Water is said to be our life because we need it for drinking, bathing, relaxing, fishing and irrigating our crops. Besides, we produce energy from water and navigate in it. Water is so an essential resource for our life that ancient civilizations have been developed in almost all river valleys of our country. With the growth of the modern civilization, our life is threatened due to pollution of water both from surface and underground. The doctors forecast that several stomach, liver and skin diseases spread due to polluted water. In our country, especially in the state of Orissa, the scarcity of pure drinking water is so much felt that 50% of urban people and 80% of rural people are affected by water pollution.

Sources of Water in Orissa

The main sources of water in the state are from the Bay of Bengal, from lakes like Chilika and Ansupa, from 11 rivers such as: Mahanadi, Bramhani, Baitarani, Rushikulya, Budhabalanga, Subarnarekha, Salandi, Kathajodi, Birupa, Kusabhadra, Daya and many rivulets. The water sources include ground water, tanks, ponds, open wells and tubewells.

Quality of Water

The pure water that is H₂O in which two parts of hydrogen and one part of oxygen are present. Obviously, this form of pure water is not available in all the above mentioned sources. The quality of water depends on the quantity of harmful elements present in it. The water from sea and Chilika lake is salty and the water from rivers, tanks and ponds is very often muddy and contain impurities of suspension, colloids and dissolved particles.

The quality of drinking water depends on the quantity of harmful elements present in it. The drinking water should be clear, odourless and tasteless and its pH value should be between 7 & 8.5. According to the World Health Organization (WHO), the permissible limits of impurities in drinking water are as follows:

<table>
<thead>
<tr>
<th>Impurities</th>
<th>Maximum permissible limits (mg/Lit.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Solids</td>
<td>500</td>
</tr>
<tr>
<td>Hardness</td>
<td>2meq/lit</td>
</tr>
<tr>
<td>Calcium</td>
<td>75.0</td>
</tr>
<tr>
<td>Magnesium</td>
<td>30.0</td>
</tr>
<tr>
<td>Sulphates</td>
<td>200.0</td>
</tr>
<tr>
<td>Chlorides</td>
<td>200.0</td>
</tr>
<tr>
<td>Iron</td>
<td>0.10</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.05</td>
</tr>
<tr>
<td>Copper</td>
<td>0.05</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.05</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.05</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.005</td>
</tr>
<tr>
<td>Cyanide</td>
<td>0.05</td>
</tr>
</tbody>
</table>
The permissible organic impurities include Bacillus coli less than 100ml/lit and other coli bacteria not more than 10 numbers.

How Water is Polluted:

Water pollution means contamination of water due to introduction of some external materials. Water may be polluted either from natural sources or human sources.

1. Pollution Through Natural Sources:

The natural elements which cause water pollution are gases, soil, minerals, humus materials, waste created by animals and other living organisms present in water. During rain, surface water with soil, mud and humus enter into the river, tanks and other water bodies. The inorganic minerals like sodium, potassium, calcium, magnesium and heavy metals like iron, manganese, lead, mercury, chromium, cadmium, nickel, cobalt, beryllium when present above the permissible limit are harmful for drinking. Ground water containing Floride above 0.15 mg/lit. at Begunia in Khurda district, in six villages (Dergaon, Jutiki, Behal, Sargiguda, Kirojhot and Kandhamal) of G.P. Koralakata of block Boden Nuapada district causes diseases like Florosis, bone and teeth deformation, in both human beings and animals.

2. Pollution of Water Through Human Sources:

The human sources of water pollution are due to one of the followings:

(i) Discharge of Domestic Effluents: In urban areas people use about 335 liters of water daily for different domestic purposes. About 70-80 percent of this water drains out to the nearby ponds, tanks or rivers through the drains or nalas of the municipality, thereby polluting the water.

(ii) Discharge of Sewage: Municipal sewage is considered to be the main pollutant of water. Most of the sewage receives no treatment before discharge in all the cities of Orissa. The cities like Bhubaneswar, Cuttack, Rourkela, Sambalpur and Berhampur generate approximately 10, 7.5, 6.0, 3.075 and 5.0 lakh litres of sewage effluents respectively everyday. These effluents are discharged into the river Mahanadi and Kathajodi in Cuttack, Kuakhai and Daya in Bhubaneswar, Brahmani in Rourkela, Mahanadi at Sambalpur and Rushikulya at Berhampur. The effluents contain heavy metals like lead, chromium, cadmium, zinc and mercury. Besides, the sewage effluents are rich with harmful bacteria and viruses which contaminate the river water. While drinking this contaminated water, people suffer from serious diseases.

(iii) Industrial Effluents: In Orissa, there are paper industries at Rayagada, Chowdwar, Jaypore, Balasore and Brajarajnagar. The paper industries discharge effluents to the rivers like Rushikulya, Mahanadi, Kolab and Budhabalanga. These effluents containing high amount of Carbonate (6.4 meq/lit.) Bi-carbonates (8.4-10.9 meq/lit.) and heavy metals of Fe, Mn, Zn and Cu, which cause pollution of drinking water.

Discharge of effluents from smelter plants of NALCO to the water bodies at Angul cause flouride pollution in drinking water of wells and tanks through lateral and vertical movement in ground. The water of these sources contains flouride more than 1.5 mg/lit. which is toxic to animals. Fly ash effluents from captive power plants of Angul, Talcher and Damanjodi contain heavy metals like chromium, lead, cadmium and iron. These effluents discharged to the nearby rivers and ponds pollute the water. The river, Nandira, at Talcher is said to be dead due to discharge of fly ash effluents into the river. The river Nandira and the creeks receiving fly ash...
effluents join to the river Brahmani in which the water is polluted with the heavy metals as mentioned above.

Press-mud effluents from sugar mills of Aska, Rayagada, Nayagarh, Dhenkanal, Badamba and Deogoaon (Bolangir) contain heavy metals like Iron (2500-8000 ppm), Manganese (280-1500 ppm), Copper (90-126 ppm) and Zinc (155-272 ppm). These effluents discharged to the nearby water bodies pollute the water.

The effluents from Chlorine Plant at Chhatrapur containing high Chloride of more than 250 ppm and SAR value of more than 10 meq/lit. cause chloride and sodium toxicity to the river Rushikulya. The ground water of open wells near the plants was detected containing high amounts of Chloride.

The Phosphatic Fertilizer Industry at Paradeep discharges effluents containing Nitric, Sulphuric and Phosphatic acids to the joining mouth of the river Mahanadi into the Bay of Bengal. Liquid Ammonia released from the plant cause pollution to the water in wells and tanks in nearby villages.

(iv) Mining Operations : Discharge of Hexavalent Chromium from Chromite mines at Sukinda of Jajpur district pollutes the water of rivulet Dharmasala as well as the water in ponds and wells in around 2-5 km. radius of the mining operation.

Leachates of soluble iron from mines of iron ore pollute the water of river Baitarani and wells and ponds of Keonjhar.

(v) Agricultural Effluents : Agricultural water pollution is caused by fertilizers, insecticides, pesticides, farm animal wastes and sediments. Research findings indicate that application and heavy doses of fertilizers pollute ground water through leaching of nitrate from nitrogenous fertilizers and of cadmium from single Superphosphate and of flouride from rock Phosphates. However, such hazardous effects in ground water of Orissa have not been detected so far.

The use of various types of pesticides and insecticides in agriculture cause water pollution. Death of aquatic animals have been reported in intensive rice growing areas of Orissa due to application of granular pesticides like Furatox and Furadon.

Careless deposit of animal waste close to the wells and ponds situated in the backyards cause pollution of water through leaching. The pathogenic organisms of these wastes transmit to the water and pose serious problems.

(vi) Man-made Water Pollutions : It is reported that during the last Dashara festival about 5000 idols of Goddess Durga were immersed in different rivers of Orissa which caused lead pollution in river water. It is estimated that one Durga idol weighing 200 kgs. contains 1.5 kg. lead. Thus 5000 Durga idols when immersed will add 7500 kgs. lead to the water. In similar case, 1 lakh idols of Ganesh immersed in water bodies add 1500 kgs. lead each idol containing 15gm lead.

Effect of Water Pollution :

Pollution of water probably cause more illness of human being than any other environmental influences. The sewage and polluted water are responsible for several water borne diseases such as : cholera, typhoid, infantile diarrhoea, dysentry, infectious hepatitis, polio, ziardiasis, jundice etc.

Presence of Cadmium in water, due to various industrial discharges and mining wastes, cause high blood pressure, kidney damage, destruction of testicular tissue and red blood cells.
Occurrence of hexavalent chromium due to mining of chromite ores cause nausea, skin ulceration, lung cancer and liver damage.

Fluorine in drinking water from various sources cause Florosis characterised by mottle of teeth and bone damage.

Lead in drinking water added through sewage, industrial effluents and paints cause anaemia, kidney diseases and nervous disorders.

Addition of mercury from industrial wastes, mining of coal and application of pesticide cause paralysis of nerve and brain.

Water pollution changes the physical and physiological nature of water. Presence of organic dyes changes the colour of the water. Release of sewage and industrial effluents to water bodies cause turbidity in water. Decomposition of organic matter, algae, fungi and filamentous bacteria impart add odors and taste to water. The industrial effluents containing several types of chemicals cause loss of soil fertility.

In general, water pollution has now become a threat to the eco-system and an important cause of environmental pollution.

**Common Measures for Controlling Water Pollution:**

The following measures can be adopted for controlling or minimizing water pollution.

(i) Proper treatment of municipal and domestic effluents before draining to rivulets and rivers.

(ii) Domestic waste water should be used for irrigating crop than releasing it to water bodies.

(iii) Use of sewage for increasing soil fertility than discharge it to drains.

(iv) The drinking water resources and its nearby areas should be cleaned.

(v) Every industry should have its own effluent treatment plant.

(vi) Use of pesticides in agriculture should be limited and only standard quality pesticide be used.

(vii) There is a need to conserve several water purifying organisms.

(viii) The bonds of the water bodies should not be used as public latrines.

(ix) Algae and water born vegetation should be cleaned regularly.

(x) Water bodies should not be used for disposal of dead bodies and idols.

(xi) To creat public awareness and properly educate the people not to pollute water.

Dr. S.K. Sahu is an Emeritus Scientist in the Department of Soil Science, College of Agriculture, OUAT, Bhubaneswar.