curapipe treasure water

Transforming Water Loss to Water Source

The Need

The world is currently subject to a rude awaking with the onset of climate change creating major disruptions in precipitation patterns much earlier than anticipated. This has led to more and more water-stressed areas sometimes scaling to drought levels, even in areas where water abundance has traditionally been the norm. In the past, many water supply systems could simply rely on traditional/standard water sources, i.e., rainwater, surface water, and groundwater. Nowadays, regulators and utilities are struggling to maintain resilient water supplies in cities in the face of climate uncertainty and are looking for ways to augment current resources. New fresh untapped water sources are urgently needed.

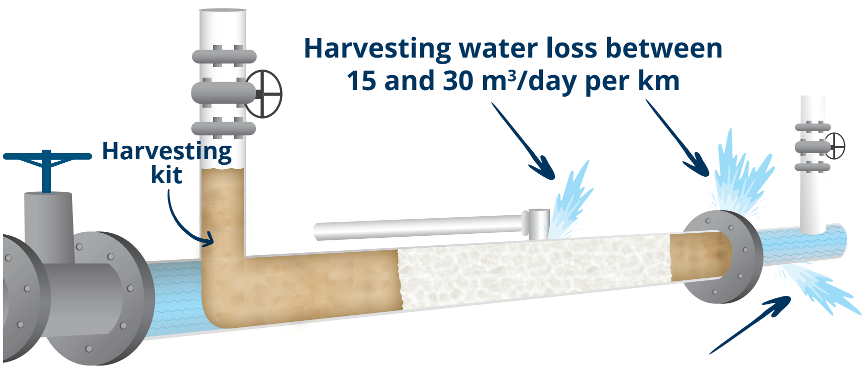
We are introducing a new and timely paradigm

"Curapipe Water-Loss Harvesting"

The cutting-edge onetime intervention performed on an urban water distribution network for the purpose of continuously recouping the major portion of water lost in the system

"The essential force multiplier for urban water supply resilience in an era of calamitous climate uncertainty"

How is Water-Loss Harvesting performed?



See demo clip: https://vimeo.com/735539827

Curapipe Water-Loss Harvesting for a City

- Scalable to any size city (3-year project)
- For example: a city supplying 170,000m^3 of water, 2,000 km of mains, 35% water loss
- Harvesting 800km per annum
- Performed by up to 8-10 limited size teams

Results:

- Year 1 harvest 27,000m^3 of water per day
- Year 2 harvest 45,000m^3 of water per day
- Year 3 harvest 55,000m^3 of water per day
- A 50% increase of consumable water!
- Harvested energy for Year 3 is 11MWh/d
- Non-revenue water is leveled off at 2%-4%
- Minimum social disruption
- Fastest & most cost-effective solution

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SUSTAINABLE DEVELOPMENT GOALS

WHITE PAPER

The Role of Urban Water-Loss Harvesting in the Circular Economy

Presenting the case for a newfound component in the essential and timely transformation from an extractive to a circular and diversified water sector

The world is currently subject to a rude awaking with the onset of climate change creating significant disruptions in precipitation patterns much earlier than anticipated. This calamitous climate variability threatens water supplies, with floods damaging water infrastructure and reducing water services. Increasing droughts reduce the availability of surface water, increase water source pollution, and as a result, increased abstraction reduces replenishment of underground water sources. For communities to be resilient to climate change, the water system must be able to survive shocks and stresses. Scarcity is already so pronounced that we cannot reach many of our desired economic, social, and environmental goals.

In response, the 21st-century water sector has the imperative to increase water security, resiliency, and equitable access to safe drinking water. But this transition has to be significantly accelerated to race against this ticking clock of climate change. The way forward is for the water sector to transform from being extractive to renewable; we must focus on adopting the technologies and strategies that will make our industry circular and diversified. Figure 1. shows the current unsustainable linear water model.

The way forward is for the water sector to transform from being extractive to renewable; we must focus on adopting the technologies and strategies that will make our industry circular and diversified.

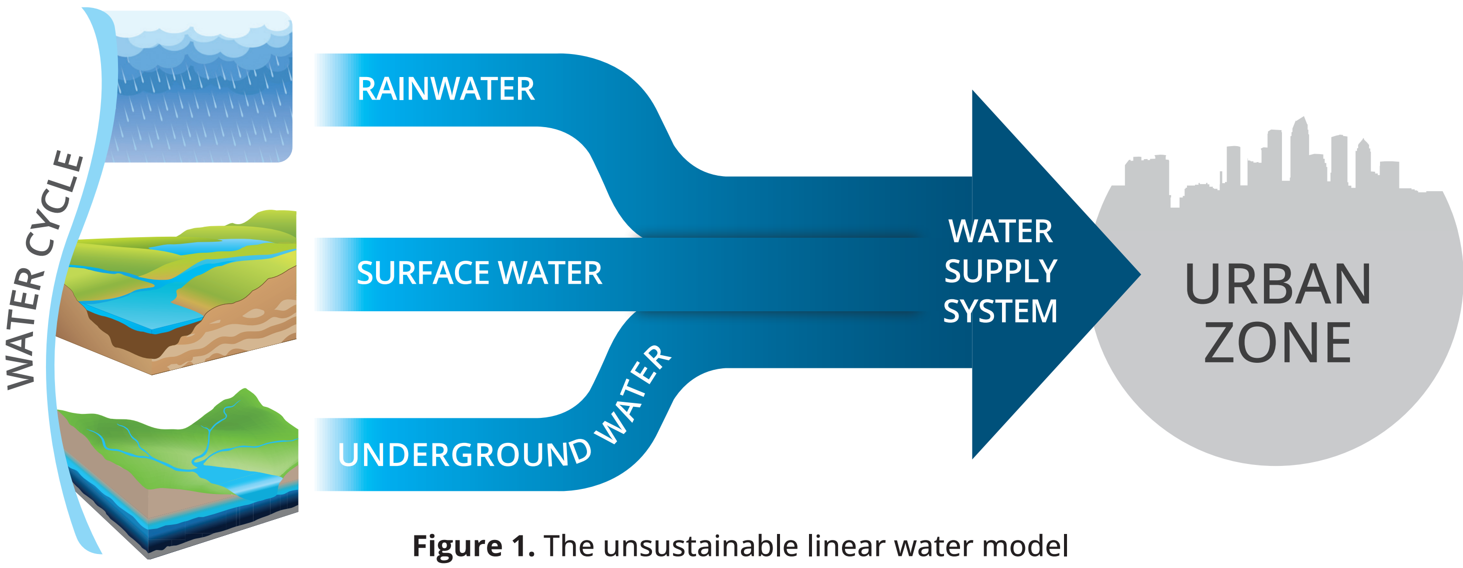

Figure 1. The unsustainable linear water model

The basic concept of a circular economy states that it is a continuous development cycle that preserves and enhances natural capital; in this sense, water is part of this natural capital. Reestablishing the water cycle at least partially through rainwater, surface water, and underground water should be a priority. This can be made possible by implementing innovative technology, such as installing greywater systems and wastewater to increase the water supply.

One outstanding liability that has grown to be disturbingly inefficient and counterproductive to the water cycle is water loss in urban distribution networks reaching between 25% to 50% of supplied water. Water loss has historically been regarded as an unavoidable reality of life partially due to a lack of comprehensive solutions to address this burgeoning problem. Under these circumstances, water loss has been seen to reach alarming proportions at a time of accelerated urban expansion compounded by climate variability.

Fortunately, the fundamental premise that wide-scope water loss is inescapable is no longer valid, with the recent introduction of a game-changing water-loss harvesting intervention by Curapipe carrying efficiency of 93%. Water-loss harvesting can be defined as a cutting-edge, one-time intervention performed broadly on an urban water distribution network for the purpose of continuously recouping the lion's share of water lost in the system.

Take an example of a medium size city with a supply of 170,000 m^3 of water per day, with 2,000 km of distribution mains and a total of 35% water loss. Within just three years of applying 8-10 intervention teams on a one-time basis, 55,000 m^3 of water per day may be continuously harvested, i.e., a 50% increase in consumable water! The outcome, which is scalable, would positively and sustainably help transform the water cycle towards a more circular model. Figure 2. shows a modified circular water model, accounting for its urban water-loss harvesting potential.

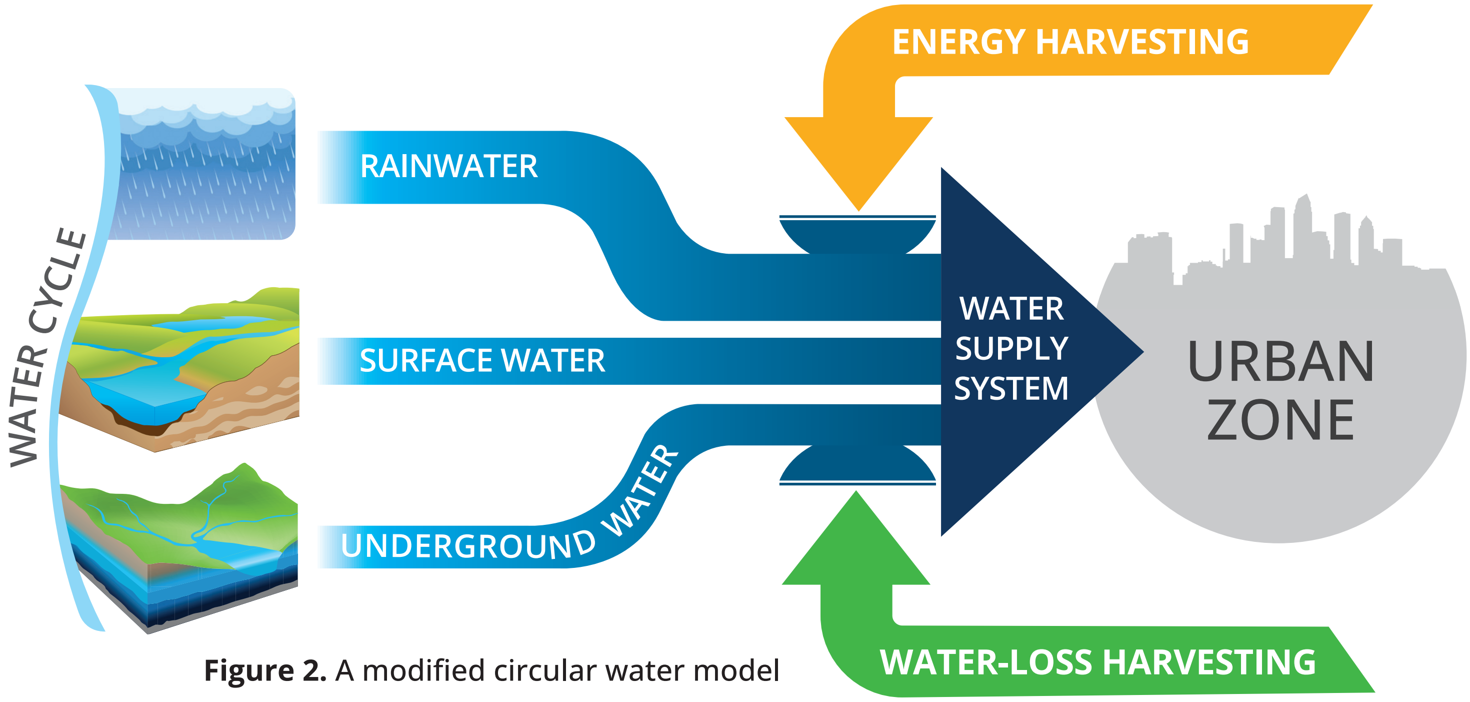

Figure 2. A modified circular water model

By harvesting the water loss, this model increases the water supply and puts less demand on abstraction from underground and surface water sources, thus allowing the recharging of aquifers to substantially higher levels. In our example (assuming rainwater and rainwater harvesting combined provide up to 15% of the supply), water-loss harvesting alone would enable 38% less abstraction relative to the current linear water model, rendering it a highly desirable intervention. An additional bonus comes in the form of harvested energy, namely that which is associated with the harvested water loss. The significance is that not only is a new and diversified source of water placed back into the water cycle, but it also does not require any additional energy investment in producing, transporting, and distributing the resource.

In conclusion, this paper demonstrates the close association of a newly introduced intervention, referred to as water-loss harvesting, with the circular economy approach relating to restoring the water cycle in urban zones.

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Urban Water Loss Harvesting – Better Use of Capital to Deliver a Sustainable Water Supply

According to the International Water Association (IWA), water loss management is one of the most important issues facing water companies worldwide. The UN Sustainable Development Goals (SDGs) have made poverty alleviation and access to safe drinking water a political priority. Unfortunately, the reality is that many of the most vulnerable around the globe still struggle to find a reliable supply of safe drinking water.

Water pipes make up the majority of asset value in a water supply system. The prevalence of high levels of water loss in the sector is both a waste of a most valuable resource and an indicator of poor operation and maintenance of the pipe network.

Traditional capital projects aimed at significantly reducing water loss have proven, overall, to be expensive and accompanied by a long-term failure to maintain low levels of water loss.

Traditional capital projects aimed at significantly reducing water loss have proven, overall, to be expensive and accompanied by a long-term failure to maintain low levels of water loss. These projects usually employ various leak detection methods followed by excavations for repair ("find & fix") in combination with a small percentage of traditional pipe replacement or rehabilitation. Rarely upon completion of these projects does the resultant water loss level reach below 25%. Moreover, since find & fix is strictly a maintenance measure, it does not address the root cause of the problem, so, as a result, water loss levels continue to rise, typically wiping out the benefits of the entire project within 1-3 years.

On the other hand, traditional pipe replacement or rehabilitation for the sole purpose of water loss reduction is an inadequate application of capital expenditure efficiency (CEE), i.e., the efficient and effective use of capital when considering the full cost of service delivery (source: World Bank).

Fig 1. depicts the traditional water loss management lifecycle, including the opex cycle (find & fix) and the capex cycle (pipe replacement/rehab). Despite large capital-intensive investment and the continuous need for maintenance, the lifecycle is typically short (1-3 years) with a low-level impact of water loss reduction, routinely not achieving water loss below 25%, resulting in a high cost of total long-term service delivery.

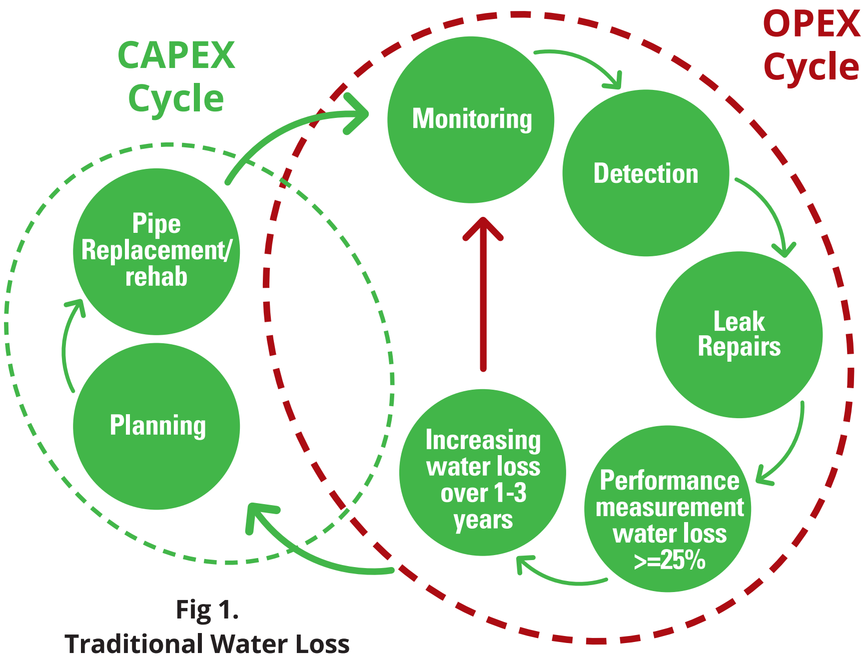

Fig 1.
Traditional Water Loss Management Lifecycle

The need for increased capital efficiency for this lifecycle has driven Curapipe to the exciting innovation of water-loss harvesting in delivering better returns which is essential to the sector's fundamental financial health and operational efficiency. Water-loss harvesting can be defined as a cutting-edge intervention performed broadly on an urban water distribution network for the purpose of continuously recouping the lion's share of water lost in the system.

***Water-loss harvesting falls into the category of capex** due to the extension of the water loss lifecycle time from 1-3 years to 5 years, with a residual water loss of only 3%-5%.*

Fig 2. depicts a capital-efficient water loss management lifecycle, including the opex cycle (requiring only general maintenance) and the capex cycle (water-loss harvesting). **Water-loss harvesting falls into the category of capex** due to the extension of the water loss lifecycle time from 1-3 years to 5 years, with a residual water loss of only 3%-5%. These are all-important asset management objectives while at the same time lowering the cost of long-term total service delivery. This is also good news for water companies, which may choose to recover the capital expenditure over the five lifecycle years.

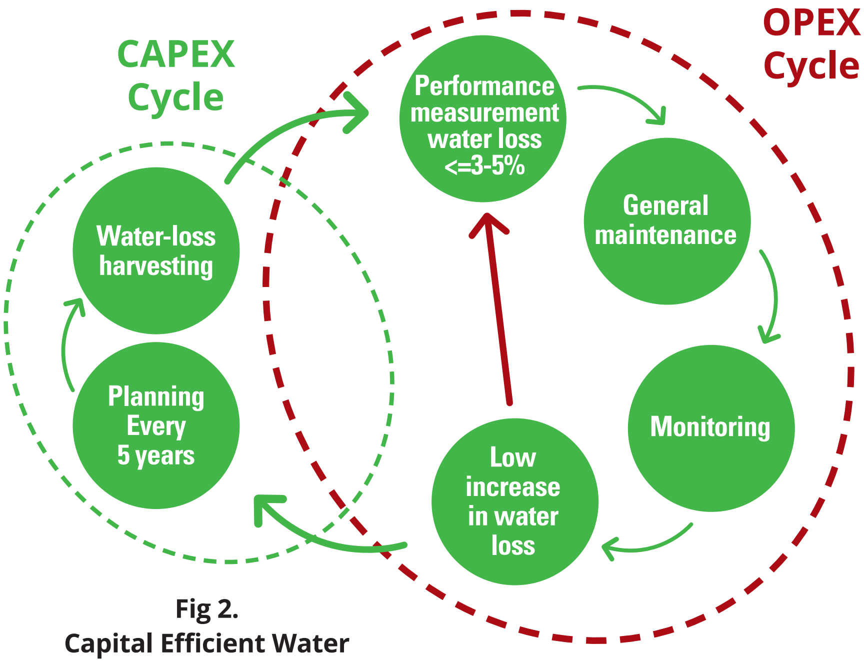

**Fig 2.
Capital Efficient Water Loss Management Lifecycle**

In conclusion, this paper demonstrates the high level of capital expenditure efficiency associated with a newly introduced intervention, referred to as water-loss harvesting, compared to traditional interventions.

Breaking the Vicious Cycle of Intermittent Water Supply

Water-loss harvesting is a vital missing component for the transition to a 24/7 water supply

> ***Water-loss harvesting is the IWS game-changer***
>
> ***Vital impact #1:*** *Reduction of water loss to circa 4%-6%*
>
> ***Vital impact #2:*** *Consumable water increase of 50%-60%*

It is well known that water loss in water distribution networks is significantly high in countries with Intermittent Water Supply (IWS) ranging from 30% to 50% of the supply volume. There are many cases where plans are in place to take immediate steps to progressively invest in converting to 24/7 supply to make the most of every drop within water supply reserves, provide a better service and improve water quality. However, IWS greatly increases the difficulty of reducing water loss and sustaining reduced levels. The main cause is that under IWS conditions, active leakage control, which applies leak detection as the measure to detect leaks, is dysfunctional if the network lacks either a minimum or constant pressure. Unfortunately, if water loss cannot be adequately reduced, IWS conditions persist even if fresh water sources are introduced. This is considered the vicious cycle of intermittent water supply (see Fig.1), which needs to be broken somehow if transitioning to 24/7 is to be achieved.

To date, measures taken to break the cycle have not seen great success since they rely on wide-scale pipe replacement, which is both cost-restrictive and highly disruptive. Clearly, this is a significant problem that is urgently looking for a practical solution, not to be found within the current "toolbox" of solutions.

Fortunately, Curapipe has, for the last few years, successfully field-tested its game-changing water-loss harvesting intervention, which can be defined as a cutting-edge, one-time intervention performed broadly on an urban water distribution network for the purpose of continuously recouping the lion's share of water lost in the system.

Water-loss harvesting is destined to be the IWS game-changer. It is designed to be the first intervention taken with the purpose of breaking the IWS vicious circle, by simultaneously delivering two vital impacts for the conversion to a 24/7 service supply. Fig 2. illustrates these two vital impacts.

The next step is to increase supply capacity from, e.g., new water treatment plants to achieve a full 24/7 service supply under minimum water loss conditions allowing full pressurization of the network with the highest efficiency. Full pressurization will also enable the 24/7 service to reach remote domestic pipes previously underserved.

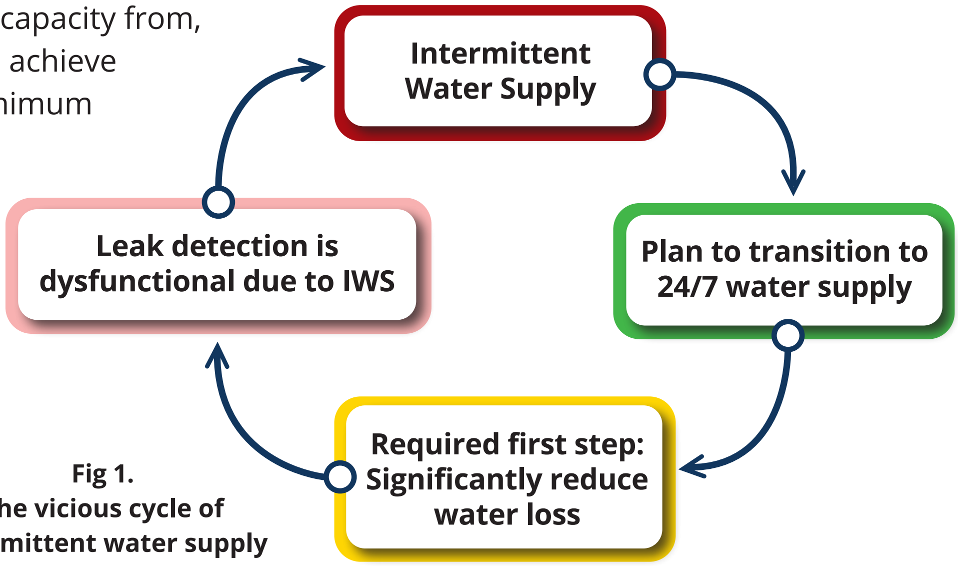

Fig 1.
The vicious cycle of intermittent water supply

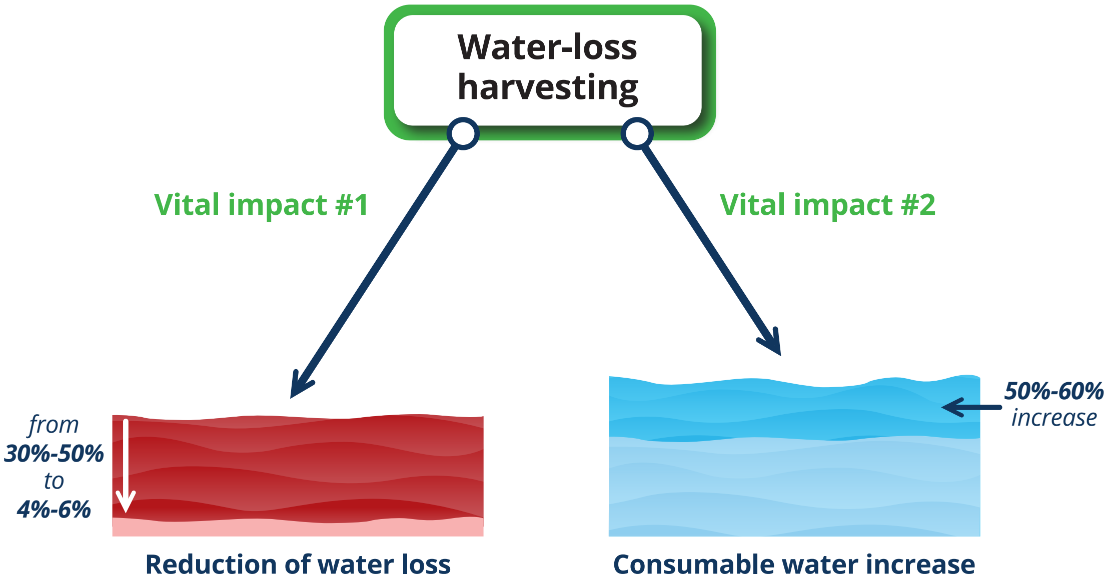

Fig 2.
Vital impacts of water-loss harvesting

Additional bonuses to water-loss harvesting

- ***Significant energy savings***
- ***Reducing risk to public health from intrusion of contamination into pipes by sealing 90% of all leaks***

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