raízen

2024 TCFD REPORT

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About this Report

For the fourth consecutive year, we are publicly disclosing climate-related information based on the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

For any feedback, questions, or suggestions about this report, please write to fale@raizen.com.

Governance

Oversight of climate-related risks and opportunities is embedded in our governance structures, reflecting senior leadership's commitment to responsible and transparent business aligned with stakeholder expectations. This approach ensures that financial, regulatory, operational, health and safety, and reputational impacts from climate change are considered in priority-setting and long-term planning, strengthening our business resilience.

The Board of Directors and committees within our corporate governance structure monitor and ensure that climate-related issues are integrated into corporate risk assessments, performance monitoring, and reviews of major action plans. Our management approach follows the guidelines outlined in ISO 31000 and COSO ERM, progressing through four steps: identification, assessment, response, and tracking. Climate risks are periodically reassessed using an established methodology that factors in updated scenarios and potential operational and financial impacts. Topics classified as critical and high-impact are reviewed by the Board to determine appropriate mitigation measures.

In addition, we have a Corporate Social Responsibility (CSR) Committee with both advisory and decision-making authority. The committee evaluates, approves, and monitors climate-related matters, tracking progress on decarbonization initiatives and climate-related investments aligned with our business strategy.

At the executive level, climate risk management is directly overseen by the CEO, supported by the Sustainability and Compliance teams. This process is carried out in collaboration with key departments, starting at the mapping stage. Identified risks are assigned to designated owners, who develop risk management plans, continuously assess the effectiveness of implemented measures, and report to the Compliance team.

The corporate risk matrix is reviewed at the end of each crop year. Each identified item is classified by likelihood and impact, using qualitative and quantitative criteria, including financial aspects. The risk management workflow ensures continuous reporting to the Executive Team and the Audit and Social Responsibility Committees, both composed of Board members—strengthening governance and ensuring that climate risks and opportunities are managed with the same discipline applied to other critical business variables.

To learn more about our governance structure, see our Integrated Report here

Strategy

We recognize climate change as a factor that directly affects our ability to operate, grow, and innovate. We incorporate climate-related risks and opportunities in setting priorities and in allocating resources and investments, ensuring the long-term resilience and competitiveness of our business model.

Time horizons

Our approach assesses risks across three time horizons—short, medium, and long term—and covers both physical and transition risks as the economy moves toward lower carbon emissions.

SHORT TERM (UP TO TWO YEARS)

In the short term horizon, we prioritize immediate actions to respond effectively to climate challenge. This includes monitoring and managing climate-related aspects affecting agricultural and industrial operations (such as climate variability between dry and wet seasons), implementing more efficient farming practices, and improving waste management.

This time frame aligns with the sugarcane growing and harvesting cycle, allowing for quick decision-making in response to changing operating conditions. It also enables a prompt response to changes in environmental policies, market conditions, and stakeholder expectations—both to mitigate risks and seize opportunities. Over this time horizon, we track progress on our commitments, ensuring alignment between goals and outcomes.

MEDIUM TERM (TWO TO NINE YEARS)

The medium-term horizon serves to plan and implement actions that require more time and resources, such as investments in new technologies, infrastructure, and processes. It offers a middle ground between the need for immediate action and long-term strategic planning, allowing us to adapt to key industry trends like the rising demand for lower-carbon biofuels.

This horizon is used to manage emerging risks, such as changes in regulatory policies, carbon pricing, shifts in consumer preferences, growing investor demands, disruptive technology, and transformations in supply chains. Evaluations in this time horizon enable us to prepare for and anticipate impacts that could significantly affect our business competitiveness and resilience.

LONG TERM (MORE THAN 10 YEARS)

Long-term analysis is needed to address challenges that require sustained effort, cross-sector collaboration, and significant investments in research, development, and innovation. This time frame allows us to anticipate environmental impacts that may affect our operations and value chain. Over the long term, we can observe the effects of initiatives implemented in the short and medium term, such as structural shifts in the energy mix, reconfiguration of value chains, and evolving infrastructure.

This time frame is key to identifying and anticipating chronic physical impacts of climate change that occur gradually but persistently, such as the increased frequency and duration of severe droughts, rising sea levels, changes in rainfall patterns, and ecosystem degradation. These risks pose threats to business continuity, asset lifespans, and long-term corporate resilience.

Climate Scenarios

Long-term analysis, combined with climate scenario modeling, is essential for understanding the implications of climate change for our industry, especially as the energy transition and physical impacts become more pronounced. We use climate scenarios developed by renowned institutions such as the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) to project possible global warming pathways and their consequences. Using the IPCC's SSP1-2.6 and SSP5-8.5 scenarios, we can evaluate long-term physical impacts, such as shifting climate patterns and the effects of extreme events like prolonged droughts, floods, and sea level rise. These scenarios enable us to anticipate changes in environmental conditions that will affect our operations, supply chains, and asset resilience.

For transition-related issues and opportunities, we use IEA scenarios—the Announced Pledges Scenario (APS), the Stated Policies Scenario (STEPS), and the Net Zero Emissions by 2050 Scenario (NZE). These scenarios offer a broad view of global climate policies and commitments that are shaping the future of energy and emissions reductions. By analyzing these scenarios, we can identify risks and opportunities linked to the shift toward a low-carbon economy and understand how decarbonization policies may directly affect our operations and markets.

Analyzing different climate scenarios and time horizons enables us to evaluate various energy transition trajectories and their respective impacts on our industry. This helps inform strategic decisions, such as investing in technological innovation, adopting decarbonization solutions, and strengthening our ability to adapt to climate change. By exploring diverse scenarios, we can ensure that our actions align with global trends and that our sustainability and climate risk mitigation initiatives are effective, supporting our long-term business continuity and competitiveness.

Long-term analysis is needed to address challenges that require sustained effort, cross-sector collaboration, and significant investments in research, development, and innovation

Risks

RISK 1

Water stress and impact on crop yields

(Time horizons: short, medium, and long term)

The production of sugar, ethanol, and bioenergy is directly affected by climate change. Sugarcane, our main raw material, depends on water, and changes in rainfall patterns—such as more frequent and intense droughts, especially in Brazil's Center-South region—affect sucrose concentration and reduce mill yields.

Climate instability affects a wide range of decisions, including the choice of cultivars, the allocation of investments in agricultural infrastructure, and supply chain management. This challenge is therefore considered material to our business, with short-term impacts and the potential to worsen over the medium and long term.

We estimate a 1% loss in productivity, with a financial impact of R$ 250 million. These effects are reassessed annually through quantitative and qualitative analyses conducted by technical, financial, agricultural, and operational experts.

In response, we have implemented a set of measures to strengthen operational resilience:

- **Real-time monitoring of weather conditions through automated weather stations installed in agricultural hubs**
- **Selecting drought-tolerant, water-efficient cultivars**
- **Investing in water management and soil conservation practices, such as fertigation and advanced irrigation techniques**
- **Maintaining over three-quarters of our planted area under fertigation and the remainder under localized irrigation, supporting circular water use in the production process**

Through our analyses, we ensure that medium- and long-term decisions—including investments in agricultural productivity and climate adaptation—are based on technical evidence.

RISK 2
Regulatory pressure and loss of competitiveness in demanding markets
(Time horizon: short term)

The advancing global climate agenda and growing fuel regulation are imposing new sustainability standards on energy products. For companies that operate globally in the biofuels market—such as ours—this means complying with increasingly strict environmental criteria, especially regarding traceability, life cycle emissions, and recognized certifications.

This context can lead to a loss of competitiveness in foreign markets if specific requirements are not met. The estimated financial impact was R$ 30 million.

Product traceability, emissions management, and certifications have therefore become essential requirements for operating in high-value markets. Any gaps in this process could compromise our future revenues and limit investments in new decarbonization pathways.

In response, we have structured a proactive approach:

- **We continuously monitor the international regulatory landscape, with a focus on climate, carbon, and energy transition.**
- **We actively participate in global forums and initiatives on climate change, the carbon market, and low-carbon fuels.**
- **We develop annual greenhouse gas (GHG) inventories using internationally recognized methodologies.**
- **We pursue internationally recognized certification to secure and maintain access to global markets.**
- **We recognize that certifications are essential to ensuring our products can access and remain in international markets.**

Opportunities

OPPORTUNITY 1
Second-generation ethanol as a global competitive advantage
(Time horizons: short and medium term)

As the world accelerates the transition to a low-carbon economy, demand is growing for energy solutions with a lower environmental footprint. Ethanol is emerging as a widely accepted and regulated alternative, and second-generation ethanol (E2G) has even greater potential, as it is produced from waste generated by the sugar and ethanol production process, adding value to existing raw materials without expanding cropland.

We are currently the only company in the world with the capabilities to produce E2G at industrial scale. This enables us to serve high-value, regulated markets such as the United States and Europe, and also allows us to capture more attractive prices by meeting demanding sustainability requirements. Depending on demand and production scenarios, we estimate a financial impact between R$ 150 million and R$ 450 million.

We assess E2G as a significant opportunity based on three criteria: potential impact, feasibility, and alignment with regulatory and market trends. Our analyses also take into account IEA scenarios, including the Net Zero and Announced Pledges Scenario (APS), providing an understanding of different levels of global climate ambition.

To realize this opportunity, a multidisciplinary team tracks developments in the international market, identifying price fluctuations and regulatory requirements in different countries. Based on these analyses, we decide where, how, and how much to produce—with a focus on optimizing margins and ensuring optimal commercial positioning. We also invest in developing our technical team, with managers, coordinators, and analysts dedicated to market intelligence, pricing, and commercial development.

OPPORTUNITY 2

Revenue generation from carbon credits and added value from biofuels

(Time horizon: short and medium term)

The carbon market is gaining traction as a catalyst for the energy transition and as a concrete opportunity to create value for those leading renewable fuel production.

In Brazil, the RenovaBio program has provided a platform to monetize the environmental attributes of biofuels through Decarbonization Credits (CBios). In the program's first year, we generated over 2.3 million CBios, yielding revenue of more than R$ 80 million. With the regulation and expansion of the Brazilian carbon market, we estimate additional potential revenue between R$ 228.8 million and R$ 279.7 million from CBio sales—depending on certified volume, average price, and market conditions. CBio sales are supported by a compliance and trading structure, with annual investments in certifications, brokerage, and custody.

Opportunities like these are classified as significant due to their revenue generation potential and alignment with market trends. We also use the APS, STEPS, and Net Zero by 2050 transition scenarios from the IEA, which project trends in both regulated and voluntary markets in the coming years.

All our bioenergy operations are certified to issue CBios. Additionally, we have a specialized trading team that transacts both purchases and sales of credits, enabling us to maximize value creation and ensure regulatory compliance—especially in the distribution segment, where we have a legal obligation to purchase credits. This structure makes us more agile in a market marked by volatility and competitive risks, such as failure of other players to pass through costs to prices.

2.3

million CBios

in the program's first year

Risk and opportunity management

Taking an integrated approach is essential in anticipating impacts, strengthening the resilience of our operations, and identifying value levers. We've made climate management an inseparable part of our corporate risk management process, with methodologies, tools, and defined responsibilities that ensure depth and consistency in each analysis.

IDENTIFICATION AND ASSESSMENT

Our approach to identifying and assessing climate risks follows the COSO Framework, as well as ISO 14001 and ISO 31000, with technical support provided by key departments. The process is carried out regularly through workshops involving all departments and covers a time horizon through 2050, considering both physical and transition risks. Risks are classified using a matrix that intersects impact and likelihood, with short- (0–2 years), medium- (3–9 years), and long-term (over 10 years) breakdowns.

The analyses consider multiple climate factors, including physical events (such as droughts, floods, and heat waves), regulatory and legal aspects (such as changes in emissions legislation or the carbon market), technological changes (such as the adoption of low-carbon solutions), reputational issues (such as shifting consumer preferences), and stakeholder or market pressures (such as new customer requirements or changes in consumption patterns).

To determine materiality, we consider associated financial and operational impacts, with a focus on those classified as medium or high in our matrix. Each cycle includes interviews with experts from affected departments to update assumptions, estimate impacts, and identify new exposures. Identified risks and opportunities are incorporated into strategic and financial planning and considered in our five-year business plans.

INTEGRATION INTO GLOBAL RISK MANAGEMENT

Our model ensures that all risks are treated with equal rigor, regardless of the evaluated impact. This means using the same classification methodology, materiality criteria, and monitoring tools. The result is an integrated management approach that not only prevents losses but also informs investment decisions.

MANAGEMENT AND MITIGATION

Following risk assessments, each risk is assigned to an owner to design, implement, and track progress on associated action plans. These plans include mitigation, contingency, or adaptation measures and are tracked throughout the year via our controls portal, with oversight by leadership.

Senior management is directly involved in plan validation and performance monitoring. In addition, we maintain a Business Continuity Plan for critical processes, which is reviewed annually with a focus on resilience against extreme events or operational disruptions.

Metrics and targets

Our primary tool for monitoring GHG emissions is our Annual Emissions Inventory, which we have developed since the beginning of our operations. This ongoing practice follows the guidelines of The Greenhouse Gas Protocol and the Brazilian GHG Protocol Program and covers Scope 1 (direct), Scope 2 (purchased energy), and Scope 3 (value chain) emissions, in both absolute and intensity terms. The data is reported annually in our Integrated Report **(available here)**, providing full transparency for our stakeholders.

In addition to the inventory, we conduct Life Cycle Assessments (LCAs) of our main products, such as first- and second-generation ethanol and bioenergy. The methodology covers all stages up to the gate of our bioenergy operations, allowing us to identify critical points and target mitigation actions with greater precision. This monitoring is essential to ensure compliance with regulatory and market requirements, especially in relation to the carbon intensity of our products—a factor that is increasingly relevant in international markets.

We also invest continuously in research, development, and innovation, prioritizing solutions that improve productivity and energy efficiency, and ultimately reduce the carbon footprint of our products. Projects involving significant emission sources undergo prior evaluation, in which emission impacts are estimated and projected.

Metrics tracking also guides decision-making across different business areas. We have action plans managed by operational teams, which are regularly tracked against emission optimization indicators based primarily on emission intensity (per megajoule of ethanol or metric ton of sugar), ensuring ongoing progress on our climate strategy. The effectiveness of these actions is continuously assessed using internal performance indicators and reports.

We are also attentive to market expectations around incorporating climate criteria into compensation policies. Aligned with this trend, we have introduced long-term variable compensation tied to an ESG metric that includes environmental performance as a criterion in assessments of key leadership personnel, including the CEO.

We also report to the CDP Supply Chain program, in response to demand from customers that actively monitor ESG performance in their supply chains, with a particular focus on emissions reduction. This further aligns our internal practices with the global decarbonization agenda.

This set of tools and commitments forms the foundation of our climate management model, which is consistent with international best practices.

Credits

General coordination
Raízen

Project management and art direction
Grupo Report

Writing
Ravi Comunicação para Sustentabilidade