Wetlands constitute a vital ecosystem performing the functions of nutrient uptake, shoreline stabilization, and groundwater recharge and provide fish, fodder and so on for the dependent local population. These fragile ecosystems are rich repository of biodiversity. Unplanned rapid urbanization has lead to the large-scale land cover changes apart from mismanagement threatening the very existence of wetlands. Sustained inflow of sewage (domestic) and effluents (industry) has altered the physical and chemical integrity of wetlands resulting in changes in the biotic trophic levels. These extreme alterations or modifications in natural habitats and water quality have necessitated regular ecosystem monitoring with cost-effective and reliable assessment protocols for the sustained management of wetlands.

Ecosystems have been monitored through well-established protocols reflecting physical and chemical integrity of the system. Nevertheless, biological integrity of an ecosystem is the consequence of physical and chemical integrity, and hence monitoring ecosystems through biological parameters would reflect the overall ecological conditions. Also, ecosystem monitoring through biological parameters would be cost effective, avoiding the usage of expensive chemicals and instruments.

Diatoms, a major group of algal communities reflect short- to long-term environmental changes due to their species specific narrow to wide range of ecological preferences that has evolved over millions of years. Diatoms have shorter lifespan, and are specific to habitats, which would reflect subtle and long-term changes and thus aid as potential bioindicators of an ecosystems. This has motivated to undertake monitoring of wetlands in rapidly urbanizing Bangalore region through the understanding of intra and inter variations in the distribution and composition of diatoms in addition to monitoring physical, chemical and hydrological parameters. Aims of the dissertation are to:

(i) Assess the influence of physical and hydrological variables on diatom community structure,

(ii) Evaluate the seasonality and habitat specificity of lake benthic diatom community,

(iii) Assess the ecological status of lakes by using diatoms as bio-indicator and formulation of tropical specific diatom indices,
(iv) Evaluate the effectiveness of lake restoration programs by diatom assemblages in lakes of Bangalore and
(v) Evaluate the diatom flora of lakes with different water quality regime in Bangalore.

Monthly sampling of selected urban wetlands in Bangalore has recorded a total of 181 diatom taxa from 45 genera, which highlights the biodiversity richness of the region. Based on the diatom community structure wetlands have been grouped into three ecological classes viz., eutrophic, mesotrophic and oligotrophic assemblages. Diatom-based indices are helpful in assessing the sensitivity as well as tolerance of each diatom species based on the habitat specific environmental stressors were computed to use as a tool for bio-monitoring as part of the conservation and sustainable management of aquatic ecosystems. Canonical correspondence analysis (CCA) aided in distinguishing severely polluted wetlands from pristine wetlands through a strong conductivity and nutrient gradient. The environmental factors thus act as a limiting variable in structuring diatom assemblages in an ecosystem especially at a regional scale. High species turnover (75%) reflects seasonal patterns in diatom species at less polluted Vadera halli and Valley school wetlands. Spatial distribution of pollution tolerant taxa was comparable with seasonal variability in urban wetlands. The better understanding of ecological classes of water bodies was exhibited with the formulation of new diatom indices termed Peninsular India diatom index (PIDI). Statistical analysis revealed higher correlation (p<0.01) of the new indices with conductivity, biological oxygen demand, chemical oxygen demand and chlorides. PIDI values categorically classified pristine lakes to polluted lakes, which helped in prioritizing lakes for restoration. The effectiveness of wetland restoration was assessed through diatom assemblages during restoration that was compared with previously restored and also with the pristine wetlands. Water chemical parameters were similar in terms of ions and organic concentration in polluted and pre-restored wetlands. One-way ANOVA revealed a significant (p<0.05) change in % eutrophic taxa (%ET) between reference and polluted wetland but no significant % ET change was observed among rest of the sites.

The study also recorded two new species of genus *Nitzschia* i.e., *Nitzschia taylorii*, sp. nov. and *Nitzschia williamsi*, sp. nov. The majority of species belonging to the genus *Nitzschia* were distinguished by minute taxonomic features those are difficult to observe and
document. New species records from urban wetlands highlight the need for broadening taxonomic and ecological investigations of cosmopolitan genera like *Nitzschia*. The study illustrates that diatom based biomonitoring in routine water quality assessment are cost effective and easily implementable. Current investigations have also revealed the short come or gaps in present lake restoration programs. Diatom indices are thus successful in assessing trophic status of Bangalore wetlands. However, further investigations are required focusing on diatoms in different biogeographic zones, which would provide insights on species’ autecology and in refining the diatom based biomonitoring approaches.