TCC Carbon Reduction Parent-Child Bankbook Social Impact Assessment Report

Abstract

Taking the "Carbon Reduction Parent-Child Bankbook" as a starting point, TCC has successfully extended carbon reduction education from campuses to families and communities, gradually constructing a cross-field, cross-generational sustainable co-learning network. The project launched as a pilot at Heping Elementary School in 2023 and expanded to Dong'ao Elementary School and the community of Heping in 2024, cumulatively reaching over 300 students, residents, and employees, demonstrating the enterprise's continuous commitment to promoting carbon reduction actions through education. **This project not only provides a practical model for sustainable education in rural areas but also embodies the deepening path of corporate citizenship in local action.**

Questionnaire results show that participants achieved high scores in all three dimensions of sustainability literacy: "Knowledge, Attitude, and Behavior." Among them, "I know what actions people do that make the Earth hotter" and "I think everyone should work together to protect the Earth" were the highest-scoring items in sustainability literacy, indicating that **the project has successfully strengthened students' causal understanding of human behavior and climate change, and promoted value recognition of group responsibility and joint action.** At the behavioral level, "turning off lights and saving energy" is the most common and continuously internalized action, symbolizing that educational intervention has transformed from cognition to concrete practice, forming an entry point for carbon reduction behavior.

The interview results correspond with quantitative trends; teachers universally observed that students could translate learning content into life actions, while parents believed that parent-child co-learning enhanced family interaction and a sense of shared responsibility. On the employee and community side, interviewees mentioned the enterprise's sincerity and long-term companionship in promoting education, gradually establishing trust and a sense of belonging. Overall, the project has formed a positive

cycle among campus—family—community, making carbon reduction no longer just an environmental slogan, but a learning action that continuously permeates daily life.

If the Carbon Reduction Parent-Child Bankbook project is to be continuously promoted and deepened in the future, it is recommended to continue optimizing "data design consistency," "pre- and post-test verification mechanisms," and "internalized incentive design." It is suggested to first use schools and elementary school students as the core field for 2-3 years of continuous promotion and modular verification, and after accumulating cross-year data, gradually expand to plant areas and communities. Through modular tracking and feedback mechanisms, educational impact can be presented quantitatively, shaping a human-centric path for sustainable transition. Ultimately, the Parent-Child Passbook is hoped to be not only a carbon reduction recording tool but also an important practical platform for promoting the enterprise, schools, and communities to move together towards a "Just Transition."

Highlights

Total Participants	**Over 300 students, parents, employees, and community members** connected over three years, forming a cross-field carbon reduction co-learning network.
Total Carbon Reduction	**A total reduction of 5.78 metric tons of** CO_2e across three fields, equivalent to the annual carbon absorption of about 480 trees, or the carbon emissions of a car traveling approximately 23,000 kilometers (about 20 trips around Taiwan island).
Impact Level of Carbon Reduction Literacy	● **Knowledge Aspect:** 84.4% of students can state which behaviors make the Earth hot. ● **Attitude Aspect:** 92.3% agree that "everyone should work together to protect the Earth" ● **Behavior Aspect:** 83.6% take initiative to save energy at home and school.
Impact of Practical Actions	Action implementation rate reaches 80%. The actions most frequently practiced by students and families are "saving electricity at home" and "energy-saving measures learned in class," **with 80% of respondents stating that air**

	conditioning settings are maintained at 26-28°C, becoming the most common lifestyle carbon reduction behavior.
Participant Feedback and Action Observation	**Cooperation and Trust:** From promotion to co-creation, trust allows actions to continue happening. **Education and Behavior Change:** Children drive families; knowledge transforms into action. **Feedback and Improvement:** Feedback drives improvement, forming a cycle of cross-field learning. **Motivation for Participation:** Moving from external encouragement to internal action, cultivating a culture of continuous participation.
IRIS+ × SDGs Indicator	IRIS+ Impact Theme: Access to Quality Education SDGs: SDG 4.7 (Quality Education) / SDG 13.3 (Climate Action Education)

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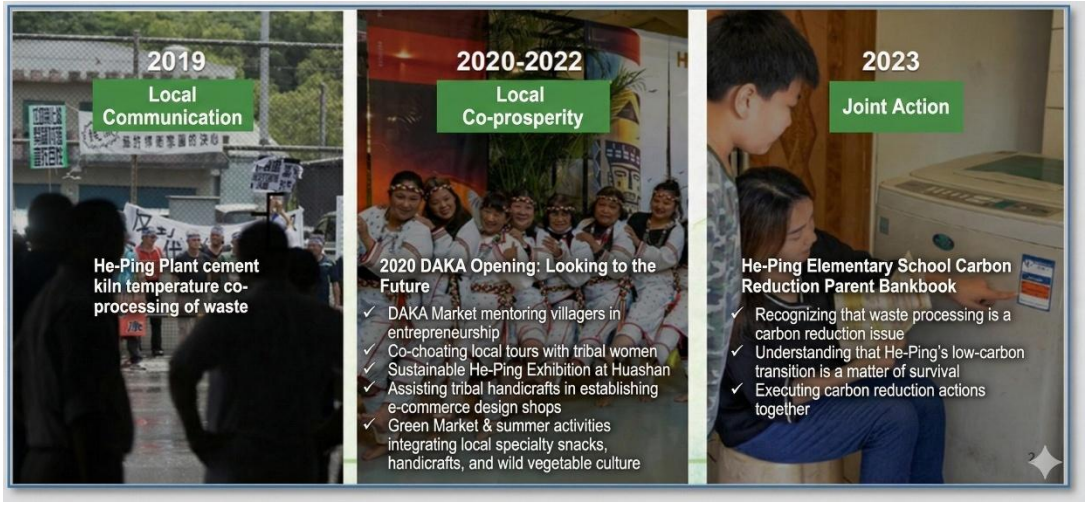
I. Foreword

Transmission and Dialogue

In the Ho-Ping Industrial Zone in Hualien, which is undergoing active transformation, we chose a dailylife approach like the "Carbon Reduction Parent–Child Bankbook" to walk into the tribes neighboring the industrial zone. We adopted **this approach not only to achieve knowledge popularization, but also to initiate dialogue efforts, conveying that net-zero emissions can help address global warming while ensuring the common well-being of all.** Although such efforts might seem like an extremely taboo direct conversation to many, we firmly believe that it is a necessary path for building trust and sustainable development.

--2025TCC Just Transition Report

As global climate change challenges become increasingly severe, environmental governance is no longer just a technical issue but also involves the equitable development and cultural heritage of communities. Against this backdrop, TCC promoted the "Carbon Reduction Parent-Child Bankbook Project," attempting to transform carbon reduction actions into common practices in local communities through parent-child co-learning and community participation, demonstrating a development process moving from environmental governance to community inclusion.



.The project originated from the controversy in 2019 when the TCC Heping Cement Plant faced issues regarding the high-temperature co-processing of waste. At that time, the focus was mainly on **"Local Communication," e**mphasizing environmental and technical solutions. With the promotion of the **"Local Shared Good"** concept from 2020 to 2022, through the establishment of the DAKA Cultural and Creative Park and market operations, TCC worked with tribal women to develop local tours, manage handicraft workshops, and operate green markets, gradually combining cultural preservation with sustainable practices. Entering 2023, the project moved towards the **"Joint Action" s**tage. Heping Elementary School took the lead in launching the "Carbon Reduction Parent-Child Bankbook," allowing students and families to understand the connection between waste treatment and carbon reduction, and to view carbon reduction as an important issue critical to community survival, thereby launching actual actions.

Through the innovative model of "parent-child co-learning," the project combines educational courses, practical activities, and incentive mechanisms to gradually strengthen the carbon reduction awareness and action capabilities of families and communities. This action not only focuses on environmental protection but also emphasizes promoting local co-learning and cooperation, enabling the sustainable transition to balance educational promotion, community participation, and cultural continuity, forming a practice model centered on local needs.

Introduction to TCC Parent-Child Carbon Reduction Passbook Project

TCC has promoted the "Carbon Reduction Parent-Child Bankbook" project since 2023, mainly implementing it in Heping Village, Hualien, and Dong'ao area, Yilan. The core concept of the project is to implement sustainable actions in daily life and, through the three dimensions of "knowledge dissemination, action experience, and community dialogue," gradually construct a multi-level promotion model spanning schools, families, and communities.

The project started with a pilot of 85 parent-child pairs at Heping Elementary School, expanded to 54 parent-child pairs at Dong'ao Elementary School in 2024, and further extended to the joint participation of over 300 villagers in the Heping area and

employees of the TCC Heping Plant; this represents an evolution from a single-school pilot to multi-region promotion. In the process, an innovative "Carbon Coin Redemption Mechanism" was introduced, combining corporate resources with community needs, which not only encourages carbon reduction behaviors but also enhances residents' sense of participation. At the same time, the project integrates local cultural characteristics, deepening residents' identification and connection with environmental issues through community activities such as DAKA Market, Flying Fish Festival, and Village Sports Meet.

This project not only sows the seeds of carbon reduction among children and families but is also dedicated to establishing a long-term community symbiosis model, making "waste reduction, resource recycling, and energy saving/carbon reduction" gradually become the daily life of Heping and Dong'ao areas. Ultimately, **through the joint effects of school education, family practice, and corporate support, with the community of shared destiny and stakeholders as the inter-subjective core of action,** a positive cycle of sustainable development involving the tripartite cooperation of the enterprise, employees, and community is formed.

Field	2023 Heping Elementary School	2024 Dong'ao Elementary School	2024 Heping Plant Area
Briefing Execution Purpose	We hope to transform together with the surrounding settlements; however, the seeds of concepts originate from children. Through the (Heping Carbon Reduction Parent-Child Bankbook) project, we expect to jointly invest in daily carbon reduction habits such as waste reduction, resource recycling, and energy saving in Heping Village, cultivating a life attitude of cherishing	The Carbon Reduction Parent-Child Bankbook is a tool that combines the forces of education, family, enterprise, and society to help children of the carbon generation face critical survival issues, establishing sensitivity to carbon issues from a young age, and cultivating the "carbon competitiveness" needed for the future job market.	By integrating local characteristics and living culture to develop localized courses, we hope to convey carbon reduction issues to the community more effectively. At the same time, we are dedicated to strengthening the understanding of local colleagues in the plant area regarding the company's carbon reduction development, thereby expanding the recognition of TCC's carbon reduction commitment in the

	resources and environmental sustainability.		communities surrounding the factory, forming a virtuous cycle of the enterprise, employees, and community jointly promoting sustainable development.
Participant	85 students of Hualien Heping Elementary School and their 60 parents	54 students of Yilan Dong'ao Elementary School + 1 transfer student, and their 37 parents	About 112 local colleagues of Heping Port/Power Plant, about 40 members of Heping and Hezhong Tribal Mothers' Classroom
Duration	1st：2023/3-6 2nd:2023/9-11	2024/03/01-06/03	2024/3-10
Partner	The Society of Wilderness, ecoco	Marine Education Counseling	Good Plastic Cycle Vehicle (FNG), Hualien County Environmental Tableware Vehicle

In this report, we incorporate the IRIS+ international standards and the IOOI logic model to conduct an in-depth analysis of the impact of the Carbon Reduction Parent-Child Bankbook project. Utilizing quantitative questionnaires and qualitative interviews, this final research report explores how the project has induced changes in the dimensions of sustainability literacy—knowledge, attitude, and behavior—across various fields and stakeholders. It further presents the overall benefits in educational promotion, family practice, and community symbiosis, illustrating the project's educational effectiveness and social impact, and provides suggestions for future optimization.

II. Questionnaire Survey

Basic Explanation of Questionnaire Survey

The first part of the questionnaire covers basic data, mainly collecting background information such as the student's grade, gender, and ethnicity. These data help us understand the distribution of respondents and allow for further comparison of differences between different grade ages, gender groups, or ethnic groups in

subsequent analyses. By mastering these basic variables, we can more clearly observe the effectiveness and impact of the project among different subjects.

The second part focuses on participation and preferences regarding carbon reduction actions. The design of this part covers both "past participation behaviors" and "future action intentions," hoping to examine the connecting effect of the project on knowledge transmission and attitude transformation through longitudinal comparison over time. The questionnaire first asks respondents if they have participated in carbon reduction courses or activities promoted by TCC to understand the project's reach and penetration; then, the item design extends to daily family life, such as whether they turn off lights to save power at home, reduce the use of disposable items, or adopt other low-carbon behaviors, to assess whether educational activities have diffused and influenced the family level. Finally, the questionnaire includes questions on "future participation preferences," asking respondents to prioritize among multiple activity options, such as waste reduction beach cleanup experiences, DIY plastic reduction actions, or recycling machine promotion. This arrangement not only examines the current implementation of actions but also provides reference directions for organizers when planning future activities, ensuring that future activity design and resource allocation better meet needs and interests.

The last part of the questionnaire, the Carbon Reduction Literacy Questionnaire, covers three dimenstions: Knowledge, Attitude, and Behavior. The knowledge dimension focuses on whether students understand the basic concepts of carbon reduction and climate change; the attitude dimension focuses on their value judgment of the importance of carbon reduction and their sense of responsibility; the behavior dimension examines whether students are willing and able to continuously implement relevant actions in their daily lives. The overall framework emphasizes the progression of literacy from **establishing knowledge (Sprouting_Knowing why), assuming attitude (Consensus_Wanting to do it), to changing behavior (Action_Really doing it)**, and behavioral change and implementation are also the final measurement indicators of educational effectiveness, usually observed through self-reporting or behavior tracking surveys.

Questionnaire Design Explanation

The carbon reduction literacy questionnaire designed in this study takes the three dimensions of Knowledge, Attitude, and Behavior as its core structure. The overall framework primarily inherits the KAP/KAB model commonly used in public health and environmental education (Kaiser & Fuhrer, 2003) and combines core literacy perspectives in the field of sustainable education (McBride et al., 2013; Goldman et al., 2006), as well as the empirical validation of sustainability literacy constructs in Karimi (2024) "Measuring Sustainability Literacy: Scale Development and Validation," establishing the theoretical basis and measurement reliability and validity of the questionnaire design.

In addition, this study further references UNESCO (2017) "Education for Sustainable Development Goals: Learning Objectives" and the sustainable education competency model proposed by Wiek, Withycombe, and Redman (2011), corresponding the three dimensions to "Systems Thinking," "Values Thinking," and "Action Competence," respectively.

In terms of item design, **the knowledge dimension contains four questions, measuring from shallow to deep whether students recognize the "Earth heating up" phenomenon, understand anthropogenic causes, and can propose solutions and explain them; the attitude dimension contains three questions, sequentially measuring students' sense of responsibility, group consensus, and values internalized in life; the behavior dimension is designed with three questions, focusing on personal habits, group cooperation, and consumption choices.** Through this framework, the questionnaire can demonstrate the sequential process of students' carbon reduction literacy from "establishing knowledge → assuming attitude → changing behavior," possessing both educational theory and practical implications for behavioral change.

Dimension	Carbon Reduction Literacy Items	Measurement Focus	Purpose
Knowledge	I know what it means that the Earth has become hot.	Basic Concepts	Whether students can identify the phenomenon of "global warming/climate change" itself.
	I know what actions people do that make the Earth hotter.	Causal Linkages	Whether students can link the causal relationship between human activities and the Earth heating up.
	I know that if everyone saves electricity and drives less, the Earth won't keep getting so hot.	Action and Impact	Whether students understand that behavioral change can have a positive impact on climate change.
	"Why is the Earth getting hotter?" I can answer why.	Knowledge Integration and Expression Ability	Whether students can explain the causes of climate change in language, rather than just having fragmented concepts.
Attitude	I think everyone should learn how to help the Earth cool down a bit.	Sense of Responsibility	Whether students believe that learning how to respond to climate issues is an ability that everyone should possess.
	I think everyone should work together to protect the Earth.	Value Consensus on Joint Action	Whether students believe that every single person should participate in action and view protecting the Earth as a shared responsibility.
	I think it is very important not to waste electricity.	Value Recognition of Concrete Behaviors	Whether students have strong value recognition for specific energy-saving behaviors in daily life (e.g., turning off lights, saving power).
Behavior	I turn off lights and air conditioners at home or school to help save electricity.	Personal Daily Energy-Saving Habits	Whether students can develop self-disciplined behaviors of saving energy in their daily lives.
	I will save electricity and do recycling well together with my family or classmates to protect the Earth.	Group Cooperation Behavior	Whether students have behavioral experience in joint practice, extending sustainable behaviors to family and peer cooperation.
	When I go shopping with my family, I look for the Green Footprint or energy-saving labels.	Consumer Choices and Long-term Behavior	Whether students have internalized sustainable consciousness into "consumption decisions" and can identify and select environmentally friendly products.

III. Impact Assessment Methods and Stages

Impact Assessment Method (1): IRIS+ (Impact Reporting and Investment Standards)

The Global Impact Investing Network (GIIN) defines impact investing as: "Investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return." On this basis, GIIN constructed the Impact Reporting and Investment Standards (IRIS+) as a universal and standardized impact measurement tool, which corresponds with the United Nations Sustainable Development Goals (SDGs).

IRIS+ has the following features:

- Standardization and Transparency: Provides complete performance metrics, disclosure frameworks, and rules, making the social and environmental benefits of different projects comparable.
- Theme-oriented: Proposes clear measurement methods targeting Impact Categories, Impact Themes, and Strategic Goals.
- Five Dimensions: Combines the Impact Management Project (IMP), covering Who (Stakeholders), What (Outcome), How Much (Scale/Depth), Contribution, and Risk.

Figure 1: Illustration of classification hierarchy

According to research published by GIIN in 2023, 76% of investors rely on SDGs to set impact strategies, with 78% using IRIS+ as their primary measurement tool. Therefore, IRIS+ has become the most widely used impact investment measurement system globally, providing a basis for transparency, credibility, and measurability for corporate social investment or public welfare projects.

IOOI Impact Assessment Method (2): IOOI

According to the "Social Reporting Standard (SRS)," the IOOI model is a logical impact assessment tool used to present how a project gradually generates actual social impact through resource input. Its structure includes:

- **Input:** Resources invested by the organization, including finance, manpower, time, and materials.
- **Output:** Activities, services, or products directly generated by inputs.
- **Outcome:** Short-term, medium-term, or long-term changes occurring in beneficiaries or social groups due to outputs.
- **Impact:** The ultimate social benefit of the outcomes, usually involving broader, long-term systemic changes.

SRS emphasizes that IOOI is not only a logical framework but also a communication tool that enables organizations to clearly express their social impact and supports subsequent data collection, performance measurement, and transparent disclosure36.

Impact Assessment Stages

This impact assessment report adopts the Impact Reporting and Investment Standards (IRIS+) and combines the IOOI logical model (Input-Output-Outcome-Impact) to construct a complete Impact Frame. In terms of specific research design, the impact assessment framework of this report integrates the following four stages:

1. **Focus Action**

   Clarify the project from the IRIS+ standards: **Core problem "What" (describing the problem the public welfare project aims to solve), action "Purpose" (explaining the strategic goal of the public welfare project), and impact target "Who" (description of stakeholders),** clearly defining the social or environmental challenges to be responded to

2. **Focus Metrics**

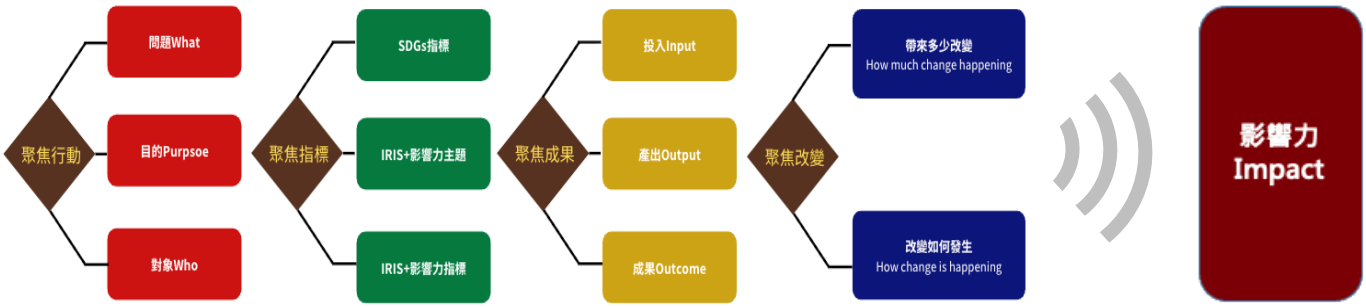
Correspond to international and sustainable standards, including: **SDGs goals (how to map to SDGs indicators), IRIS+ Impact Themes (selecting IRIS+ themes and strategies), and IRIS+ Codes (selecting impact indicators),** ensuring project performance is measurable and aligned with global trends.

3. Focus Outcomes

Based on the IOOI model, covering: **Input (resources invested in the plan or project), Output (tangible performance generated by the project), and Outcome (focusing on the results demonstrated by the project)**, presenting the actual changes brought about by the project.

4. Focus Changes

Finally, further analyze the: **extent of change (How much change happening) and the process of change (How change is happening)** facilitated by the project, connecting to the final impact framework presentation, and ultimately establishing a new complete process including management, execution, and evaluation to build a complete impact thinking logic link.



Synthesizing the above stages, this research method can effectively measure the impact of TCC's "Carbon Reduction Parent-Child Bankbook" project in dimensions such as educational promotion, sustainability literacy, sustainable behavior change, and community sustainable transition, providing quantitative and qualitative evidence compliant with international standards to support subsequent sustainable action planning.

IV. Impact Analysis

Phase 1: Focus Action

WHAT
From 2019 Local Communication -> 2020-2022 Local Shared Good -> 2023 Joint Action, continuously advancing on the path of Just Transition.
1. What problem is currently being solved? • Students and families in Heping Village, Hualien, and Dong'ao area, Yilan, lack climate change education and practical carbon reduction experience. • Community residents have insufficient awareness of carbon reduction issues and lack systematic environmental actions. 2. What is the scale/severity of the problem? • Climate change has become a survival issue that children of this generation must face; children born in the 2020s have a remaining lifetime carbon budget of only 34 tons. • Indigenous children have less exposure to carbon issues and sustainability-related content, requiring introductory education. 3. What is the impact of this problem on target stakeholders? • Affects the cultivation of the next generation's environmental adaptability and "carbon competitiveness." • Relates to the community's overall ability to transition towards sustainable development.
PURPOSE
1. What is the strategic goal? • To establish a systematic carbon reduction lifestyle mode through educational courses, practical activities, and incentive mechanisms. • To strengthen community participation by integrating local characteristics (DAKA Market, Flying Fish Festival, Village Sports Meet). • Carbon Reduction Parent-Child Bankbook moves from Level 1: Knowledge Dissemination -> Level 2: Action Experience -> Level 3: Community Dialogue. 2. What conditions are hoped to be achieved?

- To cultivate carbon reduction habits in students and families, enhancing environmental awareness and practical ability.
- To establish a sustainable community carbon reduction behavior mode and create concrete carbon reduction results.
- Transmission and Dialogue.

3. What is the importance of the results to target stakeholders?
   - Cultivating "carbon competitiveness" needed for the future job market.
   - Promoting recognition and participation of communities surrounding the factory in TCC's carbon reduction development.

WHO	
IRIS+ Code	Target Stakeholders (OD7212), Demographics (OD5752), Socioeconomics (PD2541), Regional Setting (PD6384), Geography (PD6424)

1. **Target Stakeholders (ST.) (OD7212)**: Main targets the project hopes to reach
   - 2023 Heping: 85 elementary students and 60 parents.
   - 2024 Dong'ao: 54 elementary students + 1 transfer student and 37 parents.
   - **2024 Heping Expanded** Version: 112 employees of the Port/Power Plant, 40 members of Tribal Mothers' Classroom.

   Main stakeholders of the three projects: 2023 Heping and 2024 Dong'ao are elementary school students; 2024 Heping Expanded Version are employees and Tribal Mothers' Classroom, who are also community residents.

2. **Target Stakeholders' Demographics (OD5752)**: Age, gender, race/ethnicity/minority status of main subject
   - 2023 Heping: 85 students

Grade Distribution		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
		1	17	17	15	19	16
Gender Distribution	Male	1	9	9	8	8	8
	Female	0	8	8	7	11	8
		Male: 43 (50.6%) / Female: 42 (49.4%)					
Ethnicity		Mainly residents in areas clustered with Truku people					

   - 2024 Dong'ao: 55 students

Grade Distribution		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
		6	11	8	6	9	14
	Male	2	4	1	2	6	3

Gender Distribution	Female	4	7	7	4	3	11
		Male: 18 (32.7%) / Female: 37 (67.3%)					
Ethnicity		Mainly residents in areas clustered with Atayal people (Dong'ao Village, Dongyue Tribe)					

- **2024 Heping Expanded** Version: 112 Port/Power Plant employees, 40 Tribal Mother' members, total 152 people.

Distribution	Heping Plant	Ho-Sheng	Ho-ping power plant	Hezhong Tribal Mother' members	**Hezhong T**ribal Mother' members
	68 (44.7%)	38 (25%)	6 (3.9%)	19 (12.5%)	21 (13.8%)
Residency Distribution:	Most employees' household registrations are concentrated in Heping Village surrounding the TCC plant area (120 people, 78.9%) and Hezhong Village (25 people, 16.4%), with 7 people (4.6%) in other areas, indicating that most employees are local residents, which helps in deep connection between the enterprise and the community.				

3. **Target ST. Socioeconomics (PD2541):** Socioeconomic group - Low income - Lower-middle income - Middle-upper income - Other
   - Community groups mainly consisting of indigenous tribal families, local employees of TCC plant area and their families.
   - This item was not statistically recorded.
4. **Target ST. Regional Setting (PD6384):** - Rural - Urban - Peri-urban
   - Hualien Heping Village, communities around Hezhong Village, Yilan Dong'ao Elementary School and Dongyue Tribe area.
   - Regional setting is Rural.
5. **Target ST. Geography (PD6424)**
   - Heping Village, Xiulin Township, Hualien County (surrounding TCC Heping Plant)
   - Dong'ao Village, Nan'ao Township, Yilan County (service area of TCC Su'ao Plant)

Phase 2: Focus Metrics

SDGs	
Targets	SDG 13.3, SDG 4.7

Impact Measurement and Management (IMM) is a standardized framework developed by the UN Sustainable Development Goals (UN SDGs) system, used to assess and manage the changes and contributions generated by an organization in the process of achieving sustainable development goals. This method emphasizes starting from the core business of the enterprise and ensuring through an analytical process that the selection of SDGs targets is consistent with corporate strategy or project goals.

1. Define Corporate Purpose and Key Goals

The project sets the core purpose of "cultivating carbon generation competitiveness and promoting carbon reduction transition in communities surrounding the plant," responding to TCC's original intention of building the low-carbon environmental park (DAKA) in Heping: to transform together with surrounding settlements and hoping to achieve the goal of transmission and dialogue.

2. Assess the Importance of Sustainability Impact Issues Related to Own Business:

Identify insufficient climate change education and weak community carbon reduction awareness as key issues. The project focuses on: the core problem of "carbon reduction education and behavior change" (WHAT) and "students of Hualien Heping Elementary and Dong'ao Elementary, Port/Power Plant employees, and Tribal Mothers' Classroom members" as target stakeholders (WHO).

3. Map to SDGs:

Set SDG 13.3 (Improve education and awareness on climate change) and SDG 4.7 (Education for sustainable development) as two targets.

SDG Target	Definition	Project Mapping
 Improve education, awareness-raising	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.	Carbon Reduction Parent-Child Bankbook corresponds by: Through carbon reduction education course design, including global warming cognitive courses, energy-saving and carbon reduction practical teaching, and resource recycling workshops, directly enhancing participants' understanding and response capabilities to climate change. Through a quantified carbon coin incentive mechanism, abstract carbon reduction concepts are transformed into concrete and tangible motivations for behavioral change, realizing the educational goals of "mitigation, adaptation, impact reduction, and early warning".
 Education for Sustainable Development	Before 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.	Carbon Reduction Parent-Child Bankbook corresponds by: Through the parent-child co-learning model and combining local characteristic activities (such as DAKA Market, Flying Fish Festival, Village Sports Meet), the project not only cultivates students' environmental literacy but also promotes the transmission of sustainable values in families and communities. Expanding from 85 parent-child pairs in 2023 to a participation scale of 300 villagers in 2024 demonstrates the diffusion effect of education for sustainable development, realizing cross-generational and cross-community cultivation of sustainable knowledge and skills.

IRIS+ Impact Theme		
Impact Category	**Impact Theme**	**Strategic Goal**
Education	**Access to Quality Education**	**Improving Equitable Access to Education and Learning for All**

1. Impact Category

Education aims to provide inclusive and quality education and promote lifelong learning opportunities for all learners.

2. Impact Theme: **Access to Quality Education**
   - According to the IRIS+ definition, Access to Quality Education emphasizes ensuring inclusive, equitable, and effective educational opportunities at all learning levels. **It echoes SDG 4 Quality Education**, focusing on improving the "accessibility" and "quality" of education, especially targeting barriers such as geographic gaps, economic burdens, resource allocation, and teacher capacity. This theme not only focuses on the expansion of educational resources but also emphasizes the improvement of learning outcomes, skill cultivation, and promoting the ability of individuals to continue developing in a rapidly changing society.
   - Carbon Reduction Parent-Child Bankbook can be classified under this impact theme because it integrates climate education into daily life, helping students and families acquire sustainable knowledge and practical skills. Through campus promotion and interactive tool design, this project specifically responds to the challenge of limited educational resources in rural areas, reducing the learning gap in environmental literacy. It not only enhances students' self-learning abilities but also establishes a sustainable culture in families. The approach of **balancing educational equity and climate awareness**s corresponds to the core spirit of the IRIS+ Access to Quality Education theme.

3. Strategic Goal: **Improving Equitable Access to Education and Learning for All**
   - This strategic goal aims to ensure that all children and youth have equitable access to quality education by eliminating gender disparities in educational outcomes, improving data and evidence collection on different dimensions of equity, and supporting the needs of children with disabilities and disadvantaged populations. This goal recognizes that a large number of disadvantaged and marginalized children globally are still excluded from the education system, where factors such as poverty, geography, gender, race, and language ability directly affect children's educational opportunities and learning outcomes. Therefore, equity-oriented education planning must consider multiple factors affecting children's starting conditions and educational progress, and provide

targeted support measures to compensate for the negative impacts of these unfavorable factors on learning outcomes, ultimately achieving true educational equity and an inclusive learning environment.

- Although the IRIS+ strategic goal of "Improving Equitable Access to Education and Learning for All" mainly focuses on the educational rights of children and youth, the design concept of the Carbon Reduction Parent-Child Bankbook project extends the scope of this concept. Through the parent-child co-learning model, the project extends educational subjects to parents, community residents, and enterprise employees, embodying the inclusive education concept of "learning for all." Adult residents in indigenous tribal areas also face difficulties in accessing environmental education resources, and while TCC plant employees have stable jobs, they still have learning needs regarding sustainable development knowledge. The project breaks traditional age limits in education, allowing TCC employees, Tribal Mothers' Classroom members, and villagers to participate equally in carbon reduction education, realizing true "lifelong learning" and "education for all." This cross-generational, cross-occupational education model is the precise embodiment of the core spirit of "Learning for All" in the IRIS+ strategic goal.

IRIS+ Metrics

IRIS+	Code	Definition
Greenhouse Gas Emissions Mitigated	OI5951	Amount of greenhouse gas (GHG) emissions mitigated by the organization during the reporting period, including GHG emissions reductions from both direct and indirect sources.

Client Individuals: Total	PI4060	Number of unique individuals who were clients of the organization during the reporting period.
Client Households: Total	PI7954	Number of unique households that were clients of the organization during the reporting period.
Value of Community Development Contributions	OI1619	Value of payments made by the organization during the reporting period towards activities that benefit local communities.
Stakeholder Engagement	OI7914	Describes the mechanisms in place to gather input from stakeholders on product/service design, development, and delivery.
Importance of Outcome to Stakeholders	OI5495	Describes the value or importance of the outcome being sought by the intervention or investment from the perspective of those affected during the reporting period.
Target Stakeholders	OD7212	Describes which entities the organization seeks to benefit through its products, services, and operations as of the end of the reporting period.
Target Stakeholder Demographic	PD5752	Describes the demographic groups of stakeholders targeted by the organization.
Target Stakeholder Socioeconomics	PD2541	Describes the socioeconomic groups of stakeholders targeted by the organization as of the end of the reporting period.
Target Stakeholder Setting	PD6384	Describes the setting of the groups of stakeholders targeted by the organization. Select all that apply
Target Stakeholder Geography	PD6424	Describes the geography of stakeholders targeted by the organization, expressed by country, as of the end of the reporting period.

Phase 3: Focus Outcomes

INPUT	
IRIS+ Code	Value of Community Development Contributions (OI1619)
This metric is intended to capture the value of contributions made with the intent to benefit local communities.	
Input refers to the various resources invested in a plan or project to support the design and execution of activities. These input resources are the foundation for subsequent Output and Outcome. Major types of Input include: • **Financial Resources**: Project funds, grants, sponsorships, material procurement expenditures, etc.	

- **Human Resources:** Employee hours, project teams, volunteers, external consultants or lecturers, etc.
- **Material Resources:** Teaching materials, equipment, venues, environmental materials, redemption gifts, etc.
- **Organizational/Managerial Capital:** Management systems, project planning ability, administrative coordination, cross-departmental cooperation, information systems.
- **Time Commitment:** Time required for project design, preparation, execution, and subsequent evaluation.
- **Partnership & External Contributions:** Support provided by partner units or communities, such as NGOs, local associations, government resources, or community volunteers.

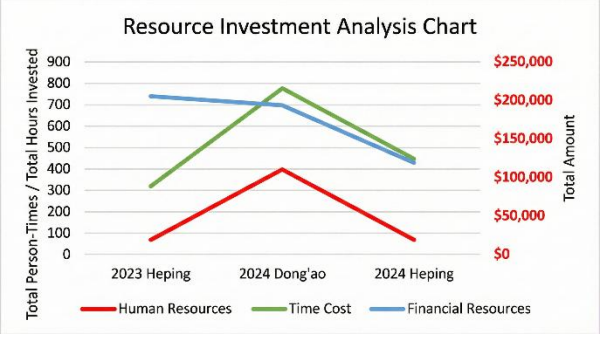
	Financial Resources	Human Resources	Time Commitment	Partnership & External Contributions
2023 Heping	NT$ 205,000	70/ person-times	317 hours	The Society of Wilderness, ecoco
2024 Dong' ao	NT$193,360	401/person-times	778.5 hours	Marine Education Counseling Group
2024 Heping	NT$119,752	68/ person-times	446 hours	Good Plastic Cycle Vehicle (FNG), Hualien County Environmental Tableware Vehicle

Dual Y-Axis Line Chart

- Left Y-axis (Gray): Presents "Total Input Headcount" and "Total Input Hours."
- Right Y-axis (Red): Presents "Total Amount."

Input Analysis:

- 2023 Heping: Highest "Amount" (205,000 TWD), but relatively lower headcount and hours, belonging to a high-budget, small-scale pilot.
- 2024 Dong'ao: Peaks in both "Headcount" and "Hours," indicating the largest scale.
- 2024 Heping: Lowest amount (119,752 TWD), but hours (446 hours) and headcount (68) are in the middle, indicating it is a more precise small-scale project .



OUTPUT / Activities

2023 Heping

March Knowledge Month: Waste reduction leads to carbon reduction	April Action Month: Saving electricity at home also leads to carbon reduction	May Challenge Month: Finding the Carbon Reduction Green Footprint	June Glory Month: Birth of the Carbon Reduction King
• Parent-Teacher Association Publicity Course (Global warming, understanding carbon emissions, Carbon Reduction Parent-Child Bankbook teaching) • Energy Saving and Carbon Reduction Love the Earth Course (Taught by The Society of Wilderness, implemented by grade) • I Am the Best at Saving Energy (Comparing electricity bills, awarding Carbon Coins based on electricity reduction) • Car-free Day (Wednesdays) (Motor vehicles prohibited within 350 meters of campus) • Lunch "Clean Plate" Zero Food Waste (Registration earns Carbon Coins)	• Sustainable Marine Fish-Eating Education Course (Taught by Yilan Marine Education Counseling Group, paired with Flying Fish Festival) • World Earth Day Activities (4/20-22): FNG Good Plastic Cycle Vehicle recycling activity (Exchanging PET bottles for Carbon Coins) • Car-free Day (Wednesdays) (Ongoing) • Lunch "Clean Plate" Zero Food Waste (Ongoing) • I Am the Best at Saving Energy (Ongoing)	• Waste Reduction and Carbon Reduction—Silver Grass (Leucaena) Removal Course (TCC Su'ao Plant + Visiting the crushing area) • Off-campus Teaching Visit to Su'ao Plant (Combined with Silver Grass project) • I Am the Best at Saving Energy (Settlement month, collecting electricity bills) • Car-free Day (Wednesdays) (Ongoing) • Lunch "Clean Plate" Zero Food Waste (Ongoing)	• Results Presentation Month Activities (Carbon reduction results display: paintings, essays, poems, etc.) • 6/28 Graduation and Commendation Ceremony (Carbon Reduction King awarding, prize redemption)

2024 Dong’ao

March Warm-up Month: Energy Saving and Carbon Reduction Love the Earth	April Heritage Month: Sustainable Marine Fish-Eating Education	May Challenge Month: Waste Reduction and Carbon Reduction	June Results Month
• Parent-Teacher Association Publicity Course (Global warming, understanding carbon emissions, Parent-Child Bankbook teaching)	• Sustainable Marine Fish-Eating Education Course (Taught by Yilan Marine Education Counseling Group, paired with Flying Fish Festival)	• Waste Reduction and Carbon Reduction—Silver Grass (Leucaena) Removal Course (TCC Su'ao Plant + Visiting the crushing area)	• Results Presentation Month Activities (Carbon reduction results display: paintings, essays, poems, etc.)

• Energy Saving and Carbon Reduction Love the Earth Course (Taught by The Society of Wilderness, implemented by grade) • I Am the Best at Saving Energy (Comparing electricity bills, awarding Carbon Coins based on electricity reduction) • Car-free Day (Wednesdays) (Motor vehicles prohibited within 350 meters of campus) • Lunch "Clean Plate" Zero Food Waste (Registration earns Carbon Coins)	• World Earth Day Activities (4/20-22): FNG Good Plastic Cycle Vehicle recycling activity (Exchanging PET bottles for Carbon Coins) • Car-free Day (Wednesdays) (Ongoing) • Lunch "Clean Plate" Zero Food Waste (Ongoing) • I Am the Best at Saving Energy (Ongoing)	• Off-campus Teaching Visit to Su'ao Plant (Combined with Silver Grass project) • I Am the Best at Saving Energy (Settlement month, collecting electricity bills) • Car-free Day (Wednesdays) (Ongoing) • Lunch "Clean Plate" Zero Food Waste (Ongoing)	• 6/28 Graduation and Commendation Ceremony (Carbon Reduction King awarding, prize redemption)

2024 Heping Expanded

Jan-Mar: Preparation and Warm-up	April: World Earth Day Series	May: Heping Village Sports Meet	Jun-Sep: Power Saving Action Oct: Results
• Carbon Coin Redemption Reset to Zero (Before Feb 29, all Carbon Coins from the previous period must be fully redeemed) • 3 Briefing Sessions (Warm-up Month) - Heping Port & Power Plant Employee Briefing- Heping Mama Classroom Session- Hezhong Mama Classroom Session • Waste Reuse Course - Old clothes recycling and reuse (Heat insulation pad DIY, 98 Li Zuo x Taiwan Jing Hao)-	• World Earth Day DAKA Waste-Free Market (Apr 19-21) - Stall owner experience (Parent-child groups priority)- NGO-FNG Good Plastic Cycle Vehicle (PET bottle recycling)- Second-hand item exchange, resource regeneration stalls	• Hualien County Government Environmental Tableware Vehicle Entry - Encourage using eco-friendly tableware to replace disposable tableware to earn Carbon Coins	• Energy Saving and Carbon Reduction Course (June, taught by The Society of Wilderness Hualien Chapter) • Home Energy Saving Battle (July-Aug, submit electricity bills in Sept for registration) • Results Presentation

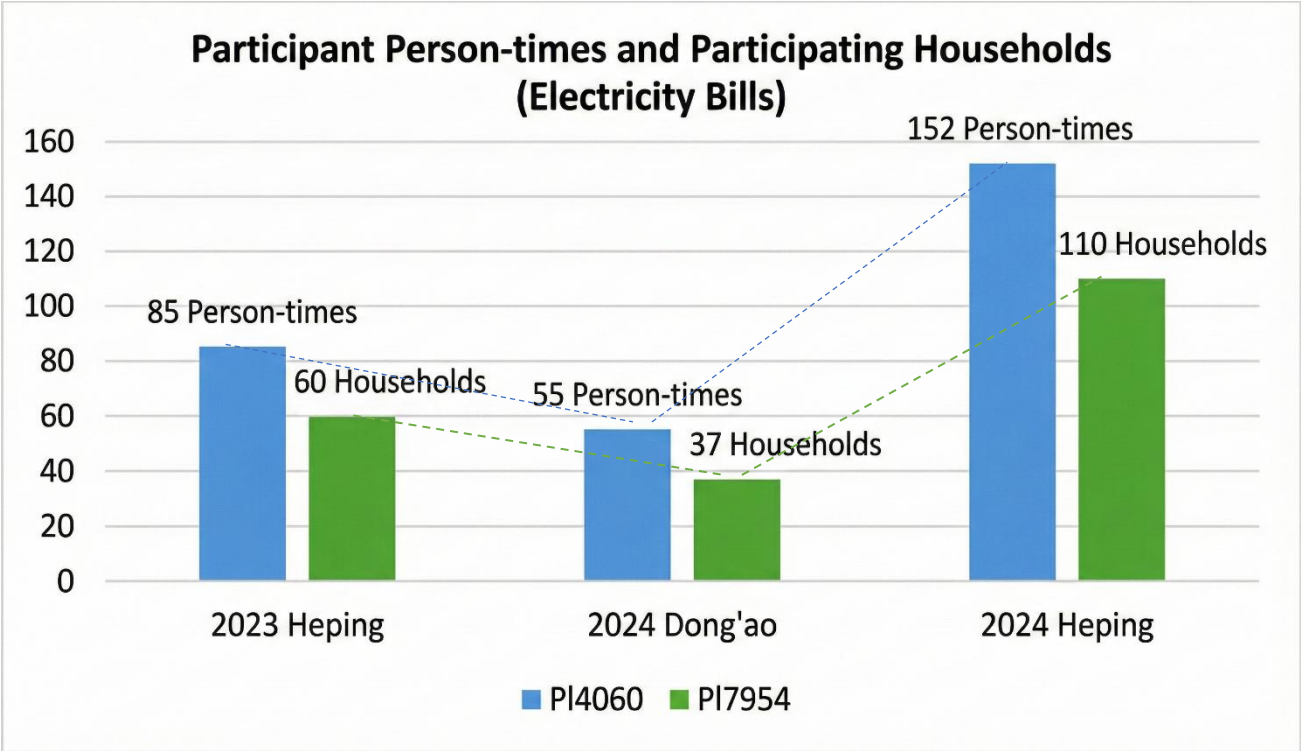
Waste cooking oil reuse (Making household soap, Tai Sheng Li) • Carbon Reduction Course (Understanding global warming and Parent-Child Bankbook)			

OUTPUT	
IRIS+ Code	Client Individuals: Total (P14060), Client Households: Total (P17954)
Count of client individuals/households served by the project during the reporting period.	

Output refers to the "tangible results" directly produced by activities or services after a plan's Input.

- It is usually a project activity result that is quantifiable and observable in the short term. For example, how many workshops were held, how many participants, how many teaching materials were distributed .
- Output is not the final social or environmental change (that is Outcome/Impact), but the products, services, or direct activity results provided by the project to the beneficiaries.

	Client Individuals: Total (P14060)	Client Households: Total (P17954)
2023 Heping	85 students	60 parents (60 households)
2024 Dong’ ao	55 students	37 parents (37 households)
2024 Heping Expanded	112 employees, 40 Hezhong moms	110 households



Bar Chart (Blue = Headcount, Green = Number of Households) Line Chart (Blue Dashed Line = Headcount Trend, Green Dashed Line = Household Trend)

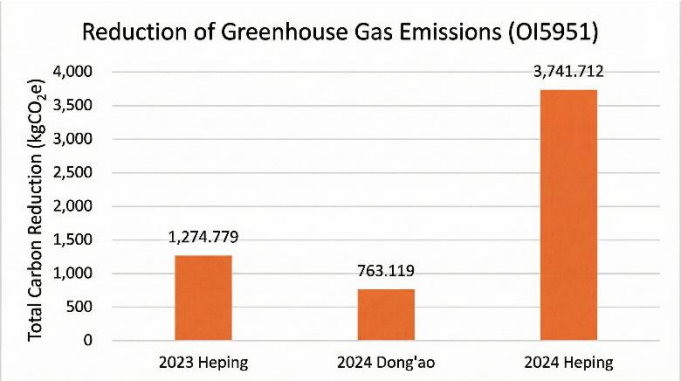
OUTCOME	
IRIS+ Code	Greenhouse Gas Emissions Mitigated (OI5951)
Amount of greenhouse gas (GHG) emissions mitigated by the organization during the reporting period, including GHG emissions reductions from both direct and indirect sources.	

Outcome refers to "changes in stakeholder behavior, capability, or status due to the occurrence of activities."

- Short-to-medium-term changes, not as long-term as Impact. Linked to Output but goes beyond simple quantitative numbers to include qualitative changes.
- Can be verified through questionnaires, interviews, pre- and post-tests, case studies, etc.

Since 2023, TCC has promoted the "Carbon Reduction Parent-Child Bankbook" project. Through daily actions such as waste reduction, resource recycling, and energy saving, the carbon reduction results of families and schools are quantified and converted into "Carbon Coin" points. Participants can redeem daily necessities based on accumulated Carbon Coins, making carbon reduction results tangible. This mechanism not only enhances the participation of residents and employees but also prompts families to

gradually internalize energy-saving habits, transforming scattered environmental actions into concrete carbon reduction data.

Greenhouse Gas Emissions Mitigated OI5951	
2023 Heping	1,274.779 kg CO_2e
2024 Dong' ao	763.119 kg CO_2e
2024 Heping Expanded	3,741.712 kg CO_2e
The reason why the carbon reduction amount of the 2024 Heping project jumped significantly to 3,741 kg CO_2e is mainly because the focus of Carbon Coin redemption was placed on "power saving" actions. Carbon emission reductions in this category are usually more significant than recycling or food waste reduction. The carbon reduction coefficient of power-saving activities is high, and its contribution to overall carbon reduction is far higher than recycling and food waste changes.	

Phase 4: Focus Changes

How much change happening	
IRIS+ Code	Stakeholder Engagement (OI7914)
Describes the mechanisms in place to gather input from stakeholders on product/service design, development, and delivery.	

In this project, the core of "how much change" lies in assessing the degree of literacy change experienced by target stakeholders (students, employees, Tribal Mothers' Classroom) after participating in the Carbon Reduction Parent-Child Bankbook activities. Since this study is a post-hoc analysis after the completion of activities and cannot conduct a complete pre-post test design or counterfactual comparison, the "Carbon Reduction Literacy Questionnaire" is adopted as the main basis. **Through quantitative analysis of the three dimensions of Knowledge, Attitude, and Practice,** we observe differences and changes between different fields.

The significance of this assessment method lies in the fact that, even in the absence of baseline values and a control group, it allows for cross-field comparisons (such as between Dong'ao Elementary School, Heping Elementary School, and employee groups). This reveals which stakeholders have shown more significant improvements in knowledge or

behavior and allows for the observation of differences between groups, thereby demonstrating the project's results in terms of "how much change happening".

- **Comprehensive Performance of Carbon Reduction Literacy: Knowledge, Attitude, and Behavior**

  Due to slight differences in questionnaire design across different fields, the questionnaires used by elementary school students (2023 Heping, 2024 Dong'ao) **adopted a 3-point scale** (1 = Disagree, 3 = Agree, 5 = Strongly Agree), whereas the 2024 Heping Expanded version adopted a 5-point scale (1 = Strongly Disagree, 5 = Strongly Agree). **To ensure comparability among the three fields, this study unifies the "High Score Ratio" as the observation indicator during analysis: for elementary school fields, the ratio of answering 5 points is taken, while for Heping Expanded, the ratio of 4 and 5 points combined is calculated.** Through this approach, a consistent baseline for comparison can be established across different scales, presenting the relative levels of respondents in the three dimensions of Knowledge, Attitude, and Behavior.

Dimension	Carbon Reduction Literacy Items	2023 Heping		2024Dong'ao		2024 Heping Expended		Average
		Score 5	Rank	Score 5	Rank	Score 4+5	Rank	
Knowledge	I know what it means that the Earth has become hot	29	61.7%	26	72.2%	93	91.18%	81.1%
	I know what actions people do that make the Earth hotter	33	70.2%	26	72.2%	93	91.18%	84.4%
	I know that if everyone saves electricity and drives less, the Earth won't keep getting so hot	31	66%	26	72.2%	91	89.22%	82.3%
	If someone asks me: "Why is the Earth getting hotter?" I can answer why	27	57.4%	26	72.2%	87	85.29%	77.3%
Attitude	I think everyone should learn how to help the Earth cool down a bit	30	63.8%	30	83.3%	93	91.18%	84.9%
	I think everyone should work together to protect the Earth	44	93.6%	33	91.7%	94	92.16%	92.3%

	I think it is very important not to waste electricity	42	89.4%	30	83.3%	89	87.25%	87.6%
Behavior	I turn off lights and air conditioners at home or school to help save electricity	29	61.7%	33	91.7%	90	88.24%	83.6%
	I will save electricity and do recycling well together with my family or classmates to protect the Earth	31	66%	32	88.9%	85	83.33%	79.8%
	When I go shopping with my family, I look for the Green Footprint or energy-saving labels	27	57.4%	26	72.2%	88	86.27%	75.9%

This table presents the high score ratios and average values of students in the three fields (2023 Heping, 2024 Dong'ao, 2024 Heping Expanded) for each question in the carbon reduction literacy questionnaire. Overall, the average score of high score ratios in the three dimensions falls above 77%, with the high score ratio of the three items in the Attitude dimension reaching as high as 88%, indicating that students generally possess basic carbon reduction knowledge, positive attitudes, and behavioral intentions. Among them, the Knowledge dimension had the highest score in "I know what actions people do that make the Earth hotter" (84.4%); the Attitude dimension was highest in "I think everyone should work together to protect the Earth" (92.3%); and the Behavior dimension was highest in "I turn off lights and air conditioners at home or school to help save electricity" (83.6%), reflecting the items that are easiest for students to grasp or practice within the three dimensions . If we correspond this back to the focus, purpose, and implications of the questionnaire design in Chapter 2:

Dimension	Carbon Reduction Literacy Items	Measurement Focus	Measurement Purpose	Score	Score Implication
Knowledge	I know what actions people do that make the Earth hotter	Causal Linkages	Whether students can link the causal relationship between human	84.40%	A high score represents that students not only recognize the phenomenon but also understand that "human factors" are the core

			activities and the Earth heating up		cause, which is a step further than Item 1.
Attitude	I think everyone should work together to protect the Earth	Value Consensus on Joint Action	Whether students believe that every single person should participate in action and view protecting the Earth as a shared responsibility	92.30%	A high score shows that students don't just feel they should know, but genuinely believe "everyone needs to do it together," which is the strongest indicator of group consensus at the attitude level.
Behavior	I turn off lights and air conditioners at home or school to help save electricity	Personal Daily Energy-Saving Habits	Whether students can develop self-disciplined behaviors of saving energy in their daily lives	83.60%	A high score indicates that carbon reduction literacy has been implemented at the level of "simple hand actions," representing the most direct and easily observable behavioral transformation.

After the implementation of the "TCC Carbon Reduction Parent-Child Bankbook" activity, questionnaire results from the three fields indicate that students demonstrated a high level of carbon reduction literacy across the three dimensions of Knowledge, Attitude, and Behavior. The highest-scoring item in each dimension reflects the specific effectiveness generated by the activity at different levels.

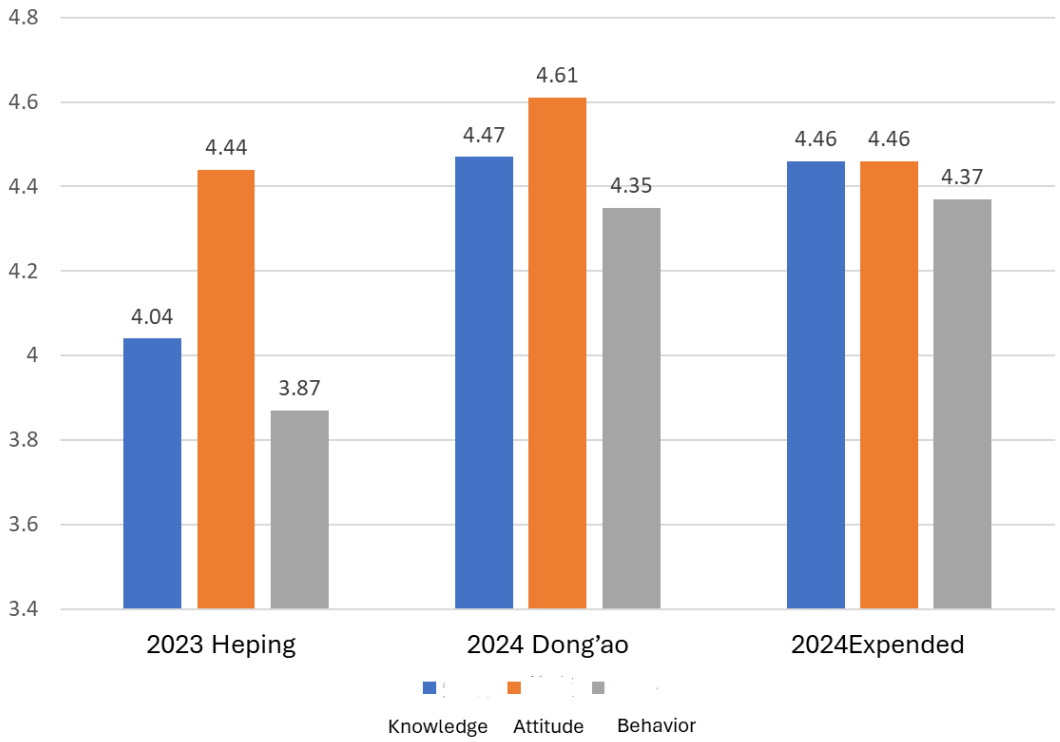
- Establishing Knowledge (Sprouting_Knowing Why): The item "I know what actions people do that make the Earth hotter" received the highest score, indicating that students have advanced from establishing basic knowledge to clearly understanding the causal relationship between human behavior and global warming. This demonstrates that through the concrete action learning regarding energy saving, carbon reduction, and recycling within the Bankbook activity, students are able to transform abstract climate change issues into life experiences and strengthen their cognition of "human behavior causing climate impacts."
- Assuming Attitude (Consensus_Wanting to do it together): The highest-scoring item was "I think everyone should work together to protect the Earth," revealing

that students have the strongest value recognition regarding "shared responsibility." This reflects the core design of the Bankbook, which centers on "family co-learning" and "campus participation," emphasizing that the joint participation of parents and children, teachers and students, and the community can effectively inspire students' group consensus and willingness to act on environmental protection.

- Changing Behavior (Action_Really doing it): The item "I turn off lights and air conditioners at home or school to help save electricity" received the highest score, indicating that energy-saving behavior has become the easiest daily habit for students to implement. This result corresponds with the implementation content of the Bankbook activity; through concrete practical methods such as "easy energy saving and point rewards" in the activity, students are enabled to take immediate action in both schools and homes.

- **Comprehensive Suggestions:** Across the three levels of "Establishing Knowledge—Assuming Attitude—Changing Behavior," the project has successfully enabled students to clearly understand environmental issues and establish a sense of shared responsibility; however, "transforming knowledge and attitudes into consistent daily actions" remains a key challenge for future implementation.

- **Field Comparison Analysis**



Field Comparison	Overall results
• **2023 Heping Elementary:** The average of the three dimensions of Knowledge, Attitude, and Behavior is the lowest (especially Behavior is only 3.87 points < 4 points), indicating that in the initial field, students still need more continuous guidance to transform environmental knowledge into behavioral habits. • **2024 Dong'ao Elementary:** The three dimensions are relatively balanced, with Attitude and Knowledge reaching 4.47-4.61 points, and Behavior also improving (4.35 points), indicating the gradual permeation of educational impact. • **2024 Heping Expanded:** The overall performance is the most stable, with all three dimensions reaching 4.4-4.5 points. In particular, the levels of Attitude and Knowledge are close, and Behavior also reaches 4.37 points, explaining that when the scale expands and execution time extends, literacy improvement tends to become comprehensive .	• Consistent ranking: Attitude > Knowledge > Behavior • Heping Elementary School: Ranked lowest among the three fields across all three dimensions • Behavior: 2023 Heping < 4 points.

- **Comprehensive Suggestions:** The differences in performance across the three fields demonstrate a close correlation between the maturity of carbon reduction literacy and the continuity of activities. As the initial launch point, the 2023 Heping field has demonstrated the foundational establishment of knowledge and attitude, but the behavioral dimension is still in the nascent stage, indicating that educational effectiveness still needs to be consolidated through long-term practice and cyclical learning. The 2024 Dong'ao and Heping Expanded fields reflect that with the continuation of activities and the accumulation of experience, students' understanding and practice of carbon reduction concepts are both more stable . The gap between attitude and behavior scores has narrowed, indicating that a trend of action internalization is gradually forming.

For stakeholders, the literacy questionnaire not only reflects their learning outcomes and behavioral changes after participating in the project but also highlights the varying effectiveness of educational interventions across rural schools, community families, and corporate employees, providing a basis for subsequent course design and resource allocation. It is strongly recommended to implement "literacy pre-post tests" as the core assessment design for future years; if conditions permit, adding a control group or quasi-experimental design would allow for the isolation of counterfactuals through dual measurements, thereby accurately determining "whether the action led to change and the extent of that change".

How is change happening	
IRIS+ Code	Importance of Outcome to Stakeholders (OI5495)
Describes the value or importance of the outcome being sought by the intervention or investment from the perspective of those affected during the reporting period.	
IRIS+ Code	Community Engagement Strategy (OI2319)
Indicates whether the organization implements a strategy to manage its interactions with local communities that are affected by its operations.	

In this study, the questionnaire survey provided quantitative data on overall trends, clearly presenting the score differences among students, families, and employees across the three dimensions of Knowledge, Attitude, and Behavior. However, data alone is insufficient to explain the reasons behind these differences; therefore, we further collected frontline experiences and narratives through qualitative interviews. By cross-referencing quantitative

data with qualitative information, we can not only verify the consistency of observations but also supplement the context that data cannot reveal—such as how students practice energy saving in daily life, how parents change their behavior under the influence of their children, and the challenges employees encounter during participation.

This combination of "quantitative data showing trends, qualitative interviews explaining reasons" allows us to more completely understand project effectiveness and the process of change. It highlights which factors facilitated the transition from knowledge enhancement to attitude consensus and finally to behavioral implementation, as well as which areas still require further support .

2023 Heping
The average across the three dimensions of Knowledge, Attitude, and Behavior was the lowest (particularly Behavior, at only 3.87 points < 4 points).
Immediacy • It has been 2 years since the 2023 activity execution. Teachers and students originally felt the activity ended when it ended, but because this experience gave students the concept of energy saving and carbon reduction, a teacher later used this activity experience to lead a small number of students to write a mini-thesis as a result presentation. They also participated in the Hualien Pacific Cup Elementary School Thesis Competition and won awards and recognition. **Activity Design** • Students participating in the mini-thesis competition could personally answer judges' questions during the Q&A session, articulating how they practiced it and why they did so, which is a better benefit than receiving prizes. • From the school's observation, students have indeed developed environmental awareness and habits; it is not merely about slogans or following teachers' instructions. However, regarding behavior after returning home, it is still necessary to devise other designs to penetrate into the children's daily habits after school. • Teachers observed that although the 2024 Carbon Reduction Parent-Child Bankbook focused on tribal mothers/employees, students who participated in 2023 were eager to act as seniors to teach their parents how to execute energy saving and carbon reduction, and were also very concerned about learning how to do better if there are activities next time.
2024 Dong'ao Elementary School
The three dimensions are relatively high on average, with Attitude and Knowledge reaching 4.47-4.61 points, and Behavior showing improvement (4.35 points).
Immediacy

- The principal regarded the carbon reduction bankbook activity as a development focus for the semester, and homeroom teachers of all grades were willing to cooperate. At Dong'ao Elementary School, Carbon Coins were settled monthly, rather than only before the end of the activity.
- The design of the Carbon Reduction Parent-Child Bankbook connects directly with the teaching model of Dong'ao Elementary School, which is very helpful for teachers who need to design DFC (Design For Change) courses, allowing participating teachers to concretely see the performance of environmental protection work.

Activity Design

- When calculating Carbon Coins, children showed a positive attitude different from that in academic work, willingly doing math to see their own results.
- The methods for obtaining Carbon Coins are quite diverse and life-oriented; for example, finishing meals can also be exchanged for Carbon Coins. Using the calculation of power consumption from electricity bills as an example, paired with advocacy courses on household appliance power consumption, students concretely understand the actual impact caused by their activities at home, which then leads to changing their own behavior.
- Courses of the same model can be stably promoted for another 1 to 2 years, and then extended to other directions, such as extending from local ingredients like sakura shrimp to river shrimp, flying fish (the origin of dried flying fish is to avoid food waste), or seasonal ingredients, etc. Besides food, tribal gathering places using local building materials (green, low-carbon architecture) can also be chosen as course fields.

2024 Heping Expanded

Overall performance is the most stable, with all three dimensions reaching 4.4-4.5 points.

Activity Design

- In 2023, children had energy-saving activities at school; children who participated would already report back to parents about the behaviors and methods of classmates accumulating Carbon Coins.
- The cultivation of carbon reduction and environmental protection habits truly requires long-term investment. Recently, it has been observed that from children to tribal elders, everyone actually knows the correct recycling methods, such as removing labels and washing containers before recycling... etc
- Adults do not necessarily engage in energy saving and carbon reduction because of the activity. If the design of the Carbon Reduction Parent-Child Bankbook is for habit formation and literacy education, setting the main target as children would be more meaningful.

Incentive Mechanism

- The opportunity for tribal classroom mothers to participate was the specialist's on-site promotion and attendance at the activity briefing. Exchanging resource recycling for daily necessities like

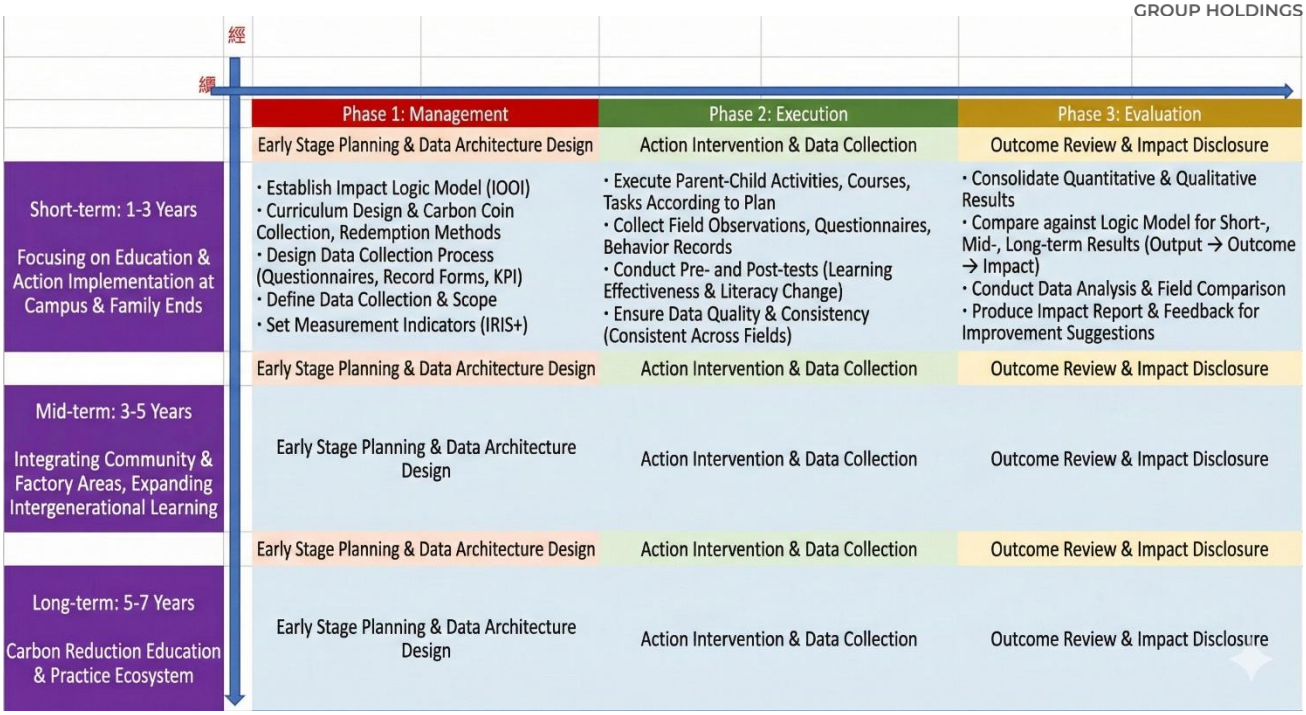
firewood, rice, oil, and salt is a great incentive, and everyone is willing to participate (it indeed attracted many people at the time) .

- Although the current incentive mechanism helps increase willingness to participate in activities or energy-saving behaviors, without rewards, the willingness to continue participating is affected.
- If the power-saving rebate is removed, it is unlikely that anyone will continue to save power. Prize/incentive mechanisms can be designed for residents; for example, linking incentive mechanisms with shops and markets in the DAKA Park, or exploring opportunities for rewards as compensation for reduced rebate funds, etc.

Conclusion

Taking the "Carbon Reduction Parent-Child Bankbook" as a starting point for communication and practice, TCC demonstrates innovative thinking in promoting carbon reduction actions through education. This project not only connects schools, families, and communities but also transforms "climate action" into tangible, feasible, and sustainable daily practices in a life-oriented way. Through companion-based learning and cross-generational co-learning, carbon reduction is no longer just policy or data, but a social action that can be seen, understood, and inherited. Such attempts lay the foundation for the enterprise on the path of Just Transition. It establishes mutual trust and consensus between the industrial park and tribes, employees and parent-child pairs, making the transition not only a change in energy or industrial structure but also a learning journey and cultural transformation centered on people.

To allow the "Carbon Reduction Parent-Child Bankbook" to go deeper and further, it is recommended to adopt a "deepen first, then expand" strategy for project promotion. Through setting phased goals, an educational action network with local connections and long-term resilience will be gradually formed to continuously advance the deepening of carbon reduction education and the impact of community Just Transition.



In the promotion process of this project, the "short, medium, and long-term" development planning can be seen as the vertical link of time (longitude), symbolizing the historical axis from carbon reduction education to the long-term vision of Just Transition, representing the extensibility and continuity of the overall promotion direction. Relatively, the three stages of "Management-Execution-Evaluation" constitute the horizontal cycle of project operation (latitude), representing the action process of continuous repetition, deepening, and optimization in different fields each year.

This interweaving of longitude and latitude is not only a continuous process of time advancement but also a system of sustainable learning and reflection. In other words, whether the project enters the short-term enlightenment stage, the medium-term diffusion stage, or the long-term autonomous action stage, each cycle must undergo the complete process of "Management (Preliminary planning and data architecture design) - Execution (Action intervention and data collection) - Evaluation (Outcome review and impact disclosure)," forming a dynamic loop.

Taking the "Carbon Reduction Parent-Child Bankbook" as an example, the vertical longitude demonstrates the timeline of educational promotion—the long-term evolution from campus enlightenment and family action to community diffusion; the horizontal latitude is embodied in the action cycle of the project each year, gradually

improving the depth and reproducibility of the project through alignment in preliminary management, co-learning practice in the execution stage, and data feedback in the evaluation stage. This dual-axis structure of "longitude as time, latitude as module" makes carbon reduction education no longer just the promotion of a single event, but a learning and transformation mechanism that can be continuously generated, tested, and diffused, allowing the advancement of Just Transition to have traceable temporal continuity and scalable social connectivity.