
Water tower

WATER, WATER EVERYWHERE

Water is essential for life. Each person needs about 2 litres (8 glasses) per day for good health. But much more is used for domestic and industrial washing and cleaning and agricultural irrigation. Since wildlife also depends on adequate water, meeting human requirements may have significant environmental effects. Careful use, management and protection of water is essential, especially for large urban populations. Fortunately water is often all around – in rivers, lakes, the sea, snow, rain, mist, ice, underground, and in living organisms.

Water evaporates from rivers, lakes or the sea or is transpired by plants. It is carried through the atmosphere and is precipitated elsewhere. Caught in river basins, of catchments, it then flows to lakes of the sea, or sinks into the ground where it can remain for many years or reappear at the surface more quickly through springs, depending on geological conditions. This cycle is influenced by, and influences, climate. Too little water brings drought. Too much brings flooding. In areas with alternating wet and dry seasons these are facts of life. Practices adapt to cope. But unexpected, protracted and long term significant changes in the distribution of moisture can cause changes to ecosystems and land ecosystems and land uses, and may make some areas difficult to inhabit without pumping water for long distances. Climate changes as time passes. It is important to understand how this will affect availability and quality of water so that current developments do not become future liabilities.

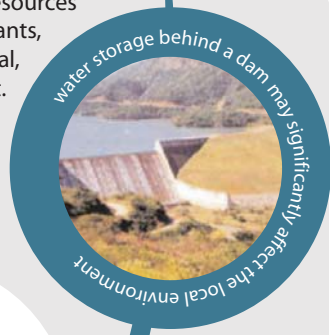
The art of water supply goes back thousands of years. Water is abstracted from surface or underground sources; stored in lakes or tanks; and distributed to consumers through surface channels or underground pipes.

Underground water is contained in aquifers – porous, cracked or fissured rocks that water can pass through or remain within (e.g. many limestones, sands, gravels). Where aquifers are contained between rocks that inhibit the passage of water (aquicludes e.g. many clays), several separated bodies of ground water may lie beneath the same area. If abstraction through wells and boreholes is excessive, natural replenishment cannot keep up and groundwater sources become depleted. Depression of groundwater levels may also affect surface vegetation and habitats and reduce discharges from spring and nearby wells. Care is needed not to take too much, too quickly from a single aquifer.

Abstracted water is stored in dammed lakes, reservoirs and tanks as well as by pumping it into natural underground reservoirs. Construction is expensive and must be undertaken carefully to prevent instability of the works or leakage. As time passes, structures become less efficient due to deposition of sediment, loss of capacity and erosion. Continuing monitoring, inspection and maintenance is required. Channels and pipes also need to be designed and maintained carefully. Outward leakage leads to loss of valuable water while seepage of fluids into pipes can lead to pollution. Care is needed to keep the balance right. In arid areas, problems can arise in the vicinity of surface supply channels because evaporating water precipitates salts that can damage nearby plants.


Tap water

So it is not simply a matter of quantity of water. Quality is crucial. We need clean water for drinking and the food industry but water of lower quality can be used for many industrial processes and irrigation. But heavily polluted water is a hazard. The freshest water needs limited processing before it can be drunk. Untreated peaty water may be distasteful and salty water may be undrinkable. Desalinisation is possible but is relatively expensive. Water can also contain harmful micro-organisms, parasites and toxins so clean water is essential to health. Drinking water can be easily polluted and is difficult to clean afterwards. It is important to safeguard water resources and to avoid discharges of pollutants, whether intentional or accidental, throughout the whole catchment. Quality standards are set for drinking water.


Water storage behind a dam may significantly affect the local environment


Lake


River

Slightly polluted water, rainfall, and foul water contaminated by sewage or industrial discharges is commonly conveyed into the same sewer making the whole volume grossly polluted. It makes more sense to segregate slightly polluted water from foul water for re-use by industry or to be relatively easily decontaminated, and to operate closed-cycle processes for industry so that the same water is reused many times over. Thus a much smaller volume of foul water has to be specially treated, greatly reducing costs. Many sustainable drainage systems are being introduced currently for new developments but more needs to be done in respect of older development.

The Water Framework Directive of the European Union, adopted in December 2000, sets an approach to sustainable management of water resources. It requires integrated management for whole river basins to safeguard and enhance water quality. This requires assessment of the quality, quantities, and flows of all significant water bodies (surface and underground); monitoring of changes; assessment of risks to water quality; and the setting of environmental objectives to work steadily towards improvement of the water resource and dependent ecosystems, while fully meeting the needs of society.

These leaflets have been prepared by Dr B R Marker OBE (UK) in collaboration with Professor Dr J J Pereira (Malaysia) and Professor I A Nyambe (Zambia)

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