World Display device Industry Cooperation Committee Environmental Report

The World Display device Industry Cooperation Committee (WDICC) is currently organized by 3 members: Taiwan Panel & Solution Association (TPSA), Korea Display Industry Association (KDIA), and China Optoelectronics and Optoelectronics Manufactures Association Liquid Crystal Branch (CODA). WDICC is aiming at display industry's global cooperation on climate change and various environmental issues. Japan Display Device Industry Committee (JDDIC) officially suspended from WDICC in the year 2020.

With climate change emerging as a serious global issue, WDICC issues this report in an attempt to publicize efforts to mitigate the impact that display has on the climate change. This report will be updated every 3 years.

WDICC members are collecting and analyzing greenhouse gas emissions, including Scope 1 and 2, as well as F-gas emissions, to effectively respond to the climate crisis caused by greenhouse gases. This report covers a 10-year period from 2014 to 2023 including F-gas emission trends, emission reduction technologies, regulatory trends of each association regarding greenhouse gases, and other environmental efforts from 2014 .

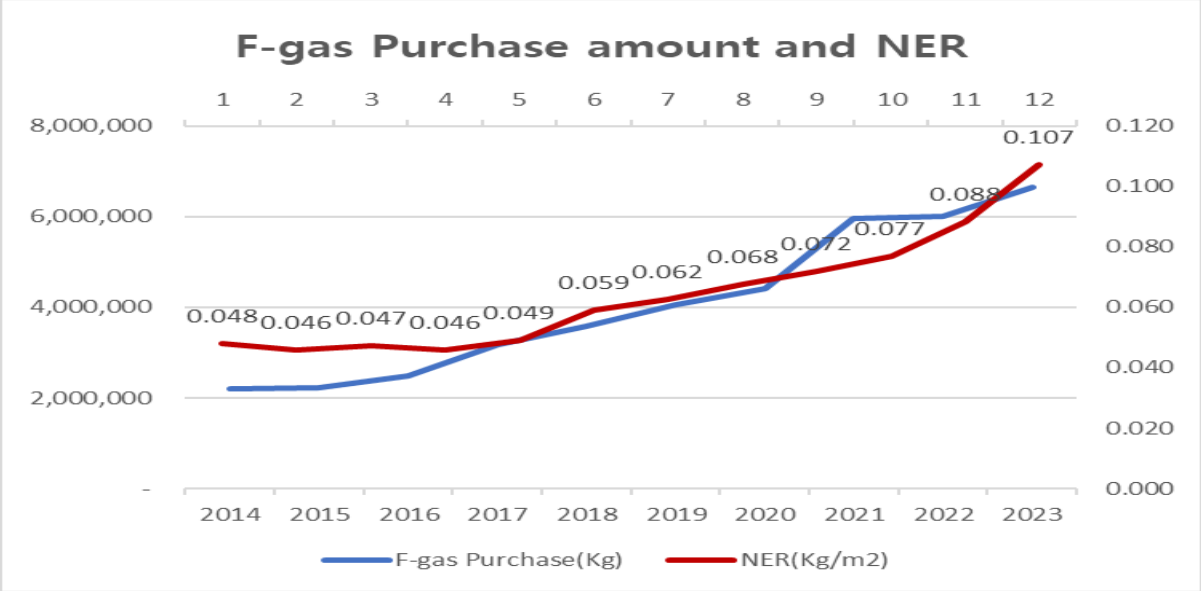
1. Recent F-gas Emission Trends

1.1 F-gas* Purchase NER Trends

F-gas* purchase amount of the four associations increased over the last 10 years (2014-2023) mainly due to the increase in the production of display products. The average annual growth rate of production during last 10 years was 6.25% while that of the amount of F-gas purchased rose 11.66%. F-gas purchase NER** increased 8.49% on the average during the same period. The significant increase in the purchase value is mainly due to the increase in the scale of OLED industry, which leads to the increase in the purchase of CF_4 gas.

* In this report, scope of F-gas data is CF_4, C_2H_6, C_4F_8, CHF_3, SF_6, NF_3.

**F-gas Purchase NER (kg / m^2) : The amount of F-gas purchased per input glass area



*'21~: data from 3 associations(TPSA, KDIA, CODA)

** CODA & TPSA : based on IPCC2019 / KDIA : based on IPCC2006

Chart 1.1- F-gas Purchase and NER Trends

1.2 F-gas Emission NER Trends

F-gas emission NER of the four associations reached the peak in 2014 at 32.6 kg-CO_2 / m^2 and then decreased by 2023 to 14.9 kg-CO_2 / m^2although the display production grew during the same period. This demonstrates the efforts that device makers had done in order to reduce the F-gas emission.

* F-gas Emission NER (kg-CO_2 / m^2): The amount of F-gas emitted per input glass area.

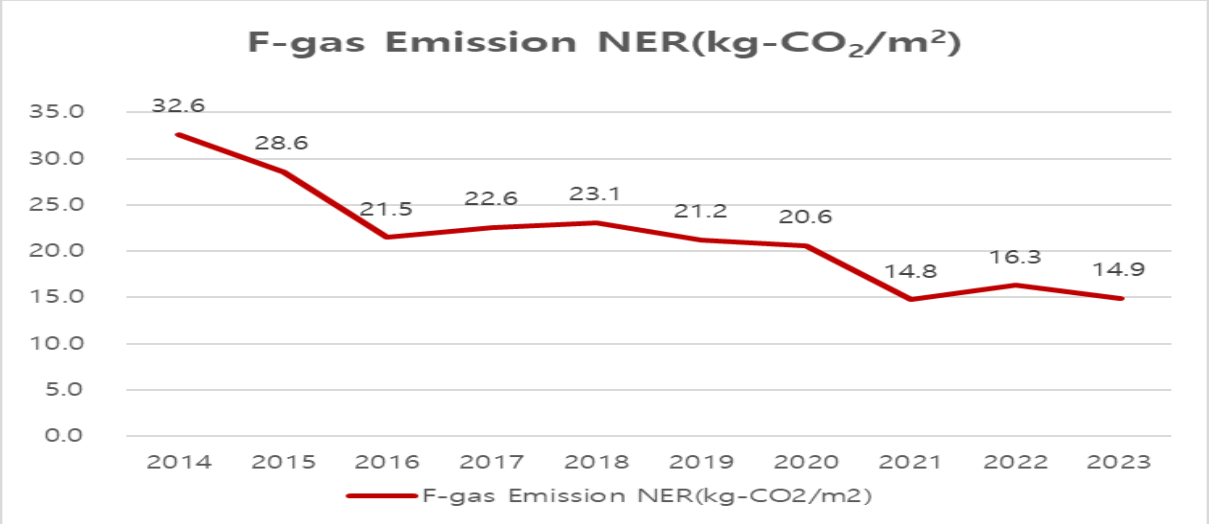


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Chart 1.2- F-gas Emission NER Trends

2. F-gas Emission Reduction Technologies

F-gas emission reduction technologies available in the display industry are described below. No single technology has a strong comparative advantage over the others. Each device maker can select and use any of the reduction technologies, considering factors such as cost, efficiency, and other relevant criteria.

2.1 Process recipe optimization

Optimizing processes to consume less F-gas is a fundamental practice for reducing F-gas emissions.

2.2 Abatement

An abatement system that destroys F-gas can be used to reduce emissions. Destruction methods are typically divided into 1) plasma treatment, 2) combustion treatment, and 3) catalyst treatment. Abatement system configurations are divided into a) Point of Use (POU) systems, which are installed at each equipment, and b) Central Abatement Systems (CAS), which are an integrated processing facilities. POU abatement systems is installed for each individual process to treat emissions directly on-site, while the CAS abatement system is a central processing method that handles emissions from a large number of process facilities collectively.

2.3 F-gas Replacement

Replacing high global warming potential (GWP) gases with lower GWP or GWP-free alternatives is the most effective solution to further reduce F-gas emissions. When adopting alternative gases, it is essential to consider their potential safety and health impacts on fab operations and employee protection.

3. Trends of Each Associations about greenhouse gas in general

3.1 KDIA

In 2020, South Korea announced its vision to achieve national carbon neutrality by 2050 and established the 2050 Carbon Neutrality and Green Growth Commission to deliberate and formulate major policies and plans for carbon neutrality and green growth. This initiative was followed by the enactment of the Framework Act on Carbon Neutrality and Green Growth for Coping with the Climate Crisis in 2021, which mandated a reduction in national greenhouse gas emissions by at least 35% by 2030 compared to 2018 levels. Subsequently, the government set a more ambitious target of reducing GHG emissions by 40% by 2030 and reaffirmed its commitment to achieving carbon neutrality by 2050.

In 2023, the government released the first National Carbon Neutrality and Green Growth Masterplan (the "Masterplan"), a comprehensive action plan designed to achieve the 2030 Nationally Determined Contribution (NDC) target. This Masterplan serves as the primary statutory framework for carbon neutrality, outlining the government's strategy and direction for implementation. Spanning a period of 20 years (2023-2042), the Masterplan includes provisions for updates every five years. Governed by the Framework Act on Carbon Neutrality and Green Growth for Coping with the Climate Crisis, it encompasses the national vision, carbon reduction targets, and sector-specific annual measures to meet both mid- and long-term reduction goals. For the display industry, the NDC reduction target is set at 11.4%, equivalent to 230.7 million tons.

The Korean Emissions Trading System (K-ETS) and the Target Management System (TMS) are key initiatives aimed at achieving the 2030 NDC target of a 40% reduction from 2018 levels, as well as the goal of carbon neutrality by 2050. As of 2023, approximately 720 companies are participating in the K-ETS, while 456 companies are involved in the TMS. The display industry is included in the emissions trading system and is subject to relevant obligations. Companies subject to the Emissions Trading System (ETS) prepare an annual emissions calculation plan, undergo third-party verification, and manage their emissions through review and approval by the Ministry of Environment, thereby contributing to achieving emission reduction targets.

Following the enactment of the Act on the Allocation and Trading of Carbon Credits

in 2015, K-ETS was launched, starting with its first planning period (2015–2017), followed by the second (2018–2020). Currently, K-ETS is in its third planning period (2021–2025). The system applies to companies with average annual emissions of 125,000 tons or more during the three years prior to the plan period, or to companies with at least one plant emitting 25,000 tons or more, as well as those that voluntarily opt for allocation targets. Six greenhouse gases are regulated under K-ETS: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The allocation method is divided between grandfathering (GF) and benchmarking (BM). In the first planning period, 100% of the credits were allocated free of charge. In the second period, 3% of the credits were allocated at cost, and this increased to 10% in the third planning period.

In the third planning period, the emissions from companies participating in the K-ETS account for 73.5% of the nation's total direct greenhouse gas emissions, underscoring the system's critical role as a comprehensive tool for achieving South Korea's national carbon reduction targets.

3.2 TSPA

3.2.1 Management and inventory of emissions sources

"Entities Required to Measure, Report and Verify Emissions of Greenhouse Gas Emissions" has been amended and promulgated and includes the first batch of entities including LCD industries, as well as factories with a total greenhouse gas emissions of 25,000 metric tons of carbon dioxide equivalent or more annually; and a second batch of manufacturers whose factories' combined annual emissions of direct emissions from fossil fuel combustion and indirect emissions from electricity use result in a total greenhouse gas emissions of 25,000 metric tons of carbon dioxide equivalent or more annually.

3.2.2 Management of verifiers and accreditation bodies

The management and reduction of greenhouse gas emissions is jointly facilitated by the government and private sector. In order to ensure the procedure and data quality of greenhouse gas emission amount inventory and reduction processes

are reasonable, fair, and consistent, the certification and management of verification and accreditation bodies is a priority. Generally, government-approved or internationally-certified third-party verification and accreditation bodies are responsible for verifying and accrediting businesses' greenhouse gas emission amount or reduction performance.

Furthermore, in response to the imminent tightening of carbon emission control measures around the world and international industry and supply chain's increasing demand for carbon emission reduction, the government has amended and on Oct. 5, 2023, promulgated the "Management Measures for Greenhouse Gas Certification Organizations and Inspection Organizations" according to the "Climate Change Response Act" ("Climate Act"). This is to reinforce the management of verification and accreditation bodies and personnel.

3.2.3 Carbon Footprint Labels

According to Article 3, Paragraph 18 of the Climate Act, "Carbon footprint refers to the amount of total carbon emissions released throughout the life cycle of a product from raw material acquisition, manufacturing, distribution and sale, use and waste treatment, calculated by total CO_2 equivalent."

To help the public understand a products' carbon footprints, according to Article 37 of the Climate Act. By disclosing products' carbon footprints, the government aims to inform citizens about the amount of carbon emitted during products' complete life cycles, thus encouraging green consumerism. Details about the policy on products' carbon footprints are available on the "Carbon Footprint Information Platform."

3.2.4 Greenhouse Gas Emission Offset Management

To lower the impact of development activities on the environment, according to the 2023 “Greenhouse Gas Emission Offset Management Rules,” businesses applying for development permits such as the “factory establishment,” “industrial park building or expansion,” “fossil fuel power station,” and “high rise development” are subject to environmental impact evaluation of their development activities. Those with additional greenhouse gas emissions must

conduct carbon offset at a ratio of at least 10% a year for 10 consecutive years or at a ratio of over 10% a year to complete the offset early.

3.3 CODA

3.3.1 The national carbon emission trading market system is gradually improving

After three years of construction and operation, the framework system of the national carbon emission trading market has been basically completed, regulatory guarantees have been strengthened and supporting technical specifications have been continuously improved.

On January 25, 2024, the State Council promulgated the "Interim Regulations on the Administration of Carbon Emission Trading" (hereinafter referred to as the "Regulations"), which came into effect on May 1. The Regulation is the first special regulation in China's response to climate change, which clarifies the main links of carbon emission trading and related activities, as well as the legal responsibilities of each subject. It strengthens the relevant provisions of legal supervision and management and severe punishment for illegal and irregular behaviors

The Ministry of Ecology and Environment has issued the "Management Measures for Carbon Emission Trading (Trial)", issued three rules for registration, trading, and settlement, and organized the revision of normative documents such as carbon emission accounting reports and verification guidelines, quota allocation plans, etc. Together with the "Regulations", it has formed a multi-level institutional system covering "administrative regulations + departmental rules + normative documents + technical specifications"

3.3.2 The vitality of the national carbon emission trading market is steadily increasing

In July 2021, the national carbon emissions trading system was launched and launched, including 2257 key emission units. The annual coverage of carbon dioxide emissions is about 5.1 billion tons, accounting for more

than 40% of the country's carbon dioxide emissions. Currently, the market with the largest global emissions coverage. As of the end of 2023, the cumulative trading volume of carbon emission quotas in the national carbon emission trading market is 442 million tons, with a cumulative trading volume of 24.919 billion RMB.

In January 2024, the national voluntary greenhouse gas emission reduction trading market was officially launched, which is another policy tool to promote the achievement of the "dual `carbon" goal after the national carbon emission trading market.

4. Other Environmental Efforts

In addition to the F-gas emission reduction activities responding to climate changes, WDICC members are engaged in a variety of activities to protect environment.

4.1 Energy Saving

Most of energy used in the display industry is electricity. To save electricity, WDICC members are in the process of fixing parts that cause power loss in production equipment, replacing existing equipment with high-efficient one, and promoting energy-saving activities in everyday life.

As shown in the Chart 5.1, Electricity Use NER* of the four associations has been generally slightly increased for past 10 years. Although high-efficiency equipment has been used and energy-saving measures have been implemented, the process has become more sophisticated, and the power consumption has increased slightly.

* Electricity Use NER (MWh/m^2): The amount of electricity used per input glass area

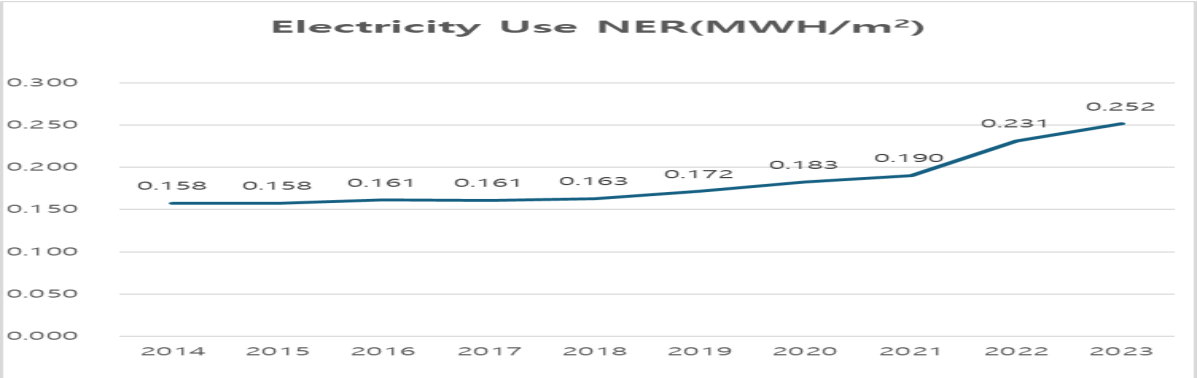

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Chart 5.1- Electricity Use NER Trends

4.2 Reduction of water use

WDICC members are reducing water usage by improving equipment and processes. These efforts not only decrease water consumption but also reduce the need for additional investment or costs associated with water usage and wastewater treatment facilities.

As shown in the Chart 5.2, Water Use NER* has generally declined over the past 10 years, reflecting the collective efforts of the members. However, since 2021, the NER has shown an upward trend. This increase in water usage is primarily due to the shift in product portfolios toward high-performance, advanced display technologies, which require more water during production. Despite this recent rise, the overall long-term trend still demonstrates the industry's commitment to efficient water use.

* Water Use NER (m^3 / m^2): The amount of water used per input glass area

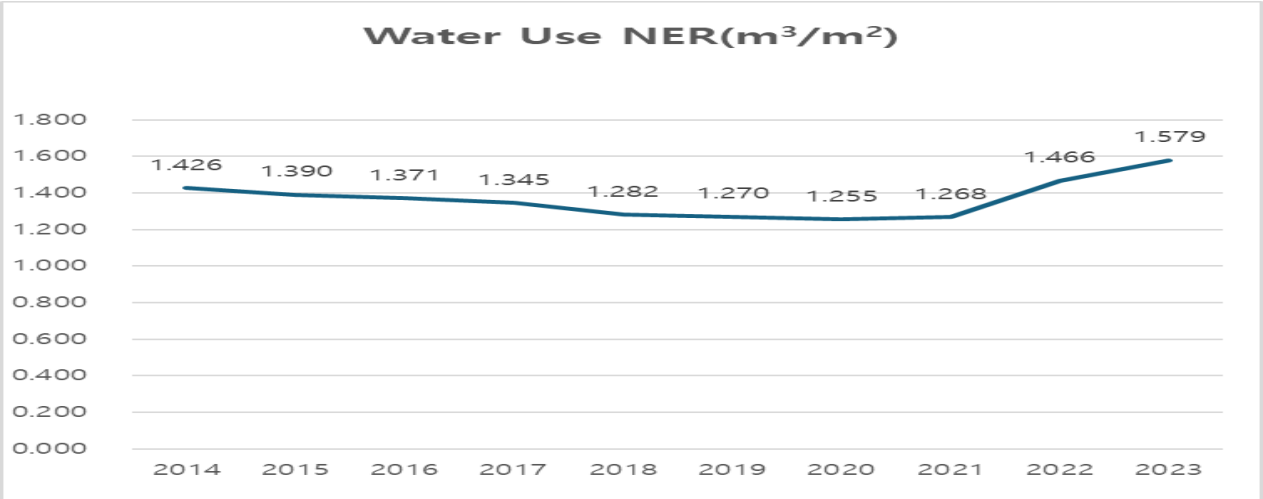

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Chart 5.2- Water Use NER Trends

4.3 Waste Recycling

The chart 5.3 illustrates fluctuations in waste NER over the years, peaking in 2017 at 4.886 kg/m². Following a steady decline, it reached its lowest point in 2020 at 2.692 kg/m². However, from 2021 onwards, waste NER began to rise again, reaching 3.265 kg/m² in 2023. This recent increase is attributed to the adoption of new, more resource-intensive technologies.

WDICC members are making multi-faceted efforts to reduce production waste to be incinerated or landfilled. Furthermore, they are actively engaged in recycling various materials, including waste organic solvent, waste glass, waste papers, and other forms of waste, thereby promoting more sustainable and eco-friendly production processes.

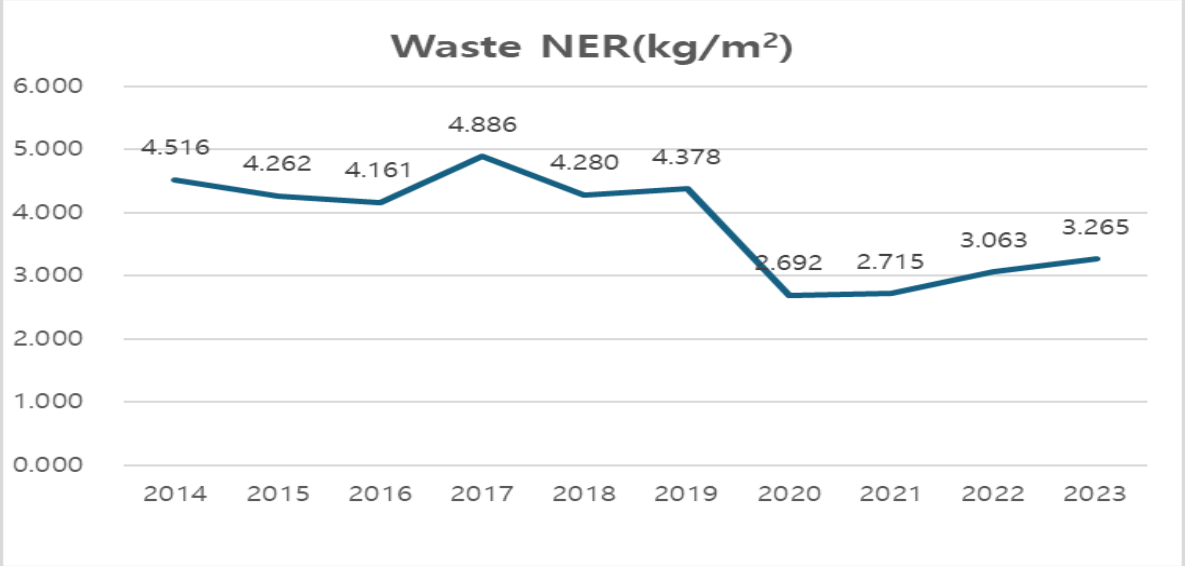

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Chart 5.3- Waste Use NER Trends

4.4 Biodiversity Conservation

With the destruction of the ecosystem becoming more severe by the day due to industrialization, WDICC members are taking part in activities to conserve biodiversity. To preserve the habitat of endangered species which are on the verge of extinction, WDICC members has expanded the scope and extent of its environmental conservation activities, and actively contributing to the protection of our environment.

4.4.1 KDIA

LG Display and Samsung Display take responsibility through organized efforts to minimize their ecological impact and preserve biodiversity, ensuring that current and future generations recognize the importance of nature and biological resources.

4.4.1.1 Biodiversity Conversation Activities with KFEM and Local Governments

LG Display and Samsung Display have concluded agreement with non-

government organizations (NGOs) and local governments to organize activities to protect biodiversity in areas where they operate. As responsible corporate citizens, we encourage our employees to appreciate the importance of the environment and understand biodiversity. To support this, we collaborate with ecological experts to monitor and document local flora and fauna and engage in volunteer activities aimed at preserving the ecosystem. In addition, we conduct environmental impact assessments to minimize the negative effects of our production activities on the environment. In this process, we focus on removing invasive species while ensuring the protection of those that need conservation efforts.

4.4.1.2 EM Earth Ball Throwing Event for Ecosystem Conservation

LG Display and Samsung Display, in partnership with residents' associations, organized the Effective Microorganism (EM) Earth Ball Throwing Event as part of their ecosystem conservation efforts. This initiative also included the collection of abandoned agricultural plastics and the improvement of reservoir water quality. The EM earth balls, made from yellow clay and EM solutions, worked synergistically to cleanse the environment. These earth balls are recognized for their effectiveness in water purification, odor removal, and the decomposition of organic matter.

4.4.1.3 Installing Ecological Plant Islands for Reservoir Management

Samsung Display is committed to preserving reservoirs within industrial complexes and managing them to support ecological diversity. To protect water quality, aquatic plants are cultivated, and "ecological plant islands" have been established, managed according to the lifecycles of the plants. To ensure the effectiveness of these initiatives, annual weed control operations are carried out in February and March to prevent weed influx, maintain plant species, and enhance the landscape's aesthetic appeal. In addition, we uphold pristine reservoir conditions by introducing treated water from the Green Center, managed by a dedicated team of domestic and international experts, including Master's and Ph.D. holders and professional engineers.

4.4.2 TPSA

The AUO “Green Party” at Taichung Site was held in collaboration with social innovation enterprises. The planting of around 1,000 Rhododendron to replenish the hedging, trimming of established trees on the site, site eco-tours, and DIY environmental education workshops helped the local community, local revitalization and corporate groups learn about the importance of living in harmony with nature and ecological conservation.

AUO partnered with the Department of Environmental Protection of Taoyuan City and Hsinchu County, the Department of Agriculture of Taoyuan, and the Hsinchu Branch of FNCA, as well as local community, environmental, and revitalization groups to host Mikania eradication and river protection events as part of the 5-Year Mikania Control Plan. The plan consists of tasks in four areas. The first is the “Green Alliance” with the government, community, NGOs and schools; the second is the adoption of the local waterway, establishment of river patrols, and rehabilitation of the local ecosystem for “Green Rehabilitation”; the third is to use environmental education courses at the “Water Resource Gallery at the Longtan Site” (AUO environmental education facility) and digital learning to cultivate sustainability literacy in order to accomplish the goal of “Green Educational finally, “Green Circulation” provides circular recycling technology to social enterprises to create reuse value from Mikania Vine. The bounty on Mikania Vine offered by the government is re-invested in environmental education.

In 2022, the Innolux Education Foundation signed a Memorandum of Understanding with Chiayi Forestry Administration to kickstart the I Go Green campaign, which aims to promote the dissemination of knowledge, mutual prosperity in society, and eco-sustainability. We believe the campaign unites us in ecological conservation, greening, and eco-education activities including beach and mountain cleaning, forest conservation, and afforestation.
In 2022, Innolux adopted 1.01 hectares of state-owned forest in Nanxi District, Tainan City, and called on all employees to join our movement. In total, we adopted 2,022 Mahogany. By taking action to protect our forests, we hope to play a leading role in various environmental movements (promoting carbon fixation, reduction, water and soil conservation, ecological restoration, biodiversity) and encourage others to follow suit. The Innolux Education

Foundation also invited every member of Innolux, CarUX, and InnoCare as well as their families to plant cherry blossoms and Rhododendrons in the Alishan National Forest Recreation Area. Participants explored scenic spots while listening to stories told by a local ecotourism guide on the ecology and history of forests.

4.4.3 CODA

4.4.3.1 Promoting the construction of eco-friendly factories

BOE integrated the eco-friendly concept into the program planning at the early stage of factory construction. BOE's 6th generation AMOLED (flexible) production line in Chongqing optimized functional zoning, placing various power supply systems close to production areas, office areas and other main energy-using bodies, so as to make the zoning clear and the arrangement centralized and compact. At the same time, it implemented a land greening and planting coverage program to increase the vegetation coverage rate to 18.6%, restoring the habitats of plants and animals and contributing to the ecological balance of the local area. BOE Mianyang 6th generation AMOLED (Flexible) production line installed a temporary protective net on the NMP system condenser to prevent birds around the plant from accidentally drinking the NMP condensate on the roof, which effectively reduced bird casualties.

4.4.3.2. Afforestation activities

Every year on March 12th, the Tree-planting Day, each enterprise organizes fruitful afforestation activities, covering community parks, factories, staff dormitories, urban green belts and other areas, greatly enriching the range of species habitats.

4.4.3.3 Supporting fire-fighting activities in mountains

When the mountain fire broke out in the forests under the jurisdiction of Banan District, Chongqing, HKC reacted quickly and mobilized immediately after receiving the notification of fire-fighting support and organized the first

and the second batch of “fire-fighting volunteer teams” to arrive at the scene to support the forest fire prevention and drought relief, and donated supplies for fire-fighting and drought relief. The company organized employees to plant trees in the isolation belt of the Nanhuan Interchange in Jieshi Town to restore the vegetation destroyed by the mountain fire.

4.4.3.4 TCL CSOT built an artificial wetland park

TCL CSOT’s “artificial wetland park” adopted advanced technology for the deep treatment of industrial wastewater, and through the construction of stabilization ponds, ecological fast filtration ponds, downward vertical flow wetlands, discharged water adjustment ponds with submerged plants landscape, and other treatment processes, the quality of discharged water reached class Ⅳ of surface water. The processed wastewater can be used for landscape watering, toilet flushing, car washing, etc., realizing the comprehensive recycling of water resources.

4.5 Conservation of the Local Environment

WDICC members are maintaining close relationship with the local communities collaborating with them in order to protect the environment of the local areas. They are making various efforts to ensure that display production causes the least possible damage to the local environment.

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