

Sustainability Management in the Environmental Dimension

KCE Electronics PCL is committed to the strict conservation of standard environmental systems under related laws and regulations. There is a policy that covers efficient energy and natural resources utilization by investing in wastewater and air treatment systems properly to prevent & mitigate environmental impacts. The Company has set an environmental policy to be a guideline for Management and staff, as follows:

Environmental Management Policy

"KCE Electronics Public Company, a manufacturer and exporter of printed circuit boards (PCBs) is committed to establishing an Environmental Management System by complying with KCE's Environment Management Policy, as follows:

- Comply with legislation Requirements and regulations related to the environment.
- Reduce wastes and natural resources consumption including energy and water consumption.
- Committed to increase utilization of Solar-powered electricity
- Reduce Carbon dioxide (CO₂) emission and greenhouse gas generated from operating activities.
- Protect the environment, prevent and control pollution, including sustainable utilization of resources, reduce & control factors that potentially affect to climate changes, biodiversity, and ecosystems
- Evaluate and Implement continuous improvements of the environmental management system to enhance overall environmental protection performance.
- Cultivate environmental and energy conservation awareness by communicating to employees, contractors, suppliers and other stakeholders.

The Company had certified environmental standard ISO 14001: 2015 certification, certificate No. TH08/1461 (March 28, 2020 - March 28, 2023). Annual audit is continually conducted by SGS (Thailand) to ensure that the Company complies with the policy and strictly operates according to environmental regulations. In 2022, the annual audit was performed in February.

In addition, the Company had certified "Green Industry – level 3", by the Ministry of Industry, certificate No. GI 3-0779/2564, valid from June 25, 2021 - June 24, 2024, as the Company has systematically managed the concerned environmental activities, monitor and assess the outcome, and continuously evaluate and improve the process accordingly.

Climate Change



❖ Greenhouse Gas Management

Climate change is a critical issue that affects the global environment and livelihoods. Countries in the world realize the urgent need to collaborate in the problem solving. Thailand also has an ultimate goal of becoming the Net-Zero Emission country within 2065, hence, the company is intensely involved in this goal by performing enterprise operation greenhouse gas emissions reduction activities such as; increasing the manufacturing process efficiency, developing innovations and technologies to improve the manufacturing processes, utilizing renewable energy, promoting supplier engagement, and cultivate employees' environmental care behaviors etc.

Management Approach:

- Establish environmental policy and greenhouse gas management strategies, including targets & management plans for both direct & indirect greenhouse gas emission reduction.
- Raise awareness of risks, opportunities, and impacts of the company's operations on climate change.
- Develop manufacturing process innovations and technologies to efficiently utilize energy and resources.
- Engage with stakeholders to mitigate climate change impacts.
- Monitor and summarize annual performance.

Plans/Projects:

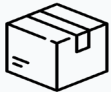













The Company has formulated a long-term greenhouse gas management plan with continual operations from 2021 to 2030 as follows.

1. Decarbonization from pre-production, inter-production, and post-production
 - Increase production efficiency: Utilize high energy-efficient equipment and machinery to reduce fuel consumption and waste.
 - Improve production with innovation and technology: Utilize automated production systems and robotics, control production with information technology systems (IT) and artificial intelligence (AI), reduce production steps and time to reduce energy consumption, optimize resource utilization, and minimize waste.
 - Promote renewable energy utilization: Install solar roof-top panels for solar energy, become a member of the Thai Renewable Energy Association (RE100) to gain access to renewable energy trading sources, and increase the proportion of renewable energy usage.
 - Promote supplier engagement: Persuade suppliers to reveal their greenhouse gas emissions and establish a greenhouse gas emission reduction plan.

- Cultivate employees' environmental care behaviors: To use resources efficiently such as paper, water consumption, etc.
2. Carbon Removal: Promote Forest restoration and regeneration.

Carbon Footprint of Organization (CFO)

The Company developed the Carbon Footprint of Organization (CFO) report in 2021, as the base year, by collecting greenhouse gas emission data from scope 1 - direct emission and scope 2 - indirect emission within the production process. The scope 3 - other indirect emission, data collection will begin in 2023. The company's CFO is shown as follows:

Upstream Activities		KCE Operations	Downstream Activities
Scope 3		Scope 1	Scope 3
Purchased goods 	Upstream transportation 	Production processes 	Downstream transportation 
Fuel-related activities 	Paper usage 	Company vehicles 	
Waste generation 	Water consumption 	Scope 2 Purchased electricity 	
Business travel 	Employee commuting 		

Remarks: Scope 1 is the direct emission from the production process.
 Scope 2 is the indirect emission from electric power consumption in the production process.
 Scope 3 is indirect emission from other pre and post production activities.

The carbon footprint of organization reports of year 2021 and 2022 were verified by SGS (Thailand) Co., Ltd. The 2021 (base year) greenhouse gas verification statement number TH-IE-22-5005385-001, data from 1st January 2021 to 31st December 2021 and the 2022 greenhouse gas verification statement number TH-IE-22-5005385-002, data from 1st January 2022 to 31st December 2022 are shown below:

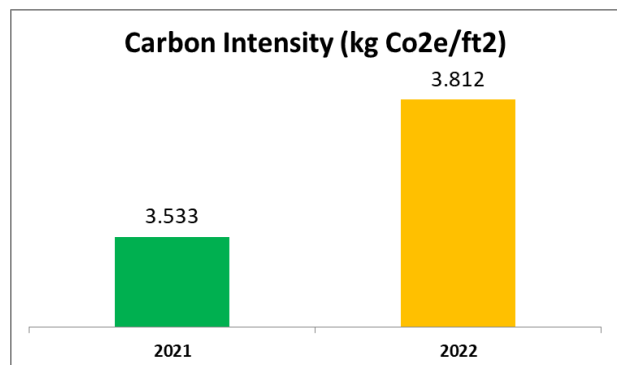
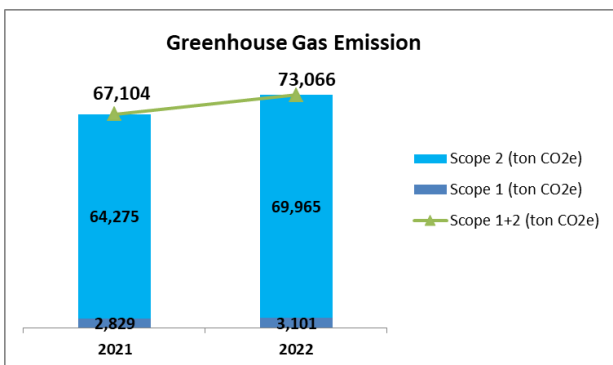


Target: To reduce the carbon intensity per production unit by 30% by 2030 in comparison to the base year 2021

Performance:

The Carbon emission of the organization and the Carbon intensity per production unit table

Year	Carbon emission (ton CO2e)			Production Output (ft ²)	Carbon Intensity (kg CO2e / ft ²)
	Scope 1	Scope 2	Total Scope 1 and Scope 2		
2021 (Base year)	2,829	64,275	67,104	18,991,472	3.533
2022	3,101	69,965	73,066	19,169,200	3.812
%Change compared to the base year	Increase 10%	Increase 9%	Increase 9%	Increase 1%	Increase 8%



Considering operation activities of 2022, the company has greenhouse gas emissions per production unit or Carbon Intensity of 3.812 kg CO₂e /ft², increased by 8% compared to 2021 (base year), due to the expansion of production capacity and increases in HDI operation proportion which has more complex production process and more energy-consuming than Multilayer operations. Therefore, the Company has to improve energy efficiency, since the main source of greenhouse gas emissions is electricity consumption.

2023 Target : To reduce Carbon Intensity by 3.38 kg CO₂e / ft²



❖ Energy Management

Energy consumption is a major cause of climate change. Hence, the company is continuously focusing on implementing efficient energy management projects and renewable energy projects to reduce greenhouse gas emissions.

KCE Electronics factory is classified as a large-size factory of Metal Products, Machinery, and Equipment and complied with Energy Conservation Promotion Act, B.E. 2535. The Company relies on two external electricity suppliers: the Metropolitan Electricity Authority and PPTC Co., Ltd. (the private power plant and electricity distributor in Lat Krabang Industrial Estate)

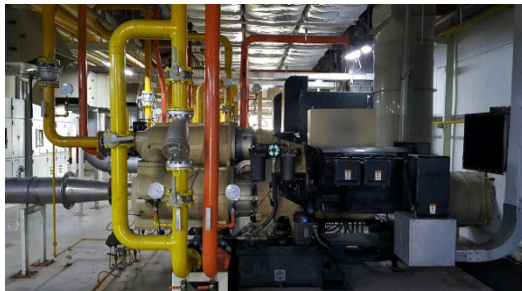
Management Approach:

- Develop energy management policies and strategies to achieve the highest efficiency.
- Assess the energy efficiency of every production unit.
- Initiate an energy efficiency improvement plan for high-energy consumption production units.
- Invest in renewable energy technologies.

Plan/Projects:

1. Energy Efficiency Improvement Project :

- Air compressor and Chillers are the two highest energy consumption equipment in the production utility system
 - Air compressors: Able to reduce energy consumption by 578,000 kWh per year, generating cost savings of 1,740,000 THB per year.
 - Chillers: Able to reduce energy consumption by 528,200 kWh per year, generating cost savings of 304,000 THB per year



2. Renewable Energy Project

- Solar rooftop installation project: to increase renewable energy consumption proportion and generate electricity for internal operation. The solar rooftop installation project phase 1 started in 2020, phase 2 in 2021, and phase 3 in 2022. In total, the project has an electricity generation capacity at 2.917 MWp.

- The solar rooftop phase 3 can replace electricity consumption by 1.157 MWh per year, generating cost savings of 4,258,000 THB per year.

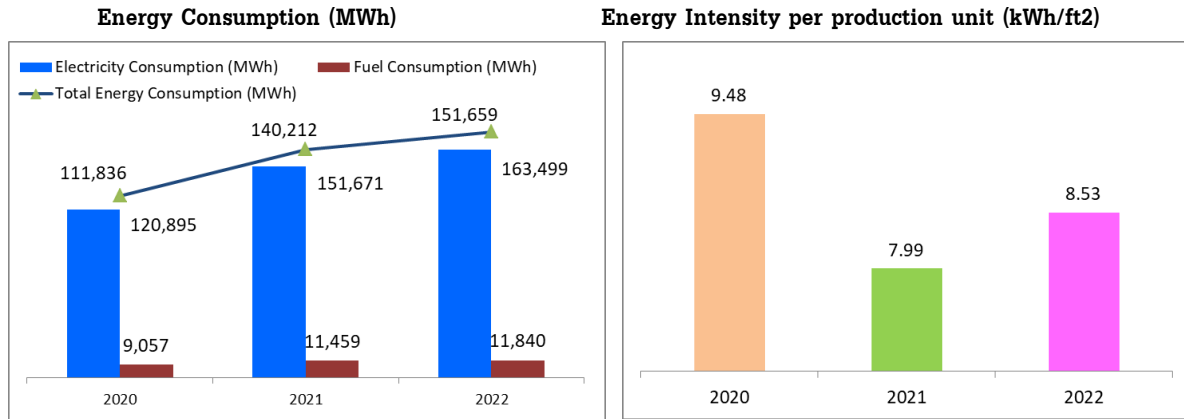


Target : To reduce 8% of energy intensity per production unit by 2027 in comparison to 2021

Performance :

Energy consumption table

List	2020	2021	2022
Electricity consumption (kWh)			
• PPTC	77,787,545	92,637,209	94,324,128
• MEA	34,050,000	47,574,764	57,335,000
Total electricity consumption (kWh)	111,837,545	140,211,973	151,659,128
Fuel consumption (kWh)			
• Natural gas	8,478,320	10,967,280	11,269,380
• Fuel oil	578,800	492,000	570,625
Total fuel consumption (kWh)	9,057,120	11,459,280	11,840,005
Total Energy Consumption (kWh)	120,894,665	151,671,253	163,499,133
Total Production Output (ft2)	12,747,614	18,991,472	19,169,200
Energy Intensity per production unit (kWh/ft2)	9.48	7.99	8.53
% Change compared to 2021	-	-	Increase 7%
Renewable energy from Solar roof-top (kWh)	762,985	1,646,326	3,674,187
% Renewable energy consumption	0.6%	1.1%	2.2%
Cost saving from renewable energy (THB)	2,797,900	6,072,200	13,485,467



According to 2022 operation, the energy intensity per production unit was 8.53 kWh/ft² which failed to achieve the target of 7.83 kWh/ft², due to the production capacity expansion and increase in HDI operation proportion which has a more complex production process and is more energy-consuming than Multilayer operations. The Company has since utilized solar energy for 3,674,187 kWh, and gained electricity cost savings of 13,485,467 THB.

2023 Target: To reduce energy intensity per production unit to 7.75 kWh/ft²

Efficient Resources Utilization



❖ Waste Management

Global waste quantity is likely to continue increasing because of industry, tourism, and community expansions. KCE is one of the growing companies with production capacity expanding; Hence, the Company is aware of the importance of waste management in accordance with laws and regulations, therefore, the waste management plan is mandatory to serve higher manufacturing capacity. The 3Rs principle (reuse, reduce, and recycle) is applied, to reduce environmental impact and waste disposal costs along with.

Management Approach:

- Manage environmental-related activities in accordance with ISO 14001:2015, environmental policy, and related laws.
- Analyze the waste sources and causes to develop the waste reduction plan.
- Prepare waste management and disposal procedures.
- Segregate wastes for appropriate treatment and disposal.
- Select, audit, and monitor the government-authorized waste disposal/treatment supplier.

Plan / Projects:

- 1. Reduce** – to reduce the amount of waste generation by manufacturing processes and other internal activities.
 - Film sludge weight reduction project: Film sludge is a hazardous waste generated from production processes and the water treatment process. Reduction of film sludge weight will decrease leakage during storage and transportation and also disposal/treatment costs. The Company has replaced the film sludge container to prevent leakage, drilled drain holes, drawn wastewater into wastewater treatment systems, and selected competent companies to professionally handle storage, transportation, and disposal.
- 2. Reuse**
 - Cleaning 25-litre and 200-litre chemical containers to have them reused.
- 3. Recycle**
 - Drinking water bottle segregation project: The Company provided a drinking water bottle segregation area at the canteen. Workers may dispose of the remaining ice and water into the wastewater treatment system and place the drinking water bottle in the designated area. Bottles will be later sold to the recycler.
 - Selection of capable waste disposal companies who can process the wastewater that contains precious metals such as copper and gold, in order to properly recycle the precious metals for other industries.

Target: To reduce 12% of waste per production unit by 2027 in comparison to 2021.

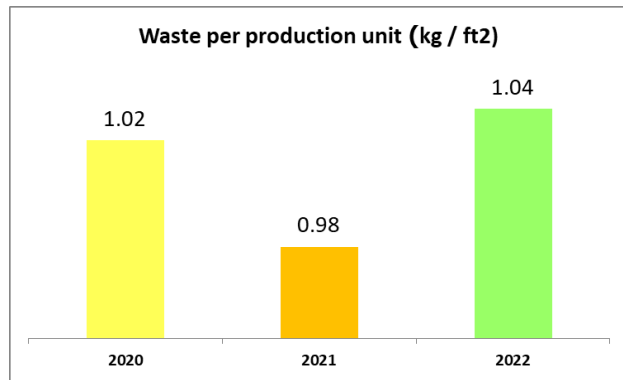
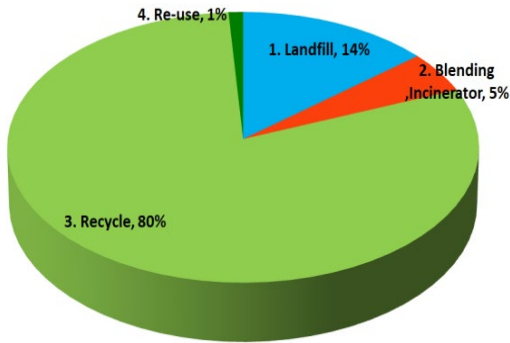
Performance :

- Film sludge weight reduction project: The company achieved a 14% film sludge weight reduction (10% in 2021) while 2022's target was 13%. This saved 321,609 THB in waste management costs.
- Selection of waste disposal companies: According to 5 years' assessment, including 2022, the selected waste disposal companies have never received any complaints or performed any illegal actions.

Waste generated table

Waste sorted by disposal method	Weight of waste		
	2020	2021	2022
1. Landfill	1,603	2,748	2,924
2. Blending ,Incinerator	673	877	1,038
3. Recycle	10,659	14,855	15,680
4. Re-use	123	216	221
Total waste (ton)	13,058	18,695	19,863
Total production output (ft2)	12,747,614	18,991,472	19,169,200
Waste per production unit (kg / ft2)	1.02	0.98	1.04
% Change compare to 2021	-	-	Increase 5%

% Waste by Disposal Method



According to 2022 operations, the amount of waste per production unit was 1.04 kg/ft2, which failed to achieve the target of 0.96 kg/ft2 due to the production capacity expansion and increase in HDI operation proportion which has a more complex production process and heavier weight per area compared to Multilayer, resulting in an

incremental amount of waste from the production process. However, the Company has continuously improved its production processes to reduce waste from production to meet the target, including controlling and prompting campaigns on efficient resource utilization.

2023 Target: To reduce waste per production unit to 0.95 kg/ft²

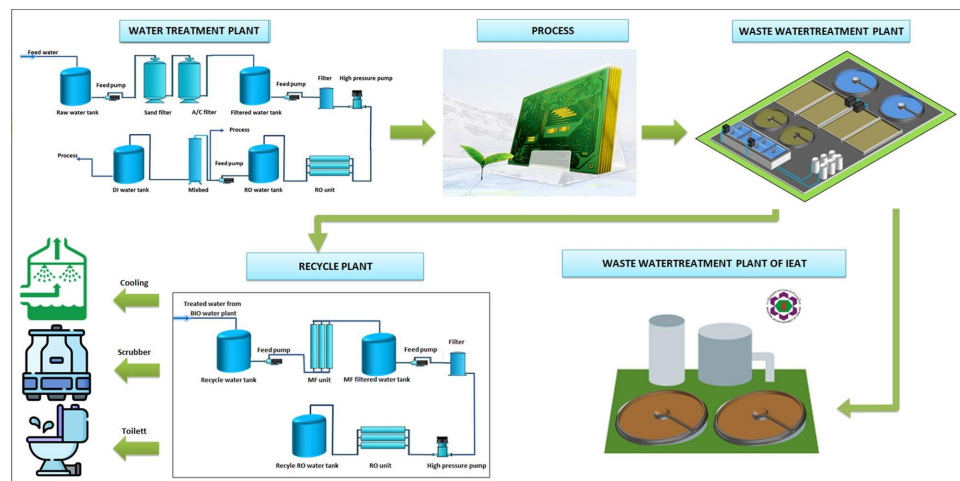


❖ Water Management

Water is an important resource, necessary in both industrial and agricultural sectors. The water demand has an increasing trend due to economic expansion, community expansion, and also climate variability. The Company recognized the importance of water management, therefore the water utilization enhancement acts have been continuously initiated and implemented, in order to reduce water consumption, enhance water recycling, and raise awareness of efficient water utilization.

The Company is located in Lat Krabang Industrial Estate, which receives water supply from the Metropolitan Waterworks Authority and distribute it to factories within the industrial estate. The Company has utilized water for both production processes and general consumption. A large amount of water is used in the printed circuit board manufacturing processes. Hence, the efficiency of wastewater treatment is very important in order to prevent environmental impacts, thus, there is regular monitoring of the various pollution measurement in accordance with legal regulations.

Water usage activities of the company



Management Approach:

- Monitor the water consumption efficiency of every production unit.
- Continually develop the improvement plan for water consumption efficiency using 3Rs principle.
- Develop the water consumption reduction plan and increase recycling efficiency.
- Manage wastewater quality in accordance with laws and regulations.

Plan/ Project:

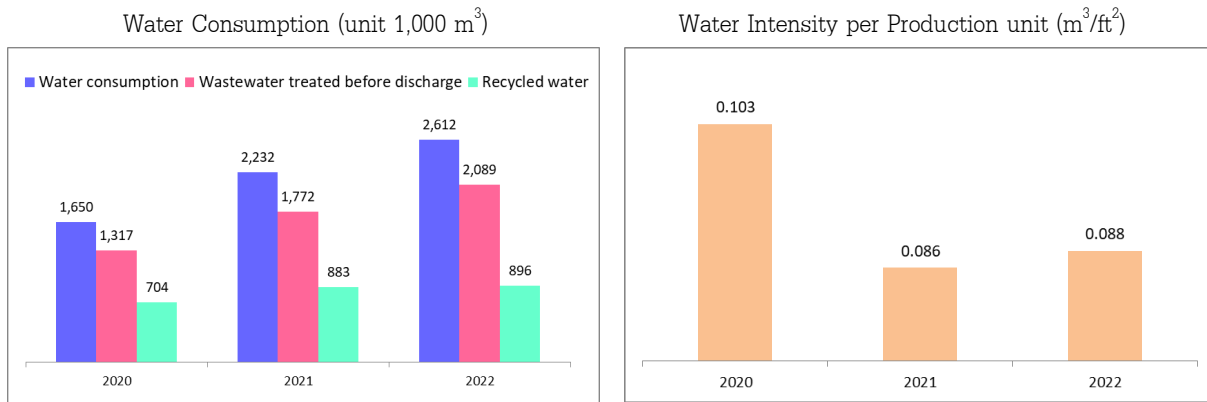
1. **Reduce:** Reduce water consumption, water loss, and improve efficiency of water used in the production process.
2. **Recycle:** Implement water recycling technology for Cooling, wet scrubber, and toilet flushing systems
3. **Reuse:** Reuse processed water (without any treatment) in non-production activities
4. **Wastewater treatment:** Monitor and control wastewater quality to comply with related laws.

Wastewater is generated from chemicals used in the production processes, product rinsing processes, cooling systems, air scrubber systems, lavatory cleaning, and kitchen cleaning. Wastewater will be collected in the sump tank and then transferred to the Metal Precipitation wastewater treatment and Biological Treatment systems. The monthly wastewater measurement was performed as required by legal requirements by Global Utilities Services Co., Ltd., and Chemlab Services (Thailand) Ltd., which were both certified with ISO/IEC 17025 standards.

Target : To reduce 10% of water intensity per production unit by 2027 in comparison to 2021

Performance :**Water Consumption Table**

List	2020	2021	2022
Water consumption (m3)	1,649,640	2,231,852	2,611,591
Water intensity per production unit (m3/ft2)	0.103	0.086	0.088
% Change compare to 2021	-	-	Increase 2%
Volume of wastewater treated before discharge (m3)	1,317,312	1,771,638	2,089,246
% Wastewater treated before discharge	80%	80%	80%
Volume of recycled water (m3)	703,620	883,037	895,880
% Recycled water	42%	42%	45%



According to 2022 operation, the water intensity per production unit was 0.088 m³/ft², which failed to achieve the target of 0.084 m³/ft², due to the production capacity expansion and increase in HDI operation proportion which has a more complex production process compared to Multilayer. However, the Company achieved 45% in recycling, against the target of 40%, resulting in a reduction of 36,811,004 THB of water cost. The quality of wastewater treated before discharge also passed the legal criteria. There were no wastewater quality complaints.

2023 Target: To reduce the water intensity per production unit to 0.83 m³/ft²



❖ Product Responsibility

KCE aims to become the world's leading PCB manufacturer for sustainability, and create business growth while being responsible on environmental and social, and governance (ESG). The Company has established a green procurement policy that contributes to environment friendliness throughout the product life cycle, from material sourcing to products' carcass management after its expiration.

Management Approach:

- Establish a green procurement policy that contributes friendliness to the environment throughout the product life cycle.

Plan / Projects:

1. Sourcing local suppliers or Localization

The Company focuses on the localization of raw materials and key components to local suppliers by establishing local supplier network to elevate social and economic improvement within communities and to reduce the environmental impacts in the supply chain.

Target and Performance : Obtain Thailand's local key suppliers for raw materials supplies

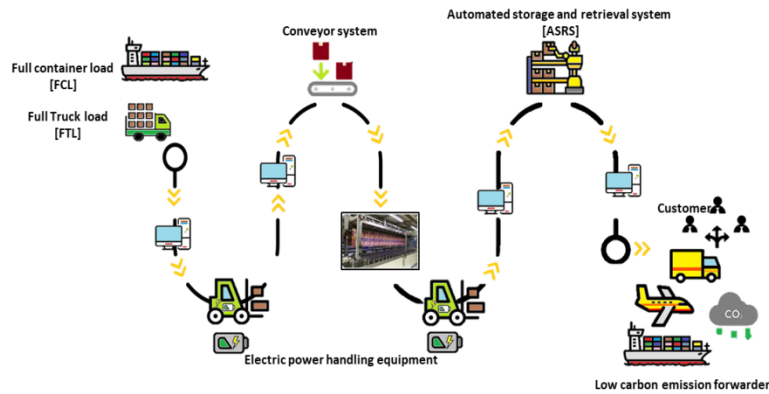
Type of Supplier	Performance	Short-term	Medium-term	Long-term
	2022	By 2023	By 2025	By 2030
Key Suppliers	50%	51%	52%	55%

2. Green Logistics Management

The Company follows Green Logistics Management Plan with the intention of creating environmental friendliness, for instance:

- Ensure that every shipment from the supplier to KCE are full truck load (FTL) or full container load (FCL).
- Select sea freight as the main delivery mode to reduce greenhouse gas emissions.
- Use the electronic data interchange (EDI) system for custom clearance process to reduce the paper consumption and increase the information transfer speed.
- Encourage the use of equipment in logistic operations that can reduce greenhouse gas emission; promoting the use of electrical handling equipment such as Stacker and Electrical Forklift.

Value Chain Diagram



Target and Performance : Effectively reduce environmental impacts with Green Logistics Management Plan

Project details	Performance	Target	
	2022	2023	2024
Full Container Load (FCL)	55%	60%	65%
Seafreight shipment	40%	45%	50%
Electronic Data Interchange (EDI)	80%	85%	90%
Use of electrical handling equipment			
- Forklift	55%	As per remark	As per remark
- Stacker	100%	100%	100%
Remark ** Modifications or changes depending on its service life			

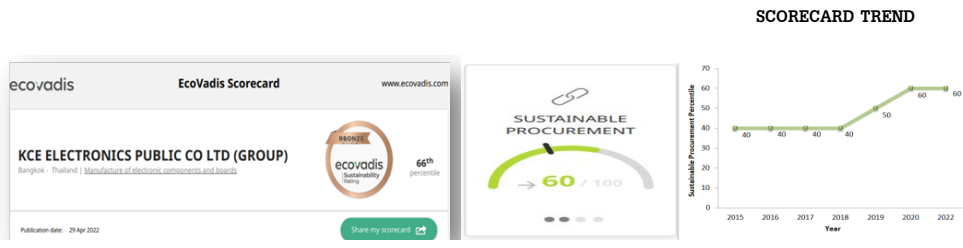
3. Engaging with EcoVadis

EcoVadis is a holistic sustainability ratings service organization that is recognized covering 200 industry categories, 160 countries, and 75,000 companies of all sizes worldwide. On yearly basis, EcoVadis will evaluate the sustainability management and the management system of each company on how well the business operates.

The methodology builds on international sustainability standards, including Global Reporting Initiative, United Nations Global Compact (UNGC) and ISO 26000 (Social Responsibility Guidelines), covering 21 indicators across 4 key areas: environment, labor and human rights. Ethics and Sustainable Procurement

Target: Continuously develop to achieve goals

Performance: EcoVadis score for Sustainable Procurement as of April 2022 was 60%.



4. Eco Packaging

The Company recognizes the importance of products that may have an impact on the environment therefore the eco packaging project has been established which concerns environmental safety by using biodegradable or recyclable raw materials.

The Company adheres to waste management policies with 3R principles, such as, reusing second-hand euro pallets for international exports or selecting 100% biodegradable/recyclable packaging materials such as wooden pallets, packing paper, corner paper, and paper boxes.

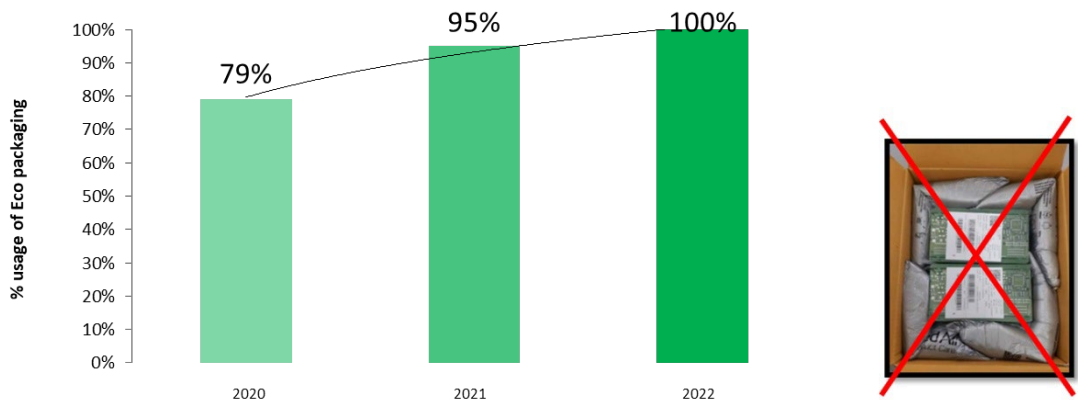
Target: Use 100% environmentally friendly packaging

Performance:

The Eco packaging project has been continually operating from 2020 to 2022 and has achieved the Target of 100% since June 2022, which could reduce the cost of foam and machine parts worth 4,500,000 THB.

In order to maintain 100% achievement in 2023, Sustainable Eco Packaging Project had been implemented, the wrapping process requirements were identified, and regular internal auditing was performed.

Graph showing the changes of shock-prevention packaging from using Foam to No Foam.



5. Responsible Raw Material Sourcing

The Company has a procedure to manage hazardous and environment-related substances starting with the material selection, product design including subsequent design changes, and supplier selection, supplier audit, incoming inspection, in-process inspection, product realization process and delivery to ensure that every department strictly follow procedures. This includes R&D, procurement, quality assurance, production processes, as well as in compliance with the standards including the RoHS Directive (Restriction of Hazardous Substances), REACH Directive (Registration, Evaluation, Authorization, and Restriction of Chemicals), and SVHC Substances (Candidate List of Substances of Very High Concern).

Target: Major raw materials are 100% comply with the Hazardous Substance Directives

Performance: 100% of major raw materials are in compliance with the Hazardous Substance Directives