PACKAGING CORPORATION OF AMERICA

TCFD INDEX

2024
RESPONSIBILITY
REPORT

Task Force on Climate-related Financial Disclosures (TCFD) Index

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Governance

Board Oversight

PCA's Board of Directors oversee the critical risks and financial impacts related to climate change and the direction we take as a company at the highest level. The Board receives regular updates from the Chair of our Sustainability Committee on climate related trends, issues, risks and opportunities that have a direct and indirect impact on the company's overall business operation. In addition to our Board, we have a Carbon Neutrality Team who are responsible for the operational and strategic aspects of our climate change related activities.

- Sustainability Committee: comprised of four Board members including our Chief Executive Officer, our Sustainability Committee oversees the company's practices, performance and strategy regarding environmental, health and safety, sustainability and corporate responsibility. PCA's Senior Vice President, Tax, ESG and Government Affairs and our Senior Vice President, Corporate Engineering and Technology attend every meeting of this Committee and provide updates on various sustainability matters including regulatory developments and impacts, climate related risks and opportunities, and progress updates on our evaluation of carbon capture technology including permanent carbon dioxide storage solutions. The Committee Chair regularly updates our full Board on these matters.

- Carbon Neutrality Team: made up of a cross-functional group of key engineering, environmental, government affairs, legal, operational, procurement, tax and sustainability employees, our Carbon Neutrality Team provides strategic direction for, and oversees our carbon reduction efforts. This team meets nearly every week to discuss progress on strategic initiatives, opportunities, and risks that are related to the company's climate strategy and is co-sponsored by PCA's Senior Vice President, Tax, ESG and Government Affairs and Senior Vice President, Corporate Engineering and Technology.

Role of Management

Various groups and individuals across our operations take part in helping PCA execute our climate strategy, including identifying and analyzing efficiency improvements and opportunities, and the evaluation and implementation of climate-related business activities. PCA's Senior Vice President, Tax, ESG and Government Affairs provides oversight for the ESG and Corporate Sustainability team, which coordinates PCA's ESG and corporate sustainability strategy and activities, including ESG reporting and climate change matters. This group helps integrate PCA's decarbonization strategy in collaboration with other functional teams, leads our ESG reporting efforts, and evaluates and reports on different ESG and sustainability topics and the impacts on our business. The ESG and Corporate Sustainability team provides guidance to the company's leadership on key sustainability and ESG trends.

PCA's Research and Innovation Center, led by the Vice President of Product Strategy and Quality, drives our product performance strategy. They develop innovative paper-based packaging products with a goal to improve sustainability. The Center supports our design and sales teams in collaborating with customers to create fiber-optimized, performance-based packaging solutions. They also develop proprietary tools and resources that support PCA's designers in engineering right-sized packaging solutions that conserve raw material inputs and energy.

Strategy

Short, Medium, and Long Term Climate Risks

In 2023, PCA conducted a scenario analysis to better understand our climate-related risks and opportunities and to inform our climate strategy going forward. The assessment revealed potential risks which are detailed in the table below and expounded upon later in this section. This exercise has informed our climate strategy and relevant pathways to reaching our climate goals and carbon emissions reduction targets.

We define short-, medium-, and long-term risks as 1-10 years, 11-20 years, and 21-30 years, respectively.

CLIMATE-RELATED RISKS

	Type	Climate-Related Risk	Potential Financial Impact	Time Horizon	Magnitude of Impact	Likelihood
Transition Risks	Policy and Legal	✓ Regulation on pricing of GHG emissions ✓ Regulation on biogenic fuels ✓ Enhanced environmental regulation ✓ Enhanced emissions-reporting obligations ✓ Change in policy relating to 2024 presidential election	✓ Carbon allowances for pulp and paper mills in states with cap and trade, or similar programs ✓ Reduced incentives to Carbon Capture and Storage (CSS) ✓ Increased production costs due to changing output requirements (e.g., waste treatment) ✓ Increased costs of compliance with more stringent rules or extensive disclosures	Short-term	Low	High
	Technology	✓ Failure or delay of new technology ✓ Transition to lower emissions technology ✓ Obsolescence of existing technology	✓ Operational costs ✓ Increased capital investments in research and adoption of new technology ✓ Costs to adopt/deploy new practices and processes	Medium-term	Low	Low
	Market	✓ Uncertain market signals ✓ Increased energy prices ✓ Increased competition for pulpwood and residuals ✓ Inflationary pressures that make timely carbon reducing investments imprudent	✓ Reduced demand for Carbon Dioxide Removal credits (CDR) ✓ Increased production costs due to changing input prices (e.g., wood, chemicals, energy) and output requirements (e.g., waste treatment) ✓ Lower than expected return on invested capital if compelled by stakeholders to make imprudent investments	Short-term	Medium	Medium
	Reputation	✓ Stigmatization of the business (US pulp and paper industry) ✓ Increased stakeholder concern or negative stakeholder feedback	✓ Reduced revenue from decreased demand for goods/services ✓ Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention) ✓ Reduction in capital availability	Long-term	Medium	Low
Physical Risks	Acute	✓ Increased severity of extreme weather events such as cyclones and floods affecting harvest outcome	✓ Increased price of timber ✓ Reduced wood supply from fewer days of logging due to wet or extremely hot conditions	Medium-term	Low	High

	Chronic	✓ Changes in precipitation patterns and extreme variability in weather patterns ✓ Rising mean temperatures ✓ Rising sea levels	✓ Reduced revenue from decreased production (e.g., transport difficulties, supply chain interruptions) ✓ Increased operating costs (e.g., storm water installation and maintenance) ✓ Increased capital costs (e.g., damage to facilities)	Long-term	High	High

Discussion On Transition Risks

Many climate-related risks to PCA's business are taking shape as the impacts of climate change are being increasingly realized globally. The extent to which transition risks will be accelerated and/or magnified is entirely dependent on how humans view the physical risks of climate change and the collective willingness of humanity to adapt to a changing planet.

Competition for pulpwood and residuals may increase with technologies like bioenergy carbon capture and storage (BECCS), biochar, and voluntary carbon offset markets encouraging forest landowners not to harvest their timber. This could increase the cost of wood, especially if impacts of climate change reduce available supply.

Cap-and-trade systems for carbon emissions may evolve as a manner of regulating carbon emissions. PCA's Wallula paper mill is subject to the Washington State Carbon Cap and Trade Law (Climate Commitment Act (CCA)). The Wallula mill had 218,000 metric tons of Scope 1 emissions in 2021, when operating near full capacity (the highest scope 1 emissions this mill has reported in the last five years, i.e., the worst-case scenario for allowances). Approximately 55% of PCA's scope 1 emissions stemming from facilities emitting more than 50,000 metric tons of CO2 per year (currently all of PCA's pulp and paper mills), are mills located in southern states where a carbon pricing scheme is a low likelihood, and 30% in midwestern states where there is a medium likelihood. The likelihood is based on our estimates, determined from our analysis of the existing political landscape of those regions. We believe that a federal cap and trade system is a low probability and low magnitude relative to PCA's peers since PCA has a measurably lower scope 1 carbon footprint per unit of revenue[1,2,3,4,5]. PCA has historically been profitable. The US Securities and Exchange Commission's recent decision not to require Scope 3 emission statements will likely be a detriment to integrated producers in the pulp and paper industry as less of its overall footprint resides in scope 3, compared to other industries.

Changes to the Inflation Reduction Act which currently provides certainty to receive up to $85 per metric ton (with inflation adjustment beginning in 2027) in the form of a tax credit for 12 years from CO2 captured and permanently stored for projects that begin construction by the end of 2032. This tax incentive helps reduce some of the cost of implementing this technology and is crucial for investment decisions competing for capital funding with projects able to achieve greater returns. Capturing and storing biogenic CO2 (BECCS) has potential to provide the same outcome as Direct Air Capture (DAC) at a lower cost[6,7], because trees capture CO2 from ambient air as they grow, with no human-made energy inputs required and the BECCS process is less energy intensive than DAC because the CO2 in the atmosphere is more dilute than the CO2 in flue gas. Reduced government incentives would likely only occur if these were being substantially offset by the voluntary market. We see this risk as low magnitude as a loss of support from tax credits could likely be made up by the voluntary market and with a low probability of occurring in the short-term due to lobbying efforts of the fossil fuel industry to promote favorable outcomes for advancing Carbon Capture and Storage

[1] NYSE WRK 2022.pdf | ResponsibilityReports.com
[2] WestRock Co. - Reports & Filings - WRK Filings - Filings Details | WestRock
[3] NYSE IP 2022.pdf | ResponsibilityReports.com
[4] International Paper Company Form 10-K Y/D 2021 | International Paper
[5] PCA 2022 Responsibility Report.pdf | Packaging Corporation of America
[6] Direct Air Capture - Energy System | IEA
[7] Bioenergy with Carbon Capture and Storage - Energy System | IEA

(CCS) technology. This reality most closely aligns with the SSP1-1.9 scenario outlined on pages 8-11 in our section on scenario analysis.

Climate change exacerbates health risks like asthma and seasonal allergies[8], cardiovascular disease[9], diabetes[10], kidney disease[11], and can negatively impact humans' mental health. Regulators may impose stricter environmental regulations to address increased health concerns.[12] A recent example is the US Environmental Protection Agency's Final Rule to strengthen the National Ambient Air Quality Standards (NAAQS) for fine particulate matter, PM2.5.

Increased costs of disclosures around climate change are not a material risk to PCA. PCA has a dedicated ESG team with experience in corporate sustainability and climate strategy. PCA has been compiling a greenhouse gas emissions inventory for scopes 1 and 2 since 2017, using a leading third-party sustainability data platform and invoice collection process which provides an audit trail for the majority of datapoints that comprise our inventory. The expertise of our in-house ESG team who understand both the nuances of climate change and our business, provide us with efficiencies in identifying climate risks and opportunities and conducting scenario analysis, when compared to relying solely on external consultants for the same scope of work.

Currently pulp and paper products are often seen as the sustainable packaging choice and a viable alternative to plastic-based packaging. Innovations in advanced recycling (chemical recycling) that hold the promise of significantly reducing plastic waste, could provide stakeholders of the plastic industry with new avenues to promote plastic products as "sustainable." This could erode demand for pulp and paper products if commercialization of the technologies and campaigns that herald the innovation are successful.

Wildfires have been increasing in the United States since the 1990s, this could drive consumer sentiment into reducing consumption of paper and wood products under the notion that avoiding paper and wood use "saves trees," which we believe to be incorrect. This sentiment has the opposite effect on forests that supply the pulp and paper industry in the United States, which are predominantly privately owned. Reduced demand creates conversion risk (converting to a non-forest use, i.e., deforestation) for multi-generational landowners in the US Southeast[13]. Forests in the Pacific Northwest are more directly impacted by climate change, with warmer temperatures increasing drought stress and making trees more susceptible to invasive species, disease, and wildfire. [14] Adapting Pacific Northwest forests to climate change will likely require some shifts in management priorities and practices in the coming years. Several studies suggest a need to emphasize building forest resilience and reducing vulnerability to increasing risks like drought, wildfire, and insect outbreaks.[1516] This may entail expanding protections for mature and old-growth forests that provide critical carbon storage and biodiversity benefits[17].

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[8] Climate Changes Allergies and Asthma | American Public Health Association (APHA)

[9] Jacobsen, A. P., Khiew, Y. C., Duffy, E., O'Connell, J., Brown, E., Auwaerter, P. G., Blumenthal, R. S., Schwartz, B. S., & McEvoy, J. W. (2022). Climate change and the prevention of cardiovascular disease. American journal of preventive cardiology, 12, 100391. https://doi.org/10.1016/j.ajpc.2022.100391

[10] Zilbermint M. (2020). Diabetes and climate change. Journal of community hospital internal medicine perspectives, 10(5), 409–412. https://doi.org/10.1080/20009666.2020.1791027

[11] Addressing the Impact of Climate Change on People With Kidney Disease | American Kidney Fund

[12] Climate Change Regulatory Actions and Initiatives | US EPA

[13] A System Level Approach to Southern Forest Conversation | Keeping Forests

[14] Safeguarding Our Lands, Waters, and Communities: DNR's Plan for Climate Resilience - February 2020 | Washington State Department of Natural Resources

[15] Halofsky, J.E., Peterson, D.L. & Harvey, B.J. Changing wildfire, changing forests: the effects of climate change on fire regimes and vegetation in the Pacific Northwest, USA. fire ecol 16, 4 (2020). https://doi.org/10.1186/s42408-019-0062-8

[16] Climate Adaptation Strategies – Climate Change Poses Significant Challenges for Forest Owners in the Northwest |Northwest Natural Resource Group

[17] What You Should Know About Protecting the United States' Old Forests | Woodwell Climate Research Center

As climate change intensifies, calls to accelerate decarbonization efforts may intensify commensurately. If compelled to do so, PCA may need to invest in capital projects that have a lower return than the company has historically achieved. This may negatively impact our profitability and stock price.

Transition Risk Overview

The technologies PCA needs to achieve net-zero carbon emissions are emerging and may become economically viable with current government incentives and voluntary markets for carbon dioxide removal credits. Because PCA has invested heavily in our operations over the past two decades, we can be patient as fossil fuel abating technologies further develop, build the necessary infrastructure and become economically viable over the medium- and long-term. We do not need to rely on nascent technologies like hydrogen, heat pumps, geothermal, and electrification to achieve net-zero carbon emissions, but these will make our path easier as these become more readily available and less expensive to install and operate as we approach mid-century. This reality aligns most closely with the SSP2-4.5 scenario but could be seen to align with the SSP1-1.9 scenario if development and deployment of alternative energy technologies continue to accelerate. Scenarios SSP1-1.9, SSP2-4.5 and, SSP3-7.0 were used for our scenario analysis and are defined later in this report (pages 8-11).

Many companies do not have the opportunities PCA has within our existing value chain to reach net-zero carbon emissions and therefore may need to rely on financial instruments to offset their emissions in the long-term. In contrast PCA could generate revenue from the sale of carbon dioxide removal (CDR) credits, which could be used to accelerate our further deployment of climate solutions.

PCA is not overly dependent on its supply chain to achieve net-zero, relying primarily on a level of carbon reduction to the transportation sector, utilities, and waste management commensurate with historical reductions over the past 30 years. We believe both supply- and demand-side solutions exist to achieve modest reductions to these sectors, averaging 1.5% per year through the year 2050.

CLIMATE-RELATED OPPORTUNITIES

Type	Climate-Related Opportunities	Potential Financial Impact
Resource efficiency	✓ Raw materials recycling ✓ Reduced water usage and consumption ✓ Reduced empty miles in upstream and downstream transportation ✓ Divert waste for beneficial reuse, or as feedstock for new products ✓ End-products recycling ✓ Energy recovery	✓ Reduced operational costs ✓ Reduced manufacturing costs ✓ Increased production capacity ✓ Increased revenue from sales (e.g., due to increased demand for lower emissions products) ✓ Increased market share (e.g., through alignment with customers' climate-change related priorities in product selection) ✓ Reduced energy costs
Energy source	✓ Emergence of new technologies ✓ Lower-emission sources of energy ✓ Self-generation source of energy ✓ Supportive policy incentives ✓ Participating in the carbon market	✓ Reduced operational costs ✓ Reduced exposure to high energy prices (e.g., due to reduced dependence on external energy sources) ✓ Reduced exposure to cost of carbon (e.g., due to reduced level of GHG emissions) ✓ Increased capital availability (e.g., from current and potential investors as operational costs are reduced and alignment with investors' interest in carbon reduction) ✓ Increased revenues (e.g., increased in market share) through better competitive position to reflect shifting consumer preferences ✓ Reduced costs associated with new governmental policies and regulations
Products and Services	✓ Development of lower-emission products ✓ Shift in customer preferences	✓ Increased revenue from sales (e.g., due to increased demand for lower emissions products) ✓ Increased revenues (e.g., increased in market share) through better competitive position to reflect shifting consumer preferences
Resilience	✓ Bioenergy with Carbon Capture and Storage (BECCS)	✓ Increased market share (e.g., through alignment with customers' climate-change related priorities in product selection) ✓ Reduced exposure to future GHG emissions related costs (e.g., the implementation of carbon tax) ✓

Business, Strategy and Financial Planning

Impact of Climate-Related Risks on PCA's Businesses, Strategy, and Financial Planning

Uncertainty in the political landscape may in the future disrupt our business through changes in environmental regulation, tax incentives, and emissions-reporting obligations for corporations. New technology geared towards lowering, capturing, and sequestrating emissions may be delayed or increase in price. Severe weather conditions or other natural disasters could affect our raw materials and operational costs, including building or maintaining facilities to withstand relevant weather event and the increased cost of insurance coverage. As a result, our capital expenditure and investments for carbon reduction projects could increase, affecting the company's overall financial planning and strategic direction on economic, environmental, and governance matters.

Impact of Climate-Related Opportunities on PCA's Businesses, Strategy, and Financial Planning

Emergence of- or the wide adoption of scalable alternative lower-emissions sources of energy could increase PCA's available capital to invest in BECCS projects, potentially shortening our timeframe to reaching our carbon targets. Future additional options in waste conversion for beneficial reuse could help PCA reduce impact that is associated with waste to landfill. End-products recycling advancements could change products and services PCA offers. Impact of these climate-related opportunities could reshape PCA's climate change and business strategy and provide an emergence of new parameters impacting financial planning activities.

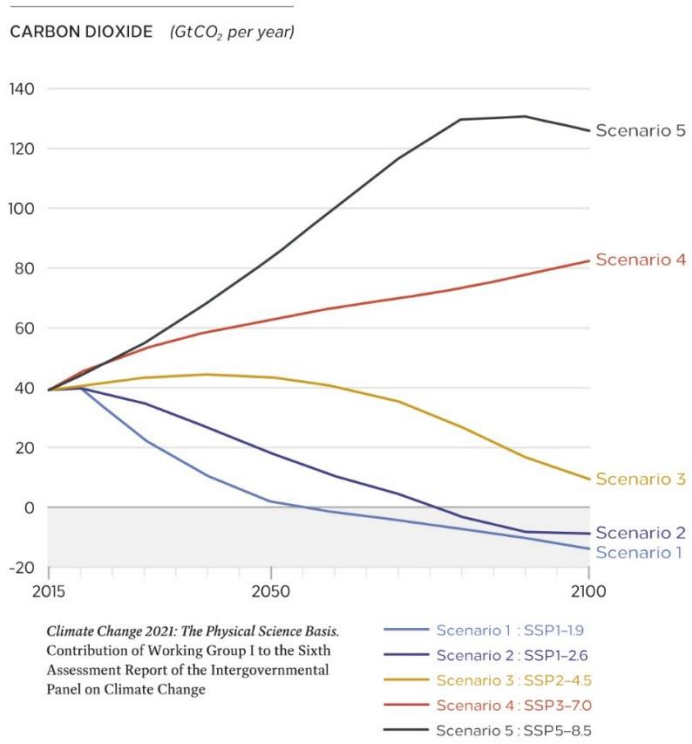
Resilience of the Organization's Strategy

In 2023, PCA engaged in a climate-change scenario analysis to assess the climate risks, its implications and to examine the resilience of PCA's strategy. As climate-mitigating efforts involve many actors and factors, there is great uncertainty that comes with each scenario analysis. Thus, it is important to understand that while these scenarios provide us with a point of reference for the future, these do not serve as predictions or forecasts which PCA bases its business decisions on.

Each of these scenarios has potential to affect PCA's business strategy and the operational decisions that follow. The integration of PCA's carbon reduction strategy (MORE) [18] into the company's wider business strategy has prepared us to respond to various climate-change scenarios, and the resilience of PCA's strategy to changing market conditions, policy development, and technology implementation and advancement that relate to global climate-change mitigating efforts. As one of the largest containerboard and corrugated packaging manufacturers in North America, one of our greatest assets, healthy working forests, have provided us with a unique set of carbon reduction opportunities compared to those in other industries.

[18] **M**aximize resource efficiency, **O**ptimize carbon benefits of sustainable forestry, **R**educe waste to landfills, **E**nergize our operations with clean power.

PCA's framework for business success also puts a great emphasis on utilizing internal expertise, tools, knowledge, and know-how, thereby reducing the uncertainty that comes with the overreliance on external resources. Moreover, PCA's carbon reduction targets have been set through moderate to conservative calculations and scenario modelling, therefore, increases in the speed of technology uptake, or technology innovation and public policy advancement would benefit PCA in reaching our stated climate goals and carbon reduction targets.



For our scenario analysis, we utilized the Intergovernmental Panel on Climate Change's (IPCC) most recent report dated August 9, 2021, and published in 2022, which includes five scenarios encompassing a broad spectrum of possible future GHG emissions. IPCC is a body created in 1988 by two UN institutions: the World Meteorological Organization and the United Nations Environment Programme. It regularly issues reports summarizing scientific assessments of climate change. The members of the panel establish forecasts and propose strategies aimed at mitigating greenhouse gas emissions. The IPCC has 195 member states, representing almost all the countries of the world.

Of the five IPCC Shared Socioeconomic Pathways (SSP) scenarios, we selected three for our first analysis. We aimed to balance optimistic (scenario 1) and pessimistic scenarios (scenario 4), as well as assessing an intermediate scenario (scenario 3) to maximize the number of actionable insights without making the exercise overwhelming. This combination of scenarios provides us with enough diversity of potential risks and opportunities sufficient to strengthen our strategies.

IPCC Scenario 1: SSP1-1.9 Emissions Pathway (Very Low Emissions Scenario/Optimistic)

SSP1-1.9 is a very ambitious and the most optimistic scenario designed to limit global warming to 1.5°C above pre-industrial levels by 2100, in line with the aspirational goal of the Paris Agreement. It assumes a rapid shift towards sustainable development, with a focus on reducing inequality, promoting education and health, and adopting environmentally friendly technologies and behaviors. Global CO2 emissions fall rapidly and reach net-zero around 2050, then become net-negative in the second half of the century. The likely range of global temperature increase by 2100 under SSP1-1.9 is 1.0°C to 1.8°C (mean of 1.4°C) relative to pre-industrial levels.

Rapid Decarbonization: SSP1-1.9 envisions a swift transition away from fossil fuels and towards clean, renewable energy sources like solar, wind, and advanced nuclear power. This is driven by strong climate policies, technological innovation, and changes in consumer behavior.

Negative Emissions Technologies: To achieve net-negative emissions in the latter half of the century, SSP1-1.9 relies heavily on the deployment of negative emissions technologies like BECCS and direct air capture (DAC) to permanently remove CO2 from the atmosphere.

Sustainable Land Use: This scenario assumes significant changes in land use practices, including reduced deforestation, increased afforestation and reforestation, and the adoption of sustainable agricultural methods that reduce emissions and enhance carbon sequestration.

IPCC Scenario 3: SSP2-4.5 Emissions Pathway (Intermediate Emissions Scenario)

SSP2-4.5 is an intermediate scenario where CO2 emissions remain around current levels until mid-century before starting to decline, but do not reach net-zero by 2100. It assumes a world with moderate challenges to mitigation and adaptation, where historical social, economic, and technological trends continue without significant changes. Progress towards sustainability is uneven, with some regions and countries making more progress than others. The likely range of global temperature increase by 2100 under SSP2-4.5 is 2.1°C to 3.5°C (mean of 2.7°C) relative to pre-industrial levels.

Gradual Emissions Reductions: SSP2-4.5 sees a gradual reduction in fossil fuel use and adoption of low-carbon technologies, driven by moderate climate policies and technological improvements. However, the transition is slower and less comprehensive than in SSP1-1.9.

Limited Negative Emissions: While some deployment of negative emissions technologies like BECCS occurs in SSP2-4.5, it is not as extensive as in SSP1-1.9, and net-negative emissions are not achieved for many operations where the biophysical possibility exists.

Mixed Land Use Changes: SSP2-4.5 assumes a mix of land use changes, with some regions experiencing continued deforestation while others see afforestation and reforestation efforts. Overall, land use changes have a smaller impact on emissions compared to SSP1-1.9.

IPCC Scenario 4: SSP3-7.0 Emissions Pathway (High Emissions Scenario/Pessimistic)

SSP3-7.0 is a high emissions scenario characterized by increasing regional rivalries and conflicts, with countries focusing on domestic issues and security concerns. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen over time. Technological progress is limited, and there is little international cooperation on climate change mitigation. As a result, CO2 emissions continue to rise throughout the century, nearly doubling from current levels by 2100. The likely range of global temperature increase by 2100 under SSP3-7.0 is 2.8°C to 4.6°C (mean of 3.6°C) relative to pre-industrial levels.

Continued Fossil Fuel Reliance: In SSP3-7.0, the world remains heavily dependent on fossil fuels, with limited adoption of clean energy technologies due to slow technological progress and lack of international cooperation.

Minimal Carbon Capture and Negative Emissions: SSP3-7.0 sees minimal deployment of carbon capture technologies and negative emissions solutions, as countries prioritize short-term economic and security concerns over long-term climate action.

Increased Deforestation: This scenario assumes continued deforestation and land use changes that contribute to higher emissions, as countries exploit natural resources to meet growing demand and address security concerns.

SCENARIO ANALYSIS

	SSP1-1.9	SSP2-4.5	SSP3-7.0
Best estimate, changes in global surface temperature, 2100.	1.4 °C	2.7 °C	3.6 °C
Temperature trend prediction	• Reaches maximum level of 1.5°C around 2030, then temperature stabilizes and starts to decline slowly. • Temperature rise stays below 1.6°C throughout the 21st century with high confidence.	• Reaches 1.5°C around 2030 and continues to rise, reaching 2.7°C by 2100 • Crosses the 2°C threshold around mid-century (2041-2060) and continues to warm, but most models stay below 3°C by 2100.	• Temperature continues to rise throughout the century and reaches 3.6°C or higher by 2100. • Crosses the 2°C threshold by mid-century (2041-2060) and 3°C threshold by 2060-2080, with a small chance of exceeding 5°C by 2100.
Proportion of CO2 taken up by land and ocean	70%	54%	44%
Classification	Sustainable	Intermediate	Regional Rivalry

Policy	**Transformative Policies:** This scenario requires the implementation of ambitious and transformative climate policies to achieve the rapid decarbonization necessary to limit global warming to 1.5°C. Policies need to focus on accelerating the transition to clean energy sources (renewable and nuclear), promoting sustainable land use practices, and deploying negative emissions technologies at scale. Strong international cooperation and support for developing countries would be essential to ensure a just and equitable transition.	**Moderate Policies:** This scenario assumes the implementation of moderate climate policies, with uneven progress across regions and sectors. Policies aim to gradually reduce fossil fuel use and promote the adoption of low-carbon technologies, but at a slower pace compared to SSP1-1.9. Governments would need to balance climate action with other socio-economic priorities, leading to a more incremental approach to emissions reductions. International cooperation would be important but less comprehensive than in SSP1-1.9.	**Weak Policies:** This scenario is characterized by weak and fragmented climate policies, with countries prioritizing short-term economic and security concerns over long-term climate action. Policies to reduce emissions would be minimal and ineffective, with little support for clean energy technologies or sustainable land use practices. International cooperation on climate change would be limited, with countries pursuing narrow self-interests. This scenario would require a significant shift in priorities and political will to avoid the worst consequences of climate change.
Technologies	**Transformative Technologies:** This scenario envisions a rapid development and deployment of transformative clean energy technologies, such as advanced renewable and nuclear energy systems, energy storage solutions, and carbon capture and storage (CCS) technologies. Negative emissions technologies, like bioenergy with carbon capture and storage (BECCS) and direct air capture (DAC), would play a crucial role in achieving net-negative emissions. The scenario also assumes significant improvements in energy efficiency across all sectors and the widespread adoption of sustainable technologies in agriculture, transportation, and industry.	**Incremental Technologies:** This scenario assumes a gradual adoption of low-carbon technologies, driven by moderate climate policies and market forces. Renewable energy technologies would continue to expand, but at a slower pace compared to SSP1-1.9. Fossil fuels would still play a significant role in the energy mix, with a gradual shift towards cleaner technologies like natural gas and CCS. Energy efficiency improvements would be moderate, and the adoption of sustainable technologies in other sectors would be uneven. The scenario also assumes some deployment of negative emissions technologies, but not at the scale required to achieve net-negative emissions.	**Stagnant Technologies:** This scenario is characterized by slow technological progress and limited adoption of clean energy technologies. Fossil fuels would remain the dominant source of energy, with minimal deployment of renewable energy systems and CCS technologies. Energy efficiency improvements would be limited, and there would be little investment in sustainable technologies across sectors. The scenario assumes minimal deployment of negative emissions technologies, as countries prioritize short-term economic and security concerns over long-term climate action. The lack of technological progress would make it increasingly difficult to mitigate the impacts of climate change.
PCA implications	▪ Rapid growth of CCS, strengthened by tax credits for CO_2 storage, such as the Inflation Reduction Act's expansion and enhancement of section 45Q, which supports PCA's carbon removal target that leverages BECCS. Rapid growth of CCS could accelerate PCA's adoption of BECCS to meet net-zero before 2050. ▪ Several pure play BECCS mills are built in our supply areas, increasing competition for wood waste generated by forests and sawmills, thereby increasing the cost of residuals, potentially pushing forests to an unsustainable growth-to-drain ratio. ▪ Fewer forests are impacted by acute and chronic physical risks, increasing the supply of wood long-term. ▪ Advancement and adoption of forest carbon monitoring technologies that model carbon storage both above ground and below ground. Monitoring of soil carbon enables forest products companies to realize significant negative emissions in their existing value chains, and most forest products are classified as carbon-	▪ Moderate growth of CCS supports PCA's carbon removal target that leverages BECCS. Incentives remain in place, but private investment in the technology slows from its current pace. Moderate growth of CCS could help PCA meet its net-zero target on schedule. ▪ BECCS is only leveraged by pulp and paper mills or biorefineries who generate useful products as their primary business and use organic waste for energy. This would maintain the current demands on forests, while removing carbon dioxide from the atmosphere, reducing the risk of forest ecosystem degradation. ▪ More forests are impacted by acute and chronic physical risks, putting some strain on supply of wood in certain years, but not every year. ▪ Forest carbon monitoring technologies only evaluate above ground biomass, significantly limiting the ability of forest products companies to claim negative emissions associated with soil carbon. This provides support for claims associated with carbon dioxide removal (CDR) but does not capture the full reality and benefit of forests created through demand for	▪ Progress on CCS is halted, and momentum is reversed. PCA's strategy for achieving net-zero emissions is no longer feasible. ▪ Technological advancements in artificial intelligence and robotics supplants much of the labor force, reducing labor-related costs while increasing energy and maintenance costs. ▪ Wildfires, and spread of disease and invasive species accelerate, as forests are significantly reduced, they are not regenerated but converted for agricultural use as yields plummet on existing agricultural lands due to the impacts of climate change. Putting a significant strain on supply leading to chronic shortages. ▪ Forest carbon monitoring is no longer a priority as food shortages become widespread and deforestation is necessary for humans to survive in the short-term. ▪ Scope 3 reductions likely to fall significantly short of our assumed 1.5% per year reduction from our 2021 baseline. ▪ Limited ability to abate Scope 2 emissions with Renewable Energy

	neutral or near carbon-neutral, as they exist today. ▪ Electric, hybrid or other low-carbon technology timber trucks and logging equipment become commercially available, with tax incentives to support loggers in acquiring the assets, creating opportunities for PCA to reduce upstream transport emissions. ▪ The US municipal solid waste system is transformed and virtually all landfills are equipped with methane capture systems, and a substantial portion of paper waste currently going to landfills is diverted for energy recovery, composted, or recycled. Such developments substantially reduce emissions from end-of-life treatment of sold products. ▪ The US grid becomes low-carbon, and reliance on Renewable Energy Certificates (RECS) and Emission-Free Energy Certificates (EFECs) is significantly reduced or eliminated. ▪ Scope 3 reductions exceed our assumed 1.5% per year reduction from 2021 baseline.	responsibly sourced wood and paper products. ▪ Wildfires, and spread of disease and invasive species continues its current trajectory, reducing available supply of wood and increasing costs of managing forests and the wood they generate. ▪ The US falls short of its goals for transitioning the US power and transportation sectors to a low-carbon economy, Scope 3 reductions meet our assumed 1.5% per year reduction from 2021 baseline, helping PCA meet its net-zero target. ▪ The US municipal solid waste system takes incremental steps to reducing methane emissions and diverting waste from landfills, and emissions from end-of-life treatment see modest reductions of GHG emissions. ▪ Reduced tax incentives for carbon capture below $85/metric ton could slow the rate of deployment of carbon capture systems or make projects unviable.	Certificates (RECs), as demand greatly exceeds supply. ▪ Significant warming impacting the number of harvesting hours, leading to supply shortages of wood. ▪ Supply shortages leading to increased costs, and the labor force being displaced by robots creates conditions where reusable containers become a more sustainable option than corrugated containers. At which point, “sustainability” will mean something different than it does today.

Risk Management

Identifying and Assessing Climate-Related Risks

We begin with the identification and assessment of ESG risks broadly with our annual materiality assessment, which informs our ESG & Sustainability team of where to prioritize their research for the year. This research is combined with the knowledge of our operations, stakeholder priorities, and the political landscape, to contextualize risks. Our climate-related risk assessment is in reference to the Task Force on Climate-Related Financial Disclosures (TCFD) recommendations. Each risk is then categorized as either transition (policy and legal, technology, market, reputation) in nature or physical (acute, chronic), and is assessed in its potential financial impact, likelihood of occurrence, magnitude of impact, and the expected timeframe.

Processes for Managing Climate-Related Risks

PCA’s Sustainability Committee and Board have oversight of climate-related risks and its potential financial impacts. The Carbon Neutrality Team provides the Sustainability Committee with regular updates on climate related trends and issues that have a direct and indirect impact on the company’s overall business operations. Currently we evaluate most risks qualitatively. For more information on the governance structure of our environmental and climate-change responsibilities, please review the *Governance* part of our Environmental Performance section.

Organizational Integration of Risk Management Practices

PCA’s Internal Audit department conducts an annual risk assessment, topics included in the Internal Audit Plan could include any changes in regulations, the economy, supply chain disruptions, talent management, cybersecurity, and climate-change related risks, to name a few. Each year, members of our sustainability team are interviewed as part of

this process, where climate risks are discussed. Our ESG & Sustainability team monitors: climate trends and related risks to the company; innovations and emerging clean technology that can be leveraged in response to climate change; and market sentiment (i.e., how climate change is driving consumer decision-making).

Metrics and Targets

Metrics Used to Assess Climate-related Risks and Opportunities

In alignment with our strategy and risk assessment process, PCA uses the following metrics to assess climate-related risks and opportunities:

- Revenue carbon intensity (MT CO2e/$M revenue)
- Product carbon intensity (metric tons CO2e/ton of paper product)
- Absolute emissions (metric tons of CO2e)

Scope 1, 2 and 3 GHG Emissions

In recent years, the number of regulations (and proposed bills) on GHG emissions for different industries by the Environmental Protection Agency and state and local governmental agencies have increased. Such regulations could potentially subject the pulp and paper industry to new taxes, operational costs and other costs associated with monitoring and assessment to comply with these regulations.

The upcoming presidential election (2024) presents uncertainty to the United States' involvement with the Paris climate accord. As such, the future of U.S. policy regarding GHG emissions and climate change could shift in several different directions, which could contribute to modifying the US climate change strategy.

GHG EMISSIONS

	2020	2021	2022	2023.	2024
Scope 1	1.77	1.95	1.81	1.72	2.00
Scope 2 (LB)	1.10	1.06	1.07	1.16	1.09
Scope 2 (MB)	1.38	1.62	1.43	1.54	1.24
Scope 3	2.30	2.48	2.43	2.29	2.57
Total Location-Based	5.17	5.49	5.31	5.17	5.66
Total Market-Based	5.45	6.05	5.67	5.55	5.81
Biogenic CO2	6.40	6.32	6.28	6.32	6.57

GHG Emissions Intensities	per	2021	2022	2023	2024
Fossil Scopes 1 + 2 (Market-Based)	employee	235	215	218	210
	$ Revenue	0.00046	0.00038	0.00042	0.00039
	Ton of Paper	0.65	0.64	0.65	0.58
Fossil Scopes 1 + 2 (Market-Based) + 3	employee	398	376	372	377
	$ Revenue	0.00078	0.00067	0.00071	0.00069
	Ton of Paper	1.11	1.12	1.11	1.05

Targets used by the Organization to Manage Climate-related Risks

In 2022, we published our climate goal to become a net-zero emissions company by 2050, with 2030, 2040, and 2050 climate targets from a 2021 baseline (using a market-based inventory).[19] Based upon our current assumptions, these targets include using trees and post-combustion carbon capture technology to remove 1.75 million metric tons of CO_2 from the atmosphere per year by the year 2040 and an additional 2.35 million metric tons per year by the year 2050 for a total of 4.1 million metric tons. Achieving our 2050 carbon removal target with carbon capture technology would provide a 68% reduction across scopes 1, 2 and 3 emissions from our 2021 baseline using a market-based inventory, and 75% using a location-based inventory. See Risks and Uncertainties in our 2024 Responsibility Report, page 25-26.

2030	2040	2050
▪ 35% reduction in scopes 1 and 2 emissions. *	▪ 60% reduction in scopes 1, 2 and 3 emissions	▪ Net-Zero carbon emissions for scopes 1, 2 and 3.
▪ 10% reduction in fossil fuel consumption.	▪ 20% reduction in fossil fuel consumption.	--
▪ Support 800,000 MWh/year of carbon-pollution-free electricity generation	▪ Capture and permanently store 1.75 million metric tons of biogenic CO_2 per year.	▪ Capture and permanently store 4.1 million metric tons of biogenic CO_2 per year.

** Includes 19% of temporary reductions from energy attribute certificates (EACs)*

Current Milestones on Our Journey to Net Zero

In 2024, we successfully commissioned and operated a Carbon Capture pilot scale plant capturing biogenic CO2 at one of our southern U.S. mills, which will operate into mid-2025. The results of this trial have been very promising and we plan to proceed with a more detailed engineering and design study that will take around seven to nine months to complete. This study will provide us with a better idea of the capital cost and construction schedule for a large-scale facility.

[19] PCA is not including scope 3 in our 2030 target because our inventory relies heavily on life cycle assessments (LCA) that are not regularly updated. We will continue using this method until meaningful progress has been made in transitioning the U.S. electrical grid and transportation system to carbon-pollution-free technologies, or we are compelled to do so by regulators.
[20] International CCS Knowledge Centre