ENVIRONMENTAL SCIENCE

Prashant Rathod,
General Dept.,
L E College,
Morbi

L.E. COLLEGE, MORBI

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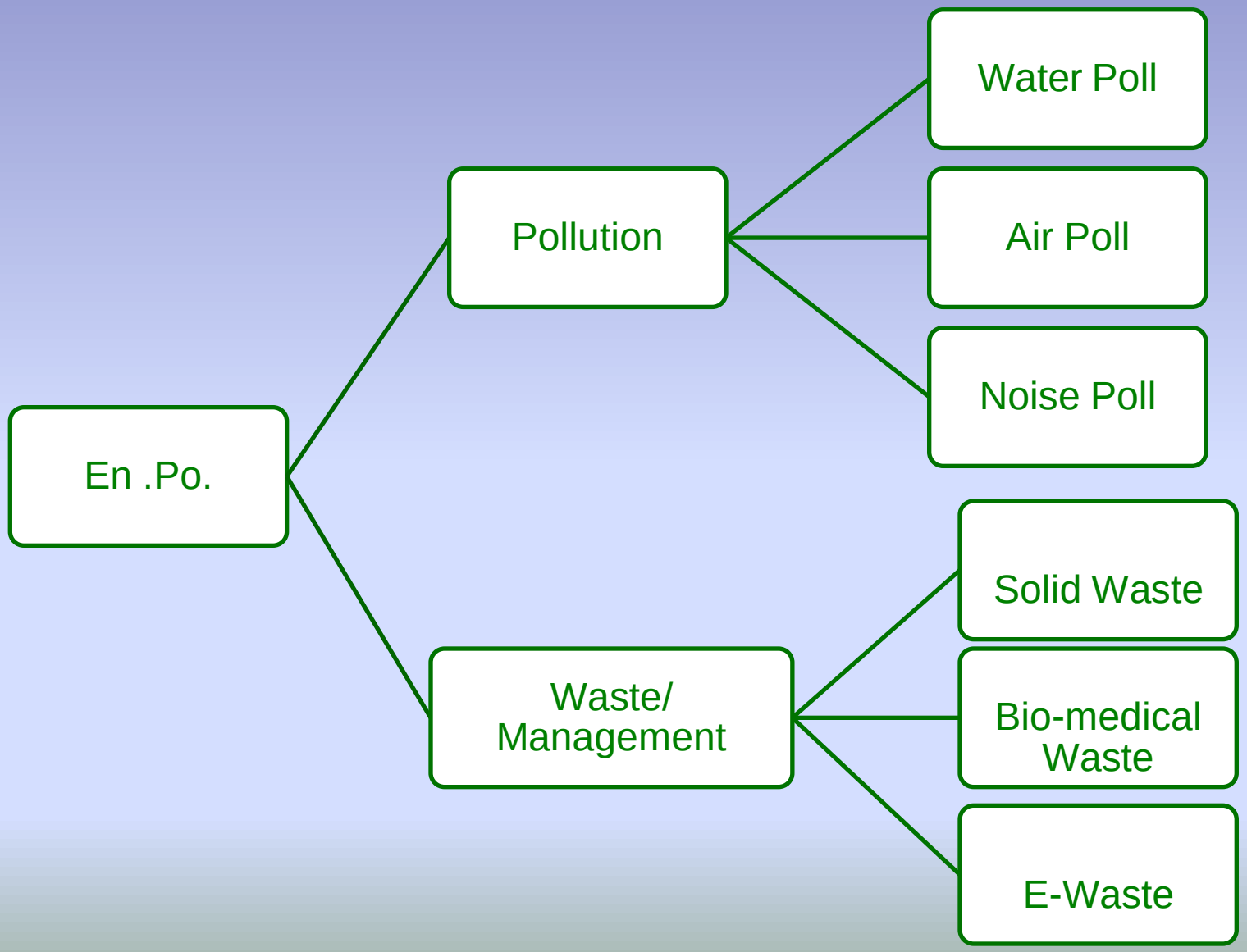
Subject Name: Environment Science

Subject Code: 3110007

Unit 2

Environment pollutions

Environment pollutions



Content

a) Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants

b) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, NOX, Auto exhaust, Effects of common air pollutants

c) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects

d) Solid Waste: Generation and management
e) Bio-medical Waste: Generation and management
f) E-waste: Generation and management

Content

Water Pollution:

- ✓ Introduction
- ✓ Water Quality Standards,
- ✓ Sources of Water Pollution,
- ✓ Classification of water pollutants,
- ✓ Effects of water pollutants
  - ✓ Eutrophication

CASE STUDY

CASE STUDY

Dt: 25th July 2020

The spill occurred when Japanese bulk carrier MV Wakashio, owned by Nagashiki Shipping Co., crashed into a reef off southeastern Mauritius.

The ship, believed to have been carrying 4,000 tonnes of fuel oil.

Mourtius

Ecological Disaster for Country food security, . economy and Tourism,

Coral reefs,
Mangroves ,
Endangered animals,
Birds.

Image Source:
https://edition.cnn.com/2020/08/09/world/gallery/mauritius-oil-spill-2020/index.html

Satellite imagery on Wednesday showed booms placed along shorelines (arrows) to protect them from oil

What we learned :

Environment Disaster are very serious threat for future of our environment , negligence may lead to serious problem for environment health. Such incidents not only effects environment but its has direct and indirect effects on our present and future.

Case Study Assignments:

Ganga River Pollution issue
Kavery river issue
Water crisis in India

❑ *what is a pollution ?*

❑ *WHAT IS A PULLUTION*

“Anything which degrades the quality of environment is known as a pollution”

Or

‘’Pollution is the introduction of contaminants in to the natural environment that Causes a harmful effect”

Or

‘Harmful or poisonous substances introduced into an environment is known as Pollution’

❑ *Why is a Pollution?*

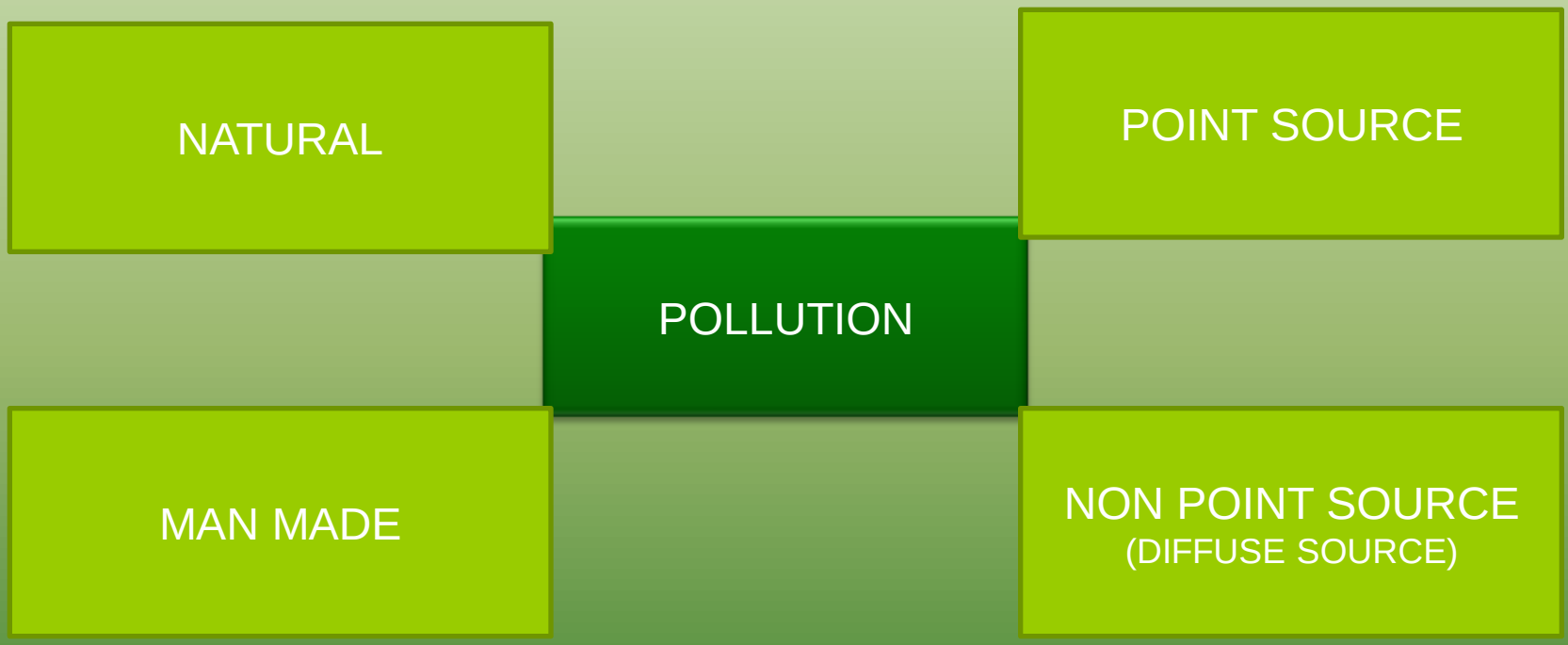
- Pollution is result of humans development in various area
  - Industries,
  - Transportation,
  - Agriculture,
  - Urbanization etc……..
- Environmental pollution has become the biggest problem to the human race on this planet.
- We are using lots of Electricity, Fuel, Power, for many purpose Which is a main reason for pollution.

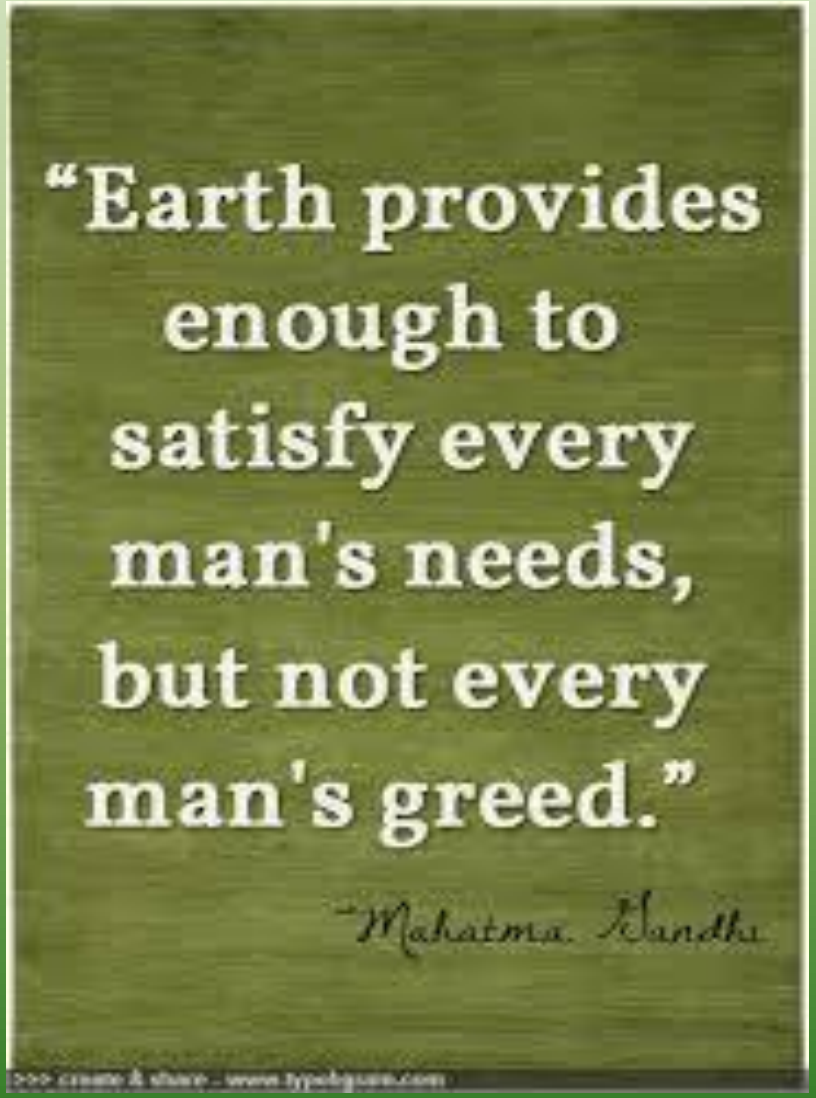
“Even we are wasting\using ENERGY for ENTERTAINMENT ”

•We are facing lots of problem related to earth, water, air, plants and animals…….due to POLLUTIONS only……..

Take care of the earth and she will take care of you.
~Author Unknown

❑ *Where is it?*


NATURAL
POINT SOURCE
POLLUTION
MAN MADE
NON POINT SOURCE
(DIFFUSE SOURCE)


"Earth provides enough to satisfy every man's needs, but not every man's greed."
-Mahatma Gandhi

❑ *TYPE OF POLLUTIONS*

- WATER POLLUTION
- AIR POLLUITON
- LAND POLLUITON
- NOISE POLLUTION
- MARINE POLLUITON

❑ *WATER POLLUTIONS*

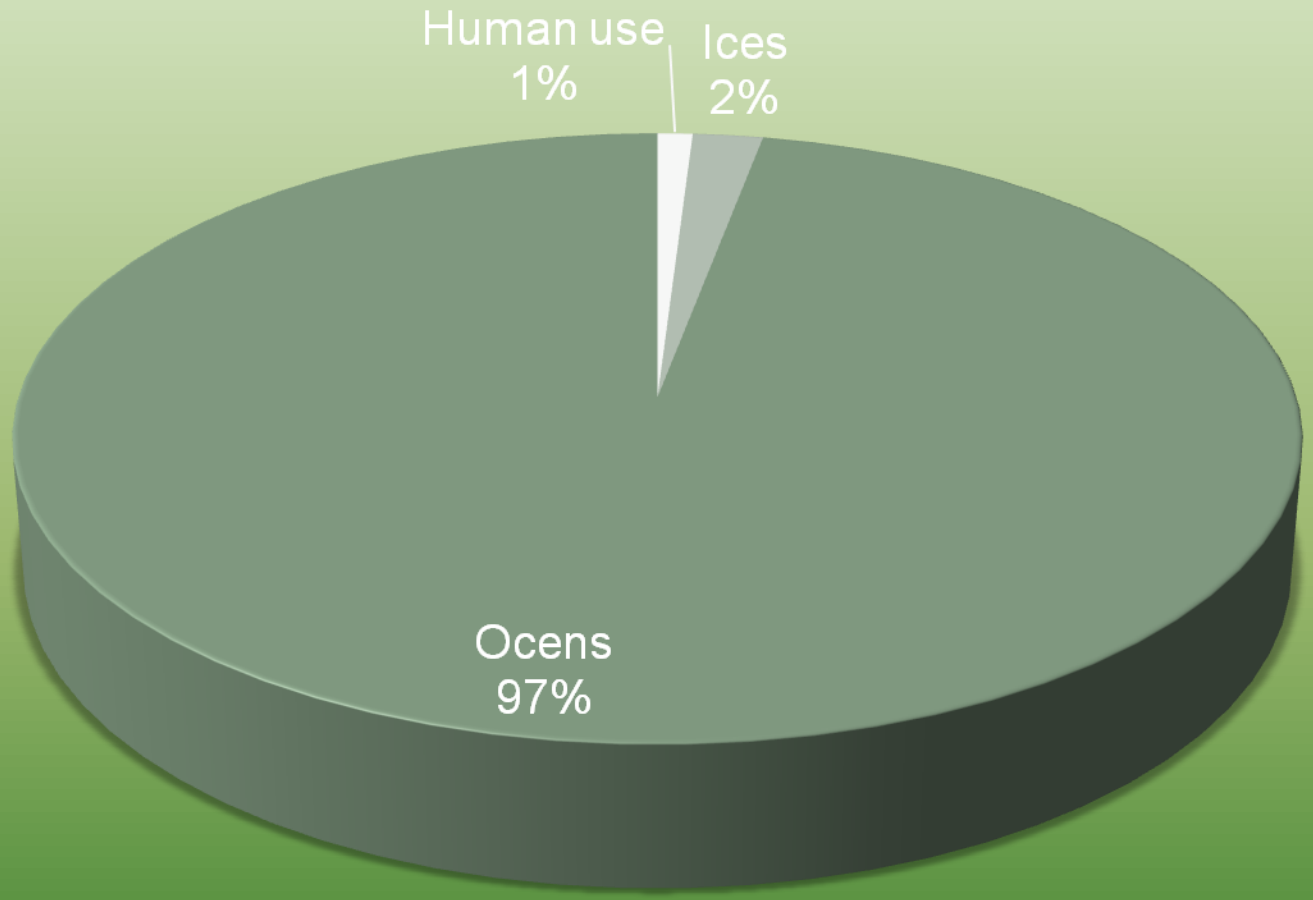
INTRODUCTION

Water is one of the basic need to sustain a life on earth.
Life can not exist without water.

Even two third of our body is made of water whereas about three fourth part of our mother earth is covered by a water

Only less than 1% of water is available for human uses, remaining 97% is in oceans
and 2% is locked as ice and glaciers

Because of human disturbance in environment it leads to various types of pollution and water pollution is one of them.



- Quantity of Water in Earth

❑ *Definition*

"water pollution is defined as Alteration in physical, chemical or biological characteristics of water through natural or human activities making it unusable "

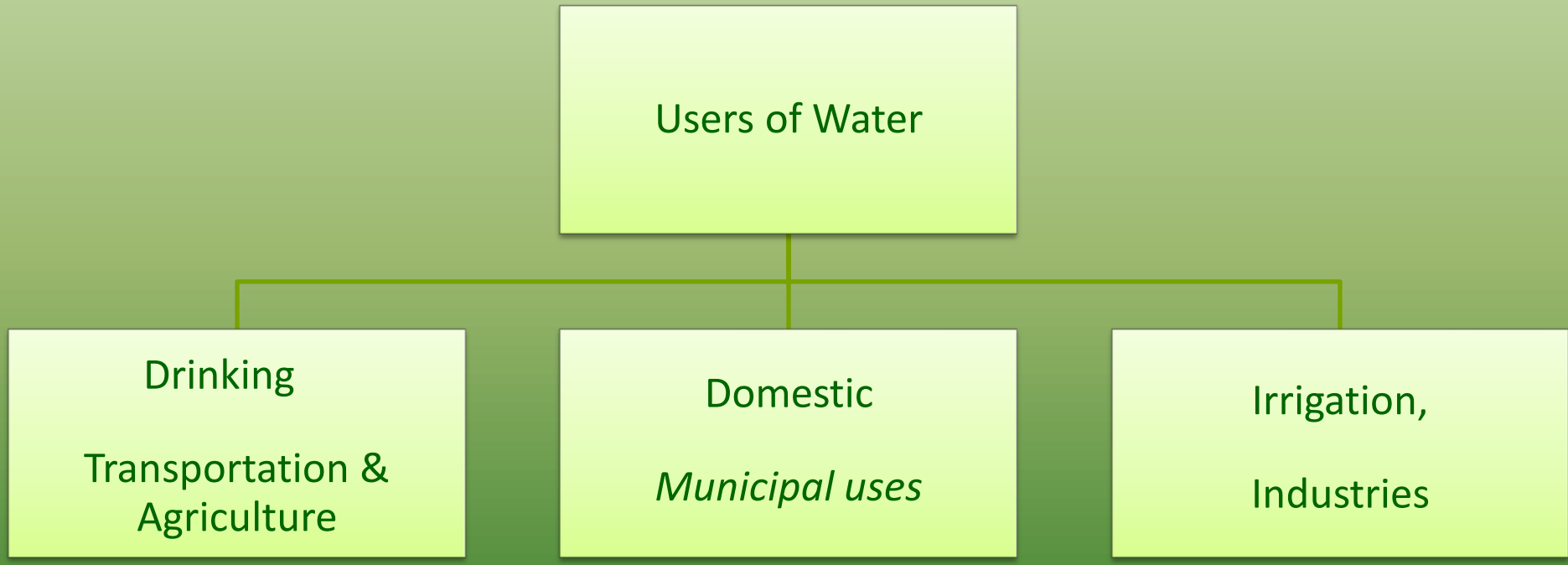
Or

"Presence of some foreign substances or impurities (Organic, inorganic, biological, radiological) in such quantity that its lower the quality of water is known as water pollution"

Or

Anything which degrades the quality of water is known as……

Users of Water



•*Signs of polluted water*

CAN I DRINK THIS WATER??????????

- *Bad Taste*
- *Bad odours (smell)*
- *Decrease in number of fish in fresh water and sea water*
- *Growth of aquatic weeds**
- *Oily substance on the surface of water.*

**A wild plant growing where it is not wanted and in competition with cultivated plants*

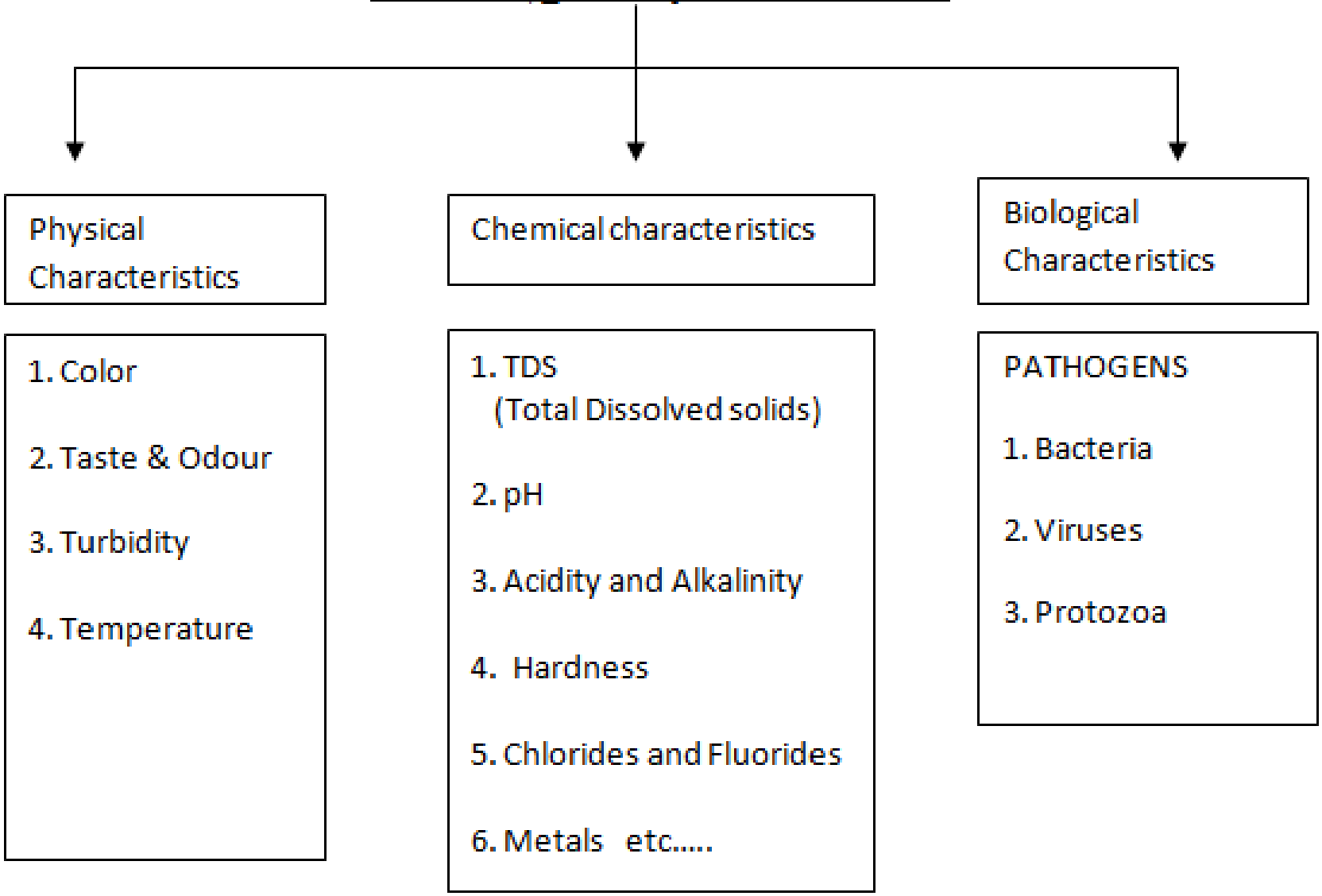
Water Quality Standards

- *Water quality Standards depends on the use of the water which may be a human consumption or It may be for industries, irrigation, etc.*
- *For different filed quality of water is different. For the purpose of drinking water quality of water must be of higher level.*
- *In India water quality standards is controlled by government organization known as "Bureau of Indian Standards"*

- *Water quality standard can be divided in three cate*

  (1) Physical
  (2) Chemical
  (3) Microbiological

Water Quality Standards



Physical Characteristics

- ***COLOUR***
- *Water is colorless in pure form, but impurities give a change in color of water.*
- *Organic matter(Woods, Weeds, Leaves etc.), Suspended solids, industrial wastes may change the color of pure water*
- *The sources of color in water should always be investigated before the water is used*
- *Accurate Measurement of color can be done by spectrophotometer*

•*Taste and Odour*

•*Good water shouldn't have any particular taste and should be odorless.*

BUT, natural water has some taste and odour due to the contact of various substance like minerals, metals and salts from the soil and Biological reactions.

•*Taste and odour may also develop during storage and distribution*

•*Growth of algae micro-organisms hydrogen sulphide an ammonia give and bad odour to water making it unfit for use.*

•*Turbidity*

•*Turbidity is the cloudiness (haziness) of a water caused by suspended solids that are generally invisible to the naked eye, similar to smoke in air.*

•*The measurement of turbidity is a key test of water quality.*

•*Turbidity is measurement of how light is passed from the water, where suspended solids may absorbed or scattered the light depending upon its properties*

•*Turbidity*

•*Turbidity in open water may be caused by growth of *phytoplankton. Human activities that disturb land, such as construction, mining and agriculture,*

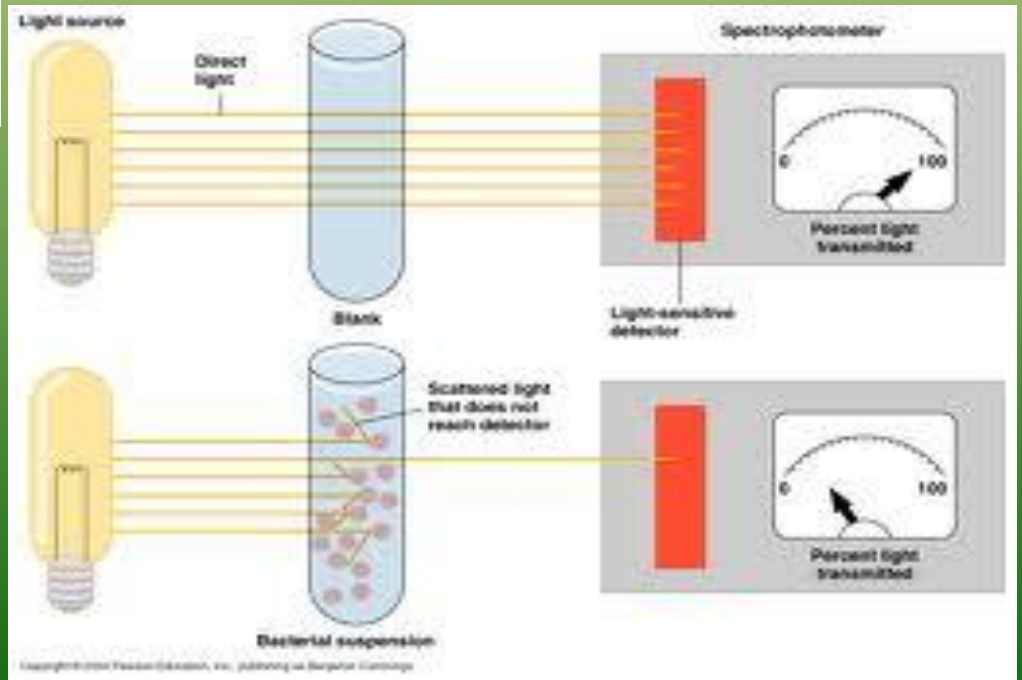
•*Turbidity is measured in Turbidity meter and its unit is Nephelometric Turbidity Units(NTU)*

•*Turbidity*


4000
3000
2000
1000
500
200
100
50
20
10


Mar
Apr
May
June
Aug
Sept
Oct
Nov


Turbidity (NTU)
Water Samples:
250
100
50
25
10

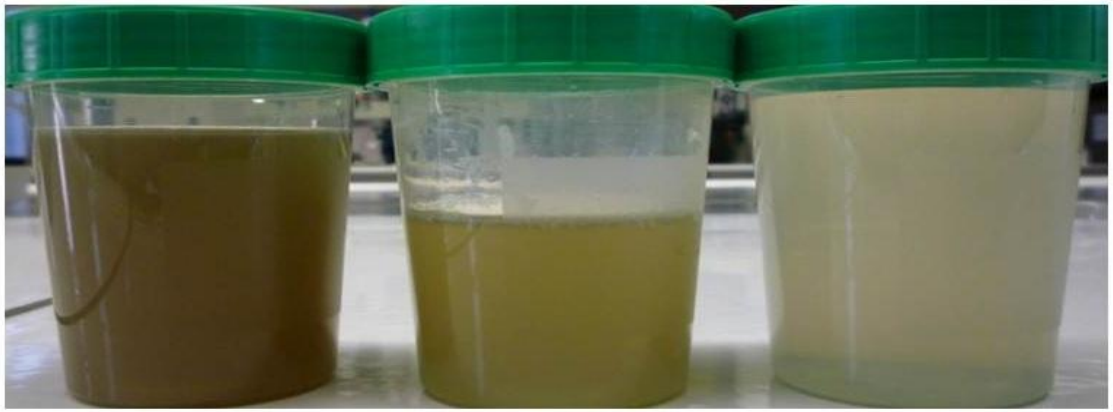

Light source
Direct light
Blank
Spectrophotometer
0
100
Percent light transmitted
Light-sensitive detector
Scattered light that does not reach detector
Bacterial suspension

Temperature

- *Water with higher temperature is unacceptable, whereas normal water with normal temperature is more acceptable to consume.*
- *Higher temperature of water leads to growth of micro-organisms in the water and may increase taste, odour and corrosion problems*
- *Common methods used for measuring temperature are also useful to measure the temperature of water*

•Suspended Solids

•Suspended solids are any particles that are neither dissolved not settled in the water.



Before | After sand filtration | After activated carbon filtration

Water clarity — a measure of suspended solids — is an important indicator of the basic health of a stream or river. The upper Mokelumne River, left, is clear, while Orestimba Creek in the San Joaquin Valley is clouded by sediments from irrigation return flows. The authors studied input waters similar to these.

•*CHEMICAL CHARATERSTICS*

- ***TDS (Total Dissolved Solids)***

- *TDS are the Total Amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of a water.*
- *Its expressed in units of mg per unit volume of water i.e. mg/l OR "ppm"*
- *Dissolved solids refer to any minerals, salts, metals cations, or anions dissolved in water*
- *TDS can be controlled by Reverse Osmosis (RO), Electro dialysis, Carbon Filtration (Charcoal).*


TDS

•CHEMICAL CHARATERSTICS

- ***TDS (Total Dissolved Solids)***

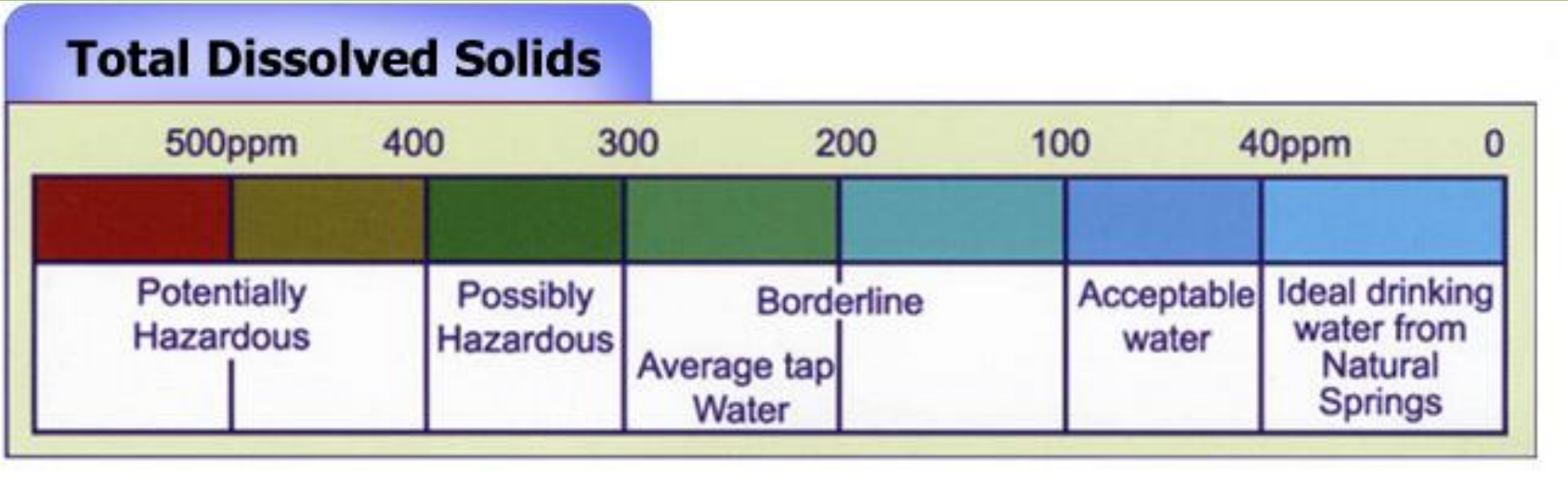
- ***Desire value of TDS in India is approx near to 500 ppm***

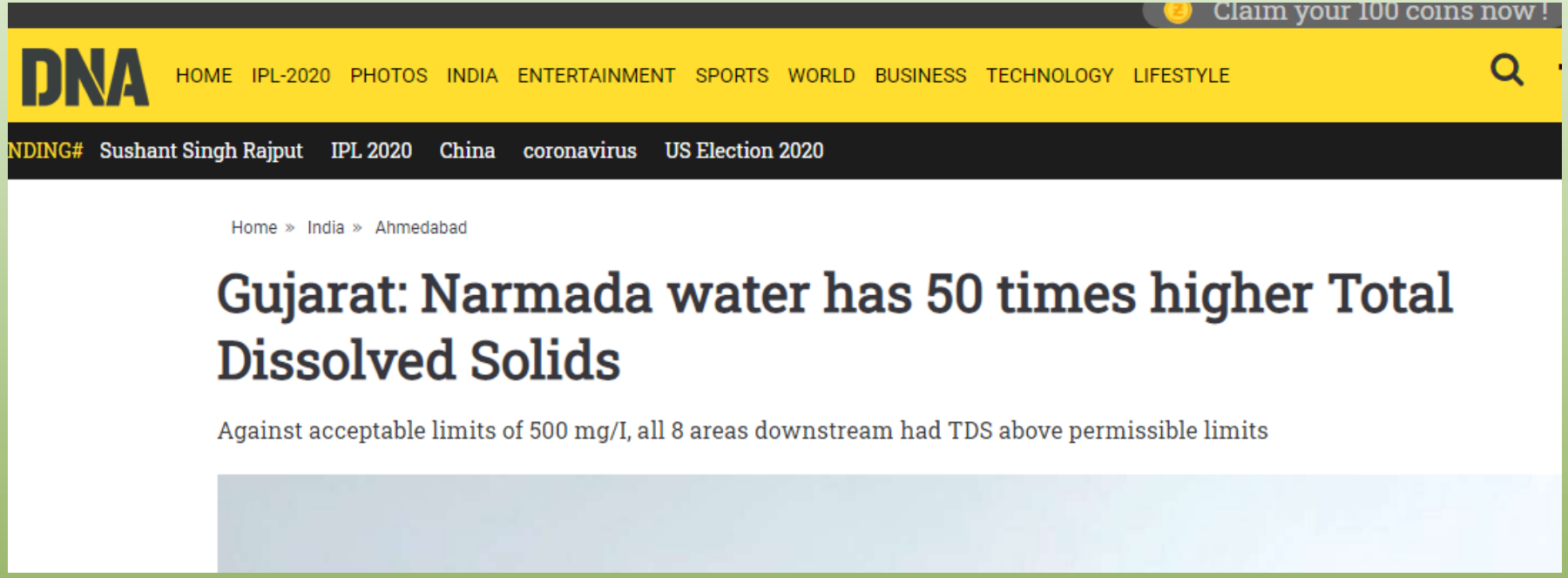
Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
(1)	(2)	(3)	(4)
vi)	Total dissolved solids, mg/l, *Max*	500	2 000

•CHEMICAL CHARATERSTICS

•TDS (Total Dissolved Solids)

Desire value of TDS in india is approx near to 500 ppm





The water samples tested from Bharuch, Kukarwada village, and Bhadbhut village had TDS levels of 19,928 mg/I, 21,506 mg/I and 25,564 mg/I respectively.

https://www.dnaindia.com/ahmedabad/report-gujarat-narmada-water-has-50-times-higher-total-dissolved-solids-2739977

[Once in a year 2009-10]

Location Of Wells Parameters:	*pH	TDS
Bore-well Bhavani Plastic, GIDC Wadhvan, Dist. : Surendranagar	7.91	3702
Bore-well Milan Industries, Kuvadva GIDC, Rajkot	7.44	3150
Bore-well Rafalesh-war GIDC, Ta.Morbi, Dist. Rajkot	7.59	444
Bore-well GIDC, Wankaner, Dist. : Rajkot	7.13	3348
W/W Sakkar – Purabhathha, Bharuch	8.1	2856
B/W Shri Ahmed -bhai Patel at Piraman, Ankaleshwar	7.78	2482
W/w Piraman near railway track, Ankaleshwar	8.19	1892
B/W Shahid Baug, Khambhat Dist. Anand	7.8	4524
B/W Enviro Infra-structure Co. Ltd, Plot 612/B, Umaraya, Ta. Padra, Dist. Vadodara	7.43	5692

https://gpcb.gujarat.gov.in/webcontroller/viewpage/status-of-water-quality-of-well-waters-in-gujarat

Effects of TDS

Taste and health

High TDS level alters the taste of water and makes it salty, bitter, or metallic. **High TDS levels** also indicate the presence of toxic minerals which is hazardous for health.

Hardness

High TDS makes water hard, leading to scale build-up in pipes, dry hair, spots on utensils and also make the kitchen appliances ineffective. Checking the TDS level of water helps you avoid these problems beforehand.

Wells and Pools, Spas

Pools, as well as spas, need to monitor the TDS level in water constantly to prevent any maintenance problem.

Ways to Reduce or Remove TDS in Water

1. Reverse Osmosis (R.O.)
Reverse Osmosis removes TDS by forcing the water, under pressure, through a synthetic membrane. The membrane contains microscopic pores which will allow only molecules smaller than **0.0001 microns** to pass through.

As the molecules of dissolved metals and salts are large compared to the water molecules, water squeezes through the membrane leaving the metals and salts behind.

2. Distillation

The process involves boiling water to produce water vapor. The water vapor rises to a cool surface where it is condensed back into the liquid form. The dissolved salts are unable to vaporize and remain in the boiling solution.

3. Deionization (DI)

In this process, water is passed through a positive and negative electrode. The ion-selective membranes enable the positive ions to separate from the water and move towards the negative electrode. The end result is **de-ionized water** with high purity. However, the water is first passed through a reverse osmosis unit first in order to remove the non-ionic organic contaminants.

•*pH*

- *pH is the negative logarithm of Hydrogen ions concentration in water, it's a measure of degree of acidity or alkalinity (Basicity)*
- *pH of pure water is about 7 at $25^{o}c$.which varies with temperature*
- *for value of pH = 7 water is neutral*

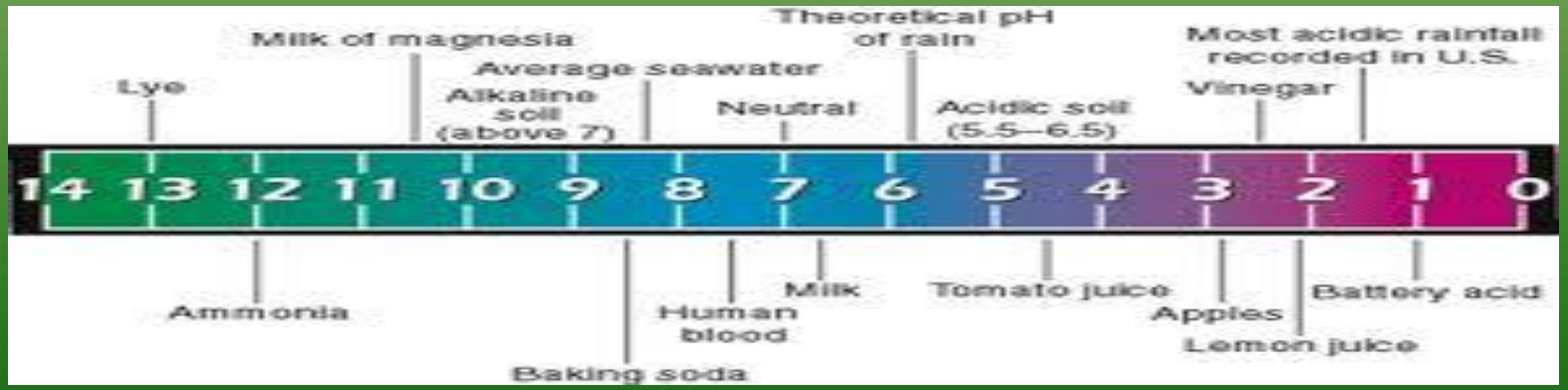
pH= 0 to 7 water is acidic

pH = 7 to 14 water is alkaline

- *Equation for pH is* $pH = - log_{10}[H^{+}]$

Acidity and Alkalinity

- *Capacity of substance to neutralize basics is known as Acidity where as a capacity of substance to neutralize Acids is known as Alkalinity.*
- *Acidity is due to presence of minerals and dissolution of carbon dioxide( ) whereas Alkalinity is due to Bicarbonates, Carbonates, and Hydroxides (-HCO_3^{-1}, CO_3^{-2}, OH^{-1})*
- *Acidity used to soft hard water, presence of it causes the corrosion of melts and pipelines, presences of alkalinity results a bitter taste of water.*



•*Hardness*

- *It's a soap destroying property of water*
- *It is of two types*
- *<u>Temporary Hardness</u>*

Temporary Hardness is developed due to presence of CO_3^{-2} *and* HCO_3^{-1} *of Calcium and Magnesium . By Boiling or adding lime in such water it can be removed.*

- *<u>Permanent Hardness</u>*

P.H. is due to the presence of sulphates, chlorides, nitrates of calcium and magnesium, to remove it soda lime process is requires Ground water is harder than surface water. Permissible value of it is near 75 to 115 ppm.

Chlorides & Fluorides

- ***Chlorides*** *is raised due to mixture of sea water, brine, industrial and domestic waste in to water sources.*
- *Its presents in form of* $Cacl_2$, *Nacl,* $Mgcl_2$
- *Over level of it leads to salty taste of drinking water, and corrosions in metal pipes*

- *Adequate value of* ***fluorides*** *in water is required, Higher level of it behaves as a toxic.*
- *Fluoride in water less than 1.0 mg/l can cause dental cavities in children's and more than 1.5 mg/l may cause dental or skeletal fluorosis.*

Chlorides & Fluorides

Normal

Questionable

Very mild

Mild

Moderate

Severe

Source: Fluoridation Forum Report 2002 (Page 126)

Metals

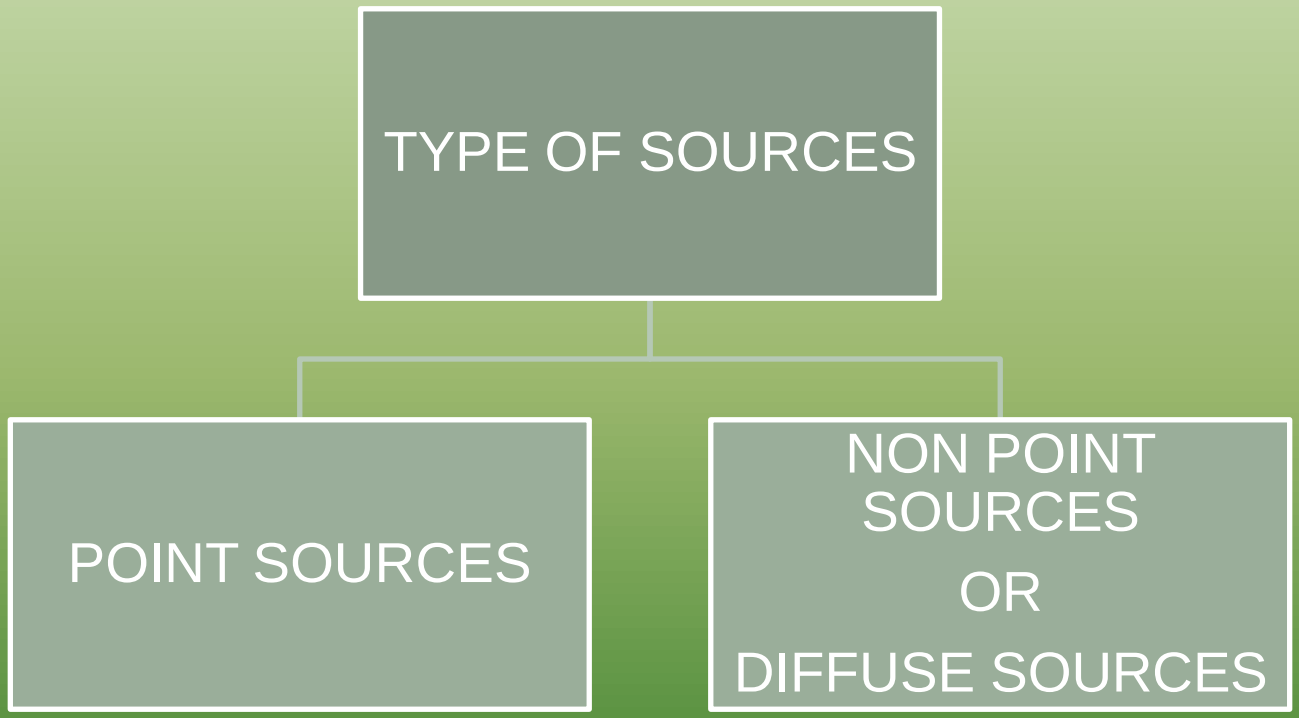
- *All metals soluble to some level in water,whereas higher amount of nay metal can produce health problems*

- *Metals can be mixed up with natural water due to natural process like rain water and by domestic industrial or agriculture discharge of waste in water*

•*Biological Characteristics of Water.*

- *The presence of micro-orgnaisms like Bacteria and Virus make the water contaminated.*
- *All micro-organisms are not harmful for human being but pathogenic micro organisms causes water Bourne diseases*
- *Pathogens : Organisms capable for infection or transmitting diseases to humans called pathogens*
- *Diseases caused by virus are Hepatitis-A, Hepatitis-E, Rotavirus Diarrhea*
- *Diseases caused by Bacteria are Typhoid, Cholera, E-Coli, Diarrhea.*

SOURCES OF WATER POLLUTANTS



Point Sources

e.g.

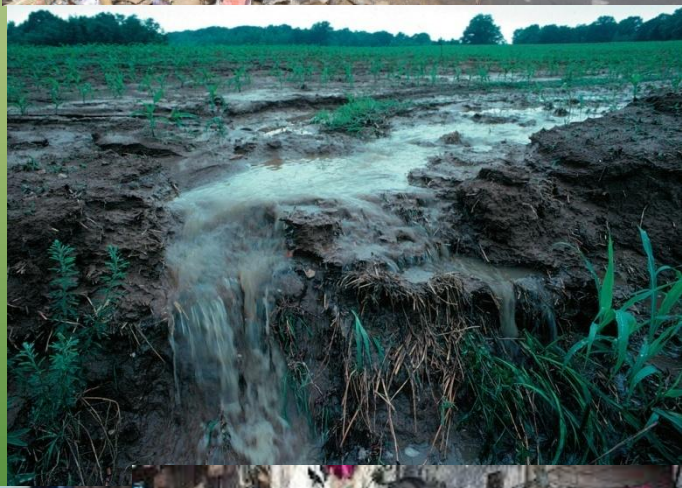
- *Industrial plants,*
- *power plants,*
- *sewage discharge*

etc

Diffuse Sources

e.g.

- *small overflowing drains.*
- *Surface runoff from agriculture fields.*
- *Small scattered and unauthorized industries*
- *Domestic level.*



CLASSIFICATON OF WATER POLLUTANTS

The various types of water pollutants can be classified in to following categories:

(1) Organic pollutants,

(2) Pathogens,

(3) Nutrients,

(4) Suspended solids

(5) Thermal Pollutants

(6) Radioactive pollutants

(7) Fluorides

(1) Organic pollutants,

Organic pollutants can be further divided in to following categories:

(a)Oxygen Demanding wastes

B*iodegradable organic compounds either in suspended, colloidal or dissolved form, which degrade and decomposed by bacterial activities,*

Which leads to higher demand of B.O.D. ,results in lower quality of water

(b)Oil

- ***O****il spills, leak from oil pipes, and wastewater from production and refineries mixes oil with water*
- *Which results in reduction of DO*
- *It effects birds and coastal plants due to coating of oils and also reducing the photosynthetic activity of the aquatic plants.*

(c)Synthetic Organic Compounds

Eg. *synthetic pesticides, synthetic detergents, food additives, pharmaceuticals, insecticides, paints, synthetic fibers, plastics,*

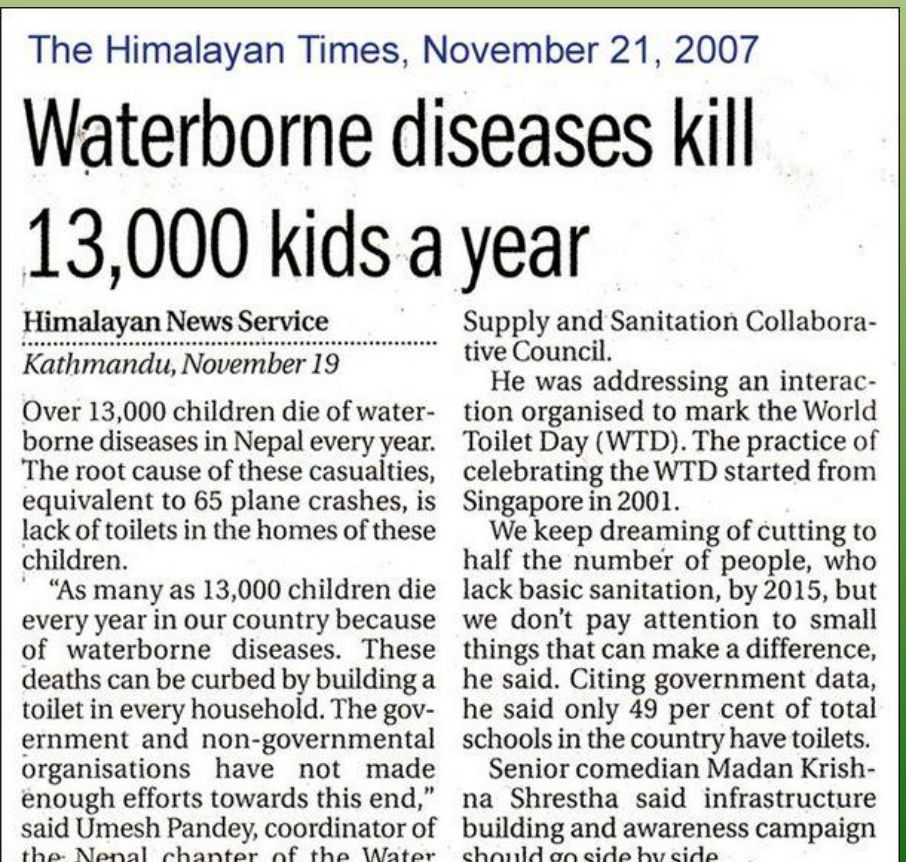
Most of these compounds are toxic and they are resistant to microbial degradation.


I'm with
Stupid
MANKIND

Pathogens

- *The pathogenic microorganisms enter in to water body through sewage discharge as a major source or through the wastewater from industries .*

Viruses and bacteria can cause water borne diseases, such as ***cholera, typhoid, dysentery, polio, hepatitis in human***



The Himalayan Times, November 21, 2007

Waterborne diseases kill 13,000 kids a year

Himalayan News Service

Kathmandu, November 19

Over 13,000 children die of waterborne diseases in Nepal every year. The root cause of these casualties, equivalent to 65 plane crashes, is lack of toilets in the homes of these children.

"As many as 13,000 children die every year in our country because of waterborne diseases. These deaths can be curbed by building a toilet in every household. The government and non-governmental organisations have not made enough efforts towards this end," said Umesh Pandey, coordinator of the Nepal chapter of the Water Supply and Sanitation Collaborative Council.

He was addressing an interaction organised to mark the World Toilet Day (WTD). The practice of celebrating the WTD started from Singapore in 2001.

We keep dreaming of cutting to half the number of people, who lack basic sanitation, by 2015, but we don't pay attention to small things that can make a difference, he said. Citing government data, he said only 49 per cent of total schools in the country have toilets.

Senior comedian Madan Krishna Shrestha said infrastructure building and awareness campaign should go side by side.

Keep in mind that individuals suffering from cholera are releasing into the environment up to 10^{13} cells of *Vibrio cholerae* per day. [Source: Mintz *et al*. 1994

A *pathogen* is anything that causes a disease
(such as a type of bacteria or a virus)

Thank You

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By Rathod Prashant k. 2018 19

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