

## **Typhoon Impacts on Sanitation Access and Service Reliability in Rural Philippines**

Supplementary information

### **Table of contents**

Figure S1. Global sanitation service levels by the WHO/UNICEF Joint Monitoring Programme






Figure S2. Photos from field observations

Table S1. Regression results for key study outcomes disaggregated by sanitation service levels post-typhoon Koinu (2024)

File S1. Survey and observation questions

Figure S1. Global sanitation service levels by the WHO/UNICEF Joint Monitoring Programme

### Global Sanitation Service Levels by the WHO/UNICEF Joint Monitoring Programme

SERVICE LEVEL	DEFINITION
<b>SAFELY MANAGED</b> 	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated off-site
<b>BASIC</b> 	Use of improved facilities that are not shared with other households but do not meet the additional criteria for safe excreta management.
<b>LIMITED</b> 	Use of improved facilities that are shared between two or more households.
<b>UNIMPROVED</b> 	Use of facilities that do not hygienically separate excreta from human contact (e.g., pit latrines without slab, bucket or hanging latrines).
<b>OPEN DEFECCATION</b> 	Disposal of human faeces in fields, forests, bushes, open bodies of water, beaches or other open places, or with solid waste

Safely managed, Basic, and Limited service levels are based on improved sanitation facilities, defined as those designed to hygienically separate human excreta from human contact. Examples include flush or pour-flush toilets connected to sewer systems, septic tanks, or pit latrines; ventilated improved pit latrines; pit latrines with slabs; and composting toilets.

Figure S2. Photos from field observations

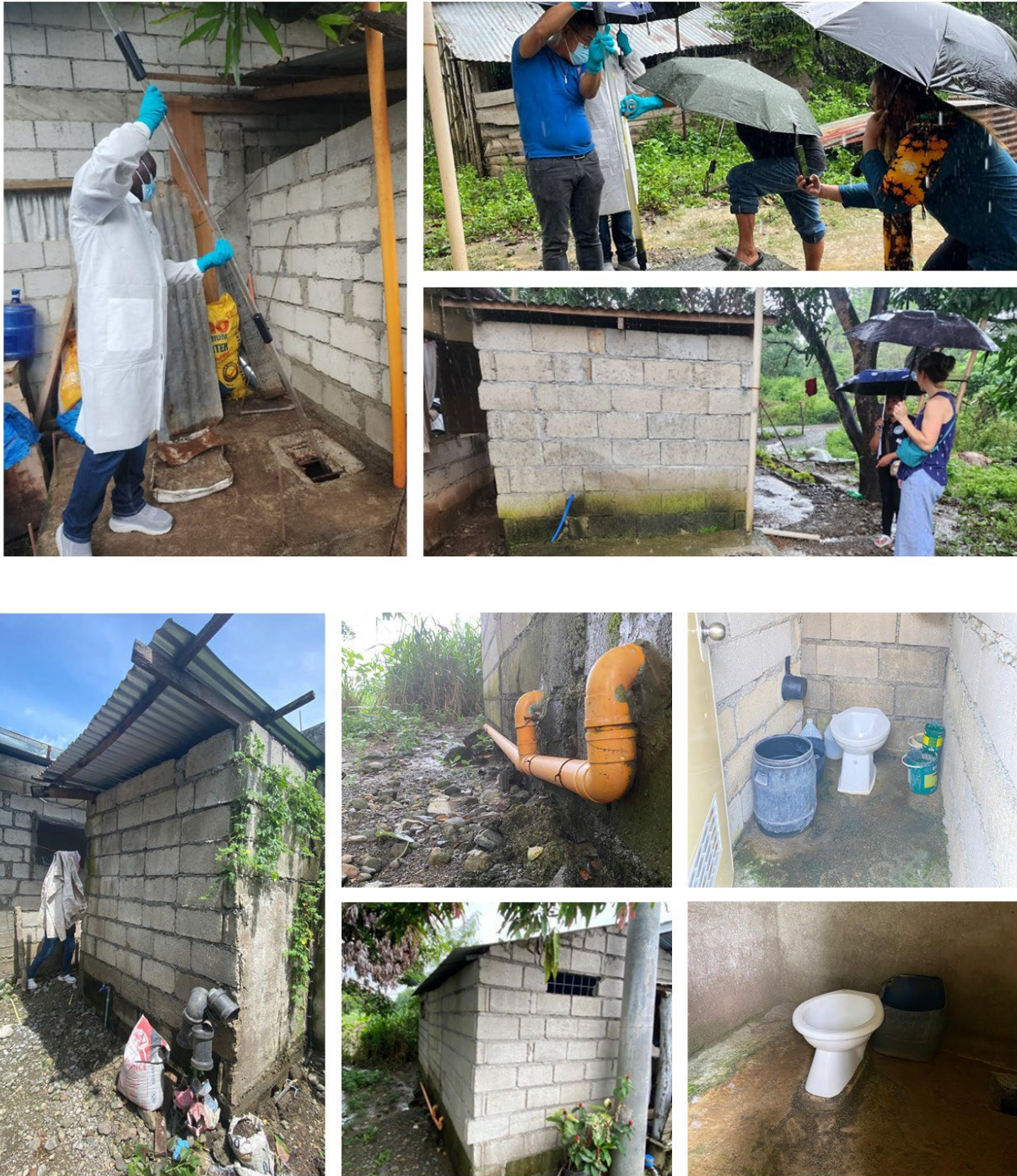


Table S1. Regression results for key study outcomes disaggregated by sanitation service levels post-typhoon Koinu (2024)

Predictor	Basic		Limited		Unimproved		Open defecation	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Toilet shared (ref: not shared)	-	-	-	-	1.36	[0.74, 2.49]	0.31	[0.11, 0.92]
Child feces disposal (ref: unsafe)	-	-	-	-	0.43	[0.05, 3.54]	-	-
Open defecation (ref: yes)	0.56	[0.20, 1.55]	1.79	[1.04, 3.09]	2.16	[1.07, 4.37]	0.93	[0.31, 2.78]
Disposal of menstrual products (ref: availability)	0.27	[0.09, 0.79]	0.22	[0.08, 0.56]	0.15	[0.08, 0.28]	0.45	[0.14, 1.46]
Diarrhea (ref: no)	4.29	[1.08, 16.99]	1.30	[0.41, 4.13]	1.74	[0.67, 4.52]	1.05	[0.18, 6.22]

# Household Sanitation Survey

## A. CONSENT

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### A1. Community

- PSBA
- SIKAP
- KASAG

A2. My name is [enumerator name] and I am from [name of group]. We would like to ask you to participate in a survey on sanitation. If you are interested, we will ask you some questions about your household and your sanitation practices. The interview will take approximately 30 - 45 minutes. The information you will be providing us with will be kept confidential and only the researchers who are involved in this study will have access to it. Your participation is voluntary, and you can withdraw from the survey any time you want. You may also choose not to answer some questions. You will not have to pay to participate in this survey; nor will we pay you. The information that you will provide us with will help us better understand the conditions of sanitation in your community.

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### A3. Has informed consent been obtained?

- Yes, written consent provided
- Yes, oral consent provided
- No (Do not proceed with interview)

## B. METADATA

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### B1. Household ID

-

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### B2. Respondent name

-

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### B3. Name of village

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### B4. Enumerator name

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### B5. Date of interview

yyyy-mm-dd

---

**B6. GPS Coordinates / location**

---

latitude (x.y °)  

---

longitude (x.y °)  

---

altitude (m)  

---

accuracy (m)  

---

**C. HOUSEHOLD CHARACTERISTICS**

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**C1. Please list the total number of people who live in your household, including yourself**  

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**C2. Are there children under the age of 5 living in your household?** Yes No**C3. What is the gender of the household head?** Male Female**C4. What is the highest level of formal education attained by the head of the household?** No formal education Elementary education High school education College education**C5. Is this house/residence owned or rented by a member of the household?** Owned Rented

**C6. If rented, does the landlord live on the compound?**

- Yes
- No

**C7. How many years have you or members of your household lived on this location/residence?**

---

**C8. Select all that your household owns from the list below.**

- Electricity
- Radio
- Television
- Telephone
- Refrigerator
- Bed
- Chairs
- Lamps
- Bicycle

**C9. Does any member of your household have a disability?**

- Yes
- No

**C10. Can the household member with disability use the toilet/latrine without getting feces on themselves or their clothing?**

- Yes
- No

**C11. Can the household member with disability use the toilet/latrine without assistance?**

- Yes
- No

**C12. Have any of your children under five years of age had diarrhea in the past 2 weeks?**

*Diarrhea is defined as three or more loose or watery stools per day, or blood in stool*

- Yes
- No

**C13. Have you or any member of your household had diarrhea in the past 2 weeks?**

*Diarrhea is defined as three or more loose or watery stools per day, or blood in stool*

- Yes
- No

**D. ACCESS TO WATER**

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**D1. What is the main source of drinking-water for members of your household?**

*Select one*

- Tube well/ borehole
- Protected dug well
- Unprotected dug well
- Rainwater collection
- Bottled water /gallon container and dispenser
- Refilled bottled water
- Public tap/ standpipe
- Piped into dwelling
- Piped to yard/plot
- Cart with small tank/ drum
- Tanker-truck
- Other [please specify]

**D2. Please specify other sources of drinking water for your household.**

---

**D3. What is the main source of water for use in your toilet/latrine?***Select one*

- Tube well/ borehole
- Protected dug well
- Unprotected dug well
- Rainwater collection
- Bottled water /gallon container and dispenser
- Refilled bottled water
- Public tap/ standpipe
- Piped into dwelling
- Piped to yard/plot
- Cart with small tank/ drum
- Tanker-truck
- Other [please specify]

**D4. Please identify other sources of water for use in your toilet/latrine.**

---

**D5. [For enumerator] Where is this water source located?**

- In dwelling
- In compound, yard or plot
- In neighbor's dwelling, compound, yard, or plot
- Elsewhere

**D6. On average, how many minutes does it take to walk to this water source?***Record response in minutes*

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**D7. On average, how many minutes do you or a household member have to wait in the line to get water?***Record response in minutes*

---

**D8. In the last month, has there been any time when your household did not have sufficient quantities of drinking water when needed?**

- Yes, at least once
- No, always sufficient
- Decline to state
- Don't know

**D9. Why were you or members of your household unable to access sufficient quantities of water when needed?**

- Water is not available from source
- Water is too expensive
- Source is too far away
- Source is not accessible
- Source is broken down
- Area around source or path to source is not safe
- Other [please specify]

**D10. Please specify other reason.**

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**D11. Is water always available from your main water source?**

- Always available
- Available most of the time
- Available some of the time
- Rarely available
- Decline to state
- Don't know

**D12. How many hours is water available from your main water source each day?**

- 24 hours per day (continuous water)
- Less than 24 hours (please specify)
- Decline to state
- Don't know

**D13. Please specify how many hours.**

---

**D14. Has your main water source had a breakdown in the past 12 months?**

- Yes
- No
- Decline to state
- Don't know

**D15. How long does it take to repair your water source after a breakdown?**

- Less than a day
- Few days
- Few weeks
- Months
- Years

**E. ACCESS TO TOILETS/LATRINES**

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**E1. Does your household have access to any toilet or latrine, regardless of if they own it or not?**

*Respond 'yes' if your household has access to a toilet for their use, regardless of if they own a toilet or not.*

- Yes
- No
- Decline to state
- Don't know

**E2. What kind of toilet or latrine do you and members of your household primarily use?**

- Automatic cistern flush
- Pour/manual flush
- Ventilated improved pit latrine
- Pit latrine with slab
- Pit latrine without slab/open pit
- Others (specify)
- No facilities or bush or field

**E3. Please specify which other toilet/latrine your household uses.**

---

**E4. Where do the contents of this toilet/latrine discharge to?**

- Piped sewer system
- Fully-lined septic tank with soakaway
- Fully-lined septic tank with overflow to drain / open ground / other
- Partially-lined septic tank (bottom and/or sides unlined)
- Fully-lined pit
- Pit with unlined bottom or sides
- Directly to open drain / ditch
- Directly to sea, lake or river
- Directly to open ground
- Others (specify)
- Don't know

**E5. Please specify where else the contents of this toilet/latrine discharge to**

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**E6. At home, where do you dispose of wastewater from the kitchen, bathing and/or laundry?**

- Piped sewer system
- Fully-lined septic tank with soakaway
- Fully-lined septic tank with overflow to drain / open ground / other
- Partially-lined septic tank (bottom and/or sides unlined)
- Fully-lined pit
- Pit with unlined bottom or sides
- Directly to open drain / ditch
- Directly to sea, lake or river
- Directly to open ground
- Others (specify)
- Don't know

**E7. Please specify where else you dispose of wastewater from the kitchen, bathing and/or laundry.**

---

**E8. [For enumerator] Where is this toilet/latrine facility located?**

- In dwelling
- In the compound
- In neighbors dwelling or compound
- Elsewhere

**E9. How many minutes does it take on average to use the toilet/latrine (walk there, queue, use, walk back)?**

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**E10. When was the toilet constructed and first used?**

---

**E11. What would stop you from using a toilet/latrine and openly defecate?**

- Toilet/latrine is located far from home
- Structural condition of the toilet (e.g. has cracks, likely to collapse)
- Typhoons
- Cannot go to toilet at night
- Lack of privacy
- Dirty
- Toilet smells bad (odor)
- Other

**E12. Please specify other reasons for not using a toilet/latrine and resorting to open defecation.**

---

**E13. The last time that your child under the age of five defecated, where did they defecate?**

- In a latrine/toilet
- On ground directly
- In cloth nappy
- In disposable diapers (Huggies, Pampers)
- In potty
- In pants/clothing
- On newspaper/paper
- Other

**E14. Please specify where else your child defecated.**

---

**E15. The last time your child under five years of age defecated, what was done to dispose of the stools?***Select all that apply*

- Child used toilet/latrine
- Put/rinsed into toilet or latrine
- Put/rinsed into drain or ditch
- Thrown into garbage
- Buried
- Left in the open
- Others (Specify)
- No Child under < 3 in the household
- Toilet/latrine gets filled fast
- Lack of water to flush toilet
- Don't Know

**E16. Please specify how else the child's stools was disposed of.**

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**E17. How did you clean the defecation site?**

- Wash with water
- Wash with water and soap
- Did not clean the site
- Other

**E18. Please specify how else you cleaned the defecation site.**

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**E19. Are you currently teaching any of your children who are less than 5 years old how to use the latrine for defecation?**

- Yes
- No - my child is not old enough to start learning how to use the latrine
- No - my child already knows how to use the latrine on their own (includes flushing and anal cleansing)
- No - I am not teaching my child how to use the latrine though my child is old enough

**E20. Do you share this facility with others who are not members of your household?**

- Yes, shared with known households (not public)
- Yes, shared with general public
- No
- Decline to state
- Don't know

**E21. How many households in total use this toilet facility regularly, including your own household?**

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**E22. How long does it take on average, to use the toilet (walk there, queue, use, walk back)?**

*Insert time in minutes*

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**E23. Do you have to pay to use this toilet?**

- No --> skip
- Yes, pay per use (public)
- Yes, weekly payment (communal not public)
- Yes, monthly payment (communal not public)

**E24. How much do you pay in peso? (per use)**

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**E25. How much do you pay in peso? (weekly payment)**

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**E26. How much do you pay in peso? (monthly payment)**

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**E27. What challenges do you face sharing a toilet/latrine with other households?**

- Challenges around cleanliness
- Embarrassment
- Not having enough time to use the toilet
- Difficulty when you have visitors
- Privacy
- Conflicts from sharing the toilet
- Other

**E28. Please specify other challenges for sharing a toilet/latrine with others**

---

**E29. Can you access the shared toilet at night?**

- Yes
- No

**E30. What do you use at night?**

- Bucket
- Open defecate
- Other

**E31. Please specify other ways**

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**E32. [For enumerator] Which of the following are present at this handwashing area?**

- Water
- Soap/detergent
- Hygienic hand drying material

**E33. Is someone in charge of cleaning this toilet facility?**

- Yes
- No/ none
- Decline to state
- Don't know

**E34. Is someone in charge of maintaining and repairing this toilet facility?**

- Yes
- No/ none
- Decline to state
- Don't know

**E35. Is there a paid caretaker?**

- Yes
- None
- Decline to state
- Don't know

**E36. Does the design of your toilet prevent other people from seeing and hearing what you are doing when you use it?**

- Yes
- No
- Decline to state
- Don't know

**E37. Is there a separate toilet for men and women?**

- 
- Yes
- No
- N/A

**E38. [For enumerator] Does the toilet/latrine have a lockable door that can be closed from the inside during use?**

- Yes
- No
- N/A

**E39. [For enumerator] Are there cracks or leaks in the toilet/toilet structure?**

- Yes
- No
- N/A

**E40. [Enumerator] Are there partitioning walls and doors with no major holes?**

- Yes
- No
- N/A

**E41. Does the toilet/latrine provide facilities to manage menstrual hygiene needs?**

*A toilet can be considered to meet the needs of menstrual hygiene management if it meets both of the following conditions: • a bin with a lid on it within the cubicle; • water and soap available in a private space for washing.*

- Yes
- No
- N/A

**E42. [For enumerator] Are the toilet facilities visibly clean?**

*Clean means with no excreta, litter, blood or body substances that could pose a human health risk.*

- Yes
- No
- N/A

**E43. Is there a cleaning system in place e.g., a cleaning schedule/rota**

- Yes
- No
- N/A

**E44. [Enumerator] Is there toilet paper available in the toilet/latrine?**

- Yes
- No
- N/A

**E45. Do toilets/latrines have adequate light, including at night?**

*There should be functioning and sufficient general or overhead light to see all areas within the toilet stall at night, as well as in areas that users will travel to and from the toilets, particularly if not located within the health facility (e.g. if outside)*

- Yes
- No
- N/A

**E46. Does the toilet/latrine meet the needs of people with reduced mobility?**

*This question refers to toilets for people with reduced mobility or people with a disability or elderly persons*

- Yes
- No
- N/A

**E47. [Enumerator] Does the toilet/latrine have ventilation (e.g. pipe, fan) to reduce odors?**

- Yes
- No
- N/A

**E48. Do you or other household members face any risks when using the toilet?**

- Yes, risk to health
- Yes, risk to harassment
- Yes, other risk (please specify)
- No
- Decline to state
- Don't know

**E49. Please specify what other risk**

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F. FECAL SLUDGE MANAGEMENT

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**F1. If this toilet empties to a pit or septic tank, has it ever filled up?**

- Yes
- No
- Don't know

**F2. In the last 5 years, how many times has it filled up?**

*Enter number*

---

**F3. What did you do when the pit or septic tank filled-up last time?**

- Emptied and reused pit/tank
- Abandoned and pit/tank unsealed
- Abandoned with sealed cover on pit/tank
- Covered and used alternative pit
- Other (Specify)
- Don't know

**F4. Has the toilet ever overflowed?**

- Yes
- No

**F5. For how long did the toilet overflow?**

- Less than a week
- Less than a month
- Several month
- Years

**F6. What was the reason for overflowing?**

*Select many*

- Blocked
- Flooded with rising water table (from below ground)
- Flooded by surface water / storm water (from above ground)
- No money to empty
- Emptiers not available when needed
- Others (specify)
- Don't know

**F7. Specify other reasons for the toilet overflowing.**

---

**F8. Has your pit/container/septic tank ever been emptied?**

- Yes
- No
- Decline to state
- Don't know

**F9. The last time it was emptied, who emptied the pit/container/septic tank?**

- Service provider
- Household member
- Community member
- Other (please specify)
- Decline to state
- Don't know

**F10. Please specify who emptied the pit/container/septic tank?**

---

**F11. How was it emptied?**

- By hand, using buckets or similar
- By hand, using manual pump
- Mechanically, using small machine
- Mechanically, using tanker truck

**F12. Where were the contents of the pit/septic emptied into?**

- Directly into drain / water body / field
- Into a pit on the compound that is then covered
- Into a pit on the compound that is left open
- Directly into drum / open container
- Directly into machine / tanker
- Contents not emptied, latrine abandoned
- Taken to treatment plant
- Other

**F13. Please specify where else the contents of the pit/container/septic tank were emptied to**

---

**F14. Which difficulties did the emptying service provider face during emptying?**

- Difficulty to access toilet (no opening)
- Poor road conditions
- Typhoon period
- There were no difficulties faced
- Other (please specify)

**F15. Please specify other difficulties faced by the emptying service provider.**

---

**F16. [For enumerator] Does the toilet/latrine have an opening (e.g.manhole) for accessing the pit during emptying?**

- Yes, purpose built hatch for easy access
- Yes, but squatting plate must be removed
- No, slab must be broken for access

F17. Please rate your satisfaction level with that service provider in terms of:

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**F18. Price**

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

**F19. Service quality**

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

**F20. Safety**

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

**F21. Ease of obtaining service**

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

**F22. Did you pay for the pit to be emptied?**

- Yes
- No

**F23. How much did you pay in total?**

*Enter amount in pesos*

---

**F24. What are the reasons why you have never emptied your pit/septic?**

- Not yet full
- I have space available for another toilet
- Can't afford emptying services
- Difficult to access emptying services
- Other

**F25. Please specify other reasons for not emptying pit/septic**

---

**F26. Next time the toilet fills up, what do you intend to do?**

- Empty by member of household
- Empty by private individual or company
- Cover and seal pit
- Abandon toilet without covering / seal
- Other

**F27. Please specify**

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**G. CLIMATE RESILIENCE AND SANITATION**

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**G1. Has your toilet/latrine ever been affected by heavy rains or typhoons?**

- Yes
- No

**G2. In the past, how often has your toilet/latrine been affected by heavy rains or typhoons?**

- Several times a year
- Few times a year (1-2 times a year)
- Once a year
- Never

**G3. How did the last heavy rains or typhoon affect your toilet/latrine?**

- Damaged toilet/latrine structure
- Disrupted functionality - toilet/latrine closed
- Power outages
- Interrupted traffic access to toilet/latrine
- Damaged or blocked pipes

**G4. How concerned are you about heavy rains or typhoons destroying your toilet/latrine?**

- Not at all concerned
- Slightly concerned
- Moderately concerned
- Very concerned

**G5. During typhoons, do you have access to the toilet/latrine you primarily use?**

- Yes
- No

**G6. What do you use instead?**

- Open defecate
- Use a flying saucer
- Use a neighbor's toilet/latrine
- Other (please specify)

**G7. Please specify other options you use during a typhoon?**

---

**G8. After the typhoon has happened, how many days does it take you to use your toilet/latrine again?**

---

**G9. Thinking about your toilet/latrine, do you know what type of flooding your property is vulnerable to?***Select many*

- River (water course flooding)
- Surface water flooding (e.g. from intense rainfall that cannot drain away)
- Sewer flooding (if sewers are at capacity and water cannot drain away)
- Tidal/ Sea flooding
- Groundwater flooding (e.g. from a rise in the water table)
- Not sure
- None

**G10. How well is your toilet/latrine protected against heavy rains or typhoons? (Rank from 1 to 5) Very low protection**

- Very low protection
- Low protection
- Moderate protection
- High protection

**G11. How quickly do you think your toilet/latrine would recover and resume its operations if it was affected by heavy rains or typhoons?**

- Very slow recovery
- Slow recovery
- Moderate recovery
- Fast recovery

**G12. If you have improved your toilet/latrine against heavy rains or typhoons, can you tick all the measures you have taken?**

- Sandbags
- Elevated toilet/latrine structure
- Moved toilet/latrine uphill
- Drains and pipes: non-return valves
- Flood retaining wall
- Planting, greenery
- Emptying the latrine
- Improvements to superstructure
- Other (specify)

**G13. Please specify other protective measures**

---

**G14. [For enumerator] Is the floor or slab contaminated with feces or urine?**

- Feces only, or feces and urine, visible
- Urine only visible (no feces)
- No feces or urine visible
- Don't know

**G15. [For enumerator] In your latrine, is the pit/tank fully covered and the cover slab sealed well?**

- Not covered
- Covered but not sealed well
- Covered and sealed well

**G16. In your latrine, is the pit/tank full, overflowing or allowing waste to leak onto the ground?**

- Overflowing or leaking
- Full, but not overflowing or leaking
- Not full or leaking

**G17. [For enumerator] Is the discharge from the latrine pan contained (e.g. in a pit/ tank/ soakaway), or is there visible discharge in the immediate environment (e.g. on open land in the property, or in an open channel)?**

- Discharge not contained - visible discharge on the property
- Discharge not contained - visible discharge to an open channel
- Discharge contained - no visible discharge

**G18. [For enumerator] Is the connecting pipework blocked or damaged, with signs of effluent leaking into the immediate environment (e.g. on open land in the property, or in an open channel)?**

- Pipework damaged or blocked and signs of leaking
- Pipework damaged or blocked but no sign of leaking
- Pipework not damaged or blocked and no sign of leakage

**G19. [For enumerator] Is there evidence that the latrine/septic tank needs desludging?**

- Latrine/septic tank full/ overflowing and in need of desludging immediately
- Latrine/Septic tank not full/overflowing but likely to need desludging soon
- Latrine/Septic tank not full/overflowing and unlikely to need desludging soon

**G20. [For enumerator] Is there evidence that the latrine has overflowed before?**

- Strong evidence of overflow, with excreta still visible
- Some evidence of overflow, but excreta not that visible
- No evidence of overflow

**G21. [For enumerator] What is the condition of the floor?**

- Collapsed or unstable and unusable
- Slightly to moderately degraded
- Good condition

**G22. [For enumerator] Is there evidence of cracking or damage to the toilet pedestal or squat slab?**

- Yes
- No

**G23. Has the toilet/larine been non-functional at any time in the past year?**

- Yes
- No

**G24. Why was the toilet/latrine non-functional?**

- Filled up
- Caved in
- Leaking
- Other (please specify)

**G25. Please specify other reasons why the toilet/latrine was non-functional.**

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**G26. Take a clear photo of the outside of the toilet**

Click here to upload file. (< 5MB)

**G27. Take a clear photo of the inside of the toilet**

Click here to upload file. (< 5MB)

That's all! Thank you for your time.

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