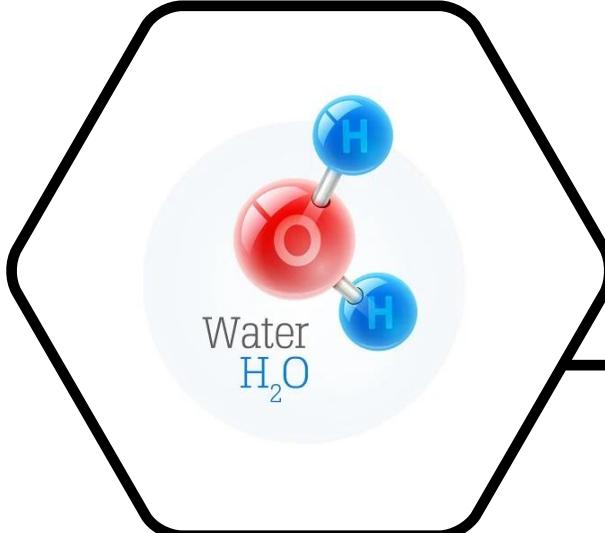


modern water management –basic track Water



Content:

Water cycle

the importance of water

Water resources

Why water (properties of water)

Why water treatment

Physical Water Analysis

Chemical Water Analysis

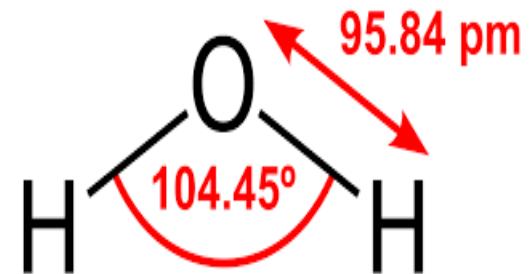
Water Control Parameters

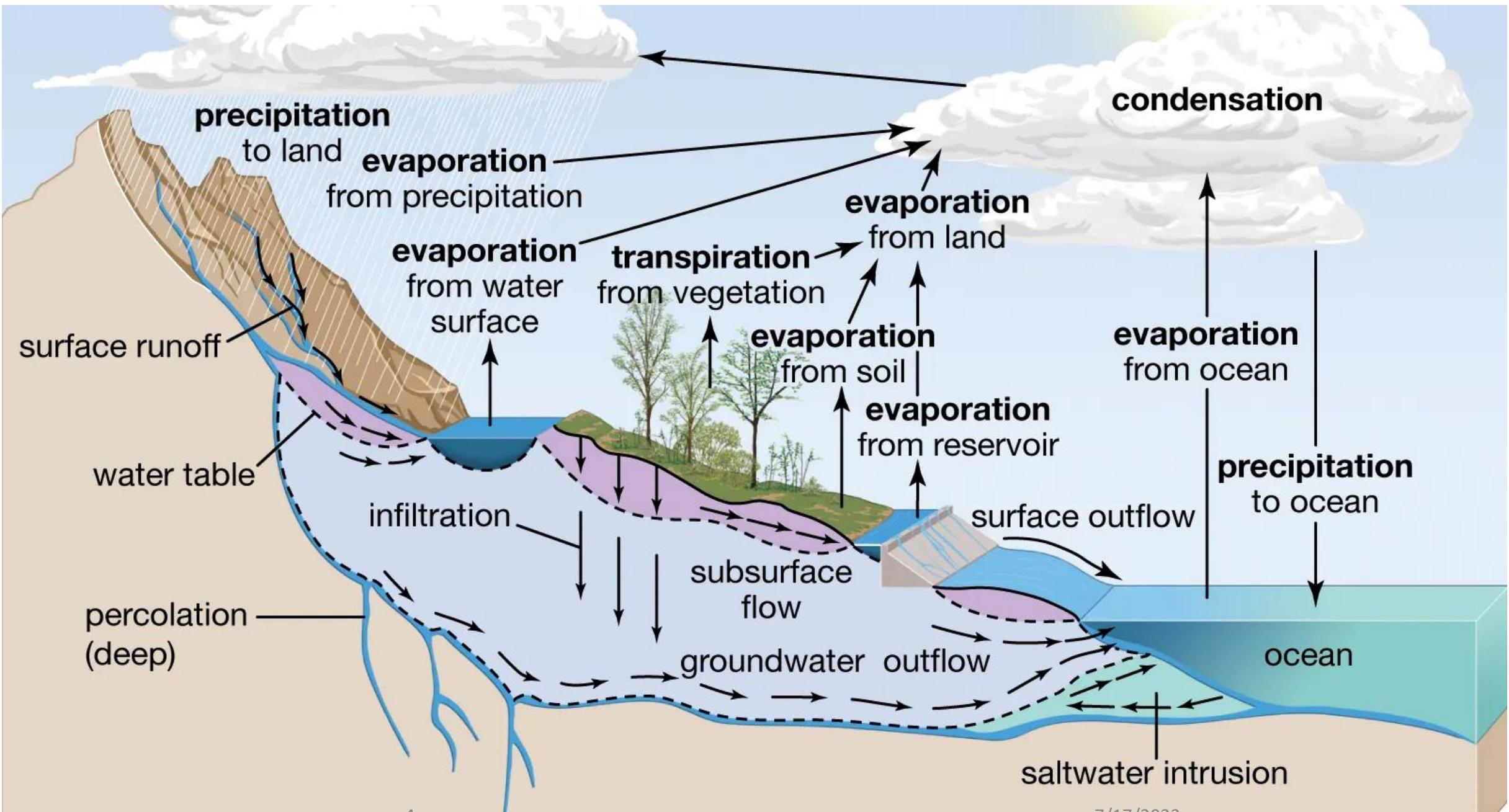
Water Impurities

The main problems in water

Water Molecule

- Covalent bond
- Hydrogen bond
- di polar
- high heat capacity
- High surface tension
- capillary tube raise (plant life)
- Bad electric conductor
- Osmotic pressure
- (control performance of all living cells)
- food preservation by salting





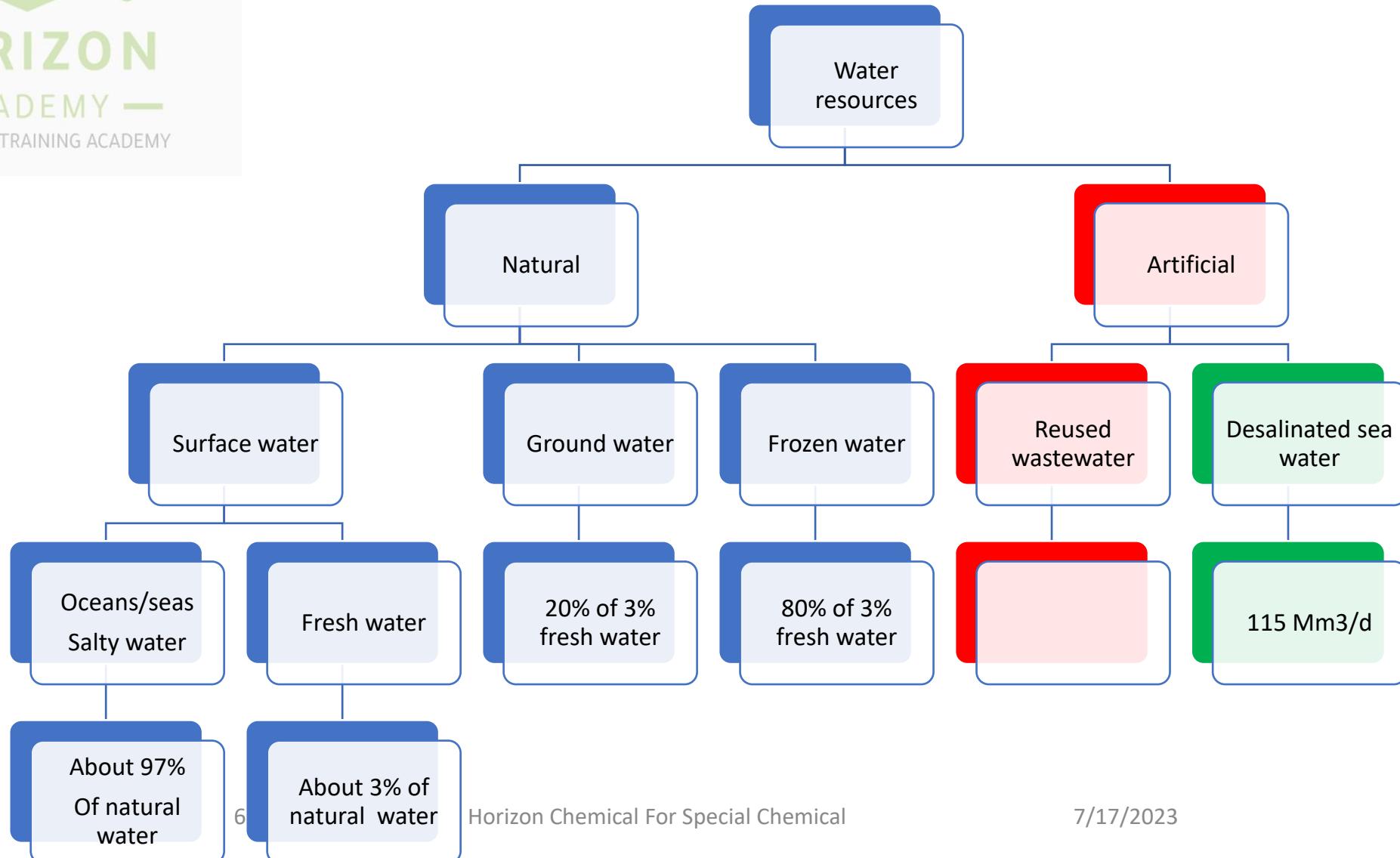
The Importance Of Water



The human body is about 75% water.



Water resources



أهم مصادر المياه

المياه السطحية وتنقسم لمصادر دائمة كالأنهار والبحيرات
ومصادر غير دائمة كالمسطحات البينية

التدفق السفلي للأنهار

المياه الجوفية وتنقسم لطبقات محصورة (حفر الآبار) وطبقات
غير محصورة (كالينابيع)

المياه المتجمدة

مياه الصرف الصحي

تحلية مياه البحر

حلول مشاكل المياه بالوطن العربي

استبدال الطرق التقليدية للري بطرق أكثر
كفاءة تقلل من استخدام المياه

تحلية مياه البحر وانشاء وحدات تحلية

مخزون المياه بالدول العربية حوالي 7734
مليار متر مكعب يستخدم منها سنوياً حوالي
42 مليار متر مكعب



مصادر المياه بالدول العربية

- الأمطار
- الدول التي تعتمد على الأمطار في بناء اقتصادها الزراعي هي المغرب، الجزائر، سوريا ،الأردن وتونس تقدر الأمطار السنوية بنحو 2100 مليار متر مكعب
- نهر النيل
- نهر الأردن
- دجلة والفرات

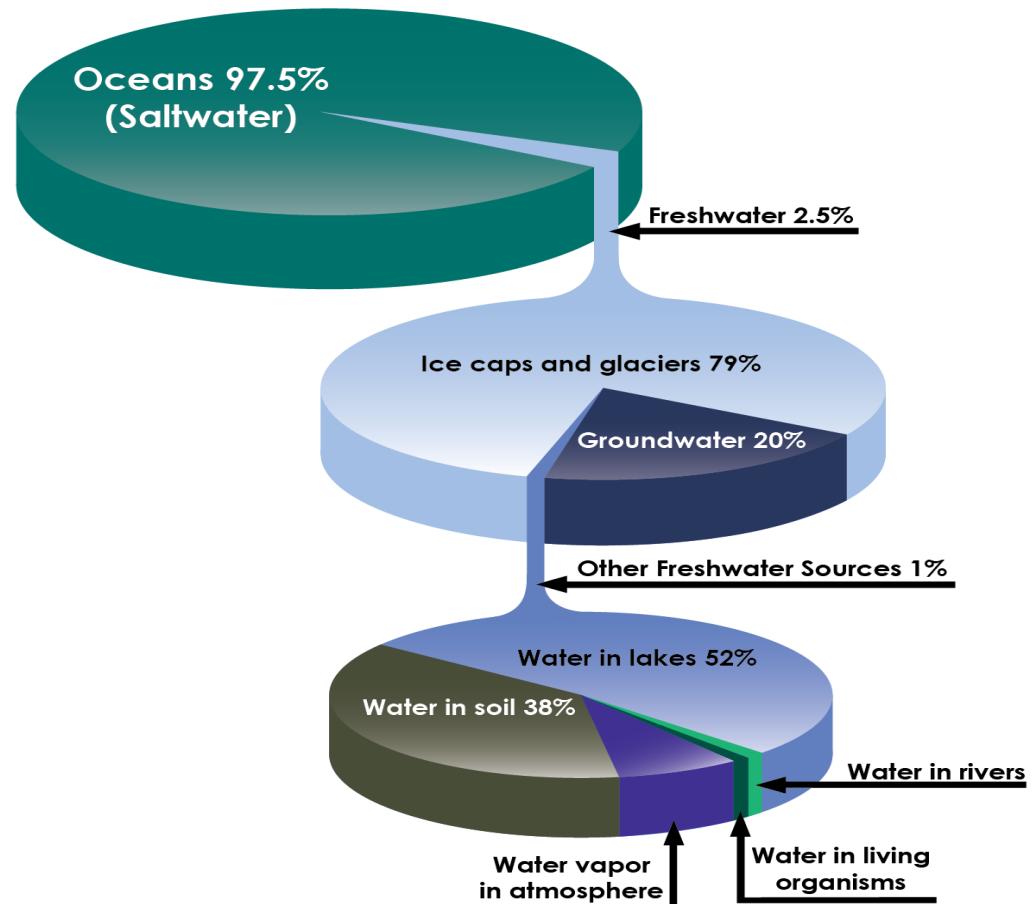


من أسباب ندرة المياه في الوطن العربي

- ازدياد نسبة البحر
- ندرة الأمطار
- زيادة نسبة التصحر

Water resources

1. Less than 2% of the Earth's water supply is fresh water.
2. Of all the earth's water, 97% is salt water found in oceans and seas.
3. Only 1% of the earth's water is available for drinking water. Two percent is frozen.



Desalinated water

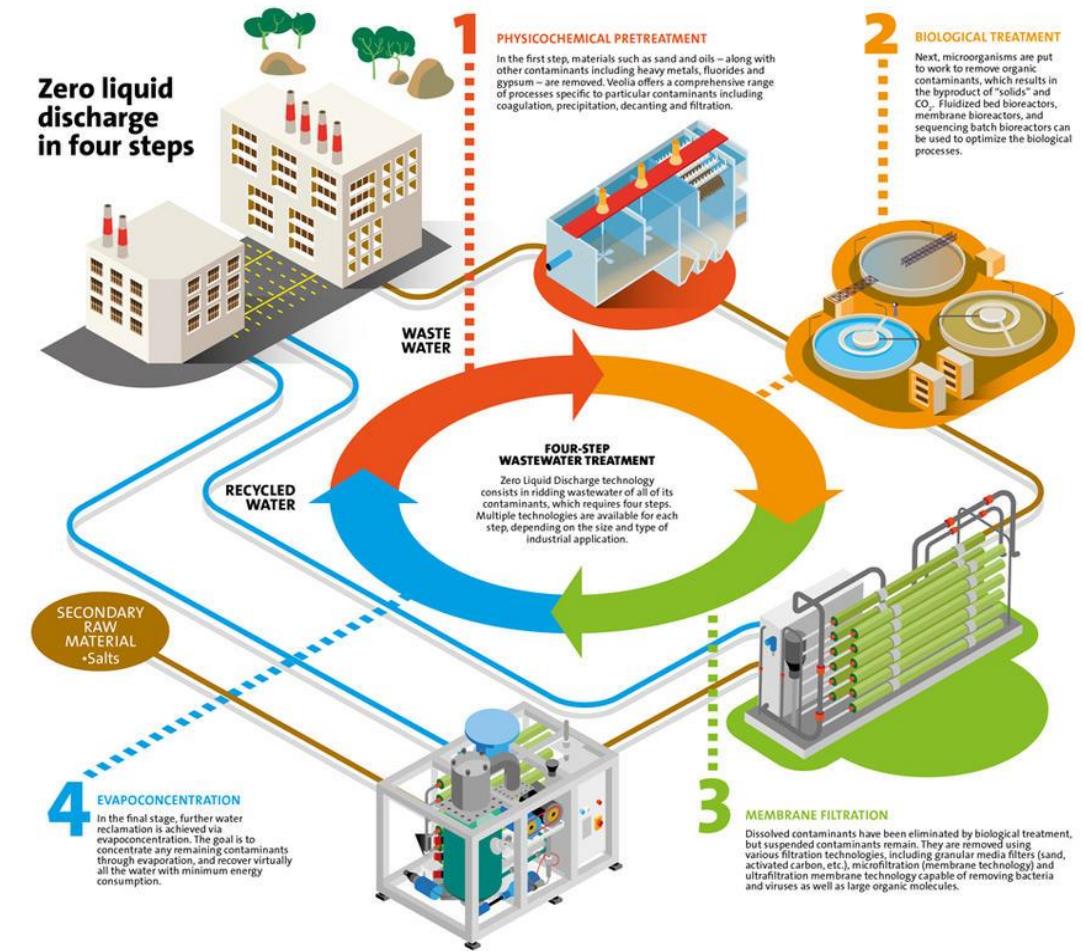
- Large-scale seawater desalination began in the 1960s, using thermal distillation processes such as multi-stage flash (MSF) and multi-effect distillation (MED), which dominated the market until 2000 .
- The membrane-based technology reverse osmosis (RO) was introduced into the market in the 1970s, mainly to treat brackish water.
- Since the 1980s, advances in membrane technology and materials have made it possible to use RO technology for seawater applications .
- As a result of this advancement, since 1999, membrane-based technologies, including RO, electrodialysis (ED), and nanofiltration (NF), have become the most dominant technologies for water desalination.
- Since that time, the average growth in desalination capacity throughout the world is about 7.5% per year, of which membrane desalination makes up about two-thirds of the total installed capacity .
- The total desalination capacity (installed and projected, 2021) **is about 115 Mm3/d**, of which 77% (~88 Mm3/d) uses RO technology.



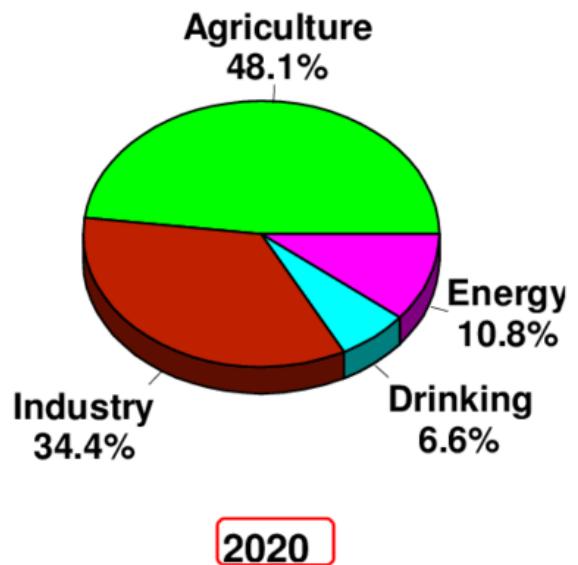
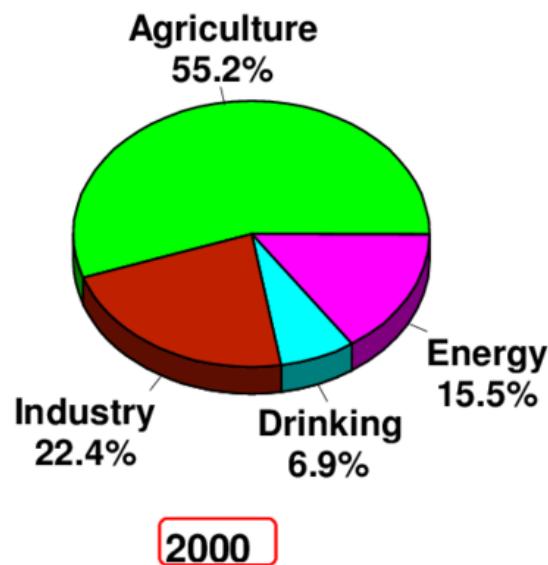
HORIZON
— ACADEMY —
INDUSTRIAL TRAINING ACADEMY

- "Globally, about 359 billion cubic meters of wastewater is produced each year, equivalent to 144 million Olympic-sized swimming pools"
- "About 48 percent of that water is currently released untreated. This is much lower than the frequently cited figure of 80 percent."
- **Creative reuse**
- "The most obvious reuse of treated wastewater is to augment freshwater water supplies," Jones states. Treated wastewater reuse is already an important source of irrigation water in many dry countries, particularly in the Middle East and North Africa. However, only 11% of the wastewater produced globally is currently being reused, which shows large opportunities for expansion."

Reused water



Water Uses



How Much Water Do We Use?



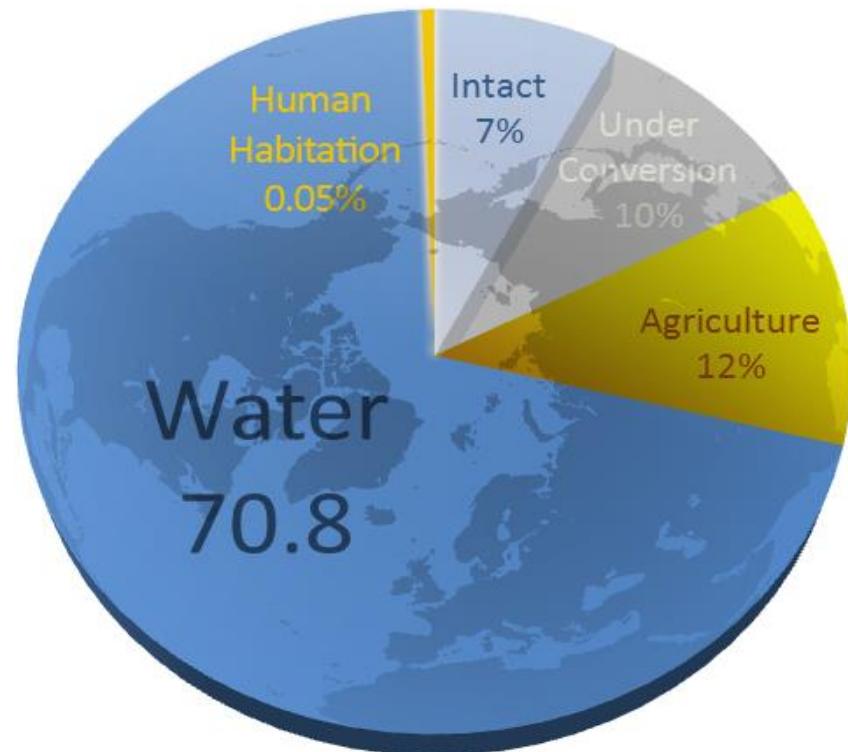
Source: Water Research Foundation, Residential End Uses of Water, Version 2. 2016



HORIZON
— ACADEMY —
INDUSTRIAL TRAINING ACADEMY

availability •

-about 70% of earth is water •



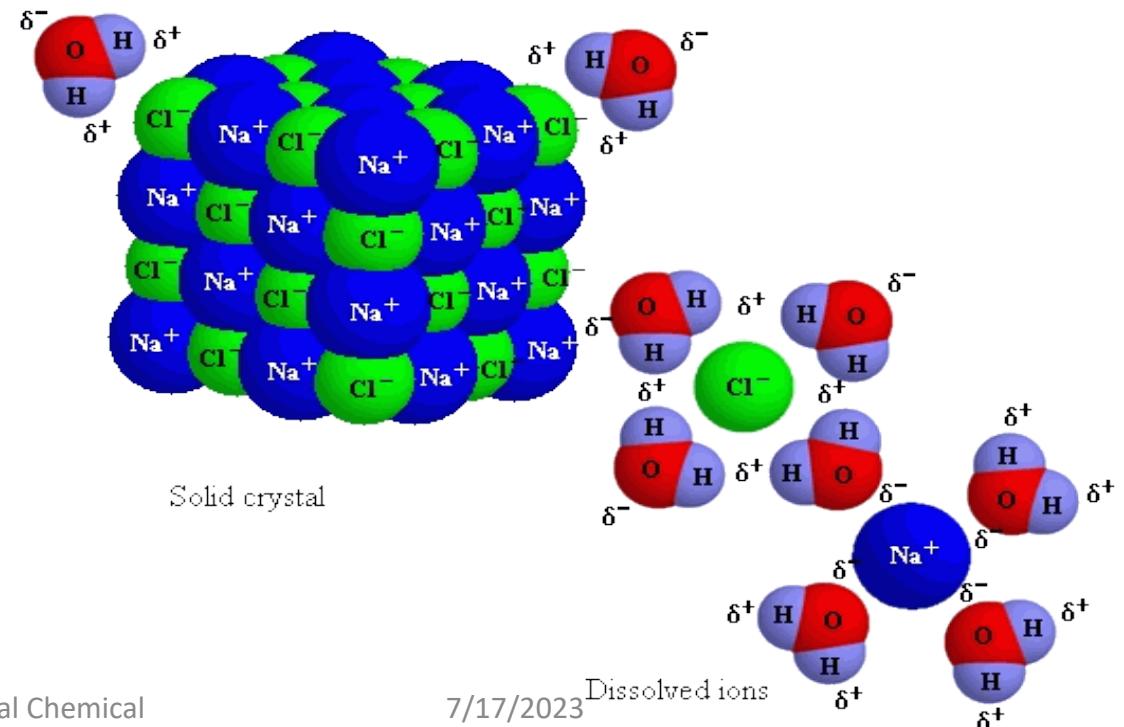
15

Why Water ?

Dissolution •

"Like dissolves like". •

molecules that are polar will dissolve in a polar solvent like water. •



Why water treatment ??

- Reducing costs resulting from stopping production
- Reduce energy consumption
- Reduce water consumption
- Reduce maintenance costs
- Extending the life of the equipment and accessories





Physical Water Analysis

- pH
- Conductivity
- Color
- Turbidity
- Odor
- Specific gravity
- Viscosity



Chemical Water Analysis

Cations

- Aluminum
- Ammonium
- Calcium
- Hydrogen
- Ferric – ferrous
- Magnesium
- Potassium
- sodium

Anions

- Hydroxide
- Carbonate
- Bicarbonate
- Sulfate
- Chloride
- Phosphate
- Fluoride
- nitrate



Water Control Parameters



Parameter	Definition
<ul style="list-style-type: none">• Hardness	<ul style="list-style-type: none">• Total hardness is the combined concentration of dissolved calcium and magnesium salts.• Alkaline or temporary hardness is caused by bicarbonate which predominate in most natural waters are easily broken down when the temperature is raised.• Non alkaline or permanent hardness is caused mainly by chloride, sulphide and nitrates• Water hardness is the most common contributor to boiler scaling.



Alkalinity

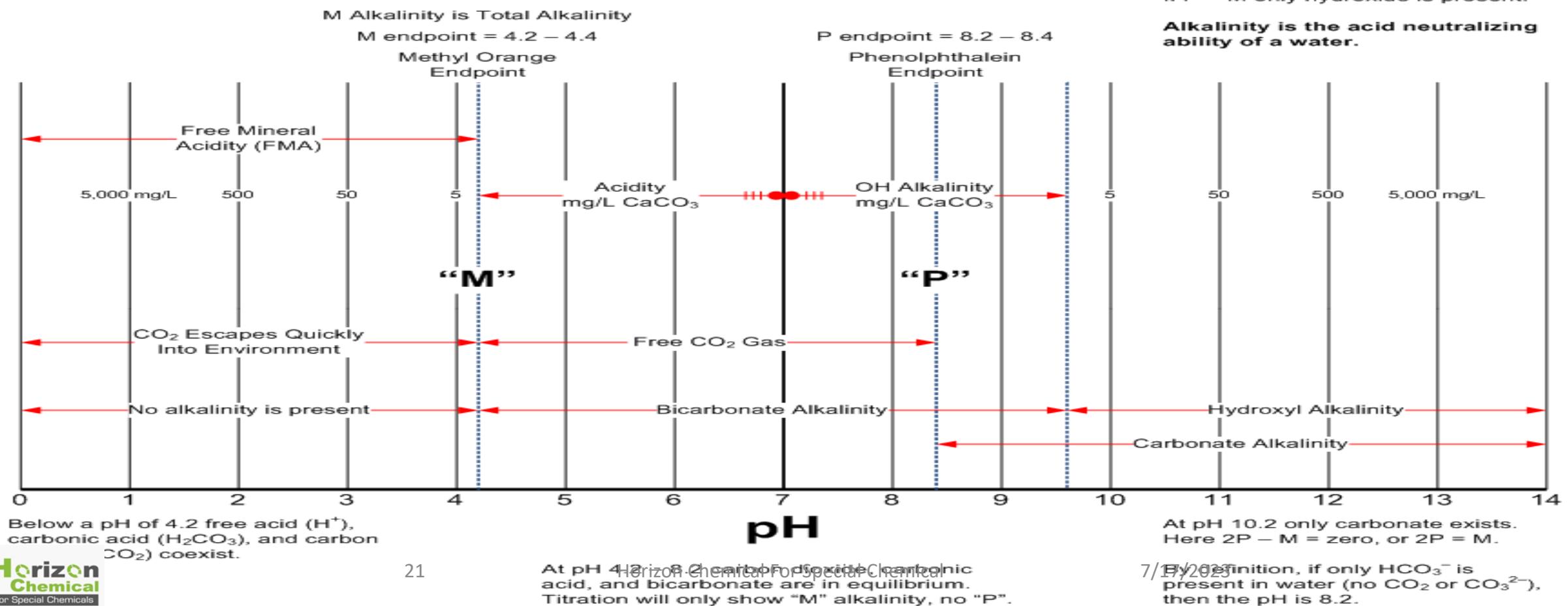
At pH 8.3 – 10.2, bicarbonate (HCO_3^{2-}) is in equilibrium with carbonate. Carbonate is favored at high pH. P alkalinity appears and $\text{P} > \frac{1}{2} \text{M}$.

At P endpoint only HCO_3^{2-} exists; no CO_3^{2-} or CO_2 is present.

Above pH 10.2 only carbonate (CO_3^{2-}) and hydroxide (OH^-) are in solution and $\text{P} > \frac{1}{2} \text{M}$.

If $\text{P} = \text{M}$ only hydroxide is present.

Alkalinity is the acid neutralizing ability of a water.





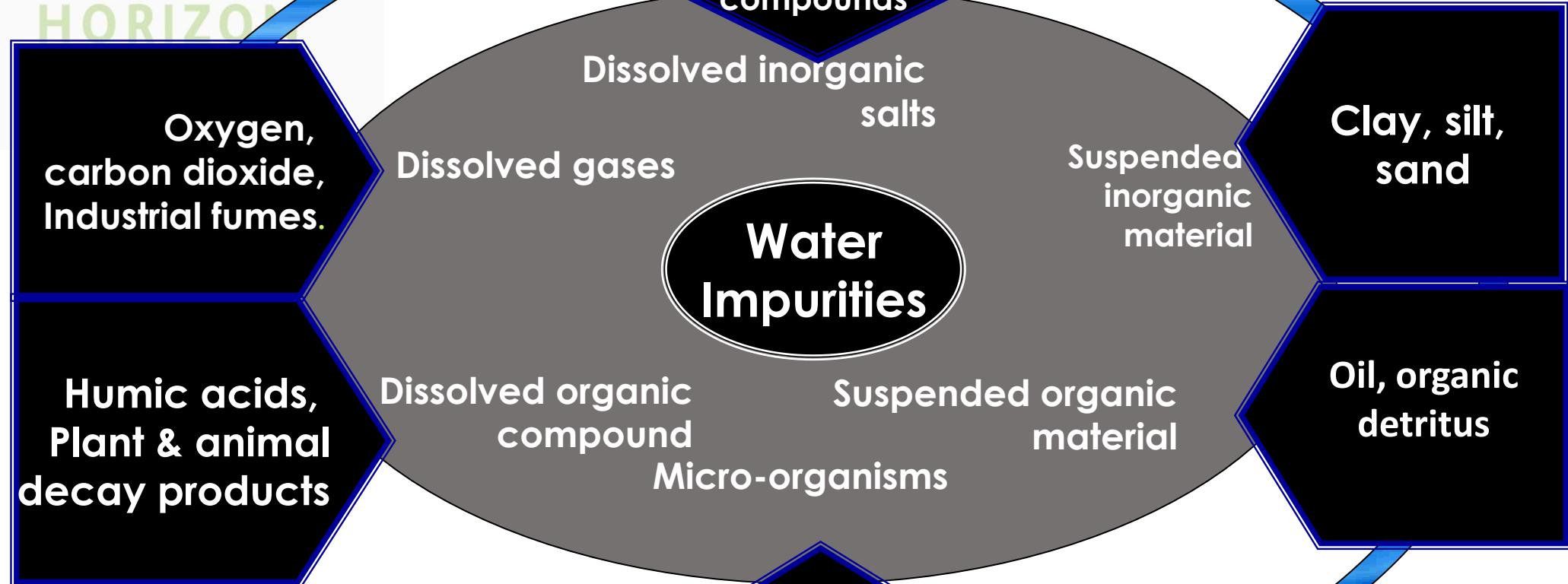
Parameter	Definition
<ul style="list-style-type: none">• Alkalinity	<ul style="list-style-type: none">• The extend to which a solution is alkaline and a measure of its hydroxide, carbonate, bicarbonate content• High alkalinity promotes foaming in boiler which lead to steam contamination
<ul style="list-style-type: none">• pH	<ul style="list-style-type: none">• A measure of acidity or alkalinity of water. on a scale of values from 0 to 14• The more extreme the pH, the more likely corrosion problems to occur



parameter	definition
• Silica	• Found as dissolved silicate and in a suspended complex form. It can combine with other compounds to give scales that are strongly insulating and difficult to remove.
• Total dissolved solids(TDS)	• A measure of total amount of solids in solution. Expressed as (ppm),(mg/l),(g/m ³)
• Suspended solids (SS)	• A measure of the particulate matter present in water. May be removed by filtration, coagulation, sedimentation.



parameter	definition
• Dissolved gases	<ul style="list-style-type: none">• Oxygen and carbon dioxide are the most important dissolved gases.• Dissolved oxygen (DO) is an important factor in determining the corrosiveness of water.• The solubility of oxygen in water depend on temperature and pressure.• Dissolved carbon dioxide gives carbonic acid that tends to lower pH that makes water highly corrosive.



The Main Problems In Water

- Water is the strongest solvent on the earth

we find in water:

- (1) suspended solids
- (2) dissolved solids
- (3) dissolved gases

all these components dissolved in water cause problems in the operation of boilers, which must be addressed

