

2020 Sustainability report Dow Thailand Group



Message from the president



Since 1995, Dow has announced our sustainability goals and been continuously working to achieve them. Today, we are in the third set of our ten-year Goals (2016-2025), which focus on cooperation across all sectors in order to lead the world and society towards sustainability in line with the United Nations Sustainable Development Goals (SDGs).

In 2020, Dow announced new sustainability targets to address both climate change and plastic waste, two of the world's biggest economic, social, and environmental problems. The targets are to reduce net annual carbon emissions by 5 million metric tons, or 15% from its 2020 baseline and enable a minimum of 1 million metric tons of plastic to be collected, reused or recycled by 2030. We will also ensure that 100% of our products sold into packaging applications must be reusable or recyclable by 2035.

Dow Thailand Group believes that sustainable innovation and collaboration across all sectors are the solutions to making these goals a reality. We are committed to developing innovations that will help promote people's quality of life while reducing greenhouse gas emissions and waste through our scientific expertise and working together with customers, partners, and organizations with the same sustainability goals in mind.

In 2020, during the COVID-19 epidemic, Dow Thailand Group continued to operate safely and reliably respond to the needs of our customers. Dow employees and related stakeholders maintained good occupational safety without recordable accidents or injuries throughout the year. In addition, we continued to undertake sustainability projects and ongoing social activities with strict COVID-19 preventive measures. Moreover, the company's resources were utilized to alleviate the pandemic situation in Thailand.

Amid the storm, only trees with strong roots will stand and be able to grow. Thank you for your kind support to Dow over the difficult past year. I genuinely hope that we will continue to work together in taking care of the environment and looking forward to overcoming the pandemic and promoting the well-being of all Thai people hand in hand with you.

Warm Regards,

Chatchai Luanpolcharoenchai

President of Dow Thailand Group

Dow Thailand Group

Dow's largest manufacturing base in the Asia Pacific



Dow is the world's leading materials science company with an ambition to become the most innovative, customer centric, inclusive and sustainable.

Dow's portfolio of plastics, industrial intermediates, coatings and silicones businesses delivers a broad range of differentiated science-based products and solutions for the customers in high-growth market segments, such as packaging, infrastructure, mobility and consumer care.

Dow was founded in 1897 by Herbert Henry Dow, one of the world's leading chemists and inventors, to produce chemical and materials that help improve people's quality of life. As of now, Dow operates 106 manufacturing sites in 31 countries and employs approximately 35,700 people.

Dow has started its business in Thailand since 1967, then expanded through a joint venture with SCG in 1987. At present, Dow Thailand Group consists of Dow's wholly-owned subsidiaries and SCG-DOW joint ventures. In addition, there is also a Solvay and Dow joint venture in Thailand.

Our focused portfolios:

1. Performance materials & coating
2. Industrial intermediates & infrastructures
3. Packaging & specialty plastics

Key markets and applications:

- Packaging industry
- Building & infrastructure industry
- Mobility industry
- Consumer cares industry
- Electrical appliances industry
- Electronics industry
- Paints & coatings industry
- Adhesives & sealants industry

Location of operations

Currently, Dow Thailand Group has 13 manufacturing plants and is the largest manufacturing base of Dow in the Asia Pacific. The sites are located in Map Ta Phut Industrial Estate, Asia Industrial Estate and WHA Eastern Industrial Estate (Map Ta Phut) in Rayong province.

Products manufactured in Thailand

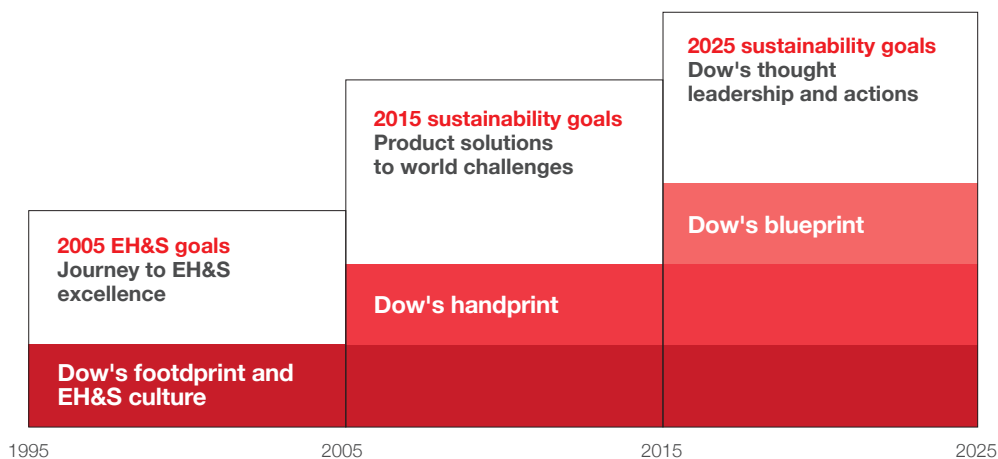
Dow Thailand manufactures Polyethylene, Polystyrene, Elastomers, Polyurethanes, Binders, and Styrene-Butadiene latex. There are also some products imported from other countries such as solvents, construction chemicals, silicones and specialty plastics.

Sustainability goals

Dow has been committed to its sustainability goals since 1995, in accordance with the vision of its founder, Herbert Henry Dow. While supporting our customers with quality products, we are also contributing to create a better environment and society through our expertise in materials science and collaboration with partners.

Dow has been applying a business decision process that values nature since our beginning. We also support our customers, partners, and stakeholders in achieving their own sustainability goals. In 2020, Dow announced a set of new targets building on our existing sustainability goals, to provide greater clarity around solving important sustainability issues.

Dow’s sustainability goals span 30 years, with clear ten-year benchmarks:



2005 EH&S goals

- Spanning 1995 to 2005
- Footprint goals: promote safety and better environments at Dow's manufacturing plants.
- Focus on efficient production and reduce unnecessary use of resources, waste, and environmental safety risks.

2015 sustainability goals

- 2015's goal is to continue improving on existing sustainability goals at Dow's plants.
- Handprint goals: deliver sustainability to customers and partners.
- Focus on product design and the efficiency of manufacturing processes, as well as offer products that are environmentally friendly and with advanced innovations for customers.

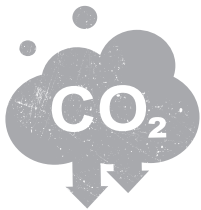
2025 sustainability goals - the blueprint goals

- Our 2025 targets are the third phase and currently in-process.
- Blueprint goals: promote sustainability standards and practices by maintaining them across different sectors--from use of raw materials to handling processes--once products are being used by consumers.
- Collaborate with various organizations to create a template and a process for solving the world's problems with focuses on climate change and marine plastic waste.

Dow 2025 Sustainability Goals are aligned with the United Nations Sustainable Development Goals.

	Leading the blueprint	           
	Delivering breakthrough innovations	         
	Advancing a circular economy	  
	Valuing nature	   
	Safe materials for a sustainable planet	    
	Engaging for impact: communities, employees, customers	     
	World-leading operations performance	     

Dow's new sustainability targets, which align to and build upon its 2025 Sustainability Goals, include:



1. Protect the climate

Dow will develop and use advanced technologies to produce products that consume less resources. Dow's products will also help customers reduce their greenhouse gas emissions.

Mission: By 2030, Dow will reduce its net annual carbon emissions by 5 million metric tons versus its 2020 baseline (15% reduction). By 2050, Dow intends to be carbon neutral. Dow's products and programs will reduce greenhouse gas emissions by an amount equivalent to Dow's greenhouse gas emissions.



2. Stop the waste

Dow is investing and collaborating with all sectors around the world in key technologies and infrastructure to significantly increase global recycling.

Mission: By 2030, Dow will enable 1 million metric tons of plastic to be collected, reused or recycled through its direct actions and partnerships.

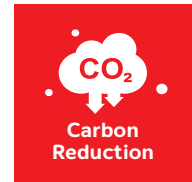


3. Close the loop

Dow is committed to redesigning and promoting reusable or recyclable packaging applications.

Mission: By 2035, 100% of Dow products sold into packaging applications will be reusable or recyclable.

Protecting the climate



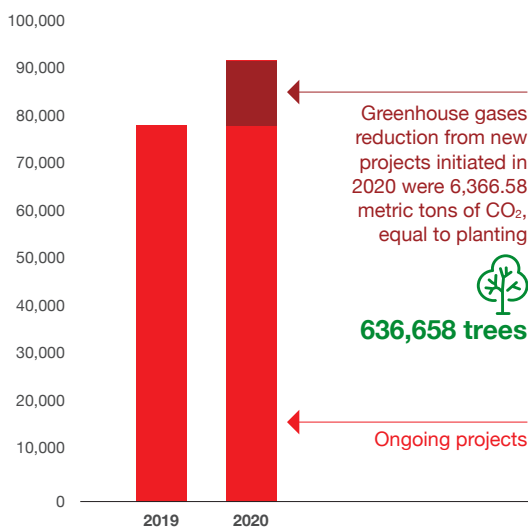
Dow Thailand Group has responded to new sustainability targets in 2020 in terms of protecting the climate at both strategic and operational levels. We plan to concretely meet our goal of reducing carbon dioxide (CO₂) emissions from the company's operations. We communicate and develop better understanding among employees at all levels with an internal campaign to raise awareness throughout the organization. We have also appointed a full-time employee responsible for CO₂ reduction, addressing our commitment to achieving our sustainability goals.

Dow operations - carbon reduction programs

Despite the COVID-19 situation, Dow has remained committed to reducing direct carbon emissions from Dow's production. 87 projects were implemented in 2020, including ongoing ones since 2015 and new projects initiated in 2020. As a result, in 2020, Dow has reduced 93,000 metric tons of CO₂ emissions from operations, equivalent to planting 9.3 million trees per year.

Dow Thailand's progress in reducing CO₂ in 2020

The total reduction of greenhouse gases (metric tons of CO₂)



Dow's ongoing and new projects helped reduce 93 billion metric tons of CO₂, equal to

9.3 million trees being planted. 

Examples of main projects supporting Dow's sustainability mission in 2020

PU & LTX - Reduce power consumption at cooling tower pump



Method: Reduce the energy consumption of the cooling tower pumps, enable them to work independently without affecting the production process.

EBSM Energy recovery

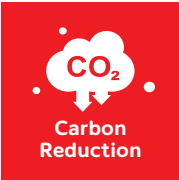


Method: Recycle 100% of the water from the alkylation boiler in the production process instead of releasing it to the industrial estate.

PS-Reduce energy consumption in product AT-1175 by MAC improvement



Method: Manage the efficiency of electricity used in the production process, despite more productivity in the past year.



Partnerships to reduce carbon emission

In addition to our environmentally friendly operations, Dow works with customers, partners, and like-minded stakeholders to promote sustainability. This includes initiating projects to reduce greenhouse gas emissions, the main cause of global warming and climate change.



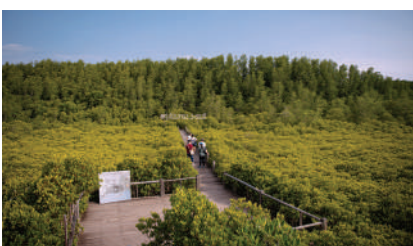
Conserve mangrove and reduce global warming with the Dow & Thailand Mangrove Alliance

Mangrove forests store up to five times more carbon than most other tropical forests around the world, helping reduce global warming. They also trap marine litter. Therefore, Dow is augmenting a mangrove planting project in the Pak Nam Prasae area, which the company has been doing for more than 12 years since the site was shrimp farms. To complete the project, we are not only planting a forest but also creating a sustainable conservation mechanism with balanced environmental, economic, and social benefits. Community garbage management is also in the project scope. In collaboration with the Department of Marine and Coastal Resources, the Ministry of Natural Resources and Environment, and the International Union for Conservation of Nature (IUCN), we aim to cover an area of 8,000,000 square meters (5,000 rai) in five years, starting with the Pak Nam Prasae mangrove forest as a pilot area before extending to mangrove forests in other provinces.

The main operations consist of creating a natural classroom learning center, driving Thailand's first carbon credit mechanism for mangroves, promoting local waste management among communities and tourists, supporting community enterprises and income generation from ecotourism as a blue carbon destination.

Progression in 2020, the first year of our 5-year journey

- Established a committee and working group for the project
- Collectively planted 16,300 mangrove trees, which absorb more than 163,000 kilograms of carbon per year
- Retrieved 355 kilograms of waste from mangrove forest
- Started renovating the Pak Nam Prasae natural classroom; installed signs, and renovated the pavilion
- Organized a mangrove forest photography contest to promote tourism
- Organized bloggers and media trip to the forest and Pak Nam Prasae local community





Innovative environmentally friendly sprayed roof insulation

Dow has collaborated with a Japanese roof insulation expert, Toyokoh, to launch innovative and eco-friendly roof insulation, Sosei, which is applied by spraying directly on the rooftop. The solution is designed to meet the humid climate in Thailand and the ASEAN region. The sprayed insulation is seamless and can protect against heat effectively, resulting in energy saving from making the building cool. Utilizing Japan's experience of facing frequent severe storms, the innovation can prevent water from leaking, reduce noise, and improve roofs' durability. Moreover, it can be applied from the outside without affecting indoor activities. The sprayed insulation addresses the need for roof renovation without activity interruption, such as the roof of factories, hospitals, and warehouses.

Sosei eco-friendly solution is 3-layer insulation sprayed directly onto roof tiles. It utilizes Dow's innovative VORACOR™ polyurethane foam and Dow's HYPERLAST™ waterproof coating, followed by a color coating layer, resulting in excellent thermal protection properties. In comparison, the average temperature underneath this roof insulation is 8-15 degrees Celsius lower than conventional roofs. Moreover, it does not cause global warming because of its zero Ozone Depleting Potential (ODP) and a very lower Global Warming Potential (GWP) than the typical foaming process. "Toyoko" is Dow's first partner to apply this innovation in Thailand and Southeast Asia.



Working with customers to develop rice bags that reduce plastic and energy use

Dow has cooperated with Prepack, Thailand's leading flexible packaging producer under SCGP, to raise the standard of rice bags for "Royal Umbrella" as Thailand's first "green" rice bag. Using Dow's innovative special polyethylene resin, INNATE™, the new rice bags are aimed to be thinner (from 110 microns to 90 microns) but stronger and more durable. The collaboration helps reduce carbon dioxide emissions that cause global warming by lessening plastic and energy used in the packaging process by lowering rice bags sealing temperatures. Moreover, it promotes recycling as the new bags are made from easily recyclable polyethylene plastic. The partners also encourage consumers to support PPP Plastics' drop points "Magic Hand x Won" by donating used rice bags. Royal Umbrella bags will be a part of the circular economy and not become residual plastic waste in the environment.

In the beginning, the program is expected to reduce the consumption of plastic by more than 300 tons per year and reduce greenhouse gas emissions by more than 600 tons of carbon per year. This is equivalent to planting over 60,000 trees, excluding carbon dioxide reduction from consumers donating empty bags for recycling.

Creating a blueprint for environment

Dow joined hands with experts from the Department of Industrial Promotion, Ministry of Industry, Plastics Institute of Thailand, National Research Council of Thailand, Thammasat University (Faculty of Engineering), and Kasetsart University (Faculty of Science) to run the "Dow for Sustainable Industry" project supporting small and medium industries (SMEs) to improve efficiency, safety, and environmental friendliness.

This collaboration is a part of the "Big Brother" project, the government's policy that encourages large private organizations to be mentors for SMEs. The support aims to strengthen the economy and promote a sustainable environment in Thailand, aligning with Dow's sustainability goals which focus on creating a blueprint to protect the climate and eliminate plastic waste. The project promotes smart factories by applying IoT (Internet of Things) technology to improve productivity, safety, and environmental management.

In 2020, 20 factories in the food and plastic industries were selected to participate in free in-depth consultations. In addition, the Industry 4.0 manual and self-assessment form have been developed. They can be used as guidelines for SMEs to upgrade to Industry 4.0 standards to increase efficiency, safety, and eco-friendliness.

Since the beginning of the project, the amount of waste from participated factories has been reduced. The quality of life and environments for more than 922,000 workers and surrounding communities nationwide have been positively impacted. The program has reduced more than 1.5 million kilograms of carbon dioxide emissions, an equivalent of planting 150,000 trees per year.





Supporting Thailand Business Council for Sustainable Development

Dow Thailand Group is a member of the Thailand Business Council for Sustainable Development (TBCSD), which has a mission to "Promote sustainable and successful businesses in Thailand to help them transition to a sustainable world." In 2020, Dow joined the Climate Change working group. It aims to determine the direction and role of the business sector in solving climate change in Thailand. The group has the Office of Natural Resources and Environmental Policy and Planning (ONEP) and the Thailand Greenhouse Gas Management Organization (TGO) as advisors. The action plan consists of quarterly training for its members, driving a low carbon business model, driving Thailand policies regarding climate change by collaborating with ONEP and TGO and establishing a greenhouse gas reduction program as well as a long-term project to increase greenhouse gas reservoirs.



Planting trees at Phudon on Paela hill

Dow has collaborated with Ban Chang municipality to improve the landscape of the Phudon forest on a small hill with beautiful scenery called Paela. Flowers were planted along the 2-kilometer road. Eventually, the trees were increased to 1,200 and maintained until today. With the cooperation of the local community, the trees are prolific. The benefits are greenery added for Rayong province, and awareness of environmental conservation is raised.





Keeping plastics out of the environment

Dow is committed to driving activities that achieve our sustainability goals, especially stopping plastic waste from ending up in the environment.



Operation Clean Sweep

Operation Clean Sweep (OCS) is a project established by the American Chemistry Council's Plastics Division and Plastics Industry Association (ACC), which has been in action for over 25 years. The objective is to ensure that plastic resin manufacturing and handling operation strictly prevent pellets, flakes, and plastic powder from leakage to protect the environment and conserve valuable resources.

Since 2018, Dow Thailand Group has participated in Operation Clean Sweep and undertaken several meaningful actions. With support from Dow's supply chain and suppliers, the company continuously ensures that plastic pellets and powders passing through Dow's plants and warehouses are handled carefully without any leakage into rivers or the sea, which would harm aquatic animals. As a result of intensive operations in 2020, Dow Thailand Group has seen no plastic entering the environment from Dow's operations.

Some of Dow's key actions as part of Operation Clean Sweep include:

- Analysis of connecting points that could release plastic pellets from the production process; including

storage and transportation of physical components (machinery, pipes, containers) as well as the working process when plastic is transferred from the production section to the packing section

- Brainstorming ideas to reduce plastic pellet leakage; for example, modifying pipe fittings

- Adding various measures to manage plastic pellets that could otherwise escape into the environment; for example, regularly cleaning the floors to reduce the plastic pellets spills, installing traps in gutters around plants and warehouses, etc.

- Persuading logistics service providers to become members of Operation Clean Sweep and taking serious measures by organizing training and regularly monitoring service providers





International Coastal Cleanup

In collaboration with the Industrial Estate Authority of Thailand and other like-minded organizations, Dow Thailand Group has again organized the 2020 International Coastal Cleanup (ICC) day like we have been doing for over 18 years to stop plastic waste in nature. To raise awareness of waste separation, we have more than 800 volunteers to collect over 3,362 kilograms of coastal waste along 5 kilometers of Sonkrasib beach in Map Ta Phut and Namrin, Phayoon, and Phala beaches in Ban Chang district; which are major tourist attractions in Rayong. The activity was held under the #PullingOurWeight campaign, which means doing our part to our full potential. Another meaning of the campaign is to pull at least 1.8 kilograms of waste from the environment, which is equal to the average weight of waste each person generates in a day. The garbage collected during this event will be recycled and utilized following the circular economy principles.



Promoting "Koh Klang Community" as a waste management learning center

Koh Klang is a 100-year-old community in the Klong Toey area, Bangkok. A population of approximately 270 people lives in 58 houses on an island belonging to the Crown Property Bureau. The site is about 4,800 square meters in the middle of the Phra Khanong canal, the neighborhood of Dow Thailand's headquarters. The community residents intend to develop their homes by holistic waste management and desire to share their best practices with other communities despite being the only "island community" in Bangkok with many limitations. Dow has supported establishing a comprehensive learning center for waste management here. The center is now ready for other communities to learn how to stop waste from entering the environment.

This project is a collaboration of Dow, the Klong Toey District Office, and the Thailand Institute of Packaging and Recycling Management for Sustainable Environment (TIPMSE). The partners have been designing a waste management structure and renovating the area since January 2020. Those interested in visiting the learning center, please contact Khun Churairat (Eew) at 089-4269723.



Recycled Plastic Road Project

Dow Thailand Group, the Department of Highways, the Department of Rural Roads, SCG, and Chiang Mai University have cooperated to develop plastic waste as an ingredient in asphalt concrete for road construction. The plastic mixture improves durability and prolongs the service life of the road. The collaboration aims to set a new standard for constructing roads in the country by responding to the need for waste management and the cost-effective use of resources in line with the government's BCG Economy (Bio - Circular - Green Economy) policy.

A 1-kilometer-long recycled plastic road of 6 meters width utilizes approximately 3 tons of plastic waste, equal to nearly 900,000 plastic bags. In 2020, Dow Thailand Group and SCG partnered with other private companies to construct 7.7 kilometers of the road using 23 tons of plastic bags.

Dow has initiated recycled plastic road programs in many countries, including the United States, Indonesia, India, Vietnam, and the Philippines. The objective is to find usage of the difficult-to-recycle plastic waste and raise awareness of the cost-effective use of resources following the circular economy principles. So far, the project has globally diverted more than 50 million packaging bags from landfills.

Recycled Plastic Road Project

- 3 tons of plastic waste, equivalent to nearly 900,000 plastic bags, can be used to build a road of 6 meters wide and 1 kilometer long
- In 2020, Dow Thailand Group and SCG partnered with other organizations to recycle 23 tons of waste plastic as a road 7.7 kilometers long
- 50 million bags is the amount of plastic packaging waste diverted as a result of Dow's recycled plastic road project around the world



Collaborations to stop the waste

In addition to direct operations, Dow also drives the reduction of plastic waste through partnerships with like-minded organizations.



PPP Plastics' founder and active member

Dow Thailand Group is one of the founders and active members of PPP Plastics (Public Private Partnership for Sustainable Plastic and Waste Management). It is the first program of its kind in Thailand. PPP Plastics works to support the 20-year roadmap of plastic waste management and promote the government's circular economy concept to achieve participatory goals, such as reducing the amount of plastic waste in the sea by at least 50 percent by 2050 and achieving 100% recycling of plastic waste by 2027.



"Magic Hand x Won" project

PPP Plastics has partnered with the "Won" project to initiate the "Magic Hand x Won" project. The collaboration has established plastic drop points called "Tang Won Toong" to collect used plastic bags and packaging in Bangkok and big provinces for recycling. It prevents these plastics from leaking into the environment and reduces plastic waste going to landfills. By 2020, nearly 400 drop points have been set up, including one at Dow Thailand Group's headquarters. Dow helped promote this project to encourage behavior change through special interviews, press releases, social media posts, and exhibition signs. In 2020 Magic Hands x Won recycled 8.7 tons of plastic bags and packaging.

Garbage separation at sources program

Dow has been supporting waste separation in the Ruamittr community. Baan Eua Arthorn Phala Community and the Baan Eua Arthorn Rayong (Wang Wa) community. The program aims to change household waste behaviors by organizing a waste bank for people in the community to exchange plastic waste for prizes twice a month. The program also supports waste sorting in many schools in Rayong province by educating students. Dow also builds permanent signs and recycling waste bins at local schools such as Map Ta Phut Municipal School.





Innovation for a circular economy

Dow is committed to promoting a circular economy by creating value for recycled plastics and promoting easier recycling through innovation. We aim to help reduce plastic waste together with Thai customers and consumers.



Innovation of recycled plastics as good as new

Dow has developed a new formula of recycled plastic compound resins designed to produce "collation shrink film," launched in Thailand for the first time in 2020 to solve sustainable plastic waste problems through innovation.

"XUS 60921.01" contains 40% post-consumer resin (PCR) plastic, which maintains properties equivalent to that of 100% virgin resins. It emits less 17% CO₂ and uses 30% less energy than using new plastic resins. The converter can replace the original plastic pellets without modifying the machinery, and once the film has been used, it can still be recycled again.



Mono-material packaging: beautiful, durable, and recyclable.

Many daily products such as food and consumer goods use multi-layer packaging bags made from multiple materials, such as metallic layers with plastic film or various plastic combinations. As a result, it is complex to recycle. Dow developed a new solution for the production of multi-layer packaging with one type of plastic (Multi-layer, Mono material), which maintains good physical performance and can easily be recycled. Recently, the new plastic resin "INNATE™ TF" has been launched to produce TF-BOPE (Tenter Frame Biaxially Oriented Polyethylene) polyethylene film. The film has better aesthetics and print performance.

Moreover, it is environmentally friendly because the packaging can be designed using all polyethylene plastic or all-PE, which is convenient for recycling and can replace many types of plastic. It also reduces greenhouse gas emissions and the amount of waste. The applications are refillable bags, stand-up bags, rice bags, animal feed bags, and heavy-duty industrial bags.



Packaging waste reduction (International-award-guaranteed)

Dow has received the 2020 Ringier Plastics Technology Innovation Awards for our innovative "COF Stable Resin." The innovation provides a stable coefficient of friction (COF) throughout the production process. It is also durable for harsh storage and transportation conditions, reduces breakage and production line interruption, as well as reduces waste during production and packing.

Compatibilizer for recycling

Many times, manufacturers need to combine different types of plastics in their packaging. As a result, these various plastics combined cannot be recycled once they have been used. To promote easier recycling, Dow has developed an innovative, recyclable plastic resin called "RETAIN™," which promotes the integration of plastics that normally cannot be mixed so they can be recycled.



World-leading operations performance

Since our establishment, Dow Thailand Group has been keeping the environment, occupational health, and safety at the heart of our operations. We strive to operate responsibly—dedicated to safety—and conserve and efficiently use energy to achieve our goal of growing our business sustainably.

Increasing safety standards while decreasing work accidents

Dow's manufacturing is committed to maintaining international standards in our operations while developing new stringent standards. Achievements in 2020 are the following:

Outstanding performance in plants turnaround

We were able to conduct major maintenance in three plants over a total of 572,537 hours without any accidents in 2020. We have complied with laws and regulations and completed the turnaround without complaints from neighboring areas and communities. Important measures are:

- COVID-19 prevention management plans which covered workers' transportation, working areas, and resting areas, such as initial health checkup, social distancing, wearing masks, and general cleanliness.
- Health screening of workers to match their type of work (fit for duty), such as those who must work at high heights.
- Traffic management in the operations area, walking path, and cordoning off the operational areas of heavy machinery.

Industrial hygiene

Analysis and reduction of noise sources in the work area with noise acoustic camera technology.

The latest technology helps identify noise sources in the work area and discovers the sound source clearly and quickly. The results can be used for precise and high-efficiency machining improvements to reduce the noise in the work area. Employees are also made safer.

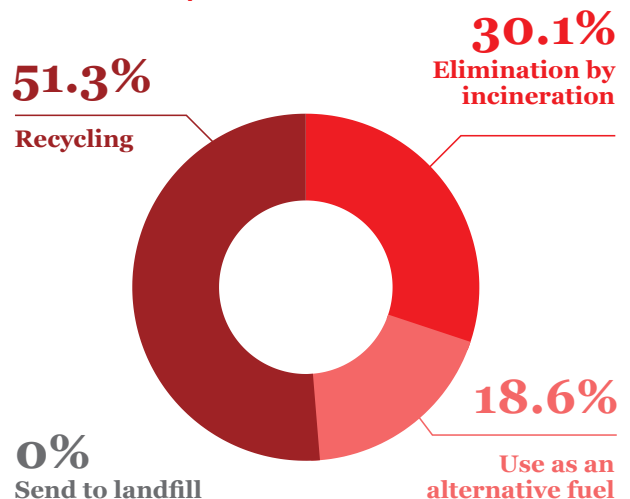
Real-time heat index alarm

The system warns employees when the heat index in the working area is high and may cause health effects. This system provides instantaneous alerts via radio communication (real-time) so that employees working in the plant are aware of the heat hazards and advance warning (heat index forecast). Employees can access the information at any time via the web page, LINE, or by calling the staff.

Efficient use of resources and waste management

Each of our plants continuously performs various activities to reduce the energy consumption per unit of production. In addition, there is a program to reduce water consumption and promote the reduction of wastewater in the production process. Instead of sending the water to be treated immediately after use, we reuse it without affecting the quality of the product. At present, we successfully send 'Zero' waste to landfills and conduct various activities to reuse resources circularly.

Our waste disposal



Change raw water sludge to a soil modifier

Most of the raw water treatment processes generate sludge that needs to be transported for further disposal by incineration, consuming high energy. Therefore, Dow Thailand Group began to use raw water sludge, which has no harmful residues, as a soil modifier. It has been licensed, tested, and certified by government and agricultural agencies to be safe and arable. Throughout 2020, the manufacturing plant has converted more than 25 tons of raw water sludge to benefit the community and the environment by delivering it to the Rayong Provincial Administrative Organization for use as a soil conditioner for public gardening. It greatly reduces incineration, saves energy wasted in the combustion process, and reduces the cost of transportation. It also reduces greenhouse gas emissions by more than 94% or about 340 metric tons/ year than conventional incineration.



Dow Ecowaste: Saving time, eliminating slow reports

Normally, all manufacturing plants are required to have a proper protocol for submitting reports, for example, reporting on hazardous waste transportation, which needs to be collected and reported to the Department of Industrial Works. In the past, the data collection and preparation of reports had to be conducted on-site. The COVID-19 situation sent many of Dow's employees to work from home, affecting the preparation of these reports.

Dow's Responsible Care Department has created a website, "Dow-ecowaste.com." It was fully implemented in March 2019. Additional functions were developed in 2020 to enable more efficient data collection, reporting, and auditing. Examples of useful functions are the status report of documents for waste delivery three months in advance, an email warning system to update the waste information sheet, and notification via the website and email when submitting documents number 2 and number 3 later than 7 days. It also has various functions to help make reporting more convenient and faster.

The success of the Dow Ecowaste project

- Preparation of accurate reports on the delivery of hazardous and non-hazardous waste transportation and on-time submission.
- Forms can be conveniently downloaded from the system, for example, vehicle inspection certificates, Kor Aor 1 document certificates, and various report formats.
- Data reporting is more efficient and accurate, with reduced paperwork time for liability guarantee documents (Kor Aor. 1) for waste transportation.
- It can be used by all departments and helps users to work more efficiently.
- It can reduce working hours and expenses up to 1,798,000 baht/ year (58,000 dollars/ year).

Building on 2020's success, Dow's Responsible Care Department has created a waste inventory webpage to control waste collection within 90 days; the webpage has already been implemented at the polyethylene plant.

Developing tomorrow's innovators

Dow Thailand Group prioritizes child and youth development to guide them in becoming talented innovators in the future. Dow's programs support fundamentals such as hygiene, brain development, and education of English language and Science.

Dow English experience program

Dow Thailand Group recognizes the importance of using English to broaden global knowledge for young people, enabling careers and providing the foundation necessary for accessing knowledge in various sciences for Thai youth. In 2020, Dow organized an online English training program to prepare students from Map Ta Phut Technical College in Rayong province for the English Proficiency Test (TOEIC), to prepare for applying for a job in the future. The online classroom also extended to teachers in charge of English courses. 15 teachers and 58 students participated.



DOW-EF Development for Successful Youth & Rayong Happiness

This project aimed at promoting good living skills for children in the local communities through the development of brain functions that enable people to regulate their emotions, think critically and make the right decisions. This affects thinking habits, learning, problem solving, and working well with others. The brain function for successful living or Executive Functions (EF) controls human's IQ and EQ. A child's brain can develop EF most effectively from zero to six years of age. Dow-EF activities in 2020 included:

- Establishing the EF Learning Center in Rayong Province, which is the country's first fully integrated EF learning center.
- Developing materials and tools such as fairy tales and game boxes to enhance EF.
- Enhancing the working mechanism and network. There were 2 board meetings, 4 subcommittee meetings, and extension of EF knowledge to departments such as child

development centers, kindergartens, hospitals and sub-district health promoting hospitals—a total of 300 locations.

- Providing training for change agents and EF facilitator teams; increasing the numbers of change agents to more than 900 and EF facilitators to more than 40.
- Developing activities promoting EF in the communities by organizing EF activities for more than 10,000 children and parents.
- Producing 200 episodes of an online documentary published on YouTube to promote EF-based child development for parents, and for people to learn at no cost.



Scan to watch Dow-EF documentary



Dow chemistry classroom

Dow Thailand Group works in cooperation with the Chemical Society of Thailand and its alliances. The "Dow Chemistry Classroom" was established in 2013 to develop the teaching of chemistry in Thailand through experiments using a small-scale chemistry laboratory kit. The kit uses 2,000 times less chemicals than regular experiments as it is small and safe. Students can have hands-on experience, so it is easy to remember and promotes a positive attitude towards studying chemistry. Moreover, it was recognized by UNESCO as having the same results as a standard test set.

The program's main activities include a small-scale laboratory workshop for high school science teachers, a contest on small-scale experiment application, and training of role model teachers to develop them into proficient lecturers for small-scale laboratory techniques. From the beginning of the program until the end of 2020, 20,200 teachers from 894 schools have participated. 81 high potential role-model science teachers have been developed, and more than 150,000 students have benefitted.



TRC-Dow clean drinking water for remote schools

Dow Thailand Group, in cooperation with the the Relief and Community Health Bureau, The Thai Red Cross Society, jointly installed high-efficiency reverse osmosis (RO) filters for drinking water for students in 10 provinces, including Rayong, Chachoengsao, Phra Nakhon Si Ayutthaya, Nakhon Nayok, Nakhon Sawan, Kanchanaburi, Singburi, Chai Nat, Nakhon Pathom, and Uttaradit. Providing clean and safe drinking water supports children to live healthily, prevents diseases caused by unclean drinking water, and encourages clear minds ready for learning.

In 2020, ongoing maintenance trainings were held to provide knowledge on repairing and maintenance of water filters for responsible staff and volunteers. Moreover, a system for collecting information from water cleanliness monitoring installed at 50 schools was developed. The data will be used to analyze the quality of drinking water and establish preventive maintenance measures. Each year, more than 8,000 children benefit from the clean drinking water program.



Vocational Chemical Engineering Practice College (V-ChEPC)

Dow Thailand Group supports the Vocational Chemical Engineering Practice College (V-ChEPC) program to develop new generations of chemical technician students aligned with industry needs. At present, 13 batches of students have participated in the program. They have received scholarships and secured jobs once they finish their studies.

Support of Dow Thailand Group from 2009 – 2020

- Supporting over THB 9.5 million of budget
- Giving the opportunity for student internships at Dow's manufacturing plants.
- Sending Dow's experts as special lecturers at the college
- Recruiting 18 students graduated from this program to work with Dow.

Empowering Thai communities

Dow Thailand Group encourages employees to use their skills and knowledge to benefit the local communities and broader society. We want to make a more inclusive world where no one is left behind.

Employee Resource Groups (ERG)

ERG, or Employee Resource Groups, is an association similar to an employee club. To promote diversity and inclusion, Dow Thailand employees are encouraged to embrace the differences of people across race, religion, culture, age, creed, and gender. This leads to an understanding and open-mindedness to celebrate diversity. Dow Thailand Group has 5 active ERGs as follows:

- **ADN** (Asian Diversity Network), a group for Asian social and cultural interests
- **GLAD**, the support group for people of gender diversity
- **PRIME**, a group for senior employees with experience
- **RISE**, a group for new employees
- **WIN** (Women's Inclusion Network), an advocacy and support group for working women



Neighbor care program

For more than 8 years, the "Neighbor Care" program has encouraged Dow's employees to propose a project that improves the neighboring communities, enhances the landscape, promotes hygiene and good habits for people, or cultivates safety conscientiousness. The 173 volunteers among Dow employees have made a difference for more than 29,000 people in Rayong through activities in the past year. In 2020, despite the COVID-19 pandemic, Dow Thailand Group successfully implemented a total of 5 projects as follows:

1. The construction of a pavilion and improvement of the parking lot at Ban Chang Hospital
2. Improvement of the waste management learning center at the Roum Mitr community
3. Community herb planting at Khiri Phawanaram temple
4. Improvement of a facility to make bio-fertilizers from chopped branches at Eua Arthorn Community, Rayong (Wang Wa)
5. Floating vegetable plots at Ban Klong Sai School





Lending a hand during the COVID-19 pandemic

Since February 2020, Dow Thailand Group has delivered the following support to Thailand;

1. Together with Solvay Group in Thailand, Dow has donated 600 tons of hydrogen peroxide (It becomes 15 million liters of hydrogen peroxide solution when diluted with water). The product is from MTP HP JV Co., Ltd., a joint venture between Dow and Solvay. It is used as a disinfectant spray for the Center for Resolution of Emergency Situation (CRES), to kill the COVID-19 virus in many risky areas.
2. Dow, together with employees and families, has donated 3,000 sets of Personal Protective Equipment (PPE) kits to support the safety of medical staff in close contact with infected people. The donations were made to Siriraj Hospital, Chulalongkorn Hospital, Phrapokklao Hospital, Rayong Hospital, HRH Princess Maha Chakri Sirindhorn Memorial Hospital, and Banchang Hospital.

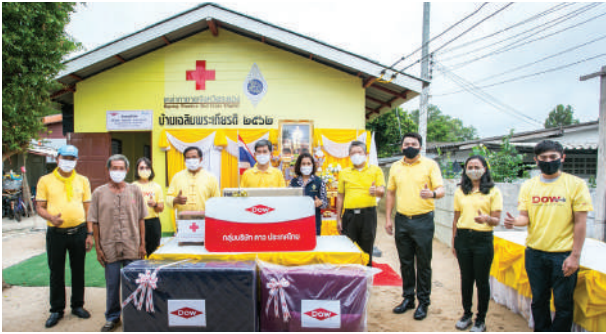


3. In collaboration with the Plastics Institute of Thailand and Thammasat Chaloem Phra Kiat Hospital, Dow has supported the production and donation of the COVID-19 "Thai Kit Spacer" to replace expensive imported equipment from abroad. The kit is a Meter Dose Inhaler (MDI), which helps reduce the diffusion of aerosol secretion. The Thai Kit Spacer uses medical-grade plastic, which is safe, durable, difficult to break, lightweight, and affordably priced.
4. The company has provided surgical masks, alcohol gel, and disinfectant spray to all employees to protect themselves from the risk of infection. Dow has also given away the preventive kits to local media, schools, and neighboring communities
5. Dow has supported community enterprises by buying cloth face masks and dry food products for people affected by the COVID-19 outbreak.



Polyethylene bag donation

Dow Thailand Group has delivered 22,000 mono-material bags, worth more than THB 1,050,000, made from ELITE™ Enhanced Polyethylene to the Thai Red Cross Society. They were used as relief bags for packing dry food and daily necessities for people in distress. The bags are specially designed for high strength and as heavy-duty packagings, and they are also easy to recycle.



Building the 37th "Dow's Habitat House" for the underprivileged

Since 2006, Dow Thailand Group has collaborated with "Habitat for Humanity" to run the Dow's Habitat House (Baan Dow Asa) program continuously. We have been providing THB 300,000 for the construction of each house, and Dow employees have volunteered to build the house. Until now, Dow has delivered 37 safe, healthy, and hygienic homes and public buildings to the communities and families of low-income people. The program solves problems and creates more opportunities to access good quality lives for the needy community members.



Market @Dow

The program has been established for local merchants to sell their products directly to Dow employees without renting the facility. Circulating a wide variety of products allows the distribution of income among local community members. In 2020, the community shops generated THB 203,596 revenue from selling products at Dow. In addition, the promotion of the market online encourages employees to purchase products to support the community during the COVID-19 outbreak.

Community Partnership Association (CPA)

Dow is one of the co-founders and an active member of CPA, which is the first cooperation among industrial entrepreneurs in Thailand to undertake environmentally friendly industrial development to coexist sustainably with the community. Activities of the association in 2020 were as follows:

- Developed an eco-industrial city to reach the highest standard, level 5
- Enhanced the quality of life of communities in the Map Ta Phut Industrial Estate in 3 areas: 1. Education and health 2. Environmental care, including increasing green areas. 3. Community economic development using "CPA - Thammasat Model" by supporting 38 community enterprises in product development and marketing.
- Upgraded the Eco Factory elements in every plant of the member companies
- Presented scholarships for nurses
- Operated mobile medical units
- Improved the capability of village health volunteers
- Held university admission tutoring via the online system
- Presented scholarships for bachelor's degrees and vocational schools
- Improved the ability of school guidance teachers in Rayong province
- Established a community emergency plan and proactive environmental surveillance network



Pun Suk Market

The market is driven by Dow Thailand Group, with a network of 13 partners, to encourage communities to create businesses that generate income from the production or distribution of products or services to be sustainably self-sufficient. Dow and the partners serve as their mentors. In 2020, community enterprises developed local community products generating a total of THB 3,578,265.

Dow Thailand Group's awards

Dow strives to conduct business that improves the quality of life for people around the world.
These awards are testaments of the team's effort.

No.	Award Name	Given organization	Year
1	Green Industry – Level 4	Ministry of Industry	2019
2	Plaque of honor for an organization that contributes to children and youth	Department of Children and Youth Ministry of Social Development and Human Security	2018
3	Plaque of honor for supporting activities of the Prostheses Foundation	Prostheses Foundation of H.R.H. the Princess Mother	2016 - 2020
4	Halal certificate	The Central Islamic Committee of Rayong	2015 - 2016
5	Carbon Footprint Label Certificates	Thailand Greenhouse Gas Management Organization (TGO)	2015
6	Certifications of "Safe Enterprise" scheme	Department of Labour Protection and Welfare, Ministry of Labour	2015
7	Corporate Social Responsibility, Department of Industrial Works (CSR-DIW) Award	Department of Industrial Work, Ministry of Industry	2015 - 2016
8	Eco Factory	The Industrial Environment Institute, Federation of Thai Industries, Ministry of Industry	2015 - 2019
9	3Rs Award / 3R+ Awards / Zero waste to Landfill Achievement Award	Department of Industrial Work, Ministry of Industry	2015
10	Asian CSR Award in Environmental Excellence	Asian Institute of Management-Ramon V. del Rosario, Sr. Center for Corporate Social Responsibility	2014
11	Employer of Choice	PROMPT Professional Resources & Services	2013
12	Gold Level Award for Zero Accident Campaign	Ministry of Labour	2013 - 2014
13	AMCHAM Corporate Social Responsibility Excellence Recognition Award in Platinum Level	American Chamber of Commerce in Thailand	2011 - 2020
14	KPI Certificate of Honor	The Federation of Thai Industries	2010
15	Good Governance Award	Industrial Estate Authority of Thailand	2009 - 2020
16	Green Meeting Certificate	Thailand Business Council for Sustainable Development (TBCSD)	2009 - 2014
17	ISO 9001: 2015 Certificate	Lloyd's Register International (Thailand) Limited	1998 - present
18	ISO 14001: 2015 Certificate		2001 - present
19	FSSC22000 Certification		2015 - present

Let us explore environmental cooperation, with many countries working together to save our world.

Among other environmental changes, the United Nations estimates that by 2050 the world's population will increase to 9.8 billion people, and more resources will be needed. The World Bank estimates that food demand will increase by 50% from today, and the World Energy Outlook estimates that the world's population will need 45% more energy. The UN World Water Development Report also reports the situation on water resources, stating that the increasing global population results in an additional 30% more demand for water.

All these are significant challenges that lead many countries to try and develop new innovations to overcome limited resources, allowing them to be recycled with peak efficiency. Enforcement is necessary to ensure that the Sustainable

Development Goals (SDGs) set up by the United Nations are taken seriously. Goals are set for global development from 2015 to 2030 to eliminate poverty, reduce inequality, lead to economic prosperity and create a better quality of life for the world's population. Of paramount importance is protecting the global environment for future generations.

Many countries face two major challenges on the road to sustainability: plastic waste that is not properly disposed of in the environment and climate change affected by global warming. The governments of many countries, as well as private companies and the public, are aware of these problems and of the need to work together to solve them by setting goals that all countries can achieve together.





Paris Agreement: The historical convention for global warming reduction

Climate change is becoming more and more critical and is often the cause of severe natural disasters. It damages people's livelihoods, economies, and societies and obstructs the progress of sustainable development. Therefore, the international community has partnered to fight and cope with the situation with an urgent global mission under a historical mutual agreement, The Paris Agreement. The deal is under the United Nations Framework Convention on Climate Change (UNFCCC), which members have reached a consensus at the 21st Annual Conference of Parties (COPS) or COP21 in 2015 in Paris, France, to cover various matters; in particular, the Greenhouse Gas Mitigation aiming at keeping the average global temperature rise in this century to be less than 2 degrees Celsius compared to the pre-industrial era. The agreement also sets a higher goal to keep global temperature rise below 1.5 degrees Celsius. In addition, the Paris Agreement sets adaptation goals as guidelines for dealing with threats from global warming, such as sea-level rise and wildfires getting

more intense and longer. These include ways to protect agricultural and food products that may be affected by inclement weather.

The Paris Agreement is an important milestone that indicates the alertness of governments, the private sector, and people in each country. Each country must present its greenhouse gas reduction targets to the global community, known as the Nationally Determined Contribution (NDC). This is in an attempt to prevent disasters caused by the climate change crisis, taking into account the capabilities of each country. The NDC proposal is required to be updated every five years to demonstrate progress and reflect the efforts and responsibility of the world together.

The 26th UN Climate Change Conference of the Parties (COP26), to be held in Glasgow, Scotland, in November 2021, is expected to accelerate the implementation of each country's announced plans, demonstrating its commitment to carbon neutrality and achieving the goal of reducing global warming under the Paris Agreement.

Carbon Neutrality: the world's most urgent mission

To achieve the ultimate goal of the Paris Agreement, UN Secretary-General Antonio Guterres, in a statement in December 2020, underscored the urgent need of the international community to work together to achieve "Carbon Neutrality" by 2050. He requested all countries to implement the Net Zero Greenhouse Gas Emissions plan. In addition, every five years, each country must propose an intense NDC plan to show genuine determination and effort to take action to achieve carbon neutrality by the middle of this century.

It is encouraging that different countries, especially economically important countries that emit large amounts of greenhouse gases, such as the EU, the United Kingdom, Norway, and many other European countries, have pledged to be carbon neutral. Countries in Asia with large economies, such as Japan and South Korea, have also announced plans to reduce net greenhouse gas emissions to zero by 2050. More than 110 countries have announced zero greenhouse gas emissions targets by 2050. Thailand has proposed a plan to reduce greenhouse gas emissions by 20 percent by 2030, and possibly to 25 percent in the future, by seeking to reduce greenhouse gas emissions in the energy sector, transportation, industrial process, and waste management.

China has announced plans to reduce greenhouse gas emissions at least 65% from 2005 and continue towards Carbon Neutrality by reducing

net greenhouse gas emissions to zero by 2060.

One of China's approaches to reducing GHG is the transition from fossil fuels such as coal, oil, and natural gas to renewable energy. This is because the largest proportion of greenhouse gases emitted into the atmosphere is from fossil fuel combustion activities.

The transition to clean energy such as renewable energy is a sustainable way to reduce global warming. Many European countries, such as Norway, are moving towards the development goal on this path. It plans to use 100% renewable energy for heating, electricity generation, and transportation.

In addition, the United States has rejoined the Paris Agreement after the inauguration of Mr. Joe Biden, the latest president of the United States. This makes efforts to meet greenhouse gas emissions targets more achievable. Formerly, President Trump withdrew the United States from the Paris Agreement, while the United States had previously set a goal to reduce its greenhouse gas emissions to zero by 2050.

Information from: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
<https://sdgs.un.org/goals>
<https://www.un.org/sg/en/content/sg/articles/2020-12-11/carbon-neutrality-2050-the-world%E2%80%99s-most-urgent-mission>
<https://climatepolicytracker.org/countries/thailand/#:~:text=Thailand%20intends%20to%20reduce%20its,percent%20in%20that%20time%20frame>
<https://thestandard.co/countries-net-zero-emissions/>
<https://eciu.net/netzerotracker>



Scope of Carbon Footprint Measurement (Greenhouse Gas Protocol)

A significant way to reduce greenhouse gas emissions to achieve the Carbon Neutral goal is to reduce the carbon footprint of our activities under the GHG Protocol (<https://ghgprotocol.org/>). There are 3 scopes of greenhouse gas emissions throughout the value chain, namely, Scope 1, 2, and 3, as follows:

Scope 1 is greenhouse gases directly emitted by the organization (Direct GHG Emissions), such as the production process of goods or products in factories.

Scope 2 is greenhouse gases emitted from energy use (Energy Indirect GHG Emissions), such as the production of electricity, heat, steam, and cold that the organization uses or purchases for use in its operations.

Scope 3 is other indirect greenhouse gas emissions throughout the value chain (other indirect GHG emissions), such as greenhouse gas emissions from raw materials used, transportation of raw materials or factory employee travel, as well as product distribution, product use, and product disposal.



Plastic and sustainable management under the concept of the Circular Economy

According to the United Nations Environment Program (UNEP), people on earth today generate more than 300 million tons of plastic waste each year, equal to the weight of the entire world's population combined. The United Nations estimates that the world's population will increase to 9.7 billion by 2050 from around 7 billion today. As a result, the amount of plastic waste is increasing as well. The World Bank estimates that if the world does not try to reduce plastic waste, the amount of plastic waste both on land and in the oceans over the next 20 years will swell to 1.3 billion tons, and those huge piles of plastic will take hundreds of years to decompose. The unmanaged waste will cause environmental pollution and affect the health and natural ecosystem of the world. Governments in many countries have raised awareness of the current problem and implemented a variety of policies and measures to reduce the amount of plastic waste, including bans on disposable plastic products such as straws and plastic glasses, refraining from using plastic bags for supermarket products, and tax legislation for certain plastic products--including incentives to encourage recycling. However, there is

still a large amount of used plastic that escapes into the environment. With the COVID-19 pandemic, the use of single-use plastic products has increased, which worsens the situation.

Efficient and sustainable plastic waste management cannot be achieved only by reducing its consumption but must incorporate the circular economy concept. Using recyclable plastic as a starting material in production creates a continuous circularity of use, preventing plastic from ending up in the environment. Recyclable plastics can be raw materials for new products and can be reused continuously in an endless cycle. The Circular Economy concept for plastics raises hope to become a plastic-free society in the future. At present, many large business organizations have turned to the idea of stopping plastic waste or reducing plastic waste to zero as one of the goals for sustainable business operations.

Information from: <https://www.oneplanetnetwork.org/world-requires-circular-and-low-carbon-economy>
<https://www.plasticseurope.org/en/focus-areas/circular-economy#:~:text=Plastics%20can%20make%20a%20major,make%2C%20use%2C%20then%20dispose>



Sustainable business concept: Environmental, Social, and Governance (ESG)

The components of sustainable business operations are:

E - Environmental

S - Social

G - Governance

This is the vision for an organization that drives for-profit and, at the same time, considers environmental, social, and corporate governance so that businesses can grow sustainably together with society.

The ESG policy is an important factor that investors use to assess the growth opportunities and risks to make investment decisions in a company. Many large business organizations have taken sustainability as part of their business strategies with concrete and continuous projects under the ESG concept

aligned with global sustainability goals.

An example of environmental aspects is the declaration of greenhouse gas emissions in the production in a retail shop aiming to reduce carbon emissions according to GHG Emission Scopes 1, 2, and 3 by promoting clean energy, circular economy of plastics including supporting reuse and the concept of zero waste.

Regarding the social aspect, the organization may focus on creating jobs, educational support, promoting people's health, and supporting small businesses in technology and funding.

Regarding governance, it is recommended to adhere to honesty, integrity, transparency, and fairness.



Building a green economy with the European Green Deal

The EU takes serious action in fighting climate change and pollution. It has announced the goal of building a carbon-neutral Europe by 2050 and issued the European Green Deal as a framework for 2010-2021 to build a sustainable European economy, achieve zero greenhouse gas emissions targets by 2050, and protect the natural habitat without leaving anyone behind.

The European Union aims for the European Green Deal to positively impact climate change and the environment and reflects the European Union's leadership role in global climate change as well as promoting the livelihoods of citizens and the sustainable growth of the European economy. The deal includes policies, strategies, and action plans to achieve its goals. The objectives are to promote the proper use of resources to build Europe into a green, create a carbon-free economy, promote a circular economy, restore biodiversity, and eliminate pollution in the environment. Important strategies and plans under the framework of the European Green Deal are;



The main elements of the EU Green Deal are:

- Climate action
- Clean energy
- Sustainable industry
- Buildings and renovations
- Sustainable mobility
- Eliminating pollution
- Farm to Fork
- Preserving biodiversity
- Research and development
- Preventing unfair competition from carbon leakage



- European Climate Law
- Offshore Renewable Energy Strategy to assess the potential of renewable energy supply from offshore energy sources.
- The Renovation Wave Strategy aims to provide clean and safe energy, improve the energy efficiency of buildings in the EU, and improve the quality of life of residents.
- Circular Economy Action Plan to transform European industries to a clean, circular economy.

Information from: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
<https://thaieurope.net/2021/02/12/eu-green-deal-2020-and-wp-2021/>





Sustainability adaptation in Thailand

In addition to foreign countries that make the environment and sustainability priorities, Thai businesses have also made interesting moves in sustainability. The cooperation of the public and private sector is pushing Thailand's environmental change to a place closer to that of the world community.

Greenhouse gas and The first Thai Global Warming Law

Thailand has expressed its intention to address global climate change under the Paris Agreement jointly. The goal is to reduce the emissions by 20-25 percent by 2030, which is equivalent to at least 111 million tons of carbon dioxide, through methods such as reducing the emissions from business operations both directly and indirectly (according to the Carbon Footprint Scopes 1, 2, and 3), investments on clean energy such as solar and wind, materials and products design with less resource-intensive manufacturing processes. Green purchasing in the organization, i.e., preferring environmentally benign materials, and participating in voluntary carbon credit trading projects are also in scope.

Most recently, in February 2021, the Federation of Thai Industries (FTI) and the Energy Policy and Planning Office (EPPO), Ministry of Energy signed a Memorandum of Understanding (MOU) to create a database of energy consumption of FTI members. The database will aid in setting targets of greenhouse gas reduction and creating industry standards of greenhouse gas emissions under the plan "Country-Determined Participation" or NDC, which Thailand has committed to the Paris Agreement.

The plan also supports industrial business in the Eastern Special Development Zone (EEC) to become a low-carbon industry.

In addition, on March 1, 2021, the National Climate Change Policy Committee (PEA) approved the essence of the draft Climate Change Act B.E.... and drafted a secondary legal framework, which will be presented to the cabinet for further consideration. This means that soon, Thailand will institute its first global warming law. Therefore, the private sector should start preparing for carbon reduction in the organization, including in products and services, to adapt quickly and take away advantages from competitors when the law passes, especially by utilizing technology and innovation.

Today, technological advances make becoming environmentally friendly not as difficult as it seems. For example, Dow's innovative INNATE™ plastic resin can produce stronger packaging using 18% less plastic. Therefore, it reduces greenhouse gas emissions while at the same time, it is recyclable. The innovation maintains the manufacturer's cost while increasing the packaging performance.

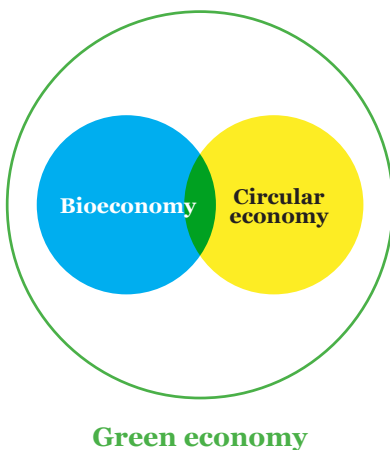
BCG is on Thailand's national agenda

The **BCG** model is an economic development concept that the Thai government has recently adopted. It consists of three major economies:

B = Bioeconomy, which focuses on using biological resources to maximum benefits. Examples are developing high nutrient or higher yields plant varieties and creating value-added from agricultural products.

C = Circular economy, linked to B, focuses on the most efficient use of resources and shifts from linear consumption to a "circle" by recycling used resources. Waste from one industry can become raw material for other industries; for example, cassava residue from starch production can be used to produce ethanol, and waste oil from paper production can be used to produce bioplastics.

G = Green Economy. It covers both B and C, aiming at solving environmental problems and creating sustainability with technology and innovation.



Taking plastics for consumers to the next level

Plastic waste management action plan 2018-2030, or the roadmap for plastic waste management in Thailand, emphasizes the use of plastic sparingly and adopts the concept of the Circular Economy by promoting the view that waste is a resource and can be reused or recycled. The effort is to ensure that no used plastic escapes into the environment.

In 2021, the government announced a plan to reduce the use of four "single use" target plastics: plastic bags thinner than 36 microns, foam food containers, plastic glasses thinner than 100 microns, and plastic straws (except for use by children, the elderly, and the sick) by 2022. The plan also aims to integrate at least 50% of the seven types of targeted plastics into the circular economy by 2022. These plastics are thick handle plastic bags, single-layer plastic film packaging, all kinds of plastic bottles, bottle caps, plastic glasses, trays, food boxes, plastic spoons, forks, and knives.

With these goals, Thailand's policies present a new challenge that manufacturers, service providers, and consumers involved in plastic packaging must move forward at the same time. Recommended actions are developing recyclable plastic packaging to bring valuable resources back into the circular economy, including managing waste sorting systems and sending waste back in for recycling.





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