How innovative investment solutions can drive radical supply chain decarbonisation and climate adaptation

This analysis is part of a series of papers looking at innovative solutions to catalysing climate action along the supply chain. In particular, this analysis will focus on the challenges and opportunities faced by production sites along the global supply chain, with a specific focus on farmers and factories. It will analyse the current barriers for these actors to invest in decarbonisation and climate adaptation efforts, and demonstrate how innovative financial solutions created by the private sector can address these barriers head on.

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Why does the supply chain matter?

UN Trade and Development (UNCTAD) estimates that 80% of global trade takes place in supply chains linked to transnational corporations[1], and a report from the World Economic Forum and BCG concludes that 8 global supply chains account for more than 50% of annual greenhouse gas emissions[2]. The global value chain is therefore a key structure in global development, and decarbonisation efforts, whilst also being increasingly vulnerable to external shocks caused by climate change.

A recent study by the International Chamber of Commerce (ICC) - found that extreme weather events resulted in US$2 trillion in economic losses between 2014-2023 within the global supply chain, and that annual damages are rising rapidly, reaching US$451 billion in 2022-2023 alone[3]. CDP reports that companies are disclosing a likely US$120 billion in costs from environmental risks in their supply chains by 2026[4].

Even in a scenario of strong mitigation action, S&P Global found that the total cumulative cost of climate hazard exposure in the supply chains of the S&P Global 1200 index constituents is projected to reach $25 trillion by 2050, the equivalent of 74% of all revenues in 2024[5].

In particular, it predicts by 2050:

- $4.5 trillion in revenue lost to business interruption
- $3.8 trillion in excess operating costs
- $16.5 trillion in property damages and excess capital expenditure
- 58% of costs to be driven by extreme heat
- 21% by water stress
- 11% by drought
- 4% by flooding due to rain[6].

Climate change is of increasing focus for companies and investors, with over 22,700 companies disclosing climate risk and action to investors through CDP in 2024. This pressure has also translated into target-setting, with over 4,000 companies setting emissions reduction targets and having them validated by the SBTi.

However, S&P Global found that only 35% of the 1200 largest companies in the world had a climate adaption plan, with consumer staples at 42% and consumer discretionary only at 29%. A

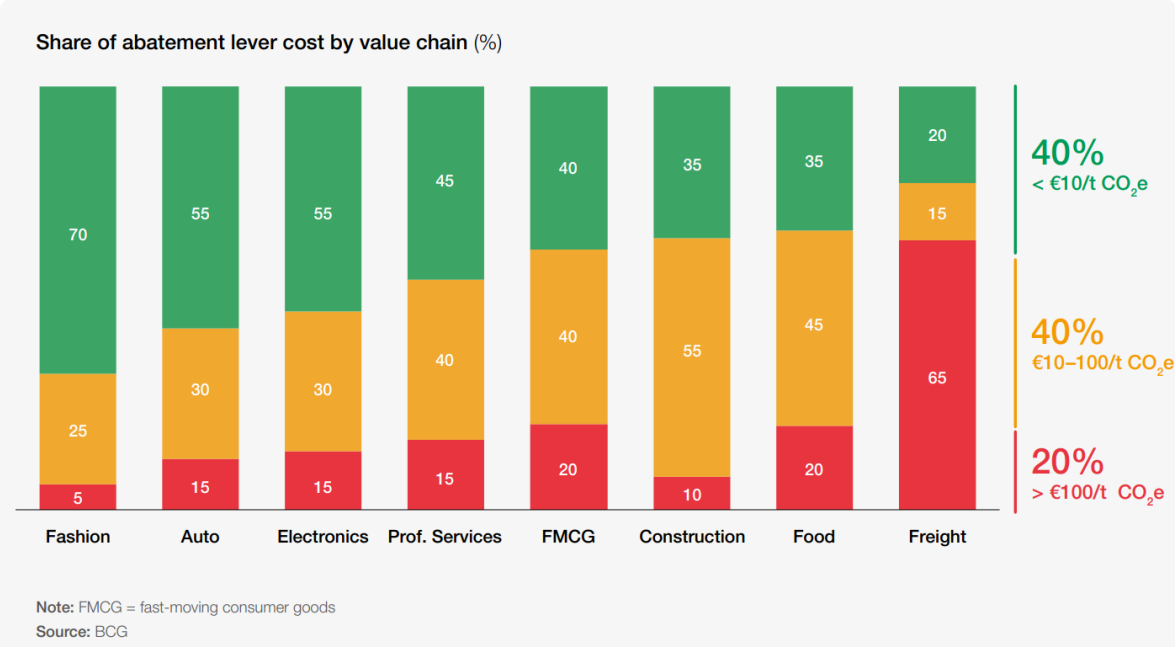
[1] *https://unctad.org/press-material/80-trade-takes-place-value-chains-linked-transnational-corporations-unctad-report*
[2] *https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf*
[3] *https://iccwbo.org/news-publications/policies-reports/new-report-extreme-weather-events-cost-economy-2-trillion-over-the-last-decade/*
[4] *https://www.cdp.net/en/press-releases/environmental-supply-chain-risks-to-cost-companies-120-billion-by-2026*
[5] *https://www.spglobal.com/en/research-insights/special-reports/look-forward/climate-costs-are-rising-but-few-companies-have-an-adaptation-plan*
[6] *https://www.spglobal.com/en/research-insights/special-reports/look-forward/climate-costs-are-rising-but-few-companies-have-an-adaptation-plan*

multinational engineering consultancy taking part in the study shared that in most cases, significant investment is often only being made after an extreme weather event, when the costs are far higher than those of prevention[7].

Climate mitigation and adaptation opportunities in manufacturing

OECD have calculated that the average climate investment in industry globally was <$50 billion per year between 2016 and 2020, and that by 2030, investments will need to reach nearly USD 200 billion per year, mostly in the Global South[8]. They note that "there are two sides to this problem: there is a limited supply of public finance for industry decarbonisation, and there is a lack of tailored instruments to de-risk projects for mobilising private capital".

Manufacturing industries account for as much as 16 gigatonnes (Gt) annually[9]. Analysis from the World Economic Forum and BCG concluded that around 40% of supply chain climate mitigation action could be achieved through low-cost measures, with particularly attractive opportunities for low-cost implementation in Fashion, Auto, Electronics and Professional Services industries[10].



[7] *https://www.spglobal.com/en/research-insights/special-reports/look-forward/climate-costs-are-rising-but-few-companies-have-an-adaptation-plan*
[8] *https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/12/oecd-work-in-support-of-industrial-decarbonisation_00ea119a/cd589e4f-en.pdf*
[9] *https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/12/oecd-work-in-support-of-industrial-decarbonisation_00ea119a/cd589e4f-en.pdf*
[10] *https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf*

In Fashion manufacturing supply chains, they estimated that:

- 15% of emissions benefits can be achieved through process efficiency and low energy technologies in sewing, spinning, weaving and knitting processes
- 45% could be achieved through switching to renewable power sources
- 20% could be achieved through new solutions to heat requirements in processing
- 10% could be achieved through moving from wet to dry processing technologies

In Food supply chains, they estimated that:

- 25% of emissions can be abated through material and process efficiency levers. These include the reduction of food waste, nitrogen-optimized feeding and increasing the productivity of low emission intensity fertilizers.
- 15% emissions savings could be achieved through renewable energy for power and heating can provide another, mainly at the food-processing and packaging stage.

In FMCG supply chains, they estimated that:

- 15% of emissions can be avoided with circularity by mechanically and chemically recycling plastics, thereby lowering demand for virgin feedstock
- 25% can be saved by improving process efficiency across the supply chain.
- 15% of emissions can be saved through renewable energy in manufacturing
- 30% could be saved through switching to renewable heat (e.g. heat pumps or biogas)

World Bank analysis of 160,000 firms in 134 countries over a 15-year period shows that factors common to producers within the global supply chain - such as smaller company size, being in a low- or medium-income country, exposure to export markets, and heat-sensitive processes - all contribute to higher sensitivity to climate-driven business losses[11]. In particular, researchers found that all firms with limited access to finance in lower income countries faced a 30% drop in revenue, compared to just 23% for firms with high access to finance in the face of modelled climate impacts, and that access to more affordable financing protected revenues until at least 1.5℃ of warming[12].

Climate mitigation and adaptation opportunities in agriculture

Analysis from OECD[13] puts current emissions from agriculture are around 12 Gt CO2eq/year, with a potential to reduce this to 4 Gt CO2eq/year by 2050. They estimate that:

- 29% of this reduction could be achieved through direct on-field emissions reductions
- 9% could be achieved through soil carbon sequestration

[11] *https://openknowledge.worldbank.org/server/api/core/bitstreams/72f74a78-b140-4f47-bd60-178481dfb5cd/content*
[12] *https://openknowledge.worldbank.org/server/api/core/bitstreams/72f74a78-b140-4f47-bd60-178481dfb5cd/content*
[13] *https://www.oecd-ilibrary.org/agriculture-and-food/policy-strategies-and-challenges-for-climate-change-mitigation-in-the-agriculture-forestry-and-other-land-use-afolu-sector_47b3493b-en*

- 62% could be achieved through addressing deforestation and other land use change emissions

Conservation International estimates that nature based agricultural solutions represent 3.1 billion tonnes of CO2e climate benefit (reductions and removals) per year in developing countries across Africa, Asia and South America - out of a total 4 billion globally.

World Economic Forum and BCG estimated that:

- 10% of all fashion emissions could be addressed via sustainable agriculture and nature-based solutions - for example in cotton production.
- 55% of total emissions reductions possible in the food supply chain need to be tackled via nature-based solutions - of which 20% of the total can be achieved through deforestation-free agriculture, and 35% through compensation for agricultural impacts through activities such as reforestation, restoration of mangroves and peatland, soil sequestration, biochar production and other levers.

Practical actions to reduce GHG emissions from farming production can include:

- Use of renewable energy for key activities such as irrigation
- Reduction in use of chemicals and fuel on-site
- Reduction in crop residue burning practices
- Sequestration of carbon in soil through crop rotation, cover cropping, low or no till practices, chemical reduction, soil restoration

Analysis from Cornell has shown that agricultural productivity has already dropped by 21% since the 1960's due to climate change impacts[14], and analysis from NASA projects that crops like Maize will lose another 20% of productivity by 2030[15]. The lead author of the study observed "We did not expect to see such a fundamental shift, as compared to crop yield projections from the previous generation of climate and crop models conducted in 2014; a 20% decrease from current production levels could have severe implications worldwide."

Adaptation actions for farmers can include:

- Increasing irrigation coverage, irrigation efficiency, and soil and surface water management
- Moving to drought, pest and heat-resistant crop strains and crop types - which may include moving away from production of some crop types altogether
- Managing soil to increase water retention and resilience

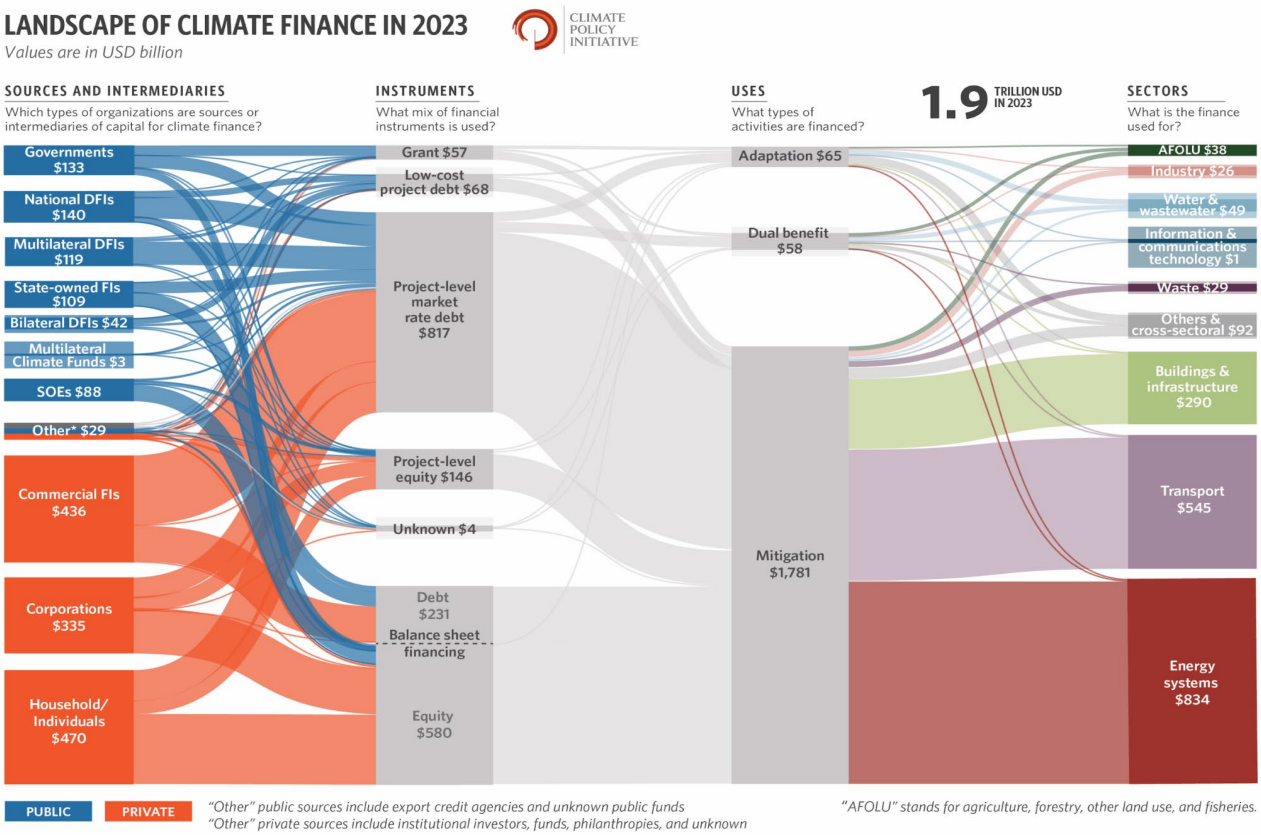
[14] *https://www.sciencedaily.com/releases/2021/04/210401112554.htm#:~:text=https://www.sciencedaily.com,all%20due%20to%20climate%20change.*
[15] *https://climate.nasa.gov/news/3124/global-climate-change-impact-on-crops-expected-within-10-years-nasa-study-finds/#:~:text=%E2%80%9CYou%20can%20think%20of%20plants,your%20yield%20actually%20goes%20down.%E2%80%9D*

- Agro-forestry, intercropping and other shade increasing and pest-resistant planting regimes
- Using high-tech solutions to accurately predict rain, pests, temperature and other factors in order to closely manage resources and protect crops

Farm size, income and climate of the relevant country, regulations and government support, crop type and many other factors play a role in how farmers can adapt to climate impacts. Those in the Global South, hotter countries, smaller farmers, and those without access to financial resources are likely to be hardest hit and least able to adapt to changing conditions.

Current financial flows to the supply chain

Research from the Climate Policy Initiative shows that finance for climate action is now at 1.9 trillion USD per year, and growing by an average of 26% per year[16]. A large proportion of this is coming from the private sector, including $436 billion from private financial institutions, and $335 billion from corporations[17].



[16] https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf
[17] https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf
[18] https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf

The majority of investment is focused on climate mitigation, with around 94% of climate finance is focused on mitigation only[19]. The private sector in particular is not investing heavily in adaptation - around 8% of climate finance for adaptation came from the private sector, compared to 54% for mitigation[20]. The Global South requires US$215 billion per year for successful climate adaptation, of which US$16 billion is for agriculture[21].

The global supply chain is still largely not accessing funding for climate action.

- Agriculture and industry (combined with other high emission industries like waste) receive <10% of flows[22].
- 80% of finance was mobilized domestically, focused in East Asia, North America, and Western Europe. Least-developed countries face barriers to accessing affordable capital, and need more financial innovation and support[23].
- Foreign investment in developing economies fell 2% in 2024, marking second year of decline[24].
- Analysis from LSE suggests a $2.4 trillion annual investment gap for emerging markets and developing countries (excluding China) to meet their climate and nature goals by 2030, and that at least $1 trillion annually, needs to come from the Global North and international institutions[25].
- The Gates Foundation estimates that only 2% of current global climate investment goes to smallholder farmers in Africa and South Asia.[26].

What types of climate financial mechanisms are available?

Different types of financial solutions are suitable for different purposes, and as investment in climate action has increased, the variety of mechanisms available has increased in order to open up more potential channels and solutions. The table below summarises some of the typical solutions available:

[19] *https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf*
[20] *https://iccwbo.org/news-publications/policies-reports/how-to-scale-private-finance-for-adaptation-and-unlock-new-business-opportunities/#:~:text=Climate%20change%20is%20already%20causing,finance%20(US$28%20billion).*
[21] *https://www.unep.org/resources/adaptation-gap-report-2023#:~:text=This%20is%20over%2050%20per,the%20necessary%20scale%20of%20investment.*
[22] *https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf*
[23] *https://www.climatepolicyinitiative.org/wp-content/uploads/2000/06/compressed_Global-Landscape-of-Climate-Finance-2025.pdf*
[24] *https://unctad.org/news/foreign-investment-developing-economies-fell-2-2024-marking-second-year-decline*
[25] *Bhattacharya A. et al (2024) Raising Ambition and Accelerating Delivery of Climate Finance, London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science*
[26] *https://www.gatesfoundation.org/ideas/climate-adaptation#:~:text=Climate%20models%20reveal%20that%20Africa%20and%20much,spikes%20in%20poverty%2C%20malnutrition%2C%20and%20economic%20inequality.&text=To%20help%20address%20this%20injustice%2C%20we%20have,the%20climate%20adaptation%20needs%20of%20smallholder%20farmers.*

Financial mechanism	Level	Cost	Explanation
Grants or philan-thropic funding	Any	N/A	A grant provides non-repayable funding from governments, foundations, charities, or other organizations. This funding supports specific projects or purposes that align with the provider's goals - in this case, climate action
Debt	Project	Market rate	Project-level market rate debt refers to loans for specific projects, such as power plants or infrastructure. These loans are financed under prevailing market conditions, meaning they are not concessional or subsidized. Private lenders provide this debt with interest rates that reflect standard market conditions and risks, and repayment is typically dependent on the project's cash flow.
		Low cost	Low-Cost Debt (Concessional Debt): Unlike market-rate debt, low-cost debt has terms and interest rates that are more favourable than prevailing market conditions. It is often provided by public institutions to encourage climate action or development in emerging markets. It can be applied to specific projects like infrastructure, with repayment based on the project's cash flow or another source of finance.
	Balance sheet (company)	Market rate	Balance sheet debt usually takes the form of a loan to a company. Private lenders provide loans with standard market conditions and risks, and may require collateral alongside any expected payback from the implementation of the funded activities or from company cash flow
		Low cost	Low-cost loans may be provided by public institutions, philanthropic entities, or development organisations aiming to support implementation of specific goals such as climate mitigation or adaptation.
Equity	Project		In project finance, equity investors, like lenders, depend on the project's cash flow for their returns. However,

Financial mechanism	Level	Cost	Explanation
		Valuation by the investor	unlike debt, equity investments do not offer the assurance of principal repayment.
	Balance sheet (company)		Private investors often acquire an equity stake in a business, providing cash flow to become shareholders. While there's no guarantee of principal repayment, they seek returns through dividends from company cash flow and potential appreciation in the value of their shares.
Catalytic finance	Any	N/A	Catalytic capital is funding designed to reduce perceived investment risks, thereby attracting private investors. Its purpose is to generate significant follow-on investment, where a relatively small amount of catalytic capital unlocks substantially larger sums from other sources. This approach often utilizes blended finance, combining various types of capital (public, private, philanthropic) to achieve specific development goals. Catalytic finance can guarantee or provide collateral for equity or debt, securing financial market access for another entity. The guarantor is only required to provide funding if there is a default on the loan and the collateral or principal needs to be called in by the lender.
Insurance	Any	Market rate	Insurance exists to 'underwrite' a specific financial risk or asset. Insurance is a contract where you pay regular premiums to an insurer, who then agrees to cover your financial losses or damages if a specific, uncertain, and adverse event occurs. It's a form of risk management that transfers the financial burden of a potential loss from the policyholder to the insurance company.

What scale of barriers exist for supply chain actors?

The focus of this analysis is on access to finance for sites and organisations that are producing supply chain goods. This includes the following actors:

- Informal and smallholder farms and agricultural producers
- Large farms and agricultural producers
- Informal manufacturers and processers
- Micro, small and medium enterprises (MSME) manufacturers and processers
- Large manufacturers and processers

Currently out of scope - although equally important - are those providing systems and solutions for the transition, including infrastructure developers and operators, technology service providers and innovators. These actors are vital in providing the core services and technologies required for climate action in the supply chain, but are subject to different market forces and barriers and therefore require their own bespoke solutions.

Analysis by the IFC found that 65 million enterprises, or 40 percent of formal micro, small and medium enterprises (MSME) in developing countries, have barriers to accessing finance[27]. This represents an unmet finance need of $5.7 trillion a year, equivalent to 19 percent of the gross domestic product (GDP) and 20 percent of the overall private sector credit supplied by banks to these economies[28].

The report also estimates that[29]:

- For 119 Emerging Market and Developing Economies (EMDEs) around the world, there is a potential demand for Micro, Small and Medium Enterprises (MSMEs) finance of US$10.3 trillion as of 2019, with a credit supply of only US$4.6 trillion.
- Among formal MSMEs, 19 percent are fully credit constrained, and 21 percent are partially constrained
- There is an additional US$2.1 trillion in estimated potential demand for finance from informal enterprises in developing countries, equivalent to 8 percent of the GDP in these countries.
- The MSME finance gap increased from US$4.4 trillion (17.2 percent of GDP) to US$5.7 trillion (19 percent of GDP) in EMDEs — on average increasing by over 6 percent annually
- About half of formal SMEs don't have access to formal credit. The financing gap is even larger when micro and informal enterprises are considered.

[27] *https://www.ifc.org/content/dam/ifc/doc/mgrt/2022-gsmef-progress-report.pdf*
[28] *https://www.ifc.org/content/dam/ifc/doc/mgrt/2022-gsmef-progress-report.pdf*
[29] *https://www.ifc.org/content/dam/ifc/doc/mgrt/2022-gsmef-progress-report.pdf*

Calculations of the finance gap for these sites are based on 2019 finance needs. Therefore, taking into account the potential increases in investment required to fund climate mitigation and adaptation needs, the total investment gap between 2025 and 2050 is likely to be much higher.

Specific barriers to investment

To carry out climate action, most sites within the global supply chain will need to invest in changes to equipment, materials, technology, processes or staff capacity. Many sites face fundamental barriers in making these investments, including their own incentives to do so. Over the last decade, many researchers and academics have tried to analyse the issue of MSME access to finance, emphasizing their dependence on credit and cash flows, including the IFC, World Bank, and many others. Some common themes emerge from these sources and in consultation with supply chain stakeholders for why this gap exists.

Fundamental incentive gaps for investment

Many sites within the global value chain do have access to finance, or are theoretically able to invest their own funds in climate action. However, there are several barriers which occur even before a site or smallholder can consider whether they can access financial solutions.

Barrier	Details
Lack of regulatory pressure	In any market where regulators are not monitoring or incentivising climate mitigation or adaptation action, or are not enforcing legislation, sites within their jurisdiction have less incentive to invest.
Energy subsidies and other policy barriers	Subsidised energy will reduce the cost-saving incentive for energy-saving technologies, and make it harder to create a business case for climate investment (although it is often there to support government development priorities) There may also be other policy barriers to action, such as barriers to procurement of renewable energy (e.g. centralised energy body or a ban on direct procurement or power purchase arrangements), a lack of suitable incentives (e.g. unfavourable or lacking feed-in tariffs), or other barriers to action such as inconsistent or limiting regulations that block action.
Lack of supply chain incentives	For many in the global supply chain, there is no incentive provided by their direct business partners. This can be due to opacity of the supply chain blocking market signals from final customers; the structure and duration of customer contracts making the business case for investment uncertain; a lack of additional incentives beyond business as usual; or a lack of consultation or buy-in to decision making creating solutions that are poorly designed to support action

Barrier	Details
Lack of technical information	There are many types of information gap that may factor into site inaction: lack of information about climate risk exposure; lack of familiarity or comfort with potential mitigation or adaptation technologies or solutions; questions around which solutions are most suitable for their specific context; lack of information about quantifying outcomes from investment; lack of familiarity with potential funding solutions; lack of information about how to create an attractive application for a lender or investor.
Technology pipeline challenges	Many actors are placed within locations with an uncertain technology pipeline for key investments. For example, in some countries there is insufficient import of suitable technologies; significant import taxes or other barriers to direct import; significantly higher costs for technologies compared to other markets; significantly lower quality of product compared to other markets; lack of installation, operation or maintenance capacity for that technology; or lack of available parts or inputs for that technology.
Operation-al concerns	For many actors in the supply chain, changes in operational processes to install new technology, train staff or drive efficiencies may bring the risk of disruption of production, lower production volumes, or other disruption that could increase operating costs. These are very real business concerns that are important for all actors from the largest factories to the smallest smallholder farmer.

Some solutions lie in the hands of policymakers, whereas some are under direct influence of the private sector. Although structural barriers are noted for context, they are challenging to address through innovation and would require longer term action by policymakers and global institutions. The most effective innovative solutions can be implemented rapidly in absence of major change in policy or social structures, and these are the focus of current analysis.

Challenges with accessing finance

Even if sites are motivated to act on climate mitigation or adaptation, and seek financial support in the form of lending, they may face significant barriers. Even amongst formal MSMEs, 40% globally will face significant barriers to financial support and investment, and informal MSMEs will struggle to access formal finance at all. The factors below may be true for some or all of those within the global supply chain, and they are interconnected.

Barrier	Details
Complexity of process	Any lending or investment will usually require completion of a bureaucratic process. This includes detailed financial documentation, lengthy approval processes, and the need for significant experience and financial literacy.
Higher-risk context	Sites located within countries or regions with real or perceived lending risks may face barriers to borrowing, put in place due to risk aversion from the financial institution (FI), national norms and conventions, or lack of access to international mechanisms. This may manifest in a lack of available instruments, more stringent lending criteria, higher costs or limited lending size.
Organisation size	Sites or companies that are smaller in scale - SMEs, smallholder farms, other small businesses - may face several barriers to borrowing including not meeting minimum lending thresholds, lacking credit, collateral or income to secure finance, perception of high lending risk due to size, and a lack of internal finance capacity to tap into relevant instruments or to make a strong case
Site informality	Many with the global supply chain are informal, unregistered or otherwise unregulated actors. This can create a huge challenge when tapping into formal financial systems that demand formal documentation, credit histories and official status.
Low credit rating	Actors of a range of sizes may face challenges in achieving a suitable credit rating to support lending, either due to challenges with credit history, organisational structures, low revenues or another reason in this list (size, location, etc).
Low collateral	Lending (or investing) will often require the use of some form of collateral against which the finance can be secured. Many businesses do not have significant assets against which they can borrow (such as savings, property or other valuable assets), or are not willing to risk these assets for the sake of investment in climate action. This can be a fundamental barrier to investment
Unpredictable or low revenues	If sites want to use revenues as a mechanism for borrowing, these revenues should ideally be predictable, long term and secure. However, many in the global supply chain do not have long-term agreements with customers, work to small operating profits, and face unpredictable demand on production. Others face fluctuating prices for commodities, driven by global market trends, or fluctuating and uncertain yields from agricultural production affected by weather patterns. This creates uncertainties in revenue, low margins and challenges in leveraging revenue to support investment or borrowing.

Barrier	Details
Unclear technology ROI	Some technologies will deliver both climate benefits and a return on investment for the sites implementing them: replacement of equipment with significantly more efficient versions or optimising production for efficiency are good examples. Use of renewable energy can have a good ROI if the policy and operational contexts are suitable. However, many activities may be strategically important (climate adaptation measures, water efficiency measures, elimination of high impact chemicals, recycling measures) without having a clear ROI. For farming in particular, the ROI may or may not be reflected in either reduction of production costs or increases in yield - and these elements can both be affected by external factors such as weather. Therefore, additional elements may be needed in order to create an ROI for important investments.
High cost of borrowing	All these factors may result in high costs and interest rates for debt where it is made available. If a lender deems the site high risk, lacks sufficient security on the instrument, or is not clear on the ROI or income stream, they are likely to charge a high rate to cover the real or perceived risks on their side. This in turn can make borrowing unattractive or impossible for sites even when in theory it is available.

Future Earth Lab

UNLOCK

Options to unlock investment flows and incentives to the supply chain

Brand and retailer solutions

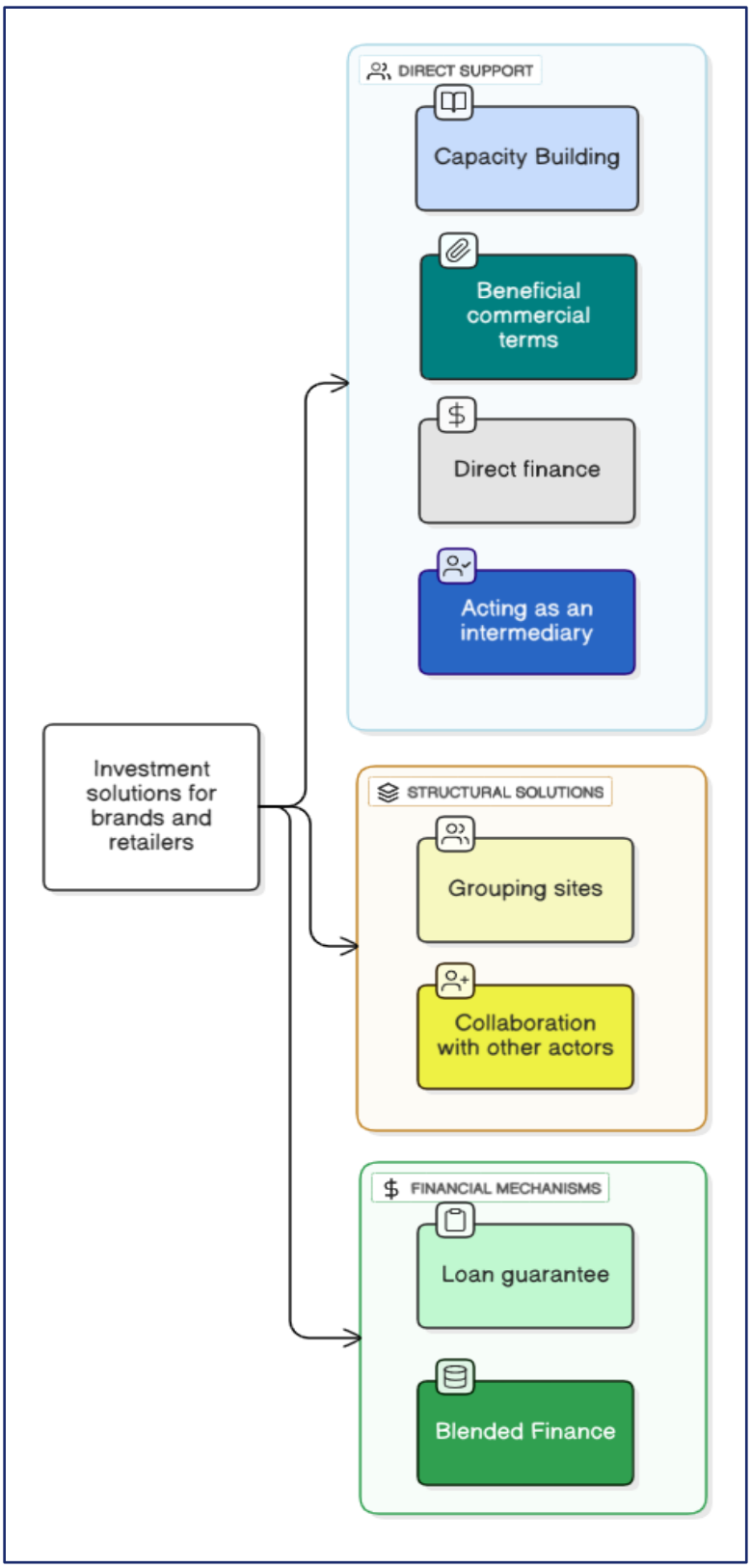
Brands and retailers have some unique challenges and opportunities when incentivising supply chain climate action.

In many cases, they have commitments to reduce their scope 3 supply chain impacts, but they are also typically not able to exert direct control over actors within the supply chain.

There are several key actions that can be taken on my brand and retail companies to address both the challenges of access to finance, and the challenge of incentivising supply chain investment in climate action.

These activities can fall broadly in 3 categories of action:

- Direct support to sites
- Structural solutions
- Financial mechanisms



Solution type	Solution	Innovation opportunities
Direct support	Capacity building	Capacity building can include support in assessing correct solutions for the relevant sites, support in navigating financial offers and access to finance, or linkages to relevant organisations. Brands and retailers should ensure that this support is underpinned by deep technical knowledge suitable to the policy context, as selecting appropriate solutions is highly specific to the site, processes and financial, social and policy landscape
	Beneficial commercial terms	Beneficial commercial terms for sites within the supply chain could include terms that provide greater security for sites (longer contract terms, larger contracts), specific commercial benefits linked to performance (e.g. contractual benefits for reduced climate impact or investment), or selection criteria focused on recognising climate action and investment. These could help provide a business case for action in sites, but are limited to those actors with direct contractual arrangements with brands and retailers (although those directly contracted with these sites may indirectly benefit though similarly longer term or more beneficial business arrangements)
	Direct finance	The brand or retailer can act as a direct lender or funder of climate action within their supply chain. This could take the form of grants, loans or payment for technologies that are then installed in supplier sites. This could also take the form of direct payment of a premium to farmers - for example through a scheme such as Fairtrade, OCA, or other premium based programmes.
	Acting as an intermediary	In some cases, brands can act as an intermediary entity to seek finance for investment within the supply chain. This can, for example, take the form of a corporate green bond that is issued by the company, but used to directly or indirectly support supplier investment in climate action. The brand takes on the risk of the bond, and once the bond is mature will pay back the balance using either ROI from the investment, its own cashflow or balance sheet, or cashflow from other financial instruments.
Structural solutions	Grouping sites	Grouping smaller or less financially powerful sites into a shared structure can help address credit issues, as it can spread the likelihood or scale by which ROI issues or defaults on debt will occur across the group. It can also make it easier to engage a number of actors through an intermediary (such as through a corporate bond), to access markets

Solution type	Solution	Innovation opportunities
		that require a minimum size of loan or investment, to provide security on finance in an efficient manner, or to achieve maximum scale of impact from a single investment.
	Collaboration with other solution providers	For brands, individual engagement with sites in their value chain may be highly strategic - but they may also benefit from collaboration with others. This may be because they have shared suppliers (manufacturers producing for a range of brands, sourcing regions for specific commodities with shared risks etc) or because collaboration with financial institutions or impact programmes allows for specialist knowledge to lead the design of instruments. Collaboration with actors within the supply chain is also important - instruments must work for the actors being served.
Financial solutions	Loan guarantee	A brand or retailer may wish to provide the collateral or loan guarantee on a debt instrument for one or more supply chain partners, taking on the risk of the debt but not taking on the interest or repayment (except in case of default). This means that the size and credit rating of the brand can be leveraged to support smaller or higher risk actors that can afford to service and repay the loan through cashflow or ROI on the investment made.
	Blended finance	Blended finance is any approach that combines different finance types in order to create a final solution that reduces risk and increases scale of the instrument. A typical blended finance solution will involve at least one party that receives funding for climate action, and at least one other party that de-risks the financial instrument, and a 3rd that provides the actual funding. There can be many types of funding in blended finance (such as philanthropic or grant based finance, private sector finance, concessional finance), but typically it exists to de-risk private sector and commercial lending or investment in order to leverage a more limited collateral 'pot' of funding to attract private finance at a bigger scale.

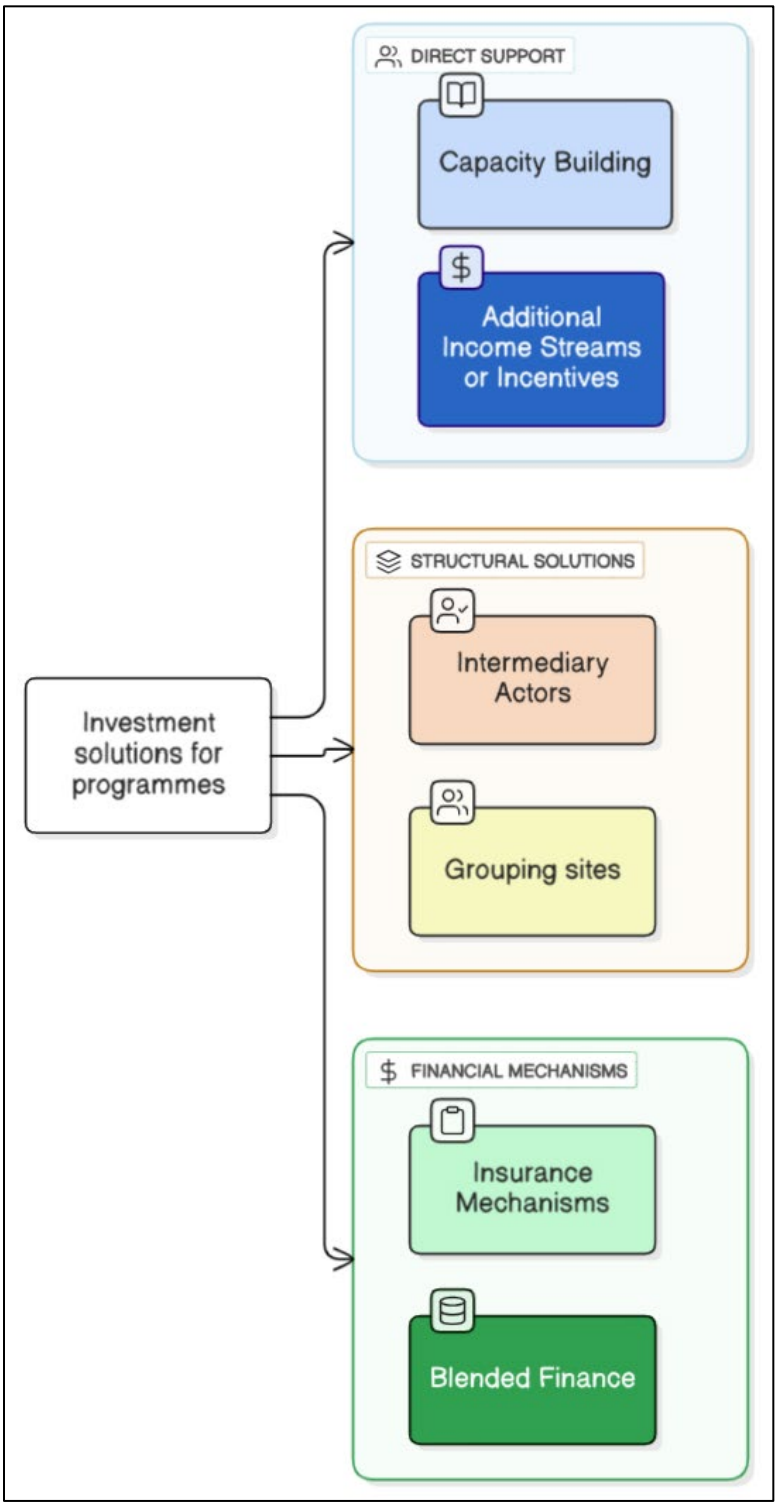
Programmatic solutions

Programmes working with supply chain actors - such as certification schemes, impact reduction programmes, or producer collectives - have similar options to brands and retailers but with different constraints and opportunities.

Broadly, programmes have the additional option of adding programmatic incentives for participating actors, as well as a natural structure in which to group different sites together.

Depending on their structure and the way in which they incentivise actors within the programme, they may also benefit from insurance mechanisms to secure programmatic outcomes - particularly if these are important to financial flows.

Finally, programmes may have more access to philanthropic funding or concessional finance, which may provide exciting opportunities for scale in financial support within the supply chain.



Solution type	Solution	Innovation opportunities
Direct support	Capacity building	Depending on the type of programme, capacity building may already be part of the scope of the organisation's engagement with supply chain actors. For example, many certification schemes already include technical support for impact reduction in farming, or sustainability programmes within business associations may already support sites in finding technical service providers. These entities therefore can focus on either: ● Financial capacity building or on accessing financial capacity on behalf of participants in the programme ● Quantification of impacts and risks and tailored guidance for sites on how to optimise climate action
	Additional income streams or incentives	Programmes have a number of options in how to activate additional income streams or incentives for sites. This may include: ● Product premiums ● Participation or practice based financial incentives ● Offset, inset or scope 3 GHG payments facilitated by the programme ● PES or other impact incentives beyond carbon claims and markets ● Grants, public funds or philanthropic funds These revenue streams are not only useful for incentivising climate action in participating actors, but also as potential revenue streams that can be used to service or pay back debt finance if combined with other mechanisms.
Structural solutions	Intermediary actors	A programme can choose to take on the role of an intermediary in order to de-risk or group demand for finance through one larger channel, taking on debt and securitisation roles directly. Programmes may also choose to create a special purpose vehicle for this purpose, or to collaborate with another intermediary that is able to secure finance for the programme.
	Grouping sites	Grouping sites is key to how a programme can structure innovative financial solutions. Participants in the

Solution type	Solution	Innovation opportunities
		programme may be grouped together, divided into sub-groups, or clustered geographically - but grouping sites that may be informal, small or otherwise not able to access finance creates a more attractive and feasible entity which is able to engage more meaningfully in financial markets. It also allows for investments in collective solutions, such as shared technologies, resilience or landscape interventions.
Financial solutions	Insurance mechanisms	Insurance mechanisms may be useful for a number of purposes: ● It can provide a payout of specific production outcomes are not met (crop failure, operational disruptions) ● It can provide a payout if incentives for climate outcomes do not materialise (results from the programme are poor, carbon credits do not sell) ● It can provide security if there is a reversal of an environmental benefit (e.g. SOC reversal, loss of forest land) Insurance comes with its own assessment of risk and premium payments, so should only be used when the financials for the insurer and the programme are favourable and premiums are not sufficient to undermine the overall business case
	Blended finance	*Collateral* for debt can come from many sources. A programme itself might in some cases be able to provide collateral where it has strong balance sheet reserves, but more normally it might look for: ● Philanthropic collateral ● Private sector collateral from brands and retailers with an interest in climate action across the participating sites ● Development bank collateral A programme may also consider leveraging concessional finance available to them to provide collateral for market rate loans to their participating sites, but this may provide too complex a structure or too high a risk for many organisations to take on.

Solution type	Solution	Innovation opportunities
		A Programme may also leverage a *loan guarantee* from a 3rd party in order to de-risk borrowing or lending to a group of sites. This would typically come from: ● A development or international bank ● Private sector actors such as brands and retailers with an interest in climate action across the participating sites

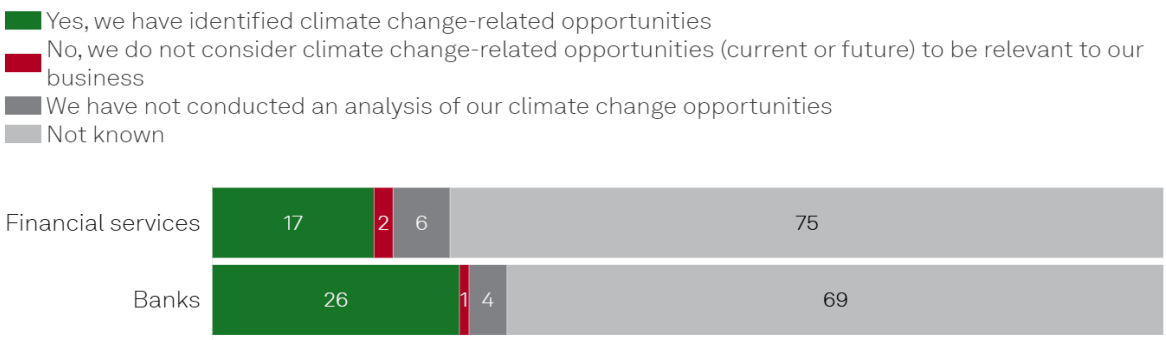
Potential benefits to the private sector and financial institutions

Innovative financial solutions must offer not only finance for climate action, but also a clear business case for all actors involved. The particular aim of many blended finance or de-risking financial solutions is to 'tap into' private, institutional or market finance, particularly commercial lending. Therefore, there should be a business case for both the entity de-risking the finance (for example by providing collateral or loan guarantees) and for the entity lending or investing within the instrument.

At a macro level, some financial institutions have not yet fully explored the degree to which climate action can represent opportunities for them. However, 21% have identified climate change related opportunities, whilst only 1-2% have explored potential climate change opportunities and found that they are not commercially viable. This opens the door to FIs that have not yet explored this potential to tap into the emerging opportunities for de-risked commercial lending to currently untapped markets.

21% of financial institutions confirm they have found climate change-related opportunities

Percentage of banks and financial services companies that have identified financial opportunities arising from climate change



Data as of Oct. 25, 2024.
Results based on responses from 1,647 companies in the banks and financial services industries assessed in the 2023 S&P Global Corporate Sustainability Assessment (CSA).
"Not known" refers to answers not verifiable in the supporting evidence or comment provided by the company, and for which CSA analysts could not find additional information.
Source: S&P Global Sustainable1.

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Analysis from Future Earth Lab (based on data from the World Bank, Climate Policy Initiative and other sources) estimates that of the widening finance gap to SMEs and Global South sites within the supply chain, approximately 12 billion USD per year of these increases are specific to site investment needs due to climate change. Extrapolated to 2030, this indicates a climate-specific gap of 135 billion USD per year for MSMEs. Drawing on World Bank data for commercial interest rates in typical supply chain regions[31], the estimated interest for climate action in the underserved SME supply chain would be 17 billion USD annually. At concessional or securitised rates of 1%, this interest would still be 1.35 billion USD annually.

In farming, we see an expected investment gap of 1170 billion USD for climate action by 2030, of which at least 410 billion USD would be needed for smallholder farms. Interest on this amount by commercial rates would be 52 billion USD annually, and concessional or securitised rates of 1%, this interest would still be 4.1 billion USD annually.

The total potential market within the global supply chain that is not currently supported with effective financial solutions for climate action is therefore estimated to be 545 billion USD per year, with a potential interest of 5-70 billion USD annually. This is without taking into account the potential compounding affects year on year of further annual borrowing required by sites.

[30] *https://www.spglobal.com/sustainable1/en/insights/special-editorial/narrowing-the-climate-finance-gap-will-take-more-action-from-banks*
[31] *https://data.worldbank.org/indicator/FR.INR.LEND*

Building an investment stack - the approach taken by the Unlock Programme

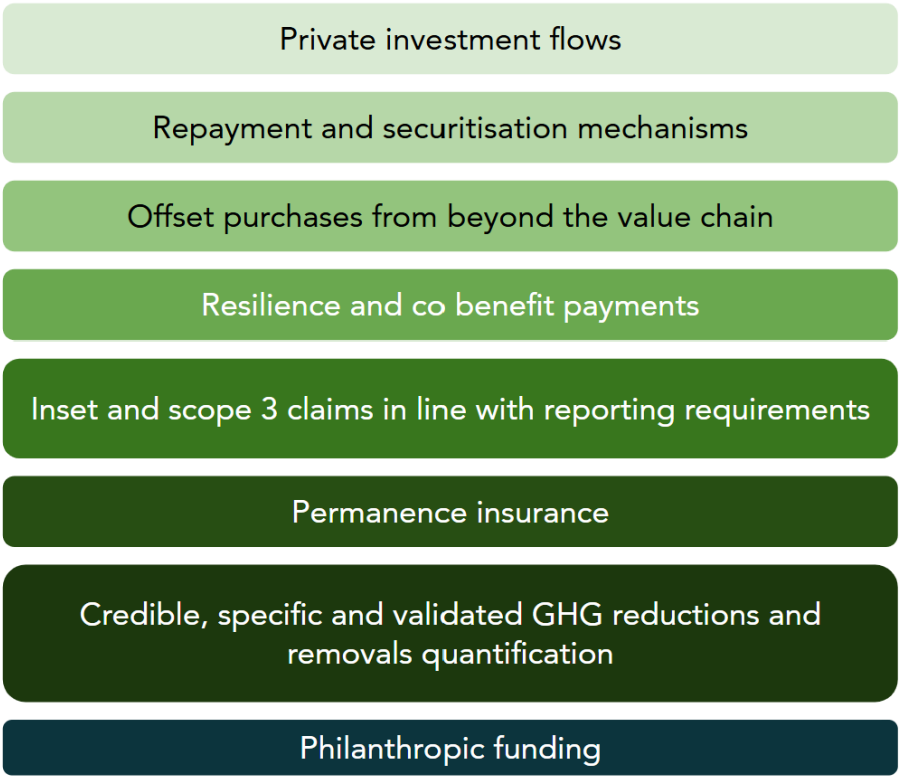
Future Earth Lab uses innovative practical solutions to address climate challenges with a particular focus on the Global South, and has developed and supported a number of new mechanisms designed to support financial flows to smaller and Global South actors. One of these initiatives is the Unlock Programme.

The Unlock Programme is a non-profit programme dedicated to improving access to hard-to-reach parts of the global supply chain through robust and credible climate action coupled with innovative financial solutions. It was developed by The Fashion Pact and climate consultancy firm 2050, funded in part by the Laudes Foundation and is now housed by Future Earth Lab.

Unlock already has a detailed and validated impact quantification and reduction method being implemented with 20,000 farmers in 2025, and has put in place additional incentives for farmers in the form of inset and scope 3 payments to farmers based on GHG reduction and removal outcomes. These outcomes are 'claimed' by companies that have these farmers within their supply chain, and the funds are passed to farmers to support and further incentivise them.

Future Earth Lab is bringing its knowledge and experience of innovative financial solutions for environmental action to create an innovative 'finance stack' for Unlock, leveraging a number of the innovative strategies outlined to support access to climate finance for under-served actors within the supply chain. This investment stack blends philanthropic, private sector and development funding and security in order to scale investment in farmer technologies and practices. It also groups farmers geographically and programmatically, and acts as an intermediary between lenders and farmers to allow for de-risked investment. Crucially, the Unlock impact payments (Unlock Units) are an important revenue stream that can be used to service and repay debt without farmers needing to access debt directly at all. Instead, Unlock secures funding, invests in practice change and technology, and then recoups the relevant funds from part of the additional payments made to farmers.

The Unlock Investment Stack



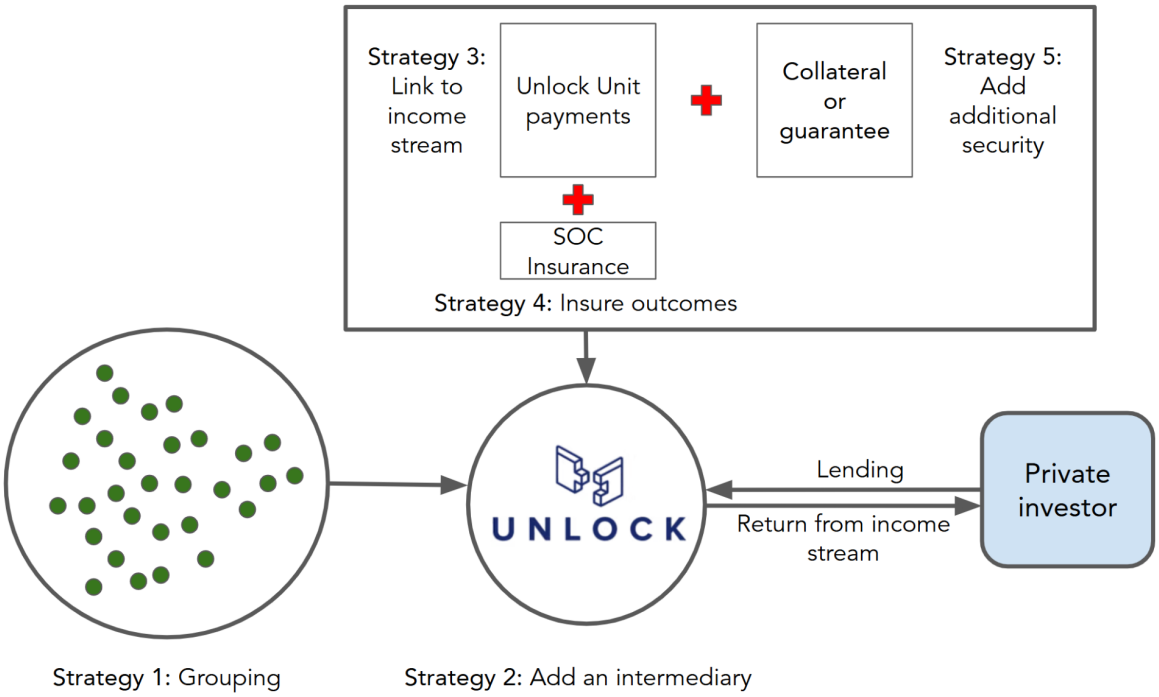
Unlock has partnered with philanthropic funders and received philanthropic donations from companies to pay for its initial development, and established a highly credible quantification system which can be the basis for the 'stack'.

This allows the programme to stack other solutions such as insurance 'on top' to de-risk these claims and issue them as insets and scope 3 claims that is financially supported by private companies looking for reduction and removals reporting within their supply chain. These payments are transferred to farmers to incentivize them to continue climate action and to provide an additional revenue stream.

In addition, brands will be invited to further support farmers in other impact areas and for farmer resilience, and will provide additional payments wherever this is strategic for them. Companies beyond the value chain will also be invited to purchase offset claims where these are available after scope 3 claims are completed, and to support further expansion of the programme.

Unlock will now set out to establish intermediary structures and security for farmer finance through loan guarantees and collateral from a range of actors, including philanthropic organisations,

development organisations, and companies seeking to support supply chain decarbonisation. This will allow private financial institutions to extend credit lines to Unlock's intermediary structures, which will in turn be used to invest in implementation of game-changing farming technologies that are otherwise highly challenging for farmers to afford. This will drive significant reduction in GHG and other impacts on site, driving radical decarbonisation within the supply chain, and increasing both the payments to farmers and the revenues available for service and repayment of loans.



This system is designed to rapidly decarbonise agricultural production within global supply chains, as well as supporting investment in climate adaptation and wider landscape and livelihood benefits for farmers. Ultimately it will do this using well-designed and de-risked financial structures that avoid adding any debt directly to farmers, create a clear revenue stream that can support financial obligations, and provide significant opportunities for scaling ultra-low-impact and regenerative farming practices globally.

Analysis from Future Earth Lab estimates that the scale of potential interest for commercial lenders from supporting action for the 20,000 farmers already enrolled in Unlock would be 13 million USD annually at a typical commercial interest rate for Low and Lower-Middle-Income countries, and 1 million USD at a 1% concessional or securitised rate. If scaled to cotton farmers globally, this could represent 64 billion USD annual interest at a commercial rate and 5 billion at a concessional or securitised rate.