



the Future is worth it

C O R P O R A T E
S U S T A I N A B I L I T Y
R E P O R T

We Share the Same Nationality, Earth

Scientific Approaches
to GHG Reduction
Carbon Footprint Management

Circular Economy
Renewable Resource Use

AI Industrial Chain
and Cloud Computing

Clean Energy – Solar, Geothermal
and Wind-Powered
Green Energy and Storage

Thriving on Community Rejuvenation
New Values for Society



Scan the page to experience the AR effect, description on page 3

Nephrolepis exaltata
Taiwan native species
Resilient vitality



**TOTAL
CLIMATE
COMMITMENT**

**TOTAL
CARE
COMMITMENT**

Yellow daffodils waltzing in the soft spring light
 Rhododendron bloom in brilliant colors
 The air of the little orange blossoms smell sweet
 Butterflies and honey bees tango among flowers
 Green grass with little white daisies sway gently
 Two eagles glide with ease through the crystal blue sky
 I had a leisurely stroll on a gray stone path
 Being temporarily relieved from this terrible pandemic
 Nature is so beautiful
 But why the new coronavirus is still so rampant
 Mother Nature, what are you saying?
 Sunshine, wind, flowers, birds, butterflies, grass, human beings and viruses
 Are all your creations
 What are we?
 What is equilibrium?
 Have we changed this equilibrium?
 Why are we so fragile?
 The answer is in the wind, in the sunshine, in the skies, in the flowers
 In our hearts, all are in the cycle of Nature



Eudaimonia

2019 TCC Corporate Sustainability Report

Augmented Reality

Looking forward to interacting with you

Download AR tool marq+ APP
STEP-01

Run marq+ APP Scan
STEP-02

TCC's AR Work
 ① Report cover
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We Believe:

"When people begin to understand and care for each other, this is the beginning of Civilization."

The same is true with enterprises.

4 billion years ago, the first single-celled organism on earth appeared in the ocean,
Human beings only slowly made their appearance in the last two million years,
These two million years is like a brief breath in the long life of the earth;
However, in these two million years,
The pace of human progress has gone so long and so fast.

Once,
For the first time, humans looked back at Earth from space,
Just like looking back at the land from the ocean for the first time 70,000 years ago;
In the middle, how many humans were on the earth
Stories of getting lost, submerging and floating, drifting, crossing, discovering,
Conquering and migrating.

Whether it was Marco Polo, Columbus, Magellan, and the Crusades from the West to
The East,
Or Zhang Qian, Xuanzang, Zheng He, and the westward expedition of Mongolians
From the East to the West;
They followed different paths, with their own languages, cultures, ideas, technologies,
Religions, arts, living habits and mythologies, to faraway places;
These travelers embarked on a journey, taking humans beyond the limit of time,
Breaking the frontiers of land, crossing the boundaries of civilization, and completely
Changing the world.

Using animal teeth to pry open fruits, using a long stick to lift a boulder,
The disc out of an old tree made the first wheel,
The Romans mixed crushed rock pieces with volcanic ash and lime to make cement.
Just like any time before, when disaster strikes,
The huge waves are coming, there are embankments;
Disoriented at sea, there is a lighthouse;
To cross the waters to another strange place, there is a bridge;
In the face of an epidemic, there is a shelter built out of cement.



When humans return home and return to a safe shelter,
When people pull down the iron gate and close the shop, the city is still there;
When people leave the noisy streets we are familiar with,
The Roman Colosseum is still there, the Milan Cathedral is still there, and the Pantheon is still there;
Cologne Cathedral in Germany, Sagrada Familia in Spain,
The Arc de Triomphe in Paris, Westminster Abbey in London,
The Statue of Liberty in New York, the Golden Gate Bridge in San Francisco,
Meiji Jingu in Tokyo, Christo Redentor in Brazil,
China's Forbidden City and the Great Wall, and many persistent historic totems are
Still there,
The little Guardian God temples without specific names hidden in Taipei are still
There.

Cement is the visible patron saint,
In the history of human beings and Nature, silently, quietly, standing there,
It's like finding coordinates that don't change easily in fast-changing times,
Allowing humans to anchor and settle down.

Nature uses the earth, water, sunlight, fire, air, wind,
To carve out a mountain, a river, a waterfall, a forest and the five continents of the World;

Humans use culture, legends, thoughts, faiths, science, and skills,
Using cement as the adhesive of civilization, it sculptured its own civilization totem.

Our ancestors spent thousands and thousands of years of life and wisdom,
Leaving a rich imprint on civilization.

Chairman

Humans Are Part of Nature

As Chief Seattle said:

Humans belong to the Earth, humans are part of Nature,
The human mind, like Nature,
Longing for the infinite, longing for the endless starry sky, longing for the endless
Great sea.

Human beings have in fact always been in Nature,
From awe of Nature, worship of Nature, to learning from Nature to borrowing the power
Of Nature,
Until one forgets his own strength, forgetting the relationship between man and Nature,
Even forgetting that people are only entities temporarily "borrowing" from the cycle Of Nature.
The storms of Nature will cleanse at once what has not been cleaned before.

After every storm, disaster, collapse of embankments, and sudden shower,
In addition to heightening embankments, thickening city walls, and widening water
channels,
Have we learned how Nature works, or how relations work between people?
Have we learned to respect, understand humility, have we learned compassion and
tolerance,
Is there a different attitude and more wisdom?
Are we willing to use a softer glance and a softer heart to listen, understand,
Communicate and interchange?
Is it love or fear that we are willing to bring to this world?
What can we bring to this world, help each other or destroy each other?

Human knowledge and wisdom are limited,
The continuation of life is limited and the resources available are limited.
It is because of limited resources, limited capacity to carry, and limited life,
The cycle is so sacred, so wise, and
Life so precious.



Photo taken in Hoping Plant Pit 1
Luciola cerata



Marine ecology of Hoping Port

Experience AR



ESG Sustainability Highlights year 2019

Change in CO₂ emissions 2013 to 2019

2013 2019

-34%

NOx SOx Particulate Matter

-25% compared to 2016

Power generation from residual heat compared to 2018

+35%

Generated renewable energy to power

52,000 homes a full month

CO₂ Captured

355 tonnes

General waste co-processed by cement kilns

859,400 tonnes

Reduction in cement plant water use, compared to 2018

-24%

100% Cement plants that passed **ISO 14001 / 45001 / OHSAS 18001**

Employees participated in the employee stock option plan (ESOP)

Employees qualified for quarterly bonuses (variable pay plan)

Long-term incentive plan supervisors qualify for treasury stocks

43.3%

Average employee contribution in 2019

97.79 working hours

Funding spent on education and training

28 million

Social welfare contributions

50.7 million

33,653 Different taxa of plant DNA stored

Restored taxa of plants

300

Note: Data collected through 2019 (or compared to 2018)

Honors year 2019

Sustainability Initiatives	Sustainability Recognition	Low Carbon Products
<p>First cement plant in East Asia to commit to the Science Based Targets initiative</p>	<p>Achieved "Management" status in the CDP Climate Change, and A-"leader" status in the CDP Supplier Engagement Rating</p>	<p>Received (ESG) B ranking status on the MSCI ACWI</p>
<p>Accepted as a member of the FTSE4Good TIP Taiwan ESG Index, a joint venture between the TWSE and FTSE</p>	<p>The first Taiwanese company in the traditional industry to become TCFD SUPPORTER</p>	<p>Became a member of the Global Cement and Concrete Association</p>
<p>Selected by the Asia Corporate Excellence & Sustainability Awards as Asia's Greenest Company of the Year</p>	<p>Recognized by the Asia Sustainability Reporting Awards for Asia's Best Workplace Reporting</p>	<p>Asia Responsible Enterprise Awards (AREA) Green Leadership award</p>
<p>Recognized by the CR Reporting Awards (CRRA) for Best Carbon Disclosure</p>	<p>Ranked first among large traditional manufacturing companies and in the Top 15 among large-scale enterprises in the Commonwealth Magazine Excellence in Corporate Social Responsibility</p>	<p>Won first place in the Global Views Corporate Social Responsibility award</p>
<p>At the Taiwan Corporate Sustainability Awards, we won a Taiwan Top 50 Corporate Sustainability Award, a Top 50 Platinum Corporate Sustainability Report Award, an English Report Award, a Climate Leader Award, a Circular Economy Award, a Social Inclusion Award, a Growth through Innovation Award, and a People Development Award</p>	<p>Golden Eagle Micro-Movie Festival: Won 7 awards, including Best Video, Most Outstanding Operations and Governance, Outstanding Filming Creativity, and Outstanding Original Screenplay</p>	<p>Named as an SDG 2000 model enterprise</p> <p>Won an International Innovation Awards eco-solution award</p>
<p>TCC's Hoping Plant won a Golden Award at the 1st National Enterprise Environmental Protection Award</p>	<p>Continued to be included among the Best Taiwan Global Brands</p>	<p>Gold Green Label Cement: Type I Portland Cement (17%) passed Environmental Labeling requirements</p>

ESG Performance and Goals



ENVIRONMENT



SOCIAL



GOVERNANCE



	2019~20	2025	2030												
GHG Management	-34% (2013 as base year) First stage target achieved in advance Committed to the most ambitious global GHG reduction initiative: SBTi	-10.8% (2016 as base year) Achieve our SBTi targets Set next stage reduction target using SDA	Continue to implement new SBT												
Emission Management	<table border="1"> <tr> <td>SO_x</td> <td>-29%</td> <td>-30%</td> <td>BACT¹ minimum</td> </tr> <tr> <td>NO_x</td> <td>-13%</td> <td>-50%</td> <td>-70%</td> </tr> <tr> <td>TSP</td> <td>-25%</td> <td>-30%</td> <td>BACT¹ minimum</td> </tr> </table>	SO _x	-29%	-30%	BACT ¹ minimum	NO _x	-13%	-50%	-70%	TSP	-25%	-30%	BACT ¹ minimum		
SO _x	-29%	-30%	BACT ¹ minimum												
NO _x	-13%	-50%	-70%												
TSP	-25%	-30%	BACT ¹ minimum												
Co-processing Capacity	859,400 tonnes		1.57 million tonnes												
Renewable Energy	19.3 MW	Manage 500 MW													
Carbon Capture	355 tonnes (accumulated)	450,000 tonnes/year	Operate at scale												
Conservation of Endangered Plant Species	33,653 taxa	More than 35,000 taxa	More than 40,000 taxa												
Land Restoration (BAP²)	100% BAP		90% Indigenous plant restoration rate												
TCC DAKA CEM³	Recognition rate of 70% Two operational points	Recognition rate over 85% Coverage at 60% of operational points	Recognition rate over 95% Coverage at 100% of operational points												
Cement Academy	Funded more than NT\$6 million	Estimate total fund of NT\$30 million	Estimate total fund of NT\$60 million												
Employee Training and Development	Invested NT\$28 million	Estimate total investment of NT\$125 million													
Supplier Management	Conducted audits on 12.4% suppliers	Conducted on-site audits on 80% suppliers	Conducted audits on 100% suppliers												
Risk Management	Established Risk Management Committee (Report to board of directors)	Recognition, management and mitigation of 7 business risks	Utilize ERM system												
Information Security	Established Information Security Committee	Obtain ISO 27001 certification by 2021	Maintain zero major incident record												

Notes: ¹BACT (Best Available Control Technology) ²BAP (Biodiversity Action Plan) ³CEM (Community Engagement Plan)

This is the 2019 Corporate Sustainability Report (referred to hereafter as the "Report") of the Taiwan Cement Corporation (referred to hereafter as "TCC" or the "Company"). Based on the principles of openness, transparency, and good faith, the Report faithfully discloses our efforts to communicate with stakeholders and engage in sustainable development. With this Report, we hope to support the business philosophy of "taking from society and giving back to society" and to improve future living quality in collaboration with our stakeholders.

Reporting period and disclosure boundaries The reporting period is between January 1 and December 31, 2019. The boundary of financial performance covers both consolidated results and the individual performance of TCC in Taiwan. The business activities of TCC in Taiwan are the focus of other contents; subsidiary companies are not included in the scope of the Report, apart from some of their sustainability achievements that impact the Company's sustainable development. In consideration of information comparability, some data are disclosed together with data from the past three years. We plan to publish a new corporate sustainability report each year.

Publication date of the previous issue: June 2019

Publication date of the current issue: June 2020

Publication date of the next issue: June 2021

Reference guidelines This report has been prepared in accordance with the "Core" disclosure principle in the GRI Sustainability Reporting Standards (GRI Standards) published by the Global Reporting Initiative (GRI). It also takes into account GRI's "Mining and Metals Sector Supplement."

Information disclosure Information relating to financial performance disclosed in this Report shall be subject to the published consolidated financial statements certified by a certified public accountant. All financial figures are expressed in New Taiwan Dollars. Since 2013, public companies listed on either the Taiwan Stock Exchange or the Taipei Exchange are required to adopt the International Financial Reporting Standards (IFRS). Therefore, we disclose financial data using IFRS. Other disclosed data were collected and adjusted with commonly used data description methods and disclosed after rounding. The Report was simultaneously published on the TCC website.

Audit and verification Internal Audits: All data disclosed or provided by individual responsible units were verified by the Report editing team. After submitting to the officers of each department, this Report was reviewed and approved by the chairman.

External Verification: The audit and consulting firm Deloitte provided an independent limited assurance of this Report using the standard for assurance in the "Assurance Engagements Other than Audits or Reviews of Historical Financial Information" announced by Taiwan's Accounting Research and Development Foundation (and based on the International Standard on Assurance Engagements [ISAE] 3000). SGS Taiwan verified and assured report compliance with the Core disclosure principle in the GRI Standards and completed verification using the Moderate Assurance in Type 1, AccountAbility 1000 Assurance Standard. Refer to the appendix for related assurance/verification methods and results.

Contact Should you have any comments or suggestions relating to this Report, please contact us at: Yi-Chung Chen, Office of the President, Taiwan Cement Corporation

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Scientific Approaches to GHG Reduction – Cement and Concrete Carbon Footprint Management



Smart Manufacturing – AI Industrial Chain and Cloud Computing



TCC's Practices, Do better together



Circular Economy – Renewable Resource Use and XRF



Clean Energy – Solar, Geothermal and Wind-Powered Green Energy and Storage

Open Factories – Thriving on Community Rejuvenation-- New Values for Society

Scientific Approaches to GHG Reduction

Cement and Concrete Carbon Footprint Management

Human is part of the nature
We share the same Earth, the same destiny
After every major storm or disaster,
When levees break or bursts of rain appear,
We are reminded of the need to be respectful and humble.

The global climate is in a state of emergency. In 2019, Oxford Dictionaries named “climate emergency” as the word of the year. Climate emergency imparts greater urgency than climate change, which has a longer-term, relatively stable impact.

The United Nations (UN) refers to 2020 as a “super year,” when we have the opportunity to bring nature back from the brink. When 195 nations adopted the Paris Agreement in 2015, they agreed to a set of intended nationally determined contributions (INDC) that will soon be evaluated. In 2020, the top risks in the 10-year outlook of the World Economic Forum’s Global Risks Report all related to severe threats to our climate. For these reasons, governments and companies around the world are developing plans to reduce greenhouse gas (GHG) emissions. As global GHG emissions become more intense, emissions management, reduction targets, resource investments, and reduction plans have become an indispensable part of efforts to slow the impact of climate change.

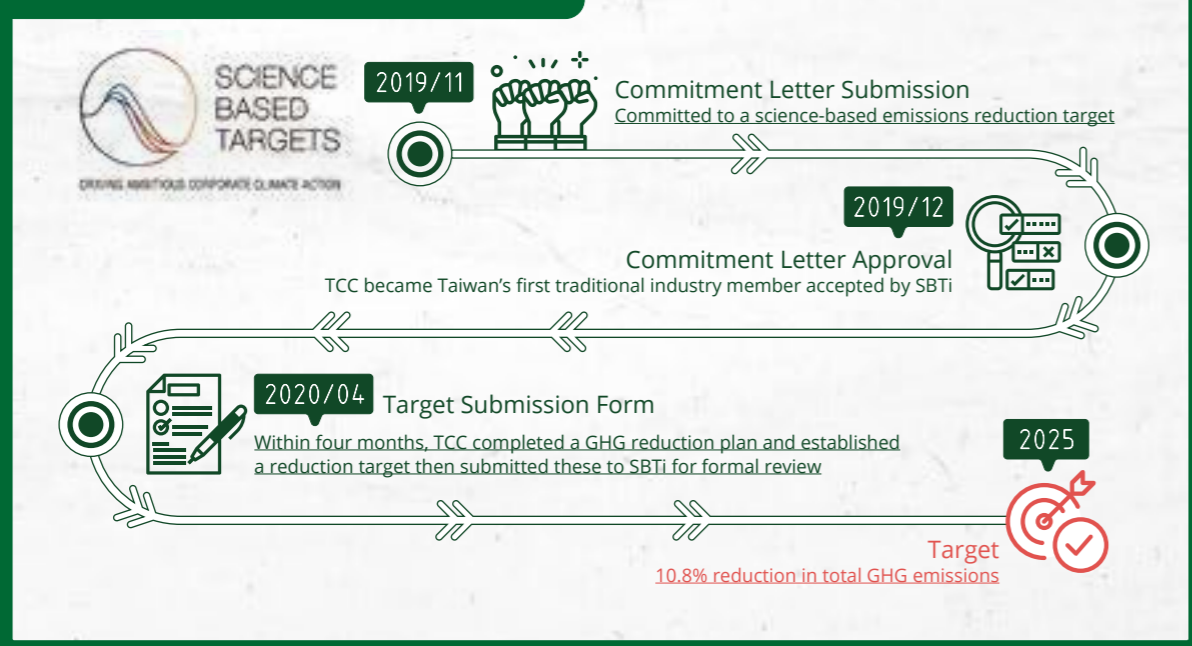
Taiwan’s First Traditional Industry Member to Commit Itself to the Science-Based Targets Initiatives

On December 1, 2019, TCC committed itself to the Science-Based Targets initiative (SBTi) for reducing GHG emissions, as part of the world’s most ambitious corporate climate action. In accordance with the methodology used by scientists at the Intergovernmental Panel on Climate Change and the International Energy Agency, TCC formulated GHG reduction methods then submitted these to SBTi in April 2020. We forecast a 10.8% reduction in our total GHG emissions by 2025 when compared to the base year of 2016. Working together with partners from around the world, we hope to limit global warming to well below 2°C.





Timeline of TCC's SBT Implementation



SBTi is a GHG reduction collaboration between the Carbon Disclosure Project, the UN Global Compact, the World Resources Institute, and the World Wildlife Fund. By April 2020, a total of 859 companies around the world had joined. Among them, TCC was the only large-scale traditional manufacturer from Taiwan and the first cement manufacturer from East Asia and Taiwan. TCC followed in the footsteps of other cement industry leaders: HeidelbergCement (Germany), LafargeHolcim (Switzerland) and Shree Cement (India).

Using the Sectoral Decarbonization Approach for setting GHG reduction targets, we established our reduction target plan in 2020, one year ahead of schedule, and committed to a 10.8% reduction in total GHG emissions by 2025 when compared to the base year of 2016. Implementing SBT provided an opportunity to learn international GHG emissions reduction methods while taking a closer look at our GHG data. In the process, we discovered limitations in Taiwan's regulatory framework that reduce the effectiveness of GHG emission reductions. TCC will discuss these issues in future communications with the competent authorities.

Pioneering Advances in Taiwan's Cement Industry: Carbon Footprint Certification and LCA Management

Cement and concrete are not considered consumer products in Taiwan, so do not qualify for carbon labels. To fulfill our corporate responsibility to reduce GHG emissions and demonstrate our shared concern with the community, in February 2020, TCC began to carry out carbon footprint surveys of our bestselling Type I Cement and 3000 psi concrete. Other ways we advanced GHG emissions standards for cement products included discussions with the Environmental Protection Administration on plans to include cement products within the scope of the Product Category Rules. TCC hopes to apply for Taiwan's first cement carbon label in 2020, which will provide a foundation for the next stage of promoting carbon emissions labels.

Science-based targets for GHG emissions enable companies to understand the major sources of their emissions, so they can effectively plan reduction strategies. TCC adopted a life cycle assessment that analyzes the potential environmental impacts of cement products from raw material extraction through manufacture, sale, use, and disposal. Using big data and artificial intelligence, we further enhanced control over product-related GHG emissions, supporting cyclical transformations and science-based emissions reductions.



To enhance product transparency, in 2019 TCC implemented the Concrete Product Traceability System for online tracing of concrete raw materials and products. Since March 2020, clients have used this client relations management system to check information on a variety of items, including cement, gravel, slag, fly ash, agents, and water. The cement tracing is exclusive to TCC. Data for other items are available in monthly test reports issued by a laboratory approved by the Taiwan Accreditation Foundation. For each delivery of ready-mix concrete, clients can use the system to check a broad range of product quality information, including quality testing reports, quality assurance certifications, chloride ion testing, and compressive strength reports. The data provide updated insight into the quality of each product.

The Industry's Only Transparent Concrete Formula Ratio: Background on Six Key Ingredients in Line with Food Product Standards



Circular Economy

Renewable Resource Use and XRF

1,300°C, which exceeds the temperature of lava ejected from a volcanic vent.

1,300°C, which is the transformation of energy and a demonstration of strength.

1,300°C cement kilns, which are the sparks for igniting the engines that run manmade cyclical systems.

This is the final destination for waste materials.

These are the crucibles that purify the city.

This is the seed that enables people to live sustainably, in harmony with nature.

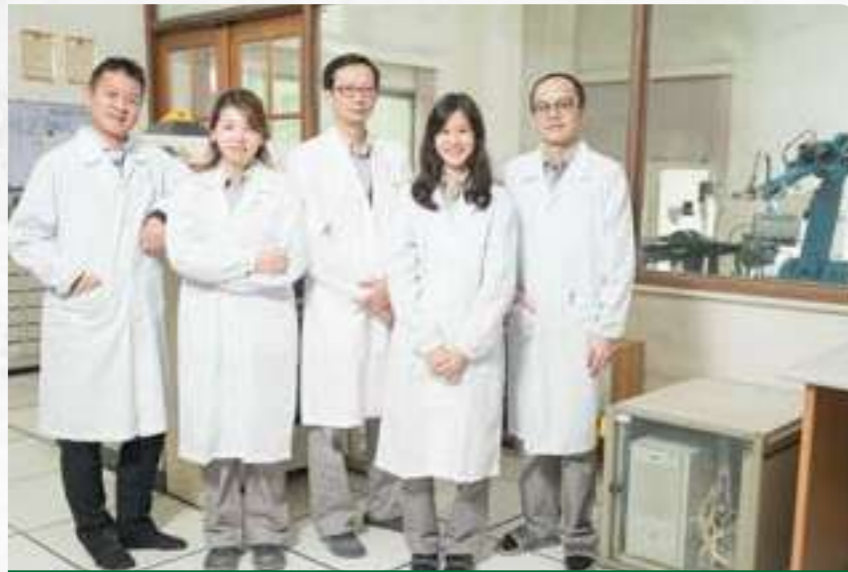
In the European Green Deal, the European Commission adopted a new Circular Economy Action Plan that emphasizes the critical importance of sustainable development. It shows the external costs of economic development for various countries, including the gradual depletion of global resources and increasing environmental pollution. The report then describes how these costs are creating a consensus to shift from a linear economy to a circular economy. As we create economic value, we must attend to sustainable co-existence with the environment.

A First in Asia: Hoping Port, Power Plant and Cement Plant Create a 3-in-1 Circular Economy Combo

In 1997, in response to government policy that aimed to shift more industries to the east, TCC further developed the Hualien Hoping cement zone. Adopting circular economy principles, a sealed pipeline network connects the zone's industrial port, power plant, and cement plant, so that raw materials, fuel and waste flow between the different facilities in a closed system. Cement products are directly shipped by sea, eliminating the higher GHG emissions associated with ground transport. This cross-industrial, circular operational model optimizes resource usage. It is part of an ecological, circular economy demonstration zone that uses resources in an innovative way to eliminate waste generation and reduce GHG emissions. It is also the only thermal power producing cement plant in the world that does not use fly ash for reclaiming land and which obtained a Certificate of Verification from the European EcoPorts Port Environmental Review System. The benefits of these initiatives are readily apparent on summer nights when fireflies light up the dark skies around the cement plant.

Co-processing by cement kilns was made possible by technical breakthroughs and innovations. In Europe it is already an important method for eliminating household and industrial waste, resolving an issue that otherwise could extend across different generations.

According to research by the World Business Council for Sustainable Development, the temperature in cement kilns exceeds 1,300°C, which is sufficient for decomposing dioxins that do not disintegrate in the typical waste management incinerators. Cement kilns eliminate most hazards associated with household waste while turning the waste into a raw material or fuel for making cement. This reduces carbon emissions and purifies the city, making the kilns the ideal urban purifiers.



In 2018, TCC became the world's first cement industry member to pass BS 8001 circular economy certification. Co-processing by our cement kilns supports a number of industries, including optoelectronics, semiconductors, paper manufacturing, water purification, chemical engineering, and steelmaking. In 2019, we processed 4% of Taiwan's total industrial waste.



In addition, in order to support waste reuse, the TCC research lab acquired an X-ray fluorescence spectrometer (XRF) to analyze a wide variety of waste products comprised of multiple components. Better understanding of the characteristics of each waste batch supports strict control over composition and turns TCC into an industrial model of the circular economy.

TCC is an eco-solution service provider company that endeavors to solve community waste problems. We join cement and energy production with environmental protection in ways that build a circular value chain so that living creatures can continue to multiply and prosper, achieving our sustainable vision.

Five Key Special Characteristics of Cement Kilns in the Circular Economy

Complete Decomposition

Use the high temperature and retention time of the kiln to completely decompose waste

No Secondary Pollution

The ashes of destroyed toxic substances and heavy metals are locked into clinker, preventing secondary pollution

Processing a Wide Range of Wastes

Urban garbage, waste tires, waste oil, toxic solvent, and city sewage sludge, etc., can all be processed

Reuse of Resources

Energy generated by burning waste in kilns is re-used in cement production, reducing the need for traditional fossil energy

Utilize Existing Cement Plant Equipment

By using the cement industry's current equipment, we minimize additional investments and land acquisitions

Co-processed of general industrial waste
+859,400
TONNES

100%
of general industrial waste reused in cement manufacturing

The cement manufacturing industry produced zero industrial waste
0

Waste Management Classification

³Within the scope of the "Waste Reuse Management Act"

Optoelectronics

Waste Categories
Calcium fluoride sludge

Waste-to-energy plants

Waste Categories
Combustible waste

Water purification

Waste Categories
Water purifying plant sludge

Public construction

Waste Categories
Construction waste dirt

Electricity

Waste Categories
**Coal ash
Desulfurized gypsum**

IC packaging plants

Waste Categories
Molding glue

Steel-making

Waste Categories
Reduced slag from electric arc and steel-making furnaces³

Chemical engineering

Waste Categories
**Desulfurized MgO inorganic sludge
Coal ash**

Urban Purifiers - Processing Household and Industrial Waste

In 2019, TCC continued to test new alternative raw materials, such as molding film and reduced slag, as well as alternative fuels, such as discarded wood, sawdust, and coal ash. In the future, we will develop additional alternative raw materials and fuels so that cement kilns can continue to support sustainability by acting as urban purifiers.



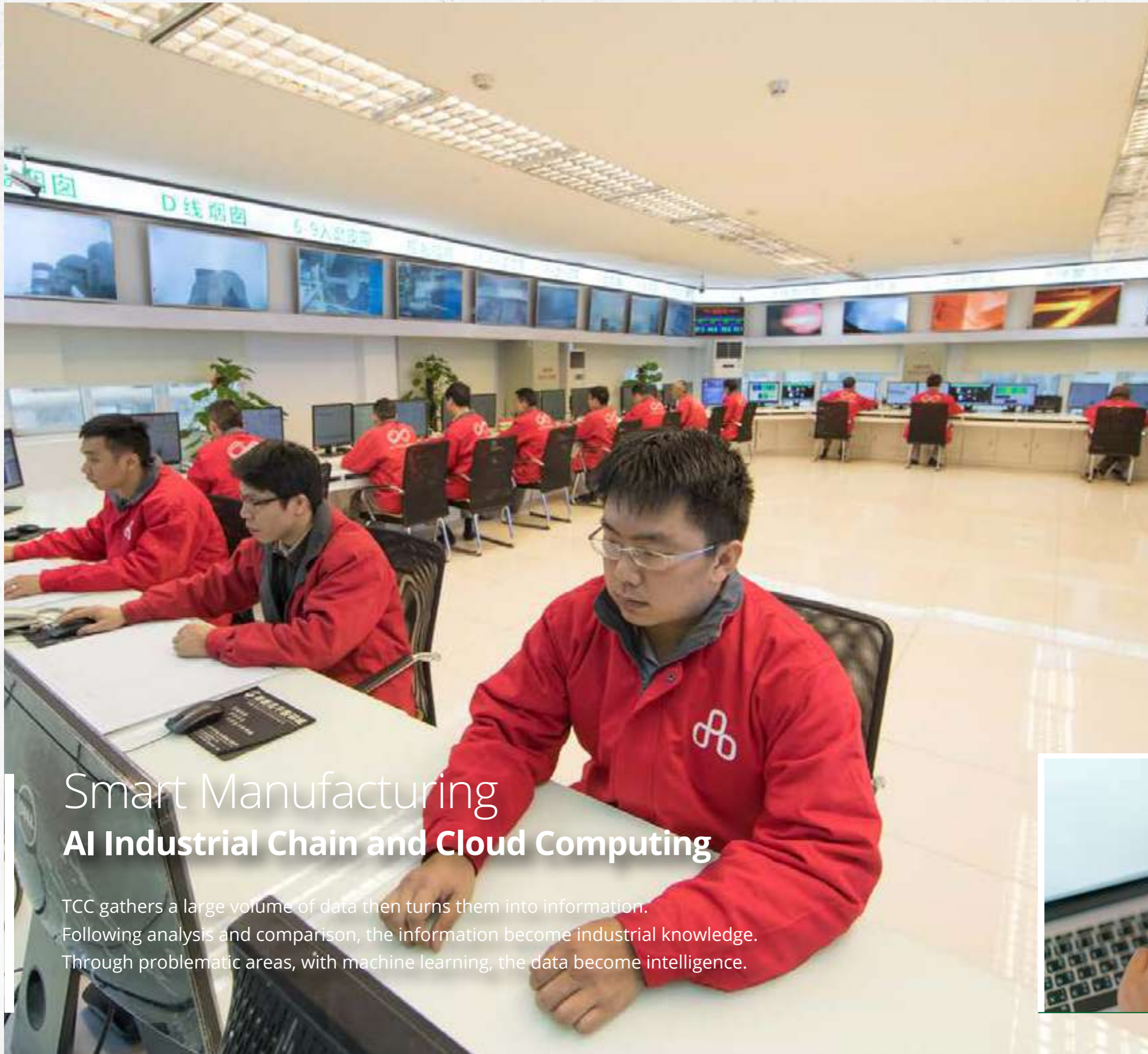
TCC's Guigang Plant, Compared to other co-processing facilities in Mainland China, the plant is of the highest standards, has the largest hazardous waste capacity, and can treat the widest range of hazardous waste products, was officially launched on April 5, 2020. It launched with the capacity to treat 200,000 tonnes of hazardous waste and 30,000 tonnes of general household waste. Guigang Plant seeks to build a "waste-free city" and fulfills the corporate responsibility of TCC.

TCC's Guigang Plant, Mainland China's Largest Cement Kiln for the Co-Processing of Solid Waste



In 2020, Guigang plant has obtained three high value practical patents. The patents include the development of cement kiln flue gas desulfurization devices, which will increase the daily waste co-processing capacity from 4 tonnes to more than 30 tonnes, increasing waste co-processing volume by 6.5 times; build a new cement kiln sludge treatment device to reduce coal consumption by more than 30%; design an organic waste liquid treatment system, combined with cement production technology and equipment, to completely incinerate organic waste liquid to prevent secondary pollution and effectively increase organic waste liquid disposal volume. In order to continuously improve the efficiency of waste co-processing, the Guigang Plant has a dedicated R&D team, as well as a technology R&D center and environmental protection laboratory. Among them, there are 15 people in technology R&D center, and the environmental protection laboratory is equipped with first-class equipment. These actions demonstrate TCC's determination to focus on technology research and development. In the follow-up, two patent applications for inventions will be further carried out to include innovative technologies in practice.





Smart Manufacturing AI Industrial Chain and Cloud Computing

TCC gathers a large volume of data then turns them into information. Following analysis and comparison, the information become industrial knowledge. Through problematic areas, with machine learning, the data become intelligence.

Owing to the challenges posed by severe changes to the global environment, sustainable development is only possible for industries that adapt to natural trends. Recognizing this development, TCC adopted smart manufacturing methods in 2000. Gradually, we built an industry-exclusive management dashboard wall integrated with the latest IT tools, including GPS-based anti-channel conflict, PDA-based factory inspections, and client relationship management. We also upgraded our enterprise resource planning system so that it could identify gathered data and conduct analysis online. Each department discusses and defines problems that must be solved. Benchmarking includes parameter selection, model building, and use of algorithms to support forecasting, warnings and smart management. When TCC uses smart management to raise our competitiveness, we also must consider the development of the cement industry as a whole. The industry faces geographic environment and supply chain limitations. We cooperate with other members of our supply chain to achieve synergy that raises the industry's overall operational efficiency.

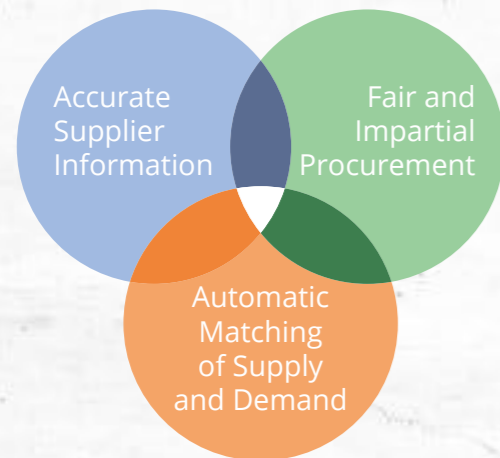
Shared Industrial Growth and Prosperity: Promoting Smart Supply Chains and Procurement Portal

Since 2016, TCC has integrated various AI technologies into our plants and supported adoption among our clients. In 2019, we developed Procurement Portal that uses AI to select suppliers, digitalize the tender process, and manage risks associated with material quality. Expanding smart manufacturing to our upstream suppliers increases the rate of industrial upgrades.



Three Advantages of Procurement Portal

- When suppliers become platform members, they provide basic information, operational permits, and financial, environmental, safety, and health information. The system analyzes these data, then creates a file, reducing errors associated with filling out paper documents.
- The digital tender process is transparent. It reduces the opportunity for human manipulation and fraud risk.



- The platform conducts automatic matching based on procurement needs and supplier member types. It can stop high-risk suppliers from participating in a tender, which effectively controls material quality.

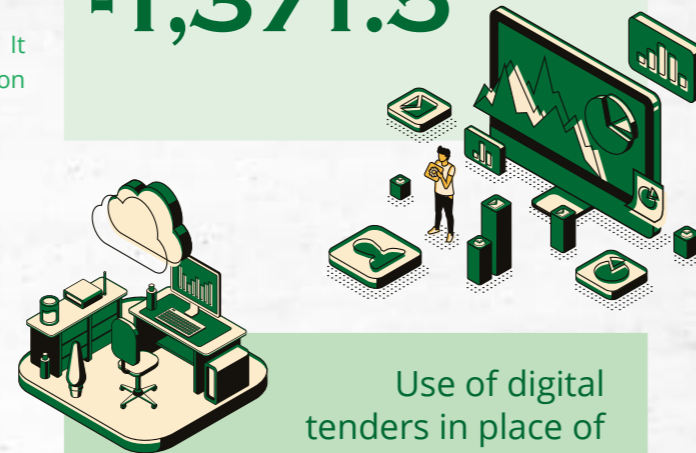


In Mainland China, TCC has already started using AI to optimize production processes, prevent pollutants such as carbon dioxide and nitrogen oxides, and improve coal consumption rates. In 2019, we added our Procurement Portal to the Yingde and Chongqing plants, and in 2020, we plan to expand the platform to 100% of our plants in Mainland China. Big data from the platform optimizes procurement strategies, enabling us to craft fair and transparent procedures that improve costing, uphold quality, and create competitive advantages. TCC will continue using smart management experiences to improve raw material procurement and product delivery, bringing new value to this traditional industry.

2019 Stage I Implementation Effectiveness

AI matching reduced work hours associated with tenders by

-1,371.5 /HOURS



Use of digital tenders in place of paper documents saved the equivalent of

-2,194⁴ /kgCO₂e

⁴Based on data from the Taiwan Product Carbon Footprint website launched by the Environmental Protection Administration, which estimates that the production and use of one sheet of A4 paper (80g) generates 0.008 kgCO₂e.

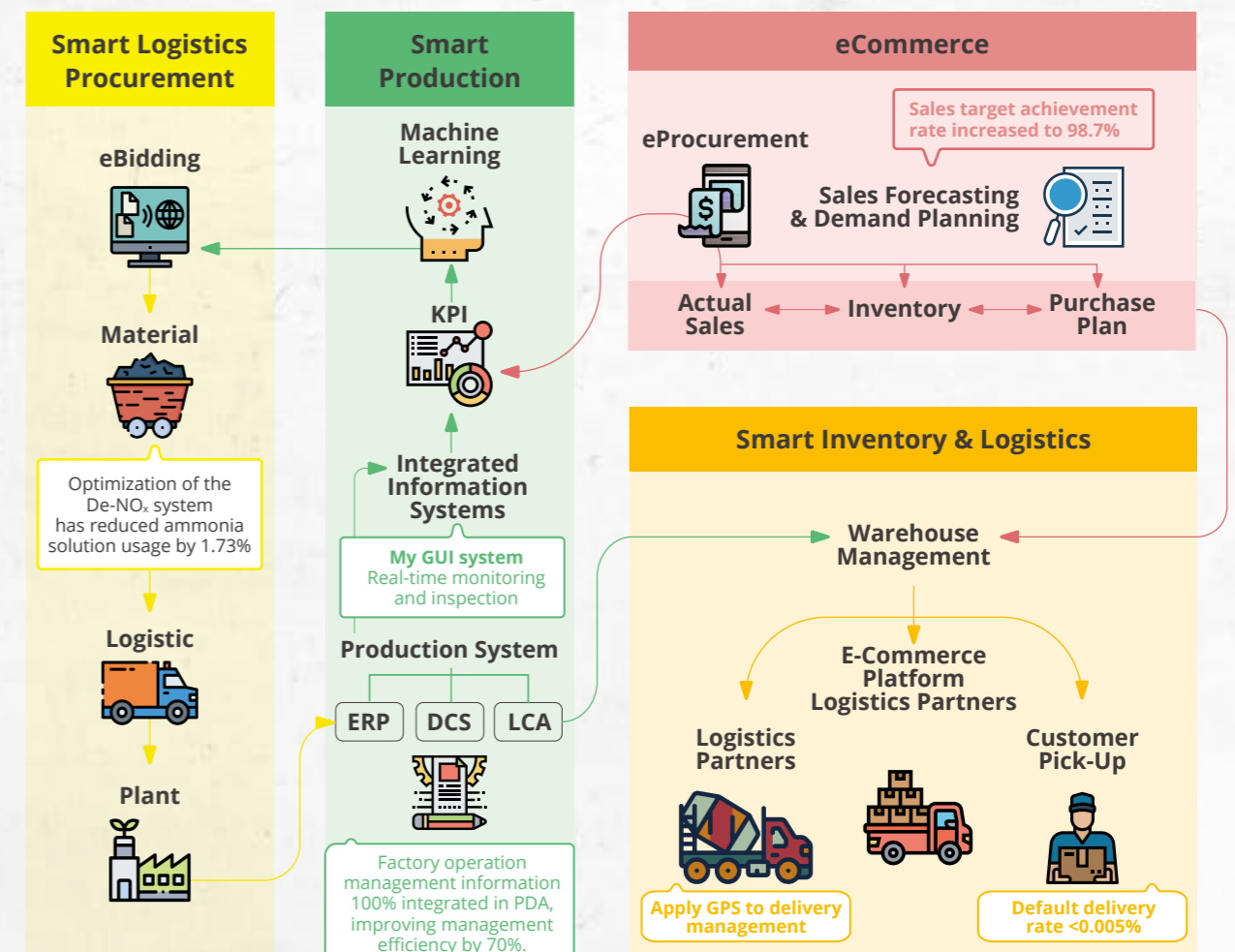
Integrating Data Analysis Techniques to Build a Smart Factory

TCC proactively combines technological and environmental management to add synergy to operations. For example, we use life cycle assessments to determine the potential environmental impacts of cement products from raw material extraction through manufacture, delivery, sale, use, and waste disposal and recycling. Analysis contributes to decision-making and recommendations around strategy development. At the same time, we use Simapro life cycle assessment software to build models for calculating the carbon emissions intensity of our cement plant manufacturing and clinker production then use these models to support GHG emissions management.

In addition, TCC uses AI to optimize existing manufacturing processes. Non-linear programming contributes to models for evaluating the benefits of alternative raw materials. Regression models calculate ammonia solution usage recommendations. For example, at TCC's Liaoning Plant in Mainland China, optimization of the De-NO_x system has reduced ammonia solution usage by 1.73%, demonstrating the excellent contributions of technological applications to sustainable development.

In the future, TCC will further expand use of big data and AI to build smart factories that optimize the group's operations and achieve our vision of smart production and a sustainable business.

Smart Production Framework



Clean Energy

Solar, Geothermal and Wind-Powered Green Energy and Storage

Turning sunlight, wind power,
and geothermal heat into green energy
that can be stored stably,
so clean natural sources
of energy can be used endlessly in a cycle.

TCC's operational philosophy includes making "nature first" and "benefit to society" as purposes. Green energy plans play a crucial role in our governance and are an integral part of improving our energy structure. The development of renewable energy is critical to ending the use of fossil fuels with high carbon emissions, but storage systems are needed to solve the unstable power output of renewable energy. When used together, generation and storage complement each other in a way that could turn renewables into the primary source of our energy supply.

To fulfill our responsibility as an international enterprise, we expanded into the renewable energy industry. We are investing in solar, wind power, geothermal, and other areas. As we research and analyze each area of renewable energy, we also develop lithium battery storage techniques to provide stable and sustainable renewable energy and strengthen our influence in the field.

Taiwan's First Combo Wind and Solar Power Plant Expands Our Renewable Energy Portfolio

At the end of 2019, TCC completed a power plant at Changhua Coastal Industrial Park with 12.1 MW of solar power installations and 7.2 MW of wind power installations. It is Taiwan's first large-scale combo wind and solar power plant. Due to our high land-use efficiency, the plant is able to produce close to 34 million kWh of electricity per year.

The Company also contributes to developing joint fishery-solar power plant projects. We plan to add solar power installations totaling more than 60 hectares to fisheries in Chiayi County. The fisheries can continue operating and even make use of the electricity generated from the PV system to improve their profits as well as the aquaculture environment, creating higher yields from fisheries, higher land-landing income, and a better fishery condition. Furthermore, they can enjoy better benefits from land rent and better aquaculture environment. By enabling the government to simultaneously support both industries, this program creates a win-win situation.

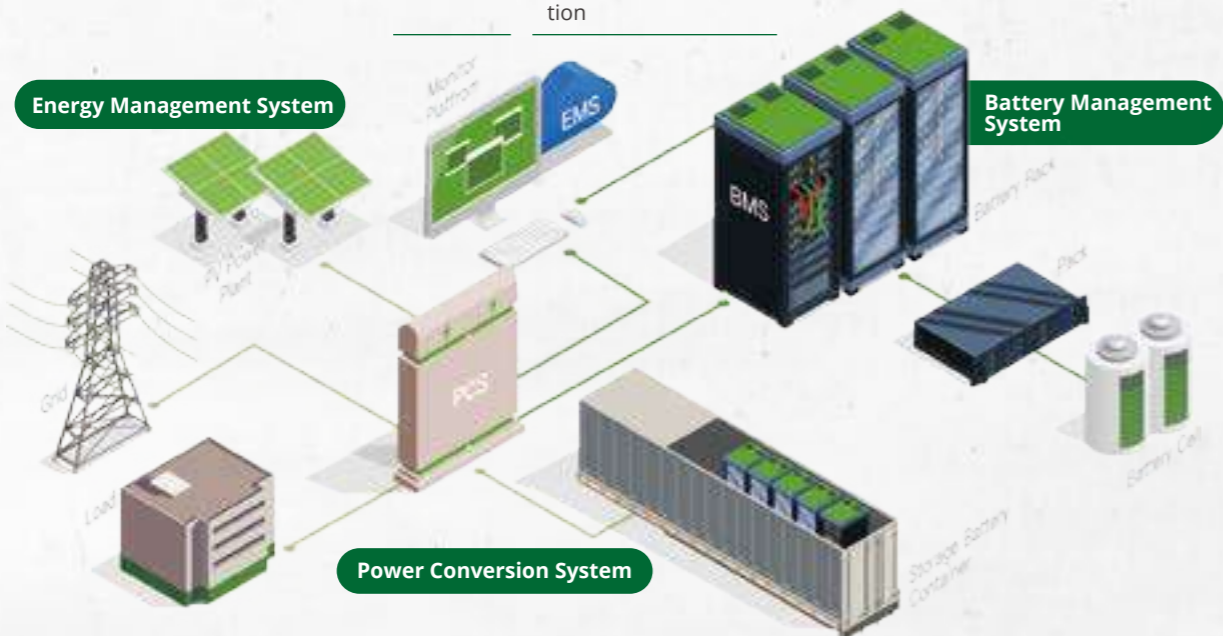


Geothermal energy is another focus of the Company. Initial plans call for building a 3 MW geothermal plant in eastern Taiwan. We completed feasibility studies using exploration geophysics and held several explanatory meetings, so more people understand renewable energy and support its development. TCC's initial renewable energy installations (including completed projects and projects that are in progress)

will reach a capacity of about 100 MW and produce close to 130 million kWh of energy per year, equivalent to a reduction of approximately 69,000 tonnes of carbon emissions. By 2025, we expect to manage renewable energy plants with more than 500 MW of capacity.

TCC Renewable Energy Projects

Project Name	Energy Type	Installed Capacity	Location	Status	Electricity Sales Plan	Special Features
Changhua Coastal Wind Project	Wind	7.2MW	Changhua Coast	Completed and connected to the grid	Feed-in Tariff	Taiwan's first large-scale wind-and-solar hybrid power plant
Changhua Coastal Solar Project, Phase I	Solar	2MW	Changhua Coast	Completed and connected to the grid	Feed-in Tariff	TCC's first ground-mounted plant
Changhua Coastal Solar Project, Phase II	Solar	10.1MW	Changhua Coast	Completed and connected to the grid	Feed-in Tariff	TCC's first Type I renewable energy plant
Chiayi Joint Fishery-Solar Power Plant	Solar	44MW	Yijhu	Filed. Applying for approval.	Feed-in Tariff	Taiwan's first large-scale fishery solar power plant
Changhua Coastal Wind Project, Phase II	Wind	14.4MW	Changhua Coast	Environmental impact assessment underway	Feed-in Tariff	Large-scale wind power
Chang-Wang Wind Power	Wind	14.4MW	Fangyuan	Construction underway	Feed-in Tariff	Large-scale wind power
TCC Rooftop solar power	Solar	2.1MW	Dadu, Linyuan, Southern Taiwan Science Park	Taiwan Transport & Storage Dadu office completed, Linyuan Advanced Materials Technology completed, others under construction	Feed-in Tariff	Green power promotion



High-Power Battery R&D Applications of Stored Energy

MoliceL, a subsidiary of TCC, is an important part of the Company's renewable energy technology R&D blueprint. Founded in 1998, MoliceL is one of Taiwan's few international-scale lithium battery cell manufacturers with more than two decades of experience. MoliceL cooperates with well-known global brands on high-profile projects, including supporting development of manufacturing a lithium battery for NASA to use in space. The battery is capable of working for five to six years under extreme cryogenic temperature, marking it the industry leader.

In recent years, MoliceL has concentrated on making high-capacity, high-output batteries with high C rates and long-cycle lives. It has become a designated supplier of top brands, including a leading British wireless vacuum cleaner brand, US medical equipment providers, and makers of military communications devices. International automobile manufacturers, super-car brands, and aviation device manufacturers are in discussions about joint development and manufacturing of the next generation of batteries. In 2018, MoliceL began working with Uber on development of a special lithium battery for use in Air Taxis, with a prototype vehicle scheduled to be ready in 2020 and commercialization scheduled for 2023.

MoliceL makes battery cells with fast charging and high C rates, and it is developing systems that have storage capacities measured in GWh. These advantages, together with advanced R&D capabilities, will support joint development of renewable energy with TCC. Plans are for these batteries to provide storage for renewable energy with intermittent supplies

(such as wind and solar) in order to support regional electricity networks and provide fast EV charging stations, thus supporting renewable energy development.

Previously developed energy storage batteries were installed at TCC DAKA market in Phase 1. At TCC Daka, MoliceL already installed a 50 kWh battery system that works in conjunction with three solar Smart Flower installations. Each day, the system stores approximately 35 kWh of electricity and powers all lighting in the TCC Vision House. We also use 40 kWh panels and a 100 kWh battery system to power water pumps and drip irrigation systems for vegetation at the Taibai Mountain mine. This demonstrates the feasibility of using renewable energy generation and storage to turn the Taibai Mountain mine into an autonomous, circular ecological system.



In the next stage, as the popularization of electric vehicles (EVs) leads to new infrastructure demands, we plan to develop 1 MWh container-type battery storage systems that provide high C rates and fast charging for EVs. MoliceL's high-power, fast-charging battery systems can be fully charged within 30 minutes and provide fast 15-minute charges to 4-5 EVs. They significantly increase turnover and efficiency at charging stations, quickly getting more zero-emissions vehicles on the road.

Open Factories Thriving on Community Rejuvenation-- New Values for Society

Factories are not independent units.
They are connected to the surrounding community.
Factories should become part of community life



TCC's Augmented Reality

In the Taroko language, "daka" is the word for an observation tower. From the vantage point of a daka, people can look out and see endless possibilities.

TCC DAKA is an open, ecological, circular factory that is a place for production and leisure park area. It is a classroom for passing on knowledge, a museum housing items of artistic significance, and a new starting point for industry and society to create value together.

"TCC, tribes and the mother nature will all reside in the land in the future."

The cement industry is a basic industry for people's livelihoods. In recent years, however, because of global warming and disputes in mineral rights, the industry's image and operations have faced unprecedented challenges. To counter these trends, TCC built an open eco-factory that serves as a public communication platform. TCC Chairman Nelson Chang, who closely monitors the relationship between industry and society, personally participates in public hearings with local citizens and government officials. Chang communicates directly with the community groups and sustainability-based organizations to understand the perspectives and concerns of different groups toward the cement industry. In 2019, TCC made the 3-in-1 Hoping circular park, which includes a cement plant, port, and power plant, into the base of TCC's open eco-factory plan, enhancing public participation.

TCC held a conceptual design competition for the Hoping open factory, with a professional group for licensed architects and designers as well as a student group. The competition called for the design of a circular, innovative living platform. The Hoping Drawing Competition on the subject of "Hoping's beauty" to decorate the covered cement corridor, becoming the most beautiful landmark on Hualien's Provincial Highway No. 9. TCC also enlisted Michelin-rated restaurants and local cuisine operators to hold the Hoping Gourmet Festival, further showing the benefits of thriving on Community Rejuvenation for localities. Chairman Chang says because we do not know where the limit is, we have to try. Human beings' limit is infinite; their imagination is infinite.



Timeline of the TCC DAKA Open Eco-Factory

2019/6

Visits to Heping Village Families

2019/7

Hoping Harvest & Food Festival

2019/9—2020/3

TCC Hoping Open Factory Design Competition

2019/10-11

Discover the Beauty of Hoping Children and Youth Drawing Competition

2020/1/9

Official Opening of the TCC DAKA Open Eco-Factory

2020/4

TCC DAKA obtained Certification as a Tourism Factory by the Economics Ministry



Donating All DAKA Profits as a Non-profit Entity to a Local Education Fund

TCC DAKA held a fair with over a dozen local residents from Heping and Aohua

villages who were eager to start new businesses that promote the characteristic culture of the Taroko tribe. We offer entrepreneurial guidance and assistance while prioritizing hiring young adults from the Taroko community, including training them as tour guides for the open factory. All profits from DAKA go towards an educational fund for Heping Elementary School. Spending priorities include hiring teachers for pluralistic teaching and providing nutritional subsidies for students. In addition, the open factory is building connections with the nearby Heping, Hezhong, and Heren tribes. Through knowledge gained on local visits, we are gradually building a culinary and travel map that covers surrounding areas. Our end goal is to create a new style of industrial-community cooperation that brings new looks and values.



TCC DAKA Is an Ecological Knowledge and Cultural Leisure Center

At DAKA Park, TCC is opening up an operating factory to demonstrate a unique production model based on circular economic principles. Special features include Asia's largest calcium looping facility for carbon capture, microalgae cultivation, ecological restoration at old mines, and conservation at Hoping industrial port. Guided tours will share these achievements with the general public. This is Taiwan's first facility to offer an up-close look at renewable energy generation, circular economy principles, and ecological conservation. The park contains East Asia's first large-scale, outdoor solar power art installation, the "Smart Flower," which rotates based on the position of the sun. At the center of the park is a musical fountain that operates using circulating rainwater. There is also a green corridor featuring a garden planned by the world-renowned Dr. Cecilia Koo Botanical Conservation Center, and design teams created concrete installations that add a unique modern industrial aesthetic to the park, exhibiting the beauty of contemporary cement artwork.

Shared Benefits, Value Creation, and Awareness for the Factory and Local Community

A spotlight is already shining brightly on TCC DAKA. As the facility gradually integrates into the community, locals who used to be strangers are now familiar faces. In 2020, to celebrate White Valentine's Day, a Heping village church held an outdoor poetry reading and concert in TCC DAKA's TUO Square. When Heping Elementary School was preparing for graduation, students visited the TCC Plant and TCC DAKA to take graduation photos. These are the best affirmations we got and have been inspiring us to continue contributing to the greater good of the industry and the society.



The combination of water, fire and earth makes this world infinite. Living creatures grow and multiply in endless and benign cycles.

Using the Chinese characters for "water," "fire," and "earth," TCC created a new character that is pronounced as "tuo." It represents TCC's self-imposed mission to build a circular, sustainable business. TCC believes in striking a balance between civilization and nature, and circular symbiosis is the only answer, and also our unwavering belief.

Old gray rocks and cement kilns,
In a peaceful (Heping) contemplation,
They are so timeless and so free.

The wind from nature is calling,
Domes and beltways,
Cement is part of this mysterious culture.

Look at the flickering stars and the lunar rhythms.
Where the mountains touch the sea,
In nature,
the green grass and fresh flowers at the seashore,
In this clear, crisp air.

Into the garden of all things,
The sea, the sambar, the white orchid,
Aristotle's harmony,
Follow the sounds of nature in the air,
Are always so quiet and peaceful.

— Nelson An-Ping Chang, 8/28/2019, "Remembering Heping's Mountains and the Sea"



Management of Sustainability Topics

Management of Sustainability Topics

- 1.1 Sustainability Dialogues with Stakeholders 37
- 1.2 Identifying Sustainability Topics 41
 - Governance and Risk
 - Society Empowerment
 - Environment and a Low Carbon Supply Chain
 - Biodiversity and Regeneration
 - Employee Benefits
 - Appendix

01 CHAPTER

Alnus Formosana Makino is a pioneer species of ecological afforestation in mines, with extremely strong environmental adaptability. Its roots have rhizobium nitrogen fixation, which is good for soil and water conservation, thus beneficial for land conservation.

Management of Sustainability Topics

Interaction and communication between a company and its stakeholders is a foundational part of sustainable development. Adhering to the principle of “Total Care Commitment,” TCC deeply values the opinions of stakeholders. Through ongoing communication and engagement, we learn the sustainability topics stakeholders care the most about, then make those topics part of our corporate sustainable development blueprint. Using the Global Reporting Initiative (GRI) Standards for sustainability reporting and the Dow Jones Sustainability Index (DJSI) as references, we develop and distribute sustainability questionnaires customized to our industry to gain insight into stakeholders’ views. We consider the degree of impact and risk of each issue on the Company’s operations to determine the issues that are of the greatest significance so that we can prioritize their handling and respond in a manner that fulfills stakeholders’ expectations.

Process for Evaluating Stakeholders and Material Issues

STEP-01 Identifying Stakeholders

Action | Managers of each department fill out a stakeholder identification questionnaire to determine the importance of each stakeholder to the Company and identify key stakeholders.

Performance Measure | Identify 10 stakeholder types

STEP-02 Determining Areas of Concern

Action | After identifying key stakeholders, the Company distributes questionnaires or conducts interviews to understand stakeholders’ views and areas of concern. We then analyze the degree of attention that should be paid to each issue.

Performance Measure | 204 valid questionnaires/one discussion forum

STEP-03 Evaluating Impacts on Business Operations

Action | Management analyzes each issue to determine the degree of impact and risk towards operations.

Performance Measure | Opinions of four high-level managers/CSR Committee resolution

STEP-04 Establishing Material Issues

Action | Based on stakeholders’ areas of concern and the degree of impact of each issue on operations, we produce a material issues matrix, showing the importance of each item.

Performance Measure | Identify 13 material issues

STEP-05 Issue Analysis

Action | We examine all material issues and compare them to the previous year’s major issues to confirm that they correspond to the Company’s sustainability objectives and overall goals.

Performance Measure | 100% of issues meet sustainability objectives and overall goals

1.1 Sustainability Dialogues with Stakeholders

Based on the AA1000 Stakeholder Engagement Standard, TCC systematically identifies and groups stakeholders based on five attributes: responsibility, influence, tension, diverse perspectives, and dependency.

In 2019, considering the value that media places on corporate information disclosures and the distinct nature of sustainability associations, we added two stakeholder groups: media and sustainability associations. Stakeholder groups are listed from top to bottom in the order of importance according to our evaluation: government agencies, clients, employees, shareholders & investors, local communities, industry associations/industrial and academic units, media, suppliers & contractors, environmental groups & non-governmental organizations (NGOs), and sustainability associations.

To ensure effective and sound communication with stakeholders, TCC arranges diverse communication channels and discloses information transparently and openly. We place great importance on stakeholders’ expectations. Areas of concern identified through communication with stakeholders become strategic operational reference points that optimize our promotion of sustainable development and implementation of corporate social responsibility. We believe that smooth and effective communication channels with stakeholders are needed to capture market, economic, social, and environmental trends. These steps make “nature first” and “benefit to society” key aspects of our sustainability mission.

Stakeholders

Government Agencies

Significance to TCC
An important stakeholder concerned with TCC's economic, environmental, and social legal compliance, which also influences industrial development and policy implementation

Areas of Concern

- Legal compliance
- Management of raw materials and water resources
- Corporate governance and ethical corporate management
- Pollution control and management
- Ecological restoration

Communication Methods and Frequency

- Regular updates to the Company website and the Market Observation Post System (MOPS)
- Participation in interviews, seminars, and conferences
- Correspondence via documents and mail

2019 Communications Performance

- Participated in conferences and public hearings on regulatory amendments to offer recommendations to competent authorities
- Discussed with Taiwan National Taxation Bureau of Taipei the action plans to encourage more Taiwanese businesses owner to invest in Taiwan market

Reflections and Countermeasures

Keep track of public policies, laws and regulations while using our status as an industry leader to promote compliance and support policy implementation

Relevant Section

2.2 Solidifying the Governance Framework

Stakeholders

Clients

Significance to TCC
A stakeholder that cares about the quality of TCC's products and services as well as operations, compliance and environmental protection efforts

Areas of Concern

- Corporate governance and ethical corporate management
- Client relationship management
- Sustainable products
- Supplier management
- Risk control

Communication Methods and Frequency

- Annual client satisfaction surveys
- Communication with clients by phone and external mail

2019 Communications Performance

- Developed a cement product traceability system to enhance our communication with clients
- Conducted the annual client satisfaction survey and results showed that client satisfaction remained high

Reflections and Countermeasures

Continue to provide products and services that are consistently high quality and comply with safety standards while conducting business in an ethical manner that does not harm the environment in order to meet clients' expectations

Relevant Section

2.3 Optimizing the Client Experience

Stakeholders

Employees

Significance to TCC
A key stakeholder and TCC's most important asset, our employees are the main reason for our ongoing breakthroughs and innovations

Areas of Concern

- Human rights guarantees and employee care
- Workplace health and safety
- Circular economy
- Waste co-processing
- Operational performance

Communication Methods and Frequency

- Annual performance evaluations and interviews
- Quarterly labor-management meetings, union meetings, employee welfare meetings, and town hall meetings
- Monthly departmental meetings
- Explanation and signing of the Code of Ethics
- Responding to employee opinions (employee mailbox)
- Promotion of human rights policies – internal announcements and disclosure on the Company website

2019 Communications Performance

- Held town hall meetings each quarter with total attendance of 1,360 people
- Held 35 employee behavior policy meetings with total attendance of 825 people
- Held 18 labor-management meetings
- Held 9 union meetings
- Held 25 employee welfare meetings
- Completed performance evaluations and interviews for 989 employees
- Publicized the Code of Ethics, human rights policies, and sexual harassment policies, which were signed either digitally or non-digitally by 100% of employees
- Received and handled one employee suggestion that was submitted to the Employee suggestion mailbox
- Human rights policies are disclosed in Chinese and English on our Company website and announced internally on our digital bulletin board

Reflections and Countermeasures

Recruit suitable candidates, invest in training and educational activities, and provide safe workplaces so that all employees can enjoy working at TCC

Relevant Section

6.2 Building a Happy Workplace

Stakeholders

Shareholders/ investors

Significance to TCC
The stakeholder that is the main financing source of TCC and that is most concerned with operational performance and sustainable developments

Areas of Concern

- Operational performance
- Corporate governance and ethical corporate management
- Legal compliance
- Workplace health and safety
- Human rights guarantees and employee care

Communication Methods and Frequency

- The annual general meeting (AGM) of shareholders
- Regular updates on the Company website and MOPS
- Replies to shareholders' questions by phone or mail

2019 Communications Performance

- Held 1 AGM
- Held 7 board meetings
- Held 5 investors' conferences
- Replied to all phone enquiries from shareholders about material topics

Reflections and Countermeasures

Continue to maintain steady operational performance in the cement industry and develop new opportunities suited to our business environment in order to uphold excellent results

Relevant Section

2.2 Solidifying the Governance Framework

Stakeholders

Local communities

Significance to TCC
The stakeholder that lives near TCC cement plants and is most affected by the Company's operations impact

Areas of Concern

- Social participation
- Ecological restoration
- Legal compliance
- Waste co-processing
- Management of raw materials and water resources

Communication Methods and Frequency

- Annual interviews with local communities and schools
- Publicizing special cases
- Communication by phone and email
- The Company website
- Industrial zone meetings

2019 Communications Performance

- Arranged 1 tour of TCC mine operations and tree planting initiatives for Heping residents
- Held 1 summer camp for Heping Elementary School students
- Brought Heping area residents on a tour of the Bali Refuse Incineration Plant
- Attended the 55th anniversary of Yongle Elementary School
- Attended 2 community rejuvenation seminars held by the Suao Township Office
- Assisted with grass and bush cutting on mountain-side roads in Changan Village
- Visited more than 60% of households in Heping Village
- More than 450 villagers attended the Heping Harvest & Food Festival
- Held the first Heping Harbor fishing competition
- The TCC Cement Handicraft Workshop was also hosted at the Suao Cold Spring Festival, the National Taiwan University campus, the Kaohsiung Museum of History, and Guangxi, Mainland China (for the first time)
- TCC DAKA Open Eco-Factory supported marketing efforts by local handicraft vendors
- Held 2 Cross-Taiwan Strait Cement Academy Summer Camp events attended by approximately 100 school children
- Held after school Cement Academy year-end presentation at two schools

Reflections and Countermeasures

Optimize onsite environmental protection and continue to interact with local communities so people are aware of TCC's environmental achievements

Relevant Section

3.1 Launching Social Dialogue

Stakeholders

Industry associations, industrial and academic organizations

Significance to TCC
A stakeholder that jointly promotes industrial development and offers business consultations and exchanges ideas

Areas of Concern

- Optimization of innovation and intelligence
- Sustainable products
- Circular economy
- Waste co-processing
- Climate action and science-based target emissions reductions

Communication Methods and Frequency

- Communication by phone, documents or email
- Yearly attendance at National Standards of the Republic of China meetings
- The Company website

2019 Communications Performance

- Attended the Ministry of Economic Affairs' Carbon Dioxide Capture and Storage R&D alliance meeting
- Attended a meeting on setting national carbon capture standards hosted by the Bureau of Standards, Metrology, and Inspection
- The cement union commissioned the Taiwan Concrete Institute to carry out the Cement Industry Circular Economy Promotion Plan

Reflections and Countermeasures

Continue to participate in organizations that promote industrial growth, communicate operational performance, and provide joint assistance for overcoming operational problems

Relevant Section

2.2.1 About TCC



STAKEHOLDER COMMUNICATION

Stakeholders

Media

Significance to TCC
A stakeholder that helps TCC to disclose sustainable measures

- Areas of Concern**
- Operational performance
 - Sustainable products
 - Ecological restoration
 - Optimization of innovation and intelligence
 - Human rights guarantees and employee care
 - Management of raw materials and water resources
 - Climate action and science-based target emissions reductions
 - Circular economy
 - Waste co-processing

Communication Methods and Frequency

- Visits by media groups
- Communication by phone or email
- Fan groups, WeChat official account, Instagram
- The Company website

2019 Communications Performance

- TV news report: carbon capture and carbon cycle
- Media interviews: school campus recruitment, investors' conferences, AGM
- Media groups: Heping environmental protection conference, Hoping Food Festival, Guigang Plant environmental protection facility opening ceremony
- Press releases: 3-5 each quarter
- 1-2 posts on company website and social media accounts

Reflections and Countermeasures
Continue to communicate with the media to deepen the awareness of TCC and the cement industry so that the general public can understand TCC's operations and sustainable development achievements

Relevant Section
3.1 Launching Social Dialogue

Stakeholders

Suppliers/ contractors

Significance to TCC
A stakeholder that works with TCC to manufacture products and raise quality, and a business partner that supports TCC's environmental and sustainability efforts

- Areas of Concern**
- Supplier management
 - Corporate governance and ethical corporate management
 - Client relationship management
 - Operational performance
 - Workplace health and safety

Communication Methods and Frequency

- Annual audits
- Contract tender meetings
- A supplier suggestion mailbox on the Company website
- Communication by external mailboxes, phone, and email

2019 Communications Performance

- Conducted annual audits of 119 suppliers
- Convened 521 contractor meetings, safety meetings, and educational and training sessions
- Received 359 emails in the supplier suggestion mailbox

Reflections and Countermeasures
Conduct comprehensive supplier management and build steady, long-term cooperative relationships that enable our suppliers to continue to grow with TCC

Relevant Section
2.4 Supply Chain Sustainability



Stakeholders

Environmental groups, NGOs

Significance to TCC
A stakeholder that urges TCC to improve environmental protection, employee care, and communication with local communities

- Areas of Concern**
- Legal compliance
 - Ecological restoration
 - Corporate governance and ethical corporate management
 - Social participation
 - Waste co-processing

Communication Methods and Frequency

- Communication by phone or email
- The Company website

2019 Communications Performance

- 50 visits by local universities and community organizations
- National Ilan University students visited the cement plant
- Participated in a circular economy demonstration with the Industrial Development Bureau
- Participated in the CommonWealth Magazine CSR forum
- Participated in the Taipei-Shanghai Forum

Reflections and Countermeasures
Continued support of environmental efforts included promoting environmental sustainability, reducing environmental damage, restoring the natural environment, and expanding environmental protection and green energy business opportunities

Relevant Section
3.1 Launching Social Dialogue

Sustainability associations

Significance to TCC
A stakeholder that focuses on TCC's awareness of environmental trends and helps to build a sustainable future

- Areas of Concern**
- Workplace health and safety
 - Waste co-processing
 - Climate action and science-based target emissions reductions
 - Management of raw materials and water resources
 - Pollution control and management

Communication Methods and Frequency

- Sustainability activities participation
- Communication by phone or email

2019 Communications Performance

- Attended 11 CSO Salons held by the Taiwan Center for Corporate Sustainability
- Arranged for 15 experts from the Taiwan Institute for Sustainable Energy to visit Hoping Plant

Reflections and Countermeasures
Continue to participate in sustainability association activities, initiatives, and guidelines in order to share sustainability experiences and strengthen sustainability measures

Relevant Section
2.2.1 About TCC

1.2 Identifying Sustainability Topics

TCC considers international sustainability development trends, CSR norms and standards (DJSI, CDP, GRI Standards), benchmark enterprises, CSR expert opinions, and industry characteristics when identifying key sustainability topics, such as corporate governance, economics, environment, and social issues. In 2019, TCC identified key stakeholders and distributed questionnaires to understand the issues that are most important to them. A total of 204 valid questionnaires were returned. Using the results, four high-level managers analyzed short-term, mid-term, and long-term financial and non-financial impacts and risks associated with each issue. They then listed the key areas of concern and operational impact in a sustainability topics matrix for disclosure of related

actions and performance in this CSR Report. In editorial meetings, staff analyzed the questionnaire results and considered previous engagements and recent sustainability trends as a basis to determine key sustainability issues for 2019. These include corporate governance and ethical corporate management, climate action and science-based target emissions reductions, waste co-processing, pollution control and management, workplace health and safety, the circular economy, operational performance, legal compliance, risk control, ecological restoration, sustainable products, human rights guarantees and employee care, and management of raw materials and water resources.



- Governance Topics**
- Corporate governance and ethical corporate management
 - Operational performance
 - Risk control
 - Legal compliance
 - Optimization of innovation and intelligence
 - Circular economy
 - Sustainable products
 - Supplier management
 - Client relationship management

- Environmental Topics**
- Climate action and science-based target emissions reductions
 - Renewable energy development and energy management
 - Waste co-processing
 - Management of raw materials and water resources
 - Pollution control and management
 - Logistics management
 - Ecological restoration

- Social Topics**
- Human rights guarantees and employee care
 - Workplace diversity and equality of opportunity
 - Workplace health and safety
 - Talent cultivation and development
 - Labor-management relations
 - Open factories and community rejuvenation
 - Social participation

Material Topics and Themes

TCC identified material topics in accordance with the GRI Standards and established management guidelines and evaluation instruments. The topics are managed systematically and results are disclosed in accordance to TCC's corporate sustainable development promises, and meet stakeholders' expectations.

	Material Topics	GRI Topics/Self-Defined Topics	Significance to TCC	Risk Assessment and Management Indicators	Value Chain	Relevant Sections
GOVERNANCE	Corporate governance and ethical corporate management	GRI-205 Anti-corruption GRI-206 Anti-competitive behavior	Compliance with the Articles of Incorporation and ethical management by all supervisors and staff are key drivers of steady growth	<ul style="list-style-type: none"> Preventing graft and corruption within the Company, regularly monitoring the latest information from competent authorities, and evaluating the scope of ethical management policies in order to ensure that we uphold the highest moral principles in our commercial practices 100% of all new employees signed the Code of Ethics 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	2.2 Solidifying the Governance Framework
	Circular economy	Circular economy	Close monitoring of the consumption of natural resources and energy while developing alternative fuels that reduce natural resource depletion and enhance energy efficiency	<ul style="list-style-type: none"> Avoiding unnecessary consumption of natural resources and regularly monitoring resource usage efficiency Setting annual product energy consumption standards (coal, electricity) Achieving 100% usage rates of alternative raw materials, such as clay, silica sand, slag, and coal ash 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input checked="" type="checkbox"/> Suppliers	4.2 Implement Environmental Management
	Operational performance	GRI-201 Economic performance	Steady growth is a commitment that we achieve through quality excellence and a sound corporate image	<ul style="list-style-type: none"> Fulfilling promises made to shareholders and employees while using comprehensive corporate governance measures, strict risk control, and stable financial planning to continue to produce economic value 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input checked="" type="checkbox"/> Suppliers	2.2.1 About TCC
	Compliance	GRI-307 Environmental compliance GRI-419 Socioeconomic compliance	We closely follow legal and regulatory changes while operating in strict compliance with local laws and regulations	<ul style="list-style-type: none"> Strict adherence to domestic laws and regulations with the goal of achieving zero violations 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	2.2.4 Legal Compliance
	Risk control	Risk control	To protect shareholder value, we built a comprehensive risk management system that includes strict risk identification, examination, monitoring, responses, and reports	<ul style="list-style-type: none"> Regularly examining risk control mechanisms for effective implementation 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	2.1 Comprehensive Risk Control
	Sustainable products	Sustainable products	Continued innovation to raise product value and development of green products to fulfill our social responsibilities	<ul style="list-style-type: none"> Continuing to develop green products 	<input checked="" type="checkbox"/> TCC <input checked="" type="checkbox"/> Customers <input type="checkbox"/> Suppliers	4.1 Better Carbon Management
ENVIRONMENTAL TOPICS	Climate action and science-based target emissions reductions	GRI-302 Energy GRI-305 Emissions	Our commitment to climate change initiatives includes making climate actions a core part of our future sustainability strategy	<ul style="list-style-type: none"> Effectively responding to climate initiative by establishing GHG reduction targets in line with international standards, making GHG reductions part of our appraisal system to promote climate action 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input checked="" type="checkbox"/> Suppliers	4.2 Implement Environmental Management
	Waste co-processing	Waste co-processing	Active development of waste co-processing to help industrial partners build a sustainable ecosphere	<ul style="list-style-type: none"> Continuing to help the government and industry solve complicated waste issues while tracking the volume of waste we co-process, thus ensuring effective contributions towards sustainability 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	4.2 Implement Environmental Management
	Pollution control and management	GRI-305 Emissions GRI-306 Effluents and waste	Production waste and discharge management are important to the Company and external stakeholders	<ul style="list-style-type: none"> Reducing environmental waste risks, engaging in pollution control and waste control, regularly evaluating pollution control effectiveness Emission of particulate matter is lower than the legal standards 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	4.2 Implement Environmental Management
	Ecological restoration	GRI-304 Biodiversity	Mine restoration and ecological sustainability are important parts of our commitment to maintaining the planet's biodiversity	<ul style="list-style-type: none"> Preserving biodiversity while considering ecological balance and reconstruction, carrying out follow-up restoration management to ensure that life is restored to mines and limestone ecology 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	5.1 Protecting the Green Environment
	Management of raw materials and water resources	GRI-301 Materials GRI-303 Water	Close monitoring of materials in our cement products and production processes while seeking ways to reduce consumption of natural resources	<ul style="list-style-type: none"> Avoiding unnecessary consumption of natural raw materials by conserving natural energy resources and fulfilling our commitment to circular economy principles Reducing water consumption by 1% each year 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input checked="" type="checkbox"/> Suppliers	4.2 Implement Environmental Management
SOCIAL TOPICS	Workplace health and safety	GRI-403 Occupational health and safety	Protecting employees by committing to safety management. Integrating occupational safety management systems to raise safety awareness among factory employees and contractors, thus preventing occupational disasters	<ul style="list-style-type: none"> Upholding occupational health and safety by regularly convening the Occupational Safety and Health Committee and issuing implementation reports When major workplace disasters occur, besides reprimanding employees at fault, we conduct reviews to identify causes and track improvement measures Maintaining zero workplace injuries as our goal 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input checked="" type="checkbox"/> Suppliers	6.2.1 Workplace Safety
	Human rights guarantees and employee care	GRI-401 Employment GRI-412 Human rights assessment	Building a harmonious, friendly, and healthy workplace environment that protects the rights of employees. Treating all employees with dignity and respect is our most fundamental promise.	<ul style="list-style-type: none"> Preventing human rights violations by tracking the status of our human rights guarantees and ensuring that we provide a working environment conducive to physical and mental health 	<input checked="" type="checkbox"/> TCC <input type="checkbox"/> Customers <input type="checkbox"/> Suppliers	6.2.4 Human Rights Guarantees

■ Direct impact
□ Indirect impact

Governance and Risk

02 CHAPTER

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Hibiscus Makinoi

A plant newly discovered in Taiwan, the whole plant is densely covered with star-shaped hairs and fluff, distributed around the mine, blooming white and lilac flowers from November to January of the following year, adding scenery to the mine in winter.

Material Topics

Risk Control	GRI 201 Economic Performance	GRI 205 Anti-Corruption GRI 206 Anti-Competitive Behavior	GRI 307 Environmental Compliance GRI 419 Socioeconomic Compliance
Management Policies			
<ul style="list-style-type: none"> Formulate the Risk Management Policies and Methods Establish the Risk Management Executive Committee, which is overseen by the Board of Directors 	<ul style="list-style-type: none"> Establish the Corporate Sustainable Development Committee to fully implement corporate sustainable development strategies 	<ul style="list-style-type: none"> Formulate the Best Practice Principles of Corporate Governance and the Corporate Social Responsibility Best Practice Principles 	<ul style="list-style-type: none"> Use education, training and information to strengthen employee regulatory awareness
Assessment Mechanisms			
<ul style="list-style-type: none"> Regularly identify risks (including risks relating to operations, finance, hazards, climate change, information security, and environmental safety & health) and determine management mechanisms 	<ul style="list-style-type: none"> Carry out annual customer satisfaction surveys (in 2019, the customer satisfaction ratio was 96.70%) 	<ul style="list-style-type: none"> 100% of all new employees sign the Statement of Integrity and Ethical Standards 	<ul style="list-style-type: none"> In 2019, there were no significant fines Employee suggestion mailbox received and processed one e-mail
Objectives			
<ul style="list-style-type: none"> Continue to carry out risk control and strengthen risk management mechanisms 	<ul style="list-style-type: none"> Continue to expand globally to raise the Company's international profile Continue to raise production capacity and reduce costs Develop market strategies and new markets to maintain our position as an industry leader 	<ul style="list-style-type: none"> Continue to develop ethical operations and management mechanisms in order to strengthen our standing as a model of ethical behavior Build a corporate culture that values ethical operations and legal compliance Continue to maintain company resources and protect the rights and interests of stakeholders 	<ul style="list-style-type: none"> Raise awareness of legal compliance among staff Use internal audit mechanisms to improve management insufficient areas





Pandemic response meeting was held on the first day back from New Year's holiday

TCC Activates COVID-19 Risk Management Mechanisms

When responding to COVID-19, TCC remains vigilance and humble. As the natural environment presented unknowns and uncertainties, we recognized mankind's vulnerabilities and the need to revisit our relationship with nature. On March 18, 2020, the number of COVID-19 cases in Taiwan surpassed 100. In an online meeting, Chairman Chang said: "In more than 40 years of my professional life, this is the biggest risk we have faced. I hope that all employees take care of yourselves and your families while thinking of the TCC Group as a big family we are all part of. We must work together to overcome this challenge." After the start of the lunar new year,

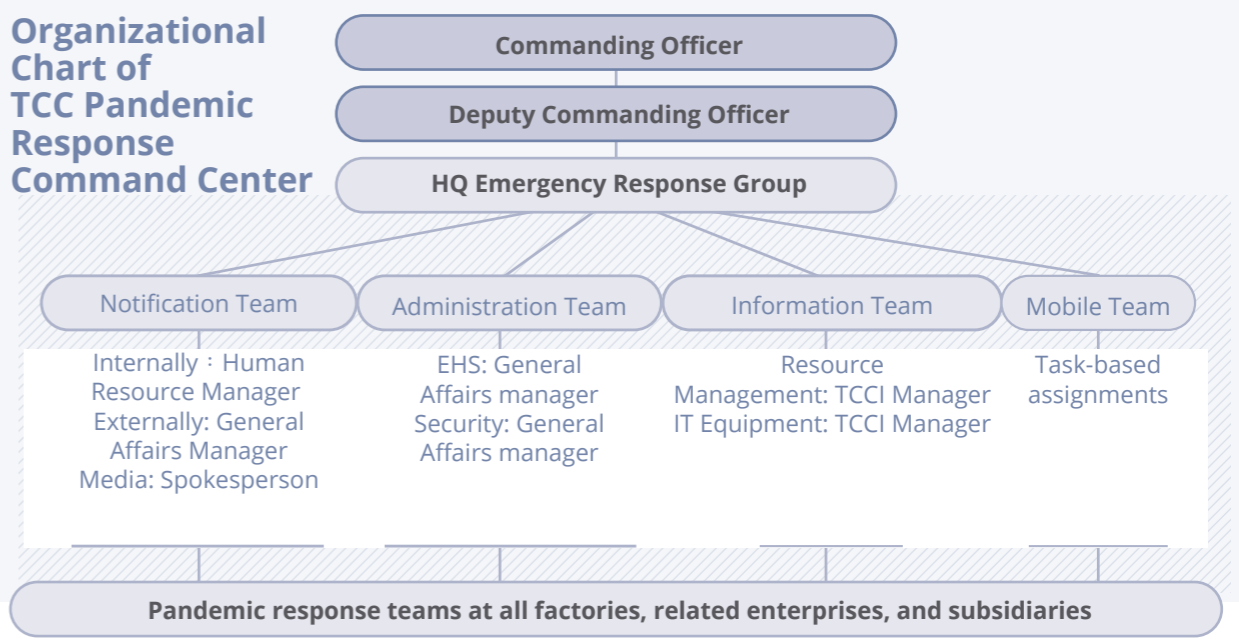
Wherever there is a shadow, there is also light. Protect TCC, employees and shareholders so that when the tsunami recedes, we are still floating.
An-Ping Chang

Chairman Chang convened several online meetings to announce TCC's pandemic response measures and operational plans. He offered care and encourage and he emphasized that the best way to get through the crisis is to have a solid belief and take it one-step at a time.

Core Features of Pandemic Risk Management: Prevent service interruptions while upholding the rights and interests of the Company, employees, shareholders, and all other stakeholders

1. Pandemic Prevention Risk Management Mechanisms:
 Command of the Pandemic Response Center: In December 2019, when COVID-19 reports emerged, Business Continuity Management system launched Business Continuity Plan when COVID-19 reports were received. On January 22, 2020, we established the TCC Headquarters Pandemic Response Center, which was led by TCC's chairman. Daily reports delivered to headquarters, subsidiaries, and related companies contained information on the pandemic situation, industrial actions, and official reports from our various locations. This information served as a reference for pandemic response teams to formulate and modify response plans. To maintain operations, the Company also conducted operational impact risk analysis, and formulated response action plans.

Organizational Chart of TCC Pandemic Response Command Center



2. Business Continuity Planning:

After experiencing SARS, TCC was prepared for the outbreak of another Major infectious. At the start of COVID-19, we gathered daily information and made timely adjustments to pandemic response planning. Business Continuity Planning focused on two main areas: employee care at operational sites and caring for the external community.

① Employee Care at Operational Sites:

Adjusted staff deployments at external units. Each plant should establish its own epidemic prevention response mechanism, and disinfect regularly. Staff were spread across different shifts and encouraged to move regular meetings and town hall meetings online. Other measures included installation of infrared temperature sensors, offering of pandemic travel subsidies, and regular distribution of masks and other disease prevention items.

② Caring for the external community:

To enact social distancing measures, TCC moved institutional investors' conferences and shareholders' meetings to suitable locations and enhanced online participation tools. Plants supported disinfection of nearby communities and distributed masks. The Company announced information through Facebook, Instagram, WeChat official account, and press releases.



Daily temperature checks of employees using infrared temperature sensors and thermometers



Providing masks and alcohol disinfectant to employees



Living a happy family life



Clean frequently Disinfect the environment



Balanced nutrition and suitable exercise



Pandemic Prevention Comic

TCC General Affairs Department Specialist Zhang Ji-Yuan, who has loved to sketch since youth, recently used this skill to remind colleagues how to stay safe and prevent disease during a pandemic. Zhang drew a humorous sketch of a sumo wrestler to show the importance of nutrition and exercise. His pandemic drawings portray the warmth of staying at home and spending time with family.

2.1 Comprehensive Risk Control

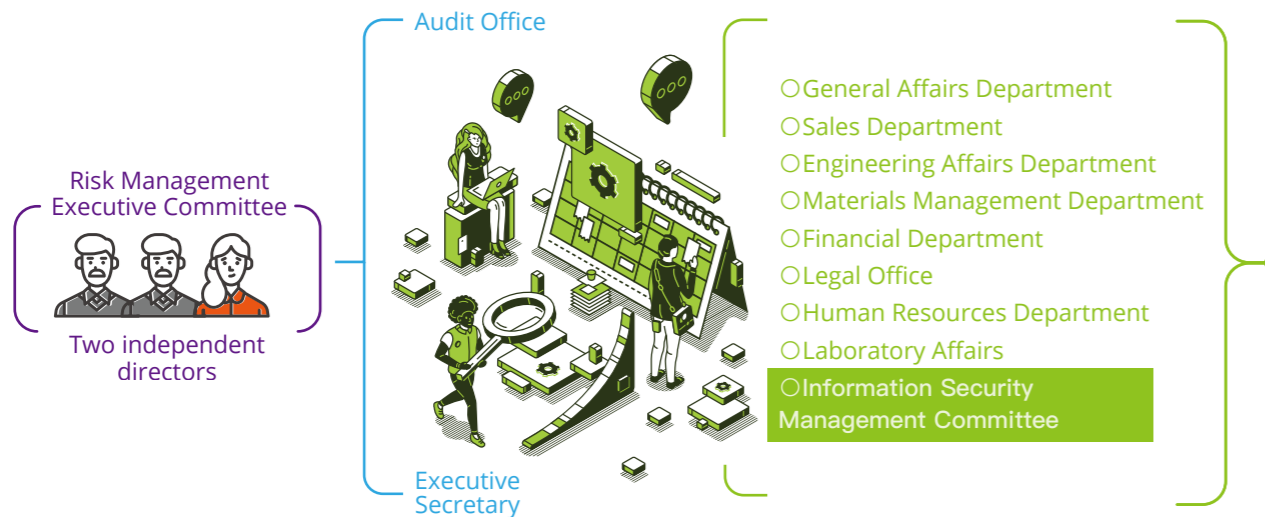
2.1.1 Risk Management Mechanisms

Risk management is key to business operations. By identifying and managing internal and external risks, then measuring and analyzing the short-, medium-, and long-term impacts, TCC improves decision making and enhances enterprise value. In order to better manage risks, TCC completed a comprehensive risk map, which includes existing financial, operational, and product-related risks, as well as climate-related risk and occupational safety risks.

Risk Management Organization

According to TCC's Risk Management Policies, the board of directors are the highest decision-making unit for the Risk Management Committee.

Besides supervising and approving risk management policies and systems, the Board organizes the Risk Management Executive Committee, which consists of three members, two of whom are independent directors. The committee convener must possess risk management capabilities, and members of the risk management organization shall be the heads of functional committees. In meetings, they evaluate the likeliness and potential impacts of risk factors, then determine which factors require management planning. After considering internal controls and inherent risks, the organization crafts response strategies. Departments then proceed to formulate short-term, mid-term, and long-term response plans that include a timetable for implementation and required resources. Besides monitoring progress, the Board discusses major risks to determine response strategies while reviewing budgets and related resources.



Note : The "Risk Management Team" was promoted to the "Risk Management Executive Committee" by the Board of Directors on May 12, 2020.

Risk Identification and Assessment Process

Risk Factor Identification	Risk Assessment Procedures	Risk Response Strategies
Each year, TCC uses the PESTEL framework (political, economic, social, technological, environmental, and legal) to identify and classify risk types then determine risk factors.	The members of Risk Management Executive Committee conducts risk assessments for risk factors.	TCC determines risk management strategies for all identified risks then determines management methods and tracks effectiveness.

Four Major Risk Management Areas



2.1.2 The Emerging Climate Change Risk

Climate Risk Governance

TCC voluntarily responded to the Task Force on Climate-related Financial Disclosures (TCFD) by disclosing the financial impacts of climate change on the Company and future response strategies. The Company's Corporate Sustainable Development Committee is responsible for monitoring sustainable development and climate management topics. Ethical governance and risk management task forces under the committee evaluate emerging risks and opportunities related to sustainability and climate. The task forces report strategic planning implementation results to the President, then the Company sets climate change performance indicators. Carbon management actions are included in performance reviews to encourage all employees to reduce emissions and create a sustainable future.

Analysis of Climate Change Risks and Opportunities

As global attention on climate change grows, the Company President, vice presidents, and plant managers discuss and evaluate potential impacts. Using external expert opinions, internal and external research reports, and the latest market development observations, they assess coming risks, opportunities, and the changes that climate change may bring. The findings, combined with financial impact analysis and discussion, are used to formulate short-, mid- and long-term action plans. These serve as the foundation of future development directions, annual plans, and operational strategies that the Company sets each year.

In 2019, TCC identified three important climate risks and two important climate opportunities while also formulating effective countermeasures to strengthen management of the risks. In the future, we will continue to monitor related risks and opportunities, in order to designate response strategies and performance goals that lead to stronger management results.

Climate Change Risk Identification and Countermeasures

Risk Type	Description	Impacts	Response Strategies
Transition Risks: Policy and Law	Rising cost of carbon emissions taxes increase operational costs	According to Taiwan's Greenhouse Gas Reduction and Management Act, a GHG emission cap and carbon tax will be enforced, and will increase operational cost.	TCC continues to develop low carbon production methods and is transitioning to energy-saving, low carbon emitting fuels to reduce our emissions per unit of production.
Transition Risks: Policy and Law	Stricter environmental policies and laws increase operational costs	Changing policies will lead to early decommissioning of plant equipment. The equipment replacement rate will rise, which will increase the cost of doing business.	TCC carries out comprehensive analysis of the impacts of climate change policies, then responds with short-, mid-, and long-term operational plans. We adopt flexible investment plans in order to respond more quickly to new policy directions.
Physical Risks- Chronic	Rising global temperatures increase operational costs	Insufficient water supply for the hydroelectric power plants and insufficient cooling water for nuclear power plants or fossil fuel power stations make local power sources unstable, destabilizing operations of the Company's plants. If unstable operations cause production delays, the plants could face claims or fines, raising the cost of doing business.	Plants research the regional electricity supply in areas where they operate and stagger operations to move production to off-peak electricity hours.

Climate Change Opportunity Identification and Responses

Opportunity Type	Description	Impacts	Response Strategies
Products and Services	Use R&D and innovations to develop new products and services	Based on Taiwan's independent carbon cutting commitments and policies of the Environmental Protection Administration, TCC strategized what corporate transformations and green energy investments are needed. Besides contributing to Taiwan's renewable energy, we can also reduce the carbon footprint of our products.	Continue to expand investments in renewable energy and develop storage techniques, as we actively make inroads in the emerging renewable energy market.
Markets	New business models and meeting customer demand to generate more revenue	In 2017, TCC announced a complete overhaul of operations aimed at transforming from a traditional cement manufacturer to a green environmental engineering company. With climate change becoming an increasingly serious issue, more countries and regions are becoming stricter at regulating emissions. TCC therefore plans to establish a global carbon asset management enterprise that will manage the impact of emissions and create new revenue-generating opportunities.	TCC has extensive carbon rights development and management experience. Using financial engineering of carbon allowances and voluntary carbon rights development plans, we will be better prepared to mitigate the impact of emissions restrictions. These business models could also serve as new revenue generators.

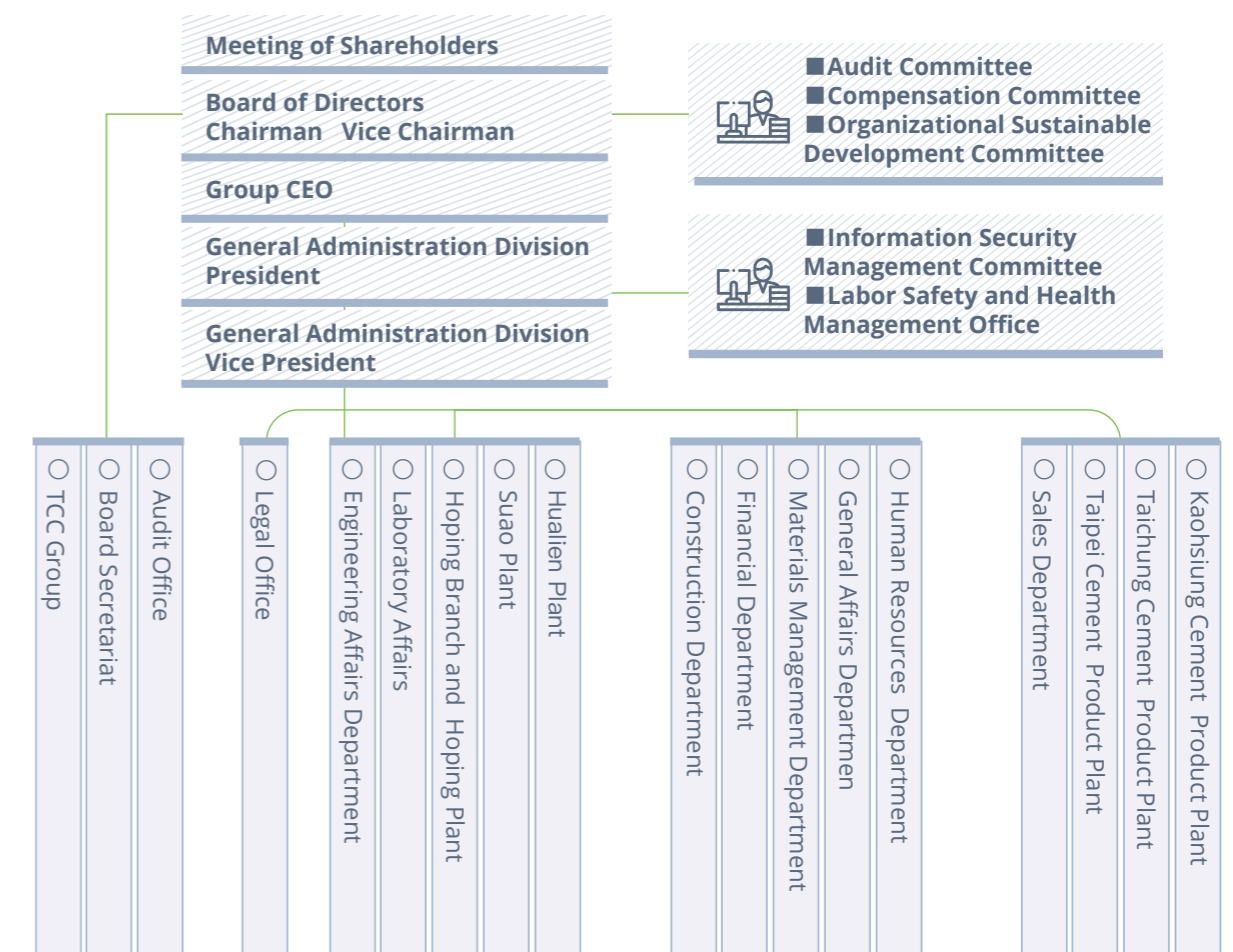
2.2 A Robust Governance Framework

2.2.1 About TCC

The cement industry involves extracting rock and other ingredients from the earth, then using them to build sustainable spaces that support civilization. Early on, TCC contemplated the relationship between the cement industry and nature. Our actions and business management philosophy make "nature first" and "benefit to society" key aspects of our sustainability mission. We take a holistic view of how to bring about positive industrial development that adheres to a high degree of social responsibility. In 1954, when state-run TCC was privatized, we became the first brand to represent Taiwan. In 1962, we went public with the stock code 1101. In 2019, we changed our registered capital amount to NT\$70

billion. Over the past 60 years, we grew with Taiwan and expanded our territory in pace with national policies. By participating in infrastructure and major national construction projects, we contributed to Taiwan's social and economic miracles. TCC is one of Taiwan's representative brands. In the future, we will continue to focus on eco-friendly manufacturing and becoming an eco-solutions provider. Using innovative technology and thinking, we will develop new energy sources and contribute toward building a "zero waste, zero pollution, and zero emissions" circular economy. As we become a sustainable enterprise, we will create greater value.

TCC Organization Framework



1. The Taipei, Taichung, and Kaohsiung cement product plants include 21 branches and three distribution stations.
 2. The Hualien Plant includes a ready-mix concrete plant.
 3. On July 17, 2019, the Board approved the addition of the Group CEO position.
 4. On March 20, 2020, the Board approved the establishment of the Risk Management Executive Committee, which is overseen by the Audit Committee.

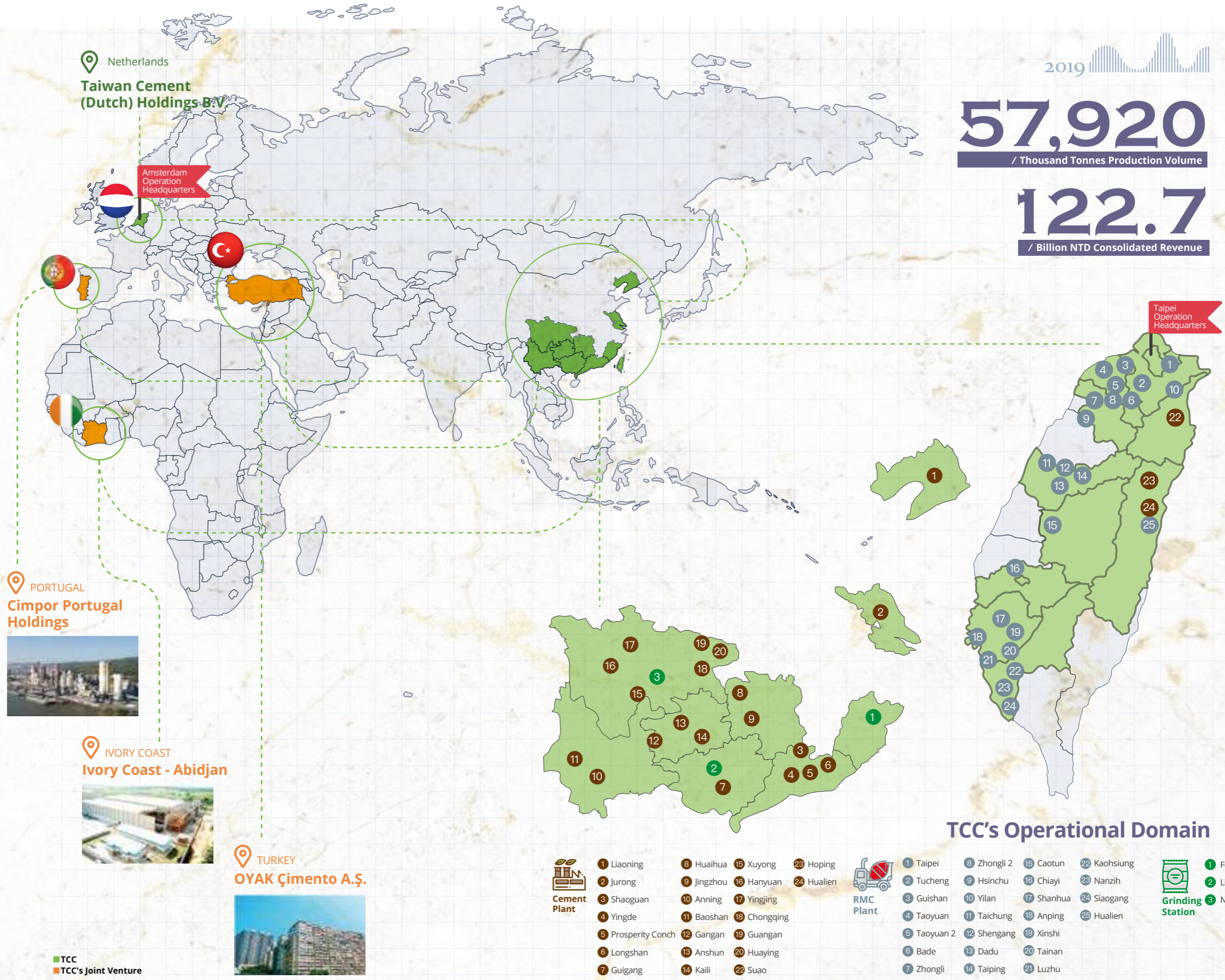
Global Market Deployment

Strong R&D and stringent process control are the formula behind our high-quality products and reputation for excellence. Our production in 2019 was 57,920,000 tonnes. In support of the government's 2025 national export policy that calls for reducing the ratio of national exports to 20% of total output, currently we only sell a small portion of our products abroad, primarily to clients in the Philippines, Hong Kong, Guam and Mauritius, providing quality products and services. We have sold products worldwide, including to clients in Taiwan, Mainland China, Japan, South Korea, Hong Kong, the United States, the Philippines, Kuwait, Saudi Arabia, Palau, Honduras, Bangladesh, India, Singapore, Malaysia, Brunei, Vietnam, Nigeria, and West African countries.

In response to new cement and milling plants in Mainland China, TCC will invest in building aggregate and ready-mix concrete plants to extend our product range to higher-value downstream cement products. We will incorporate independently developed decision-making support systems, such as an internal control alert system and a war room system, as well as an e-commerce app that accelerates the integration of sales, production and logistics. Sharing information and experiences will raise our integrity, efficiency, and reliability.

In 2019, as part of an ongoing globalization push, TCC used a wholly invested subsidiary, Taiwan Cement (Dutch) Holdings B.V, to enter into a joint venture company called Cimpor Global Holdings BV with Turkey's largest cement group, OYAK Çimento A.Ş. Cement. TCC holds 40% of the Cimpor Global Holdings BV and OYAK Çimento A.Ş. holds 60%. OYAK Çimento A.Ş. has 13 cement clinker production lines and 45 ready-mix concrete plants spread across Turkey's key markets, including the Marmara Sea, the Black Sea, the Mediterranean Sea, and the Anatolia Plateau.

In 2019, the European Union approved OYAK Çimento A.Ş.'s acquisition of Cimpor Portugal Holdings, which primarily operates in Portugal and Cape Verde (West Africa). In the future, TCC will use Turkey as a stepping stone to further expand into the African market and become a global cement industry leader.



Financial Performance

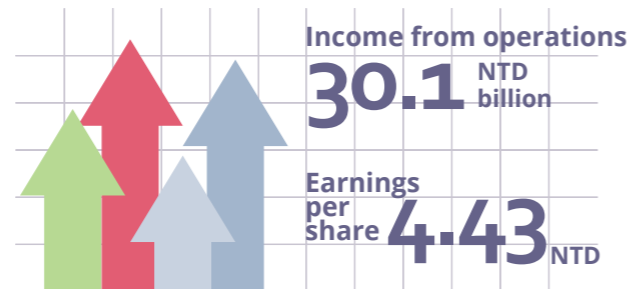
TCC reduces costs, raises production capacity, develops market strategies, and continues to enter new markets. In 2019, consolidated revenues were NT\$122.7 billion, income from operations was NT\$30.1 billion, and earnings per share were NT\$4.43. TCC made no political contributions in 2019.

TCC Consolidated Financial Performance in 2019

(Unit: NT\$1,000, except for Earnings Per Share (EPS) and Dividends Per Share (DPS), which are shown in NT\$)

Type	Item	Amount
Economic Value Generated	Operating Revenue	122,783,014
	Income (Loss) from Operations	30,156,721
	Non-Operating Income and Expenses	2,476,698
Economic Value Allocated	Operating Cost	86,872,759
	EPS	4.43
	DPS	3
Economic Value Residual	Cash Dividend	2.5
	Stock Dividend	0.5
	Income Tax (TW)	1,788,339
	Income Tax (CN)	5,346,035
	Income Tax (Others)	43,955
	Employee Salary and Benefits	6,918,081
	Social Expenditures	277,476
Retained Earnings	11,082,411	

Note: The final numbers for DPS, cash dividends, and stock dividends will be available after the 2020 shareholders' meeting reaches a resolution.

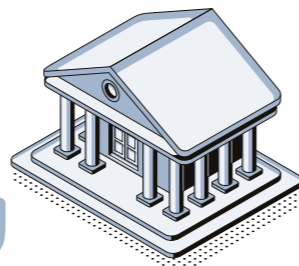


2019 TCC Group Tax Information (Unit: NT\$1,000)

	Taiwan	Asia	Total
Operating Revenue	49,351,277	73,431,737	122,783,014
Income from Operations	7,363,331	22,793,390	30,156,721
Income Tax	1,788,339	5,389,990	7,178,329

2019 TCC Group Effective Tax Rate (Unit: NT\$1,000)

	2018	2019
Pre-Tax Income	30,544,421	32,633,419
Income Tax Expenses	7,900,350	7,178,329
Effective Tax Rate (%)	25.87	22.00
Cash Taxes	4,355,775	6,435,021
Cash Tax Rate (%)	14.26	19.72



Tax Policy

TCC is committed to meeting all tax obligations. We support government initiatives to promote corporate innovation, R&D, economic growth, and tax reform. In order to achieve sustainable development and meet our corporate social responsibility obligations, we set strict tax policies and abide by the tax law.

1. Truthful Tax Reporting and Payment

TCC follows tax laws in each of the countries we operate in. We fulfill our social responsibility as a taxpayer by truthfully reporting our income and paying required taxes. We do not engage in transactions that are conducted solely to avoid tax payments.

2. Information Transparency

Tax disclosure should be conducted in accordance with related regulations and standards.

3. Mutual Trust and Honesty

TCC builds mutual trust and honesty with tax agencies and engages authorities in tax-related discussions when needed. We endeavor to maintain good relations with officials responsible for tax-related affairs.

4. Rigorous Evaluation of Tax Risks and Impacts

When carrying out major transactions and decisions, TCC carefully evaluates the tax risks and impacts. Management mechanisms are used to control risks.

5. Raising Employees' Tax Professionalism

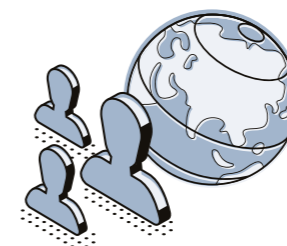
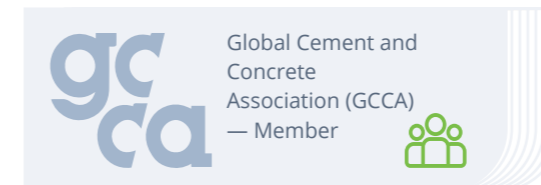
When tax rules change, employees responsible for tax-related issues must be able to analyze the impacts and formulate appropriate response strategies.

Participation in International Initiatives and Associations

TCC is an active participant in external initiatives. To share our research outcomes and best practices in sustainable development in the cement industry, we joined the Global Cement and Concrete Association (GCCA), which was established by the World Business Council for Sustainable Development (WBCSD). We committed to emissions reduction targets as part of the Science Based Targets initiative (SBTi). Further support toward climate change mitigation and responses included becoming a Task Force on Climate-related Financial Disclosures Supporter (TCFD Supporter). In addition, we continue to disclose our GHG management performance, as shown by our obtaining "Management" level status for two consecutive years in the Carbon Disclosure Project's (CDP) Climate Change program. In the CDP Supplier Engagement Rating (SER), we received a final score of A-, demonstrating an exemplary commitment to minimizing our impact on climate change.

TCC participates in associations to share knowledge, information, experiences, and best practices while expanding our industrial influence and encouraging

Participation in International Initiatives



the cement industry to raise standards. In 2019, we commissioned the Taiwan Concrete Institute to carry out the Cement Industry Circular Economy Promotion Plan, which raises alternative energy usage rates and lowers natural resource consumption. The plan will make a significant contribution to the development of the circular economy. We also joined mandatory meetings on formulating national carbon capture standards hosted by the Bureau of Standards, Metrology, and Inspection, under the MOEA. Participation in research on the feasibility of carbon capture development shows how TCC benefits the environment.

Membership of Associations

● Board Member
● Professional Member
● Member

Association	Board Member	Professional Member	Member
Taiwan Cement Manufacturers' Association	✓	✓	✓
Taiwan Ready-Mix Concrete Association	✓	✓	✓
Taiwan Marble Association	✓		✓
Chinese Institute of Mining & Metallurgical Engineers	✓		✓
Taiwan Concrete Institute	✓	✓	✓
Chinese National Federation of Industries	✓		✓
Chinese National Association of Industry and Commerce	✓		✓
Taiwan Corporate Governance Association			✓
Chinese International Economic Cooperation Association	✓		✓
Cross-Strait CEO Summit	✓		✓
Monte Jade Science and Technology Association of Taiwan	✓		✓
Taiwan Stock Affairs Association	✓		✓
The Third Wednesday Club			✓
Audit Bureau of Certification			✓
Bio-App Biotechnology Industry - Academia Research Alliance			✓
CNS Certification Mark Association	✓		✓
Chinese Arbitration Association, Taipei			✓
Taiwan Accreditation Foundation			✓
The Institute of Internal Auditors - Chinese Taiwan			✓
Taiwan Carbon Capture Storage and Utilization Association	✓		✓
Taiwan Institute for Sustainable Energy			✓
Center for Corporate Sustainability	✓		✓
Taiwan Institute of Directors			✓
Taiwan Circular Economy Network			✓
Taiwan Society for Circular Economy	✓		✓

Note: TCC is a supervisor of the CNS Certification Mark Association and offers a NT\$20,000 advertising sponsorship each year.

2.2.2 The Board of Directors

Composition and Diversity of the Board of Directors

The TCC Board of Directors currently consists of 19 directors (including four independent directors), two of whom are female. Board elections are held in accordance with the “Company Act” and the Company’s Articles of Incorporation. Each term is three years. Four directors, or 21% of the total, are aged 31-50, and 15 directors, or 79%, are 51 years old or above. On average, general board members serve 11 years and independent directors serve five years. The Board carries out its duties in accordance with related laws and regulations, the TCC Articles of Incorporation, and board procedural rules. With expertise in a wide range of fields and rich industry experiences, directors exercise their supervision and management duties in good faith and assume responsibility for optimizing operational disciplines and protecting the rights and interests of investors. The Board conducts its duties with self-discipline and prudence while faithfully implementing major operational resolutions. Certified public accountants attend board meetings to present financial reports and offer opinions to directors.

Board of Directors Operations and Performance

In accordance with regulations, the Board holds at least one meeting each quarter and requires a minimum attendance rate of 80% from members. In 2019, the Board held six meetings and the attendance rate was 84.21% (attendance was 100% when including alternate directors). When directors face a conflict of interest, whether personal or related to the institutional investors they represent, they explain the conflict to the Board, then abstain from voting. Important resolutions are quickly posted on the Market Observation Post System (MOPS) to ensure transparency.

For the purpose of corporate governance and to improve the operational capabilities and efficiency of the Board, TCC formulated the “Board of Directors Performance Evaluation Regulations.” These are used for regular evaluations of the Board and functional committees. Items considered include degree of participation in the Company’s operations, improvements to the Board’s decision-making quality, the composition and structure of the Board, election of board members, and member advancement, and internal control.

Board (functional committee) members hand their completed performance self-evaluation questionnaires to the Board Secretariat, which then conducts a combined evaluation according to each director’s attendance rate and performance. In 2019, the Board and functional committees achieved an average score of 4.33 (out of 5).

Remuneration Policies

The President’s performance as well as related wage and remuneration policies, mechanisms, standards, and structure are evaluated by the Compensation Committee based on contributions to the Company’s operations, then presented to the Board for approval. Wages and remuneration are affected by non-financial performance in areas such as corporate governance, green finance, social care, and environmental sustainability.

Objectives are as follows:

1 Earnings-related Performance Indicators
Revenue and profits, achieving budgetary goals.

2 Talent Training Performance Indicators
Cultivating talent, raising the capabilities and quality of employees, fostering an international vision.

3 Risk Indicators
Compliance towards rules and regulations.

4 Strategic Indicators
Circular economy development, achieving sustainability goals (including expanding the processing of household and industrial waste in Mainland China, carbon capture and fixation by microalgae, and green energy generation).



Core Competencies of the Members of the 2019 Board of Directors

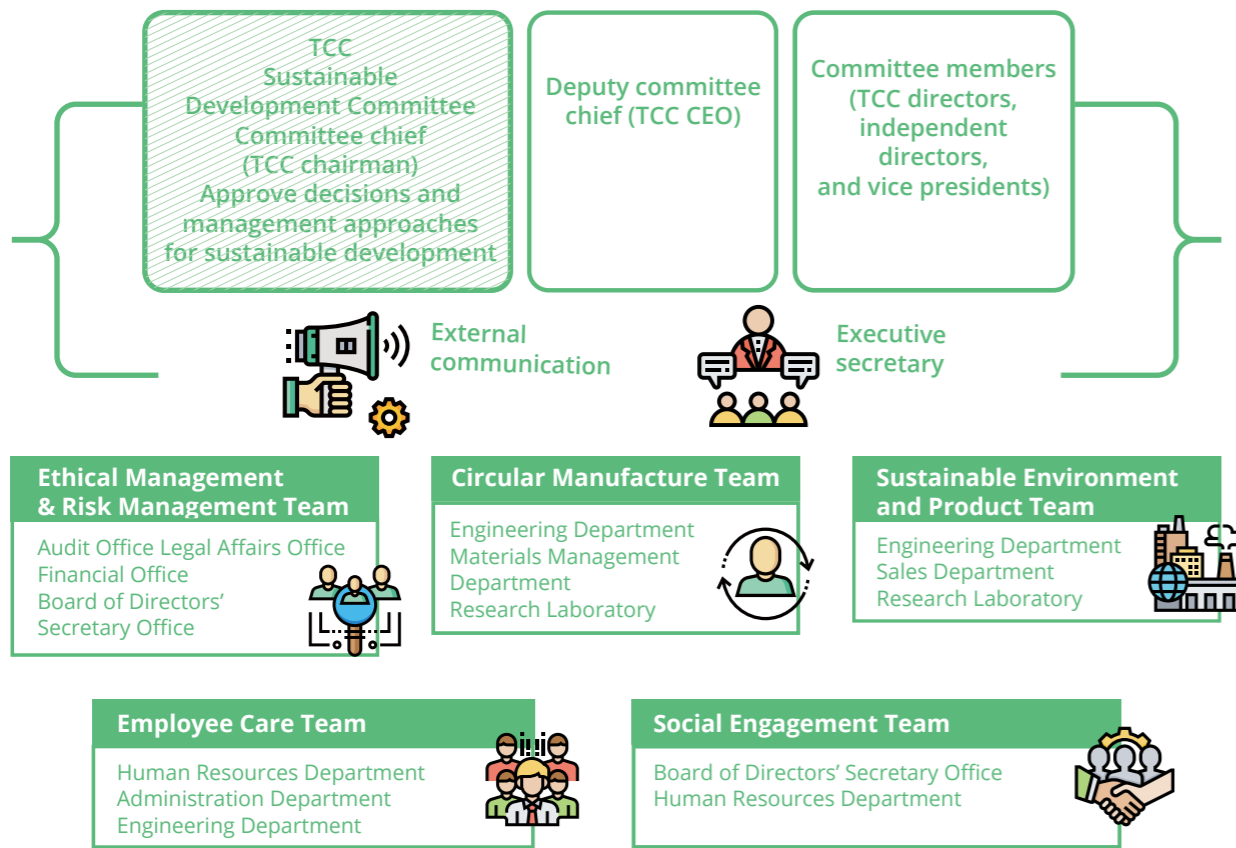
Title	Institutional Investor	Representative	Gender	●	●	●	●	●	●	●	●	●	●	●	●
				Finance	Law	Business	Technology	Banking	Investment, Mergers and Acquisitions	Information	Risk Management	Operational Management	Lecturer	Cement Industry	
Chairman	Chia Hsin R.M.C. Corp.	An-Ping Chang	Male	v	v	v	v	v	v	v	v	v	v	v	v
Director	C.F. Koo Foundation	Jong-Peir Li	Male	v	v	v	v	v	v	v	v	v	v	v	v
Vice Chairman /Director	Taihe Industrial Corp.	Kung-yi Koo	Male	v	v	v	v	v	v	v	v	v	v	v	v
Director	China Synthetic Rubber Corp.	Kenneth C.M. Lo	Male	v	v	v	v	v	v	v	v	v	v	v	v
Director	Fu Pin Investment Co., Ltd.	Por-yuan Wang	Male	v	v	v	v	v	v	v	v	v	v	v	v
Director	Chung Cheng Development & Investment Co., Ltd.	Tzun-yen Yu	Male	v	v	v	v	v	v	v	v	v	v	v	v
Director	CTCB Investments Co., Ltd.	Yvonne Liu	Female	v											
Director	Xin Hope Investment Co., Ltd.	Chi-Wen Chang	Male	v	v				v	v	v	v			
Director	Shinkong Synthetic Fibers Corp	Eric T. Wu	Male	v	v				v	v	v				
Director	Sishan Investment Co., Ltd.	Nan-chou Lin	Male	v	v				v	v	v				
Director	Chia Hsin Cement Corp.	Jason Kang-lung Chang	Male	v	v				v	v	v				
Director	Fu Pin Investment Co., Ltd.	Chi-chia Hsieh	Male	v	v	v			v	v	v				
Director	Chia Hsin Cement Corp.	Chi-te Chen	Male	v	v				v	v	v				
Director	Heng Qiang Investment Co., Ltd.	Jian Wen	Male	v	v				v	v	v				
Director	Heng Qiang Investment Co., Ltd.	Zhi-Zhong Cai	Male	v	v					v	v				
Independent Director		Arthur Yu-cheng Chiao	Male	v	v	v			v	v	v				
Independent Director		Victor Wang Emile	Male	v	v				v	v	v				
Independent Director		Chih-jen Sheng	Male	v	v				v	v	v				
Independent Director		Ling-Tai Chou	Female	v	v					v	v				

NOTE: Koo, Kung-Yi resigned from the position of Vice Chairman on January 9, 2020

To effectively carry out the Board’s duties and advance the Board’s decision-making quality, TCC established the Audit Committee, the Compensation Committee, and the Corporate Sustainable Development Committee. Independent directors convene or participate in the committees to ensure that decisions and recommendations are forward-thinking, objective, and comprehensive, thus supporting independent oversight and balance. By placing the committees under the oversight of the Board, we ensure that the Board’s decisions, actions, and proposals are reported and discussed. When directors face a conflict of interest, whether personal or related to the institutional investors they represent, they abstain from voting. Some proposals are reported on and discussed at the shareholders’ meeting to further enhance support of stakeholders’ rights and interests.

Audit Committee and Compensation Committee

To help the Board evaluate and supervise the compensation of directors and managers, we established the Audit Committee in 2015. The committee took over several duties from supervisors: the formulation and revision of internal control systems; the procedures for handling significant financial actions; and the auditing of marketable securities, financial statements, and directors’ conflicts of interest. We also established the Compensation Committee to formulate and review policies for assessing the performance and compensation of directors, independent directors, and managers. In 2019, the attendance rate of the members of the Audit Committee was 95.83%, and the rate was 100% when including authorized representatives. The attendance rate of the members of the Compensation Committee was 93.75%, and the rate was 100% when including authorized representatives.



Corporate Sustainable Development Committee

In line with the Company's values, the Board approved the establishment of the Corporate Sustainable Development Committee. This functional committee, which is chaired by the Company chairman, established five working groups that oversee ethical governance and risk management, circular manufacturing, sustainable environment and products, employee care, and social care. Besides planning and implementing strategies aimed at achieving corporate sustainable development, the working groups regularly disclose effectiveness of their strategies and compile the Company's corporate sustainability report. In 2019, the committee met to discuss climate change responses, the circular economy, social communication, and other issues.

Corporate Governance

TCC's commitment to corporate governance was shown when we placed in the 6 - 20% group of the 6th Corporate Governance Evaluation. Monthly discussions involving top managers focus on potential areas of improvement. Each department or staff member responsible for an evaluation indicator shall carry out improvement planning and implementa-

tion, covering areas such as strengthening information disclosure, optimizing Board operations, and improving the disclosure of information in English. Our goals for the 7th Corporate Governance Evaluation are closely connected to the performance of responsible department managers, who shall conduct assessments and make improvement plans. To further strengthen the efficacy of our corporate governance, in 2019 the Board approved the establishment of a corporate governance manager and designated the Board Secretary Office as a specialized unit responsible for promoting corporate governance.

2.2.3 Integrity and Ethics

TCC values discipline and honesty, as shown by our inclusion of anti-corruption, anti-bribery, and anti-racism clauses in our "Code of Ethics" and "Ethical Corporate Management Best Practice Principles." When new employees report to work, they undergo education and training that includes countering corruption, countering bribery, explanations of rights and interests, labor standards, and TCC's environmental safety and health management principles.

Additional internal and external refresher courses discuss legal and regulatory announcements as well as ethical corporate management best practice principles. In 2019, TCC did not commit any ethical corporate management violations.

Formulating Policies and Regulations	Signing Contracts with Suppliers
Formulated the "Code of Ethics" and "Ethical Corporate Management Best Practice Principles" to specify that directors and managers are obliged to maintain honesty and trust when carrying out their duties. They also shall observe the "Political Donations Act," "Anti-Corruption Act," and other laws and regulations governing business practices.	For material procurement contracts with an amount above NT\$300,000, we shall request suppliers to sign a standard procurement contract to ban undue or improper advantage.

Four Key Integrity and Ethics Measures

Promoting Ethical Corporate Management Principles	Establishing Channels for Grievances and Reporting
Employees of TCC and TCC's subsidiaries (including joint venture companies) are required to sign the Statement of Integrity and Ethical Standards on their first day of work. They take part in one-on-one sessions to ensure a complete understanding of the Company's code of conduct. In 2019, TCC held employee conduct policy meetings to strengthen our message on human rights policies, the code of conduct, and harassment prevention policies. There were a total of 93 meetings attended by 2,154 people. Additionally, 3,171 employees re-signed the Company's code of conduct or signed it for the first time as new employees.	We encourage employees to report any alleged or confirmed unethical conduct to management. Any suppliers or contractors, investors, or employees may report work discipline or integrity violations to the complaint mailbox (MP.Buster@taiwanecement.com).

2.2.4 Legal Compliance Compliance Status

<p>UNIT Legal Office</p> <p>Authority/Performance</p> <ul style="list-style-type: none"> • Requests that each department and subsidiary report on all lawsuits and claims as well as the status of any legal disputes. The office follows up on each of these issues and takes action when necessary. • Plans external consultations and cooperative services
<p>UNIT Human Resources Department</p> <p>Authority/Performance</p> <ul style="list-style-type: none"> • Holds seminars, education and training, and lectures to strengthen legal awareness • Coordinates external education and training
<p>UNIT Audit Office</p> <p>Authority/Performance</p> <ul style="list-style-type: none"> • Implements internal audit mechanisms to prevent risks and enhance business operational effectiveness
<p>UNIT All Departments and Subsidiaries</p> <p>Authority/Performance</p> <ul style="list-style-type: none"> • The Company abides by the law when carrying out all business activities. For product sales and marketing, we observe sales and labeling regulations and insist on high quality standards. For environmental protection, we observe the "Air Pollution Control Act" and related regulations.
<p>UNIT External Consultants</p> <p>Authority/Performance</p> <ul style="list-style-type: none"> • In 2018, the Company appointed an external legal firm to carry out a long-term compliance optimization plan • In 2019, the Company appointed an external financial consultant to discuss US anti-corruption and anti-money laundering regulations as well as related sanctions

In 2019, TCC did not report any environmental, social, or economic sanctions involving significant fines¹. There were eight minor fines totaling NT\$646,000, and we corrected all environmental non-compliance incidents. To reinforce the prevention of potential threats to industrial safety and environmental pollution, we implemented the Industrial Safety and Environmental Improvement Project. Plants in Taiwan proposed a total of 31 items requiring improvement. We hold monthly industrial safety and environmental protection meetings and follow up on progress in order to prevent recurrence of non-conformities.

Note 1: The Company designates NT\$300,000 as the threshold for a significant fine. In 2019, no fine reached this threshold.

Internal Audits

The Audit Office carries out internal audits according to the annual audit program. The process includes pre-audit meetings, audit implementation, internal recommendations, closing meetings, and submission of the audit report. Based on past experience and future trends, the office enacts projects to help audited business units investigate internal control shortcomings and improve operational results, thus making the organizational structure more robust. In 2019, to make the audit process more flexible, we dispatched one auditor to our Mainland China operational center to offer direct support.

Response to Allegations of Violating the "Fair Trade Act" with Ready-mix Concrete Price Hikes

In April 2019, the Fair Trade Commission suspected that TCC's raising of ready-mix concrete prices violated restrictions against concerted action contained in the "Fair Trade Act." However, the price hikes were in response to higher upstream raw material costs. Their scope was reasonable, and there was no concerted action. We therefore launched administrative litigation proceedings that are still ongoing.

2019 Audit Office Performance

To ensure that cement products safely reach worksites and to stabilize prices, major cement manufacturers in Mainland China built GPS monitoring systems and internal channel controls. These measures include requiring that delivery trucks install GPS monitoring systems. Compliance is part of annual performance reviews. Following numerous checks, fines, and follow-up of improvements, there was a significant decrease in the number of channel conflict incidents. To ensure that cement products safely reach worksites and to stabilize prices, major cement manufacturers in Mainland China built GPS monitoring systems and internal channel controls. These measures include requiring that delivery trucks install GPS monitoring systems. Compliance is part of annual performance reviews. Following numerous checks, fines, and follow-up of improvements, there was a significant decrease in the number of channel conflict incidents.



The cement industry requires more than 50 types of licenses, including production safety licenses and mining licenses, each with an expiration date. To prevent the risk of work shutdowns caused by expired license, each business unit established a license management system that issues an alert before a license is due to expire. Performance reviews are affected when an important license is not included within the scope of these systems.

Voltage drop and machine room management are important aspects of cement plant management. We therefore carry out spot checks to prevent staff from failing to inspect equipment, leaving their post, or sleeping on the job. In 2019, we strengthened these checks to lower risk.

2.3 Optimizing the Client Experience

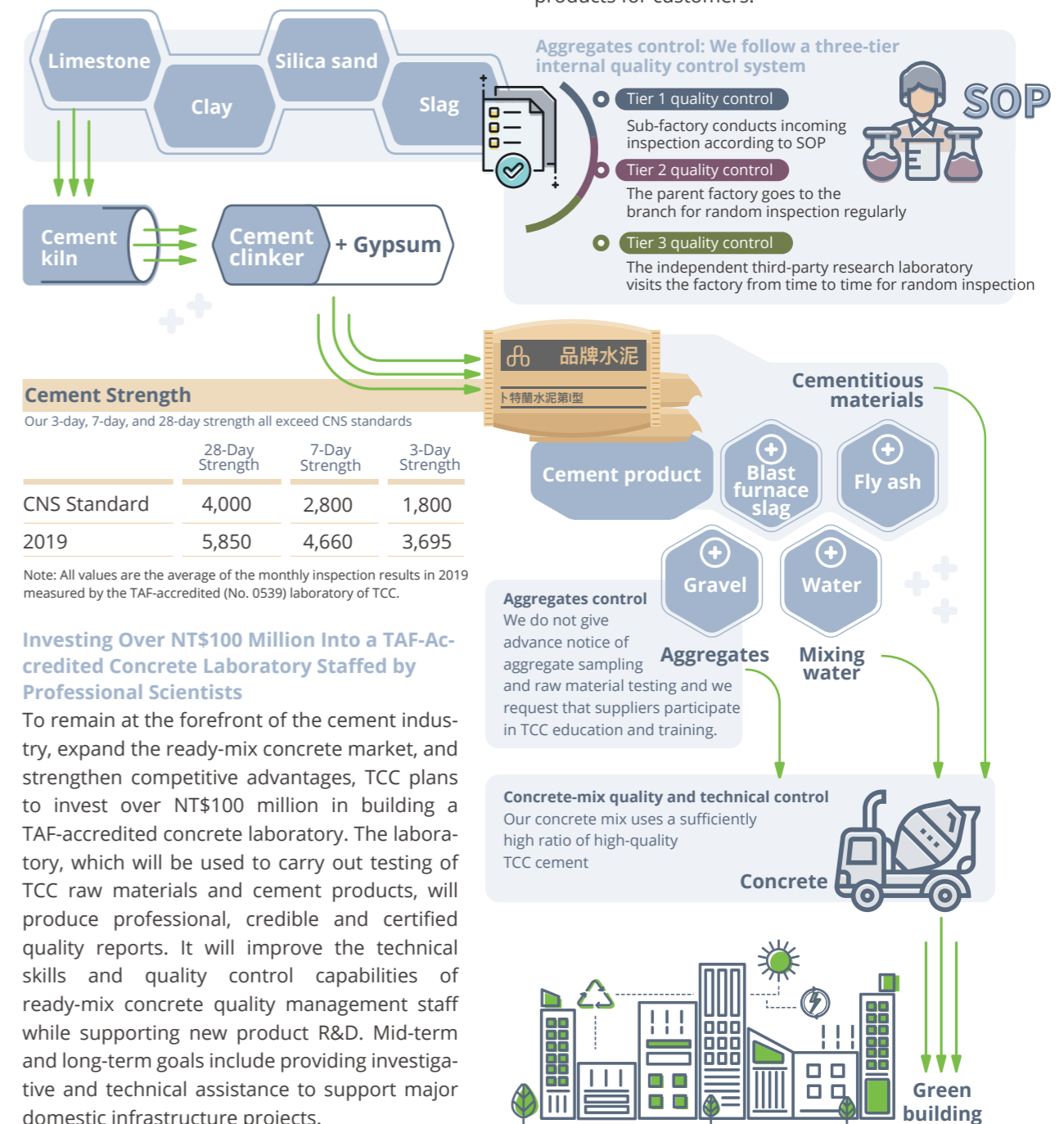
2.3.1 Product Quality

TCC continues to improve the quality of all our products to ensure they exceed international standards. We start from cement strength, aggregates control, self-inspection, concrete quality, and technology to assure that all products pass quality assessments and to guarantee end-user safety.

Comprehensive Quality Management

TCC Quality and Safety Policies

Product quality is of the utmost importance to TCC. For ready-mix products, we set strength requirements that are above the regular standard of 500 psi, and our 28-day strength requirement is ≥ 1.10 f'c (the standard strength). We disclose the ratio of ingredients in our products and ensure that at least 50% of our cementitious materials consists of traditional cement, in order to guarantee safe products for customers.



Investing Over NT\$100 Million Into a TAF-Accredited Concrete Laboratory Staffed by Professional Scientists

To remain at the forefront of the cement industry, expand the ready-mix concrete market, and strengthen competitive advantages, TCC plans to invest over NT\$100 million in building a TAF-accredited concrete laboratory. The laboratory, which will be used to carry out testing of TCC raw materials and cement products, will produce professional, credible and certified quality reports. It will improve the technical skills and quality control capabilities of ready-mix concrete quality management staff while supporting new product R&D. Mid-term and long-term goals include providing investigative and technical assistance to support major domestic infrastructure projects.

A Pioneer in Promoting Product Tracing

Raw material inspection

6 kinds of raw material inspection report

¹ Cement gold grade environmental protection mark

² Sandstone Third-party inspection unit

³ Hearthstone SGS

⁴ Fly Ash SGS

⁵ Pharmacy SGS

⁶ Mixing water Third-party inspection unit

Inspection frequency

TCC's TAF laboratory /Monthly

Third-party inspection

every six months, yearly

Product testing

Chloride content

28-day Cement Strength

Coarse and fine particle physical test



To improve product quality transparency, in 2019 TCC implemented a product traceability system. Clients who use TCC branded ready-mix concrete can utilize this client relationship management system to check information on a variety of items, including cement, gravel, slag, fly ash, agents, and water. For each delivery of ready-mix concrete, clients can use the system to check a broad range of product quality information, including quality testing reports, quality assurance certifications, chloride ion testing, and compressive strength reports.

Benchmark Construction Projects

- ★ **Section 1 tender for the entrances and land development of a station joint development building on the Wuri-Wenxin-Beitun Line, Taichung MRT**
- ★ **Taoyuan Airport taxiway construction**
- ★ **Downstream management of the Hebao Islet drainage line, Ma Chou Hou Industrial Park**
- ★ **New construction of the Changhua Coastal Industrial Park water treatment plant**
- ★ **Desilting tunnel of Shimen Reservoir - Amouping Tunnel construction**
- ★ **Linhai wastewater treatment plant and reclaimed water project**
- ★ **Seismic retrofit projects for national freeway sections and bridges**

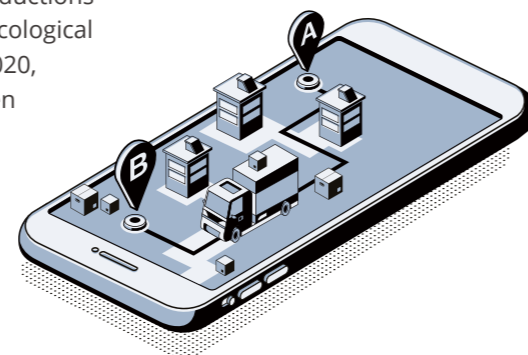
2.3.2 Customer Recognition

TCC has always endeavored to provide exceptional products and services. By putting ourselves into the shoes of our clients, we offer customized items. On-site services include cement use applications, ready-mix concrete proportion adjustments, and problem solving. Task groups plan monthly client service trips to understand product use and share technical knowledge. Client Service Planning and Follow-Up Charts maintain long-term, positive interactions, thus creating more value. In 2019, there were no client privacy complaints.



Placing Digital Orders

TCC recognizes the importance of managing dealer (client-side) relations. An e-commerce app for placing orders, including a new iOS version in 2019, provides greater convenience. A built-in "TCC Developments" link connects to the Company's official fan group and WeChat account. It promotes the latest environmental protection developments in product intros (obtaining low-carbon certifications), R&D descriptions (carbon capture results) and other posts. Automatic push notifications provide more sustainability info to clients, including progress on emissions reductions initiatives and ecological mining. Since 2020, clients have been able to directly trace products using the digital system.



Helping Clients Expand Social Care Initiatives

TCC is an "environmental engineering company handling the complex relationship between human civilization and nature." To uphold this commitment in our cooperative sales channels, we recruit exclusive agents for bagged cement. Agents assigned to districts near TCC plants participate in Company-run community care activities focused on health, education, support for the disadvantaged, donations, and other social welfare initiatives. Activities include river maintenance, youth counseling, physical and mental counseling for autism patients, and support for the elderly. Active participation by the local agents promotes good interaction and relationships. The agents become key advocates of the Company's culture and our mission to promote charitable activities.

Responses are used as a reference for making improvements and oversight. They reveal market trends and client needs. Transaction terms and conditions are adjusted based on the survey results to improve cooperation between clients and TCC and to increase the Company's overall profits.

In 2019, the Company gave surveys to 91 domestic clients and received 91 valid responses. The percentage of clients that responded was 99.97% (based on sales volume). Based on responses, the Company conducted a complete analysis of the delivery of goods and costs then designed a delivery timetable for each plant and station. For clients with projects requiring large deliveries, each plant and station extended the delivery time or shipped goods on weekends or holidays. In 2020, TCC will purchase two packing machines and automatic palletizers. They are expected to be installed and operational by March 2021, which will further raise our delivery efficiency.

In 2019, we received six client claims, five of which related to quality and one of which related to bagged cement weight gaps. All claims were settled following negotiation with the clients.

Client Satisfaction

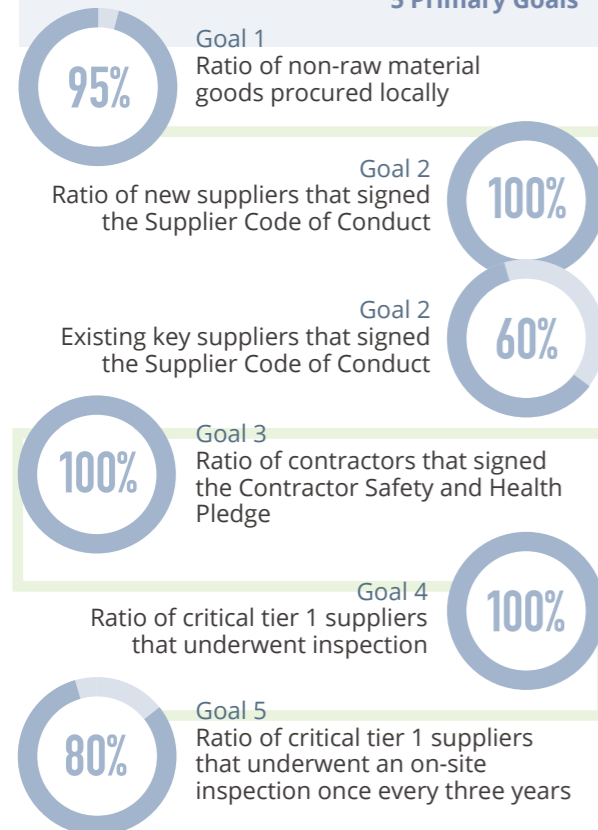
Each year, the Company distributes client satisfaction surveys to all clients that engaged in a transaction with TCC, excluding subsidiaries and related enterprises.

Results of Clients Satisfaction Surveys from the Last Four Years				
Measured Items	2016	2017	2018	2019
Company Image	88.00%	90.27%	90.11%	92.31%
Cement Brand	88.86%	90.27%	89.89%	91.21%
Cement Quality Stability	84.57%	88.11%	87.59%	89.89%
Delivery Plant Convenience	71.71%	78.92%	78.62%	83.08%
Service Attitude and Sincerity	85.71%	87.03%	85.98%	88.79%
Client Complaint Response Time	81.43%	84.05%	84.14%	87.91%
Professionalism and Technical Capabilities of Service Staff	—	—	—	88.35%
After-Sales Service	81.14%	83.78%	82.30%	87.47%
Total	80.95%	84.35%	82.71%	88.63%
Overall Product Satisfaction ¹	80.29%	85.68%	83.91%	87.03%
Overall Service Satisfaction	81.43%	85.14%	82.99%	86.15%
Percentage of Clients Rated as "Satisfied" in the Satisfaction Survey ²	85.71%	92.57%	91.38%	96.70%
Percentage of Clients That Responded to the Satisfaction Survey ³	99.41%	99.52%	99.91%	99.97%

Note 1: Product satisfaction rates were calculated using the following formula: Actual total client score of all valid collected surveys divided by total points available on all valid collected surveys (questions scored on a scale of one to five).
 Note 2: "Satisfied" was classified as a score of four or more.
 Note 3: The percentage of clients who responded to the satisfaction survey was calculated using the following formula: Total domestic sales volume accounted for in survey responses divided by domestic sales volume (excluding sales to concrete manufacturers and related enterprises, sales used directly by TCC and related enterprises, and small purchases of 200 tonnes or fewer).
 Note 4: In 2019, we eliminated two survey items: "Cement Price" and "Payment Terms." Since TCC is a market leading brand, it is important that we emphasize the consistent, high-quality nature of our products and our superb service. While other cement manufacturers may offer lower prices, we do not use price cuts as a tool for raising client satisfaction, which is why we eliminated these items from the survey. We added "Professionalism and Technical Capabilities of Service Staff" to better understand the quality of our employees so that we can continue to provide high quality service to clients.

2.4 Supply Chain Sustainability

2020 Sustainable Supplier Management 5 Primary Goals



TCC endeavors to grow with our suppliers in order to support sustainable supply chain management. Steps we take include revising contracts and outsourcing agreements to include human rights, child labor, environmental protection, and other important sustainability topics. We expect suppliers to join us in implementing sustainable management and development. In recent years, to strengthen the sustainable management of our supply chain, we added ESG criteria to our new supplier selection mechanisms, built a supplier tier and type classification system, conducted on-site supplier inspections, promoted supplier CSR risk evaluations, praised suppliers with excellent performances, and offered sustainability guidance. These initiatives spread our spirit of sustainable development.

Adding ESG Criteria to New Supplier Selection Mechanisms

In order to build shared sustainability awareness with our cooperative partners, TCC formulated the Plant Supplier Evaluation Regulations and the TCC Supplier Sustainability Evaluation Chart.

These are used to evaluate suppliers on the basis of labor, health and safety, environment, ethics, and management systems. Before an enterprise can become a TCC supplier, it must meet these basic sustainability requirements.

Combining Technology and Sustainability — Procurement Portal

When TCC uses smart management to raise our competitiveness, we also must consider development of the cement industry as a whole. We therefore cooperate with the members of our supply chain to achieve industrial synergies and raise the operational efficiency of the whole industry. In 2019, TCC launched Procurement Portal, with plans for 100% of procurement mechanisms at our Mainland China plant to utilize the platform by 2020. Gradually, we will expand the platform to all of our plants. The platform makes procurement procedures more open, fair, and transparent. Besides reducing costs and maintaining quality, it uses big data and logical operations to establish optimal procurement strategies, thus strengthening our competitiveness and maintaining our leading industrial position.

- AI Supplier Selection Mechanisms**
 - A bid solicitation system automatically notifies suppliers
 - A mechanism identifies high-risk suppliers and prevents them from submitting a bid
- Digital Tender Procedures**
 - Digital tender procedures accelerate participation and bidding
 - The tender process becomes more transparent and prevents manipulation
 - Simplified tender procedures raise procurement efficiency
- Big Data Logical Operators**
 - Material traceability and adjusting abnormal cases to optimize procurement risks and controls
 - Logical operators applied to past procurement data are used to formulate future procurement strategies and planning

Building a Supplier Tier and Type Classification System

For effective supply chain management, TCC designates suppliers based on tier and type. This provides a systematic method of understanding the Company's overall supply chain. At present, TCC's suppliers can be divided into six main types, based on the products or services they provide: raw materials, outsourcing and subcontracting, equipment parts, construction (including goods and services), transport, and explosives.



Besides dividing main suppliers into six categories based on type, TCC set additional standards to identify critical suppliers. Critical Tier 1 suppliers are those suppliers that have a major impact on the Company's production quality or delivery schedule, as well as suppliers that reach certain sales thresholds or provide a high proportion of specific goods. Through the end of 2019, TCC had 953 Tier 1 suppliers, 83 of whom were classified as "critical" and accounted for 89.32% of our total procurement value. Critical Tier 1 suppliers must be managed more closely and undergo supplier evaluations.

Promoting Supplier CSR Risk Identification

Using supplier evaluations, TCC assesses supplier CSR risks based on the likelihood of risks occurring, the potential impact of those risks, and weak points. We then divide suppliers into categories based on their degree of sustainability risk and prioritize areas of improvement. Since our objective is to grow together with our suppliers, we notify suppliers at risk of not meeting standards and provide guidance. Improvements must be met by a certain deadline. So far, we have only issued improvement notices to a small number of suppliers

Conducting Supplier On-Site Inspections

TCC carries out on-site inspections of critical suppliers that have high sustainability risks in order to understand their management situation. An evaluation task group meets with members of various departments, from materials to quality management, manufacturing, and finance, or we commission a third party to carry out the inspection. Key items for investigation include quality, service, organization, and financial performance. Sustainability items include labor, health and safety, environment, ethics, and management systems. Through onsite interviews, we gain a comprehensive understanding of the supplier's sustainability status, then offer suggestions for improvements. Our expectation is that suppliers continue to raise their sustainability management performance so that we can jointly improve industrial development.

Praising Suppliers with Excellent Performances and Offering Sustainability Guidance

In the future, TCC plans to hold annual supplier CSR meetings to announce key CSR management points. Industrial sustainability leaders and experts will join the meetings to share their experiences. We will also announce results of our annual supplier CSR assessments and risk identification evaluations. Audit results will play a role in our procurement decision making, highlighting the importance of CSR. As we prioritize procurement from suppliers with outstanding CSR results, we will continue to urge suppliers with lower scores to make needed improvements.

Strengthening Supplier Sustainability Cooperation

While adhering to environmental protection laws and regulations, TCC also requests that suppliers implement sustainable management. For example, transport suppliers must use vehicles that meet Level 4 or Level 5 environmental standards. When an operator uses a vehicle that only meets Level 3 standards, TCC provides guidance and mandates the addition of a diesel fuel filter to meet our emissions reduction standards. By adopting the above measures, TCC cooperates with suppliers to create a more sustainable future.

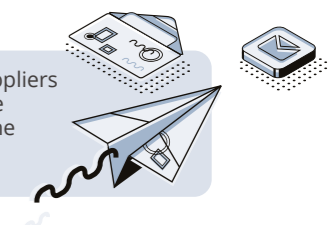
Local Procurement

TCC adheres to the principles of local development and local supply. We cultivate local suppliers to achieve procurement at the right time and place. This lowers management and operational costs, reduces transportation-associated carbon emissions, and creates local job opportunities and economic prosperity. To ensure the timely delivery, quality, and price of raw materials, apart from establishing a sustainable raw material management system, we regularly gather related information to support overall procurement management.

Local Procurement in 2019 (Unit: NT\$10,000)			
Item	Raw Materials	Non-Raw Materials	Total
Local Procurement Amount	771,585	431,807	1,203,392
Total Procurement Amount	907,630	435,469	1,343,099
Local Procurement Ratio (%)	85.01%	99.16%	89.60%

Note 1: To achieve local procurement, we buy from Taiwanese suppliers for plants in Taiwan.
 Note 2: Non-raw materials include spare parts, construction, and on-site labor.

Supplier Grievance Mechanism: Suppliers may report any offences against the discipline and integrity of work to the complaint mailbox at MP.Buster@taiwancement.com



Common Earth of Mankind

Now,
Mankind temporarily stopped its steps, canceling all travel plans.
Whether it is between countries, or between cities,
Between communities, or between home and home,
Humans temporarily stopped all movements.

This refers not only to air routes from one continent to another,
Sea routes from one land to another,
It also includes trips from home to company, to school, to market,
Even just to the park, a restaurant, a movie theater,
Or any other daily routines, such as a simple visit.

No matter where you come from,
May believe in the same religion and speak the same language;
Find a useful APP on the same community software;
Wear the same brand of clothes, and even eat the same rice or wheat produced on the
Same plot of land;
We can share the same news and information without going out.

In today's globalization,
What happens on the other side of the earth is like what happens next to one's home,
Today, an infectious disease occurring on a certain land,
Tomorrow, it may spread to the land on the other side of the earth.
This is the world we share at this moment in 2020.

Once, humans stood on their respective lands,
The world was their respective islands;
Once, the pace of human progress stopped before the vast unknown oceans,
Believing that everything they saw with their eyes was the world in its entirety.
Once, no one knew what the true shape of the earth was ...

Once, "only one earth" was but a slogan;
The famine in Africa happened in Africa, the fire in Australia happened in Australia,
The earthquake in Japan occurred in Japan, and the hurricane in the United States
Occurred in the United States.

The new coronavirus in 2020,
Let us really understand and feel deeply that
We live on the same planet, with
The same ocean, the same sky, the same atmosphere, and
The same sunshine, air and water.
We even share the same thoughts, the same consequences, the same emotions,
And the same viruses.
You and me, each of us is in it, everyone is on this earth,
Everyone's life has changed and everyone has been affected.

The new coronavirus also followed globalization.
While each country re-segregated itself, closing the borders again, and
Redefining the borders.
At the same time of redefining the borders,
We are also increasingly able to experience the fact that we all exist as one.
This refers not only to the same earth,
But also share the same destiny.
One thought, one action, one decision for everyone,
Are enough to affect people living on the other side of the earth.
The pandemic of the century has given mankind a chance to reflect fully.
A world of 7.7 billion people, although there are 6,500 languages,
There is only one earth, and only one future that we jointly create.

Globalization is still an inevitable trend,
We need to re-establish a value system of people-oriented globalization,
Only a harmonious society can move forward.



Society Empowerment

03 CHAPTER

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Bletilla formosana
 Orchidaceae, a rare plant in Taiwan, is commonly found in the mine grass area, roadside or slope soil. It has been rehabilitated in the mine through the aseptic planting technology of the Plant Conservation Center. The flowers are pale pink and have ornamental and medicinal value.

Material Topics

Management Policies

- Build an open, ecological, circular factory that shows how industry and society can co-exist
- Hold innovative TCC cement handicraft workshops to generate new opportunities to communicate with the general public and change the image of the cement industry
- Continue to promote the Cement Academy and learning initiatives while spreading education to cultivate the next generation
- Popularize traditional arts and culture while building bridges that promote international communication, artistic dialogues, and cultural exchanges

Assessment Mechanisms

- Regularly track and review implementation of social participation projects and assess social influence

Objectives

- Continue to invest NT\$6 million annually in the Cement Academy to support educational development
- Continue to promote various social participation projects to increase our corporate social influence





TCC DAKA began from the story of a mysterious giant in Hoping

Hoping, a tiny seaside mountain village, was home to the Laqi community on one end and the powerful Qahur on the other. The Qahur lived in a fantastic castle where they frequently milled about. One small Laqi child often ran to the opposite side of the mountain to observe the castle from afar or to stroll by the castle gates. He wanted to enter.

TCC DAKA uses this fairy tale to build connections between the cement plant and community residents. The curious Laqi child discovered how the Qahur manufacture small green fairies which consume chimney smoke, allowing for wonderful sea views and painting the sky a brilliant blue. The sight of the magical, beautiful objects contained within the castle lifted the veil over the giant Tani who lived within the castle gates, causing the mystery surrounding him to vanish.

For more stories about "Taiwan DAKA" please refer to our website





TCC DAKA - Interactive Environmental Education

The general public is always welcome to visit TCC DAKA, where they can see how green energy, ecology, and local placemaking thrive. Using an online reservation system¹, guests choose from among three different tours:

PLAN A
Led by DAKA
 Green energy and ecological highlights tour

A tour guide introduces the TCC Vision House, the Smart Flower, DAKA Market, the cement design studio, the Bromeliads Garden, and other interesting sights. The guide also describes the park's circular ecology and cultural highlights.

PLAN B
Exploring the Circular Economy
 3-in-1 tour showing the port, power plant, and cement plant

The three-in-one port, power plant, and factory tour that includes a visit to a mine with wonderful views of the Pacific Ocean and coral found within. This adventure tour provides an introduction to the circular economy and operations at Hoping Port, Hoping Power Plant, and Hoping Cement Plant.

PLAN C
Cement Fun & Creativity
 Cement Handicraft Workshop

Participants mix the cement, pour it into a mold, then remove it. Once their handicraft is finished, they use it as a vessel for planting succulent plants. Highlights include the surprising aesthetic beauty of the cement handicrafts and the heat emitted when water is blended into the cement.

3.1 Initiate Social Dialogue

3.1.1 TCC DAKA Open Factory

TCC DAKA is Taiwan's first operational cement plant that is open to the general public. Located at TCC's Hualien Plant site, TCC DAKA offers a new dialogue model between industry and society. It is a non-profit, cooperative effort between TCC and the local community.

With the opening of the new Suhua Highway, DAKA has become a link between Heping Village and external communities.



¹ Ecological tour appointments can be made on the TCC DAKA website: <https://www.tccdaka.com/tw/bookingPlan.html>



Interior of the TCC Vision House

[TCC Vision House]

Using exhibitions, videos, freely operated dynamic models, and guided tours, TCC introduces three key features of Heping Industrial Park. First, the circular economy model based on the three-in-one port, power plant, and cement plant, which supports waste reuse and economic recapture of carbon. Second, mining ecological restoration, including an introduction to the restoration of indigenous and endemic plants at the Heping Mine restoration site. Third, and of particular interest, is use of local culture and history as a starting point to show how the cement plant is intertwined with the local community. By highlighting this connection, we demonstrate how cooperation leads to greater value.

[TUO Square]

An infinity symbol located in the square and a rainwater recycling system are symbols of TCC's commitment to the circular economy. When nature is not contaminated by trash, plants and animals reproduce and prosper without end. A fountain show choreographed to the song "What a Wonderful World" plays at the start of every hour, adding to the wonderful mood.



The TCC DAKA Guide Team

[Placemaking]

TCC DAKA primarily hires youths and mothers from the local community to serve as guides. It is a new job opportunity in Heping Village. At the same time, DAKA invites industrial arts entrepreneurs from Heping Village (Hualien) and Aohua Village (Yilan) to join DAKA Market to promote their businesses. As part of this cooperative model, TCC offers guidance on sales and marketing.



Tuo Square

A Preschool Teacher Becomes a Hometown Guide – Wen Wen

Hi everyone, my name is Jing Wen, but everyone calls me Wen Wen! I'm from Hualien's northernmost village, Heping, which is located beside TCC DAKA, a new multi-functional landmark that ties together ecology, culture, and recreation. When I became a guide at DAKA, I was quite shy about speaking in front of crowds. After having studied childcare for eight years then working in preschools, it was a big change to face the general public. At first, I wasn't ready, but a lot of guests were very forgiving and helped me to overcome my early challenges. Whether it was words of encouragement or criticism, you all helped me uncover new personal perspectives.

Typically, people see the cement industry as a sort of mystery box. With the launch of the open factory, TCC opened its doors and turned community members into very important keys. We hope that all visitors take their personal key and use it to share circular economic ideas with people in all corners of the world! Next time, whether you are passing by or making a special trip to TCC DAKA, don't forget about me. I will tell you stories about my hometown of Heping and our great neighbor, DAKA. Please come visit the young guides of Heping!

[Smart Flower]

The park contains East Asia's first large-scale, outdoor solar power art installation, the "Smart Flower", which opens and rotates based on the position and intensity of the sun. A battery system installed by the TCC subsidiary Molice works in conjunction with the solar cells to provide power to the Vision House and the entrance signage at nighttime. These facilities turn DAKA into Taiwan's only outdoor green energy classroom that can be experienced up close.

[Ecological Classroom: Bromeliads Garden]

TCC is a long-time sponsor of the world-class Cecilia Koo Botanic Conservation Center. For the first time, the center established a conservation site in eastern Taiwan, where it is growing more than a hundred bromeliads. It is also the world's only open garden that specializes in growing plants from the Bromeliaceae family.



"Smart Flower": East Asia's first large-scale, outdoor solar power art installation

[Cement Design Studio]

Located inside DAKA Market, the Cement Design Studio collaborates with renowned design teams. They show how cement can be crafted into contemporary luxury goods, creative works, and fashionable lifestyle products. The beauty of their artisanship is a sight to behold.



Cement Design Studio

Bromeliads Garden



Market Recruitment

- DAKA Market introductory meeting
- Expert introductions
- Applicant interviews – initial announcement – secondary announcement



Chairman Chang talks to community members at a DAKA Market introductory meeting

- Hardware: TCC DAKA provides standard vendor booths
- Software: Entrepreneurial assistance courses (including marketing, sales, design, and display) as well as DAKA Market media promotions

Placemaking Resources



TCC invited experts to help DAKA Market vendors arrange their product display (shown is the shauwany traveling market team)



A DAKA Market vendor that offers Taroko-style lunchboxes



A traditional handicraft vendor at DAKA Market – Siuhua Workshop



A DAKA Market vendor that offers local cuisine – Chu Mama Snacks



[Development – Helping to Build a Strong Future for the Local Community]

On January 9, 2020, TCC DAKA officially opened, signaling the arrival of an all-new industry and job opportunities to the Heping Village area. Initially, 15 vendors joined the DAKA Market. Between January and April 2020 nearly 490,000 guests visited.¹ There were 66 ecological tours and 746 participants in total.² By April 2020, TCC DAKA was officially named a tourism factory by the Ministry of Economic Affairs. TCC donates all of its guide fees and market vendor fees to the educational foundation of a local elementary school, and the 7-Eleven and Starbucks branches located within the park contribute a portion of their monthly revenues to the foundation. These contributions build good relations with surrounding communities as we jointly embark on a multi-faceted approach to public space management.

Note1: Accumulated TCC DAKA open factory 489,246 visitors between January and April 2020
 Note2: Accumulated TCC DAKA ecological tour guests between January and March 2020

TCC DAKA's Social Influence

The respondents who fill out the survey after participating in the TCC DAKA tour.

53.9%  40.2% 

The response rate was 94.1%, the analysis of its impact on society is as follows

- More than 70% of the respondents agree that TCC DAKA will bring positive social impact
- More than 50% of the respondents also named the three tour topics they are most interested in attending in the future

High-temperature co-processing of waste by cement kilns 66.7%

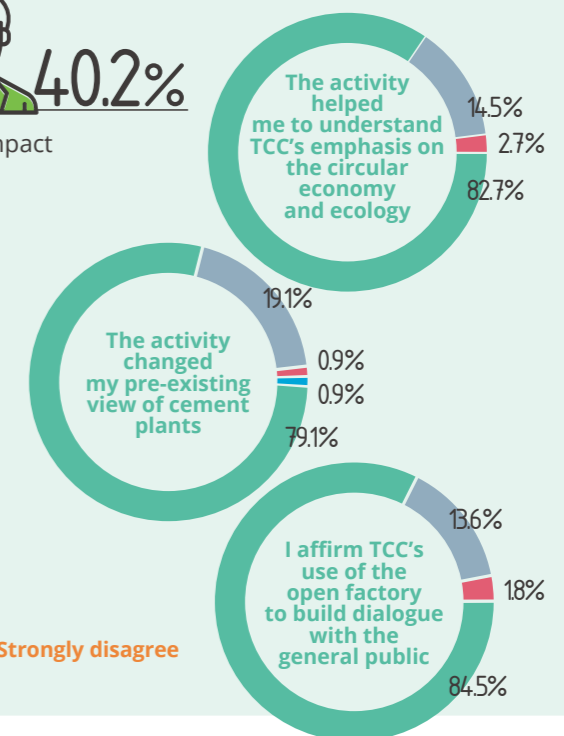
Renewable energy 58.3%

Circular economy 50%

The responses show the interest generated by TCC's stakeholder development themes.

■ Strongly agree ■ Agree ■ Ordinary ■ Disagree ■ Strongly disagree

*Data collection period: 1/9/2020 (opening) to 5/20/2020



3.1.2 Generating Positive Discussion of Cement

TCC's business is based on finding diverse applications suited to cement's unique properties. While many people see cement only as a material for constructing large buildings, we want to show its imprint on human history and its role as an approachable substance that can be made into household objects like utensils and pots. Cement can be beautiful, and with creativity, this beauty has therapeutic effects. Using cement handicrafts, we communicate with stakeholders. Workshops blend in lessons on art, history, and the environment, thus promoting novel uses for cement.

TCC Helps the Community Uncover Historic Roots

Cement can serve as a medium that fosters communication between schools and communities. TCC joined teachers and students from Yongle Elementary School, local senior citizens, and other residents on a journey to the remote location of a former school branch, where they placed a monkey statue that was made through a joint effort involving TCC and the school. The statue plaque said, "People should know how difficult this was to achieve." The activity provided an opportunity for the school's students and teachers to revisit local history and culture.



TCC Cement Handicraft Workshops

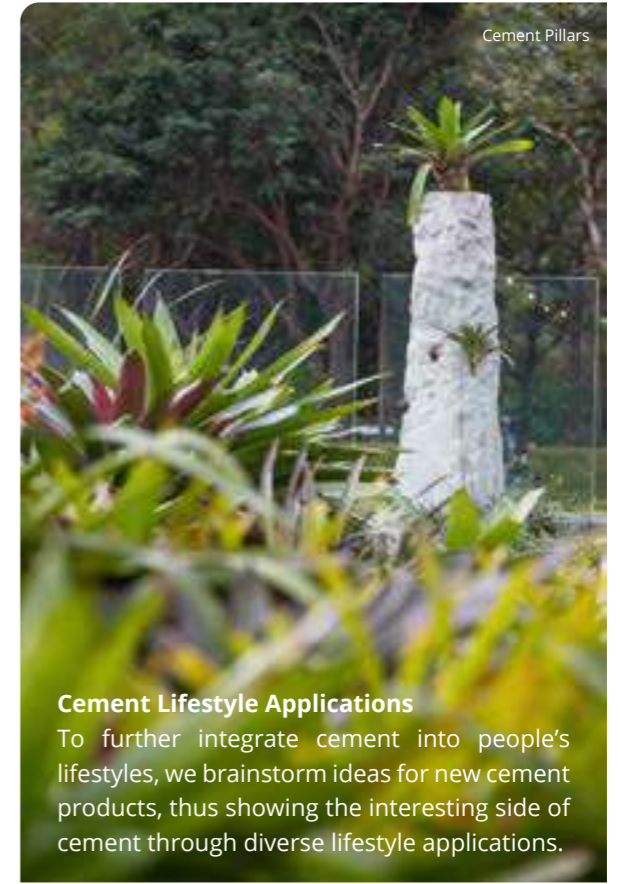
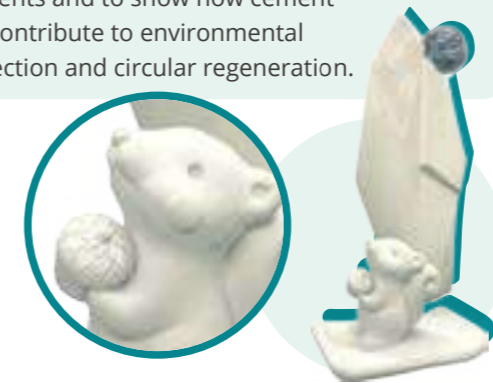
In 2019, we held a total of nine TCC Cement Handicraft Workshops spread across various locations, including local schools, the Suao Cold Spring Festival, the NTU Green Collar Fair, and the Kaohsiung Museum of History. Gradually, we are expanding the program to all regions of Taiwan. Also, for the first time, we held the workshop at TCC's Guigang Plant in Mainland China. The workshops blend culture, creativity and art with environmental education, transforming people's understanding of the cement industry. In the future, we plan to use Hoping's open, ecological, circular factory to extend the influence of our workshops and strengthen our dialogue with society. Internally, the workshops promote communication and consensus among staff. Externally, they are a mechanism for expanding beyond the traditional B2B limits of the cement industry to attain B2C interaction. A benefit of this model is letting people know how the cement industry achieves sustainable development in harmony with the ecological environment.



My Impressions of a TCC Cement Handicraft Workshop (Tsai Meng-shan, Kaohsiung Museum of History)

The TCC Cement Handicraft Workshop began with an introduction to cement. Step-by-step, TCC staff members provided instruction until each handicraft was complete, giving new insight into cement for all the adults and children who joined. Many people were quite astonished to learn how heat is generated when cement is mixed with water, and they were impressed with how cute the finished handicrafts were. Everyone who participated said they would like to join another workshop.

TCC's history is closely intertwined with modern architecture and industrial development. Its practices affect many areas, from the environment of mines after extraction ceases to Taiwan's culture and history. TCC has successfully restored many mines, it established the Shoushan National Nature Park, and its Kaohsiung Plant provided land to build the Chaishan flood prevention park. TCC also preserves lime kilns and brick warehouses, keeping the history of this land alive. I want to thank TCC staff who visited from across Taiwan to explain the development of the cement industry to southern residents and to show how cement can contribute to environmental protection and circular regeneration.



Cement Lifestyle Applications

To further integrate cement into people's lifestyles, we brainstorm ideas for new cement products, thus showing the interesting side of cement through diverse lifestyle applications.

To further integrate cement into people's everyday lives, TCC made cement recliners. Another design resembles ancient pillars that would be found among ruins. Gashes on the pillar shafts are filled with plants to symbolize regeneration. Both installations are on display in TCC DAKA Pineapple Park.



3.1.3 Community Engagement

TCC makes a concerted effort to interact with the communities we operate in. We arrange for local residents and educational institutions to visit our plants and show stakeholders that we operate in accordance with laws and planning. In 2019, we welcomed a total of 1,112 people from 50 groups, including regulatory agencies, universities and colleges, and local communities. They visited the Hoping Plant and Hoping Mine to observe our vertical shaft and algae systems. Visitors learned how the discharge of water from our mining system follows all water and soil conservation laws, and that after extraction from the mine ceases we do an excellent job of restoring the natural environment. Local residents see that there is no reason to fear environmental impacts associated with our operations, which improves our community relations.



Hoping Port x Community Fishing Competition

TCC deeply values transparent communication with local residents. We therefore cooperated with the Heping Industrial Harbor Administration, IDB on hosting a local fishing competition. Our goal was to eradicate the stereotype of factories being seen as heavy polluters. Through our actions, we wanted to show local residents our circular economic model, which is based on operating the world's first three-in-one cement plant, power plant, and port.



NTU TAROGE Science Plan

"Without TCC, we never would have been able to conduct experiments at the South Pole..." A group of astrophysics teachers and students from National Taiwan University and National Chiao Tung University hiked to more than 20 mountains in Taiwan in search of the area with the lowest volume of electromagnetic wave interference and the best field of view. Their objective was to gather messages coming to earth from other parts of the universe.

"We even investigated sites in Xinjiang, but found that the best view was at the TCC Hoping Mine in Hualien," said Liu Tsung-che, an NCTU electrophysics instructor and one of the key researchers on the Taroko project. Liu said that when the team set up an antenna and a detector at Hoping Mine as part of its fully automated, unmanned station, TCC staff contributed to the effort and closely monitored the group's safety each time it ascended the mountain.

The Hoping Mine observation station is a stable, remote-controlled detector that gathers data on cosmic rays. Experience gained putting together and operating the TCC observation station enabled the team to successfully build another observation station at the South Pole.

Liu said, "Thank you to TCC for supporting basic science research." The Taroko plan is a long-term research project that will explore the universe. According to Liu, without TCC's support it might have never gotten off the ground. Whereas most companies reject scientific plans that do not directly support their operations, TCC provided labor support, earning the gratitude of the research team.

My Impressions of Being an Intern at the Hoping Plant and Learning About the Cement Plant Circular Economy (National Taipei University of Technology)

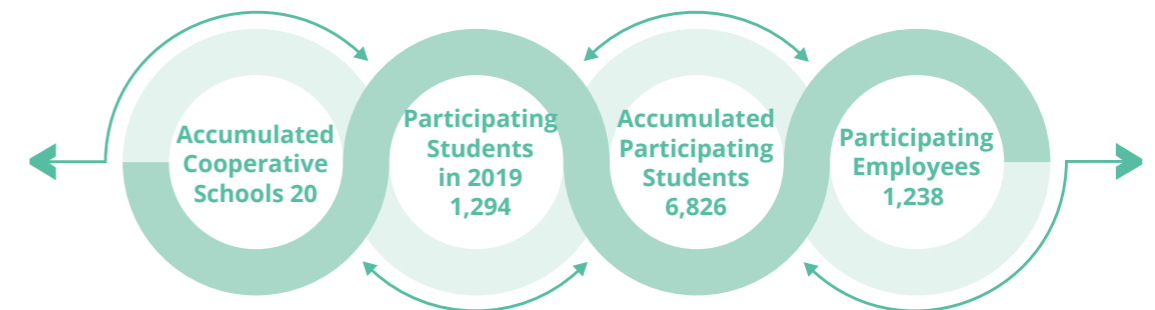
To support the government's eastern regional development policy, TCC built a cement industrial park in Heping. The Hoping Plant's many geographic advantages include Heping Station in front and Hoping Port in back. A vertical shaft transport system makes cement transport more convenient and supports the import of coal and clay. Nearby is the Hoping Power Plant, which turns thermal energy produced by the cement kilns into electricity, creating a circular economic system.

Students who intern at TCC study how to combine theory with practice. They learn about the Management Assistant Program and how it creates a path to being promoted into management. The program generates further interest and offers another opportunity for the students to join TCC.

3.2 Publicizing Conduct and Promoting Education

3.2.1 Protecting the environment and heeding nature

Since 2012, TCC has carried out the Cement Academy public welfare project. In 2019, the academy integrated environmental topics, such as protecting the environment and heeding nature, into lessons. Affiliated programs, including summer camps, visits to the TCC DAKA open factory, and the academy scholarship program, further expand our efforts to teach green energy and environmental protection in fun ways. The academy focuses on reaching students of rural schools. Through lively lessons that explore the magic of cement handicrafts, we promote environmental conservation and the importance of caring for life. In the future, we will remain steadfast to the development principle of "taking from society and using for society" as we continue to promote the academy. Our goal is to teach students about the importance of character, conduct and quality. As we make individuals conscious of environmental protection, we will gradually raise awareness of how these topics affect society and the home.



Holistic Care for Students

"Happy students make better learners." In recent years, TCC has observed that left-behind children (meaning those living with extended families) in rural communities often face difficult challenges, such as a lack of educational resources or insufficient nutrition. To counter these problems, cement plants in Taiwan and Mainland China began to cooperate with neighboring schools on holding the Cement Academy. At the program's core is teaching students about the importance of character, conduct and quality. We work with schools and households to cultivate future citizens of the earth. By providing better resources, we support the development of local communities. This enables educational institutions, students, families, and enterprises to jointly grow.

As progress takes place, they see value in the social improvements that are made.

Program content focuses on both on-campus care, such as after-school mentoring clubs and care meals, and off-campus care, such as post-class transportation and community support.





TCC Awards the First Cement Academy Scholarship

In 2019, TCC launched the Cement Academy Scholarship Plan. Based on the qualities of character and conduct, judges examine teacher recommendations and school performance of students from the 20 schools that participate in the academy program, then award the top 10% of students a certificate and scholarship. In 2019, a total of 94 received this honor.

Besides receiving financial support, students who participate also learn about the meaning of the scholarship while gaining encouragement. The students become even more inspired to learn and build good character. As they follow the correct path, they influence their school, family and community, growing into youths and young adults who give back to society.



Summer camp is the Cement Academy's highlight of the year. In 2019, for the first time the camp was held in Mainland China, with the Hoping Plant in Taiwan's Hualien County and the Yingde Plant in Mainland China's Guangdong Province both hosting the event. Students from elementary schools located near TCC plants joined the three-day, two-night activity, participating in a series of nature-based activities and learning about TCC's environmental conservation themes. Through game-based learning, the students gain extracurricular knowledge and capabilities.

The theme of this year's camp was "protecting the environment and heeding nature." Led by TCC staff, close to a hundred students ran in grassy fields, crafted puzzles from recycled cardboard, made rubber-band propelled vehicles from bottles, wove bags from hemp rope, and, for the first time, watched fireflies and camped at the cement plant. Participants joined together to experience the warm embrace of nature. As they played and learned, they built a stronger awareness of environmental conservation and grew into young environmental pioneers. Through the summer camps, the TCC DAKA open factory, and other activities, TCC teaches green energy and conservation topics in fun, accessible ways. The academy focuses on reaching students of rural schools. In lively cement handicraft-making lessons, the academy quietly promotes environmental conservation and the importance of caring for life.

3.2.2 Empowering The Disadvantaged Education Funding

TCC donates to the Ministry of Education's School Education Savings Account to ensure that there are no disruptions to the education of disadvantaged youths. The account helps students of all levels in Taitung, Changhua, and Yunlin counties to continue to grow and learn, which enhances their competitiveness. In 2019, we donated a total of NT\$160,000 in scholarships to students at six primary and junior high schools in Meilun District, Hualien: Meilun Junior High School, the Experimental Primary School of National Dong Hwa University, Haixing Primary School, Ming Chi Primary School, Fuxing Primary School, and Chu Chiang Primary School. We sponsored activities organized by local charities and temples. Additional donations of cement and funding aided reconstruction of disaster areas and contributed to small-scale infrastructure projects in communities.

Providing Bento Lunches to Disadvantaged Students at Hualien Girls' Senior High School

For over a decade, the educational foundation of National Hualien Girls' Senior High School has provided 50 bento lunches to economically disadvantaged students. The monthly cost is approximately NT\$50,000. Toward the end of May 2019, when a lack of funding put the meal program at risk of cancellation, TCC donated NT\$500,000 to ensure that it could continue unabated.

Supporting Construction of the Hualien Disaster Preparedness Center to Enhance Local Rescue Resources

The Hoping Plant donated 326 tonnes of cement to support construction of the Hualien Disaster Preparedness Center. The center, which officially opened on February 17, 2019, provides storage for tents, sleeping bags, blankets, generators, lifeboats and other relief supplies. These are readily available when natural disasters strike.

Fast Earthquake Relief Showed TCC's Commitment to Social Care

After a major earthquake struck Hualien in April 2019, TCC joined a meeting held by the Industrial Development Bureau to discuss the problem of damaged stone building materials and derivatives. We immediately agreed to handle 60% of this waste in the Meilun area, amounting to a total of 33,000 tonnes. By contributing to the government's relief effort, we accelerated the return of local residents to their hometown.

3.2.3 Food Donation Plan

TCC participates in community development and charitable activities through a wide variety of methods and channels, demonstrating our care for the local environment. For many years, we have showed particular concern toward homeless individuals. Our long-term support and corporate resources, together with urging employees to regularly join in providing care, has helped more people find ways to smile again and enjoy life. In response to the second United Nations Sustainable Development Goal of "Zero Hunger," TCC upgraded a program to provide bento boxes to the homeless into a long-term, systematic plan. The new plan gathers employees, the Company and suppliers.

Helping to Build a New Home for Adolescents' Home

Taoyuan Adolescents' Home, which supports placement of youths who lost family or support, is one of the top-rated community organizations in Taiwan. When the organization was forced to move after its landlord would not continue to lease the building, a suitable new location was found, but it lacked some needed facilities, including an office and rooms for the adolescents. The group did not have the funds to make these improvements. TCC helped bridge this financial gap by donating the concrete that was needed, preventing the home's more than 20 adolescents from being left without a place to stay. The organization is expected to fully move in to its new home by May 2020.



Charitable Donations (NT\$)

Donation Type	Amount
Financial Donations	28,821,052
Volunteer Time	18,570,000
Material Donations (Cement)	476,139
Management Expenditures	2,835,000
Total	50,702,191

Note 1: Volunteer time was converted to a monetary expenditure on the basis of the hourly pay of management assistants.

Besides encouraging employees to donate meal vouchers, we produce 600 meals a year that are donated to a local charity group, which then delivers these hot meals to the homeless, low-income households, and disadvantaged groups that are not supported by other social welfare organizations.

3.3 Promoting Cultural Conservation

■ Program ■ Theater Management ■ Culture and Tourism Exchange Promotion

Plan Name	Implementation Method	Times Held	Participants	Location	Benefits
Taipei Li-Yuan Peking Opera Theatre 2019 Twinkle, Twinkle!	Performance	3	1,124	Taipei Family Theater	Opera promotion and young actor training
Mainland China Peking Opera promotional tour	Performance	18	12,459	Changsha, Chongqing, Beijing, Shanghai, Yantai, Weifang, Zhangqiu, Tianjin, Bazhou, Shijiazhuang	Cross-strait performance art exchange
2019 Li Bao-chun latest productions	Performance	2	1,650	Taipei Metropolitan Hall	Opera promotion
2019 Cross-strait cultural exchange performances	Performance	4	2,120	Taipei Family Theater, National Taichung Theater, Great Enlightenment Auditorium (Fo Guang Shan, Kaohsiung)	Cross-strait performance art exchange
2019 US performance tour	Performance	4	1,520	Cooperated with the Foundation for Chinese Cultural Heritage, toured in cities such as Houston and Austin	Promote cultural tourism and traditional performance art
2019 Domestic performance tour	Performance	5	4,529	National Taichung Theater and National Theater	Domestic performance art exchange
2019 Li Bao-chun Peking Opera Domestic performance tour	Performance	5	3,109	National Theater, the Hsinchu County Cultural Bureau Performance Hall, and National Taichung Theater	Opera promotion
2019 Family Theater Labor procurement for front and back stage technical support and service management	Other			Taipei Family Theater	Theater management and talent cultivation
2019 Dadaocheng Theater In-depth Art Education, Technical Services, and Front and Back Stage Management Project	Other			Taipei Dadaocheng Theater	Theater management and talent cultivation
Traditional art and tourism theater TaipeiEYE	Performance	207	42,458	Cement Hall	Promote cultural tourism and traditional performance art
Promotional talks	Lecture	29	5,140	Major schools, arenas, and organizations, as well as a tour of schools in Mainland China	Art education promotion
Theater Future Encounters international forum	Lecture and discussion	3	320	Cement Hall	International performance art exchange
Participate in major international performance art organizations	Other			Host cities, such as New York City and others	International performance art exchange

For more cultural conservation information, please visit the C.F. Koo Foundation website <https://www.koo.org.tw/>



3.3.1 Preserving Traditional Arts

From crafting new traditional art performances to creating avant-garde modern dance routines, the foundation's 2019 program included a diverse range of performances spread across multiple disciplines. The foundation was the primary producer of two new Peking operas: *Xiang Yu* and *the Two Ladies* and *She and Her Men*. Whether describing *Xiang Yu's* (the king of Western Chu) choice between power and love or the writer Li Qingzhao's quest to become the first woman to win a divorce lawsuit, both operas offered profound portraits of human nature that excited modern viewers. Eastern and western musicians contributed new musical scores, further enhancing the modern feel of the performances.

The conservation of a nation's cultural environment cannot be accurately quantified, but its importance is no less than that of keeping a clean homeland. For 30 years, the C.F. Koo Foundation has tirelessly worked to conserve the cultural environment, in line with TCC's interests. When Chinese opera or another form of traditional performance art is at risk of being lost, the foundation preserves the art in its original form. It also creates new compositions and trains new talent so that these priceless expressions of human nature can be preserved. In recent years, the foundation has performed in Mainland China and international locations, further spreading the reach of Taiwan's art scene.

The New Peking Opera *Xiang Yu and the Two Ladies*

The Taipei Li-Yuan Peking Opera Theatre used Chinese opera elements with modern theater techniques to create the wartime dance spectacle *Xiang Yu* and *the Two Ladies*. Peking opera served as the main performance tool, with modern music, dance, and multimedia techniques blended in. Putting these various elements together created an all-new artistic experience.



In 2019, the foundation's Peking opera promotional tour made stops in Mainland China and the United States. In the first half of the year, the troupe did 18 performances in total of the Peking-Kun style opera *She and Her Men* and the neo-classic *The Orphan of Zhao* spread across nine cities: Changsha, Chongqing, Beijing, Shanghai, Yantai, Weifang, Zhangqiu, Tianjin, Bazhou, and Shijiazhuang. Locals were astonished to see how well Chinese opera was preserved in Taiwan, which provided an excellent opportunity to build friendships. In the US, the troupe toured in cooperation with the Foundation for Chinese Cultural Heritage, performing *The Monkey King* and *Havoc in Heaven* as well as other operas in the Texas cities of Houston and Austin. Exquisite performances combined with pre-performance English explanations and front stage activities left a deep impression on the audience, further spreading Chinese traditional opera culture. Besides performances, the foundation holds a variety of activities aimed at expanding opera audiences, including talks, workshops, and demonstrations. The target group for these events is primarily schoolteachers and students. In 2019, for the first time the foundation sought to expand theater participation among senior citizens. Starting from a cultural and historic perspective, it introduced opera art, then had participants try basic postures.

The activity provided these energetic seniors with a new way to learn and relax. In 2019, the foundation carried out 29 such activities spread across various regions of Taiwan and Mainland China. More than 5,000 people participated.



[Peking Opera Promotion]

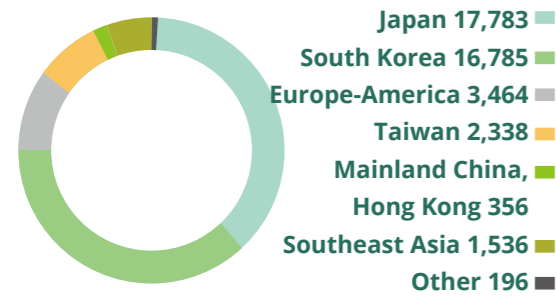
To deepen youths' awareness of Peking opera, Li Bao-chun led the Taipei Li-Yuan Peking Opera Theatre to numerous colleges and universities to give a series of lectures. At National Tsing Hua University in Hsinchu Li gave a talk on the narrative, history, literary, and musical elements of the opera *She and Her Men*. He used the opportunity to discuss topics such as human emotions and anxiety while describing the ambitions and manners of independent modern women.

TaipeiEYE

Every Monday, Wednesday, Friday and Saturday evening audiences as diverse as the United Nations gather at the Taiwan Cement Building in Taipei.

Their annual numbers exceed 10,000, with tourists from Japan, Europe, and America making up a large number of the visitors. One excited viewer said the following after seeing a show, "This is a great place for foreigners to learn and experience what makes traditional Taiwanese culture and arts performances so great."

The C. F. Koo Foundation founded TaipeiEYE in 2002. Each year it hosts close to 200 Taiwanese folk art and classical Chinese performances, such as acrobatics, hand puppets, marionette, lion dance, indigenous songs and dances, and Peking opera. In 2019, TaipeiEYE met popular demand by releasing shows with more martial elements, including Legend of Eight Immortals Crossing the Sea, Legend of the White Snake, and Gold-Coin Leopard. These were shown in conjunction with performances that foreigners rarely have a chance to see, including acrobatics, marionette, lion dance, and indigenous songs and dance. For the full year, TaipeiEYE hosted 207 shows with total admissions of close to 43,000 people, achieving our goal of cultural diplomacy.



Nationalities of TaipeiEYE Audiences, 2019

Thirteen organizations, among them schools and government agencies, reserved all seats for special showings, with total attendance of 2,710 people.

3.3.2 Training Theater Talents

The foundation has long promoted Peking opera at schools of all levels to encourage future generations to preserve this important cultural treasure. Recently, it performed *Twinkle, Twinkle!*, a popular new production that features young actors in leading roles. In 2019, the foundation put on 11 classic shows with strong female leads to put female characters on display. These themes not only opened a new artistic mode that belongs to today's youths but also sparked youth dialogue and showed TCC's success in cultivating talented young artists. The foundation has built a reputation for excellent production, management, and advising of performances and activities.

In recent years, it served as a technical advisor for 16 newly constructed theaters in Taiwan and held theater management classes in Taiwan and Mainland China to cultivate a new generation of theater management experts. It expanded these efforts after taking over the front and back stage technical and service management of sites under the authority of the Taipei City Arts Promotion Office. In 2019, the foundation carried out the Taipei City Government Family Theater Front and Back Stage Technical and Service Management Project as well as the Dadaocheng Theater In-depth Art Education, Technical Services, and the Front and Back Stage Management Project. These projects showed how the foundation leverages its extensive theater management experiences towards helping the Taipei City Government to manage theaters, support audiences and performance troupes, and raise the usage rate of public facilities.

3.3.3 International Exchanges

To spread the beauty of Chinese culture and art while showing international audiences the passion and energy of Taiwan performing arts, the foundation has long participated in international cultural platforms and served as a senior member of international cultural organizations, such as the International Society of Performing Arts (ISPA), the Association of Performing Arts Presenters (APAP), and the Federation for Asian Cultural Promotion (FACP). At the beginning of 2019, the foundation commemorated its 30th anniversary by holding the Theater Future Encounters international forum. The forum welcomed domestic and foreign performance industry members to give talks or join forum discussions. Three days of exciting conversation benefitting all involved, especially managers and academics in the Taiwan arts and culture industry. In addition, after earning the privilege of hosting the Taipei 2020 ISPA Congress, the foundation arranged meeting facilities and hotels while crafting the congress theme. Unfortunately, due to COVID-19, the ISPA New York headquarters canceled the 2020 Taipei Congress. In the future, the foundation will continue seeking more international exposure to promote local culture.



In Greek Mythology

Prometheus stole fire from Apollo and changed humanity,
Pandora also opened her box, releasing diseases and death.

Beautiful mythology often hides serious truth;
In fact, mankind learns to progress in the endless predicament of history.

Human beings, living on this blue planet,
Are always situated in the intractable unknowns.

In the past, it took us nearly 600 years to get to know *Yersinia pestis* which caused the
Bubonic plague,

This time, we isolated the first new coronavirus strain in less than three months,
Allowing us to discern the horrible appearance of the new coronavirus.

The relationship between the progression of human history and plagues
Is a course of mutually chasing and repelling;
There used to be and there is now.

If humans do not learn to establish a balanced relationship with Nature,
The situation will repeat itself in the future.

The experience accumulated by humans against epidemics over thousands of years
Is also the driving force behind the continuous advancement of human civilization;
Just because of our progress, most of these disasters have become less tragic.

Material Topics

GRI 303 Water	GRI 305 Emissions	GRI 302 Energy	GRI 306 Wastewater and Waste	GRI 301 Materials
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Management Policies

- Implement ISO 14001, ISO 50001, ISO 14064 and ISO 14046 management to maintain effective systems · the coverage is 100% of all cement plants.
- Formulate “environmental management policies” and remain committed to sustainable operations, resource reuse and recycling, and management strategies focused on the air, water, energy, and raw materials. Comply with all regulations and meet self-expectations.

Assessment Mechanisms

- 2019 cement plant total carbon emissions were 34% lower than 2013
- 2019 cement plant total water usage was 24% lower than 2018
- 2019 cement plant total pollutant discharge was 14% lower than 2016
- Implement an internal carbon pricing system. Count energy saving and GHG reduction goals as well as environmental protection management indicators towards the annual performance reviews and quarterly bonuses of management and staff.
- Monitor replacement ratios as a measure of the performance of alternative natural raw materials. In 2019, the ratio of renewable raw materials was 77.46%.

Objectives

- Reduce water use by 1% annually
- Lower 2025 NOx, SOx, and TSP emission by 30%-50% compared to the base year of 2016
- Hold regular meetings to review environmental management performance
- Lower 2030 GHG emissions by 30% compared to the base year of 2013
- Assist in processing 1.57 million tonnes of waste by 2030
- Continue to promote circular economy commercial models
- Expand alternative raw material types to lower our environmental impact



Environment and a Low Carbon Supply Chain

04 CHAPTER

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Lagerstoemia subcostata

It is drought-tolerant and barren, with strong plant germination. It is suitable for planting on the slope of mines to strengthen soil and water conservation. The leaves turn red in winter, the trunk is smooth, and the tree is not crawling, the wood is hard, and it is also good wood.

4.1 Stronger Carbon Management



4.1.1 Science-Based Carbon Reduction Goals and Internal Carbon Pricing

Recognizing the potential global impacts of climate change, since 2013 TCC has commissioned annual third party emissions surveys. As global carbon emissions reach critical levels, we implement measures to reduce emissions. In response to the Carbon Disclosure Project's questionnaire on climate change, we set a first stage target of reducing total emissions at our Taiwan plants by 30% by 2030 when compared to the base year of 2013. In recent years, following energy savings, emissions reduction, and production capacity adjustments, we reduced our 2019 emissions by 34% compared to 2013, thus achieving our first stage goal ahead of schedule.

In the current stage, TCC is focusing on international goals. By following stricter standards that further reduce the impact of climate change, we are turning ourselves into a model for the Taiwan cement industry to follow.

Science-based Carbon Reduction Goals

In December 2019, TCC committed itself to the Science-Based Targets (SBT) for reducing GHG emissions, officially declaring that we will follow international GHG emissions reduction initiatives. In response to the Paris Agreement target of keeping global warming under 2°C, we established a task force that aims to use alternative fuels and energy saving technical transformations to reduce emissions.

We also formulated GHG reduction by using a Sectoral Decarbonization Approach methodology and logic calculation, then submitted our carbon emission reduction intensity targets to the Science-Based Targets initiative (SBTi) in April 2020. In the future, we will work with the Industrial Technology Research Institute on developing carbon capture techniques suitable for cement plants. By following strict international standards, we obtain an accurate picture of the effectiveness of our carbon reduction actions.

Internal Carbon Pricing

To get closer to real-time readings of cement plant emissions, in 2018 we added our carbon emissions management system to the list of items our war room dashboard. Using AI, we calculate the GHG emission of our production process and our unit emissions intensity then use these data to set emissions intensity goals and emissions indicators for each of our cement plants. These form the basis of our internal carbon pricing and assessments. At the same time, we plan annual energy savings and emissions reduction projects with monthly reviews. These are incorporated into the annual performance assessments and quarterly bonus evaluations of managers and employees at all levels, enabling us to implement carbon emissions management throughout the Company.

Carbon Trade Market

In an effort to slow climate change, the Mainland China government promotes carbon trade markets. After regional pilot planning began in 2011, a total of 200 million tonnes was traded across eight emission-intensive sectors between 2013 and 2017. In 2020, the markets are expected to open up to more industries. TCC's Yingde and Chongqing plants are located within the regional pilot planning zones and will contribute to future carbon trade market development.

Using Carbon Footprints and Labels to Become an Industry Benchmark

Carbon footprints look at the direct and indirect GHG emissions of an activity or a product throughout its whole life cycle, from raw material acquisition, manufacture, delivery, and sale to use and waste recycling.

The carbon footprint not only offers insight into a product's GHG emissions but also serves as a reference for energy savings and emissions reduction measures. In 2019, we arranged to calculate the carbon footprints of our products. We discussed with the Environmental Protection Administration about formulating product category rules for cement products, which could lead to Taiwan's first carbon label for a cement product in 2020. Implementing the carbon label system will bring greater transparency to GHG emissions at each stage of the product's life cycle, which will enable us to optimize the manufacturing process in order to reduce GHG emissions.

Cement Plant GHG Emissions Over the Past Four Years (Unit: Tonnes of CO₂e)

	2016	2017	2018	2019
Scope 1	4,396,724	4,144,669	4,228,688	4,266,390
Scope 2	253,768	241,691	247,702	223,096
Total (Scopes 1 and 2)	4,650,492	4,386,360	4,476,390	4,489,486
Scope 3	-	8,873	15,041	21,083

Note 1: GHG emissions are inventoried in terms of operational control. The equation used is emissions = activity data x emissions factor (EF) x global warming potential (GWP). EF is subject to the EPA GHG Emissions Factor Management Table (v. 6.0.4) and GWP is subject to the IPCC Fourth Assessment Report (2007). GHGs include CO₂, CH₄, N₂O and HFCs.

Note 2: Since 2017, we measured the main activity associated with Scope 3 emissions using the GHG Protocol - Corporate Value Chain (Scope 3) Accounting and Reporting Standard (WRI & WBCSD) with third-party certification.

Note 3: In 2019, Taiwan's clinker production capacity was 5,239,637 tonnes. The carbon emissions intensity (Scope 1 and Scope 2) was 0.857 tonnes of CO₂e per tonne of clinker.

Note 4: TCC first obtained third party verification on GHG inventory in 2013. The emission in 2013 of 6,851,987 tonnes CO₂e is used as the base year.

GHG Emissions of Ready-mix Concrete Plants Over the Past Four Years (Unit: Tonnes of CO₂e)

	2016	2017	2018	2019
Scope 1	1,842	1,762	1,992	1,415
Scope 2	6,000	5,956	6,144	5,010
Total	7,842	7,718	8,136	6,425

Note 1: GHG emissions are inventoried in terms of operational control. The equation used is emissions = activity data x EF x GWP. EF is subject to the EPA GHG Emissions Factor Management Table (v. 6.0.4) and GWP is subject to the IPCC Fourth Assessment Report (2007). GHGs include CO₂, CH₄, N₂O and HFCs.

Note 2: In 2019, the EF of GHG Scope 1 diesel fuel was 2.6060 CO₂e/l. For Scope 2 emissions, we used the 2018 EF of purchased electricity, which was 0.533 kg CO₂e/kWh.

Note 3: We calculated GHG emissions internally. For Scope 1 emissions, we only calculated diesel fuel emissions.

GHG Emissions of Headquarters Over the Past Four Years (Unit: Tonnes of CO₂e)

	2016	2017	2018	2019
Scope 2	2,089	2,172	2,026	1,934

Note 1: In 2019, for Scope 2 emissions we used the 2018 EF of purchased electricity, which was 0.533 kg CO₂e/kWh.

Note 2: We calculated GHG emissions internally.

Note 3: We recalculated 2018 emissions data using full-year electricity usage.



TCC Develops Green Raw Materials That Reduce GHG Emissions by 70%

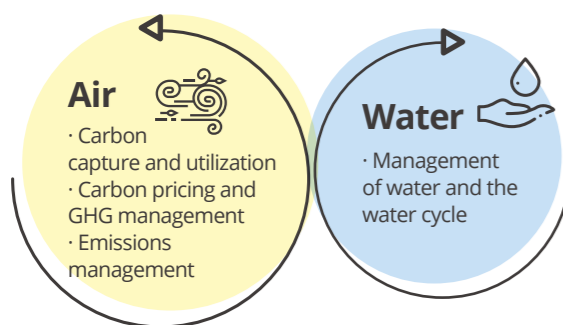
Recognizing the importance of GHG management, TCC researches the use of green raw materials for producing cement. In a joint venture with Turkey's OYAK Çimento A.Ş., we are building a new cement factory in the Ivory Coast- Abidjan. In 2020, this factory will produce the latest environment-friendly concrete by using green clinker that can reduce GHG emissions by 70% compared to traditional methods.



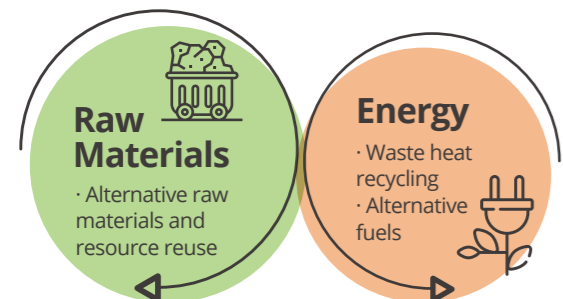
4.2 Implementing Environmental Management

Environmental Management Policies

TCC is involved in three core businesses: environmental protection, energy, and cement. Our circular economy objectives focus on achieving zero waste, zero pollution, and zero emissions. Obtaining international certifications such as ISO 14001, ISO 50001, ISO 14064, ISO 14046, and BS 8001 has further raised the quality of our products and the effectiveness of our energy, water, wastewater, and waste management performance. When formulating energy conservation, environmental protection, and production management improvement plans, TCC integrated sustainable management concept in all TCC operations, including due-diligence, mergers and acquisitions, in order to reduce environmental impact. As an additional measure, we urge suppliers and contractors to reduce the negative impacts on the environment that occur during production, manufacturing, and transport. Together, we create sustainable values throughout our industrial supply chain.



Management of 4 Key Cycles



TCC pledges to continue to operate sustainably and reuse resources. Management strategies focus on four main areas: the air, water, energy, and raw materials. In 2019, our cement plants invested NT\$180 million on environmental protection measures. 80% of this funding will be used to upgrade all of our electrostatic dust precipitators to electrostatic-bag composite dust precipitators, which will raise our dust collection capabilities beyond the required legal threshold, thus reducing the amount of particulate emissions we produce. When making these changes, we seek innovative, feasible breakthroughs that fulfill our sustainability objectives of zero waste, zero pollution, and zero emissions. To carry out climate change mitigation strategies, TCC established energy management mechanisms. We set energy conservation targets that meet the Bureau of Energy's policy of annual 1% energy consumption reductions. At the same time, we introduce systematic energy consumption control. New technologies that we develop improve production processes and equipment. We include energy consumption and power generation data in our war room system to provide real-time references that support internal management.

Each year, we establish product energy consumption (coal & electricity) indices, plan energy conservation programs, and develop alternative raw materials and fuels. As we continue to research energy conservation and emissions reduction plans to reduce GHG emissions, we hold monthly review meetings to check progress. For raw materials management, we hold monthly production and sales meetings to evaluate raw material needs. Ensuring proper inventory volumes that are suited to our sales needs reduces the frequency of material transportation, which lowers transportation-related GHG emissions produced by our upstream suppliers.

4.2.1 Air Emission Management

Emission Reduction Targets:
-30% ~ -50%
 as SO_x, NO_x and TSP by 2025
 base on 2016 level



Emission control items for cement plants include total suspended particulates, NO_x, and SO_x. Online monitoring systems send these data to the local Environmental Protection Bureau, and a third-party testing agency carries out quarterly measurements to determine whether stack emissions data support the monitoring data. TCC added emission indicators are added to the internal control system to improve monitoring and to build an alert system based on the data collected. The alert system will make adjustments to manufacturing process in advance, and prevent environmental impact on the factory. Boosted by these advances, we reduced our 2019 air emissions by 14% when compared to 2016. In 2020, we are planning to use multi-stage combustion techniques during manufacturing to further reduce NO_x emissions.

The Hoping Port, which is located in Heping Industrial Park, brings together a port, a power plant, and a cement plant. In accordance with requirements in the environmental impact assessment, each quarter a third party carries out environmental monitoring at the park to check the air quality, noise, soil, water quality, marine ecology, land ecology, and other environmental factors.

The Suao Plant undergoes quarterly environmental monitoring of the factory. Biannual environmental monitoring is carried out at the neighboring Shih-Min Elementary School to check air quality, noise, soil, water quality and other environmental factors.

The cement industry is fairly unique in not producing any industrial waste. Non-industrial waste, such as scrap metal, is gathered and regularly recycled by a contracted waste management company. In 2019, TCC recycled 1,769 tonnes of non-industrial waste.

Emission Control Actions

Gaseous pollutants

- (1) Optimized SNCR equipment, including the pipelines, water pumps, and vessels
- (2) Use of low sulfur, sub-bituminous coal
- (3) Use of low-NO_x combustion devices
- (4) Plan to use multi-stage combustion techniques starting in 2020

Particulate pollutants

- (1) Upgraded differential pressure gauges on our bag dust precipitators increase efficiency, and we regularly replace the filtration bags
- (2) Sealed transport systems: To prevent spreading of particulate pollutants, we renovated all corridors, transport towers, and building doors and windows
- (3) Improved electrostatic-bag dust precipitators on Kiln 1 and Kiln 2 at the Hoping Plant

Air Emissions at Cement Plants Over the Past Four Years (Unit: Tonnes)

	2016	2017	2018	2019
Nitrogen Oxides	7,331	7,035	6,744	6,388
Sulfur Oxides	111	82	85	79
Volatile Organic Compounds	0.00776	0.00656	0.00636	0.00616
Particulate Matter	433	587	643	305
Total	7,875	7,704	7,472	6,772

Note 1: Operations were suspended at the Hualien Plant in 2019, so there was not any air emission from this plant.

Note 2: Starting from the third quarter of 2018, we added heavy metal monitoring data at the request of the Environmental Protection Administration.

Note 3: Starting from the fourth quarter of 2018, our cement plants reported mercury vaporization in accordance with legal requirements. In 2019, our mercury vaporization was 0.221723 tonnes, and there was no mercury vaporization at our RMC plants.

Note 4: In 2019, dioxin emissions at our cement plants were 0.0865g I-TEQ.

Note 5: Our RMC plants primarily mix ingredients and transport product, so they generally do not produce pollutants through manufacturing. During the past four years, the plants did not produce any air emissions.



Understanding the importance of water conservation, TCC implements measures to reduce water usage. In 2019, the Suao and Hoping Ports became Taiwan's first cement plants to pass ISO 14046 Water Footprint certification, which will support water resource management efforts at the cement plants. In 2019, total water usage at our cement plants was 2.12 million m³, a reduction of 24% compared to 2018.

Suao Plant and Hoping Plant are not in areas with high water risk

4.2.2 Management of Water Resources and the Water Cycle

Water resource reduction goal
Cement plants aim to cut water use by **-1%** annually



In 2019, we used wastewater recycling facilities at the Hoping Plant to generate more recycled water for green areas and roadside sprinkler systems. These will be able to reduce our annual water expenses by NT\$990,000. We also added more piping, water pumps, and water reservoirs to the Suao Plant to increase wastewater recycling. The recycled water is used in the plant's storage areas, roadside sprinkling

pollution prevention system, garden watering system and other areas, which conserves about 300 m³ of water per day. Additional measures included strengthening management of reclaiming tank water levels to reduce overflows and continuing to replace old piping.

Water Resource Use at Cement Plants Over the Past Four Years (Unit: M³)

	2016	2017	2018	2019
Municipal water	395,554	411,376	-	-
Groundwater	1,650,335	1,837,214	1,426,603	1,109,183
Industrial Use Water	1,037,154	978,629	910,927	991,050
Reuse of Process Wastewater	797,749	595,325	452,683	23,224
Total	3,880,792	3,822,544	2,790,213	2,123,457

Note 1: Operations were suspended at the Hualien Plant in 2019, so the 2019 data is for the Suao and Hoping Ports
 Note 2: In 2019, Taiwan's clinker production capacity was 5,239,637 tonnes and the water use intensity was 0.41m³ per tonne of clinker.
 Note 3: Note 3: Municipal water data is based on reported data.

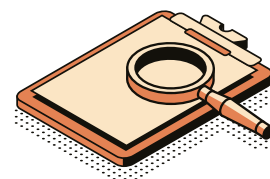
In the second half of 2019, we refurbished the sand and gravel separators and wastewater recycling equipment at the Nan-tzu and Siaogang branches of the Kaohsiung plant. In urban areas, we need these pieces of equipment to recycle water used to wash transport vehicles and to reduce siltation, which is important for meeting environmental regulations, keeping the factory clean, and building a good image for our industry. We budgeted NT\$4 million to continue to replace old sand and gravel separators.

We reuse 100% of our recycled water as well as separated particles, which enables us to achieve zero emissions and zero pollution. In 2019, we recycled and reused 247,284 m³ of water.

Water Resource Use at RMC Plants Over the Past Four Years (Unit: M³)

	2016	2017	2018	2019
Municipal water	282,317	339,173	247,780	316,832
Groundwater	-	-	-	85,725
Total	282,317	339,173	247,780	402,557
Reuse of Process Wastewater	227,679	203,693	152,130	247,284

Note 1: The scope of disclosure is the water for which TCC holds water rights. Disclosure of groundwater began in 2019.
 Note 2: Municipal water data is based on our water bills and groundwater data is based on reported data. Usage refers to the actual amount of water consumed in each applicable month.



Water Resource Use at Headquarters Over the Past Four Years (Unit: M³)

	2016	2017	2018	2019
Municipal water	14,842	19,646	16,454	17,280

Note 1: We recalculated 2018 data using full-year water usage.
 Note 2: Municipal water data is based on our water bills.

Wastewater Management

Most wastewater at cement plants comes from cooling water used during production and sewage from employees' daily living. We treat the water using wastewater collection systems, desilting basins, and other equipment, then discharge it in accordance with water pollution prevention regulations. The local environmental bureau tests the effluent each quarter to ensure it meets required quality standards for discharge.

At the Hoping Port, sewage and production wastewater are treated to the discharge standard, sent to the wastewater treatment plant at Heping Industrial Park for additional treatment then discharged into the Pacific Ocean. At the Suao Plant, process water and rainwater runoff are transported to the sedimentary pond, treated to meet the discharge standard, then discharged from the effluent outlet into Baimi River. RMC plants do not produce industrial wastewater, but do treat rainwater and water for cleaning truck tires and concrete mixers in the buffering pond and sedimentation pond before reusing it for cleaning. In 2019, our cement plants discharged a total of 444,256 m³ of wastewater and were not subject to any water discharge quality fines.

4.2.3 Energy Management

Environmental sustainability is a key goal of TCC. Facing the impacts brought by global climate change, we optimize cement production and corporate operations using green management systems and concepts. We obtained ISO 50001 Energy Management Systems certification, which complements our ISO 14000 Environmental Management and ISO 14064 Green house Gases certifications. We continue to search for ways to improve energy performance, reduce energy costs, and raise energy management capabilities.

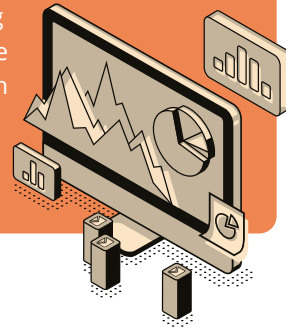
Besides energy management, TCC equips each cement plant with a waste heat electricity generation system in order to recover and reuse the heat energy emitted from rotary kilns. We use advanced Japanese flash distillation technology to enhance heat recovery efficiency, thus maximizing system benefits. In 2019, the output of the waste heat generation system was 100.3346 million kWh, equivalent to 23% of our purchased electricity.

TCC also conserves energy by upgrading old equipment, including replacing old air compressors and waste heat boiler tubes as well as refurbishing kiln systems. In 2019, these measures saved approximately 30.83 million kWh of power, which reduced power expenditures by about NT\$89 million.



TCC Energy Management Policies

TCC pledges to continue improving our energy systems and raising management performance. We buy energy saving products and services while designing and manufacturing products that save energy. We provide resources to meet energy-saving system goals while ensuring that employees have time to participate in related actions.



Plant Production Management

Tracking Energy Conservation Results

- Plants plan energy conservation projects each year then follow up results.
- TCC sets energy consumption indicators (coal, electricity) for various products each year then regularly follows up and reviews energy efficiency.
- Systems are in place to perform daily checks of energy consumption and generation. Data are included in the daily reports of each plant and provided to the war rooms to use as a reference for internal management meetings.

Cement Plant Energy Consumption Over the Past Four Years

	2016	2017	2018	2019
Coal (Kilotonnes)	738	690	679	708
Diesel (Kiloliters)	1,008	1,521	1307	946
Purchased Electricity (GWh)	489	470	467	433

Cement Plant Energy Consumption Over the Past Four Years-Converted to Gigajoules

	2016	2017
Coal (GJ)	18,195,789	17,012,323
Diesel (GJ)	35,444	53,482
Purchased Electricity (GJ)	1,760,400	1,692,000
Total (GJ)	19,991,633	18,757,805
	2018	2019
Coal (GJ)	15,689,903	16,157,228
Diesel (GJ)	45,957	33,264
Purchased Electricity (GJ)	1,681,200	1,558,800
Total (GJ)	17,417,060	17,749,292

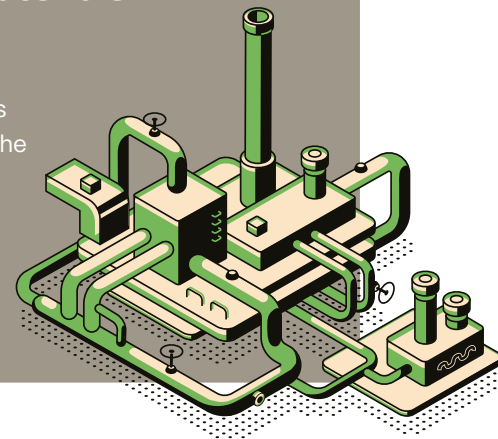
Note 1: For calorific value conversion factors, the Suao Plant uses 5,451.55 kcal/kg for coal and the Hoping Plant uses 5,450 kcal/kg for coal and 8,400 kcal/L for diesel.

Note 2: In 2019, our coal use increased by 4% compared to 2018 due to increased production.

Note 3: In 2019, Taiwan's clinker production capacity was 5,239,637 tonnes and the energy intensity was 3.39 GJ per tonne of clinker.

Alternative Fuels and Raw Materials

TCC researches alternative fuels and raw materials that can reduce the amount of CO₂ emitted during incineration.



Reducing Transport Frequency

TCC formulates transportation plans and forecasts raw material needs in monthly production and sales meetings. Our objective is to ensure that we have the right amount of inventory to meet sales volume while preventing excess production and inventories of finished goods that would increase our energy consumption and GHG emissions. We also seek to decrease the frequency of raw material deliveries to reduce transport-related GHG emissions.

Energy Efficiency Enhancement

In recent years, TCC's RMC plants used transport management and equipment upgrades to improve energy management.

Transport

Ground

TCC's RMC plants have accelerated the replacement of old, high fuel consumption concrete mixers in favor of environment-friendly, energy efficient vehicles. The amount of diesel we use is decreasing annually. In 2018, our Kaohsiung Plant began to renew its vehicles, adding 20 new vehicles that meet level 5 emissions standards to replace old vehicles that only met level 1 or 2 standards. The renewals, which were completed in the fourth quarter of 2019 at a total cost of NT\$80 million, fulfill our responsibility to protect the environment. In 2020, our goal is to buy an additional 15 vehicles to replace old vehicles that only meet level 3 or 4 standards.

Shipping

For better energy saving and environmental protection, in 2016 TCC signed an agreement with Japan's Shin Kurushima shipbuilding to build two customized ships at a cost of 3.518 billion yen each. Delivery was completed in 2019. Named "Dafeilun" and "Dayanglun," the ships are fully featured, fully automated, and non-polluting. Their main engines, which use an advanced hydraulic, electronic engine control tuning system that reduces fuel use, have lower NO_x emissions than International Maritime Organization standards and produce 15% less CO₂ and 20% less nitrogen oxide emissions compared to the previous generation of diesel engines. They reduce fuel consumption by 15% or more. We also planned installation of an alternate maritime power (AMP) system, use low sulfur fuel, and integrated a smart ship management system and a ballast water treatment system. These reduce GHG emissions, SO_x emissions, and fuel consumption, which enhances our environmental management while protecting the marine ecology. By the end of 2021 we plan to complete installation of an onshore power supply.



Equipment Upgrades

In recent years, TCC invested approximately NT\$800 million to upgrade and expand our RMC plants. In 2020, we will complete relocation of our Taipei Plant in the first quarter and our Hsinchu Plant in the second quarter. We also invested NT\$100 million to add a new concrete mixer to our Kaohsiung Plant and to our Tainan Plant. The new equipment, which will raise manufacturing and energy efficiency, is expected to be fully installed in the first quarter of 2020.



Hsinchu Plant



Taipei Plant

RMC Plant Energy Consumption Over the Past Four Years

	2016	2017	2018	2019
Diesel (Kiloliters)	862	750	657	664
Gasoline (Kiloliters)	-	-	120	158
Purchased Electricity (GWh)	10.83	10.75	11.09	9.36

RMC Plant Energy Consumption Over the Past Four Years-Converted to Gigajoules

	2016	2017	2018	2019
Diesel (GJ)	30,310	26,372	23,102	23,348
Gasoline (GJ)	-	-	3,918	5,159
Purchased Electricity (GJ)	38,988	38,700	39,924	33,696
Total (GJ)	69,298	65,072	66,944	62,203

Note 1: According to the Emissions Factor Management Table (v. 6.0.4) on the Bureau of Energy's website, calorific values are 8,400 kcal/L for diesel, 7,800 kcal/L for gasoline, and 3,600 GJ/GWh for electricity.
 Note 2: RMC plants started collecting data on gasoline use in 2018.
 Note 3: The same conversion factors were used to calculate the diesel from 2016-2018

In 2016, the Taiwan Cement Building received Diamond Class Green Building certification in the category of old building refurbishment. Since then, we have continued to find new ways to conserve energy and reduce carbon emissions, including adding solar panels to the building's roof. The building generated 49,056 kWh of power in 2019 and obtained 42 Taiwan's Renewable Energy Certifications (T-RECs).



Diamond Class Green Building Label, TCC Headquarters

- Solar systems on the roof generate more than 10,000 kWh of electricity per year
- Water from a rainwater recycling system is used for outdoor landscaping and cleaning
- Upgraded to water conserving equipment
- Improved lighting fixtures
- Raised the central air-conditioning system efficiency

Headquarters Energy Consumption Over the Past Four Years

	2016	2017	2018	2019
Purchased Electricity (GWh)	3.77	3.92	3.8	3.63

Headquarters Energy Consumption Over the Past Four Years-Converted to Gigajoules

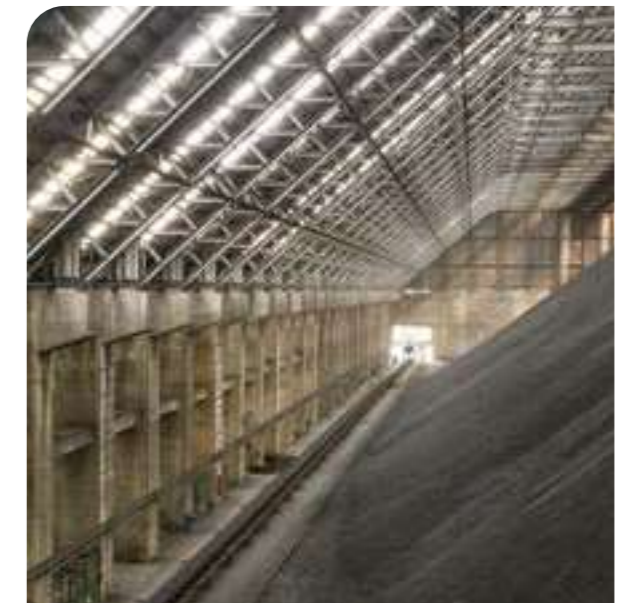
	2016	2017	2018	2019
Purchased Electricity (GJ)	13,572	14,112	13,687	13,064

Note: We recalculated 2018 emissions data using full-year electricity usage.

4.2.4 Raw Materials Management

Limestone, clay, silica sand, iron slag, and coal ash are the main raw materials in our finished products. In response to environmental protection trends and natural resource scarcity, we endeavor to minimize resource extraction and procurement by expanding recycled raw material use and raising production efficiency.

The Hoping Plant uses construction waste dirt and power plant coal ash (fly ash, bottom ash) as alternatives for clay. Desulfurized gypsum from the power plant serves as an alternative for natural gypsum. Additional raw materials we processed in 2019 included 1,434 tonnes of inorganic sludge from a paper factory and 22,712 tonnes of reduced slag from electric arc and steelmaking furnaces.



The Suao Plant uses limestone, iron slag, building silica sand, low alkali silica sand, construction waste dirt, power plant coal ash (fly ash, bottom ash), reduced slag from electric arc and steelmaking furnaces, calcium fluoride sludge, combustible waste, and desulfurized inorganic sludge reclaimed using magnesium oxide. After starting to use the combustible waste and reduced slag in the second half of 2018, the plant increased usage in 2019, processing 3,677 tonnes of combustible waste (a five-fold year-on-year increase) and 4,835 tonnes of reduced slag (a 21-fold increase).

Raw Material Consumption, 2019

Categories	Raw Material	Consumption Volume (Unit: Tonnes)
Non-renewable Raw Materials	Limestone	6,650,900.59
	Silica sand	132,302.57
Renewable Raw Materials	Clay (construction waste dirt)	1,164,069.91
	Iron slag	194,728.61
	Fly ash	240,906.92
	Bottom ash	50,924.45
	Desulfurized gypsum	272,399.69
	Water purifying plant sludge	67.54
	Reduced slag	27,547.79
	Calcium fluoride sludge	13,538.00
	Combustible waste	3,677.06
	Inorganic sludge	5,501.96
	Molding glue	179.90
Total raw materials		8,756,744.99
Proportion of renewable raw materials		22.54%

In 2019, TCC consumed 8.76 million tonnes of raw materials and recycled 100% of the clay, iron slag, coal ash, and bottom ash that we produced. For each tonne of concrete, we processed 191 kg of discarded materials. In the future, we will increase our use of alternative raw materials in order to process more waste per tonne of concrete and reduce consumption of natural raw materials.

4.3 The Road to a Circular Economy

As climate change and natural disasters become more severe, the circular economy, with its objective of protecting the environment, has become an important trend. This idea was considered when TCC built Hoping Industrial Park, which brings together a cement plant, a power plant, and a port. The three-in-one facility uses a circular economy operational model to optimize resource use benefits. For example, the raw materials required for making cement, including fuel, iron slag, gypsum, and slag, are shipped in via Hoping Port, and finished cement products are shipped from the same port to cement receiving stations at major ports in western Taiwan, saving transportation expenses and lowering environmental impact. Waste produced from power generation can be divided into fly ash and bottom ash, both of which are coal ash substances. We use 100% of the coal ash from the Hoping Power Plant as a raw material for the Hoping Cement Plant, showing the extent to which we prevent marine pollution and make waste reuse a reality.

In 2018, TCC became the world's first cement company to achieve BS 8001 Circular Economy certification.

Important 2019 achievements of TCC's pioneering "cement + energy + environmental protection"

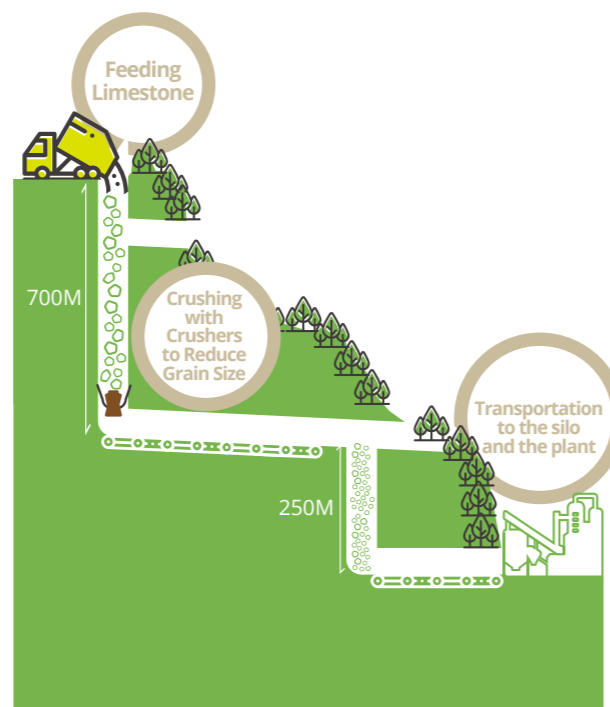
3-in-1 circular economy combination

■ Began sailing "Dafeilun" and "Dayanglun," a pair of ships that are fully featured, fully automated, and non-polluting. Their main engines use an advanced hydraulic, electronic engine control tuning system which reduces fuel use, has lower NO_x emissions than International Maritime Organization standards and produce 15% less CO₂ and 20% less nitrogen oxide emissions compared to the previous generation of diesel engines. Their fuel consumption is 15% or more lower.

■ Used 216,201 tonnes of coal ash and 95,096 tonnes of desulfurized gypsum from the Hoping Power Plant as a raw material at the Hoping Cement Plant, showing how we not only prevent marine pollution but also reuse resources.

■ The Hoping Power Plant invested NT\$80 million on upgrading the transformers in a portion of its electrostatic dust precipitators to high-frequency transformers. These are better at gathering dust and reduce the amount of particulate pollutants.

■ The Cement Plants has processed 610,000 tonnes waste from many industries, including optoelectronics, semiconductors, papermaking, water purification, steelmaking, chemical engineering and power plant. The plants reused the waste as part of this cross-industrial cooperative effort.



Taiwan Cement's Mission

"The reason why the sea is great is that in addition to being beautiful, vast, and full of Life,
There is also a kind of self-purifying function."
Kant realized this problem two hundred years before us.

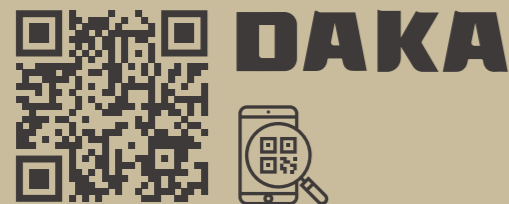
The relationship between humans and sunlight is that the latter
Can only form friendly touching
Through the sunscreen lotion applied to the body, the opened parasol, and the
UV-resistant glass.
The water of life flowing in the mountains and the sea must go
Through very complex processes;
Only after filtering out the pollutants made by humans can it return to the operation of
Nature's ecology.
Sunshine, air, water are
No longer that kind of simple and pure relationship between
Our ancestors and Nature in the past.

At this moment, always wearing a mask that covers our happiness,
Fury, sorrow, and joy,
We suddenly remembered that openness is such a precious existence.

The epidemic is now,
Forcing us to helplessly generate garbage that is not in the amount we expect,
Masks, gloves, wrapping paper, plastic bags, disposable tableware, protective clothing,
Medicine containers, chemical drugs ... etc.
One-time-use, cheap, disposable waste from the city.
The precepts for waste disposal set up by society through arduous efforts are
Once again neglected, shelved, even forgiven;
This is a serious issue that we must face even more after the pandemic.

Facing survival, the fastest to disintegrate
Is the beautiful consensus about the circular economy which has just been
Budding through so much effort.
Facing the possible sequelae following these pandemics,
We are all ready to adopt this rather difficult engineering project.
We must again state with patience and love the importance of the circular economy.
No matter how difficult the situation is, we must firmly implement this belief.
In the past, when nobody was willing to do, when it was difficult,
Taiwan Cement was always willing to step forward and shoulder the burden.

Taiwan Cement's sense of mission and its self-assigned coordinates
Have been established through practices again and again.



For more information on the "cement + energy + environmental protection" three-in-one circular economy, please visit the TCC DAKA website at <https://www.tccdaka.com/tw/story.html>

Biodiversity and Regeneration

05 CHAPTER

- Management of Sustainability Topics
- Governance and Risk
- Society Empowerment
- Environment and a Low Carbon Supply Chain
- Biodiversity and Regeneration**
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- Appendix

Duchesnea chrysantha

Rosaceae, a native species of Taiwan, creeping herbs with walking stems, spread and grow in mines. Although the fruit is smaller than strawberries, the red berries are very eye-catching in the green grass. A non-rare plant, the soil needs to be pollution-free, is described as the fruit of the mine's rejuvenation.

Material Topics

GRI 304 Biodiversity

Management Policies

■ Carefully consider ecological balance and restoration, uphold use of extraction methods that have a low environmental impact, restore the ecology of mining areas, and engage in plant conservation initiatives

Assessment Mechanisms

- Maintain communication channels with stakeholders, regularly arrange for local community residents and educational organizations to visit mining areas and plants
- Ensure that environmental management takes place in accordance with regulations and planning
- Plant more than 4,000 plants and trees per hectare at Suao's Taibai Mountain Mine
- Achieve 77% green area coverage at Hualien's Hoping Mine
- The conservation center already collected 33,653 taxa of live specimens (through April 1, 2020)

Objectives

- By 2027, the conservation center shall collect live specimens from 40,000 taxa
- By 2030, achieve the following five goals: expand the accumulated mining zone restoration area to 16 ha, reach a 90% proportion of indigenous trees, achieve an 80% average survival rate for various plant and tree taxa, successfully grow more than 12,000 plants and trees, and plant at least 25,000 saplings
- Implement mine ecology restoration that preserves the biodiversity of mining areas and reduces the environmental impact of mining



The Mining Ecosystem

Restoring the Original Ecological Environment

Rather than settling for "ecological pond" or "butterfly park" type installations, we restore the original ecosystem

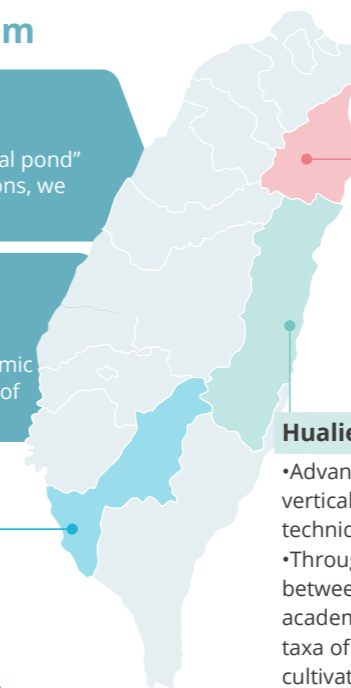
Proactive Engagement

9 visits by members of a French mining university, the Bureau of Industry of the Ministry of Economic Affairs, academics and residents of Heping Village



Kaohsiung Shoushan Mine

- Plant and animal habitat
- Limestone kilns and brick cultural zone

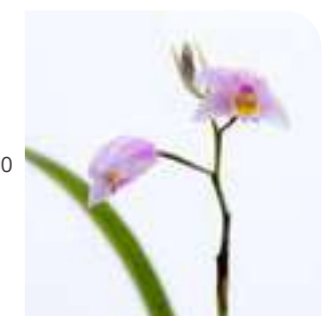


Suao Taibai Mountain Mine

- Use ropeway transport systems that do not produce dust, lower pollution produced by truck transport
- Density of more than 4,000 plants per hectare, far exceeding the legal requirement

Hualien Hoping Mine

- Advanced, low carbon vertical shaft excavation techniques
- Through cooperation between industry and academia, more than 4,000 taxa of native plants were cultivated



During mine excavation, we must minimize environmental impact. After mining is completed, we must return the site to its natural state.

Biodiversity Policies

TCC commitments not to operate, explore, mine or drill in World Heritage areas and IUCN Category I-IV protected areas. TCC aims to restore mining areas to their original ecology and ensure sustainable development. We divide organisms in mining zones into plants and animals, separate them by type, category, distribution and population, then create an organism directory which includes diversity indicators. Plant growth distribution charts and protected animal sighting locations are kept. Data comparisons reveal changes to the mine environment ecology. Each quarter we commission an external organization to carry out environmental monitoring in order to track progress of mining ecology restoration and guide industrial-academic cooperative models and planning.



5.1 Protecting the Green Environment

Mines are a core part of TCC's business. We are committed to only using extraction methods that protect the environment, to restoring the ecology of mining areas, and to go so far as to preserve key plant species. TCC's mining restoration is different from typical rushed greening models. We do not blindly focus on high green coverage rates or large quantities of saplings.

Through long-term planning, careful consideration of ecological balance and restoration, and ongoing restoration management, we gradually return mining areas to their original state. We work with academia and the Dr. Cecilia Koo Botanic Conservation Center (KBCC), Asia's largest plant conservation center, to research indigenous plants and restore limestone ecosystems.

Yilan's Taibai Mountain Mine – Taiwan's First Green Energy Ecological Restoration System

The Taibai Mountain Mine area in Yilan is not rich in soil organic matter. It has a rocky surface that is not readily conducive to plant growth. With seeds struggling to flourish under these conditions, restoration was highly difficult and a short-term plan to restore indigenous vegetation was not feasible. To overcome these challenges, TCC cooperated with the sustainable landscape lab at National Ilan University's Department of Horticulture. Professor Huang Ji-wei and students Lee Zong-zhi and Lee Yi-ci supported the launch of a habitat restoration and ecological recovery plan that starts with restoring the micro-habitats of individual plant taxa. Rather than using rushed greening methods, the plan introduced pioneer species, indigenous species, and indigenous endemic species. Gradual succession over the course of three years has already led to the restoration of close to a hundred indigenous taxa. We also overcame natural limitations of the site by pioneering a green energy drip irrigation system together with wind reduction nets and precision watering.

The first challenge

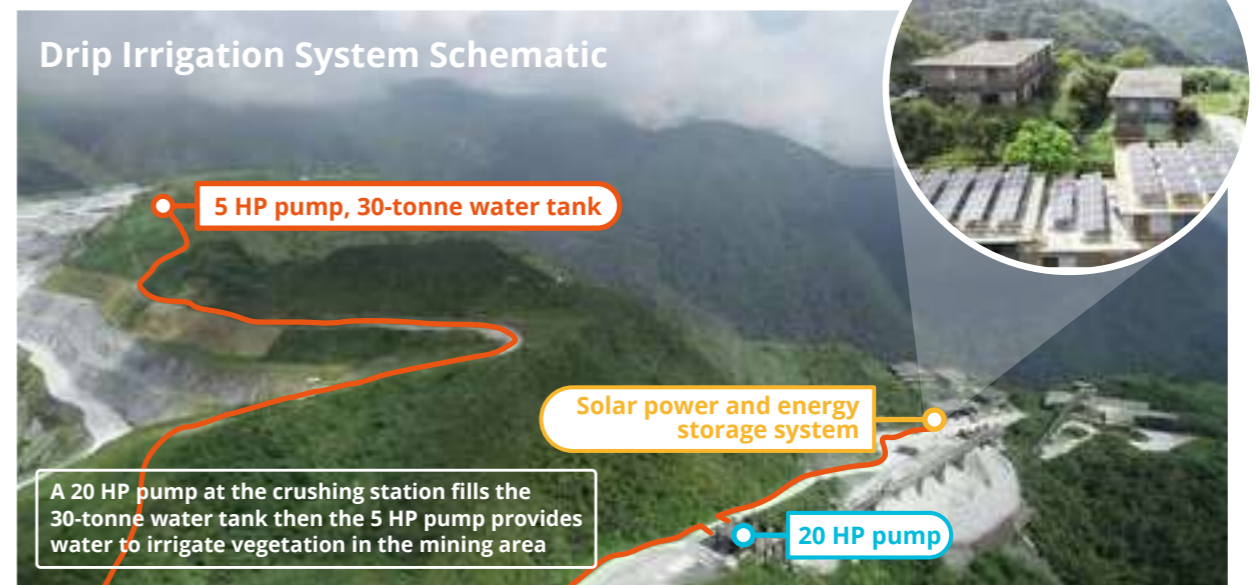
The first challenge was to supply water to the restoration area using a 100% green energy drip irrigation system. Taking advantage of the low shade coverage and high sun exposure on mountainsides, we added solar panels and energy storage equipment. This powers the irrigation system by raising water to a high point at the mine (elevation of about 900 m). The system generated 4,670 kWh of energy between the end of 2019, when it went online, and the middle of March 2020, reducing CO₂e emissions by 2.5 tonnes.

The second challenge

The second challenge was to mitigate strong winds, the necessity of which was demonstrated in 2019 when Typhoon Bailu destroyed a high volume of vegetation. Newly installed wind reduction netting with an effective porosity of 60% provides protection. Each sapling is also nourished by its own drip irrigation emitter. The angle shall not exceed 30 degrees to ensure sufficient water delivery.



Visual inspections show the results of three years of vegetation growth and succession. Ecological surveys using manual inspections and infrared camera records provide greater insight into the ecological system changes and advances. Data show that insects and animals from all levels of the food chain returned to the area, contributing to higher biodiversity. Rare species, such as endemic *Coniglobus sphaeroconus*, *Aegista mackensii*, and more than 10 species of birds have been seen in the area. Even *Geothelphusa nanao*, *Odorrana swinhoana*, and *Rhacophorus moltrechtii* were detected in what was previously an arid environment.



Note: None of the TCC's mines are in ecological conservation or rehabilitation area

Mining Area Indigenous Habitat Construction

"Three years ago, Zhong-yi (the mining department director of Suao Plant) drove me up Taibai Mountain to about 900 meters elevation. For the first time, I was visiting one of Taiwan's earliest limestone mining areas. The landscape was completely new to me. Standing on the barren mountaintop, without a tree in sight, the northern winds were fierce. Zhong-yi pointed to a mountain peak in the distance that was a bit greener. It seemed as if mining stopped there 50 years ago yet there were still no trees. I felt discouraged, as if I were Su Wu tending to a flock of sheep in a harsh environment. How would we be able to plant trees on this big rock?"

During the past three years, we kept trying innovative new methods. In January of this year, we found that a mountain boar which likely weighed over 100 kg had destroyed a water pipe. Boars had also eaten plants and unearthed several trees. What started as one to two boars grew into a family of more than 5 members.

We are researching restoration plans that place animals first while still being environmental friendly.

Boars cause a lot of damage, but their presence shows the effectiveness of our mining restoration efforts. Today this ecosystem has a wide range of creatures, including insects, mammals, snakes and birds. Like some golf courses in the United Kingdom, we are conserving nature in a way that is even more impressive than many nature reserves."



Professor Huang Ji-wei, Department of Horticulture, National Ilan University, 2020.5.12

Hualien Hoping Mine: Eco-Forestry

“Eco-forestry is a forestation method that mimics natural succession.”



A TCC Hoping Plant engineer, Ling Yu-wu, looked at an alder tree growing from the mining area and happily said: “Once the alder trees mature, we won’t have to worry about them. Eco-forestry is the best method for restoring the environment and natural ecology.”

At the Hoping Mine, TCC uses a highly mature, highly advanced vertical shaft extracting method. This low-carbon mining technique has a relatively low environmental impact, is completely underground, and is both automatized and safe. It reduces surface damage by preventing surface scars and exposed areas. Since 1996, we have also carried out a plant restoration plan. Phase I prioritized pioneer species that typically grow on developed mountain slopes, such as Formosan alders, which have high adaptability and keep atmospheric nitrogen in their roots. We also improved the soil in landslide areas with trees that when fully grown will offer protection and shade while enhancing water conservation.

Phase II is underway with the growth of Griffith’s ash, ring-cupped oak, Chinese soap berries, and Taiwan zelkova, each of which plays a role in ecological succession. Green area coverage already reached



Kaohsiung Shoushan Mine – A Place Where Industry, Culture, Ecology, and Recreation Coexist

“The air is really clean here. Conditions are good again.”

After TCC’s mining rights in Shoushan expired in 1992, this mountainous area of Kaohsiung gradually filled with an abundance of wild animals, including snakes, wild boars, monkeys, and birds. The dense green forest zone also became a popular site for Kaohsiung residents to visit in afternoons and on weekends to stroll or hike. As part of our corporate social responsibility, TCC provided the Kaohsiung City Government with land to build detention basins and open canals at no charge. These facilities in turn created a basin park for locals to relax and to ease flooding in the Gushan area.

77%, showing the success of our mining restoration efforts. Ling Yu-wu says that blossoming indigenous *Bletilla formosana* in summer and *Hydrangea longifolia* in winter demonstrate Hoping Mine’s abundant plant resources. In the future, even more seasonal flowers and plants will be visible.

A deputy director at Kaohsiung Cement Product Plant, and an employee of TCC for more than 40 years, LIN,WEN-FU was overwhelmed to see the old factory got transformed into an ecological park. To restore the Shoushan area to its original ecology, since 2014 the management center of Shoushan Park has worked with TCC to plant common Orange jessamine and other indigenous plants. Results are excellent. Besides conservation of the local ecology, this is a historic site that is recognized as the birthplace of Taiwan’s cement industry. The Kaohsiung City Government already designated a 100-year-old lime kiln and brick building that were built during the Japanese colonial period as historic sites. TCC is also contributing funds towards restoration. In the future, the Company’s goal is to turn this into a site for industrial history, culture, and ecological tourism

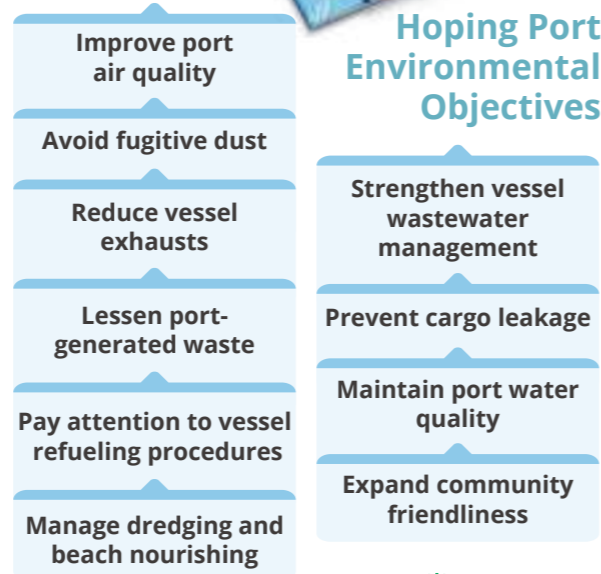


Cement lime kiln, a Kaohsiung historical building



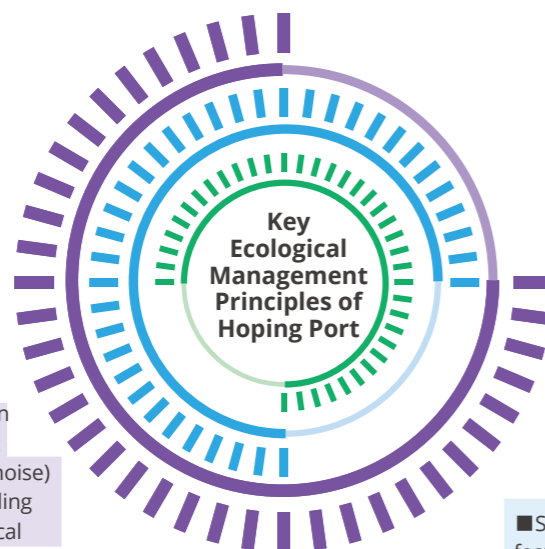
5.2 Building an International Eco-Port

To launch the eco-port project, TCC consulted the Taiwan green ports promotion plan. With a focus on four key port aspects: passenger transport, cargo transport, port environment, and development of cities and communities, we plan to turn Hoping Port into a green port that improves the local environment, develops passenger transport, and enhances the living quality of surrounding areas. The green port initiative will also raise operational efficiency, lower pollution, and improve the port image, fulfilling our circular economy vision. In 2019, the Hoping Port achieved Eco-Ports certification from the ECO Sustainable Logistics Chain. This will support sharing of ecological balance and other environmental information with major international ports (such as the Port of Amsterdam, the Port of London, the Port of Stockholm, and the Port of Oslo), turning Hoping Port into a major port with strong environmental awareness.



Carbon and pollution management

- Reduce environmental pollution caused by sea and land transport (carbon emissions, air pollution, noise)
- Replace old loading and unloading equipment and convert to electrical equipment



Ecological development

- Develop recreational facilities at ports that connect cities to water
- Support local government development, promote port-related businesses, and seek support for port infrastructure projects

Environmental monitoring

- Optimize port environmental quality (air, water, green spaces)
- Support sustainable operations by fostering a green corporate image

Expanded Environmental Monitoring to Promote Ecological Development of Port Areas

TCC is a longstanding supporter of environmental protection. In order to better understand the environment surrounding the Hoping Port, we voluntarily commissioned National Taiwan Ocean University to implement the Hoping Industrial Zone Integrated Environmental Survey Project. Outcomes will serve as a reference point for long-term research and monitoring of the nearby ecology by industry, the government, and academia. In 2019, air quality tests showed no irregularities and SO₂, NO₂, and CO levels were far below legal standards, demonstrating the effectiveness of our environmental management.

Strengthen Port Environmental Management and Greening Measures

The primary pollution sources at the Hoping Port are the emissions from ships and automobiles, dust from shoreline protection areas, and dust from riverbeds. Improvements focus on two key air quality improvement measures: avoiding fugitive dust emissions and reducing pollution from automobiles. Additional environmental monitoring systems and daily patrols enable better understanding and tracking of pollution sources.

Strategies to reduce automobile pollution include replacement of combustion engine automobiles. We added five electric scooters, which will save approximately 618 liters of gasoline a year and reduce our GHG emissions by the equivalent of 1,418 kg of CO₂. On the southern end of Hoping Port we added a 7.9-hectare green belt with iron wood trees to block wind and within the port we have 8.8 ha of green area, for a total green area of 16.7 ha, or 10.52% of the port's total area. This vegetation reduces annual GHG emissions by the equivalent of 317,172 kg of CO₂.

Installing an AMP System to Save Energy and Reduce GHG Emissions

To reduce fuel use and GHG emissions during the loading and unloading of ships, TCC plans to invest NT\$162 million in an alternate maritime power (AMP) system. The installment will take place in two phases. The first phase, to be completed before the end of June 2020, involves renovating and adding new equipment to the Dayanglun ship as well as the Hoping and Taichung ports.

The second phase, to be completed before the end of December 2021, involves renovating and adding new equipment to the Dafeilun ship and Kaohsiung Port. These improvements support our sustainability vision of saving energy and reducing GHG emissions.

Anticipated Environmental Benefits

Benefits	Generators	AMP	Results
Save Energy and Reduce GHG Emissions	Based on annual loading and unloading volumes at the Hoping, Taichung, and Kaohsiung ports, 3,894 tonnes of fuel is needed each year, which produces 13,104 tonnes of CO _{2e}	AMP does not require any fuel and would produce 8,257.6 tonnes of CO _{2e}	Reduce fuel use by 3,894 tonnes and cut CO _{2e} emissions by 4,846.4 tonnes each year
Availability Rate	Each generator requires major maintenance every three years or 16,000 hours of use and annual maintenance and repair costs average NT\$707,000	Each AMP station requires major maintenance every 5.6 years or 16,000 hours of use and annual maintenance and repair costs average NT\$378,600	Based on a 22-year lifespan; the lifespan can be increased by 10.4 years with regular maintenance. Annual cost savings of NT\$13,661,440
Lower Air Pollution	Annual emissions of 14.88 tonnes of PM ₁₀ , 219.15 tonnes of NO _x and 183.3 tonnes of SO ₂	Annual emissions of 0.313 tonnes of PM ₁₀ , 4.33 tonnes of NO _x and 4.03 tonnes of SO ₂	Reduces emissions of sulfur and nitrogen-containing chemical compounds and minute smoke and dust particles by 93% or more

Marine Ecology

The Hoping Port undergoes regular environmental quality monitoring. We primarily test pH, biochemical oxygen demand (BOD), and dissolved oxygen content, and all results exceed national standards. In the clear waters off the port various fish and corals can be observed, including gar fish, *Diodon holocanthus*, *Acropora muricate*, and tree soft coral. The Environmental Protection Administration designated Hoping Port as having a first rate maritime environment. This is the same rating achieved by Penghu, demonstrating the rich biodiversity of the area.

Phytoplankton: Collected samples of as many as 33 taxa of algae

Zooplankton: Collected samples of as many as 29 taxa of zooplankton

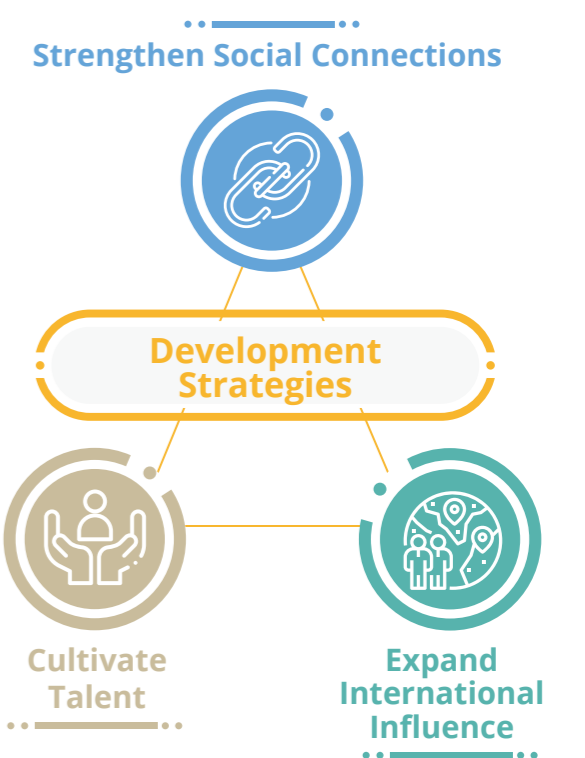
Benthos: Collected samples of as many as 16 taxa of benthos

Fish: Collected samples of as many as 12 taxa of gobiidae, exocoetus, *Thryssa chefuensis*, and *scorpaenidae*



5.3 Putting Species Protection Into Practice

The Dr. Cecilia Koo Botanic Conservation Center (KBCC) was founded in 2007 with the support of Mr. Leslie Koo of the TCC Group and Cecilia Koo. Its mission is to conserve tropical and sub-tropical plants and maintain rich biodiversity on Earth. For the past 13 years, TCC has contributed both funding and manpower to KBCC so that it can focus on research. Through international academic exchanges and participation in global tropical and sub-tropical plant conservation plans, KBCC has become a world-class base for plant preservation. In 2019, KBCC received Level 1 accreditation from ArbNet. Initially, KBCC preserved orchidaceae, bromeliaceae, musaceae, palmae, theaceae, zingiberaceae, araceae, heliconia, maranthaceae, asclepiadaceae, gesneriaceae and fern specimens. Later it expanded to include rutaceae, begoniaceae, bambusoideae, aquatic plants, carnivorous plants, succulent plants, and bryophyte. The conservation center has already collected a world-leading 33,653 taxa of live specimens (through April 1, 2020), and by 2027 it expects to have live specimens from 40,000 taxa.



Tree soft coral



Acropora muricate

Diodon holocanthus



Strengthen Social Connections

In 2019, KBCC expanded communication with stakeholders and shared abundant research findings with society. Besides gathering and preserving living plant specimens, it cooperated with government agencies, research institutions, and domestic medical centers to offer educational and research resources. KBCC provides opportunities for nature to preserve life and nurture the Earth, thus protecting the world's ecology and improving people's quality of life.



First Local Library for Plant Medicinal Products Enhances R&D Capabilities

Many key ingredients in the development of medicine come from plants. KBCC cooperated with the Kaohsiung Medical University Graduate Institute of Natural Products to build a high throughput screening platform and a natural extract medicinal library, providing unique resources for local R&D teams. In 2019, the Ministry of Science and Technology supported the establishment of core facilities that enable further sharing of these resources among local researchers.

During the past few years, KBCC and the university expanded the library to over 2,500 extracts, screened for many projects, and found that nepenthaceae and musaceae are able to suppress biological activity of breast cancer, liver cancer, and oral cancer as well as the pathogens that cause hepatitis B and influenza. Related research is being prepared for publication in international journals. In the future, this platform will accelerate interdisciplinary cooperation and enhance domestic medicinal product R&D capabilities.

Liquid Nitrogen Storage of Plant DNA as Part of an Industrial-Academic Sharing Platform

In 2019, KBCC cooperated with National Tsing Hua University and the National Museum of Natural Science to develop comprehensive sample collection techniques, including liquid nitrogen freezing, wax leaf, liquid preservation, and original color methods. A supplementary online database of plant specimens provides comprehensive living collection and sample support for academic and industrial organizations.

Several agencies in Taiwan carry out liquid nitrogen genomic DNA preservation. The Academia Sinica Institute of Biomedical Sciences cooperates with the Koo Foundation Cancer Center to preserve human pathologic tissues. The Food Industry Research and Development Institute and the National Museum of Natural Science both have ultra-low storage for fungal culture samples. The Academia Sinica Biodiversity Research Center operates a cryobank for wildlife genetic material and the Barcode of Life Database, which contain more than 10,000 samples, including more than 3,000 different frozen genome samples from Taiwan wildlife.

From 2016 to 2019, TCC implemented the Global Tropical Plant Genome and Transcriptome Ultra-Low Temperature Preservation Plan, in cooperation with the National Museum of Natural Science and with the support of the Ministry of Science and Technology. Current facilities include 40 large liquid nitrogen storage tanks that can store 6,000 specimens each, for a total storage capacity of 30,000 taxa and 240,000 specimens. Currently, KBCC stores 4,492 taxa and 24,952 specimens in liquid nitrogen, demonstrating the center's influence in plant preservation.



For more information



Liquid Nitrogen Storage



Red aechmeas



Tillandsia usneoides

Cooperation with Taipei Zoo to Reproduce the Amazon Rainforest Ecology

With more than 60% of the world's plants concentrated in tropical rainforests, remote conservation bases are needed to ensure that these resources are preserved. KBCC and the Taipei Zoo therefore cooperated to build the all-new Tropical Rainforest House – Pangolin Dome. The facility, themed on the Amazon River environment, offers a taste of the biodiversity found in tropical rainforests.

KBCC devoted manpower and resources to provide 2,871 specimens of 298 different taxa of plants. These included several members of the 100 Species for Conservation Action plan, such as *Pitcairnia wendlandii*, *Pitcairnia scepstrigera*, and *Begonia zhuoyunii*, as well as *Aechmea serrata* (extinct in the wild), *Pinguicula gigantea* (a midge-eating carnivore), *Vriesea imperialis* (the second largest bromeliad in the world), and *Tillandsia usneoides* (the world's smallest tillandsia). Giant Victoria water lilies floating on the water can support up to 80 kg. The brilliant red leaves of aechmeas stand out, and an endangered type of buttonbush, which in the Taiwan wild is limited to Yilan, blends into the rainforest environment. The rich biodiversity makes the facility an important educational resource.

Vriesea imperialis grows on the wall



For more information



A Conservation Plan Centered on Four Lanyu Orchids, Including Taiwan's Only Vanda Orchid

According to The Red List of Vascular Plants of Taiwan, 2017, of the 65 types of orchids produced on Lanyu, 34 (52%) are at risk of extinction. In May 2018, KBCC and the Taiwan Power Corporation's Nuclear Backend Management Department agreed to a plan that prioritized the restoration of four types of orchids: 1. *Bletilla formosana*, an endangered local orchid that is used as a Chinese medicine to stop bleeding and reduce inflammation, 2. *Dendrobium goldschmidtianum*, a popular ornamental plant, 3. *Tuberolabium kotoense*, which has a strong almond scent, and 4. *Vanda lamellata*, Taiwan's only vanda orchid. Phenological studies showed how to introduce new plant varieties, collect seeds, and build sterile seed germination and mericlone systems that support ex situ conservation. These techniques will be used in future conservation efforts. The plan concluded at the end of 2019.



Dendrobium goldschmidtianum



Tuberolabium kotoense



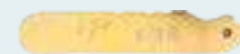
Vanda lamellata



Bletilla formosana



the plant specimen



the plant specimen numbering tag



the conservation center numbering tag

The ex situ conservation of a *Tuberolabium kotoense*

When plants or animals are endangered and their original environment is damaged or threatened, ex situ conservation may be required. Humans intervene to move the organisms to a safer location, whether in captivity or the wild, then provide the necessary conservation and protection. In the initial stage, it is important to ensure that the organisms can live and reproduce. Once a suitable habitat is found, they should be moved at the appropriate time. Besides preventing extinction, it is important to uphold the diversity of future generations.



Expand International Influence

KBCC is the world's largest conservation center for tropical and sub-tropical plants. It gathers people who are highly passionate about botany. Of all the world's botanic research institutions, it has the most diverse collection of tropical plants. The center attracts visits by domestic and international scholars and international plant organization members. Through a wide range of cooperative mechanisms, KBCC spreads TCC's philosophy of using indigenous plant restoration to restore a city's natural roots. At the same time, it lets the world know of Taiwan's passionate, competent preservation of indigenous plant life.

Major International Cooperation Plans in 2019

KBCC and the Singapore Botanic Gardens signed a memorandum of cooperation to jointly carry out biodiversity conservation plans



International Visits and Exchanges in 2019

Visits by the Longwood Gardens, the Singapore Botanic Gardens, the Taiwan International Cooperation and Development Fund, the Taiwan Bryophytes Association, and the science and technology minister



Cultivate Talent to Produce a Sustainable Generation

KBCC recognizes the importance of cultivating good researchers. Members therefore regularly attend and support plant research and study activities to prepare for future research. In June 2019, the Taiwan-Vietnam Plant Conservation International Research Center held an instructional workshop on ginger order plants at KBCC. Trainees from Taiwan and six Southeast Asian nations attended and got to see two prominent researchers making their first joint appearance in Taiwan: Jana Skornickova, a ginger order expert with the Singapore Botanic Gardens, and Tran Huu Dang, a researcher in the Vietnam Academy of Science and Technology's Southern Institute of Ecology. Over the course of four days, participants discussed ginger order plant identification, field observation, greenhouse care, molecular experimentation, and other topics. KBCC and the Singapore Botanic Gardens also used the opportunity to sign a cooperative agreement that will usher in a new era of international cooperation.



Summer, Winter Vacation Internships

In 2019, KBCC accepted 596 students carrying out field studies or internships from 10 universities and colleges in Taiwan and overseas. The students stayed for periods ranging from two weeks to five months. Coming from a variety of backgrounds and a diverse range of disciplines, their presence built a good sense of camaraderie among people from many different places.



2019 Work Items

Work Item	Key Points
Strategy Strengthen Social Connections	
Plant Specimen Shared Platform	Cooperated with National Tsing Hua University and the National Museum of Natural Science to expand the quantity of collected taxa, research plant specimen techniques, and build online databases to support related research activities.
Kaohsiung Medical University Plant Medicinal Library	Cooperated with Kaohsiung Medical University and the Ministry of Science and Technology to build a natural extract medicinal library that currently holds over 2,500 extracts.
TCC DAKA Pineapple Park	Taiwan's first outdoor pineapple display area, which features approximately 1,200 pineapple plants from 147 different taxa.
Subalpine Conservation Plan	Reached an agreement with the NTU Experimental Forest Xitou Management Station to build a plant nursery at Xitou. The nursery contained 1,362 taxa of plants suited to a subalpine climate.
Species Ark Plan	Signed a conservation letter of intent with Taipei Zoo and National Tsing Hua University. The plan, which is centered on plant and wildlife conservation as well as environmental education, included establishment of a tropical rainforest plant exhibition area that had 2,871 specimens from 298 different taxa.
Lanyu Plan	Cooperated with Taiwan Power Corporation on a plan that prioritized restoration of four types of orchids: <i>Bletilla formosana</i> , <i>Dendrobium goldschmidtianum</i> , <i>Tuberolabium kotoense</i> , and <i>Vanda lamellata</i> .
Protecting Endangered Plants	Signed a letter of intent with the Pingtung County government to implement an action plan to preserve rare species in the county that were facing extinction. These included wuwei camellia, which already had more than 3,000 specimens restored. Also selected three taxa with high ornamental horticulture value to plant on green areas surrounding the city government: <i>Bulbophyllum pingtungensis</i> , <i>Bulbophyllum taiwanense</i> , and <i>Kalanchoe garambiensis</i> .
Formosan Tanoak Restoration Plan	The Formosan tanoak is a distinct species that faces a serious extinction threat. KBCC therefore cooperated with Botanical Gardens Conservation International and National Chiayi University to use explanting, mericlone, and other propagation methods to increase the population.
National Taiwan Science Education Center Exhibition	Since 2020, KBCC cooperated with the National Taiwan Science Education Center on a joint exhibition, with plans to display approximately 100 taxa of plants for a period of five years.

Strategy | Expand International Influence

International Cooperation	<ul style="list-style-type: none"> •KBCC and the Singapore Botanic Gardens signed a memorandum of cooperation to jointly carry out biodiversity conservation plans. •Will implement the 2020 Luzon Island Conservation Plan, which involves carrying out plant cultivation and seed preservation together with Northwestern University (Philippines) Botanic Gardens. The purpose is to help the Philippines preserve species found on the island. •Building new bridges by continuing to expand research partnerships through the New Southbound Policy plan. In 2020, KBCC visited the Nong Nooch Tropical Botanical Garden to engage in short-term field work and participated in a sago palm research course, which takes place once every three years.
International Visits and Exchanges	Visits by the Longwood Gardens, the Singapore Botanic Gardens, the Taiwan International Cooperation and Development Fund, the Taiwan Bryophytes Association, and the science and technology minister.

Strategy | Cultivate Talent

Plant Research and Study	Held an international instructional workshop on ginger order plants that was attended by trainees from Taiwan and six Southeast Asian nations.
Summer, Winter Vacation Internships	Accepted 596 students carrying out field studies or internships from 10 universities and colleges in Taiwan and overseas.

The Company's Natural Functions and Responsibilities

We have finally stabilized the confusion caused by the virus,
 Have slowly found a new order and secured time.
 Testing technologies, vaccines, and therapeutic medications research and development
 From the basis of scientific and technological civilization are
 Facing the pandemic, which is a state common to the entire society, and
 No one can escape.

In such difficult times,
 There are many professions that work wholeheartedly and diligently to constantly
 Support and complement each other,
 Maintaining the normal operations of the entire society
 Under the onslaught of the pandemic.
 Mankind is fighting for time together,
 Harboring the best of hopes,
 Exerting the greatest efforts with visionary plans.
 Looking at our common future, seeking a possibility by targeting
 The day that the pandemic leaves.

In extraordinary times, we need extraordinary professionals;
 Every corporate body is a highly professional organization.
 At this crucial moment, it is precisely the time when professionalism
 Should be highlighted;
 It is also the moment when society most needs professionalism.

In the operation of an enterprise, isn't it always doing what is its strong suit, and
 Doing the things that win people's trust?
 This is precisely the professionalism of all businesses and all trades, and it is also
 Precisely the enterprise's natural functions and responsibilities.



Employee Benefits

06 CHAPTER

- Management of Sustainability Topics
- Governance and Risk
- Society Empowerment
- Environment and a Low Carbon Supply Chain
- Biodiversity and Regeneration
- Employee Benefits
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 - 6.3 Promoting Diversity and Harmony 132
- Appendix

Ulmus parvifolia

Native Taiwanese species, light-loving, drought-tolerant, delicate branches and leaves, strong germination, suitable for growing in mines, smooth elm wood, like soaked in chicken butter, light brown or yellow sapwood, heartwood gray brown, yellow brown or reddish brown, nickname "Red Chicken Butter"

Material Topics

GRI 401 Employment
GRI 412 Human Rights Assessment

GRI 403
Occupational Health and Safety

Management Policies

- Formulate human rights policies that adhere to conventions enacted by the United Nations and international labor organizations

- Implement ISO 45001 and CNS 15506 management to ensure system effectiveness

- Carry out hazard identification and risk analysis to eliminate potential hazards

Assessment Mechanisms

- Regularly conduct Human Rights Due Diligence and reduce potential risks

- Make the General Administration Division responsible for overseeing the occupational safety management results of each of the Company's plants, and link the results to operational performance evaluations

- Train all employees engaged in operational activities related to human rights policies or procedures

- Regularly convene Occupational Safety and Health Committee meetings to investigate incidents and follow up on improvements

- In 2019, we convened 102 explanatory meetings and conducted a total of 1,095.5 education and training hours related to human rights topics

- In 2019, TCC did not have any occupational disease incidents

Objectives

- Continue to ensure that TCC does not violate human rights

- Create a friendly and safe workplace with zero workplace injuries for the full year



6.1 Cultivating a Sustainable Workforce

Excellent human resources are the bedrock of sustainable corporate development. In order to improve the competency and quality of our employees, and thus maintain an important long-term competitive advantage, since 2019 TCC has carried out plans to enhance the international outlook and innovative capabilities of staff. The plans focus on four main areas: international vista expansion, foreign language improvement, smart technology application, and professional capabilities enhancement.

Besides business administration and plant administration, the plans support business unit expansion by offering technical training. In 2019, TCC raised training and education expenditures to nearly NT\$28 million and provided 118,639.6 hours of training. To be prepared for any challenges from global trends and corporate sustainability developments, we adopt numerous projects and solutions to enhance recruitment and retention of employees while building an employee-friendly working environment.

6.1.1 Youth Cultivation

TCC conducts recruitment on school campuses to find new generations of leaders who have a global outlook that can lead our future development. As the Company becomes more international, we hope to cultivate more youths with an international vista. We monitor students' progress to the degree of viewing their development as part of our corporate responsibility. At the same time, we incorporate our corporate spirit of international development and the circular economy into internship programs, training

courses, and industrial competitions held in conjunction with universities and colleges. We then encourage participating students to "show their resumes to the world." In 2019, TCC's recruitment drives focused on students from MBA programs (international trade, business administration, financial management) as well as graduates of foreign language academies, electrical and computer engineering programs, and science and engineering (such as information engineering, machinery, materials, and chemical engineering).

Join TCC



① Development of a digital resume system that increased the number of resumes received from campus recruitment by 27.4%.

② Significantly raised TCC's visibility by using digital technology such as Facebook, Line, and Instagram to share recruitment information.

③ Produced three Management Assistant Program (MAP) videos and used other methods to interact with youths.

④ Strengthened relationships with schools and promote more industrial-academia cooperative programs, such as the Seed Talent Program (STP) with National Taiwan University, internships with National Chung Hsing University, and school fairs/explanatory meetings. We held a total of 21 such events across Taiwan.

Use Digital Technology to Enhance Recruitment Results

⑤ In 2020, the COVID-19 pandemic severely disrupted the job market. TCC went counter to this trend by holding 17 online interview sessions. Job seekers chose a date, then were guaranteed to receive an interview. Recognizing the popularity of live broadcasts, the Company launched "TCC-Online," in which the chairman, President, and other high-level executives discussed the circular economy, smart factories, big data, and other topics with students. Speakers encouraged students to apply their enthusiasm and expertise to helping the earth together.

4/10 (Sat) TCC Online Talk
13:30-14:30

School Internships and Cultivation Plans to Enhance Youth Influence

In 2019, TCC offered internships to students from 12 schools, arranging for them to work in cement plants, RMC plants, and various departments at the headquarters, including human resources, finance, general administration, and public relations.

Also, for the first time, we cooperated with Chung Hsing University on a program that enrolled 35 students in a TCC-designed course that included a two-day visit to TCC, special lectures, and student reports. Company executives participated to further enhance the sharing of ideas between academia and industry.



1st TCC Circular Economy Camp – 2019 Camp Gathering

TCC and the Chemical Engineering Department of National Taiwan University held a joint competition with five categories, each focused on a core area of development: carbon cycle and the green economy, co-processing of household waste and solid/hazardous waste by cement kilns, renewable energy, the battery age, and intelligent industry. A gold medal project used a novel, efficient technique to reduce the high energy and cost of carbon capture by using a simulated movable bed design to simplify transport. A silver medal proposal based on the "The Last Mile on the Road to Carbon Reduction – NiCoin" theme used innovative methods to connect TCC, related companies, distributors, consumers, and members of society in meaningful ways. A bronze medal proposal used "circular economy, green energy villages" to publicize green energy production and use. A lithium battery regeneration project that presented a unique, highly feasible battery recycling process won an outstanding potential award. The special jury prize went to the "Best Long-Term Care Provider for the Elderly," which captured the trend of the market and stood out among many proposals.



TCC X STP Seed Talent Program



Since 2013, the Taiwan Institute of Directors has combined academic and industrial resources to provide training and practical experiences. TCC joined the initiative in its 13th session as an advising enterprise. Our president serves as a corporate advisor while the President's Office and human resources supervisors participate in STP activities and interact with students. Each session includes close to a hundred students from various schools and disciplines, including business administration, finance, and machinery. Besides supporting student participation in designated competitions, TCC provides internships. The students join corporate brand activities, website management, and CSR report compilation, so that they can better understand the Company as well as the internal organization and operations. After completing their internships, many students still support TCC and join the Company's activities, demonstrating their satisfaction with the program.

TCC's Management Assistant Program (MAP), which was launched in 2007, aims to train management professionals with a wide range of skills in order to meet the staffing needs of our diversified business operations. In 2019, as MAP entered its 13th year, we established "Global Vision, Building Dreams – Boldly Show Your Resume to The World" as a core development theme. As TCC grows globally, we will cultivate more youths with a global vista.

MAP is a comprehensive staff cultivation plan. Participants study at multiple plants, engage in projects, and undergo assessments in order to enhance their professional skills and management capabilities. To meet the diverse needs of our organization, we invite trainees with a wide range of skills to engage in cross-departmental and in-depth learning. At cement plants in Taiwan and Mainland China, they study various aspects of the cement industry, from production to sales and marketing. The General Administration Division plans training courses that cover corporate decision-making and risk control strategies. Structured teaching is used for situational lessons, departmental drills, foreign language courses, book clubs, language study, on-site technical training, and advisor support. Besides strengthening students' professional capabilities, we enrich their international vista and raise their CSR awareness. During the training period, students visit the conservation center to learn about the importance of ecological conservation. Management assistants who passed evaluations for program completion now work at TCC plants in Taiwan and Mainland China as well as the General Administration Division and laboratories. They are continuing to learn how to become outstanding managers.

Knowledge Sharing and Transfer

Management assistants benefit from not only the professional managers who give lessons during the course of the program but also past participants who offer valuable feedback. The program ends with a promotion ceremony. Joining the event are family members, company managers, and past graduates of the program, who add to the symbolism of knowledge transfer from one generation to the next. By 2019, a total of 389 management assistants participated in the program were recruited, with a retention rate of 54%.

The Six Stages of MAP

1 Cross-Plant Study

The program includes practical study at numerous cement plants in Taiwan and Mainland China. Cooperating with staff from across the Taiwan Strait enables management assistants to gain a well-rounded understanding of business and cultural differences. By applying this knowledge, they can quickly adapt to new work situations.

2 Management Practice

Diverse management courses incorporate practical work. Comprehensive instructional materials and case studies provide management assistants with the knowledge and skills they need to become competent managers.

3 Course Assessments

A monthly evaluation meeting assesses training effectiveness based on participants' professional skills, thinking, and adaptability to new management models and work environments.

4 Diverse Communication Channels

Course content is not limited to professional skills specific to management assistants' main areas of work. Participants must understand operations at the departments they will communicate regularly with as well as upstream and downstream affiliated divisions. They build channels that promote cooperation and support, thus facilitating division of labor and coordination.

5 Corporate View

TCC updates management assistants on operational planning and system designs in order to provide insight into how corporate leadership thinks. The management assistants learn how to plan and carry out strategies.

6 Future Development

After completing the program, participants are promoted to assistant managers. Following a promotion ceremony, graduates officially become part of the TCC leadership team. Opportunities become available for these new assistant managers to join TCC's subsidiary companies and partners to advance their careers.

MAP Success Stories

MAP Impressions: TCC is a "green environmental engineering company." From carbon capture technology R&D to the co-processing of waste by cement kilns, TCC continues to use technology and creative thinking to protect the environment.

Cross-departmental lessons and guidance from different managers enabled me to advance from a complete lack of knowledge of cement and concrete to having the ability to fluently engage clients in related discussions. The most fascinating part of being a MAP candidate was making new breakthroughs throughout the course of the program. I took great pride in this growth.



MAP candidate, 10th session: **Chen Wei-zun**
Currently an assistant manager at TCC's Taipei Plant

6.1.2 Talent Development

TCC values training and development for employees at each stage of their career. Based on surveys of our corporate blueprint, expansion plans, global development, and training needs, we build training plans centered on having "an international perspective and professional adaptability." The plans meet the professional training needs of employees at all levels by improving their management abilities, technical skills, and international competitiveness, so that we can achieve our goals of sustainable operations and talent cultivation.

In 2019, TCC launched a training plan that promotes greater internationalism and innovation. The plan was made to support the design of diverse, refined courses featuring lectures, small classes, dynamic lessons, field trips, interactive teaching, reading clubs, and other presentation methods. In 2019, we added 481.7 hours of courses for mid-level managers and 9,712.6 hours of courses for professionals. These lessons provide the professional training and management skills employees need to develop, so that employees and the Company can strive for excellence together.

TCC continues to systematically build a talent pool by closely connecting talent development channels with organizational needs. Besides lowering external recruitment costs as well as potential disruptions to our organizational culture, these steps provide the professional skills and management capabilities that are needed to build a more international organization.



Establishment of a high-capacity team



English



TCC's New Silk Road, getting to know Turkey

Expand International Perspectives

The Company chairman regularly holds town hall meeting to discuss the history, ethnicities, and religions of new markets TCC will expand to in Turkey, Europe, Africa, and other places. The objective is for employees to gain a deeper, more expansive understanding of cross-cultural cooperation and communication.

Better Foreign Language Capabilities

Hold beginner and advanced all-English conversational courses, as well as custom courses for high-level managers and special courses for plant CEOs. Each course lasts at least four months in order to make real progress in improving employees' foreign language capabilities.

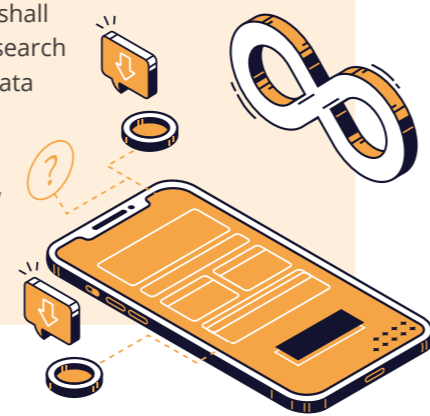
Four Main Themes of TCC's Education and Training

Advanced Professional Capabilities

Encourage employees to participate in training courses held by external organizations or the government, such as explosives training, GRMC, AI, and big data applications. The Company also holds a diverse range of management training courses for managers of all levels, including systematic problem analysis and decision-making, mid-level management training, and operational management. The courses support organizational development needs by preparing a pool of managers with requisite skills.

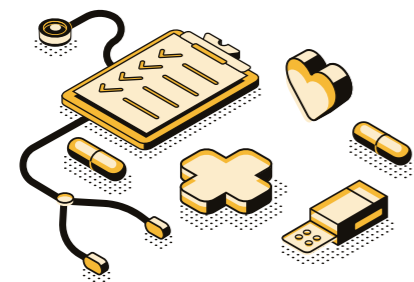
Smart Technology Applications

Continue to arrange for information technology team to undergo internal and external training while establishing specialized intelligence teams under the President. Each department shall select seeds to research data mining, big data analysis, machine learning, the Internet of Things, algorithms, and other related knowledge.



In 2019, TCC invested NT\$28 million in education and training to cover classroom expenses, paid hours for instructors and after-class appraisals by internal staff, and other fees. Total training hours were 118,639.6. Included are 1,123 employees of subsidiary companies and related enterprises, who had a total of 4,738.5 training hours.

Figure 1: TCC training session (and town hall meeting). Participants included employees of subsidiary companies and related enterprises.



Employee Category	Training Hours		Total Hours		Average Hours	
	Male	Female	Male	Female	Male	Female
High-Level Supervisors	46.8	203.9	250.7	15.7		
Mid-Level Supervisors	253.7	1,383	1,636.7	21.8		
Base-Level Supervisors	269.2	1,354	1,623.2	25.4		
Professionals	15,659.4	97,448.5	113,107.9	608.1		
Direct Labor	192.7	1,828.5	2,021.2	3		
Total Hours	16,421.7	102,217.9	118,639.6			
Average Hours	674.1	140.07				

Note 1: High-level supervisors are at the assistant vice president level or above. Mid-level supervisors are managers or deputy managers. Entry-level supervisors are junior managers or section managers. Professionals are engineers, project managers or management associates.
Note 2: Education and training hours include overseas regions.

6.2 Building a Happy Workplace

6.2.1 Workplace Safety

Work environment safety for employees has always been a primary concern of TCC. Our longstanding objective has been to achieve zero workplace injuries among employees and contractors. We also passed ISO 45001:2018 Occupational Health and Safety Management Systems certification to provide systematic tools for managing employee safety.⁸ Besides establishing the Occupational Safety and Health Management Office to take charge of OSH-related affairs, TCC holds regular OSH Committee meetings and follows up on task implementation and project progress. Each plant established a Quality Assurance (QA) Section to plan the management and implementation of plant ESH tasks. Headquarters oversees implementation.



Passed the CNS 15506: 2011 Taiwan Occupational Safety and Health Management System (TOSHMS) Certification



All plants regularly report the outcomes of OSH improvement plans, including the handling and prevention of accidents and safety management of contractors, to keep headquarters apprised of OSH status and support continued progress.

In 2019, to prevent workplace falls, entanglements, traffic accidents, and other hazards, the office proposed two objectives:

Eliminate 100% of hidden hazards in plant facilities and equipment
Less than one traffic accident in each factory

TCC also participated in the Taiwan Cement Manufacturers' Association and completed a safety partnership implementation plan with the Ministry of Labor's Occupational Safety and Health Administration. The plan calls for announcing OSH guidelines for the cement industry by 2020 in order to raise safety awareness among cement industry workers. TCC was also named as a model facility for occupational safety management in the year 2020.

Using our goal of zero workplace injuries or occupational accidents for the full year as a starting point, we share our management methods to lead the industry towards a safer future. In 2019, TCC did not have any occupational disease incidents.

⁸ The Suao Plant passed ISO 45001:2018 Occupational Health and Safety Management Systems and the Heping Plant plans to obtain certification in 2020

Health and Wellness Classes



The Hoping Plant held two health talks that focused on stretching, exercise, mental health, communicable diseases, and prevention of the "three-hypers": hypertension, hyperlipidemia, and hyperglycemia.



In order to build a harmonious work environment, care for our employees, improve economic growth of the society, TCC signs collective bargaining agreement with all the factories in Taiwan. 95.6% of TCC employees are members of the union.

Employee Participation Survey Offers Insight Into Employee Needs

In 2019, internal and external communication was an important part of our sustainability drive. Our goal was to strengthen employees' understanding of industrial sustainability, so that they gain better awareness of our sustainable development mission. Since 2019, the Human Resources Department has planned annual employee participation surveys. Using questionnaires and regular testing, the department designed 25 topics based on four primary themes: organizational recognition, work environment, work development, and work relations. Learning employees' work expectations and experiences provides a reference for making future improvements. In 2019, the coverage rate of the survey was 95.1% and the engagement rate was 93.1%. The HR department will discuss specific topics with supervisors and employees according to employee category, and report the results in meetings regularly. Improvement plans will be evaluated, and then implemented after obtaining approval.

6.2.3 Salary and Benefits

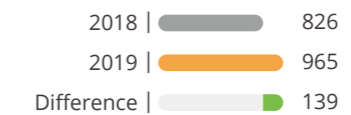
TCC offers competitive salaries and generous performance bonuses. In accordance with rules governing performance bonuses, we establish job objectives and behaviors, then combine overall performance of the Company with individual performance to reward outstanding employees. In 2019, the performance evaluation rate was 100%. In addition, we optimized the salary system by using industry standard salary reports to review salary and bonus mechanisms. These become a reference for salary adjustments and employee promotions. In 2019, we launched an employee stock option plan for full-time employees, with participation from 977 of 1,061 qualified employees, for a participation rate of 92.08% (includes employees on external assignments).

Another long-term incentive TCC launched was a treasury stock plan, which is open to employees with outstanding performance who meet years of service requirements. Performance assessment indicators are linked to the Company's short-term, mid-term, and long-term sustainability development goals, taking into account progress on initiatives such as our carbon capture, fixation by microalgae, and green energy generation programs.

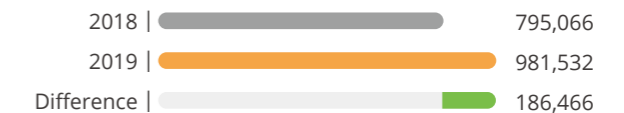
⁹The performance evaluation scope does not include new employees who did not complete their probationary period, employees with fixed-term contracts, and those participating in MAP.

Number of Full-Time, Non-Managerial Employees and Their Total Salary, Average Salary and Median Salary

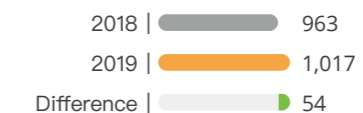
Total Number of Full-Time, Non-Managerial Employees (People)



Total Salary of Full-Time, Non-Managerial Employees (NT\$1,000)



Average Salary of Full-Time, Non-Managerial Employees (NT\$1,000)



Median Salary of Full-Time, Non-Managerial Employees (NT\$1,000)



Work-Related Injuries in 2019

		Occupational Accidents		Lost Days	Lost Day Rate (LDR)	Work-Related Injury Count	Injury Rate (IR)	Total Length of Absenteeism (Days)	Absenteeism Rate (AR)
		Work-Related Injuries	Work-Related Fatalities						
TCC	Female	0	0	0	0	0	0	82	0.48%
Headquarters	Male	0	0	0	0	0	0	75	0.33%
Plants	Female	0	0	0	0	0	0	130	0.48%
	Male	2	0	131	17.37	2	0.24	494	0.26%

Note 1: Work-related injuries are based on the monthly occupational accident reports submitted by each plant.

Note 2: Injury rate = (total number of injuries/actual number of hours worked) x 200,000. Refer to the "Regulations of the Examination of Injuries and Diseases Resulting from the Performance of Duties by the Insured Persons of the Labor Insurance Program" for injury determination criteria.

Note 3: Lost day rate = (number of lost days/number of available work hours) x 200,000

Note 4: AR = (total number of work days lost to absenteeism/total number of available work days) x 100. Absenteeism includes sick leave, menstrual leave, work-related injury leave, personal leave, and family care leave.

Note 5: In 2019, most work-related injuries were due to individual employees not following SOP or not wearing appropriate PPE. After an incident occurred, TCC sought to raise employees' self-awareness on safety through meetings, the bulletin board, education and training.

Contractors must abide by OSH related laws and regulations and the "Contractor OSH and Environmental Management Rules and Punishment Guidelines" established by the Company. Before entering a TCC plant, contractors are required to fill out the Workplace Environmental Hazards Notice and the Workplace Environmental Hazards Advice to ensure they understand the Company's environmental safety and health guidelines. Contractors also must sign the OSH Letter of Undertaking to pledge that their workers will abide by OSH rules when working at TCC plants. In 2019, no work-related injuries were reported by TCC contractors.

6.2.2 Labor-Management Relations

TCC values positive communication and mutual trust between employees and employers. We encourage both sides to interact and communicate regularly, honor and respect the rights of union members, maintain a healthy labor relation.

Through labor-management meetings and meetings regarding collective bargaining agreement, TCC ensures the HR policy is in compliance with legal requirements, and the work conditions and benefits are better than labor laws.

Comprehensive Welfare Benefits for Employees and Their Families

Since its establishment, TCC has spared no effort in building a warm, ideal work environment to take care of employees and their families. By planning and implementing a diverse set of benefits, including group insurance as well as scholarships and dormitories for employees' children, we are always ready to provide support. We also subsidize clinical care, hospitalization and other expenses for employees' families, so our staff can work with their minds at ease.

In addition, besides the traditional bonuses provided at the Lunar New Year, Dragon Boat Festival, Mid-Autumn Festival, and employee birthdays, TCC employees receive a NT\$3,500 bonus on Labor Day and an end-of-year bonus of around NT\$25,000 to NT\$40,000. Employees also receive medical care, travel, education, and advanced studies subsidies. On average, each employee receives NT\$50,000 to NT\$100,000 in annual bonuses and subsidies, and all full-time employees¹⁰ qualify for these benefits.

Number of Times Welfare Benefits Were Used

Medical Care Subsidies	2,044
Travel Subsidies	869
Scholarships for Employees' Children	572
Health Examination Subsidies	62
Birthday Gifts	26
Funeral Consolation Payments	24
Birthday Subsidies	20
Marriage Gifts	20
Retirement Benefits	13
Extended Education Subsidies	10

¹⁰A full-time employee is an employee who signed an open-ended contract

Office Renovations Provide a Happier Workplace Environment

TCC headquarters was fully renovated. We predominately used green building materials to provide a workplace environment that raises sustainability awareness.



Teamwork Exhibited at the Hualien Liyu Lake Dragon Boat Festival



Dragon boat racing is not only a part of the Dragon Boat Festival holiday but also a novel group activity. Spending time together on the same boat builds rapport. Every person has the same goal, and every person is vitally important. Cooperation and coordination are the keys to success. To prepare for the 2019 Hualien Liyu Lake Dragon Boat Festival, the TCC team practiced for four months. On the day of the competition, they were cheered on by a group of around 120 supporters, including colleagues, families, and fans. Besides generating team spirit and friendships, the race enriched company activities and provided employees with diverse weekend and holiday activity choices.

Protecting the Sea Begins with You and Me – Beach Cleanup Activity at the Suao Wuwei Harbor Waterbird Protected Zone



Beach cleanups aim not only to end the problem of trash on coastlines but also to initiate people's love of the sea. They are an excellent way of bringing people to coastal areas to pitch in and protect these important habitats. Wuwei Harbor in Suao is rich in aquatic wildlife and is located at an important stopping point for migratory birds. Many birds make it their home during the cooler months of October to February. Around 120 volunteers from TCC therefore decided to join a beach cleanup activity at the harbor, to jointly find harmony with nature as well as value in striking a balance between production and a sustainable ecology. The result was a clean harbor.



Love, Care, and the Value of Life – Kaohsiung Children Are Us Castle Volunteer Activity

"We like you" is a common phrase that expresses both the inspiration and hope of the Children Are Us Foundation. Founded in 1995 to provide lifelong care and learning to people with mental disabilities, each year the foundation provides regular support and services to close to 600 people, transforming their lives and the way that we value people with disabilities. The foundation also recognizes that as people with intellectual disabilities become older, their need for care and support grows even greater. 48 volunteers from TCC accompanied members from Children Are Us Foundation to participate in games and handicraft activities. The members showed the volunteers how to experience life and obtain happiness from simple things like games and crafts. It also provided the members an opportunity to learn new skills and be self-reliant. As the children's pure happiness showed the volunteers the value of the life, the volunteers helped the children to become more self-reliant.



Clean Race Crew

The 2019 Taroko Gorge Marathon was a success! A total of 111 TCC employees based in Taiwan and abroad gathered with members of LDC Hotels & Resorts to form a "clean race crew."

After completing their race, the crew returned to the first water station to clean up what is considered to be one of the most beautiful marathon courses in the world and a must-run race.

The runners demonstrated with their actions that we should take responsibility for the trash we created, and this concurred with TCC's commitment to protect the environment and ensure the sustainability of the Earth. Volunteers for the clean-up include employees



from TCC, LDC Hotels & Resorts and some of the runners. They picked up cups, food wrappers, and other trash, as well as alcohol bottles and other items that littered the streets even before the race. These actions demonstrated the importance of jointly caring for the earth's ecology in order to create a better, more sustainable future for all. The shared commitment shown by these runners represented both companies' belief in protecting our treasured Earth.

	2016		2017		2018		2019	
	Female	Male	Female	Male	Female	Male	Female	Male
Employees Qualified for Parental Leave Without Pay in the Year (A)	6	52	8	58	13	58	18	59
Number of Employees Applying for Parental Leave Without Pay (B)	1	0	1	3	4	0	1	0
Scheduled Number of Employees Resuming Work in the Year (C)	0	1	1	2	3	1	1	0
Actual Number of Employees Resuming Work (D)	0	1	0	2	3	1	1	0
Number of Employees Continuing Work at TCC After Resumption of Work for 12 Months (E)	1	0	0	1	0	2	3	1
Resumption Rate After Parental Leave Without Pay (D/C)	-	100%	-	100%	100%	100%	100%	0%
Retention Rate One Year After Resumption of Work (E/D in Previous Year)	100%	-	-	100%	0%	100%	100%	100%

Note: Only full-time employees who have been at the Company for at least six months qualify to take parental leave without pay.



Fitness Centers

More and more people are aware of the importance of hypertension prevention. TCC therefore installed automatic blood pressure monitors at the headquarters and all plants for employees to measure their blood pressure free of charge. To promote exercise, we added a fitness center and recreational facilities at the headquarters and all plants. Indoor equipment includes treadmills, stationary bikes, elliptical cross-trainers, table tennis, and pool tables. Outdoor basketball courts are also available, and we offer massage chairs for employees to release stress. With these extensive facilities, we hope employees remain physically strong and stay healthy at work and in everyday life.



Pension System

In accordance with the "Labor Standards Act" and the "Labor Pension Act," we appropriate labor pension reserve funds. We established the Labor Pension Fund Supervisory Committee to oversee pension rules. In accordance with regulations, each year we allocate pension reserve funds to a dedicated Bank of Taiwan account in order to guarantee employees' pension rights. The TCC Employee Welfare Committee also formulated a consolation compensation program, which supports employees who leave their job or retire.

Social Group Activities

TCC founded a basketball club that already has 18 members and meets every week to play. Besides providing a great opportunity to exercise, the friendly interaction helps participants to relax. In 2019, we added a badminton club that already has close to 15 members.

6.2.4 Human Rights Guarantees

In order to build a harmonious, friendly, and healthy workplace environment, TCC guarantees the rights of workers. We treat each employee with respect and establish human rights policies in accordance with the spirit and basic principles of international treaties, such as the United Nations Global Compact, the Universal Declaration of Human Rights, and the Declaration of Fundamental Principles and Rights at Work. We apply these principles to all employees, including those on fixed-term contracts and interns.

Our human rights policies are applied to the parent company, to all subsidiaries in Taiwan and overseas, to joint ventures, and to the other related enterprises and organizations that we have control over. After approval from the Company chairman, the policies are announced internally via regular town hall meeting, employee information platforms, email, and other methods. They are disclosed on our corporate website and in our corporate social responsibility report.

All new employees are informed of the policies in order to ensure that they understand implementation methods. In addition, TCC established supplier CSR standards so that suppliers also uphold human rights principles.

Employee Cafeteria

TCC uses reusable ceramic tableware in the employee cafeteria. Nutritious meals with one serving of meat, three vegetables, a soup, and a dessert meet the four basic principles of a balanced diet, food hygiene and safety, delicious taste, and fair price. Each plant provides educational health knowledge on notice boards and updates new health-related information to help employees learn about important topics, such as the prevention of chronic renal disease; the importance of checking for hypertension, hyperlipidemia, and hyperglycemia; and health promotion activities such as "Healthy Life Side by Side."

In 2019, we held 102 explanatory meetings and conducted 1,095.5 hours of human rights education and training. All employees engaged in operational activities related to human rights policies or procedures underwent training.

To maintain an equal and healthy work environment, ensure gender equality in employment, and respect personal dignity, we established the Special Regulations for Workplace Sexual Harassment Prevention and related grievance channels. Employees who are sexually harassed in the workplace may report to the head of the Human Resources Department via the grievance hotline or email for special staff to confidentially handle their grievances.

This protects the rights and interests of employees and maintains a healthy work environment. In addition, we arrange courses on sexual harassment prevention and grievance channels for newcomers during orientation training. In the future, we will continue to plan mechanisms for preventing human rights violations in order to better protect employees. In 2019, TCC had zero reported human rights violations.

To ensure that human rights policies are properly carried out, in 2019 TCC conducted human rights fulfillment assessments.

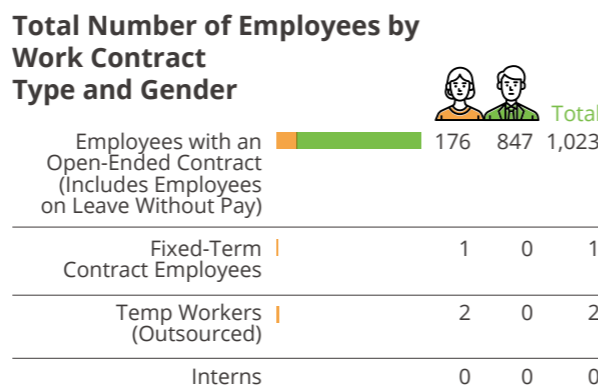
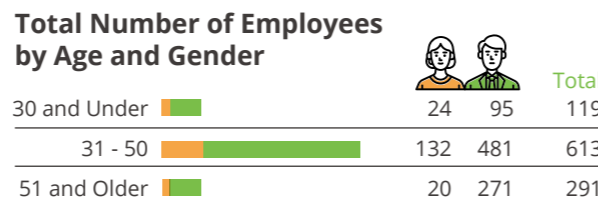
We distributed questionnaires to 15 of our locations, including related companies, then analyzed results. For items in which a large proportion of respondents answered “disagree” or “strongly disagree,” we drafted policy responses or improvement measures. Analysis showed three items that posed a relatively high risk: excessive work hours, the resting environment of working facilities, and internal communication mechanisms. We will therefore revise work-hour calculation, notification, and management. Adjustments to our spatial design planning will improve the facility environment. Communication will be enhanced via more effective responses. These measures will mitigate associated risks.



6.3 Promoting Diversity and Harmony

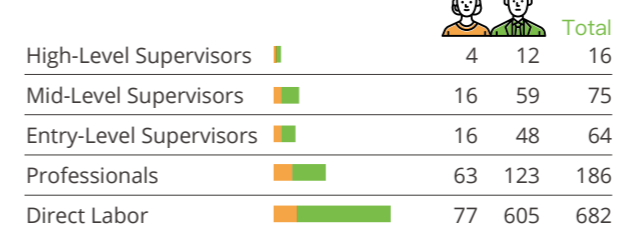
6.3.1 Workforce Composition

Our employees are the most important organizational asset and the source of TCC’s continuous growth. In response to new business developments and the expansion of some duties, by the end of 2019 we had increased our workforce to 1,023 people, an increase of 115 people compared to 2018. In terms of gender, we had 847 male employees and 176 females. The number of female employees increased by 28 compared to 2018, which demonstrates our ongoing efforts to achieve gender equality. In terms of age distribution, 119 employees were 30 or under, 613 employees were between 31 and 50, and 291 employees were 51 or older. In addition, in 2019 we hired 11 employees with disabilities.



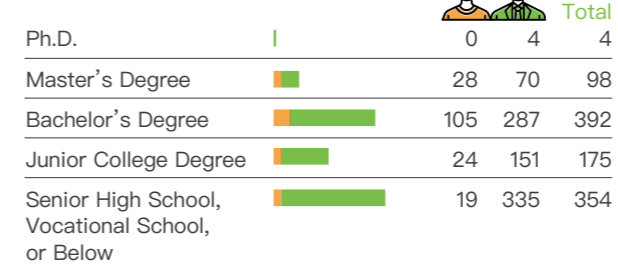
Note1: All TCC employees are full-time employees. The total number of employees disclosed does not include one employee on a fixed-term contract and two temp workers (outsourced).

Total Number of Employees by Position Level and Gender

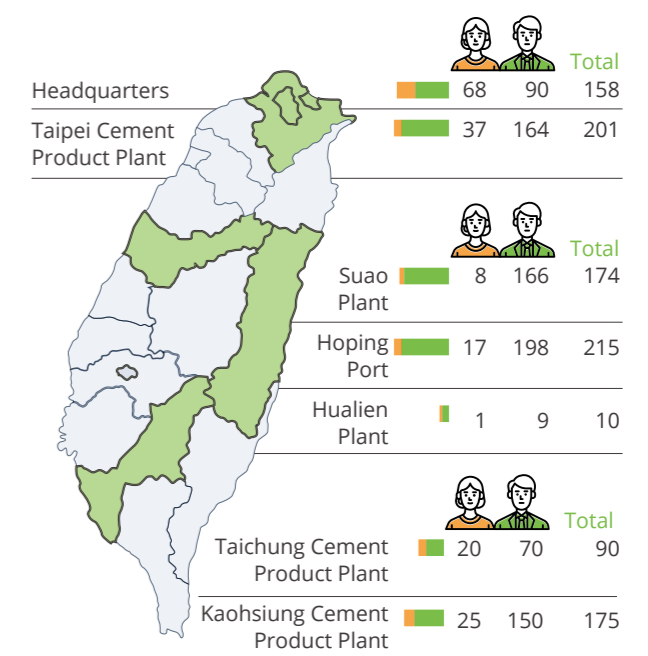


Note: High-level supervisors are at the assistant vice president level or above. Mid-level supervisors are managers or deputy managers. Entry-level supervisors are junior managers or section managers. Professionals are engineers, project managers or management associates.

Total Number of Employees by Education and Gender



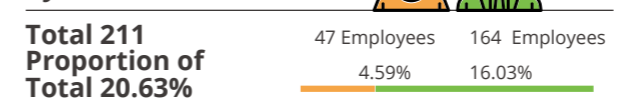
Total Number of Employees by Location and Gender



6.3.2 Turnover

In 2019, TCC added 211 new employees, accounting for 20.63% of the Company’s total workforce. Among the new employees were 47 women and 19 persons aged 51 or above. There were 95 employees who left the Company in 2019, accounting for 9.28% of the total workforce. The employee resignation rates between 2015 and 2019 are 24.86%, 25.96%, 16.87%, 11.03% and 9.28%, respectively. The rate has been decreasing over the years which indicates the effectiveness of our employee retention policies.

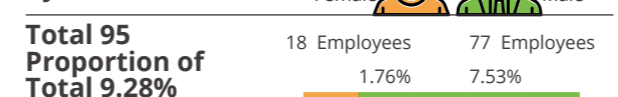
Number of New Employees by Gender



Number of New Employees by Age



Number of Termination of Employment by Gender



Number of Termination of Employment by Age



▲ The number of termination includes resignations during the probation period, retirement, voluntary and involuntary resignations

Resignations due to personal factors after probation period This type of employees leaving in 2019 accounts for 5.18% of all employees

Resignations during the probation period This type of employees leaving in 2019 accounts for 2.15% of all employees

Retirement This type of employees leaving in 2019 accounts for 0.98% of all employees

Core Values of TCC

The pandemic has changed the picture of the market,
But it is impossible to change the goals set by Taiwan Cement in the past few years.
The responsibility of Taiwan Cement is to constantly find various ways,
Sometimes circular, for human beings to interact with Nature.
Walking in front of the specifications, echoing the expectations of the society,
TCC seeks more beautiful possibilities.

Facing the burning pandemic, Taiwan Cement has been prepared in advance,
Stabilizing the company's financial foundation and putting
Every colleague's mind and body at ease.

Every day we still focus on our profession; in addition to
The improvement of emission reduction and carbon capture,
New possibilities are also emerging in the battery and green energy businesses.

The cement kilns in the Anshun Plant of Guizhou and the Guigang Plant of
Guangxi still use the hottest 1300-degree flames,
Cooperating in the disposal of the waste produced daily by the city,
In 2022, the Shaoguan Plant of Guangdong will also formally join the battle ranks for
Reducing city waste.

In the practice of the circular economy,
RDF — The technology that transforms waste into fuel through different processing
procedures is a crucial link.
Especially for RDF5, with even calorific value, easy to transport,
Convenient to store and not easy to decay,
We must push for it with an even more proactive attitude.

TCC is committed to SBT (Science Based Targets) and set a carbon reduction goal of
10.8% within five years.

At the same time, the carbon footprint inventory of cement and concrete will be
Initiated in order to establish Product Category Rules (PCR) for the cement industry
With the Environmental Protection Agency with
The goal of applying for the first carbon label for cement products in Taiwan.

In 2020, the Hoping DAKA Park of Taiwan Cement won the certification of the first
Sightseeing factory of the domestic heavy industry, engaging in expanding
Community innovative rebirth and donate the market income to the local remote rural
Primary school for its education fund.

We continue our production in Europe and Central Asia, and this year we will also
Enter Côte d'Ivoire in Africa to build an environment-friendly cement plant.

Even if the pandemic is severe,
I still believe that TCC has chosen the right path in recent years,
Allowing Taiwan to have an enterprise that has truly entered the world,
Collaborating with international talents, penetrating language barriers and
Sharing common values.

For decades, the core values of TCC have never changed.
The values of a people-oriented enterprise have made a team that is professional,
Enthusiastic, mutually dependent and mutually supportive,
Laying a solid foundation for this society and for the common future of mankind,
Doing what we should do.

In the course of human civilization, many things collapsed and disappeared;
Many things are also left. Those left behind,
Whether it's from one hundred years, five hundred years, one thousand years, or two
Thousand years ago, still nourish our souls even now.

Dawn always shines first on the enterprises that have been prepared.
What Taiwan Cement pursues and believes in concern the evolution of human
Civilization and the relationship between man and Nature.
TCC is a green environmental engineering company,
Finding a possibility for the future of humanity.

TCC employs the 1,300 degree purifier to learn from Nature the restoration capacity,
Restoring air, wind, water, and land to complete use in a clean manner and complete
Return to Nature in a likewise clean manner,
Allowing mankind to reposition their role in Nature,
Pursuing Eudaimonia--the ultimate beauty in everyone's heart.



Index

GRI Standards Index and Guidelines *Voluntary disclosure

GRI102 : General Disclosures 2016

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		6.3 Promoting Diversity and Harmony	132	
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102-9	Supply chain	2.4 Supply Chain Sustainability	66	
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		1.2 Identifying Sustainability Topics	41	
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102-48	Restatements of information	Report profile	14	Comment separately according to the content of each chapter
102-49	Changes in reporting			No major changes

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GRI102 : General Disclosures 2016

GRI201 : Economic Performance 2016

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Note: GRI 2016

Mining and Metals Sector Supplement				
Aspect	Indicator	Commentary	Corresponding Sections or Note (including omissions)	Page
Biodiverse	MM1	Amount of land (owned or leased, and managed for production activities or extractive use) disturbed or rehabilitated.	Biodiversity and Regeneration	102
Biodiverse	MM2	The number and percentage of total sites identified as requiring biodiversity management plans according to stated criteria, and the number (percentage) of those sites with plans in place.	Biodiversity and Regeneration	102
Effluents and Waste	MM3	Total amounts of overburden, rock, tailings, and sludges and their associated risks.	Biodiversity and Regeneration	102
Labor/ Management Relations	MM4	Number of strikes and lock-outs exceeding one week's duration, by country.	No related incident was reported in 2019	
Local Communities	MM6	Number and description of significant disputes relating to land use, customary rights of local communities and Indigenous Peoples.	No related incident was reported in 2019	
Artisanal and Small-scale Mining	MM8	Number (and percentage) of company operating sites where artisanal and small-scale mining (ASM) takes place on, or adjacent to, the site; the associated risks and the actions taken to manage and mitigate	No related incident was reported in 2019	

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Accountant's Independent Assurance Report

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INDEPENDENT AUDITORS' LIMITED ASSURANCE REPORT

The Board of Directors and Stockholders
Taiwan Cement Corp.

We have performed a limited assurance engagement on the selected subject matter information (see Appendix A) in the Corporate Sustainability Report ("the Report") of Taiwan Cement Corp. ("the Company") for the year ended December 31, 2019.

Responsibilities of Management for the Report

Management is responsible for the preparation of the Report in accordance with Taiwan Stock Exchange Corporation Rules Governing the Preparation and Filing of Corporate Social Responsibility Reports by TWSE Listed Companies and GRI Standards and Sector Guidance published by the Global Reporting Initiatives (GRI) and other applicable rules according to its sector features, and for such internal control as management determines is necessary to enable the preparation of the Report that are free from material misstatement.

Auditors' Responsibilities for the Limited Assurance Engagement Performed on the Report

We conducted our work on the selected subject matter information (see Appendix A) in the Report in accordance with the International Standard on Assurance Engagements 3000 (revised) (ISAE 3000 (revised)) to issue a limited assurance report on the preparation, in all material respects, of the Report. The nature, timing and extent of procedures performed in a limited assurance engagement are different from and more limited than a reasonable assurance engagement and, therefore, a lower assurance level is obtained than a reasonable assurance.

We applied professional judgment in the planning and conduct of our work to obtain evidence supporting the limited assurance. Because of the inherent limitations of any internal control, there is an unavoidable risk that even some material misstatements may remain undetected. The procedures we performed include, but not limited to:

- Obtaining and reading the Report.
- Inquiring management and personnel involved in the preparation of the Report to understand the policies and procedures for the preparation of the Report.
- Inquiring the personnel responsible for the preparation of the Report to understand the process, controls, and information systems in the preparation of the selected subject matter information.
- Analyzing and examining, on a test basis, the documents and records supporting the selected subject matter information.

Independence and Quality Controls

We have complied with the independence and other ethical requirements of the Norm of Professional Ethics for Certified Public Accountant in the Republic of China, which contains integrity, objectivity, professional competence and due care, confidentiality and professional behavior as the fundamental principles. In addition, the firm applies Statement of Auditing Standard No. 46 "Quality Control for Public Accounting Firms" issued by the Accounting Research and Development Foundation of the Republic of China and, accordingly, maintains a comprehensive system of quality controls, including documented policies and procedures regarding compliance with ethical requirements, professional standards, and applicable legal and regulatory requirements.

Conclusion

Based on the procedures performed and evidence obtained, nothing has come to our attention that causes us to believe that the selected subject matter information in the Report are, in all material respects, not prepared in accordance with the above mentioned reporting criteria.

Deloitte & Touche

Deloitte & Touche
Taipei, Taiwan
Republic of China

June 9, 2020

APPENDIX A

SUMMARY OF SELECTED SUBJECT MATTER INFORMATION

#	GRI Number	Descriptions of Indicators	Corresponding Section	Applicable Criteria
1.	GRI Standards 205-3: 2016	Confirmed incidents of corruption and actions taken	2.2.3 Integrity and Ethics	Total number of confirmed incidents of corruption about the organization, employee, and business partners in 2019.
2.	GRI Standards 302-1: 2016	Energy consumption within the organization	4.2.3 Energy Management	Total fuel consumption within the organization from purchase of electricity, gasoline, diesel and coal in 2019.
3.	GRI Standards 303-1: 2016	Water withdrawal by source	4.2.2 Management of Water Resources and the Water Cycle	Total volume of water withdrawn with a breakdown by the sources (Tap water, Groundwater, and Industrial use water) in 2019.
4.	GRI Standards 305-7: 2016	Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	4.2.1 Pollution Control and Management	The total emissions of nitrogen oxides (NOx), sulfur oxides (SOx), Particulate matter (PM), and Volatile organic compounds (VOC) in 2019.
5.	GRI Standards 306-2: 2016	Waste by type and disposal method	4.2.1 Pollution Control and Management	Total weight of non-hazardous waste in 2019.
6.	GRI Standards 403-2: 2016	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	6.2.1 Workplace Safety	Types of injury, injury rate (IR), occupational disease rate (ODR), lost day rate (LDR), absentee rate (AR), and work-related fatalities, categorized by region and gender.

Notice to Readers

For the convenience of readers, the independent auditors' limited assurance report and the accompanying summary of selected subject matter information have been translated into English from the original Chinese version prepared and used in the Republic of China. If there is any conflict between the English version and the original Chinese version or any difference in the interpretation of the two versions, the Chinese-language independent auditors' limited assurance report and summary of selected subject matter information shall prevail.

Independent Assurance Opinion Statement



ASSURANCE STATEMENT

SGS TAIWAN LTD.'S REPORT ON SUSTAINABILITY ACTIVITIES IN THE TAIWAN CEMENT CORPORATION'S CORPORATE SOCIAL RESPONSIBILITY REPORT FOR 2019
NATURE AND SCOPE OF THE ASSURANCE/VERIFICATION

SGS Taiwan Ltd. (hereinafter referred to as SGS) was commissioned by TAIWAN CEMENT CORPORATION (hereinafter referred to as TAIWAN CEMENT) to conduct an independent assurance of the Corporate Social Responsibility Report for 2019 (hereinafter referred to as CSR Report). The scope of the assurance, based on the SGS Sustainability Report Assurance methodology, included the sampled text, and data in accompanying tables, contained in the report presented during on-site verification (2020.03.25~2020.05.07). SGS reserves the right to update the assurance statement from time to time depending on the level of report content discrepancy of the published version from the agreed standards requirements

The information in the TAIWAN CEMENT's CSR Report of 2019 and its presentation are the responsibility of the management of TAIWAN CEMENT. SGS has not been involved in the preparation of any of the material included in TAIWAN CEMENT's CSR Report of 2019.

Our responsibility is to express an opinion on the report content within the scope of verification with the intention to inform all TAIWAN CEMENT's stakeholders.

The SGS protocols are based upon internationally recognized guidance, including the Principles contained within the Global Reporting Initiative Sustainability Reporting Standards (GRI Standards) 101: Foundation 2016 for accuracy and reliability and the guidance on levels of assurance contained within the AA1000 series of standards and guidance for Assurance Providers.

This report has been assured using our protocols for:

- AA1000 Assurance Standard (2008) Type 1 evaluation of the report content and supporting management systems against the AA1000 Accountability Principles (2008) at a moderate level of scrutiny; and
- evaluation of the report against the requirements of Global Reporting Initiative Sustainability Reporting Standards (100, 200, 300 and 400 series) claimed in the GRI content index as material and in accordance with.

The assurance comprised a combination of pre-assurance research, interviews with relevant employees, superintendents, CSR committee members and the senior management in Taiwan; documentation and record review and validation with external bodies and/or stakeholders where relevant.

Financial data drawn directly from independently audited financial accounts and Task Force on Climate-Related Financial Disclosures have not been checked back to source as part of this assurance process.

STATEMENT OF INDEPENDENCE AND COMPETENCE

The SGS Group of companies is the world leader in inspection, testing and verification, operating in more than 140 countries and providing services including management systems and service certification; quality, environmental, social and ethical auditing and training; environmental, social and sustainability report assurance. SGS affirm our independence from TAIWAN CEMENT, being free from bias and conflicts of interest with the organisation, its subsidiaries and stakeholders.

The assurance team was assembled based on their knowledge, experience and qualifications for this assignment, and comprised auditors registered with ISO 26000, ISO 20121, ISO 50001, SA8000, RBA, QMS, EMS, SMS, GPMS, CFP, WFP, GHG Verification and GHG Validation Lead Auditors and experience on the SRA Assurance service provisions.

VERIFICATION/ ASSURANCE OPINION

On the basis of the methodology described and the verification work performed, we are satisfied that the information and data contained within TAIWAN CEMENT's CSR Report of 2019 verified is accurate, reliable and provides a fair and balanced representation of TAIWAN CEMENT sustainability activities in 01/01/2019 to 12/31/2019.

The assurance team is of the opinion that the Report can be used by the Reporting Organisation's Stakeholders. We believe that the organisation has chosen an appropriate level of assurance for this stage in their reporting. In our opinion, the contents of the report meet the requirements of GRI Standards in accordance with Core Option and AA1000 Assurance Standard (2008) Type 1, Moderate level assurance.

AA1000 ACCOUNTABILITY PRINCIPLES (2008) CONCLUSIONS, FINDINGS AND RECOMMENDATIONS
Inclusivity

TAIWAN CEMENT has demonstrated a good commitment to stakeholder inclusivity and stakeholder engagement. A variety of engagement efforts such as survey and communication to employees, customers, investors, suppliers, CSR experts, and other stakeholders are implemented to underpin the organization's understanding of stakeholder concerns. For future reporting, TAIWAN CEMENT may proactively consider having more direct two-ways involvement of stakeholders during future engagement.

Materiality

TAIWAN CEMENT has established effective processes for determining issues that are material to the business. Formal review has identified stakeholders and those issues that are material to each group and the report addresses these at an appropriate level to reflect their importance and priority to these stakeholders.

Responsiveness

The report includes coverage given to stakeholder engagement and channels for stakeholder feedback.

GLOBAL REPORTING INITIATIVE REPORTING STANDARDS CONCLUSIONS, FINDINGS AND RECOMMENDATIONS

The report, TAIWAN CEMENT's CSR Report of 2019, is adequately in line with the GRI Standards in accordance with Core Option. The material topics and their boundaries within and outside of the organization are properly defined in accordance with GRI's Reporting Principles for Defining Report Content. Disclosures of identified material topics and boundaries, and stakeholder engagement, GRI 102-40 to GRI 102-47, are correctly located in content index and report. For future reporting, it is recommended to explain the mechanisms for evaluating the effectiveness of the management approach specifically (103-3). More descriptions about the results of the evaluation of the management approach and specific actions aimed at improving performance are also encouraged.

Signed:

For and on behalf of SGS Taiwan Ltd.

David Huang
Senior Director
Taipei, Taiwan
22 May, 2020
WWW.SGS.COM





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