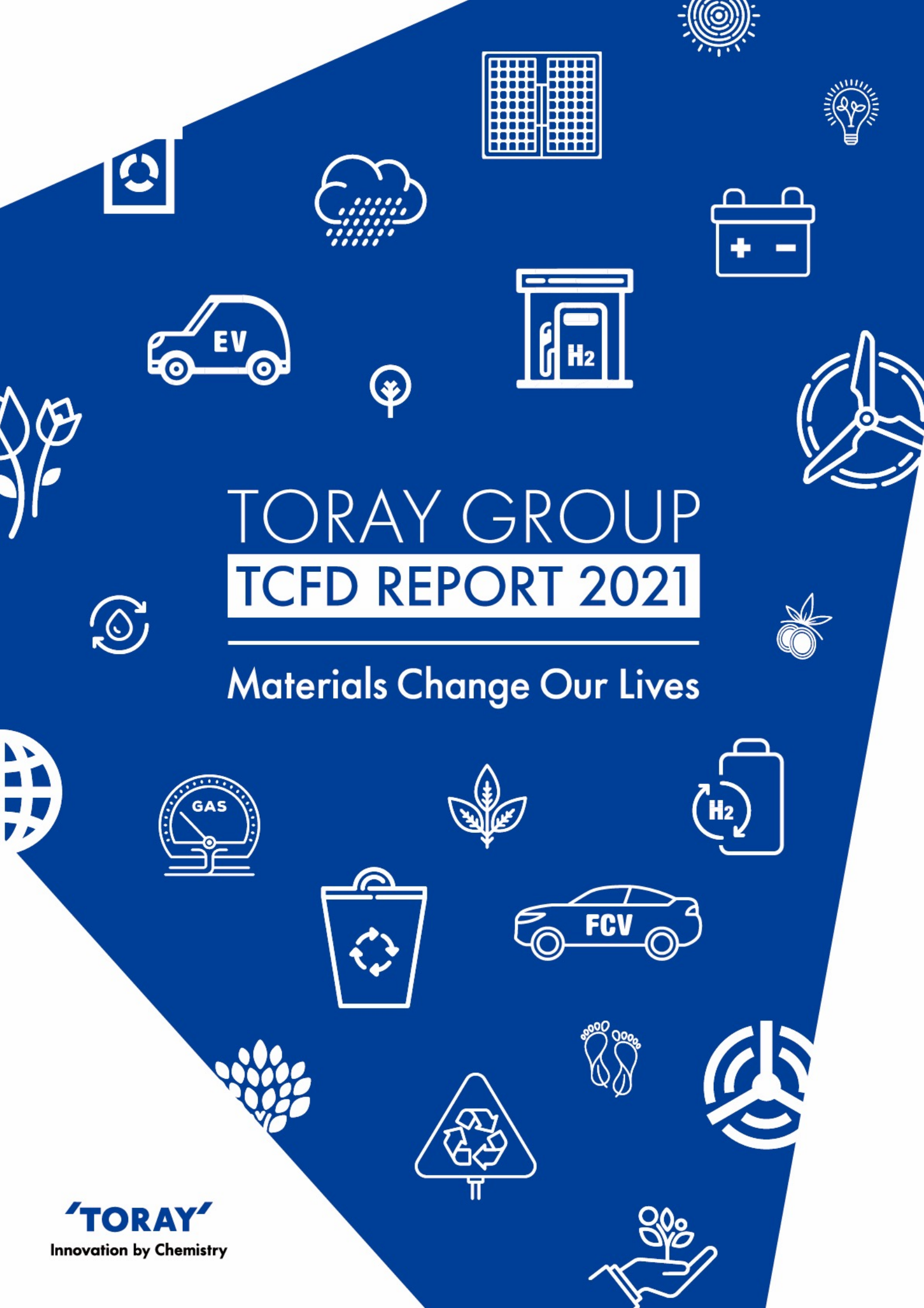


TORAY GROUP
TCFD REPORT 2021

Materials Change Our Lives

'TORAY'
Innovation by Chemistry

Contents

I. Achieving a World of Net Zero GHG Emissions in 2050 ---- 2

II. Toray Group Efforts to Date ---- 3

Ⅲ. Governance System Related to Climate Change ---- 4

Ⅳ. Impact Analysis of Climate Change ---- 5

Ⅴ. Toray Group's Initiatives in Response to Climate Change Issues ---- 10

Ⅵ. Risk Management ---- 20

Ⅶ. KPIs and Targets ---- 20

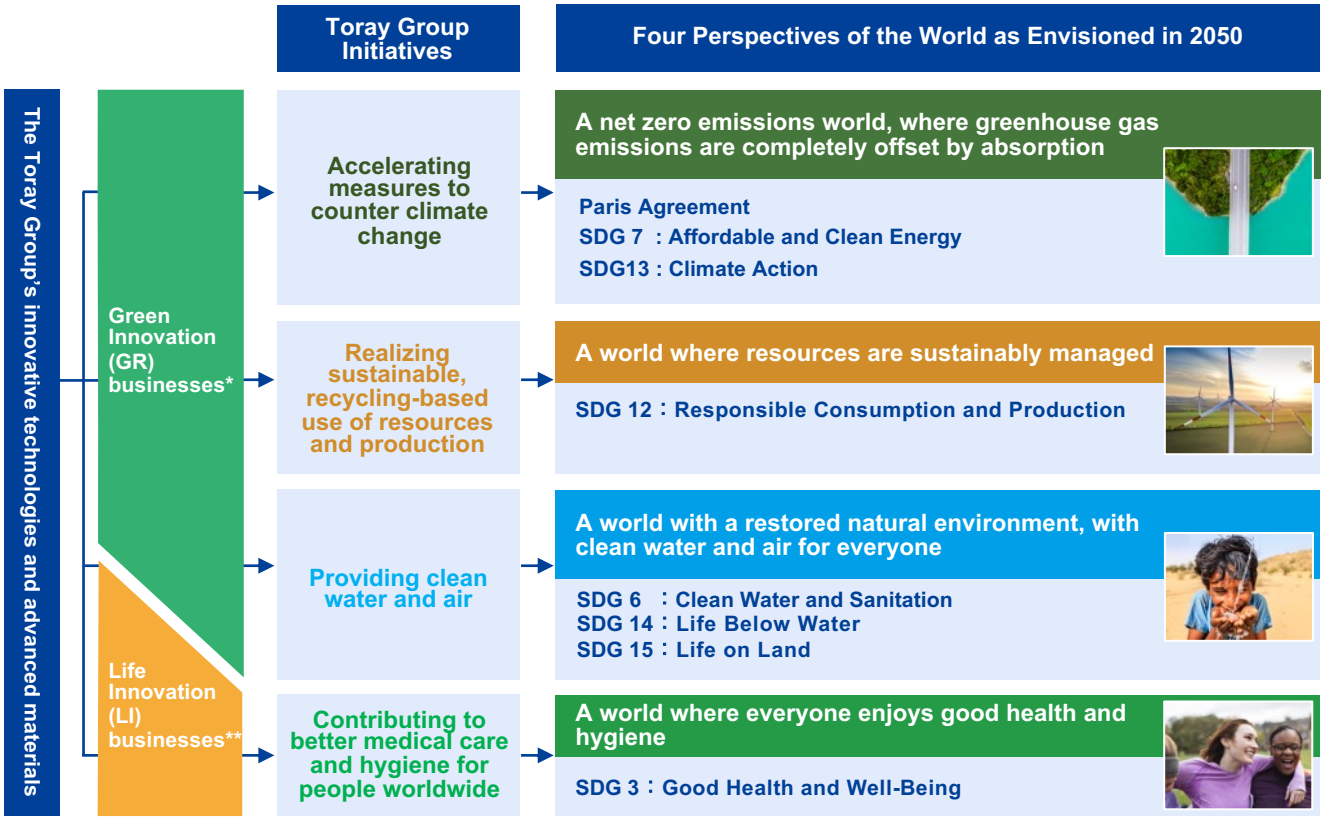
Ⅷ. Conclusion ---- 21

Index of TCFD Recommended Disclosure Items ---- 21

I. Achieving a World of Net Zero GHG Emissions in 2050

In July 2018, Toray Group announced the Toray Group Sustainability Vision[1](hereinafter Sustainability Vision), declaring its long-term determination to provide innovative technologies and advanced materials that help global issues including climate change. In the vision, Toray Group declared its aim of "A net zero emissions world, where greenhouse gas emissions are completely offset by absorption," effectively cutting greenhouse gas (GHG) emissions to zero by 2050.

Figure 1: Toray Group's Vision for the World in 2050



* Businesses that contribute to solving global environmental issues and resource and energy-related issues

** Businesses that improve the quality of medical care, enhance public health, and support people's health maintenance, longevity, and personal safety

To help the world get to net zero GHG emissions, Toray Group is addressing climate change in the following ways. Firstly, it is contributing to solving climate change issues through the value chain, such as by reducing CO_2 emissions throughout the product life cycle with the creation of innovative technologies and advanced materials. Secondly, Toray Group is moving forward with initiatives to address climate change across its business activities, such as working to reduce GHG emissions in the manufacturing stage. The Toray Group Sustainability Vision establishes key performance indicators (KPIs) for fiscal 2030 as interim targets on the road to a world of a net zero greenhouse gas emissions. In terms of contributing solutions for climate change issues through the value chain, the KPIs include the contribution to CO_2 reduction,[2] which the entire chemicals industry has long been seeking to improve. KPIs for efforts to address climate change in business activities include GHG emissions per unit of sales revenue. This KPI is based on the fiscal 2030 targets set forth by the Government of Japan under the targets of the Paris Agreement.[3] (Refer to VII. KPIs and Targets.)

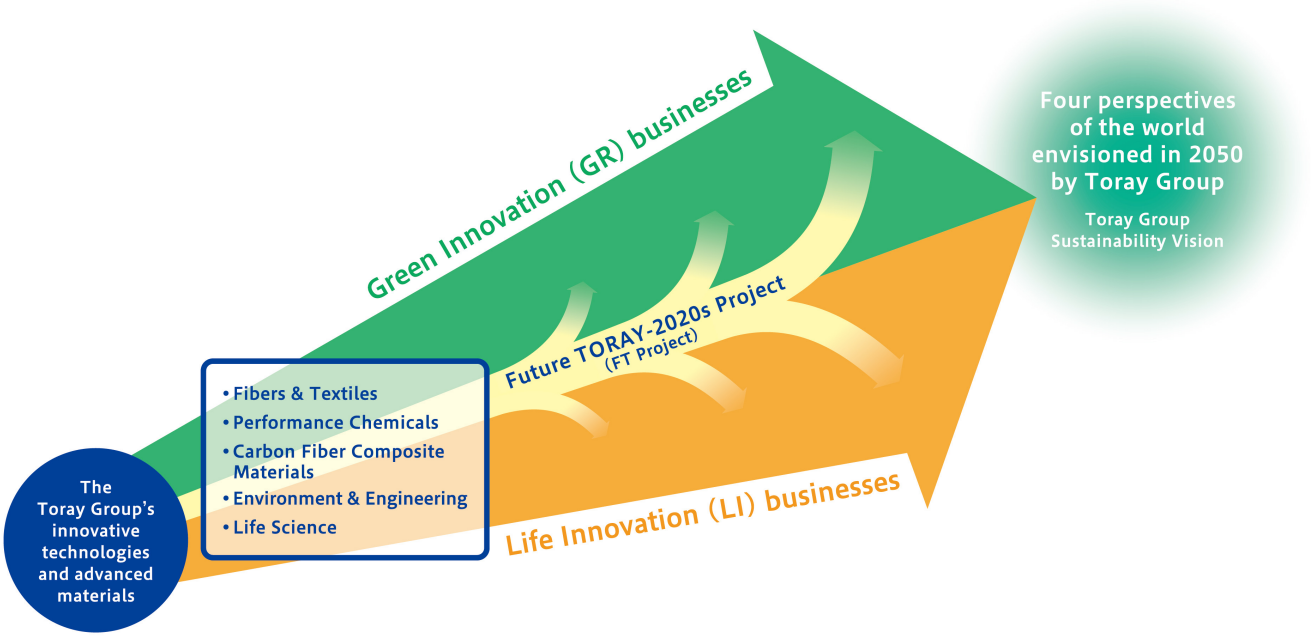
The following discloses important information concerning climate change as per the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

II. Toray Group Efforts to Date

Since its establishment in 1926, Toray Group has been guided by the principle of "realizing that corporations are public institutions of society and contributing to society through our business." Under this principle, Toray Group has long sought to create innovative technologies and advanced materials that offer solutions to various social issues, including global-scale environmental issues, and to contribute to sustainable global development. Figure 2 summarizes Toray Group's initiatives to address global environmental issues to date.

Figure 2: Chronology of Toray Group's Initiatives to Address Global Environmental Issues

The Long-Term Corporate Vision, TORAY VISION 2030,[4] commits Toray Group to achieving the KPIs for fiscal 2030 outlined in the Toray Group Sustainability Vision. In all business segments, Toray Group will expand its business not only by capturing increased demand, but also by creating new demand focusing on Green Innovation (GR) businesses that contribute to solving global environmental issues and resource and energy-related issues, and on Life Innovation (LI) businesses that contribute to improving the quality of medical care, enhance public health, and realize health maintenance, longevity, and personal safety. To create and expand new businesses, Toray Group is implementing the Future Toray-2020s Project. This is a group-wide project focusing on themes such as hydrogen and fuel cell-related materials that will drive the next stage of growth, and products and process technologies that utilize biomass. Toray Group will aim for sales revenue of 1 trillion yen from all new businesses by 2030.



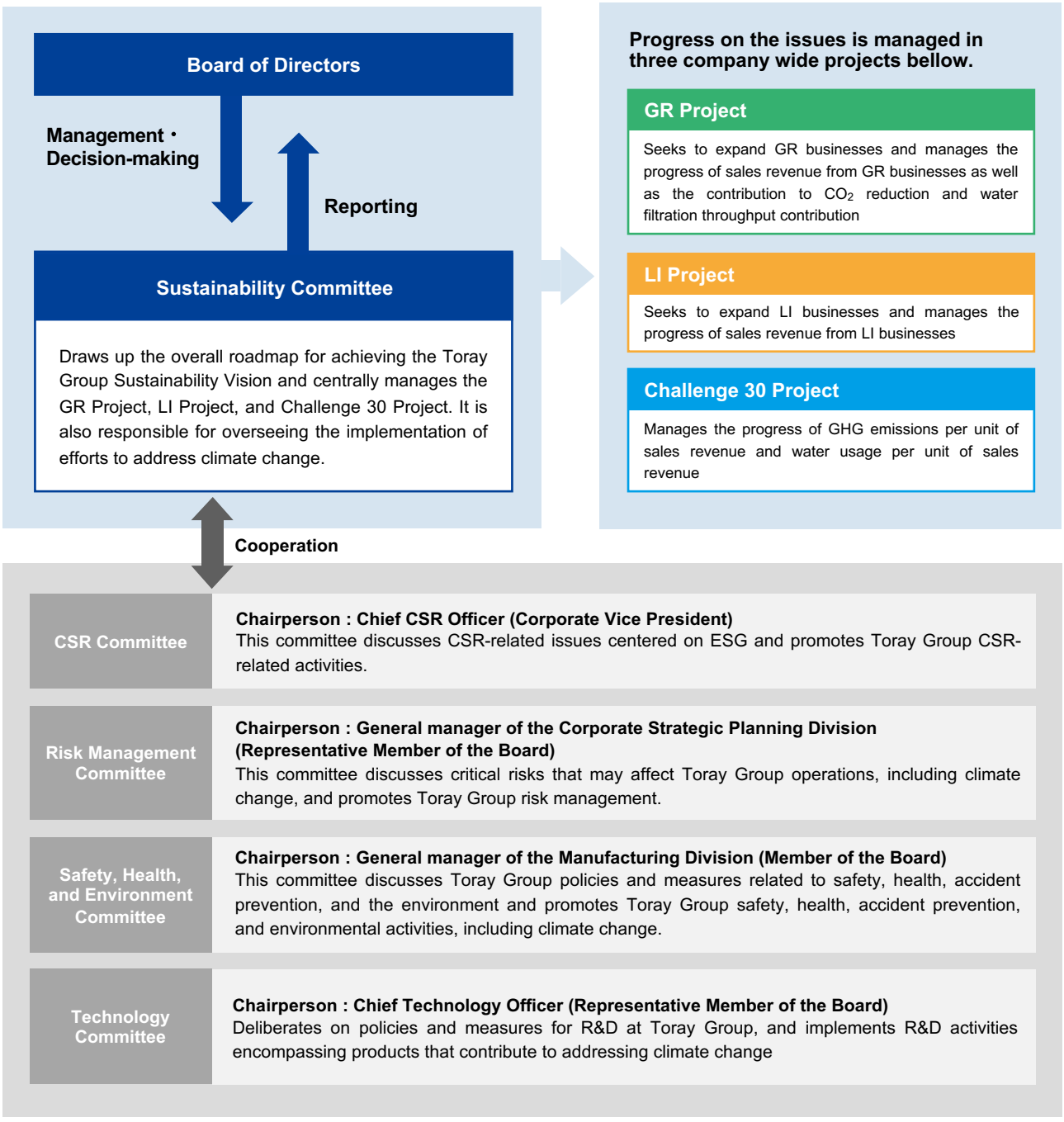
Toray Group also promotes innovation through its endorsement of the Challenge Zero initiative co-organized by the Japan Business Federation (Keidanren) and the Government of Japan. This initiative promotes innovation that seeks to build a decarbonized society. Toray Group is committed to leveraging its strengths from having long been an active contributor to solving global environmental issues through its business, while continuing to direct its full energies toward creating innovative technologies and advanced materials that fundamentally solve global environmental issues.

III. Governance System Related to Climate Change

Until now, Toray Group has monitored, evaluated, and managed its response to global-scale issues including climate change via three group-wide committees: the CSR Committee, the Risk Management Committee, and the Safety, Health, Environment Committee. On April 1, 2021, the Group established the Sustainability Committee to serve as a group-wide committee. Headed by the president, its task is to accelerate the Group's existing initiatives and promote initiatives aimed at achieving the Toray Group Sustainability Vision. In addition to drawing up the overall medium- and long-term roadmaps and action plans for achieving the Toray Group Sustainability Vision, the Sustainability Committee deliberates on the yearly action plans for the three group-wide projects—the Green Innovation Business Expansion Project (GR Project), the Life Innovation Business Expansion Project (LI Project), and the Challenge 30 Project—which manage the progress on KPIs for fiscal 2030. The committee also conducts overall management of execution issues and the status of initiatives. The Sustainability Committee is additionally responsible for overseeing the implementation of efforts to address climate change and discusses important policy matters and topics related to climate change. It also collaborates with the CSR Committee, Risk Management Committee, Safety, Health and Environment Committee, and Technology Committee to address climate change-related issues for the entire Toray Group.

At least once a year, the Board of Directors receives a report summarizing the matters discussed by each group-wide committee, and issues guidance to the committees and makes decisions. When formulating business strategies and making management decisions, the Board of Directors considers climate change-related issues as one of the important elements of its overall deliberations and decision-making.

Figure4：Governance structure for climate change issues



IV. Impact Analysis of Climate Change

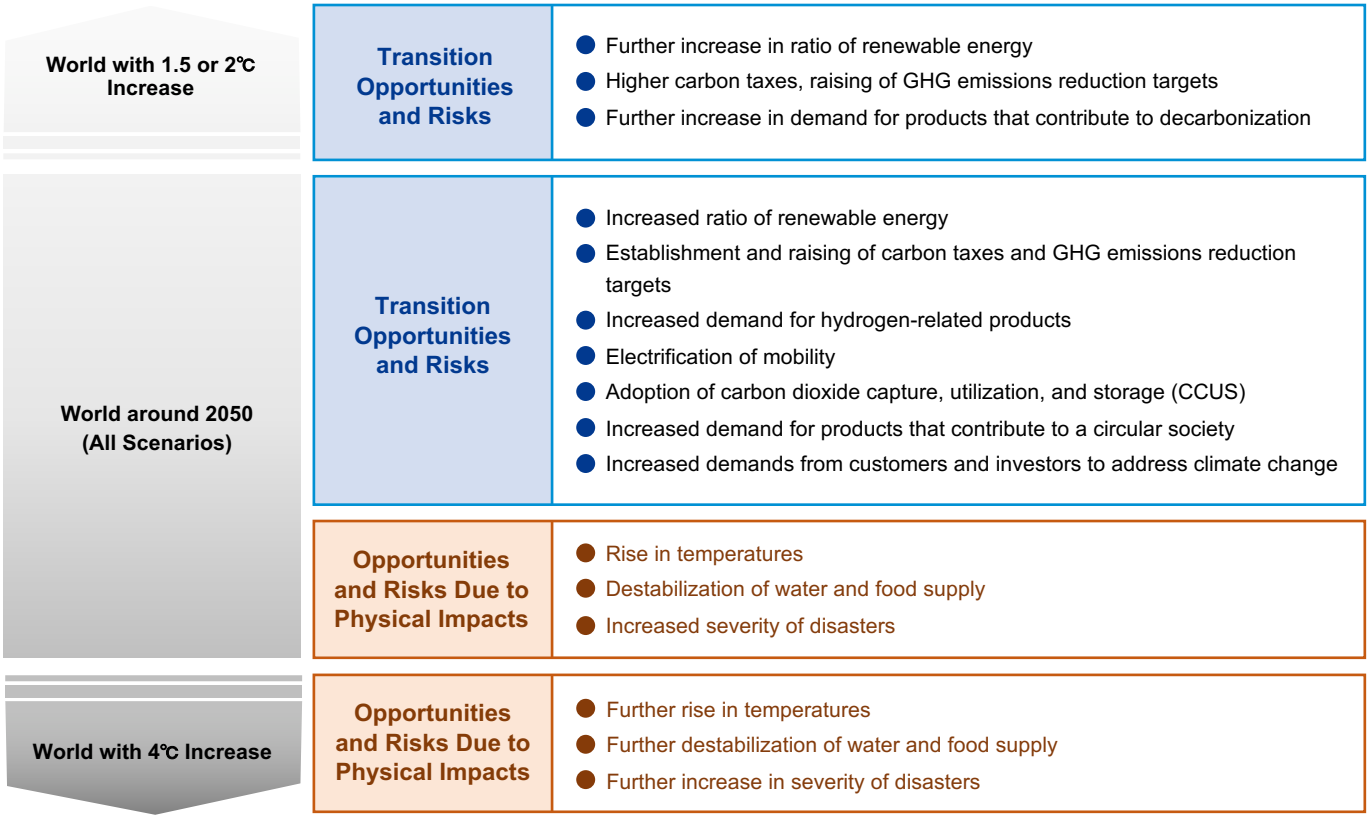
1. Analysis and Summary in Toray Group Sustainability Vision

When formulating the Toray Group Sustainability Vision in July 2018, Toray Group analyzed and summarized its future risks and business opportunities under the Paris Agreement. Upon announcing its support for the TCFD recommendations in May 2019, Toray Group took the opportunity to identify opportunities and risks related to climate change, which are both difficult to predict and uncertain. To determine how the opportunities and risks could impact Toray Group, a scenario analysis was conducted as per the TCFD recommendations. After the analysis was conducted, Toray Group confirmed the resilience of the long-term strategy (outlined in the Long-Term Corporate Vision, TORAY VISION 2030) that will drive its achievement of the Toray Group Sustainability Vision.

2. Assumptions for Scenario Analysis

The Paris Agreement target is to limit global warming to well below 2℃, preferably to 1.5℃, compared to pre-industrial levels. Looking to help achieve this target and build a decarbonized society, Toray Group primarily analyzed the 1.5℃ increase scenario, but also considered the 2℃ increase scenario. The Group also looked at the 4℃ increase scenario assuming insufficient progress on efforts to ameliorate global climate change. The Toray Group Sustainability Vision outlines the KPIs for fiscal 2030 as interim targets toward the world it envisions for 2050. Accordingly, the scenario analysis covered the period from 2030 to 2050. Toray Group also broadly summarized the impacts of climate change on the Group and conducted analysis emphasizing markets that are thought to have a particularly significant impact on the Group. These markets are synthetic fibers for apparel, electric vehicles, aircraft, wind power generation, lithium-ion batteries, next-generation batteries, fuel cells, and water treatment. The following figure summarizes how the world might look under each scenario. For the 1.5℃ and 2℃ scenarios, we used IEA SDS, IPCC RCP2.6, IPCC SR1.5, and WRI Aqueduct Optimistic as a reference. For the 4℃ scenario, we used IEA STEPS, IPCC RCP8.5, and WRI Aqueduct BaU as a reference.

Figure 5: Worldview under Each Climate Scenario



3. Main Opportunities and Risks Related to Climate Change

(1)Results of Opportunity Analysis

Figure 6 summarizes the main business opportunities related to climate change, Toray Group's initiatives in response to the main business opportunities, and the magnitude of the impact on Toray Group in each scenario based on analysis conducted using the worldviews in Figure 5.

Figure 6:
Main Opportunities Related to Climate Change and Response by Toray Group GR :GR product LI :LI product

Social Change	Main Opportunities	Main Response by Toray Group	Magnitude of Opportunity* 1.5℃	2℃	4℃
Increase in ratio of renewable energy	① Growth of renewable energy-related business	・Carbon fiber for wind turbine blades GR	L		
	② Growth of storage battery-related business	・Battery separator film GR			
Establishment and raising of carbon taxes and GHG emissions reduction targets	③ Growth of energy conservation-related business	・Lightweight materials (carbon fiber, resin) ・Insulating and heat shielding products (insulation, heat shielding fibers, films, etc.) GR LI ・Functional garments (cooling materials)	L		
Increased demand for hydrogen-related products	④ Growth of business related to hydrogen manufacturing, transport, storage, and use	・Gas separation membrane (porous carbon fiber) ・High-strength carbon fiber for hydrogen tanks GR ・Components and materials used in fuel cells	L		
Electrification of mobility	⑤ Growth of materials business for electric mobility	・Lightweight materials (carbon fiber, resin) ・Battery materials GR ・Materials for motors and hydrogen tanks	L		
Adoption of CCUS	⑥ Growth of businesses related to CO_2 separation and recovery	・Gas separation membrane (porous carbon fiber) GR	L	M	S
Increased demand for products that contribute to a circular society	⑦ Growth of biomaterials business	・Biopolymers ・Membrane bioprocess GR ・Biodegradable materials	L		
	⑧ Growth of recycled materials business	・Recycled materials (Ecouse®, &+™, etc.) GR			
	⑨ Growth of businesses contributing to waste reduction	・High-performance packaging materials ・VOC free waterless printing system for flexible packaging GR			
Increased demands from customers and investors to address climate change	Growth of customer base and increased investment due to climate change response	・Growth of businesses contributing to efforts to address climate change and reduction of GHG emissions	L		
Rise in temperatures	⑩ Growth of businesses related to dealing with heat	・Functional garments (cooling materials) ・Insulating and heat shielding products (insulation, heat shielding fibers, films, etc.) GR LI ・Components and materials for health status monitoring devices	L		
	⑪ Growth of businesses related to infectious disease measures	・Infectious disease protective wear and masks Materials for air purification products GR LI			
Destabilization of water and food supply	⑫ Growth of businesses related to water and food supply	・Water treatment ・Fertilizer and agricultural chemical ingredients GR	L		
Increase in severity of disasters	⑬ Growth of businesses related to disaster mitigation	・Reinforcement materials and protection netting Water treatment GR LI	L		

Note1: L:Large, M:Moderate, S:Small,
Note2: The magnitude of the impact on sales revenues and business profits was assessed to be large, moderate or small. Where the magnitude of the impact on a given item varies according to the climate scenario, the gradient indicates the particular scenarios where the impact is greater. It should be noted that the gradations indicate differences in magnitude from scenario to scenario for that specific item. They do not indicate relative differences in the magnitude of opportunity from one item to another nor do they provide a point of comparison between items.

The Toray Group Sustainability Vision mandates that Toray Group increase the contribution to CO_2 reduction by increasing the supply of GR products, in addition to increasing the supply of LI products and increasing water filtration throughput contribution of Toray's water treatment membranes.

As shown in Figure 6, there are significant opportunities for businesses that mitigate climate change, focusing on GR businesses. There is a possibility that the business opportunities will increase as efforts to address climate change continue to advance.

There are also significant business opportunities related to adapting to climate change in segments such as water treatment. While there are significant opportunities in the scenario where efforts to address climate change make insufficient progress (world with a 4℃ increase), there are expected to be ample business opportunities in the scenarios where progress is made on efforts to address climate change (world with a 1.5℃ or 2℃ increase). Furthermore, there are expected to be business opportunities for adapting to climate change in LI businesses in segments such as infectious disease protection garments.

(2) Results of Risk Analysis

Figure 7 summarizes the main risks related to climate change, response by the Toray Group, and magnitude of impact on Toray Group in each scenario.

Figure 7: Main Risks Related to Climate Change and Response by Toray Group

Social Change	Main Risks	Response by Toray Group	Magnitude of Risk (1.5℃ / 2℃ / 4℃)
Increase in ratio of renewable energy	① Increased electricity costs	・Energy conservation initiatives	L
Establishment and raising of carbon taxes and GHG emissions reduction targets	② Carbon tax burden Increased procurement costs for fossil-based raw materials and fuels	・Reduce GHG emissions	L
Increased demand for hydrogen-related products	③ Increased competition	・Enhance competitiveness	L
Electrification of mobility	④ Reduced demand for products related to internal combustion engines	・Meet demand for electrification	L
	⑤ Increased competition	・Enhance competitiveness	
Adoption of CCUS	⑥ Increased cost of electricity from coal-fired power plants	・Energy conservation initiatives	L / M / S
Increased demand for products that contribute to a circular society	⑦ Increased cost of waste processing	・Strengthen waste management and promote recycling	L
	⑧ Contraction of markets for plastics and high-performance materials	・Meet demand for biomaterials and recycling	
Increased demands from customers and investors to address climate change	Increased demands to reduce GHG emissions	・Reduce GHG emissions	L
Rise in temperatures	⑨ Less demand for warming materials and winter sports applications	・Meet demand for functional garments (cooling materials)	M / L
Destabilization of water and food supply	⑩ Water usage restrictions	・Reduce water usage	L
Increase in severity of disasters	⑪ Impact on raw materials procurement, plant operations, etc.	・Business continuity plan ・Strengthen supply chains	M

Note: L:Large, M:Moderate, S:Small,

For the climate change risks, there is a particularly significant risk of carbon tax burdens and restrictions on GHG emissions. The carbon tax burden in the scenario where progress is made on efforts to address climate change was found to be around US$800 million (equivalent to approximately 85 billion yen).[5]

Furthermore, Toray Group is engaged in a wide range of businesses worldwide and there is a possibility that some business sites will be significantly impacted by water intake restrictions. Therefore, water usage restrictions were determined to be a significant risk. Toray Group will continue to assess water risks by region and type of business.

These risks can be reduced by implementing initiatives to achieve the GHG emissions and water usage targets outlined in the Toray Group Sustainability Vision. However, further initiatives may be needed depending on social circumstances going forward.

Additionally, other significant changes could arise in existing supply chains due to rising energy costs, further electrification of mobility, and the shift to a circular society. Toray Group will reduce these risks by implementing the initiatives listed in Figure 7 including energy conservation initiatives and by meeting new demand.

(3) Relation to Long-Term Strategies

Based on the scenario analysis for climate change-related opportunities and risks, it was determined that the Toray Group Sustainability Vision addresses the social changes arising from climate change (see Figure 8). It was further confirmed that there is no need at this time to change the long-term strategy of accelerating efforts to address climate change whereby Toray Group is aiming to achieve the KPIs for fiscal 2030 to help shape a world of net zero GHG emissions, as outlined in the Toray Group Sustainability Vision, under the Long-Term Corporate Vision, TORAY VISION 2030.

Toray Group recognizes, however, that it will be necessary to continue to regularly supplement the content of the opportunity and risk analysis as significant social changes occur and to keep the information up to date. In particular, in terms of reducing GHG emissions, Toray Group will closely monitor the impact of the Government of Japan's declaration that the country will be carbon neutral by 2050. As such, Toray Group will accelerate its initiatives going forward and help to build a decarbonized society by increasing its contributions to reducing CO_2 emissions.

Figure8：
Relationship between the Toray Group Sustainability Vision and Social Change arising from climate change

		Toray Group Sustainability Vision			
	A better world in 2050	A net zero emissions world, where greenhouse gas emissions are completely offset by absorption	A world where resources are sustainably managed	A world with a restored natural environment, with clean water and air for everyone	A world where everyone enjoys food health and hygiene
Social Change	Initiatives	Accelerating measures to counter climate change	Realizing sustainable, recycling-based use of resources and production	Providing clean water and air	Contributing to better medical care and hygiene for people worldwide
Increased ratio of renewable energy		●	●		
Establish and raise targets for decarbonization and reduction of GHG emissions		●			
Increased demand for hydrogen-related products		●	●		
Adoption of electric vehicles		●	●		
Adoption of carbon dioxide capture, utilization, and storage (CCUS)		●	●		
Increased demand for products that contribute to a circular society		●	●	●	
Increased demands from customers and investors to respond to climate change		●			
Rise in temperatures		●		●	●
Destabilization of water and food supply				●	●
Increased severity of disasters		●		●	

V. Toray Group's Initiatives in Response to Climate Change Issues

1. Contribution to Solving Climate Change Issues through the Value Chain

(1) GR Businesses Contributing to Climate Change Mitigation

Meeting the challenge of climate change requires the reduction of CO_2 emissions through the entire life cycle of products and services. Toray Group has been implementing group-wide initiatives to reduce GHG emissions and has rapidly adopted measures to reduce CO_2 emissions across the entire value chain. The KPIs for fiscal 2030 state that Toray Group will achieve an eight-fold greater contribution to CO_2 reduction in the value chain compared to fiscal 2013 by increasing the supply of GR products.

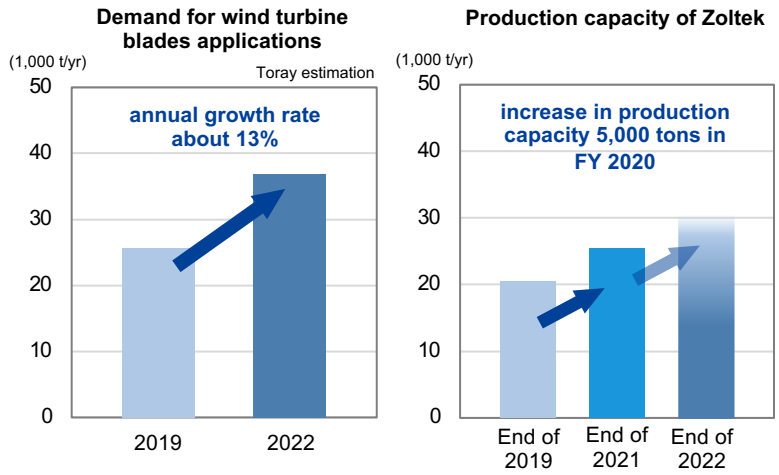
Toray Group's GR businesses are those businesses that contribute to solving global environmental issues and resource and energy-related issues. Toray Group applies a GR product certification to products with objective evidence showing that they are beneficial in addressing global environmental issues and implements the Green Innovation Business Expansion Project (GR Project). For details about initiatives GR businesses, refer to Green Innovation[6] and Contributing to Solving Social Issues through Business.[7]

The following paragraphs describe Toray Group's GR businesses and products that contribute to efforts to address climate change.

Businesses Related to Renewable Energy GR Opportunity ① [8]

In the field of wind power generation, large-scale installation projects are underway in various regions. Given the fact that installation locations are shifting to offshore and regions with low wind speeds due to site restrictions, power generation efficiency improvements are sought-after. Larger wind turbine blades are needed to improve the power generation efficiency, but making them with conventional fiberglass composites would leave them more vulnerable to sagging, creating a risk that the turbine blade will clip the tower and cause damage. Using stiff carbon fiber reinforced plastic materials will suppress sagging and reduce weight, making it possible to manufacture larger wind turbine blades and thereby contributing to further adoption of wind power generation.

Toray Group company Zoltek commands about a 60% share of the global market for the large-tow carbon fiber used in wind power turbine blades, on the strength of the cost competitiveness and high quality of Zoltek's products. Zoltek will aim to further expand its business by actively participating in emerging markets including China and new offshore wind power generation projects.



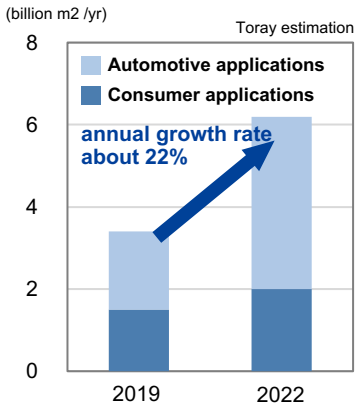
Materials Business for Electric Mobility, Storage Battery-Related Business GR
Opportunity ②⑤ Risk ④

Toray Group is contributing to the advance of next-generation electric mobility solutions by supplying resins and films for separator films and electrical components in lithium-ion batteries, weight reduction materials (resins, carbon fiber), and resins and carbon fiber for hydrogen tanks.

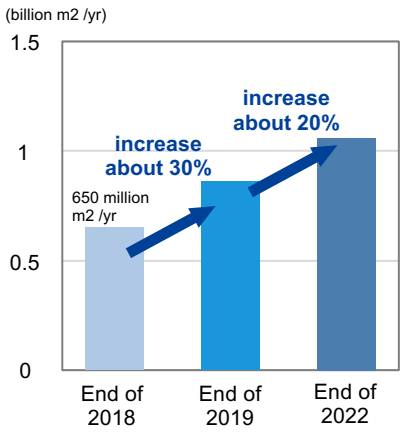
Battery Separator Films

There is growing demand for battery separator films (BSF) used in lithium-ion batteries for consumer applications (mobile electronic devices, stationary storage batteries) and automotive applications in the EU market. Toray Group has decided to build BSF production facilities in Hungary, for a third BSF production site, joining the existing facilities in Japan and the Republic of Korea. The facilities in Hungary are scheduled to begin operating in 2021.

Demand for Battery separator films



Toray Group production capacity of Battery separator films



Energy Conservation-Related Business GR LI Opportunity ③

Toray Group is contributing to energy conservation in a number of ways, including weight reduction using carbon fiber and resins, water treatment through membrane utilization, functional garments made from thermal insulation materials and cooling materials, and window films and sealing materials laminated glass.

Raising Energy Utilization Efficiency Using Carbon Fiber Reinforced Plastic

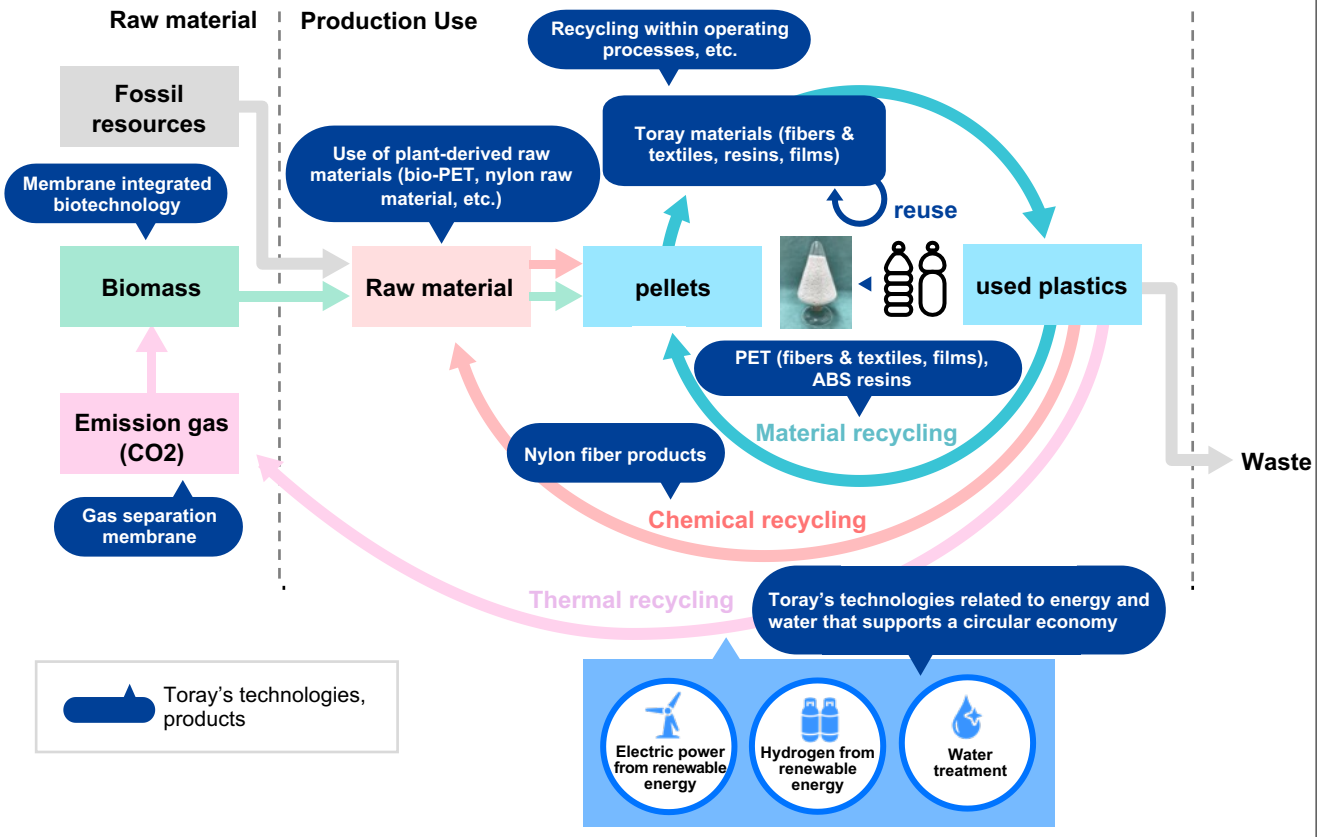
Carbon fiber reinforced plastic (CFRP) is both lightweight and strong, and its use in aircraft and automobile applications contributes to weight reduction and improved fuel economy. Life cycle assessments (LCAs) that assess the total environmental impact from materials manufacturing through disposal indicate that using CFRP contributes significantly to reducing CO_2 emissions. (The following estimates were made by The Japan Carbon Fiber Manufacturers Association.)

- Vehicle with 17% CFRP by car body weight
  → Compared with a conventional vehicle (no CFRP), using CFRP cumulatively saves five tons of CO_2 emissions per vehicle over 10 years due to improved fuel economy from weight reduction.
- Aircraft with 50% CFRP by fuselage weight
  → Compared with a conventional aircraft (3% CFRP by fuselage weight), using CFRP cumulatively saves 27,000 tons of CO_2 emissions per aircraft over 10 years due to improved fuel economy from weight reduction.

The mobility revolution, growth of new energy, and environmental needs are expected to create new business opportunities for CFRP. Toray Group projects that demand for CFRP will grow by an annualized rate of 8% through 2030. In aerospace applications, there is already demand for CFRP for commercial aircraft, and in addition, Toray Group projects there will be new demand for CFRP for use in “flying cars” such as air taxis and large drones. For general industrial applications, Toray Group projects that there will be significant growth in hydrogen-related demand such as for hydrogen tanks, with the adoption of fuel cell vehicles.

CO_2 Emission Reductions Made Possible by a Circular Society GR

Toray Group aims to help build a circular society through various technology developments including transitioning to bioplastics and recycled plastics, adoption of renewable energy and hydrogen, and water reuse as described in the following paragraphs.



Biomaterials Business Opportunity ⑦ Risk ⑧

Toray Group is developing plant-based materials made from plant-based raw materials instead of petroleum-based raw materials. For example, in the segment of biomass-based fiber, Toray Group mass produces partially bio-based polyethylene terephthalate (PET) fibers that are made from plant-based ethylene glycol, which is also used to make Ultrasuede PX ultra-microfiber non-woven fabric with suede texture. Toray Group is also prototyping a 100% bio-based PET fiber and developing membrane bioprocesses.(For more information, refer to (3) Innovation Contributing to Efforts to Address Climate Change.)

Recycled Materials Business Opportunity ⑧ Risk ⑧

Toray Group applies the unified Ecouse® branding to its recycled materials and products across a wide range of business segments including fibers & textiles, plastics, and films. These products include fibers made by recovering and recycling discarded PET bottles and scrap ends generated from manufacturing processes, and films made by recovering and recycling films that have been used in customer processes.

In the fiber segment, Toray Group offers the CYCLEAD™ recycling system for the recovery and circulation of used fibers. Toray Group has also introduced the &+™ ("And plus") brand of recycled fibers that include Toray's original traceability function. These fibers are made from discarded PET bottles and use filtering and cleaning technologies to remove foreign matter, resulting in a fiber with high whiteness that can be made into a wide variety of products.
(For more information, refer to Promoting Recycling Activities.[9])

Businesses Contributing to Waste Reduction Opportunity ⑨

The food packaging market is currently diversifying and initiatives to reduce food loss are gaining traction, creating demand for packaging materials with advanced functionality and quality. Toray Group is combining film products and film processing technologies to supply products that are optimized for every kind of packaging application and contributing to longer food preservation.

Toray Group is jointly developing a volatile organic compound-free waterless offset printing system for flexible packaging that fully eliminates VOC emissions and greatly reduces CO_2 emissions from electricity usage.
(For more information, refer to (3) Innovation Contributing to Efforts to Address Climate Change.)

(2) GR and LI Businesses Contributing to Climate Change Adaptation

In addition to implementing measures to mitigate climate change, Toray Group is also focusing on measures to adapt to climate change. In GR businesses, Toray Group is helping to solve global water shortages and water pollution with its water treatment business.

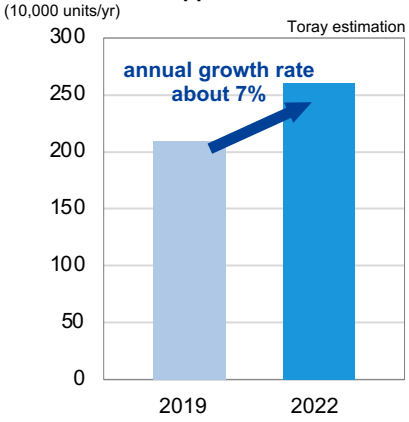
Contributing to Climate Change Adaptations and Reducing CO_2 Emissions with the Water Treatment Business GR Opportunity ⑫

Rapid population growth and climate change are giving rise to global water shortages and water pollution. Today, nearly 800 million people around the world lack access to basic water and sanitation services.[10] Furthermore, there is a risk that by 2050 the majority of the global population and approximately half of global grain production will face water stress.[11]

Toray Group seeks to contribute solutions to water issues by promoting the use of its membrane treatment technologies, which are low in CO_2 emissions. Toray Group is developing a wide variety of high-performance membranes and globally proposing systems to secure sustainable sources of water.

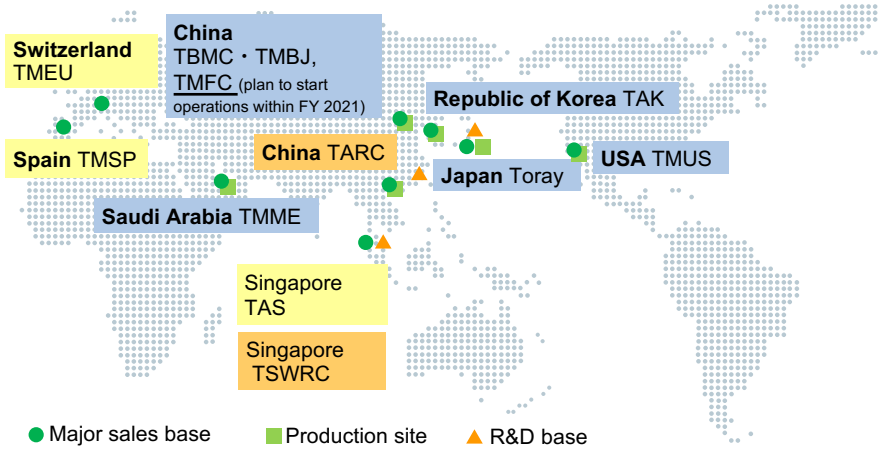
Seawater desalination technology using Toray's reverse osmosis (RO) membranes is estimated to contribute to saving 172.57 million t-CO_2 compared with evaporation desalination methods that require steam and heating.[12] (Based on estimated contribution to reducing CO_2 emissions by seawater desalination plants constructed globally in 2020.)

Market size of RO membranes for industrial applications



Toray Group Water Treatment related operational bases

Plan to increase Toray Group's production capacity by 1.6-fold against 2019 in 2022



Businesses Related to Disaster Mitigation GR LI Opportunity ⑬

Climate change is expected to bring more frequent and severe droughts, torrential rain, and flooding. Toray Group's water treatment business will contribute to providing irrigation and drinking water in these situations.

Additionally, Toray Group will supply carbon fiber that can be used for reinforcement, and emergency desalinators and water purification equipment for disaster preparedness and disaster relief.

Toray Group defines businesses that help improve the quality of medical care, enhance public health, and support people's health maintenance, longevity, and personal safety as LI businesses, which are being advanced by the Life Innovation Business Expansion Project (LI Project). LI businesses contribute to climate change adaptation by offering products that enhance public health, for instance products that help protect people from infectious disease, disasters and abnormal weather events, which have been increasing in recent years.

Contributing to Better Public Health and Personal Safety (Addressing Heat and Infectious Disease) GR LI Opportunity ⑩⑪ Risk ⑨

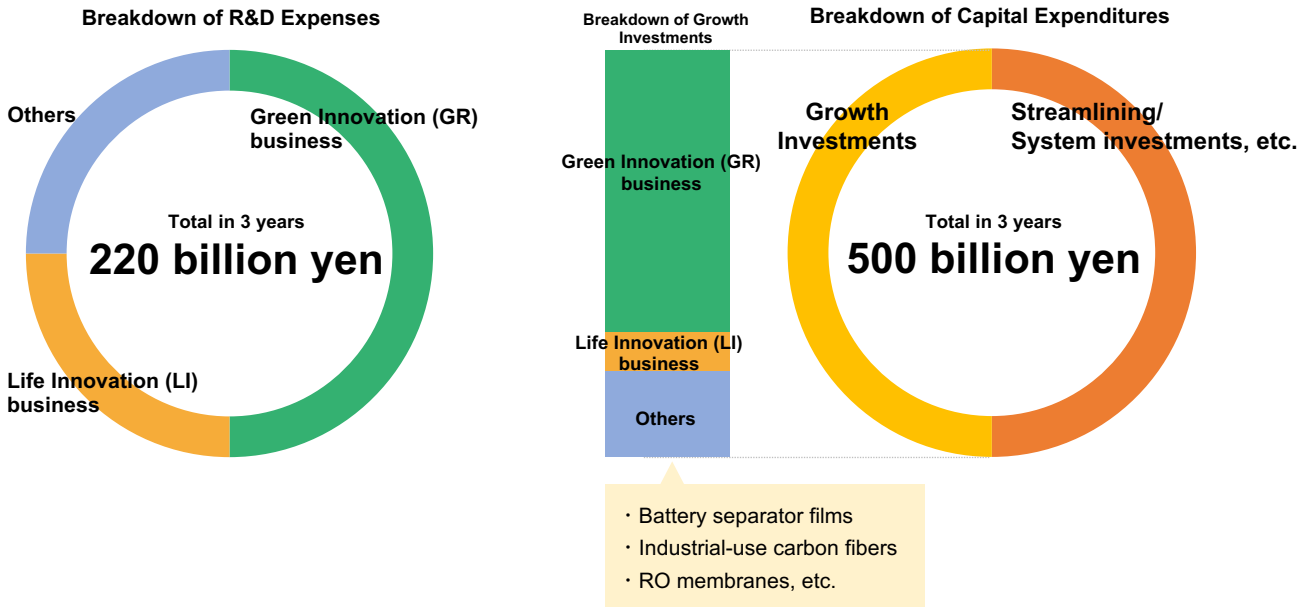
Global-scale climate change and greater circulation of people and goods is increasing the risk of infectious disease transmission and spread. Toray Group has developed a new type of protective wear that helps protect against infectious disease. It combines microporous film and non-woven fabric to achieve a balance of high virus and blood barrier performance with high moisture permeability for enhanced comfort, which existing protection clothing struggles to achieve. In 2017, Toray Group donated 10,000 pieces of protective wear at the request of the government of the Republic of Guinea to help the nation fight the Ebola virus and prevent the spread of new infectious disease. Inquiries for the protective wear are currently increasing due to COVID-19. Toray Group is also developing materials that offer superior shielding from heat and light and ultraviolet protection. Products such as Summer Shield fabric protect people against heat and ultraviolet rays.

For more information about initiatives in LI businesses, refer to Life Innovations for a Better Society[13] and Contributing Solutions to Social Issues through Business Activities.[14]

(3) Innovation Contributing to Efforts to Address Climate Change

The Long-Term Corporate Vision, TORAY VISION 2030, mandates that Toray Group deliver business growth driven by GR and LI businesses. Under the Medium-Term Management Program, Project AP-G 2022, which covers the three years starting in fiscal 2020, Toray Group is allocating 220 billion yen for R&D expenses over this three-year period. Approximately 50% of this amount is allocated to GR businesses and another 25% to LI businesses. Additionally, roughly half of Toray Group's capital investment over the three years (equivalent to approximately 250 billion yen) is being allocated to driving growth in the GR businesses and LI businesses, mainly to battery separator films, industrial carbon fibers, and RO membranes. GR LI Risk ③⑤

Figure 9: R&D Expenses and Capital Investment for Fiscal 2020–2022



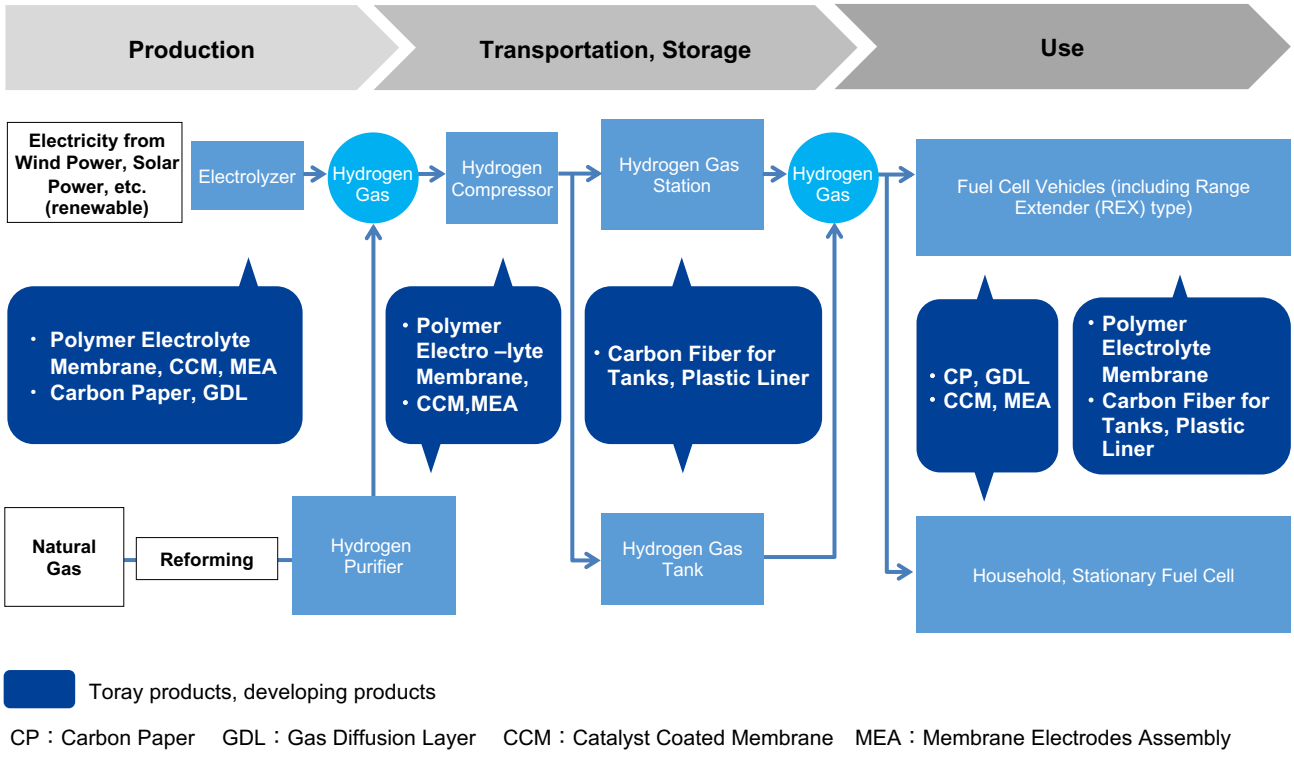
Under the Long-Term Corporate Vision, TORAY VISION 2030, Toray Group aims to generate 1 trillion yen in sales revenue from all new businesses by 2030. The Group will achieve this goal by advancing the Future Toray-2020s Project and focusing its energies on the major themes that will drive the next stage of growth. This, in turn, will accelerate development and drive the creation of new business models. The themes of the Future Toray-2020s Project include hydrogen and fuel cell-related materials, biomass utilization products and processing technologies, and eco-friendly printing solutions. Toray Group is also developing applications for porous carbon fiber that can be used in the structural support layer of gas separation membranes that are used for CO_2, biogas, and hydrogen separation.

Businesses Related to Hydrogen Production, Transport, Storage, and Use GR Opportunity ④

Hydrogen has potential as a clean next-generation energy source that does not emit CO2 during the energy usage stage, and is an important element for the creation of a recycling-oriented society. Not only can hydrogen be used in fuel cell vehicles, it also can be applied to chemical and CO2 recycling. It can even enhance stability in power systems using variable renewable energy, as surplus electricity can be used to manufacture hydrogen.

Toray Group is conducting R&D for various products in each phase of hydrogen production, transport, storage, and use, and is pursuing business growth in this segment. For example, in the segment of polymer electrolyte fuel cells used in fuel cell vehicles and electric vehicles, Toray Group is expanding its production facilities for core components and materials, namely catalyst coated membranes (CCMs), membrane electrode assemblies (MEAs), carbon paper (CP), and gas diffusion layers (GDLs). Toray Group also manufactures and develops materials (carbon fiber, liner plastics) that reduce the weight of hydrogen tanks, while commanding a dominant share of the global market for carbon fiber for pressure vessels.

In December 2020, Toray Group joined the Japan Hydrogen Association, which works to promote a hydrogen-powered society through cross-industry cooperation. Toray Group seeks to help build a sustainable world of low-carbon emissions, powered by a circular economy, by contributing to the development of technologies for hydrogen production, storage, and use.



Reducing CO_2 Emissions By Helping to Build a Circular Society

Biomaterials Business GR Opportunity ⑦ Risk ⑧

Toray Group is promoting a fully bioPET material made from plant-based ethylene glycol and bio-para-xylene produced at its pilot plant , as its flagship eco-friendly products. Toray Group seeks to launch mass production of these materials for sportswear and automotive interior applications in the early 2020s.

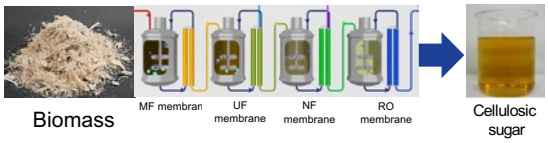
Toray Group is also developing a membrane bioprocess to enable plant-based raw materials to be manufactured with greater efficiency. This membrane bioprocess combines separation membrane technology and bio-organic synthesis technology to create new applications for water treatment separation membranes in processes such as saccharification, conversion, and refinement. The technology significantly improves the manufacturing of raw sugar from non-edible biomass and increases fermentation efficiency, thereby fostering a non-fossil raw material. Toray Group is currently operating a technology demonstration project for a saccharification process that produces sugars from nonedible biomass. Toray Group will work to commercialize the technology, in order to build a supply chain that produces materials and chemicals from non-edible biomass.

Biomass (cellulose)

Saccharification → Cellulosic sugar → **Conversion / Refinement** → Bio-chemicals → **Polymerization / Polymer processes** → Fibers & Textiles / Films, Resins

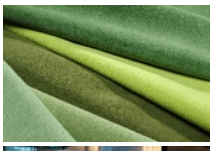
Membrane-integrated saccharification process

A processing technology that realizes cost reduction through energy-saving and recycling by applying water treatment membranes for the biomass saccharification process.



Installed demonstration plant for cellulosic sugar production in Thailand, started prototype evaluation by customers

Partial Bio-PET fiber
already in mass production



"Ultrasuede ® BX," a non-woven material created using ultra-fine fibers made with plant-based raw materials

100% Bio-PET fiber

- Completed prototype production at the demonstration plant
- Positioning it as a top-level environmentally friendly material, started prototype evaluation mainly for sportswear and automotive interior applications
- Aim for mass production in the 2020s

Businesses Contributing to Waste Reduction GR Opportunity ⑨

Toray Group is working with a partner to develop a VOC-free waterless offset printing system for flexible packaging. The system fully eliminates problematic volatile organic compounds (VOC) emitted during gravure printing, a process is widely used in Asia for printing on flexible packaging. The system also utilizes an ink drying process that uses power-saving LED-UV technology to eliminate solvent drying and exhaust treatment that are required for gravure printing. As a result, the waterless offset printing system uses less than one-sixth of the amount of electricity, which significantly reduces CO_2 emissions from electricity use. By 2030, Toray Group aims to see enough of the systems adopted and in operation to save approximately 4.4 million tons of CO_2 emissions per year (approximately 270,000 tons saved in Japan and 4.13 million tons saved outside of Japan). (Data based on estimates and trial calculations performed by Toray Industries, Inc.)

Gas Separation Membranes (CO_2, Biogas, and Hydrogen Separation) Opportunity ④⑥

Toray Group has created the world's first porous carbon fiber with a nano-sized continuous pore structure. The fiber can be used in the support layer for the structure of gas separation membranes used for CO_2, biogas, and hydrogen separation. Conventional gas separation membranes that use an absorption or adsorption process are bulky and use a great deal of energy leading to increased CO^2 emissions. The new material can be used to make the membranes smaller and lighter in weight while enhancing separation performance. The material is also chemically stable, which makes it usable for a wider range of separation membrane applications.

Toray Group will develop applications for the new material to promote carbon recycling and help build a hydrogen-powered, energy-efficient society.

2. Efforts to Address Climate change in Business Activities

(1) Toray Group Initiatives to Reduce GHG Emissions

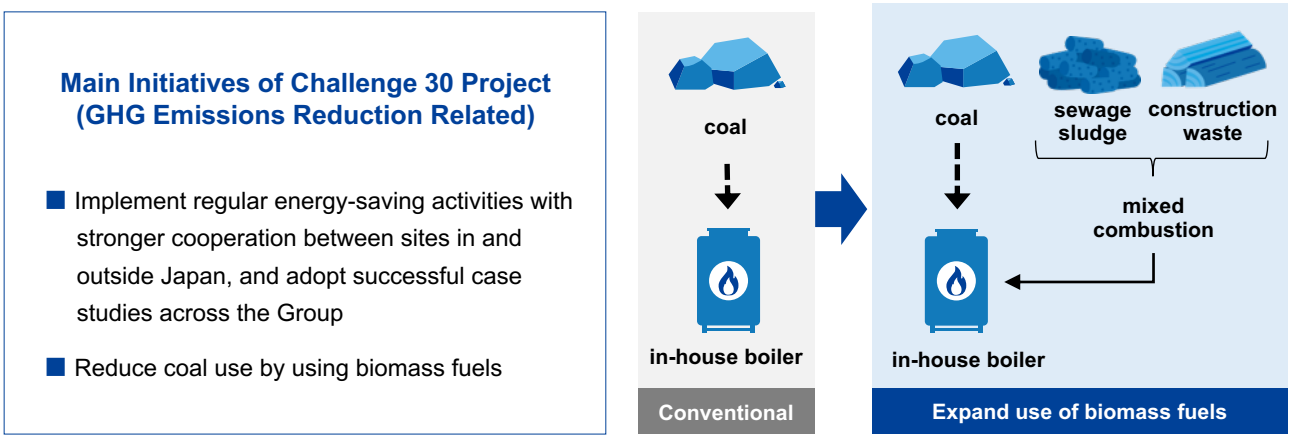
A. Reducing Emissions in Raw Materials Procurement Risk ②

As previously mentioned, Toray Group conducts research for and manufactures bio-based and recycled raw materials that help to reduce GHG emissions. Toray Group is also reducing GHG emissions in the supply chain by asking suppliers to implement initiatives to reduce GHG emissions and conserve energy.

B. Reducing Emissions in Production Risk ①②⑥

As an interim target toward building a decarbonized society by 2050, the Toray Group Sustainability Vision directs the Group to achieve a 30% reduction of GHG emissions per unit of sales revenue compared with fiscal 2013 levels, by 2030. Toray Group has launched the Challenge 30 Project,[15] a group-wide project to reduce water usage, and is implementing initiatives to conserve energy driven by process improvements, renewable energy use, and reduced coal use.

Figure 10: Main Initiatives of Challenge 30 Project (GHG Emissions Reduction Related)



For fiscal 2019 results and fiscal 2020–2022 targets for production, refer to Energy Saving and Curbing Climate Change[16] and CSR Roadmap 2022.[17]

C. Reducing Emissions in Distribution Risk ②

Toray Group endeavors to reduce CO_2 emissions in distribution by implementing initiatives to reduce transport distances (reducing the impact on the environment), execute a modal shift to ship and rail transport, and raise transportation efficiency.

For fiscal 2019 results and fiscal 2020–2022 targets for GHG emissions reduction in distribution, refer to Toray Group Distribution Initiatives[18] and CSR Roadmap 2022.[19]

D. Reducing Emissions in Disposal Risk ②⑦

Toray Group implements waste reduction initiatives that lead to lower GHG emissions. (For more information, refer to Initiatives to Reduce Waste.[20]) As previously mentioned, Toray Group also operates recycling businesses that lead to lower GHG emissions.

(2) Initiatives Regarding Physical Risks Arising from Climate Change Risk ⑩⑪

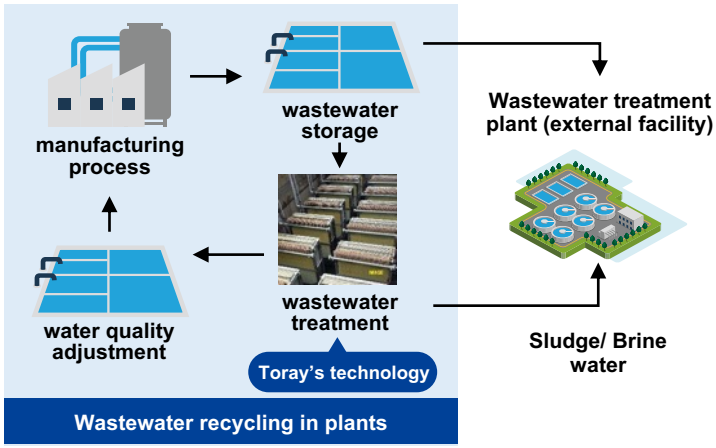
Climate change will lead to higher temperatures, more severe disasters, and increase the frequency and severity of water shortages, torrential rains, and flooding, which will impact raw materials procurement and plant operations. Every year, Toray Group assesses the water risks and endeavors to effectively utilize and suitably manage water usage such as through circulation and reuse initiatives. (For more information, refer to the waste management items in the Comparative Table with SASB Standards[21] and Initiatives for Managing Water Resources.[22])

Toray Group operates the Challenge 30 Project, which mandates that the Group achieve a 30% reduction of water usage per unit of sales revenue compared with fiscal 2013 levels, by 2030. Under the project, Toray Group is implementing initiatives to conserve water and recycle wastewater using its water treatment technology.

Figure 11: Main Initiatives of Challenge 30 Project (Related to Water Usage Reduction)

Main Initiatives of Challenge 30 Project (Related to Water Usage Reduction)

- Water conservation initiatives and greater collaboration in and outside of Japan, mutual horizontal deployment of improvement case studies
- Promote wastewater recycling, etc. with Toray Group's water treatment technologies



Water conservation initiatives and greater collaboration in and outside of Japan, mutual horizontal deployment of improvement case studies.

VI. Risk Management

Toray Group identifies issues that are material to both stakeholders and Toray Group, then adjusts the CSR Roadmap, sets the KPIs, and implements initiatives accordingly.

On climate change, Toray Group seeks to contribute to solving environmental issues through its business and considers the reduction of GHG emissions to be extremely important to both stakeholders and Toray Group, and has established the KPIs outlined in VII. KPIs and Targets. (For more information, refer to Materiality.[23]) Toray Group addresses group-wide risks associated with climate change under the direction of the Risk Management Committee. Specifically, the Group conducts regular risk management (priority risk mitigation activities) and ongoing risk management (monitoring trends in and outside of Japan and through risk detection, assessment, and monitoring). (For more information, refer to Risk Management.[24])

VII. KPIs and Targets

As previously mentioned, the Toray Group Sustainability Vision sets forth KPIs for fiscal 2030. Figure 12 shows the fiscal 2019 performance[25] and interim targets in the Medium- Term Management Program, Project AP-G 2022.[26]

Figure12：Targets and Actual results for achieving the Sustainability Vision

	FY 2013 Actual	FY 2019 Actual	FY 2022 Target	FY 2030 Target
	(baseline year)	(compared with FY 2013)		
	(J-GAAP)		(IFRS)	
Sales revenue from GR businesses	—	**1.8 fold**	**about 2.2 fold**	**4 fold**
	463.1 billion*	820.1 billion	1,000 billion	
Sales revenue from LI businesses	—	**1.9 fold**	**about 2.5 fold**	**6 fold**
	119.6 billion*	223.2 billion	300.0 billion	
Contribution to CO_2 reduction in value chain	—	**5.1 fold**	**5.3 fold**	**8 fold**
	38.45 million tons	196.0 million tons		
Water filtration throughput contribution of Toray's water treatment membranes**	—	**1.9 fold**	**2.4 fold**	**3 fold**
	27.23 million tons	50.95 million tons		
Greenhouse gas emissions per unit of sales revenue in production activities	—	**12% reduction**	**20% reduction**	**30% reduction *** **
	33.7 tons/billion yen	29.7 tons/billion yen		
Water usage per unit of sales revenue in production activities	—	**23% reduction**	**25% reduction**	**30% reduction**
	1,520 tons/billion yen	1,170 tons/billion yen		

* Net sales

** Toray calculates water treated with Toray's water treatment membranes by multiplying the amount of fresh water that its ultrafiltration water treatment membranes can produce per day, including reverse osmosis (RO), ultrafiltration (UF) and membrane separation bioreactors (MBR), by the number of membrane elements sold.

*** In Japan, Toray works to surpass the reduction target set for the industrial sector by the Government of Japan (absolute emissions reduced by 7%), which is based on the Paris Agreement. With the use of renewable energies and other zero emission power sources rising worldwide, Toray Group aims to employ zero-emission power sources at a rate equivalent to or better than the targets in each country by 2030.

GHG emissions by Toray Industries, Inc. have been verified by a third party, Lloyds Register Quality Assurance Limited[27]. For GHG emissions by Toray Group, refer to ESG Data[28].

VIII. Conclusion

Toray Group is guided by a corporate philosophy of “contributing to society through the creation of new value with innovative ideas, technologies and products.” The Group will continue to pursue its mission to deliver innovative technologies and advanced materials that contribute real solutions to climate change and the other global-scale issues humanity faces on the road to balancing development and sustainability.

Index of TCFD Recommended Disclosure Items

TCFD Recommended Disclosure Items	Recommended Disclosures	References
Governance (Disclose the organization’s governance around climate related risks and opportunities.)	a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term	・**III. Governance System Related to Climate Change**（p.4-5）
	b) Describe management’s role in assessing and managing climate-related risks and opportunities.	
Strategy （Disclose the actual and potential impacts of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning where such information is material.）	a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	・**IV. Impact Analysis of Climate Change**（p.5-9） ・**V. Toray Group’s Initiatives in Response to Climate Change Issues**（p.10-19） ・Toray Group CSR Report 2020 ＞Comparative Tables with GRI Standards, SASB Standards, and ISO 26000 Subjects ＞Comparative Tables with SASB Standards ＞Water Management（p.324-325）
	b) Describe the impact of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning.	・**IV. Impact Analysis of Climate Change**（p.5-9） ・**Ⅴ. Toray Group’s Initiatives in Response to Climate Change Issues**（p.10-19）
	c) Describe the resilience of the organization’s strategy, taking into consideration different climate-related scenarios, including a 2℃ or lower scenario	
Risk Management （Disclose how the organization identifies, assesses, and manages climate-related risks.）	a) Describe the organization’s processes for identifying and assessing climate-related risks	・**III. Governance System Related to Climate Change**（p.4-5） ・**VI. Risk Management**（p.20） ・Toray Group CSR Report 2020 ＞Toray Group Corporate Social Responsibility ＞Materiality（p.38-39） ・Toray Group CSR Report 2020 ＞Fiscal 2019 CSR Activity Report ＞Risk Management（p.109-117）
	b) Describe the organization’s processes for managing climate-related risks.	
	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization’s overall risk management.	
Metrics and Targets （Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.）	a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process. b) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	・**Ⅰ. Achieving a World of Net Zero GHG Emissions in 2050**（p.2-3） ・**Ⅱ. Toray Group Efforts to Date**（p.3-4） ・**Ⅶ. KPIs and Targets**（p.20） ・Toray Group CSR Report 2020 ＞Toray Group Corporate Social Responsibility ＞Sustainability Vision（p.43-64） ・Toray Group CSR Report 2020 ＞Toray Group Corporate Social Responsibility ＞Long-Term Corporate Vision（p.11-13） ・Toray Group CSR Report 2020 ＞Toray Group Corporate Social Responsibility ＞Medium-Term Management Program（p.14-16） ・Toray Group CSR Report 2020 ＞Fiscal 2019 CSR Activity Report（p.65-292）
	c) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	・**VII. KPIs and Targets**（p.20） ・Toray Group CSR Report 2020 ＞CSR-Related Policies and Guidelines / ESG Data ＞ESG Data ＞Greenhouse gas emissions（p.309-310） ・Toray Group CSR Report 2020 ＞Fiscal 2019 CSR Activity Report ＞Safety, Accident Prevention, and Environmental Preservation ＞Third-Party Assurance（p.289）

Concluded

1 Toray Group CSR Report 2020 P.40

2 Contribution to CO2 reduction (avoided emissions) is the estimated reduction of GHG emissions achieved by replacing conventional products and services with new products and services developed by Toray Group. For CO2 emissions avoided in the value chain, Toray calculates the CO2 emissions reduced throughout the value chain of products in accordance with the chemical sector guidelines of the Japan Chemical Industry Association, the International Council of Chemical Associations (ICCA), and the World Business Council For Sustainable Development (WBCSD).

3 Hold the increase in the global average temperature to well below 2℃ above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5℃ above pre-industrial levels. To achieve this temperature goal, aim to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century.

4 Toray Group CSR Report 2020 P.10

5 Calculated by multiplying the fiscal 2019 GHG emissions (5.75 million t-CO_2) by the estimated carbon tax (US$140 per ton) under the 1.5℃ and 2℃ scenarios.

6 https://www.toray.com/sustainability/activity/social/gr.html

7 Toray Group CSR Report 2020 P.63

8 “Opportunities (1)” indicates that the content pertains to “(1) Growth of renewable energy-related business” in the Main Opportunities column of the table Main Opportunities Related to Climate Change and Response by Toray Group. The same applies to “Risks (1).”

9 Toray Group CSR Report 2020 P.71

10 WHO/UNICEF JMP (2019) Progress on household drinking water, sanitation and hygiene 2000-2017. Special focus on inequalities.

11 Water, Sanitation and Hygiene Fact Sheet, United Nations Information Centre

12 Contributing to Avoided Emissions through the Global Value Chain (Third Edition), Japan Business Federation (Keidanren)P.28

13 https://www.toray.com/technology/philosophy/lifeinnovation.html

14 Toray Group CSR Report 2020 P.63

15 The Challenge 30 Project is the successor to the Challenge 25 internal project, which was implemented by Toray Industries, Inc. and its group companies in Japan. The Challenge 30 Project adds initiatives related to water usage and expands the scope to encompass group companies outside of Japan, and as such will be implemented by the entire Toray Group.

16 Toray Group CSR Report 2020 P.239

17 Toray Group CSR Report 2020 P.21

18 Toray Group CSR Report 2020 P.165

19 Toray Group CSR Report 2020 P.21

20 Toray Group CSR Report 2020 P.253

21 Toray Group CSR Report 2020 P.307

22 Toray Group CSR Report 2020 P.251

23 Toray Group CSR Report 2020 P.35

24 Toray Group CSR Report 2020 P.107

25 Toray Group CSR Report 2020 P.61

26 Toray Group CSR Report 2020 P.12

27 Toray Group CSR Report 2020 P.276

28 Toray Group CSR Report 2020 P.295

Toray Industries, Inc.
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