SMART WATER MANAGEMENT

PROBLEMS:

Water quality refers to the chemical, physical, and biological characteristics of water based on the standards of its usage. It is most frequently used by reference to a set of standards against which compliance, generally achieved through treatment of the water, can be assessed. The most common standards used to monitor and assess water quality convey the health of ecosystems, safety of human contact, extent of water pollution and condition of drinking water. Water quality has a significant impact on water supply and oftentimes determines supply options.

HUMAN COSUMPTION:

Contaminants that may be in untreated water include microorganisms such as viruses, protozoa and bacteria; inorganic contaminants such as salts and metals; organic chemical contaminants from industrial processes and petroleum use; pesticides and herbicides; and radioactive contaminants. Water quality depends on the local geology and ecosystem, as well as human uses such as sewage dispersion, industrial pollution, use of water bodies as a heat sink, and overuse (which may lower the level of the water).

The United States Environmental Protection Agency (EPA) limits the amounts of certain contaminants in tap water provided by US public water systems. The Safe Drinking Water Act authorizes EPA to issue two types of standards:

- *primary standards* regulate substances that potentially affect human health;
- *secondary standards* prescribe aesthetic qualities, those that affect taste, odor, or appearance.

The U.S. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk.

In urbanized areas around the world, water purification technology is used in municipal water systems to remove contaminants from the source water (surface water or groundwater) before it is distributed to homes, businesses, schools and other recipients. Water drawn directly from a stream, lake, or aquifer and that has no treatment will be of uncertain quality in terms of potability. The burden of polluted drinking water disproportionally effects under-represented and vulnerable populations. Communities that lack these clean drinking-water services are at risk of contracting water-borne and pollution-related illnesses like Cholera, diarrhea, dysentery, hepatitis A, typhoid, and polio. These communities are often in low-income areas, where human wastewater is discharged into a nearby drainage channel or surface water drain without sufficient treatment, or is used in agricultural irrigation.

SOLVING THE PROBLEM:

REAL TIME MONITORING:

Although water quality is usually sampled and analyzed at laboratories, since the late 20th century there has been increasing public interest in the quality of drinking water provided by municipal systems. Many water utilities have developed systems to collect real-time data about source water quality. In the early 21st century, a variety of sensors and remote monitoring systems have been deployed for measuring water pH, turbidity, dissolved oxygen and other parameters. Some remote sensing systems have also been developed for monitoring ambient water quality in riverine, estuarine and coastal water bodies.

An electrical conductivity meter is used to measure total dissolved solids

The following is a list of indicators often measured by situational category:

- Alkalinity
- Color of water
- pH
- Taste and odor (geosmin, 2-Methylisoborneol (MIB), etc.)
- Dissolved metals and salts (sodium, chloride, potassium, calcium, manganese, magnesium)
- Microorganisms such as fecal coliform bacteria (*Escherichia coli*), Cryptosporidium, and Giardia lamblia; *see* Bacteriological water analysis
- Dissolved metals and metalloids (lead, mercury, arsenic, etc.)
- Dissolved organics: colored dissolved organic matter (CDOM), dissolved organic carbon (DOC)
- Radon
- Heavy metals
- Pharmaceuticals
- Hormone analogs

Physical indicators;

- Water temperature
- Specific conductance or electrical conductance (EC) or conductivity
- Total suspended solids (TSS)
- Transparency or turbidity
- Water clarity
- Total dissolved solids (TDS)
- Odour of water
- Color of water (such as Forel-Ule scal
- Taste of water

Chemical indicators

- Alkalinity
- Orthophosphates

- Biochemical oxygen demand (BOD)
- Chemical oxygen demand (COD)
- Dissolved oxygen (DO)
- Total hardness (TH)
- Heavy metals
- Nitrate
- pH
- Pesticides
- Residual sodium carbonate index (RS
- Sodium adsorption ratio (SAR)
- Surfactants

Biological indicators

See also: Biological integrity and Index of biological integrity

- Ephemeroptera
- Plecoptera
- Mollusca
- Trichoptera
- *Escherichia coli*
- Coliform bacteria
- *Pimephales promelas* (fathead minno
- *Americamysis bahia* (Mysid shrimp)
- Sea urchin

Biological monitoring metrics have been developed in many places, and one widely used family of measurements for freshwater is the presence and abundance of members of the insect orders Ephemeroptera, Plecoptera and Trichoptera (EPT) (of benthic macroinvertebrates whose common names are, respectively, mayfly, stonefly and caddisfly). EPT indexes will naturally vary from region to region, but generally, within a region, the greater the number of taxa from these orders, the better the water quality. Organisations in the United States, such as EPA. offer guidance on developing a monitoring program and identifying members of these and other aquatic insect orders. Many US wastewater dischargers (e.g., factories, power plants, refineries, mines, municipal sewage treatment plants) are required to conduct periodic **whole effluent toxicity** (WET) tests.

Individuals interested in monitoring water quality who cannot afford or manage lab scale analysis can also use biological indicators to get a general reading of water quality. One example is the IOWATER volunteer water monitoring program of Iowa, which includes an EPT indicator key.

CLOUSER :

By using the sensor we could measure all the real time monitoring data and solve it very soon