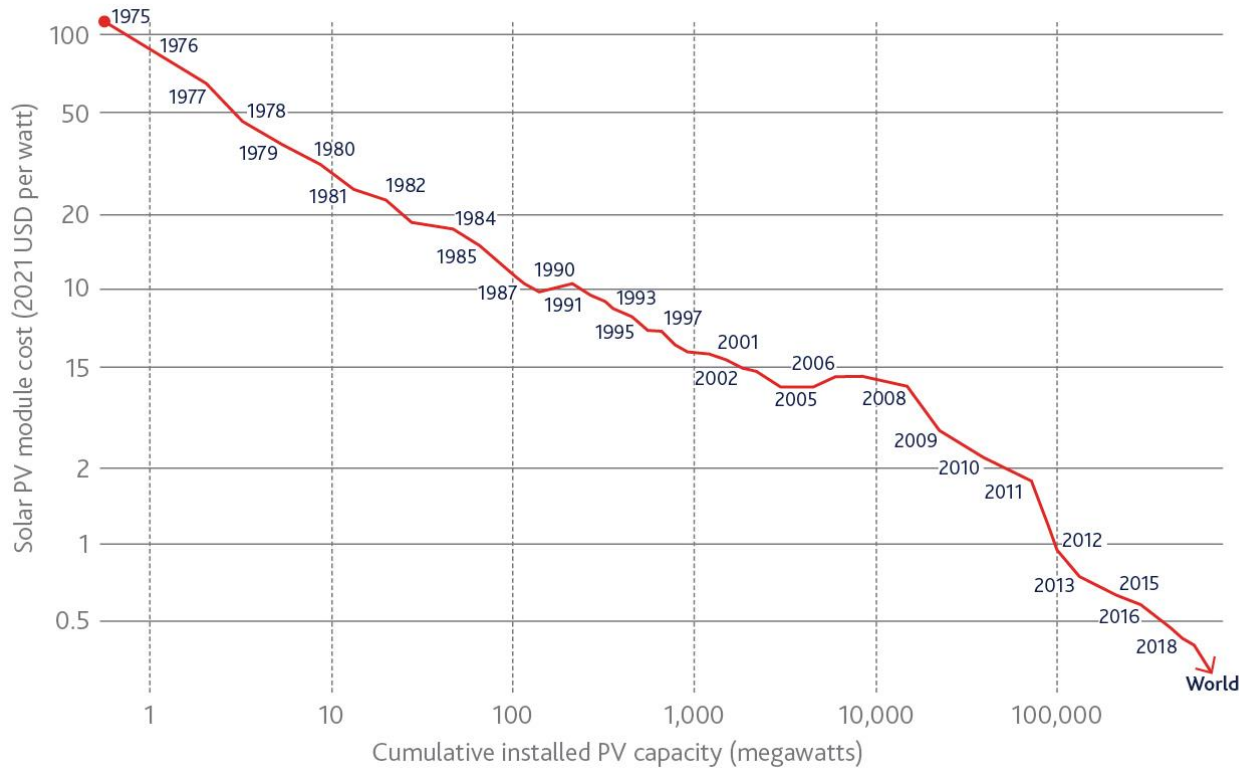
Need to expedite at-scale commercial deployment of wide range of emerging climate technologies to meet these targets

Challenges

- ⊙ **Massive investment gap** : ~USD 8 – 10 trillion USD annually until 2050.
- ⊙ A **significant portion** is needed for development and deployment of **new climate technologies that remain in pre-commercialization stages** (e.g. green hydrogen, carbon management, Sustainable Aviation Fuel, Long-Duration Energy Storage)
- ⊙ Climate technologies are **capital intensive, highly complex**, many **untested risks**, challenges with **scaling** and **market readiness, scarcity of data** for assessing risks and **insurability conditions**

Addressing these challenges requires new ways of doing business, i.e. cross-sectoral collaboration to innovate risk management and financing solutions.

It took over four decades for renewables to become cost-competitive and still have not realized their market potential – We don't have time!



1975 → **2021**
World

1975
115.28 USD
per watt; 0.54
megawatts

2021
0.27 USD per
watt; 848,404.56
megawatts

Traditional approach to technology commercialization is focused on addressing technological risks



Technology Readiness Level Framework

At-scale commercial deployment	9	Wide-scale commercial deployment	
	8	Early commercial deployment	Traditionally re/insurers engage in commercialisation stages
Demonstration and early deployment	7	Complete system demonstration in an operational environment	
	6	Early field demonstration and system refinement completed	
	5	Early system validation demonstrated in a laboratory or limited field application	
	4	Subsystem or component validation in a laboratory environment to simulate service conditions	
Research and development	3	Proof-of-concept validation	
	2	Technology concepts and/or application formulated	
	1	Exploratory research transitioning basic science into laboratory applications	

A number of other risks hinder climate technologies' market readiness delaying deployment



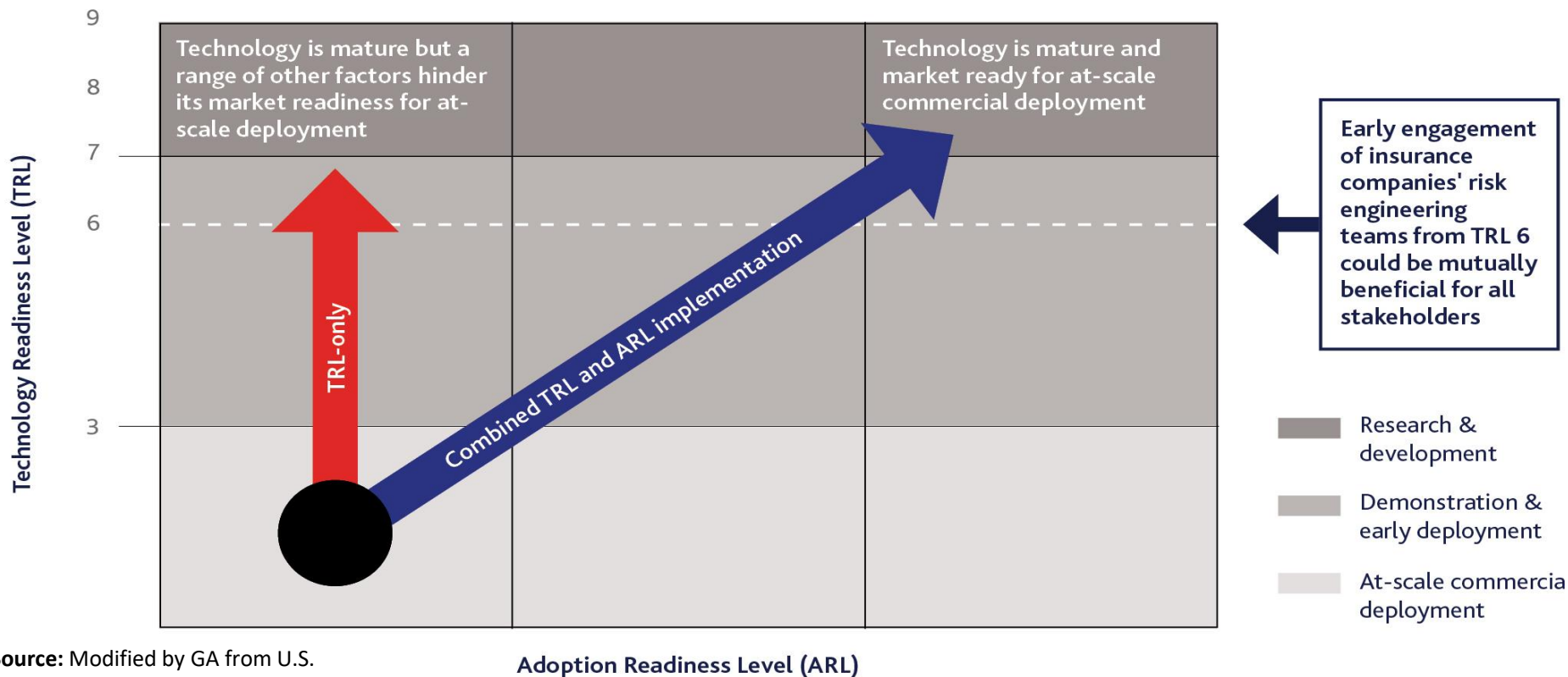
Launch of Adoption Readiness Level Framework Launched by the US DoE

I. Value Proposition	II. Market Acceptance	III. Resource Maturity		IV. License to Operate	
1. Delivered Cost	4. Demand Maturity / Market Openness	7. Capital Flow and	10. Manufacturing & Supply Chain	13. Regulatory Environment	16. Environmental & Safety
2. Functional Performance	5. Market Size	8. Project Development, Integration, Management	11. Materials Sourcing	14. Policy Environment	17. Community Perception
3. Ease of Use / Complexity	6. Downstream Value Chain	9. Infrastructure	12. Workforce	15. Permitting & Siting	
			18. Insurability and availability of affordable insurance		

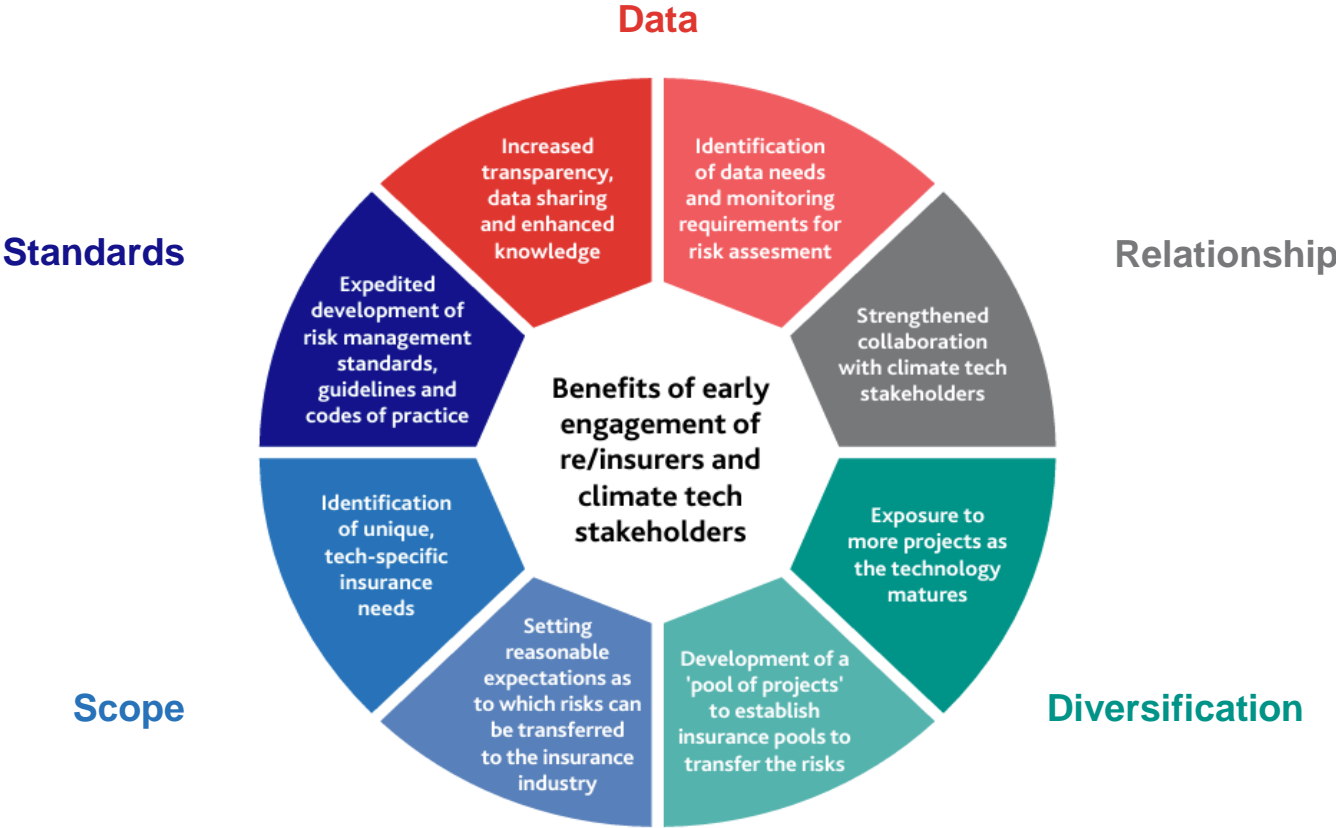
Source: Modified by GA from U.S. Department of Energy

Expediting climate tech market readiness requires new approaches

Utilising traditional Technology Readiness (TRL) Level and ARL Frameworks with early engagement of re/insurers



Mutual benefits of engaging re/insurers' risk engineering teams from the pre-commercialization stages across projects



Offered a novel Insurability Readiness Framework (IRF)

Expediting assessment of insurability conditions for emerging climate tech

- ① **The IRF classifies climate tech risks into 7 categories with related issues** that need to be considered for assessing insurability conditions
 - 1) technology risk; 2) project information and organisation risk; 3) legal, finance and compliance risk; 4) physical risk at project location; 5) business interruption and supply chain risk; 6) long-term risk; and 7) environmental, social and governance risk.
- ① **IRF**
 - Enabling a more informed conversations between climate tech stakeholders and re/insurers from early stages to ensure that risks are considered and mitigation strategies are developed in line with insurance expectations.
 - Helping pinpoint areas within climate tech projects that pose the greatest challenges to insurability and identify risks that may require different interventions, such as PPPs or government backstops.
 - Identifying data requirements on a tech by tech basis
- ① **IRF is being adopted by key platforms investing in climate tech (DoE, Breakthrough Energy)**

- Re/insurers have a crucial role to play in supporting the rollout of new climate technologies, but significant progress needs to be made to unlock their potential contributions. This will necessitate:
 - How to get re/insurers' risk engineering teams directly and more efficiently engaged from the very early stages of technology development s and projects?
 - Exploration of how insurance markets could be best leveraged to expedite the development and deployment of climate tech
 - What are insurance needs for funding climate tech projects through debt and capital market financing
 - How industrial sectors adopting these emerging technologies, implications for their business models and subsequently insurance needs?

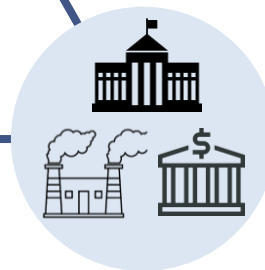
Rewire



**New ways
of doing
business**



Unprecedented
cross-sectoral
collaboration



Breakdown
institutional silos

Thank you



www.genevaassociation.org



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Classification of climate litigation cases (Based on analysis of over 1800 cases)

Three categories and seven types

Category I: Lawsuits against companies



Type 1.
Lawsuits against companies for causal contribution to climate change



Type 2.
Lawsuits against companies, fund managers and/or their fiduciaries for miscommunication or failure to adapt to climate change risk



Type 3.
Lawsuits seeking to force companies to align their emissions plans with the Paris Agreement



Type 4.
Litigation challenging companies' projects or technologies



Type 5.
Cases challenging governments' policies or approval of projects or technologies



Type 6.
Litigation to accelerate climate policy (which could accelerate the transition and so change the competitive landscape for companies)



Category II: Lawsuits against governments with indirect impacts on companies



Type 7.
Lawsuits against governments or utilities for failure to adapt to climate change risk



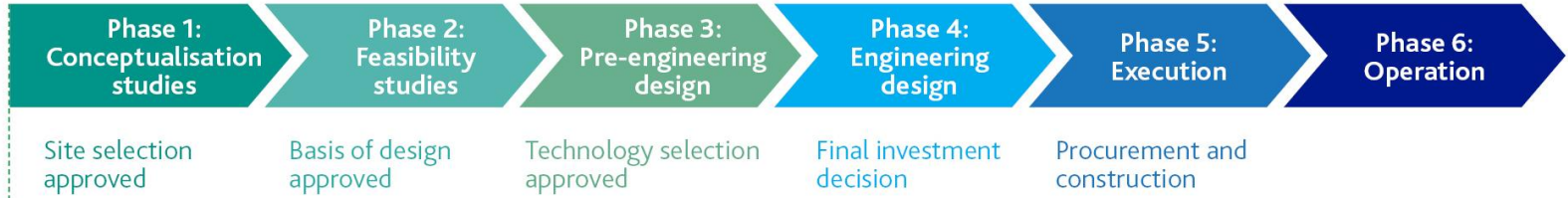
Source: The Geneva Association 2021b. Sources against companies and governments and implications for insurers

Benefits of rethinking re/insurers touchpoints in project finance

Building risk Mitigation into project concept and design from early phase

Stages of project development, financing and execution

Project development milestones



Reconsidering touchpoints of re/insurers and project developers for early engagement



Benefits of early engagement with re/insurers' risk engineering teams

1. Risks are considered, assessed and managed holistically to enhance insurability, potentially shortening the due diligence process
2. Provision of feedback on important decisions, such as site and technology selection, and risk mitigation strategies

● Traditional touch point of re/insurers