

Itaú Asset

Itaú



Integration of Climate Scenarios into the investments of Itaú Asset Management

Context of the Integration of Climate Scenarios into the investments of Itaú Asset Management

As managers of our clients' resources, we are responsible for investing in an ethical and responsible manner, seeking a complete understanding of the opportunities and risks involved in our investment decisions.

We believe that environmental, social and corporate governance (ESG) factors are important long-term performance elements for companies, whether due to the opportunities presented or to the risk mitigation prospect.

Our mission is to help our clients reach their long-term financial objectives, contributing to the evolution of the topic of sustainability in investments, by means of our entire platform of products and services.

It is part of our fiduciary duty to understand and anticipate the impacts of climate change on society, the environment and economic sectors and, consequently, on investments. This study presents the evolution of the topic in the world and shows the models and tools that Itaú Asset Management uses to integrate these topics into its investment decisions.

ESG and Sustainability in Investments at Itaú Asset Management:

Itaú Asset Management has been developing and improving mechanisms for more than 15 years to understand, price and manage the impact of climate issues on investments. This process is inserted in our responsible investment and ESG integration approach.

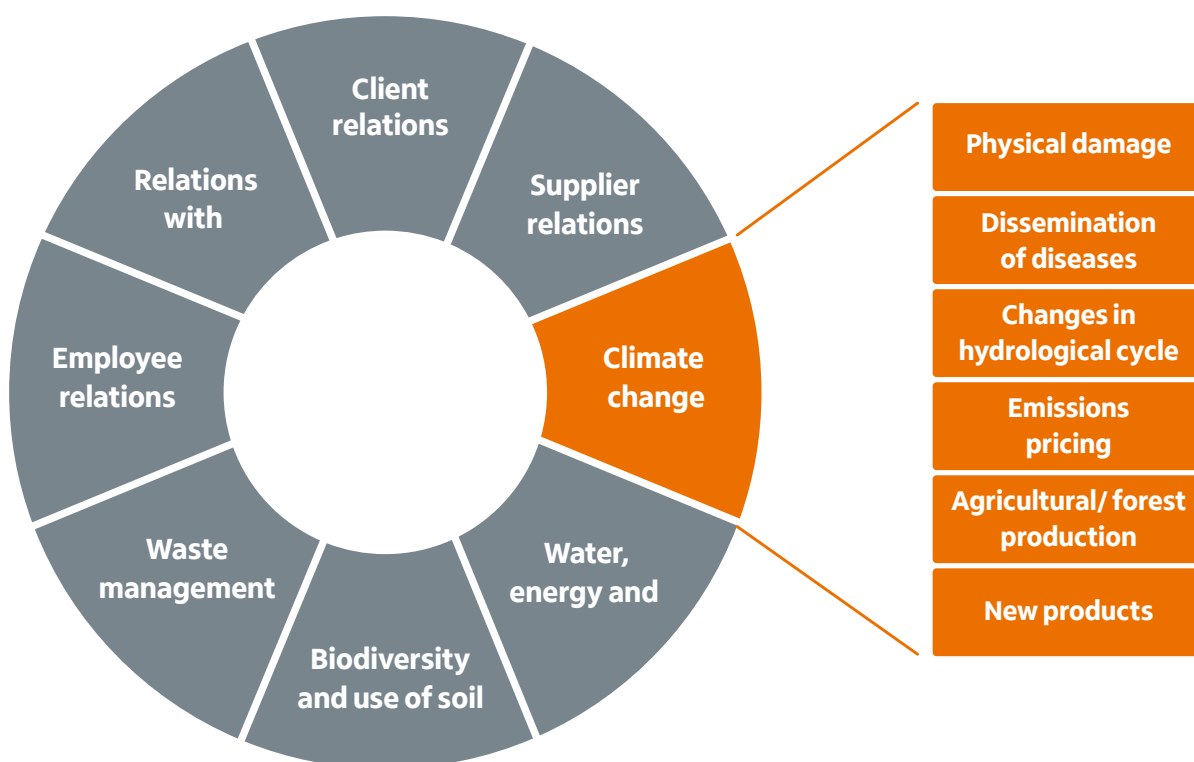
We understand our leading role in the promotion of more sustainable and effective actions in the capital markets for the purpose of creating value for our clients and society, which continues to be active and increasingly more aware of its role as a change agent.

The assessment and integration of ESG aspects into the investment process of companies enables a decision-making process with a better risk-adjusted return and, additionally, it promotes the engagement of companies with ESG topics that are more relevant to their business. Reduction of production costs, easier access to capital and identification of new opportunities are some of the gains identified.

Always the first to address this topic in the financial market, we launched, in 2004, the Fundo Itaú Excelência Social (Itaú Social Excellence Fund - FIES), one of the first Brazilian ESG funds whose main characteristic was to invest in shares of companies with the best performance in sustainability. We were also Brazil's first investment manager to join, in 2008, the UN Principles for Responsible Investment (UN PRI), which currently has more than 3,000 signatories and around US\$100 trillion in assets under management [3].

In order to deepen the understanding and be able to estimate the financial impact of ESG topics on each investee, we developed our own assessment models in 2010, which we keep improving: we disclosed the ESG integration models for fixed and variable income in 2013 and 2014 and, in 2016, we joined the Amec Code of Institutional Investors' Principles and Duties – Stewardship whose principles and guidance are aimed at encouraging, among other actions, the assessment of ESG aspects by institutional investors and the exercise of voting rights at general stockholders' meetings [3 and 4]. Our proprietary ESG assessment models, which already cover 99.8% of our assets under management, take into consideration the climate issue as one of the key analysis elements, together with seven other environmental and social topics, in accordance with chart 1 below. Further methodological details can be found in chapter 3.

Environmental and social analysis dimensions and types of impact of climate changes



Source: Itaú. Climate change and its impacts (2018) [6]

In 2018, we launched a study presenting, in detail, our approach to the integration of climate risks and opportunities in the analyses of companies, as well as on which industries would win or lose as a result of the impacts of climate change [7].

In 2021, the Economic World Forum pointed out in its reports extreme climate events as one of the three main threats to the planet in the short-term, together with infectious diseases¹ and crises associated with the way of living of populations[1]. A publication of the United Nations Office for Disaster Risk Reduction showed that between 2000 and 2019, extreme climate events generated economic losses of around US\$2.97 trillion. This amount represents almost twice Brazil's GDP.

The same study shows that these costs were 80% higher in relation to the period between 1980 and 1999. Encouraged by the increase of the urgency of the climate topic, we continued the work developed in 2018 with this study. We present here a methodology and proprietary tool developed to assess the performance and resilience of investment portfolios in view of different climate change scenarios. This proposal is in line with the Task Force on Climate Related Financial Disclosures (TCFD) recommendations, published in 2017. The TCFD determines that this analysis must take into consideration the risks and opportunities of climate change for different trajectories of climate change, including a 2°C or less scenario [8].

Enjoy your reading!



1. The approach of Itaú Asset Management to the integration of climate scenarios into investments

We began this study by presenting the approach developed by Itaú Asset Management to assess and integrate climate scenarios into our investment decisions.

In sessions 2 and 3, the conceptual topics related to climate change, its economic impacts and the development status of investors, companies and governments on this topic are further addressed.

The creation of our climate scenario analysis integration tool is the development of a more comprehensive approach adopted at Itaú Asset Management for the integration of ESG topics into our investment process, as well as for the development of an ESG product shelf.

This approach aimed at the climate topic will also allow us to have greater assertiveness in the assessment of impacts related to climate change in portfolios, increasing the risk and return of our strategies, in addition to addressing the demands of the Task Force on Climate Related Financial Disclosures and Principles for Responsible Investment, which now includes the assessment of climate scenarios in its recommendations for investors.



The construction of climate change scenarios and impacts on the value of assets and investments is one of the key elements of TCFD.

One of the TCFD recommendations is associated with the resilience of investments, taking into consideration different climate change scenarios, including a scenario that is equal to or lower than 2°C. Additionally, the TCFD recognizes that the climate scenario analysis is a recent approach that will evolve over time. The construction of these scenarios will have an evolution trajectory but be supported by scientific bases.

Among the recommendations adopted by TCFD for the development of scenario analyses, we may highlight the following:

1) Adoption of more than one scenario, including the 2°C or less scenario;

2) Selection of entry assumptions and parameters, including assumptions on possible responses and terms of technologies, differences in delivery parameters between regions and sensitivities that approximate the main assumptions;

3) Definition of time horizons in the scenarios, including medium and long-term milestones.



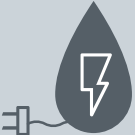



All these elements will be useful to assess the resilience of the portfolios, the implications in each scenario and the capital allocation decisions.

There is today, available on the market, a number of platforms and tools that offer climate risk assessment and even pricing estimates of the impact of climate risks in different climate change scenarios. However, the majority of these estimates have an industry or monothematic analysis scope when addressing potential impacts on companies. Aware of this scenario and in line with our philosophy of proprietary analysis development, we chose to create our own methodology in which climate scenarios represent both scientific projections and market data. Therefore, the impacts on companies are assessed on a customized basis, respecting the particularity of each region where they operate, the characteristics of the productive process and strategy to adapt and the resilience to climate change. This development took place in accordance with the following stages:

We developed a materiality matrix to assess the impact of climate change on different industries and companies

The materiality analysis is a necessary stage of all ESG analysis. Its purpose is to point out which ESG topics are more relevant for each company or industry. Following the same rationale, and aware that climate impacts come out in a different way in different companies, we developed an industry materiality matrix taking into consideration which climate impacts will be the most relevant for each industry. The topics, or macro-climate drivers, are as follows:

Macro-climate drivers

	<p>New products and changes in consumption pattern</p>	<p>Climate change is also expected to affect the consumption pattern of society and requires new types of services and products. For example, it is possible to observe the rapid growth in the demand for plant-based proteins in China, as well as the increased demand for wood products with forest stewardship certification. The consumables industry is expected to be the most affected by this aspect, as well as its production chain. The financial industry may also benefit from the creation of specific products aimed at stimulating a low-carbon economy, in addition to being an essential agent in this transition, such as a production sector intermediary.</p>
	<p>Physical damage caused by extreme climate events</p>	<p>This comprises the damage caused by extreme climate events on the fixed assets of companies, as well as any possible physical losses and interruption of production. The industries that are most vulnerable to this type of risk are those that are capital good intensive, such as the industrial, energy, road concession and sanitation sectors. Events related to forest fires, strong rainfalls and wind are the most frequently observed. The majority of the Intergovernmental Panel on Climate Change (IPCC) models point at an intensification of these phenomena in the coming decades, characterizing it as a medium to long-term risk.</p>
	<p>Ecoefficiency initiatives</p>	<p>As part of the strategy to face the impacts of climate change and generate benefits for their stockholders, many companies have been investing in solutions connected to energy and water efficiency, renewable energy, replacement of fleets, among others. This market is expected to continue to grow in the coming years, offering opportunities to reduce costs for companies and generate income for those that operate in the supply chain of these types of equipment.</p>
	<p>Change in water cycle</p>	<p>The change in the rainfall regime and patterns is expected to affect the availability of water for many industries, which can lead to an increase in costs or even the interruption of activities. The most intensive water consumption industries, as well as companies that generate electric energy and provide sanitation services, are expected to be most affected. These industries have already been feeling the impacts of these changes in rainfall patterns and this risk is, therefore, relevant in the short term.</p>
	<p>GHG emissions pricing</p>	<p>The medium term carbon pricing trend may affect the cost structure of companies with intensive emissions, such as companies from the oil and gas, and the heavy and thermoelectric energy generation industries. On the other hand, some low-emission or negative-emission industries, such as the forest and renewable energy generation industries may accrue income by selling carbon-emission credits and rights on organized markets. In the case of Brazil, there is no legal provision for introducing emission pricing mechanisms. However, in view of the evolution of this topic in other countries and the targets assumed by Brazil, emission pricing is expected to become a material topic in the medium term.</p>
	<p>Agricultural and forest production</p>	<p>The increase in the occurrence of extreme events, the change in the volume of rainfalls and the loss of ecosystemic services are expected to affect the production of the majority of agricultural crops in the coming decades. The geographical distribution of agricultural production is also expected to be affected, as described in detail in the previous chapter, which will require investments to adapt. As a consequence, the cost of inputs of many industries is expected to rise. The forest and pulp and paper industries, on the other hand, may benefit from genetic improvement and changes in the use of soil. According to our analyses, the impacts of climate change on the agroforestry industry and consequent increase in the cost of inputs are expected to take place more strongly in the medium and long terms.</p>

The six topics above were segmented into ESG drivers and shaped for the companies in our portfolio. The materiality matrix below shows us the industries in which these topics are most relevant:

Materiality of the macro ESG drivers per industry

Industry / climate driver	Changes in consumption pattern	Extreme climate events	Ecoefficiency initiatives	Changes in hydrological cycle	Emission pricing	Agricultural and forest production
Consumables						
Healthcare						
Real estate						
Materials						
O&G						
Industrial						
Financial services						
Utilities						
Information and Communication Technology (ICT)						

It is material for the industry. It is not material for the industry.






The pricing of greenhouse gas emissions in particular, appears to be the main topic that is expected to impact the results of companies. On the other hand, there is also a high level of uncertainty around the scope, coverage, values and term for the implementation of this mechanism since it depends on regulatory and political aspects and mobilization of public and private sectors. As mentioned before, the creation of different scenarios allows us to better measure the uncertainties in the model developed.

We adopted scientific and market scenarios to shape the impacts of climate change on the companies covered by us.

In line with the TCFD recommendations, our approach allows us to assess the performance of companies in portfolios based on three distinct scenarios, as described below:

Climate scenarios adopted

<p>1.5°C </p>	<p>For both scenarios, scientific-based assumptions related to an average increase of temperature of 1.5°C or 2°C in relation to pre-industrial levels were adopted whenever available. The assumptions behind this scenario take into consideration, for example, carbon prices that generated incentives to reduce emissions in line with a 2°C scenario, a change in the occurrence of extreme climate events, technological changes, among others. The transition impacts tend to have a more relevant effect than the physical impacts in this scenario.</p>
<p>2°C </p>	
<p>Bau </p>	<p>For the business as usual (BAU) scenario, market assumptions were adopted that more closely reflect the current scenario and prospects. As a rule, this is a more pessimistic scenario with respect to climate change, where the transition to a low-carbon economy is slower, making the physical impacts of climate change more significant. In this scenario, which does not have a scientific base, the prices adopted in the carbon pricing models are closer to the amounts that are already charged in some jurisdictions. Technological changes, such as the electrification of vehicle fleets, investments in renewable energy and energy efficiency, take place in a more conservative way.</p>

There is a big difference in terms of efforts and results for the achievement of the 1.5°C and 2°C scenarios

The last IPCC report, launched in 2021, shows some relevant points about the 1.5°C and 2°C scenarios and the difference between them [10]:

• Where are we?

The Earth has already reached a 1°C average increase in temperature in relation to pre-industrial levels, making efforts to maintain the average warming at 1.5°C in 2025 very challenging;

• How good is a 1.5°C scenario?

A 1.5°C increase still represents significant economic and human risks, in particular for regions with greater vulnerability, such as coastal zones or regions that already face water scarcity. However, in this scenario, it is less probable that the impacts caused by climate change are irreversible;

• What changes in a 2°C scenario?

A 1.5°C scenario may represent 11 million people that are less exposed to extreme heat, 61 million people that are less exposed to draughts and 10 million people that are less exposed to an increase in sea levels in relation to a 2°C scenario;

• What is the level of effort to reach each scenario?

For us to achieve a 2°C scenario, the volume of greenhouse gas emissions launched into the atmosphere would be something like 1,000 GtCO₂eq by 2050, whereas in a 1.5°C scenario, the volume would be something like half of it. Taking into consideration our trajectory of current emissions and demographic forecasts, we can say that the achievement of a 1.5°C scenario strongly depends on the development and scalability of carbon sequestration and capture technologies.

The World Resources Institute conducted a survey on the other potential physical impacts involving both scenarios. This information is available in Attachment I [53].

Carbon price may vary significantly when we consider scientific scenarios and the prices adopted in the market.

Scientific scenarios: The scientific scenarios usually attribute a price per metric ton of carbon equivalent that makes the necessary technologies viable for the transition to a low-carbon economy. However, the technological root and the underlying carbon prices are not a consensus among the many existing models.

In the table below, we present two scenarios of prices adopted by renowned research institutes on the topic: The Grantham Institute of the London School of Economics (LSE) and the Intergovernmental Panel on Climate Change (IPCC SR 15). They both made a carbon price modeling that would be consistent with the achievement of the 1.5°C and 2°C scenarios, in accordance with the table below:

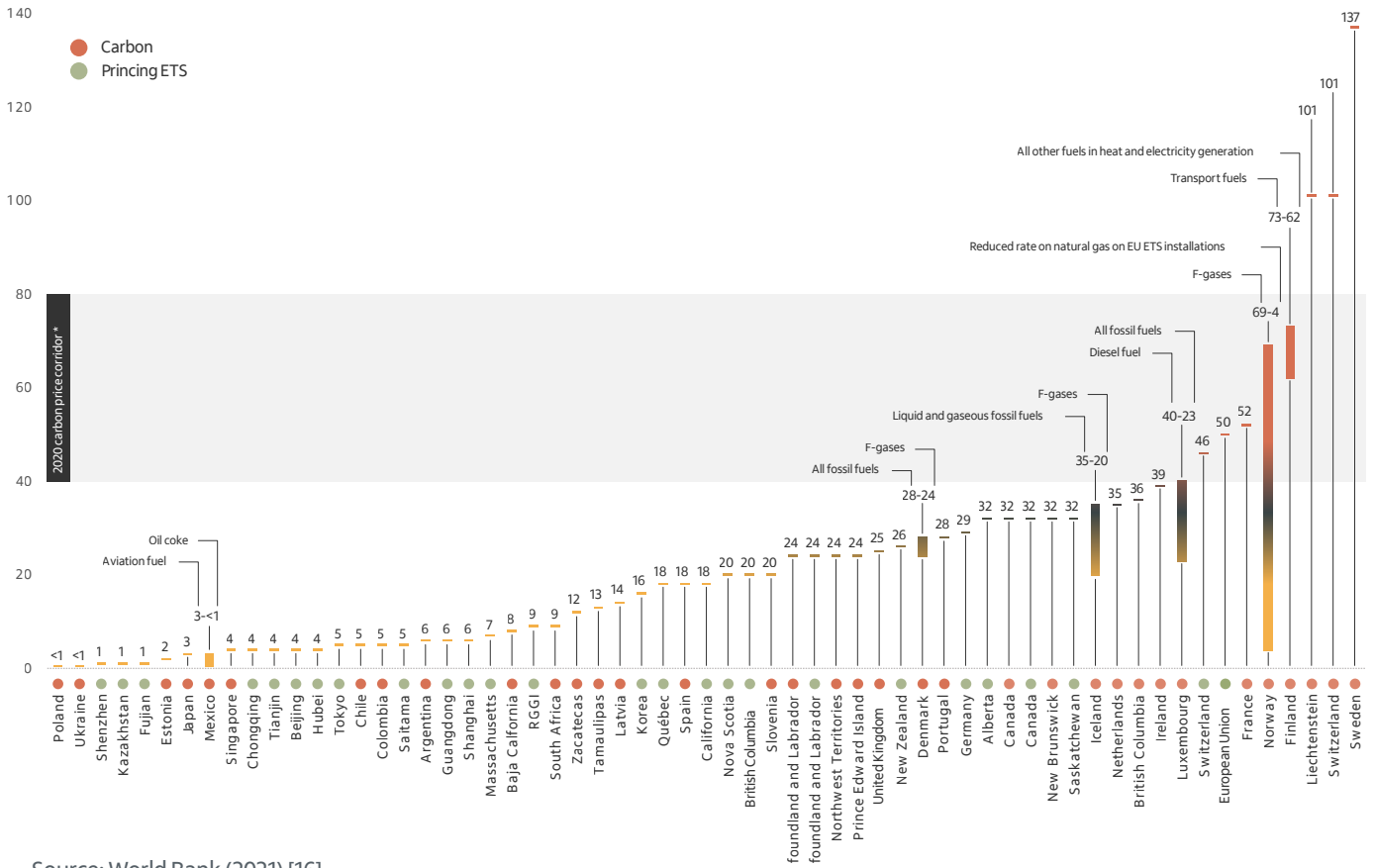
Carbon price suggested for the achievement of the 1.5°C and 2°C scenarios, in accordance with the IPCC and the LSE (2030 and 2050)

1.5°C Scenario	2030	2050
IPCC SR15	135-6.050 USD/tCO ₂ e	245-14.300 USD/tCO ₂ e
LSE	100-185 USD/tCO ₂ e	220-430 USD/tCO ₂ e
2°C Scenario	2030	2050
IPCC SR15	15-220 USD/tCO ₂ e	45-1050 USD/tCO ₂ e
LSE	40-80 USD/tCO ₂ e	100-250 USD/tCO ₂ e

Based on the results above, we can observe that the scientific scenarios present a huge difference with respect to the prices that would make viable the transition to a low-carbon economy, revealing the difficulty in determining which is the most adequate. However, all these scenarios have significant economic impacts, in particular on those companies and industries that are more greenhouse gas emission intensive.

Market scenarios: The amounts currently charged for greenhouse gas emission in most jurisdictions are well lower than the references mentioned above. In our business as usual scenario, we adopted carbon emission pricing amounts based on many global experiences. The chart below, taken from the State and Trend of Carbon Pricing 2021 report, of the World Bank, shows us that the amounts charged for carbon, whether in market or pricing models, are usually lower than USD 40/tonCO₂eq, with three jurisdictions exceeding USD 100/ tonCO₂eq.

Carbon pricing and market mechanism implemented in the world (in USD/tonCO2eq)



Source: World Bank (2021) [16]

The integration of climate scenarios into the analysis of companies is customized on a case by case basis

In the example below, we present a hypothetical company from the energy transmission industry and the way that the different scenarios addressed can influence the generation of income by its operation. Models that are similar to the case below were applied to all the companies covered by us for the purpose of having a complete view of the potential impacts of climate change from a portfolio standpoint.





Impact of extreme climate events on energy transmission companies

Infrastructure transmission assets have a high exposure to extreme climate events. In accordance with data from the National Institute of Space Research, around 70% of the brownouts and failures in transmission systems are caused by lightning and storms. With the increase in the occurrence of this type of event, caused by climate change, it is probable that these impacts will be even greater in the future. Transmission assets are remunerated based on their availability in the system so that when there are failures in their operation, its annual permitted income may be negatively impacted [56].

1.5°C scenario: CAGR of 0.3% in the occurrence of extreme climate events;
2°C scenario: CAGR of 0.6% in the occurrence of extreme climate events; BAU scenario: CAGR of 1.5% in the occurrence of extreme climate events;

Accordingly, the impacts were calculated as follows:

- A - Revenue loss arising from the interruption of services in year 0;**
- B - % of the interruptions associated with extreme climate events;**
- C – Change in the occurrence of extreme climate events;**

$$\frac{[A \times B \times (1 + C)]}{discount\ rate}$$

As a result, the net present value of the impacts for this company was as follows:

1.5°C scenario: - R\$42.3 million
2°C scenario: - R\$94.9 million;
BAU scenario: - R\$291 million.

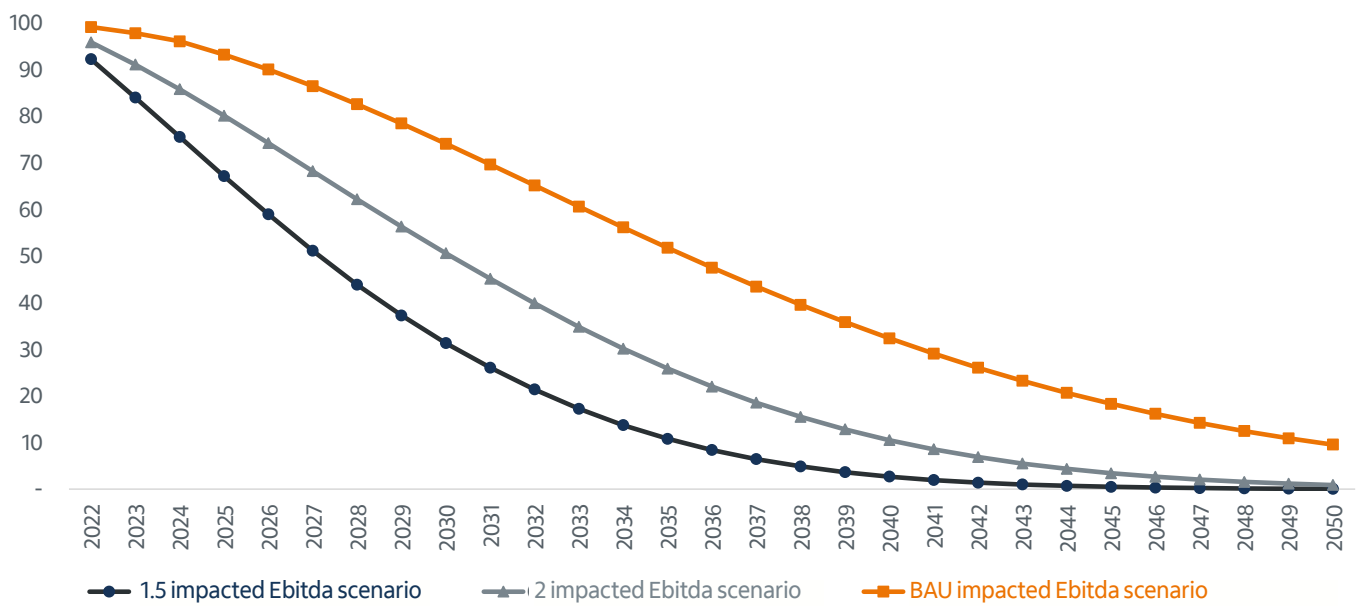
Based on analyses similar to this one, it was possible to model the impacts of the scenarios mentioned above on portfolios, as presented in the next subsection.

Analysis of climate scenarios in portfolios

Based on the approach presented in the previous section, we built a database that would allow us to compare the resilience of different portfolios in relation to the climate risks and opportunities posed.

For illustration purposes, the result of the Ibovespa portfolio for April 2021 is presented below:

Impacts on consolidated Ebitda of the Ibovespa companies in different climate scenarios (2021 – 2050)



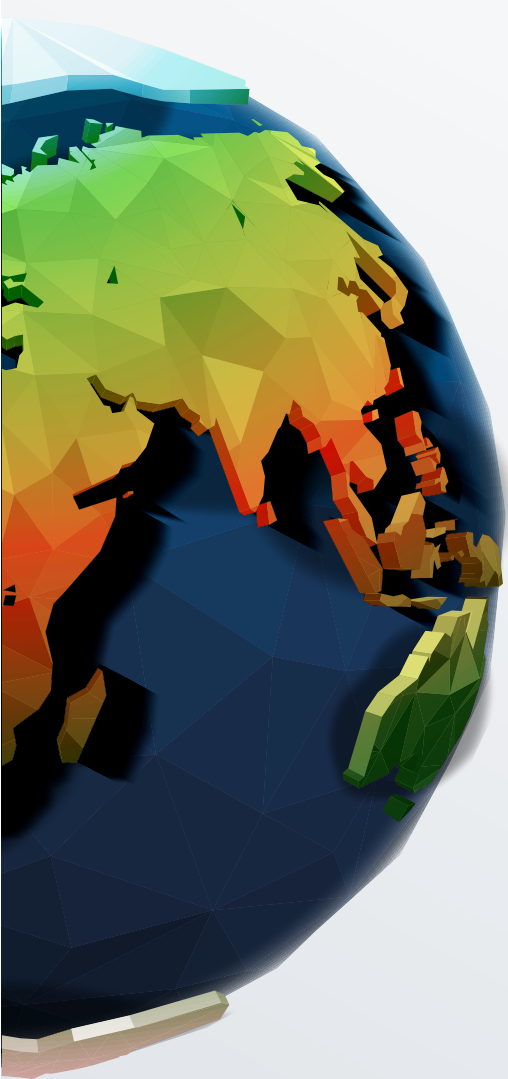
Source: Itaú Asset Management (2021)

The companies that were included in the index are more exposed to climate risks than to climate opportunities. This means that although we are already in a transition period, their business models still have great opportunities and challenges in a transition to a low-carbon economy.

This reinforces the need for companies to more emphatically incorporate climate issues into their strategy and planning, as well as to have a greater level of transparency with respect to their possible impacts, in line with the TCFD recommendations.

Finally, it is important to take into consideration that part of the impacts captured through the modeling above may be socialized, that is, transferred to their production chains, mitigating the impacts on their balance sheets.

Additionally, because it is a long-term assessment, the analysis made reveals a picture of the current business models, which could be influenced by new regulations or market demands, for the purpose of managing, in a more efficient manner, climate risks and opportunities, reducing the impact estimated here.



2. Climate change and its economic impacts

1.1 What is climate change?

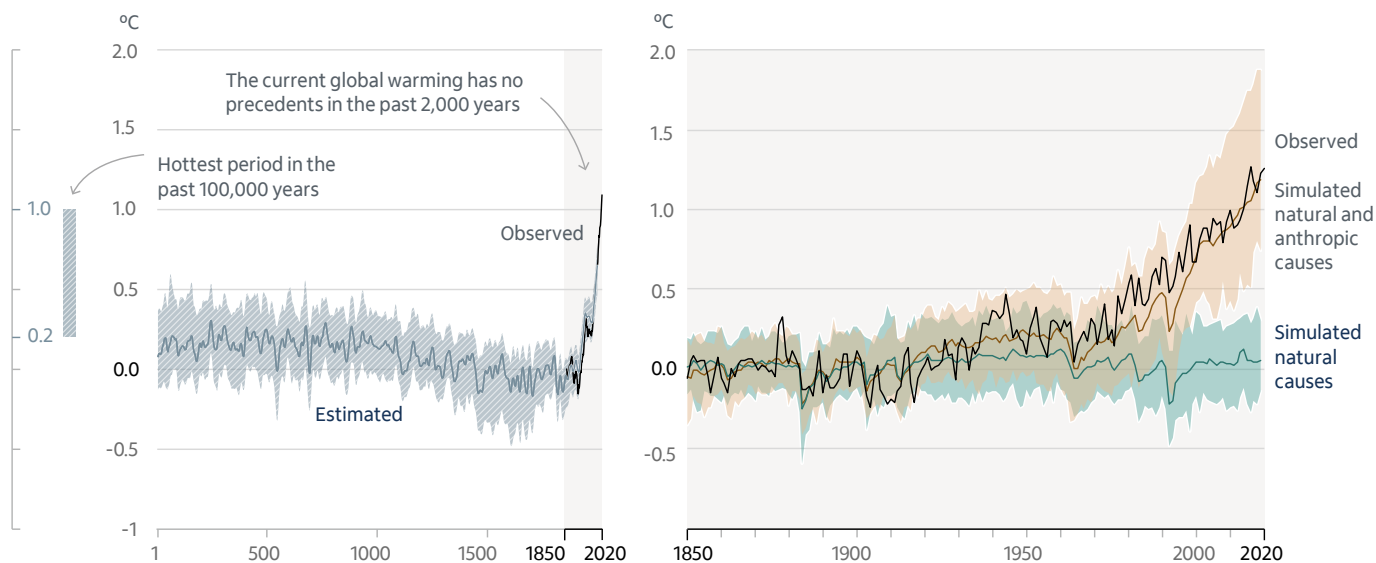
The concern about environmental degradation and climate change exponentially increased over the past two decades and, consequently, has been put in the spotlight in the global ESG agenda. Climate change can be caused by natural factors, such as changes in the orbital movements of the Earth and solar radiation, or it may be a consequence of human activities.

According to the Intergovernmental Panel on Climate Change (IPCC), we can define climate change as a significant change in average climate parameters, which persists for a very long period (usually for decades or more) [9].

We know that the changes in the cycle of carbon, the main gas responsible for global warming, have occurred naturally in the cycle of the Earth for millions of years. However, anthropogenic action (of the human being) has been causing, over the past 150 years, relevant changes in this cycle.

The last report published by the IPCC, in August 2021, shows that greenhouse gas emissions from human activities accounted for approximately 1.1°C of an average increase in temperature in relation to the pre-industrial period, which represents more than all the warming observed in the past 2,000 years and concludes that, on average, in the next 20 years, the global temperature is expected to reach or exceed a 1.5°C warming [10].

Observed and estimated change in average temperature of the global surface



Source: Climate Change 2021, IPCC [10]

Since the beginning of the Industrial Revolution, when the method of production intensified the burning of fossil fuels and, consequently, increased greenhouse gas (GHG) emissions, the concentration of carbon dioxide (CO₂), the gas that is considered the most relevant among those that cause the greenhouse effect, increased and has been growing at alarming levels, as shown in the table below:

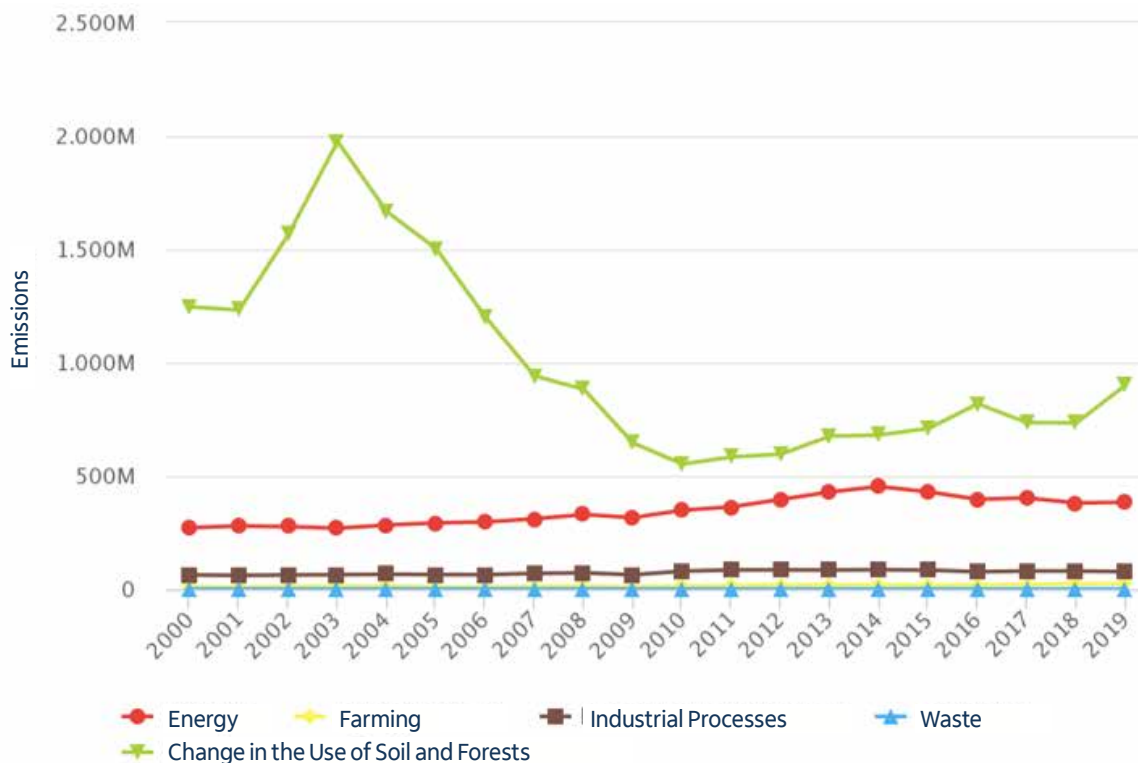
Concentration of carbon dioxide in the atmosphere in parts per million (ppm) (1960 - 2020)



Source: UNEP (2021) [11]

Meanwhile, in Brazil, the main cause of greenhouse gas (GHG) is connected with the exploration of land and forests. The System for Estimating Greenhouse Gas Emissions (SEEG) is an initiative of Brazil's Climate Observatory that allows us to estimate the history of greenhouse gas (GHG) emissions in Brazil.

Greenhouse gas emissions in Brazil per industry (2000-2019)



1.2 Why should we be concerned with climate risks?

The increase in the occurrence of extreme events, such as hurricanes, floods and draughts, is one of the most relevant consequences of climate change. Its negative impacts are felt in the health of the population, in the damage to infrastructure and in the high economic loss, since bearing the costs caused by climate change has been increasingly burdensome for governments, companies and the world population as a whole. We present here a description of the types of impacts and show data from studies on the effect of the impacts on the economy.

The impacts associated with climate change may be classified into two types:

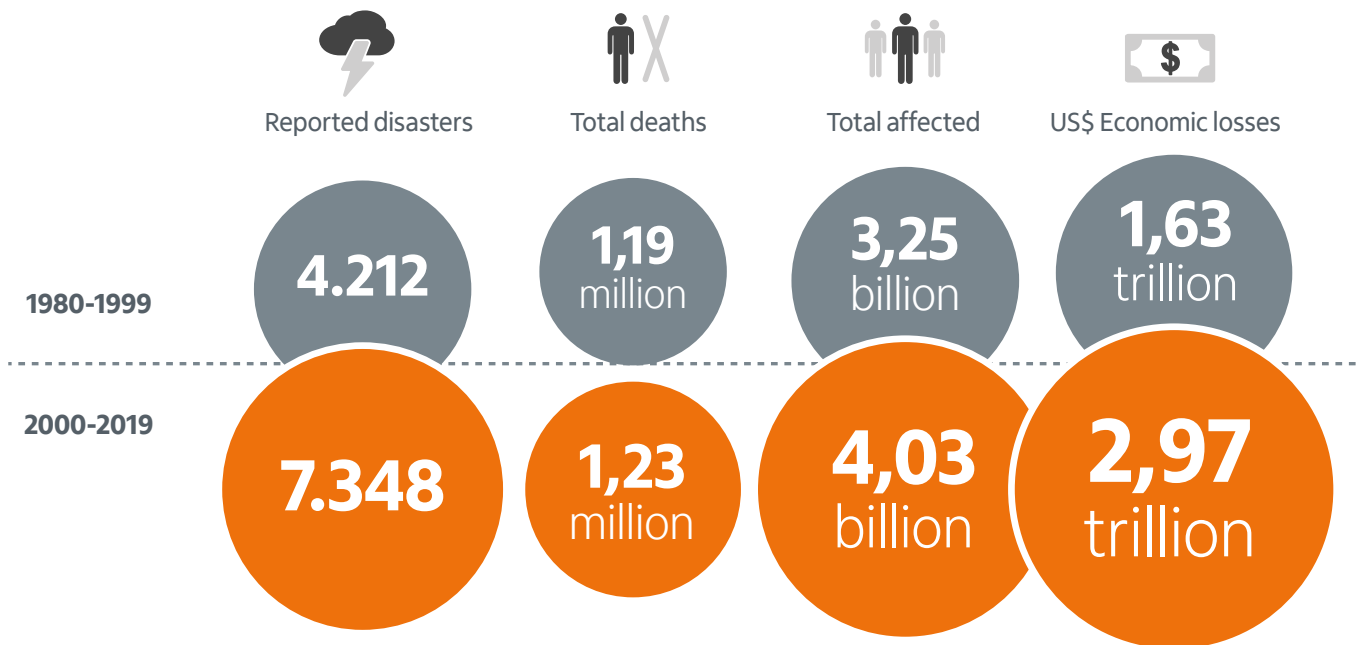
Transition impacts: The transition impacts arise from the transformations that will occur in regulatory, economic, technological and

market terms as a consequence of the transition to a low-carbon economy.

Physical impacts: They arise from extreme climate events and their impact on assets. They may be classified as acute or chronic. The gradual changes in natural conditions are considered chronic, such as the increase in sea levels and change in temperature patterns. Meanwhile, the acute impacts are those associated with isolated and high-intensity events, such as precipitations and cyclones.

All these impacts can trigger economic and/or financial risks. A study published by UNDRR (United Nations Office for Disaster Risk Reduction), published at the end of 2020, showed that extreme climate events dominated the global scenario of disasters in the 21st Century, resulting in approximately US\$2.97 trillion in global economic losses between 2000 and 2009 [2].

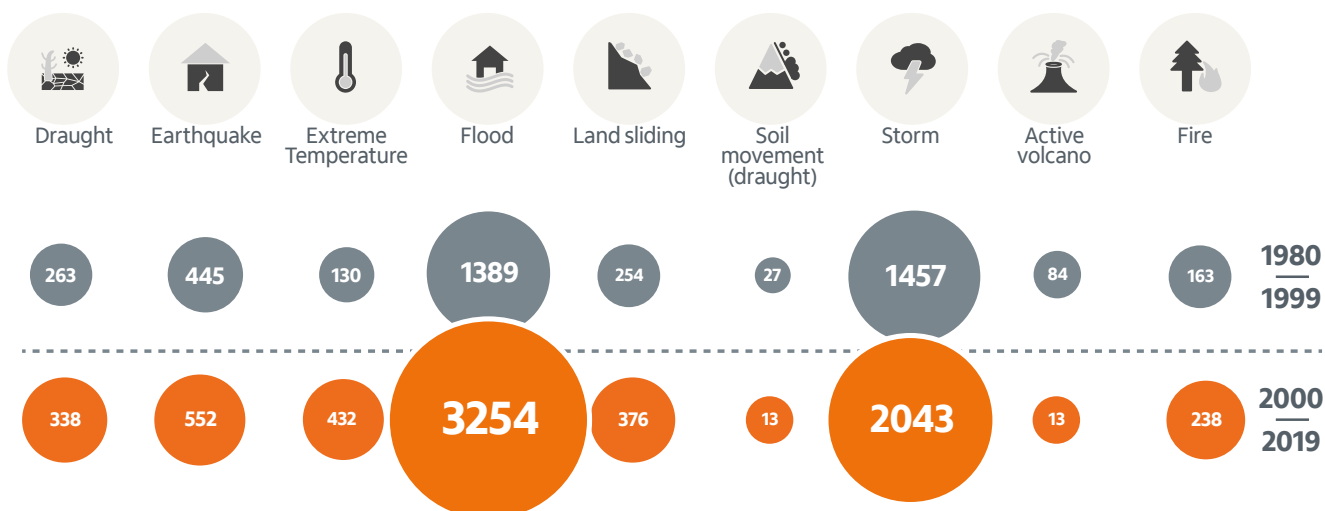
Impacts of climate disasters between 1980-1999 and 2000-2019



Source: UNDDR 2020 [2]

Additionally, a study by the Institute for Public Policy Research (IPPR) states that, since 1950, the number of floods around the world increased 15 times, extreme temperature events, 20 times, and fire became seven times more frequent [13].

Figure 6 – Total climate disasters per type – 1980 - 1999 vs. 2000 - 2019

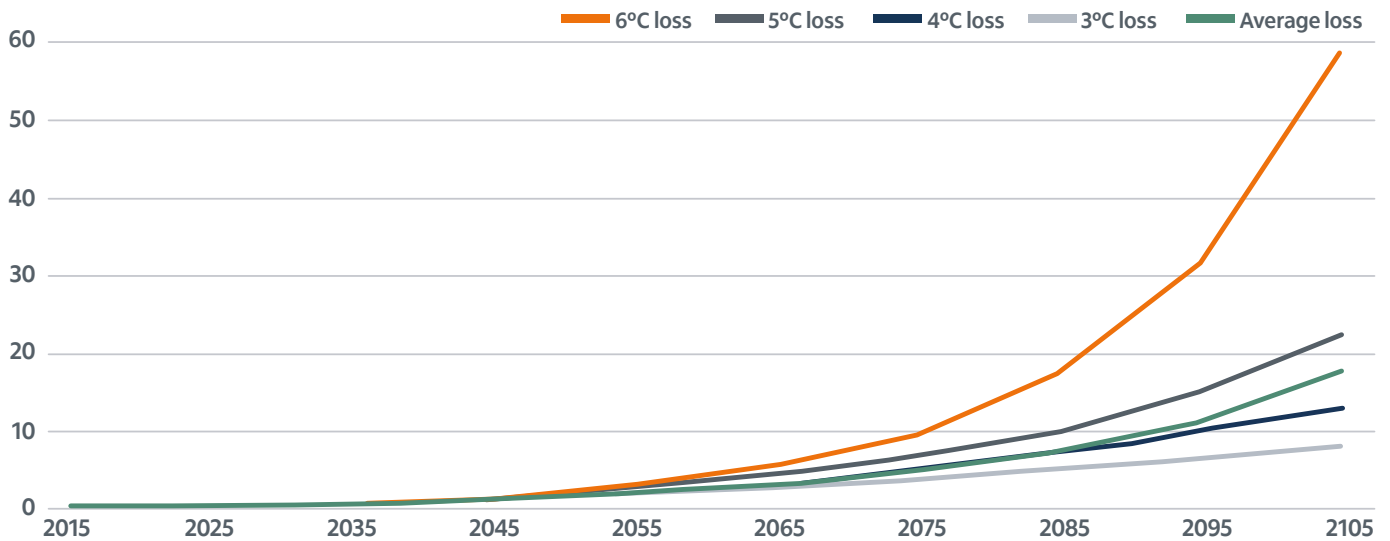


Source: UNDDR 2020 [2]

A survey conducted by McKinsey measured the financial losses in assets associated with climate disasters in the scenarios of an increase in temperature between 3°C and 6°C by 2100. It concluded that the average amount of losses will be US\$13.9 trillion. Taking into consideration the losses on both extremes - of 3°C and 6°C, the estimated losses are US\$13.9 trillion and US\$43.0 trillion, respectively.

Value-at-Risk of global financial assets in different climate change scenarios by 2100

Amounts in US\$ trillion, taking into consideration 2015 prices



Source: McKinsey [14]

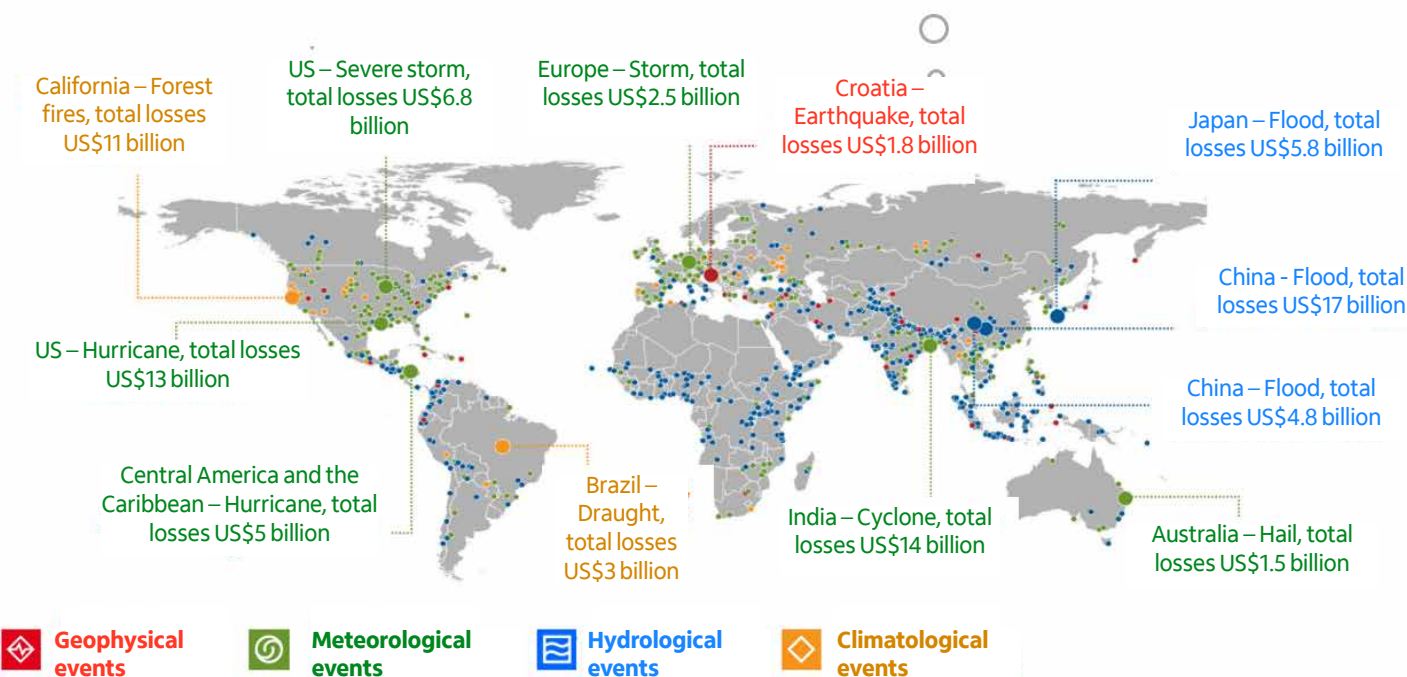
In 2020, a record number of forest fires, flood and hurricane events cost the world US\$210 billion, of which the uninsured amount corresponded to approximately 60%, as disclosed in the report of the insurance company Munich Re. In the United States alone, the damage totaled US\$95 billion

The map below provides an overview of the places of occurrence of natural catastrophes and the most relevant loses all over the world in 2020. Once again, it is worth noting that only a small part of the losses was insured in the growing

economies of Asia. The most expensive natural disaster for the year was the severe floods in China during the monsoon summer rainfalls and the total losses from which amounted to approximately US\$17 billion, of which only around 2% was insured.

Meanwhile, the United States had six of the world's ten most expensive disasters, including hurricane Laura, total losses from which reached US\$13 billion, with insured losses of US\$10 billion.

Relevant world losses caused by natural disasters in 2020



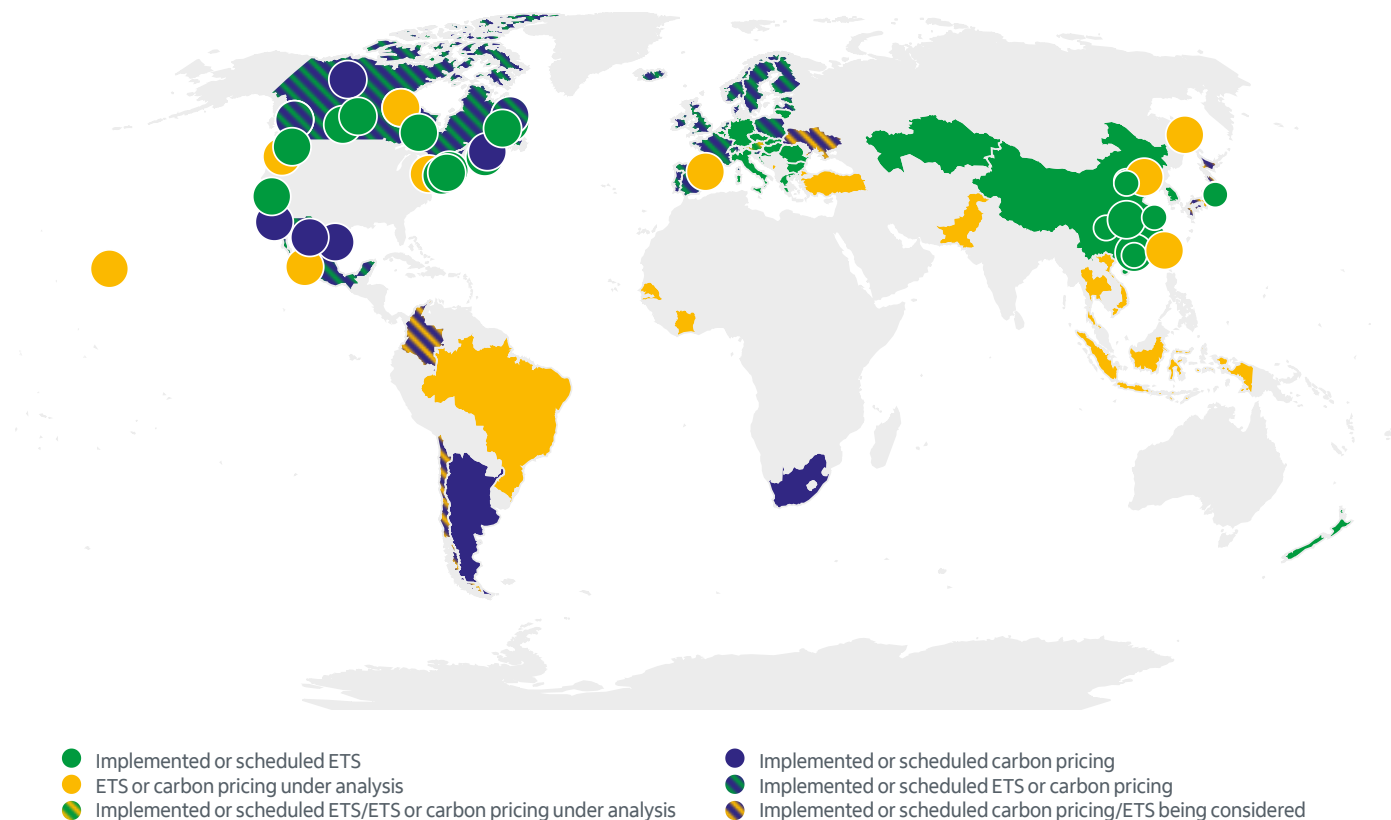
Source: Munich Re, 2021 [15]

1.3 Carbon pricing – an alternative to mitigate emissions and challenges for the real economy

Carbon pricing is a key mechanism to stop and mitigate the impacts of climate change and greenhouse gas (GHG) emissions and foster investments in efficient and clean technologies. The IPCC believes that pricing CO2 emissions is the most efficient way to fight climate change.

Therefore, pricing externalities contributes to the evolution of this agenda as the population starts to have an important cost, which is a powerful tool to encourage companies to adopt practices that are in line with a more carbon-efficient economy.

Countries/Jurisdictions with carbon pricing initiatives implemented or planned in 2021



Source: World Bank (2021) [16]

The data in the Carbon Pricing Map above shows us that there are already 64 carbon pricing initiatives implemented. In 2021, these initiatives covered 11.65GtCO₂e, representing 21.5% of global GHG emissions.

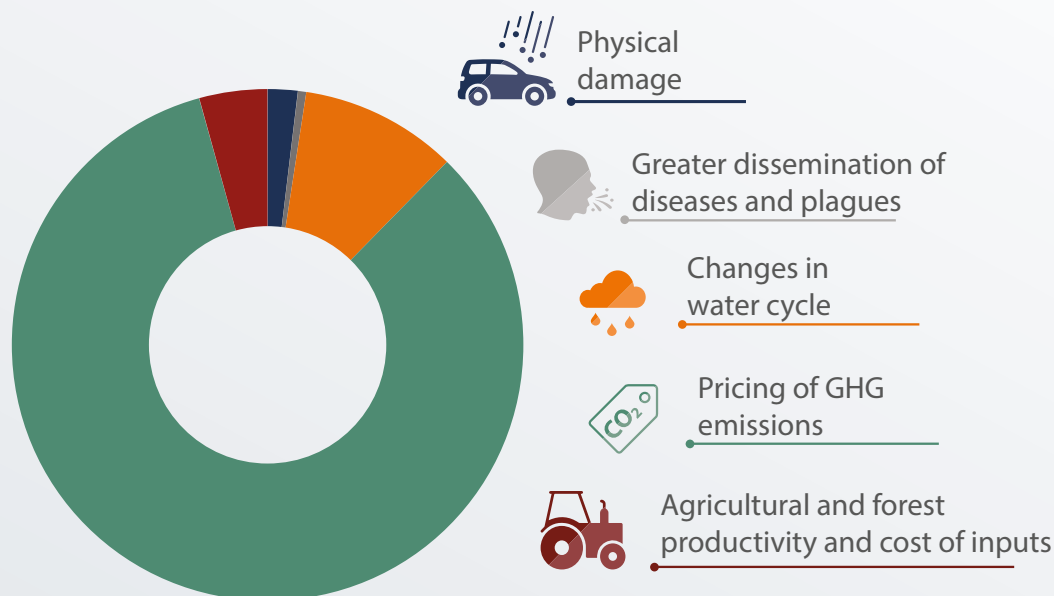
According to the annual State and Trends of Carbon Pricing report of the World Bank, published in May this year, carbon pricing generated US\$53 billion in revenue between 2020 and 2021. It concludes that the potential of carbon prices is, in its majority, unexplored and that most carbon prices are still way lower than the recommended range of US\$40 to US\$80 per metric ton of carbon equivalent (CO₂e).

The credits in this recommended price range cover less than 5% of global emissions [16].

In addition to being a key factor for the transition to a low-carbon economy, the pricing of emissions is also expected to be the main climate transition risk to be faced by companies in the coming decades, in particular those that operate in the carbon-intensive industry chain.

Back in 2017, Itaú Asset Management published a study called Climate Change and its Impacts, in which it identified that carbon pricing would be the main climate-related impact for their investment universe.

Impact of climate change on companies' value, per type

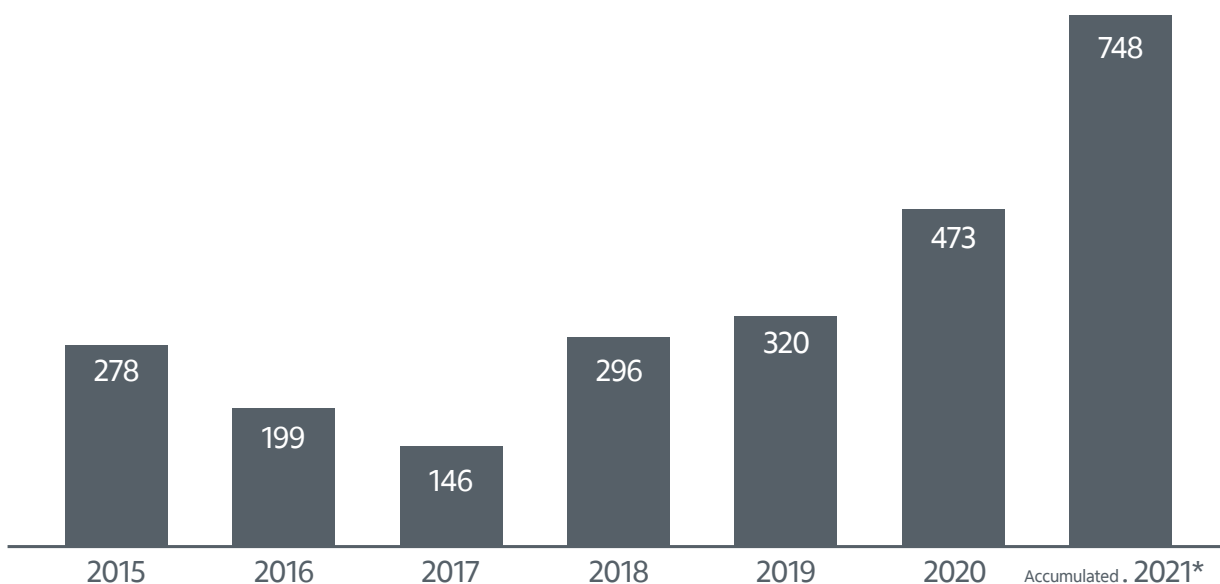


Source: Itaú Asset Management, 2018 [6]

A survey conducted by Ecosystem Marketplace shows that there was a boom in the trading of carbon credits in voluntary markets. Voluntary markets are those where participants do not have a legal obligation to acquire or generate these credits so that their transactions usually occur in a bilateral format, without the

intervention of a regulatory authority and for a mainly reputational purpose. One of the reasons for the growth of voluntary markets is the commitments assumed by companies to achieve targets to offset their emissions. The chart below shows this evolution [18].

Volumes traded in voluntary carbon markets between 2015 and August 2021 (US\$ millions)



Source: Ecosystem Marketplace – Sep 2021 [18]

In addition to the increase in volume, the average price of these credits also increased 24% this year in relation to 2020, to US\$3.11 from US\$2.51 per metric ton of carbon equivalent.

In Brazil, the carbon market regulation has been presenting good evolution prospects. Bill No. 528/2021, which regulates the carbon market in Brazil, was presented in February 2021, and its replacement was presented in conjunction with the Brazilian Corporate Center for Sustainable Development (CEBDS).

The text proposes the formation of the Brazilian System of Emission Sale (SBCE), where we will have a limit of launches for aggressive industries with the assignment of emission rights that may be traded between authorized agents. In practice, those that emit less sell credits to those that emit more than what is permitted, thus generating a carbon price and encouraging the reduction of emissions.

As a way to ensure protection for competition, combined with a learning curve for companies and regulators, the proposal is to gradually implement the system by 2030. In addition to buying emission rights between the agents that will be regulated, a part may be purchased in the so-called offset market – generated

by sources that will not be part of SBCE, such as the energy generated by biogas and forest credits. Accordingly, the proposal suggests the adoption of good practices for the voluntary carbon market in Brazil, creating the Brazilian Offset Registration System (SBRC). The idea is to provide some comfort to companies that wish to offset their emissions using Brazilian credits and create an institutional base for Brazil to participate in international markets.

Simultaneously, some companies, in a meeting at the National Confederation of Industries (CNI), seem to be open to discuss the regulation and launched, in September 2021, an analysis of international experiences in the carbon market. They support the regulation of a carbon emission system known as cap and trade, where the government determines a cap for emissions and, if it is exceeded, the companies must purchase the permissions for those that are under the limit [18].

1.4 Neutrality vs. net zero

In the rush to reduce and reach the greenhouse gas emission reduction targets, companies from all over the world have been making efforts to neutralize or eliminate their CO₂ emissions. An important initial step is to understand the difference between the two types.

Neutrality

Carbon neutrality is achieved when no carbon dioxide equivalent² is added to the atmosphere by an individual, a company, a building or a country. This can involve the elimination of emissions, their offset, or a combination of both. The carbon neutrality expression came into the spotlight with the Kyoto Protocol, which established GHG emissions as a new commodity for which the emission reduction (or removal) projects earn carbon credits, which can be measured and sold, thus enabling the carbon offset³. It is worth mentioning that carbon neutrality usually encompasses only Scope 1 and Scope 2 emissions and does not cover Scope 3.

Key points:

- It is achieved when no carbon dioxide equivalent is added to the atmosphere;
- It mostly covers only Scope 1 and 2;
- It allows residual emissions to be treated with the purchase of offsets that promote reductions or better carbon efficiency;
- More traditional offsetting measures that still prove to be valuable in the reduction of emissions;
- It does not generate a negative carbon balance.

Net Zero

Although there is not yet an internationally recognized net-zero pattern, it is considered a reference for decarbonization. In accordance with the Carbon Trust, the targets based on this concept must be in line with the target of the Paris Agreement to limit global warming to 1.5°C and be achieved within a period that is compatible with the agreement's target for 2050. The remaining emissions must be offset only by certified carbon removal credits (for example, carbon capture technology), which permanently remove an equivalent amount of carbon from the atmosphere. This can range from reforestation – provided that the trees remain in the soil for around 100 years – to the capture and direct storage of carbon in the air, where the emissions are physically removed from the atmosphere. Usually, the net-zero targets must also include the emissions in the supply chain, or Scope 3.

² - Carbon dioxide (CO₂) equivalent: a scale that allows many greenhouse gases to be compared based on their potential for warming the Earth.

³ - Offset: Measures taken to reduce or avoid greenhouse gas emission outside the value chain of a company for the purpose of globally mitigating greenhouse gas emissions.

⁴ - Scope 1: emissions for which the company has a direct responsibility.

⁵ - Scope 2: emissions generated by the purchase of electricity, heat and vapor, for example.

⁶ - Scope 3: emissions arising from the company's activity, but from sources that do not belong to or are not controlled by the company.

Key points:

- It is achieved when a player reduces its emissions to as close to zero as possible in a given period without having remaining GHG emissions, which are fully neutralized by similar removals, with projects that definitely remove emissions from the atmosphere;
- It covers direct (Scope 1) and indirect (Scopes 2 and 3) emissions;
- Offsets that avoid emissions cannot be used;
- GHG capture technologies are still under development and expensive;
- There is negative carbon generation, which occurs when there is more removal of carbon dioxide equivalent in the atmosphere than what is emitted.

ANeutrality can be considered a transition stage to net zero because, together, they show a commitment sustained by significant actions for now and for the future [19].

3.3. How investors, companies, government and civil society have been dealing with climate risks

In this chapter, the main collective actions, initiatives, products and other tools developed by the market related to the adaptation and mitigation of climate change will be presented and discussed. Discussions on policies, investors' commitments, reporting patterns and investment products associated with the topic will be addressed.

2.1 History of the discussion on climate issues: from Eco-92 to the Paris Agreement

As a reaction to a scenario where climate change starts to directly affect the world economies and the major polluters come to the spotlight, the discussion on the climate change topic for taking actions focused on stopping and reducing emissions of gases that accelerate climate change became urgent.

We present below the main milestones involving civil society, the private sector and governments.

ECO - 92

A great milestone of these discussions was the Eco-92 Conference held in Rio de Janeiro. The Conference was attended by 178 heads of government and was characterized by the strengthening of the work of representatives from civil society, the effective participation of NGOs and social movements in the Global Forum.



The Conference had important developments from the scientific, diplomatic, political and environmental standpoint, in addition to making room for debates and contributions to the environmentally sustainable development model.

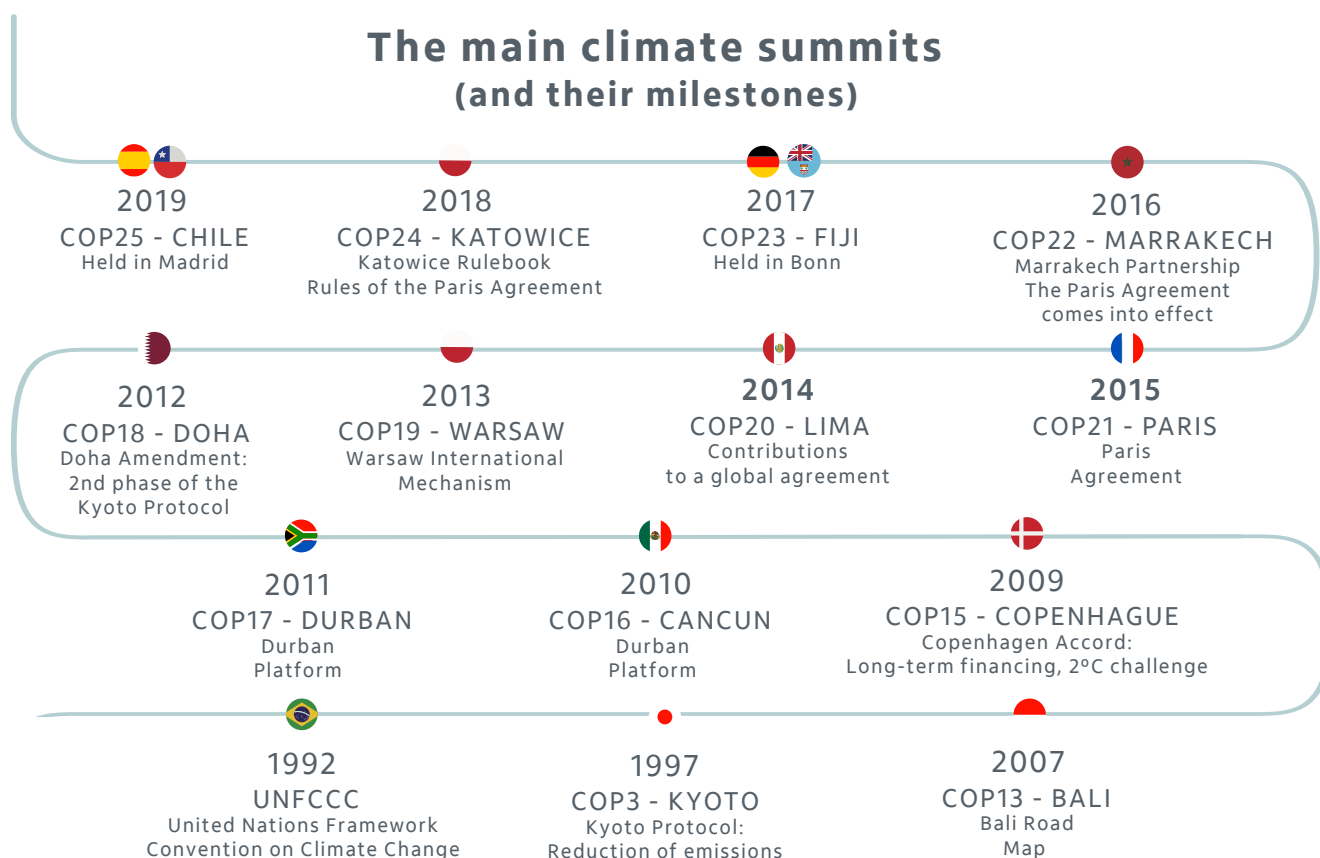
The sustainable development concept became popular at the Eco-92 Conference, but it was used for the first time in 1987 in a UN report called “Our Common Future”, which criticized the development model adopted by the industrialized countries, which was reproduced by the developing nations, in addition to raising important points on present and future environmental needs. One of the main results of the Conference was the so-called “Agenda 21”.

The Agenda 21 is a plan of actions and targets with 2,500 recommendations to achieve sustainable development. Among the main objectives of Agenda 21 are the universalization of basic sanitation and education and greater participation of NGOs, labor unions and workers in the life of society; the planning and the sustained use of soil resources, plant formations and rivers, lakes and oceans; and the conservation of biodiversity.

During the ECO-92 Conference, UN member countries started to discuss the combat of climate change, thus giving rise to the United Nations Framework Convention on Climate Change (UNFCCC).

Every year, the countries that are signatories to the Convention meet at the Conference of the Parties (COP) to discuss climate change-related issues. [20].

The main climate summits (and their milestones)



Fonte: Iberdrola [21]

Kyoto Protocol



KYOTO 1997

United Nations
Climate Change Conference

The agreement negotiated in 1997 in Japan defined emission reduction targets for developed and developing countries. The Kyoto Protocol was signed by 141 countries and came into effect only on February 16, 2005.

Initially, the configuration of the Protocol provided for the assignment of responsibility to the countries that had historically been the main emitters of greenhouse gases.

Among the targets, the Protocol established the reduction by 5.2% in relation to 1990 of greenhouse gas emissions, in particular by the industrialized countries, in the period between 2008 and 2012. The protocol also stimulated the creation of sustainable development ways to preserve the environment. It was signed in 1997 but it was ratified only in 2005 by the minimum number of countries so that it could become effective.

The results, unfortunately, were not satisfactory. Differences of opinion between the member countries that demanded the same mandatory responsibilities from the developing countries, in addition to demanding reduction targets from the United States, caused the objectives not to be achieved. Additionally, some countries like Russia, China, Canada and Japan did not renew the agreement.

Accordingly, reports show that ten years after the signing of the treaty, the Kyoto Protocol did not reach the desired success since GHG emissions increased 16.2% worldwide between 2005 and 2012.

As a legacy, the Kyoto Protocol established the first global carbon credit trading market. In general terms, the developed countries could buy carbon credits from the developing countries through the Clean Development Mechanism (CDM). The carbon credits generated at projects, after an audit examination and verification that they fall under the CDM, were converted into securities or certificates (Certified Emission Reduction – CER) and launched into the market for trading. This market has reached major proportions once, with Brazil issuing many credits in the 2000's. However, after the global economic crisis in 2008, the trading prices dropped significantly, as we can see below.



Source: Thomson Reuters

The instability of the Kyoto Protocol led the Parties to meet in Copenhagen in 2009 in COP-15 to establish a post-agreement, where the United States questioned Europe's interpretation of the system and defended the voluntary establishment of targets by the Parties, which would become the Nationally Determined Contributions (NDCs).

From that moment onwards, the Paris Agreement started to be shaped and was presented at COP-21 in Le Bourget, France [22, 23 and 24].

Rio+20



RIO+20

Held in 2012, Rio+20 was then known by this name because it marked the 20 years of the United Nations Conference on Environment and Development (Eco-92). The main purpose of the Conference was the renewal of the political commitment to sustainable development by means of the assessment of the

progress, the gaps in the implementation of the decisions made and the addressing of new and emerging topics. Two priority topics were discussed at the Rio+20 Conference: green economy in the context of sustainable development and eradication of poverty, and the institutional framework for the development.

The final document presented many intentions, introducing for the coming years the definition of practical measures to ensure the protection of the environment [25].

Paris Agreement



Approved in 2015 at COP 21, the Paris Agreement replaced the Kyoto Protocol in 2020.

Based on the national climate plans shared by more than 190 countries, the Paris Agreement was marked by the creation of the Nationally Determined Contributions (NDCs), which are progressive commitments to reduce greenhouse gas emissions by part of the signatory countries.

The objective is to maintain the increase in average global temperature below 2°C above pre-industrial levels and seek efforts to limit the temperature increase to 1.5°C.

One of the highlights of the agreement is its Article 6, which establishes two market instruments to support the transition to a low-carbon economy.

The first, defined in Article 6.2, establishes a large emission reduction trading system between the countries. The second, established in Article 6.4, corresponds to the generation of emission reduction based on private and certified projects validated by a supervising body. It is worth mentioning that Article 6 is not regulated and is pending a number of definitions about the operation of the mechanisms above [26].

Brazil has committed to a reduction target of 37% of its greenhouse gas emissions by 2025 and of 43% by 2030. The base year used is 2005 [27].

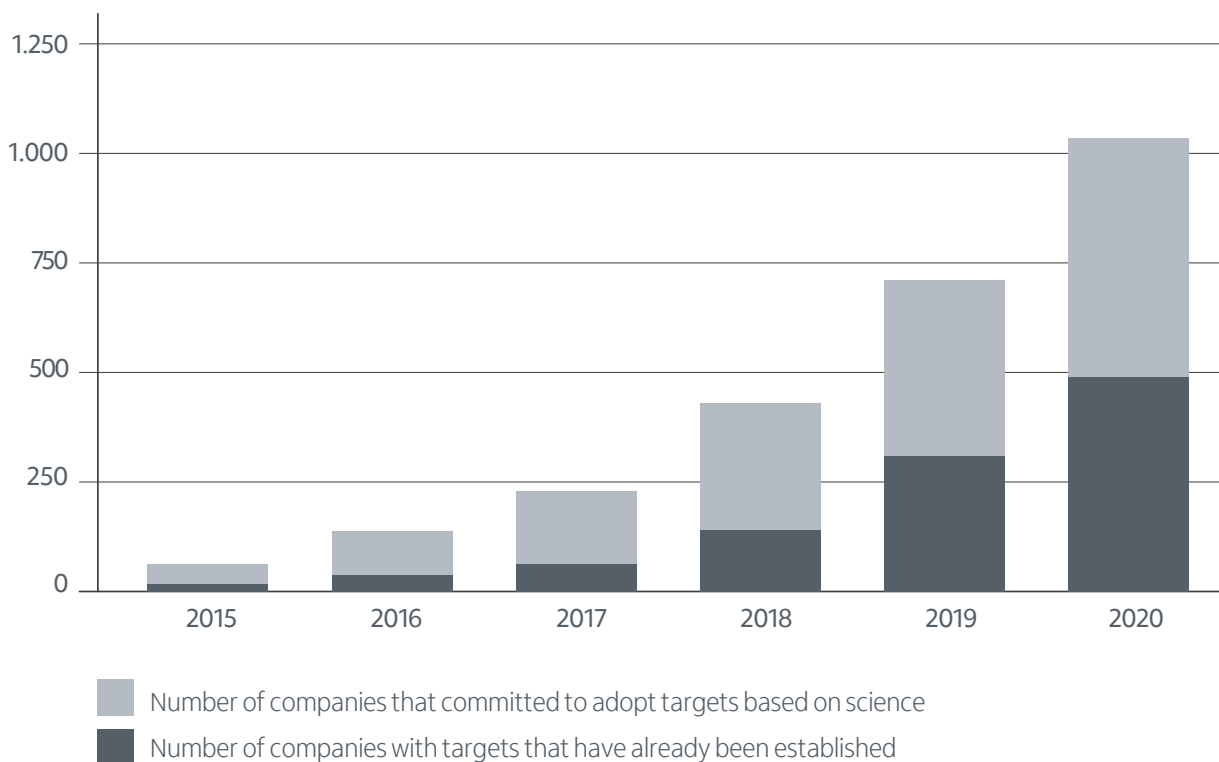
Since then, more than establishing emission reduction targets, countries and companies have been seeking the support of initiatives so as to direct and measure whether the dedicated efforts are actually promoting the transition to a net-zero carbon economy.

The Science Based Targets (SBTi) is one of these initiatives. Created from the partnership between the Carbon Disclosure Project, the UN Global Compact, the World Resources Institute (WRI) and the World Wildlife Fund (WWF), it drives ambitious climate actions in the private sector with reduction targets based on scientific studies.

In its last report, disclosed in January 2021, the initiative shows that 1,040 companies from more than 60 countries and nearly 50 industries, which represent almost 20% of global market capitalization (more than US\$20.5 trillion), are working to reduce their emissions in the pace and scale necessary to prevent the worst effects of climate change. It was shown that, whereas the global emissions of energy and industries increased around 3.4% between 2015 and 2019, the emissions of the companies that are signatories to the SBTi dropped 25% in the same period [28].

It is worth noting the recent increase in the demand for this initiative since 370 organizations joined the SBTi between November 2019 and October 2020 at an average number of 31 companies per month – more than twice the average number between 2015 and 2019.

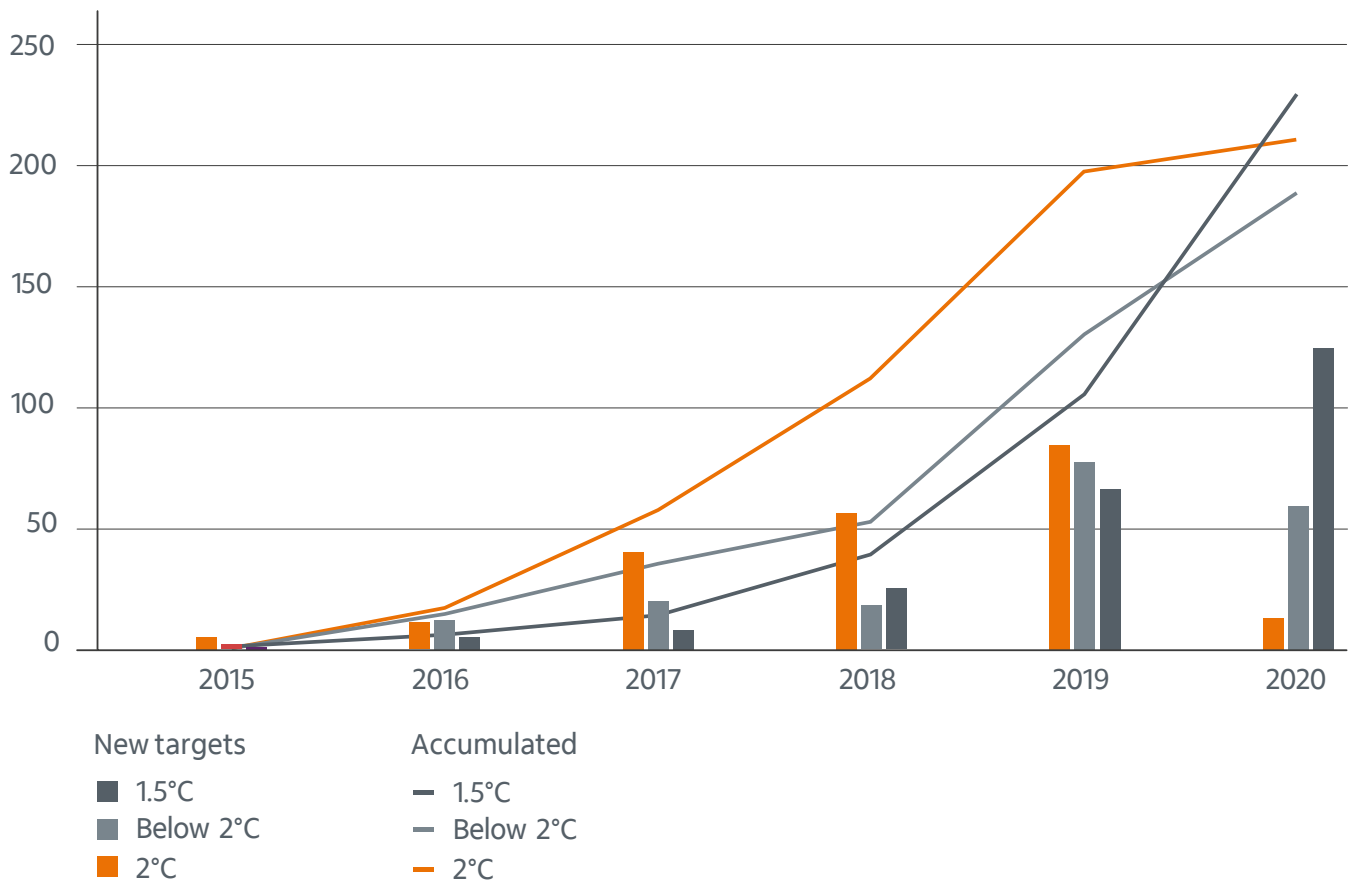
Increase in the number of companies with science aligned targets (SBTi) between May 2015 and October 2020



Source: Science Based Targets Initiative (2020)

In October 2020, 41% of the companies had targets for their entire productive chain in line with a 1.5°C scenario. In 2020, for the first time, most of the new Scopes 1 and 2 approved targets were in line with a 1.5°C scenario, which is now the most common target among the signatories.

Corporate scopes 1 and 2 greenhouse gas emission targets in line with a 1.5°C scenario



Source: Science Based Targets Initiative (2020)

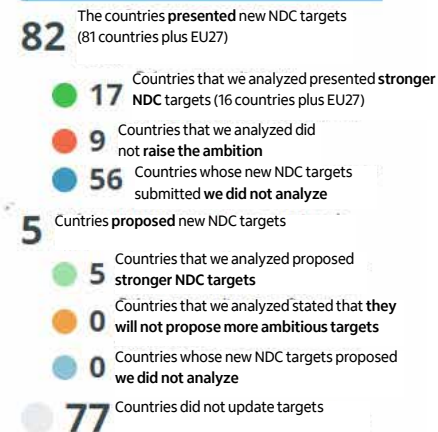
Another initiative aimed at promoting a scientific analysis that monitors and measures the climate actions developed by the countries in accordance with their targets established in the Paris Agreement is the Climate Action Tracker (CAT).

The CAT covers the countries with the highest levels of emissions and a representative sample of smaller emitters covering around 80% of global emissions and approximately 70% of the global population [29].

Status of the commitments assumed by the countries in the scope of the Paris Agreement (NDC)

Climate Targets

Status of the NDC updating process



Last update: August 18, 2021
Map is for reference only

The commitments and initiatives of governments, civil society and private sector contribute to increase the climate awareness of the agents from the financial market and real economy. As a consequence, over the past decades, we observed the emergence of many actions, investment products and reporting patterns to monitor and manage the impact of climate change on businesses.

In Brazil, one of the main decarbonization actions aimed at Brazilian investors is the Investors for Climate (IPC).



The Investors for Climate seeks to engage and train Brazilian investors for them to evolve in decarbonization and portfolio climate management. This is the first 100% Brazilian initiative aimed at the topic and has the participation of 25 investors that represent more than R\$3 trillion in assets under management, including Itaú Asset Management.

Among the commitments assumed by the participants is to report on the risks and opportunities associated with the climate issues in line with the Task Force on Climate Related Financial Disclosures (TCFD), and carry out, every year, engagement and stewardship actions with investees with a focus on discussing and promoting a climate agenda.

The initiative has been in effect since the second half of 2019 and is led by SITAWI, with the support of the Institute for Climate and Society (ICS) and partnership with the Carbon Disclosure Project (CDP) and Principles for Responsible Investment (PRI) [30].

2.2 Climate-related investment products

In addition to the carbon credits mentioned in the previous sections, the market has developed a series of standards, labels and products aimed to provide more transparency and enable the allocation of funds to activities in line with the transition to a low-carbon economy. In the subsection below we will provide an overview of these actions and initiatives.

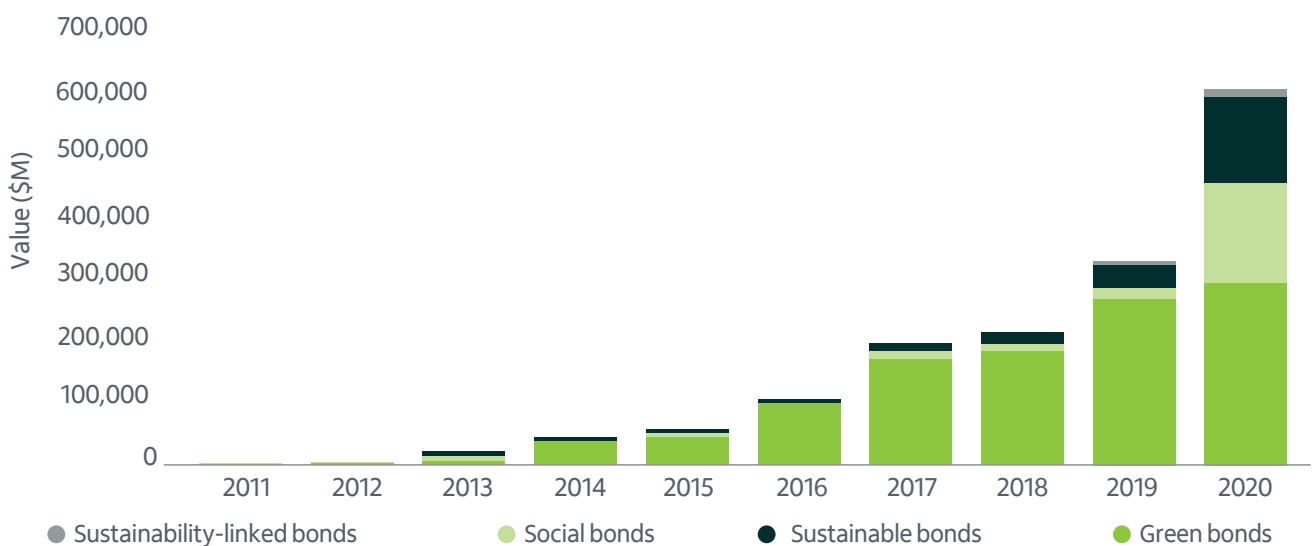
Green, sustainable and sustainability-linked bonds

A number of financial instruments have been designed to make fundraising possible for activities with environmental and climate additionality, such as Green, Sustainable and Sustainability-Linked Bonds.

The world's first green bond was issued in 2007 by the European Investment Bank (EIB), pioneering the market for sustainable debt financial instruments.

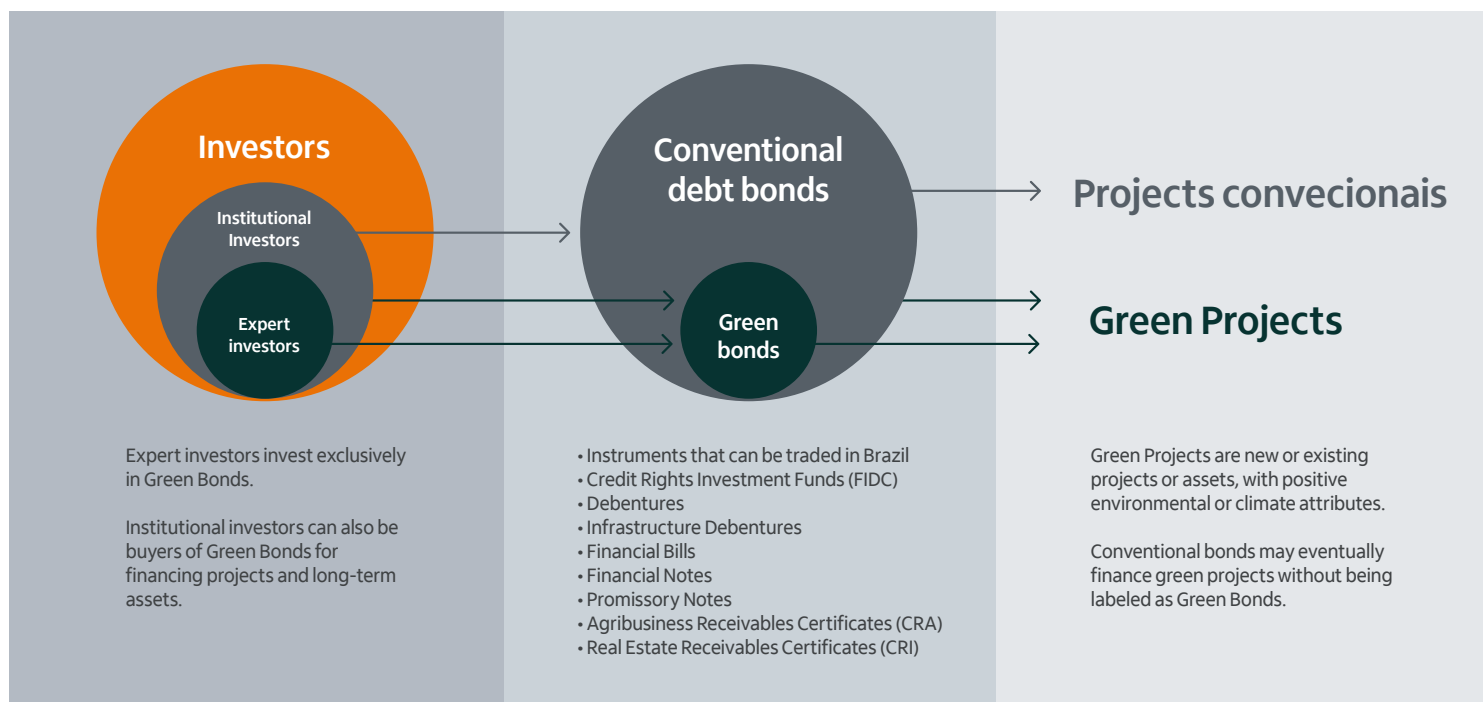
This market has since then experienced rapid growth, adding issuers such as commercial banks, corporations, and countries [31].

Sustainable debt financial instruments in the global market (2015-2020)



Fonte: SITAWI (2021) [31]

Comparing green and conventional bonds



Green and Sustainable bonds are debt instruments issued by companies, governments and multilateral entities, traded on capital markets and committed to financing assets with environmental, social or climate additionality⁸.

One development of this market was the creation of the so-called Sustainability-Linked Bonds (SLB). SLBs are debt instruments whose ultimate goal is to make the issuer achieve ESG targets, which are calibrated based on key performance indicators (KPIs).

According to the achievement, or not, of previously-set targets, this type of security may have its structural and financial characteristics modified, even with a possible interest rate increase. Many debt issuances through this instrument have included carbon and climate change targets and indicators.

8 - Additionality refers to benefits, gains and improvements for the environment and/or society that go beyond the mere compliance with legislation or corporate standards.

Itaú Asset has been monitoring and assisting the development of the SLBs and Green Bonds market in Brazil.

Characteristics of green bonds, sustainable bonds and sustainability-linked bonds

	Characteristics	Examples of Projects
Green Bonds	These are bonds whose proceeds are specifically used to raise funds to finance projects with positive environmental or climate attributes.	Renewable energy, energy efficiency, clean transport, green buildings, wastewater management and climate change adaptation.
Sustainable Bonds	These are bonds whose proceeds are specifically used to raise funds to finance or refinance a mix of green and social projects or activities.	Sanitation projects focused on expanding access and water and energy efficiency.
Sustainability-Linked Bonds	Bonds linked to the improvement of the organization's ESG performance, whose proceeds raised have no specific use.	Indicator: Waste management/ Target: 97% of waste to be recycled by 2025 Indicator: Renewable energy/ Target: Achieve 100% of renewable energy consumption by 2022.

Source: International Capital Markets Association [32, 33 and 34]

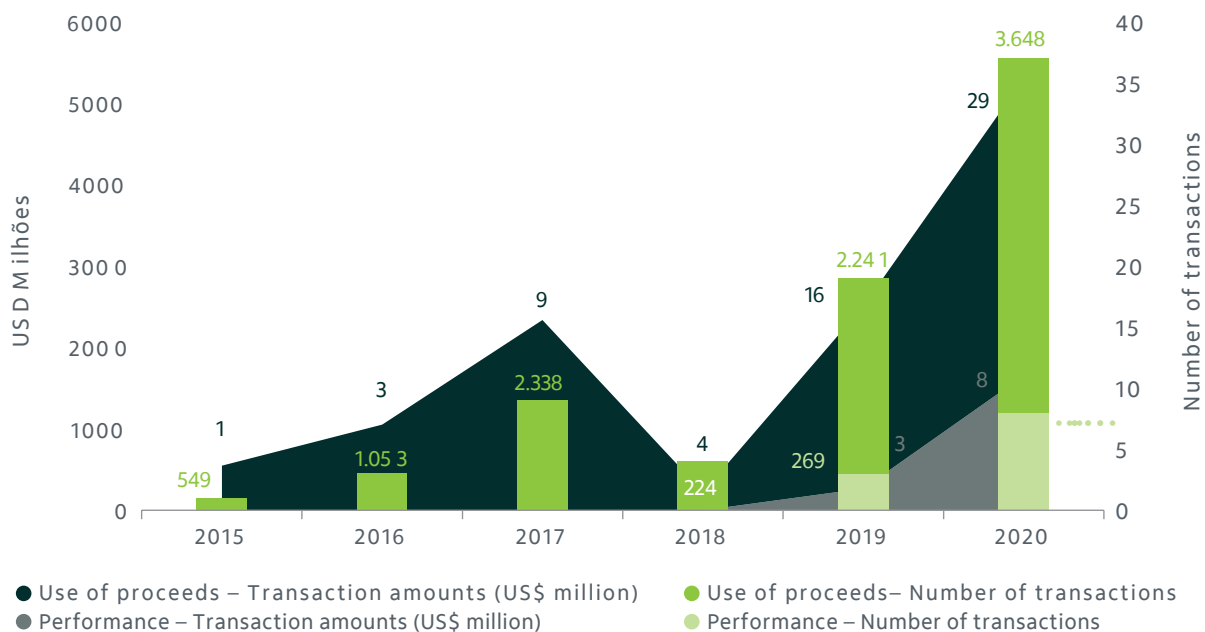
Sustainable debt market outlook

Faced with the urgent allocation of more funds for climate change mitigation and adaptation actions, in Brazil, FEBRABAN teamed up with CEBDS and launched in 2016 a Green Bond Issuance Guide aimed to drive active participants in the fixed income securities market in Brazil through the issuance process of these specific securities [35].

The ESG bond market in Brazil continues to grow strongly. ESG-linked loans jumped to 29 from 19 in 2015-2020.

This figure had already soared to 67 by July 2021.

ESG-linked loans in Brazil in 2015-2020



Source: SITAWI (21) [31]

In 2020, sustainability-linked funds raised by Brazilian companies hit a record just short of R\$28 billion, a three-fold volume compared to 2019.

Green bonds have historically been the main type of sustainable financial instrument in Brazil. However, a great potential exists for green bonds to be outperformed by sustainability-linked instruments in 2021 and after. Surveys indicate that the issuance of sustainable debt bonds is set to reach US\$650 billion.

Issuances of green, social and sustainable bonds in 2013-2021.

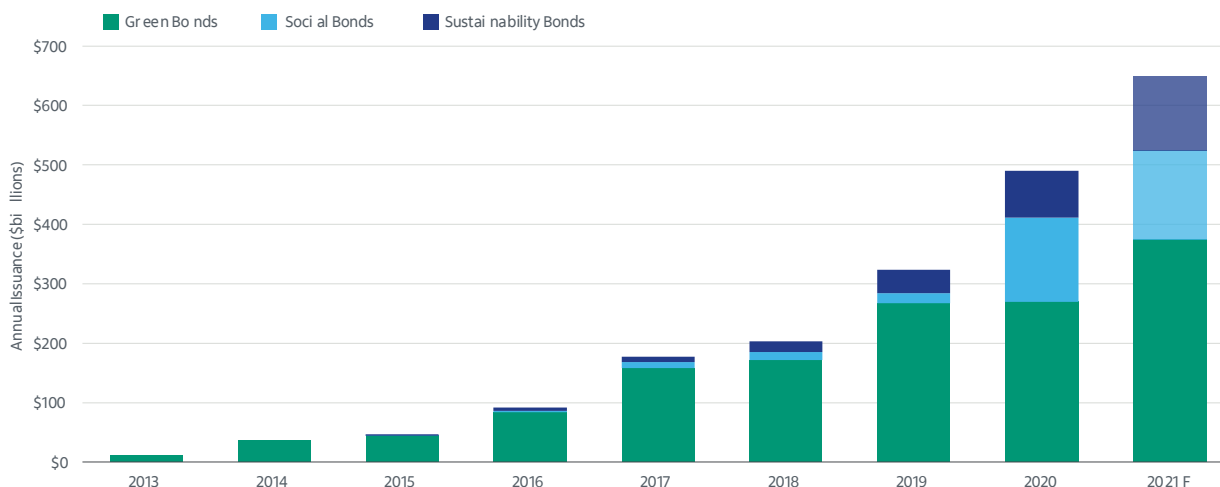


Figure 1: Sustainable bonds to hit record \$650 billion in 2021

Sources: Moody's Investors Service, Climate Bonds Initiative, Dealogic

Source: Environmental Finance (2021) [36]

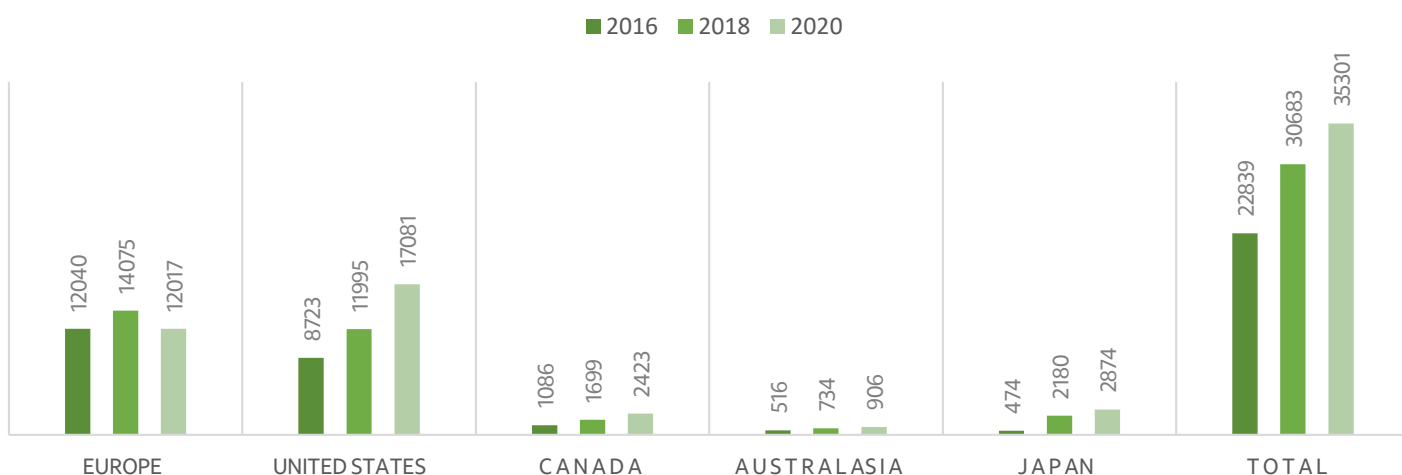
Green, ESG and climate-focused investment funds

In the segment of investment funds and products, strategies aimed to promote good sustainability practices and tackle climate change, as well as new labeling standards, are gaining momentum.

According to a study developed by the Global Sustainable Investment Alliance (GSIA), 35.9% of global investment funds have some ESG integration practice from 27.9% in 2016 [37].

Net worth of funds that have ESG integration criteria in 2016, 2018 and 2020 (in US\$ billions)

VOLUME OF GLOBAL SUSTAINABLE INVESTMENTS - 2016, 2018, 2020
(US\$ BILLION)



Source: GSIA (2021)

Regulation and Taxonomy

In the European Union, aimed to promote transparency of the disclosure of ESG fund information, the SFDR (Sustainable Finance Disclosure Regulation) has set out new specific reporting data that are mandatory for asset managers and other financial market participants.

Its key goal is to ensure comparability and avoid greenwashing⁹, as it provides clearer and standardized information about the ESG strategy adopted by each fund [38].

⁹ - Greenwashing, also called green sheen, is a marketing strategy used by companies to create a deceptive image of sustainability, without actually carrying out sustainable practices.

The SFDR was introduced by the European Commission, alongside the Taxonomy Regulation and the Low Carbon Benchmark Regulation, as part of a package of legislative measures derived from the European Commission’s Action Plan on Sustainable Finance. It is worth mentioning that, with the introduction of the SFDR, the accounting for ESG investments in Europe was down US\$2 trillion (US\$14 trillion in 2018 to \$12 trillion in 2020). Noteworthy is the fact that this fall was not due to reduced enthusiasm for ESG investments in Europe, but rather to policymakers tightening the parameters for what can be deemed as an ESG investment [39].

In the Brazilian regulatory scenario, minimum criteria to be met by ESG funds have not yet been set. However, with the increase of ESG-focused assets in the market, a key issue has arisen: how to provide transparency and assure investors that environmental, social and governance

criteria have indeed been integrated in the portfolio. To contribute to this debate, a public hearing is being held at the Brazilian Securities and Exchange Commission (CVM) on the creation of an environmental and social classification for Credit Rights Investment Funds (FIDC), a type of fixed-income investment based on securities receivable from a company.

Another public hearing is being held at the Brazilian Association of Financial and Capital Markets (Anbima) on a proposal for classifying ESG funds in Brazil along of lines of the European SFDR. This proposal comprises equity and fixed-income funds, which can be classified as “sustainable investment funds” or “funds integrating ESG issues in their management”.

The table below shows the main characteristics of these types of funds:

Proposta de classificação de fundos ESG no Brasil

	Sustainable investment funds	Non-sustainable investment funds, but that include ESG issues in their management
Is it identified as a Sustainable Investment fund?	YES (indicative suffix included)	NO
Fund name: An indicative suffix is included?	YES	NO
Do promotional materials of funds include this differentiation?	NO – But the inclusion of a suffix already indicates this is a sustainable investment fund	Standard wording in promotional material: This fund includes ESG issues in its management, according to the ANBIMA Code of Third Party Funds, available on the Association’s website on the internet.”
Does it include information in ANBIMA registration and supervision systems?	YES (indicative suffix included)	YES (specific field to be filled in)
Type of fund	Equities and fixed income	Equities and fixed income

Source: Anbima (2021) [39]

These regulatory initiatives contribute positively to the structured development of the Brazilian market. As it has been debated in Brazil for some time, we can see a growing interest in this topic, even though figures are still low compared to the fund segment as a whole.

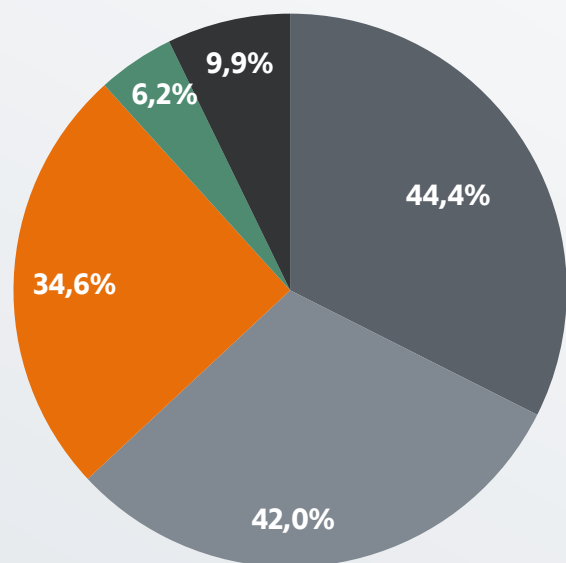
According to an Anbima report released in January 2020, the integration of ESG issues in investment analyses in Brazil is still at its early stages.

Although most managers who answered the 2nd Sustainability Survey, published by Anima in 2018, factored in the potential impact

of ESG issues in their investment decision-making process, only few of them has a specific department (11%) or employees directly involved (18%) or a specific committee (5%) to analyze ESG investments or otherwise have a specific responsible investment policy (21.36%) [40].

With respect to assets analyzed according to ESG issues, most are variable income (44.44%), followed by private equity (41.98%) and corporate fixed income assets (34.57%).

Net worth of funds in Brazil with ESG integration criteria, broken down by asset class (2020)



Source: Anbima (2018)

Types of assets subject to ESG analysis





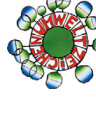

- Variable Income
- Private equity/venture capital
- Corporate fixed income/ private credit
- Sovereign fixed income
- Other (please specify)

ESG Investing Certification Initiatives

According to a survey conducted in March 2020, a total of 935 funds, accounting for an equity worth US\$326.7 billion, were awarded at least one of the nine sustainability labels launched in Europe. Sustainability labels are the result of governmental or private initiatives aimed to certify funds whose transparency and portfolio selection and evaluation processes integrate sustainability criteria.

Some of the main labeling standards for investment funds are as follows:

ESG labeling for the most common funds in Europe *

Label	ESG strategy	Exclusion framework	Other
 SRI Label	ESG screening of 90% of portfolio - 20% reduction of the investable universe	Mandatory inclusion of sectors; human rights	Impact (Use of indicators); Engagement and Voting Policy
 FNG-Siegel	ESG screening of 100% of portfolio	Exclusions framework (UN Global Compact and norm based country exclusion list)	Point system includes impact, best in class and/or thematic investments and engagement
 LuxFLAG ESG	100% portfolio screening, according to ESG strategy	Mandatory, subject to approval	Best in class or multiple Exclusions strategy
 Towards Sustainability	ESG screening of 100% of portfolio, with temporary exceptions	Negative screening; do no harm (UN Global Compact and others)	At least one of the other approaches
 Umweltzeichen	ESG Strategy (70% to meet the score) investable universe (25, 33 and 50%)	Exclusions framework (norm based, sectors and governments)	Point system includes rewards for engagement, carbon footprint/risks and credibility
 Nordic Swan Ecolabel	ESG screening for 90% of portfolio (points for 100%) 50% "strong ESG practices"	Internal exclusions framework (restrictions to non-adherence to international agreements)	System point includes engagement and specific exclusions

*In order of appearance: SRI Label (France), FNG-Siegel (Germany, Austria and Switzerland), LuxFLAG ESG (Luxembourg), Towards Sustainability (Belgium), Umweltzeichen (Austria), Nordic Swan Ecolabel (Nordic countries). Source: Novethic (2020) [42]

2.3 TCFD in the Central Bank of Brazil's agenda

As the regulator of the National Financial System (SFN), the Central Bank of Brazil – in line with the global sustainability agenda and other central banks - has developed a series of sustainability-related measures and standards over recent years, such as its Environmental and Social Responsibility Policy (PRSA).

Since September 2020, the Central Bank of Brazil has supported the Task Force on Climate-Related Financial Disclosures (TCFD), which was created in 2015 to meet the G20's request to include climate change risks in the scope of the Financial Stability Board (FSB).

TCFD sets out climate-related financial disclosure recommendations aimed to help companies provide better information to support capital allocation.

These disclosure recommendations are structured around 4 topics: governance, strategy, risk management, and metrics and targets. TCFD is mainly engaged in helping companies implement its recommendations and make headway in the availability and quality of climate-related disclosures.

Voluntary adherence to TCFD recommendations can provide investors, creditors and insurers with useful information in order to properly assess and price climate change risks and opportunities.

The new dimension of the Central Bank of Brazil's work agenda recognizes the importance of Sustainability in the economy and the National Financial System, and therefore this topic has been picked as the focus of the fifth dimension of the BC# Agenda, comprising: strategic and dynamic agenda, promotion of sustainable finance, proper management of environmental, social and climate risks in the National Financial System, and integration of sustainable variables in the Central Bank of Brazil's decision-making process [44].

TCFD has currently over 1,200 members worldwide and this figure is just growing more and more. Investors with over US\$34 trillion under management support this initiative. Brazil can showcase only 20 official signatories to TCFD nevertheless. One of the difficulties for implementing the recommended metrics, as raised by representatives of companies and banks, is poor regulation - as we have seen in previous sessions, here in Brazil regulation is still in progress. Brazil still has a long way to go: according to the latest TCFD's monitoring report of June 2019, supporting companies were reporting, on average, only 3.6 of the 11 recommendations made by the TCFD. This is due to companies still have questions on how to address and report scenarios and to their inability to measure them, even though they are able to identify climate-related risks and opportunities [45].

2.4 Opportunities in new technologies

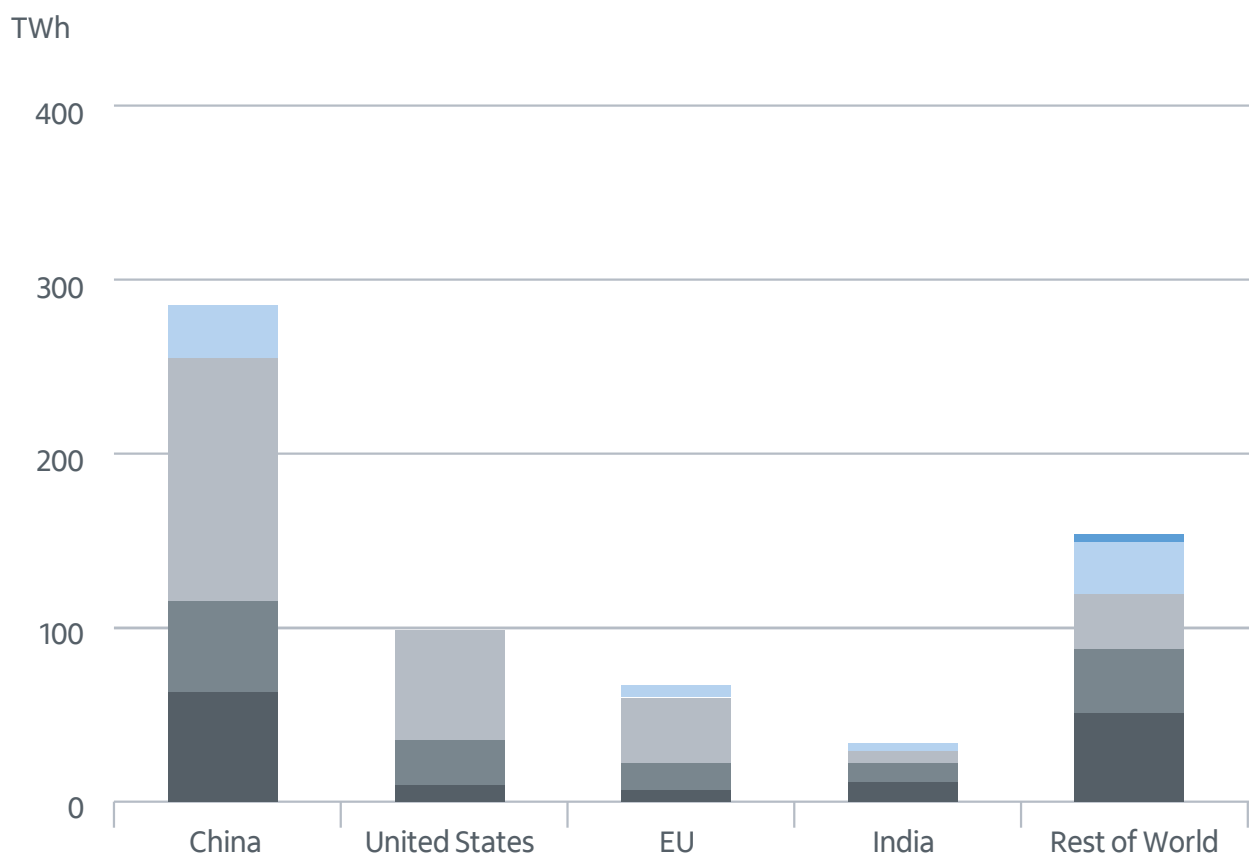
Renewable energy

According to the Global Energy Review 2021 study, published by the International Energy Agency (IEA), the use of renewable energy in the world increased by 3% in 2020, driven by the growth of nearly 7% in electricity generation from renewable (solar, wind, biomass) sources. Solar and wind energy are expected to contribute two-thirds of renewables growth.

The share of renewables in electricity generation is expected to increase to nearly 30% in 2021, its highest share since the start of the Industrial Revolution and up from 27% in 2019. Wind energy is on track for the largest increase in renewables generation, increasing by 275 TWh, or about 17%, from 2020. Solar PV electricity generation is expected to increase by 145 TWh, or nearly 18%, to approach 1,000 TWh in 2021 [46].

China alone is expected to account for nearly half of the global increase in renewable electricity in 2021, followed by the United States, the European Union and India.

Increase in renewable energy generation 2020-2021



Source: International Energy Agency (IEA) (2020) [46]

As disclosed by the International Renewable Energy Agency (IRENA), energy investments are expected to reach US\$95 trillion by 2050. Energy transformation based on renewables would increase this amount to US\$ 110 trillion. Additional investment amounts, although massive, are lower than past estimates. This is due to the continuous fall of renewable energy costs. [47].

A worldwide trend, investments in renewables has recorded an exponential increase in Brazil in recent years. According to a survey by Bloomberg New Energy Finance, Brazil is expected to attract US\$300 billion investments to the energy sector by 2040, up 189% from its current capacity, with 90% set to come from renewable sources. According to the Ministry of Mines and Energy, renewable sources represent 83% of the Brazilian electricity matrix. Hydropower (63.8%) accounted for the largest share, followed by wind (9.3%), biomass and biogas (8.9%) and solar PV (1.4%).

The increasing renewables use will contribute to meet the emission reduction commitments signed under the Paris Agreement, even though they are still very far from the related goals. This is because Brazil has increased its absolute emissions compared to 2005, when it signed an agreement to reduce emissions by 37% by 2025 and by 43% by 2030; however, Brazil has not updated the target, which should proportionately jump to 57% by 2030 [48].

Green hydrogen

Perceived as one of the most innovative solutions in recent times to crack down on climate change, green hydrogen, also known as sustainable hydrogen, has been developed by some countries.

It is obtained from renewable sources, such as wind and solar energy, through electrolysis and no carbon emission. Hydrogen has three times more energy than gasoline. Unlike the latter, however, green hydrogen is a clean source of energy, being produced through renewable energies and releasing water (H₂O) only, in the form of steam, as a by-product. The current production of hydrogen from fossil fuels is still predominant nevertheless [49].

Carbon capture process

Few technologies are deemed by experts as more important in addressing climate change risks than carbon capture and storage (CCS). Deployed on a large scale, CCS can significantly reduce greenhouse gas (GHG) emissions. According to the International Energy Agency (IEA), it is not possible to address climate change scenarios, including the one outlined in the Paris agreement, without applying CCS to energy generation and other industries [50].

Another alternative in tackling global warming, particularly for Brazil, is carbon capture carried out by forestry and agricultural-based companies. The great challenge for modern agriculture is to produce food, fiber and energy for a growing world population that still generates a positive balance of carbon capture [51].

Proper soil management is key so that carbon dioxide fixed in the soil through photosynthesis (which is three times greater than CO₂ fixed in the atmosphere) is not released.

Brazil has different public policies and tools aimed to reduce GHG emission, such as the Low Carbon Agriculture Plan (ABC Plan) coordinated by the Ministry of Agriculture, Livestock and Supply (MAPA) and carried out by the Brazilian Company of Farming Research (Embrapa) and partners, effective, in principle, for the 2010-2020 period. In line with this policy, in July 2020 the Federal Government set up the National Executive Commission of the Sector Plan to Consolidate the Low-Carbon Emission Economy in Agriculture.

The ABC Plan is broken down into seven programs: Recovery of Degraded Pastureland, Crop-Livestock-Forest Integration (iLPF) and Agroforestry Systems, No-tillage System (SPD), Biological Nitrogen Fixation (BNF), Planted Forests, Animal Waste Management, and Climate Change Adaptation.

In light of the aforementioned trends, challenges and opportunities, Itaú Asset has developed a proprietary tool to fully understand how these changes can impact its portfolios. The next section outlines how this tool was designed and its methodology, providing a comparison to broader IAM's actions for ESG integration and climate change issues [52].

4 Conclusions and main messages

Climate change poses a real economic risk to investors and companies.

Based on the review of literature and proprietary analyzes presented throughout the study, it becomes evident that changes in climate parameters will bring challenges not only in human, environmental and social, demographic and political aspects, but also in terms of the financial health of companies, which should take them into consideration when making investment decisions.

Our study has unveiled significant challenges for this journey of transition we are witnessing and therefore the many different participants of this ecosystem must have to get ready for these transition risks and have greater resilience to these physical risks.

The analytical approach explored herein provides us with a better technical foundation to seek to influence practices in favor of an economy better prepared to deal with the challenges posed by climate change.

Throughout the study we have noted that transition impacts linked to technological changes, consumption and production patterns, as well as carbon emission pricing, are massive for asset pricing purposes. However, these elements depend on factors that are difficult to predict, such as consumer habits, political changes and coordination among the public, private and civil society sectors.

Even physical impacts, which tend to be more easily forecast as they are based on technical modeling, can vary in terms of intensity and direction.

To deal with this scenario of uncertainty, we have chosen to adopt science-based scenarios and assumptions with market data. Accordingly, we will be able to adopt models that better reflect the real world, rather than waiting for the real world to adjust to our models.

Therefore, it is worth noting that even with plenty of studies, a high element of uncertainty exists about how climate change will affect the real economy. This is a complex system with a number of variables with significant dynamism, which ends up impacting initial estimates. The outcomes thus presented here reveal just a snapshot of the moment.

Furthermore, the ongoing review of assumptions, ideas and investment rationales is part of the culture of continuous learning integrated in Itaú Asset's ESG analysis processes. An example of this practice is to consider carbon pricing scenarios, present in our models since 2011, being constantly updated for term, probability and values according to the political, economic and international scenarios.

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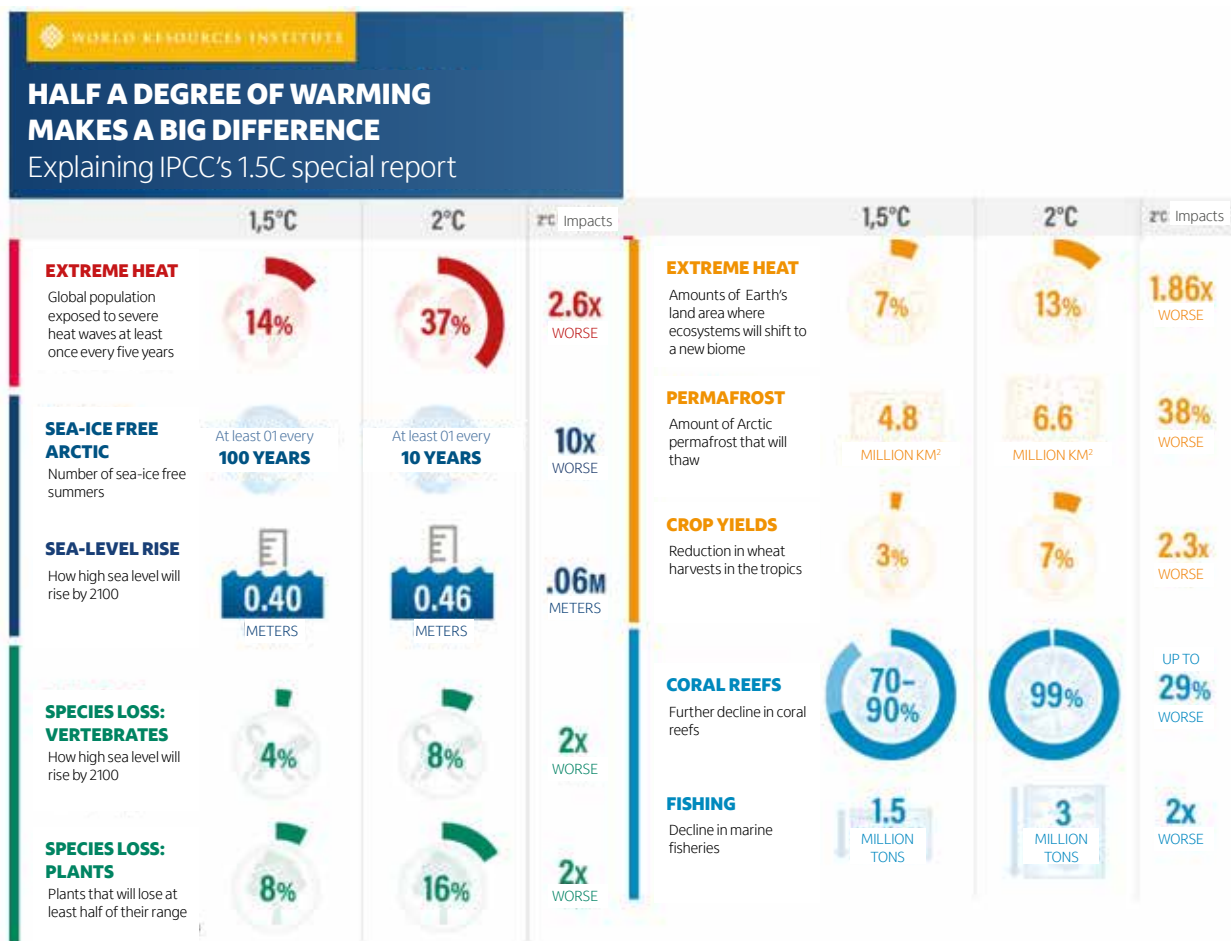
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Attachment I – Impacts of the average increase in Earth’s temperature in a 1.5°C and 2°C scenario



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