ABSTRACT

Water is an essential resource for economic and social development and one of the indispensable constituents for the survival of animals and plants on Earth. Water resources have enormous contribution to environment and climate. It is the major renewable resource amongst the various natural resources. Among the water sources, the inland sources like rivers, ponds and lakes are very important as they provide water for domestic, agricultural and industrial uses. Realising the importance of the water, Indian Government has constructed many dams and has planned to connect all rivers across the country to utilize the excess water available in one region by another region. However, small lakes and ponds across the country are being affected by the human activities.

The increase in population, migration of population to the cities and thrust on industrialization affect the quantity and quality of Water sources. Maintaining the water quality suitable to the required utilisation and providing sufficient amount of water for the requirement is essential. For the quality and quantity maintenance, measurement of available water and its quality is prime activity.

The quality of the water is estimated based on physical, chemical and biological constituents available in the water. Normally water quality parameters are measured with conventional methods that involve sample collection by physically reaching the test location, measuring the constituents using chemical, gravitational and light attenuation methods in laboratory. These conventional methods are time consuming and not suitable for more samples. Alternately the remote sensing methods which utilize the reflection spectra to estimate water quality parameters are economical. Remote sensing
methods have advantages of covering more area in less time, getting synoptic view and having systematic coverage.

The estimation of selected water quality parameters like Chlorophyll-a, total suspended matter and turbidity etc. provide the concentration of important chemical constituents like nitrogen, phosphorus etc. Numerous studies on water quality parameters of Case-1 water have used multispectral remote sensing data. As the inland Case-2 water resources are smaller in size and have more nutrients and constituents, they are to be studied with high spectral and spatial resolution data. The hyperspectral remote sensing provides high spectral information through hundreds of narrow continuous spectral bands. It improves the estimation accuracy of water quality parameters.

In this study, water quality parameters like Chlorophyll-a, total suspended matter and turbidity were estimated with both Multispectral and Hyperspectral remote sensing data. During the study, water samples and spectral reflectance data were collected and water quality parameters were measured at laboratory. Suitable indices were selected, values were calculated and were correlated with measured values. The band combinations which provide high correlation were selected for water quality estimation. The regression study provides the relation between the index values and concentration of water quality parameter. Using this relation and the satellite remote sensing data, concentration of parameter in other areas was estimated.

The spatial variations of water quality parameter within lake and across lakes were studied. The temporal variation was also studied by estimating water quality parameters in different seasons and the variation with respect to the seasons were compared. To increase the estimation accuracy, existing algorithms were improved and used. The performance of improved algorithm and existing algorithms were compared. The
capability of different models and different data in water quality parameter estimation were compared and the results are presented. The relations between the water quality parameters were also studied.

Water surface area of water bodies was estimated in different seasons with remote sensing methods. The algorithms for water surface area estimation were improved to get better accuracy and used for estimation. The estimated area was correlated with concentration of water quality parameters and the relation between them was also investigated.