2021 TCFD Disclosure

TRONOX HOLDINGS PLC

TCFD Disclosure

This report is prepared in line with the recommendations of the Taskforce on Climate-Related Financial Disclosures (TCFD).

GOVERNANCE
The organization's governance around climate-related risks and opportunities

STRATEGY
The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning

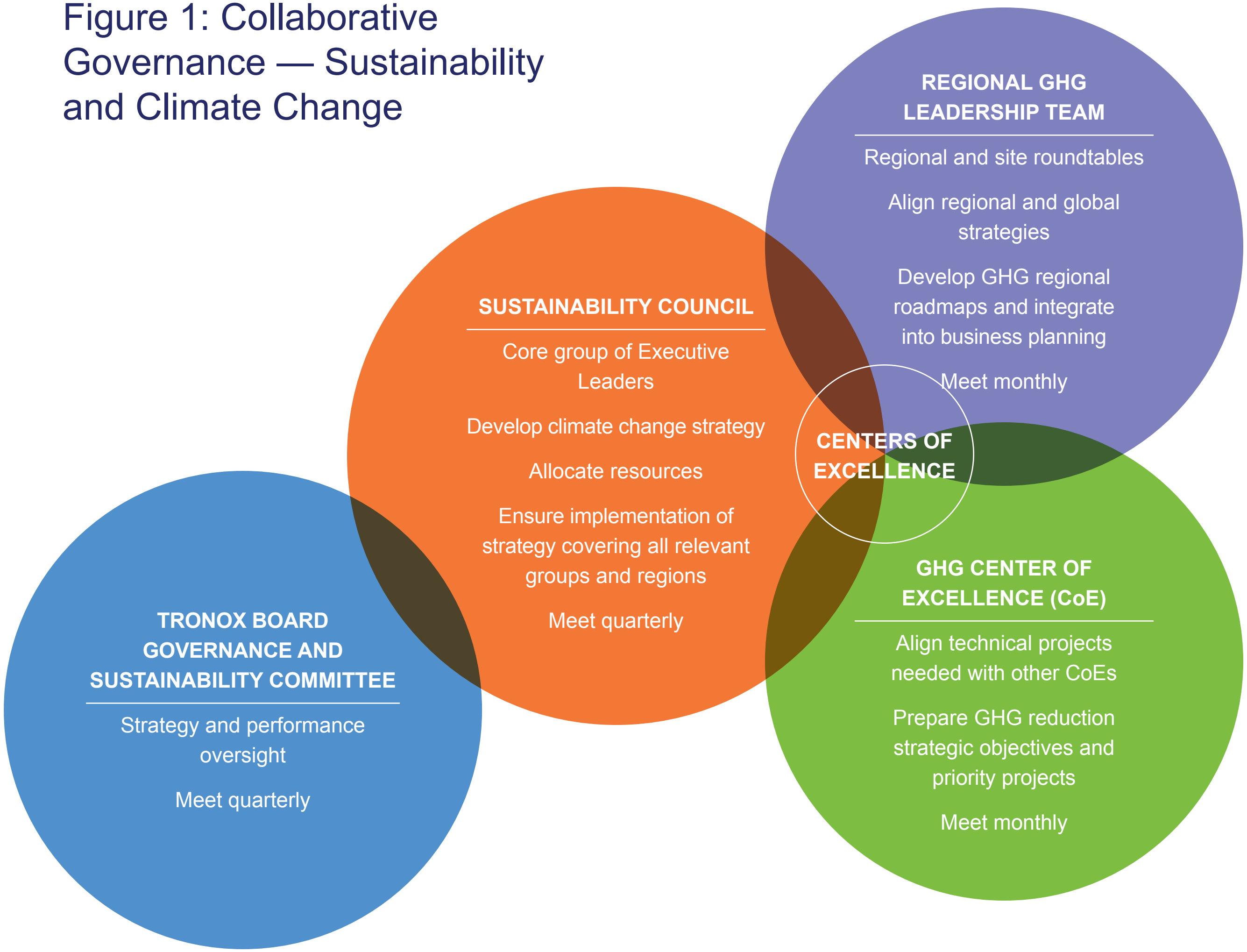
RISK MANAGEMENT
The processes used by the organization to identify, access and manage climate-related risks

METRICS AND TARGETS
The metrics and targets used to assess and manage relevant climate-related risks and opportunities

a. Governance

Tronox's sustainability-related governance structure starts at the highest level of the enterprise: a dedicated committee of the Board of Directors called, "The Governance and Sustainability Committee," comprised of three independent members of the Board of Directors, including the non-executive chairman. Underneath the Board is a governance structure comprised of multiple layers, starting with Tronox's senior executives and cascading down to each local site. Climate change is a core focus: reducing emissions, mitigating risk and optimizing opportunities. The governance structure and the roles/responsibilities are described in figure 1 on the right. The governance structure includes processes and initiatives to align the activities of the cross-enterprise global functions with individual sites and regions to effectively implement the sustainability and climate change-related strategies.

Figure 1: Collaborative Governance — Sustainability and Climate Change



b. Strategy

Our strategy on climate change is three-fold.

- **Achieve** net zero carbon emissions by 2050.
- **Ensure** the resilience of our communities and operations against the physical impacts of climate change.
- **Offer** our customers products with the lowest carbon content that is reasonably achievable to help them transition to a low carbon economy.

To move towards net zero carbon emissions, we established our initial goals in 2021 and then, based on the implementation of a few key carbon-reduction projects and our robust pipeline of additional projects, we announced new, more aggressive medium-term goals with the publication of our 2021 Sustainability Report.

In addition, whereas our original goals measured reductions based solely on the carbon intensity of producing our products against a 2019 baseline, our updated goals relate both to carbon intensity and absolute reductions. Both sets of goals cover 100 percent of our Scope 1 and 2 emissions. We intend to publicly disclose annually our progress against these goals.

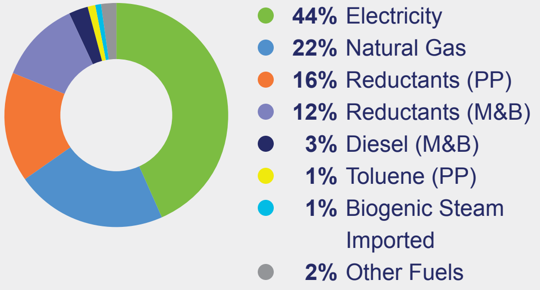
	OLD TARGET*	NEW TARGET*	HOW WE WILL DO IT
2025	15% (Intensity)	35% (Intensity)	• Replacing 74% of coal-intensive electricity power supply in South Africa with cleaner renewable sources (wind/solar)
		22% (Absolute)	• Continued optimization/efficiency programs • Energy Management Systems
2030	35% (Intensity)	50% (Intensity)	• Convert power supply to renewable sources at our mining sites and most of our pigment plants
		44% (Absolute)	• Carbon capture and storage projects • Electrification of processes at selected sites • Renewable fuel alternatives as waste to energy, biogas and biomass at selected sites
2050	100% (Intensity)	100% (Intensity & Absolute)	• Alternative renewable reductants • Electrification of mining earthmoving equipment

** In the event of any mergers, acquisitions or divestments, the baseline will be re-calculated based on the GHG Protocol Accounting Standards.*

One of the most significant projects underway is a 200 MW solar energy project in the Republic of South Africa to replace power we currently consume generated from coal-fired power plants owned and operated by Eskom. This project will come online by the end of 2023 and will reduce our global Scope 1 and 2 emissions by 17 percent as measured by intensity and 13 percent as measured in absolute terms. We are working on numerous additional renewable energy projects to replace carbon-based electricity in both South Africa and Australia.

The pie chart below shows the key contributors to 2021 Scope 1 and 2 emissions. The main contributor is CO_2 emissions for purchased electricity, accounting for approximately 2 million tons, followed by carbon-based reductants for minerals beneficiation and pigment production contributing approximately 1.2 million tons. The third largest contributor is natural gas, contributing approximately 0.95 million tons. Other sources contribute to reducing around 0.25 million tons.

CO_2 EMISSIONS BY COMPONENT — 2021



Based on these contributions, we developed our global decarbonization roadmap, which underpins how we will achieve the reduction goals. We are also working on more granular decarbonization roadmaps at the site and regional level for all geographic areas in which we operate. The regional roadmaps will help us set more ambitious targets in a pragmatic and feasible manner.

Our global decarbonization roadmap stems from extensive analysis using a TCFD-compliant methodology and involving all our internal climate governance teams, as well as representatives of each business unit and operational function. This work was two-fold:

- Detailed climate-related transition **risk assessment** based on various scenarios (see Climate Risks and Opportunities and Scenario Analysis) to identify the key transition risks to the business.
- Identification of **key mitigation opportunities** and a techno-economic **performance assessment** to model their potential future impact on GHG emissions, energy consumption and mix, and economic performance.

As a result, we have been able to model projections of GHG emission reduction strategies for Tronox based on market insights (e.g., evolution of energy prices and national electrical grid carbon intensities) and a range of the most significant transition mitigation opportunities that could be implemented through to 2050.

Our roadmap covers three key focus areas to achieve our long-term emissions reduction goals: source 100 percent renewable electricity, switch to low-carbon reductants and complete phaseout of fossil fuel energy for thermal needs (natural gas in particular).

FOCUS ON 2022-2025 ROADMAP

To meet our emissions reduction target of 35 percent (intensity) and 22 percent (absolute) by 2025 compared with our 2019 baseline, we are focusing most intensively on decarbonizing our electricity supply in geographies where the power grid supply has a high carbon content. As noted, the first significant project in South Africa has already been validated. In that project, Tronox entered into a long-term Power Purchase Agreement (PPA) with independent power producer, SOLA Group, to supply Tronox's mining and smelting operations with 200 MW of solar power, starting in Q4 2023. This contract alone should replace 40 percent of the current coal-intensive electricity supply of our South African sites and contribute to reduce our global carbon emissions by about 17 percent (intensity) and 13 percent (absolute) compared to the 2019 baseline. Similar PPA-type projects are being considered to decarbonize electricity-related (Scope 2) emissions in other South African and Australian mineral beneficiation sites. These PPAs alone could help us meet our 2025 target considering that the power grid carbon intensity is also forecasted to decrease in several of our geographies in the years to come.

In addition, we aim to tackle emissions related to our consumption of fossil fuels and carbon-intensive reductants (1.2 Mt CO_2 for the latter, or 27 percent [intensity] and 21 percent [absolute] of total GHG emissions measured against our 2019 baseline) with short-term actions. We are deploying energy efficiency projects to reduce our operational carbon emissions, such as automation for process optimization, as well as energy management systems. We have also launched a program to optimize our coke consumption in all plants by 2025.

FOCUS ON 2025-2030 ROADMAP

To meet our goal of 50 percent (intensity) and 44 percent (absolute) GHG emission reduction targets by 2030, our strategy is to tackle Scope 1 emissions related to our operations through carbon capture technologies and a near-total switch to renewable fuel alternatives, and to eliminate a larger share of our Scope 2 emissions related to electricity consumption.

We also intend to electrify certain pieces of equipment, such as natural-gas powered steam/boilers, which will result in a switch from fossil fuels to renewable electricity and therefore reduce our total carbon footprint. Such initiatives are being explored within the regional decarbonization roadmaps.

By 2030, there will be a significant decarbonization focus on Scope 1 emissions, as they will become the main contributor to our product carbon intensity (considering that Scope 2 emissions will have been significantly reduced with green PPAs in the focus 2020-2030 area). To tackle these emissions at their source, we will switch to low-carbon sources of energy to meet our thermal energy needs and phase out fossil fuels, such as natural gas. In addition, we are considering deployment of Carbon Capture, Utilization and Storage (CCUS) projects at our Botlek (NL) pigment manufacturing plant by 2030. We expect that these geographies will experience significant increases in CO_2 prices due to the increased ambitions of the EU-ETS carbon trading scheme.

FOCUS ON 2030-2050 ROADMAP

To reach our long-term 2050 carbon neutrality target, our main challenge after 2030 will be to develop and implement projects to tackle our remaining “hard-to-abate” GHG emissions. Within our global decarbonization roadmap, we have so far identified four main opportunities to be explored further.

The first opportunity focuses on finding alternative reductants to switch from anthracite and coke, which currently represent 1.2 Mt CO_2, or 21 percent of total GHG emissions. A few projects are currently under study to replace fossil reductants in our operations:

- Replacement of anthracite reductants with **green hydrogen** to pre-reduce ilmenite feedstock, which has the potential to cut 90 percent of the emissions associated with the titanium slag-making process.
- After pre-reduction in the titanium slag production process, replacement of the remaining anthracite that is required with **biochar**. Biochar is biomass (usually wood pellets) that has gone through pyrolysis (thermal decomposition in an air-deprived environment). If used in conjunction with hydrogen pre-reduction of ilmenite, this has the potential to cut almost all the emissions associated with the titanium slag-making process.
- Replacement of coke in the rutile/slag/ilmenite chlorination process, with alternatives such as **bio-coke** or CO.

These initiatives concerning alternative reductants will require investment in R&D programs, pilots and plant revamps over the next 10 years to begin deployment by 2035, depending on the development scenario.

The second key opportunity in the long-term roadmap is the increased electrification of operating activities that could benefit from the renewable energy projects implemented in the 2020-2030 focus period. For example, we aim to electrify mining earthmoving equipment in our operations in Australia and South Africa, which by then should be running fully on low-carbon electricity. However, the increasing electrification of our operations and the potential production of green hydrogen through electrolysis leads electricity consumption increases in all scenarios modeled. A cheap and clean electricity supply is therefore critical both to mitigate Scope 2 emissions and optimize costs. In the long term, opportunities to develop onsite renewable energy generation will be evaluated to switch from PPAs once those contracts expire.

Residual Scope 1 emissions related to thermal energy needs will need to be tackled, with a focus on switching from natural gas across all sites. Relatively mature solutions to phase out natural gas from our processes will be explored further as part of the region-specific decarbonization roadmaps (e.g., switch to synthetic methane or biomethane), as they can gain maturity and become cost-competitive over time.

Finally, as all emissions may not be reduced to zero to reach our carbon neutrality target, several actions are being contemplated in the long-term to mitigate those residual emissions, such as Expanding CCUS projects to other plants and considering deployment of carbon capture and storage in Stallingborough after 2030.

SCOPE 3 EMISSIONS AND BECOMING THE LOW-CARBON SUPPLIER OF TiO_2

Seventy-one percent of our carbon footprint arises from Scope 1 and 2 emissions and hence lies within our operational control. This is important because by aggressively reducing these emissions, we can offer our customers TiO_2 products that will help them reduce their Scope 3 emissions. Significantly reducing our own Scope 3 emissions is also part of our strategic goal of offering our customers products with the lowest carbon content that is reasonably achievable. During 2021, we focused on quantifying and understanding our upstream Scope 3 emissions and the “cradle to gate” environmental footprint of our main products. To effectively reduce Scope 3 emissions, we must understand the potential risks associated with switching away from high carbon raw materials and develop the necessary plans to either substitute or collaborate with our suppliers to reduce the carbon footprint of these materials. In 2021, our upstream Scope 3 emissions were approximately 1.8 million tons.

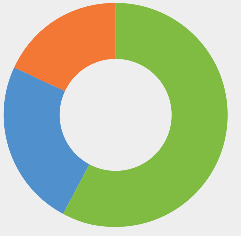
The main contributor to our Scope 3 emissions is the manufacturing and transportation of the chemical and other raw materials used in our production processes. A detailed breakdown of our Scope 3 emissions performance, including the categories quantified and the calculation methodology can be found on pg. 23.

The bulk of our Scope 3 emissions are from upstream raw materials for our intermediate or final products. For example, petcoke to produce an intermediate product ($TiCl_2$) or alumina to produce pigment. Furthermore, the diversity of our products in terms of number of end-markets we serve — everything from architectural paint to coatings for plastics and paper — and the global geographical distribution of our sales makes it very difficult to estimate downstream Scope 3 emissions.

The pie charts below show Tronox emissions distribution and the main contributors to our upstream Scope 3 emissions.

TRONOX — ALL GHG EMISSIONS

TRONOX — UPSTREAM SCOPE 3 CO_2 EMISSIONS



	ORE FEEDSTOCK *(tCO_2e / year)*	CHEMICALS/ MATERIALS *(tCO_2e / year)*	ENERGY *(tCO_2e / year)*	WATER *(tCO_2e / year)*	WASTEWATER *(tCO_2e / year)*	WASTE *(tCO_2e / year)*	TOTAL *(tCO_2e / year)*
Tronox — All	330,690	1,037,531	425,035	2,724	4	8,171	1,804,156
% contribution	18.33%	57.51%	23.56%	0.15%	0.00%	0.45%	

COMMITTING TO SCIENCE BASED TARGETS INITIATIVE (SBTi)

We are planning to commit to the Science Based Targets Initiative. The SBTi developed a sector-based approach for the high emitting chemical industry or “primary chemicals.” This approach recognizes the potential growth in demand for these chemicals when setting targets for decarbonization. The Sector-Based Approach is not applied to other chemical industries, including titanium dioxide manufacturing, to which an absolute contraction approach is applied instead.

In December 2020, the SBTi published a report on “Barriers, Challenges, and Opportunities for Chemical Companies to Set Science-Based Targets.” The report made three high-level recommendations to develop chemicals sector Sectoral Decarbonization Approach (SDA), including physical intensity approach(es) for chemical companies; such as TiO_2 manufacturing; which are not covered under primary chemical sectors with SDAs.

In the How-to-Guide published in December 2021 for the chemical sector, the chemical companies will have a choice either to use the Absolute Contraction Approach or 1.5ºC SDA pathway when available. We believe that the SDA is the more appropriate approach for Tronox to support our journey to carbon neutrality while continuing to grow and deliver value to our shareholders.

We are closely monitoring the ongoing scoping project by SBTi to develop sector-specific methods for the chemical industry. In the meantime, we will continue our efforts to set targets for our Scope 3 emissions by 2023 and will submit our targets once we sign our commitment letter.

c. Risk Management

Tronox's primary tool for managing risk is the Enterprise Risk Management process (ERM).

This annual process is overseen by the entire Board of Directors and managed on a day-to-day basis by the Vice President, Internal Audit and Deputy General Counsel.

The process starts in Q3 each year with 1:1 meetings with each Board member and the Co-Chief Executive Officers, Chief Financial Officer, General Counsel, and Vice President, Internal Audit, to discuss the Company's most significant risks and the effectiveness of the mitigation plans intended to address those risks. Feedback from our directors is used to help identify key risks and improve the effectiveness of the mitigation activities.

At the management level, Tronox has formed a Global Risk Committee (GRC), comprising senior leaders from around the globe representing all functions and business units, which is charged with assisting Tronox's Board to identify significant enterprise risks, assess its risk mitigation strategies and, where appropriate, help implement those strategies, and review and suggest specific risk tolerances and risk appetite.

The GRC meets in Q2 of each year to review the scope and appropriateness of the ERM plan, taking into consideration any changes since the prior year ERM process, including changes in Tronox's scope of business activities, events in the prior year suggesting lapses in the prior year's ERM process, geopolitical events, and evolving stakeholder expectations. In addition, the GRC reviews the results of any specific risk mitigation activities that resulted from the prior year's ERM process and the implementation of any specific risk tolerances or "risk appetite" adopted.

The GRC meets again after the ERM process is completed. It reviews results of that year's ERM process and suggests specific risk mitigation actions that result from (or should result from) the ERM process and ensure adequate resources available to undertake activities. This may include updates to existing policies or adoption and implementation of new policies; employee education and training related to specific risks; and desktop risk mitigation exercises, specific risk tolerances or "risk appetite" standards that result from the ERM process.

After the ERM process is complete, the Vice President, Internal Audit and other key ''risk owners'' present the results of the analysis to the full Board typically at its February meeting.

CLIMATE RISKS AND OPPORTUNITIES

In 2021, we worked on analyzing how the relevant climate change "transition scenarios" would impact Tronox. These transition scenarios were based on the global community's ability to act against climate change ranging from inaction to sustainable development. We discussed with our internal and external stakeholders how these transition scenarios would impact Tronox and ways Tronox could adjust under each scenario. Next, we conducted a quantitative evaluation of how each scenario would likely impact Tronox's commercial activity. The outcomes of the quantitative risk assessment were reviewed by a cross-functional team to prioritize risks and explore opportunities with the aim of developing a climate change roadmap that is integrated into the company Strategy. The outline of the roadmap is presented on pg. 5-6.

INTERNAL CARBON PRICING

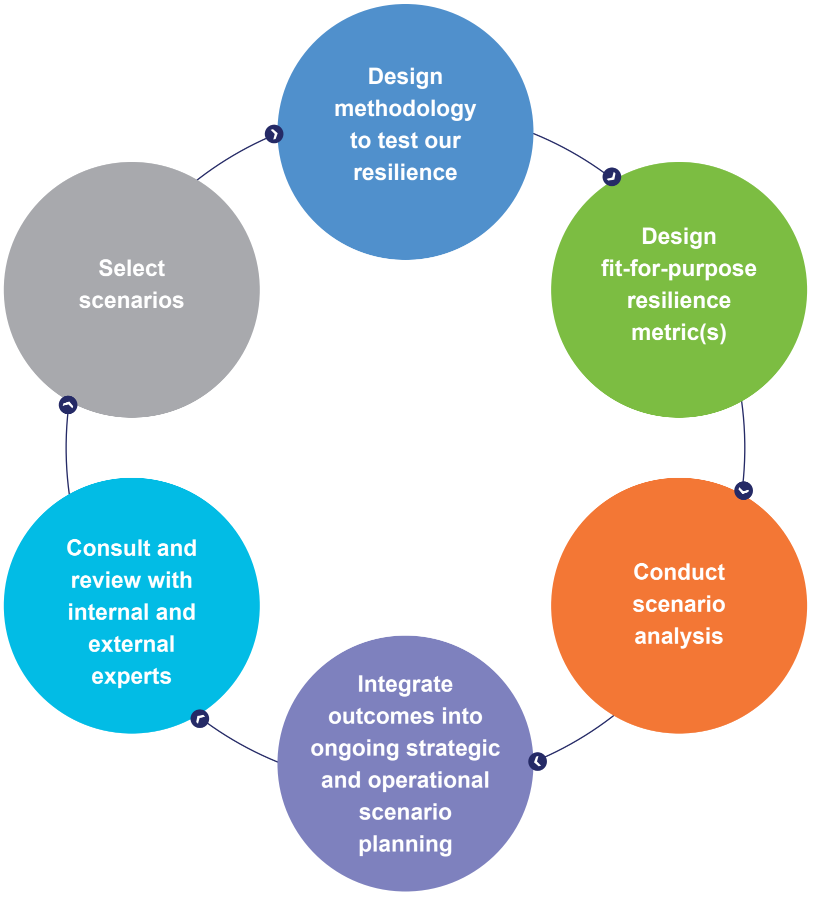
As part of our commitment to sustainably transition to a low-carbon economy, we recognize the potential cost of inaction as a key risk. For that purpose, we are in the process of establishing an internal carbon costing mechanism covering all our functional and regional operations. Through our scenario analysis, we developed a global carbon price forecast and jurisdiction-based carbon pricing in relevant areas. During the latter half of 2022, we will explore how an internal carbon price mechanism can be incorporated into our planning and capital expenditure decisions to enable an informed decision-making process recognizing climate-related risks and opportunities with a goal of incorporating internal carbon pricing into our 2023 budget process. In our global carbon pricing forecast, we are not only looking at the actual carbon pricing data, but also addressing long-term average costs relevant to jurisdictions where Tronox operates under low carbon transition scenarios.

TRANSITION SCENARIO ANALYSIS

We built the climate change scenarios using a staged approach in alignment with the TCFD guidelines. We navigated through different climate scenarios and sectoral-specific roadmaps to understand risks and opportunities identified.

The reviews included:

- **Reference climate scenarios:** Intergovernmental Panel on Climate Change (IPCC); International Energy Agency (IEA); Greenpeace; and International Renewable Energy Agency (IRENA)
- **Industry strategies and roadmaps:** European Chemical Industry Council (CEFIC), Vision and Roadmap for European Raw Materials (VERAM); International Council of Chemical Associations (ICCA); US Department of Energy; and Mineral Council of Australia
- **Sectoral decarbonization pathways:** Science Based Target Initiative (SBTi) and Transition Pathway Initiative (TPI)



WHAT IS A SCENARIO?

A scenario describes a path of development leading to a particular outcome. Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments. It is important to remember that scenarios are hypothetical constructs; they are not forecasts or predictions; nor are they sensitivity analyses. Scenario analysis is a tool to enhance critical strategic thinking.

TCFD Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities (June 2017).

With the support of specialized consultants and subject matter experts, we developed three Tronox-specific scenarios in addition to the base-case (the case of no action taken):

Figure 1: Transition scenarios constructed to evaluate transition risks

TRANSITION SCENARIO	REFERENCES	BRIEF SCENARIO NARRATIVE
Inaction >+3.6ºC in 2100	IPCC SSP3-7.0 and SSP5-8.5	• Little climate action is implemented, materialized by a low allocation of capital in low-carbon energy sources and technologies (incl. for TiO_2 processes) and no ambitious policy extensions (e.g., no global carbon pricing emerges) • Extreme pressure on natural resources generates nationalism, international tensions and fragilizes multilateral bodies, while climate changes are extremely visible with large impacts on health and life quality • Used for base case analysis and as worst-case scenario for assessment of physical risks
Announced Actions ~+2.7ºC in 2100	IPCC SSP2-4.5 IEA STEPS	• Climate action reflects current and announced policy settings, but will not achieve global net-zero pledges made by countries • Technology development enables an increase in society's resilience, but is insufficient to meet decarbonization needs, preventing the achievement of a low-carbon economic growth • Used for scenario analysis for physical and business risk assessments
Fast Technological Change ~+2.0ºC in 2100	IPCC SSP1-2.6 IEA APS Meadows Report — Comprehensive Technology	• Rapid technological progress enables a decrease in energy and carbon intensity of the economy (incl. TiO_2 value chain): renewable energy, electrification, energy efficiency, hydrogen, OOUS, biofuels, etc. • Steady economic growth and low-carbon technologies generate high pressure on critical minerals, including titanium, which is mitigated by a high international cooperation • Used for scenario analysis for business risks assessment
Sustainable Development ~+1.5ºC in 2100	IPCC SSP1-1.9 IEA SDS IRENA 1.5ºC Pathway	• High collective decarbonization efforts: all current net zero pledges are achieved in full, advanced economies reach net zero emissions by 2050, China around 2060, and all other countries by 2070 at the latest • The combination of technological development, ambitious policies (e.g., rapid fossil fuel phase out) and rapid shift of socio-economic behaviors (e.g., circular economy) enables the advent of carbon-neutral economies and green growth • Used for scenario analysis for business risks assessment

Figure 2: Summary of key assumptions and outputs in each transition scenario

	BASE CASE SCENARIO	ANNOUNCED ACTIONS SCENARIO	FAST TECHNOLOGICAL CHANGE SCENARIO	SUSTAINABLE WORLD SCENARIO
Sales	Base case assumptions given by Tronox	Base case assumptions given by Tronox	Slower growth, especially in the plastics sector	Slower growth, especially in the plastics sector
Energy Prices	Low energy prices, IEA's Stated Policies scenario	Sharper increase, Enerblue scenario	Sharper increase, Enerblue scenario	Extreme increase, Energreen scenario
Carbon Prices	Low carbon prices, IEA's Stated Policies scenario	Low carbon prices, IEA's Stated Policies scenario	Sharper increase, IEA's Announced Actions scenario	Extreme increase, IEA's Sustainable World scenario
Mitigation Actions	No mitigation measures	Only planned mitigation measures (PPAs)	Only planned mitigation measures with slightly more ambition (PPAs, a few H_2 projects)	Only planned mitigation measures with slightly more ambition (PPAs, a few H_2 projects)

These scenarios provide a comprehensive view of various climate change-driven impacts that may affect our business. Risk assessments were carried out to determine each scenario's potential impact on our business, both quantitatively and qualitatively. The analysis helped to assess our business's resilience and evaluate various mitigation measures included in our roadmap.

Tronox will update the scenario analysis at least every three years; or when a significant shift in climate change policies is anticipated. We will also commit to disclose progress of our actions to mitigate these risks on annual basis.

RISKS RELATED TO POLICY AND REGULATION

	Carbon Price	Carbon Border Adjustment	Reduction of Importations	Supply Chain/ Production Tensions	Grid Carbon Intensity	Fossil Fuel Phaseout	Natural Resources Tensions	Stricter Regulation	Environmental Taxonomy
Announced Actions	Medium	Only in the EU	Low reduction of imports	High risk	Planned measures only, slow decarbonization	Progressive	Very high	Not beyond planned policies	Not beyond planned policies
Fast Technological Change	Medium	Only in specific countries	Low reduction of imports	Moderate risk	Planned measures only, slow decarbonization	Progressive	High	Stricter regulation	Strict taxonomies
Sustainable World	High	Widespread	Short circuits privileged	Moderate risk	Clean	Progressive then fast	Moderate	Stricter regulation	Strict taxonomies
	Carbon mechanisms		International situation		Techno-political decisions			Environmental regulation	

- Low
- Moderate
- Moderate-High
- High

RISKS RELATED TO TECHNOLOGY, MARKET AND REPUTATION

	Tronox's Energy Mix	Grid Reliability	Tronox's Processes	Tensions on Energy Supply	Consumer Demand Shifts	Recycling Habits	Nuclear Phaseout	Stakeholder Pressure	Social Acceptance
Announced Actions	Slow replacement	Moderately reliable	Slow retrofit	High tensions	Observed shift	Observed shift	Current announces	Moderate pressure	Moderate impact
Fast Technological Change	Active replacement	Hiaghly reliable	Active innovation	High tensions	Observed shift	Observed shift	Current announces	Moderate pressure	Moderate impact
Sustainable World	Active replacement	Highly reliable	Active innovation	Moderate tensions	Progressive shift	Progressive shift	Phase-out in some countries	High pressure	High impact

Technological risks: Tronox's Energy Mix, Grid Reliability, Tronox's Processes

Market risks: Tensions on Energy Supply, Consumer Demand Shifts, Recycling Habits, Nuclear Phaseout

Reputational risks: Stakeholder Pressure, Social Acceptance

- Low
- Moderate
- Moderate-High
- High

The following table summarizes the key transition risks facing Tronox globally that require mitigation action.

TRANSITION RISK BY 2050	TIME HORIZON	PROCESS/BU CONCERNED	IMPACT DESCRIPTION	RISK	MITIGATION AND OPPORTUNITIES
Carbon pricing	As of today	All BUs	Carbon pricing policies and associated regulatory mechanisms — including carbon border taxes — are being adopted with increasing levels in various countries given our current infrastructure, resources and priorities	If no GHG emission reduction action is undertaken, production costs could increase dramatically resulting from both direct carbon pricing penalties ($/ton product sold) and indirect increasing costs of carbon-intensive energy sources and raw materials (chlorine, sulfur, petcoke, etc.)	• Emissions reduction of 22% by 2025 and 44% by 2030, see Decarbonization roadmap pg. 5-6 • Regular scenario-based assessment of carbon pricing policies and modeling of an internal carbon price (see pg. 5-6)
Fossil fuel phaseout	From 2030 onwards	All BUs (in particular energy-intensive activities, e.g., pigment manufacturing)	Increasing number of countries with regulations to phase out from coal and other fossil fuels	Rising energy and raw material costs; especially in the Sustainable World scenario; which can lead to production cost increase, particularly in smelting and chlorination processes, if no major change is made in the energy and raw material supply mix	• Securing supply of low-carbon and stable-priced electricity through green corporate Power Purchase Agreements (PPAs) or self-consumption models, for example by installing solar photovoltaic panels and storage on Tronox's facilities • Progressively phasing out coke consumption in feedstock processing steps by replacing it with alternative reductants, such as biocoke, low-carbon hydrogen and methane

TRANSITION RISK BY 2050	TIME HORIZON	PROCESS/BU CONCERNED	IMPACT DESCRIPTION	RISK	MITIGATION AND OPPORTUNITIES
Increased environmental regulations on end products	As of today	Pigments & SC&M	Increased sectoral regulations for the production of end products (plastics, paints, coatings, etc.) through eco-design requirements and environmental labeling of consumer products	Reduced sales in certain markets (e.g., single-use plastics) and higher expectations from clients on the environmental footprint of products supplied	• Marketing low-carbon Tronox products that result from actual GHG emission reduction efforts undertaken (see Decarbonization roadmap pg. 5-6) and which are sold to customers along with a Guarantee of Origin (GO) mechanism, helping Tronox's clients to decrease their Scope 3 emissions • Regular scenario-based assessment of the evolution of the environmental regulation of end products (e.g., EU Chemicals Strategy) in order to best understand which end markets are at risk and how Tronox products can help those markets be more resilient
Technology changes	As of today	All BUs	Tronox needs to adopt new technologies to fully decarbonize its activities and thus respect its GHG emission reduction targets. The availability of decarbonization technologies at a competitive cost is thus a challenge	Tronox may experience challenges reaching net zero by 2050 if some technologies are unavailable at a sufficiently competitive cost (e.g., green hydrogen, carbon capture, biocoke, etc.); Tronox can also face a high cost to implement those technologies	• Regular scenario-based assessment of decarbonization technology availability and competitiveness and impacts on operations and supply • Decarbonization roadmap (pg. 5-6) to be regularly updated to best assess what technologies should be prioritized to reach GHG emission reduction targets while maintaining sufficient productivity and competitiveness
Market shift for products with lower carbon impact	As of today	Pigments & SC&M	Demand from both clients and end consumers for products with a lower carbon footprint	The main risk consists of higher expectations from clients on the environmental footprint of products supplied The TiO_2 pigment market is for now relatively less threatened by a massive demand shift because of the absence of alternative products (e.g., biobased or synthetic pigments) with the same performance	• Marketing low-carbon Tronox products (see "Increased environmental regulations on end products" risk mitigation) • Regular scenario-based assessment of demand forecasts based on close surveillance of market trends and customers' expectations, and integration of insights into strategic planning

TRANSITION RISK BY 2050	TIME HORIZON	PROCESS/BU CONCERNED	IMPACT DESCRIPTION	RISK	MITIGATION AND OPPORTUNITIES
Reputation	As of today	All BUs	Increased stakeholder concern about GHG emissions and reporting Decreasing social acceptance of activities with negative environmental impact	If Tronox does not implement the necessary actions to meet the climate ambitions it has set, several reputational risks can be faced: • Less funding available and/or increased production costs due to boycott by shareholders, banks and commercial partners • Closure of existing mining and pigment manufacturing plants and impossibility to create new plants and deliver because of potential activism	• Decarbonization roadmap (see pg. 5-6) to be implemented and updated following potential climate ambition revision • Open dialogue with shareholders and maintained importance of Tronox's cross-functional governance structure on sustainability (see p. 9) • Annual sustainability reporting in full compliance with TCFD to provide transparent information on the progress made on climate ambitions and inform about climate-related strategic planning adjustments

We also conducted a detailed assessment of the physical risks related to climate change for all of our operational sites. Both acute and chronic physical risks associated with climate change were assessed. Chronic risks are associated with those physical changes that change slowly over time and have a cumulative impact. These include changes to temperature, mean sea level, annual precipitation, and average monthly wind speed. Acute risks are those associated with extreme events, such as bushfires, cyclones, storm surge, flooding, etc. While chronic climate change needs to be considered given the potential life of the risk management project, extreme events can cause the most disruption and pose the most significant risk to life and property.

The physical climate modeling undertaken includes the most recent Sixth Assessment Report (AR6) of the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC). The Physical Science Basis (released in August 2021) underpins the modeling undertaken. These models include several new and updated emission pathways that explore a much more comprehensive range of possible future outcomes than were included in CMIP5. Specifically, a set of scenarios were chosen to provide a range of distinct end-of-century climate change outcomes.

For each physical climate change, we explored how this will impact the business and the risks that result. In this way, climate stressors were translated and the vulnerability of the business to climate change was established.

The following table summarizes the key risks facing Tronox globally that require action to either better define the vulnerability and exposure of Tronox to each risk or to investigate mitigation and adaption options further. We are working on assessing the resilience of each of our sites against the risks identified and the outcomes will be incorporated into our ERP Process.

PHYSICAL RISK BY 2050	TIME HORIZON	SITES IMPACTED	BUSINESS IMPACT	RISK	MITIGATION AND OPPORTUNITIES
Temperature increase 0.8-2.0ºC	Chronic	All sites — lesser impacted are sites that have lower annual mean temperatures to begin with, such as European sites. Also, some sites exhibit an increase in rainfall (e.g., Fuzhou, Hamilton) which helps to mitigate the impact of a hotter climate.	Increased degradation of infrastructure and physical assets	Increased maintenance costs, potential for capital investment, increased management of workforce to ensure safety	Investigation into the impact of baseline temperature on infrastructure degradation and maintenance costs across sites that experience currently different climate conditions
	Chronic		Increased frequency and duration of electricity supply interruptions due to degradation of state-owned or privately owned infrastructure	Each site will face slightly different consequences depending on their specific requirements, exposure and resilience	Become self-sufficient for energy production or move to hub model where applicable
	Chronic		Competition for electricity during warmer conditions		
	Chronic		Hotter conditions lead to increased base load for increasing competition and place greater pressure on water management and regulation		Water management is already a key component of Tronox operations at most sites. Investigation of potential alternative sources of water (e.g., self-managed ground water, water recycling, desalinization plants)
	Acute		Hotter conditions increase risk of damage from bushfires to not only Tronox infrastructure but physical assets that support energy, water and workforce		Bushfire management plans are already in place for relevant sites, investigation as to adequacy with increasing climate risks and review emergency response procedures; potential for investment in additional firefighting infrastructure
	Chronic		Increased insurance costs associated with increased hazards and degradation of infrastructure	Increased insurance costs, as well as access to insurance	Refer to mitigation measures mentioned above

PHYSICAL RISK BY 2050	TIME HORIZON	SITES IMPACTED	BUSINESS IMPACT	RISK	MITIGATION AND OPPORTUNITIES
Temperature increase 0.8-2.0ºC *(continued)*	Chronic	Sites with dredging ponds	Increased evaporation rates to dredging ponds	Competition for water resources will only increase with increasing temperature, assessment of evaporation requirements needs to be considered as part of overall site water balance	See water management
	Chronic	Mining sites with closure requirements	Increased risk to closure activities, such as revegetation and impact of hotter conditions on TSF design and closure liability	Increased failure rate for re-vegetation and potential TSF failure will increase risk of regulator involvement and potential for damage to brand reputation. Greater investment required will result in decreased shareholder value and increased closure costs	Research into closure impacts due to changing climate required, including implication to rehabilitation and TSF management
	Chronic	All sites	Decreased air quality	Increased temperature leads to decreased air quality at sites, which may lead to increased incidence of compliance breaches, regulatory involvement and damage to reputation	Continue to work towards reducing emissions and assess each site’s capacity to reduce/manage airborne pollutants and particulates
	Chronic	Thann, Stallingborough, Botlek	Decreased incidence of cold-related illness, and decreased energy requirements relating to heating	Decreased energy requirements and increased workforce productivity	Positive impact. Not applicable

PHYSICAL RISK BY 2050	TIME HORIZON	SITES IMPACTED	BUSINESS IMPACT	RISK	MITIGATION AND OPPORTUNITIES
Extreme 24-month drought increase in likelihood	Chronic — acute	All sites	Increases in the frequency and intensity of drought conditions are predicted to occur across all sites leading to increased competition for water resources, increased occurrence and intensity of bushfires	Increased risks associated with access to water, water quality and the spread of disease and tighter regulation with respect to air quality control	See water management
			Regions with poorly developed support systems and resilience to drought may face hardships in terms of domestic food supply	Decreased food and water security creating social and political issues in areas of operation	Increase contributions to community development programs that help build resilience to climate change and encouragement of uptake in community of programs
Increase in humidex "danger" days	Acute	All sites. Some sites are impacted to greater extent than others. Lesser at European sites	Increased heat-related illness among workforce, increased risk of accidents and slips because of heat, decreased productivity due to inability to undertake physical tasks	Increased risk of safety incidents, breaches to regulation and employee discontent if not adequately managed	As a global operator, management protocols and lessons learned at sites that have a higher mean annual temperature like Yanbu, can be used as a template for management of sites that are predicted to see an increased impact of heat on working conditions

PHYSICAL RISK BY 2050	TIME HORIZON	SITES IMPACTED	BUSINESS IMPACT	RISK	MITIGATION AND OPPORTUNITIES
Extreme rainfall events increase in precipitation volume	Acute	All sites. Some sites are impacted to a greater extent than others	Damage to infrastructure, physical assets and equipment at each site either directly or indirectly through flash flooding	Interruptions to operations causing decreased production and increased costs of maintenance and repairs, possible replacement of infrastructure	Assess each site's ability to handle predicted increases in precipitation amount during extreme rainfall events to determine current level of exposure
	Acute		For mine sites, increased risk of loss of ore from flash flooding and TSF competency both during operation and after closure. For other sites, exceedance to current drainage may lead to possible runoff and contamination from sites	Loss of product with decreased profit, as well as increased risk of contamination and TSF failure causing compliance breaches, regulatory action and reputation damage	Assess surface water and runoff management at each applicable site to determine exposure
	Acute		Interference with the process either directly through cooling or dilution or indirectly through flash flooding	Interruptions to operations causing decreased production, potential for quality of product to be impacted.	Ensure adequate protection for process during extreme rainfall events relevant to each site
	Acute		Increased exposure to hazards and disruption of workforce during event and immediately after	Decreased production, increased incidence of safety breaches, potential for increased liability and reputation damage	Ensure each site has a flood management and response plan and that staff are trained and adequately prepared
	Acute		Increased chance of accidents during commute and decreased site access	Disruption to workforce and supply chain	Education for staff and protocols in place during extreme events, risk analysis of supply chain response to extreme events
	Acute		Increased likelihood of interruption to energy supply due to flooding of and damage to infrastructure	Each site will face slightly different consequences depending on their specific requirements, exposure and resilience	See energy management

PHYSICAL RISK BY 2050	TIME HORIZON	SITES IMPACTED	BUSINESS IMPACT	RISK	MITIGATION AND OPPORTUNITIES
Extreme rainfall events increase in precipitation volume	Acute	All sites. Some sites are impacted to a greater extent than others	Decreased capacity of wastewater network to deal with additional inundation, causing systems to clog	Potential for interruptions to production, damage to product quality	Assess each site's ability to handle predicted increases in precipitation amount during extreme rainfall events to determine current level of exposure
	Chronic		Flood insurance costs increased	Increased insurance costs as well as access to insurance	Refer to mitigation measures above
Extreme wind events increase in wind speed	Acute	Australian, South African, and European sites	Increased wind speeds during extreme events leading to damage to infrastructure, physical assets and equipment at each site	Interruptions to operations causing decreased production and increased costs of maintenance and repairs, possible replacement of infrastructure	Assess each site's ability to handle predicted increases in wind speed during extreme events to determine current level of exposure and requirement for any additional infrastructure changes
			Potential for exceedance to safe operating envelopes in terms of production, as well as interruptions to maintenance	Decreased production and increased time required for maintenance as well as increased costs and potential for increased safety incidence	Assess extreme wind event exposure at each site and develop management and response plan
Extreme increase in water levels (1 in 100-year event)	Acute — Chronic	Botlek, Stallingborough, Yanbu (lesser at Namakwa North and Australind)	Increased risk of inundation during storm surge events causing coastal erosion leading to damage to infrastructure, flooding and salt-water degradation. Site access may be impeded, and groundwater quality impacted	Increased insurance costs as well as access to insurance. Decreased production and increased incidence of safety and contamination breaches during events, increased maintenances costs, damage to product quality, interruptions to supply chain	Assess impact of extreme water level at each site and develop a management and response plan to deal with temporary effects. Explore potential for physical/ engineering options and inundation management, as well as changes to groundwater and surface water quality at site

d. Metrics and Targets

Refer to 2021 Sustainability Report for Scope 1, 2 and 3 emissions and other metrics in alignment with TCFD, SASB and GRI.