

1. Step-by-step implementation manual

Phase 1: Define the pilot

1. Clarify your goal
 - One pilot unit in a severely arsenic-affected village
 - Treat groundwater from a borewell to make it safe to drink
 - Show safe handling of arsenic-bearing waste (sludge + exhausted GFH)
 - Involve local school students in operation and basic monitoring
2. Choose the site
 - Work with a district official / NGO to pick the village
 - Basic criteria:
 - Arsenic in handpumps above 50 µg/L
 - Iron clearly present (colour, metallic taste or test)
 - Poor or unreliable electricity
 - Willing panchayat and school

Phase 2: Water testing and design

3. Test the water from at least 2–3 local wells

Minimum parameters:

- Arsenic
 - Iron
 - pH
 - Turbidity
 - (If possible) phosphate and silica
4. Decide the design basis
- Example design:
- Raw water: arsenic ~ 100 µg/L, iron high
 - Flow: 1,000 L/h
 - Operation: 4 hours per day
 - Total treated water: about 4,000 L/day
- Treatment train:

- Borewell pump to elevated raw water tank
- Iron removal filter
- Activated carbon filter
- GFH arsenic removal filter
- Backwash filter and sludge barrel
- Treated water tank and tap

Phase 3: Sizing and procurement

5. Size the main components (typical values)
 - Raw water tank: 2,000 L
 - Treated water tank: 1,000 L
 - Filters: 4 FRP vessels in series (iron, carbon, GFH, backwash)
 - GFH media: about 25–30 kg for one community unit
 - Pump: sized to deliver ~1,000 L/h to the raw water tank
 - Solar panel set large enough to run the pump in daylight hours
6. Source equipment and media
 - FRP filters and tanks from a local water-treatment vendor
 - GFH from a reputable media supplier
 - Pipes, valves, stands, basic civil works done locally
 - Solar package from a local solar integrator

Phase 4: Installation

7. Civil and structural work
 - Concrete slab for filters and sludge barrel
 - Small platform or frame for tanks and solar structure
 - Secure fencing if needed
8. Mechanical installation
 - Install borewell pump and connect to raw water tank
 - Install four filters in sequence: iron → carbon → GFH → backwash
 - Connect pipes:
 - Raw tank to iron filter

- Iron filter to carbon filter
- Carbon filter to GFH filter
- GFH filter to backwash filter
- Backwash filter to treated water tank
- Install separate pipe from backwash filter outlet to sludge barrel
- Install outlet tap from treated water tank

9. Electrical and solar

- Wire solar panels to controller and battery (if used)
- Connect controller to borewell pump
- Add simple switch and basic protection (fuse, MCB)

Phase 5: Commissioning

10. Media loading and rinsing

- Fill iron filter with iron removal media, rinse to waste
- Fill carbon filter with activated carbon, rinse until black fines are gone
- Fill GFH filter with 25–30 kg GFH, rinse to waste as per supplier instructions
- Fill backwash filter with appropriate media (sand or multi-grade), rinse

11. Initial test run

- Pump water to raw tank
- Open flow through filters to treated tank
- Monitor flow rate and check for leaks
- After the system stabilises, test:
 - Arsenic at inlet and treated water
 - Iron, pH, turbidity at the outlet

12. Community handover

- Explain the flow path and safety aspects
- Train 2–3 people (and students) on:
 - Starting and stopping the pump
 - Backwashing the filters as recommended
 - Keeping the sludge barrel closed

- Not tampering with the GFH vessel

Phase 6: Operation, maintenance and disposal

13. Routine operation

- Operate daily for the planned hours
- Keep a simple log: date, hours run, basic observations
- Backwash iron, carbon and backwash filters at regular intervals
- Ensure all backwash water goes to the sludge barrel

14. Monitoring

- Test arsenic and iron in treated water periodically (for example, once a month using field kits, plus occasional lab confirmation)
- Record any drop in performance

15. Sludge barrel management

- Allow solids to settle in the barrel
- Occasionally decant clearer water from the top back to the raw water tank
- Let sludge thicken at the bottom
- When the barrel is nearly full, seal it and store in a safe, dry area for later transport

16. GFH replacement and disposal

- Based on flow and arsenic level, plan to replace GFH once per year (details in budget section below)
- When media is exhausted:
 - Drain the GFH vessel
 - Scoop out the media into a sealed, labelled drum or double-bagged container
 - Load new GFH into the vessel and rinse according to instructions
 - Keep the sealed GFH waste in a safe place until it can be transported to a hazardous waste facility or central disposal point