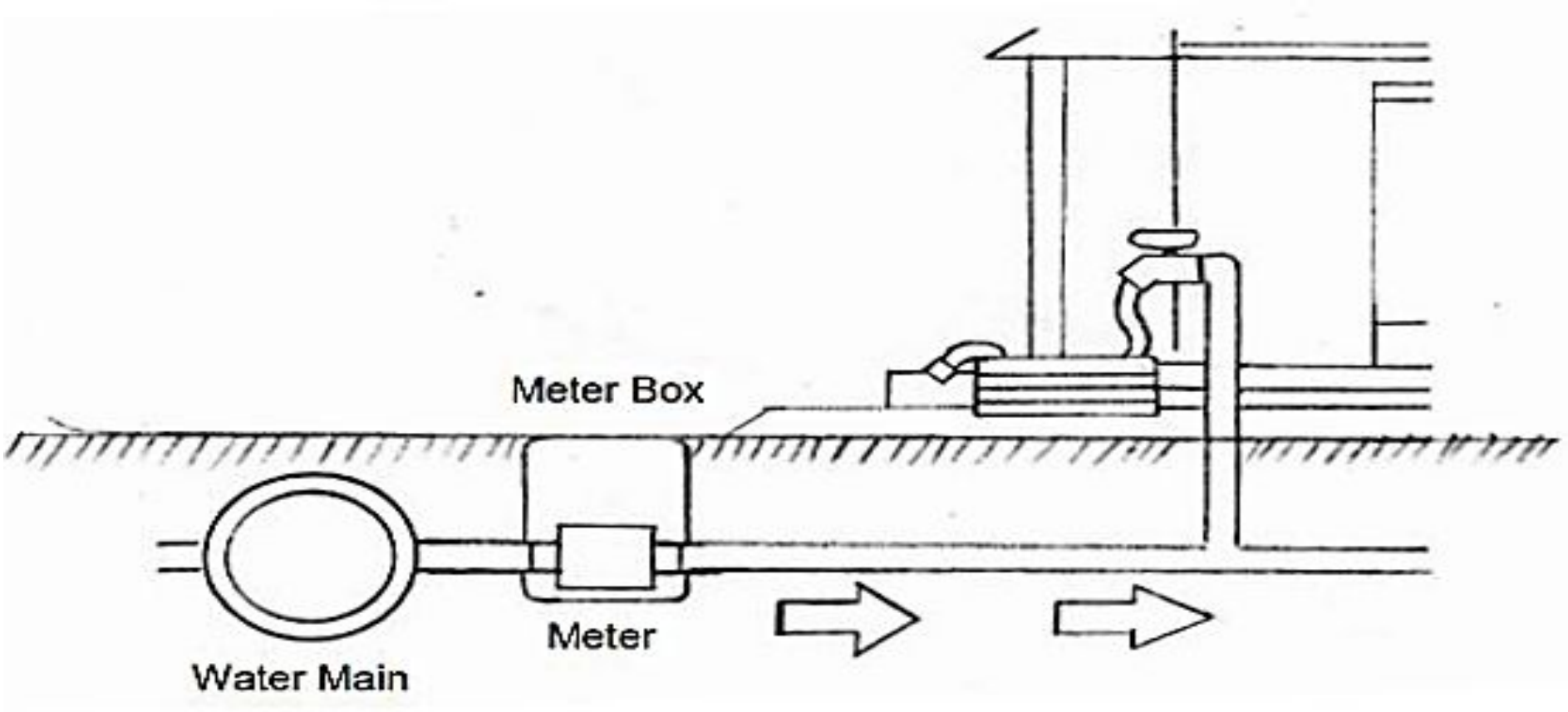
Water Loss



Typical Installation System for Domestic Water Meter

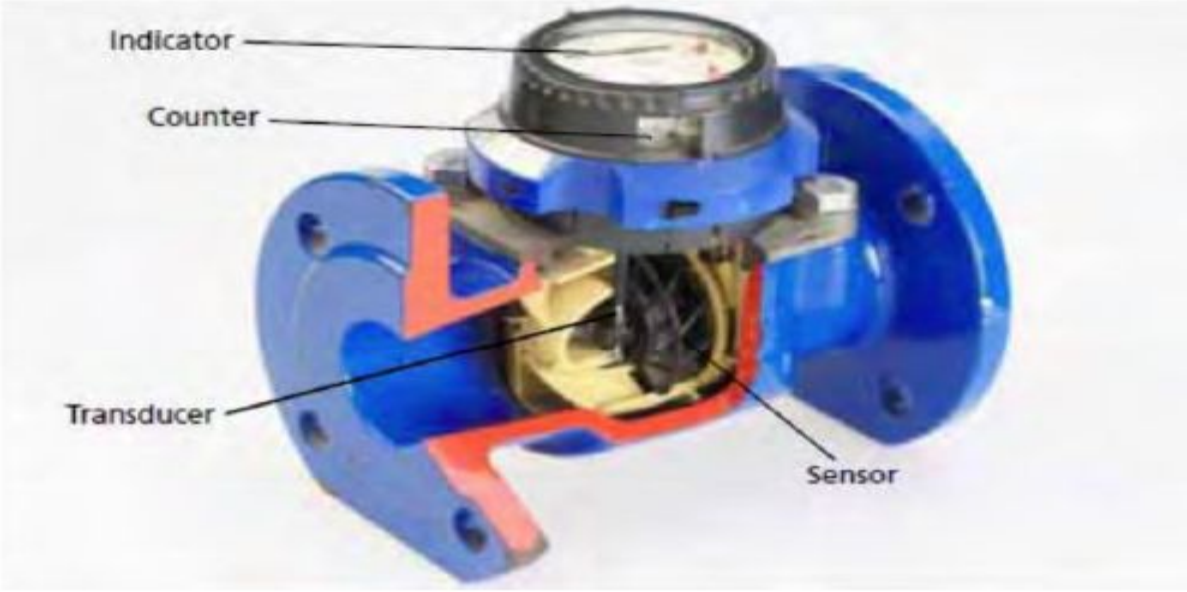
Water Meter

A device that measures the volume of water that passes through it. In most of the world water meters are calibrated in cubic meters (m3) or liters.

Meters installed to measure household consumption are called domestic water meters.

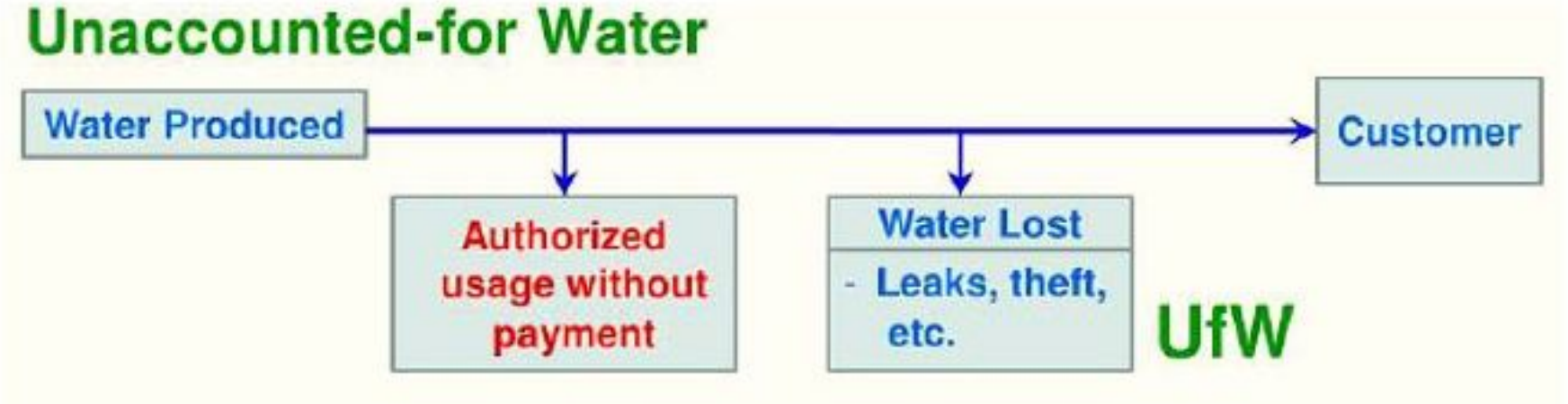
All meters have four basic components

1. Sensor
2. Transducer
3. Calculator
4. Indicator



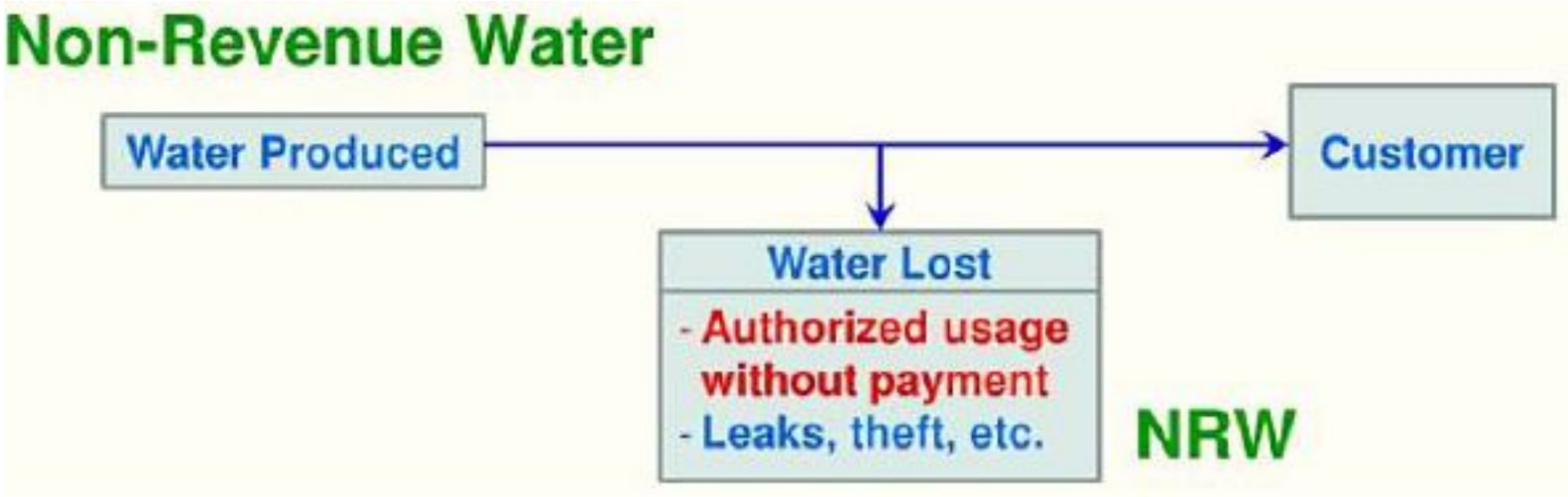
Unaccounted for Water & Non Revenue Water

Unaccounted-for Water (UFW) is the difference between the quantity of water supplied to a city's network and the metered quantity of water used by the customers through leaks, thefts, etc.



Unaccounted for Water & Non Revenue Water

Non revenue water (NRW) produced and lost before it reaches the customer through **leaks, theft, or legal usage** for which no payment is made.



Water Loss	
Physical Loss (Real Loss)	Commercial Loss (Apparent Loss)
Pipe breaks and leaks	Metering errors
Storage overflows	Water theft
House connection leaks	Billing anomalies

Non Revenue Water









APPARENT LOSSES

Apparent losses are the non-physical losses that occur in utility operations due to customer meter inaccuracies, systematic data handling errors in customer billing systems and unauthorized consumption. In other words, this is water that is consumed but is not properly measured, accounted or paid for. These losses cost utilities revenue and distort data on customer consumption patterns.

Apparent Loss

The best ways to **control the apparent losses** is to eliminate:

- customer meter inaccuracies (installation and calibration procedures for large meters, selection of customer meters, consumption profiles, meter sizing, meter installation, meter aging, optimum replacement period, comprehensive and/or targeted replacement programs),
- systematic data handling errors (data capture, data transmission, data processing, meter reading procedures, automatic meter reading)
- unauthorized consumption (overall metering policy will identify unauthorized consumption. Utilities, however, must have autonomy to regulate the illegal connections. Politics is often an obstacle).

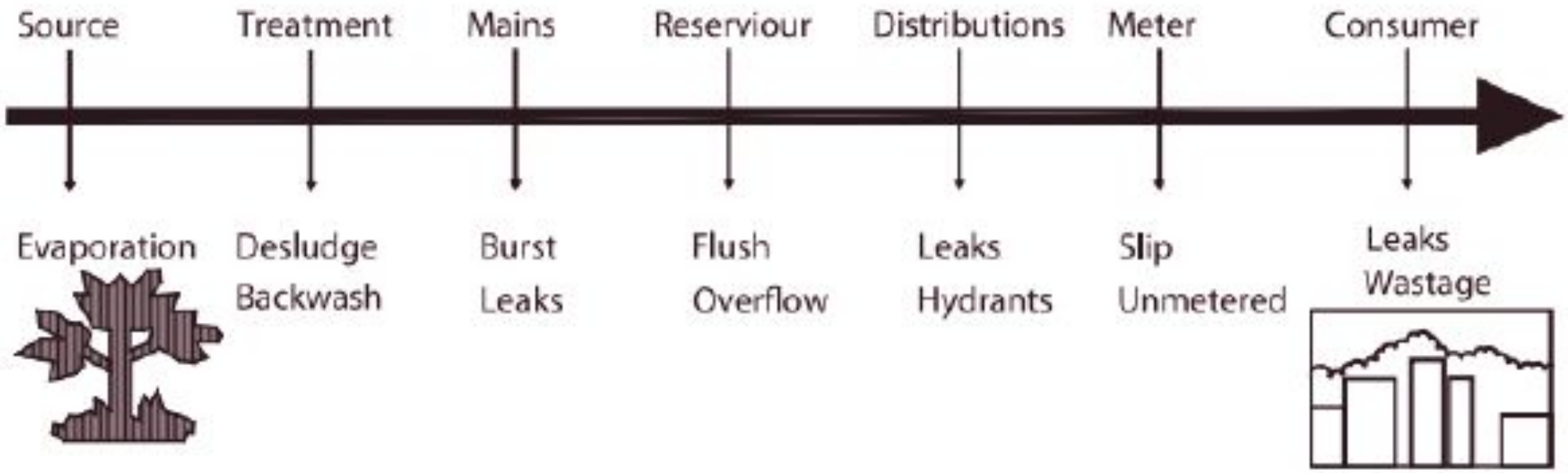
REAL LOSSES

Real losses are the physical losses of water from the distribution system, including leakage and storage overflows. These losses inflate the water utility's production costs and stress water resources since they represent water that is extracted and treated, yet never reaches beneficial use.

Real Loss

- It is impossible to eliminate real losses. Some losses are simply unavoidable and some leakages are undetectable since they are too small or it is not economical to repair them.
- The best ways to **reduce real loss** :
  - rapidly react to leakages (identifying leaks, optimizing pipeline repairs and managing water pressure)
  - avoid storage overflows.

Location of Water Losses



Some Leaks are Easy to Find



Abandoned Service Line

Some Leaks Stay Underground



Subsurface (blind) leak into the sewer

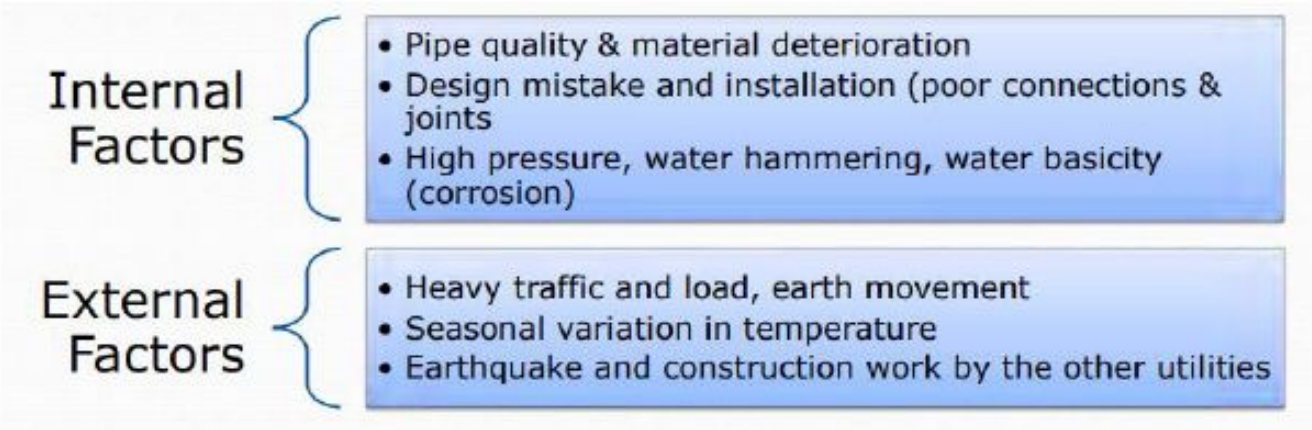


Subsurface (blind) leak formed cavity below the street

Pipe Leakage Detection

- Locating leaks and losses can be accomplished through an examination of billing records, flow monitoring, visual inspection or leak detection equipment (e.g., acoustic, thermal, electromagnetic, tracer).
- **Water audits** compare the amount supplied to the amount consumed using water meters at the supply and householders ends of the distribution network

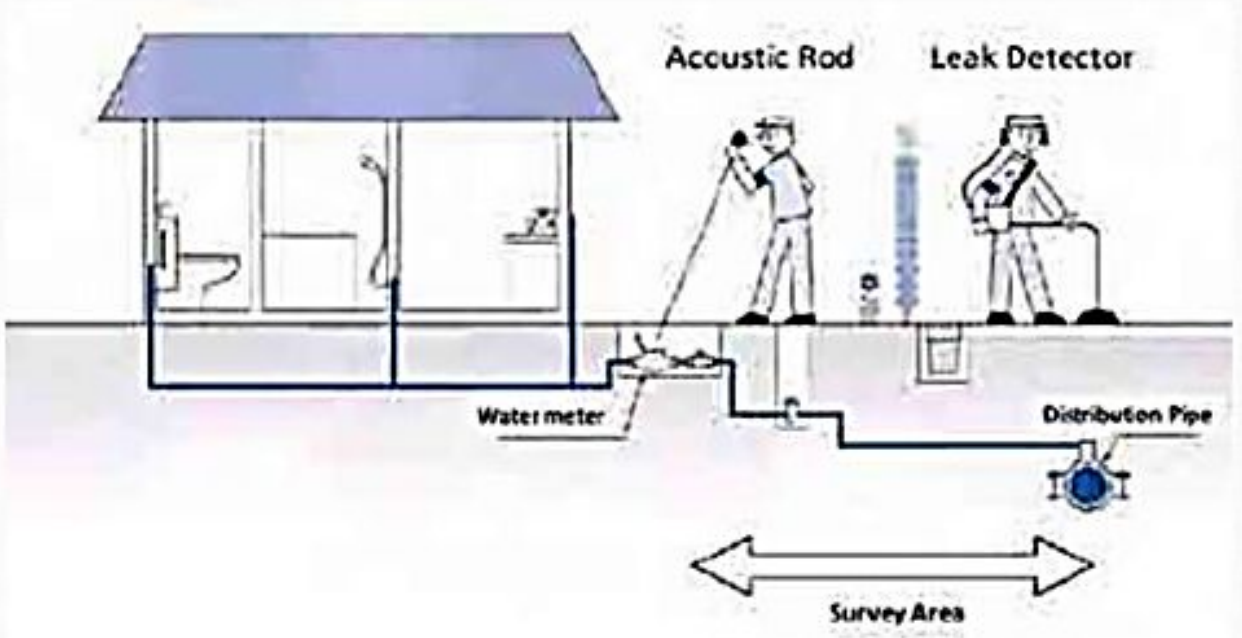
Factors affecting leakage



Pipe Leakage Detection: An Example

Acoustic Rod & Electronic Leak Detector

- Sound is amplified and transmitted to headphones
- As the sound is high exactly above the leak, indication leads to pinpoint exactly.



O&M of Conveyance Systems

Maintain record of pumping head vs. flow: this will provide an indication of pipeline deterioration

Regular inspection:

- illegal or unauthorized connections
- right of way encroachments
- construction activity near pipelines
- slime growth in pipes
- leaks
- damaged structures

Check operation of air release and vacuum valves Inspect pipe interiors:

- slime accumulation
- deterioration of lining materials