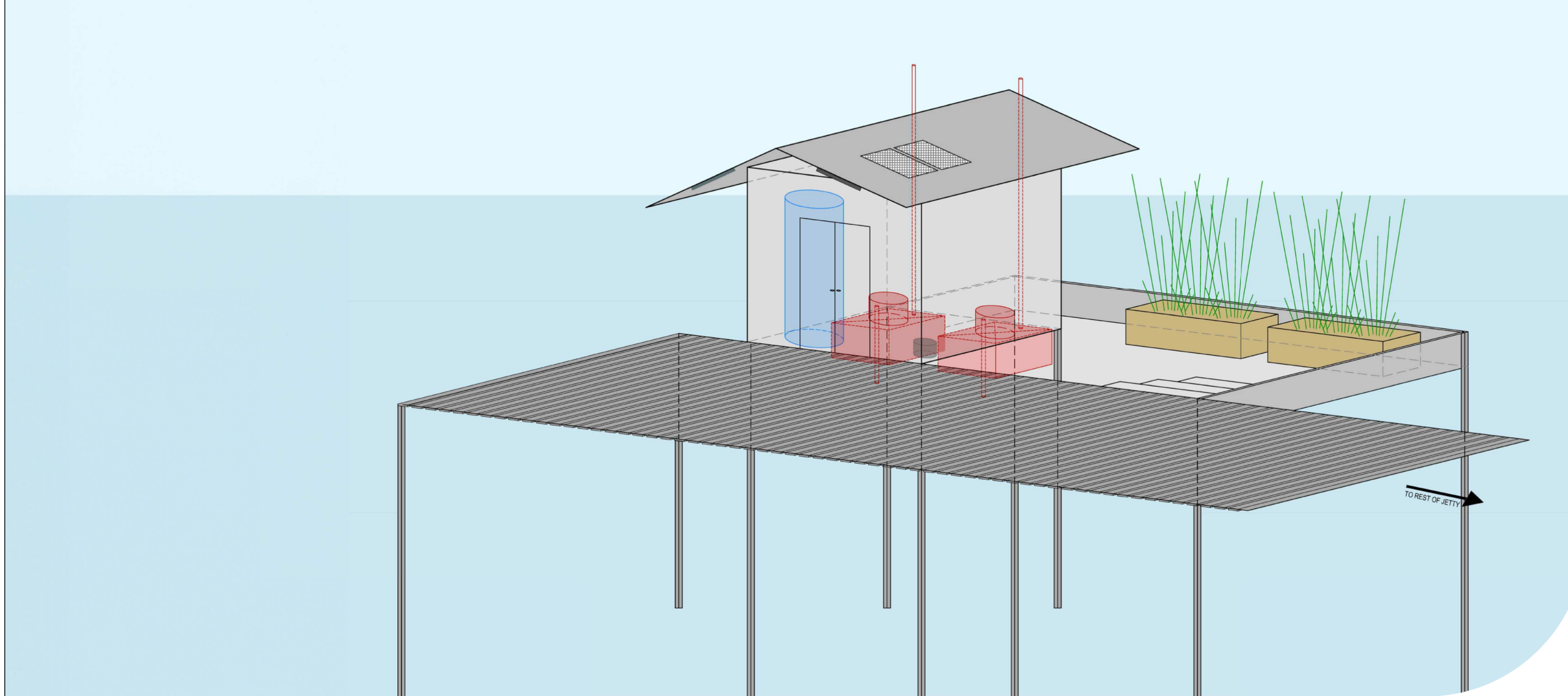




📍 PARI VILLAGE, PAPUA NEW GUINEA

2024 Stantec Winnovators

Technical Challenge Report

Introduction

Pari is a traditional coastal village 9km southeast of Papua New Guinea’s capital, Port Moresby. Papua New Guinea is severely challenged by poor sanitation, water supply and sewerage – challenges which are heightened in Pari.

8.9 million	154 th / 193
Population	UN Human Development Index (HDI) Globally
183 rd / 193	160 th / 161
Global ranking for basic sanitation access	UN Gender Inequality Index

(United Nations, 2024)



28%
Infant mortality caused by improper WASH facilities
(SE Asia Average is 7%)

Statistics

Sanitation Service Level	Safety & Privacy	Anal Cleansing Materials	Willingness for Change
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33%

% of Pari that openly defecate

42%

% of Pari who felt ‘risk’ when using the toilet

40%

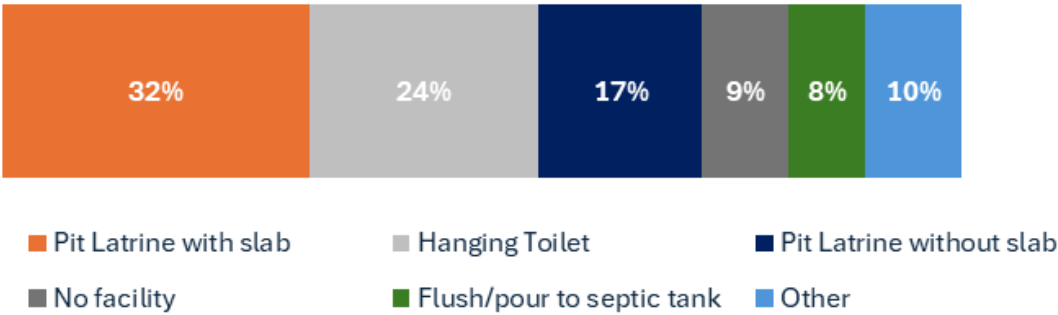
% of Pari use Newspaper for anal cleansing

80%

% of Pari willing to upgrade facilities

(WaterAid Pari Village Baseline Report 2021)

Toilet Facilities available in Pari



Matrix Assessment

A multi-criteria analysis matrix was developed to establish preferences between design solutions.

The aim was to achieve a set of objectives targeting the sanitation issues at Pari and to assess the extent to which the objectives can be achieved using a weighted score.

OPTIONS ANALYSED



1) Sago Toilet over Land



3) Portable Sago Toilet



2) Sago Toilet over Water



4) Tidal Energy Powered Toilet

Criteria

1.Sustainability

2.Constructability

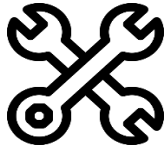
3.Ease of maintenance

4.Ease of Land Acquisition

5.Culturally Appropriate

6.Accessibility

7.Ability to impact problem Statement



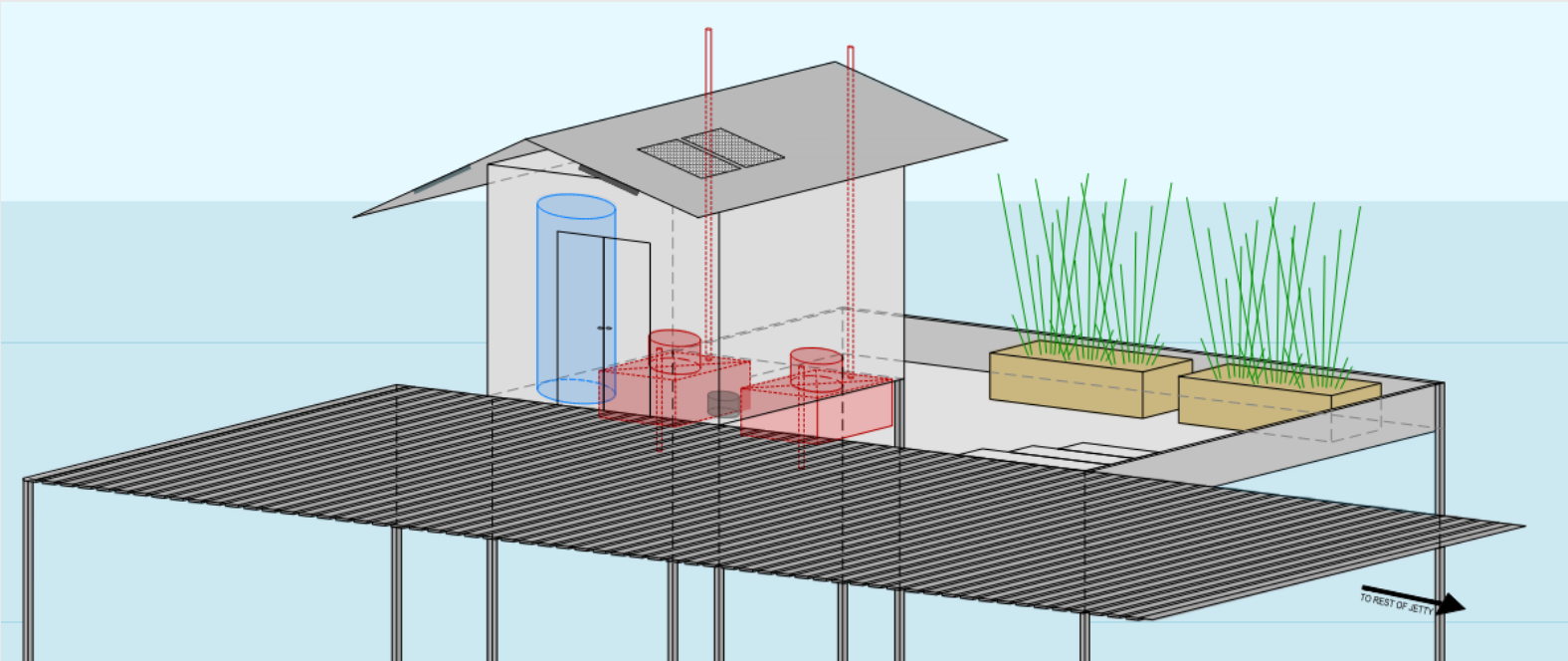
Options	Criteria 1: Sustainability	Criteria 2: Constructability (Resource Availability, Cost)	Criteria 3: Ease of Maintenance	Criteria 4: Ease of Land Acquisition	Criteria 5: Culturally Appropriate	Criteria 6: Accessibility	Criteria 7: Ability to impact problem statement	Weighted Score
Weighting	15%	25%	10%	20%	10%	10%	10%	
1) Sago Dry Toilet on Land	6	6	5	1	3	3	6	4.3
Weighted Score	0.9	1.5	0.5	0.2	0.3	0.3	0.6	
2) Sago Dry Toilet over Water	5	4	4	5	5	5	5	4.65
Weighted Score	0.75	1	0.4	1	0.5	0.5	0.5	
3) Portable Toilet on Land	4	4	4	2	3	2	5	3.4
Weighted Score	0.6	1	0.4	0.4	0.3	0.2	0.5	
4) Tidal Energy powered Toilet	5	1	2	4	3	3	6	3.2
Weighted Score	0.75	0.25	0.2	0.8	0.3	0.3	0.6	

The MCA analysis showed **Option 2 – Sago Toilet over water** had the highest weighted score and was subsequently developed for our technical submission.

Solution – Sago

Sago Dry Toilets are a simple and existing solution already successfully used within PNG.

Proven scalability, constructability and effectiveness, SAGO dry toilets are rolled out in PNG’s inland villages – Stantec are proposing a modification of the design for use over water on Pari’s jetties.



WHAT IS IT?

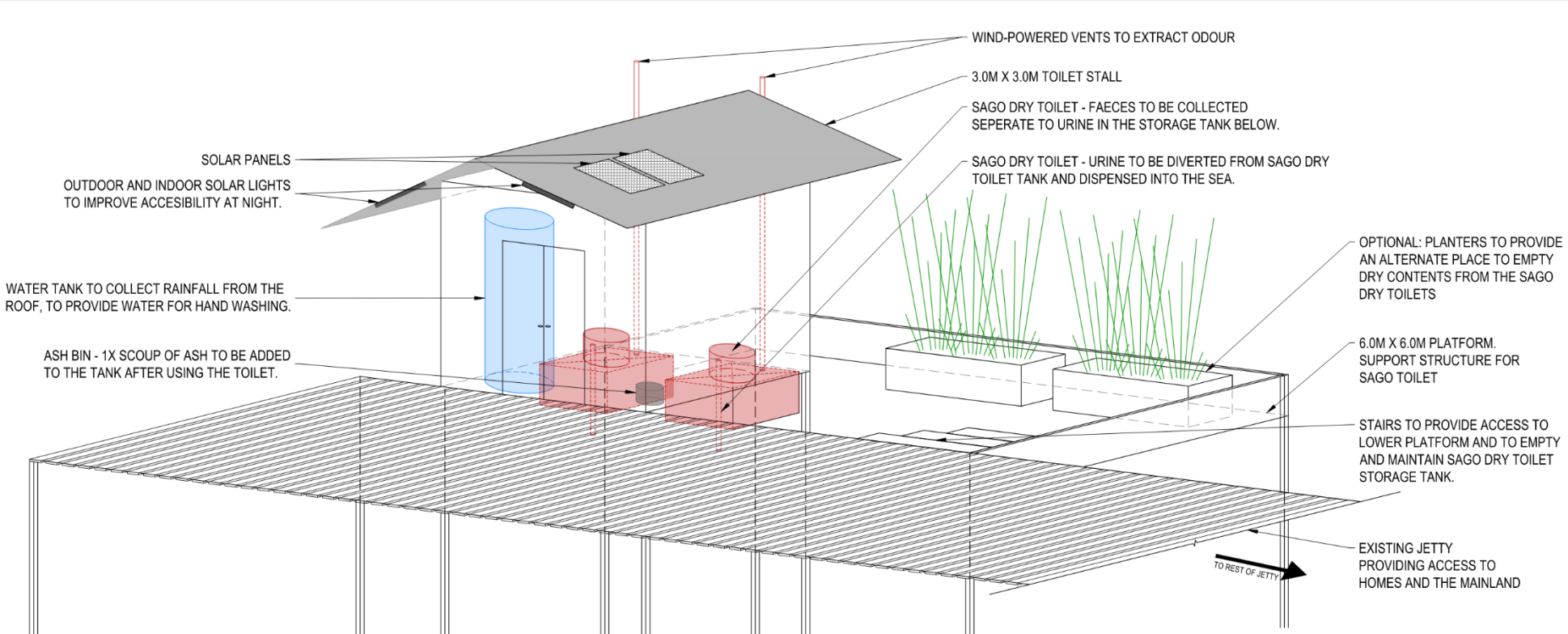
- Waterless, powerless sanitation solution
- Attach to end of end of each jetty.
- Two level structure; jetty level for toilet access with lower level for maintenance.

WHO CAN USE IT?

- Up to 15 people.
- Practically, use will be by households along each jetty.
- Solution is non-exclusive; enabling use by women, children & those with disabilities.

ADDITIONAL FEATURES

- Handwashing. Rainwater is harvested to provide handwashing facilities.
- Lighting. The modified Sago dry toilet will incorporate a solar panel to provide light functionality for safe nighttime usage.



Sago Dry Toilets have proven success in PNG...

300

Sago dry toilets already installed across PNG

10 years

Sago dry toilets tried & tested over 10 years in PNG

8/20

provinces in PNG already have Sago dry toilets

(Sago, 2024)



Solution – Sago

HOW DOES IT WORK?

URINE DIVERTED & SOLID WASTE CAPTURED

Users of the Sago Dry Toilet sit directly on the toilet.

Solid waste drops directly into the dehydration tank with urine falling directly into the sea.

ASH ADDED & CHEMICAL LEVELS BALANCED

After each toilet use, a scoop of ash is added down the toilet.

Ash has a high pH level and assists to break solid waste down over time.

DUAL TANKS & CONSTANT DEHYDRATION

Sago dry toilet has two tanks to store, ventilate and dehydrate waste on a 6-month rotational system.

Vents & convection-drive ducts constantly draw air into the tanks, expelling smell out high above the toilet in a process which dehydrates the waste & turns it into fertiliser.

- At 6 months, first chamber is decommissioned, and the second chamber is activated by moving pedestal cap.
- During second 6 months, second chamber is used as waste in first chamber dehydrates, reduces in volume and turns into fertiliser.

FERTILISER EMPTIED & CYCLE REPEATS

Solid waste has become fertiliser & will be deposited into strategically placed vegetation patch adjacent to tanks. Tanks are swapped and cycle repeats.

Dehydration Cycle



Maintenance

Regular Maintenance

Small amount of regular maintenance – not ‘set and forget system’.

Monthly Checks

For example, ensuring diapers or sanitary pads aren’t being disposed of into the tank.

Six-Monthly Maintenance

If used properly, only maintenance required. Removal of dry fertiliser and rotation of tanks being used.

Solution – WASH

The Sago dry toilet solution is to be accompanied by a WASH education program which strongly empowers GEDSI.

Without a WASH education program, improper use of the toilet could result - undermining its purpose and effectiveness.

The WASH education program has 4 key principles:

- i) Provide instructions on how to use & maintain the Sago Dry toilet.
- ii) GEDSI empowerment
- iii) Teach locals how to sanitise effectively.
- iv) Raises funds and awareness for sanitation problem.

\$1 —————> **\$46**

investment in **WASH** education programs

generated through increased productivity and workforce participation

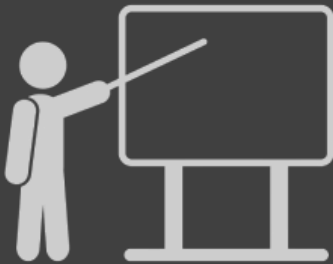
(The WASH Foundation, 2024)



An example handwashing poster in PNG *(LiveLearn)*

Education Program Features

1. Learning



Sesssions to be run which promote basic hygeine practice both generally and specific to the SAGO toilet.

Instructions will be shared on how to use the SAGO toilet.

2. Timing



Important feedback from Sago was ensuring a WASH program/ education is timed before the toilet infrastructure is installed.

Improper use of the toilet and failure to sanitise will ultimately be a waste of time & resource.

3. GEDSI



Integrating Gender Equality, Disability, and Social Inclusion (GEDSI) principles, the program will offer inclusive training, empower marginalized groups, and ensure that facilities are accessible to all, addressing specific needs such as menstrual hygiene management.

4. Circular Solution



Program to identify and train local volunteers to run sessions after initial WaterAid leadership. Method enables solution to be ‘circular’ and sustainable.

5. Charity Sports Day



Sport is a big part of PNG culture. Sports days to be held at schools to both promote awareness and raise funds for local sanitation.

6. Schools



Sessions will primarily target schools, focusing on reaching students to instill lasting behavioral changes. School-based sessions can increase attendance by over 60%.