

HOUSEHOLD WATER AND SANITATION SOLUTIONS



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The content for this manual was created through the manufacturer's manual, website or Akvopedia, which has an excellent summary of water and sanitation solutions on their website at www.akvo.org.

Thank



You

Table of Contents

A. Household Water Filters

- | | |
|-----------------------------|----|
| 1. SkyBox™ | 4 |
| 2. LifeStraw® Family Filter | 6 |
| 3. LifeStraw® Filter | 8 |
| 4. Biosand Filter | 10 |
| 5. Ceramic Water Filter | 12 |
| 6. LIFESAVER® jerrycan | 14 |

B. Other Household Water Solutions

- | | |
|--------------------|----|
| 1. Rain Harvesting | 16 |
| 2. SODIS | 18 |
| 3. Chlorine | 20 |
| 4. PUR | 22 |
| 5. Purikit | 24 |
| 6. Puriclar | 26 |

C. Household Sanitation Solutions

- | | |
|--|----|
| 1. Composting Latrine - Double Chamber | 28 |
| 2. Composting Latrine - Loveable Loo | 30 |
| 3. Biodigester | 32 |
| 4. Constructed Wetland | 34 |

A. HOUSEHOLD WATER FILTERS

1. SkyBox™

a. Water Source:

SkyBox™ is able to filter any water except sea or brackish water, or sources contaminated with arsenic or iron.

b. Initial Cost:

~US \$199

c. Implementation Time:

Setup time should take no more than 5 minutes before first use.

d. How it works:

SkyBox™ is an ultrafiltration membrane that is placed at the bottom of a water container. The height of the filter should be between 1 meter and 1.5 meters from the ground. This provides enough pressure for the water to pass through the membrane to be purified. With the proper PVC connections, the water passes through the outlet into an additional potable water tank.



Photo Credit: SkyJuice™ Foundation

e. Maintenance:

Cleaning the SkyBox™ membrane

It is anticipated that up to 100 x 20 liter containers can be filtered through the unit before a manual shake wash is undertaken (100 cycles). The shake wash interval will depend on the characteristic of the feed water. Dirty and turbid water will require more manual cleans. The manual clean is undertaken by filling the SkyBox™ with 10 liters of clean water and then putting the lid on. The drop snorkel is temporarily disconnected. The SkyBox™ is picked up and shaken vigorously for approximately 30 seconds. Then remove the lid and empty the contents into a convenient location nearby.

Medium term clean (1000 - 1500 cycles)

The SkyBox™ will need an intermediate sanitizing to remove organics. This is encouraged to ensure the unit is “sanitary” and no harmful bacteria to pathogens compromise the water quality. It is undertaken with chlorine. The SkyBox™ should be half filled with clean water so that the membrane is adequately covered. Then chlorine is added to the water inside the box. Put the lid on and shake the SkyBox™ in accordance with the previous instructions for a manual clean. The unit should then be left overnight to soak for 8 hours. Lastly, it should be emptied and rinsed with clean water.

f. Maintenance cost:

Chlorine is required for medium term cleaning. The cost can range from US \$1 to US \$11.

g. Lifespan:

If maintained properly, it can last 5 years.

h. Advantages:

- + Provides up to 600 liters of purified water per day.
- + Filter can be used in a variety of water containers (minimum size of 50 liters).
- + Operation and maintenance is simple and affordable.
- + Removes a minimum of 99.9% of bacteria, viruses and protozoan cysts.
- + Removes turbidity.
- + Requires no electrical power, batteries or replacement parts.

i. Disadvantages:

- + Initial cost is high.
- + Requires additional water containers.
- + Imported from Australia.

j. Additional Resources:

SkyJuice™ Foundation: www.skyjuice.com.au



Photo Credit: SkyJuice™ Foundation

A. HOUSEHOLD WATER FILTERS

2. LIFESTRAW FAMILY FILTER

a. Water Source:

The Lifestraw® Family Filter is able to filter microbiologically contaminated water from any source (except salt water or water contaminated with chemicals.)

b. Initial Cost:

Lifestraw® Family Filter: ~US \$80 (depending on the country where it is purchased)

c. Implementation Time:

The filter can be used immediately. The flow rate is 9 liters per hour.

d. How it works:

The filter works by pouring dirty water into the feed water bucket (#1). Inside the bucket there is a prefilter (#2), which removes coarser turbidity. Then the water passes through the halogen chamber (#3), which releases low-level chlorine to prevent membrane fouling. Next, simple gravity forces the water through a plastic hose (#4) and into the membrane cartridge (#5) that removes the contaminants. Clean and safe water is then ready to flow from the blue tap (#6). Dirt accumulated in the membranes can be released from the exit valve (#8) by pressing the cleaning bulb (#7) after use.



Photo Credit: Vestergaard Frandsen

e. Maintenance:

To clean prefilter everyday:

- + Take the prefilter out from the dark blue container.
- + Wash the prefilter to remove all the dirt that may have collected in it.
- + Place the clean prefilter back into the dark blue container.

To clean the membrane cartridge everyday:

- + Close the light blue tap.
- + Close the red tap.
- + Fill the dark blue container with water.
- + Open the red tap until dirty water is released for 3 seconds. Close the red tap.
- + Do not drink water released from the red tap.

- + Squeeze the red bulb unit it is flat. Wait till it is refilled. Do this process three times.
- + Open the red tap until some water is released for 3 seconds. Close the red tap.

In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

None.

g. Lifespan:

- + 18,000 liters or approximately 3 years.

h. Advantages:

- + Filters up to 18,000 liters of water, which is enough to supply a family of five with clean drinking water for three years.
- + Ensures high flow rate and high volume of purified water.
- + Removes a minimum of 99.9% of bacteria, viruses and protozoan cysts.
- + Removes turbidity.
- + Requires no electrical power, batteries or replacement parts.
- + Has an easy-to-clean prefilter and purification cartridge.



Photo Credit: Verónica Cisneros Toro

i. Disadvantages:

- + LifeStraw® Filter does not remove heavy metals or salt.
- + LifeStraw® Filter must be used frequently.
- + LifeStraw® Filter must be replaced when it reaches 18,000 liters of use.
- + Can easily be stolen.

j. Additional Resources:

Vestergaard Frandsen: www.vestergaard-frandsen.com/lifestraw/lifestraw-family

A. HOUSEHOLD WATER FILTERS

3. LIFESTRAW® FILTER

a. Water Source:

The Lifestraw® Filter is able to filter microbiologically contaminated water from any source (except salt water or water contaminated with chemicals.)

b. Initial Cost:

Lifestraw® Filter: \$20

c. Implementation Time:

Lifestraw® Filter can be used immediately.

d. How it works:

- + Place LifeStraw® Filter in water and sip through the mouthpiece.
- + Regularly blow through the LifeStraw® after drinking to keep the filters clean and to prevent clogging.

e. Maintenance:

At regular intervals, it is recommended to back-wash the filter by blowing some air out through the LifeStraw®. This will clean the pre-filters of whatever sand, silt and debris that might have been deposited in the textile filters.

Be sure to close both caps when not in use to avoid contamination.

f. Maintenance cost:

None.

g. Lifespan:

- + 1,000 liters or approximately 1 year.

h. Advantages:

- + Offers easy access to clean and safe drinking water away from the home.
- + Filters* at least 1000 liters of contaminated water.
- + Removes a minimum of 99.9999% of waterborne bacteria.
- + Removes a minimum of 99.9% of waterborne protozoan parasites.
- + Reduces turbidity by filtering out particles of greater than approximately 0.2 microns.



Photo Credit: Verónica Cisneros Toro

- + Contains no chemicals.
- + Has a high flow rate.
- + Requires no electrical power, batteries or replacement parts.

i. Disadvantages:

- + LifeStraw® Filter does not remove viruses, heavy metals or salt.
- + LifeStraw® Filter must be used frequently.
- + LifeStraw® Filter must be replaced when it reaches 1,000 liters.
- + LifeStraw® Filter is for personal use only.
- + Can easily be stolen.

j. Additional Resources:

Vestergaard Frandsen: www.vestergaard-frandsen.com/lifestraw



Photo Credit: Simón Zimmer

A. HOUSEHOLD WATER FILTERS

4. BIOSAND FILTER

a. Water Source:

The biosand filter is able to filter microbiologically contaminated water from any source (except salt water or water contaminated with chemicals.)

b. Initial Cost:

- + Concrete filter bodies: US \$12 to \$30
- + Plastic: US \$75

c. Implementation Time:

Initial use requires a waiting period of 14 days because the biological layer needs to be created first. This is created by pouring ~19 liters of water through the filter every other day for the first 2 weeks. Afterwards, .6 liters of water a minute can be purified for concrete bodies and .8 liters for plastic bodies.

d. How it works:

Contaminated water is poured into the top of the bio sand filter on an intermittent basis. The water slowly passes through the diffuser plate and filters down through the biological layer, of sand and gravel. The treated water naturally flows out through the outlet tube.

e. Maintenance:

There are four maintenance considerations:

- + **Biological layer:** A significant decrease in flow rate means maintenance is required, which consists of allowing the biological layer to recover and fully develop again. This should not be performed more than 4 times per year.
- + **Outlet tube:** Growth of mold or algae in the outlet tube means maintenance is required. This condition is most prevalent in hot, humid climates. Periodic cleaning is recommended.
- + **Diffuser plate:** Accumulation of dirt, scum, or debris in the diffuser plate means maintenance is required. Periodic cleaning is recommended.
- + **Clean water container:** The need for periodic maintenance varies depending upon household conditions and usage patterns. Weekly cleaning of the water container using a chlorine solution is recommended.

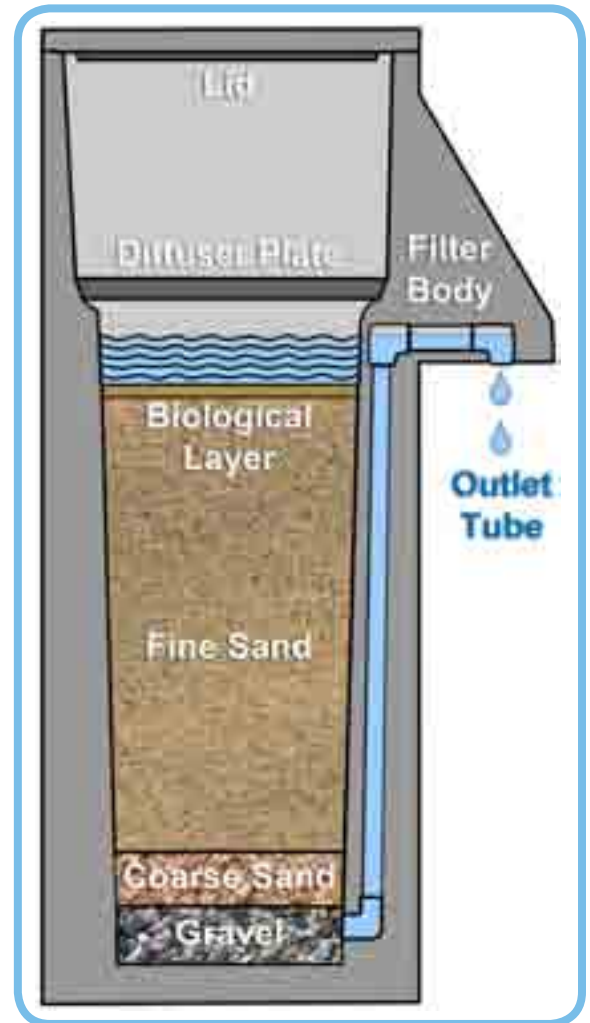


Photo Credit: Alexis Doucet

In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

None unless buying chlorine, which can cost ~US \$1.00 per small bottle.

g. Lifespan:

- + Concrete Bodies: 30 years
- + Plastic Bodies: 10 years
- + Lid & Diffuser Plate: May need to be replaced earlier.

h. Advantages:

- + High flow rate
- + Affordable
- + Long life span
- + Minimal maintenance
- + Can be constructed from local materials.

i. Disadvantages:

- + Post-filtered water may require chlorine, solar disinfection or boiling.
- + Biological layer needs to be created first.
- + Highly turbid water sources may require more maintenance on cleaning the biosand filter.

j. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Water
- + Centre for Affordable Water and Sanitation Technology (CAWST): www.cawst.org

A. HOUSEHOLD WATER FILTERS

5. CERAMIC WATER FILTER

a. Water Source:

Ceramic water filter is able to filter any water that is contaminated can be used except if it has high metals, salt or chemicals in it.

b. Initial Cost:

Plastic bucket, faucet and ceramic water filter: US \$20 to US \$30 (varies on country)

c. Implementation Time:

- + First time use: Fill the ceramic water filter three times, allow the water to seep through, and discard the filtered water.
- + Daily Use: 1 to 3 liters per hour

d. How it works:

- + Pour contaminated water through the ceramic water filter.
- + By gravity, the water seeps through the ceramic filter and fills up the plastic bucket.
- + Use the faucet to access purified water for consumption.

e. Maintenance:

- + The ceramic water filter should be cleaned once per month.
- + Clean the inside surface of the lid with soapy water and let it dry.
- + Scrub the inside of the ceramic water filter with a cloth or soft brush and rinse with clean water. Do not use soap to clean the ceramic water filter. Do not clean the outside of the ceramic filter.
- + Clean the plastic bucket and spigot with soapy water.
- + Put the ceramic water filter into the plastic bucket immediately after cleaning to prevent recontamination. The ceramic water filter does not have to be dried after cleaning, it should remain moist at all times.

In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

Replacement filter: US \$10 to US \$12



Photo Credit: Verónica Cisneros Toro

g. Lifespan:

Replace ceramic water filter every 1 to 2 years.

h. Advantages:

- + 99 to 100% effective for removing bacteria and parasites.
- + No further disinfection (chlorine) is required.

i. Disadvantages:

- + Ceramic water filter is fragile and can easily be cracked during handling.
- + Low flow rate.
- + Ceramic water filter may need to be replaced over time.
- + Can easily be stolen.

j. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Water
- + Potters For Peace: www.pottersforpeace.org/



Photo Credit: Verónica Cisneros Toro

A. HOUSEHOLD WATER FILTERS

6. LIFESAVER® JERRYCAN

a. Water Source:

LIFESAVER® jerrycan is able to filter any water except sea or brackish water, or sources contaminated with arsenic or iron.

b. Initial Cost:

~US \$199

c. Implementation Time:

First time use: The ultrafiltration cartridge needs to be primed. Please consult the instruction manual for detailed instructions. This process should take ~5 minutes.



Photo Credit: LIFESAVER® Systems Ltd.

For routine use:

- + Fill
- + Pump
- + Drink

d. How it works:

- + The water is purified through an ultrafiltration system built inside the jerrycan.
- + The pumping action pushes the water through the ultrafiltration system and purifies the water.

e. Maintenance:

- + **Front Side Washing:** Over the life of the membranes, particulate matter will build up on the surface. The filter cartridge's unique design induces particulate matter to form a caking layer on its external surfaces. To reduce this build-up you should perform a front-side wash on a regular basis.
- + **Maintaining the pump:** LIFESAVER® jerrycan's pump has been designed for high workloads. The o-ring inside the pump is designed to glide easily up and down the tube. A small amount of silicone grease should be added to the o-ring of the pump plunger from time to time.
- + **Replace Ultrafiltration cartridge:** Depending on the quality of water and usage, the cartridge may need to be replaced if water quality is not adequate and front side washing does not improve the situation.

In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

Replacement cartridges are available but it is cheaper to buy a new LIFESAVER® jerry-can.

g. Lifespan:

One cartridge can purify 20,000 liters of water.

h. Advantages:

- + Provides up to 20,000 liters of purified water.
- + Provides a sturdy and durable water container with a water treatment system all in one.
- + Easy to use.

i. Disadvantages:

- + Initial cost is high.
- + Ultrafiltration cartridges are expensive.
- + Can easily be stolen.

j. Additional Resources:

LifeSaver Systems Ltd.: www.lifesaversystems.com/jerrytech.html



Photo Credit: LIFESAVER® Systems Ltd.

B. OTHER HOUSEHOLD WATER SOLUTIONS

1. RAIN HARVESTING

a. Water Source:

The water source for rain harvesting is rainfall.

b. Initial Cost:

US \$100 to US \$2,000 (depending on the size of the water tank and how the gutters are supported)

c. Implementation Time:

1 to 2 days to install the systems. Once the tank is filled, the water is ready to be consumed.

d. How it works:

Rain harvesting is the process of capturing rainwater from roofs or other surfaces through gutters and storing it in a water storage tank.

A rain harvesting system will provide a household with an independent clean water supply. However, to assure that the captured rainwater remains potable the system needs to be built with the following quality components:

- + **Rain Gutters:** Collect the rainwater from the roofs.
- + **Rain Heads:** Separate leaves and debris from the rainwater to assure that animals, snakes and insects such as mosquitoes cannot enter the captured rainwater.
- + **First Flush Diverters:** Prevent the first downpour of rainwater from entering the water storage tank. This is important because this rainwater could be contaminated by pollutants from the roof such as bird droppings.
- + **Closed Water Storage Tanks:** Prevent animals and mosquitoes from entering the water. Closed water storage tank to prevent bacteria and viruses from spreading due to insufficient lighting and organic matter (food).



Photo Credit: Sabrina Zimmermann

e. Maintenance:

The rain head needs to be cleaned once a month depending on how much debris there is. The first flush diverter needs to be cleaned every 1 to 2 weeks. The closed tanks should be cleaned every 6 months with chlorine.

In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

None.

g. Lifespan:

10 years or more depending on a consistent maintenance routine.

h. Advantages:

- + Rainwater can be collected from most roofs.
- + Local materials can be used to construct rainwater catchment system.
- + Rainwater is a clean water source.
- + Minimal maintenance.
- + Affordable

i. Disadvantages:

- + Lack of a water source when there is no rain.
- + Certain roofs are not recommended for capturing rain water (Asbestos sheeting or lead-painted surfaces should be avoided).
- + Supplies can be contaminated by bird/ animal droppings on catchment surfaces and gutter surfaces unless they are cleaned/flushed before use.
- + Not all rainwater is safe for human consumption. Rainwater near factories may be contaminated and should be tested first before installing a rain harvesting system.

j. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Water
- + Water Aid: www.wateraid.org/documents/plugin_documents/rainwater_harvesting.pdf

B. OTHER HOUSEHOLD WATER SOLUTIONS

2. SODIS

a. Water Source:

SODIS treats microbiologically contaminated water with low turbidity, however it can not treat water with salt, chemicals or metals. Pre-filtration may be required to remove particulate matter that may harbor pathogens before SODIS can be carried out effectively.

b. Initial Cost:

The cost of a transparent PET-bottle or glass bottle.

c. Implementation Time:

6 hours

d. How it works:

Use new or used PET (Polyethylene Terephthalate) plastic bottles. Wash the bottle thoroughly the first time you use it. Fill the bottle with water and close the cap. Expose the bottles in the sun for at least 6 hours (or 2 days in cloudy conditions). The water is then ready for consumption.

e. Maintenance:

Replace old bottles that are no longer transparent after 4 - 6 months of daily use. In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

Cost of a plastic bottle from soda or water.

g. Lifespan:

4 to 6 months

h. Advantages:

- + Very Affordable.
- + No electricity required.
- + Reduces diarrhea.



Photo Credit: SODIS Eawag

i. Disadvantages:

- + Does not work during rainy days.
- + Water should be clear.
- + Bottles need to be replaced every 4 to 6 months.
- + Does not remove suspended particles or dissolved compounds.

j. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Water
- + SODIS: www.sodis.ch



Photo Credit: flickr - lindastrande

B. OTHER HOUSEHOLD WATER SOLUTIONS

3. CHLORINE

a. Water Source:

Chlorine is able to be used with any purified water that requires further disinfection especially during storage.

b. Initial Cost:

US \$1 to US \$11 depending on the product (tablets, powder or liquid) purchased.

c. Implementation Time:

30 minutes or longer depending on the product (tablets, powder or liquid) purchased.



Photo Credit: Achlor Liaocheng Ltd.

d. How it works:

Add appropriate dosage of tablet, powder or liquid to water container. Consult the product's directions for exact dosage depending on the amount of water.

e. Maintenance:

None. In general, always carefully read the instruction manuals on the exact procedure for operating and maintaining the water solution.

f. Maintenance cost:

None.

g. Lifespan:

Tablets can last up to 5 years without being used. Liquid chlorine should be used within 3 months of purchase.

h. Advantages:

- + Affordable
- + Ease of use.
- + Scalability
- + Well-known treatment solution in rural communities.

i. Disadvantages:

- + Taste and odor
- + Chlorine degrades over time.
- + Dangerous if used improperly.

j. **Additional Resources:**

Akvopedia: www.akvo.org/wiki/index.php/Portal:Water



Photo Credit: Sabrina Zimmermann

B. OTHER HOUSEHOLD WATER SOLUTIONS

4. PUR

a. Water Source:

PUR is able to purify any water that is contaminated except when it has high metals, salt or chemicals in it.

b. Initial Cost:

US \$15 for 6 packets

c. Implementation Time:

30 minutes

d. How it works:

- + One packet cleans 10 liters of water.
- + Put one packet into 10 liters of unpurified water.
- + Take a spoon and stir the water for 5 minutes. Large particles will form after stirring.
- + Wait 5 minutes for them to settle down at the bottom of the container.
- + Use a filter cloth (100% cotton cloth) when pouring the water into a different container.
- + Dispose of the filter cloth away from children and animals.
- + After filtering, wait 20 minutes to drink the water. This is very important because this is when remaining pathogenic bacteria are killed.

e. Maintenance:

Drink treated water within 24 hours after its preparation. Water that is not consumed may be used for cooking, washing, animals or otherwise discarded.

f. Maintenance cost:

Cotton cloth costs US \$1.

g. Lifespan:

Every 60 liters of purified water, a new packet is required.



Photo Credit: PUR

h. Advantages:

- + By adding one packet, 10 liters of water can be purified in 30 minutes.
- + PUR packets are small and portable, enabling them to be easily used in remote locations and emergency situations.

i. Disadvantages:

- + Does not clean all types of water.
- + Not effective for removal of *Cryptosporidium parvum* and dissolved chemicals.

j. Additional Resources:

PUR Water Filtration Systems:

www.purwater.com/clean-drinking-water-for-the-world.html



Photo Credit: Oxfam

B. OTHER HOUSEHOLD WATER SOLUTIONS

5. PURIKIT

a. Water Source:

Purikit is able to purify any water that is contaminated can be used except if it has high metals, salt or chemicals in it.

b. Initial Cost:

US\$3 per kit (175 grams).

c. Implementation Time:

45 minutes

d. How it works:

- + One packet cleans 20 liters of water.
- + Put one packet into 20 liters of unpurified water.
- + Take a spoon and stir the water for 5 minutes. Large particles will form after stirring.
- + Wait 20 minutes for them to settle down at the bottom of the container.
- + Use a filter cloth (100% cotton cloth) when pouring the water into a different container.
- + Dispose of the filtered cloth away from children and animals.
- + After filtering, wait 20 minutes to drink the water. This is very important because this is when remaining pathogenic bacteria are killed.

e. Maintenance:

- + Drink treated water within 24 hours of its preparation.
- + Water that is not consumed may be used for cooking, washing, watering animals or otherwise discarded.

f. Maintenance cost:

Cotton cloth costs US \$1.

g. Lifespan:

Every 20 liters of purified water, a new packet is required.



Photo Credit: Purikit

h. Advantages:

- + Affordable
- + Eliminates bad smells, taste and toxins.
- + Easy to use.
- + Easy to transport.

i. Disadvantages:

Does not clean all types of water.

j. Additional Resources:

Sulfoquimica S.A.: www.sulfoquimica.com/purikit.php?id=9



Photo Credit: Purikit

B. OTHER HOUSEHOLD WATER SOLUTIONS

6. PURICLAR

a. Water Source:

Any water that is contaminated used except if it has high metals, salt or chemicals in it.

b. Initial Cost:

US \$7.5 for 2 bottles

c. Implementation Time:

~52 minutes

d. How it works:

- + Put 7 drops of the Puriclar bottle #1 into 10 liters of unpurified water.
- + Take a spoon and stir the water for 1 minute. Large particles will form after stirring.
- + Wait 20 minutes for them to settle down at the bottom of the container.
- + Pour the water into another water container but make sure the solids at the bottom are not poured with it.
- + Put 7 drops of Puriclar bottle #2 into the water.
- + Stir the water for 30 seconds.
- + Wait for 30 minutes and then the water will be ready to consume.

e. Maintenance:

None.

f. Maintenance cost:

None.

g. Lifespan:

Lifespan of the bottles lasts ~ 3,000 liters of purified water.

h. Advantages:

- + Affordable
- + Easy to use.
- + Easy to transport.



Photo Credit: Puriclar

i. Disadvantages:

Does not clean all types of water such as salt water.

j. Additional Resources:

+ Aguas de Colombia

http://www.aguacol.com/index.php?option=com_content&view=article&id=62%3Apurificar&catid=37&Itemid=37&showall=1

+ Agua Vida

http://www.aguavidapremium.com/inicio/index.php?option=com_content&view=article&id=48&Itemid=71



Photo Credit: Sabrina Zimmermann

C. HOUSEHOLD SANITATION SOLUTIONS

1. COMPOSTING LATRINE - DOUBLE CHAMBER

a. Initial Cost:

~US \$2,000 per double-vault dehydration toilet.

b. Implementation Time:

1 week

c. How it works:

A composting latrine consists of a toilet seat and base, which is placed over a chamber. The feces enter a well-ventilated chamber where aerobic microbes break down the waste materials. After each use, the feces are covered with sawdust, ash or dirt. After 8 to 12 months, the waste turns into an excellent fertilizer, which can be used for agricultural purposes.

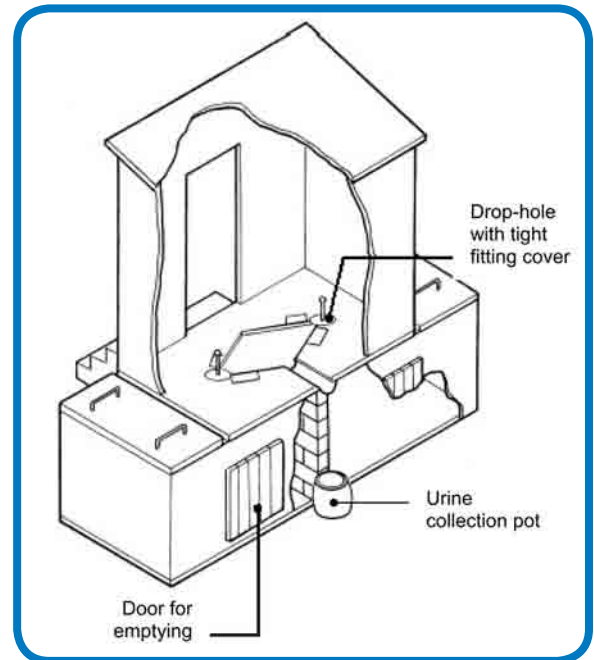


Photo Credit: GTZ

The urine does not enter the chamber but instead goes through tubing, known as a diverter that leads to a soak pit, a hole in the ground filled with coarse aggregate and covered with excavated soil on top. This allows the urine to be filtered naturally back in to the ground without any negative environmental effects. Alternatively the urine can be collected in a container and used to water plants (diluted with water).

d. Maintenance:

Operation and maintenance include keeping the toilets clean, covering the feces after defecation with sawdust, ash or dirt and monitoring the urine and feces levels in the collection containers and vaults. Feces are spread in the vault from time to time to enhance the drying process.

At most twice a year, a collection chamber may need to be emptied, requiring another couple of hours of work. Bulking material, such as ashes or sawdust, is in most cases available for free.

e. Maintenance cost:

None.

f. Lifespan:

20 years or more if the latrine is built properly.

g. Advantages:

- + Provides improved sanitation facilities for households and public institutions in rural areas.
- + Provides fertilizer for small-scale farmers.
- + Does not require water.
- + Low maintenance.

h. Disadvantages:

- + Educational training is required to overcome cultural issues with handling feces
- + Proper maintenance required to avoid issues such as bad odors and flies

i. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Sanitation
- + Susana: www.susana.org



Photo Credit: Sustainable Sanitation

C. HOUSEHOLD SANITATION SOLUTIONS

2. COMPOSTING LATRINE - LOVEABLE LOO

a. Initial Cost:

~US 225 per composting latrine.

b. Implementation Time:

Assembling the composting latrine requires a few hours.

c. How it works:

A composting latrine from Loveable Loo collects human feces and urine in a 20 liter bucket. It is housed inside a wooden container with a toilet seat attached to the top. Inside the bucket, there can be a biodegradable bag acting as a liner. After each use, the feces and urine are covered with sawdust. When the bag or bucket is full, remove the bag or bucket and place it in a compost bin. Place a new bag into the bucket and it can be immediately used again.



Photo Credit: Loveable Loo

When the bag or bucket is full, remove the bag or bucket and place it in a compost bin. Place a new bag into the bucket and it can be immediately used again.

d. Maintenance:

- + It is essential that the bucket is replaced as soon as it is full.
- + After each use of the composting latrine, always cover the feces and urine with sawdust to prevent any bad odors.
- + Create 3 composting bins. It takes 12 to 24 months until the compost pile is composted to be used for fertilizer.
- + Each home should have two buckets with biodegradable bag liners prepared for immediate use. This assures consistent and proper use of the composting latrine.

e. Maintenance cost:

Biodegradable bag liners cost ~\$4.69 for 10 bags.

Biodegradable bag liners are not required; they are optional.

f. Lifespan:

Depending on the climate, a composting latrine can last +10 years.

g. Advantages:

- + Provides improved sanitation facilities for households and public institutions in rural areas.
- + Provides fertilizer for small-scale farmers.
- + Does not require water.
- + Low maintenance.

h. Disadvantages:

- + Educational training is required to overcome cultural issues with handling feces.
- + Proper maintenance required to avoid issues such as bad odors and flies.

i. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Sanitation
- + Loveable Loo: www.humanurehandbook.com/store/LOVEABLE-LOO-Eco-Toilet.html
- + Humanure Toilet: www.humanurehandbook.com/



Photo Credit: Loveable Loo

C. HOUSEHOLD SANITATION SOLUTIONS

3. BIODIGESTER

a. Water Source:

Black water (water from a toilet) and grey water (water from a sink, shower)

b. Initial Cost:

~US \$300 per Rotoplast biodigester.

c. Implementation Time:

1 week to construct.

d. First Time Use:

Will not operate at full capacity until after 6 to 9 months when the biomass has stabilized.

e. How it works:

A biodigester treats wastewater (used water from the home) through an anaerobic (without oxygen) process. The wastewater enters the biodigester, where bacteria decompose the organic matter of the wastewater. The remaining water is filtered before it is released to be used for irrigation. The solids that are not decomposed fall to the ground and have to be removed every 6 months.

f. Maintenance:

Depending on the design, the solids need to be emptied every 6 months.

g. Maintenance cost:

The removal of the sludge by a company may cost \$50 or more.

h. Lifespan:

10 years depending on construction.

i. Advantages:

- + Secure way to treat black and grey water.
- + Affordable
- + Low maintenance.
- + No electricity is required.
- + Provides fertilizer or water for irrigation.



Photo Credit: Rotoplas

j. Disadvantages:

Appropriate only for at home use, but not communities.

k. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Sanitation
- + Rotoplas: www.rotoplas.com/assets/files/hogar/guiabiodigestor.pdf



Photo Credit: Rotoplas

C. HOUSEHOLD SANITATION SOLUTIONS

4. CONSTRUCTED WETLAND

a. Water Source:

Black water (water from a toilet) and grey water (water from a sink, shower).

b. Initial Cost:

US ~\$2,000 (Depends on the size, # of people served and materials used for the constructed wetland)

Costs can be much higher if designing a constructed wetland for a large community.



Photo Credit: Lloyd Roz

c. Implementation Time:

Several months are required until the plants have grown enough to purify the water.

d. How it works:

Constructed wetlands work both mechanically and biologically to filter pollutants. First, water flows from the greywater source (such as a laundry washing station) into the wetland. As water flows through the wetland, it is first cleaned mechanically as it passes through gravel leaving sediments behind. Then, water is cleaned by biological processes as oxygen from the roots of wetland plants breaks down smaller contaminants in the greywater. Lastly, the water passes through an outlet. The outlet can lead to a drain or be used to water an additional garden.

e. Maintenance:

- + Wetlands should be checked after high flows; particularly at outlets. Any damage, erosion, or blockage should be corrected as soon as possible to prevent problems.
- + Flows and water levels should be checked regularly.
- + Alternate flows and drawdown to help oxidize organic matter and to encourage the recruitment of new plants into the wetland.
- + Vegetation should be inspected regularly and invasive species should be removed.
- + Herbicides should not be used.
- + Prevent the breeding of mosquitoes.
- + After 8 years, the gravel may need to be replaced due to buildup of solids and bacterial film.

f. Maintenance cost:

~\$50 to \$500 depending on what repairs are needed and the size of constructed wetland.

g. Lifespan:

15 years and up depending on how well the constructed wetland has been maintained.

h. Advantages

- + Construction costs are much less than conventional wastewater treatment systems.
- + Pleasant to look at.
- + Provides environmental education opportunities for the community and local schools.
- + They do not require operators who are highly trained.
- + Facilitates water reuse and recycling.

i. Disadvantages

- + Require long start-up time.
- + Performance may be less consistent than in conventional treatment.
- + Biological components are sensitive to toxic chemicals (ammonia and pesticides).
- + Wetlands cannot survive complete drying.

j. Additional Resources:

- + Akvopedia: www.akvo.org/wiki/index.php/Portal:Sanitation
- + Swiss Federal Institute of Aquatic Science and Technology (EAWAG): www.eawag.ch/forschung/sandec/index



Photo Credit: Jack Levenson

