Nature-based Solution protocols

CityAdapt
RECONNECTING CITIES WITH NATURE
LATINAMERICA AND THE CARIBBEAN

UN environment programme

gef

Rainwater harvesting system

Rainwater harvesting systems (SCALL, acronym in Spanish for system described here) allow for the collection of rainwater from roofs (private or community buildings) through gutters and pipes that channel it to a tank or cistern, passing through a filter (and other treatments depending on the intended end use) that cleans and makes the water available for private or community consumption. The system can also strengthen the community through collective water management for agricultural production, livestock/animals, and hygiene.

Integration with international agreements

Sendai: Goal 4 - Reduction of damage caused by natural disasters

Duration

A SCALL for schools can be installed in 5 days, and, for homes, 1 day. Its use life is 20 years.

Place of implementation

Areas with rainfall greater than 800 mm per year. For limited agricultural use, they can be installed in areas with rainfall of 300 to 800 mm.

Beneficiaries (~#)

A water harvesting system with a storage capacity of 10,000 liters and a catchment area of 65 m² per filling can supply a family of 5 members for 40 days (minimum supply of 50 l/inhabitant/day, according to WHO).

Threats Addressed

- High temperatures
- Heavy rainfall
- Changes in rainfall patterns
- Drought

Social and economic co-benefits

Increasing inputs available

- Utilizes an already available and untapped resource for everyday needs
- Simple and economical installation with low maintenance
- Less energy for pumping and transporting water

Social cohesion

Strengthens community cooperation, including at key locations such as schools and public buildings

Education

Educational tool for efficient water use

Fires

Stored water can be used to fight fires

For more information visit
www.cityadapt.com

Main climate impacts addressed

Decrease in water availability
· Ensures a reliable source of water for multiple uses in periods of increasingly frequent shortages and unpredictable rainfall.
· Reduces consumption of drinking water from other sources (bottles, faucet, etc.).
· Decreases overexploitation of bodies of water and aquifers.
· Facilitates access to uncontaminated water for vulnerable populations (women, poor, children).
· Improves hygiene in private homes or public buildings.

Floods
Decreases flooding by reducing water runoff.

Erosion
Mitigates the erosion effect of floods during heavy rains.

Landslides
With less water flow and flooding, the risk of landslides is reduced.

Losses and/or damages
Provides water in times of drought for productive activities, including agriculture, and reduces loss and/or damage due to flooding and erosion, thus increasing food security.

Implementation stages

Stage 1. Basic questions to design the system

1 Is it feasible where I live? How much does it rain per year?

The system is designed with respect to:
- the building where the water will be collected, and where and how each component of the system will be placed.
- the calculation of the amount of water that can be captured, which depends on the chosen storage unit and local conditions. Please check weather service indications and the estimates of how many days per year the system can provide enough water (note: some places will receive less rain due to climate change).

2 Do I have the right surface for harvesting water?

Surfaces can be waterproof, smooth, uniform, and clean roofs, sheds, or even patios. The best materials are polycarbonate sheeting, steel, zinc, concrete roofing and, lastly, tile or other materials. Avoid cardboard sheets with hydrocarbons (oil or grease) and other materials with asbestos.

3 Do I have enough storage or space to build a cistern or place a water tank?

Calculate the space according to the storage required. If the building is under construction, opt for a cistern. If not, consider an area to place a rotomould tank. A 200 liter first water separator is recommended for every 5,000 liters of water.

4 What is the daily water demand?

Determine whether the SCALL will be used by the community or private residences, or for human consumption or productive activities. Refer to WHO to estimate demand. In Mexico, for example, the demand is 150 to 250 liters per inhabitant per day, but varies according to each location's climate.

References

- **Video:** Captación de agua de lluvia
- **Haus. 2019.** Agua de lluvia: 7 grandes beneficios de recolectar, almacenar y aprovechar el agua del cielo.
- **Escamilla, P. 2020.** Captación de agua de lluvia, alternativa sustentable.
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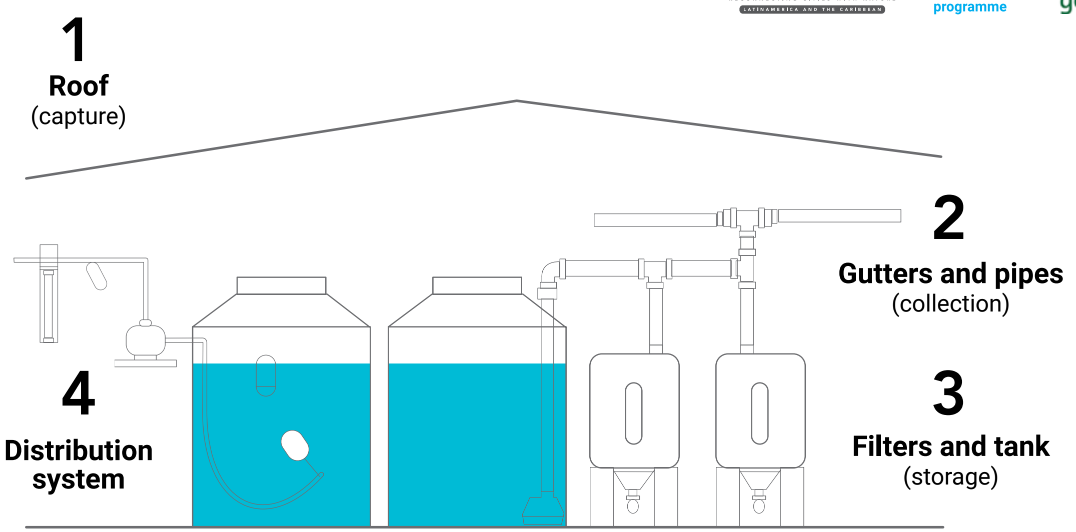
- www.islaurbana.com.mx
- **Valentini, G. 2018** ¿Cuáles son los beneficios de la captación de aguas pluviales?
- **Ministry of Environment of El Salvador (MARN), 2016.** "Guía Práctica de Captación de Agua Lluvia". San Salvador, El Salvador. 12 pages

Stage 2. Installation

A SCALL has four main components: roof (catchment), gutters and pipes (collection), filters and storage tank, and distribution system.



1 Gutters are installed at the eaves of the roof, along the entire edge or perimeter.
They should be made of PVC or metal, with sizes according to the calculation of water to be collected, reinforced structure for the weight of the water, and without obstructions or leaks. If gutters already exist, make sure their condition and size are adequate for the volume of rain to be collected.

2 Rainwater downspouts are installed, making sure that their dimensions are sufficient for the largest possible water flows.
The downspout connects directly to the first filter which prevents solid waste from reaching the tank. The piping system should be as direct as possible, without excessive changes in direction or long distances. It is recommended to use PVC pipes and fittings without any damage or leaks.

3 The catchment tank is placed, connected and installed (see graphic).
Depending on the type of system, gravity or pumping, complementary structures are installed, such as the water separator. Depending on the type of tank, additional instruments are installed, such as chlorine doser, float pump, and others.

4 The water passes to another filter so that the water can be used for different purposes.
At this stage the water is cleaned of any sediment or contaminants, odors and taste. A good practice is using the first rain for self-cleaning of the roof, gutters and pipes, and not to store it.

5 Depending on the intended use, you can then:

- Install an irrigation system for crops, green areas, orchards, etc.
- Connect the tank outlet to toilet and/or sink intake pipes for cleaning and maintenance of toilets, bio-gardens, among other options.
- If you would like to purify water for drinking, additional steps must be taken to install the appropriate filtration system, which will cost more to maintain.

Costs and inputs[1]

Cost in USD	Community System Two 5000-L Tanks	Home System One 2500-L Tank
Labor	$300	$73
Direct inputs	$1,804 [2]	$730
Indirect inputs	$375	$260
Technician and social promoter	$974	N.A.
Total	**$ 3,453**	**$1063**

1. Community system costs from CityAdapt El Salvador; home system costs from CityAdapt Mexico.
2. Includes workmanship, placing of gutters, two tanks, pumping system installation. For community use, consider the additional cost of batteries for 4 bathrooms (about $3500 USD), 6 community laundry stations (about $2500 USD), and biogardener (about 300 for $4m^2$).

Stage 3: Maintenance to ensure its operation

- Cleaning of gutters, filter and tank is required.
- The screen filter should be washed every 15 days.
- The activated carbon filter cartridge must be changed out every 6 or 12 months according to specification.
- Keep the screen or filter intact and in place to avoid creating breeding areas for mosquitos and related diseases.

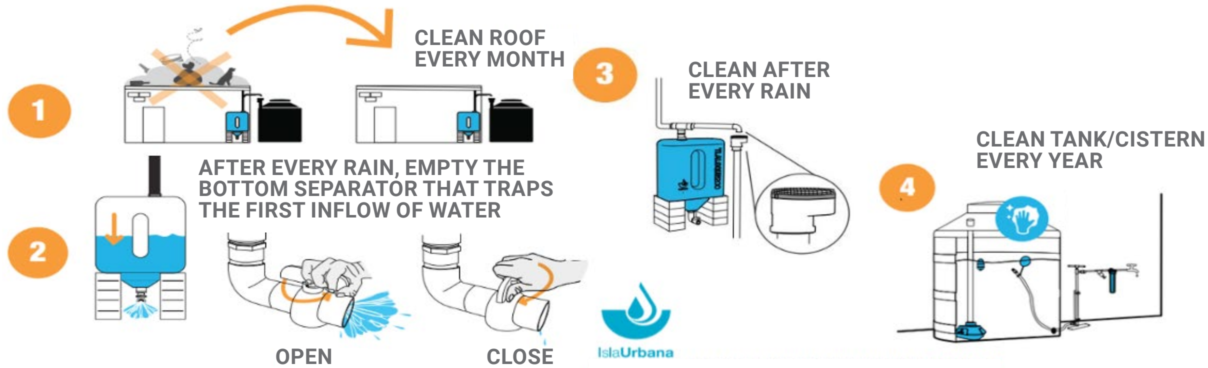


Diagram provided by Isla Urbana

Indicators

Implementation	Number of systems installed (#)
Quantitative impact	• Water demand without SCALL (m3) • Number of people directly benefited (#) • Savings in the cost of potable water service (USD$) • Volume of water used for human consumption (m³)
Qualitative impact	• Perception of water supply vulnerability (before and after SCALL installation) • Perception of simplification of household chores • Time spent on some household chores (before and after SCALL installation) • Diversification of strategies to cope with water scarcity (e.g. using public sinks to wash clothes, sharing water, capturing rainwater directly for certain uses, etc.).

References

- **Japan International Cooperation Agency (JICA), 2015.** "Guía Técnica para Cosechar el Agua Lluvia: Opciones técnicas para la agricultura familiar en la Sierra". Chimborazo, Ecuador. 24 pages.
- **Food and Agriculture Organization of the United Nations (FAO), 2013.** "Captación y Almacenamiento de Agua de Lluvia: Opciones técnicas para la agricultura familiar en América Latina y el Caribe". Santiago, Chile. 272 pages.
- **Ventura. E.** Captación "in situ" del agua de lluvia para la producción de cultivos en regiones semiáridas. Autonomous University of Queretaro. C.U. Cerro de las Campanas, Querétaro, México.