Butuanon Panalipdi, Kaugmaon Andami:
Challenges and Solutions for the Butuanon River

METRO CEBU RIVER SCAN CHALLENGE 2024

A COLLABORATION BETWEEN

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Abstract **-** In April 2024, The Butuanon River upstream almost completely dried up due to the rising heat index. The river is also filled with pollutants due to improper waste disposal in the area. After interviewing the residents and assessing the affected area, a Gabion check dam was proposed by the researchers. This dam would create a small reservoir of water to be stored for dry periods or to be infiltrated into the ground to recharge the aquifer. A check dam would also mitigate erosion and sedimentation, which reduces river pollution by trapping pollutants and promoting sediment filtration. This two-pronged solution would address the problems of pollution and water scarcity in the upstream portion of the Butuanon River.

Keywords **-** *Butuanon River, Gabion check dam, water scarcity, pollution*

PART A. RESEARCH REPORT

INTRODUCTION

Background of the Study

In recent decades, rapid urbanization has transformed the landscape of the tri-cities area in Cebu, namely Mandaue, Lapu-Lapu, and Cebu City, leading to significant environmental changes. The conversion of natural areas into urban spaces has paved the natural ground and reduced green areas, increasing the risk of flooding during heavy rainfall due to reduced soil absorption. Additionally, the growing population and inadequate waste management have resulted in heightened pollution levels, exacerbating the vulnerability of communities to environmental risks, particularly those residing along riverbanks and coastlines.

One such river profoundly affected by these challenges is the Butuanon River, which stretches from the mountainous regions of Cebu City to the urbanized barangays of Mandaue City. It was classified as a "dead river" in 1992, meaning that it could no longer support biodiversity. However, due to the efforts of local government units and other organizations, it was reclassified as a river for fisheries and other underwater resources in 2023 (Sunstar, 2023). Despite this, issues continue to persist. Upstream, agricultural activities such as livestock farming contribute to water contamination, while downstream, industrial and residential areas discharge untreated waste directly into the river. Recent assessments revealing the presence of the poliovirus underscore the urgency of addressing water quality concerns (Litonjua, 2020).

Aside from the issues of the river itself, the Butuanon River also has informal settlers living around its three-meter easement zone. Everyday, these citizens' health and safety are put at risk due to flooding and water quality issues. The multifaceted challenges that surround the Butuanon River call for a collaborative solution between the government, schools, and the Cebu community. This study seeks to explore the problems around the Butuanon River and propose solutions to safeguard its ecological integrity and the well-being of surrounding communities.

Statement of the Problem

In the upstream regions of the Butuanon River, particularly in Barangay Pulangbato, the citizens expressed concerns over water scarcity and pollution. Livestock farming practices, prevalent in the mountainous barangays of Cebu City, contribute to the contamination of water sources through the discharge of untreated waste. Additionally, the improper dumping of garbage by community members along the riverbanks further compounds the pollution, degrading water quality and threatening ecosystem health.

Moreover, the Philippines is currently facing a heat wave which has subsequently dried out the river. The exacerbation of water scarcity in the upstream areas amplifies the vulnerability of local populations, heightening socioeconomic disparities and impeding sustainable development efforts. The diminishment of river flow during periods of drought intensifies competition for limited water resources, placing additional strain on agricultural livelihoods and exacerbating food insecurity. This dual burden of pollution and water scarcity underscores the urgent need for holistic interventions to address the root causes of environmental degradation and ensure the resilience of upstream communities in the face of escalating environmental pressures.

Objectives of the Study

The objective of this study is to propose a cost-effective and technologically-simple solution to address water scarcity in the upstream side of the Butuanon River, specifically in Barangay Pulangbato, Cebu City. It also seeks to accomplish the following objectives:

1. To understand how the citizens of Barangay Pulangbato use the Butuanon River water
2. To analyze the effects of the dried up Butuanon River on the citizens' quality of life, and
3. To find and present a solution that would benefit the local community and improve their current situation.

Main Research Question

This research aims to answer the main research question and these specific sub-questions:

1. What is a cost-effective and low-technology solution that would address water scarcity in the upstream side of Butuanon River, specifically in the informal settler community of Barangay Pulangbato?
    a. How do the citizens use the water of Butuanon River?
    b. How are the citizens affected by the water scarcity problem brought out by the dried river water?

METHODS

To answer the main research question and the sub-questions, qualitative interviews with the resident community of Barangay Pulangbato were conducted. Through these interviews, the citizens were able to express how the river affected them in their day-to-day lives. A workshop was also held by the research team in order to find out the problems of the community, the causes of such problems, and solutions done by the government and suggested by the people.

Specifically, the following questions were answered:

1.) Do you consider yourself a "lumad" or a local residing in this community?
    1.1.) How long have you been residing in this community?

2.) From your recent memory, what has been a main problem you have encountered during your time living in this area near the river?
    2.1.) How did you try to manage and recover from its effect?
    2.2.) Do you think it is something that can be avoided?

3.) During the hot/dry season, what problem is greatly affecting your household and your everyday living?

4.) During the rainy/wet season, what problem is greatly affecting your household and your everyday living?

5.) What solution did the government implement already to combat the problems/issues that the community is encountering?
    5.1.) Do you think the solution is working?

Moreover, to attain the maximum flood height, the researchers also interviewed the locals on the usual water levels that a flood would typically reach. The researchers measured from the shore of the river to this water level using a measuring tape.

RESULTS AND DISCUSSION

Maximum Flood Height

The maximum flood height in the area was found to be 5.5 meters, although the residents stated that the flood would often go over the roofs of their homes. Since the construction of a riprap wall in 2020, the flood height has decreased significantly. However, many residents feel that the riprap wall is not tall enough and that it would be helpful to increase its height.

Figure 1. Height of the riprap wall, human person for scale

Measuring River Width

The total width of the river was measured by taking measurements at three different points and averaging all the values obtained. This is done to provide a more accurate representation of the river's width considering the inconsistency of the width across the span of the river. The width measurements that were obtained were 18.63 m, 17.14 m, and 20.36 meters having an average width of 18.71 m. A summary of the data gathered is presented in the table below.

River Width (100 m interval)	
Point	**Width (m)**
1	18.63
2	17.14
3	20.36
Average Width	**18.71**

Table 1. Total Width of the River

The Effect of the Butuanon River on the Citizens' Lives

The citizens of Barangay Pulangbato highly depend on the river for their day to day lives. They use it for hygienic purposes such as washing laundry. They also use it to water their plants. On some days, especially after a flood, they can catch fish such as tilapia from the river. They also depend on the river for their livelihood; the flow of the river brings with it sand, which the community collects and sells to construction companies for Php 200 per kilogram. While the surrounding areas are polluted, the water from the river is generally clear when it is flowing, so the residents also drink from it. Overall, it is an important river that greatly affects the citizens' socio-economic and physical lives.

Problems Faced by the Community

a. Water Scarcity

Water scarcity was often stated as the biggest challenge that the community faced. Currently, the Philippines is facing a dry period of extreme heat or the El Nino phenomenon. This has caused a water crisis in Metro Cebu, having affected 50,000 households as of April 18, 2024 (Piquero, 2024). Due to the lack of water, the residents have struggled with finding water sources, and the government is currently practicing water rationing in the community. The deepwell in the area has also dried up, which has caused the residents to dig through the soil to find water. The dried upstream river is shown in the figure below.

Figure 2. Dried up Butuanon River in the upstream

b. Pollution

Aside from water scarcity, the next most common problem stated by the citizens was pollution. The area of the community is inaccessible for most big vehicles such as garbage trucks, and therefore no one collects the trash there. This has caused confusion among the residents as to where they will put their trash, hence the trash is often just dumped anywhere. In

the workshop, the barangay shared that trash is actually collected every week on Saturdays. However, many residents complained that the location of trash collection was too far away and that the trash was too heavy to carry all the way.

Not only that, but the residents have reported that cars will sometimes drive by and dump their trash in the river. They have found dextrose syringes and others among the dumped trash. The trash was grouped up in a large pile on one side of the river, as shown in Figure 3.

Figure 3. Trash in the site

c. Flooding

In the dry periods, the river would dry up and cause a water shortage. On the other hand, the rainy periods would often bring about heavy flooding. Pre-pandemic, before the riprap wall was constructed, the flooding was often unbearable for the residents of Barangay Pulangbato. The flood height would be taller than the people themselves and flood their whole houses. It was a safety issue for many residents. However, in recent years, the construction of the riprap wall has greatly alleviated the flood situation. Many residents said that the riprap wall improved the flooding. Others stated that the riprap wall could also be taller.

d. Infrastructure

The community was only accessible through a narrow footbridge, which had the width of about two people standing side by side. In the event of a flood scenario, the residents would not be able to escape due to the only point of exit being this footbridge.

Not only that, but as stated earlier, the lack of accessibility makes it difficult for development in this area. The citizens are not able to have the government collect trash there, or create more infrastructure since it would be difficult to bring in equipment.

Solutions Implemented by the Government

So far, the most notable solution that the government has implemented was the riprap wall. The residents praised the wall for alleviating the flood situation in the area, although some stated that the height of the wall could be increased. The local government has also implemented a trash collection system, although some complained that it was too far away to be practical.

The residents suggested that another deepwell should be constructed, and more policies regarding trash dumping in the river.

CONCLUSION AND RECOMMENDATIONS

The community of Barangay Pulangbato was interviewed, and a workshop was conducted in order to identify aforementioned issues and suggested solutions. The insight of local residents was valuable in order to create a profile of the river and the community residing beside it. For the purposes of finding a feasible solution however, it would have also been helpful to conduct quantitative methods to identify issues such as water quality and river ecology.

The residents of Barangay Pulangbato depend on the Butuanon River for various purposes, such as their livelihood and hygienic tasks. As such, they are also heavily affected by the issues that surround the river. Currently, due to the El Nino phenomenon that is affecting several parts of the Philippines, the river has almost completely dried up. This has resulted in a lack of water for the residents, which has become the biggest problem that they are facing currently.

While the community and the government are working together to create solutions for the issues in the Butuanon River, currently the most helpful solution has been the riprap wall to prevent flooding. This has alleviated the flooding situation and made things easier for the residents. Still, the problem of water scarcity remains. The researchers propose to create a check dam in order to address the problem of water scarcity by creating a check dam, as well as allowing the water to absorb back into the ground and recharge the aquifer.

PART B. PRACTICAL SOLUTION

DESIGN OF THE SOLUTION

Gabion Check Dam

A gabion check dam is a versatile structure constructed using wire mesh containers filled with rocks or stones, strategically placed to impede the flow of water in rivers or streams. Beyond erosion control, it serves as a small reservoir during periods of high water flow, aiding in groundwater recharge and providing a source of water for irrigation or domestic use during dry seasons. Additionally, by slowing down the flow of water, gabion check dams mitigate erosion and sedimentation, thereby reducing river pollution by trapping pollutants and promoting sediment filtration. These multifunctional structures play a crucial role in watershed management, helping to address water scarcity while enhancing overall river health and resilience to environmental stressors.

Figure 4. Gabion Check Dam

Design Procedures

6.1 General

6.1.1 Estimate maximum discharge. Procedures in flood discharge analysis are detailed in Annex A of PNS/BAFS/PAES 229:2017 – Design of a Diversion Dam.

6.1.2 Calculate spillway dimensions.

$$Q=CLD^{3/2}$$

where:

C is the coefficient which is 3.0 for loose rock, boulder log and brushwood check dams; 1.8 for gabion and cement masonry check dams
L is the length of spillway (m)
D is the depth of spillway (m)
Q is the maximum discharge of the catchment area at the proposed check dam point (m3/s)

6.1.2.1 The length of the foundation shall be longer than the length of the spillway to prevent scouring and undermining by falling water.

6.1.2.2 The crest of rectangular and trapezoidal spillways should be level.

6.1.3 Check the stability of the check dam. For loose-stone, boulder, gabion and cement-masonry check dams, details of stability analysis are detailed in PNS/BAFS/PAES 229:2017 – Design of a Diversion Dam

6.2 Gabion Check Dam

6.2.3 The stones shall be hard enough to withstand abrasion, non-disintegrating, and resistant to weathering and packed inside the boxes. The bigger stones should be put along the sides of the box gabions while the smaller ones are filled in the middle.

6.2.4 When using box gabions which are 2 m long, after they are one-third full, 5 parallel ties should be placed between their inner and outer sides. Five more should be placed when the boxes are two-thirds full. Four corner ties should be placed.

6.2.5 A lid should be laced with binding wire to the top of all the sides after overfilling a box gabion slightly to allow for subsequent settlement. Its lid must be stretched to fit exactly to the sides.

6.2.6 If there is more than one layer of boxes in a gabion check dam, the ones in the upper layer should be placed to those below. A strong inter-connection of all units is an important feature of the technique. Therefore, it is essential that the lacing is done correctly.

6.2.7 If it has layers and is no higher than three meters a bounding box gabion shall be placed in the middle or top layer.

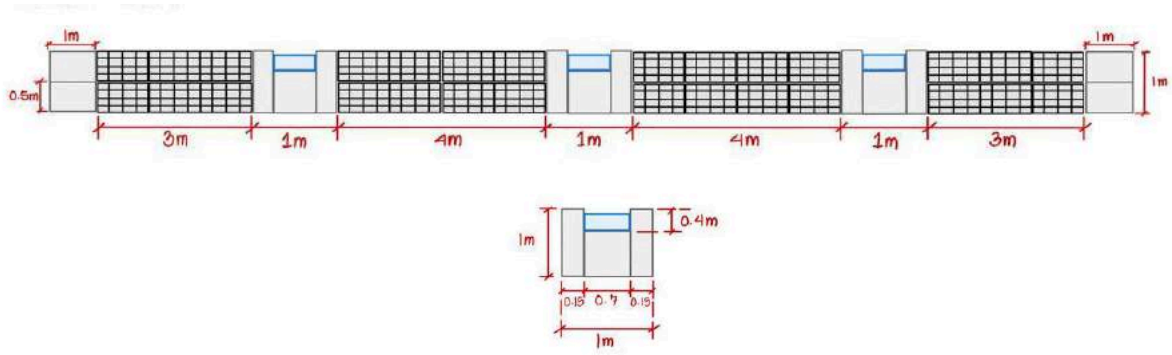
6.2.8 The space behind the dam and wing walls shall be filled with soil excavated for the foundation and from the gully bed.

6.2.9 Wings shall enter at least 50 cm into each side of the gully and they should be protected against flash water by wing walls. The angle between the wing and wing wall is 0 to 45 degrees. The height of a wing wall is equal to the depth of the spillway.

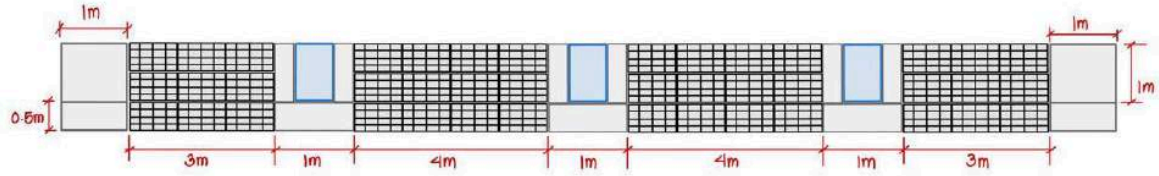
The proposed design for the Gabion Check Dam adheres to the guidelines outlined in the Philippine National Standard PNS/BAFS/PAES 230:2017 ICS 65.060.35, established by the Bureau of Agriculture and Fisheries Standards, ensuring compliance with industry regulations and best practices for effective watershed management and erosion control.

Technical Specifications

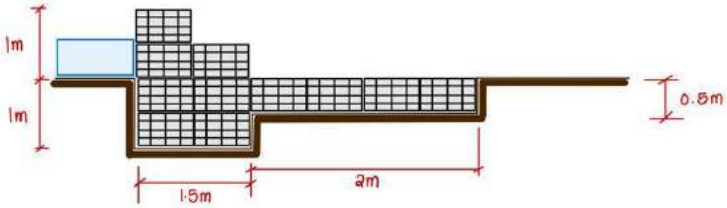
FRONT VIEW



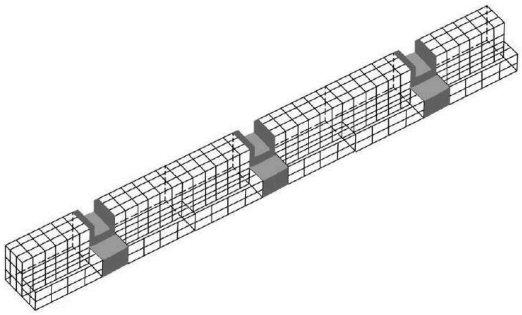
TOP VIEW



SIDE VIEW



ISOMETRIC VIEW



The design of the 1-meter high gabion check dam integrates several key features to ensure its structural integrity and effectiveness. Three spillways, each characterized by a 0.4-meter depth and a 0.7-meter length crest, have been strategically incorporated into the design. Through careful calculations, the maximum discharge for each spillway is determined to be 0.32 m^3/s, optimizing the dam's capacity to regulate water flow during varying flow conditions. Gabion cages are strategically positioned between the spillways, serving as a critical and main component of the structure. These cages are filled with compressed rocks, which not only contribute to the overall stability of the dam but also act as a natural filtration system, trapping sediment and debris. In addition, coconut coir netting is strategically incorporated behind the gabion cages. By utilizing coconut coir as a filtration layer in gabion check dams, communities can leverage a sustainable and locally available material to effectively capture sediment and debris, thereby improving water quality in nearby waterways. This approach not only promotes environmental stewardship but also contributes to sustainable waste management practices by repurposing agricultural by-products for infrastructure development.

To further enhance stability, cemented wing walls are installed at the edges of the dam, providing additional lateral support. Additionally, the foundation of the dam involves a 1-meter excavation, allowing for the insertion of additional gabion cages to reinforce the structure along the natural grade line. A 2-meter excavation, with a depth of 0.5 meters, accommodates additional gabion cages to bolster the dam's resistance against high stream velocity, particularly during periods of intense rainfall or flooding. In front of the dam, gabion cages, half the height of the structure, are strategically placed to offer supplementary lateral support, particularly during instances of elevated stream velocity. These cages are securely bonded using zinc-coated binding wires, ensuring structural cohesion and stability under varying hydraulic conditions.

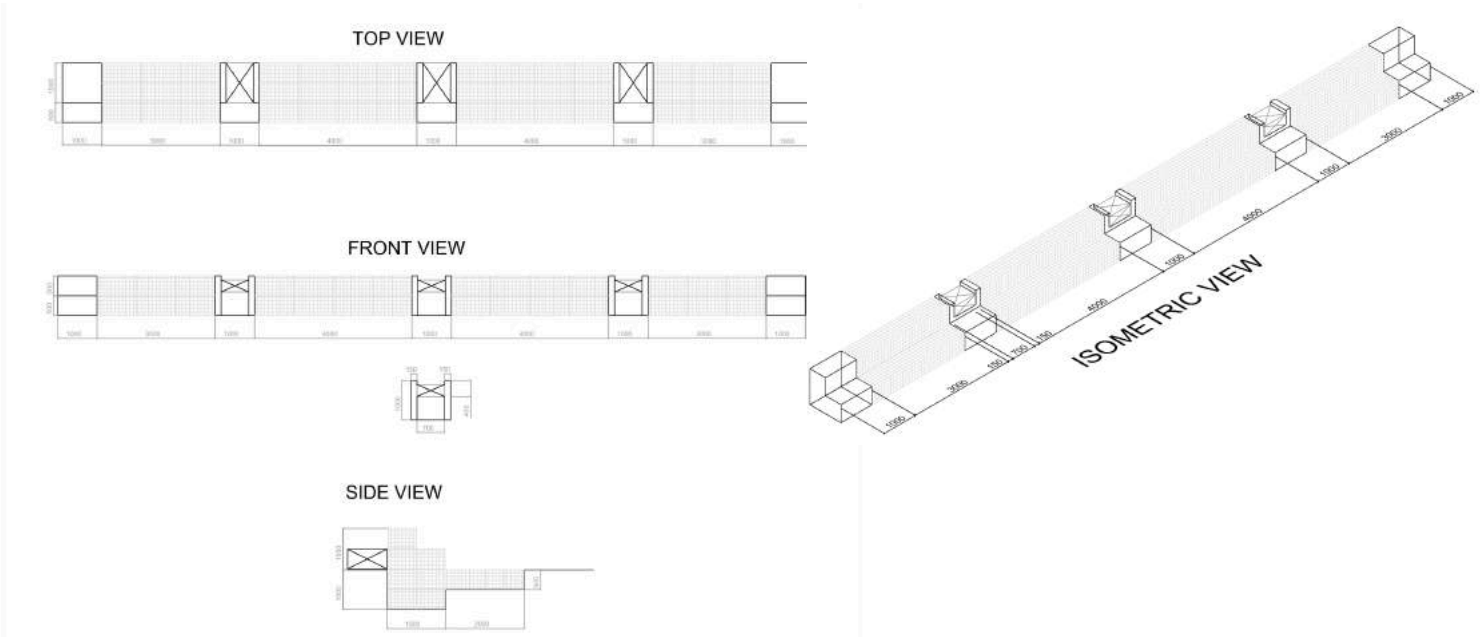


Figure 5. CAD Generated Plan of the Check Dam (Scaled)

LOCATIONAL ANALYSIS

Figure 6. Actual Photograph and Satellite View of the Proposed Location

The chosen site for the Gabion Check Dam is strategically situated at the upstream section of the Butuanon River within Barangay Pulangbato, Cebu City. This location was selected due to its close proximity to the community, ensuring easy access for residents. Additionally, the site's adjacency to a community footbridge, located approximately 25 meters away from the proposed check dam location, enhances its visibility and accessibility for ongoing monitoring and maintenance activities. By positioning the check dam in this area, it serves as a

visible landmark for residents and facilitates the implementation of necessary measures to address environmental concerns and ensure the sustainable management of the river ecosystem.

SOCIAL COST-BENEFIT ANALYSIS

The gabion check dam comes at a modest cost of ***Php 440,410***, making it a financially prudent option for government initiatives. Despite its affordability, it promises lasting benefits, offering a sustainable solution that minimizes long-term expenses often associated with recurring band-aid fixes.

Table 2. Estimated Cost of the Proposed Solution

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	SUBTOTAL
Labor	Manpower	30	laborer per day	₱425.00	₱12,750.00
Concrete	Ready Mix Concrete (Kimwa)	6	cu.m	₱5,805.00	₱34,830.00
Reinforcing Bars	16mm, 6m	470	kg	₱40.00	₱18,800.00
Excavation	Earth	47.5	cu.m	₱1,000.00	₱47,500.00
Backfill	Earth	47.5	cu.m	₱1,000.00	₱47,500.00
Formworks	Phenolic Board	23	sq.m	₱290.00	₱6,670.00
3x1x1m Gabion Cage	DPWH Standard (Zinc Coated), 3.05mm dia. Body Wire	4	pcs	₱7,315.00	₱29,260.00
4x1x1m Gabion Cage	DPWH Standard (Zinc Coated), 3.05mm dia. Body Wire	4	pcs	₱9,145.00	₱36,580.00
3x0.5x0.5m Gabion Cage	DPWH Standard (Zinc Coated), 3.05mm dia. Body Wire	4	pcs	₱4,880.00	₱19,520.00
4x0.5x0.5m Gabion Cage	DPWH Standard (Zinc Coated), 3.05mm dia. Body Wire	4	pcs	₱6,100.00	₱24,400.00
Binding Wires	2.2mm Zinc Coating	400	kg	₱90.00	₱36,000.00
Coconut Coir Netting	Agricultural By-Product (Recycled)	2.1	kg	₱0.00	₱0.00
Gravel	G-3/4, 10 to 20mm	100	cu.m	₱910.00	₱91,000.00
Gravel	G-1, 20 to 40mm	40	cu.m	₱890.00	₱35,600.00
TOTAL COST					***₱440,410.00***

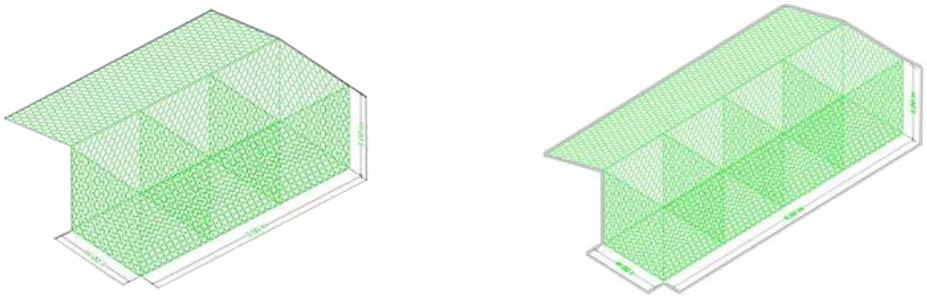


Figure 7. 3x1x1m and 4x1x1m Gabion Cages from SOLID.PH

The Gabion Cages for the project will be sourced from SOLID.PH, a reputable local manufacturer renowned for providing gabion cages that meet DPWH standards. SOLID.PH offers a range of gabion cage options and can customize designs to suit specific project requirements. Additionally, they manufacture the binding wires required for the project. Opting for a trusted brand like SOLID.PH not only ensures compliance with standards but also enhances

the overall strength and reliability of the structure, ensuring long-lasting performance and durability.

Figure 8. Coconut Coir Netting

In utilizing coconut coir netting for the project, we tap into the abundant natural resource of coconuts, prevalent in the Philippines and particularly in Cebu City. Engaging local community members to craft these coconut coir nettings not only helps reduce project costs but also fosters a sense of local identity and pride, showcasing our own products and resources in the process.

PLANNING

Planning for the construction of check dams and rainwater harvesting systems will involve several stages, including:

1. **Conducting a site assessment and feasibility study.** This study can be carried out in collaboration with technical experts from relevant government agencies, such as the Department of Public Works and Highways (DPWH) and the National Water Resources Board (NWRB). The feasibility study will help determine the most suitable locations for the systems while minimizing potential risks and ensuring compliance with local regulations.
2. **Establishing a multi-stakeholder consultation and coordination**. Given the complexity of the project and the involvement of various stakeholders, it is essential to establish a formal consultation and coordination mechanism. This could take the form of a multi-stakeholder committee or task force comprising representatives from relevant government agencies. This would facilitate effective communication, collaboration, and decision-making throughout the planning and implementation phases.
3. **Integrating the project into local development plans**. To ensure alignment with local priorities and long-term sustainability, the proposed project should be integrated into relevant local development plans. This involves coordinating with the LGUs to

incorporate the project into their Comprehensive Land Use Plans (CLUPs) and seeking endorsement from relevant local councils or committees.

4. **Developing a comprehensive funding strategy**. Infrastructure projects require significant upfront investment and ongoing maintenance costs. By exploring diverse funding sources and innovative financing mechanisms, the local government units (LGUs) can ensure the financial sustainability of the project throughout its lifecycle, from construction to operation and maintenance.
5. **Establishing a monitoring and evaluation framework**. This tracks the project's progress, assess its impact, and identify areas for improvement. This framework should involve clear indicators, data collection methods, and regular reporting mechanisms.
6. **Developing a capacity-building and community engagement plan**. To ensure the long-term sustainability of the project, a capacity-building and community engagement plan should be developed. This should include training programs for local community members on the operation and maintenance of the systems, as well as awareness-raising campaigns to promote ownership and participation in the project.

STAKEHOLDERS INVOLVED

There are a number of stakeholders who have important roles to play in the planning and development of check dams. The most primary stakeholder is the Cebu City local government unit (LGU), as they hold the most resources and power which can help the affected community. Other than the Cebu City LGU, local communities, local authorities, technical experts, funding agencies, and private sector partners should also cooperate to design and implement the systems so that it satisfies the community's needs, is safe and sustainable, and is financially supported.

Agencies that would/may be involved:

1. Department of Environment and Natural Resources (DENR): The DENR will play a crucial role in this endeavor especially relating to the River Scan Challenge or any river-related infrastructure projects due to the authority given to them mandating the country's natural resources and ensure environmental protection. This national agency sets environmental regulations and provides technical assistance in pollution control. They would likely be involved in setting guidelines for the ensuring that the solution proposed comply with environmental law.

Local Government Units:

2. Cebu City Environment and Natural Resources Offices (CCENRO): This office would play a key role in this initiative by providing data on existing environmental programs, pollution levels, and river health. They might also be involved in the coordination processes with communities and the issuing of permits for any field research and conduct during this initiative.

3. National Water Resources Board (NWRB): (1) NWRB formulates policies and plans for the Philippine water sector, with the framework of Integrated Water Resource Management through coordination and integration of development programs, projects, and activities. (2) The conservation of all water resources by regulating its utilization and allocation based on policies consistent with beneficial use and sustainable development. (3) Providing protection to consumers and the economic viability of water utilities by determining service standards and targets, tariff levels and schemes, monitoring and measuring company performance, enforcing compliance, and imposing sanctions.
    a. Functions: (1) Policy Formulation and coordination (2) Resource Regulation (3) Economic Regulation

4. Department of Science and Technology (DOST) To direct, lead, and coordinate the country's scientific and technological efforts geared towards maximum economic and social benefits for the people. The DOST is the "provider of world-class scientific, technological and innovative solutions that will lead to higher productivity and better quality of life.
    a. Environmental and Geotechnical - conducting research or expert analysis on the environmental impact of the check dam; studies on soil and water interaction, sediment transport, and ecological impacts.
    b. Engineering Innovations - offer expertise in the engineering and technology to design dam structures that are not only efficient but also sustainable.
    c. Material Science - researching materials that can be used in the dam construction to enhance durability and cost-effectiveness.
    d. Community Engagement and Education - assisting through community education and engagement efforts to the science and benefits behind the check dam project

5. Civic and Non-governmental organizations: Civic and non-governmental organizations can play a significant role in the environmental and infrastructure projects which can particularly involve areas such as community engagement, advocacy, policy influence, and on-the-ground implementation, These may include lobbying community rights ensuring that the population have a say in the project development, public awareness campaigns (workshops and meeting), and participation in the planning—community based initiatives like construction.

6. National Economic Development Authority: This agency will serve as the highest socio-economic planning and policymaking agency of the government that will greatly help the river scan challenge implemented in the country as it ensures that programmes of government agencies are consistent with the government programmes as laid out in the rivers rehabilitation plan.The planning documents incorporate water resources sector plans at the national and regional levels. There are also coordinating committees established to align development of water resources with the national strategies and fiscal direction of the government.

OPERATION AND MAINTENANCE

The operation and maintenance of the Gabion Check Dams involve regular inspections to ensure structural integrity, particularly after heavy rainfall or flooding events. Maintenance tasks may include clearing debris from the spillways, checking for any signs of erosion or damage to the gabion cages, and replacing any damaged or worn-out binding wires. Additionally, sediment buildup within the gabion cages should be periodically removed to prevent blockages and maintain proper water flow.

Similarly, the coconut coir netting, serving as a filter for sediments and debris, requires periodic maintenance to ensure optimal filtration performance. This may involve inspecting the netting for signs of clogging or damage and clearing any accumulated sediment or debris. Additionally, replacing worn-out or damaged sections of the netting may be necessary to maintain effective filtration. Regular monitoring of water quality downstream of the gabion check dams can also help assess the effectiveness of the coconut coir netting in capturing pollutants and sediment.

The operation and maintenance of the Gabion Check Dams, as well as the coconut coir netting, are jointly carried out by the Local Government Units (LGUs) and members of the local community. Regular inspections and maintenance tasks, such as clearing debris, checking for structural integrity, and replacing damaged components, are coordinated by LGU personnel. Additionally, community members play a vital role in monitoring the dams and netting, reporting any issues or concerns, and assisting with maintenance activities as needed. This collaborative effort ensures the effective functioning and longevity of the infrastructure while fostering community ownership and involvement in its upkeep.

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