

Report 2020

Management of Risks Related to Climate Change at Vale

1. Climate Change Impacts

Vale recognizes that climate change represents a scientifically proven reality and a challenge which affects not only our production activities, but the society and the entire planet as well. The ability to plan for, adapt to, and mitigate the impacts of the climate change is nothing less than a top, strategic priority for Vale's purpose to society at large, to expectations to its shareholders and stakeholders, and as such to its agenda of sustainable growth in the future.

To address this matter, Vale has been working continuously based on the scientific and practical references, always in compliance with the internal policies and norms.

Mining activities are highly dependent on logistics infrastructure, themselves sensitive to extreme climate risks.

Fixed assets, such as railroads and ports, are especially vulnerable to an extreme climate event (e.g. flooding, damaging winds), considering that these are physically fixed (stationary) assets, whose planned life-cycle often decades-long and with limited, if any, flexibility to relocate the asset once constructed.

2. Management of Climate Related Risks at Vale

The risks and the opportunities related to climate change are continuously monitored by Vale's Sustainability Department, with the Environmental Management Area therein responsible in an operational sense, acting as a [second line of defense](#)¹. These risks/opportunities are identified based on the strategic business planning cycle, and existing risk management processes which take into account the monitoring of the regulatory environment. Furthermore, the Low Carbon Forum, which gathers Vale executives and multifunctional teams monthly, further enables the identification of emerging climate risks (physical and transition) and monitoring of and deliberation regarding the implementation of different mitigation initiatives.

Material risks and opportunities are periodically presented to the Executive Risk Committee, where they are analyzed to be reported to Vale's Board of Directors quarterly, and published in Vale's Annual Report and Sustainability Report, respectively, in addition to CDP. The identified risks are monitored and reviewed annually. Vale uses a risk matrix, which considers the severity and the probability of each event². For climate change related risks, Vale has developed specific analysis methodologies divided into **1) impacts deriving from the transition to low-carbon economy and 2) physical impacts, in line with the guidelines of the Task Force on Climate-related Financial Disclosures (TCFD).**

¹ To understand the risk governance at Vale, go to [Portal ESG](#).

² See Vale's risk management policy, [here](#).

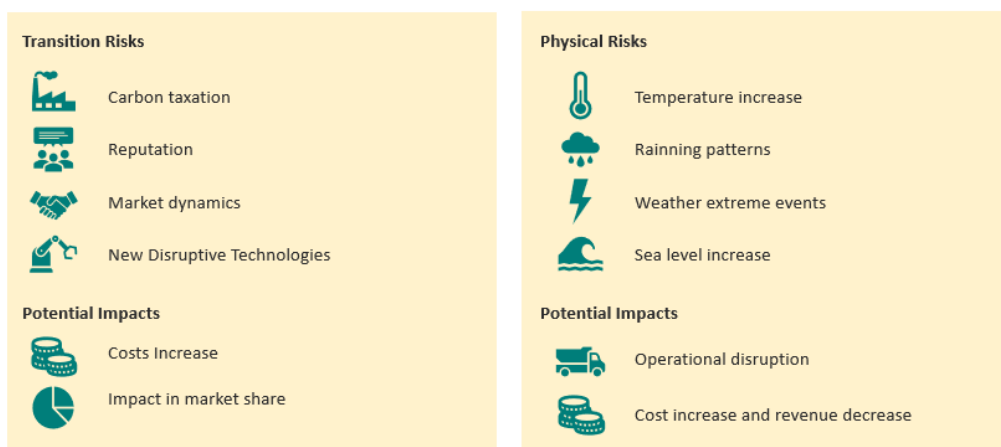
In 2017, Vale adhered to the TCFD recommendations, led by the Financial Stability Board, containing guidelines on reporting of climate change related financial risks by companies and financial institutions.

Figure 1: TCFD diagram for management of climate-related Risks and opportunities



Source: TCFD (2017).

Figure 2: Proposed management plan for risks related to Climate Changes at Vale.



Source: Vale's and Catavento's analysis based on the Task Force on Climate-related Financial Disclosures - TCFD

Source: VALE SA (2020).

The main risks related to the Climate Changes monitored by Vale are presented below.

Regulatory / Legal

- Changes in the public policies on emission restrictions (ex.: carbon pricing or tax) or demands to adapt to the effects of the climate change, imposing costs on the emitting operators;
- Litigations for non-achievement / non-adherence to policies intended to mitigate climate change impacts.

Technological

- Replacement of products/process by more efficient/modern technologies.

Market

- Changes in supply and demand pursuant to alternative products.

Reputation

- Consumers and investors' perception of the company's demonstrated commitment in adhering to and driving the realization of robust climate policies.

Physical Risks

- Direct damages to assets and indirect impacts on the supply chain caused by floods, droughts, sea level rise, incidence of strong winds and a higher incidence of atmospheric discharges (lightning).

3. Management of Transition Risks

As part of the strategy, and in line with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), to what refers to the transition risks, Vale made an analysis of the resilience of its strategy paired up against three climate change scenarios, considering as a baseline the scenarios put forth by the International Energy Agency (IEA).

Building climate-related scenarios enables Vale to identify indicators to monitor the external environment and quickly adapt to the needs identified from each scenario to the extent that one or another comes to reflect the emerging reality of the given topic.

At the end of 2019, the IEA updated its scenarios focusing on the goals necessary to achieve the Paris Agreement and the commitments and policies assumed by the countries. Throughout 2020, it also provided specific publications on the use of batteries and iron processing technologies. The resilience analysis of our portfolio was based on these documents. As it is specialized in energy, the IEA brings only developments focused on this sector, such as the impact on thermal and metallurgical coal demands, requiring specific studies for mining and steel.

In order to keep an impartial and transparent analysis, we rely on the support of an external consultancy to unfold the market implications for iron ore, copper and nickel. Thus, we aim to identify the different drivers of supply and demand in climate scenarios and understand how they vary, resulting in long-term prices and competition dynamics that impact our commodities and affect our strategy.

Then, we apply these results to our portfolio, identifying opportunities and risks related to the energy transition, so that we can perform a quantitative analysis of our long-term financial results, including the possibilities that each scenario allows. In order to support our transition risk management process, the exercise of scenarios is updated on a recurring basis due to the evolution of trends and the appearance of new threats in the external environment³. The conclusions are used as inputs for the Annual Strategic Planning Cycle, a process with the participation of the business and support areas, the Executive Board and the Board of Directors.

Vale, also, monitors the main regulatory trends of emission limits and pricing in relevant jurisdictions worldwide, where it operates and/or has commercial interests. Vale developed an internal model to assess the potential impact of taxing carbon emissions upon businesses, based on the forecast of project costs for each business. Furthermore, the company takes part in external forums and has tools for the monitoring and control of transition risks.

4. Management of Physical Risks – “Vale Climate Forecast”

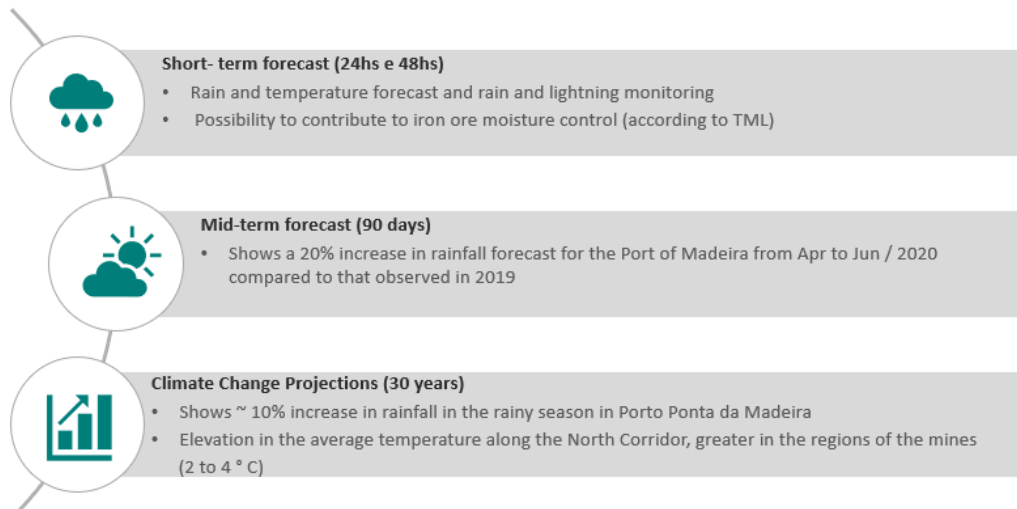
Based on IPCC studies, Vale developed, together with Vale Technological Institute, a model for the projection and mapping of the possible physical impacts that lead to long-term risks for the company's operations. The climate forecast is performed using a modeling system that enables the simulation of future temperature and rainfall scenarios. The forecasts were made for sections of Vale's integrated logistics corridors, in particular the “northern corridor,” the “southern corridor,” the “southeastern corridor” and Corumbá.”⁴ . Furthermore, preliminary studies have also been carried out in operational areas outside of Brazil and some physical risks have already been mapped in such operations. Currently, Vale is implementing a Vale Climate Forecast, an internal methodology for the management of the physical risks associated with the climate changes, which is divided into:

- **Very short-term, midterm, and seasonal forecasts** for the physical risks, whose main focus is the mitigation of impacts on **the operation and shipment of products**.
- **Long-term analysis**, whose main focus is the assessment of the impacts of the climate change in a multi-year horizon, aiming to evaluate the necessary investments in the facilities for their adaptation/mitigation (**planning**).

³ For further information, click [here](#).

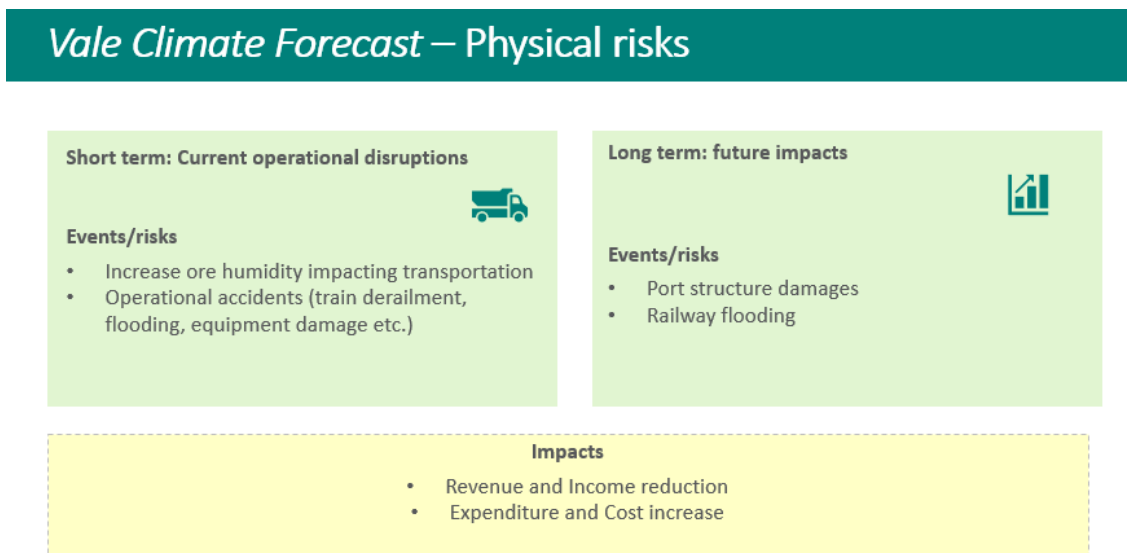
⁴ Vale's integrated logistics corridors comprise of rail, port, and/or river-freight combinations connecting the mines to portside beneficiation and export / ship-loading facilities. They are denominated geographically, as such the northern corridor (“Corredor Norte”) which extends through the states of Pará and Maranhão, the southern corridor (“Corredor Sul”) through the states of Minas Gerais and Rio de Janeiro, the and the southeast corridor (“Corredor Sudeste”) which extends through the states of Minas Gerais to Espírito Santo .

Figure 3 - Climate and weather information that can be produced by the ITV.



Source: VALE SA (2020)

Figure 4: Summary of the two aforementioned work categories: shows the causes, the events/risks and the consequences for the business (*Vale Climate Forecast*)



Source: Vale SA (2020)

a) Short-term physical risk analysis

Regarding the short-term analysis, the **“Vale Climate Forecast”** enabled Vale, in partnership with the Vale Technological Institute and the Integrated Global and Local Operation Centers, to

update the diagnosis of risks and impacts caused by the Climate Change in the North, South and Southeast Corridors.

Specifically for the Port of Ponta da Madeira, site for the pilot for implementation of the Vale Climate Forecast, an application with rain forecasts was developed making it feasible to disseminate the data in a way which is systematic (daily) and helpful to neighboring operators, as it is also made available to all operators at the Port. This data is now available to assist in Vale's Production Schedule, helping decision-making in the operations of shipments and distribution of iron ore and other products. With these forecasts in hand, the operators optimize the product shipment plans and minimize the risk of non-shipment due to excessive humidity content in the ore. It is worth adding that the weather forecast data will also be made available in dashboards to achieve the highest possible number of users.

It is important to point out that this project is already in the process of expansion to other Vale areas. The mines in Carajás, for example, will be provided with a new meteorological radar that can provide greater accuracy in localized weather forecasts. The expansion will also take into account operations in the Southeast Corridor, such as the Port of Tubarão in the Espiritu Santo state. Furthermore, Vale is promoting higher integration between ongoing projects and the company's Geotechnical area, so that the forecasts will assist in dam management and as such adhere to guidelines of the ICMM and of Vale's Executive Board.

The analysis of short-term climate risks enables the inclusion of climate variables in the decision-making processes of Vale's operations systematically. It generates a higher control against the impacts of climate change - impacts which are already being witnessed in/around our operations as they are elsewhere worldwide – helping to mitigate the causes of risks and their potential negative consequences for the business.

Adaptation measures are already being implemented in operational areas where the impacts of climate change have already been identified, in particular related to the increase in the intensity of and frequency flood-causing rains, which can lead to operational stoppages and material environmental impacts.

b) Long term physical risk analysis

In 2020 Vale updated its qualitative analysis of the vulnerabilities and probability of impacts related to climate change in some operations, a work aimed at the long-term, and carried out in parallel to the work by the ITV on climate projections and by the operational areas for the adaptation and better management of water resources. . For this purpose, a tool proposed by the Standard Chartered Bank⁵ was utilized, which indicates on a map the points most likely to be impacted by climate changes, such as flooding and sea level rise. The analysis uses projections based on IPCC, RCP 2.6, RCP 4.5 and RCP 8.5 Scenarios.

At the Guaíba Island Terminal (TIG), in Rio de Janeiro, for example, in figure 9, the results point to the risks of impacts caused by the higher levels of precipitation in the region and the likely increase in the sea level:

- For the 2050 and 2100 horizon, the main risk is sea level rise

⁵ A British Bank Vale is a client of and which has developed climate change resilience analyses for its clients.

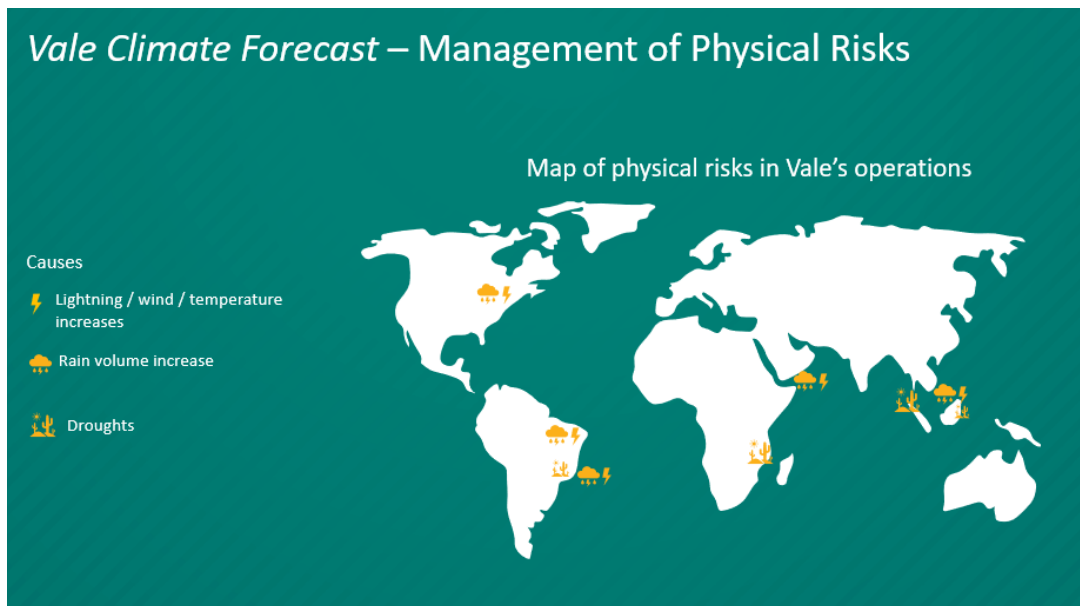
Figure 9 - Standard Chartered Bank analysis for ITG- Rio de Janeiro.



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Source: Standard Chartered Bank (2020).

Figure 10 - Map showing the location of the identified risks caused by climate change.



Source: Vale SA (2020)

The projects (infrastructure/engineering projects) cited herein are aligned with the needs of adaptation, not only in a near-term horizon but also those projected out to the timeframe of 2050 and 2100.

The management of physical risks related to climate change is connected to the emission reduction strategy to contain global warming. The results from this process contribute to avoiding/minimizing the occurrence of the risk factors at play and form an integral role in the

structuring of robust adaptation/mitigation plans to address instances in which the risk factors materialize.

Vale endeavors to constantly improve the management of risks related to climate change. We are guided by a broader commitment to active listening and dialog with the society, to the promotion of healthy and safe environments, to the desire to be a trusted neighbor to communities and stakeholders.