CONSERVATION & MANAGEMENT OF URBAN LAKES

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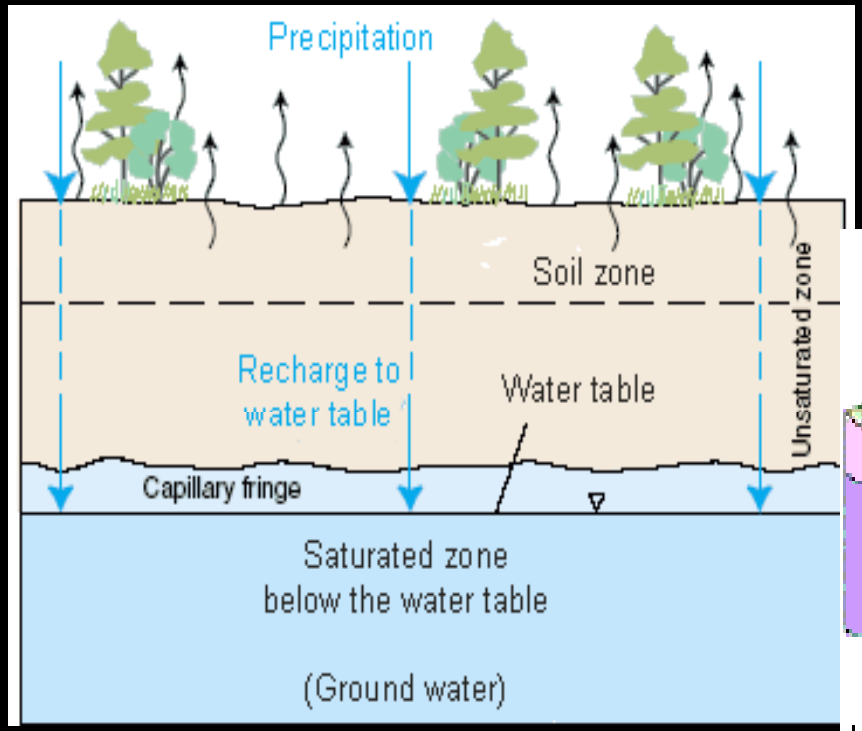
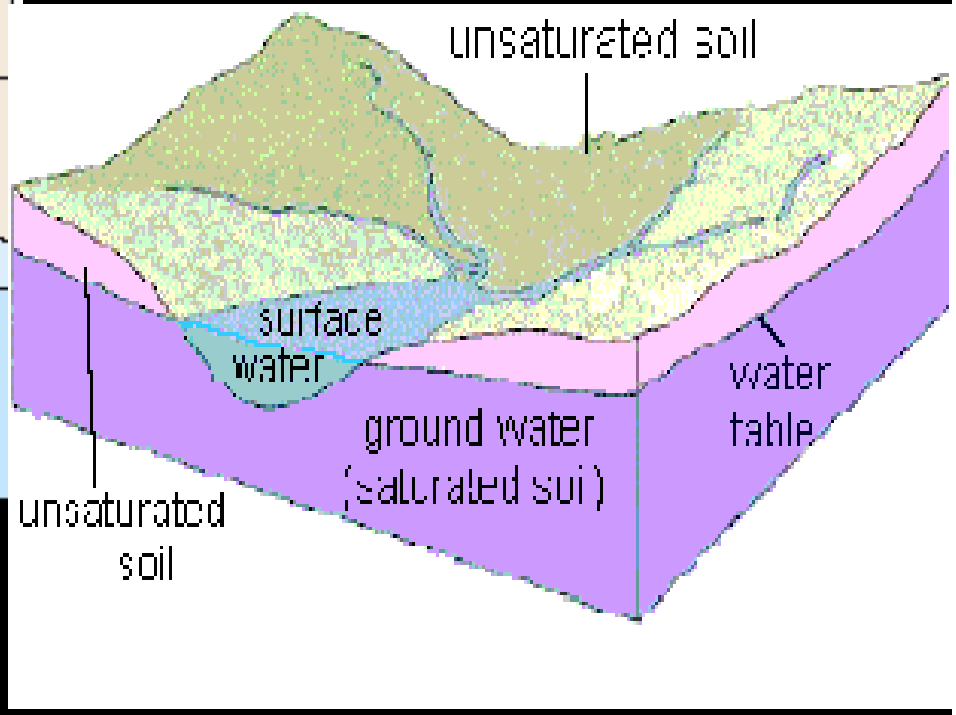
Holistic and Integrated Approaches – Conservation and Management

- Common Jurisdictional boundary for all para-statal agencies
- To minimise the confusion of ownership – assign the ownership of all natural resources to a single agency
- Custodian shall manage natural resources - let that agency have autonomus status
- Lake management should involve all stakeholders like public, local non-governmental agencies, etc.
- Make every one environment literate (current environment literacy level is < 10%). Teach the concepts of ecosystems and environment at all levels of education.

Maintain Catchment Integrity
To ensure lakes are perennial

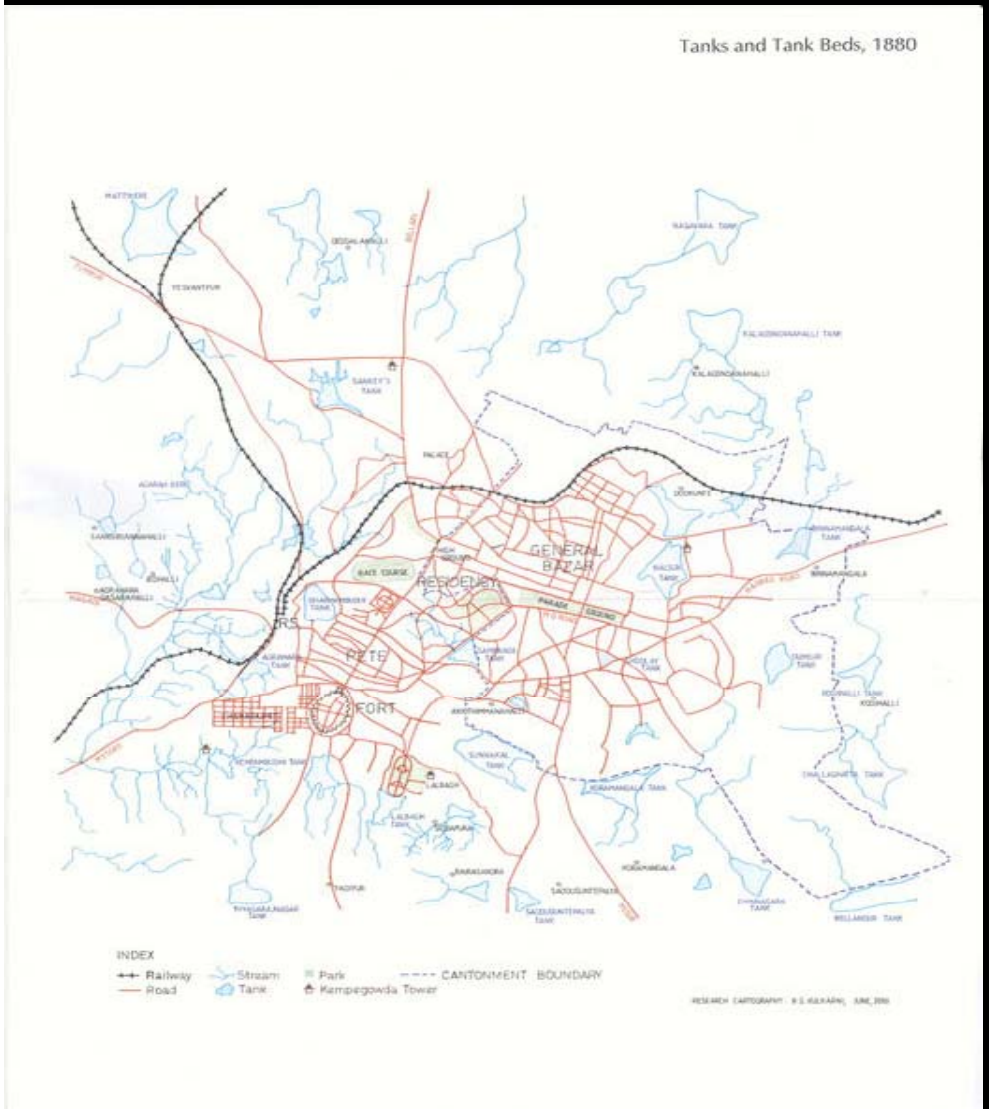
At least 33% land cover should be of Natural Vegetation

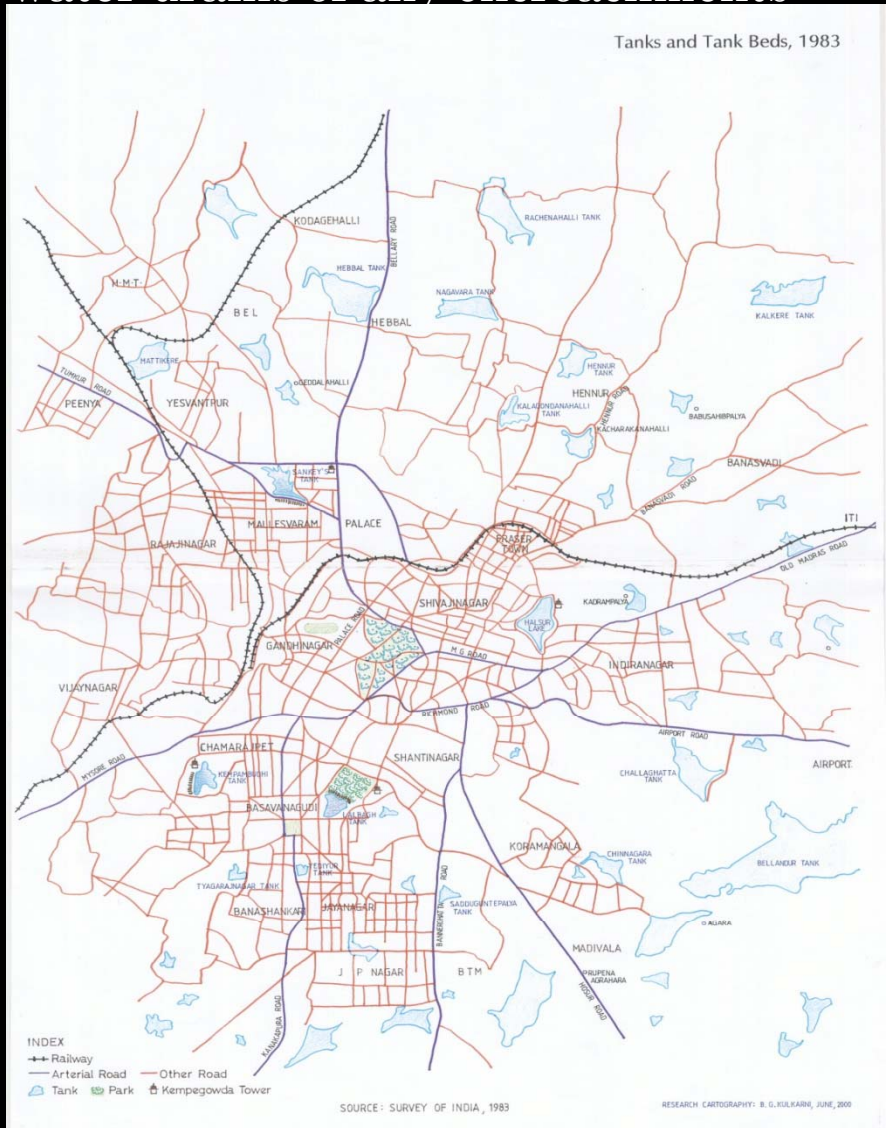




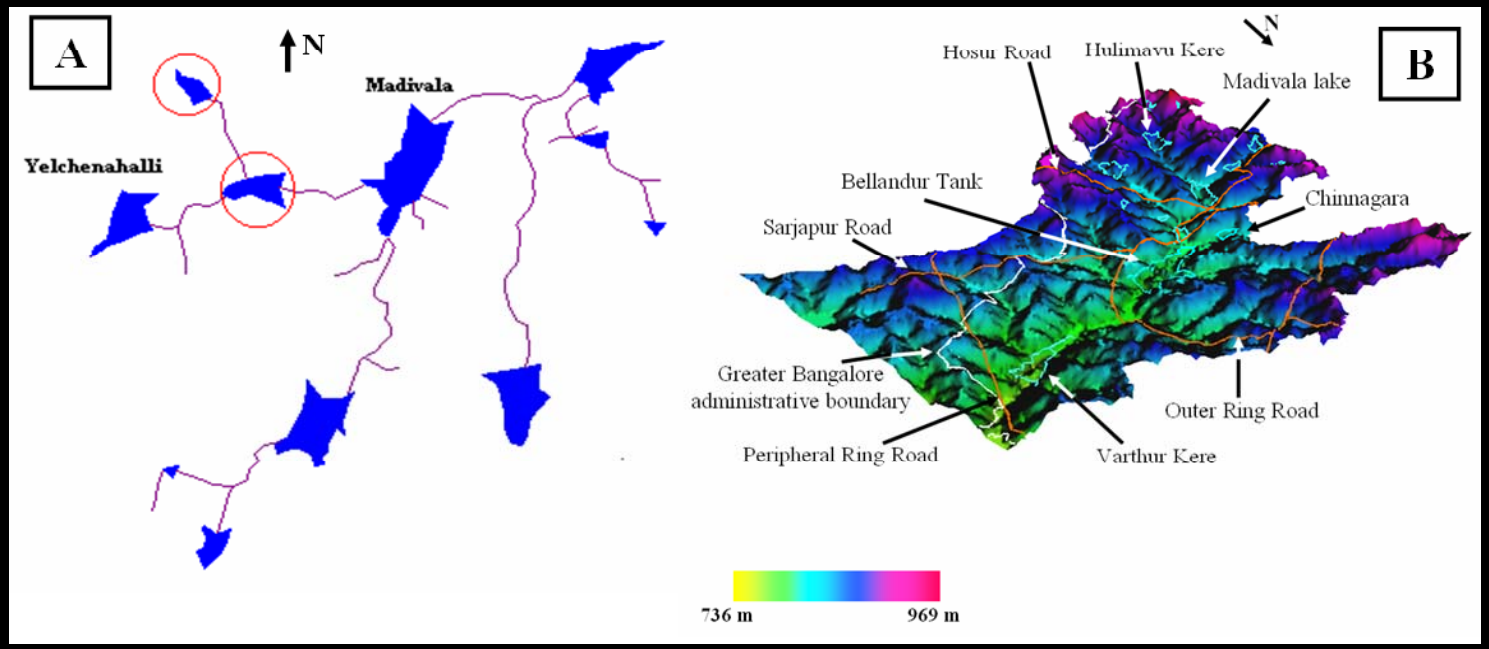
PHYSICAL INTEGRITY

Free storm water drains of any encroachments



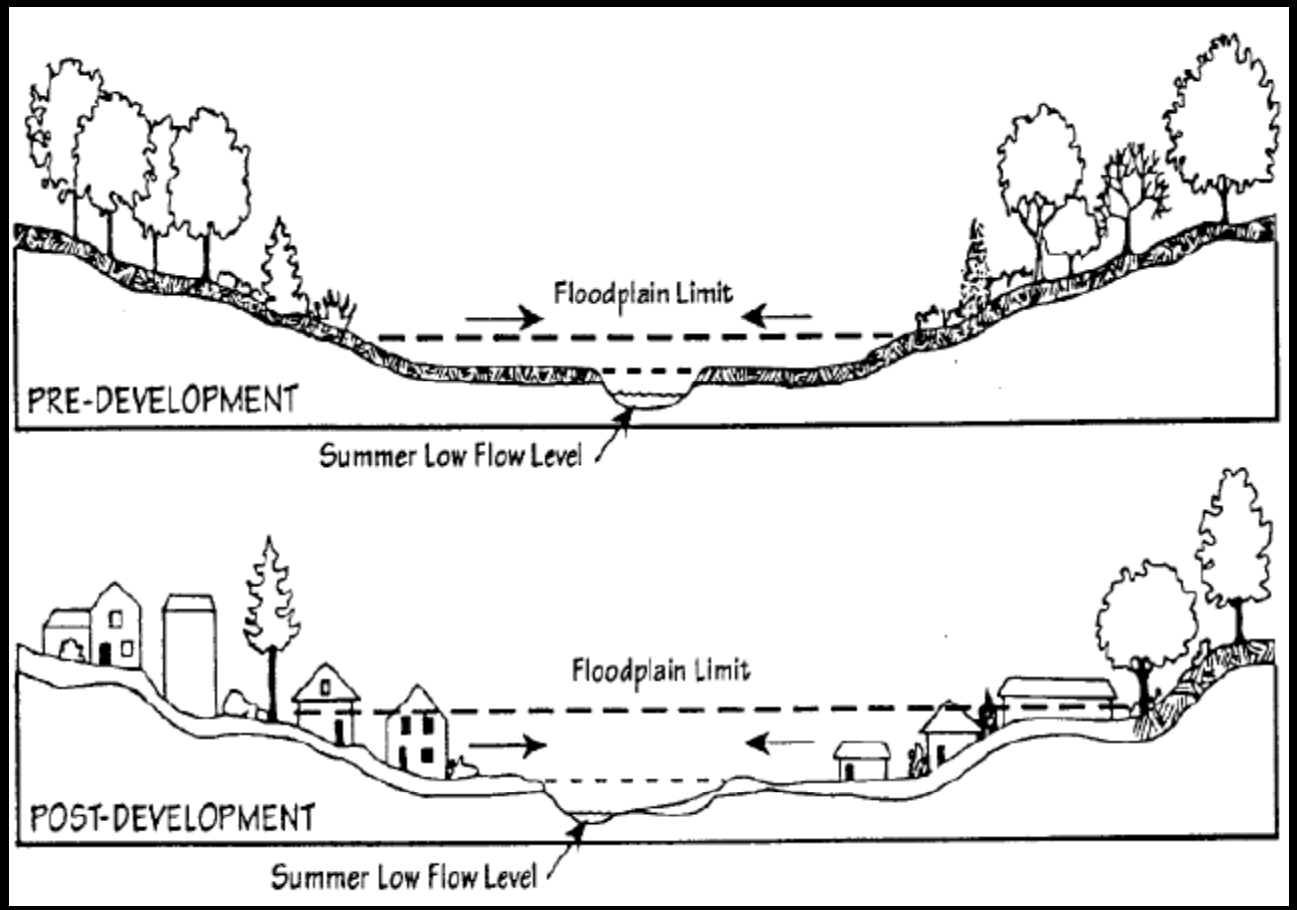


ESTABLISH INTERCONNECTIVITY



To minimise flooding in certain pockets

Floodplains, Valley zones – no activity regions



Remove - Encroachment of floodplain (no akarma and sakrama)

STOP RECLAMATION OF WETLAND

PENALIZE POLLUTERS:
SOLID WASTE DUMPING

PENALIZE POLLUTERS – UNTREATED LIQUID WASTE (SEWAGE & EFFLUENTS)

STOP INTRODUCING EXOTIC SPECIES

Cyperus haspans

Alternanthera philoxiroides

Eichornia crassipes

MAPPING OF WATER-BODIES

- The mapping of water bodies should also include smaller wetlands, particularly hill streams, Myristica swamps of the Western Ghats, springs etc.
- The neglect of these hydrological systems could cause considerable impoverishment of water flow in the river systems as well as turn out to be threats to rare kinds of biodiversity.

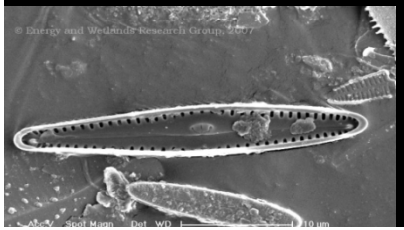


MAPPING AND INVENTORYING

- The mapping of these smaller water-bodies, along with their catchments needs to be conducted involving also the local Biodiversity Management Committees.
- The jurisdictional agreements on the water usage and watershed protection need to be arrived at on a case to case basis involving all the stakeholders.

DOCUMENTATION OF BIODIVERSITY

- The biodiversity of every water body should form part of the Biodiversity Registers (BR).
- The local Biodiversity Management Committees (BMC) should be given necessary financial support and scientific assistance in documentation of diversity.
- The presence of endemic, rare, endangered or threatened species and economically important ones should be highlighted.
- A locally implementable conservation plan has to be prepared for such species.



PREPARATION OF MANAGEMENT PLANS FOR INDIVIDUAL WATER BODIES

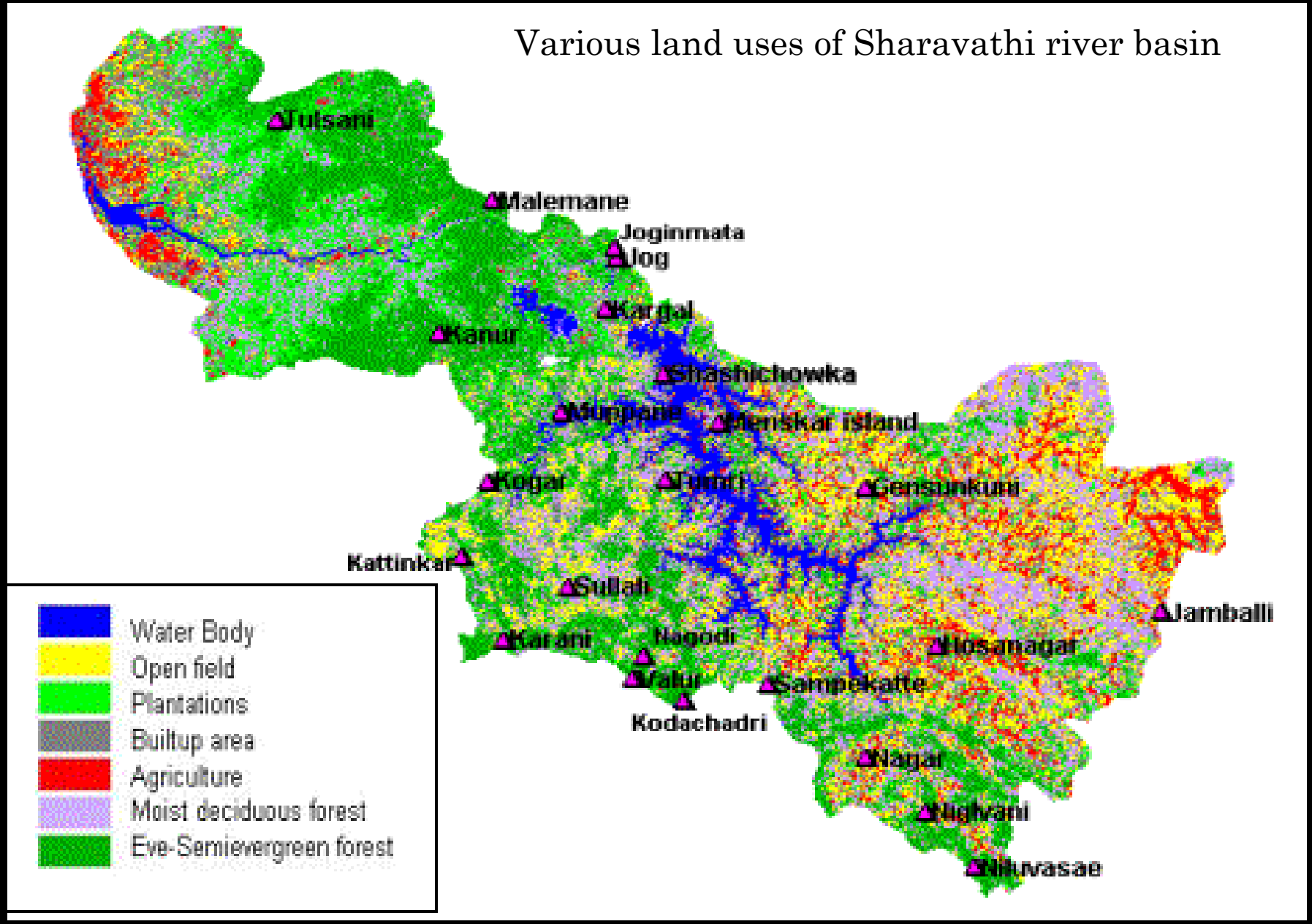
- Most large water bodies have unique individual characteristics.
- Therefore it is necessary to prepare separate management plans for individual water bodies.

PREPARATION OF ESTUARY BASED MANAGEMENT PLANS

- Estuaries are ranked among the highest productive ecosystems of the world.
- These are dynamic ecosystems of highly variable environmental factors and therefore require preparation of management plans for individual estuary.

DEMARCATION OF THE BOUNDARY OF WATER BODIES

- The existing regulations pertaining to boundary demarcations within different states need to be reviewed according to updated norms and based on geomorphology and other scientific aspects pertaining to individual water bodies.
- Maximum Water Level mark should form the boundary line of the water body.



http://wgbis.ces.iisc.ernet.in/energy/water/paper/orchid/i

Demarcation of the boundary of water bodies

- In addition, a specified width, based on historical records/ survey records etc. may be considered for marking a buffer zone around the water body.
- In case such records are not available, the buffer zones may be marked afresh considering the flood plain level and also maximum water levels.
- The width of the buffer zone should be set considering the geomorphology of the water body, the original legal boundaries, etc.
- The buffer zone should be treated as inviolable in the long term interests of the water body and its biodiversity.

MAPPING OF WATER BODIES

- Spatial Extent of Water bodies
- Spatial extent of its catchment (watershed/basin)
- Land cover in the catchment
- Demarcate Flood plains
- Identify the natural areas in the catchment
- Biodiversity inventory – capture entire food chain
- Develop a comprehensive database (spatial with attribute information)
- Identify and demarcate the region around the lake where all activities are to be prohibited (Flood plain)
- Demarcate buffer zone – with a list of regulated activities
- Ensure at least 33% of land cover is covered with natural vegetation (to ensure the lake perennial)

IMPLEMENTATION OF SANITATION FACILITIES

- To preserve the purity of waters and to safeguard the biodiversity and productivity, dumping of waste has to be prohibited.
- In addition to this, all the settlements alongside the water body should be provided with sanitation facilities so as not to impinge in anyway the pristine quality of water.

MANAGEMENT OF POLLUTED LAKES

- Bioremediation method may be preferred for detoxification of polluted water bodies.
- The highly and irremediably polluted water bodies may be fenced off to prevent fishing, cattle grazing and washing, bathing and collection of edible or medicinal plants to prevent health hazards.
- Warning boards should be displayed around such water bodies.
- Collection of any biomaterials from such water bodies should be prohibited.

VALUATION OF GOODS AND SERVICES

- Goods and services provided by the individual water bodies to be documented, evaluated through participatory approach and be made part of the People Biodiversity Registers (PBR).
- If in any case the traditional fishing rights of the local fishermen are adversely affected by lake conservation or by declaring it as a bird sanctuary, etc they should be adequately

PROTECTION OF RIPARIAN AND BUFFER ZONE VEGETATION

- Any clearances of riparian vegetation (along side rivers) and buffer zone vegetation (around lakes) have to be prohibited.

RESTORATION OF LINKAGES BETWEEN WATER BODIES

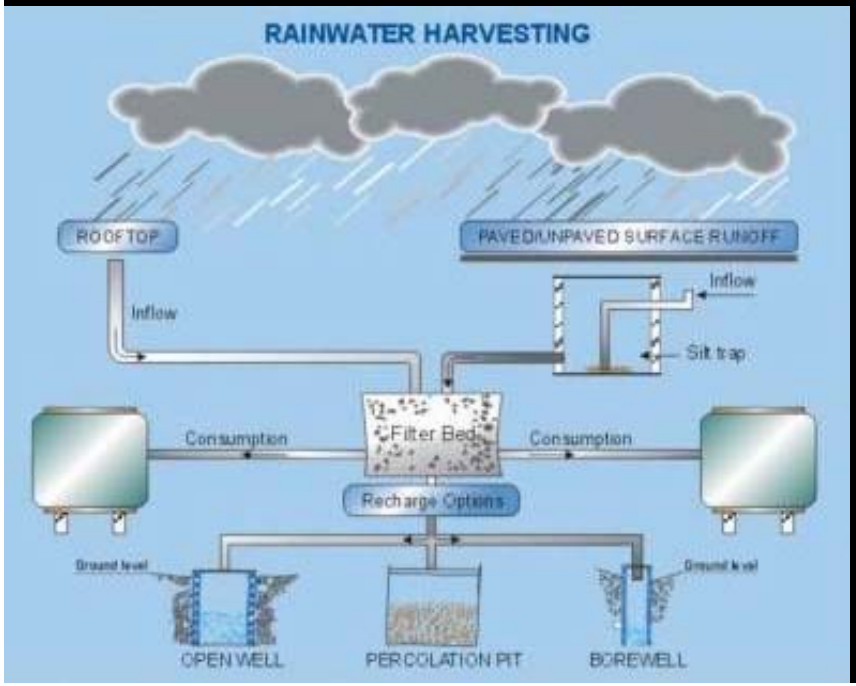
- The process of urbanization and neglect caused disruption of linkages between water bodies such as ancient lake systems of many cities.
- Wherever such disruptions have taken place alternative arrangements should be provided to establish the lost linkages.

PROTECTION OF SACRED GROVE-WATER BODY SYSTEM

- Ponds, lakes, springs, streams and rivers associated with the sacred groves were integral to the landscape management systems.
- If these groves are recognized, ecologically restored and brought under appropriate management mechanisms in collaboration with local communities, a fresh revival can happen of the water bodies associated with them.

RAINWATER HARVESTING

- Intensive and comprehensive implementation of rain water harvesting techniques can reduce taxation of water bodies and also minimize electricity requirements.



- The country needs in principle a holistic rainwater harvesting policy aimed at directing water literally from “roof-tops to lakes” after catering to the domestic needs.

CARRYING CAPACITY STUDIES FOR ALL MACRO CITIES

- Unplanned concentrated urbanisation in many cities has telling impacts on local ecology and biodiversity, evident from decline of waterbodies, vegetation, enhanced pollution levels (land, water and air), traffic bottlenecks, lack of appropriate infrastructure, etc.
- Hence, it is necessary to carryout “carrying capacity studies” before implementing any major projects in macro cities.

ENVIRONMENT EDUCATION

Brainstorming Session on Conservation & Management of Urban Lakes 26th Sept 09

URBAN LAKE MONITORING & MANAGEMENT (23rd -25th Sept 09)

Lake series Symposiums (1998, 2000, 2002, 2004, 2006, 2008 …)

Winter school – Dec 2001

Schools – EE programme

- Environmental education program should be more proactive, field oriented and experiential (with real time examples) for effective learning.
- It should be made mandatory for teachers and teacher educators at the teachers' training institutes (Tch, B Ed, D Ed)
- Experts to be involved in the preparation of resource material related to ecosystem studies and the same to be disseminated to educational institutions for monitoring surrounding ecosystems through electronic or print form in local/bilingual language.
- Implement solid waste management effectively at educational institutions level towards zero waste. (2006 recommendation)

- Government agencies, academics, institutions and NGO's must co-ordinate grass-root level implementation of policies and activities related to conservation of ecosystems (both inland and coastal), their sustainable utilisation, restoration and development including human health.
- Line agencies at the national level, like UGC, DST, DBT, MoEF, ICAR, CSIR, etc.; And at the state level, like education, science and technology, forest, agriculture, irrigation, etc.; Be suggested to integrate their activities among themselves seeking assistance from the educational institutions and ngo's. (2002 recommendation)
- Traditional knowledge and practices have to be explored as remedial measures. Cost-intensive restoration measures should be the last resort after evaluating all the cost-effective measures of conservation and management of ecosystems. (2006 recommendation)

- Ecosystem approach in aquatic ecosystem restoration endeavour considering catchment land use plan as of pre-project status and optimal land use plan shall first be prepared for short term (10 years and 30 years) and long term periods keeping in view developmental pressure over time span.
- Aquatic ecosystems restoration works taken up by any agency govt. 10% of restoration costs (per annum) spent or set off for awareness building, research and monitoring compulsorily in future through education institutions , NGO's, ... (2002 recommendation)
- Soil conservation measures based on designated and actual land use plans, compatible to climate, topography, soil type and hydro-geology of the catchment and impact of siltation on productivity of land and ecosystem values.

- Catchment areas of wetlands in general with lakes and riverine ecosystems in particular, to be protected. Large scale land cover / land use changes should be curtailed / minimized with immediate effect.
- Impact of pesticide or fertilisers on wetlands in the catchment areas to be checked.
- Regulate illegal sand and clay mining around the wetlands. (2006 recommendation)

- Immediate steps to conserve endangered wetlands such as myristica swamps
- National wetlands policy both at state and national level to be formulated and enforced.
- Identify water bodies of biodiversity importance and declare them as wetland conservation reserves (WCR)
- Marine and coastal areas to be considered as fragile ecosystems and hence should be comprehensively protected from any industrial and power generation activities(2006 recommendati

- Lake management should involve all stakeholders like public, local non-governmental agencies, etc.
- Management and maintenance of lakes to be decentralised involving stakeholders, local bodies, institutions and community participation without any commercialization or commoditization of lakes. (2006 recommendation)

- At local level, lake management authority (LMA) having stakeholders-representatives from central and state and local body authorities, NGO's and eminent people and experts shall be constituted with autonomy corpus funds from plan allocations of state and center and responsibility and accountability for avoiding excessive cost and time over runs.
- Generous funds shall be made available for such developmental works through the national committee, as mentioned above. Local stakeholders be suggested to generate modest funds for immediate developmental needs in the aquatic systems in their localities. (2002 recommendation)

- All wetlands to be considered as common property resources and hence custodians should carefully deal with these ensuring security.
- Urban wetlands, mostly lakes to be regulated from any type of encroachments. (2006 recommendation)

- Lake privatised recently to be taken over and handed over to locals immediately thus restoring the traditional access to these lakes by the stakeholders.
- Restore surviving lakes in urban areas strengthening their catchment area and allowing sloping shorelines for fulfilling their ecological function.
- Alteration of topography in lake / river catchments should be banned. (2006 Recommendation)

- Provisions to be made for adoption of wetlands by the ngo's and self-help groups for their conservation, management, sustainable utilisation and restoration.
- Centre for Ecological Sciences (CES) be the nodal agency for capacity building at all levels: formal and non-formal and govt. Officials. Students should be involved in participatory management of the wetlands. Due impetus be given on equipping the institutions with qualified environmental specialists. Teachers of the local institutions shall be trained for in-turn capacity building in their own areas, in which, aquatic ecosystems especially wetlands could serve as `field laboratories'.
- Public needs to be better informed about the rational, goal and methods of ecosystem conservation and restoration. In addition, the need was realized for scientist and researchers with the broad training needed for aquatic ecosystem restoration, management and conservation. (2006 recommendation)

- Public education and outreach should include all components of ecosystem restoration. Lake associations and citizen monitoring groups have proved helpful in educating the general public. Effort should be made to ensure that such groups have accurate information about the causes of lake degradation and various restoration methods.
- Funding is needed for both undergraduate and graduate programmes in ecosystem conservation and restorations. Training programmes should cross traditional disciplinary boundaries such as those between basic and applied ecology: water quality management and fisheries or wildlife management: among lakes, streams, rivers, coastal and wetland ecology. (2006 recommendation)

- To be cost effective, lake quality classification using appropriate parameters and values assigned on the best designated use of lake or lake system shall be prescribed as a policy guideline.
- Aquatic sanctuaries be created and tanks of religious places be declared as heritage centers for in situ conservation.
- Appropriate technologies for point and non-point sources of pollution and in situ measures for lakes restoration shall be compatible to local ethos and site condition as well as objectives of aquatic ecosystem restoration action plan (aerap). (2002 recommendation)

- There is an urgent need for creating a `data bank' through inventorisation and mapping of the aquatic biota. This task be networked through Centre for Ecological Sciences (CES) in collaboration with the sister organisations.
- All kinds of introduction of exotic species and quarantine measures be done in consultation with the concerned authorities and the data bank.
- It is suggested that, ecologically sound approach be practiced in reservoir / dam construction, keeping in view, the consequences to be faced by the rivers, wetlands, coastal areas, migrating aquatic biota and the beneficiaries. (2002 recommendation)

- Beneficiary participation from planning to operational stage be ensured including financial contribution.
- Appropriate cropping pattern, water harvesting, urban development, water usage, and waste generation data shall be utilized and projected for design period for arriving at preventive, curative and maintenance of aquatic ecosystem restoration action plan (AERAP).
- A mechanism to disseminate information on wetlands, through publications be initiated. Print and electronic media be suggested to give wide coverage of environmental issues pertaining to aquatic ecosystem. Exposition of plans of maintenance and expansions be made mandatory for all industries. (2002 recommendation)

- Legislations be formulated at the earliest for efficient and sustainable management of aquatic ecosystems. Sustainable aquatic resources development and management depends mainly on proper planning, implementation, operation and maintenance, which is possible with GIS and remote sensing techniques, complementing and supplementing ground data collection in various facets of different kinds of water resource projects. Provisions should be made for easy access and transfer of accurate information to researchers working in the aquatic systems including survey of India maps, GIS software and remote sensing data.
- It is recommended to maintain the sediment regime under which the aquatic ecosystems evolve including maintenance, conservation of spatial and temporal connectivity within and between watersheds. (2002 recommendation)

- Intersectoral systems approach is suggested for decision making regarding river basin management and integrated catchments / watersheds development.
- It is recommended for greater role and participation of women in management and sustainable utilisation of resources of aquatic ecosystems.
- Based on the concept of polluter pays, a mechanism be evolved to set up efficient effluent treatment plants [ETP], individual or collective, to reduce the pollution load. Polluting industries be levied environmental cess, which can be utilised for conservative measures by the competent authorities. A `waste audit' must be made compulsory for all the industries and other agencies. (2002 recommendation)

- A project must be initiated to assess the practicality of using the information available for increasing the oxygen content by aerating raw sewage, which encourages proliferation of phyto and zoo species (hygienic agents of nature) and the eventual cleanup process. It is necessary to see how these processes can be expedited. The situation in Bangalore offers an ideal opportunity to try out the linear treatment plants along the channels flowing out from the city.
- Regularly monitored "ambient water quality stations" need to be immediately established and run by responsive and responsible group or agencies. (2002 recommendation)

- Energy intensive, high cost mechanized systems for pollution control shall be weighed based on cost effectiveness vis-à-vis viability of operation and maintenance on a sustainable manner.
- The project reports to be subject to public access and public hearings before approved by competent authority.
- The goals for restoration of aquatic ecosystems need to be realistic and should be based on the concept of expected conditions for individual eco-regions. Further development of project selection and evaluation technology based on eco-region definitions and description should be encouraged and supported by the national and state government agencies. (2002 recommendation)

- Integrated aquatic ecosystem management needs to be implemented to ensure sustainability, which requires proper study, sound understanding and effective management of water systems and their internal relations.
- The aquatic systems should be managed as part of the broader environment and in relation to socio-economic demands and potentials, acknowledging the political and cultural context. (2002 Recommendation)

- A comprehensive action plan be chalked out immediately for taking care of health, disease and quarantine aspects of the aquatic biota. The aspects assume importance in view of the still persisting virulent disease like epizootic ulcerative syndrome (EUS) among the freshwater fishes of India . A national committee be formed to tackle such health and disease problems among the aquatic biota which has been a concern to the society as a whole. The committee be entrusted to find ways and means to control the epidemic.
- Temporary ponds be identified and their diversity explored to delineate their contribution to the society.
- Introduction of exotic fishes into lakes to be permitted only after clearance from fishery experts. (2000 recommendation)

- Declare Chilika lake, with its watershed, the national heritage site and strict implementation of time bound conservation and restoration measures. Integrated water resource management of Chilika watershed and integrated coastal management.
- Interdisciplinary, intensive monitoring and modeling of hydrological, meteorological, limnological and coastal oceanographic studies be taken by CDA.
- Reconstitution of CDA involving all stakeholders - local people (who depend on the lake for their livelihood), academicians and researchers. Constitution of a task force involving local people for regular monitoring.
- Reduction of siltation: improvement in land cover in a phased manner with appropriate land use practices. Catchment treatment with the species locally preferred (or could meet the food, fodder and fuel requirement of the local population as well as fauna).
- Measures to protect coral reefs and other aquatic flora and fauna.(2004 recommendation)

- Pollution prevention (through an appropriate design of sewage treatment plant up to tertiary level, if possible).
- Implementation of best engineered wetlands: prevention of non point source pollution.
- Rehabilitation of the local population (with proper housing, drinking water, drainage and sanitation systems).
- Ban on aquaculture (that is unsustainable from the ecosystem point of view).
- The constitution of cooperative societies involving all local fishermen and ban on over harvesting of fish resources (restriction on the size of the net, number of licenses, immediate removal of non local fishermen with unsustainable harvesting practices). Removal of contract system (middle men) and sharing of resources equitably by local people. Constitution of local self help groups.
- Prevention of oil spillage (motor boats, etc.). (2004 recommendation)

- Conservation of forests and restoration of natural forests (deforestation is the prime cause for declining water resources, etc.).
- Strict law enforcement to our waters for their preservation (life). (2004 Recommendation)

THANK YOU