As the demand for water is increasing rapidly with the resources staying the same there is a huge rift in the demand-supply dynamics of water. As the surface water resources are becoming scarcer we are relying more and more on groundwater to meet our ever increasing needs. The prominence and importance of water as an asset has been growing rapidly and the proper management of water is the most important necessity now.

Water management is a heterogeneous area with linkages to different sectors of Indian economy including the agricultural, industrial, domestic and household, power, environment, fisheries and transportation areas. There are various key issues related to conservation of depleting ground water resources, soil conservation, flood control and availability of drinking water. Because water is a shared and community resource, it has often led to disputes between different states and also with the neighboring countries and that adds to the problems of water resource management in India.

The future of water quality at local, regional, and global scales depends on investments of individuals, communities, and governments at all political levels to ensure that water resources are protected and managed in a sustainable manner. This includes not only technological solutions to water quality problems, but changes in human behavior through education and capacity building to better preserve aquatic resources.

Local organizations interested in managing a particular body of water are more likely to be successful if they include the primary industrial, urban, and agricultural stakeholders that rely on the body of water for economic well-being. It could also be that the government uses the new groundwater legislation to appropriate its distribution in a slightly more centralized fashion. The management of water cannot be piecemeal and fragmented. They need to be integral parts of a holistic vision. One difficulty in this regard is the multiplicity of perspectives on water that need to be taken into account. For instance, consider the following:

- The rights perspective
- The social justice/equity perspective
- The women’s perspective
- The community perspective
The state perspective
The water quality perspective
The citizen/water-user perspectives
The economic perspective
The ‘growth’ perspective
The business perspective
The legal perspective and
The environmental/ecological perspective

The above points show that a multiplicity of disciplines is involved regarding ground water management. The formulation of a national water policy must necessarily be an inter-disciplinary exercise. The basic requirement for such an exercise needs the baseline assessment of water in the area for various factors including physico-chemical parameters, pollutant concentration and presence and hydrodynamics. The assessment of the Physico-chemical parameters and the heavy metal concentration in water can give an overall understanding of the hydrodynamics and the pollutant pathways in the aquifers.

In many parts of the world, point source loads of contaminants are well-controlled and pollution of aquatic systems now is mostly due to non-point source transport of contaminants across the landscape and from the atmosphere. Water quality monitoring for the detection of trends, impacts, and improvements is further complicated because the issues of concern and available resources are constantly changing (Hirsch et al., 2006). Although it is not always possible to predict new and emerging threats to aquatic ecosystems, baseline water quality monitoring must be maintained to facilitate the early detection of such threats, and water resource managers should be prepared to adapt their programs to take into account these threats. Some issues will require simply the maintenance of routine monitoring, whereas others will require focused efforts to target specific parameters and/or contaminants. In ground water management there is a need to map both the shallow aquifer and the deeper aquifer as well as keep tabs on the extraction structures and the volume of extraction from groundwater. Recharge and withdrawal can then be optimized.
The current study focuses on the ground-water standards existing in the Visakhapatnam area. The study can be used as a baseline data for future studies as well as a regular monitoring to assess the hydrological cycle and study the dynamics of ground water movement. Visakhapatnam is a rapidly growing city both industrially and demographically. This sudden growth of population coupled with poor infrastructure and inadequate waste management and public sanitation services is bound to create problems in the public health sector. Since the most important medium of contamination is domestic water, this study is imperative to provide safe potable and domestic water to the ever-increasing population.

Ground water samples were collected from 40 selected areas in and around Visakhapatnam city and Analyzed for various physico-chemical parameters and tested for heavy metal concentrations. The sampling sites were selected based on the water from the source being used by the people for drinking and other domestic purposes. Basic statistical analysis of all the parameters has been carried out. Water Quality Index has been calculated for the physico-chemical parameters in the different samples.

Results revealed that most of the chemical parameters in the ground waters are beyond the standard limits prescribed for drinking water (shown in table). This indicates non-point source contamination of aquifers throughout the study area as well as various other associated problems discussed above.

The concentration of EC, TDS, Chloride and Dissolved Oxygen are high in the waters. The reason can be due to seepage of sewage and silage due to improper drainage system, waste water in the surroundings of the wells, industrial effluents both organic and inorganic, leachates from solid wastes and water from agricultural lands with excess quantities of fertilizer.

Sulphate and Phosphate are high in all the samples tested. This could be due to the seepage of waste water from the surroundings of the wells in to aquifer. All samples showed more than desirable limits of hardness. This can be ascribed to the intrusion of sea water into the aquifers and high concentration of Ca in the surrounding waters. It can be seen that the DO values are also lower than the prescribed limits in most of the wells.
indicating reduction reactions in the bore well water due to anaerobic conditions and the seepage of organic wastes from the surrounding regions.

The Fluoride concentrations in some areas were above the recommended standards. The Central and several State Governments in India identified the areas with the ground water high in F⁻ concentrations and are trying to provide drinking water to the people in those areas, with permissible levels of fluoride, after suitable treatment. But the treatment systems are not working satisfactorily and the people in those regions are suffering due to health problems, because they are drinking the ground water with high F⁻ contents without any treatment.

Drinking water standards with respect to heavy metals revealed that the Aluminum (Al) concentrations were high in all the sampling locations except Paradesipalem. The results indicate that there is an environmental impact on the ground water of these areas due to industrialization and solid waste dumping where the values were higher. Chromium concentrations were high only in Mindi followed by Boravanipalem, Steel Plant, Maridi, Rusikonda, Sriharipuram, Kurmannapalem and Paravada while remaining sampling locations indicated Cr within the permissible limit of drinking water standards.

Manganese concentrations similarly showed excess in Mindi, Steel Plant, Rusikonda, Sriharipuram, Kurmannapalem, Parawada and Pandurangapuram while remaining sampling locations indicated permissible limit. Iron concentrations were highest in Mindi followed by Akkireddypalem, Peddagantyada, Sriharipuram, Pandurangapuram, Parawada, Rusikonda, Paradesipalem, Dabagardens, Sheelanagar, Gnanapuram, Dwarakanagar and Vambay Colony.

Compared with ground water standards the nickel concentrations were very low except in Mindi, NAD Junction, Boravanipalem, Paradesipalem, Kapuluppada Village, Steel Plant, Maridi, Dabagardens and Parawada. Copper concentrations were highest at Sagarnagar Kapuluppada Village Boravanipalem Mindi Maridi Steel Plant, Vambay Colony, Sriharipuram, Peddagantyada, Kurmannapalem, Paradesipalem, NAD Juction, Visalakshinagar, Parawada, Akkireddypalem, Dabagardens, Naiduthota, Pandurangapuram and Lawsons Bay Colony.
The above results relating to heavy metal pollution follow a definite trend with reference to industrialization. The pollution was more in highly industrial areas decreasing in residential areas. The focus of remediation should be in those industrial areas where most of the industrial workers reside with inadequate sanitation and infrastructure. Water treatment plants should be provided in these areas immediately.

It can be seen from the tables (Shown in table. ) that the correlation among the different parameters pH, Hardness, Chloride, Sulphate, DO, Fluoride, Aluminum, Fe, Ni, Cu and As is good (2-tailed significant) and even though there are correlations among certain parameters like.. This may be due to the reason that the total concentration of these parameters is contributed from different sources in different regions. They may be

- Soluble salts from soil all along the length of earthen sewer lines.
- Seepage of waste water from drainage (sewage and silage) in urban residential and slums.
- Seepage of waste water from leachates of agricultural and organic waste dumps.
- Seepage and ion exchange of waste water with soil from Effluent ponds.
- Seepage and ion exchange of produce water from oil refinery sites with soil.
- sea water intrusion in coastal areas

Thus, the correlation coefficient matrix supports the author’s interpretation that the surface and ground waters are contaminated by different sources. Similar correlations among physico-chemical parameters of surface and ground water have been reported by several researchers and they interpreted the data in a similar manner.

**Suggestions and remedial measures prescribed by the author based on the study of local conditions and practical observations**

- People must be educated to take precautions to control contamination of the ground water and well water.
- Surroundings of the wells must be cemented and maintained cleanly.
- Avoid activities using water, like washing and cleaning, in the surroundings of the well so that seepage of waste water in to the well is prevented.
➢ The drainage canals and septic tanks must be constructed far away from the wells. In case the wells are close to the drainage canals and septic tanks, cement lining should be provided for the drainage canals and septic tanks.

➢ Those who can afford must use good filters that reduce turbidity and remove the absorbable organic matter as well as kill bacteria by using UV light.

➢ Even though filters function well, they must be properly maintained by the users and the manufacturer must provide proper service and advice to the customers.

➢ The author suggested pot chlorination in the overhead tanks in some areas since there is no chlorination in those areas.

Apart from the local conditions the author notes that the major problem in groundwater management is that a multi-disciplinary approach is needed along with an inter-departmental strategy to tackle the problem.