



Crested Serpent Eagle
The Hoping Mine in Hualien



TCC Official Website



TCC ESG Section



TCC Facebook



Wechat Public Account



TCC Instagram

No.113, Sec.2, Zhongshan N. Rd., Zhongshan Dist., Taipei City 104-48 <http://www.taiwancement.com>

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2022 TCC NATURE & BIODIVERSITY REPORT

TASKFORCE ON NATURE-RELATED FINANCIAL DISCLOSURES

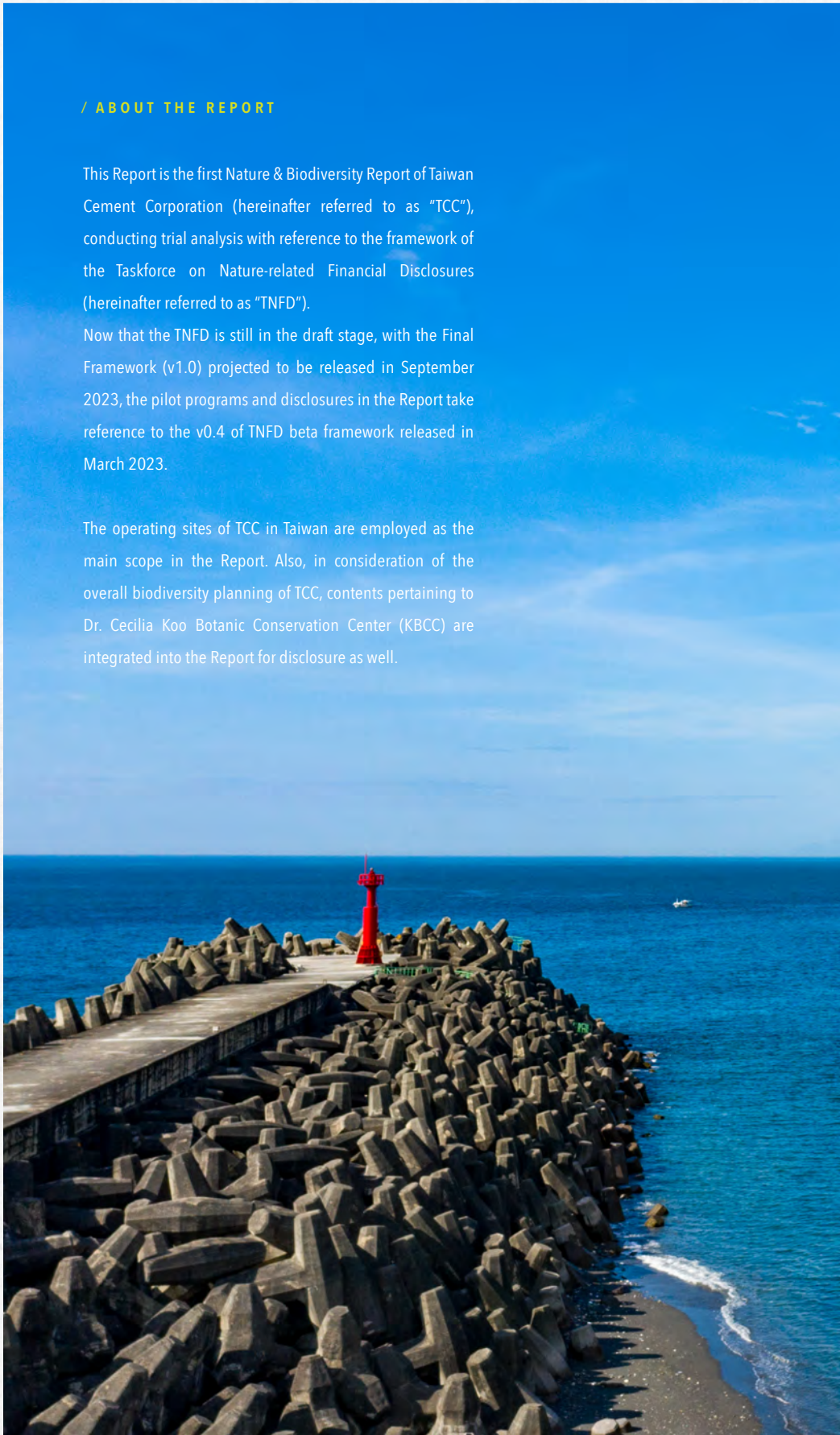
PILOT PROGRAM

/ ABOUT THE REPORT

This Report is the first Nature & Biodiversity Report of Taiwan Cement Corporation (hereinafter referred to as “TCC”), conducting trial analysis with reference to the framework of the Taskforce on Nature-related Financial Disclosures (hereinafter referred to as “TNFD”).

Now that the TNFD is still in the draft stage, with the Final Framework (v1.0) projected to be released in September 2023, the pilot programs and disclosures in the Report take reference to the v0.4 of TNFD beta framework released in March 2023.

The operating sites of TCC in Taiwan are employed as the main scope in the Report. Also, in consideration of the overall biodiversity planning of TCC, contents pertaining to Dr. Cecilia Koo Botanic Conservation Center (KBCC) are integrated into the Report for disclosure as well.



/ TABLE OF CONTENTS

| | |
|---|----|
| Chairman's Address | 04 |
| IN SERVICE FOR LIFE: Management Philosophy with Nature at the Core of TCC | 05 |
| TCC Nature Actions | 10 |
| Biodiversity Plans at TCC | 12 |
| Accumulated Achievements of TCC in Nature Conservation Projects | 12 |



| | |
|---|-----------|
| 1 Nature Topic Strategies | 13 |
| 1.1 Biodiversity Policy | 15 |
| 1.2 Nature Governance Framework and Targets | 15 |
| 1.3 Professional Partnerships and Initiatives | 16 |
| 2 TNFD Pilot Program | 17 |
| 2.1 Nature-related Risk and Opportunity Assessment Process | 18 |
| 2.2 Results of the Dependencies and Impacts on Nature Evaluation | 19 |
| 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies | 21 |
| 2.4 TNFD Pilot Process and Review | 25 |
| 3 TCC Natural Conservation Development | 27 |
| 3.1 Status and Planning for the Focused Business Areas of TCC | 29 |
| 3.2 Stakeholder Engagement on Topics of Nature | 39 |
| 3.3 Guardian of Life on Earth for Good – KBCC | 41 |
| 4 Future & Prospect | 45 |
| Appendix | 47 |



| | | | | | | | | | | |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

Life Diversity

Amidst the symphony of life diversity,
The majestic landscape of nature lays out a splendid embroidery.
Biodiversity is a treasure of profound significance,
Nurturing the earth and giving birth to each life's uniqueness.

On the earth, prides of lions run free,
With graceful leopards traversing betwixt the lush prairie.
The magnificently plump elephants are the faithful guardians of mother nature,
Marching in pride to embody the values of the wilderness onward.

Blue blips shine deep in the ocean,
Whales sing songs that tug at our heartstrings, resonating to the far side of the ocean.
Over the seabed full of colorful coral reefs,
Creatures in postures of variety dance gracefully to the oceanic symphony.

Among the canopy in emerald green, creatures dwell,
In the forest bit by bit mysteries unveil.
Monkeys leap, game, and play at liberty,
As birds spread their wings, soaring high in the heavenly melody.


Flowers release intoxicating fragrancy,
Painting the face of the earth splendidly.
Bees hum and caress petals with their wings,
Disseminating pollens and the future for fruits.

Amidst the perpetual cycle of life and the cuddle of great love of nature,
Each life is a masterpiece as much as an artwork.
With unlimited talents and diverse infinity,
It holds hope and the consciousness of greater self to pass on the world.

Protecting and respecting everything we cherish,
For we have the power to choose in our hands
To safeguard those we hold dear.

Let us create a future of praise and contemplation of nature,
A world that is greener, brighter, and without fear.

Zuo Ren
August 2023


Nelson An-ping Chang
Chairman
TCC



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|



MANAGEMENT PHILOSOPHY WITH NATURE

IN — SERVICE — FOR — LIFE

AT THE CORE OF TCC

For long, we humans have been enjoying the seemingly endless gift granted by nature selfishly, without realizing that the sources on Earth are limited and that we are on loan from the future environment. Needless to say, there are only a few that remember to thank all things in return as we should, in service for all lives.

We have to see that the ecosystem of Earth cannot support the development of human life if there are only humans and the flora and fauna tamed thereby remain on Earth.

~Nelson An-ping Chang, Chairman of TCC

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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

“Biodiversity loss” has been included by the World Economic Forum (WEF) for four consecutive years as the top five threats to be faced in the decade to come. According to the statistics, 50% of the world's total GDP derives from natural capital. Should we fail to mitigate and preserve natural capital actively, the economies worldwide will sustain a loss of over \$42 trillion, as the human race will face the survival crisis. As part of nature, TCC actively mitigates the impacts on the natural environment, takes the potential nature-related risks of the Company seriously, and treats them as critical topics at present.

Cement is Derived from Nature, Applied to the Society, and Accountable for the Earth’s Environment

Cement stemmed from the basic needs of humanity for security. With the raw material derived from the limestone in mines, it has been one of the industries that rely on natural resources. TCC, as the first cement company in Taiwan, has been dealt with issues of environmental protection since the 1990s. In compliance with the eastern shift industrial plan of the government, TCC constantly reflects on the relationship between the cement industry and nature. With “nature first” and “Benefit to Society”, TCC seeks the balance of human development and nature. Chairman Nelson An-ping Chang specifically incorporated “In Service for Life” into the basic thinking of the corporate operation. He is convinced that In Service for Life is not a strange topic, but a subject philosophers and scholars of humanities have been exploring for life over millennia. Nevertheless, this subject was never incorporated into the basic thinking of corporate operation. It seems to be confined onto the moral level, never been realized in the reality of human society. It is not morality or a slogan, nor does it an abstract notion, but a highly professionalism to be fused into the everyday work contents of an enterprise. TCC launched the plant conservation project in 2007. Dr. Cecilia Koo and Mr. Leslie Koo, the former Chairman of TCC, provided the private land of “Taihe Farm” located in Gaoshu Township in Pingtung to establish “Dr. Cecilia Koo Botanic Conservation Center” (KBCC). Tasked with the mission of conservation and research on the endangered and rare species in the tropical and subtropical climates, it preserves different parts of plants in

liquid nitrogen as well. At present, there are over 34,000 taxa of plant species conserved, with over 62,000 specimens frozen with liquid nitrogen, as the research materials for the generation scientists to come. Regarding the conservation efforts on land, TCC insists on that “During mine excavation, we must minimize the environmental impacts. After mining is completed, we must return the site to its natural state” The optimal restoration methods are adopted in line with the characteristics of the mines owned by TCC, aiming primarily to restore the local ecological environment. The indigenous plant propagation project was commenced for the mines in 2016. Also, TCC works with relevant departments in universities, and KBCC became the professional team for the mine restoration project as well. Soil is a habitat for the survival of countless live. It is also the largest carbon pool on land. However, humans have very limited knowledge about it. Therefore, TCC launched the “Ho-Ping Ark Ecological Program” in 2022, committed to the 10-year soil monitoring plan and a long-term support to the research progress. The first semi-closed ecosystem experimental base in the world was created in search of the solutions for the future Earth ecosystem. Regarding the marine conservation, upon discovery of corals at the Hoping Port over a decade ago, TCC engaged in various basic surveys and restoration efforts successively, preserving the port environment and marine ecology in an active manner. At present, over 280 corals have been restored to the Hoping Port, with up to 89% of restoration rate overall.

Participation in International Nature Initiatives and Efforts on the Basis of UN SDGs

The three UN Sustainable Development Goals (SDGs), i.e. Goal 13 Climate Action, Goal 15 Life on Land, and Goal 14 Life below Water, are employed as the strategies at TCC. Biodiversity survey, research, and conservation programs were launched for its plants, the forests and soil at the mines, and the ports. Meanwhile, echoing with nature-related topics and the current initiatives internationally, TCC proactively signed “Call to Action” and “Make It Mandatory” of Business for Nature and joined Taiwan Nature Positive Initiative (TNPI) of the Business Council for Sustainable Development of the Republic of China (BSCD-Taiwan) to voice out for the conservation of biodiversity hand in hand with corporate partners.



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

／ TCC NATURE ACTIONS ／



INTERNATIONAL TRENDS

1992

The Rio Conventions of the United Nations

United Nations Framework Convention on Climate Change (UNFCCC)
Convention on Biological Diversity (CBD)
United Nations Convention to Combat Desertification (UNCCD)

1994 CBD COP1

1995 UNFCCC COP1

1997 CBD COP3

Signing of Kyoto Protocol

2010 CBD COP10

20 Aichi Biodiversity Targets stipulated



Life in harmony, into the future
いのちの共生を、未来へ
COP 10 / MOP 5

2015



17 Sustainable Development Goals (SDGs) of the United Nations released
UNFCCC COP21 Paris Agreement: limiting the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C

2018

UN IPCC Special Report: Global Warming of 1.5°C



UNFCCC COP26

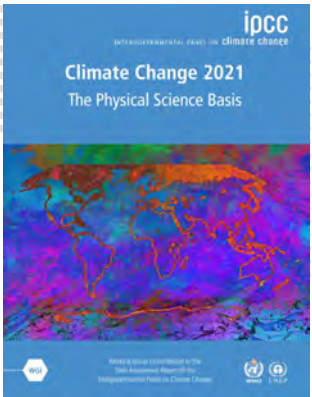
A strict compliance with the threshold value of 1.5°C of global warming, proposal of Net Zero target, phase-out of fossil fuels, Deforestation Pledge, committed to put an end to the issues of deforestation and land loss

CBD COP15

Taskforce on Nature-related Financial Disclosures (TNFD) launched jointly by the UN and G20

2021-2023

IPCC 6th Assessment Report, disclosing the fact that the global warming of 1.1°C reached and accounting the relationship between climate change with the changes of land, ocean, and the cryosphere



UNFCCC COP27

Protecting biodiversity is protecting the Paris Agreement, United Nations Environment Programme (UNEP) said

CBD COP15

Adoption of the Kunming-Montreal Global Biodiversity Framework (GBF), with the target "30 by 30" established, along with an enhanced promotion of Other effective area-based conservation measures (OECMs)



Taskforce on Nature-related Financial Disclosures

IN SEPTEMBER

The Final version (v1.0) of TNFD Framework to be released



COP28
UAE

1992-2000

2001-2020

2021

2022

2023

TCC ACTIONS



The Kaohsiung Shoushan Mine

1992

Mining rights terminated

1993

Restoration works initiated



LAND

SEA (HOPING PORT)

2019

The biodiversity policy of TCC stipulated



2007 Dr. Cecilia Koo Botanic Conservation Center established
The Suao Taibaishan Mine

2006

Quarterly environmental and ecological monitoring (long-term program)

2017

Ecosystem restoration program commenced, with the results tracked every half a year (long-term program)

The Hoping Mine

2006

Annual ecological survey long-term program

2016

Quarterly environmental monitoring and launch of the reforestation program (long-term program)

2020

First estimation of ecosystem service value and the survey on the plant restoration efforts



2015 Life below water survey launched

2019

Port Environmental Review System (PERS) certified

2020

Identification and distribution survey of the coral species and benthos in the port

Biodiversity Management Plan (BMP) executed

Membership of Business for Nature obtained



Survey of the Hoping Mine Ecosystem expanded to quarterly execution



Bio Cube Coral Creation Project commenced
The APSN Green Port Award System (GPAS) certified
The PERS certification renewed

The first manufacturer in Taiwan involved in the TNFD Pilot Program

Nature, CBD, and COP15, including Make It Mandatory and Call to Action, signed

Initiatives of Business for

Taiwan Nature Positive Initiative



"Ho-Ping Ark Ecological Program," the only one long-term on the sole soil species in the world commenced



Hoping Port certified Environmental Education Facility



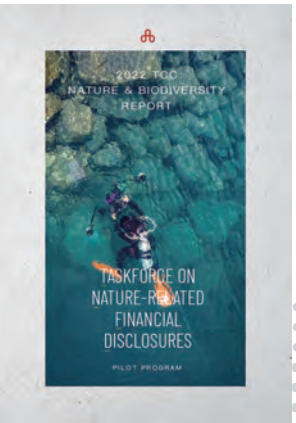
IN AUGUST



Nature & Biodiversity Report -

TNFD Pilot Program to be released

Planning to partake in the national OECM recognition
Introduction of the Final version (v1.0) of TNFD and the SBTN framework



BIODIVERSITY MANAGEMENT PLANS AT TCC



Established by TCC Group in 2007, KBCC is tasked with the mission to conserve the tropical and subtropical plants in the world, preserving biodiversity via ex-situ conservation. On the basis of academic research, it actively engages in international academic exchanges and tropical plant conservation projects as a world-class botanical conservation base.

Dr. Cecilia Koo Botanic Conservation Center

34,154 taxa of plants (endangered plants included) conserved cumulatively as of 31 March 2023

Over 6,200 plants in 60 taxa provided for academic & medicinal research_cumulatively from 2008 to March 2023

Over 2,500 extracts constructed at the Natural Product Libraries

10,000 seedlings restored in the Lanyu program

ArbNet Level 1 accredited

Asteroid No. 526460 named "Ceciliakooen"



The Hoping Mine in Hualien

The Hoping Mine in Hualien has been conducting the survey of the mine's land ecosystem to collect basic information since 2006. In 2016, TCC launched the long-term restoration project and established nurseries and hardiness facilities in the mountains for seedling growing works. Also, it works with Dahan Institute of Technology, National Hualien Agricultural Senior High School, and KBCC to propagate and conserve the indigenous species of the mine.

Suao Taibaishan Mine

The century-old mine—Suao Taibaishan Mine—presents harsh conditions for restoration thanks to its challenging climate and terrain since the Japanese ruled period. The environmental monitoring and the animal and plant ecological survey have been carried since 2006. In 2017, the "dedicated ecological restoration project" was launched in collaboration with the Sustainable Landscape Laboratory, National Ilan University, using the solar-powered microirrigation system, rainwater harvesting ponds, and windbreak nets to overcome the adversities for growing.

Ecological restoration projects for mines



100% Coverage of Biodiversity Management Plans (BMPs)

74% of area restored in Suao, and 89% in Hoping, in 2022

Indigenous plant species accounted for 90% in Suao, and 89% in Hoping, in 2022

First Prize of Environmental Friendly Project, the 18th CSR and ESG Awards of Global View Monthly in 2022 for "Homecoming for the Indigenous Residents in Taibai Mountains-TCC Ecosystem Restoration Program in Suao"

Top 10 Sustainable Micro-Movie, the 6th Taipei Golden Eagle Micro-Movie Festival in 2022 for "Indigenous Residents in Taibai Mountains"

ACCUMULATED ACHIEVEMENTS OF TCC IN NATURE CONSERVATION PROJECTS



Upon the discovery of coral colonies at the Hoping Port, TCC engaged in the life below water survey in collaboration with the team of National Taiwan Ocean University in 2015 and surveyed the species of corals and benthos together with Taipei University of Marine Technology in 2020, in which the broken branches from indigenous corals were found. Hence, TCC worked with Eco-Angel Environment Conservation Association to launch the Bio Cube Coral Creation Project to foster a richer habitat environment.

Hoping Port Ecological Restoration

Hoping Port certified to PERS in 2019 & 2021 consecutively

APSN Green Port Award System (GPAS) certified for the first time in 2021

284 corals restored with a 100% coral larvae survival rate and the area restored nearly tripled as of February 2023

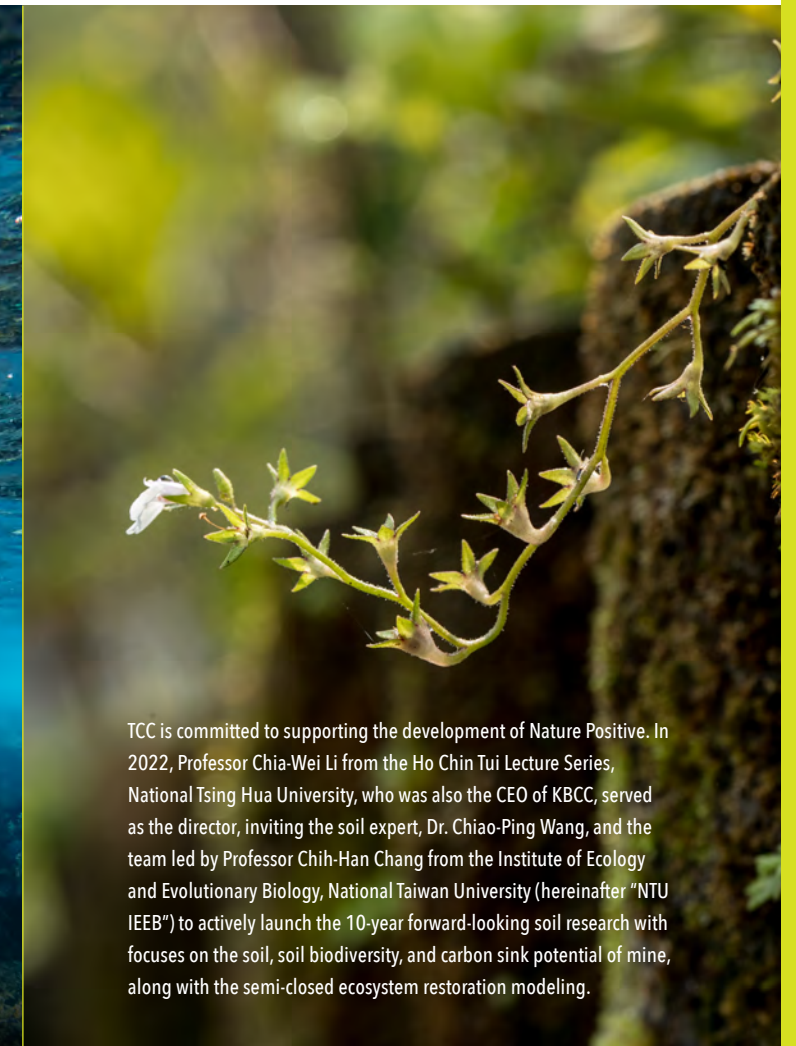
Shortlist of Environmental Friendly Project, the 19th CSR and ESG Awards of Global View Monthly in 2023 for "The Great Barrier Reef of Hoping-TCC Bio Cube Coral Creation Project"

Silver Award of Sustainable Micro-Movie, the 7th Taipei Golden Eagle Micro-Movie Festival in 2023 for "Build A Home for Corals"

5,276 visitors benefited cumulatively

382 participants in the environmental education courses with satisfaction up to 90%

Environmental Education Facility certified



TCC is committed to supporting the development of Nature Positive. In 2022, Professor Chia-Wei Li from the Ho Chin Tui Lecture Series, National Tsing Hua University, who was also the CEO of KBCC, served as the director, inviting the soil expert, Dr. Chiao-Ping Wang, and the team led by Professor Chih-Han Chang from the Institute of Ecology and Evolutionary Biology, National Taiwan University (hereinafter "NTU IEEB") to actively launch the 10-year forward-looking soil research with focuses on the soil, soil biodiversity, and carbon sink potential of mine, along with the semi-closed ecosystem restoration modeling.

Ho-Ping Ark Ecological Program

1167 plants of 173 taxa transplanted

Irrigation of the plants in the Ark Program using the reclaimed water from shaft tunnels, with 74 metric tons reclaimed in total as of March 2023

Gold Award of Corporations
the 1st Taiwan Biodiversity Awards in 2023



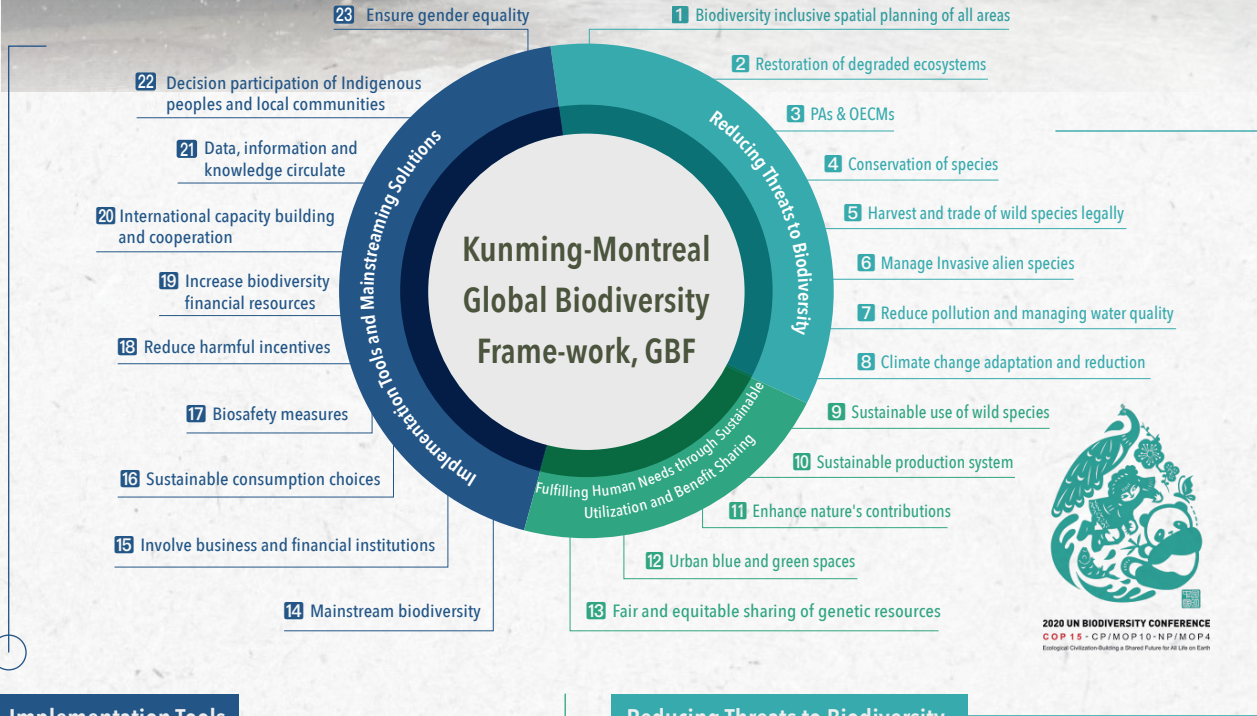
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|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|

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NATURE TOPIC STRATEGIES

Living Planet Report 2022 found that the wildlife populations on the planet have plunged by nearly 70% in just under 50 years since 1970. The Kunming-Montreal Global Biodiversity Framework (GBF) was adopted by the UN Biodiversity Conference (COP15) in 2022. Bearing a significance the same as the Paris Agreement on climate issues, the GBF clearly defines its target: turn the tide of biodiversity loss by 2030, encouraging businesses to regularly monitor and disclose their dependencies and impacts on nature.

Chairman An-ping Chang is convinced that “the human activities on Earth have led to drastic changes in the environment, resulting in destruction of habitats and extinction of species. Only through mutual consideration, symbiosis, and altruism with nature can we find the best way to a true survival and development.” In line with the three dimensions of the GBF, TCC examined the core businesses and the nature-related policies and actions of the enterprise with 23 action targets. Meanwhile, aiming primarily for Biodiversity No Net Loss, TCC advances toward the vision of Nature Positive to coexist with nature in harmony.



Implementation Tools and Mainstreaming Solutions

- 14 Addition of the biodiversity functional group to the sustainability management framework
- 15 Regular monitoring of operating sites and release of Nature & Biodiversity Report – TNFD Pilot Program
- 16 Promotion of TCC's EARTH HELPER initiative, the carbon reduction sustainability action initiative
- 19 Establishment of the Water Environment Watch at the Hopping Port to recruit from the local community to jointly safeguard the marine environment
- 21 Annual Sustainability Report, Eco-tour, and Environmental Education Courses
- 22 Tribal consultation for mines and establishment of TCC DAKA Eco-Factory
- 23 Females included in the teams of BMPs for the life on land and below water

Reducing Threats to Biodiversity

- 3 Assessment of the availability of OECM accreditation for the Hopping Port and Ho-Ping Ark Ecological Program Base
- 4 Support to the establishment of Dr. Cecilia Koo Botanic Conservation Center in 2007 to conserve the provenance and genes of tropical and subtropical plant species
- 6 Removal of the alien species White Popinac at the Shoushan Mine in Kaohsiung; assistance of the Hopping Plant to Hualien County Government to recycle the alien species White Popinac as bioenergy
- 7 Introduction of ISO 14001 and ISO 46001 to 100% exercise all-round environmental management
- 8 The Kaohsiung Plant provided to the city government for the construction of detention basin, free of charge, to mitigate and adapt the impact of flood

Fulfilling Human Needs through Sustainable Utilization and Benefit Sharing

- 11 BMPs for the life on land and below water
- 13 Donation of plants by KBCC for academic and medicinal research

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|--------------------|--|--------------------|---------------------------|---|
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|--------------------|--|--------------------|---------------------------|---|

1.1 | Biodiversity Policy

TCC is committed to not exploring or exploiting World Heritage Sites or IUCN Protected Areas I-IV, averting and minimizing the impacts on nature from development following the principle of avoidance, reduction, mitigation, compensation. For any development in the high biodiversity importance areas of global or national out of business needs, Biodiversity Management Plans (BMPs) shall be conducted in line with the local laws and regulations and GCCA Sustainability Guidelines for Quarry Rehabilitation and Biodiversity Management.

No Deforestation Commitment

In line with the zero-deforestation spirit of the COP26 resolution under the United Nations Framework Convention on Climate Change (UNFCCC) and in response to the SDG 13: Climate Action and SDG 15: Life on Land, TCC has made its No Deforestation Commitment, implementing management approaches for forest areas within mines as follows:

SCOPE | TCC Mines

- 100% mining sites not in the nationally protected areas
- 100% zero deforestation beyond the mining areas and commitment to the recovery and restoration in mining areas

Nature-based Solution (NbS)

The International Union for Conservation of Nature (IUCN) has defined a nature-based solution (NbS) as “actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.” With NbS at the core, TCC effectively manages the environmental impacts of operating sites, restores local ecosystems, and protects unique and endangered species in order to mitigate climate change and create Nature Positive impacts.

Promotion of Supply Chain's Response on Biodiversity

TCC extends to partners on the value chain, emphasizes the environmental impact management of suppliers on biodiversity, discusses and shares biodiversity-related information with its partners. Also, with reference to the United Nations Global Compact (UNGC), TCC strengthens its influence on suppliers via six steps, including target setting and risk and impact assessments. Moreover, TCC added topics of biodiversity in the 2022 Supplier Sustainability Evaluation Forms as well to collectively protect the biodiversity on the value chain.

1.2 | Nature Governance Framework and Targets

| | |
|---|---|
| Board of Directors | Guides and supervises the management performance of TCC on issues related to nature and biodiversity risks. |
| Corporate Sustainable Development Committee | Responsible for the approval and supervision over works related to the development of nature and biodiversity. |
| Office of Responsibility and Sustainability | Responsible for integration of group resources and promotion research on nature and biodiversity issues as well as identification of the risks, impacts, and related opportunities of TCC on nature and biodiversity. |
| Biodiversity Group | <div>▲ Responsible for the TNFD and SBTN research, along with ongoing assessment of the responses for biodiversity and natural hazard mitigation.</div> <div>▲ Executes works biodiversity projects.</div> |

Short-, Medium-, and Long-term Targets for Nature Conservation

TCC sees environmental conservation and ecosystem restoration as the vital obligation and commitment of the enterprise. Through communication, integration, and strategy planning, TCC formulated specific conservation targets for plant provenance conservation and protection of indigenous species at mines.

TCC specifically set its biodiversity targets for 2025, 2030, and 2050. Actions and works are implemented via the Biodiversity Group and tracked regularly by the Office of Responsibility and Sustainability, which are reported to the Corporate Sustainable Development Committee and Board of Directors by the Chief Sustainability Officer on a regular basis, so as to ensure an effective implementation of the targets.

More detailed biodiversity metrics and targets shall be formulated in alignment with international frameworks like TNFD and SBTN.

| Performance in 2022 | Target by 2025 | Target by 2030 | Target by 2050 |
|---|----------------|----------------|----------------|
| Plants conservation endangered species included Unit taxa | | | |
| 34,154 | ≥35,000 | ≥40,000 | ≥45,000 |
| Ratio of indigenous plants species at mines Unit % | | | |
| 88.88% | None | 90% | 95% |

1.3 | Professional Partnerships and Initiatives



Professor from the Ho Chin Tui Lecture Series, National Tsing Hua University and CEO of KBCC.
Professor Chia-Wei Li
TOPICS FOR PARTNERSHIP
Ho-Ping Ark Ecological Program
COMMUNICATION FREQUENCY
Quarterly



Professor Chyi-Rong Chiou, the Director of NTU Biodiversity Research Center
TOPICS FOR PARTNERSHIP
TNFD Pilot Program consultation
TNFD industrial-academic collaboration
project with graduates
COMMUNICATION FREQUENCY
Timely



Soil expert, Dr. Chiao-Ping Wang and the NTU IEEB team led by Professor Chih-Han Chang
TOPICS FOR PARTNERSHIP
Innovative ecosystem modeling, mine sites soil and reforestation projects, soil research expert grants
COMMUNICATION FREQUENCY
Quarterly



Professor Ji-Wei Huang, Sustainable Landscape Laboratory, National Ilan University
TOPICS FOR PARTNERSHIP
Taibaishan Mine Ecosystem Restoration Program
COMMUNICATION FREQUENCY
Weekly



Eco-Angel Environment Conservation Association Secretary-General Chen Ying-ling
TOPICS FOR PARTNERSHIP
Bio Cube Coral Creation Project
COMMUNICATION FREQUENCY
Quarterly

| PROFESSIONAL PARTNERSHIP | TOPICS FOR PARTNERSHIP | COMMUNICATION FREQUENCY |
|---|--|-------------------------|
| Shoushan National Nature Park Administration | <div>▲ Restoration of the indigenous plants at the mine of Kaohsiung Plant</div> <div>▲ Reconstruction of the Kaohsiung Plant into a tourist attraction rich in history, culture, and eco-tour and organization of guided-tour activities</div> | Yearly |
| Hoping Village Office, Chairs of Gukut and Knlibu Tribes, and Tribal Mothers' Classroom | Consultation on the ecological conditions in the traditional areas | Every half a year |
| Taipei University of Marine Technology | <div>▲ Identification and distribution survey of coral species in the port</div> <div>▲ Illustrated Book of the Dominant Coral Species in the Port</div> <div>▲ Survey before and after the operation below water for the bio cube demonstration site</div> <div>▲ Ecological survey of fish and shellfish</div> | Quarterly |
| National Taiwan Ocean University | <div>▲ Survey on the status of offshore seabed ecological habitats and changes in the area</div> <div>▲ Research on the ecological impact of bio cube placement</div> | Quarterly |
| National Dong Hwa University | <div>▲ Participation in the island-wide 2022 Science Train Program</div> <div>▲ Conclusion of the service-learning agreement to jointly cultivate talents in environmental education</div> | Every half a year |

| INITIATIVE PARTNER | COMMUNICATION FREQUENCY |
|--|-------------------------|
| <div>BUSINESS FOR NATURE</div> <div>TCC Involvement in the COP15 business statement as the platform member</div> <div>Sign-up for Make It Mandatory and Call to Action</div> | Yearly |
| <div>wbcscd</div> <div>WBCSD & Taiwan Nature Positive Initiative</div> <div>Promotion of nature topic governance with businesses by TCC as the founding member</div> <div>Systematic examination of the current status and development opportunities of TCC via six dimensions with reference to WBCSD Nature Readiness Assessment</div> | Monthly |
| <div>gccca</div> <div>GCCA</div> <div>Introduction of GCCA Sustainability Guidelines for Quarry Rehabilitation and Biodiversity Management to examine the development on biodiversity and nature topics</div> | Yearly |

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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

TNFD PILOT PROGRAM

TCC started the trial of the TNFD framework in 2022. Also, it joined the TNFD Forum and the Pilot Program to offer feedbacks on the trial. In the meantime, TCC assessed the impacts of its business activities on biodiversity, identified and disclosed nature-related risks and opportunities, and adopted corresponding protection and restoration measures.

2.1 | Nature-related Risk and Opportunity Assessment Process

The pilot method for the analysis of nature-related risks and opportunities took reference with the LEAP approach recommended in the TNFD v0.4. We located the nature-related scope in the business activities of TCC, assessed and evaluated the dependencies and impacts on natural resources from our business activities, contemplated and deliberated over the existing strategies and future development directions, and disclosed the pilot results. Two biodiversity seminars and internal questionnaire survey were organized in the duration. Experts and scholars were consulted multiple times as well. With its operating sites in Taiwan as the priority pilot scope, TCC followed the recommended approach of Locate in LEAP, setting the Hoping Mine in Hualien, 3-in-1 Park of Port, Power, Cement Plant, Suao Taibaishan Mine, and Suao Plant as the locations for assessment.

The LEAP Approach in the TNFD Pilot Program of TCC

LOCATE

Identify priority locations of business activities

1

In line with the locations of TCC business activities, TCC tried to assess the nature conservation importance of the locations and the interaction of TCC with local natural environment to identify priority locations of key business activities for the pilot.

PRINCIPLES FOR IDENTIFICATION

Identify the interaction of key businesses with nature, such as an extensive use of natural resources or change to the local ecosystem

- ▲ Hoping Mine in Hualien
- ▲ Suao Taibaishan Mine

Identify the areas of high biodiversity importance or of water stress

- ▲ Hoping Mine in Hualien
- ▲ Suao Plant

Identify the business footprints and locations of key businesses

- ▲ 3-in-1 of Port, Power, Cement Plant at Hoping, Hualien
- ▲ Suao Taibaishan Mine
- ▲ Suao Plant

EVALUATE

Evaluate the dependencies and impacts of business activities

2

Grounded on the content of priority business activities, TCC tried to evaluate its nature-related dependencies and impacts of its business activities on the natural environment or local residents.

ASSESS

Analyze the nature-related risks and opportunities

3

Based on the dependencies and impacts on nature, TCC tried to analyze the possible nature-related risks and potential development opportunities it might face.

PREPARE

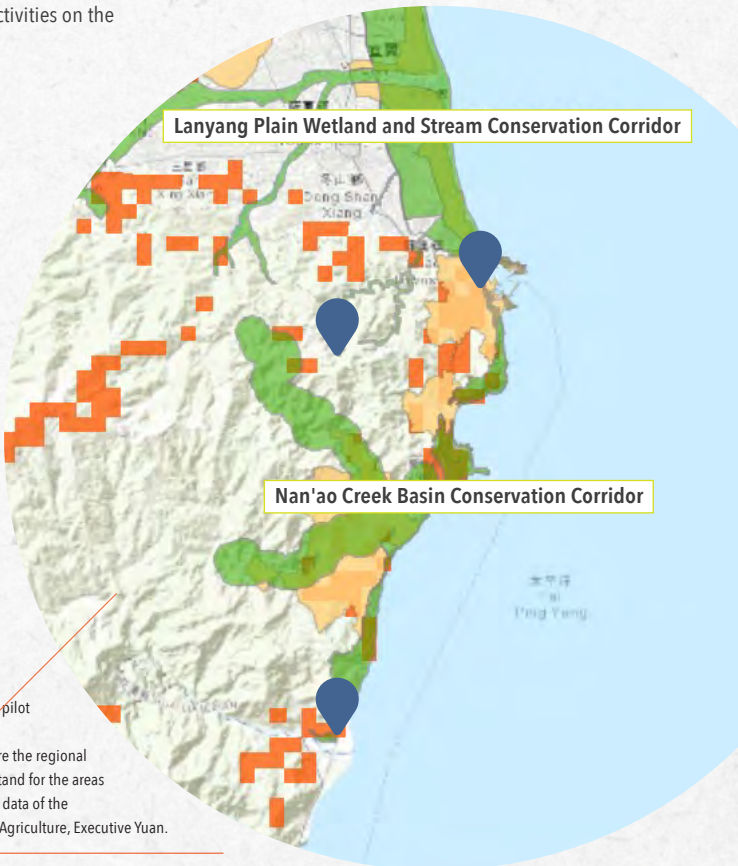
Nature-related strategy thinking and disclosure reporting

4

Based on the results of the nature-related risk and opportunity analysis, TCC mulled over its current actions and future strategic directions and disclosed the pilot results.

Note 1: The blue flags on the map represent the priority business activities in the pilot program of TCC.

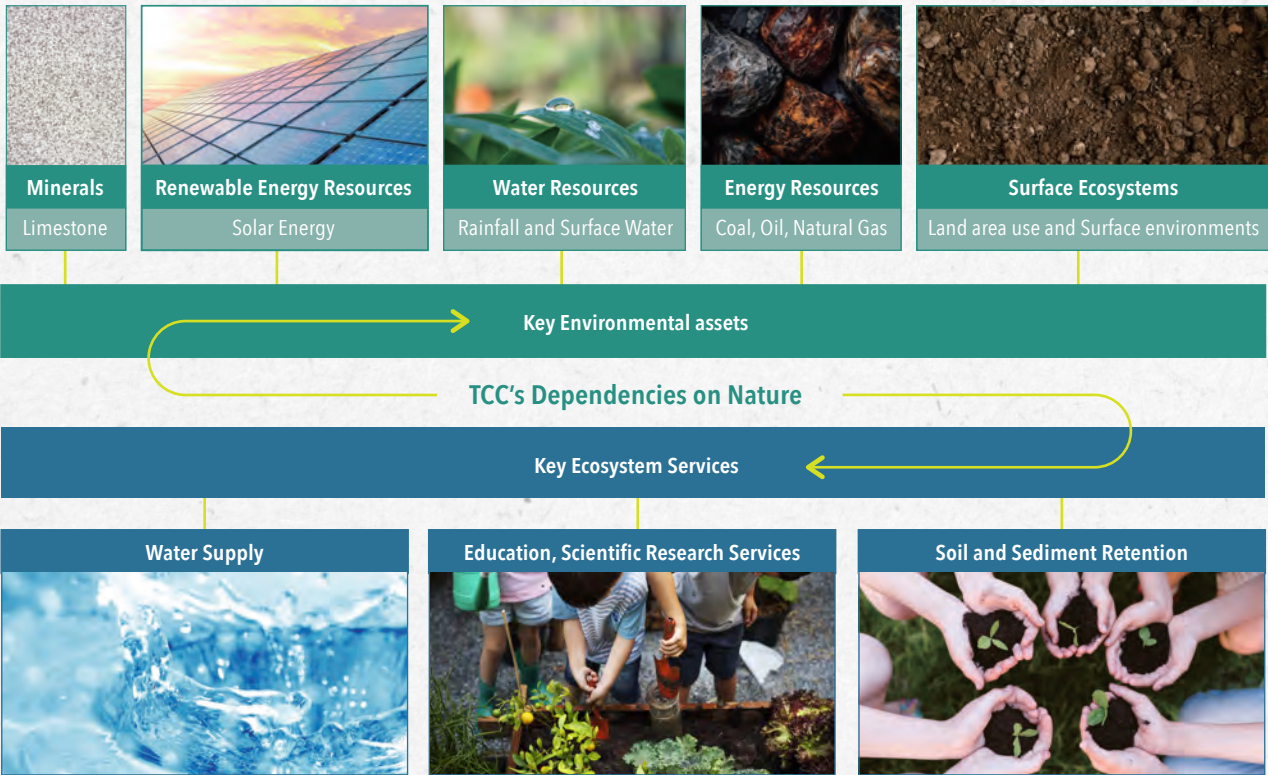
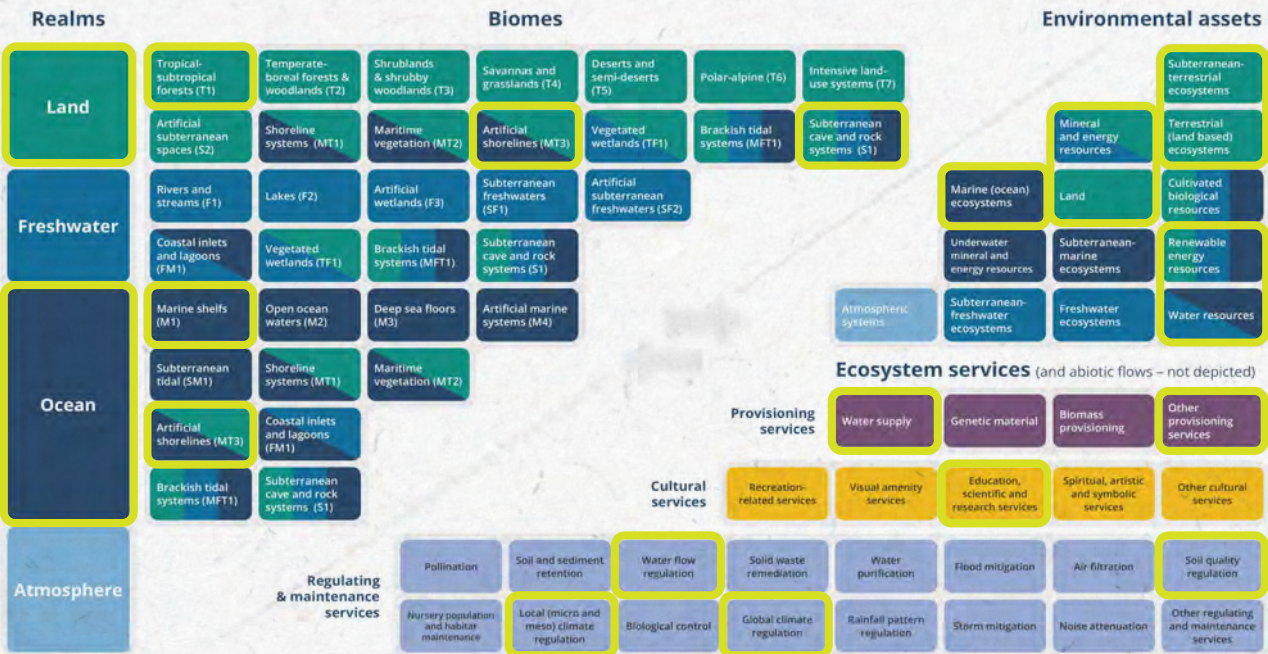
Note 2: The orange cubes represent the biodiversity hotspots; the green blocks are the regional conservation corridors of the National Green Network; the areas in light orange stand for the areas of concern of the National Green Network. The data was retrieved from the public data of the National Green Network, Forestry and Nature Conservation Agency of Ministry of Agriculture, Executive Yuan.



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

2.2 | Results of the Dependencies and Impacts on Nature Evaluation

The Nature Elementary Concept of TNFD

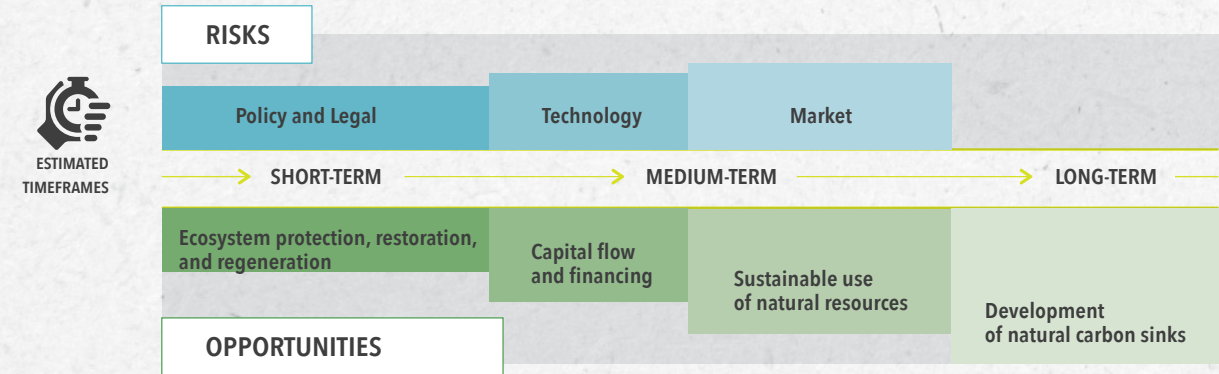


TCC's Potential Impacts on Nature

| IMPACT DRIVER | POTENTIAL IMPACTS AND IMPACTED SUBJECTS |
|---------------------------------------|---|
| Land use change | <p>BUSINESSES OF THE ORGANIZATION</p> <p>Minerals are vital raw materials. The mines are 100% approved after the government's environmental impact assessments (EIAs). The restoration of the mine vegetation constitutes the content of the EIA commitment, which requires relevant investments.</p> <p>LOCAL INDIGENOUS PEOPLES AND RELEVANT STAKEHOLDER GROUPS</p> <p>The environmental changes stemmed from mining may lead to concerns of changes to the quality of life and risks of safety for residents.</p> <p>LOCAL ECOSYSTEM</p> <p>The change of the original forest ecosystem due to mining may lead to destruction of habitats of the local animals and plants, resulting in failure of survival or displacement from their original habitats.</p> |
| GHG emissions | <p>BUSINESSES OF THE ORGANIZATION</p> <p>GHG emissions from business activities may increase the costs in carbon fee or tax.</p> <p>LOCAL INDIGENOUS PEOPLES AND RELEVANT STAKEHOLDER GROUPS</p> <p>GHG emissions may cause the warming effect and extreme weather events in the long run, possibly rendering impacts of climate disasters on the local residents and stakeholders.</p> <p>LOCAL ECOSYSTEM</p> <p>GHG emissions may cause extreme weather events in the long run, rendering impacts on the health of ecosystems and the survival of local flora and fauna.</p> |
| Pollutions of air, water, noise, etc. | <p>BUSINESSES OF THE ORGANIZATION</p> <p>Pollutions from business activities may lead to additional regulatory risks for the organization, which may require investment in new technologies or change the means of production, resulting in an increase in operating costs.</p> <p>LOCAL INDIGENOUS PEOPLES AND RELEVANT STAKEHOLDER GROUPS</p> <p>Pollutions may lower the quality of life of local residents and stakeholders and threaten their health.</p> <p>LOCAL ECOSYSTEM</p> <p>Pollutions may affect the health of local ecosystem, resulting in inability to survive and forced displacement for the local flora and fauna.</p> |
| Depletion of mineral/ water resources | <p>BUSINESSES OF THE ORGANIZATION</p> <p>Depletion of mineral resources, for example, will render a mine unable to operate normally and the possible need in finding an alternative mining site and reconstruction of mine infrastructure.</p> <p>LOCAL INDIGENOUS PEOPLES AND RELEVANT STAKEHOLDER GROUPS</p> <p>Water scarcity, for example, will lead to grave impact on the quality of life of local indigenous peoples, who may not be able to live anymore in the region.</p> <p>LOCAL ECOSYSTEM</p> <p>Depletion of mineral or water resources, for example, will impact the foundation of local ecosystem, rendering inability of flora and fauna to survive.</p> |
| Invasive alien species | <p>BUSINESSES OF THE ORGANIZATION</p> <p>Due to the change in the mine vegetation from mining activities, the organization needs to protect the local environment from invasive alien species, which requires investments of relevant manpower and resources.</p> <p>LOCAL ECOSYSTEM</p> <p>The removal of indigenous plants due to mining may increase the risk of alien species invasion and lead to extinction of certain rare indigenous species resulting from crowding out.</p> |

2.3 | Results of Nature-related Risks and Opportunities and Coping Strategies

With NbS at the core, TCC manages risks and develop opportunities, committed to the solutions to the challenges of human society, including:



Coping Strategies for Nature-related Risks and Opportunities

| RISKS | | | |
|-------------------|---|--|--|
| | POSSIBLE IMPACTS | FINANCIAL IMPACTS | COPING STRATEGIES |
| SHORT-TERM RISKS | Policy and Legal Demands of more intensive environmental assessment and disclosure on biodiversity management from competent authorities or international organizations | Products & services Higher EIA requirements result in impacts on the mining costs, production processes, and suppliers of TCC. Reputation, investment & financing Since mining is an irreversible action, there are impacts on the original ecosystem despite efforts in ecological restoration made, resulting in damage to the corporate image and reputation of TCC. | Domestic/International collaboration and participation ▲ Participate in GCCA, Business for Nature, and Taiwan Nature Positive Initiative of WBCSD-Taiwan to stay abreast with international trends and emerging ecological protection strategies. ▲ Sign up for the TNFD Pilot program to experiment with the introduction of the TNFD Framework to identify risks and plan for coping strategies in advance. ▲ Engage in industrial-academic cooperation with the relevant departments of domestic universities to conduct biodiversity research and analysis at mines and introduce good restoration technologies. High-level self-examination Unceasingly conduct environmental and ecological monitoring superior to the EIA requirements to elevate the capacity of regulatory response. |
| | Technology Requirements of a better efficiency of and less destruction to the environment from the mining or production technologies | Production impacts Limits of mining area and time result in a lower production capacity of mines and waste of efficiency in mineral resource utilization. | Mining method optimization Adopt joint mining to raise the efficiency in mining and quarry output available, delay the depletion of mine resources, and avoid ineffective waste. Raw material transportation optimization The Hoping Mine employs a vertical shaft system to transport limestone, saving 1,600 truck trips per day. It is planned to introduce unmanned electric mining vehicles into the mines of the cement plants across the Taiwan Strait that meet the criteria in place of the traditional fuel-burning counterparts. |
| SHORT-TERM RISKS | | | |
| | Market Preference of nature-friendly cement products from customers or investors | Products & services Customers turning to buy nature-friendly products may lead to decreased sales of existing products. New R&D and investment Development of nature-friendly cement products may require an increased input of relevant resources like R&D funding, equipment, and talents. | Communication enhancement Disclose carbon emissions on product delivery notes, set up a traceability system of products on a par with the food-grade counterpart, and incorporate sustainability topics in the Client Satisfaction Survey for client communication and education. Development of low-carbon products Low-carbon products R&D Actively employ methods like alternative raw materials, power generation by waste heat recovery, equipment & process enhancements, and renewable energy for self-consumption to achieve low-carbon and circular production. Continue to innovate and develop eco-friendly products and increase carbon reduction benefits by optimizing the existing mix ratios or developing circular materials and concrete recycling. |
| MEDIUM-TERM RISKS | | | |

| | | | | | | | | | | |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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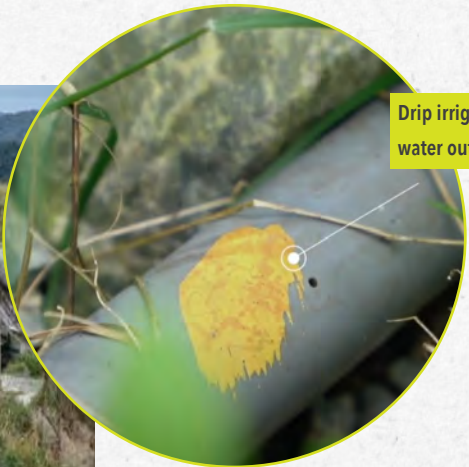
Coping Strategies for Nature-related Risks and Opportunities

OPPORTUNITIES

| SHORT-/MEDIUM-TERM OPPORTUNITIES | !!! Ecosystem Protection, Restoration, and Regeneration | POSSIBLE IMPACTS | FINANCIAL IMPACTS | COPING STRATEGIES |
|----------------------------------|--|--|---|--|
| | | Circular use of Resources Reduce dependencies on the conventional energy and water resources, thereby lowering carbon emissions and water consumption. | Decreased Costs Increased Access to Capital | Renewable energy utilization The first microirrigation system with the PV and energy storage combined in Taiwan is installed at the Suao Taibaishan Mine. The intermittency of renewable energy is solved via the energy storage system, sustaining the power for the microirrigation system throughout the year to irrigate and restore plants in a precise and stable manner. Circular use of water resources ▲ Rainwater harvesting ponds are installed to the Suao Taibaishan Mine. ▲ A vertical shaft tunnel water reclamation system is installed to the Hoping Mine to recycle water resources for reuse. ▲ The membrane bioreactors (MBRs) are activated at the Hoping Plant to treat the domestic sewage on the plant for the purposes of sprinkling, plant irrigation, and tire washing, etc., achieving a 100% recycling of domestic sewage. |
| | | Restoration to the optimal or original ecosystem Improve biodiversity and restore local ecosystems. | Return on investment in carbon sequestration technologies | Restoration area expansion Gradually expand the coverage of restoration upholding the principle of restoring while mining, continue afforestation for the remaining walls and undeveloped areas, and reserve a certain distance around the mine as a buffer zone, so as to avoid a direct impact of the developed area on the restoration results. Restoration system establishment 100% implement biodiversity management plans and conduct education and training by KBCC or a professional restoration team to educate employees at the TCC mines for the restoration efforts, and transplant at least 20 suitable plant species (trees, shrubs, and ground cover) into the mines to ensure the indigenous species ratio above 60%. |




The Photovoltaic Energy Storage System at the Suao Taibaishan Mine



Drip irrigation system water outlet

OPPORTUNITIES

| SHORT-/MEDIUM-TERM OPPORTUNITIES | !!! Capital flow and financing | POSSIBLE IMPACTS | FINANCIAL IMPACTS | COPING STRATEGIES |
|----------------------------------|-------------------------------------|---|--|---|
| | | Investment in nature projects and actions Protect and improve biodiversity, increase land use, and afforest to increase natural carbon sinks. Reputation, investment, and financing opportunities The world will have a certain degree of recognition for the nature-friendly actions of TCC if TCC acquires nature-related green funds. | Decreased Costs Increased Access to Capital | Active nature-related information disclosure Proactively disclose nature-related strategies and measures in the international ratings and sustainability reports and actively respond to questions from the rating entities to account for how to allocate the green funds obtained to the investments related to sustainable development and nature conservation. Active acquirement of green funding TCC actively applies for green credits from financial institutions, including green loans and sustainability index-linked loans, and directs green funds into the green infrastructure construction. Meanwhile, TCC reduces its consumption and pollution of natural resources as well as lowers its carbon emissions and water consumption, so as to mitigate issues like climate change and water scarcity. |
| | | Sustainable use of natural resources | New technologies and well-being creation Change the way of nature utilization and create new business opportunities. | Return on investment in carbon sequestration technologies Business model development |
| SHORT-/MEDIUM-TERM OPPORTUNITIES | Development of natural carbon sinks | Reduced carbon fee/tax Inventory and assess the carbon sink potential for an effectively application in the carbon reduction of the Company | Decreased costs Return on investment in carbon sequestration | Carbon negative/removal Develop carbon credit certification and offset in line with international standards to offset carbon emissions for competitiveness boost. Natural carbon sink strategies TCC continues to develop strategies for mine afforestation (green carbon), soil research (yellow carbon), and creation of coral ecosystem or seaweed bed at the Hoping Port (blue carbon) to increase carbon sequestration efficiency and sinks as well as mitigate climate change. |
| | | Climate resilience enhancement Manage carbon sinks to reduce carbon while effectively protecting the natural environment and enhancing the resilience of Earth. | |  |

2.4 | TNFD Pilot Process and Review

During the TNFD analysis process, TCC was deeply aware of the grave impact caused by ecosystem destruction and biodiversity loss. In addition to contemplation and investigation of the risks and opportunities faced, TCC also actively formulated strategies and targets and implemented corresponding measures to achieve the mutual benefits of ecological protection and business operation. TCC shall continue to conduct ecological protection and restoration plans. Aiming to protect the affected biodiversity hotspots and restore the potentially impacted ecosystems, the plans cover works such as mining operations, species protection, ecological restoration, and ecological value evaluation.

| Discovery and Future Challenges for TCC | Plans and Practices of TCC |
|--|---|
| Base Year of Ecological Restoration Since the restoration of an ecosystem takes time and is subject to various factors, determining a clear benchmark makes the critical element for ecological restoration monitoring. Nonetheless, due to the difficulty in finding historical data and the lack of actual, specific data, it is challenging to determine the benchmark. | <p>▲ Work with local experts to continuously and extensively collect and analyze historical data and monitoring data of local ecosystems, including biodiversity indicators, species richness, community structure, etc., understand the trend of ecosystem changes through a detailed data analysis, and find the appropriate base year via analysis.</p> <p>▲ Establishing a database demands a long-term continuous monitoring. Through regular data update and ongoing participation of local experts, TCC constantly revises and improves the mean to set the base year, so as to engage in and assess restoration efforts in an optimal manner.</p> |
| Judgment of Restoration Results Now that nature and ecosystems present regionality, there is no unified scientific method to follow for indigenous species restoration. | <p>▲ Actively cooperate with local experts, including conducting ecological research with experts in the ecosystems in Taiwan and nature, and join the nature initiatives of Taiwan to capture the ecological issues related to Taiwan.</p> <p>▲ The undeveloped forest in proximity or the original landscape is used as the benchmark for comparison at this stage.</p> <p>Suao Mine: Understand the local indigenous species with the undeveloped forest in proximity as the reference.</p> <p>Hoping Mine: Plant the tree species recommended by Forestry and Nature Conservation Agency in line with the EIA and work with KBCC, with the indigenous species in the region at core, to replant trees at different altitudes to the mine successively, restoring the limestone habitat to its original landscape systematically. Meanwhile, plant the tree species recommended by the Forestry Bureau in line with the EIA.</p> |
| Global Scenario Analyses At present, without a unified international guidance for reference, there is only qualitative scenario analysis available. | TCC shall stay abreast of international initiative organizations, such as the contents of the SBTN and the Final Framework (v1.0) of TNFD. |

Key Actions Taken by TCC



Ecofriendly Low-carbon Mining Hilltop Platform Mode & Vertical Shaft Transport Method

Hoping Cement Special Zone tackled common transportation issues associated with open-pit mining in cement production, caused by dust, mud, and smoke from large trucks.

The circular economy model was taken into account right at the beginning of plant establishment, and the 3-in-1 of port, power, cement plant business model was adopted to optimize the efficiency of resource use. Beginning in 1987, TCC invested NT\$3.75 billion to establish the only open-pit mining with a vertical shaft transport system at the Hoping Mine, which significantly reduced environmental impact and landscape disruption. Limestone is mined progressively from mountaintop to plant using this vertical shaft system. After crushing, the raw materials are conveyed to silos and the plant via underground, enclosed conveyor belts, ensuring automation and eliminating noise and dust pollution. This pioneering approach received recognition, including a Technical Medal from the Chinese Institute of Mining and Metallurgical Engineers and the Excellence Award for Safety and Health Practices from the Council of Labor Affairs.

KBCC_Assistance in Restoring the Indigenous Species of Mines from Greenhouse to the Wild

To restore mine ecosystems effectively, TCC focuses on preserving the indigenous plant provenance and partners with KBCC for their expertise. KBCC helps conserve and propagate indigenous plants like Taiwan urn orchids and Oriental chain ferns, planting them back in their natural habitats. This effort aims to transition greenhouse-grown seedlings to the wild. KBCC shall continue to provide ongoing support by offering expert advice and selecting appropriate species for afforestation plans, aligning with natural forest evolution. TCC will continue growing seedlings, expanding indigenous species in the mines, and restoring the mines original ecological landscapes.

The Hoping Mine: In 2020, TCC collaborated with KBCC to restore the rare and endemic Taiwan urn orchid (*Bletilla formosana*), which is an indigenous plant in the in Hualien's Hoping Mine. KBCC employed aseptic seeding to cultivate around 2,000 seedlings, which were then transferred to the Hoping Mine's nursery for a minimum of 6 months to acclimate to the local climate. In October 2020, 300 Yunnan *Bletilla* seedlings were manually planted, with one planted for every 5 meters of mining. In 2022, KBCC continued the restoration efforts by propagating over 3,000 oriental chain ferns (*Woodwardia prolifera*) and brush pot trees (*Sphaeropteris lepifera*) using bulbil and seedling methods, preserving them in their greenhouse.

The Suao Taibaishan Mine: Starting from 2018, KBCC has been regularly collecting the provenances of the indigenous brush pot tree and oriental chain fern from the Suao Taibaishan Mine each year for cultivation back at KBCC. After the provenances become saplings, they are restored to the Taibaishan. Also, certain saplings are provided to the National Ilan University (NIU) for academic cooperation so as to continue cultivating and propagating the plants at the restoration greenhouse of NIU.



Quantitative Report of the Mine_ The First Case of ESV Evaluation for the Hoping Mine

In 2020, the Hoping Plant of TCC worked with Professor Chyi-Rong Chiou, Director of Biodiversity Center, National Taiwan University, to perform evaluation of the ecosystem service value (ESV) for the Jinchang Mine in Xiulin Township, Hualien County. The value of natural regulation services was estimated, including carbon sequestration, water conservation, air purification, and support services and encompassing items like soil and sand loss prevention and biodiversity. Based on the relevant measurements and reference prices of ecosystem services, such as international carbon trade prices, municipal water prices, costs for reduction of different pollution sources, and costs for dredging of streams and reservoirs, the ESV in the scope of the Jinchang Mine was estimated at NT\$108,371,802.

For the full text of the report on the ESV estimation for the mining area at the Jinchang Quarry, please refer to:



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| | | | | | |
|--|---------------------------|----------------------|--|---------------------|----------|
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|--|---------------------------|----------------------|--|---------------------|----------|



TCC NATURAL CONSERVATION DEVELOPMENT

MANAGEMENT APPROACH

TCC upholds strict self-management standards and requirements for nature-related business activities. All TCC-owned mines passed environmental impact assessments (EIAs). TCC performs impact projections and assessments regularly, proposes countermeasures or alternative solutions to prevent or mitigate environmental impacts from development, and carries out quarterly monitoring of environmental impacts in mining areas in line with the plans committed. To track the progress of mine plant restoration efforts, TCC surveys the plant growth in the mines monthly and implements ecological restoration projects to facilitate restoration of biodiversity locally.

STEPS - 1

AVOID

100% pass the government's EIA review, uphold zero deforestation beyond the red line of mining areas, maintain the original ecosystems, and avoid decisions that result in negative impacts on the high-importance natural environment.

STEPS - 2

REDUCE

Reduce biodiversity impact through scientific methods and innovative technologies; adopt the Hilltop Platform Mode Phased-excavation, systematic explosion management and monitoring to reduce noise and dust pollutions; employ a fully enclosed vertical shaft transport system to reduce interference and carbon emissions from truck transport in order to reduce the overall impact on the environment.

TCC carries out natural conservation actions in accordance with the "Biodiversity Conservation and Sustainable Management of Living Natural Resources–Mitigation hierarchy" proposed by the International Finance Corporation (IFC) of the World Bank. The primary sites for restoration include the Hoping Mine, Suao Taibaishan Mine, and Hoping EcoPort.

STEPS - 3

RECOVERY

Protect and restore the degraded natural environment affected by business activities, 100% enforce the biodiversity management plans for mines, conduct environmental monitoring quarterly, and work with internal and external units for ecological restoration.

STEPS - 4

REGENERATE

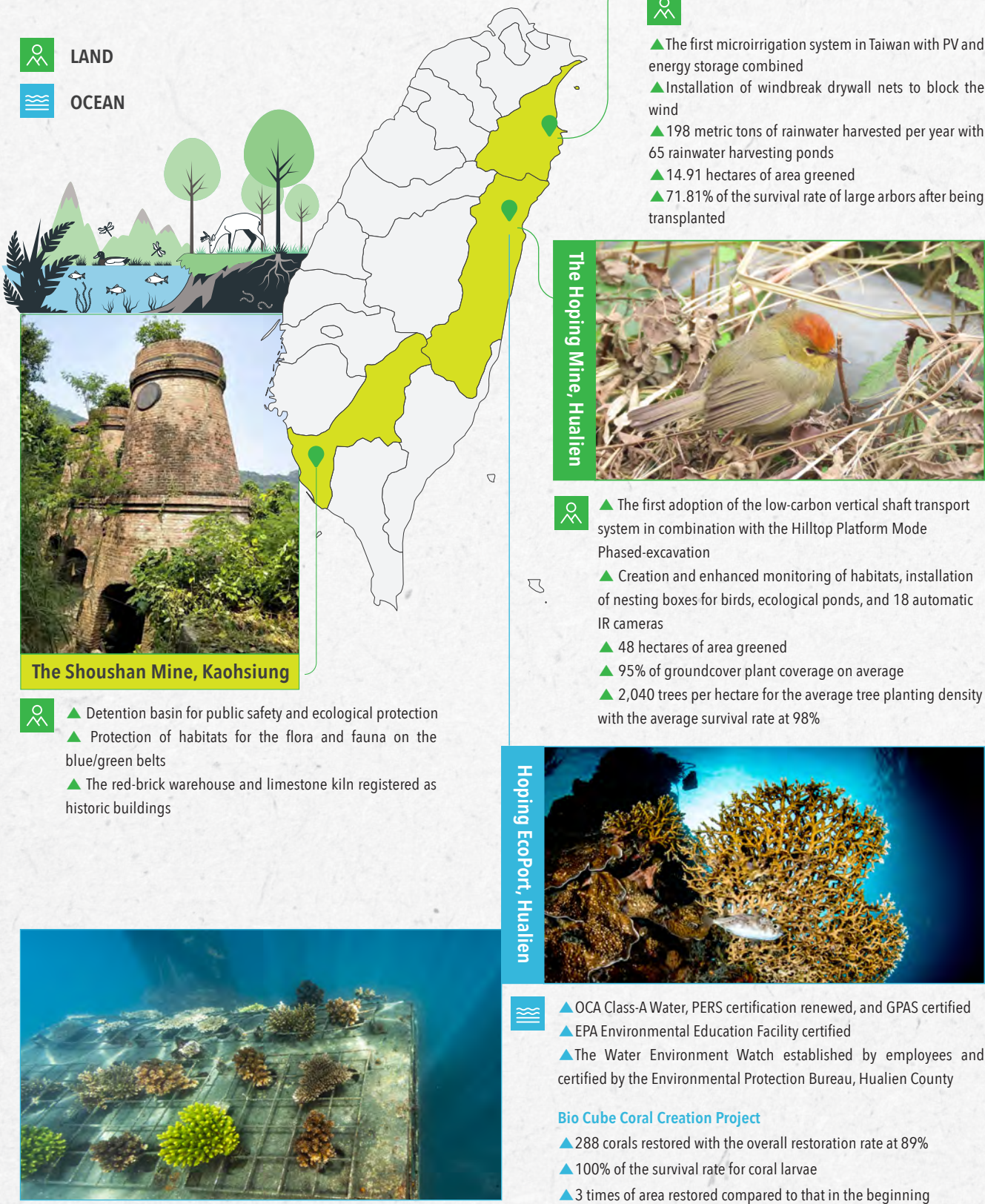
Engage in the long-term soil monitoring and research of mines, soil biodiversity monitoring, and analysis of the pedogenic properties at mines to achieve an optimal restoration.

STEPS - 5

TRANSFORM


At the first semi-closed ecosystem experimental base in the world, introduce thousands of plants and continuously observe and practice the evolution process of restoring plants to the wild. Introduce renewable energy and energy storage applications to plants, build large-scale energy storage systems, and utilize the energy storage project sites on the plants to create the first low-carbon green energy park in the eastern Taiwan.


3.1 | Status and Planning
for the Focused Business Areas of TCC





TCC stresses on mine restoration and local biodiversity conservation and has always taken the restoration of the original landscape of limestone mines as its main goal. Generally, the topsoil on which plants grow will be removed directly in mining. The restoration that follows involves moving in the soil from elsewhere, and even the fast-growing alien tree species (e.g. White Popinac) will be adopted as the greening plants. TCC employs the most natural and non-instant restoration method, retaining the topsoil as the provenance to rebuild the original habitat. In the initial stage of mine restoration and evolution, the species to be restored were selected using the six criteria recommended by KBCC: **the intolerant (pioneer) plants played an important role. The intolerant species were cultivated first to provide shade, and then the tolerant species were planted in phases, to enrich the growth environment in the mines.**





- 

Indigenous species first; trees fit for the area selected
- 

Pilot introduction of pioneer plants for greenification
- 

Utilization of soil and seed bank
- 

Fast-growing alien tree species replaced by indigenous species
- 

Mid-succession used for estimated seedling required
- 

Species with economic values first

Six Principles for
Mine Ecosystem Restoration

| | | | | | | | | | | |
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

LAND

3 Steps for Greenification in the Hoping Mine

STEPS - 1

Sapling cultivation at nursery Preparation stage

- ▲ Cultivate pioneer saplings; transplant and raise saplings of precious and rare plants.
- ▲ Set up the nursery of over 1,10m² to cultivate approximately 4,000 indigenous saplings per year, including White Beech, Formosan Ash, Formosan Alder, Chinese Soap Berry, and Ring-cupped Oak.

STEPS - 2

Acclimatization at hardening facility

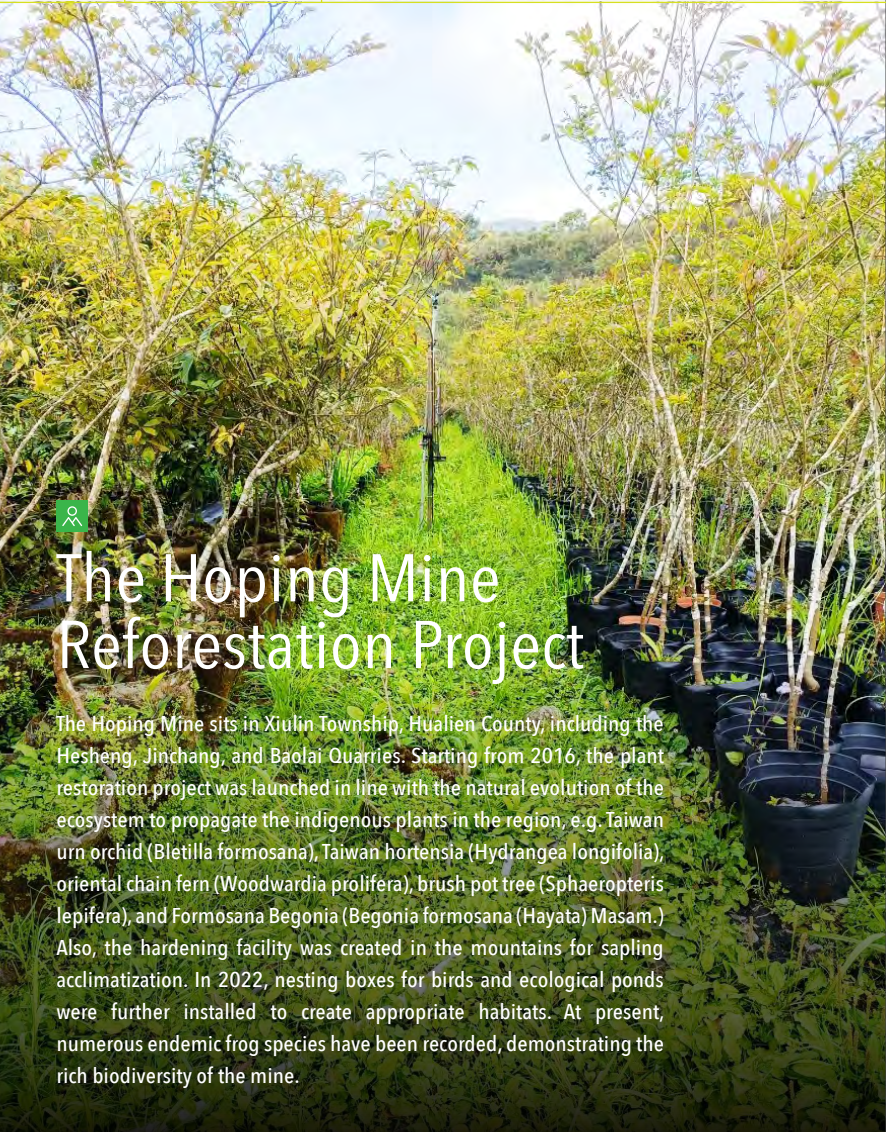
Pre-forestation stage

- ▲ Cultivate the existing dominant species in the original habitat.
- ▲ The saplings are repotted after half a year of cultivation and moved to the hardening facility in the mountains for acclimatization to adapt to the climate at the mine.

STEPS - 3

Green restoration Reforestation stage

- ▲ The saplings are transplanted to the final residual walls upon reaching to a height of 1.5 to 2 meters.
- ▲ Focus on the indigenous broad-leaved tree species to expand the scale of restoration to rock wall ecology and the large platform for greenification.



The Hoping Mine Reforestation Project

The Hoping Mine sits in Xiulin Township, Hualien County, including the Hesheng, Jinchang, and Baolai Quarries. Starting from 2016, the plant restoration project was launched in line with the natural evolution of the ecosystem to propagate the indigenous plants in the region, e.g. Taiwan urn orchid (*Bletilla formosana*), Taiwan hortensia (*Hydrangea longifolia*), oriental chain fern (*Woodwardia prolifera*), brush pot tree (*Sphaeropteris lepifera*), and Formosana Begonia (*Begonia formosana* (Hayata) Masam.) Also, the hardening facility was created in the mountains for sapling acclimatization. In 2022, nesting boxes for birds and ecological ponds were further installed to create appropriate habitats. At present, numerous endemic frog species have been recorded, demonstrating the rich biodiversity of the mine.

RESTORATION CHALLENGE

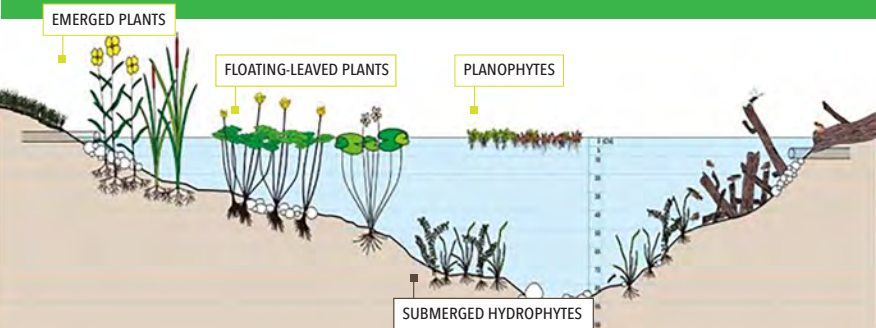
Because there are multiple slopes in the Hoping Mine, it is prone to disasters if there is a heavy rain and flood, which will affect the ecosystem.

SOLUTIONS

- ▲ Establish platform ditches, drain ditches, large-scale silt detention basins, and other facilities in accordance with the soil and water conservation plan.
- ▲ Set up solid rock embankments at a height of 2 meters or higher for the slopes at the side of the mine to prevent significant impact of heavy rain on the surrounding ecosystem.

Ecological Pond

The endemic frog species, such as temple tree frog and Chou's stream tree frog, have been constantly observed in the humid area at the Hoping Mine, presenting a rich amphibian ecology. In 2022, part of the hinterland of the mine was transformed into ecological ponds to store rainwater and surface runoff with a depth of 1 meter. Also, planophytes and submerged hydrophytes are grown to serve as the habitat for frogs and for animals to rest and drink water. Crested Serpent Eagle, Formosan Serow, muntjac, etc. were recorded at present.



The Suao Mine Ecological restoration project

Taibaishan located in Suao, Yilan, has been an important mining area since 1934 during the Japanese Rule. It shares an intimate tie with the economic development in Taiwan. However, the data of local topography, ecology, and hydrology are rather scarce. Since TCC took over the region, it has been restoring the mine step by step. Starting from 2017, TCC has been working with the professor of the Department of Horticulture, NIU, inventing new restoration methods, including installation of the first microirrigation system in Taiwan with PV and energy storage combined, precision irrigation, windbreak nets to block strong winds, and rainwater harvesting ponds to overcome the water retention challenges presented in the karst topography. Through the various innovative approaches, TCC overcame the harsh environment for restoration and safeguard biodiversity.

3 Steps for the Basic Survey of the Suao Taibaishan Mine

STEPS - 1

Establishing Base Site Survey Database

Set up micro-climate monitoring stations across all restoration platforms to systematically map out the topography of the mine, mountain slopes impact, wind speed, wind direction, and temperature changes to establish the base survey database.

STEPS - 2

Planting technology research

- ▲ Plan the greenification area with the trees fit for the area in line with the varied altitudes and topographical differences.
- ▲ Find the best planting methods for indigenous trees, along the right seasons (solar terms) and the use of green manure and top dressing, to speed up the recovery of autogenic succession.

STEPS - 3

Analyzing Soil Physicochemical Properties

- ▲ The alkaline composition of the soil in the karst topography of the Taibaishan will increase with mining, and the alkalized soil will make it difficult for plants to grow.
- ▲ Implement various soil dressing amendment projects, add natural organic compost like mushroom bulk bags, chicken manure compost, etc., to balance the physical / chemical properties of the soil.

RESTORATION CHALLENGE

CHALLENGE 1 |

Mild-typhoon-level fierce wind for years

The wind is strong at the windward side of the northeast monsoon of the Taibaishan, with the wind speed measured throughout the year always two levels higher than that of the Suao Weather Station, rendering trees unable to grow back on the windward side for decades.

SOLUTIONS

- ▲ Install windbreak drywall nets to block the wind, which can reduce the wind speed by 3 levels.
- ▲ The windbreak nets with the density at 60% in the restoration area ensure a successful growth of plants, effectively mitigating the damage from strong winds and facilitating the survival of the transplanted plants.

CHALLENGE 2 |

The Karst terrain without water sources

The Taibaishan are all karst terrain, which pose a challenge in water retention as water seeps through the rocks to the lower layer and cannot be effectively retained.

- ▲ Use high exposure of morning mountain sun for a PV-powered microirrigation system, pumping water to a 900 meter high mine for restoration.
- ▲ Each restored sapling gets a dedicated microirrigation hole, angled at 30 degrees or less for precise watering for new plantings.
- ▲ Install rainwater harvesting ponds to the part of restoration platforms for emergency watering plants
- ▲ The windbreak nets can block some vapors and improve the soil moisture.

CHALLENGE 3 |

Destruction of vegetation and infrastructure by the animals returning to the wild

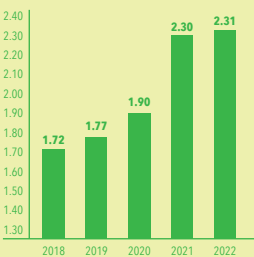
After returning to the wild in the mine, the animals gnaw on saplings and dig the soil, presenting challenges to the seedling restoration and irrigation pipeline maintenance.

- ▲ Set up white strips in the areas where mammals are mostly observed in the manner of least interference for deterrence.
- ▲ Plant pumpkin, sweet potato, potato, yam, taro, chayote, and other crops interspersed, to divert mammals from eating saplings temporarily.
- ▲ Enhance plant resilience by building a under-mountain nursery and a hardening facility for mature plant relocation to the mine.

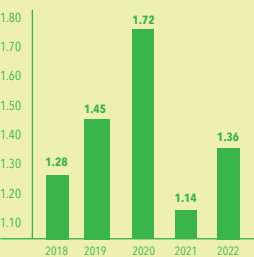
The Hoping Mine & the Suao Mine Restoration Performance

Biodiversity makes the bedrock of the ecosystem services provided by nature. Aiming for restoration of ecosystem as a whole, TCC has been tracking and monitoring the diversity of the flora and fauna species in the mines, which serve as the indicators of the restoration performance.

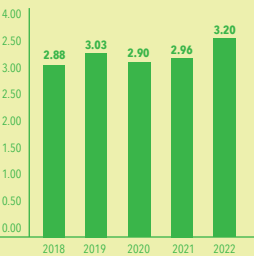
Plant Diversity Index



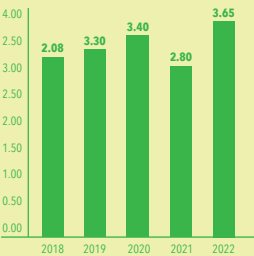
Mammal Diversity Index



Bird Diversity Index



Butterfly Diversity Index

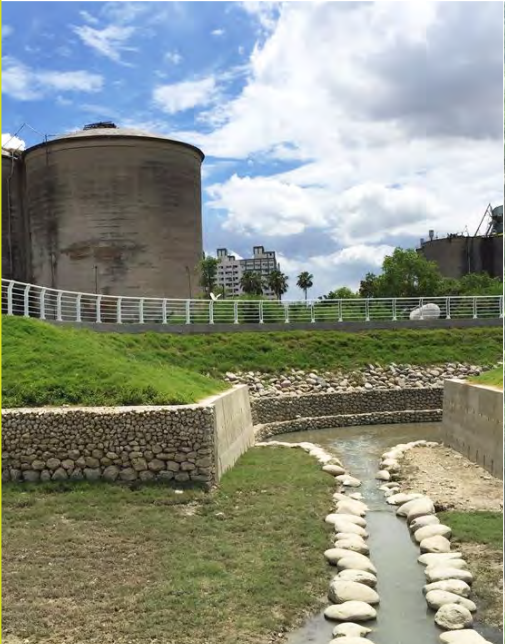


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|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|

The Shoushan Mine Ecology-Culture Coexistence Project



Following the termination of mining rights in 1992, the Kaohsiung Plant began its restoration efforts in 1993. It worked with the national park administration to experiment with planting indigenous plants in lieu of the alien species White Popinac (*Leucaena leucocephala*). The restored Shoushan Mine enjoys a rich ecology, becoming a popular hiking destination for the citizens in Kaohsiung. The Kaohsiung Plant sits at the junction of the Shoushan (Shou Mountain) and the canal in the Gushan District. In the past, it was prone to flooding in the area due to the terrain. In 2013, TCC provided the plant site, free of charge, for the city government to build detention basins and bypass channels to help with flood mitigation and public safety protection locally. The completed Chaihsan Flood Detention Park was open to the public in 2017. In addition, the century-old limestone kiln and red-brick warehouse of the Kaohsiung Plant were registered as historic buildings of Kaohsiung City in 2020, which is a rarely well-preserved prototype of modern cement firing facility in Taiwan. In 2022, we further collaborated with the Bureau of Cultural Affairs, Kaohsiung City Government, to organize tours of culture/history guided by the corporate consultant Wen-Fu Lin. Moving forward, it plans to open to visits from time to time in line with the plan of the Kaohsiung City Government and formulate the strategies of carbon sink and afforestation.



Shoushan Detention Basin Bypass Channel

OCEAN



The Hoping Port Coral Creation Project

The Hoping EcoPort is located in "3-in-1 Port, Power, Cement Plant" in Hualien. With the circular economy thinking incorporated right from the design phase, it is the only circular production facility in the world with zero waste. The EcoPort is responsible for the everyday transportation of the raw materials and products of cement in and out. In this only dug-in port in Taiwan, a group of delicate guests brought by the Kuroshio Current—coral—reside for more than 2 decades.

The rigorous environmental management at the Hoping EcoPort has been certified against the Port Environmental Review System of EcoPorts (PERS) consecutively. The water quality is also recognized as the OCA Class-A Water, which is equivalent to that of the Penghu waters. It thus became the home for coral to spawn and grow to our surprise. TCC started the research on the ecosystem below water of the port in 2015. It also worked with Eco-Angel Environment Conservation Association to carry out the bio cube coral creation project in 2021 to transplant the corals broken by natural factors or the currents in the port to the cement bio cubes in the port.

3 Phases of Ecological Survey at Hoping Port

PHASE-1

Life below water survey
2015
National Taiwan Ocean University
▲ Obtained the basic underwater ecological information in the port as the basis for the assessment of the ecological plan that followed.
▲ Monitored the port and the surrounding waters, including underwater photography, sediment sampling, and mapping of water temperature changes, etc.

PHASE-2

Identification and distribution survey of the coral species
2020
Taipei University of Marine Technology
▲ Identified indicator species as the metrics for monitoring and tracking that followed to establish the benchmark for the long-term environmental monitoring.
▲ Analyzed coral species composition and benthos coverage.
▲ Set up 120 50 - meter transect lines at depths of 3 meters and 6 meters to record coral species using the transect method.
▲ Corals in the port were found broken, which were determined to be resulted from the rich sediment in the existing area and the lack of substrates for attachment.

PHASE-3

Bio Cube Coral Creation Project
2021 to date
Eco-Angel Environment Conservation Association
▲ Due to the limited space in the port, the sculptability of cement and the micropores on the surface of the cement that allow attachment of algae are leveraged to create the cement bio cubes.
▲ The bio cubes placement passed the environmental impact assessment.
▲ With the dual-layer design adopted for the bio cubes, coral fragments are tied to the stainless steel meshes on the bio cubes' surface to avoid sediment coverage.
▲ The lower layer employs the lattice design for benthos to reside, with the goal to create a coral reef ecosystem.



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|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|---------------------------|----------------------|--|---------------------|----------|



Restoration Performance

As of February 2023, a total of 284 corals were restored at the Heping Port with the overall restoration rate at 89%. In addition to the transplanted corals originally, the restoration team also found larvae of natural corals and protected species Tridacnae on the bio cubes growing at the speed above the average. This means that aside from asexual reproduction to expand their presence, coral fragments also undergo sexual reproduction for larval release, which indicates that the environment at the Heping Port is very suitable for coral growth. At present, among the "residents" of the bio cubes, the 25 species of Acropora account for the majority, followed by 9 species of Merulinidae. The whole area restored has tripled compared to the initial area, covering 38% of the bio cubes, presenting a vibrant ecology.

In addition, 3 species of corals that had not been recorded in the eastern coast of Taiwan were found in the Heping Port, namely Acropora caroliniana, Acropora bifurcate, and Turbinaria frondens. Since the main goal at this stage is to assist with the safe growth of coral fragments, some fragments broken from Turbinaria frondens were collected and

transplanted onto bio cubes as a key item for observation. Although coral reefs only account for 0.2% of the ocean, they are home to a quarter of marine life. TCC and the Heping Port shall continue to invest in restoration and environmental education efforts. In 2023, the coral restoration site will be expanded to the extent of 1,000 corals. Also, together with the certification of environmental education facility obtained in 2022, we shall encourage the public to invest in marine conservation. In addition, from March 2023, the Heping Port kicked off an ecological survey of fish and shellfish to identify the dominant species. It is to plan for the next stage of ecological development and continue the long-term monitoring and improvement on a rolling basis.



Expanded Area for Coral Creation

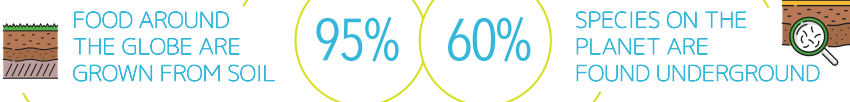


FORWARD LOOKING STUDY –

Ho-Ping Ark Ecological Program

Nelson An-Ping Chang, TCC Chairman (2nd right); Chia-Wei Lee, CEO of KBCC (3rd left); Dr. Chiao-Ping Wang, Soil Expert (3rd right); Chih-Han Chang, Professor of NTU (middle); Chun-Ming Chen, Senior Collection Manager of KBCC (2nd left); Chia-Pei Wei, Plant Manager of Hoping Plant (1st right); and the research team.

Soil makes the source of species and life as well as the largest carbon sink on land.



The significance of soil to humans and nature is self-evident. However, there is no professional assessment mechanism in Taiwan at present that can effectively estimate the extent of soil changes, nor there is a systematic knowledge and assessment of the carbon cycle mechanisms in soil. It is impossible to effectively evaluate the impacts on the ecological environment and biodiversity in soil, either. Hence, TCC promotes the "Ho-Ping Ark Ecological Program" (Ark Program) and works with the soil expert, Dr. Chiao-Ping Wang, and the team led by Professor Chih-Han Chang from NTU IEEB to carry out innovative ecosystem modeling, long-term soil monitoring and research, and professional cultivation. It involves mine soil sampling and testing, studying interactions between soil and plants on site, as well as the critically important research on the ecosystem functions of soil in the material cycle. With that, TCC endeavors to accumulate long-term soil observation and monitoring data as the key materials for the studies on soil biodiversity so as to realize the core vision of TCC, "living in harmony with nature." At the beginning of the program, the expert team conducted research on the status of the greening of the residual walls in the mine. They found that the saplings appeared to be packing with poor potential. It is planned to strengthen the education and training on species selection moving forward.

Also, the phase 2 for afforestation experimentation is engaged to increase the amount of carbon sink via dense planting. Besides, the approach of direct seeding plus small seedlings is adopted in place of big seedlings. Furthermore, the research on the soil restoration technology for the residual walls in mine is launched as well. In the future, the experimental base of the Ark Program will continue to introduce at least 1,000 plant taxa pursuant to its geographical microenvironment and experiment plan. Meanwhile, it shall continue to observe and practice the evolution process of restoring plants to the wild. It planned to invite the Taiwan Forestry Research Institute, Endemic Species Research Institute, and the scientific team of the National Museum of Natural Science to conduct surveys on the biology in the mine in an attempt to better capture the biological richness and assess for the priority species for conservation. In addition, the experimental base will also develop towards an environmental education facility in the future. Combining the TCC DAKA Open Eco-Factory (hereinafter referred to as TCC DAKA) and the TCC DAKA Renewable Resource Recycling Center (RRRC), it endeavors to become the most characteristic environmental education and leisure facility in the eastern Taiwan.

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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|



The first semi-closed ecosystem experimental base in the world

/ EXPECTED BENEFITS
Remove alien species from outside the base, introduce thousands of valuable species, and conduct ecosystem rebuilding modeling to actively restore the species in the local ecosystem in search of cures for the future Earth ecosystem.

/ WORK RESULTS
"Skynet-based Ark Plan" established at the mine of the Hoping Plant with an area of approximately 1.45 hectares

173 plant species transplanted, including 783 orchids like Taiwan urn orchid (*Bletilla formosana*), *Bulbophyllum taiwanense*, *Papilionanthe taiwaniana*, and *Vanda lamellata*; 186 bromeliads; and 198 Apocynaceae plants

Discarded oil tanks from the mine repurposed as water tanks for the reclaimed tunnel water from Section B of Shaft 1 in the mine to be filtered before introduced to irrigate the plants in the Ark Plan, **with 74 metric tons of water reclaimed as of March 2023**



Long-term soil monitoring and research

/ EXPECTED BENEFITS
Conduct soil biodiversity monitoring and carbon decomposition experiments on the base and analyze the mine ecology restoration and the pedogenic properties. Achieve the optimal restoration of soil ecology in the mine and accumulate the long-term soil research data, including the soil fauna, soil microbiota, and physico-chemical analysis, and the research in the carbon sinks of soil and forest.

/ WORK RESULTS
Long-term monitoring of the decomposition of the large stubs on the base, increase of habitat heterogeneity of dead branches and fallen woods, observation of decomposition constants for different wood qualities, investigation of soil nutrients and animal composition, measurement of microbiota in different stages of decomposition, and data estimation of the overall carbon sequestration of soil and forest



Soil sampling from the mine and the Ark plan venue conducted by the team of Dr. Chiao-Ping Wang, along with instructions to TCC employees for following monitoring and execution



Scholarship mechanism to cultivate soil professionals

/ EXPECTED BENEFITS
Offer scholarships to cultivate talents in soil environment and biodiversity for the society and the academic circle and raise the public awareness of the significance of soil and biodiversity.



Industry-Nature Symbiosis for Protected Areas of OECM

The "30x30 goal" was established on COP15 in 2022: protect 30% of Earth's lands and oceans by 2030. According to the UN Convention on Biological Biodiversity, an OECM can be accounted in the global biodiversity conservation area and included in the scope of 30x30 goal. Therefore, the OECM inventory and certification has become a direction to work for to various countries.

OECM stands for Other Effective Area-based Conservation Measure. According to the Ocean Conservation Administration (OCA)¹, it is "governance and management in a specific geographical area outside protected area via different methods that render positive and long-term sustainable impacts on local biodiversity and related ecosystem functions and services as well as offer cultural, spiritual, socio-economic, and other local-related values," making it the concept of a "quasi-protected area."

Four General Criteria for OECM Certification

- 1 Area is not recognized as Protected Area
- 2 Area is governed and managed
- 3 Long term sustained in-situ conservation of biodiversity
- 4 Associated ecosystem functions and services in line with the Satoyama/Satoumi² concept

The OECM Recognition Standard

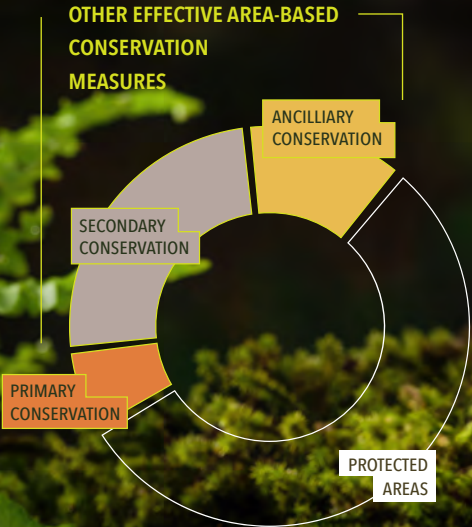
An OECM has to be recognized by the local competent authority. Nevertheless, there are no relevant laws or regulations in Taiwan as to the clear definition and recognition thereof. At present, the OCA and the Forestry and Nature Conservation Agency are working on it. The OECM certification schemes or regulations for lands and oceans are projected to be released successively by the end of 2023.

The Hoping Port and the Bio Cube Coral Restoration Area

According to the preliminary assessment of marine conservation scholars, the venues are hopeful to meet the OECM Criteria. In addition to the ongoing high-intensity management and in-situ restoration, TCC also planned to further consult domestic and foreign experts and scholars for the feasibility study of OECM certification, so as to contribute to the marine ecosystem.

Ho-Ping Ark Ecological Program Experimental Base and the Shoushan Mine in Kaohsiung

According to the analysis of forestry experts, since TCC owns the land, which is within a clearly defined area, a management system shall be established and continuously improved in alignment with the OECM Criteria.



Note 1: Source: The alternative thinking beyond the marine protected areas -Other Effective Area-based Conservation Measure, Ocean Conservation Administration, retrieved on 2022/4/28. https://www.oca.gov.tw/ch/home.jsp?id=14&parentpath=0,2&mcustomize=news_view.jsp&dataserno=202204280001

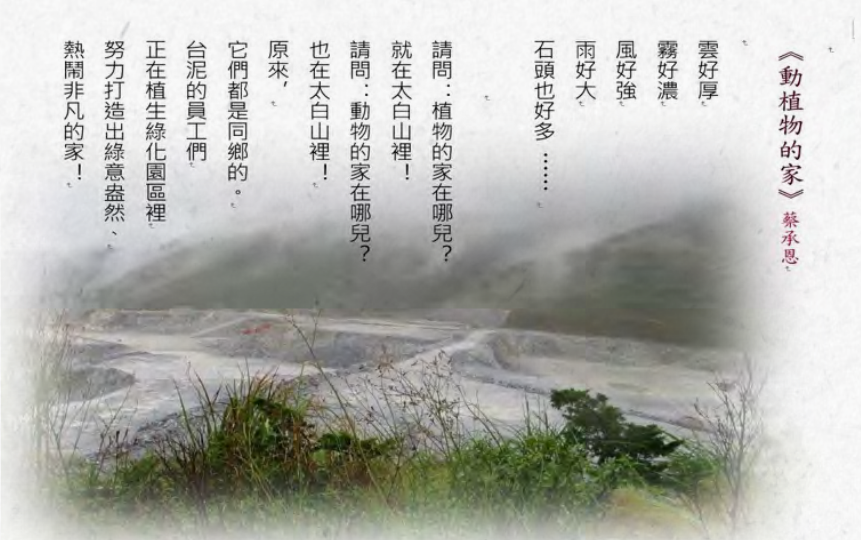
Note 2: Satoyama/Satoumi is the living model promoted by the UN Convention on Biological Diversity, with the integration of human's development needs and the natural environment taken into account. It indicates the achievement of the win-win-win in life, ecosystem, and production for the mountains, forests, streams, and oceans surrounding human communities through the proper use by humans to provide diversified habitats for flora and fauna.

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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

3.2 | Stakeholder Engagement on Topics of Nature

ECO-TOUR

TCC DAKA was open to the public on 9th January 2020, disclosing the actions of TCC in a transparent manner and holding multiple activities to interact with different people to convey the spirit of promoting the sustainable development of industry and cities. Through the “3-in-1 Tour of Port, Power Plant, and Cement Plant,” the public can go into the Hoping Mine and the Hoping Port to see in person the environmental management and investment in the restoration efforts for the mine and corals as well as the model of circular economy with zero emission, zero pollution, and zero waste. Aligned with the innovative communication model of TCC DAKA, the Hoping Port was certified by the EPA Taiwan as the first port-based environmental education facility on 22nd February 2022. The public



Students from Shih Min Elementary School in Yilan presented their reflections on the visit to the Taibai Mountain in a new poem.

《動植物的家》蔡承恩
雲好厚
霧好濃
風好強
雨好大
石頭也好多……
請問：植物的家在哪儿？
就在太白山裡！
請問：動物的家在哪儿？
也在太白山裡！
原來，
它們都是同鄉的。
台泥的員工們
正在植生綠化園區裡
努力打造出綠意盎然、
熱鬧非凡的家！



TCC DAKA Happy Farm

can learn about marine conservation and port management through the tour by professional environmental educators and on-site visit. Due to the sensitivity of corals, to narrow the gap between the public and the coral reef ecosystem, the Hoping Port uses anemones, which are also cnidarians and can be regarded as a larger version of corals, for interactive experiences. Visitors can learn about coral ecology by feeding the anemones in the tour. In addition, the Hoping Power Plant of TCC worked with the Coast Guard Administration in 2021 in response to the OCA's policy of Tribute to the Ocean. The space on the first floor of the inspection office by the Hanben Beach, Aohua Village, Yilan County, was revitalized. Group guided tour and “Convenient Beach Cleaning,” a beach cleaning equipment loan service, are available as well. In 2023, all the staffs on the station became OCA volunteers, caring for marine conservation and marine debris issues together with travelers.



Respect nature, conform to nature



Local Tribe Communication

To facilitate the industry-society communication and practice the factory-community coexistence in harmony, TCC actively interacts with local residents via various channels to exercise the philosophy of “factory as classroom.” Aside from partnering with local schools and organizations to offer customized itineraries, the Hoping Plant and the Suao Plant would invite local residents from time to time to go into the mountains to learn about the performance on mine restoration. TCC took the initiative to elaborate on the status of its operation and environmental management to local communities, reducing the residents' concerns about the risks for their living environments. For example, in May 2023, the teachers of Yongle Elementary School in Yilan went to the Taibaishan for an eco-tour, during which the Taibaishan Mine Restoration Team guided the teachers through the endemic and indigenous plants successfully restored.



Teachers from Yongle Elementary School in Yilan visited the Taibaishan Mine.

In response to the mining matters of the Hoping Mine (including the Hoping, Baolai, Heshengyuan, and Jinchang Quarries), the Hoping Plant took the initiative to apply to the Xiulin Township Office of

Hualien County in October 2021 for tribal consultation. The tribal consultations and voting procedures were organized on 17th and 22nd of March 2022, at the Gukut and Knilibu Tribes in the Xiulin Township, respectively. 82.2% of the households in the Gukut Tribe and 97.6% in the Knilibu Tribe approved as the result. In the process of communicating with the tribes, TCC produced a special booklet “For the Future, Make Peace with Sustainability,” in which it recounts the fruits of TCC in the circular economy at the Hoping Port and Power Plant as the result of collaboration with the local communities over the past 2 decades and explain the future plan of TCC to transform the designated cement zone into a low-carbon environmental green energy park, hoping to join hands with the Heping Village on the path to a sustainable development of the tribes.



In addition to the customed guided tours conducted by the Taibaishan Mine Restoration Team from time to time, the Suao Plant also organized cement handcraft workshop occasionally, created a Facebook Page [TCC Suao Plant – A Centennial Transformation of Cement Fantasy], and opened the plant for active interactions with local residents. The Suao Plant taps into its century-old history to write the history of cement with Taiwan that combines the cement industry and humanistic features. The plant communicated with Suao on the present and future via diverse activities as well. TCC also initiated the plan for the consultation with the Iyo Tribe.

The Happy Farm at the Cement Plant
Food waste turned into nutrients that nurture the earth

One third of soil worldwide is degrading. Organic wastes like food waste are made into soil amendment. It not only leverages organic matters in lieu of the chemical fertilizers that consume energy but also return nutrients back to soil to improve soil quality. In February 2021, the Hoping Plant opened the Food Waste Recycle Center. The diners at the tribes send their food waste to the Hoping Plant, which is transformed into soil amendment by the large fermentation equipment for the villagers in the neighborhood to use it in farming at the Happy Farm in the Hoping Plant. The Taibaishan in Suao also actively promotes eco-friendly agricultural research to farm with zero chemical fertilizer, zero pesticide, and zero additive in the manner of co-benefit of crops in symbiosis, which prevents both pests and weeds.



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

3.3 | Guardian of Life on Earth for Good – KBCC

TCC Group has been investing in Dr. Cecilia Koo Botanic Conservation Center (KBCC) for 17 years since 2007. The establishment of KBCC was a fruit stemming from the Confucian demeanor of Mr. C.K. Koo, the late Chairman, who tied the business purpose of the Company with giving back to the society. His spouse, Ms. Cecilia Koo, committed to charity and supporting the disadvantaged, donated 20 hectares of the land in Pingtung for free to establish KBCC and build an ark for the survival of endangered species on Earth.

KBCC mainly collects endangered or rare plants in the tropical and subtropical regions. The footprints of its hunters can be seen in the Southeast Asia, Mainland China, Oceania, Africa, Central and South America, etc. They race against all odds and time in an attempt to rescue the plants close to distinction prior to disappearance of the rapidly destroyed rainforests. The actions have also attracted the attention of media worldwide, including the National Geographic Channel. From the initial 12 taxa of plants such as orchids and bromeliads to the addition of begonias, succulents, aquatics, and mosses, KBCC has accumulated nearly 30 taxa of plants, many of which are the world's best or extinct in the wild. As of 29th June 2023, 34,260 taxa of plants from around the world have been successfully cultivated, among which the collections of orchids, bromeliads, begonias, mosses, and ferns are the best in the world. The goal is to preserve 40,000 taxa of plants by 2027, making it the world's most significant sanctuary for tropical and subtropical plants. In addition, cryopreservation of different parts of plants in liquid nitrogen is carried out. There are now more than 4,000 species and 25,000 tissue specimens preserved and available as research materials for the next generation of scientists.

Asteroid No. 526460
–Ceciliakooen

In recognition of the long-term commitment to species conservation and ecosystem sustainability as well as the selfless support to academic research and new drug development programs, the National Central University specifically named the Asteroid No. 526460 found by Lulin Observatory as “Ceciliakooen” officially. Followed by the approval after the review by the International Astronomical Union (IAU), the name was officially registered among the stars in January 2022, signaling the aspiration that the largest tropical plant conservation center on the planet may be the Ark of Plants to sail onward with the hope of sustainability onboard. The Asteroid “Ceciliakooen” shall transform this spirit and shine in the universe for good.



The plant collection mainly features plants that are cultivated in greenhouses.

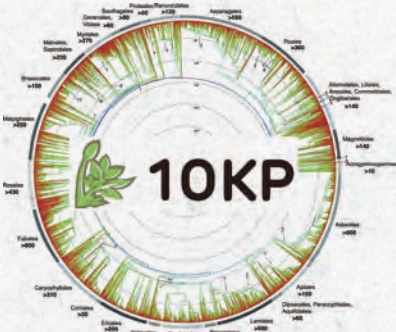
17 net greenhouses, totaling 35,398 m² (about 3.5 hectares).
There are also 2 temperature-controlled rooms dedicated to the cultivation of aquatic plants, insectivorous plants, begonias, Arai, Melastomataceae, etc.
All the collections are labeled with barcodes. Just like a digital ID, it allows anyone to check a plant's name, place of origin, and when it entered Taiwan at any time for the ease of research.

Animals Conservation Program

In addition to plant conservation, KBCC has been conducting bird conservation since May 2013. To date, it has collected 32 species, including 1 taxon of Gallus gallus, 14 taxa of internationally registered strains, 1 variant, 15 regional strains, and 1 taxon of genetic mutation expression, totally 499 birds as of 30th June 2022.
In December 2013, commissioned by the Forestry and Nature Conservation Agency, KBCC raised the turtles found in smuggling activities. Thus, the turtle conservation program commenced. There were 430 turtles of 23 taxa in the collection as of 30th June 2022.

Participation in the 10K Plant Genome Sequencing Project

During the 19th International Botanical Congress (IBC), BGI Research joined hands with authoritative experts in the field of botany from the United States, Germany, the United Kingdom, and Canada, to initiate the 10,000 (10KP) Plants Project, aiming to sequence the genes of 10,000 critical plants on Earth within five years from 2017. However, the research sampling has been severely impeded due to COVID-19, with only more than 1,000 specimens received from over 50 institutions from more than 20 countries, including Mainland China, USA, UK, France, Australia, and Canada, and nearly 300 plants completing their genome sequencing. KBCC joined the project in January 2022, providing the sources of genetic materials.
The project remains in progress. Through the extensive global partnership, comprehensive resource collection, and systematic scientific design and research, it carries out sequencing and research on the genomes of 10,000 plant species, offering extremely crucial genetic information for the botany science community to promote the application and research on biodiversity, evolution, and ecology.



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|



Partnership with the Graduate Institute of Natural Products, KMU for the Library of Natural Anticancer Products

Most of the crucial elements in the development of human medicine come from natural plants. In 2014, KBCC collaborated with Kaohsiung Medical University (KMU) for extraction and establishment of natural product libraries. At present, the plants in the natural product libraries came from 920 taxa across 83 families of plants. A high-throughput screening platform has been established, along with the natural product libraries, to improve the throughput screening services and make the unique resources available to the domestic new drug R&D. Through the mutual collaboration over the past few years, the natural product libraries established more than 2,500 extracts, assisted in the completion of multiple screening projects, and found that the Nepenthaceae and the Musaceae exhibit biological activity against breast cancer, liver cancer, oral cancer, HBV, and influenza viruses, and may even be used in the COVID-19 research, boosting the energy of drug R&D domestically.



Partnership with the Institute of Molecular Medicine (IMM), NTHU for Cranial Nerve Repair Drugs R&D

The Institute of Molecular Medicine (IMM), National Tsing Hua University (NTHU), found in the research that the plant extract of Araceae can be used as a drug for the treatment and repair of cranial nerves, mainly to facilitate the axon regeneration of cortical neurons and hippocampal neurons after traumatic brain injury. Meanwhile, it also verified that the extract has no negative impact on the glial cells. In the future, we will apply for relevant patents with the hope to contribute to the health of humans around the world.

Drought-resistant Millet Research in Response to Extreme Changes Plan for GIAHS Application

Featuring drought tolerance and a short life cycle, millet is regarded as a food for famine relief, which has been more emphasized in the face of climate change impacts. KBCC started to work with the laboratory at the National Cheng Kung University (NCCU) and the cultural and creative group in Hualien in 2019 to analyze the millet provenances of Taiwanese tribes and preserve them in liquid nitrogen. The National Sun Yat-sen University partnered with KBCC for the in-depth collection, preservation, classification, research, and promotion of indigenous millet provenances in 2023. At present, taking the indigenous millets for example, there are more than 400 tribes in Taiwan, but

at least 300 tribes no longer grow millet anymore over the past century. The loss rate of provenances of the produce millet is over 75%. This project will apply for becoming one of the Globally Important Agricultural Heritage Systems (GIAHS) as well.



Cryopreservation in liquid nitrogen

Homecoming Project for the Indigenous Species of Lanyu (Orchid Island) Lanyu, formerly known for its orchids, has no orchid today.

KBCC collaborates with the National Museum of Natural Science, NMNS Foundation, Taipei Zoo, Endemic Species Research Institute, National Museum of Marine Biology and Aquarium, and Taiwan Forestry Research Institute for the feature botanical garden project at the Lanyu ecological base. With plants at the core for ecological research, experimental habitats were selected for relevant species to observe their subsequent development. At present, Nunyu Bletilla (Bletilla formosana (Hayata) Schltr. f. kotoensis (Hayata) T. P. Lin), Dendrobium miyakei, Tuberculolabium kotoense, and Vanda lamellata endemic to Lanyu and in danger of extinction are selected as priority species for restoration, with more than 4000 seedlings have been cultivated. Meanwhile, it is planned to open the natural history exhibition rooms of Lanyu and Xiaolanyu. With the exhibition rooms with specimens at the core, the residents, or the public, can appreciate the collections of natural history of animals, plants, fungi, and rocks on the islands.

KBCC plans to establish research stations and dormitories on Lanyu in the next 2-3 years for researchers to carry out basic works of specimen processing. In addition, simple dormitories shall be built to solve the issues of research supplies and accommoda-

tion. In order to promote the concept of sustainability, this project is connected with the Earth Helper campaign of TCC to replant the endangered orchids that have been successfully restored back to their original habitat, Lanyu, as another way to promote the concept of ecodiversity.



The Endemic Species of Pingtung “Pyrenaria buisanensis” Returns to Mother Earth
Seeds Academy & Endemic Insect Propagation Project of Taipei Zoo



For more information, please refer to P.62 and 63 of the 2022 TCC Sustainability Report



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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

4

FUTURE & PROSPECT

"We answer the call of Mother Nature with actions, abiding by the sustainable code of survival that enterprises are inseparable from life."

~Nelson An-ping Chang, Chairman



In 1990, the era of environmental protection awakening, TCC has been impacted and concerned, followed by the commitment to mitigating environmental impacts along the way. It actively took ecological conservation actions, aligned itself with international sustainable trends and biodiversity initiatives. Recently, TCC further joined platforms of relevant organizations and initiatives at home and abroad, learning, exchanging, and collaborating with the academic, environmental, and regional organizations.

Without nature, the goal of 1.5 degrees in the Paris Agreement will not be achieved. TCC deeply recognizes the significance of biodiversity to the sustainable survival and development of the human race. Through the assessment with the TNFD pilot framework, TCC examined itself, identified risks and opportunities related to biodiversity, continues to carry out more comprehensive conservation actions, and further extends to the value chain overall. Moving forward, with the official versions of TNFD and SBTN, TCC shall actively integrate the nature and climate goals to create more powerful action strategies for the environment.

TCC follows the "Kunming-Montreal Global Biodiversity Framework" of COP15, there are 23 short-term targets for 2030, which is in a decade from 2020, and 4 long-term goals for 2050 regarding biodiversity worldwide, TCC will continue to collect and monitor relevant biological and environmental data, expand the gene pool of KBCC, accumulate the soil research and experiments for the Ho-Ping Ark Ecological Program, and implement natural management measures; establish a system of mine restoration plans, develop carbon sinks of forests, seas, and soil, mitigate the impacts from the relevant industrial activities and operations of TCC on climate change and nature, and develop the natural areas under its management into "Other Effective Area-based Conservation Measure" (OECM) step by step, contributing to the conservations on land and below water and the 30x30 goal of CBD COP15. We seek to make good use of the resources of KBCC, provide new drug R&D and food crops that adapt to climate change, continue to communicate and collaborate with stakeholders, academic institutions, and initiative organizations, promote the restoration, protection, and sustainable use of biodiversity, and further the well-being of humanity.

Life is the most worthwhile matter.

There is still hope for life on Earth to create a nature, where they are protected and have a future. Action is the only answer.

*Nature is borderless, the Sun voiceless, and the wind shadowless.
Creation is flowless, fragrance colorless, and life priceless.
Benevolence is speechless, love demand-less, and cement formless.*

Zuo Ren, 2021

Appendix

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|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|
| Chairman's Address | Management Philosophy with Nature at the Core of TCC | TCC Nature Actions | Biodiversity Plans at TCC | Accumulated Achievements of TCC in Nature Conservation Projects | | 1-Nature Topic Strategies | 2-TNFD Pilot Program | 3-TCC Natural Conservation Development | 4-Future & Prospect | Appendix |
|--------------------|--|--------------------|---------------------------|---|--|---------------------------|----------------------|--|---------------------|----------|

Reference Tables



TNFD Framework v0.4 Reference Table

| TNFD General Requirements | |
|--|---|
| ITEMS | CONTENTS |
| Approach to materiality | <p>The organisation should set out its approach to materiality- aligning to external standards or regulatory requirements where appropriate - to help report users understand the context of the information being presented by the report preparer.</p> <p>CORRESPONDING SECTIONS</p> <p>1.1 Biodiversity Policy 1.2 Nature Governance Framework and Targets 2.1 Nature-related Risk and Opportunity Assessment Process</p> |
| Scope of disclosure | <p>The organisation should provide a description of the scope of the disclosures, both in terms of the coverage of the business and value chain, as well as which elements of the TNFD framework have been disclosed against, and plans to extend this scope in the future.</p> <p>CORRESPONDING SECTIONS</p> <p>About This Report TCC Nature Actions Accumulated Achievements of TCC in Nature Conservations Projects 2.1 Nature-related Risk and Opportunity Assessment Process 2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies 2.4 TNFD Pilot Process and Reviews 3.1 Status and Planning for the Focused Business Areas of TCC 3.3 Guardian of Life on Earth for Good - KBCC 4. Future & Prospect</p> |
| Consideration of nature-related issues | <p>The organisation should identify nature-related risks and opportunities based on an assessment of dependencies and impacts on nature.</p> <p>CORRESPONDING SECTIONS</p> <p>2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies</p> |
| Location | <p>The organisation should consider the specific locations of its interface with nature as integral to the assessment.</p> <p>CORRESPONDING SECTIONS</p> <p>About This Report Biodiversity Management Plans at TCC Achievements of TCC in Nature Conservation Projects to Date 2.1 Nature-related Risk and Opportunity Assessment Process 3.1 Status and Planning for the Focused Business Areas of TCC</p> |
| Integration with other sustainability issues | <p>The organisation's nature-related disclosures should consider, and be integrated with to the extent possible, other sustainability-related disclosures, including climate-related disclosures, with any alignment, contributions and possible trade-offs clearly identified.</p> <p>CORRESPONDING SECTIONS</p> <p>2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies 2.4 TNFD Pilot Process and Reviews 3.1 Status and Planning for the Focused Business Areas of TCC</p> |
| Stakeholder engagement | <p>The organisation should take consideration of stakeholder engagement into account across its disclosures.</p> <p>CORRESPONDING SECTIONS</p> <p>TCC Nature Actions Biodiversity Management Plans at TCC Achievements of TCC in Nature Conservation Projects to Date 1.3 Professional Partnerships and Initiatives 2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies 3.2 Stakeholder Engagement on Topics of Nature 3.3 Guardian of Life on Earth for Good - KBCC</p> |



| TNFD Recommended Disclosures | |
|------------------------------|---|
| ITEMS | CONTENTS |
| Governance | <p>Describe the board's oversight of nature-related dependencies, impacts, risks and opportunities.</p> <p>Describe management's role in assessing and managing nature-related dependencies, impacts, risks and opportunities.</p> <p>CORRESPONDING SECTIONS</p> <p>1.2 Nature Governance Framework and Targets</p> |
| Strategy | <p>Describe the nature-related dependencies, impacts, risks and opportunities the organisation has identified over the short, medium, and long term.</p> <p>CORRESPONDING SECTIONS</p> <p>2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies</p> <p>Describe the effect nature-related risks and opportunities have had and may have on the organisation's businesses, strategy, and financial planning.</p> <p>Describe the resilience of the organisation's strategy to nature-related risks and opportunities, taking into consideration different scenarios.</p> <p>CORRESPONDING SECTIONS</p> <p>2.3 Results of Nature-related Risks and Opportunities and Coping Strategies 2.4 TNFD Pilot Process and Reviews</p> <p>Disclose the locations where there are assets and/or activities in the organisation's direct operations, and upstream and/or downstream and/or financed where relevant, that are in priority areas.</p> <p>CORRESPONDING SECTIONS</p> <p>1.1 Biodiversity Policy 2.1 Nature-related Risk and Opportunity Assessment Process 2.2 Results of the Dependencies and Impacts on Nature Evaluation</p> |
| Risk & Impact Management | <p>Describe the organisation's processes for identifying and assessing nature-related dependencies, impacts, risks and opportunities in its direct operations.</p> <p>Describe the organisation's approach to identifying nature-related dependencies, impacts, risks and opportunities in its upstream and downstream value chain(s) and financed activities and assets.</p> <p>CORRESPONDING SECTIONS</p> <p>2.1 Nature-related Risk and Opportunity Assessment Process 2.2 Results of the Dependencies and Impacts on Nature Evaluation</p> <p>Describe the organisation's processes for managing nature-related dependencies, impacts, risks and opportunities and actions taken in light of these processes.</p> <p>CORRESPONDING SECTIONS</p> <p>2.1 Nature-related Risk and Opportunity Assessment Process 2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies</p> |

| ITEMS | CONTENTS |
|--------------------------|---|
| Risk & Impact Management | <p>Describe how processes for identifying, assessing and managing nature-related risks are integrated into the organisation's overall risk management.</p> <p>CORRESPONDING SECTIONS</p> <p>1.2 Nature Governance Framework and Targets</p> <p>Describe how affected stakeholders are engaged by the organisation in its assessment of, and response to, nature-related dependencies, impacts, risks and opportunities.</p> <p>CORRESPONDING SECTIONS</p> <p>TCC Nature Actions Biodiversity Management Plans at TCC Achievements of TCC in Nature Conservation Projects to Date 1.3 Professional Partnerships and Initiatives 2.2 Results of the Dependencies and Impacts on Nature Evaluation 2.3 Results of Nature-related Risks and Opportunities and Coping Strategies 3.2 Stakeholder Engagement on Topics of Nature 3.3 Guardian of Life on Earth for Good - KBCC</p> |
| Metrics & Targets | <p>Disclose the metrics used by the organisation to assess and manage material nature-related risks and opportunities in line with its strategy and risk management process.</p> <p>CORRESPONDING SECTIONS</p> <p>1.1 Biodiversity Policy 1.2 Nature Governance Framework and Targets</p> <p>Disclose the metrics used by the organisation to assess and manage dependencies and impacts on nature.</p> <p>CORRESPONDING SECTIONS</p> <p>1.1 Biodiversity Policy 1.2 Nature Governance Framework and Targets 2.2 Results of the Dependencies and Impacts on Nature Evaluation</p> <p>Describe the targets and goals used by the organization to manage nature-related dependencies, impacts, risks and opportunities and its performance against these.</p> <p>CORRESPONDING SECTIONS</p> <p>1.1 Biodiversity Policy 1.2 Nature Governance Framework and Targets 1.3 Professional Partnerships and Initiatives 2.4 TNFD Pilot Process and Reviews 3.1 Status and Planning for the Focused Business Areas of TCC 3.2 Stakeholder Engagement on Topics of Nature 3.3 Guardian of Life on Earth for Good - KBCC</p> |



Publications of Dr. Cecilia Koo Botanic Conservation Center




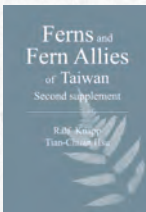
Asian Begonia 300 Species Portraits
http://www.kbcc.org.tw/tw/announce_newsArticle.html?id=387





Field Guide to the Plants of Solomon Islands
http://www.kbcc.org.tw/tw/announce_newsArticle.html?id=270




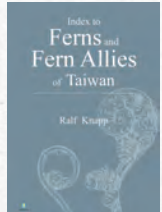
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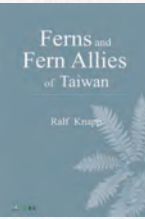
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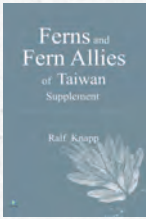
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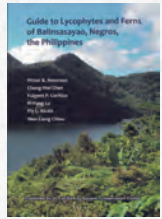
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The Wild Orchids of TAIWAN
An Illustrated Guide
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Guide to Lycopodiums and Ferns of Balinasayao, Negros, the Philippines
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