2024

Transportation manufacture industry of Taiwan

Manual of Net Zero Emissions Actions

Together! Faster!

Contents

Foreword

Climate change has become an issue that globally concerned. The international climate convention, "Paris Agreement," which came into effect in 2016, aims to limit the global average temperature increase within 2°C above pre-industrial levels, with efforts to further control the increase in 1.5°C. To achieve this ambitious goal, countries must take action to reduce greenhouse gas emissions, promote the development of renewable energy, and drive low-carbon transitions across industries. As a critical part of the global supply chain, Taiwan is also actively responding to this global carbon reduction movement.

The European Union had already launched the "EU Emissions Trading Scheme" (EU ETS) as early as 2005, establishing the world's largest carbon trading market. Under this system, different industries are allocated varying amounts of carbon emission allowances, with companies receiving a certain proportion of free allowances. However, if a company's emissions exceed the amount allocated during the period, it must purchase additional carbon credits in the trading market to cover the excess emissions. Taiwanese authorities began planning to levy carbon fees in 2023, which also includes certain Taiwanese vehicle manufacturers and upstream supply chains. Furthermore, around 60 listed companies in the vehicle industry are subject to carbon verification schedules and climate risk disclosure regulations set by the Financial Supervisory Commission in its "Sustainability Pathway for Listed Companies." In addition, as market demand changes, the sustainability requirements and standards of international supply chain customers are becoming stricter steadily, while Europe and the United States are introducing harsher and more specific carbon emission regulations to address issues like carbon leakage that arose from earlier policies.

The transport equipment manufacturing industry, which includes automobiles, motorcycles, and bicycles, plays a crucial role in the pursuit of net-zero emissions. These industries are committed to manufacturing low-carbon vehicles, reducing carbon emissions from the transportation sector, and promoting low-carbon travel and green consumption. In manufacturing, they are working to reduce emissions during the production process, driving a comprehensive low-carbon transition. In recent years, with rising pressures from both domestic and international demands for low-carbon vehicles, industrial decarbonization, energy transitions, green finance, and justice transitions, the transport equipment manufacturing industry has been increasingly challenged to meet low-carbon transformation expectations.

In response to domestic and international carbon reduction pressures, Taiwan's automobile, motorcycle, and bicycle manufacturers have successively established long- and short-term carbon reduction targets and action plans. They have also begun collaborating with suppliers, the government, and industry associations to jointly promote carbon reduction measures. For example, the Taiwan Transportation Vehicle Manufacturers Association and the government have reached a consensus: "Vehicle manufacturers and their supply chain partners will implement carbon reduction measures, investing funds, manpower, and research capacity to contribute to the effort to limit global warming to within 1.5°C." In 2023, through joint efforts by various public, private, academic, and research institutions, Taiwan’ s vehicle industry invested NTD$33.17 million, achieving an annual carbon reduction of 5,574 tons, marking an inspiring beginning.

Global Policies and International Brand Climate Targets

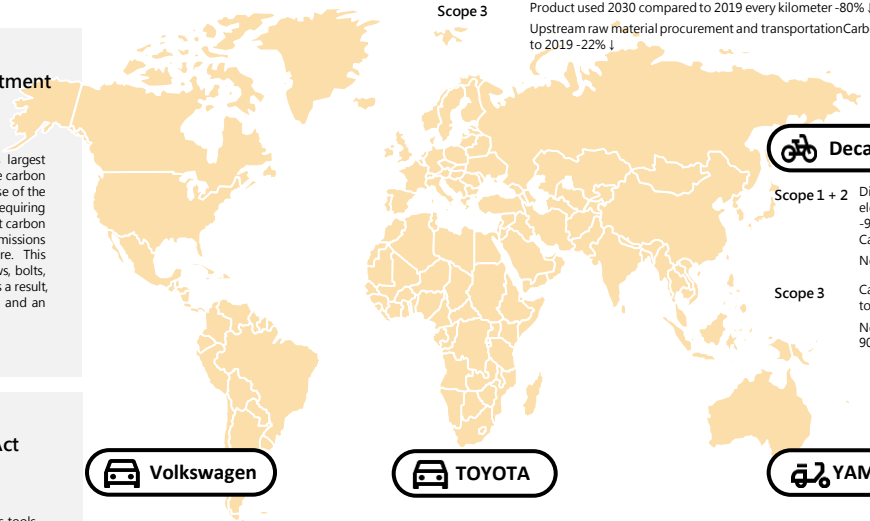
In the global shift towards net-zero carbon emissions, the transport equipment manufacturing industry is a key focus due to its high emissions. Major economies like the EU and the US have established carbon trading systems and strict reduction policies, pushing the automotive industry towards net-zero goals. Leading automakers from Europe, Japan, and the US have committed to achieving net-zero emissions by 2050 or earlier, highlighting the crucial role the global automotive industry plays in the low-carbon transition.

EU Carbon Border Adjustment Mechanism (CBAM)

The EU Emissions Trading System, the world' s largest mandatory carbon trading market, aims to mitigate carbon leakage. In October 2023, the EU began a trial phase of the Carbon Border Adjustment Mechanism (CBAM), requiring European importers of regulated products to report carbon emission data, with plans to charge for excess emissions through corresponding certificates in the future. This includes vehicle-related components such as screws, bolts, iron and aluminum tubes, and aluminum fittings. As a result, "carbon" is gradually becoming a bargaining chip and an opportunity in international trade negotiations.

U.S. Clean Competition Act (CCA)

The U.S. views carbon border adjustment policies as tools to promote global industrial emission reductions. To mitigate the impact of the EU's CBAM on U.S. exports, the U.S. Senate introduced the Clean Competition Act (CCA), which imposes a carbon intensity fee on primary products (such as glass, steel, aluminum, and chemicals) if their carbon emissions exceed the U.S. average for similar products. Once implemented, this is expected to affect Taiwanese industries as well.



BMW

Scope 1 + 2	Direct emissions and indirect electricity by 2030 compared to 2019 -80% ↓
Scope 3	Product used 2030 compared to 2019 every kilometer -80% ↓ Upstream raw material procurement and transportationCarbon intensity by 2030 compared to 2019 -22% ↓

Decathlon

Scope 1 + 2	Direct emissions and indirect electricity by 2026 compared to 2016 -90% ↓ Carbon intensity -53% ↓ Net zero emissions in 2050
Scope 3	Carbon intensity by 2026 compared to 2016 -53% ↓ Net zero emissions in 2050 90% of supply chain set SBTs in 2026

Volkswagen

Scope 1 + 2	Direct emissions and indirect electricity by 2030 compared to 2018 -50.4% ↓
Scope 3	The whole life cycle of the product by 2030 compared to 2018 -30% ↓

TOYOTA

Scope 1 + 2	Direct emissions and indirect electricity by 2035 compared to 2019 per vehicle -68% ↓
Scope 3	Product used 2030 compared to 2019 Carbon intensity of middle and heavy truck -11.6 % ↓ Carbon intensity of passenger cars and light vehicles -33.3 % ↓

YAMAHA

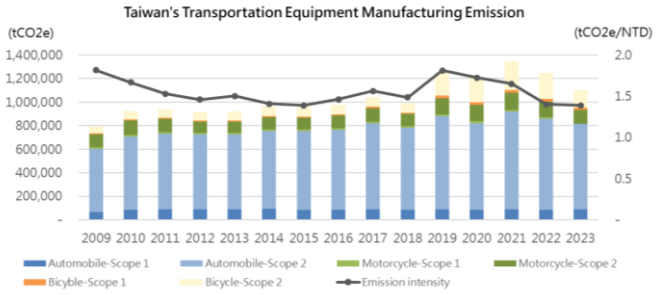
Scope 1 + 2	Direct emissions and indirect electricity by 2030 compared to 2010 -80% ↓ Carbon neutrality in 2035
Scope 3	Product used 2030 compared to 2019 Carbon intensity -24% ↓ Carbon neutrality of product in 2050

Taiwan's Transport Equipment Manufacturing Emissions

Taiwan, as an export-oriented country, sees 70% of its annual automobile production and 90% of its bicycle production exported, while the annual export volume of motorcycles reaches 400,000 units. With the advancement of international climate agreements and the EU's carbon border tariff policies, Taiwan's vehicle industry faces increasing pressure to accelerate its low-carbon transition. Moreover, international brand clients and parent companies have set clear carbon reduction targets and plans, progressively passing down the pressure for low-carbon product development to the supply chain. They require suppliers to provide accurate emissions data and encourage further carbon reduction to ensure competitiveness and compliance in the global market.

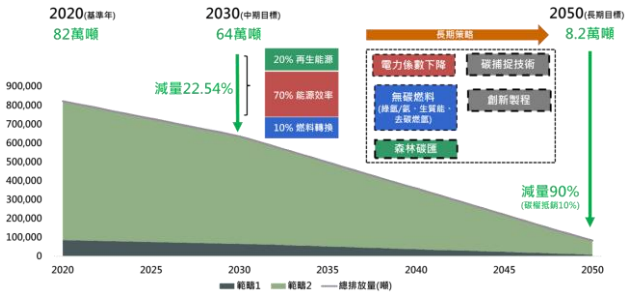
As shown in Figure 1, carbon emissions from the automobile and parts manufacturing industry can be analyzed by scope. Over the years, approximately 90% of emissions from this sector have come from Scope 2 (indirect emissions from energy), while Scope 1 (direct emissions) accounts for only 10%. Observing the long-term trend from 2009 to 2022, carbon emissions in this sector started at around 600,000 tons of CO2e in 2009 and have shown a slight upward trend, reaching approximately 860,000 tons of CO2e in 2022—an increase of 42.42% compared to 2009.

Additionally, the carbon intensity of the automobile and parts manufacturing industry, which refers to the amount of carbon emissions per unit of output value, can be used to assess the sector’ s carbon emission efficiency. In 2009, the carbon intensity was 2.11 tons of CO2e per million NTD. It slightly decreased, reaching a low of 1.63 tons of CO2e per million NTD in 2014. However, it gradually rose to 2.12 tons by 2019, before starting to decrease annually, reaching 1.76 tons of CO2e per million NTD in 2022—a reduction of 16.55% compared to 2009.



source: CIER (2024/9/25)

In terms of reduction targets, some domestic vehicle manufacturers, such as China Motor Corporation (CMC), are still unable to follow the Science Based Targets initiative (SBTi) carbon reduction pathway. This pathway is not only applicable to vehicle manufacturers but also to parts suppliers. Therefore, the carbon reduction targets align with those set by Taiwan's National Development Council (NDC). The baseline year for the NDC's targets is set to 2005; however, there is no available carbon emissions data on that year. After considering the accuracy of emissions data, 2020 was chosen as the baseline year. The mid-term target year aligns with the national target of 2030, and the long-term goal is to achieve net-zero emissions by 2050. Upon recalculation, the national goal of a 24% reduction in emissions by 2030 compared to 2005 translates to a 22.54% reduction compared to 2020. Therefore, the industry has set its 2030 target as a 22.54% reduction from 2020 levels.



In the short term (before 2030), carbon reduction strategies will primarily focus on commercially available technologies, ranked by their contribution to emission reductions as follows: "improving energy efficiency," "adopting renewable energy," and "fuel switching." The long-term strategies from 2030 to 2050 will rely on net-zero technologies that are not yet commercially available, such as biofuels, carbon-free fuels like green hydrogen or decarbonized hydrogen, and carbon capture technologies. Additionally, the expansion of national renewable energy infrastructure is essential to reduce the carbon intensity of the national electricity grid. Any remaining emissions after implementing reduction measures will depend on forest carbon sinks or carbon credits.

Industry Consensus: Accelerating Diffusion through Collaboration

As environmental standards continue to rise with evolving times, green energy has become the core focus of the vehicle industry's development. The Taiwan Transportation Vehicle Manufacturers Association and the government have reached a consensus: vehicle manufacturers and their supply chain partners will actively implement carbon reduction measures by investing funds, manpower, and research resources to collectively limit global warming to within 1.5°C. Following the National Development Council's "Taiwan 2050 Net-Zero Emissions Pathway" for electric vehicle development, manufacturers will strongly promote the advancement of electrification and carbon-free transport. The Vehicle Manufacturers Association also plans to establish a shared platform to integrate member needs and government resources, share carbon reduction technologies, and successful case studies, to drive the entire vehicle industry toward achieving the net-zero emissions goal.

With the support of government resources, combined with an industry-academia collaboration model, expert teams are dispatched to address the needs of businesses. These teams provide consultation and diagnostics for low-carbon and smart transformation, helping companies identify internal issues and offer relevant improvement suggestions. They also conduct carbon inventories and cultivate industry capabilities for low-carbon transformation, driving the industry toward low-carbon and smart upgrades, thereby enhancing international competitiveness.

Currently, over 200 companies have participated in the seed training camps, carbon inventory diagnostics, and net-zero emissions guidance programs. The participation from the transport equipment industry supply chain is as follows: the automotive sector is led by China Motor Corporation (CMC), Kuozui Motors, and Yulon Motor; the motorcycle sector includes Kymco, SYM, Yamaha, and Aeon Motor; and the bicycle sector is represented by Giant, Merida, and Decathlon. These companies have had a significant influence on the supply chain, encouraging over 20 to 50 suppliers to pursue net-zero targets.

Net-zero emissions have become a consensus and goal in international markets and among governments worldwide. For example, Kuozui Motors has, since 2023, assisted nearly 20 partner suppliers in participating in post-pandemic low-carbon and smart transformation guidance projects, producing low-carbon and smart diagnostic reports as well as carbon inventory reports. Kuozui also led 11 partner suppliers to achieve an annual carbon reduction of over 4,000 tons through technological innovations (such as replacing hydraulic forming machines with all-electric forming machines), daily improvements (such as using high-efficiency variable frequency motors instead of fixed frequency motors), and energy management measures. In alignment with Toyota's carbon neutrality goals, Kuozui and its supplier association have actively responded by conducting factory carbon inventories, daily improvements, and process innovations, contributing to the global effort to mitigate climate impacts.

China Motor Corporation (CMC) has been actively promoting a "large leading small" strategy in its low-carbon transformation efforts. Since 2023, through its "Low-Carbon Transformation Guidance Project," CMC has assisted over 20 partner suppliers in conducting carbon inventories and introducing low-carbon technologies. It has provided practical carbon reduction suggestions, such as process improvements (replacing with high-efficiency motors and implementing energy management systems), and produced professional carbon inventory and improvement reports. Additionally, CMC has collaborated with its partner suppliers, investing funds and technical resources to promote a series of low-carbon technology upgrades, such as using more efficient production equipment and renewable energy. CMC's strategy not only focuses on carbon reduction cooperation within its supply chain but also encourages its partner suppliers to actively participate in industry associations for carbon reduction technology sharing and successful case exchanges, thereby strengthening the overall supply chain's capacity for green transformation.

Building Carbon Management Competency

For the transport equipment industry, carbon management and achieving net-zero emissions present a completely new challenge. Traditionally, the industry has focused on improving production efficiency and reducing costs, with little experience in carbon emissions management. However, with increasing global carbon reduction pressures and stricter policies, the transport equipment industry must quickly build carbon management competency. This includes carbon inventory, target setting, and the application of carbon reduction technologies to effectively respond to market changes and maintain a competitive edge.

Executive Awareness → Basic Capability → Advanced Strength → Benchmark Learning

Lead with Net-Zero: Trends and Policies for Executives

Following the steps for corporate net-zero carbon implementation, along with industry examples, news trends, and community exchanges, this section breaks down and analyzes carbon emission calculations, appropriate target setting, the selection of carbon reduction technologies, and carbon credit systems. By integrating the government's net-zero targets and policies, it helps companies better understand and navigate their objectives.

Build Data Foundation! Calculate Carbon Emission

Experienced and internationally certified instructors and teaching assistants guide companies through the standards for organizational carbon inventory (ISO 14064-1) and product carbon footprint inventory (ISO 14067). By combining practical exercises, they help companies efficiently complete routine data collection tasks.

Integrate Carbon Reduction into Governance!

Collaborating with carbon management experts, companies can assess the impact of carbon pricing policies—such as carbon taxes, offsets, and carbon border adjustments—on operations. Practical case studies help design strategies for energy management, science-based targets, and internal carbon pricing, ensuring effective carbon reduction.

Standing on the Shoulders of Giants! Learn from Leaders

Through cross-industry exchanges and sharing of current experiences, companies can gain foresight into the challenges and solutions they will face on their carbon reduction journey. From short-term plans to long-term strategies, this collaboration fosters innovation for a net-zero future and helps facilitate win-win cross-sector partnerships, leveraging strengths to create green business opportunities.

Promoting Carbon Reduction Strategies and Measures

Carbon Management Mechanisms and Carbon Reduction Technology Guidance Programs

Technical research institutions and management consultants provide on-site consultations to identify carbon reduction needs, guide companies in applying for transformation subsidies, complete carbon inventories, and pass third-party verification. They also assist in preparing inventory lists and reports. The outcomes include ensuring that team members understand the greenhouse gas inventory process and identify emission sources, empowering companies with internal verification capabilities for carbon inventories, and ensuring the correct execution of carbon reduction strategies. Additionally, the results of the carbon inventory are used to plan the company's future digital transformation pathway.

Analysis of Net-Zero Carbon Reduction Strategies for the Transport Equipment Manufacturing Industry

In 2023, expert consultation meetings were held separately for the automotive, motorcycle, and bicycle industries, focusing on net-zero carbon reduction goals and strategies. The discussions covered topics such as cost reduction curves and reduction technology surveys, methods for setting reduction targets in the transport equipment industry, comprehensive evaluations of corporate net-zero transitions, the feasibility of linking product carbon footprints to commodity taxes, and future improvements in promoting industry and SME upgrades and transformations.

Promoting Low-Carbon and Smart Upgrades in the Transport Equipment Manufacturing Industry

In the post-pandemic period, guidance was provided for low-carbon and smart transformation, including factory carbon inventories. In 2023, 53 companies completed Scope 1 and 2 carbon inventory reports, with 35 of them obtaining SGS verification. Additionally, low-carbon and smart diagnostics were conducted, resulting in 128 reduction proposals, identifying 3,286 tons of potential carbon reductions, and facilitating investments exceeding NT$20 million.

Carbon Management Mechanisms and Carbon Reduction Technology Guidance Programs

Through the introduction of circular materials, energy management, aluminum melting, and energy-saving technologies in stamping processes, companies are assisted in adjusting their production processes and improving line efficiency. This includes optimizing parameters, scheduling, and technology, achieving process control and optimization that reduces costs and material usage, while enhancing resource utilization and profitability. At the same time, these measures reduce production costs, improve quality, save energy, and support sustainable development for businesses. This not only promotes industry investment but also significantly reduces corporate carbon emissions.

Low-Carbon Processes

Taking the companies participating in the 2023 carbon management mechanism and technology guidance program as an example, achievements include increasing the use of recycled plastics, reducing waste, and optimizing energy consumption in processes. These efforts have established a low-carbon production line for recycled plastics that meets international carbon reduction standards, becoming a model for the green supply chain of domestic transport equipment components. This initiative advances the goal of net-zero carbon emissions and strengthens the resilience of the industry' s supply chain towards net-zero.

Production Line Efficiency Improvement

Taking the companies participating in the 2023 carbon management mechanism and technology guidance program as an example, achievements include improving yield rates, developing new materials, automating process monitoring, replacing systems with more efficient ones to reduce working hours, and improving structural designs. These improvements can be promoted across the entire industry, enabling the transport equipment sector to learn and progress together.

Global Low-Carbon Cooperation

In recent years, the rise of green consumption and low-carbon mobility in Europe and the U.S. has driven the market for electric-assisted bicycles, aligning with global carbon reduction trends and pushing the global bicycle industry toward a net-zero transition. Taiwan, known as the "Bicycle Kingdom," has a comprehensive supply chain and continually advancing technology and design, making it a favorite among many European and American brands.

To help the bicycle component manufacturing industry tap into international low-carbon trends and opportunities, the Chung-Hua Institution for Economic Research (CIER) signed a Memorandum of Understanding (MOU) with Decathlon, the top bicycle brand in Europe, under the witness of the then Director-General of the Industrial Development Bureau, Lien Chin-Chang. This collaboration promotes cross-border low-carbon cooperation in five key areas: education and training, the use of renewable energy, improving factory energy efficiency, reducing single-use plastics, and expanding the use of sustainable materials. By learning from international methods and experiences, Taiwan' s bicycle industry is advancing its low-carbon transition, enhancing its competitiveness in the global market.

Training and Education

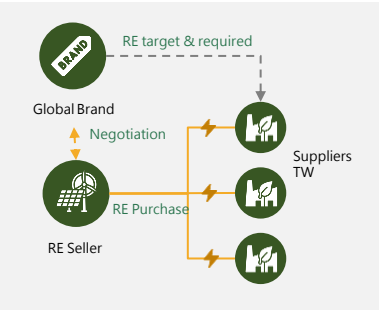
Building knowledge and consensus is the first step toward reducing carbon emissions in the supply chain. By assisting 28 Taiwanese bicycle supply chain companies in calculating factory emissions and component carbon footprints, they gain an understanding of their emissions data and hotspots. Based on scientific methods, these companies can then set targets and roadmaps to initiate carbon reduction actions. For example, as indirect electricity use is the primary source of emissions in the bicycle industry, improving factory energy efficiency and expanding the use of renewable energy have become critical challenges for component manufacturers.

Improving Factory Energy Efficiency

Enhancing energy efficiency not only helps reduce carbon emissions across the supply chain but also saves energy costs for businesses. However, its effectiveness depends on robust management practices, effective solutions, and continuous improvement efforts. Through three key steps—energy efficiency maturity assessments, foundational knowledge building, and solution matching—we assist Taiwanese suppliers in understanding international brand requirements for energy efficiency maturity. After learning the underlying principles and international methodologies, we invite four domestic and international energy management companies to share their solutions. This helps match digital energy efficiency tools to ease the burden of data collection and analysis, uncovering potential energy-saving opportunities in factories.

Expanding the Use of Renewable Energy

To address the challenge of limited purchasing power and negotiation space for individual Taiwanese suppliers when procuring green energy, we have leveraged the strength of international brands to establish Taiwan' s first joint procurement model for small and medium-sized enterprises (SMEs). This model integrates the energy purchasing needs of the supply chain, enabling them to secure renewable energy at more competitive prices. The first group of five SME suppliers participated, with an annual procurement total exceeding 1 million kWh, resulting in a reduction of 495 tons of CO2e annually.



Conclusion & Future Outlook

In response to the escalating global warming crisis, companies are facing risks related to supply chain disruptions, high carbon costs, or loss of orders due to the need for low-carbon transitions. At the same time, there are opportunities to capitalize on low-carbon business prospects. Many companies have already begun their journey toward net-zero emissions, with over 200 businesses in the transport industry participating in seed training camps, carbon inventory diagnostics, and net-zero emissions guidance programs. Some early adopters, primarily large enterprises, have leveraged their supply chain relationships to lead 20 to 50 suppliers toward net-zero, demonstrating significant influence within the supply chain.

Since carbon reduction policies often involve decisions made at the management level, having a solid understanding of carbon management is crucial. First, it is important to comprehend both domestic and international carbon reduction policies and trends, so businesses can grasp the basic principles and make informed decisions on suitable carbon reduction methods. Next, gathering product carbon emission data and establishing a carbon data management foundation is essential. Finally, companies should integrate the carbon reduction mindset into corporate governance and make use of various carbon reduction tools and techniques. Additionally, learning from industry benchmarks and pioneers can help companies anticipate potential challenges and solutions in their own journey.

On the technical front, the impact of technologies on achieving net-zero emissions is equally important. For instance, companies that participated in the 2023 carbon reduction technology guidance program have introduced technologies such as circular materials, energy management, and energy-saving processes for aluminum melting and stamping, helping to decarbonize production processes and improve production line efficiency. These efforts not only support sustainable business development but also significantly reduce corporate carbon emissions while fostering industrial investment.

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