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ORBITAS
Navigating climate transition risks

Executive Summary

Agriculture in the Age of Climate Transitions

Stranded Assets. Less Land. New Costs. New Opportunities.

AN INITIATIVE OF

CLIMATE ADVISERS TRUST

SUPPORTED BY

Norad

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

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Stranded Assets. Less Land.
New Costs. New Opportunities.

Agriculture in the Age of Climate Transitions

Orbitas is a center of excellence that examines climate transition risks for capital providers financing tropical commodities. Orbitas is an initiative established by Climate Advisers Trust (CAT). Orbitas is grateful to the Norwegian Agency for Development Cooperation (NORAD) for their generous financial support.

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DECEMBER 2020

Foreword

When economies change, **those that are most willing and able to adapt to new realities always come out on top.** In this respect, the transition to the zero-carbon economy that the scientific evidence so clearly tells us we need will be no different: the businesses, investors and financiers who prove themselves most able to devise and implement strategies that allow them to take advantage of the growing demand for climate-friendly goods and services will thrive in the economy of the future, while those that do not will struggle to survive.

We can already see this happening in the fossil fuel sector; yet in other sectors, many are still unaware of the changes that are coming down the line. This is particularly true of tropical agriculture. We established Orbitas to help the producers of internationally traded agricultural commodities and their capital providers to anticipate and adapt to the new government policies, corporate commitments and changing consumer preferences that the imperative to protect the world's forests will undoubtedly bring.

This report represents the first step in that process. By outlining the risks – and substantial opportunities – associated with the coming climate transition, we hope to initiate a conversation that will lead business and investors in the tropical agriculture sector to begin the process of adapting to a new reality in which the ability to expand agricultural land is likely to be severely constrained, standing forests have financial value and emissions costs need to be factored into business models.

Although we believe the evidence presented here is striking enough to command the attention of all actors in the tropical commodity sector, we also recognise that this is only a start. In the coming weeks we will publish deep dives on cattle-ranching in Colombia, palm oil in Indonesia and palm oil in Peru. And, in 2021, we plan to expand our analysis to cover more countries and commodities, put our methodology in the public domain and develop tools that enable direct assessment of individual companies and investment portfolios. We will also publish a disclosure framework compatible with the Task Force on Climate-Related Financial Disclosures (TCFD).

We would like to express our sincere appreciation and gratitude to all those who have made this work possible. The Norwegian Agency for Development Cooperation (NORAD) provided the core funding for Orbitas, and we received additional financial support from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The core modelling and analytical work was carried out by Michael Obersteiner, Nikolai Khabarov and Sylvain Leduc from the International Institute for Applied Systems Analysis (IIASA), Jason Eis, Bryan Vadheim, Mateo Salazar, Madison Cole and Alessa Widmaier of Vivid Economics and the Concordian Global team of Markus Walther, Emily McGlynn and Kandice Harper. Without their intellectual curiosity, rigour and commitment, none of this would have been possible. We are particularly grateful to Shally Venugopal for her outstanding leadership in coordinating collaboration and analysis across all the project partners. Finally, we would like to thank our Climate Advisers Trust colleagues for their creativity, intellect and collegiality, in particular Anthony Mansell and Ameer Azim, the core members of the Orbitas team.

Nigel Purvis
CEO, Climate Advisers Trust

Mark Kenber
Managing Director, Orbitas

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This report breaks new ground by illuminating how inevitable responses to today's climate crisis will impact global agriculture sectors. The first-of-its-kind economic and financial analysis presented here demonstrates that those associated with the $1.5 trillion global market for agricultural commodities must proactively manage so-called "climate transitions"—rapidly evolving policy, corporate, consumer, and civil society responses to the climate crisis.

A. INTRODUCTION

It is widely recognized that a meaningful climate transition will require systemic transformations in the global energy and transportation sectors, resulting in new sources of risk. For example, investors are increasingly aware that oil, coal and gas reserves are likely to become "stranded assets," i.e., assets whose values deplete or become unusable under climate transitions.

But climate transitions and their impacts are not limited to the energy and transportation sectors. Global agricultural sectors, which contribute to 23 percent of anthropogenic greenhouse gas (GHG) emissions globally, are similarly exposed.[2] Agricultural activity is also a key driver of forest loss, especially in the case of palm, beef and soy, which jointly account for 36 percent of global deforestation.[3] Yet, these sectors are largely overlooked by investors assessing climate transitions owing to a lack of awareness, inadequate measurement tools, the sector's complexity, and the absence of reliable data, among other factors. Of 24 capital providers recently surveyed by Orbitas--all of whom had tropical commodity exposure--not even one had screened their loan books and/or investments for agricultural transition risks.

The report's findings demonstrate that climate transition risks – and opportunities – are as material in agriculture as they are in the energy and transportation sectors. Our analysis shows that under climate transitions:

1. **Growth strategies premised on converting forests into farmland have no future.** In a world that adequately limits global temperature rises, up to 600 million hectares of agricultural land – or over 10% of agricultural land globally - would revert to forests.
2. **Companies relying on expansion into forested lands face significant asset stranding.** In Indonesia, up to 76% of unplanted forest concessions and 15% of existing palm oil assets could be written-down or off under a meaningful national climate transition.
3. **Greenhouse gas pricing and/or regulations will disrupt agricultural business models.** Global palm, beef, and soy producers alone face $19 billion in additional costs.

As countries strengthen their actions to reduce GHG emissions and growing populations demand more food, these transition risks (Box 1) will become increasingly evident. It is essential – both for the planet and investment returns - that commodity producers and their financiers are aware of these risks and factor them into their investment decisions.

Despite these material risks, agricultural companies and investors can also derive significant opportunities (Box 2) from climate transitions. By investing in sustainable intensification, regenerative agriculture, and diversifying revenue streams, forward-looking agricultural companies will see their net value and profitability rise under transitions. For example, our analyses show that in Indonesia climate transitions could boost the palm oil industry's value by US$9 billion. In Colombia, potential carbon sequestration revenues of up to US$485/hectare could dwarf current cattle ranching profits.

Policymakers have an essential role to play in ensuring that incentives for agricultural growth are aligned with the need for climate mitigation. The livelihoods and wellbeing of subsistence and family farmers, so-called "smallholders," will need particular attention. Smallholders produce around 40 percent of the world's palm oil and one-third of the world's food supply.[4,5] Indeed, our findings underscore that policies that disregard smallholders won't halt deforestation and will also fail these communities by not helping them finance the agricultural improvements necessary for them to thrive.

Box 1:
CLIMATE TRANSITION RISKS IN AGRICULTURE

Climate Transitions Risks

Stranded Assets

76%

of Indonesia's unplanted concessions at risk of becoming stranded assets.

15%

of current Indonesian plantations are on peatlands and are also at risk of stranding.

78%

less land available in Peru for palm expansion compared to business as usual.

Growth Constraints

286-604 million

hectares of global agricultural land will be converted to forest by **2050** compared to BAU.

This means cropland prices are higher by

50%

Carbon pricing plus NDPE restrictions lead to

7.5m ha

of extra forest cover and

13% less

land available for cattle ranching in Colombia in **2040.**

Emissions Costs

$19 billion

annual emissions costs for tropical agriculture companies.

15%

of total operational costs for palm oil companies in Peru and Indonesia by **2040.**

By **2040**, Colombian cattle breeders face emissions costs almost

6 times

higher than current production costs.

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B. ORBITAS APPROACH

Assessing climate transition risk impacts in agriculture requires addressing the complex relationships within and between commodities, value chains, and the broader economy. Existing scenario analysis frameworks tend to focus on the energy and transportation sectors, discounting the major role of agriculture, forest, and land use change activities in anthropogenic GHG emissions.

To address this gap, Orbitas collaborated with Concordian, Vivid Economics, and the International Institute for Applied Systems Analysis (IIASA) to create transition risk analysis tailored for agricultural commodities. The result is a pioneering analytical framework that draws together a number of economic and financial models alongside land use and industry datasets to quantify the financial impacts of a range of possible climate transitions on tropical soft commodity production. This framework and its results offer a first-of-its-kind tool for investors to examine how agricultural portfolios and investees fare in various climate transition scenarios.

Our framework, which is outlined in Figure 1 and detailed in this report's accompanying Technical Guidance, consists of four steps:

a) **Climate Transition Scenario Planning:** We start by defining five global and three corresponding national climate transition scenarios--Historical (Baseline), Modest, and Aggressive--which represent increasing levels of climate ambition. These scenarios vary by climate mitigation policies, forest area protections, bioenergy pathways, and consumer diets.[6]

b) **Sectoral Projections:** We use Step 1's scenarios as inputs into macroeconomic and land use modelling tools that project how, and to what extent, climate transitions would impact global and regional agricultural commodity prices, production, and land use over the next 30 years.

c) **Industry Impact Evaluation (National):** Using Step 1's scenarios and Step 2's projections, we use land use, financial, and economic models to evaluate transition impacts on three case study industries: Indonesian palm oil, Peruvian palm oil, and Colombian beef. These three industries were chosen due to their high emissions-intensity and historical association with tropical deforestation, but also to represent regional variation and different industry maturities.

d) **Company-Level Vulnerability Analysis:** Finally, we use a mix of risk benchmarking, company-level profitability projections, and market power analysis to stress-test the vulnerability of companies to the industry impacts identified in Step 3.

C. KEY RESULTS

Our analysis finds that across all scenarios, agricultural demand and prices rise over the next fifty years to feed a growing and increasingly wealthy global population. By 2050, our model projects agricultural commodity prices that are 10 to 40 percent higher, and production volumes around 50 percent higher than today across all scenarios. These results are primarily driven by higher demand for food and bioenergy, which overcomes the competing force of rising production costs.

Climate transitions' favorable pricing conditions benefit many agricultural commodity markets if companies manage these changes effectively-- e.g., in Indonesia, an Aggressive climate transition could boost the palm oil industry's baseline value by at least $9 billion if companies invest in sustainable yield improvements, avoid high carbon stock and conservation value lands, and invest in new revenue streams like intercropping and biogas capture and cogeneration. But in some emissions-intensive sectors like beef, market value deteriorates due to higher input and production costs and because consumers shift toward more sustainable alternatives.

Under climate transitions, most agricultural producers face three material risks: stranded assets, growth constraints, and emissions costs. These are detailed below.

1. Stranded Assets
Effective climate transitions will require society to protect and restore high carbon stock and high conservation value lands, including forests and peatlands. Already, corporate purchasers have put in place No Deforestation, No Peat, No Exploitation (NDPE) requirements for their suppliers. Under climate transitions, government-mandated land use restrictions will further threaten to render assets stranded, particularly in palm:

- In Indonesia, up to 76%–almost 10 million hectares–of the country's unplanted concessions and up to 15% of existing smallholder and industrial palm plantations on peat are at risk of asset stranding and/or losing value under an ambitious climate transition.[7]
- In Peru, 97% of palm-suitable land is located on forest and/or peat soils; to avoid stranded asset risks, producers must focus on expanding into already degraded lands. Grupo Palmas–the industry's largest cultivator–has already had to forgo clearing forests within their owned land banks in response to civil society outcry.

Orbitas' framework offers a first-of-its-kind tool to examine agriculture across various climate transition scenarios.

Box 2:
CLIMATE TRANSITION OPPORTUNITIES IN AGRICULTURE

Climate Transitions Opportunities

By acting optimally, Indonesia's palm oil industry could realize **$9 billion** in additional value.

Higher demand for food and bioenergy drives commodity prices **10-40%** higher. Production also increases by **50%**, but only sustainable companies will capitalize.

Installing biogas generation facilities at Indonesia palm oil mills increases enterprise value by **400%**

Carbon sequestration payments for Colombian forests reach as much as **$485/ha**, far higher than revenues obtained from dairy and beef sales from cattle ranchers.

Upgrading practices improve profitability, but will require capital investments **30% higher** than under a business as usual pathway.

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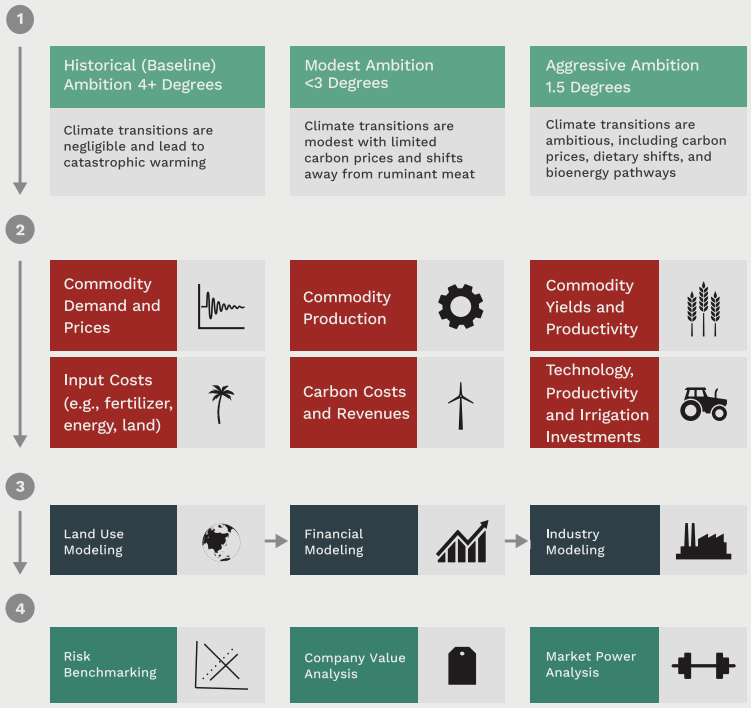
Figure 1:
TRANSITION RISK FRAMEWORK FOR AGRICULTURE



Source: Authors

Beyond legal stranding, companies face "economic stranding" under climate transitions as some assets are no longer able to generate the output and revenues required to offset expected increases in production costs.

- In Indonesia, we expect significant economic stranding where palm plantation and mill expansion is NDPE-restricted; for example, our analysis finds that Kalimantan Barat's palm industry could see its value decline by $512 million under an Aggressive climate transition relative to the baseline pathway.
- In Colombia, as beef demand and production ramp down, breeders, slaughterhouses, processing plants and warehousing facilities are likely to see significant write-downs.
- Economic stranding in many industries is highly associated with sustainability strategies and transparency: for example, in Indonesian palm oil, the company with the greatest expected losses under transitions–BEST group–also has among the lowest industry SPOTT[8] scores (1.3%)–a measure of its environmental, social, and governance (ESG) practices.[9]

2. Geographic Growth Constraints

Under climate transitions, the combination of land use restrictions and carbon sequestration payments incentivizes net forest gains at the expense of agriculture. We project total global net agricultural land losses ranging from 4 to 15% of current area--286 to 604 million hectares--by 2050 under our transition scenarios, relative to the baseline scenario. Tropical agricultural commodity-producing regions like South America, Southeast Asia, Africa, and China see the largest drops in agricultural land. These trends are also apparent in our industry analyses:

- In Indonesia, within 20 years, an Aggressive climate transition would lead to 15 million hectares more forest cover compared to the baseline scenario, thereby reducing the maximum future footprint of industrial oil palm plantations by 31%.
- In Peru, within 20 years, NDPE restrictions under an Aggressive climate transition would reduce land available for industrial palm[10] by 78% relative to the baseline scenario.
- In Colombia, within 20 years, even a Modest transition with zero-deforestation restriction results in forest expansion of 2.6 million hectares, reducing total available land for commercial ranching (i.e., contiguous tracts of over 200 hectares on land suitable for cattle[11]) from 13.7 million hectares to 11.9 million hectares of land (-13%).

3. Emissions Costs

Within just ten years, we project that an Aggressive transition's carbon pricing would mean emissions costs of up to $19+ billion annually in beef, palm, and soy. The beef supply chain is particularly emissions-intensive; annual emissions costs would reach more than $11 billion by 2030. That is equivalent to 1% of revenue in the global beef sector, which is material for an industry that operates on tight margins. And while total emissions costs in 2030 are lower in palm and soy than in beef, the cost as a percentage of sector revenue is notably higher, at roughly 8% for palm oil and 3% for soy (Figure 2, next page). In our industry case studies, emissions costs are also material:

- In Indonesia and Peru, direct operational emissions costs (including from fertilizer application, diesel fuel use, and mill processing) for an archetypical mill-plantation would comprise up to 15% of annual operational costs within 20 years.

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- Emissions costs for Colombia's commercial beef producers would be devastating; large breeders (over 250 head) in particular would see operational emissions costs rise to a level equal to total projected production costs within 10 years. Within 20 years, these emissions costs rise to almost 5 times the projected production costs.[12]

The beef supply chain is particularly emissions-intensive; annual emissions costs would reach more than $11 billion by 2030.

D. RISK EXPOSURE AND VULNERABILITY ANALYSIS

To manage these three risks, agricultural producers will need to undergo radical transformations in their operational and growth strategies – namely, by increasing productivity. Under an Aggressive transition, the average cost of cropland by 2050 is nearly 50% higher than in the baseline scenario; in our industry-specific analyses, shadow agricultural land values almost double by 2040. Traditional growth strategies relying on land clearing and limitless geographic expansion are clearly no longer tenable under climate transitions. Instead, producers will have to find low carbon means to increase yields on existing land.

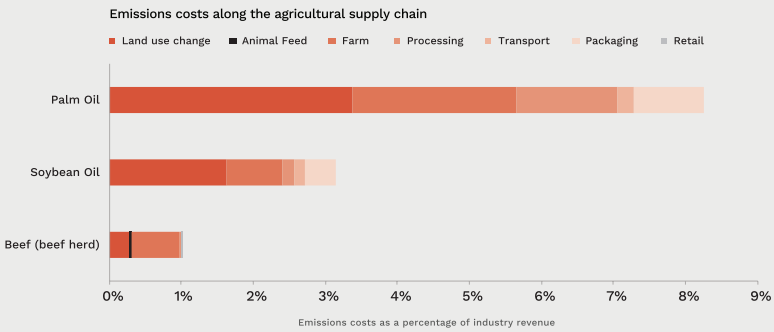
While sustainable productivity investments are essential under transitions, they will not come cheaply: firms must raise funds today to adequately cover necessary increases in operational and capital expenditures, particularly to boost productivity. Public investments are also required, especially to support smallholders. By 2050, cumulative required investments in technological change under climate transitions are between 6 and 30 percent higher than in the baseline scenario.

Where productivity increases are costly or inadequate to combat rising production costs, we expect land conversion to more profitable crops like palm or, in some areas, back to forest. In Colombia, where 63% of the country's existing pasture overlaps with palm-suitable land,[13] beef producers may find it more profitable to sell their land, convert to palm--which provides 15 times higher profit margins[14]-- or even reforest for carbon sequestration payments.

Smallholders will play a pivotal role in both increasing industry productivity and meeting climate goals. Smallholders require substantial technical and financial assistance to close current yield gaps, but nevertheless represent low hanging fruit to increase industry productivity cheaply. Notably, overlooking the need for smallholder support from both the public and private sectors will jeopardize valuable forest and peatlands, especially since local land use restrictions are likely to be more lenient for smallholders. In Indonesia, for example, our models project that without enforcement of zero deforestation, smallholders could expand into up to 5 million hectares of forest and peatlands by 2040 under a Modest climate transition.

Low carbon, efficient producers with capital access are best positioned to manage transition risks and also stand to gain under our Aggressive climate transition scenario. Producers who proactively pursue deforestation-free growth strategies, increase yields sustainably, and find smart ways to capture GHG emissions can considerably benefit from the rising commodity and/or GHG emissions prices associated with ambitious climate transitions; for example:

FIGURE 2:
2030 SUPPLY CHAIN EMISSIONS COSTS AS A PERCENTAGE OF INDUSTRY REVENUE FOR A 1.5 DEGREE WORLD



Source: Vivid Economics
Notes: 1.5C Strong Ambition LP Scenario; Emissions intensities from Poore & Nemecek (2018) are multiplied with model-led 2030 production results by commodity to yield emissions by each commodity by supply chain position in 2030. The emissions share of each commodity and supply chain position is then multiplied by the total emissions cost to obtain an estimate of emissions costs along the supply chain for each commodity. Emissions costs are then normalized by total industry revenue. Note that while beef represents the lowest emissions costs as a percentage of industry revenue, beef production is the most expensive in absolute terms, with more than $11billion in annual emissions costs. Emissions costs are GHG certificate prices – these do not include search, information, or trade costs.

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- Installing biogas generation facilities in mills in 2030 (when carbon prices start to become material) could boost an Indonesian palm oil company's enterprise value[15] by four times or more due to reduced emissions, diesel fuel needs and electricity sales.
- In Colombia, converting an average-sized dual-purpose (dairy and beef) ranch to an intensive silvopastoral system (ISPS) that includes high-density fodder shrubs and timber trees would result in the following benefits under transitions:
  - Emissions and their associated costs are up to 44% lower, while potential certified-sustainable price premiums boost sales revenues by up to 23%.
  - Storing carbon provides potential revenues as high as $485 per hectare–which is much higher than current per-hectare revenues from dairy and beef sales.

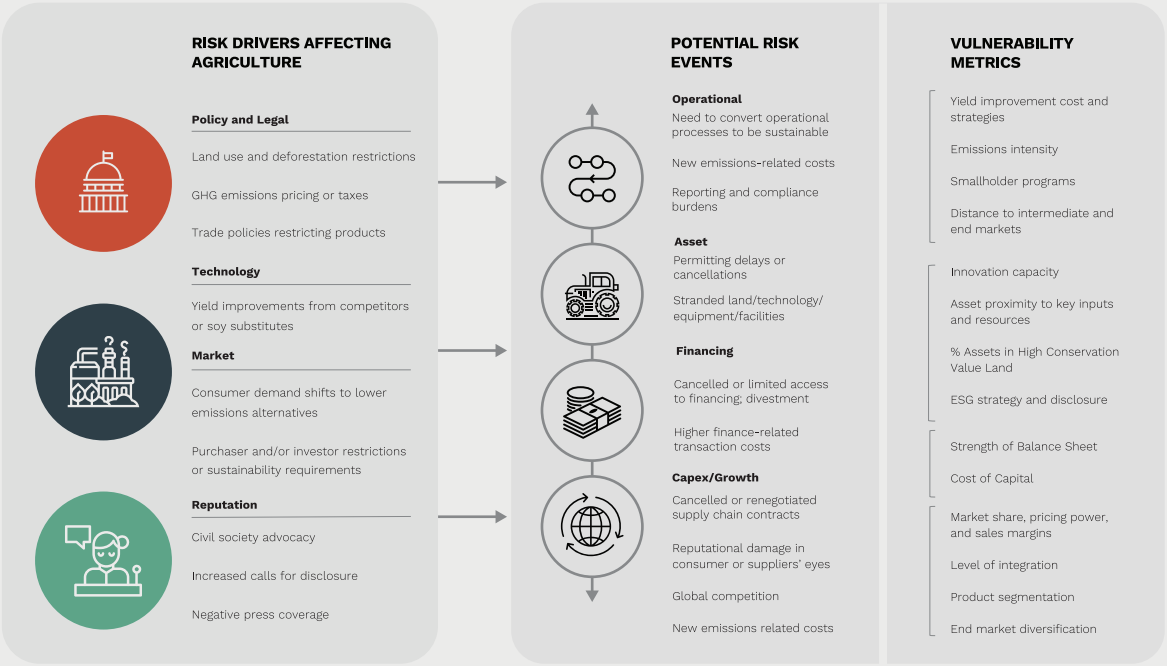
E. CONCLUSIONS AND RECOMMENDATIONS

Our analysis makes it clear that climate transitions pose material risks to companies and investors who are unwilling or unable to adapt to their associated shifts. But these same transitions create significant opportunities for those who can and do proactively embrace sustainable practices. This report and our methodological framework provide important guidance to companies, investors, and policymakers. Our findings clearly underscore that these actors must examine climate transitions more closely and take the following actions:

Agricultural producers should embrace the opportunities afforded by climate transitions, but also adopt the following risk mitigation strategies:

- Institute and enforce NDPE policies, including by progressing toward 100% supply chain traceability and meaningful technical and credit support to smallholders.
- Invest in increasing yields sustainably, including by closing smallholder yield gaps within agricultural supply chains.

FIGURE 3:
CLIMATE TRANSITIONS AND VULNERABILITY METRICS



Source: Concordian

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- Shift to emissions-mitigating agroforestry techniques like intercropping and technologies like biogas capture and cogeneration which will lower costs, increase productivity, and diversify income as a hedge against likely commodity and energy price volatility.

Climate transitions pose material risks to companies and investors who are unwilling or unable to adapt to its associated shifts.

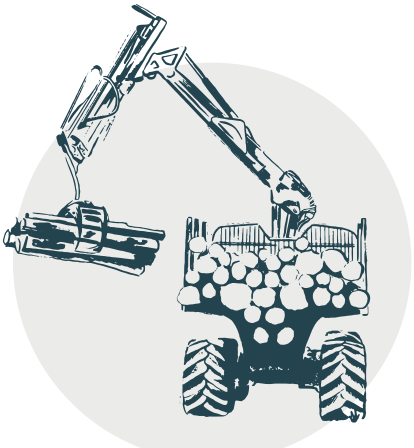
Investors and financiers should shift capital toward sustainable companies, technologies, and practices. Climate transitions will magnify the divide between sustainable and unsustainable business practices and render emissions-reducing technologies more appealing. To preserve capital returns and repayment security, investors with agricultural exposure should:

- Require investees to assess and disclose climate transition risks and associated vulnerability indicators (see Figure 3) using the methods detailed herein alongside other guidance from existing disclosure frameworks (e.g., such as the Sustainability Accounting Standards Board (SASB), CDP, TCFD, and World Business Council for Sustainable Development (WBCSD)).
- Arrange results-based financing to incentivize company investments in emissions-reducing growth strategies that are well-positioned under climate transitions.
- Encourage investees to consider climate transitions across all business lines and supplier relationships, and as an essential input into business growth strategies.
- Shift capital away from companies that are vulnerable to stranded asset risks, i.e., companies whose growth relies on expansion into high carbon stock and conservation value lands.

Policymakers can simultaneously support economic growth, climate goals, food security, poverty alleviation, and energy independence by:

- Investing heavily in improving agricultural productivity, particularly by scaling up technical assistance, grants, and favorable credit to smallholders.
- Implementing and enforcing forest and peatland protections, which protect industries from reputational risks, preserve valuable ecosystems, and inspire consumer confidence.
- Providing agricultural actors, their financiers, civil society, and consumers with robust, and where possible, spatially specific, industry and land use data.

Climate transitions will magnify the divide between sustainable and unsustainable business practices and render emissions-reducing technologies more appealing.



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References

(1) FAO, "The State of Agricultural Commodity Markets 2020" , FAO, Rome, 2020
(2) Shukla, Priyadarshi, Jim Skea, Eduardo Calvo Buendia, Valérie Masson-Delmotte, Hans-Otto Pörtner, Panmao Zhai, Raphael Slade, Sarah Connors, Renée van Diemen, Marion Ferrat, Eamon Haughey, S. Luz, Suvadip Neogi, Minal Pathak, Jan Petzold, & Joana Portugal Pereira, "Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems," IPCC, 2019, https://www.ipcc.ch/srccl/. **(3)** 36 percent of global tropical forest loss between 2000 and 2011 was driven by the production of beef, palm oil, and soy. Tropical Forest Alliance, "Commodities and Forests Agenda 2020: Ten priorities to remove tropical deforestation from commodity supply chains," World Economic Forum, September 2017, https://climatefocus.com/sites/default/files/TFA2020_CommoditiesandForestsAgenda2020_Sept2017_0.pdf. **(4)** https://rspo.org/smallholders **(5)** https://www.sciencedirect.com/science/article/pii/S2211912417301293
(6) For each global scenario, we assess risk exposure for a basket of agricultural commodities using MAgPIE, an open source land use allocation model that projects commodity prices, production, productivity, and land use, among other variables. MAgPIE is the Potsdam Institute's Model of Agricultural Production and its Impact on the Environment, See this report's accompanying Technical Guidance for additional details on MAgPIE. **(7)** Due to spatial and temporal misalignments between concession data sets and planted palm data sets, our calculations may over or understate the amount of unplanted palm in forest and/or peat. Nevertheless, these calculations are based on the most reputable and recent publicly available data and provide a useful indication of the extent of asset stranding risks under climate transitions. **(8)** Sustainability Policy Transparency Toolkit, available at: http://spott.org **(9)** Percentage of concession area that is unplanted peat land or forest (2%) plus percentage of concession area that is palm on peat (25%). Estimate is based on Greenpeace 2015 concessions map; 2015 forest cover derived from Hansen et al. 2013; 2012 peat map from Indonesian Ministry of Agriculture (obtained from Global Forest Watch); planted palm maps from Kemen Austin, Austin et al. 2017, and Danylo et al. 2020. **(10)** Tracts of non-forest, non-peat, palm-suitable land with minimum size of 1,000 hectares. **(11)** As defined by the Colombian rural agricultural planning agency, UPRA. **(12)** This assumes that the Colombian government does not provide any kind of subsidies to the industry to cope with emissions costs increases. **(13)** Concordian, combining a land use map from IDEAM 2012 and an oil palm biophysical suitability map from Pirker et al. 2016. Administrative boundaries are from GADM. See Technical Guidance for more details.
(14) FEDEGAN, "Beef Production and Silvopastoral Systems,"Agri Benchmark Beef and Sheef Conference, 2015, http://www.agribenchmark.org/beef-and-sheep/conferences/2015-colombia.html. **(15)** Enterprise value (EV) represents the takeover value, i.e, the amount of money an investor should have to pay to get complete ownership of the company.
It is calculated by taking a company's projected free cash flows and discounting them at an industry-appropriate weighted average cost of capital.

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