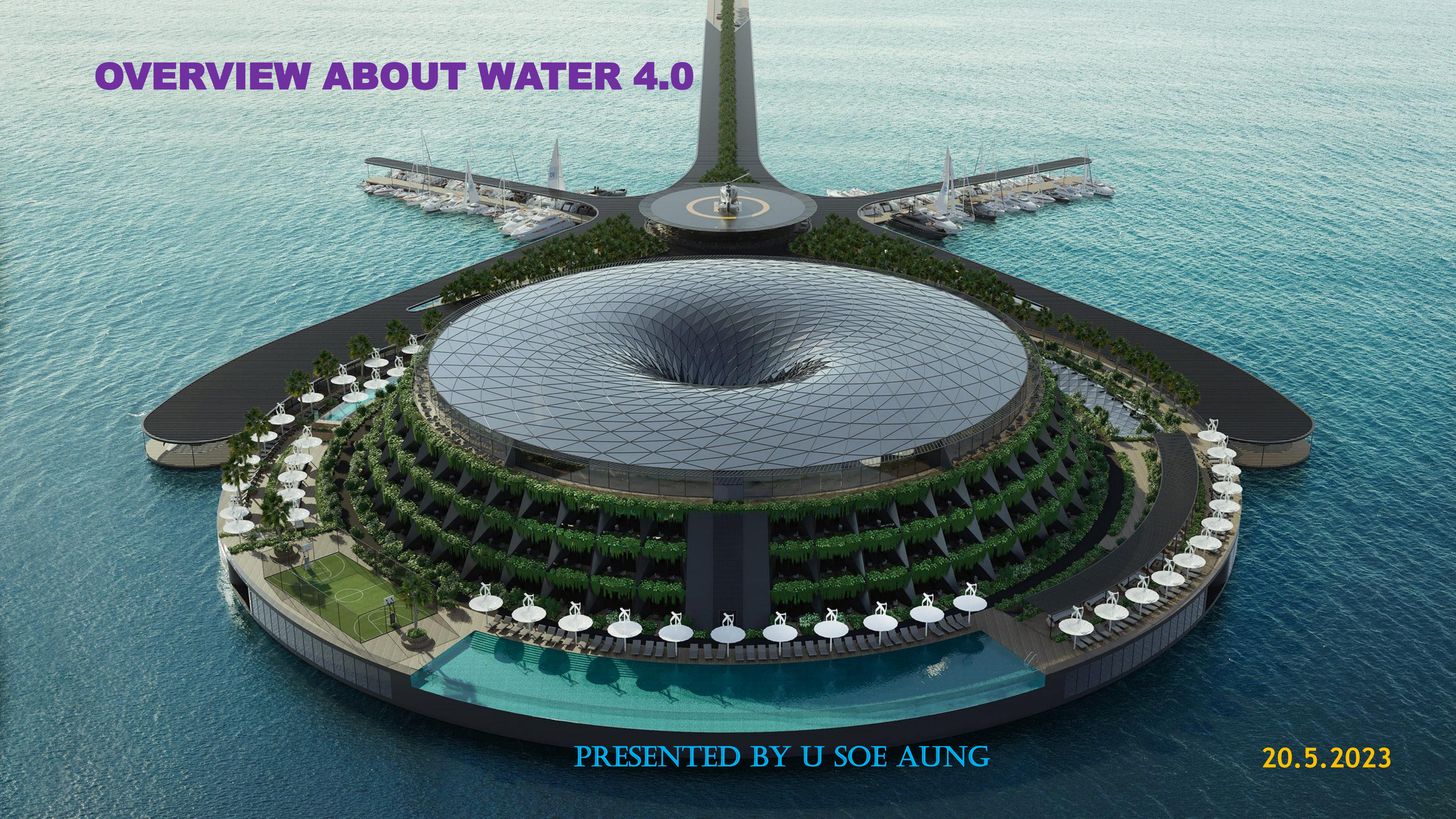
OVERVIEW ABOUT WATER 4.0



PRESENTED BY U SOE AUNG

20.5.2023

Five Star Spinning Hotel Generates its Own Power (sustainable Hotel), The Coast of Qatar

- Eco floating Hotel by Hayri Atak Architectural Design Studio (HAADS)
- It is 5 star hotel, has 35000 sq. meter, 152 rooms
- The vortex shape of the roof in the central section of the circular hotel would be used to collect rainwater
- The hotel spins over 24 hours, each guest would have a different view from their private balcony
- Using slowly spinning system to generate electricity,
- Below water, the current would be harnessed with a tidal energy system as the hotel rotates so as to also produce power.
- The hotel's solar panels and wind turbines would also help provide the space with renewable energy.
- Clean water would be gathered by purifying seawater, and wastewater would be treated so as not to harm the environment.


WATER IS HEALTH
75%
OF HUMAN
BODY IS WATER
Lorem ipsum dolor sit amet, consec
HOW MUCH
WATER DO YOU REALLY NEED?
8 GLASSES PER DAY OR
1 GLASS PER 20 LB OF BODY WEIGHT
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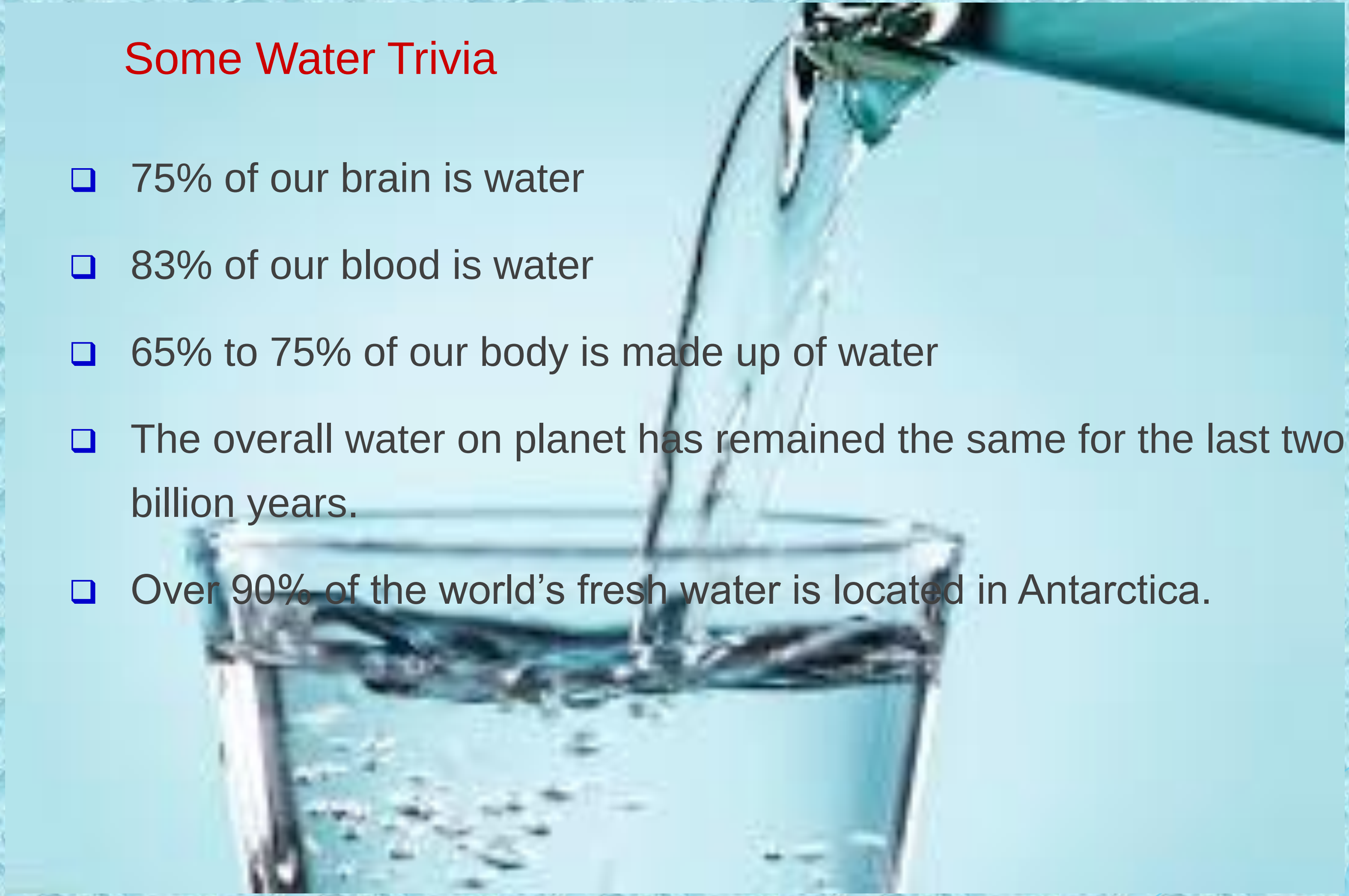
AFTER WAKING UP
BEFORE EACH MEAL
BEFORE TAKING BATH
BEFORE GOING TO BED
WHY DRINK MORE WATER
BETTER MOOD
BRAIN BOOST
HEALTHY HEART
TOXINS REMOVER
CLEAR SKIN
JOINTS GREASER
MUSCLE GAIN
WEIGHT LOSS
BENEFITS OF
DRINKING WATER

Introduction

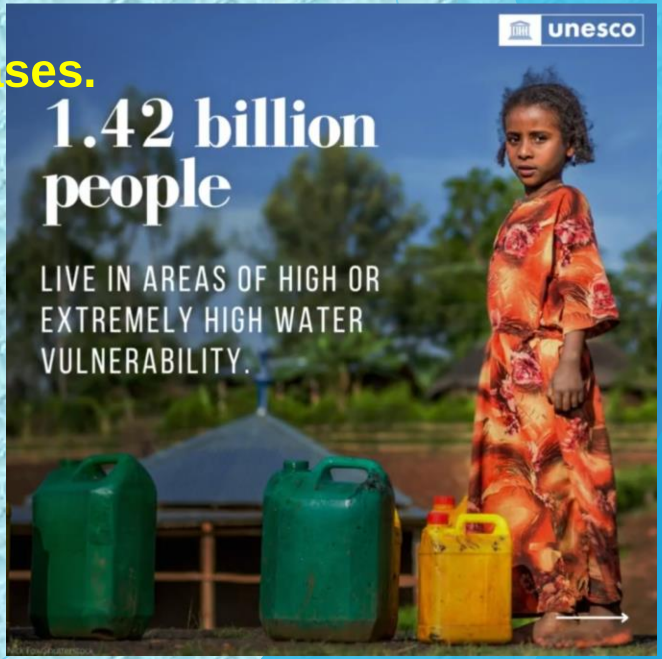


Some Water Trivia

- 75% of our brain is water
- 83% of our blood is water
- 65% to 75% of our body is made up of water
- The overall water on planet has remained the same for the last two billion years.
- Over 90% of the world’s fresh water is located in Antarctica.

Introduction

- 450 million people in 29 developing countries face water shortage problems.
- 2.3 billion people do not adequate sanitation.
- 1.4 billion people across the world lack access to safe water.
- 4000 children die everyday due to water borne diseases.



Introduction

- 7 million people die yearly from diseases linked to water.
- Half of the world’s rivers and lakes are critically polluted.

(Source from the World Water Commission for the 21st Century)

Introduction

Exhortation of World Bank

- According to The World Bank, the global population is growing fast, and estimates show that with current practices, the world will face a 40% shortfall between forecast demand and available supply of water by 2030.
- To strengthen water security, we need to invest in information management systems for resource monitoring in order to better allocate, regulate, and conserve water.
- Get in touch with us to help you monitor and manage your water.

Introduction

- Salt water oceans and seas hold 97% of the surface water.
- 2.4 % are found in the glaciers and polar ice caps.
- Leaving 0.6% for surface waters such as rivers & lakes.
- It is a known fact that a person can survive a month without food, but only about a week without water. Dehydration sets in.
- Climate change will have an impact on water resources- the behaviour of the river run offs and precipitation intensity – drought and decreased rainfall, increase in sea levels (saline intrusion).
- Water will become a scarce commodity in the future if its management is not properly controlled and secured.
- Water moves around the earth in a water cycle. Global climate may alter the hydrological water cycle.

Overview about Water 4.0

Content

1. Water 4.0 technology used in developed countries

2. Water 4.0 book written by David Sedlak

1. Water 4.0 technology used in developed countries

Water 4.0 is a latest technology which is specially designed to get fruitful results for a water supply system using the digital technology called Industrial 4.0 in water management. (BC 312 first aqueduct, 3rd century AD - 226 aqueduct in Roman Empire , 1804, 1829 world first slow sand filtration system)

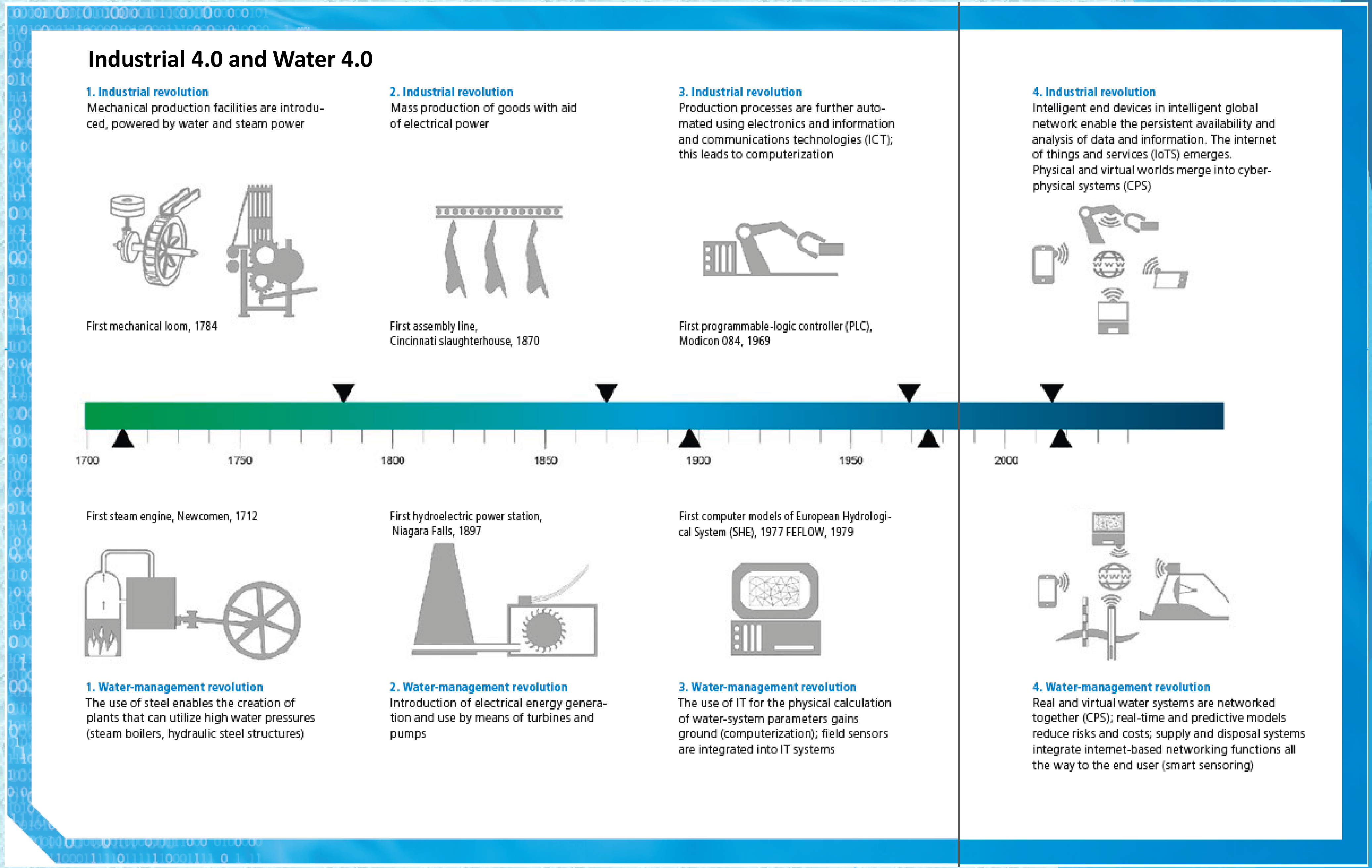
Water 4.0 is a concept that refers to the integration of advanced digital technologies into water management systems. This includes a range of innovative technologies that help to improve water efficiency, cost effective, reduce waste, and optimize water treatment processes. Here are some examples of Water 4.0 technologies:

1. Water 4.0 technology used in developed countries

It comprises the following technologies

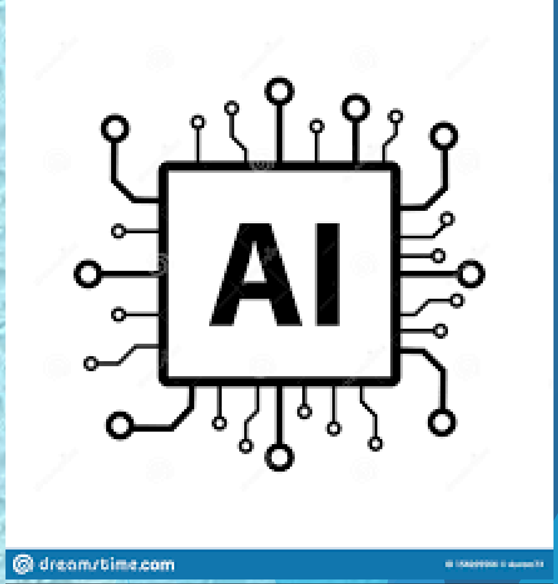
- AI (Artificial Intelligence)
- Machine Learning
- IoT (Internet of Things)
- Cloud computing
- Sensors
- Data Analytics
- Augmented Reality (AR) and Robotics
- Blockchain Technologies
- Remote sensing

1. Water 4.0 technology used in developed countries



Artificial intelligence (AI)

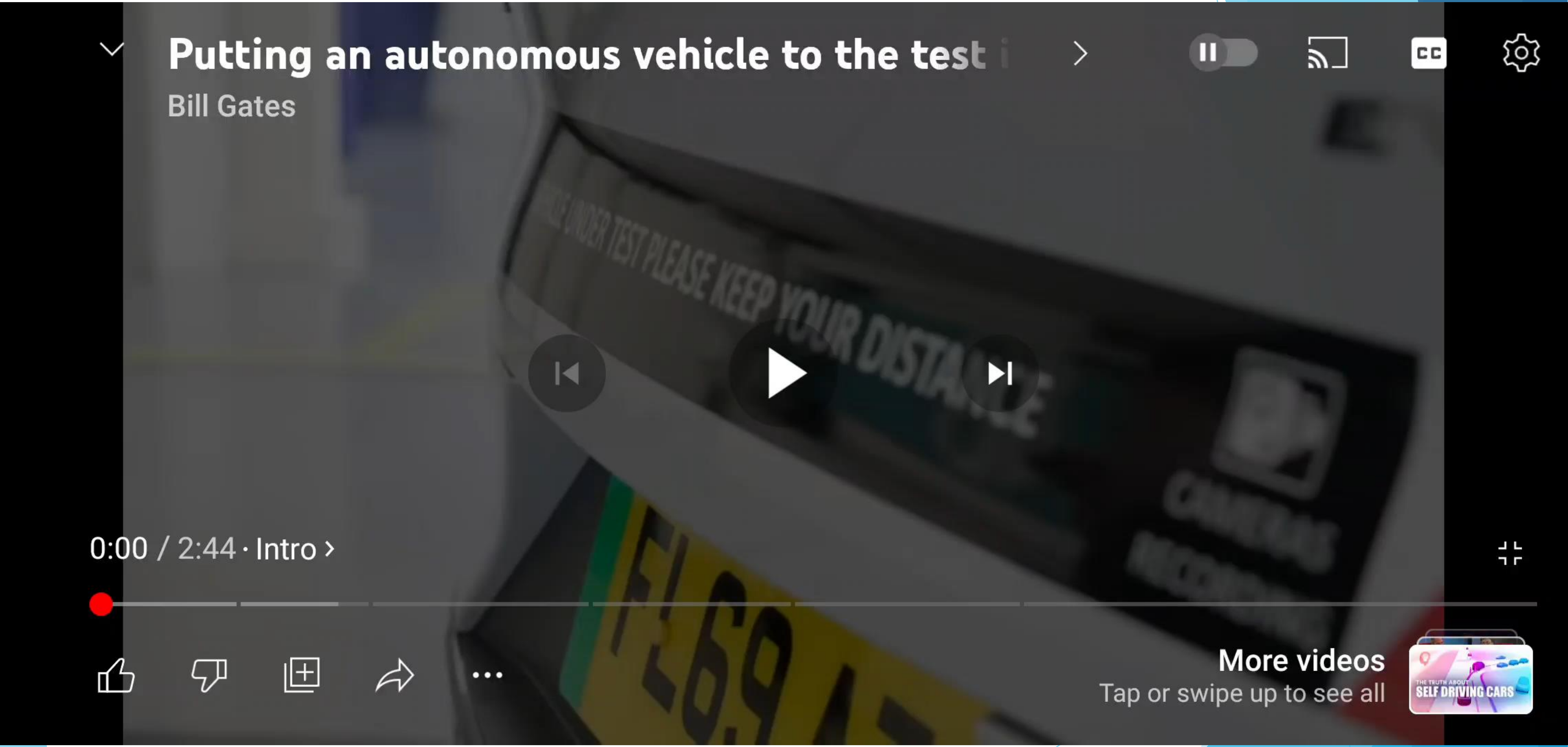
- Artificial intelligence (AI) is the core and well-known branch of computer science that deals with building smart systems and resolves problems in a manner comparable to the human intelligence system. The primary motive of AI applications to a system is to enhance computer functions that are relevant to human knowledge, such as learning, problems solving, reasoning and perception. AI is a fast-growing field and having real-world applications in diverse fields such as healthcare, smart cities and transportation, e-commerce, finance, and academia. AI is further classified into machine learning, deep learning and data analytics. These techniques are mainly used for intelligent decision-making, blockchain, cloud computing, the internet of things (IoT) and the fourth industrial revolution (Industry 4.0). AI is booming mainly due to its unique features to learn and adapt a system based on historical data and to make a decision. AI's significance is rising incessantly with time due to the integration of AI-based systems with intelligence, adaptability and intentionality in their proposed algorithms.
- AI technologies can be used to analyze large datasets and predict water demand, identify leaks and other issues, and optimize water treatment processes. This can help to reduce costs, improve efficiency, and ensure the consistent delivery of high-quality water. For example, AI algorithms can analyze historical data on water usage patterns, weather patterns, and other factors to predict future water demand. AI can also be used to analyze real-time data from IoT sensors to identify issues, such as leaks or changes in water quality, and automatically adjust water treatment processes to ensure consistent water quality.



What is and where does AI go?

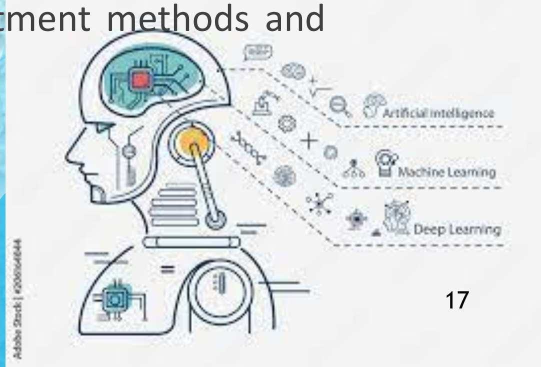
- Eventually, AI will monitor the entire human body and point out areas of weakness.
- In order for humans to live longer, AI will study the entire human body and develop preventive and curative technologies.


Tesla Model Y: How To Use Autopilot
Bryan Hauer
AUTOPILOT
TESLA
1:17 / 15:47 · Autopilot Explained
More videos
Tap or swipe up to see all

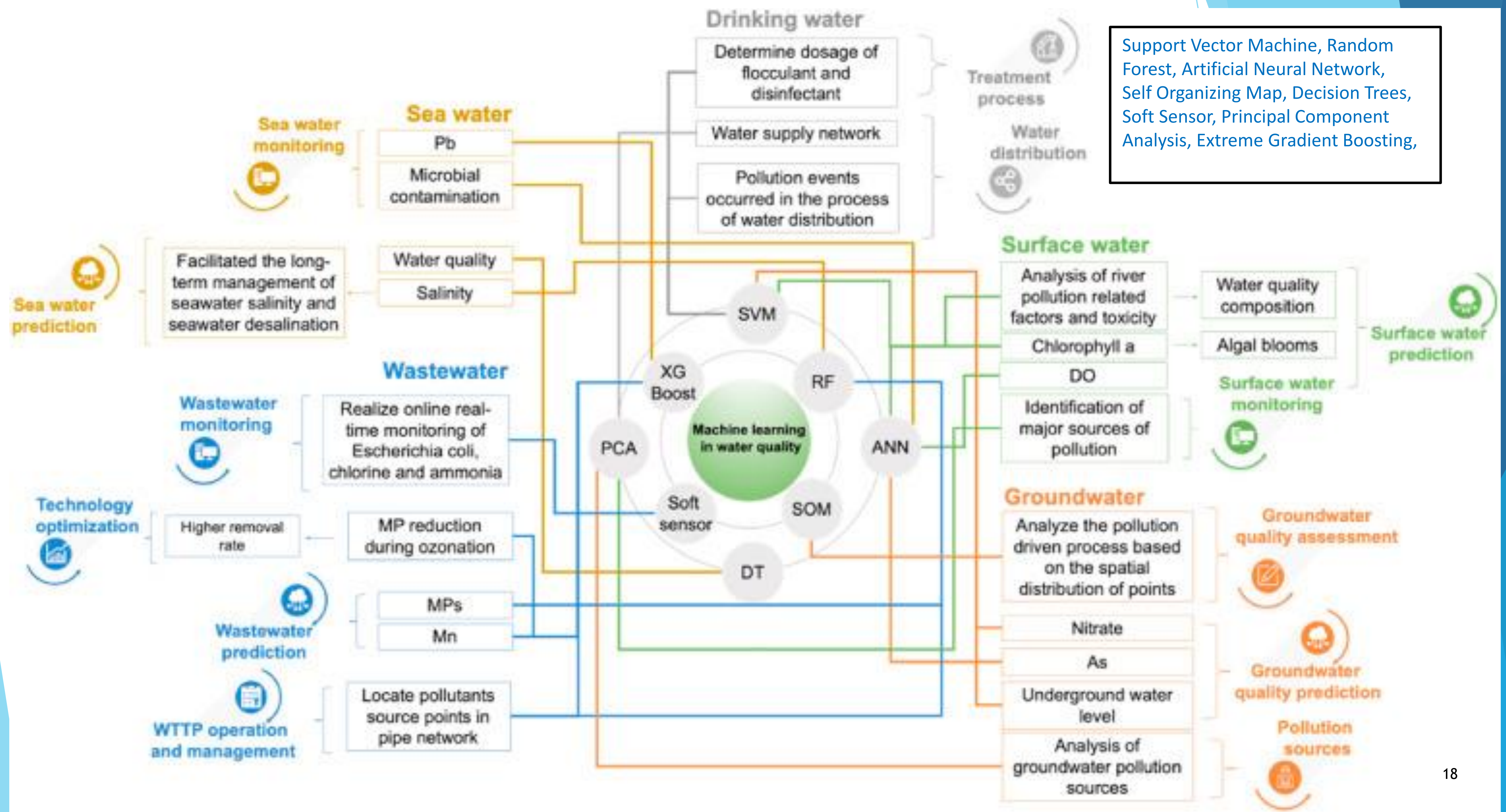

Putting an autonomous vehicle to the test i
Bill Gates
VEHICLE UNDER TEST PLEASE KEEP YOUR DISTANCE
0:00 / 2:44 · Intro
More videos
Tap or swipe up to see all
THE TRUTH ABOUT SELF DRIVING CARS

Machine Learning (Algorithms)

- Machine learning (ML) can do everything from analyzing X-rays to predicting stock market prices to recommending binge-worthy television shows with such a wide range of applications.
- In simple terms, a machine learning algorithm is like a recipe that allows computers to learn and make predictions from data. Instead of explicitly telling the computer what to do, we provide it with a large amount of data and let it discover patterns, relationships, and insights on its own.
- At the core of machine learning are algorithms, which are trained to become the machine learning models used to power some of the most impactful innovations in the world today.
- you'll learn about 10 of the most popular machine learning algorithms that you'll want to know, and explore the different learning styles used to turn machine learning algorithms into functioning machine learning models.
- ML algorithms can be used to train models that can accurately predict water quality, detect anomalies, and optimize water treatment processes. . ML can also be used to automate routine tasks, such as data entry, analysis, and reporting. For example, ML algorithms can analyze data on water quality and identify patterns that may indicate changes in water quality. ML can also be used to optimize water treatment processes by analyzing data on the performance of different treatment methods and identifying the most effective approach for a given set of conditions.
- Random Forest, Artificial Neural Network, and Support Vector Machine Models for Honey Classification



Machine Learning Classification in Water Quality Monitoring



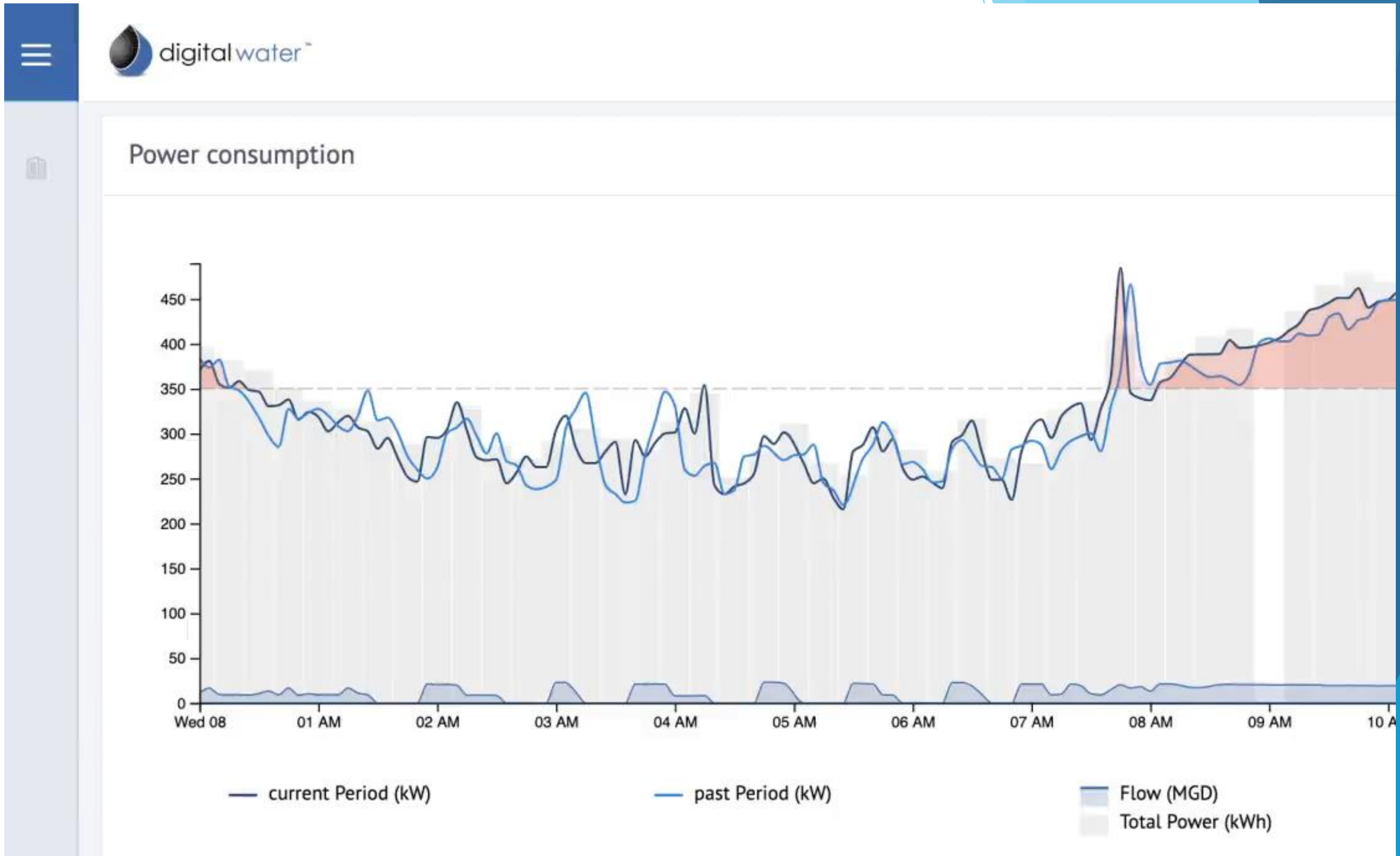
Support Vector Machine, Random Forest, Artificial Neural Network, Self Organizing Map, Decision Trees, Soft Sensor, Principal Component Analysis, Extreme Gradient Boosting,

Internet of Thing

- The Internet of things (IoT) describes the network of physical objects (or groups of such objects) —"things"—that are embedded with sensors, processing ability, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet or other communications networks.
- Internet of Things (IoT): IoT sensors are being used to monitor and control water systems in real-time. These sensors can provide data on water quality, flow rates, pressure, and temperature, which can help to identify potential issues and optimize system performance. For example, IoT sensors can detect leaks or changes in water quality, and automatically adjust water treatment processes to ensure consistent water quality.

Energy Management

In the water sector, energy is often the highest operational expense for a utility. Treatment processes require enormous amounts of power, and facilities are under pressure to improve how they approach energy management. Digital Water's solutions allow customers to optimize power usage through load aggregation, provide realtime visibility of electricity demand for sub-metered components, and empower operators to load-shed/shift/shape during high demand periods.



We can check real time condition of system and if it is not a normal situation will know immediately.

Production cost per 1unit water depends on power consumption.

Ampere will increase due to Motor, Pump misalignment and wearing by friction

Coffee Break

Sensors

- A **sensor** is a device that produces an output signal for the purpose of sensing a physical phenomenon.
- In the broadest definition, a sensor is a device, module, machine, or subsystem that detects events or changes in its environment and sends the information to other electronics, frequently a computer processor. Sensors are always used with other electronics.

water quality probe

The AP-7000 Aquaprobe is our largest multiparameter water quality probe. The AP-7000 allows you to add up to 6 additional sensors alongside the standard parameters found on all of our Aquaprobes. The probe is designed for long periods of unmanned monitoring, facilitated by the integral self cleaning system that cleans all sensors installed on the probe.

Build
All Aquaprobes are made with the same marine grade aluminium, finished in black with hard anodising for excellent corrosion and biofouling resistance. The use of metal, as opposed to plastic, gives our products their characteristic weight and high quality look and feel.

Sensors
The AP-7000 comes with all of the common water quality testing sensors pre fitted to the probe:

pH • ORP • Conductivity • TDS • SSG • Resistivity • Salinity • Dissolved Oxygen • Depth • Temperature

Probes come with 6 empty sockets
The AP-7000 comes with six empty Aux sockets pre-fitted with removable blanking plugs. These sockets allow you to customise your probe by adding in additional sensors. Each socket can house either an Ion Selective Sensor (ISE) or any of our optical sensors:

ISE Electrode Options:
Ammonium / Ammonia,
Chloride,
Nitrate,
Fluoride,
Calcium.

Optical Electrode Options:
Turbidity,
Chlorophyll,
Blue Green Algae,
Rhodamine,
Fluorescein,
Refined Oil,
CDOM / FDOM.

Self cleaning system
The AP-7000 uses a built in central cleaning system that will clean ALL installed sensors multiple times per cleaning cycle. Cleaning can also be triggered prior to calibration to remove any air bubbles from optical sensors.

Easy and cost effective to maintain
Over time the brushes can become fouled particularly during long deployments, so the wiper arm is designed to be easily removed for quick and simple brush replacement in the field:

Top: Remove the pin from the top of the cleaning arm
Middle: Slide out the cleaning arm
Bottom: Slide out the brushes and quickly replace.

The wiper brushes will keep all sensors clean during the deployment, this is paticularly important for the optical sensors that use lenses for measurement.

Cleaning control
The wiper cleaning frequency can be configured when used with an Aqualogger. When used with a telemetry system the wiper will run every 6 hours to reduce battery drain.

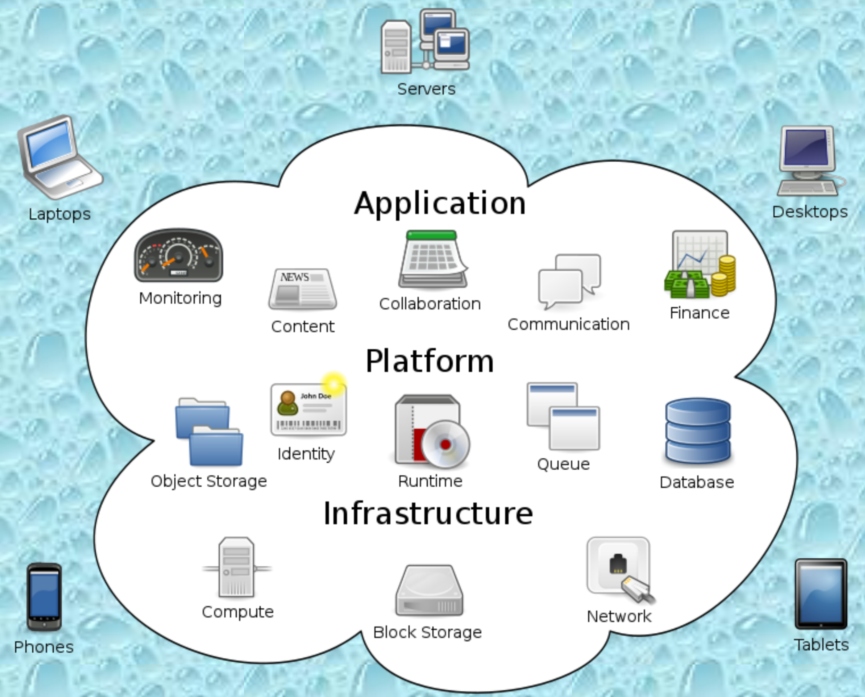
Sensors

- These are the types of sensors most commonly used to measure water quality in wastewater treatment.

- **pH sensors**
  - Measure how acidic or alkaline water is
- **Oxidation-reduction potential (ORP) sensors**
  - Measure the ability to oxidize or reduce a substance
- **Turbidity sensors**
  - Measure water clarity
- **Total suspended solids (TSS) sensors**
  - Measure the amount of silt, sediment, and substances suspended in water
- **Dissolved oxygen (DO) sensors**
  - Measure oxygen levels dissolved in water
- **Chemical oxygen demand (COD) sensors**
  - Measure oxygen levels in water for use in chemical treatment reactions
- **Biological oxygen demand (BOD) sensors**
  - Measure oxygen levels in water for use by bacteria in treatment processes
- **Temperature Sensor, Vibration Sensor, Flow Sensor, Pressure Sensor, Level Sensor**

Cloud Computing

- Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale. You typically pay only for cloud services you use, helping you lower your operating costs, run your infrastructure more efficiently, and scale as your business needs change.
- There are three different ways to deploy cloud services: on a public cloud, private cloud, or hybrid cloud. Learn more about public, private, and hybrid clouds.



Big Data Analytics

- Big Data Analytics: Big data analytics can be used to analyze large datasets to identify trends, patterns, and insights that can inform water management decisions. This includes data on water usage, quality, and distribution. For example, big data analytics can be used to identify areas with high water usage and target conservation efforts in those areas. It can also be used to identify patterns in water quality that may indicate issues with the water supply.

Augmented Reality (AR) and Robotics:

- Augmented Reality (AR): AR technologies can be used to provide real-time information on water systems, including visualizations of water flow, pressure, and quality. This can help to identify issues and optimize system performance. For example, AR can be used to visualize the flow of water through pipes and identify areas where there may be blockages or leaks. AR can also be used to provide real-time information on water quality and treatment processes.

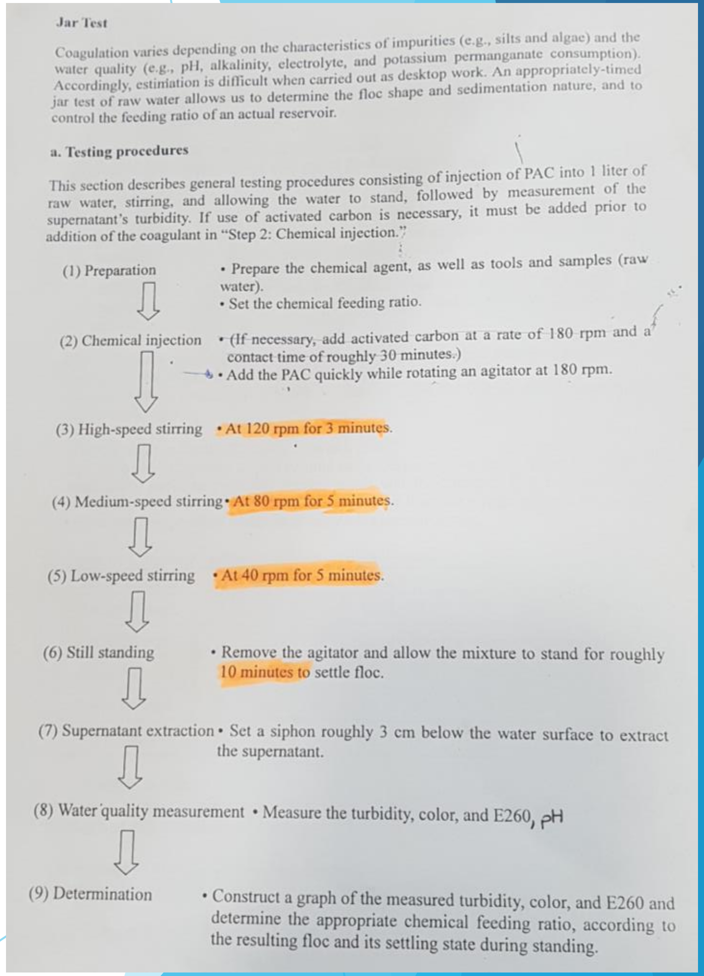
- Robotics: Robotics technologies can be used to automate routine tasks, such as cleaning and maintenance, and to inspect water systems for potential issues. This can help to reduce costs and improve efficiency. For example, robots can be used to clean and maintain water treatment equipment, reducing the need for manual labor. Robots can also be used to inspect pipes and identify areas where there may be blockages or leaks.

Blockchain Technologies

- Blockchain: Blockchain technologies can be used to provide secure, transparent, and tamper-proof records of water usage and transactions. This can help to ensure the fair and efficient distribution of water resources. For example, blockchain can be used to track water usage and ensure that water is distributed fairly and efficiently. It can also be used to create a transparent and auditable record of water transactions, ensuring that water resources are used effectively and responsibly.

Differences between Human and technology

Water quality monitoring and testing by human	Water quality monitoring and testing by using technology
Turbidity test	Sensors
Jar test (30 Minute)	Data analyze and transmit
Spectrophotometer(150°C-30Minute)	IoT
Hand held tester	Machine learning
Laboratory equipment	AI



Jar Test

Coagulation varies depending on the characteristics of impurities (e.g., silts and algae) and the water quality (e.g., pH, alkalinity, electrolyte, and potassium permanganate consumption). Accordingly, estimation is difficult when carried out as desktop work. An appropriately-timed jar test of raw water allows us to determine the floc shape and sedimentation nature, and to control the feeding ratio of an actual reservoir.

a. Testing procedures

This section describes general testing procedures consisting of injection of PAC into 1 liter of raw water, stirring, and allowing the water to stand, followed by measurement of the supernatant's turbidity. If use of activated carbon is necessary, it must be added prior to addition of the coagulant in "Step 2: Chemical injection."

(1) Preparation
- Prepare the chemical agent, as well as tools and samples (raw water).
- Set the chemical feeding ratio.

(2) Chemical injection
- (If necessary, add activated carbon at a rate of 180 rpm and a contact time of roughly 30 minutes.)
- Add the PAC quickly while rotating an agitator at 180 rpm.

(3) High-speed stirring
- At 120 rpm for 3 minutes.

(4) Medium-speed stirring
- At 80 rpm for 5 minutes.

(5) Low-speed stirring
- At 40 rpm for 5 minutes.

(6) Still standing
- Remove the agitator and allow the mixture to stand for roughly 10 minutes to settle floc.

(7) Supernatant extraction
- Set a siphon roughly 3 cm below the water surface to extract the supernatant.

(8) Water quality measurement
- Measure the turbidity, color, and E260, pH

(9) Determination
- Construct a graph of the measured turbidity, color, and E260 and determine the appropriate chemical feeding ratio, according to the resulting floc and its settling state during standing.

Difference between 4G and 5G which affected water quality sensing process

Capacity

We've all experienced that frustrating moment when you're in a relatively small area with a bunch of people — a concert, sports stadium or the airport during holiday travel season — and you see the "spinning wheel of death" while trying to open a webpage or play an Instagram video.

Too many devices trying to use the network in one place can cause congestion. The network infrastructure just can't cope with mass numbers of devices, leading to slower data speeds and longer lag time for downloads.

5G is expected to solve that issue — and then some. The next generation network is expected to have significantly more capacity than 4G.

Speed

Speed is one of the most highly anticipated elements of the next generation network.
5G is expected to be nearly 100 times faster than 4G. With speeds like that, you could download a two-hour film in fewer than 10 seconds, a task that takes about seven minutes on 4G (no more panicking while trying to download your in-flight entertainment on the tarmac before the plane takes off).
Rapid speeds have obvious consumer applications, including movie streaming and app downloads, but they'll also be important in many other settings. Manufacturing experts talk about the possibility of putting video cameras throughout a factory, and very quickly gathering and analyzing massive amounts of footage to monitor product quality in real-time.

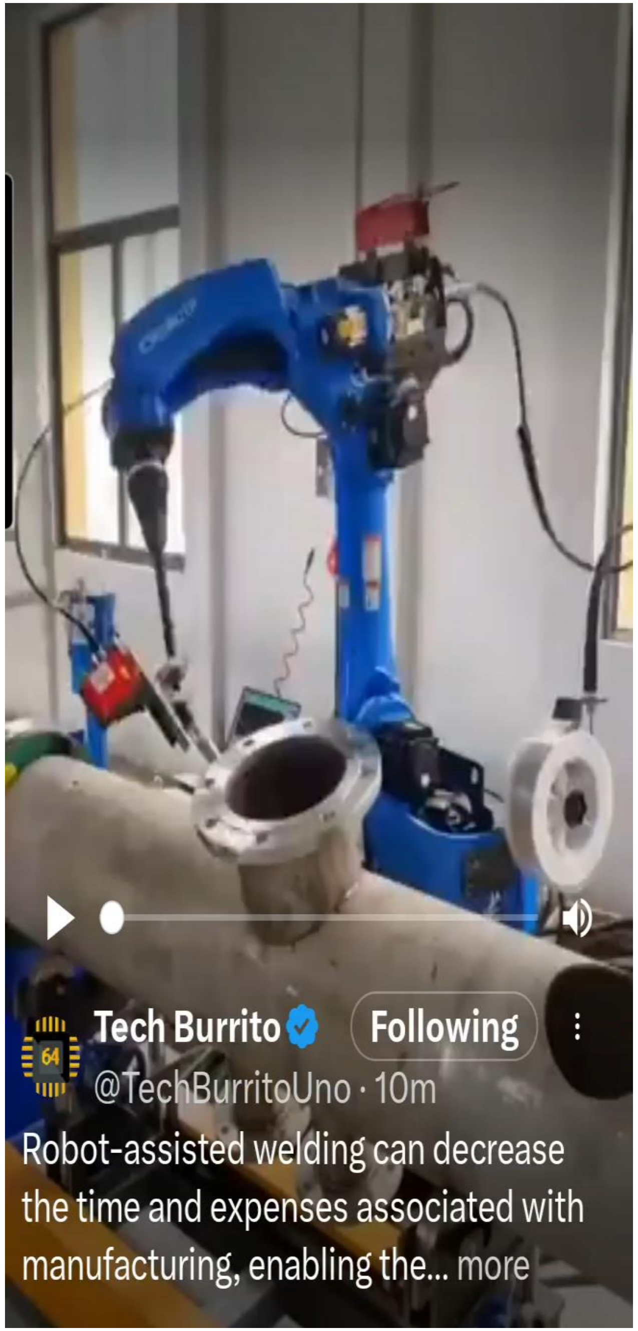
Latency

A small but significant difference exists between speed and latency, which is the time it takes for devices to communicate with each other or with the server that's sending them information.

Speed is the amount of time it takes for your phone to download the contents of a webpage. Latency is the time between when you send a text to a friend's phone and when their phone registers that it has received a new message.

Although latency is measured in milliseconds, all those milliseconds add up when sending and receiving huge packets of information for something as complex as video — or self-driving car data.
Latency is already low with 4G, but 5G will make it virtually zero.

AI Robot assisted welding



Drop seeds via drone

Water Quality Monitoring and Water Treatment System By using SCADA Automation

Lamella Clarifier

Rapid Sand Filtration with Auto Backwash System

၅.၂။ Renewable Energy(Solar/Wind Power)သုံးရေတင်စနစ်နည်းပညာ

၅.၄။ District Metered Areas (DMAs)ရေဖြန့်ဝေမှု နည်းပညာ

ဇုန်ခွဲခြား၍ ရေပေးဝေခြင်း

A typical layout is shown in Figure 6

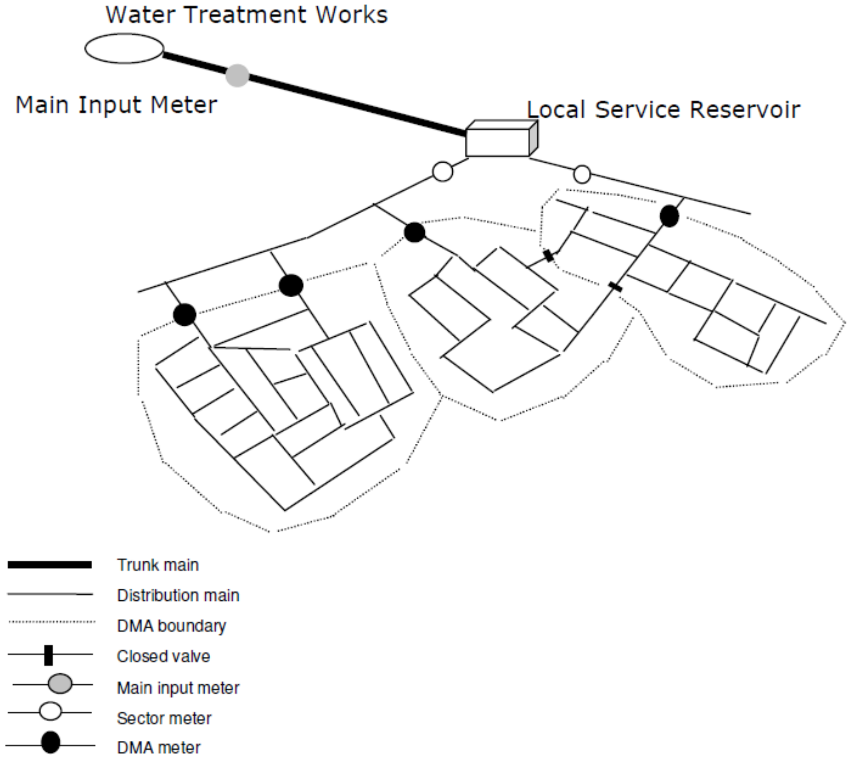


Figure 6: Typical DMA configuration

Pressure Reducing Valve နှင့် District Meter တပ်ဆင်ထားပုံ

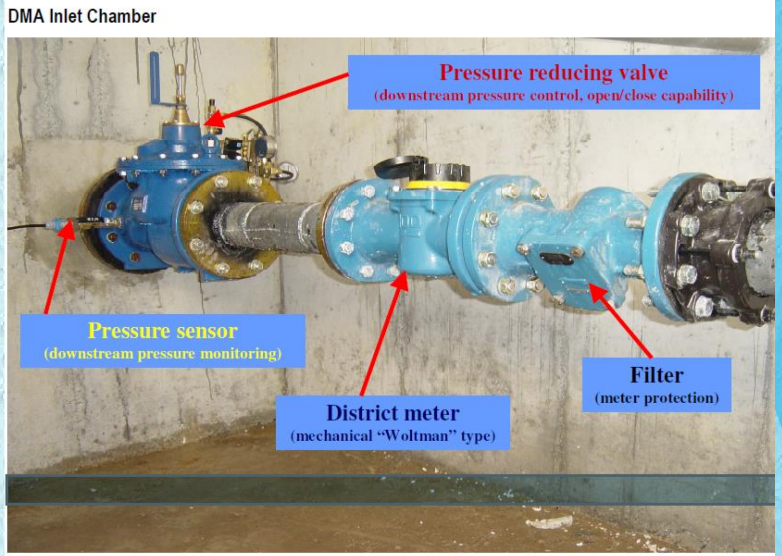
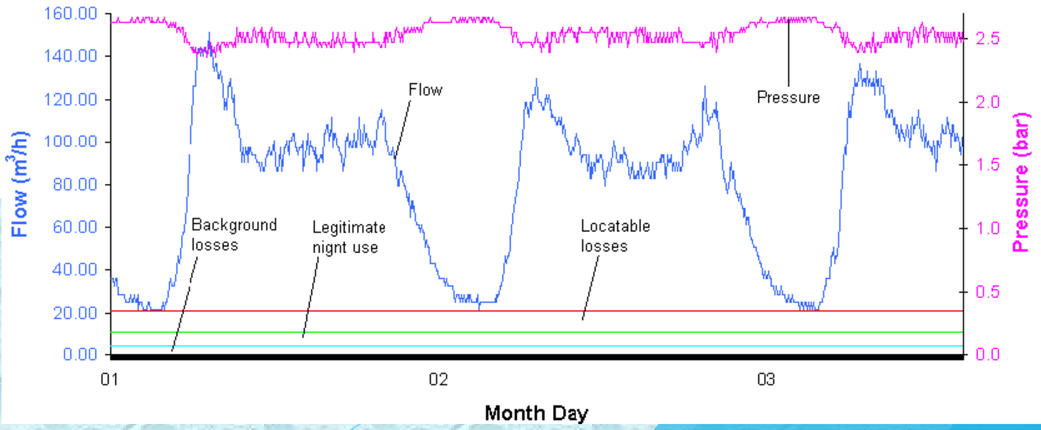


Figure 2. Typical flow and pressure pattern in a DMA

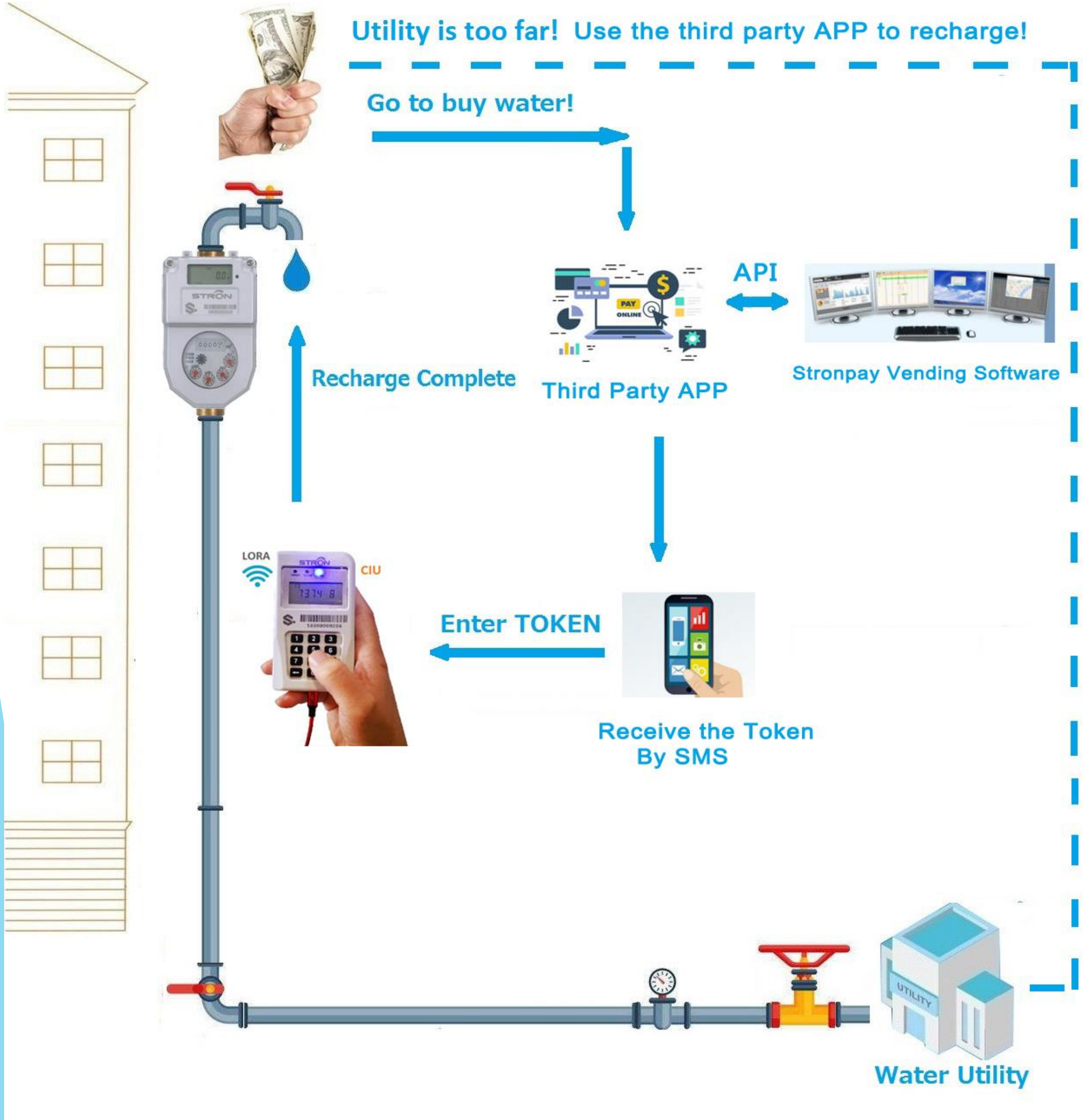


Water Meter (Accuracy)

Data supplier – iPERL measuring device
represents a new dimension in water measurement

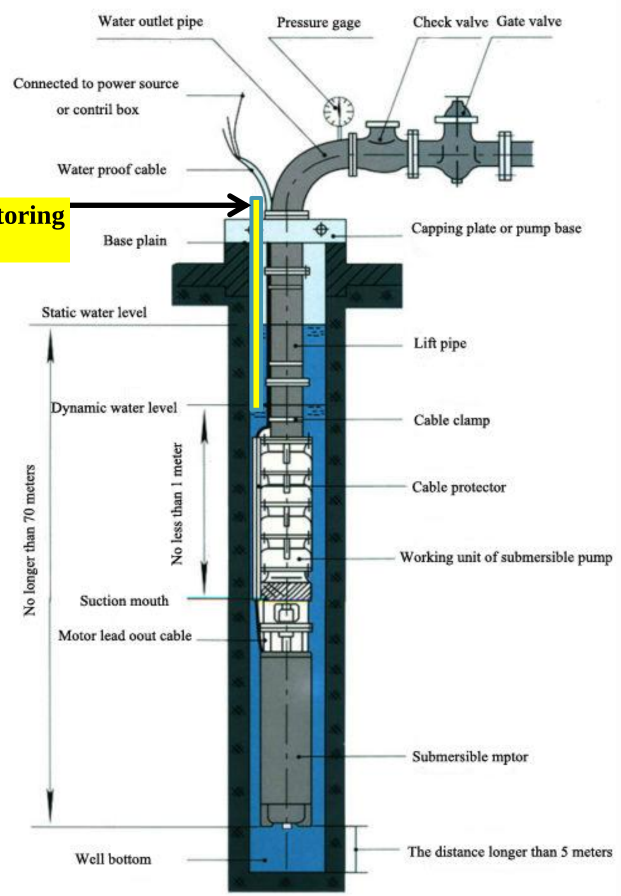
enabling a precise reading from the nominal size Q3 4 and above with a starting value of as little as one litre per hour. Both the construction and the contact-free measuring technology also have a positive effect on pressure management, as Martin Grüger confirms, “At some points of our network, the pressure is low and we appreciate being able to minimize the pressure loss with iPERL. This also contributes to cost and energy efficiency.”

PREPAID WATER METER SYSTEM

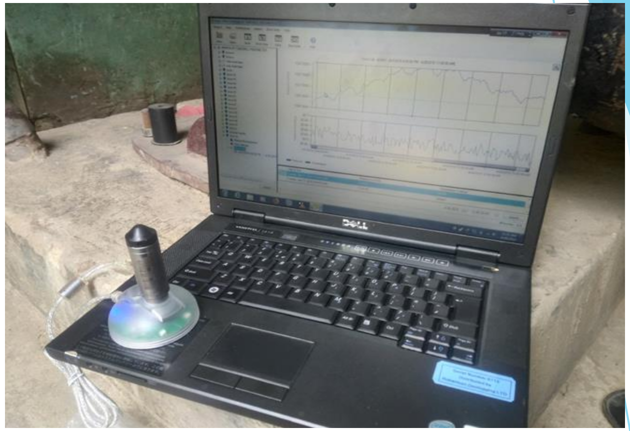


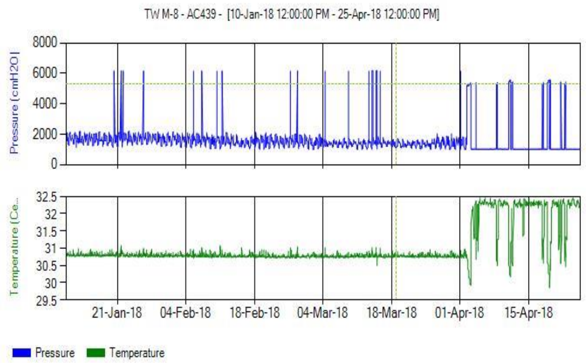
- **Prepaid ရေမီတာတပ်ဆင်အသုံးပြုခြင်းဖြင့် ရရှိနိုင်သော အကျိုးကျေးဇူးများ**
- ရေမီတာဘေ တောင်းခံရန် မီတာဖတ်စရာ မလိုသည့်အပြင် အိမ်ရှင်မှရုံးသို့ ဘေသွားရောက် ဆောင် စရာမလိုသည့်အတွက် အချိန်ကုန်သက်သာခြင်း၊ ဝန်ထမ်းစရိတ်သက်သာခြင်း၊ အလုပ်မရှုပ်ခြင်း
- ရေမီတာစခရင်၌ ယူနစ်လက်ကျန် အမြဲဖော်ပြနေသည့်အတွက် မိမိ၏ရေသုံးစွဲမှုအား တွက်ချက်သိရှိ ထိန်းချုပ်နိုင်ခြင်း
- ပုံမှန်ထက် ရေသုံးစွဲမှုများနေပါက Warning Message ပေးပို့မည်ဖြစ်သည့်အတွက် ဆင်ခြင်သုံးသပ် နိုင် ခြင်း
- ရေမီတာ လက်ဆော့ခြင်း၊ မီတာချို့ယွင်းခြင်း၊ ရေယိုစိမ့်ခြင်း စသည့် ပုံမှန်မဟုတ်သော အခြေအနေ တရပ်ရပ် ဖြစ်ပေါ်ခဲ့ပါက ချက်ချင်းသိရှိပြီး တားဆီးပြုပြင် ကာကွယ်နိုင်ခြင်း
- ဈေးနှုန်းပြောင်းလဲလိုပါက အလွယ်တကူပြောင်းလဲနိုင်ပြီး အသုံးပြုရ လွယ်ကူခြင်း
- ဘေကုန်ကာနီး၌ Alarm ပေးသည့်အတွက် ဘေအသစ်ဝယ်ယူရန် အချိန်ရခြင်း
- အဆင့်မြင့်လုံခြုံရေးကုတ်ထည့်သွင်းထားသည့်အတွက် လုံခြုံစိတ်ချရခြင်း
- ရိုးရိုးရေမီတာအဖြစ်လည်း အချိန်မရွေး လွယ်ကူစွာ ပြောင်းလဲအသုံးပြုနိုင်ခြင်း

Ground Water Level, Pressure, Temperature Monitoring System By Piezometer in Deep Tube Well



Data Downloading From Piezometer on Site





Data Downloading From Piezometer

Monitoring Tube

Observation Tube

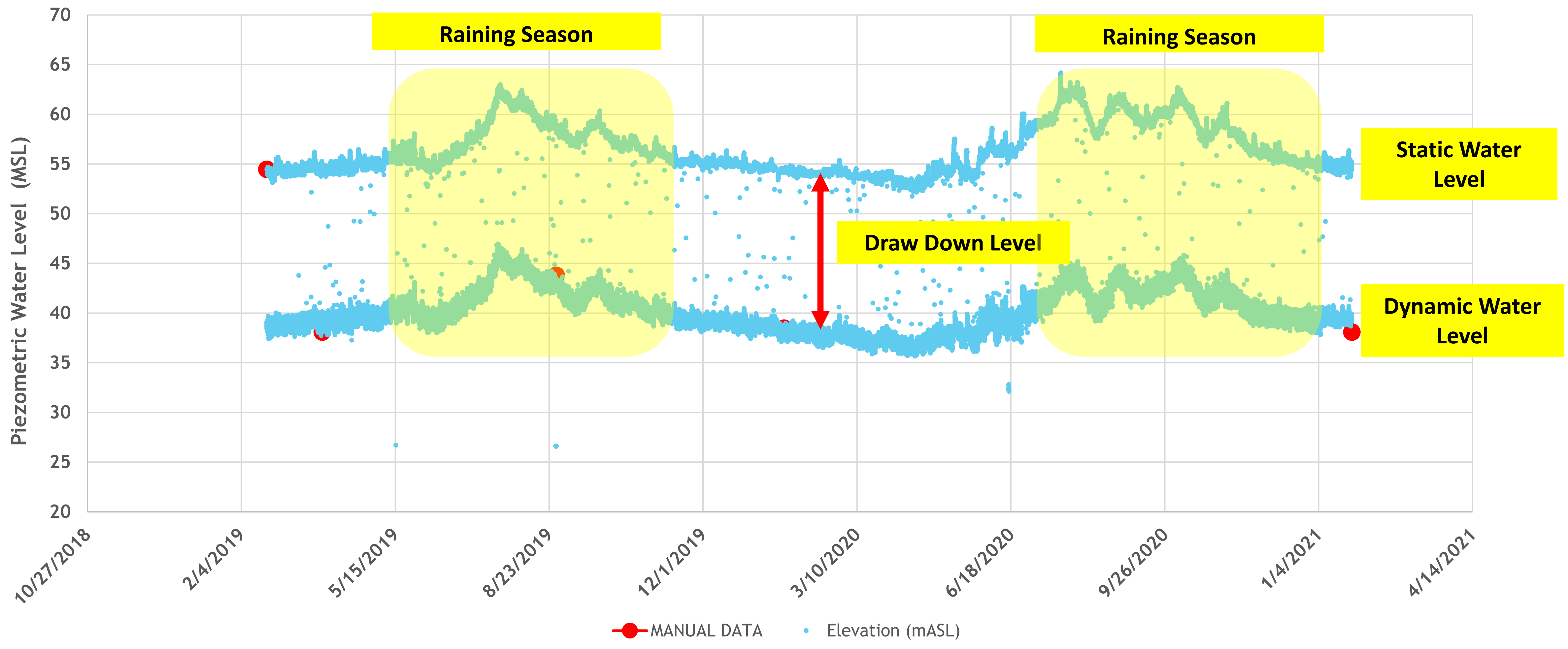
Piezometer Equipment

- What is Piezometer ?

- Piezometer is an instrument for measuring the pressure of a liquid or gas or something related to pressure (such as the compressibility of liquid). Piezometer are also placed in borehole to monitor the pressure or depth of groundwater

You should do like this, if you related with water supply industry using ground water.

TW23(Analysing Result From Piezometer)

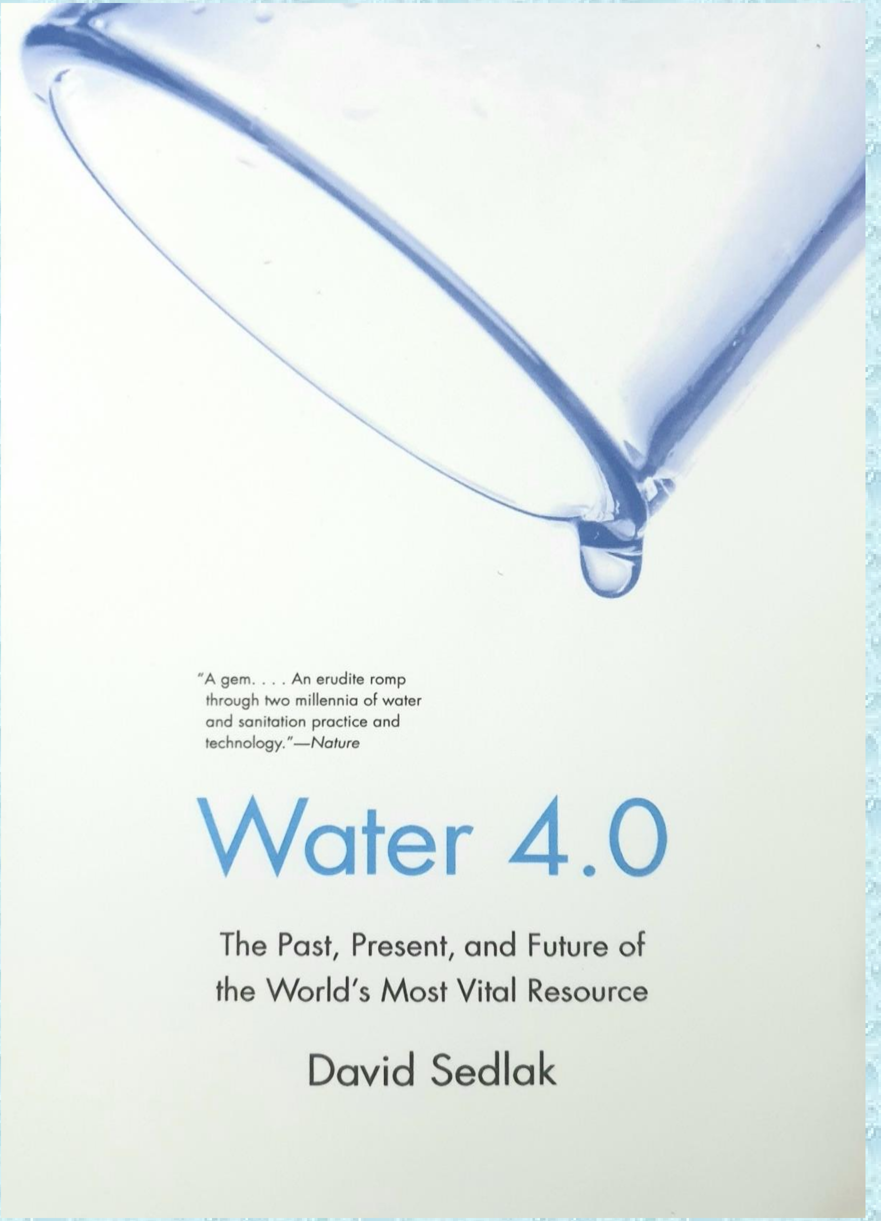


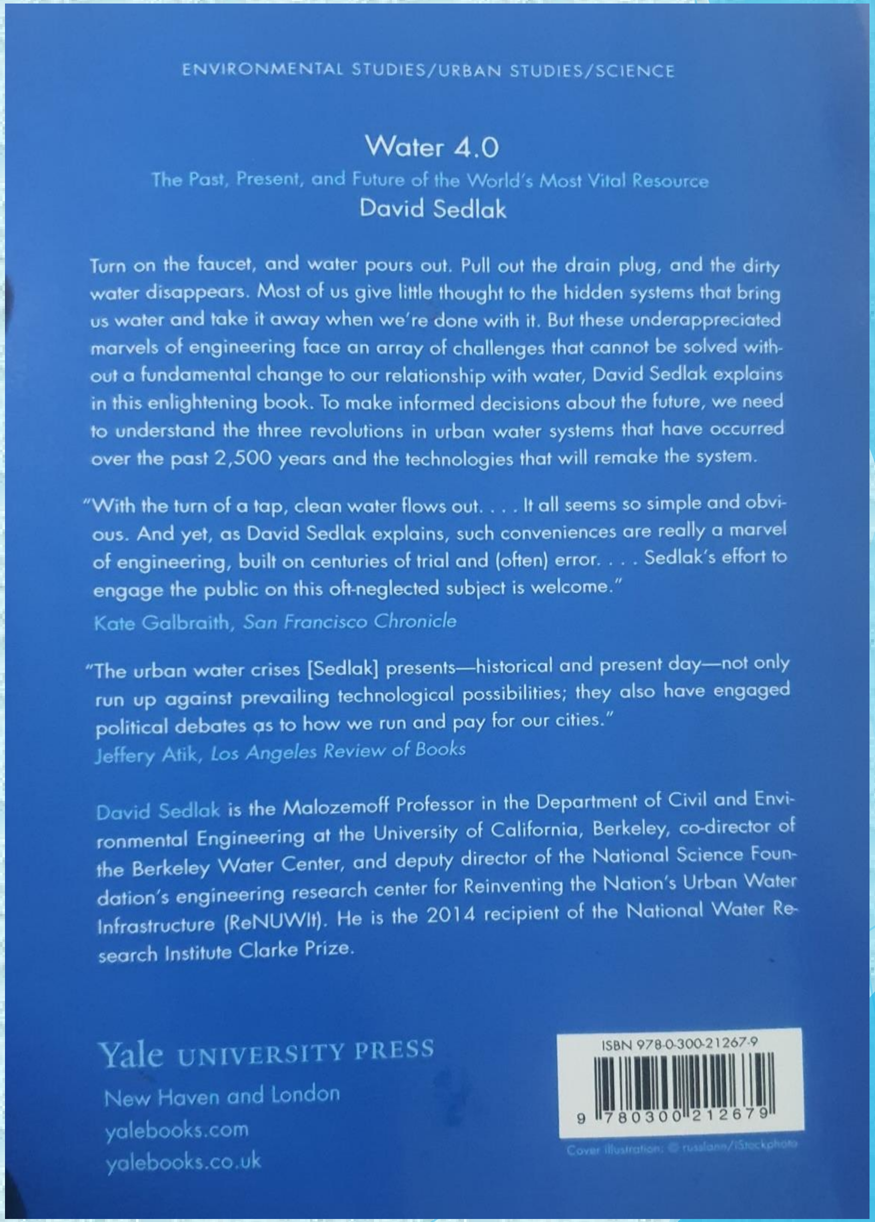
E	N	Township	Tube-Well Name	Location
96.0617487	21.9860592	AMTZ	TW 23	Bet: 26th & 35th Street,Bet:Myo Patt Road & Pulaing street

Ground water Recharge Process

- Tube well > 1860 > British hydrologist John Norton
- Recharge by dug well (<50’)
- Recharge by shallow tube well (50’ -100’)
- Recharge by medium tube well (100-300’)
- Recharge by deep tube well (300-800’)
- Recharge by deep tube well (800’-1300’)
- Where does the water we fill reach?
- Is it effective or not?
- Do we need to fill by pressure?
- Do we need to know the size and thickness of water table?
- Do we need to know well logging?
- Do we need to know geological formation of well field area (Lithology)?

2. Water 4.0 book written by David Sedlak





2. Water 4.0 book written by David Sedlak

- The repeated cycle of growth, failure, and reinvention that has occurred over the past 2,500 years of urban water systems can be likened to a series of revolutions.
- The first revolution, Water 1.0, occurred as the piped water systems and sewers first built by the ancient Romans were replicated in European cities that were growing very quickly during the first wave of global industrialization.
- As these cities continued to expand, public health suffered because the massive volumes of wastes flowing out of sewers transmitted waterborne diseases such as cholera and typhoid. Drinking water treatment, or Water 2.0, was the next revolution-stemming the spread of waterborne disease and leading to unimagined health benefits.
- Jump ahead half a century to a world in which modern technology and continued economic progress had caused cities to expand until the wastes pouring out of their sewers were causing more than a little bit of trouble immediately down- stream. Following decades of decline in the rivers, lakes, and estuaries surrounding cities, a third revolution-Water 3.0-occurred as sewage treatment plants became a standard feature of urban water systems.

2. Water 4.0 book written by David Sedlak

- Another half century later and all signs point to the approach of a fourth revolution, Water 4.0, as continued population growth and climate change stretch the ability of urban water systems to meet our needs. At this stage of the cycle, the nature of the challenge is poorly understood by the people who will eventually have to make the big decisions. In the cities where water systems are showing the greatest signs of stress, the problems manifest themselves in different ways.
- In some places, it's too much water, while others struggle with chronic shortages and still others are struggling to maintain pipe networks and treatment plants that are falling apart under the pressure of escalating maintenance costs.
- The components of the fourth revolution are still a work in progress, with multiple paths leading to better water systems, provided that we are willing to invest the resources, energy, and political will needed to make them a reality.
- Decisions about the future of urban water systems are best made by an informed public. I hope that this book and the associated website (www.water4point0 .com) will not only contribute to a broader, deeper understanding of the issues, but also motivate readers to become personally involved in efforts to improve their community's water system.

2. Water 4.0 By David Sedlak, Professor in the Department of Civil and Environmental Engineering at the University of California, Berkeley

1. Water Supply in Rome, the World's First Metropolis (36)
2. The Bucket Era (29)
3. Europe's Sewage Crisis (39) (1831, 1848, London , Cholera waterborne disease , Physician John Snow) Intake is located at down stream of city, French constructed canal in 1802),from feces to fertilizer
4. Growing Old Thanks to Water Treatment (43) New York aqueduct watershed from 190KM, built a network of underground tunnels to convey sewage to the ocean, Lowell,Lawrence,Typhoid,150 ,83 , late 19 century, built slow sand filter,1893
5. Burning Rivers, Fading Paint, and the Clean Water Movement(59) Sewage was discharged rivers, Polluted river, Hydrogen sulfide, decrease DO, Imhoff tank designed to remove solids from sewage, activated sludge process
6. The Chlorine Dilemma (46)
7. Drains to Bay (47)
8. Traces of Trouble: Hormones, Pharmaceuticals, and Toxic Chemicals (44)
9. Paying for the Fourth Revolution (48)
10. The Toilet - to - Tap Solution (46)
11. Turning to the Sea for Drinking Water (56)
12. A Different Tomorrow (57)
13. Reflections

There are five hundred and fifty(550) references.

2. Water 4.0 book written by David Sedlak

6. The Chlorine Dilemma (Water 4.0 Page 90 – Page 111)

- Pathogens
- Waterborne diseases
- Chlorine
- Residual chlorine
- Disinfection by products(DBPs)
- Dutch chemist Johannes Rook from Rotterdam Water Supply(after 35years of intensive research)
- Organic substances(compounds released by decaying plants and algae)
- Trihalomethanes, haloacetic acids(100µg/liter) (20-30µg/liter)
- Carcinogenic
- Adding ammonia , (Sodium Metabisulfite dosing (SMBS))
- Chloramines(molecule of ammonia) still inactivated microbes but they did not produce trihalomethanes
- Depend on pipeline length and we can manage chlorine booster setpoints.
- DDT (Dichlorodiphenyltrichloro ethane)Endrin pesticides US Govt ban the use of DDT in 1972, had killed 10M fish in lower Mississippi river.)
- Silent Spring (1962)

Lesson Learned from water 4.0 by David L. Sedlak

From water 4.0 by David L. Sedlak

The water culture (the evolution process related to water), which is more than 2,300 years old, has been reviewed and presented with a combination of education, wisdom, experience, knowledge, and the attitude of wanting to benefit human society.

Humans went to places where there was water and used it as raw, then, transported it to their places of residence and created good quality water using technologies for their long life living. There were many challenges, opportunities , and investment.

On the one hand, we want good water quality, on the other hand, because we have to use chemicals for good water quality, we may face side effects.

There is a need for regular research in the field of water quality monitoring and evaluation and water treatment process using chemicals

Lesson Learned

- From water 4.0 by David L. Sedlak

In the current situation, we are entering the digital age, and there is no precise framework of how to act for the water 4.0 industry. Policy, technology, etc. are not defined. I understand that we have to establish a road map that is compatible with climate, geographical position, our culture and investment ability.

After reading this book, I got somethings to consider about the rule to follow, to do policy and frame work relevant with climate, our culture, geographical situation and investment status.

Question and Answer


THANK YOU FOR YOUR TIME