

Ground water

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Manifest Pedagogy

Ground water resources and issues of problems and conservation have been repeated more often in mains exam. The recent policy frameworks for conservation can be important dimension of asking question.

In news

Water conservation fees for industries

Placing in syllabus

Distribution of resources

Environmental pollution and degradation

Static dimension

- What is Ground water
- Distribution of ground water
- Problems
- The way forward

Current Dimension

- Recent policy framework

Ground water

What is Ground Water

Groundwater is the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks

called aquifers.

Water seeping down from the land surface adds to the ground water and is called recharge water. Ground water is recharged from rain water and snowmelt or from water that leaks through the bottom of some lakes and rivers. Ground water also can be recharged when water supply systems (pipelines and canals) leak and when crops are irrigated with more water than the plants can use.

Ground water distribution in India

Groundwater resource availability depends upon a combination of favourable parameters, such as, **geological environment, geomorphological conditions, topographical set-up, nature and type of the weathered zone and soil cover and climatic conditions, particularly in terms of precipitation.** As mentioned above, these parameters are not uniform throughout the country. Consequently, the resource availability is also highly variable in the country, for example, one third of the country, covered by alluvial and sedimentary formations has very good potential, whereas the remaining two-third, overlain by hard rocks, has limited to moderate potential only.

The lofty mountain chains/**Himalayas** in the north with high runoff, offers little scope for groundwater storage. However, they play an important role in recharging the vast **IndoGanga-Brahmaputra plains.**

Indo-Gangetic-Brahmaputra Alluvial Plains: This region encompasses an area of about 850,000 sq km covering states of Punjab, Haryana, Uttar Pradesh, Bihar, Assam and West Bengal, accounting for more than one fourth of country's land area, comprises the vast plains of Ganges and Brahmaputra rivers and are underlain by thick piles of sediments of Tertiary and Quaternary age. This vast and thick alluvial fill, exceeding 1000 m at places, constitute the most potential and productive ground water reservoir in the country. These are characterized

by regionally extensive and highly productive multi-aquifer systems

The peninsular shield in the south, on the other hand, comprises discontinuous aquifers of limited potential in weathered and fissured consolidated sedimentary rocks, basalts and crystalline rocks. Rugged topography and compact and fissured nature of the rock formations results in the formation of discontinuous aquifers with limited to moderate yield potentials.

The **coastal areas** around the peninsular shield have a thick cover of Pleistocene to Recent alluvium with potential aquifers but associated with the **risk of sea water intrusions**.

The arid and semi-arid regions of Rajasthan and Gujarat with scanty rainfall and practically no recharge have restricted occurrence of deep aquifers tapping fossil water only.

Problems of ground water in India

Over-exploitation of ground water

Following are a few reasons leading to groundwater depletion.

- Dependence on the use of groundwater for agriculture due to lack of rainfall.
- Indiscriminate use of groundwater by industries.
 - Excessive withdrawal of groundwater is increasing the stress on groundwater system due to subsidized power

Groundwater levels in India are dropping at an alarming rate. Extraction of groundwater in some states of India (Delhi, Haryana, Punjab and Rajasthan) has reached to 100%. The development of groundwater in different parts of the country is non-uniform resulting in over exploitation and depletion of groundwater resources. Some of the states/union territories facing a severe problem of water level decline are Tamil Nadu,

Madhya Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, Gujarat, Punjab, Haryana, Karnataka, National Capital Region of Delhi and Pondicherry

Ground water contamination

Ground water contamination is the presence of certain pollutants in ground water that are in excess of the limits prescribed for drinking water. The commonly observed **contaminants include arsenic, fluoride, nitrate and iron**, which are geogenic in nature. Other contaminants include **bacteria, phosphates and heavy metals which are a result of human activities including domestic sewage, agricultural practices and industrial effluents**. The sources of contamination include pollution by landfills, septic tanks, leaky underground gas tanks, and from overuse of fertilizers and pesticides. It has been pointed out that nearly 60% of all districts in the country have issues related to either availability of ground water, or quality of ground water, or both.

Legislative and Policy Framework

Currently, the Easement Act, 1882 provides every landowner with the right to collect and dispose, within his own limits, all water under the land and on the surface. This makes it difficult to regulate extraction of ground water as it is owned by the person to whom the land belongs.

Water falls under the State List of the Constitution. This implies that state legislative assemblies can make laws on the subject. In order to provide broad guidelines to state governments to frame their own laws relating to sustainable water usage, the central government has published certain framework laws or model Bills. In 2011, the government published a Model Bill for Ground Water Management based on which states could choose to enact their laws. In addition, it outlined a National Water Policy in 2012 articulating key

principles relating to demand management, usage efficiencies, infrastructure and pricing aspects of water.

The Groundwater Bill, 2017 proposes a different regulatory framework from the century-old, outdated, inequitable and environmentally unfriendly legal regime in place. It is based on the **recognition of the unitary nature of water, the need for decentralised control over groundwater and the necessity to protect it at aquifer level**. The Bill is also based on legal developments that have taken place in the past few decades. This includes the recognition that water is a public trust (in line with the oft-quoted statement that groundwater is a common pool resource), the recognition of the fundamental right to water and the introduction of protection principles, including the precautionary principle, that are currently absent from water legislation. The Bill also builds on the decentralisation mandate that is already enshrined in general legislation but has not been implemented effectively as far as groundwater is concerned and seeks to give regulatory control over groundwater to local users.

The way forward

1. Estimation of groundwater resources and recommendations to improve assessment include
 - Strengthening database management
 - Adopting alternative techniques for recharge assessment
 - Mapping aquifers effectively
2. Agricultural crop pricing and water intensive crops, and improvement measures are
 - Dry-season crop planning for specific area depending on local modalities
 - Adoption of modern precision irrigation technologies
 - Restrictions to control groundwater abstraction through regulatory measures
 - Energy subsidies and groundwater extraction needs to be

regulated

- Ration water use in agriculture
- Reward farmers by cash incentives equivalent to unused units of water/power
- Encourage farmers to use on-farm water management techniques to enhance production per drop of water
- Inadequate regulation of groundwater law: Present power only of identification and notification, not enforcement

3. Quality of groundwater and recommendations

- Govt needs to establish enforceable water quality standards for lakes, rivers and groundwater
- Penalties need to be levied for violations
- States need to take measures for source control of pollutants

4. Local management of groundwater where recommended steps include

- Determining relationship between surface hydrological units and hydrological units below the ground
- Identification of groundwater recharge areas
- Maintaining groundwater balance at the level of the village or the watershed
- Creating regulatory options at the community level

Test Yourself: Mould your thoughts

Growth of agriculture in India is dependent on the sustainable usage of ground water. Discuss how the recent policy frameworks help in regulation of ground water in agriculture sector.