

WiE Women Innovator Challenge 2026

AQUAVault

Smart Building-Scale Condensate Water Recovery System

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PROBLEM

The UAE’s high cooling demand creates an overlooked opportunity for water recovery.



1. Water Scarcity

<100 MM/YEAR

Average annual rainfall in the UAE

2–3 M/YEAR

Evaporation rate



2. High Cooling Demand

The UAE’s hot, humid climate drives extensive use of air-conditioning in buildings.

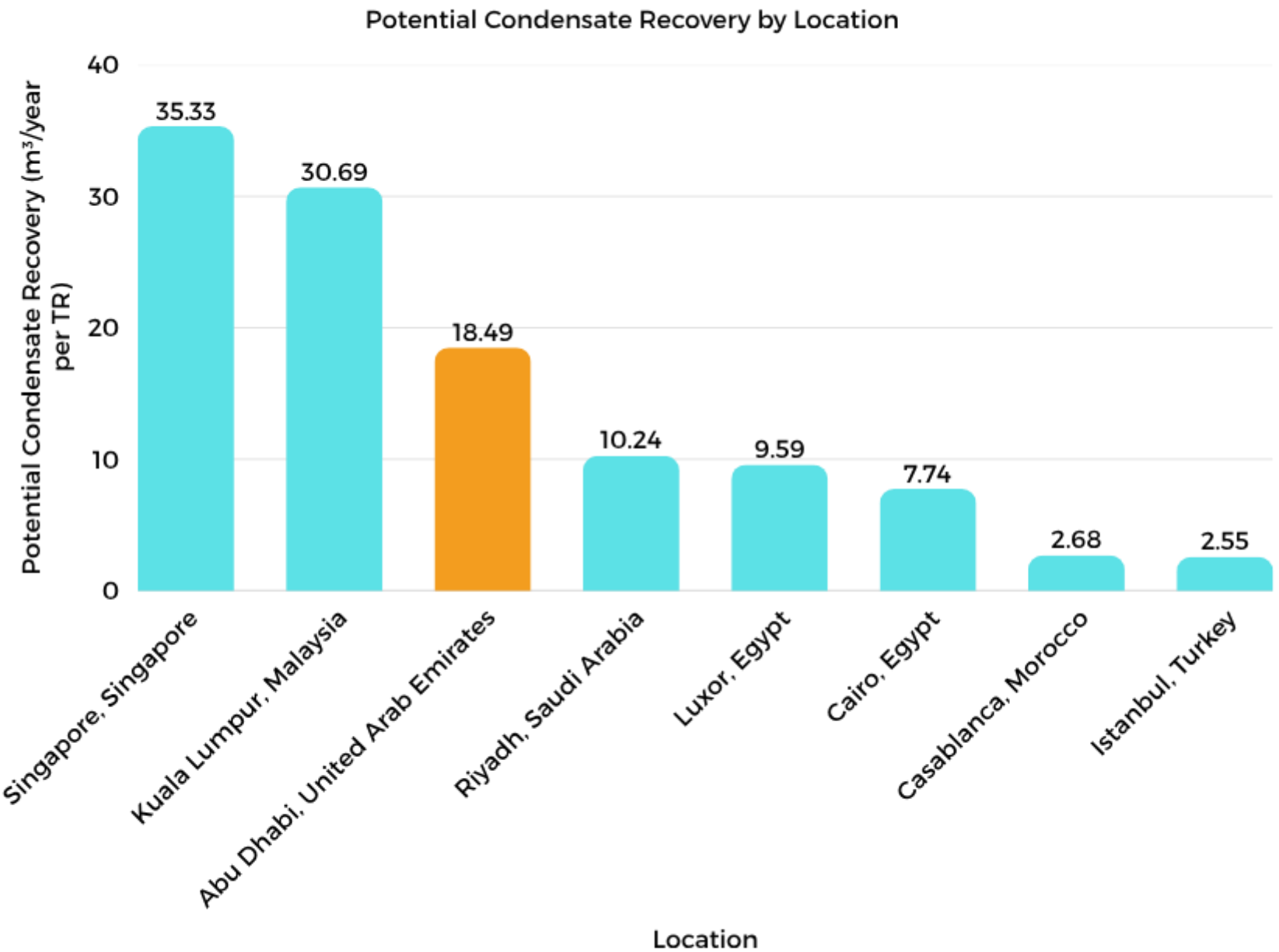


3. The Actual Problem

AC condensate is typically not recovered. Instead, this potentially reusable water is commonly discharged to drainage.

18.49 m³/year/TR

Potential condensate recovery in Abu Dhabi



GAP & NEED

Current water strategies address supply and reuse but AC condensate remains an **underutilized building-level resource**.

DESALINATION



- Large-scale freshwater supply
- Energy-intensive process

GREYWATER REUSE



- Reuses household/building wastewater
- Requires treatment before reuse

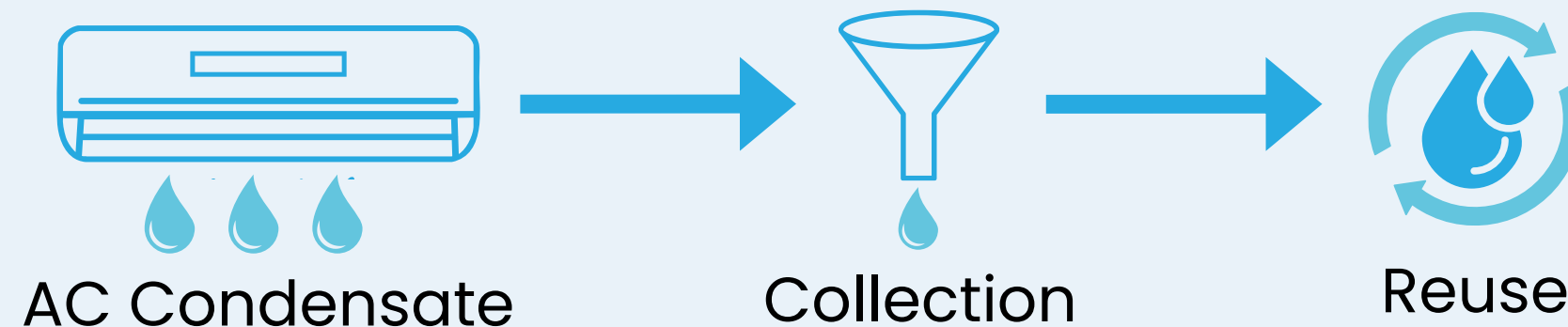
THE GAP



- AC condensate is generated within buildings, yet its recovery and reuse are **not commonly integrated** at building scale.

AN OVERLOOKED RESOURCE

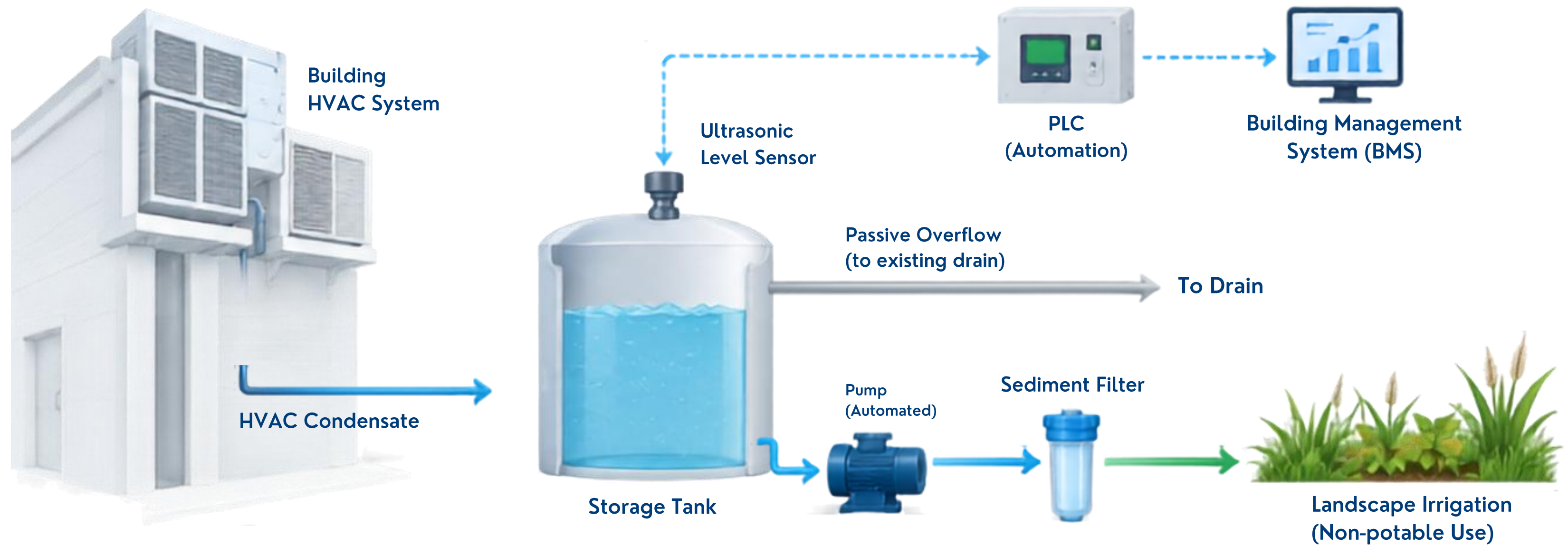
AC systems generate condensate water as a by product of cooling.



AquaVault targets this overlooked building-level water stream.

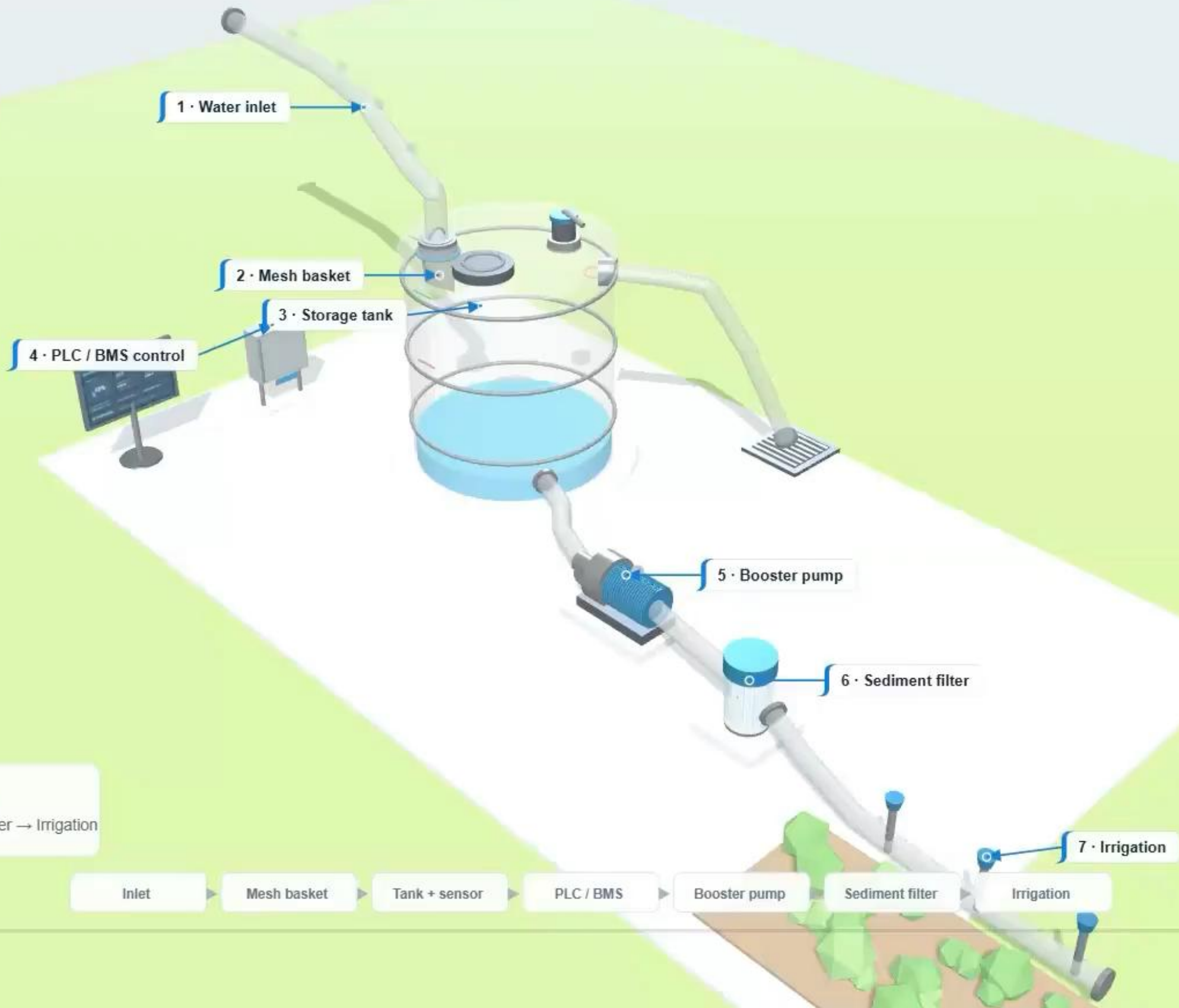
PROPOSED SOLUTION

AquaVault is a smart building-scale system that **captures, monitors, filters, and reuses** HVAC condensate for non-potable applications.



AQUAVault SYSTEM VIDEO

AquaVault



Automated condensate collection & irrigation

Inlet → Mesh basket → Tank → PLC/BMS control → Pump → Filter → Irrigation

VALIDATION

2,600 L/day

CONDENSATE RECOVERY ESTIMATED FOR A G+20 BUILDING IN DUBAI

- Demonstrates building-scale condensate recovery potential under UAE conditions.
- Uses industry-standard HVAC modeling (ASHRAE-based)
- Demonstrates substantial condensate generation under high-temperature, high-humidity conditions

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Conservation of Potable Water
Using Chilled Water Condensate from Air
Conditioning Machines in Hot & Humid Climate

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Abstract-The hot and humid climate offers a substantial environment for generations of condensate water through cooling coils of air conditioning machines. This waste can be utilized to diminish the use of considerable amounts of potable water. This paper presents a focus on conservation of potable water using condensate water generates during cooling and dehumidification process in the air conditioning machines. The cooling coil's condensate water from air conditioning machines goes wasted to municipal sewerage systems usually. A considerable amount of low temperature condensate water can be harvested and utilized in the commercial buildings having a large cooling capacity plant. This alternative source can be utilized in various drainage and irrigation applications to reduce the use of municipal potable water and saving the energy. The G+20 Floor building's HVAC system consisting fresh air handling units typically can produce 2600 liters condensate water in 24 hrs and 78000 liters in a month at an average summer outdoor conditions, which can be utilized to trim down the demand of potable water and saving a substantial amount of energy and reducing 0.54284 kg CO₂e per kWh carbon emission which results in reduction of carbon footprint.

Despite the fact that most of the part of our earth is covered by water and is about 1.4 billion KM on earth, the freshwater resources are only 2.5% of this total volume which is merely 35 million km³ as illustrated in fig.1 [3].Resources are being consumed at an unsustainable rate. In order to maintain a contemporary lifestyle of an average European or North American for global population approximately 3.5 Earth Planet will be required [4]. Despite of the fact that millions of people have no access to drinking water and thus resulting in death of one child every 21 seconds due to the diseases caused by the use of dirty water, human beings are using natural resources at an unsustainable rate [5] . Keeping in view of the current potable water resources and world population growth rate, it is estimated that by 2030 about 47% of the world population will be dwelling in high water stress areas. The developing countries will be the most affected due to their highest population growth rate in the areas which are already under cute water stress having limited access to safe drinking water and without any adequate sanitation facilities [6]. In

STUDY EVIDENCE (ASHRAE-BASED HVAC ANALYSIS)

TECHNICAL FEASIBILITY

1 Water Source Feasibility



-  Condensate is formed from atmospheric moisture and typically has low dissolved solids.
-  Suitable for non-potable applications with appropriate treatment.

2 System Integration



-  Integrates with existing HVAC condensate drainage infrastructure.
-  Uses commercially available components for collection, storage, filtration, and pumping.

3 Operational Reliability



-  Ultrasonic level sensing + PLC-controlled pumping enable automated operation.
-  Passive overflow provides fail-safe drainage at maximum tank capacity.

4 Deployment Feasibility



-  Designed for retrofit or integration into new buildings.
-  Scalable across residential and commercial applications.

ECONOMIC & IMPLEMENTATION STRATEGY

Economic Case



~AED 71,600 (~\$19,500)

Reference system cost from UAE case study

UPVC Pipe Dia (mm)	Pipe length(m)	Estimated Unit rate(\$/m)	Total cost(\$)
25	300	5.0	1500
50	1000	6.0	6000
75	450	7.0	3150
100	450	8.5	3825
Total cost (\$)			15675
Underground tank estimated cost (\$)			3000
Labor cost estimated (\$)			2000
Grand total cost (\$)			19475

Table 3: Estimated Cost for Condensate Water Harvesting



~949 m³/year

Annualized recovery potential (based on 2,600 L/day)



~AED 8,350 – 10,650/year

Estimated avoided water charges

Based on September 2026 DEWA commercial/industrial water tariff + fuel surcharge; actual savings depend on the building's applicable consumption slab.

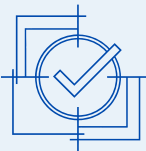
Implementation Strategy



NEW BUILDINGS + RETROFITS

Can be integrated in new buildings or retrofitted into existing systems.

Integration with existing HVAC condensate drainage infrastructure.



PRIORITY APPLICATIONS

Best suited for buildings with non-potable water demand.

Examples: landscape irrigation, facilities.



TARGET BUILDINGS

Residential towers, malls, campuses, commercial buildings.

IMPACT

By turning wasted condensate into a valuable resource:



~949,000 L/YEAR

Of potentially recovered condensate from **one G+20 building.**

(based on 2,600 L/day)



WATER CONSERVATION

- Nearly **1 million litres/year** of recovered water.
- Reduces potable-water demand for **non-potable applications.**



ENERGY & CARBON

- Reduces reliance on desalinated water, which requires **high energy.**
- Supports **lower energy use and carbon emissions** associated with water supply.



ECONOMIC VALUE

- Reduces **purchased potable-water consumption** for building operations.
- Creates recurring **water-cost savings** for building operators.

SCALABILITY

From one building to city-wide water recovery

1 BUILDING



2,600 L/day
≈ 949,000 L/year

10 BUILDINGS



26,000 L/day
≈ 9.5 million L/year

100 BUILDINGS



260,000 L/day
≈ 94.9 million L/year

Based on 2,600 L/day per building



POTENTIAL ECONOMIC VALUE

Up to
≈ AED 1.07M/year

avoided water charges at 100-building
scale*

*Illustrative estimate based on the upper applicable DEWA commercial/industrial water tariff + fuel surcharge. Actual savings vary by consumption slab and building characteristics.

CAPTURE • CONSERVE • REUSE

AQUA**VAULT**

Every Drop **Matters.**

Turning overlooked HVAC condensate into a
valuable water resource.

Thank You