

CLIMATE RISK EXPOSURE SCREENING REPORT

Level I of the IDB Invest Climate Risk Assessment

Monday, December 6, 2021

Transaction Name	Empresas Ariztia
Transaction Number	13720-01
Physical Risk Exposure	Medium
Transition Risk Exposure	Medium

This report classifies the project into low, medium or high exposure in two areas, physical and natural disaster risk and low carbon transition risk.

Physical risk relates to hazards caused or exacerbated by acute¹ or chronic² shifts in climate patterns and include exposure to e.g., hurricanes, floods, sea level rise or chronic heat waves.

Transition hazards relate to the financial and operational impacts that may result from society's transition to a low-carbon economy, e.g. policy, market, reputational, technology and supply chain changes that may affect the project.

Physical Risk Exposure:

Pursuant to IFC PS 1 (policies) and 4 (natural disasters, emergency management)

The screening considered five locations, four of which are in the Santiago de Chile region and one of them in Arica in the north of Chile. It is noteworthy that the hazard exposure indicated below does not necessarily concern all of the five asset locations that were screened. A site-specific analysis can yield more specific insights, also with respect to applicable asset-specific vulnerabilities.

The locations overall are exposed to a variety of chronic hazards. Drought exposure is moderate, with significant changes potentially occurring as a result of climate change. Similarly, depending on the climate model used, changes in precipitation patterns are modelled to be moderate to high. Lastly, there is moderate to high water supply scarcity both considering historical trends and towards the end of the century when considering climate change progressing.

In terms of acute hazards, there is moderate to high exposure to earthquakes and high exposure to tsunamis. There is also moderate exposure to riverine flooding, both considering historical trends and considering the (pessimistic) RCP 8.5 climate scenario.

Given this exposure to a variety of natural hazards, it is important to see in how far the client has considered climate and natural disaster risk in management systems and processes, such as its risk matrix, emergency preparedness and response procedures and community health and safety at large.

¹ Acute or rapid onset hazards occur in the short term and have a short duration (e.g. earthquakes, floods, landslides, severe storms, and wildfires).

² Chronic or slow onset hazards take years to develop (e.g. drought, sea level rise (SLR) and pest infestations).

Transition Risk Exposure:

Pursuant to IFC PS 1 (policies) and 3 (GHG emissions)

The project's exposure to transition risk is considered moderate based on the industry and country of the client. Chile is amongst the countries in the region best positioned to facilitate a quicker decarbonization of the economy, and consequently policy risk (e.g., from carbon legislation) for emission-intensive agricultural clients increases. This is not least the case considering that the Chilean NDC targets the agriculture sector.

The meat, poultry and dairy industry at large is the segment of the agriculture sector with the highest exposure to transition risk due to production-related emission intensity - however, poultry clients are less exposed than meat clients and are backed by rising demand. The client is likely to face emissions primarily related to feed production, but also to on-farm energy use, post-farm processing and transport and manure storage/processing. Lastly, in the supply chain, the client may face risk related to potential deforestation in the production of the soy used as poultry feed.

Improving the efficiency of energy generation and supply and of energy use (on- and off-farm) constitute climate opportunities for this client. The client may also engage with feed suppliers to improve the sustainability of production practices, e.g., by improving the efficiency of crop production (particularly related to fertilisation management) and by ensuring no deforestation is associated with feed production.

Using this report

This report informs the Environmental and Social Due Diligence (ESDD), depicting which natural hazards and physical climate conditions as well as which risks associated with the low carbon transition the project may be exposed to. It builds the foundation for further analysis by classifying projects into low, moderate, or high exposure for the two respective categories.

*This report **does not** indicate whether a project is vulnerable or has the necessary mitigants in place. Where exposure is high or moderate, further analysis is necessary, pursuant to Level 2 of the Climate Risk Assessment methodology to gauge whether exposure to the identified hazards is critical and whether a project is vulnerable to such hazards.*

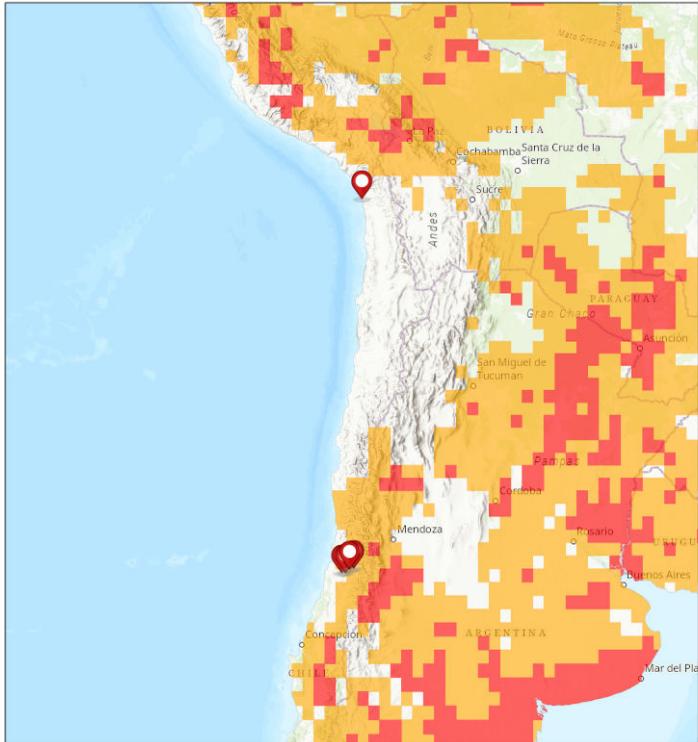
The SEG Officer may integrate the findings of this screening report into the Environmental and Social Review Summary (ESRS), in the relevant sections relating to PS1, PS3, PS4 and PS6³. Actions derived from this screening may be integrated into the Environmental and Social Action Plan (ESAP).

This report is for informative purposes only and IDB Invest assumes no liability as regards to any investment, divestment or retention decision taken by the investor based on this report.

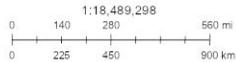
³ When applicable.

Area of Interest (AOI) Information

Dec 6 2021 17:33:45 Eastern Standard Time



Drought hazard
 High
 Moderate



Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, USGS

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Drought hazard

#	Hazard	Area(hectares)
1	Moderate	N/A

Drought hazard_change for the end of the century (with Climate Change)

#	Risk	Area(hectares)
1	High	N/A

Water Supply Scarcity hazard - Water Supply Scarcity hazard

#	Risk	Area(hectares)
1	Moderate	N/A
2	High	N/A

Water Supply Scarcity hazard_End of the Century (with Climate Change)

#	Risk	Area(hectares)
1	Moderate	N/A
2	High	N/A

Riverine Flooding Hazard

#	Hazard	Area(hectares)
1	Moderate	N/A

Riverine Flooding Hazard with Climate Change - Riverine Flooding CC Final

#	Hazard	Area(hectares)
1	Moderate	N/A

Precipitation changes_BCCCSM11

#	Hazard	Area(hectares)
1	High	N/A

Precipitation change GFDL_CM3

#	Hazard	Area(hectares)
1	Moderate	N/A
2	High	N/A

Precipitation changes MRI CGCM3 - RCP8.5

#	Hazard	Area(hectares)
1	High	N/A

Precipitation Change MIROC_ESM_CHEM

#	Hazard	Area(hectares)
1	Moderate	N/A
2	High	N/A

Precipitation change MIROC5

#	Hazard	Area(hectares)
1	High	N/A

Earthquake hazard

#	Hazard	Area(hectares)
1	High	N/A
2	Moderate	N/A

Tsunami hazard

#	Hazard	Area(hectares)
1	High	N/A

Critically Endangered Species

#	Class	Order	Family	Species	Range Type	Area(hectares)
1	AMPHIBIA	ANURA	RHINODERMATIDAE	Rhinoderma rufum	Extant (resident)	N/A
2	AVES	CAPRIMULGIFORMES	TROCHILIDAE	Eulidia yarrellii	Extant (resident)	N/A

Endangered Species

#	Class	Order	Family	Species	Range Type	Area(hectares)
1	INSECTA	HYMENOPTERA	APIDAE	Bombus dahlbomii	Extant (resident)	N/A
2	MAMMALIA	CETARTIODACTYLA	BALAEOPTERIDAE	Balaenoptera musculus	Extant (resident)	N/A
3	MAMMALIA	CHIROPTERA	VESPERTILIONIDAE	Myotis atacamensis	Extant (resident)	N/A

Near Threatened Species

#	Class	Order	Family	Species	Range Type	Area(hectares)
1	AVES	GRUIFORMES	RALLIDAE	Laterallus jamaicensis	Extant (resident)	N/A
2	AMPHIBIA	ANURA	BUFONIDAE	Rhinella arunco	Extant (resident)	N/A
3	MAMMALIA	RODENTIA	OCTODONTIDAE	Octodon lunatus	Extant (resident)	N/A
4	MAMMALIA	LAGOMORPHA	LEPORIDAE	Oryctolagus cuniculus	Extant & Introduced (resident)	N/A
5	MAMMALIA	RODENTIA	CRICETIDAE	Chelemys megalonyx	Extant (resident)	N/A
6	AVES	CHARADRIIFORMES	SCOLOPACIDAE	Calidris canutus	Extant (non-breeding)	N/A
7	AVES	CHARADRIIFORMES	CHARADRIIDAE	Charadrius nivosus	Extant (resident)	N/A
8	AMPHIBIA	ANURA	ALSODIDAE	Alsodes nodosus	Extant (resident)	N/A
9	MAMMALIA	CARNIVORA	FELIDAE	Leopardus colocolo	Extant (resident)	N/A
10	AVES	CHARADRIIFORMES	SCOLOPACIDAE	Calidris pusilla	Extant (non-breeding)	N/A
11	AVES	PHOENICOPTERIFORMES	PHOENICOPTERIDAE	Phoenicopterus chilensis	Extant (resident)	N/A
12	AVES	CHARADRIIFORMES	CHARADRIIDAE	Phegornis mitchellii	Extant (resident)	N/A
13	AVES	CATHARTIFORMES	CATHARTIDAE	Vultur gryphus	Extant (resident)	N/A
14	AVES	SULIFORMES	PHALACROCORACIDAE	Leucocarbo bougainvilliorum	Extant (resident)	N/A

Restricted Range Species

#	Class	Order	Family	Species	Range Type	Area(hectares)
1	AVES	PASSERIFORMES	FURNARIIDAE	Ochetorhynchus melanurus	Extant (resident)	N/A
2	MAMMALIA	RODENTIA	OCTODONTIDAE	Octodon lunatus	Extant (resident)	N/A
3	REPTILIA	SQUAMATA	DIPSADIDAE	Pseudalsophis elegans	Extant (resident)	N/A
4	REPTILIA	SQUAMATA	DIPSADIDAE	Philodryas tachymenoides	Extant (resident)	N/A
5	REPTILIA	SQUAMATA	DIPSADIDAE	Philodryas simonsii	Extant (resident)	N/A
6	MAGNOLIOPSIDA	CARYOPHYLLALES	CACTACEAE	Eriosyce engleri	Extant (resident)	N/A
7	REPTILIA	SQUAMATA	TROPIDURIDAE	Microlophus tarapacensis	Extant (resident)	N/A
8	AVES	CAPRIMULGIFORMES	TROCHILIDAE	Eulidia yarrellii	Extant (resident)	N/A
9	AVES	PASSERIFORMES	THRAUPIDAE	Conirostrum tamarugense	Extant (non-breeding)	N/A
10	AMPHIBIA	ANURA	ALSODIDAE	Alsodes nodosus	Extant (resident)	N/A
11	REPTILIA	SQUAMATA	TROPIDURIDAE	Microlophus quadrivittatus	Extant (resident)	N/A
12	AMPHIBIA	ANURA	RHINODERMATIDAE	Rhinoderma rufum	Extant (resident)	N/A
13	MAGNOLIOPSIDA	CARYOPHYLLALES	CACTACEAE	Haageocereus decumbens	Extant (resident)	N/A

Vulnerable Species

#	Class	Order	Family	Species	Range Type	Area(hectares)
1	AVES	SPHENISCIFORMES	SPHENISCIDAE	Spheniscus humboldti	Extant (breeding)	N/A
2	MAMMALIA	CARNIVORA	FELIDAE	Leopardus guigna	Extant (resident)	N/A
3	MAMMALIA	CHIROPTERA	FURIPTERIDAE	Amorhochilus schnablii	Extant (resident)	N/A
4	AVES	CAPRIMULGIFORMES	APODIDAE	Chaetura pelagica	Extant (non-breeding)	N/A
5	AVES	PASSERIFORMES	HIRUNDINIDAE	Progne murphyi	Extant (resident)	N/A
6	AMPHIBIA	ANURA	CALYPTOCEPHALIDAE	Calyptocephalella gayi	Extant (resident)	N/A
7	AVES	PASSERIFORMES	THRAUPIDAE	Conirostrum tamarugense	Extant (non-breeding)	N/A

If any indigenous or afrodescendant community is found within the project area, a Sociocultural Analysis should be carried out.

Disclaimer: this Screening App is a work in progress. We strive to update and add new maps and information to the platform, but many gaps remain. Note that the absence of data does not indicate the absence of indigenous or community land, biodiversity issues or disaster and climate change risk issues.

TRANSITION RISK ASSESSMENT

ABOUT THE REPORT

Transition risk is defined as the financial risk related to the transition to a low-carbon economy. This report forms part of the first level of the Climate Risk Assessment (CRA) performed by the Social, Environmental and Governance Division (SEG) for direct investments during the environmental and social (E&S) due diligence phase. Here, SEG classifies projects into low, medium or high transition risk^{1,2} and provides information about the general transition risk profile of the project based on key characteristics such as industry and country. As this report is a semi-automated rapid risk profile, not all aspects included in the report may be applicable to the project at hand.

Low-classified projects require no further analysis regarding transition risk and the process concludes.

Medium or high classified projects require further analysis (CRA level two) to assess whether the project is in fact vulnerable to or has the necessary mitigants in place to respond to the gross risk identified, taking into account aspects such as project-level GHG emissions, reduction strategies and technology used.

During the follow-up meeting to the CRA screening, the SEG Officer and the Climate Risk Officer discuss the report and next steps.

1: High exposure means the project is likely to face transition risks. This may be because the project is likely to have a substantial environmental impact or because it is in an industry that is facing a rapid decarbonization or is otherwise exposed as society transition towards low-carbon technologies. Conversely, a low exposure means the project is not likely to face transition risks. This score refers to gross risk and does not incorporate performance indicators of the specific project that is screened.

2: The underlying scoring is available upon request.

READING THE REPORT

The report is split into different sections. In the summary and comments section, the central information about the transition risk profile of the project is presented. This includes the classification, whether further analysis into transition risk is necessary and any comments by the Climate Risk Officer.

The subsequent sections may be read to obtain more detailed indicators and information about the transition risk profile of the industry, country and supply chain.

TRANSITION RISK REPORT

SUMMARY

Project Data		Transition Risk Classification
Name	Empresas Ariztia	Medium - further analysis necessary
Number	13720-01	
Sector	Food & Beverage	
Industry	Meat, Poultry & Dairy	
Country	Chile	
Does the project directly contribute to the decarbonization process?	No	

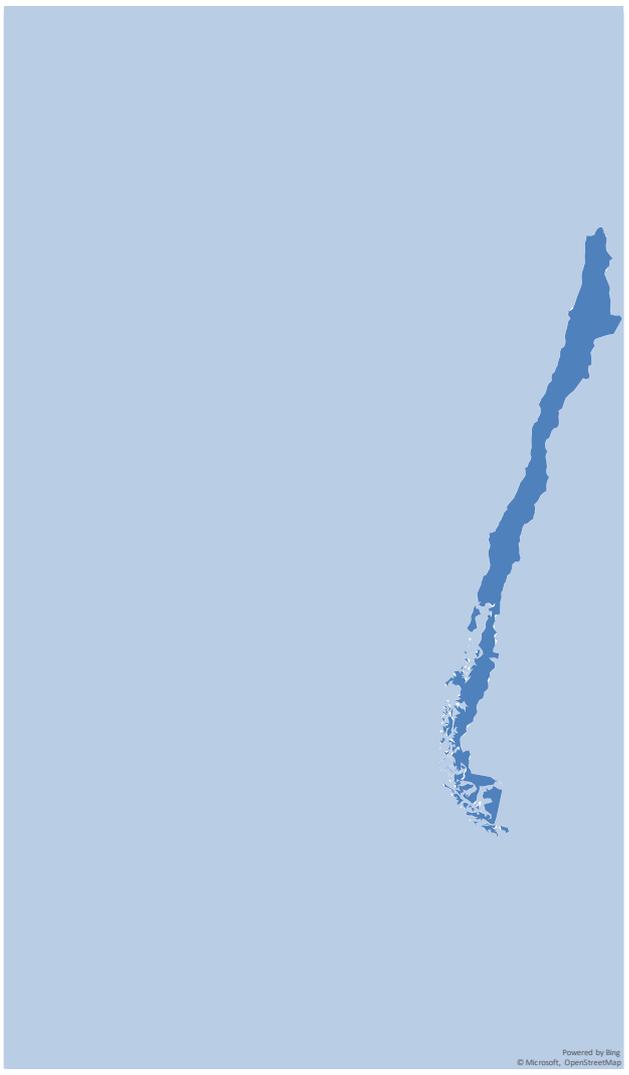
COMMENTS FROM SEG CLIMATE RISK OFFICER

Comments	Climate Opportunities
<p>The project's exposure to transition risk is considered medium based on the industry and country of the client.</p> <p>Chile is amongst the countries in the region best positioned to facilitate a quicker decarbonization of the economy, and consequently policy risk (e.g., from carbon legislation) for emission-intensive agricultural clients increases. This is not least the case considering that the Chilean NDC targets the agriculture sector.</p> <p>The meat, poultry and dairy industry at large is the segment of the agriculture sector with the highest exposure to transition risk due to production-related emission intensity - however, poultry clients are less exposed than meat clients and are backed by rising demand. The client is likely to face emissions primarily related to feed production, but also to on-farm energy use, post-farm processing and transport and manure storage/processing. Lastly, in the supply chain, the client may face risk related to potential deforestation in the production of the soy used as poultry feed.</p>	<p>Improving the efficiency of energy generation and supply and of energy use (on- and off-farm) constitute climate opportunities for this client. The client may also engage with feed suppliers to improve the sustainability of production practices, e.g., by improving the efficiency of crop production (particularly related to fertilisation management) and by ensuring no deforestation is associated with feed production.</p>

COUNTRY TRANSITION RISK PROFILE

	Chile	<i>This section presents the country profile based on five areas that may influence how rapidly and smoothly the country may transition based on macroeconomic indicators. This information may or may not be applicable to the project but provides macroeconomic data-driven insights into the country context of the project.</i>
Indicator	Description	Rank of 26 countries in Latin America and the Caribbean (higher rank has higher risk exposure)
Economic Carbon Intensity	How embedded is carbon in the economic activity of a country? This is measured by looking at a country's share of alternative and nuclear energy and its CO2e emissions relative to its population and size of economy. A higher economic carbon intensity increases the exposure to transition risks for projects as the scope of the country's decarbonization task increases. In turn, the uncertainty level of the regulatory environment in the country increases.	12 out of 26
Pace of Decarbonization	What is the pace of the decarbonization process in the country? This is measured by looking at the change in alternative energy and in CO2e emissions relative to size of economy and population size during the past ten years. A higher pace indicates that the immediate future will be more uncertain for projects that has a significant environmental impact. Therefore, transition risks increase.	22 out of 26

Fossil Fuel Dependence	How dependent is a country on fossil fuels? This is measured by looking at the total rents from natural resources and the level of fossil fuels in exports. A high dependency increase exposure to transition risks as the country face a more large-scale transition.	8 out of 26
Climate Transition Readiness	How is the country placed to decarbonize its economy and respond to the risks of climate change? This is measured by looking at its institutional and infrastructure strength, i.e., its ability to convert policy into action, and by considered the vulnerability of the country to the negative impacts of climate change.	5 out of 26
Climate Finance Ability	To what extent is the country likely to have the funds available to address climate change? This is measured by looking at the size of the economy, its public debt and the ability of companies to take on loans. A high-ranking country is more likely to be able to carry out a speedier decarbonization of the economy. In turn, the level of uncertainty for a project in the country increases and so does exposure to transition risks.	1 out of 26

 Nationally Determined Contribution (NDC) to the Paris Agreement		<i>This section summarizes the latest version of the country's NDC and where applicable, its Long Term Strategy (LTS). This information may or may not be relevant for the project but serves as an insight into the country's commitments to the Paris Agreement.</i>
NDC Submission Date	04/09/2020	
Summary	<p>Chile commits to a GHG emission budget not exceeding 1,100 MtCO₂e between 2020 and 2030, with a GHG emissions maximum (peak) by 2025, and a GHG emissions level of 95 MtCO₂e by 2030. This is an intermediate point on the road to carbon neutrality by 2050, which we have established in the Draft Framework Law on Climate Change that is currently under discussion in the National Congress of Chile.</p> <p>The NDC also includes a target to "Reduce total black carbon emissions by at least 25% by 2030, with respect to 2016 levels."</p>	
Target Year(s)/Period	2030	
Non-GHG Target Type	Multiple non-GHG targets	
Non-GHG Target	<p>Chile commits to the sustainable management and recovery of 200,000 hectares of native forests, representing GHG captures of around 0.9 to 1.2 MtCO₂e annually by 2030. Chile commits to afforest 200,000 hectares, of which at least 100,000 hectares will comprise permanent forest cover, with at least 70,000 hectares of native species. By 2025, protect at least 20 coastal wetlands as new protected areas. By 2030, protect at least 10 additional coastal wetlands as protected areas. By 2030, protect at least 10% of under-represented marine eco-regions (Humboldt, Central Chile, Araucania and Chiloé), in the framework of a participatory marine spatial planning, based on science and holding criteria to deal with the effects of climate change. By 2030: 100% of marine protected areas created between 2020 and 2025 will have management or administration plans including actions for adaptation to climate change. By 2030, 95% of Rural Health Systems will be inspected and registered, ensuring the quality standards of rural drinking water. By 2030, 100% of companies in the health sector will have implemented disaster risk management plans, including consideration of risks resulting from climate change. By 2030, non-treated sewage will be reduced by at least 25%.</p> <p>By 2025: 100% of marine protected areas created up to 2020 will hold management or administration plans including actions for adaptation to climate change. By 2025: Management or administration plans of at least 40% of the marine protected areas created before 2020 will be implemented at least through monitoring, control, community involvement and threat control programs.</p>	
Long-Term Target	No long-term target	
Sectors covered	Energy, industrial processes, use of solvents and other products, agriculture and waste. It does not include the LULUCF sector.	



Carbon Pricing Mechanisms

This section describes any carbon pricing schemes that are under consideration or already implemented in the country. This serves to provide information about the regulatory environment in the country of the project.

Type	Status	Description of Initiative	Recent Developments
Emissions Trading System	Under consideration	The implementation of the Chile carbon tax and a monitoring, reporting and verification system is designed to be ETS compatible to facilitate the possible implementation of an ETS in the future.	The government is working on a Framework Law on Climate Change that sets a carbon neutrality goal for 2050. The draft law includes provisions for a possible trading system. Regulated entities could reduce their emissions below limits fixed by the regulator or implement emission reduction projects that meet certain standards to earn credits. These credits could then be sold to other regulated entities to use for compliance. The government could also allow these entities to implement mitigation projects and use the certified reductions to either achieve the standard or transfer those reductions to third parties. A dedicated registry would track the projects and the transfers. The draft law is still in legislative process after it was submitted to Congress in January 2020.
Carbon Tax	Implemented	The Chile carbon tax is a part of the tax on air emissions from contaminating compounds (impuesto destinado a gravar las emisiones al aire de compuestos contaminantes) and aims to reduce the negative impacts of fossil fuel use for the environment and public health. The tax is part of wider tax reforms to increase taxes for big businesses and lowering them for individuals.	On February 24, 2020, amendments to the carbon tax were adopted as part of a broader tax reform. The carbon tax now applies to installations emitting 25,000 tCO ₂ or more, as well as to those that release more than 100 tons of particulate matter into the air each year. Under the previous legislation, installations with a thermal capacity higher than 50 megawatts were subjected to the tax. The amendments also introduced the possibility to use offsets to meet compliance obligations, for which the rules still have to be established. The carbon tax rate remains at US\$5/tCO ₂ .

INDUSTRY TRANSITION RISK PROFILE

Meat, Poultry & Dairy

This section highlights:

- A) If GHG emissions (Scope 1 -3), crucial drivers of transition risk, are a material issue for the industry.
- B) The percentage of the country's emissions the sector accounts for and how that compares to the same sector in other countries in the region.
- C) What are the climate issues that are likely to be material for actors in this industry.

Greenhouse Gas (GHG) Emissions

Scope 1: Are companies in the industry likely to emit a high level of CO ₂ e?	Yes
Scope 2: Are companies in the industry likely to have high energy use?	Yes
Scope 3: Are companies in the industry likely to contribute to indirect emissions up or down the value chain?	No
If applicable, where are scope 3 emissions likely to be concentrated?	-



Sector Size of

Agriculture

NB: This data is only available at the general sector level

What percentage of the country's CO₂e emissions does the sector account for?

10%

How does this percentage level rank the sector relative to the same sector in other countries in Latin America and Caribbean (1-26 - highest to lowest)? 22

SASB Industry Climate Issues

Greenhouse Gas Emissions	Energy Management	Water Management	Land Use & Ecological Impacts	Environmental & Social Impacts of Animal Supply Chain

SASB Industry Climate Issues: climate topics in each industry that are likely to affect the financial condition or operating performance of actors within the industry and: 1) pose direct financial risks, 2) may be regulated in the near future, 3) are becoming industry norms and drive competitive best practices and 4) are raised by stakeholders and threaten brands or license to operate. The information is derived from the Sustainability Accounting Standards Board (SASB).



Industry Information

This section describes the transition risk profile of the industry in more detail. It points towards areas of further analysis that may be relevant for the project.

Industry Risk Profile

UNEP-FI (2021): Agriculture and forestry are essential activities for feeding the global population. However, they are also major contributors to climate change, primarily through land use change, fertilisers, and livestock emissions. Livestock emissions alone represent nearly 15% of all anthropogenic greenhouse gas emissions (World Economic Forum 2019). A rapid transition cannot succeed without considering the Agriculture & Forestry sector. In an ambitious transition scenario, activities such as cattle ranching, and industrial livestock production would face significant disruption. Cattle have an emissions footprint that is several times higher than most other animals and dozens of times higher than food plants (Poore and Nemecek 2018). As part of a rapid transition, not only would land-use practices be more tightly controlled, but the high intensity of emissions would also incur major costs from a carbon tax. Even without direct regulation, changes in consumer behaviour have the potential to reduce revenues. Shifts to plant-based diets for health, ethical, or environmental reasons will result in a decrease in livestock production. Similarly, as climate change puts greater strains on water and other natural resources, resource intensive crops will also face rising costs. However, within this sector, a rapid transition will also produce winners. Agricultural biotechnology firms who can increase yields while reducing land and resource use will experience growing demand for their innovations (Singh et al. 2018). Other winners are likely to be developers of meat substitutes and replacements as evidenced by the success of companies like Beyond Meat. Although transition risks may vary across regions for all sectors, differences for Agriculture and Forestry may be particularly regionally dependent.

SUPPLY CHAIN DECARBONIZATION



Supply Chain: Food

Based on analysis by the World Economic Forum and the Boston Consulting Group (2021), this section provides information about the distribution of emissions along the supply chain. This information may be used to assess the potential for mitigation in the project's supply chain.

Main abatement Levers

Nature-based solutions, material and process efficiency and renewable power and heat

Detailed Information

Within the food supply chain, less than 2% of emissions can be reduced via circularity in plastics packaging. Approximately 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 emissionintensity fertilizers. Renewable energy for power and heating can provide another ~15% emissions savings, mainly at the food-processing and packaging stage. The biggest bucket (~55% of total emissions) needs to be tackled via naturebased solutions. About 20% of emissions are caused by deforestation and should be addressed by moving to deforestation-free agriculture, e.g. via projects in relevant countries that provide the financial means to protect large forests from being converted into cropland and that provide alternatives to logging for the local population. The remaining ~35% are inherent to agriculture and cannot be reduced any further - they need to be addressed through reforestation, restoration of mangroves and peatland, soil sequestration, biochar production and other levers. About 5% of emissions need to be addressed via fuel switch for more carbon-efficient transport means.

