



EFLM TASK FORCE-GREEN and SUSTAINABLE LABORATORIES

WATER CONSERVATION STRATEGY

for SUSTAINABILITY

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Water Management



Less than 1% of the Earth's water is freshwater

Less than 40% of that is unpolluted



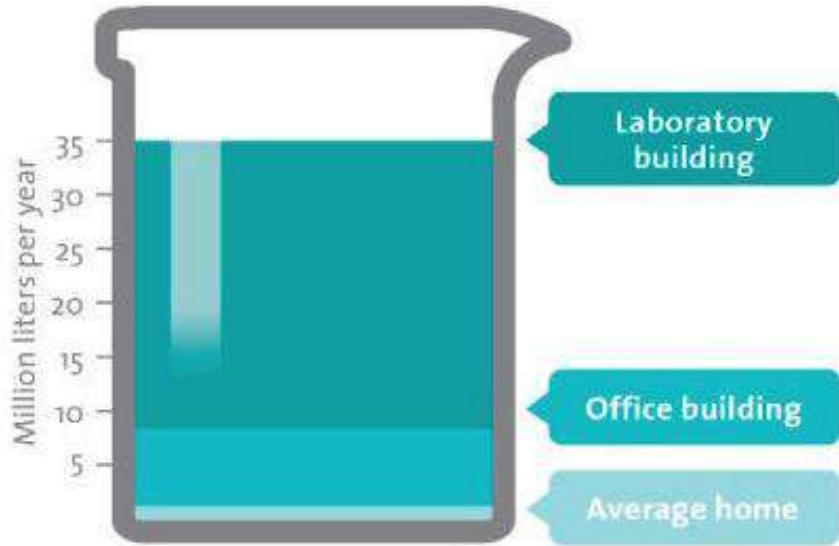
Minimising water consumption ensures that there is more clean fresh water available to all species

The water services industry is the fourth most energy intensive sector in the EU

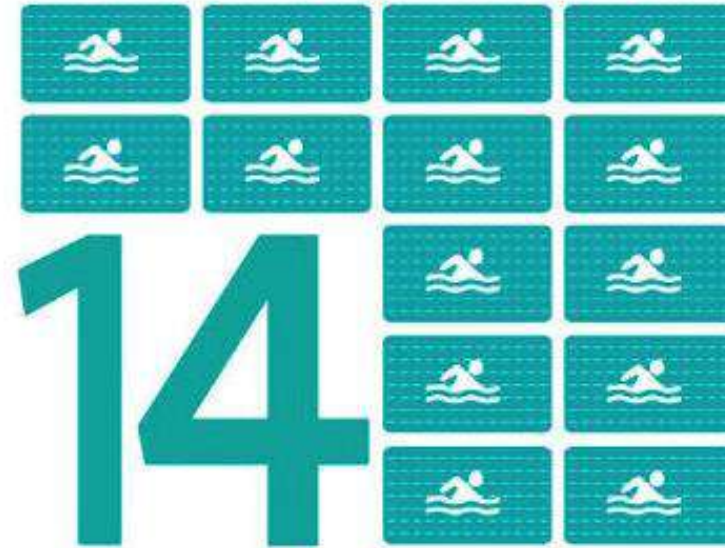


Minimising water consumption can further cut energy conservation and carbon footprint

Laboratories use a lot of water



A typical laboratory is estimated to use around 5 times as much water as a similarly sized office building^{1,2,3}



35 million liters per year is enough to fill over 14 Olympic-sized swimming pools

Picture: Elga Labwater (<https://www.process-worldwide.com/facts-about-lab-water-gal-653338/?p=1#gallerydetail>)

Labs consume 1-3 m³ of water / m² of floor area



Based on a typical laboratory of 5 000 m² this translates into an annual water consumption of between 5 000-15 000 m³

S-LAB ENVIRONMENTAL GOOD PRACTICE GUIDE FOR LABORATORIES - A REFERENCE DOCUMENT FOR THE S-LAB LABORATORY ENVIRONMENTAL ASSESSMENT FRAMEWORK VERSION 1.0 OCTOBER 2011 ©S-LAB

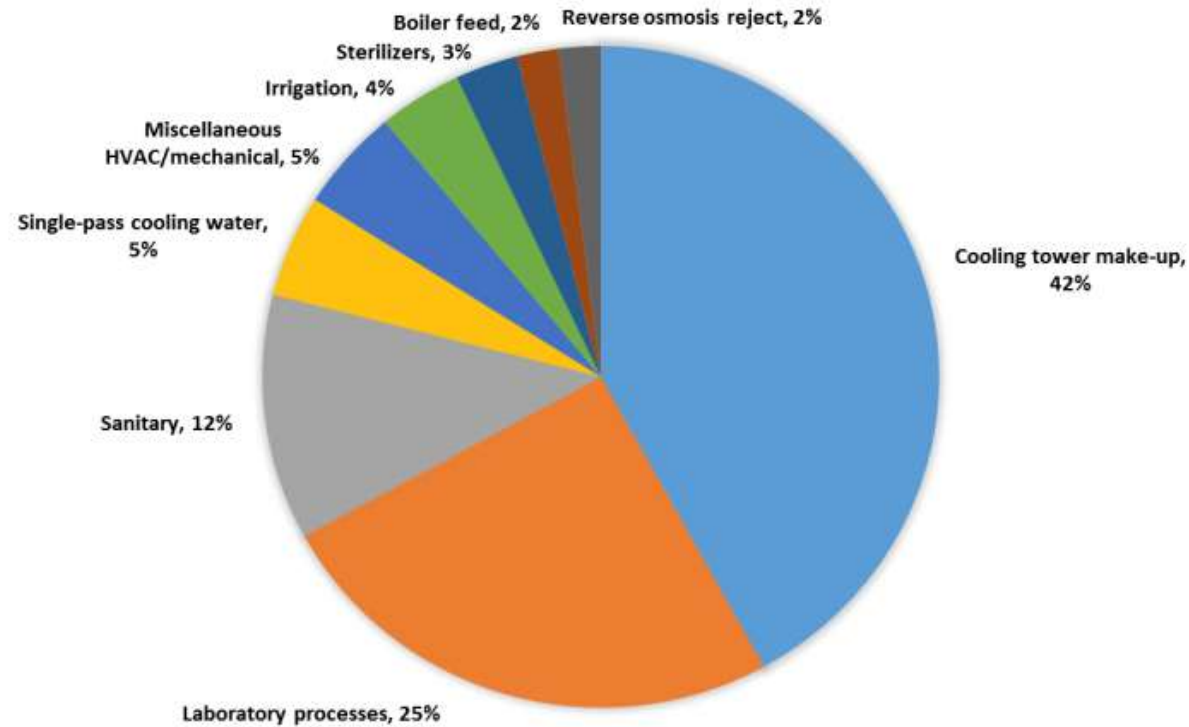
Water Use in Labs

- Routine preparation of reagents and standards
- Water stills and RO / DI systems
- Icemakers
- Vacuum aspirators
- Western blots
- Single-pass cooling equipment
- Cooling towers
- Cage washers and glassware washing
- Autoclaves
- Heating baths
- Sterilizing systems
- Humidification systems
- Irrigation
- Taps



Why water conservation should be a priority for labs?

TYPICAL LAB BUILDING WATER USE



Source: U.S. Environmental Protection Agency, 2015 (reflects performance at EPA facilities)

- Wide range of water-using equipment in laboratories (labs use 4x more water than office spaces of the same size)
- Relatively easy to improve efficiency
- Excellent savings potential



General Guidelines

- Water management should be raised at a senior management level and support secured
- It is worth working on keeping the water use as low as possible
- Start small, initially set achievable targets
- There is always place for continuous improvement



General Good Practices

- Creating awareness of water consumption (costs/environmental impacts)
- Assessing the water quality needed for each laboratory process
- Using purified water appropriately and sparingly (producing it by reverse osmosis)
- Monitoring consumption to detect leaks and to identify improvement opportunities
- Improvement of laboratory process equipment (cooling of equipment, rinsing, and flow control)
- Use of alternative water sources (air-conditioning condensate recovery and rainwater harvesting)



Meter/monitor water consumption



Meter/monitor water consumption

➤ Reduce use of tap water

- Turn off when not in use
- Use electronic faucets
- Post signage with reminders to turn off the water



➤ Use timers

- Install or use timers on critical or continuous water uses





Meter/monitor water consumption

➤ Install low-flow aerators

- Install low-flow aerators on lab faucets



➤ Install flow restrictors

- Installing flow restrictors with balanced pressure is a cost-effective way to reduce water use



➤ Install sink aerators

- Remove any tubing and barb attachments from faucets, screw in a sink aerator, and secure it with a clamp





Meter/monitor water consumption

- **Install water misers**
- **Install data-logging water meters**
- **Conduct a water audit**
- **Maintain the proper functioning of the plumbing system**
- **Check for faucet leaks and other leaks on autoclaves, ice machines, water-cooled equipment**





Select / use equipment & instrumentation wisely



Select / use
equipment &
instrumentation
wisely

- Conduct a **pre-purchase water consumption assessment** of equipment/instruments
- Give priority to **low water consumption** items, to manufacturers who use **environmentally friendly manufacturing processes** and/or to those who have **ISO certification for good environmental practices**
- (If possible) include a **green element to procurement**





Select / use equipment & instrumentation wisely

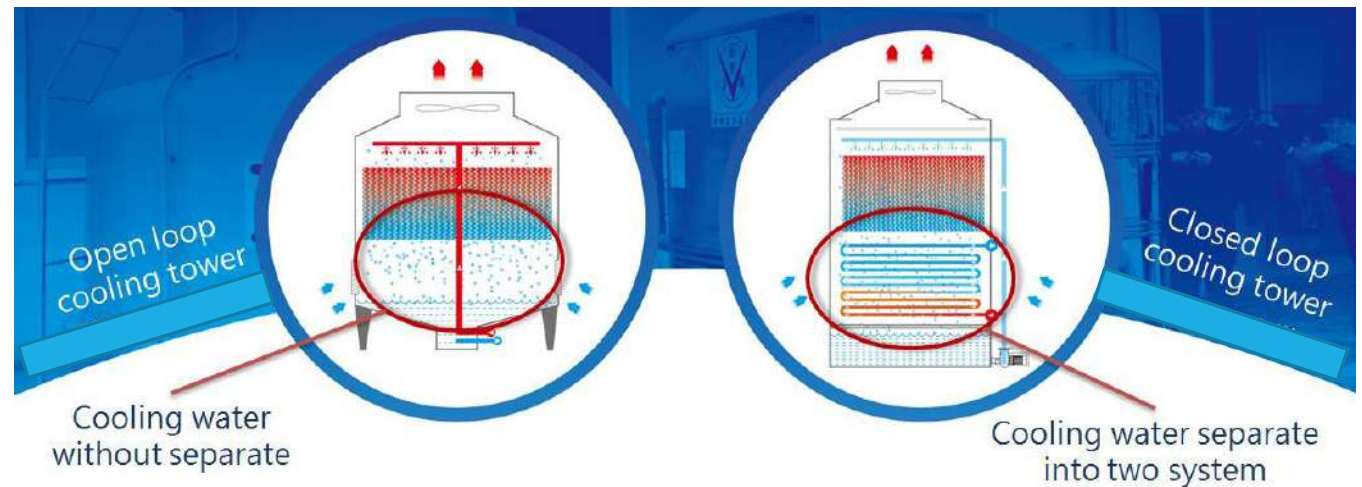
- Determine the quality of water required in each application and match the process to the actual quality of water
- Limit the use of deionised water
- Use water purification only when necessary
- Choose a filtration process that matches the laboratory's requirements for high-quality water the main treatment process usually being a RO membrane with specific modules and cartridges, ultraviolet lamps, and ultrafiltration
- Rinse bulky glassware or equipment with regular tap water before utilizing deionised water for the last stage of rinsing



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➤ Cooling, rinsing, and flow control

- Reduce/eliminate single-pass cooling
- Use a recirculating process or cooling loop through a cold-water bath
- Use the cleanest water only for the final or last stages of a rinse operation, and batch processing
- Use a control or solenoid valve to allow water to flow only when the unit is being used

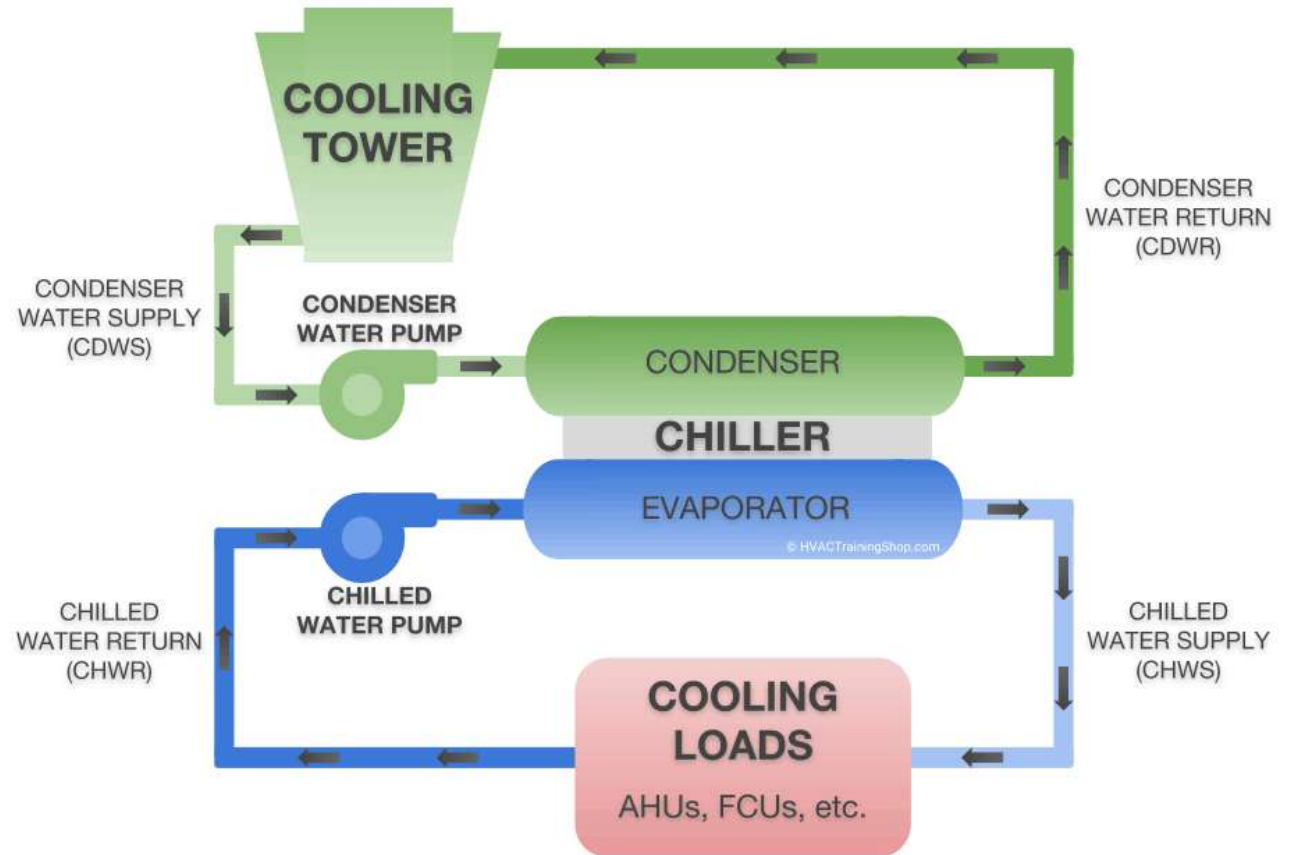


The biggest feature of closed loop cooling tower is it has two cooling water systems.



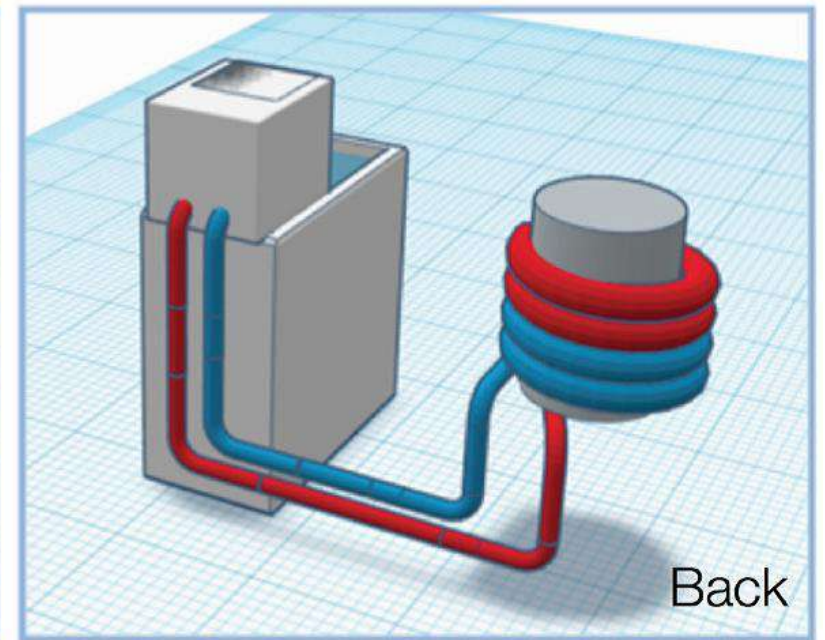
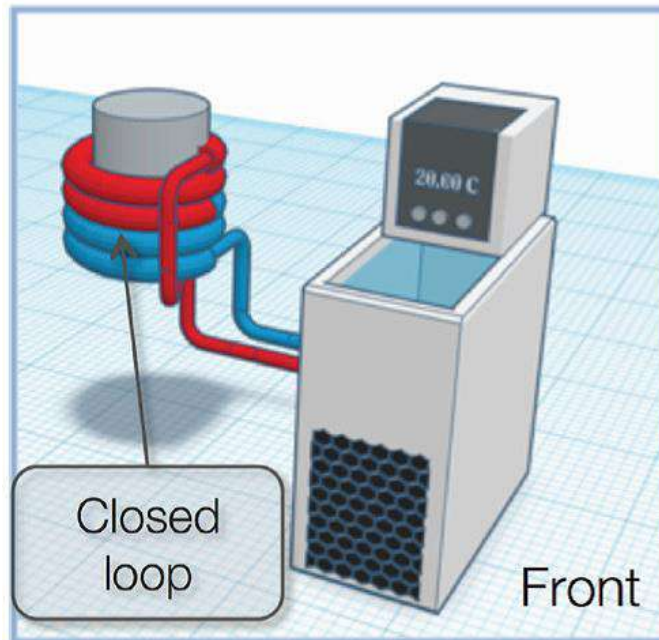
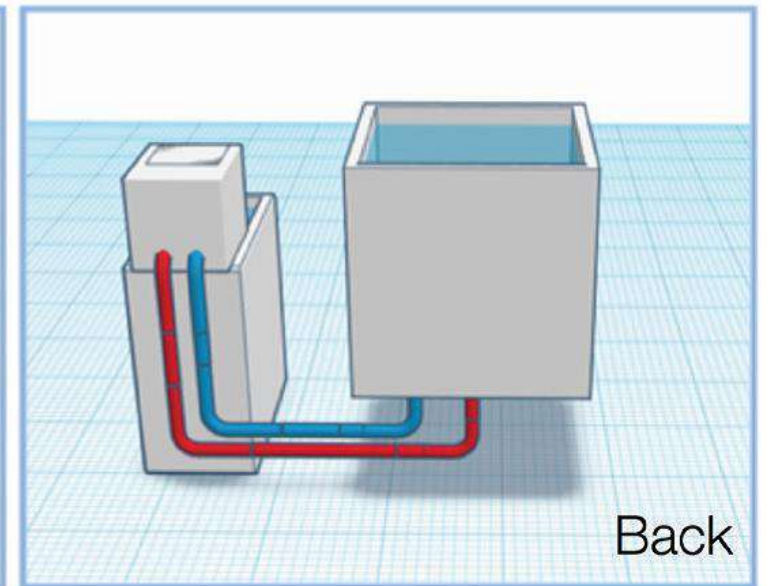
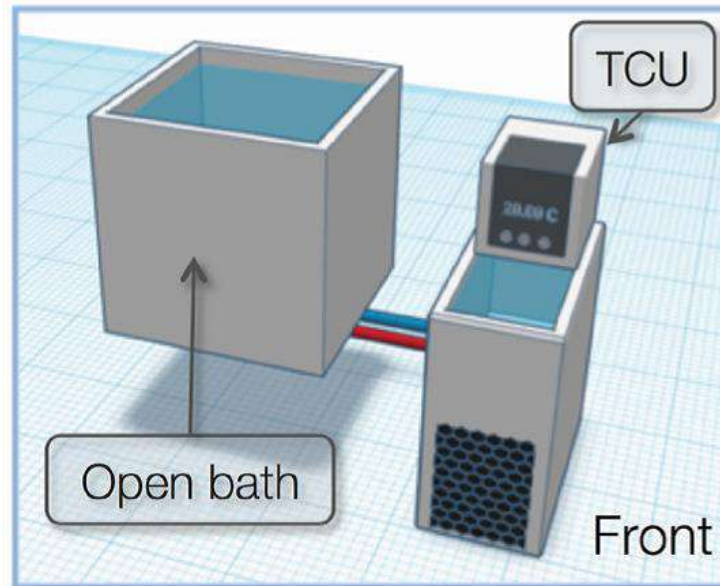
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➤ Laboratory Cooling Towers





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Select / use equipment & instrumentation wisely

- Focus on water consumption for autoclaves and sterilizers
- Run at full capacity
- Choose right-size autoclave for the number of cycles you run
- Set them to stand-by mode / shut-off units not in use
- Consider water consumption of autoclaves





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- Eliminate vacuum aspirators
- Use a vacuum pump instead
- Always turn OFF vacuum pumps when not in use





Select / use
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- Always cover the water baths when working
- Use melted ice for non-sterile procedures like filling water baths
- Use a waterless “water bath” or a bead bath as an alternative to a traditional water bath to reduce water use, energy use, reducing risk of microbial growth and sample contamination





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- Use air-cooled instead of water-cooled (open loop) icemakers
- Specify ENERGY STAR icemakers
- Cycle them off at night and on weekends





Select / use equipment & instrumentation wisely



- Consider soaking rather than continuous flushing
- Run dishwasher only when it is fully loaded
- Reduce the number of rinse cycles whenever possible and use minimum flow
- Use newer dishwashers & rinsing detergents which use less water than older models



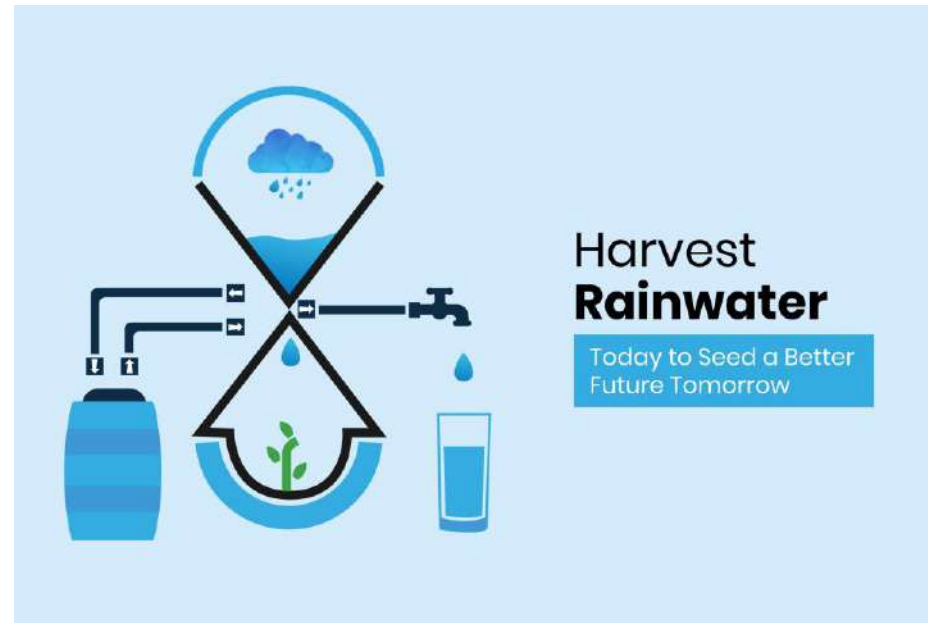
Select / use
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- Buy chlorine free paper
- Recycle and reuse paper
- Reduce printing
- Encourage printing only where necessary





Select / use equipment & instrumentation wisely



<https://www.jalbharat.com/rainwater-harvesting-for-a-better-tomorrow/>

- Use alternative source of water for non potable water
- Recover condensate water
- Harvest rainwater as another source for non potable water use
- Reclaim wastewater for some non potable applications, such as cooling tower make-up