

Transformative Innovation

We strive to achieve sustainable lifestyles for consumers and solve intractable social issues by providing innovative products and services driven by essential research and technology innovation.

Risks	Strategy			Metrics, targets and results			Initiatives	Financial impact
<ul style="list-style-type: none">Increased disasters and loss of biodiversity due to global warming are affecting corporate activitiesCompetition is increasing due to the entry of global companies and companies from other industries into the marketSocial issues and lifestyles diversify, and needs and value propositions are becoming more complexLack of the ability to respond to heightened environmental awareness and stricter regulations leads to loss of business opportunities	Overall	(1) Develop globally competitive core technologies and products						<ul style="list-style-type: none">Increase in sales by developing technologies to solve social issues and proposing high-value-added productsGreater profit margins by differentiating from existing productsAcquisition of new markets and customers by developing technology that solves specific customer and social issues and providing high-value-added products
		(2) Achieve both customer value and sustainable value creation						
		(3) Strengthen development based on speed as a competitive axis						
	Product development research	Improving QOL: Value proposals and product development that contribute to an enriched life	Cumulative number of proposed or realized products with a big positive impact on lifestyles (cumulative since 2019)	10 2030	7		<i>Toilet Magiclean Foam Pack</i> has received the Award for Trend in the 2024 Nikkei Excellent Products and Services Award (2)	
		Decarbonization: Product development that contributes to reducing CO ₂ emissions (energy and water conservation, reducing usage and waste, etc.), prevention of air and water pollution, and use of environmentally friendly raw materials					Established the technology for lamellar structured shampoo (1)	
		Development of safer and healthier products						
Opportunities <ul style="list-style-type: none">Secure a competitive advantage by promoting technology innovation and value transformation, and develop new marketsSolve customer and social issues with unique value proposition endorsed by evidence and an understanding of the essence, and provide indispensable products and servicesCo-create with partners to solve difficult issues and achieve early social implementation	Fundamental technology research	Decarbonization, zero waste, water conservation: Development of technologies and systems to build a recycling-oriented economic society	Cumulative number of proposed or realized businesses and systems with a big positive impact on lifestyles (cumulative since 2019)	10 2030	7		EpiSensA alternative method for skin sensitization testing developed by Kao added to the OECD test guidelines (1)	Environmental and social impact <ul style="list-style-type: none">Reduction of waste and carbon dioxide emissionsRealization of a healthy and comfortable society by improving the quality of lifeIncrease in the number of external collaborations due to recognition of technologies that solve environmental and social issues
							Plant Factory "SMART GARDEN" (3)	
		Technology development that solves social issues and creates high-value-added products and new businesses					Kao and Earth Corporation collaborate in the field of "Insect (Mosquito) Control" in Thailand (3) <i>LUNAFLOW</i> , a water-based mold release agent that maintains a slippery surface (2)	

* The numbers at the end of the metrics, targets, and initiatives indicate the strategy identifiers.

Strategy

To reduce risks and create opportunities for Transformative Innovation, we are implementing strategies that are unique to Kao, are effective, and contribute to business growth and solving social issues.

■ Social issues

For Kao to remain a sustainable and competitive entity, it is essential to have an accurate understanding of social issues. This will not only mitigate business risks for Kao, but will also be an important starting point for identifying new business opportunities that will drive growth. Kao recognizes the following social issues related to this theme.

- Global warming: The impact on people's lives of the heat waves and disasters associated with climate change that continue to progress around the world
- Globalization and diversity: Growing interest in environmental and social issues associated with the globalization of people, goods and services, resources and capital, and information, as well as the diversification of lifestyles and values
- Technology innovation: Market entry by different industries and startups in the environmental technology field, and promotion of technology innovation through national strategies
- Regulations and rules: The formation of an international framework to deal with climate change, international regulations and standardization reflecting increased awareness of safety and security, and the competition to form rules in each country

■ Risks and opportunities

Kao faces various risks in this business environment, which includes these social issues, but it is also identifying new business opportunities. Identifying these risks and opportunities is an important process in formulating corporate strategies and measures. The main risks and opportunities identified by Kao in this theme are as follows.

Risks

- Increase in major disasters caused by global warming and the loss of biodiversity, causing a slowdown in corporate production activities and a sharp rise in the cost of procuring raw materials
- Needs and value propositions becoming more complex due to social issues and the diversification of lifestyles

- Greenwashing and damage to corporate credibility caused by insufficient sustainable responses
- Fierce global competition in product and technology development, resulting in a decline in product competitiveness due to a decline in raw material procurement, technology development, cost competitiveness, environmental compatibility, and safety
- Loss of business opportunities due to increased compliance costs and a lack of relevant response capabilities
- Weakening and loss of traditional R&D competitiveness due to technology innovation and market entry by companies from other industries

Opportunities

- Improving corporate reliability through initiatives and proposals for solutions to environmental and social issues, and creating medium- to long-term businesses
- Continuously securing a competitive advantage through technology innovation at companies with distinctive technology assets
- Opportunities for creating new businesses and services in response to the diversification of lifestyles and customer values
- Promotion of cross-industry, industry-government-academia collaboration through open innovation for intractable environmental and social issues

■ Strategy

We have formulated the following strategies to address the identified risks and opportunities. These strategies are important initiatives that directly support the vision of the Mid-term Plan K27 of “Protecting future lives” and one of our basic policies of “Becoming an essential company in a sustainable world.” With the driving force of our essential research and technology innovation, which we have cultivated over many years, we aim to be a *Global Sharp Top* that makes the most of Kao's strengths to take on difficult social issues and become the world's No. 1 contribution by addressing customer needs with cutting-edge solutions.

(1) Develop globally competitive core technologies and products

We provide globally competitive products and services that solve environmental and social issues by leveraging our unique core technologies that we have developed for over 100 years, including the precise interfacial control technology, and our accumulated technology assets across a wide range of business fields.

Related initiatives: **P101** Improving QOL with foam cleaning technology that achieves cleanliness without scrubbing: *Toilet Magiclean Foam Pack*, **P101** Established the technology for lamellar structured shampoo, **P102** *LUNAFLOW*, a water-based mold release agent that maintains a slippery surface, **P103** and EpiSensA alternative method for skin sensitization testing developed by Kao added to the OECD test guidelines

(2) Achieve both customer value and sustainable value creation

Aiming to create innovative products that are accepted worldwide, we will balance customer value and sustainable value creation in line with the Kao Sustainable Product Development Policy through close collaboration between product development research and fundamental research. We also aim to provide innovative and essential products and services by solving the problems of customers and society through essential research that seeks to uncover the mechanisms of phenomena and objects, and unique proposals endorsed by evidence.

Related initiatives: [P101](#) Improving QOL with foam cleaning technology that achieves cleanliness without scrubbing: *Toilet Magiclean Foam Pack*, [P102](#) Plant Factory “SMART GARDEN”, [P102](#) Commercialization of mosquito control products in Thailand by collaborating with another company, [P102](#) and LUNAFLOW, a water-based mold release agent that maintains a slippery surface

(3) Strengthen development based on speed as a competitive axis

We promote open innovation and aim to achieve early social implementation through co-creation with partners. We will utilize DX technologies such as simulation, machine learning, and deep learning, as well as materials informatics to streamline and speed up the R&D process, also cultivating DX human resources and strengthening our development capabilities.

Related initiatives: [P102](#) Plant Factory “SMART GARDEN”, [P102](#) Commercialization of mosquito control products in Thailand by collaborating with another company, [P103](#) and EpiSensA alternative method for skin sensitization testing developed by Kao added to the OECD test guidelines

Impact generated by implementing the strategies

We believe that the aforementioned strategies will have the following financial, environmental, and social impacts.

Financial impact

- Acquisition of new markets and customers and increase of sales by developing technology that solves specific customer and social issues and providing high-value-added products
- Greater profit margins by differentiating from existing products
- Increased customer loyalty and repeat purchase rates through improved brand value
- Stabilization of business foundations through product design based on the latest regulatory information
- Expansion of market share and stabilization of revenue base by improving market competitiveness

Environmental and social impact

- Increase in the number of external collaborations due to greater recognition of technologies that solve environmental and social issues
- Reduction of waste through the provision of resource-recycling containers and products

- Participation in standardization for indicators and evaluation methods that contribute to solving environmental and social issues
- Reduction of carbon dioxide emissions in use scenarios through the proposal of water- and energy-saving products
- Healthy and comfortable society through the improvement of quality of life
- Greater customer satisfaction by responding to diverse needs

Strategic resilience

In response to the risks of global warming, natural resource shortages, and intensifying global competition, Kao ensures the stability of its business by promoting technology innovation to effectively utilize and secure natural resources and provide products that deliver high value to consumers and customers. In addition, we are modifying our R&D strategy as needed while collecting information through industry-government-academia collaboration in response to stricter regulations and risks that are difficult to predict over the medium to long term. These measures are designed to maintain business continuity while also ensuring that we have the resilience to adapt quickly to changes in society and the market.

Metrics and targets

To improve the effectiveness of our strategies, we have established performance metrics related to risks and opportunities, and we regularly monitor our progress. We have set targets for the metrics related to particularly important risks and opportunities, and we are steadily promoting initiatives by utilizing the PDCA cycle to check the status of achievement of these targets.

Targets and progress

Strategy	Metrics	Results					Mid- to long-term targets	
		2020	2021	2022	2023	2024	Target value	Year
(1) (2) (3)	Cumulative number of proposed or realized products with a big positive impact on lifestyles (cumulative since 2019)	3 cases	4 cases	5 cases	6 cases	7 cases	10 or more	2030
(1) (2) (3)	Cumulative number of proposed or realized businesses and systems with a big positive impact on lifestyles (cumulative since 2019)	1 case	3 cases	5 cases	6 cases	7 cases	10 or more	2030

In terms of “products”, *Toilet Magiclean Foam Pack Without Rubbing* was awarded the “2024 Nikkei Excellent Products and Services Award in the Trend Category Award,” and in terms of “businesses or systems”, an alternative method for skin sensitization testing *EpiSensA* was adopted in the OECD Test Guidelines, and these contributions to people’s lives and society were recognized. Furthermore, we will continue our activities.

Governance

In terms of governance for Transformative Innovation, the R&D is the main division under the supervision of the Board of Directors, and the head of the R&D Strategy is responsible for the strategy. The strategy is formulated, and progress is checked through reports to the management and business management levels.


Specifically, the progress of research themes and the degree of achievement of KPIs are reported to the corporate, business, and research management at the annual research and technology meeting and research management meeting. In addition, at the ESG Promotion Meeting, the policies, strategy implementation, and progress of R&D activities are reported to the management and business management levels.

 Our ESG Vision and Strategy > Governance

Risk and opportunity management

■ Policies

To implement its Transformative Innovation, Kao has established the following policies as guidelines for its daily operations and decision-making. For details, please see the website.

-  • R&D Philosophy
<https://www.kao.com/global/en/innovation/research-development/>
- Kao Sustainable Product Development Policy
<https://www.kao.com/global/en/sustainability/klp/policy/product-development-policy/>

■ Management process

The status of our initiatives to address the risks and opportunities associated with Transformative Innovation is managed through the following processes: planning, implementation, evaluation of results, and corrective action, and we are working to make steady improvements.

P (Planning)

Formulate an annual R&D strategy, and share and confirm it with management and business management.

D (Implementation)

Please see our initiatives (P100-103).

C (Evaluation of results)

Share R&D activities in monthly and semi-annual reports with the research management team, and check the research theme progress, personnel assignments, budget performance, etc.

A (Corrective action)

Share and confirm the results of annual research with management and business management.

■ Initiatives

Kao is engaged in a variety of initiatives aimed at Transformative Innovation. These initiatives are based on the aforementioned strategies and are being promoted in collaboration with one another to achieve our targets. Here we will introduce some of the important initiatives from among the many we are engaged in.

We have also introduced related initiatives under other themes.

Strategy		Initiatives	
Overall	(1) Develop globally competitive core technologies and products	Product development research	Improving QOL with foam cleaning technology that achieves cleanliness without scrubbing: Toilet <i>Magiclean Foam Pack</i> Established the technology for lamellar structured shampoo
	(2) Achieve both customer value and sustainable value creation	Fundamental research	Plant Factory “SMART GARDEN” EpiSensA alternative method for skin sensitization testing developed by Kao added to the OECD test guidelines
	(3) Strength development based on speed as a competitive axis		Commercialization of mosquito control products in Thailand by collaborating with another company <i>LUNAFLOW</i> , a water-based mold release agent that maintains a slippery surface

<Product development research>

Product development that contributes to reducing CO₂ emissions (energy and water conservation, reducing usage and waste, etc.), prevention of air and water pollution, and use of environmentally friendly raw materials

[P124](#) Our Progress > Decarbonization (Efforts during use and efforts in disposal and recycling), [P145](#) [P149](#) Our Progress > Water Conservation (Efforts during use and employees' opinions), [P156](#) Our Progress > Air & Water Pollution Prevention (Initiatives to prevent air pollution through product development and provision of products, and initiatives to prevent water pollution through product development and provision of products)

Development of safer healthier products

[P77](#) Our Progress > Safer Healthier products (Use of safe ingredients and development of safe products)

<Fundamental technology research>

Decarbonization, zero waste, and water conservation: Development of technologies and systems to support a circular economy

[P135](#) Our Progress > Zero Waste (Initiatives for recycling packaging)

Improving QOL with foam cleaning technology that achieves cleanliness without scrubbing: *Toilet Magiclean Foam Pack*

Region: Japan

Corresponding strategies: (1) (2)

In the midst of heightened hygiene awareness due to infectious diseases, cleaning the toilet is a chore that can feel like a burden. Kao has developed *Toilet Magiclean Foam Pack* by evolving its unique precise interfacial control technology. This product allows users to clean and sanitize without scrubbing with a brush by allowing the adsorbed foam to stay firmly on the toilet bowl and absorb dirt. This reduces the effort and stress of cleaning the toilet for consumers and contributes to improving the quality of life of our customers.

In addition, technology innovations that control the quality and lather of bubbles have led to a reduction in the amount of surfactants used, and a reduction in environmental impact. In the future, we will promote the development of foam cleaning technology that can be used to clean a variety of surfaces, not just toilets.

Established the technology for lamellar structured shampoo

Region: Global

Corresponding strategy: (1)

Kao provides hair care products that address a wide range of hair damage, based on essential research, and that also deliver a satisfying feel when used. The lipid components within hair that affect hair manageability and shine are easily lost when we wash our hair, which is an issue in hair care to supply them. Furthermore, when lipid components are added to shampoo, they tend to separate, which can inhibit the formation of bubbles, posing a technical issue.

Kao applied its unique precise interfacial control technology to develop a technology that incorporates lipid ingredients within the lamellar structure* stably and in large quantities. By combining this technology with specific ingredients, we have achieved rich lather and a smooth feel when rinsing, while also

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Promotion

Purpose Driven
Brands

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Innovation

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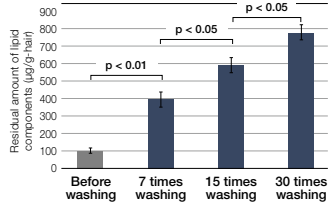
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replenishing lipids and care ingredients during hair washing. Repeated hair washing with products that use this technology has been confirmed to increase the amount of lipid ingredients left in the hair, making the hair strands more uniform and manageable.

We will continue to pursue innovation that will enhance Kao's presence in the global market by making use of our knowledge of hair research.

Changes in the residual amount of lipid components due to hair washing



* Fatty acid glycerides (C8 mono-, di-, and triacylglycerides total)

* Lamellar structure: A layered structure in which layers of lipid and water molecules are stacked in an orderly manner.

Comparison of the appearance of hair bundles before and after washing



Plant Factory “SMART GARDEN”

Region: Japan

Corresponding strategies: (2) (3)

Kao has built its proprietary plant factory, SMART GARDEN, using equipment that can capture and purify the CO₂ emitted from the waste incineration plant owned by Saga City, Saga Prefecture. This plant factory has introduced water-saving hydroponic farming technology, the use of renewable energy, and cultivation management through environmental monitoring, reducing the environmental impact and achieving efficient plant cultivation.

Kao has also developed a technology for controlling the ingredients used to obtain highly pure and effective plant extracts. The rosemary and roman chamomile extracts obtained using this technology have been confirmed to have effects such as improving the skin barrier and are used in Kao's skin care products *est G.P. Serum-in Lotion* and *est G.P. Serum-in Emulsion*.

SMART GARDEN is able to provide a stable supply of raw materials without being affected by climate change. We will continue to collaborate with Saga City to build a sustainable, recycling-oriented society.

Commercialization of mosquito control products in Thailand by collaborating with another company

Region: Southeast Asia

Corresponding strategies: (2) (3)

Kao and Earth Corporation are working together to solve the problem of infectious diseases caused by mosquitoes. In 2024, Kao's technology that interferes with the flight behavior of mosquitoes by wetting their wings and bodies and Earth Corporation's expertise were used to commercialize the mosquito control spray ARS Mos Shooter in Thailand.

Kao discovered through essential research into mosquito behavior that mosquitoes can continue to fly by repelling water from their bodies, however, aqueous surfactant solution can make mosquitoes lose the ability to fly by wetting their surface. This product, which utilizes this technology, is able to knock down mosquitoes without using chemical synthetic insecticide ingredients and can be used safely even by small children.

This product aims to contribute to solving the problem of infectious diseases caused by mosquitoes, together with *Bioré GUARD Mos Block Serum*, which is equipped with anti-landing technology that prevents mosquitoes from landing on the skin.

We will continue to contribute to the prevention of infectious diseases such as dengue fever and malaria by providing safer and more effective products while designing and developing products that comply with the laws and regulations of each country.

LUNAFLOW, a water-based mold release agent that maintains a slippery surface

Region: Global

Corresponding strategies: (1) (2)

Kao has developed a mold release agent called *LUNAFLOW* that makes it easier to remove rubber and plastic products from their molds during the manufacturing process. This product uses cellulose nanofiber (CNF), a cutting-edge biomass material that has been controlled using Kao's proprietary technology to achieve high oil retention. With its excellent mold release properties and the fact that it can be used repeatedly once applied, it helps to reduce the occurrence of defective products and the need for frequent re-coating, contributing to improved workability in the manufacturing process. It also doesn't contain solvents or fluorine, which helps to reduce the environmental impact and health risks for workers.

The CNF used in *LUNAFLOW* is a cutting-edge biomass material made by refining wood fibers down to the nano level. Kao possesses technology (hydrophobization technology) that makes CNF compatible with resins and solvents, and has been selling CNF customized for each user's purpose and application. In 2024, CNF received the 73rd Chemical Technology Award from the Chemical Society of Japan, and its excellent technological capabilities and sustainability have been highly evaluated.

Kao will continue to make the most of the characteristics of CNF and work with other companies to develop products that reduce environmental impact while also creating new value.

EpiSensA alternative method for skin sensitization testing developed by Kao added to the OECD test guidelines

Region: Global

Corresponding strategies: (1) (3)

Kao is working to develop and promote technologies that can precisely evaluate skin sensitization without using animals. In 2024, EpiSensA, an alternative method for skin sensitization (allergy) testing developed by Kao that does not use animals, was adopted in the OECD Test Guidelines*, which have been recognized globally as official testing methods.

EpiSensA is a test method that uses an artificial skin model to evaluate the skin sensitizing potential of a broad range of chemical substances, including oil-soluble ingredients. Skin sensitization (skin allergic reactions) is a complex mechanism among biological reactions, and it is considered difficult to evaluate it using methods that replace animal testing. EpiSensA is the first artificial skin model to be adopted in the Guidelines of alternatives to animal testing for skin sensitization. This addition means that EpiSensA can now be used not only in Japan, but also worldwide, providing a new option for the safety assessment of chemical substances.

From now on, we will continue to explore alternative methods for reproducing the skin sensitization phenomena. Additionally, we will work with the International Collaboration on Cosmetic Safety to develop, standardize, and promote an evaluation system that combines with the EpiSensA method.

* OECD Guidelines: A list of internationally agreed test methods for assessing the safety of chemical substances and mixtures, as defined by the OECD.

Employees' opinions

A new botanical extract created by a diverse range of professionals



Haruhiko Doi

Biological • Material Science
Research 5,
Kao Corporation

I began this project with a question: "What if we could create truly good materials for people without harming the environment, starting from the cultivation of plants?" I was practically a novice when it came to plants, but Kao has many professionals who are knowledgeable about plants and cosmetic materials. Sometimes we also enlisted the help of people outside the company. We formed a strong team with members from inside and outside the company who empathized our concept and worked on everything from cultivation to processing. As a result, we were able to launch plant extracts using SMART GARDEN. From now on, we will continue to take on the challenge of creating even better value by making the most of our strong teamwork.