Government of the Netherlands

RIDGE TO COAST, RAIN TO TAP PROJECT

CAGAYAN DE ORO CITY, THE PHILIPPINES
2018 - 2024

VEI Dutch Water Operators
Cagayan de Oro City Water District 1973
Philippine Red Cross
hineleban foundation
Cagayan de Oro Riverbasin Management Council
unifrutti
FIC FRRL Industrial Trading Corporation
The Netherlands Red Cross
Ridge to Coast Rain to Tap Project Cagayan de Oro
Wetlands International
Water for life

CREDITS

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ACRONYMS

CDO	Cagayan de Oro City
CDORBMC	Cagayan de Oro River Basin Management Council
COWD	Cagayan de Oro City Water District
DPWH	Department of Public Works and Highways
DRRM	Disaster risk reduction and management
DST	Decision support tool
ERP	Emergency response plan
FDW	Fonds Duurzaam Water – Sustainable Water Fund
FITC	FRRL Industrial Trading Corporation
GIS	Geographic information system
HM	hydrological model
IRBM	Integrated river basin management
IT	Information technology
JICA	Japan International Cooperation Agency
KASATATRIACO	Kaliwawa Salawagan Talaandig Tribal Agricultural Cooperative
MSU-IIT	Mindanao State University – Iligan Institute of Technology
OCC	Operations control center
PAWD	Philippine Association of Water Districts
PES	Payments for ecosystem services
PEWUP	Performance Enhancement Water Utilities in the Philippines
R2CR2T	Ridge to Coast, Rain to Tap
RVO	Rijksdienst voor Ondernemend Nederland – Netherlands Enterprise Agency
USAID	United States Agency for International Development
VCA	Vulnerability and capacity assessment
VEI	VEI B.V. (*formerly Vitens Evides International B.V.*)
WASH	Water, sanitation, and hygiene

Front cover and inside cover photos: Students wash their hands thanks to improved water supply at Camaman-an Elementary School.

FOREWORD

It was an honor and pleasure for me to have been involved in the *Ridge to Coast, Rain to Tap* (R2CR2T) project from the end of 2022 until early 2025.

This comprehensive project in the south of the Philippines builds and expands on the proven elements of the cooperation between VEI and partner public water utilities worldwide, especially in Africa and South East Asia. VEI's primary aim is to contribute to the achievement of Sustainable Development Goal 6 to ensure access to water (and sanitation) for all.

Conceived in response to the devastating flooding ravaging Cagayan de Oro City in 2011, the R2CR2T project not only covers aspects of water, sanitation, and hygiene (WASH), but also targets integrated river basin management (IRBM) to prevent future flooding disasters. This document illustrates some of the successes of the R2CR2T project.

I am thankful to all dedicated professionals at Cagayan de Oro City Water District (COWD), VEI, FRRL Industrial Trading Corporation (FITC), Cagayan de Oro River Basin Management Council (CDORBMC), Wetlands International, Hineleban Foundation Inc., Unifrutti Tropical Philippines Inc. – Mt. Kitanglad Agri-Ventures Inc., The Netherlands Red Cross, and Philippine Red Cross, who have contributed to the achievements of the R2CR2T project.

Moreover, I am exceptionally grateful for the affection I have felt from project partner associates on site, and the trust they put in me, basically from the moment I arrived in Cagayan de Oro City till today.

Rik Dierx
Resident Project Manager VEI B.V.
of the Ridge to Coast, Rain to Tap (R2CR2T) project

The R2CR2T project team in January 2023: Rik Dierx, Mabelle Diez, Eugene Ortega, Flor Wassing, and Annilyn Castigon.

CONTENT

INTRODUCTION

Launched in 2018, the *Ridge to Coast, Rain to Tap* (R2CR2T) project was designed to address the pressing challenges of flooding, deforestation, and a vulnerable water supply system in Cagayan de Oro City (CDO), Mindanao, the Philippines. Motivated by the catastrophic impacts of Tropical Storm Sendong in 2011, this initiative introduced integrated solutions to strengthen flood resilience in CDO and across the wider Cagayan de Oro River Basin.

This publication shares the project's journey, showing how different organizations came together to restore the environment, secure water supply, and empower communities to safeguard their lives and their future. By highlighting key strategies, achievements, challenges, and lessons learned, it aims to inspire and inform similar efforts in the Philippines and beyond.

The Cagayan de Oro River flows through CDO. During Tropical Storm Sendong, the river burst its banks, flooding large parts of the city.

THE CHALLENGE

In the night of December 16, 2011, Tropical Storm Sendong devastated CDO and surrounding areas. The storm unleashed heavy rains, causing the Cagayan de Oro River to rise rapidly and triggering destructive flash floods. The sudden deluge caught the city's residents off guard, many of whom were fast asleep when the floodwaters swept through their homes. The floods claimed 1,300 lives, damaged over 50,000 houses, and disrupted the city's public water supply for over three weeks. The tragedy laid bare the region's vulnerability to severe flooding and the challenges in recovering from such events.

A DISASTER-PRONE NATION

The Philippines, composed of more than 7,000 islands, is one of the most disaster-prone countries in the world. According to the World Bank, at least 60% of the country's land area is exposed to multiple hazards, and 74% of its population of 120 million is vulnerable to their impacts.

Located in the Northwestern Pacific Basin, the country is particularly prone to tropical storms. Each year, an average of 20 tropical storms enter the Philippine area of responsibility, with about eight making landfall. Climate change increases the frequency and severity of tropical storms, exacerbating the risks.

A RIVER BASIN UNDER STRESS

The Cagayan de Oro River Basin is prone to flooding due to its steep and funnel-shaped topography and degradation of its forests. Large-scale logging, mining, and slash-and-burn farming across the landscape have reduced the land's capacity to absorb water, leading to faster runoff and more severe floods downstream. Efforts to restore and protect the river catchment face obstacles such as limited funding, weak enforcement of land-use policies, and insufficient coordination among stakeholders. Indigenous communities living in the upland areas are not adequately involved in decision-making processes, further hindering effective action.

A VULNERABLE WATER SUPPLY SYSTEM

Sendong revealed the vulnerabilities of the city's public water utility, the Cagayan de Oro City Water District (COWD). The floodwaters damaged vital infrastructure and led to interruptions in water supply for weeks, slowing the city's recovery. In the years after Sendong, COWD took notable steps to improve its flood resilience, supported by JICA and USAID. While these efforts had made progress, many challenges remained. An aging network, outdated processes, and limited resources continued to hamper COWD's ability to provide reliable water supply services to its customers and kept its delivery system at risk of future disruptions.

74%

OF THE PHILIPPINE POPULATION IS EXPOSED TO VARIOUS HAZARDS, INCLUDING TROPICAL STORMS, FLOODS, EARTHQUAKES, TSUNAMIS, AND VOLCANIC ERUPTIONS

Damaged generator at one of COWD's production wells.

Flooded pumps at COWD's main booster pumping station.

COMMUNITIES AT RISK

Urban poor in CDO and across the country are disproportionately vulnerable to disaster, often living in crowded areas, high-risk locations, and substandard houses. This became painfully clear during the Sendong flash floods, which hit the informal settlements along the Cagayan de Oro River particularly hard, leaving thousands of low-income families homeless.

After the disaster, over 20,000 families were relocated to housing sites designated by the city government. While the homes provided acceptable shelter, many relocation sites were not connected to the public water supply network, forcing residents to fetch water from communal taps or buy expensive water from vendors. The water was often stored in jerrycans and drums, creating risks of waterborne diseases. Poorly maintained sanitation facilities in nearby schools further heightened these risks and made it difficult to promote healthy practices. These dire water, sanitation, and hygiene (WASH) conditions limited the abilities of flood survivors to rebuild their lives and prepare for future disasters.

THE NEED FOR ACTION

The devastating impacts of Sendong and the persistent vulnerabilities in CDO and the Cagayan de Oro River Basin showed how urgent it still was to take additional measures. In 2018, VEI teamed up with organizations specializing in water management, information technology (IT), reforestation, conservation, health, and disaster risk reduction and management (DRRM) to tackle these challenges together. This partnership led to the *Ridge to Coast, Rain to Tap* (R2CR2T) project, which took a holistic approach to strengthening flood resilience.

A woman fills her water containers at the communal tap in one of CDO's relocation sites.

Deforested slopes are a common sight in the upland parts of the Cagayan de Oro River Basin.

THE PROJECT

RIDGE TO COAST
RAIN TO TAP PROJECT
CAGAYAN DE ORO

PROJECT PERIOD

January 2018 – December 2024

TOTAL BUDGET

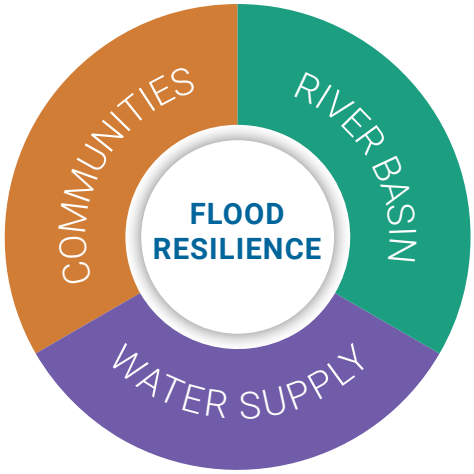
EUR 6,193,762

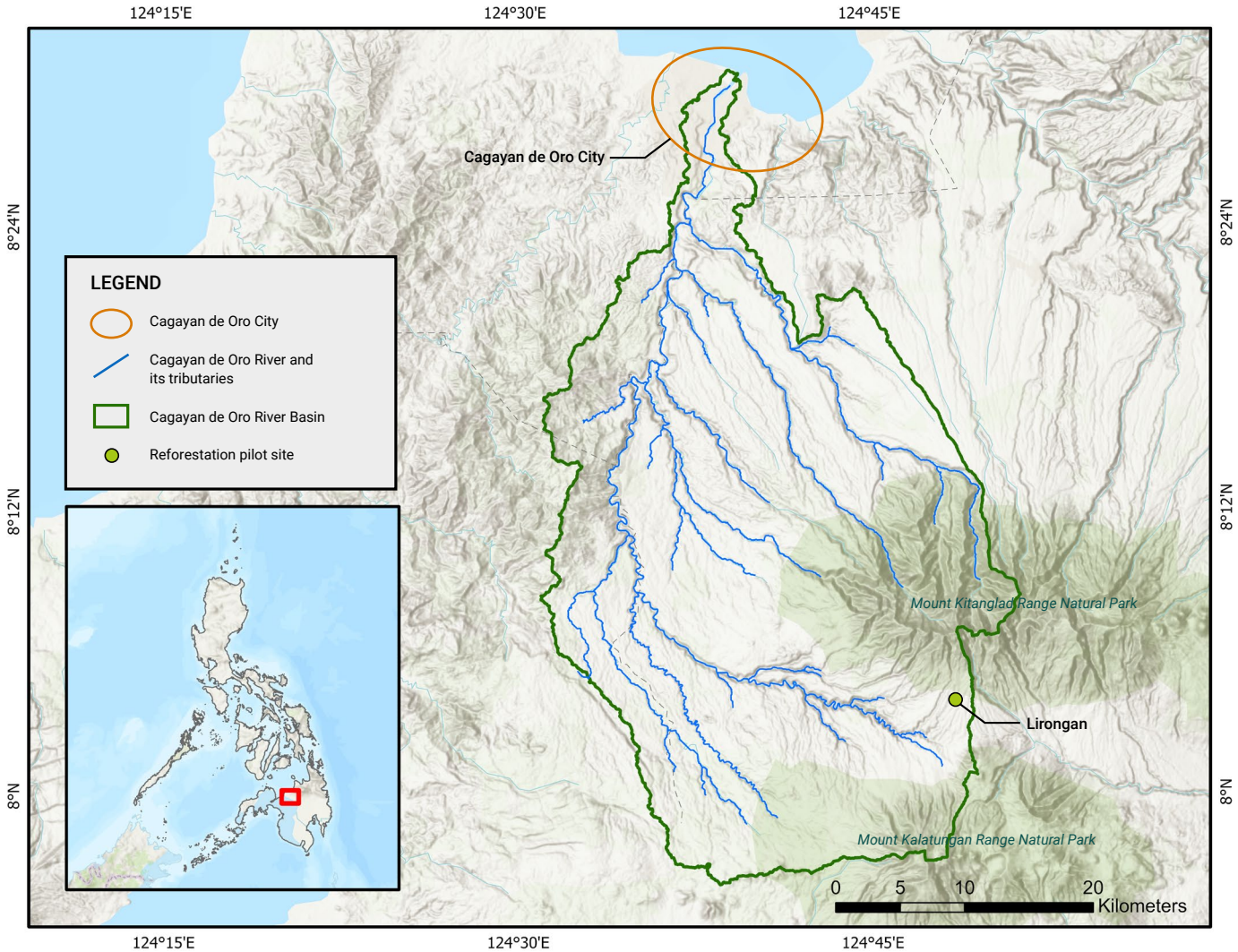
GOAL

Strengthen the **flood resilience** and reduce the vulnerability of CDO's public water supply system, its urban poor communities, and the wider river basin.

LOCATION

CDO and several sites across the Cagayan de Oro River Basin on the island of Mindanao, in the south of the Philippines.





"RESILIENCE is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through the preservation, restoration, or improvement of its basic structures and functions."

United Nations Office for Disaster Risk Reduction

FUNDING

The R2CR2T project is 49% co-funded by the **Netherlands Ministry of Foreign Affairs**, and administered by the Netherlands Enterprise Agency (*Rijksdienst voor Ondernemend Nederland* – RVO) through the Sustainable Water Fund (*Fonds Duurzaam Water* – FDW). The other half is funded by the **project partners** and the **Water for Life Foundation**.

A PUBLIC-PRIVATE PARTNERSHIP

The R2CR2T project involved multiple public, private, and non-governmental partners:

Public

- Cagayan de Oro City Water District (COWD)

Private

- VEI B.V.
- FRRL Industrial Trading Corporation (FITC)
- Unifrutti Tropical Philippines, Inc. – Mt. Kitanglad Agri-Ventures, Inc.

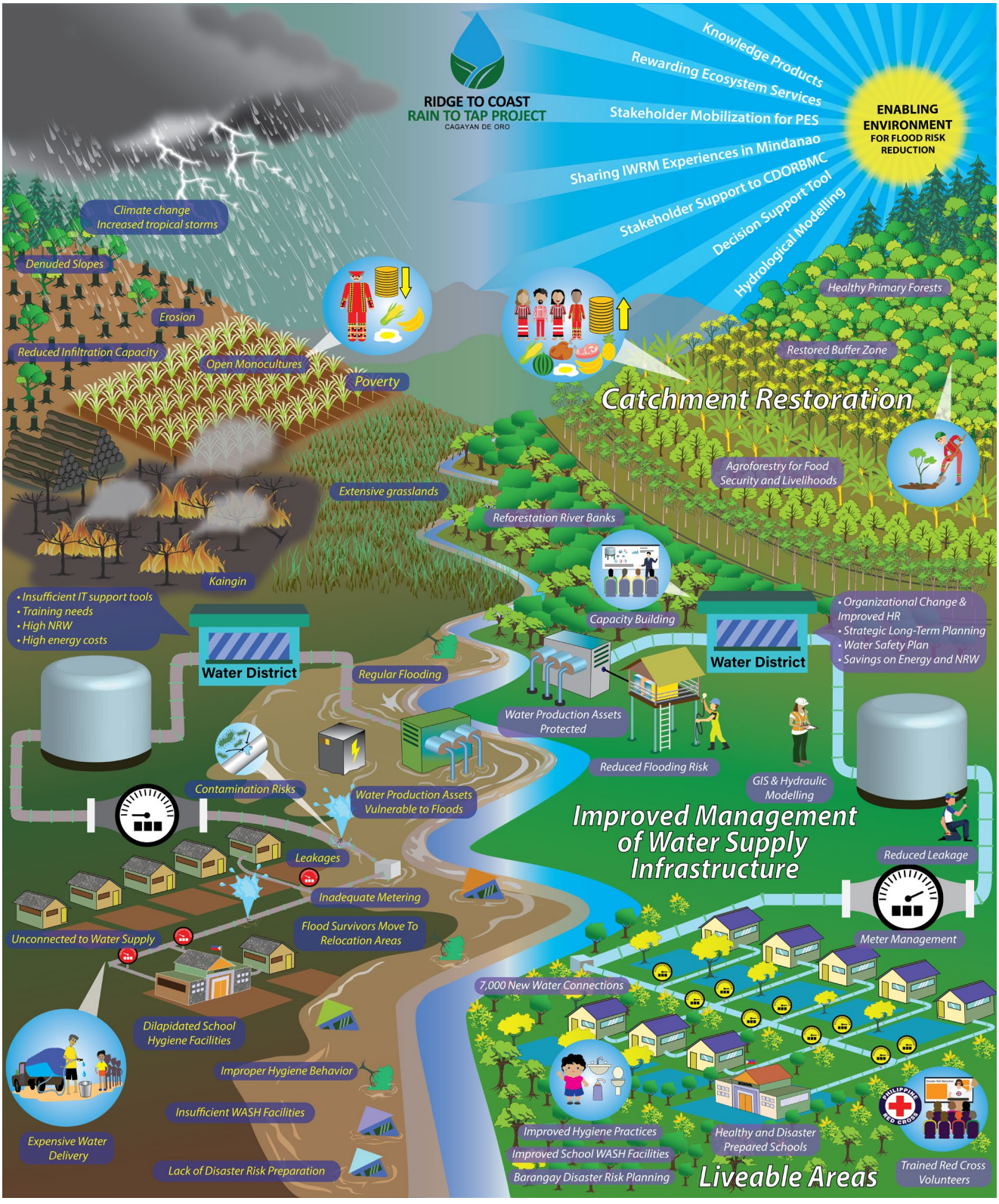
Non-governmental

- Hineleban Foundation, Inc.
- Cagayan de Oro River Basin Management Council (CDORBMC)
- Wetlands International
- The Netherlands Red Cross
- Philippine Red Cross

Representatives of all the project partners, the Dutch ambassador to the Philippines, and the mayor of CDO during the project's signing ceremony in July 2018.

PROJECT APPROACH

The illustration below represents the project's theory of change. The left side shows the challenges the project was designed to address. The right side shows the intended project outcomes. To achieve its objectives, the project adopted an integrated flood resilience strategy, focusing on three key areas: the river basin, CDO's public water supply system, and relocation sites and other urban poor areas.



1. REDUCING RISKS OF FUTURE FLOODING THROUGH INTEGRATED RIVER BASIN MANAGEMENT (IRBM)

- **Reforestation pilots:** Carrying out reforestation pilots with indigenous communities to demonstrate sustainable models for restoring critical river catchment areas.
- **Decision support tools:** Developing tools and models to identify priority areas, guide restoration decisions, and support evidence-based lobbying for catchment restoration.
- **Stakeholder cooperation:** Enhancing collaboration among river basin stakeholders by strengthening multi-stakeholder platforms through capacity development and financing.
- **Mobilizing investments:** Encouraging stakeholders to fund catchment restoration initiatives through payments for ecosystem services (PES).
- **Knowledge sharing and scaling:** Sharing best practices and advocating for the replication of IRBM successes in other river basins across the Philippines.

2. IMPROVING FLOOD RESILIENCE AND MANAGEMENT OF THE PUBLIC WATER SUPPLY SYSTEM

- **Infrastructure upgrades:** Protecting critical water supply assets against flood damage.
- **Disaster preparedness:** Updating COWD's emergency response plan (ERP) and conducting simulation drills to improve disaster readiness.
- **Advanced IT tools:** Integrating advanced IT tools into COWD's operations to improve network efficiency, asset management, and long-term planning.
- **Capacity building:** Providing trainings, hardware, and technical assistance to enhance COWD's operational and financial performance.

3. IMPROVING WASH CONDITIONS AND DISASTER PREPAREDNESS IN RELOCATION SITES AND OTHER URBAN POOR AREAS

- **Water access:** Expanding the public water supply network to underserved areas and schools.
- **Sanitation access:** Building and repairing toilets and handwashing facilities in schools and training sanitation committees to maintain these facilities.
- **Hygiene and health promotion:** Conducting hygiene promotion trainings and campaigns, vaccination drives, and COVID-19 awareness campaigns in schools and communities.
- **Disaster preparedness:** Strengthening the capacities of barangays (wards) and schools to assess risks and prepare for and respond to emergencies.
- **Capacity building:** Training community-based volunteers in WASH and DRRM to rapidly respond to local needs.

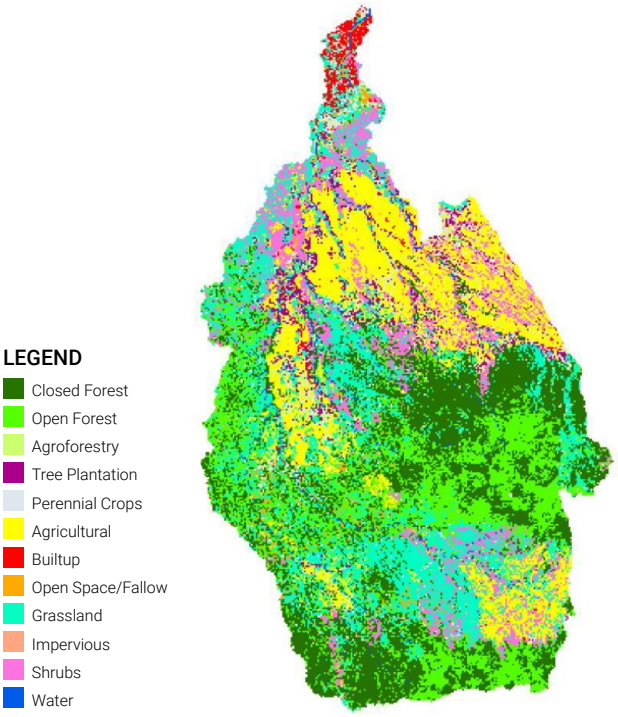
KEY ACHIEVEMENTS

HEALTHIER FORESTS

and a stronger enabling environment for catchment restoration

- **156 hectares** of forest restored
- **52 families** have improved food security and cultivate alternative income crops
- **Decision support tool (DST)** developed
- **PES ordinance issued** by Cagayan de Oro City, allocating PHP 10 million annually for reforestation
- **Cagayan de Oro River Basin Management Council (CDORBMC) serves as a model** for other river basins in the country

Forester Jonathan Gican (Hineleban Foundation) next to a young indigenous forest tree planted through the project.



DECISION SUPPORT TOOL (DST)

Relying on a scientifically-sound hydrological model (HM) for the Cagayan de Oro River Basin, the DST illustrates the impact of upstream reforestation on different water flows and downstream flood risks. The tool helps the CDORBMC to identify critical areas for catchment restoration, prioritize measures, and lobby for additional PES funding.

The land cover map on the left, generated from satellite imagery of the river basin, was used as input for the DST.

The HM-DST was developed through collaborative efforts of Wetlands International, CDORBMC, consultancy firm FutureWater, and Mindanao State University – Iligan Institute of Technology (MSU-IIT).

FLOOD-RESILIENT WATER SUPPLY

and strengthened capacities for improved water supply services

7 production wells and COWD's primary booster pumping station resilient to flooding

COWD emergency response plan (ERP) for flood events operational, updated annually, and with regular drills

Improved IT tools for GIS, hydraulic modeling, and asset and customer management integrated into COWD's operations

350 COWD staff trained in managerial, technical, operational, and IT skills

Increased efficiencies and new working methods integrated into COWD's operations

Jennie Empleo and Annilyn Castigon (COWD) with Bas Dilven (VEI) on an elevated platform which protects gensets from flooding.

VEI experts Jorn de Boer and Jan Peuten conduct a training on good distribution practices.

TRAININGS FOR COWD STAFF

VEI provided a wide range of trainings to COWD staff, tailored to the water utility's needs. Experts sourced from seven Dutch drinking water companies shared their knowledge online, in the office, and in the field. Training topics included:

- Good distribution practices
- Non-revenue water reduction
- Asset management
- Water safety planning
- Leadership & high-potential program
- Customer service
- Corporate communications
- Human resources

In addition, FITC trained COWD staff in the use of specialized PureNet software, notably:

- **Albion:** geographic information systems (GIS)
- **WADISO:** hydraulic modeling
- **IMQS:** data visualization and analysis

RESILIENT COMMUNITIES

through improved WASH conditions and disaster preparedness

The Netherlands Red Cross

3,500 households gained access to safe water through 229 meter stub-outs installed in low-income areas

4 schools have improved toilets and handwashing facilities

7,574 children reached by hygiene awareness campaigns

5 barangays and 4 schools are better prepared for disasters

17,474 people vaccinated against COVID-19

The residents of Mahogany relocation site gained access to safe water and disaster risk reduction and management (DRRM) activities.

Students of Camaman-an Elementary School wash their hands at a handwashing facility built during the COVID-19 pandemic.

IMPACT STORIES

The following stories offer a glimpse into the support provided by the R2CR2T project and its tangible impact on individuals, communities, systems, and the environment. From transforming lives and landscapes to securing water supply, these stories illustrate how collaborative efforts can bring about meaningful and sustainable change.

Amor Deconlay, a member of the Talaandig tribe, carries calliandra seedlings to reforest degraded lands in upland portions of the Cagayan de Oro River Basin.

BRINGING BACK THE FOREST

A tale of renewal on the slopes of Mount Kitanglad

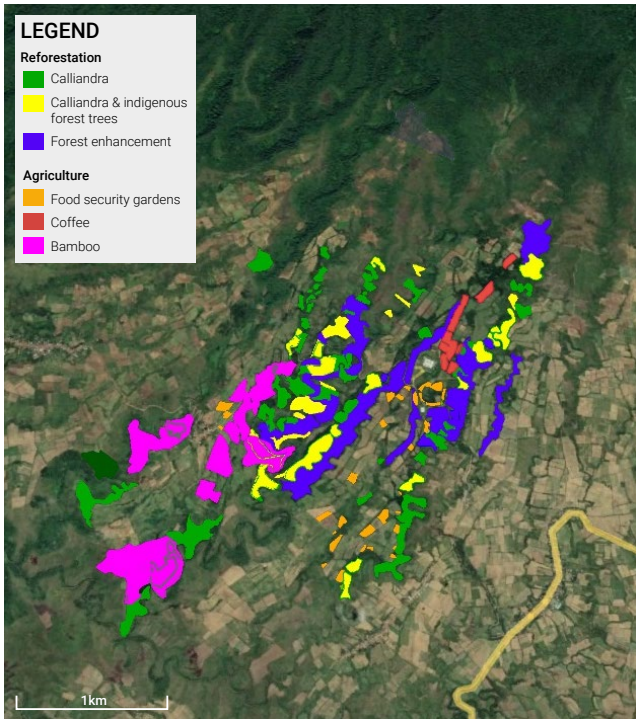
In the southern foothills of the Mount Kitanglad range, a reforestation pilot under the R2CR2T project is turning degraded lands into thriving rainforests, and changing lives in the process.

Community houses in Lirongan, against the backdrop of Mount Kitanglad range.

Pinky Rose Salahay is a member of the indigenous *Talaandig* tribe, or 'people of the slopes'. In 2018, her community partnered with the Hineleban Foundation to launch a transformative reforestation program. Through this pilot initiative, community members have restored 156 hectares of critical forest along rivers and streams in Lirongan, an upland area of the Cagayan de Oro River Basin, bringing new life to the degraded landscape.

The project followed Hineleban Foundation's *rainforestation* methodology, starting with fast-growing calliandra trees as a pioneer species to suppress invasive grasses, improve soil quality, and create favorable conditions for planting indigenous forest trees, such as *lawaan*, *ulayan*, and *kalamagan*. When the indigenous trees mature into a diversified and healthy forest, the calliandra can be harvested as an alternative source of firewood, ensuring that conservation efforts align with community needs.

In tandem with environmental restoration, the project carried out a food security and livelihoods program, benefitting 52 local families. Pinky and her neighbors were trained in climate-smart and sustainable farming practices and gained access to profitable markets. The initiative improved food security, created much needed income opportunities, and helped build stronger, more resilient communities.



This map shows the reforestation areas and agriculture plots in Lirongan planted through the R2CR2T project.

"In our backyard garden we planted root crops such as sweet potatoes, cassava, and taro, intercropped with coffee. I am very happy, because we can easily get food from our garden without spending a centavo. In fact, it gives us extra income because there are people buying our root crops."

Pinky Rose Salahay, partner farmer

THE COMMUNITY AS STEWARDS

A key success factor was the establishment of the Kaliwawa Salawagan Talaandig Tribal Agricultural Cooperative (KASATATRIACO). Formed in 2018 by the project's partner farmers, the cooperative gave the community a legal identity and a collective voice, enabling them to protect their interests and ensure that project activities aligned with their cultural practices. "Being organized into a cooperative empowered us as a group", shares Pinky, who now serves as KASATATRIACO's secretary. The cooperative holds regular meetings with its members and the Hineleban Foundation to coordinate activities, address challenges, and explore opportunities for improvement.

While initially focused on agriculture, KASATATRIACO has gradually taken on a broader role as environmental steward. During a recent focus group discussion, Pinky and her fellow cooperative leaders expressed their growing sense of responsibility for forest restoration and their vision for sustaining the project. They committed to organize regular tree planting activities and plan to allocate part of the cooperative's resources to environmental protection.

LEARNING FROM CHALLENGES

Despite its achievements, the reforestation pilot has also faced its share of challenges, including prolonged drought, financial constraints, maintenance gaps, and competing land claims. As a result, survival rates of the planted trees varied widely, with promising results in some years and setbacks in others. These challenges have prompted adaptive strategies and provided valuable lessons for shaping future efforts. A key takeaway has been the importance of long-term maintenance plans and budget allocations to support the care of young trees during their vulnerable early years.

TOWARDS A GREENER TOMORROW

The R2CR2T reforestation pilot is a story of perseverance, adaptability, and the enduring belief that degraded landscapes can be transformed. The intervention has been modeled in the project's decision support tool (DST), which showed positive effects on water infiltration and reduced soil erosion – key factors in lowering the risk of downstream flooding. Hineleban Foundation, Wetlands International, and CDORBMC regularly present the reforestation initiative at conferences and organize study tours and tree planting events in Lirongan to share lessons and inspire similar projects elsewhere.

For Pinky and her community, the project fostered a renewed sense of pride for their environment, their indigenous culture, and their ability to drive change.

"It is very important for us to bring back the forest. The forest is our hospital where we get our medicines, our market where we get our food, and our school where we learn. Our life is in our land."

Pinky Rose Salahay

Pinky plants an indigenous forest tree seedling.

Pinky and fellow KASATATRIACO members.

FLOOD PROOFING COWD'S WATER SUPPLY SYSTEM

The violent floods triggered by Tropical Storm Sendong severely damaged COWD's water supply system, destroying pumps, motors, and gensets, flooding control rooms with mud, and contaminating reservoirs. Through the R2CR2T project, VEI supported COWD in identifying critical assets at risk of flooding and implementing a total of 24 infrastructure upgrades, such as elevating equipment, installing submersible pumps, and sealing reservoirs. These upgrades, coupled with a robust emergency response plan (ERP), have strengthened the resilience of CDO's public water supply system, ensuring better protection against future flooding and faster recovery after disaster.

An elevated platform for gensets *protects them from flooding, ensuring emergency power supply for the city's main Macasandig booster pumping station during electricity outages, which often occur during floods.*

Sealed fiberglass manhole covers *prevent floodwater from entering COWD's reservoirs, protecting the water supply network from bacterial contamination.*

Bottom-intake submersible pumps *are less vulnerable to flooding than COWD's previous vertical turbine pumps.*

The electrical controllers for the pumps have been elevated *and placed in air-conditioned spaces, protecting them from flooding and improving reliability.*

Gensets at flood-prone production wells have been mobilized onto carts*, allowing evacuation of the equipment when a tropical storm warning is issued.*

A double layer of protection

In parallel with the R2CR2T project, the Department of Public Works and Highways (DPWH) constructed a dike along the Cagayan de Oro River to protect the city from flooding. With the dike's height and construction timeline initially uncertain, VEI and COWD had to remain flexible and adapt their plans as new information emerged. Through discussions with DPWH, the project influenced the dike's location, ensuring that most of COWD's production wells were positioned on the protected side. Two wells remain between the dike and the river; these have been equipped with mobile carts for potential evacuation of the generator sets.

By the end of the project, the construction of the dike was also completed. While the dike can withstand moderate to severe floods, the infrastructure upgrades implemented by the project may still safeguard COWD's critical assets in case of more extreme flooding events.

SCALING RESILIENCE

Taking emergency response planning to the national level

Tropical Storm Sendong exposed COWD's vulnerabilities, leaving it struggling to restore water supply for weeks. This painful experience became a catalyst for change, reshaping the way COWD, and later many other water districts in the Philippines, prepared for emergencies.

In the aftermath of Sendong, COWD drafted a basic one-page emergency response plan (ERP), which evolved over the years, incorporating lessons from subsequent typhoons and guided by USAID's *Toolkit for Climate Resilient Water Utilities*. By 2017, the ERP had grown into a 100-page document with five activation levels based on storm severity and projected path. Each level outlines clear steps to protect critical assets, maintain water supply, and ensure the safety of staff and their families, enabling swift, coordinated responses during emergencies.

Through the R2CR2T project, VEI helped COWD strengthen its ERP further and introduced annual practice drills. These drills, blending role-playing with flood scenarios, helped build a culture of preparedness among staff and ensured plans were actively tested and improved.

"The heart of our ERP is the action planning. We know exactly what to do, when to do it, and who will do it."

Jiselo Abragan, COWD ERP team

SHARING THE COWD EXPERIENCE

In December 2021, the Philippines was hit by another major storm: Typhoon Odette. While it did not hit CDO directly, it shattered water supply infrastructure on the islands of Cebu and Negros, the focus areas of VEI's *Performance Enhancement Water Utilities in the Philippines* (PEWUP) project. This wake-up call prompted PEWUP to seek support from R2CR2T to train all six PEWUP-supported water districts in developing ERPs.

COWD's ERP team with VEI experts after the 2022 practice drill.

Armed with new training modules, a three-person team – Jiselo Abragan and Jojie Cabahug from COWD and Adriaan Ruijmschoot from VEI – traveled to Carcar and Dumaguete to guide the participants through every step of drafting a comprehensive ERP, providing examples from COWD's experiences. The intensive five-day trainings were not just about disseminating knowledge, but also created opportunities for mutual exchange and learning.

"Sharing experiences with other water districts was very enriching for us. We went there as trainers, but we also learned a lot from their experiences."

Jojie Cabahug, COWD ERP team

The PEWUP participants left the trainings with detailed outlines for their ERPs. Within weeks, four of the participating water districts had developed full-scale board-approved ERPs, complete with narratives and data. Drills followed, ensuring the plans were tested and ready in case of future emergencies.

Jiselo and Jojie also brought back valuable lessons to strengthen COWD's ERP. One idea that was adopted was setting up mutual aid agreements with fuel suppliers, ensuring priority access to fuel during emergencies. This shows that when faced with similar challenges, sharing experiences benefits all.

A PARTNERSHIP FOR SCALING RESILIENCE NATIONWIDE

Recognizing the transformative impact of the ERP trainings, PEWUP collaborated with the Philippine Association of Water Districts (PAWD) to take the initiative to the national level. Throughout 2022, 2023, and 2024, a series of ERP trainings were organized across Luzon, Visayas, and Mindanao, ensuring that water districts from all regions of the Philippines could participate. These three-day events were made possible through funding from VEI's *Sustainable and Resilient Pro-Poor Water Supply* project in Cebu City and the Embassy of the Kingdom of the Netherlands.

COWD's ERP trainers Jiselo and Jojie were joined by fellow-trainers Carl Kamstra (VEI) and Samantha Pastor (Carcar Water District), who brought their own unique perspectives and lessons from Typhoon Odette. Over time, the training evolved, incorporating examples from participants who had faced other hazards, like earthquakes and droughts, reflecting the diverse contexts of water districts across the Philippines.

By the end of 2024, the dedicated team from the water districts of CDO and Carcar had guided 105 fellow water districts to draft ERP outlines tailored to their specific risks and conditions. Each participant signed a commitment to finalize their ERPs and conduct drills, turning training into action. The result is a growing nationwide network of water districts better prepared to face a wide range of emergencies.

A RESILIENT FUTURE

From the chaos of Sendong to a nationwide movement of ERP development, R2CR2T and PEWUP's collaborative journey highlights the power of partnerships in building resilience across the sector. The initiative nurtured new trainers, empowering Jiselo, Jojie, and Samantha to become champions of ERP development in their country. The impact of these efforts now even extends beyond the Philippines, with PEWUP successfully replicating the training for Mongolia's main water utility, which serves 1.5 million people in its capital Ulaanbaatar. This unplanned yet impactful scaling of the R2CR2T project's results shows how collective efforts can create a safer, more resilient future for all.

"The ERP training has capacitated us in dealing with situations requiring prompt, synchronized, and organized responses, especially during a typhoon. In general, the whole organization gained confidence in utilizing the necessary resources and in timely connecting or coordinating with other actors involved in responding to the situation."

Edward L. Remo
Carcar Water District General Manager

Jiselo Abragan, Jojie Cabahug, Carl Kamstra, and Samantha Pastor with ERP training participants in Cebu City.

PROGRESS IN THE PIPELINE

COWD's data-driven journey to improved water supply management

Faced with a multitude of challenges, COWD struggles to meet the water needs of a growing population. With the establishment of a centralized operations control center (OCC), the R2CR2T project introduced a new way of solving problems – one that is data-driven, collaborative, and future-focused.

An aging water network, outdated processes, and limited resources pose mounting challenges for COWD in delivering reliable water services to the city's 820,000 inhabitants. Some neighborhoods have little to no water pressure, while in others, high pressure causes pipe bursts, water losses, and costly repairs. Behind the scenes, the situation is just as challenging. Until recently, COWD's departments worked in silos, often solving one problem only to create another elsewhere.

"There was no coherent strategy. Every department had its own way of analyzing the system and addressing problems."

Jimmalyn Arabejo, COWD Hydraulic Modeler

COWD needed more than quick fixes; it needed a way to understand its network as a whole and the capacity to tackle its challenges in an integrated manner.

LAYING THE GROUNDWORK FOR CHANGE

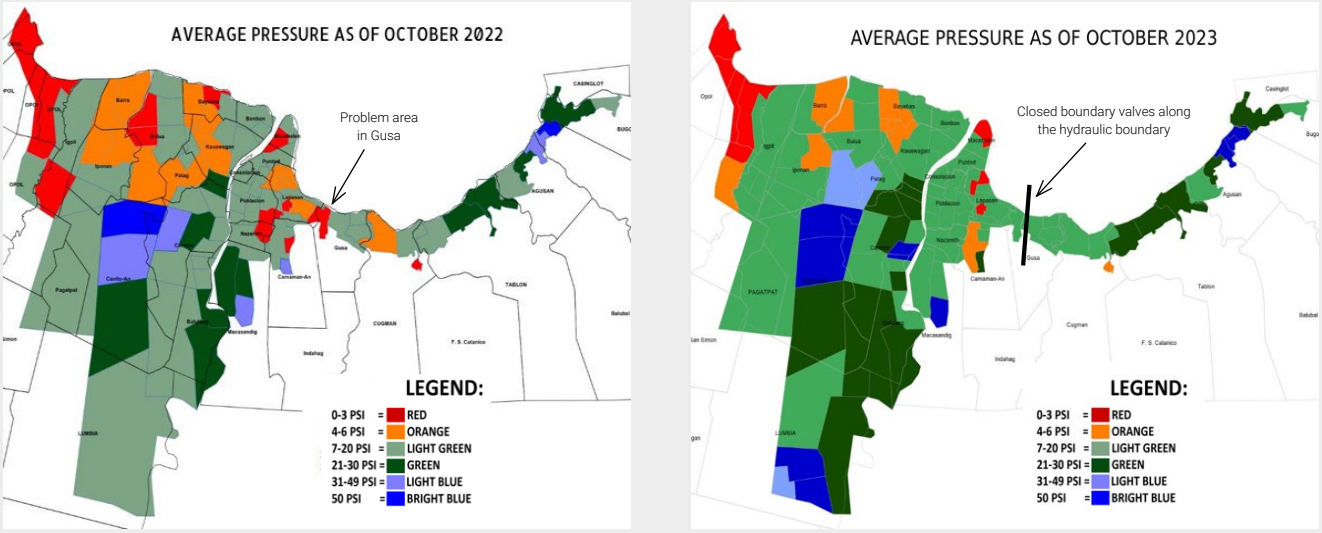
For a water utility to manage its network effectively, reliable data and robust IT tools are essential. Through the R2CR2T project, IT experts from FITC, like Koen Kinsbergen, equipped COWD with advanced software, notably for GIS mapping and hydraulic modeling. The new tools made it possible to visualize water pressure and flow across the network, pinpoint problem areas, and simulate scenarios.

Building on this solid IT backbone, VEI operations expert Chris Rix supported COWD in setting up an operations control center (OCC). Its purpose was simple yet transformative: to unify data, tools, and expertise in one central hub. Staff from different departments — production, maintenance, and engineering — were brought together in a team and trained to analyze data holistically, verify findings in the field, and identify system-wide solutions to some of the most pressing issues in COWD's network. The team's findings can help COWD's management to make informed decisions and prioritize measures to enhance water supply management.

Hydraulic modelers Vianney Deseo (left) and Jimmalyn Arabejo (right) in COWD's OCC office.

DATA-DRIVEN SOLUTIONS – THE CASE OF GUSA

One significant issue the OCC team addressed was the low water pressure in parts of Barangay Gusa. Through careful system analysis on the basis of pressure measurements and hydraulic network modeling, the OCC team recommended separating the water supply network into two distribution zones by installing boundary valves. After applying the change, water pressure in Gusa increased slightly but crucially, providing residents with improved supply of water throughout the day. This success demonstrated the power of data-driven solutions to resolve persistent issues.



Pressure maps, created with actual field data and Albion GIS software, allow to visualize pressure issues. Red zones have low pressure, indicating residents get little to no water. Blue zones have high pressure, making them susceptible to pipe bursts. Left shows Gusa's problem area in red before intervention. Right shows the situation after installation of boundary valves along the hydraulic boundary, turning the area green, a sign of improved water pressure.

"The OCC introduced a scientific way of coming up with solutions, supported by actual data. Some solutions are straightforward, once you understand the behavior of water."

Jimmalyn Arabejo

CHALLENGING ENTRENCHED PRACTICES

Change is rarely easy, and the OCC's journey was no exception. Convincing teams to trust the data and move away from long-standing practices was a challenge. For example, maintenance teams often throttled valves to boost the water pressure in certain areas, overlooking the risk of water hammer and reduced water pressure elsewhere. Proposals to abandon the practice were initially met with resistance, but as the OCC's recommendations consistently aligned with field results, skepticism gave way to trust. "Thanks to the hydraulic model, we were able to open many throttled valves", hydraulic modeler Vianney Deseo shares proudly. Today, department heads actively seek the OCC's guidance, a testament to its credibility and impact.

PROGRESS IN THE PIPELINE

The OCC has set COWD on a path towards progress. While the journey is far from complete, COWD now has the tools, data, and skills to transform its water supply network and system, while planning for the future. The OCC's simulations have shaped COWD's 20-year master plan, which maps out critical pipeline replacements and infrastructure upgrades to meet the needs of CDO's residents for generations to come. For staff like Jimmalyn and Vianney, the OCC has been a source of professional growth and job satisfaction. Together with the rest of the team, they now regularly share their knowledge with other water districts, helping to drive change beyond their own network.

"I really grew in my profession thanks to all the trainings, the information that has been given to us, and the experience with the OCC. It molded us into who we are today. We can now talk to other water districts, with confidence in what we do."

Vianney Deseo, COWD Hydraulic Modeler

TRANSFORMING LIVES THROUGH ACCESS TO CLEAN WATER

Displaced by disaster or eviction, thousands of low-income families face the challenge of rebuilding their lives in relocation sites across CDO. Through the R2CR2T project, COWD expanded the public water supply to some of the most disadvantaged relocation sites, providing residents with access to affordable and clean water. These stories from the field show how water access has transformed lives and laid the foundation for communities to thrive.

WATER ACCESS BRINGS RELIEF TO CHENDY'S FAMILY

Growing up on the banks of the Cagayan de Oro River, Chendy Pendringuez never imagined the devastation Tropical Storm Sendong would bring. At just 14, she watched in terror as floodwaters invaded her home, forcing her family to flee to a neighbor's second floor. They waited in fear for hours, while their house and all their belongings were swept away to sea. More than a decade later, the memories of that night still bring tears to Chendy's eyes.

Starting over in Xavier Ecoville relocation site brought safety but also challenges. Fetching water was a daily struggle, until Chendy's family finally got a household connection. "Now we can shower anytime, wash our clothes anytime, and use water whenever we want," Chendy said. With clean water flowing from the tap, life has become easier. Chendy no longer needs to buy drinking water or carry heavy buckets across long distances. This small change has transformed the family's life, bringing not only convenience, but also relief and hope for a better future.

"The water that we drink is from the tap. We don't buy water anymore. This is drinkable; it's clean."

Chendy hugs her five-year-old daughter Noreen.

Chendy's two-year-old son Cedrick plays with his bathwater, which flows from the family's tap.

WATER ACCESS BRINGS OPPORTUNITY FOR WILMA

Every night, Wilma Ratunil would wait in line for hours at the communal tap in Pamalihi relocation site to fill her jerrycans with water. The task was exhausting, especially with a family of eight to care for and a food stall to run. Thanks to the R2CR2T project, Wilma got a water connection at home. She now has more time and energy to focus on growing her business and care for her husband, who is recovering from a stroke. For Wilma, access to clean water is a source of comfort and opportunity.

"Having water is really a big help for my business. I use it for washing plates, pots, meat, and vegetables."

AFFORDABLE WATER BRINGS COST SAVINGS FOR SALVACION

"Life is better now that we have water. Before, we would spend 70 to 80 pesos every day to buy water. This added up to about 2,000 pesos per month. Now that we have a water connection, we only pay the minimum monthly fee of 238 pesos. We use the money saved to buy food for our family."

Salvacion Jamero, resident of Berjaya GK Village relocation site

SAFETY STARTS IN THE CLASSROOM

A school's path to disaster preparedness

In January 2017, a major flood swept through Camaman-an Elementary School, severely damaging its facilities. Through the R2CR2T project, the Philippine Red Cross worked with the school to strengthen its disaster preparedness and create a safer learning environment.

For teacher Ralph Lituañas, the flood was a defining moment. Without warning, the school's classrooms were inundated by rising waters, prompting teachers and students to flee upstairs. "We were trapped on the second floor until 10 PM, without any water or food," Ralph vividly recalls.

The damage was staggering: classrooms were destroyed, educational materials were lost, and the school was forced to close for a month, disrupting learning for over 3,000 students. Although no lives were lost, some children were left traumatized, breaking into tears at the sound of heavy rain. It was clear the school needed to be better prepared to handle emergencies.

STRENGTHENING CAPACITIES

Through the R2CR2T project, the Philippine Red Cross carried out a series of activities to build disaster risk reduction and management (DRRM) capacities of staff and students at Camaman-an Elementary School. Determined to make a difference, teacher Ralph stepped up as the coordinator for the school's DRRM committee. The team participated in a school-based DRRM training and a first aid and basic life support course, equipping them with essential tools, knowledge, and skills to prepare for and respond to emergencies. Teacher Ralph particularly valued the first aid training:

"I once had a student who slipped and fractured his arm. At the time, I didn't know what to do. Now I know how to properly apply first aid in that kind of situation. I realize that I have learned so much."

Ralph Lituañas, teacher at Camaman-an Elementary School

A key strategy to improve disaster preparedness was the conduct of a vulnerability and capacity assessment (VCA). This participatory process helped the school identify and prioritize its risks, with flooding emerging as the most pressing threat. Using the VCA findings, the school developed a school DRRM plan to address the identified vulnerabilities and guide its response to future emergencies.

Tabletop exercise for flood scenarios.

To test the plan, the Philippine Red Cross facilitated a tabletop exercise, a simulation to practice what to do in the event of a flood. The activity involved 50 participants, including school staff, local government officials, and personnel from relevant emergency response agencies, such as the Philippine National Police, Armed Forces of the Philippines, Bureau of Fire Protection, and Philippine Coast Guard. The exercise helped to identify gaps in the plan and improve stakeholder coordination, thereby strengthening everyone's disaster-readiness.

TURNING PLANS INTO ACTION

Guided by the VCA, the tabletop exercise, and the resulting plan, Camaman-an Elementary School has taken notable steps to reduce vulnerabilities and strengthen disaster preparedness:

- **Better drainage:** A new drainage system was installed, reducing the risk of future floods.
- **Student safety policies:** Policies were introduced to

maintain updated parent contact lists and to ensure every student is accounted for during emergencies.

- **Life-saving trainings:** In collaboration with local health institutions, a basic life support training was organized for selected students and parents, teaching them life-saving skills to respond to emergencies in the classroom and at home.
- **Direct communication lines:** The school maintains direct communication lines with local authorities, enabling swift action and decision-making during crises.

"Before, when a tropical storm was coming, we just waited for the announcements on the radio. Now we are more proactive; we know who to contact in the barangay office to discuss dismissing the children ahead of time."

Ralph Lituañas

Perhaps the most significant change has been a shift in the mindset of individuals. Recognizing that disaster preparedness is not a one-time activity, but an ongoing process, teacher Ralph continues to educate his students about emergency scenarios – from snakebites to fires and earthquakes.

Basic life support training for students and parents.

A SAFER LEARNING ENVIRONMENT

The story of Camaman-an Elementary School shows how educational institutions can effectively address disaster risks. It highlights the importance of training, proactive planning, and collaboration in creating a safer learning environment for students and staff alike. Thanks to the R2CR2T project and the dedication of individuals like teacher Ralph, Camaman-an Elementary School is now better equipped to face future emergencies.

Teacher Ralph practices a 'drop, cover, and hold on' exercise with students, the appropriate action to prevent injury during earthquakes.

LESSONS LEARNED

The R2CR2T project has been a journey of both successes and challenges, offering valuable lessons along the way. These insights provide guidance for enhancing future initiatives and fostering meaningful collaboration and impact.

1. **Strong and visionary leadership drives change**
   Strong leadership within water utilities is crucial for implementing challenging reforms. Due to the hierarchical organization culture in government agencies in the Philippines, bottom-up change is more difficult to achieve than change mandated from above. Having visionary leaders in place is a key success factor for achieving progress and overcoming resistance to change.
2. **Strict and cumbersome regulations hinder effective management of water districts in the Philippines**
   For example, fear of personal liability often delays procurement for construction projects and rigid laws make it difficult to remove ineffective staff or make necessary tariff adjustments. These constraints give private water operators an unfair advantage and highlight the need for systemic reform.
3. **Aligning reforestation activities with cultural practices builds trust**
   At the start of the reforestation pilot, Hineleban Foundation obtained consent from the communities through a participatory cultural impact assessment involving dialogues and Talaandig rituals. This helped build trust and ensured that the project was culturally respectful and inclusive.
4. **Fragmentation in responsibilities can weaken partnership effectiveness**
   A split in funding and implementation roles, as seen in some project collaborations, slowed decision-making and added administrative burdens. Direct cooperation and communication with on-the-ground partners proved more effective, fostering stronger relationships, better knowledge exchange, and greater ownership of the project outcomes.
5. **Flexibility is key for responding to changing circumstances and needs**
   Adapting to unforeseen challenges, like the COVID-19 pandemic, requires flexibility in project planning and execution. Successful examples include shifting trainings to virtual platforms and introducing new activities, such as a community vaccination drive, to address emerging needs.

RAPID COVID-19 VACCINATION RESPONSE

Leveraging its network of volunteers trained through the R2CR2T project, the Philippine Red Cross swiftly expanded COVID-19 vaccination access in CDO during the pandemic. Starting with mega vaccination centers, the team pivoted to include mobile units and house-to-house visits to reach underserved communities.

By working closely with local government and health offices, the initiative vaccinated over 17,000 people and reached 58,000 individuals through COVID-19 awareness campaigns. This success highlights the importance of flexibility, preparedness, and partnerships to respond rapidly to crises.

KNOWLEDGE SHARING AND REPLICATION

The impact of the R2CR2T project extends beyond its direct achievements. By sharing lessons and experiences, project partners have helped others replicate and scale effective strategies, strengthening resilience in diverse contexts.

CROSS-PROJECT LEARNING AT VEI

Frequent collaboration and knowledge exchange with VEI's two other projects in the Philippines – *Performance Enhancement Water Utilities in the Philippines* (PEWUP) and *Sustainable and Resilient Pro-Poor Water Supply in Metro Cebu* – led to significant outcomes, including:

- **Emergency response plan (ERP) development and drills replicated** in the PEWUP project.
- **ERP trainings scaled up to the national level** through a webinar, online master class, and nationwide training program, guiding many water districts to draft or update their ERPs.
- **Metro Cebu Water District trained in the use of leak detection tools** by COWD.
- **COWD developed a business plan** based on trainings by PEWUP.

SHARING LESSONS WITH OTHERS

- **COWD regularly conducts trainings and presentations on its operations control center (OCC)** for water districts across the Philippines.
- **Wetlands International, CDORBMC, and Hineleban Foundation shared lessons on integrated river basin management (IRBM)** through conferences and field visits, including:
  - **2019 Ridge, River, Reef Summit:** Discussed issues, coordinated strategies, and shared knowledge among stakeholders from Cagayan de Oro River Basin and the adjacent Tagoloan River Basin.
  - **2021 Stockholm International Water Week workshops:** Shared strategies on reforestation and financial landscape investment, promoting stakeholder collaboration.
  - **2022-2023 Learning exchanges:** Study tours introduced PES and reforestation approaches to managers of other river basins in the Philippines.
  - **2023 National conference on IRBM:** Shared the project's reforestation, PES, and DST approaches with the national River Basin Control Office and representatives from 13 river basins in the Philippines.

These efforts inspired the replication of IRBM strategies. For example, the Tagoloan River Basin established its own river basin management council and PES technical working group, marking a significant step towards reducing the risks of flooding in the region.

Participants of the 2023 national conference on IRBM.

TOWARDS A RESILIENT FUTURE

The R2CR2T project has been a powerful example of how collaborative, inclusive, and adaptive strategies can be used to tackle complex challenges. Over the span of seven years, it has made significant strides in restoring ecosystems, improving water supply systems, and empowering communities to prepare for disasters, thereby enhancing flood-resilience in CDO and across the wider river basin.

As the project comes to an end, its legacy lies in the strengthened capacities, the friendships forged, and the knowledge it leaves behind. This foundation can serve as an example for other regions facing similar challenges and paves the way for a resilient and sustainable future.

RIDGE TO COAST
RAIN TO TAP PROJECT
CAGAYAN DE ORO

Jaime Opiso, a resident of Berjaya GK Village relocation site, shows his new water meter.

FIND OUT MORE

- **R2CR2T project page, VEI:** https://www.vei.nl/projects/fdw-ridge-to-coast-rain-to-tap
- **R2CR2T project page, RVO:** https://projects.rvo.nl/projects/nl-kvk-27378529-fdw16012ph
- **R2CR2T project Facebook page:** https://www.facebook.com/R2CR2T
- **R2CR2T project introduction video:** https://www.youtube.com/watch?v=-Se1Eudx-yk

- **Rainforestation explainer videos and IRBM factsheet:** https://philippines.wetlands.org/publication/profile-ridge-to-coast-rain-to-tap-work-package-2/
- **Kitanglad PES campaign video:** https://youtu.be/TKNU6imHZMg
- **Adlai livelihoods case study:** https://www.vei.nl/news/reinventing-adlai-from-indigenous-staple-food-to-sustainable-income-source
- **Reforestation and livelihoods human interest story:** https://www.vei.nl/news/human-interest-story-ridge-to-coast-rain-to-tap-project

- **COWD's ERP journey video:** https://drive.google.com/file/d/1bzcySG3zefyN9gjlHwM8ChObUOf1Jrhh/view?usp=sharing
- **USAID toolkit for climate-resilient water utility operations:** https://www.climatelinks.org/resources/toolkit-climate-resilient-water-utility-operations
- **PEWUP project Facebook page:** https://www.facebook.com/PEWUPPhils

- **Water access impact video, VEI:** https://www.youtube.com/watch?v=2djc99EN3wg
- **Water access impact video, COWD:** https://www.youtube.com/watch?v=dmKF5R1YPBo
- **Water access human interest story:** https://www.vei.nl/news/safe-water-for-displaced-families-in-cagayan-de-oro-the-philippines
- **Disaster risk reduction success story:** https://www.vei.nl/news/building-disaster-resilience-at-local-level-ndash-philippines-amp-netherlands-red-cross

Back cover photo: Five-year-old Noreen drinks water from the tap at her home in Xavier Ecoville relocation site.

VEi
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