INDIGOFERA scapo recto soliorum pinis ovatis ad apicem obtusis late virentibus, florum spicis erectis, floribus sparsi, leguminibus teretibus pendulis incurvis, subhirsutis.
FOCUS AREAS

- Lake and Wetland Conservation
- Water Issues & Rivers
- Unconventional Wastewater Treatment
- Biodiversity & Habitats
- Conserving Landscapes
- Sustainable Agriculture
- Geo-heritage
- Planning
- Restoration of Historic Landscape
- Listing & Documentation

Cover Page Image: Indigo Plant Illustration
Source: Biodiversity Heritage Library
https://www.biodiversitylibrary.org/page/677980#page/124/mode/1up

Side Panel Image: Cotton Fabric dyed with Indigo using the traditional Bagru-Dabu Hand Block Printing Technique
Picture Credit: Team NHD

Edited & Designed by Meenakshi Singh
From the Principal Director’s Desk

The portents for the planet are grim in the short and medium term. Years of industrial activity and living beyond our environmental means has resulted in cumulative impacts which are aggravating faster than the projections of the most sophisticated forecasting models. The scenario is compounded further by the USA being ruled by an environmentally retrograde regime which has reneged even upon the diluted Paris agreement. If major polluters will not rein in their emissions the voluntary efforts by lesser players will be of little consequence.

Climate change impacts and water shortages are by now well nigh irreversible. Retarding the rate of change and coping and adjustment strategies are the areas which now demand our fullest attention.

Closer at home the environmental scene remains as bleak as ever. While forest cover has slightly increased, the deterioration in forest quality is a cause for concern. Winter rains are now appearing to be a phenomenon of the past. The drying of rivers, the widespread loss of soil health and soil productivity, shrinking wetlands, health issues resulting from dangerous deterioration of the water-air – food quality parameters, biodiversity losses, urban sprawl, governance issues, combined with the need for development as well as providing employment on a massive scale, form a complex and tangled fabric where any step forward is more than matched by some retrograde activity.

A recent visit to Uttarakhand showed that in the name of developing an unnecessary 4 lane highway to Kedarnath, 25,000 trees, many of which were of great age, have been cut down. The target is 35,000 but on the basis of a PIL, the matter has been put under judicial stay for the moment. Which brings up the moot point – must we always resort to the Judiciary to rein in environmentally harmful activity, when common sense would suffice? It is pertinent to point out here that the National Green Tribunal is working at half its bench strength.

At the same time several positive trends are afoot. The quantum jump in renewable energy generation has established that already there is no need for further thermal power generation capacity upto 2027. In fact with right policies renewable energy could make many existing hydro-electric projects redundant as well freeing our Himalayan rivers greatly. The oncoming revolution in electrical vehicles would provide great relief from air and noise pollution. Sustainable agriculture initiatives of both the govt. and NGOs can make for climate smart agriculture.

We are convinced, however, that it is only a fundamental alteration of mindset, whereby ecological and environmental considerations are inbuilt into the development process and are valued equally, if not more than GDP growth, that the balance can be restored in favour of natural processes and natural assets.

In this vast arena of multifarious activities and actors, we at INTACH have been contributing to positive trends in a small way. Our sustainable agriculture initiative based on traditional techniques, centered around Khajuraho and Bharatpur region promises to attain a take-off stage this year. In attempting to save wildlife outside protected areas we have launched an initiative to create watering holes for wildlife, particularly chinkaras, in the western desert. Having obtained favourable orders from NGT for protection of Najafgarh Jheel we are trying to get the Haryana Admn. to adhere to the Tribunal’s directions. The Hindon River Report, completed this year, has drawn up a classic basin approach for river conservation which has leveraged INTACH into the position of knowledge partner to the Nirmal Hindon Initiative of UP Govt. A City Biodiversity Index has been drawn up for NCT Delhi – this complements our earlier work on ‘Naturalizing Delhi – A Plan to Enhance Habitats and Biodiversity’. The bioremediation work on Assi Nadi, Varanasi, has found significant resonance amongst both activists and policy makers.

These and many other works are reported upon by the dedicated scientists and planners of the Natural Heritage Division in this 5th Edition of our annual newsletter.

Manu Bhatnagar
Principal Director
Natural Heritage Division
# Table of Content

Focus Areas  
Message from Principal Director’s Desk  

State of India’s Rivers ~ Manu Bhatnagar  
Medium and Minor rivers ~ Sajid Idrisi  
Zawar and Dhinodhar ~ Abhishek Kumar  
INTACH’s Pilot project on Assi Nadi ~ Manu Bhatnagar  
City Biodiversity Index ~ Bharati Sarin  
Naturalising Jaipur ~ Nimisha Deshwal  
Thoughts on Urbanization and Water ~ Manu Bhatnagar  
Agricultural Heritage ~ Ritu Singh  
The Purpose of Life ~ Rakesh Gupta  
Mapping of Lentic Water Bodies ~ Abhishek Kr. Upadhyay  
Understanding Natural Dyes ~ Meenakshi Singh  
Saving the Chinkara ~ Manu Bhatnagar  
Nature and Poetry ~ Nimisha Deshwal  
Poems on Nature  

---

Background Image:  
The dwindling remains of Natural Heritage of Delhi -  
House Sparrow (the State Bird of Delhi) on the shores of Bhalaswa Lake.  
Picture Credit: Team NHD
Rivers in India are in a crisis. What ails the life giving arteries of our nation?

India is a diverse land mass with very varied geographies and natural conditions and thus contains several types of rivers. Officially, India has 14 major rivers, 42 medium rivers and 55 minor rivers. These are imprecise numbers. On the ground, however, the first and second order streams, whether perennial, seasonal or ephemeral, are in the thousands.

Rivers are considered dead or dying because they are unable to perform their ecological duties. Are they able to transport sediments? Are they able to recharge aquifers? Are they able to support floodplain wetlands and marshes? Can they support fish and other aquatic fauna? Can they support the holy rituals and rich cultural expressions associated with them and which form the intangible core of this civilization?

But ever since we have started considering our rivers as a source from which waters are to be extracted and into which untreated wastes can be disposed off, from then on our rivers have started their anaemic journey to extinction. In the last 4 decades, the engineering juggernaut has single-mindedly manipulated our rivers solely for construction benefits while harming rivers, environment, sustainability and more.

---

*According to most Engineers and the Hydrocracy:*

- Rivers are like a drainage system or water pipes which can be twisted/tunnelled/bent
- Water in rivers is flowing waste to the sea.
- Water can be transferred from ‘surplus’ to ‘deficit’ river basins
- Rivers can flow through tunnels instead of their natural channels!
Today we are in the tenuous position where we have to bleed some rivers in order to infuse life into drying rivers. Many rivers have now been rendered anaemic, especially in the lean season, with several higher order rivers struggling to reach the sea. **Thus, if we do not change course immediately and set about conserving our rivers then soon perennial rivers will become seasonal, seasonal rivers will become ephemeral whilst ephemeral ones will simply disappear from the map. Thereafter it is quod erat demonstrandum or swa ha.**

There exist two dichotomies in river conservation. Firstly, whilst major rivers are beginning to receive substantial attention, the plight of medium and minor rivers, which constitute the sub-basins, has largely gone unaddressed. And, secondly, where river conservation is being addressed, priority has been given to the directly visible and noticeably harmful aspect of pollution or ensuring nirmal dhara. The far more difficult issue of restoring adequate flows to rivers or unbroken flows or aviral dhara has largely been ignored or does not square with the interests of dam/canal building.

INTACH, as part of the India Rivers Week grouping [WWF, SANDRP, Toxic Links, Peoples’ Science Institute, Yamuna Jiye Abhiyan, Peace Institute], also called as IRW, have decided to create policy options and change the public discourse on rivers. On the occasion of India Rivers Week, 2016 several major initiatives were advanced. These were captured in the Conference Report released on 25th November, 2017 on the occasion of India Rivers Day held at INTACH. The Report has significant material for those concerned with the well being of Indian Rivers.

### Main Features of the Report

1. **State of India’s Rivers Report** was prepared for almost all states of the Union. What was clear from these reports was that India’s arteries and lifelines – its rivers - are being flogged almost to death by ‘development’. The overall picture is mostly gloomy and in patches ominous. It is not that there are no pristine stretches but these are mostly confined to remote areas and headwater stretches.

2. A comprehensive River Health Methodology was drawn up [still evolving] which on the basis of several parameters would classify India’s rivers or river stretches red [critical], pink [threatened], and blue [pristine/safe]. The parameters proposed provide for a holistic assessment in terms of flow, water quality, biodiversity assessment, floodplains, interventions such as dams/barrages, groundwater, catchment characteristics, cultural aspects, livelihoods. As against this, the official agencies only provide some data on water quality that is woefully inadequate to assess river health.

3. The common denominator issues which resonate across the board are :
   * Flow obstructions affecting longitudinal connectivity
   * Excessive abstraction
   * Pollution inflows
   * Diminished base flows
• Bed Mining and catchment area mining
• Floodplain embankment and encroachments affecting lateral and vertical connectivity

4. The adverse impacts show up as:
• Submergence of fertile lands and forests
• Displacement
• Loss of livelihoods
• Destruction of biodiversity [in coastal areas on mangroves and salt-water intrusion in deltas]
• Destructive pulsation of HEPs [hydro electric projects]
• Groundwater decline
• Declining power generation
• Declining agro-productivity
• Adverse climate change impacts

5. Another across the board feature is a lack of in-depth data and research done on rivers so far by official agencies and institutions – thus flow data is collected at very few locations – for less recognized rivers there is hardly any data [virgin or otherwise is hardly available]. Similarly little work has been done on river biodiversity and ecology preventing the influence of these aspects in the river debate.

6. No factoring in of climate change impacts in projections
7. Continuous trend in increasing extraction due to demands in the catchment and command
8. Increasing observations of drying up of small rivers
9. Interstate conflict is on the rise
10. And even intra state conflicts are beginning to emerge such as in Andhra, Telangana and Maharashtra
11. A major question in interlinking is – whom is it for – why proponents go to great lengths to skirt clearance framework and are hell bent on implementing projects of dubious value or outright harm
12. While the threats posed by the controversial Inter-linking of Rivers Project have never been faced squarely by its proponents, the various sane alternatives of optimization of basin resources before considering ILR have also not generated traction with the authorities. This is now compounded by the scheme of National Waterways which requires continuous dredging of rivers to maintain navigable depth. Experts have pointed out several ecological flaws in the scheme [a 111 stretches of rivers have been proposed as inland national waterways].
Emergent Recommendations

1. All dams on the main–stem as well as the tributaries and sub tributaries must be mandated to ensure environmental flow into the respective channels
2. Massive program of re-vegetation in the catchment need to be started to revive base flows
3. Some of the anicuts on the main stem as well as the tributaries need to be removed to allow reasonable free flow of the river
4. All polluting influences (industries, mining, cities) need to be brought under control
5. Integrity of wildlife areas (Sanctuaries) needs to be respected and all developmental plans that could compromise the same must be reviewed and dropped
6. Much greater effort at riverine research in particular biodiversity is neededNeed for pollution control boards to get their act together
7. The Government has shown interest in the idea of legally constituting River Basin Authorities/ organizations for better management that needs to be pushed
8. River Revival strategies should be initiated across the board
9. Planning and implementation of rejuvenation process for the entire river basin must be a totally - Decentralised bottom – up process
10. Conflict resolution mechanisms must address operations of existing HEPs
11. No mechanisation be permitted in sand removal and Sand Mining Holidays in selected degraded river stretches
12. Vegetative regeneration of river banks
13. Department of water resources must explore decentralized and non-high dam / barrage irrigation options (on farm ponds, village ponds and lift irrigation etc)
14. Department of Environment / Forests / Fisheries need to monitor the health of the rivers catchment vegetation as well as its faunal biodiversity
15. Sites of cultural, historical and archeological importance need to be conserved in compatibility with the integrity of the river system
16. Better conflict resolution mechanisms are to be evolved

A major output of the IRW was the drawing up of a River Health Methodology which, on the basis of several parameters, would classify India’s rivers or river stretches red [critical], pink [threatened], and blue [pristine/safe]. The parameters proposed provide for a holistic assessment in terms of flow, water quality, biodiversity assessment, floodplains, interventions such as dams/barrages, groundwater, catchment characteristics, cultural aspects, livelihoods. As against this, the official agencies only provide some data on water quality that is woefully inadequate to assess river health.
In addition to this, this year onwards IRW has decided to prepare river gazetteers, taking a basin approach. INTACH has prepared the first such gazetteer of a medium river, the Hindon, entitled “Reviving Hindon River: A Basin Approach”.

The Gazetteer on Hindon River, part of Yamuna River basin in North India, was released by Shri Shashi Shekhar, former secretary, Union Ministry of Water Resources, Govt of India. Each Gazetteer is expected to provide an overview of various aspects of the concerned river basin. This is the first attempt at building a **basin level picture of a medium river**. The document, we hope, would serve as a first template subsequent gazetteers on other rivers. The report is divided into five chapters has five annexures, 158 images, 75 maps (pullout maps are additional) and 77 tables.
1. Rivers in India are facing crises from multiple and enduring threats. Major rivers are regularly making the news and receiving some attention from official circles although their data is scarcely available in the public domain. On the other hand, the plight of medium and minor rivers receives little or no attention with consequent humongous data gaps – they are at the mercy of Irrigation Departments for merciless bleeding and exploitation or for callous disposal of untreated effluents.

2. So far river conservation has focused on river pollution with its visible impacts, foul odours and colours, a spike in water borne diseases, contaminated surface and groundwater. These aspects immediately grab media attention.
3. The aspects of adequate minimum flow, riverine biodiversity, riparian areas and floodplains, cultural and livelihood aspects find no resonance. Without addressing these issues river conservation cannot take place holistically and the rivers cannot be restored to vibrant healthy status.

4. The basin is a socio-economic-ecological landscape. All river issues can be scientifically addressed only through a bottom up basin level approach [BU-IRBM]. The world over basin organizations are being formed to derive a rational balance between river use and development needs of the basin. In spite of the National Water Policy of 2012 advocating a basin approach for river management authorities are averse to forming watershed to basin organizations for the probable reason that no concerned organization, departments, administrative jurisdiction or political authority is willing to subordinate itself to an overarching, community driven basin authority which will constrain them to respect the basin hydrology and ecology.

5. There are hardly any river conservation models within the country and the few external models are not relevant to Indian conditions. Moreover, although the National Water Policy has spoken about the need to adopt a basin approach, such holistic planning will take a long time to be implemented with no observable initiatives and certainly, on interstate rivers, does not seem to be on the horizon.

6. Hindon is a medium river, where for the first time basin level data has been assembled in a narrative which provides a basin level approach to river conservation. The exercise has thrown up interesting issues about data limitations especially historic data. The use of rivers as water transfer canals, upsetting the entire eco-system, has created a situation where there are neither fish nor fowl i.e. neither wholly a river nor wholly a canal.

7. The implementation of the elements of the basin level approach recommended through this conservation plan are going to be a long drawn and difficult exercise visualized over a time horizon of 15 years even as the climate patterns are in a state dynamic adverse flux. The results would be beneficial to adjacent basins as well.

8. The small INTACH team engaged in drawing up this document has had its hands full and the effort has only highlighted the arduous energy required to conserve India’s several hundred streams and rivers. The document has benefitted by the guiding light of the holistic River Health Assessment methodology developed by the India Rivers Week. As a first attempt of its kind there would be several shortfalls which, we hope, can be remediated in due course with expert advice.
In the wake of climate change and consequential environmental crisis, rivers are being seen as major subject of deliberations. While there have been considerable focus on major rivers as a result of media attention and civil society activism, the plight of medium and minor rivers and thousands of seasonal or ephemeral streams often goes unnoticed. Lack of data and scattered studies do not provide any holistic picture for any intervention.

Ever increasing demand for water due to population growth, urbanization and changing lifestyle pose serious challenges to water security, and rivers are increasingly getting threatened due to large scale pollution and water abstractions. The National Water Policy of India, 2012, states that "large parts of India have already become stressed. Rapid growth in demand for water due to population growth, urbanisation and changing lifestyle pose serious challenges to water security".

As per Central Pollution Control Board [CPCB] 2015 report, half of the India’s river are polluted and fall in Class C [unfit for drinking and bathing]. Out of 445 rivers, 275 have polluted stretches facing govt. as well public apathy.

Medium or minor rivers have either completely dried, lost or polluted beyond recognition turning into 'nallahs' (drains) especially in urban cities. For instance, courses of Katha River in western Uttar Pradesh and Sahibi River in Rajasthan are now difficult to trace. Mithi River (Mumbai), Musi River (Hyderabad), Mula Muthe (Pune), Numbul River (Imphal) are bearing the brunt of urban sewage disposal beyond their capacities. Quite noticeably, situation further exacerbates leading to lowered ground water table and its contamination posing higher risk to public health.

Healthy and unclogged minor streams and drains provide resilience to cities from floods and help in ground water recharge besides providing innumerable ecosystem services. Recent urban flooding events such as flooding in Chennai (Dec 2015) and Srinagar (Sept. 2014) due to excessive
downpour happened largely due to clogged minor streams and encroachment of smaller water bodies and depressions.

Ecosystem services provided by streams and rivers have always been neglected by the society. Besides many economic, ecological and regulating services, these smaller rivers and streams have been important part of our culture and society. In the rural landscape of India, such smaller rivers and streams provide the much needed avenues for community gatherings, religious and cultural ceremonies including holy bathing. Currently, there is clear socio-cultural disconnect due to high degree of pollution in the rivers.

There is an urgent need to study such medium and minor rivers and their secondary and tertiary channels. Even Ganga River Notification of 2017 recognises the tributaries of the tributaries of the Ganga River, considering their importance in the river revival process. The revival process should consider two interlinking aspects i.e. water quality health as well as flow. While several aspects of the river have been identified and some studied, there are as yet no comprehensively organized studies which lead to an action plan. Based on all the studies so far and with thorough surveys, including building a baseline of the earlier condition [based on resource persons and secondary literature], there needs to be a comprehensive revival plan which also takes into account the flood-plains and tributaries.

Keeping this in mind, Natural Heritage Division of INTACH, recently carried out study on Hindon River, which is a tributary of Yamuna River and one of the most polluted minor rivers in India. Hindon is a 400 km long rain fed river with a catchment area of about 7083 sq. km - originates from upper Shivalik region in the lower Himalayan range. Study emphasised on the basin level factors with illustrative maps and conservation recommendations. The detailed study is hoped to help plug information gaps and assist in its conservation with the major objective to empower sound decision by govt and public authorities.

Various conservation and humanitarian organisations in India may take up the initiative of studying several medium and minor rivers and their seasonal and ephemeral streams, which would be helpful in tackling larger problems associated with water availability and usage. Improved condition of smaller rivers and their tributaries would have positive cascading effects on large rivers of the country.
M. Brocx has defined in his publication, Geoheritage from perspectives to local principles for conservation and planning, geoheritage as "Globally, Nationally, State-wide, to local features of geology such as its igneous, metamorphic, sedimentary, stratigraphic, structural, geochemical, mineralogic, Palaeontologic, geomorphic, pedologic, and hydrologic attributes at all scale, that are intrinsically important site or culturally important sites, that offer information or insights into the formation and evolution of the Earth, or into the history of science, or that can be used for research, teaching or reference".

In the view of Australian geologist Elizabeth Maud McBriar, geoheritage focuses on the diversity of minerals, rocks and fossils, and petrogenetic features that indicate the origin and alteration of minerals, rocks & fossils. It also includes landforms and other geomorphological features that illustrate the effects of present & past effect of climate & earth forces. The United Kingdom is considered as the birthplace of the idea of geoheritage and geo-conservation due to its history and its leadership role in preservation of geological sites. The first reference to the term geoheritage as such was used at the 1993 conference held in The United Kingdom - The Malvern International Conference on Geological and Landscape Conservation. The United Kingdom today has taken the initiative to integrate the knowledge of geoheritage with education, tourism, planning and management.

UNESCO lists 100 geoheritage parks across the globe out of which 27 belong to China while India's count is still zero. The issue in India’s context is not the absence of naturally occurring geological marvels but the presence of rampant destruction and disregard for our existing geological heritage. There is no mechanism in place to recognise and protect these sites as "Geoheritage Sites", though GSI (Geological Survey of India) has identified 26 geological sites over the years and tagged them as "National Geological Monuments".

There is an immediate requirement for a legislative safeguard to protect such sites. Ministry of Mines and Minerals needs to be given the responsibility to recognise and understand the scientific value of the site’s geological features, and using this knowledge to protect, conserve and acknowledge these sites as "Geoheritage".
Similar to the case of United Kingdom mentioned previously, geoheritage sites could be cooperated with tourism department, schools & colleges to raise awareness among students, and with development authorities so that these sites can be considered while planning process. Geo-tourism is a new model of tourism that focuses upon a site’s wealth in terms of its minerals, rocks, fossils and landforms. This endeavour can be promoted by the tourism departments to spread awareness among people about the value and relevance of geoheritage sites. Geo-tourism will also establish a fresh revenue stream and generate livelihood opportunities for local people.

INTACH has been working in this field for quite a while and prepared a monograph in 2016 on "National Geoheritage Monuments of India". In this document, INTACH proposed a draft geoheritage law for the conservation of the concerned site along with a format for recording geoheritage sites prior to its inclusion in the database. Presently, INTACH is initiating work on individual geoheritage sites such as Zawar in Rajasthan and Dhinodhar hill in Gujarat to highlight the potential of the area.

Zawar is a zinc mining site located 40km south of Udaipur along the NH-48. Zawar falls in the southern part of the Aravalli mountain range. Evidence present on site, shows continued mining and smelting activities at Zawar starting from the 8th century BCE. In the history of the world, Zawar witnessed the very first smelting process to obtain zinc. Alongside, the site is rich in archaeological remains. Zawar has 80-90 ruins of ancient temples of Hindu and Jain faiths spread all over the region. These ancient temples are fine representatives of the architecture of their time. The inscription on these temples give details about the history of this region. The presence of these temples also indicate towards the existence of ancient settlements in these areas. The site also has walls made of retorts and several mounts of retorts/slag exist all over area. The presence of the ruins of the old Tidi dam across the Tidi river and the Old Zawar fort on top of a nearby hillock adds to the importance of the site.
Another important geological site, Dhinodhar hill is located in the heart of Kutch. Dhinodhar hill is an exposed magma chamber that serves as a dramatic remainder of the first episode of the Deccan outburst. The hill is located 60km north west of Bhuj in Nakhatrana taluka, spread over approximate 225 ha. It is under the authority of the state govt. Dhinodhar Hill is famous among local people primarily due to the presence of a small domed temple called "Dhoaramnath Shrine" on the hill at an elevation of 378 mamsl. The knowledge of the geological importance of the hill is still not widespread among people. The hill is a volcanic plug formed by the hardening of melted rock from earth's magma inside an abandoned and eroded volcano. The rocks have a striking pattern of columnar jointing in basaltic flows and exhibit a unique arrangement. This site would be extremely significant for palaeontologic, geomorphic, stratigraphic and pedologic studies.

Due to the lack of any mechanism whatsoever to recognise and protect our geological heritage, these geoheritage marvels are rapidly losing their importance and character. INTACH is presently in the process of identifying the morphology of these geoheritage sites and bringing it to the notice of concerned administration. Simultaneously, INTACH is also preparing the conservation & tourism enhancement plan for these sites. INTACH is working and looking forward to protecting and regaining our nation’s vast wealth of geoheritage sites.
High pollution load in holy River Ganga at Varanasi is due to domestic wastewater flowing into the river through 33 nallahs and rivulets. Sewerage systems and treatment plants are going to take several years to be effectively in place. In the meantime the river will continue to remain polluted. Based on its experience in Delhi and Agra, INTACH initiated a month long pilot project for cleaning waste water flow in the 3.5 km long Assi Nadi meandering through densely populated areas, using the process of bacterial bio remediation.

The water is fast flowing owning to the elevation difference of 27 m. between origin and river level. The Pilot project consists of making 4 weirs (HDPE bags filled with boulders/chips), coir log filters at 20 locations, plastic media in gabion cratons (for providing surface shelter to bacteria). These fixed works increase detention time of the water as well as provide filtration effect on suspended solids. The most potent action however is the dosing of 100 litres of bacteria concentrated (including anaerobic strains) 7 locations that degrades organic pollutants, enhances dissolved oxygen levels, and removes odours.

Interaction with residents along the Nadi indicated their relief from the foul odour and their positive impression of water quality improvement. Regular bathers at Assi Ghat also vouched a palpable improvement in the water quality. Laboratory tests are now awaited to confirm measurable improvements.

It is expected to remove at least 70% of the pollution load at a fraction of the cost of conventional arrangements. During the course of the work it was observed that in the absence of garbage removal, most of the area solid waste is dumped into Assi Nadi. The lesson for Varanasi is clear:

- There needs to be strong emphasis on Municipal solid waste collection and removal
- Landscape elements and aquatic plants need to be planted along the banks and in the water courses wherever possible
- Filtration and settling elements on the courses of all water sources out falling in the river along with bacterial bioremediation can have a salutary effect on reducing pollution in River Ganga.
- These arrangements can continue till capture of generated sewage and its treatment is not effectuated by other means
- The cost of this treatment annually would be around Rs. 3 crores.
- In contrast conventional treatment would require Rs. 75 crores of capital cost, plus land cost for 10 ha, plus annual operational cost of Rs. 12 crores, plus laying of sewer lines from individual houses as well as trunk sewer lines, a matter of few years.

~ ~ ~ ~ ~
Biodiversity starts in the distant past and it points toward the future.

—Frans Lanting

City Biodiversity Index (CBI) is an innovative self-assessment tool to measure biodiversity in cities and monitor conservation efforts over time. For an expansive urban sprawl of Delhi, the calculation of CBI would highlight the noteworthiness of biodiversity component in various regulating and supporting ecosystem services provided by urban biodiversity such as regulating local climate and air quality, and providing aesthetic and recreational spaces.

Evolution of the City Biodiversity Index

The Convention on Biological Diversity (CBD) was put into effect on 29 December 1993 with an aspiration towards conservation and sustainable use of components of biological diversity. Additional aim was fair and equitable sharing of the benefits arising out of utilization of genetic resources. National Biodiversity Strategies and Action Plans are the crucial instruments for effectuating the Convention at the national level.

India ratified the Convention in 1994. The Conference of Parties (COP) is the governing body of CBD. At the ninth meeting of the Conference of Parties to the Convention on Biological Diversity (COP-9), Germany (2008), Mr. Mah Bow Tan (then Minister for National Development of Singapore) commended attention the development of CBD-led City Biodiversity Index. Secretariat of the CBD (SCBD) and National Parks Board of Singapore (NParks) conducted the First Technical Expert Panel workshop in 2009. In the subsequent year, members of the Global Partnership on Cities and Biodiversity with SCBD, worked towards test bedding the City Biodiversity Index on various cities. In the Second Technical Workshop in March, 2010, the development of CBI as an evaluation tool was deliberated and its indicators were refined to be executed for gauging and estimating biodiversity in urban pockets. The presentation for the acceptance of the CBI was made at CBD COP-10, Nagoya (Japan). Concomitantly, the parties to the CBD adopted strategic plan for Biodiversity 2011-20 at COP-10, including twenty practical and enterprising targets under five strategic goals also known as Aichi Biodiversity Targets (October, 2010). The CBI was also named the Singapore Index on Cities’ Biodiversity, or Singapore Index (SI). The United Nations General Assembly at its 65th session declared the period 2011-20 to be the “United Nations Decade on Biodiversity, with a view to contributing to the implementation of the Strategic Plan for Biodiversity for the period 2011-2020”. The Greater Hyderabad City acted as a host for the eleventh meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 11) (October, 2012). The Greater Hyderabad Municipal Corporation also released the “Greater Hyderabad Biodiversity Index” at this international event.

The two parts of the CBI consists of:
1. Profile of the city
2. Twenty three indicators that measure native biodiversity, ecosystem services provided by biodiversity, and governance and management of biodiversity.
### NATIVE BIODIVERSITY
- Proportion of Natural Areas in the City
- Connectivity measures
- Native Biodiversity in built up areas (Bird Species)
- Change in number of Vascular Plant Species
- Change in number of Bird Species
- Change in number of Butterfly Species
- Change in number of Species of Group 1 (any other taxonomic group selected by the City)
- Change in number of Species of Group 2 (any other taxonomic group selected by the City)
- Proportion of Protected Natural Areas
- Proportion of Invasive Alien Species

### ECOSYSTEM SERVICES PROVIDED BY BIODIVERSITY
- Regulation of quantity of water
- Climate Regulation: Carbon Storage and Cooling Effect of Vegetation
- Recreation and Education: Area of Parks and Natural Areas
- Recreation and Education: Number of Formal Education visits per child below 16 years to Parks with Natural Areas per year

### GOVERNANCE AND MANAGEMENT OF BIODIVERSITY
- Budget allocated to Biodiversity
- Number of Biodiversity Projects implemented by the City annually
- Existence of Local Biodiversity Strategy and Action Plan
- Institutional Capacity: Number of Biodiversity related functions
- Institutional Capacity: Number of City or Local Government Agencies involved in Inter-agency Co-operation pertaining to biodiversity matters
- Participation and Partnership: Existence of Formal or Informal Public Consultation Process
- Participation and Partnership: Number of Agencies/Private Companies/NGOs/Academic Institutions/International Organisations with which the city is partnering in Biodiversity Activities, Projects and Programmes
- Education and Awareness: Is Biodiversity or Nature Awareness included in the school curriculum
- Number of Outreach or Public Awareness events held in the city annually

---

Table showing twenty three indicators of the City Biodiversity Index
INTACH in the year 2017 initiated the calculation of CBI for Delhi. The score of the first indicator is to be determined by quantifying the proportion of natural areas in the city. The data for the area of the natural ecosystems in Delhi is being compiled using reports published by INTACH, various government agencies (Delhi Parks and Gardens Society, and, Delhi Government Forest Department), and, satellite imagery (Google Earth Pro). Along with the natural terrestrial ecosystems, the area of the water bodies will be taken into consideration. Delhi has been reported to have 450 water bodies (both urban and rural). Though various government agencies are responsible for the management of these natural reservoirs— they are either polluted or have shrunk in size (in comparison to their previous size). The change in size of these water bodies has been observed using the satellite imagery. Undeniably some of these have dried up completely or usurped owing to residential and commercial needs of the growing population.

The calculation of CBI is advantageous in providing a ready check on the size and quality of biodiversity of the city at the local level. By the end of 2012 more than seventy cities of the world were in different stages of applying the index in conformity with their unique natural conditions. The indicators in themselves can act as a policy-making tool. CBI is not a mechanism to compare two cities, as different metropolitan areas are located in varied climatic zones with a history of their development stipulating human intercession in cities’ biodiversity and ecosystem nor it is a single time assessment. The policy priorities which could be framed based on the initial baseline measurement of the biodiversity can help identify gaps in biodiversity management and monitor progress in reducing the loss of urban biodiversity. Indicators can be used for master planning of new districts. The indicators can act as guidelines to design strategies and local action plans for conservation, enrich the biodiversity in cities and check the loss of biodiversity as mapped out in the Aichi targets. It helps to identify gaps in data generation. Moreover, the data collected for the calculation of indicators can act as the biodiversity database. Areas of weakness can be identified as scores are calculated for each specific indicator. Cities’ data will be extended towards global assessment of urban biodiversity trends in future editions of the City Biodiversity Outlook. Though the Singapore Index was initially devised as a monitoring tool at the city level however it is not restricted to the cities and can be employed at different scales, for instance, sub-city level, regional or state level. The city’s results can make headway in aiding National Governments where city’s contribution to biodiversity can be included in national reports to the CBD. The idea of applying CBI can lead to a networking of NGOs, government agencies and academia exchanging and sharing details on measuring biodiversity. It could also serve as medium of awareness for a better communication between the citizenry and administration to conserve locally important species and ecosystems.
As the political and economic capital of the state of Rajasthan, Jaipur is one of the fastest growing cities in India. Popularly known as the ‘Pink City’, Jaipur is known for its rich cultural and natural heritage. Since 1975, the city has continued to expand southwards due to presence of hills on the northern and eastern edge acting as natural barriers. The city has expanded from a 390 sq.km. area (1976 Master Plan) to an expansive 1959 sq. km with 326 sq.km as the urbanized core city area and additionally 64.57sq.km. of satellite and inner ring towns.

Jaipur’s expansion over the years has swallowed productive cropped area, fallow land and degraded forest. The development of satellite towns (Sanganer, Bagru, Chomu, Achrol, Kanota, Shividaspura, Chandlai, Bassi, Kookas, and Jamwa Ramgarh) has intensively fuelled deforestation and mining activities creating lasting damage on the reserve forests of Nahargarh and Jhalana. The Master Plan of Jaipur, 2021 has noted that the forest cover has reduced by 50% from 1950 to 2010 with a lot of forestland being regularly diverted to mining, roads/railways and thermal transmission lines.

The city that was once famous for its orchards, gardens, water canals and diverse flora-fauna is now left to flounder with scattered patches of greens and a near dead river. The Amanishah Nallah which was once the provider of clean water now bears the sole burden of carrying the waste effluents from the Nahargarh reserve forest and the Vishwakarma Industrial area before leaving the urban area to join the Dhund River below. Over the years the city has witnessed a degradation in its natural environment due to water depletion, decrease in forest cover, soil erosion and unfavorable changes in the diversity of flora and fauna due to many human authored factors as well as climate change.
There has been a notable change in the formation of Urban Heat Islands (UHI) in Jaipur. The term "heat island" describes built up areas that are hotter than nearby areas. Heat islands can affect communities by increasing summer time peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.

UHIs can be mitigated with concerted efforts in greening the urban regions.

* Increasing tree and vegetative cover;
* Creating green roofs (also called "rooftop gardens" or "eco-roofs");
* Installing cool—mainly reflective—roofs; and
* Using cool pavements

The report ‘Naturalising Jaipur’ thus is an attempt to build upon the natural and built history of Jaipur and find connections and linkages that will help in the revitalisation of Jaipur’s greens and consecutively its urban biodiversity and habitat. The proposals in the report can also pave way to strengthen the climate resilience of the city. This document does not end with homilies but has gone on to produce a map of the Jaipur depicting the various potential patches and corridors in detail. The map would have possibly captured >95% of the feasible sites excluding the vast number of individual buildings and house level gardens.

The map consists of 13 main layers marked with lines and polygons. Other 3 boundary layers include Jaipur Urban Boundary, District Boundary and Block Boundary. The layers are:

1. Highway Tree Strip: Tree strip along all major highways entering Jaipur
2. Local Nature Reserve [LNR]: All large green campuses including Universities, Institutions, Sewage Treatment Plants [STP's], Water Treatment Plants [WTP's], Common Effluent Treatment Plants [CETP's], Hospitals etc.
3. Gram Sabha Land [GSL]: All Gram Sabha Lands around villages
4. Power Station and Fly ash Dumping Site [PS]: All power stations and flyash dumping sites.
5. District Park [DP]: All district parks in Jaipur
6. Regional Park [RP]: All regional parks in Jaipur
7. Protected Area [PA]: All protected and nature reserves such as Reserve Forests, Biodiversity Parks, and Wildlife Sanctuaries.
8. Ecosystem Service Area [ESA]: All large green areas, which do not come under any category, with significant vegetation, support biodiversity and provide ecosystem services to the city have been marked under ESA.
9. Lakes, Village Ponds, Depressions, and Quarries: All large and small water bodies, such as lakes, village ponds, depressions, quarries have been marked.
10. Heritage Sites: All heritage sites with significant green cover and natural vegetation
11. Drain Floodplain [DP]: Floodplain area of Amanishah Nalla at both left and right bank SW Channels & Riparian Buffers: Storm water channels, drains, irrigation channels, along with riparian vegetation
12. Railway: Railway tracks along with vegetation and barren lands

~ ~ ~ ~ ~
Q. Urbanisation is on the rise and consequently the rise of construction activities. A major impact of this has been the depletion and disappearance of small and large water bodies of any settlement that are getting filled up for construction purposes. The consequence of this is being experienced now with urban flooding and drying up of water sources. How can this issue be addressed by planners and policy makers?

MB: Pattern of rainfall has now changed from long drawn events to brief intense and even extreme events. Extensive concretization and inadequate soft surfaces leave the water no place to percolate. So while the aquifer depletes due to over exploitation, on the surface damage to property, life and economic losses occur.

Waterbodies and low lying areas moderate floods while simultaneously storing the monsoon bounty as a local resource and adding to the quality of life. In this era where India is transitioning from a predominantly rural to an urbanized country powerful lobbies see lands with high ecological and hydrological values in terms of real estate values based upon their proximity to existing developments and infrastructure. They frequently get their way.

Planners too, in general, have little knowledge of waterbody processes. Merely marking a blue blob on the landuse map is not enough to save a waterbody for a waterbody cannot be seen in isolation of its catchment. Urbanization is the process of colonization of the natural watershed. The hydrological processes in the landscape must be understood and respected by planners. Planners also need to pay heed to National Disaster Management Authority's guidelines on urban flooding and desist from allowing construction in low lying areas.

2005 Mumbai Floods, the city suffered due to unplanned development & inefficient drainage system as well as destruction of mangrove ecosystems which provide buffer between land and sea.
(Source: https://d1u40o4r13yy8.cloudfront.net/75ca8220-57b7-44c0-887e-cdaa0e172061.jpg)
In these times on increasing water scarcity planners in local planning authorities need to assert the hydrological values of lands based upon inputs from hydrogeology and topography. Meandering natural drainage channels, waterbodies and need to be respected and protected in the urban landscape. Lineaments and paleochannels [identified through remote sensing] should remain unbuilt upon as groundwater recharge gateways. Thus, the watchword should be hydrological sensitivity in landuse planning. This will also bring a measure of reliance upon local resources in a world where the water resource is increasingly contested - witness interstate and intersectoral conflict as well as anaemic rivers.

Policy makers need to revisit ‘Report of Sub-committee for Development of National Sustainable Habitat Parameters on Urban Stormwater Management’ in order to enhance the availability of local water resources. The report recommends that at least 2% - 5% of urban land may be earmarked for water storage. Increasingly this may not be enough and percentages may be raised to offset the increasing runoff from increased hard surface cover. Waterbodies and low lying lands would thus store the water as a resource which is otherwise seen as a bane in terms of water logging and flooding.

Q. Crores of money has been spent over the decades, on river cleaning action plans. But our rivers are still extremely polluted and in some cases on the verge of drying up. Since cleaning the rivers require huge infrastructure in terms of interceptor sewers and treatment plants, how can we mobilize the required funds to meet these costs? How do we address the cultural and behavioural characteristics of the population using the rivers, as also the current landuse along the entire course of the river, which contributes to a large part of the pollution?

MB: The assumptions loaded in the question are questionable. Do we need vast investments in sewerage and sewage treatment plants? Do we need to “change public behaviour towards using the rivers” or do we need to change the pattern of abuse to which our local bodies have subjected the rivers? The fact is that the approach towards rivers in India has been determined by the hydrocracy and public utilities which are driven by an engineering and capital intensive approach. The heavy and fruitless investments are a milch cow for many and these authorities are least interested in low cost and low time lag solutions which encroach upon their turf.

Why is there low flow situation in our rivers? Why are summer seasons witnessing dried channels even in major rivers like Godavari? This is because we are abstracting excessive amounts of water from the rivers as well as from aquifers. As an example let us take the case of Yamuna River. AS the river comes into the plains the Tajewala Barrage diverst the waters into the East and West Yamuna Canals leaving little flow into the river channel. At Delhi significant amount of water is abstracted at Wazirabad Barrage. At Okhla Barrage water is diverted into Agra Canal and Gurgaon Canal. All that is left in the river is the sewage and industrial effluents much of which is untreated.

Rivers lean season flow also consists of seepage from aquifers. However, with overexploitation of the groundwater the falling water tables are unable to augment lean season flow in the river. 80% of water used in India is going to irrigation - the productivity of irrigation water in India is a fourth of the USA and half of China. Our domestic and industrial usage has also plenty of scope for efficiency.
As an example Tata Steel has reduced their water consumption in steel production from 14 tons to just 6 tons of water per ton of steel. In domestic usage low flow taps, atomizers, dry toilets can bring down water demand drastically. Efficiency combined with recycling of treated water [Singapore even treats sewage to potable levels] urban and industrial demand can enormously reduce its footprint on the rivers and aquifers. In agriculture restoration of soil health, use of organic fertilizers, appropriate crop rotation, appropriate choice of crop [based on local natural resource endowment] can not only halve water input but also reduce input costs with resultant better margins to farmers. Reduced water demand would reduce impact upon water tables and enable aquifers to restore lean season flow to rivers.

With urban efficiency reducing demand the overall sewage generation would significantly reduce. With recycling most sewage would become a resource and not be thrown into the river. Dry toilets, decentralized sewage treatment [constructed wetlands, soil bio-technology, bioremediation, advanced septic tanks and baffle reactors] would curtail the flow of sewage to rivers.

Given the vast array of options which can be deployed quickly pollution in rivers can be reduced significantly in double quick time and with vastly reduced capital and O & M costs.

Policy makers need to lay out directives freezing capital and energy intensive centralized technologies in favour of decentralized demonstrated and proven technologies to obtain expeditious results on river pollution. And as water efficiency improves, abstraction of water from rivers needs to be brought down to restore flows. This would have to be accompanied by decommissioning a number of these ecologically destructive dams and barrages.

Q. Do you think it is time to move from urban planning to introduce planning norms for rural areas, since the rural areas form a major part of the catchment areas of rivers, and are also severely affected by floods and droughts?

MB: Villages are towns in embryonic form. Timely planning can help them become well planned towns. Disaster zoning would be especially important in flood prone areas.
Q. Tourism is often considered a channel for economic development and growth of a town/region. Do you think that we have not adequately assessed the flip side of the growth of tourism and are therefore now facing the consequences, especially in the hilly areas of the country? Should India also consider imposing limits on tourism, as is being demanded in some parts of Europe?

MB: A balance needs to be struck between quantity and quality. Excessive numbers damage the fragile ecology of hill areas. Revenue generation alone cannot justify the cost benefit analysis. The cost side does not show the unmonetized costs to the ecology. Nainital, for eg., a town of 50,000 is receiving 40,000 visitors per day in the season along with 10000 cars. The High Court has directed a fixed number of vehicles only to be permitted and hotels without parking facilities to be shut down. Uttarakhand has also regulated the number of visitors to the Char Dhams. Shimla, Panchgani, Darjeeling are all reeling under tourist stress. So definitely time has come to impose limits to the number of visitors and disperse them to new locations and attractions.

Q. Rainwater harvesting has been made mandatory in some states. What have been the definite benefits of adopting rainwater harvesting? Has the availability of water resources and water management been better in these states in comparison to the other states?

MB: Urban water harvesting has yet to show significant results. This is because small water harvesting pits are ill-maintained. Area based water harvesting at colony and campus level can show better results. Simply keeping large surfaces soft or under porous paving can yield good recharge. Water harvesting through large depressions, waterbodies and lakes can show excellent results. Restoration of ponds in rural areas of Maharashtra [such as Latur] and Rajasthan has resulted in significant decline of distress calls for tankers.

Q. Non-revenue Water is significant in large cities, while small cities face water scarcity. How would you like this issue to be addressed? Is water metering one of the solutions? What could be the options for improving universal access to drinking water?

MB: The issue affects the economically weaker sections. This segment actually uses available water with utmost efficiency. Under Article 21 Col human right to water is recognized and India is also a signatory to UN resolution guaranteeing water for all. The state has to step in to providing 50 litres of water per day per capita in slums and EWS and LIG areas while reducing distribution inequities. In Karnataka pilot projects have curtailed distribution losses and provided slum areas with 24 x 7 water supply against payment successfully - clean water supply at the doorstep has significant offsets in terms of health costs and opportunity cost.
Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas, with more than 50% of the rural households depending on it. It also contributes a significant figure (about 17%) to the Gross Domestic Product (GDP). Sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies such as soil conservation, sustainable natural resource management and biodiversity protection, is essential for holistic rural development. Indian agriculture and allied activities have witnessed a green revolution (development in crop production, mainly wheat), a white revolution (development in milk production), a yellow revolution (development in edible oil production) and a blue revolution (development in fisheries and aquaculture).

At the same time, the plight of farmers is not unknown to us. Farmer suicides are on the rise all over the country. High input costs and low market prices are pushing the farmers into an unending debt cycle taking their toll on the farmer community resulting in mass migration, crimes and suicides. Even as the country planned and executed several policies as part of green revolution for farmer welfare, the results of these programmes and policies proved to be counterintuitive.

Conventional agriculture propagates mono cropping, irrigation supplementation, high yielding seeds developed under laboratory conditions and intensive use of chemical fertilizer and pesticides. Thus, cultivation is dependent on high external inputs with high input costs. Conversely, traditional agriculture was based on crop diversity, multi / mixed cropping, organic inputs to soil, crop rotation, protective irrigation during dry spells and seed conservation.
Dominance of finger millet, pearl millet, sorghum and little millets is commonly observed in the archaeological findings. The findings also suggest that a network of regional farmers supplied assorted farm produce to the markets of the civilisation's ancient cities.

Keeping diversity in crops and cultivating them as per climatic suitability is key to secure agriculture production even today. Both these factors are lacking in conventional agricultural systems focusing on mono-cropping and constant irrigation supply. Cultivating crops in rotation, in accordance with the prevailing climate and soil condition, helps in maintaining soil texture and health, consequently minimizing the need for fertilizer inputs. Further, native seeds and landraces of the common crops are resilient to vagaries of climate. In Bundelkhand we have observed that local desi seeds are surviving much better than high yielding varieties. These seeds require lesser resources in terms of water (irrigation), fertilizers, pesticides, are resilient to long dry spells as well as flooding and are pest resistant – common problems in conventional industrial agriculture. These native seeds and traditional practices are our Agricultural Heritage. The need of the hour is to conserve and popularise this heritage for the benefit of farmers and our food security.

Given the constrains due to shift in rainfall pattern – decreased number of rainy days and higher intensity of rainfall – resulting in dry spells and flooding both, native seeds provide a solution. Along with addition of organic matter to soil – to ensure soil health – this provides a solution for adaptation to climate change.
Several lessons from our Agricultural Heritage are -

a. Seed conservation: As native seeds evolve in the region locally and are adapted to it, they are hardy, climate resilient and have higher germination potential. Thus, farmers can save their own seeds and reduce dependence on external systems.

b. Soil health: farmers can maintain soil health by adding manure to soil, cropping as per soil suitability, crop rotation and mixed cropping. Healthy soils are resistant to erosion and flooding.

c. Millets: along with wheat and barley (both winter crops) millets were significant grains consumed since Harappan times till recently. Millets not only grow with minimal resources and are rainfed crops, these also provide biomass and conserve the soil and environment.

d. Time of sowing: traditionally sowing was undertaken as per onset of monsoon. There were traditional monsoon prediction systems that often worked and sowing was done as per suitability – late onset of monsoon meant short-duration variety of crop would be sown.

e. Pulses: mixed cropping of pulses, oils seeds and grains, during both cropping seasons has been practised since Harappan times. This is less resource intensive, conservative farming and ensures gross production.

f. Protective irrigation: the water storage and conservation systems used to provide for protective irrigation during dry spells in rainfall. The cropping system was not completely dependent on irrigation. Traditional water harvesting systems across the country are a proof of this.

g. Agroecology: the agriculture systems that are diverse and integrated provide for healthy ecosystems in the farm. Thus, pests are controlled by friendly insects, birds and microorganisms, eliminating the need for use of chemical pesticides.

All of these formed an integral part of a region's culture. All the festivals, timing of marriages in villages, religious ceremonies, fairs, etc. revolve around the agricultural calendar of the region. Harvest festivals are still most enthusiastically celebrated across the country, be it Baisakhi or Pongal.

Such a diverse system was probably well suited to mitigating risk from shifts in climate that was common during Indus Valley Civilisation. It may be that some of today's farming monocultures could learn from the local crop diversity of the Indus people 4,000 years ago.

～～～～～

In Barmer Distt., Rajasthan, the villagers of Gangawas and Korna villages filed a PIL with NGT in protest against acquisition of land in the catchment of their drinking water sources for a power grid station.

The PIL was supported by INTACH and ultimately NGT ruled in favour of the petitioners. This signal achievement was honoured by INTACH with the Anirudh Bhargava Environmental Award.

The Award was given to the Gram Pradhans in a ceremony held at the village. Chairman INTACH Maj. Gen. L K Gupta (Retd.) and State INTACH Convener Maharaj Gaj Singh did the honours.
If we, the honeybees, were to ask these simple questions to ourselves, the only response would be ‘cross pollination’.

However, humans generally evaluate us only on the basis of our honey production capacity. It is an absolute error of judgment and we tend to differ from all such perceptions which are essentially the outcome of immense greed. Cross pollination will remain our primary function in life - it justifies our very existence. Honey is secondary. This difference of opinion, over the ages has ensured that our relationship with humans lies in tatters. During the same time, however, we evolved an amazing relationship of inter-dependence with flowers. Since neither of us can develop in isolation, this alliance symbolizes trust, hope and progress. It also ensures conservation of the ecosystem by cross pollination of a wide variety of flora, a service that is silent, efficient, continuous and meaningful.

Pollen is a major source of protein for us. With a complete range of amino acids, it is also rich in folic acid, linoleic acid, carotenoids, bioflavonoids and phytostreols. Sourced from different flowers, its protein content and the nutritional values also differ. But for us, reason overrides the taste and we generally prefer to collect pollen with high protein index. A mix of pollen and nectar constitutes our daily feed and is absolutely necessary for our growth, immunity and efficient execution of our age defined functions. Scarcity of pollen adversely affects our propagation and our very survival.

Crops are also pollinated by other insects also but our numerical strength ensures that we emerge as the most efficient pollinator of all. We are the most organized, disciplined and controllable pollinators. In contrast, the numerical strength in humans normally generates confusion, chaos and anarchy.
Needless to say, through cross pollination we enhance productivity in a variety of crops. Studies have established that productivity increases by about 67% in sunflower, about 64% in onion, 43% in mustard and in coconut by about 40% simply because of our well timed involvement. Fruits, vegetables and crops pollinated by us with variable but very effective results include Walnut, Apple, Cherry, Lychee, Lemons, Cashew, Cardamom, Strawberry, Apricot, Plum, Almond, Peach, Guava, Pomegranate, Buckwheat, Cantaloupe, Okra, Clover, Fennel, Coriander, Cucurbits, Sesbania, Sesame, Turnip, Beans etc. This list is only an indicator that humans stand to lose a lot by disregarding our crucial function.

There are two significant dimensions of this cross pollination activity. Even a casual observer will realize that the pollen pellets we carry in our pollen baskets situated on our hind legs, on our way back to the hive is always of a single colour – red, yellow, beige, purple, orange etc. Considered to be a mass of nearly one million to two million pollen grains, each such pollen pellet is never composed of multiple coloured pollen grains. The reason is that while collecting pollen on a foraging flight, individually, we confine ourselves to same species of flowers – a phenomenon defined by humans as ‘floral fidelity’. The pollen adhering to plumose hairs covering our body cross pollinates flowers of the same type that we subsequently visit. We realize that on one foraging flight, our movement on different species of flowers will defeat the very process of cross pollination.

Another aspect of pollen collection is that each pollen pellet carried by us individually is of uniform size and weight. There is absolutely no variation. However, the mass and weight of the pollen pellets will differ amongst our sister bees. We relentlessly perform a fine balancing act because uniformity in weight of both pollen pellets is necessary to maintain equilibrium during flight. This complex activity is performed constantly and effortlessly without any access to mechanical arrangements - an example in precision and perfection for humans!

The environmentalists should accept us as an effective indicator of the balanced eco-system. The farming community must realize our role as a principal factor in agricultural production. Please realize that extensive and uncontrolled use of pesticides and insecticides intimidates us. It is a major threat to our survival. Over the ages we have managed to live to tell the tale despite your efforts to decimate us. May we now humbly request you to immediately bring an end to this insensitivity. Please do not ignore us. Please do not procrastinate. Otherwise, the day is not far off when we may simply cease to exist and you will visualize us only in your thoughts. It will then be too late to resurrect us.

Think, how long will you survive then?

～～～～～

The article is contributed by Mr. Rakesh Gupta, from Golden Hive Foundation, who avidly works towards spreading awareness about bees, and their amazing role in ecosystems and our lives. He brings with himself experience, exposure, passion and new ideas for bee keeping. INTACH along with Golden Hive Foundation organised an apiculture workshop in September 2017, Gandhi Smarak Nidhi in Chhatarpur, Madhya Pradesh. The workshop was attended by 20 participants mostly comprising of local farmers who received theoretical, hands on and interactive training from Mr. Rakesh Gupta. He
meticulously explained the life and workings of bee, and particulars of bee keeping. It was especially significant for farmers considering the important role of bees as pollinators that aids crop productivity. Participants were able to observe bees and their behaviour closely under the guidance of Mr. Rakesh.

The workshop also resulted in setting up of bee box at Gandhi Smarak Nidhi that is thriving with the bees enjoying the nector from ber or Indian Jujube (Ziziphus mauritiana) and has already lead to a successful extraction of honey and bee wax.

Some of the highlights from the workshop.

Mr. Rakesh Gupta explaining the life of bees and providing hands-on experience to the workshop participants. (Picture Credit: Team NHD)

Enthusiastic students. (Picture Credit: Team NHD)
India’s inland water resources are classified into rivers, canals, reservoirs, tanks, ponds, oxbow lakes, derelict water, and brackish water. A global study on abundance and size distribution of lakes, ponds and impoundments states that natural lakes and ponds are estimated to cover about 4.2 million sq. km of the earth’s surface whereas impoundments cover 260,000 sq. km and farm ponds cover about 77,000 sq. km. These data, taken together, indicate that lakes, ponds, and impoundments cover more than 3% of the earth’s surface (1). According to the Ministry of Environment, Forest and Climate Change, the lentic water bodies (closed system i.e. stagnant water) in India cover an area of about 7 M ha. Along with rivers which are considered the arteries of land, lentic water bodies are the nodes that provide localised support to the society and ecosystems. This makes the understanding and studying of these water bodies extremely important. The present study focuses on GIS mapping of lentic water bodies (lakes/ponds/tanks/reservoir/derelict water) of Chhatarpur district, Madhya Pradesh.

Chhatarpur is an important district in Bundelkhand region of Madhya Pradesh. It lies on the lower part of Bundelkhand plateau and is rich in the natural resources. The district has several natural depressions and tanks constructed during the period of Chandela and Bundela dynasty. Abundance of these water bodies in the region is difficult to estimate due to poor or incomplete water body inventories. The National Remote Sensing Centre monitors the status of approximately 2 lakh water bodies (area > 2 ha) of the country. However, there are several water bodies in Chhatarpur region with area less than 2 ha or which are ephemeral, intermittent or seasonal but play a significant role in maintaining ecological balance, providing numerous ecosystem services, etc. Thus, the identification and mapping of these water bodies is an important task. According to the Inter-governmental Panel on Climate Change (IPCC), the highest impact of climate change will be on water cycle, and will result in increased frequency and intensity of extreme atmospheric events (especially floods and droughts). In the recent years, Chhatarpur district has witnessed back-to-back droughts due monsoon failures.
The present condition shows that monsoon failures, changes in amount, pattern and intensity of rainfall are likely to influence the amount and distribution of runoff in rivers. The impact of future climatic variability is expected to be more severe than the present time. Thus, the mapping of water body in the region is of great concern.

India’s mapping traditions dates back to the Indus Valley Civilization (c. 2500–1900 BCE) and were influenced by Vedic, Tibetan, Islamic and more recently, British cartography. The Survey of India (SOI) topographical maps are the earliest true maps of India showing various land use/cover classes including Water Bodies. We have come a long way since then with the advent of modern mapping techniques like satellite imaging. Recent years have seen advances in mapping technique to prepare maps with much more information. Of particular importance is the remote sensing and geographic information system (GIS) technique. Advances in survey techniques, instrumentation, and computing technologies, as well as the use of aerial photography and satellite data, have dramatically improved mapping coverage, accuracy, and efficiency.

In the present study, mapping of water bodies started with the identification of water bodies in Chhatarpur district. There are about one thousand water bodies identified in eleven tehsil of Chhatarpur district (Fig. 1) with the help of Google Satellite Imagery and Bhuvan’s Water Body Information Centre (WBIS). The identified water bodies include the natural depression as well as man-made water bodies i.e. tanks, ponds, reservoir, and derelict water. Out of one thousand water bodies, there are approx 250 water bodies (calculated as per water-spread area from WBIS and Google imagery) in the region whose area is more than 2.5 hectares. After identification process, it was found that Rajnagar tehsil has the maximum number of water bodies (331 water bodies) followed by Chhatarpur, Chandla, Gaurihar, Buxwaha, Bijawar, Lavkush Nagar (Laundi), Nowgaon, Ghuwara, Bada Malhera and Maharajpur tehsil. After identification process, water resource map (Fig. 2) of Rajnagar Tehsil is created with the major focus on natural & man-made water bodies, river & river channels, and canals for irrigation and drinking purposes etc.
Geographic Information Systems (GIS) are altering the production and use of traditional maps and, subsequently, the representation of streams. Typically, in the present study water bodies are identified and the map is created from the satellite images. Since we know that streams are not static, they are dynamic. The extent of a stream network can change from dry to wet years or even from summer to winter. The length and size of water bodies depend on water availability. During summer period water is always a critical factor, so it is very difficult to map first order streams. Thus, mapping process can introduce map error (Fig. 3) because streams are usually determined by visual inspection only which can lead to missed streams or water bodies. In order to overcome the problem of missing streams especially first-order streams, ground truthing was done in the different region of Rajnagar. The process of ground-truthing enables calibration of remote-sensing data, and aids in the interpretation and analysis of what is being sensed.

![Aerial photo of Khudar River, Rajnagar, showing digitized and missing streams.](image)

The Identified water bodies are further divided into five categories as historical water bodies, pristine (water bodies in the undisturbed area), urban water bodies, reservoirs and water bodies in mining areas. Previous studies on water quality of lentic water bodies of the Chhatarpur district indicate that water system is continuously degrading (2,3) while the ecological status of several water bodies in the region has been changed due to mismanagement in order to accommodate the various human needs. The various impacts due to anthropogenic activities need to be assessed at regular intervals for its restoration and conservation. Based on previous studies, identified water bodies and water resource map of the area, INTACH has planned a study to understand the present ecological status of water bodies with the prime focus on water quality, vegetation near water bodies and avian diversity in and around water bodies. The study of ecological status of water bodies will open the doors for conservation and protection while the study of pristine water bodies of the region will act as reference ecosystem for further restoration works.

References


Our interaction with nature and its expression has been ancient. Nature has continually invoked different feelings in humans, and over the ages we have tried to find ways to express these feelings through poetry, paintings, building monuments, or making pottery and toys in the form of animals and birds. In materialization of these things, colours have played a crucial role, in establishing the connection with nature as well as in expressing that connection. Colour theory suggests that different colours inculcate different feelings in people, white for instance relates with purity, black with power, red with energy and love, and yellow with happiness. Red which is also the colour of blood has long been associated with life. For example, in burial sites the colour red was used extensively to paint the walls of the burial chamber and the body of the deceased. Many people divulge that it can be considered humanity's way of not bowing down to death. Colours, thus, have long been a medium of expression.

Rationale dictates that humanity has had a strong fascination towards colours since mans’ creation. The indication of humankind's association with colours can be traced back to around 25000 BC when it comes to cave paintings and 3000 years BC when considering textile dyeing. There have been found evidences of textile dyeing using extracts from plants, barks and insects dating back to 5000 years in China. Indigo, another natural pigment, has been grown and used in fabric dyeing in India extensively since 2000 BC to the extent that it was exported to various parts of the world like areas surrounding the Mediterranean Sea. Between 14th to early 19th century India monopolised the textile trading and developed various arts like Ikat, Bandhni, Patola, etc. in the context of textile dyeing. Other than indigo, plants popularly utilized for dyes included madder, safflower, turmeric, palash, among many others. The patterns imprinted on fabrics depicted animals, flowers, trees and humans, and were occasionally connected with joyous celebrations such as births and weddings.

Bagru, situated about 30 km south-west of Jaipur on Jaipur-Ajmer highway, is one of the many centres in India where textile dyeing using natural dyes is practised even today. It is said the Chhipa (printers) community arrived in Bagru from SawaiMadhopur, a city approximately 180 kilometres away from Bagru nearly 450 years ago. Today the Bagru print is famous world over and enjoys the status of GII (Geographical Indication of India). The families that are involved in printing have been engaged in it for generations and possess the traditional knowledge of colour making, equipments used for dye-
making as well as the hand blocks used for printing. This is considered as their ancestral heritage and passed down through generations. Bagru is acclaimed for two kinds of prints – the Bagru print and the Bagru Dabu print. The characteristic printing of Bagru i.e. Bagru Prints include hand block printing on fabrics. Dabu prints on the other hand is a resist dyeing technique. The motifs chiselled on the block have Persian influences and usually represent birds, animals and floral forms, along with geometrical patterns. The famous Bagru patterns include jaal, chakri, chhoti and badibooti, patti, etc. Another important pattern of dyeing in Bagru is indigo dyeing where different patterns and designs are created by the application of indigo in multiple steps of dyeing. The common resources used for the formulation of these natural dyes are harad or myrobylan, indigo, dhaya or dhataki flowers, manjishtha or Indian madder, imli and jaggery, in addition to, iron, alum, and gum (from babul or corn).

On a different side of Jaipur, about 15 km south-east of it, is situated another dyeing centre by the name of Sanganer. Sanganeri prints have their own niche and demand in the world market. The story goes that, tired of the frequent battles between Mughals and Marathas, printers from Gujrat migrated to Sanganer. The designs of Sanganer, consequently, bear a resemblance to the Gujrati prints. The designs are highly intricate and include impressions of flowers, petals, birds, and geometric designs. The 500 years old art of hand block printing in Sanganer, gained significance due to support by the local nobility and later by the East India Company which exported it extensively. Compared to Bagru, Sanganer has modernised with the changing times. Many of the printing workshops in Sanganer have machines to print, catering to the increasing demand of block prints.

One of the points of differences in Sanganer and Bagru prints is the base colour of the cloth on which the printing is done. In Bagru, the background is typically off white or ivory coloured and in Sanganer, the background of cloth is white. The prints belonging to these places also differ in the sense that Bagru block prints are of bigger size and have thick lines, whereas Sanganer motifs are smaller with comparatively thin lines. Although with passage of time these differences have fused and both places now print many kinds of motifs that are not necessarily distinctive of them.
Time has also led to another point of difference between these two places. While Bagru still continues to predominantly use natural dyes, Sanganer has turned to synthetic dyes which have gained importance due to their vibrancy, variety, reproducibility and easy availability. Sanganeri printers claim that the demand for hand printed cloth cannot be matched by just natural dyes which take time to prepare and depend on limited resources for their making. Additionally, they cannot be used in machine printing, and inevitably require hand printing which is time-consuming.

Many skeptics however feel that not everyone can afford natural dyes, also the environment would not be able to provide a sustainable source of raw materials for the production of dyes. It is in this context that the Natural Heritage Division, INTACH has commenced research on natural dyes. The aim is to understand the economic and environmental sustainability of natural dyes. The research encompasses the art and history of natural dyeing in the specific context of textile dyeing, the major centres in India where natural dyes are still used for textile dyeing, the plant resources used in dye making and their geographical distribution. The ultimate objective is to increase not only the number of groves bank of natural dyes but also the plants. These plants will both enhance the local biodiversity and increase the availability of natural dyes. Thus, effectively match the consumer’s growing interest in non-chemical natural materials.

---

**Interesting Fact**

Germans dominated the synthetic dye stuff industry; so in 1913, Germany was exporting about 135000 tones of dyes compared to Britain’s 5000 tones. At the outbreak of the First World War, the only khaki dye available for British army uniforms was manufactured in Germany and had to be imported secretly.
The Chinkara are small deer (ranked in the vulnerable category) inhabiting the deserts of western India. These herbivores are grazers and browsers who play a natural role in seed dispersal. With the passage of winter their watering holes dry out in the arid landscape and they turn to sources in the village for quenching their thirst. They are caught by village dogs and succumb to injury by the thousands in the year.

NHD proposes to make a series of water holes near their habitats to avert the situation obviating their need to come into the villages. A pilot watering hole (check dam) has been created at Lunavadi, Distt. Jodhpur. This will hold water for more than a year serving the chinkaras well into the next monsoon. The work was facilitated with the help of Jodhpur Chapter (Dr. Mahendra Singh Tanwar and Shri Samarth Singh) and Barmer Chapter (Convenor Shri Yashovardhan Sharma).

INTACH proposes to construct 200 such watering holes at an average cost of 125,000/- each with the help of CSR support and donations over the next two years earnestly appealing for help. Chapters could easily replicate this initiative in their own areas.

~ ~ ~ ~ ~

Interesting Fact
An important unit of weight in ancient India was Raktika or Rati. The seed of Gunja (Arbus precatorius) possess the fascinating quantity of having almost identical weight, approximately equal to 0.118 grams.
As a mass noun, Nature is defined as “all the animals, plants, and other things in the world that are not made by people, and all the events and processes that are not caused by people”. It is also referred to as “the physical force regarded as causing and regulating the phenomenas of the world”. It is the force responsible for physical life and is sometimes spoken of as a person. The inspiration man derives from nature has continued to be more central in our existence than can be acknowledged. Inspiration comes from the Latin word inspirare, meaning “to breathe into”, it is “the process of being mentally stimulated to do or feel something, especially to do something creative”. L. Simpson defined inspiration as ‘the spontaneous overflow of powerful feelings; it takes its origin from emotion recollected in tranquility’.

A stroke of genius, of creativity and innovation has helped man since he started to walk earth in the development and enhancement of human life. It was the discovery of fire, it was the urge to draw its bestial companions of the wild on cave paintings and it was the need to feel close to nature through songs, verse and stories celebrating the beauty around them. The term nature in these verses mostly covered topics of fauna, flora, water, soil, wind and air, sun and similar resources from nature both organic and inorganic.

When it came to the beauty and complexity of nature, no one was left unaffected by it - the romantics readily revered it, the virtuoso either learned from it or innovated ideas to shun it and the artists tried to mimic it. Nothing is more complex yet simple than the processes of nature. And man’s need to find threads of connection between man and nature is omnipresent. This urge can be attributed to the fact that somewhere in our subconscious we realize and accept that organizations, processes and mechanisms that are a part of nature are far more superior to the development and discoveries we have made over the centuries. And learning and mimicking the on-goings of nature might lead to enlightening solutions.

INSPIRATION IN LITERATURE
The most significant mark of love for nature, and its teachings, can be found among the poets of Industrial Revolution, when development came at the cost of beloved nature and created lasting threats to its preservation. Man’s achievement of speech allowed him to transfer knowledge orally. Songs at the time were more like life lessons and teachings. The invention of writing, oral knowledge transformed into written scripts that could be documented. Songs were followed by poetry and became a form of personal expression for the literates. The Age of Enlightenment was not just the time of immense technological progress but also a period of immense change among scholars who started receiving literary inspiration from nature.
Nature was a predominant theme among their creations as part of a large artistic and scholarly movement, as described by Isaiah Berlin as ‘the greatest single shift in the consciousness of the West that has occurred’. The poets revelled in the beauty of nature and expressed their love for all its facets. They created verses recalling the rolling green meadows, thick lush forest, flowers in the breeze, and other scenes of natural beauty. Walt Whitman in his poem ‘Song at Sunset’ reminisced –

As I sail’d down the Mississippi,
As I wander’d over the prairies,
As I have lived—As I have look’d through my windows, my eyes,
As I went forth in the morning—As I beheld the light breaking in the east;
As I bathed on the beach of the Eastern Sea, and again on the beach of the Western Sea;
As I roam’d the streets of inland Chicago—whatever streets I have roam’d;
Or cities, or silent woods, or peace, or even amid the sights of war;
Wherever I have been, I have charged myself with contentment and triumph.

Romantic Poets of the Age like Coleridge and Wordsworth maintained that the absence of nature’s inspiration in a man’s life made him vain and incomplete. Wordsworth’s creations lamented how modern life had divorced us from nature. He shares his belief that remembering beautiful scenes from the natural surroundings was consoling and created an upliftment from the perplexities of the new world. Wordsworth looked at nature as an entity with the power of healing and curing all ailments. In his poem ‘Daffodils’ Wordsworth relays that remembering the field of daffodils is what chases away his weariness –

For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.

Poems often talked about life experiences of natural surroundings. And provided an analogy to human actions in terms of interactions with nature. Poet Robert Frost in his poem the ‘Road not taken’ talks about his choice to take the less trodden path in a forest as poetic substitutes to his life choices that were different from the common norm during his time. He writes -

“Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth”

Poets have continued to explore nature as a medium of expression exploring nature in its varied dimensions. And it’s not just poets who use the canvas of nature to bring forth the beauty and vagaries of life. Nature has continued to inspire both the creative and scientific leagues. We, at INTACH, perceive nature as one of our most valuable heritage. Nature continues to inspire us in our endeavours to protect and nurture it.
Join us in our attempt to remember and reminisce the marvels of nature as seen by the poets of a century past through our collection of selected poems.
Thou art the sky and thou art the nest as well.
O thou beautiful,
there in the nest is thy love that encloses the soul with colours and sounds and odours.
There comes the morning with the golden basket in her right hand
bearing the wreath of beauty, silently to crown the earth.
And there comes the evening over the lonely meadows deserted by herds, through trackless paths,
carrying cool draughts of peace in her golden pitcher from the western ocean of rest.
But there, where spreads the infinite sky for the soul to take her flight in,
reigns the stainless white radiance.
There is no day nor night, nor form nor colour, and never, never a word.

Thy sunbeam comes upon this earth of mine with arms outstretched and stands at my door
the livelong day to carry back to thy feet clouds made of my tears and sighs and songs.
With fond delight thou wrappest about thy starry breast that mantle of misty cloud,
turning it into numberless shapes and folds and colouring it with hues everchanging.
It is so light and so fleeting, tender and tearful and dark, that is why thou lovest it,
O thou spotless and serene.
And that is why it may cover thy awful white light with its pathetic shadows.

The same stream of life that runs through my veins night and day
runs through the world and dances in rhythmic measures.
It is the same life that shoots in joy through the dust of the earth
in numberless blades of grass and breaks into tumultuous waves of leaves and flowers.
It is the same life that is rocked in the ocean-cradle of birth and of death, in ebb and in flow.
I feel my limbs are made glorious by the touch of this world of life.
And my pride is from the life-throb of ages dancing in my blood this moment.
I wandered lonely as a cloud
That floats on high o'er vales and hills,
When all at once I saw a crowd,
A host, of golden daffodils;
Beside the lake, beneath the trees,
Fluttering and dancing in the breeze.
Continuous as the stars that shine
And twinkle on the milky way,
They stretched in never-ending line
Along the margin of a bay:
Ten thousand saw I at a glance,
Tossing their heads in sprightly dance.
The waves beside them danced; but they
Out-did the sparkling waves in glee:
A poet could not but be gay,
In such a jocund company:
I gazed–and gazed–but little thought
What wealth the show to me had brought:
For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.

Winter Morning
~ Alexander Pushkin

Cold frost and sunshine: day of wonder!
But you, my friend, are still in slumber -
Wake up, my beauty, time belies:
You dormant eyes, I beg you, broaden
Toward the northerly Aurora,
As though a northern star arise!

Recall last night, the snow was whirling,
Across the sky, the haze was twirling,
The moon, as though a pale dye,
Emerged with yellow through faint clouds.
And there you sat, immersed in doubts,
And now, - just take a look outside:

The snow below the bluish skies,
Like a majestic carpet lies,
And in the light of day it shimmers.
The woods are dusky. Through the frost
The greenish fir-trees are exposed;
And under ice, a river glitters.

The room is lit with amber light.
And bursting, popping in delight
Hot stove still rattles in a fray.
While it is nice to hear its clatter,
Perhaps, we should command to saddle
A fervent mare into the sleight?

And sliding on the morning snow
Dear friend, we'll let our worries go,
And with the zealous mare we'll flee.
We'll visit empty ranges, thence,
The woods, which used to be so dense
And then the shore, so dear to me.
The Road Not Taken

Robert Frost

Two roads diverged in a yellow wood,  
And sorry I could not travel both  
And be one traveler, long I stood  
And looked down one as far as I could  
To where it bent in the undergrowth;

Then took the other, as just as fair,  
And having perhaps the better claim,  
Because it was grassy and wanted wear;  
Though as for that the passing there  
Had worn them really about the same,  
And both that morning equally lay  
In leaves no step had trodden black.  
Oh, I kept the first for another day!  
Yet knowing how way leads on to way,  
I doubted if I should ever come back.

I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I—  
I took the one less traveled by,  
And that has made all the difference.

At Night On The High Seas ~ Hermann Hesse

At night, when the sea cradles me  
And the pale star gleam  
Lies down on its broad waves,  
Then I free myself wholly  
From all activity and all the love  
And stand silent and breathe purely,  
Alone, alone cradled by the sea  
That lies there, cold and silent, with a  
thousand lights.  
Then I have to think of my friends  
And my gaze sinks into their gazes  
And I ask each one, silent, alone:

"Are you still mine"  
Is my sorrow a sorrow to you, my death a  
death?  
Do you feel from my love, my grief,  
Just a breath, just an echo?"  
And the sea peacefully gazes back, silent,  
And smiles: no.  
And no greeting and now answer comes from  
anywhere.
In Praise Of Henna ~ Sarojini Naidu

A kokila called from a henna-spray:
Lira! liree! Lira! liree!
Hasten maidens, hasten away
To gather the leaves of the henna-tree.
Send your pitchers afloat on the tide,
Gather the leaves ere the dawn be old,
Grind them in mortars of amber and gold,
The fresh green leaves of the henna-tree.

The Way through the Woods ~ Rudyard Kipling

They shut the road through the woods
Seventy years ago.
Weather and rain have undone it again,
And now you would never know
There was once a road through the woods
Before they planted the trees.
It is underneath the coppice and heath,
And the thin anemones.
Only the keeper sees
That, where the ring-dove broods,
And the badgers roll at ease,
There was once a road through the woods.
Yet, if you enter the woods
Of a summer evening late,
When the night-air cools on the trout-ring pools
Where the otter whistles his mate,
(They fear not men in the woods,
Because they see so few.)
You will hear the beat of a horse's feet,
And the swish of a skirt in the dew,
Steadily cantering through
The misty solitudes,
As though they perfectly knew
The old lost road through the woods.
But there is no road through the woods.
Caged Bird ~ Maya Angelou

The free bird leaps
on the back of the wind
and floats downstream
till the current ends
and dips his wings
in the orange sun rays
and dares to claim the sky.

But a bird that stalks
down his narrow cage
can seldom see through
his bars of rage
his wings are clipped and
his feet are tied
so he opens his throat to sing.

The caged bird sings
with fearful trill
of the things unknown
but longed for still
and his tune is heard
on the distant hill
for the caged bird
sings of freedom.

The free bird thinks of another breeze
and the trade winds soft through the sighing
trees
and the fat worms waiting on a dawn-bright
lawn
and he names the sky his own.

But a caged bird stands on the grave of
dreams
his shadow shouts on a nightmare scream
his wings are clipped and his feet are tied
so he opens his throat to sing

The caged bird sings
with a fearful trill
of things unknown
but longed for still
and his tune is heard
on the distant hill
for the caged bird
sings of freedom.

There Will Come Soft Rains ~ Sara Teasdale

There will come soft rains and the smell of the ground,
And swallows circling with their shimmering sound;
And frogs in the pools singing at night,
And wild plum trees in tremulous white,
Robins will wear their feathery fire
Whistling their whims on a low fence-wire;
And not one will know of the war, not one
Will care at last when it is done.
Not one would mind, neither bird nor tree
If mankind perished utterly;
And Spring herself, when she woke at dawn,
Would scarcely know that we were gone.
वह गंगा, यह केवल छाया,
वह लोक चेतना, यह माया,
वह आत्म वाहिनी ज्योति सरी,
यह भू पतिता, कंचुक काया।

वह गंगा जन मन से लिसूत,
जिसमें बहु बुदबुद युग नर्तित,
वह आज तरंगित, संसृति के
मृत सैकत को करने च्यावित।

दिशि दिशि का जन मत वाहित कर,
वह बनी अकूल अतल सागर,
भर देगी दिशि पतल पुलिनों में
वह नव नव जीवन की मृदा उद्धर।

अब नभ पर रेखा शशि शोभित,
गंगा का जन श्यामल, कम्प्हित,
लहरों पर चाँदी की किरण
करती प्रकाशमय कुछ अंकित।
आ रही रवि की सवारी
~ हरिवंशराय बच्चन

आ रही रवि की सवारी।

नव-किरण का रथ सजा है,
कलि-कुसुम से पथ सजा है,
बादलों-से अनुचरों ने स्वर्ण की पोशाक धारी।
आ रही रवि की सवारी।

विहग, बंदी और चारण,
गा रही है कीर्ति-गायन,
छोड़कर मैदान भागी, तारकों की फौज सारी।
आ रही रवि की सवारी।

चाहता, उछलूँ विजय कह,
पर ठठकता देखकर यह-
रात का राजा खड़ा है; राह में बनकर भिखारी।
आ रही रवि की सवारी।

चम्बा की धूप
~ कुमार विकल

ढहरो भाई,
धूप अभी आयेगी
इतने आतुर क्यों हो
आखिर यह चम्बा की धूप है—
एक पहाड़ी गाय—
आशाम से आयेगी.

यहीं कहीं छोड़न में घास चरे

गद्दी महिलाओं के संग सुस्तायेगी
किलकारी भरते बच्चों के संग खेलेगी
राधी के पानी में तिर जायेगी.

पर खेल कूद के बाद

यह सूरज की भूखी बिटिया
आटे के पेड़े लेने को
हर घर का चूल्हा —चूख्ट चूमेगी.

और चाचानक थककर

दूध बेचकर लौट रहे
गुजजर— परिवारों के संग,
अपनी छोटी —सी पीठ पर
अँधेरे का बोझ उठाये,
उधर—
जिघर से उत्तरी थी—
छढ जायेगी—
यह चम्बा की धूप—
पहाड़ी गाय.
लू के झाँकों झुलसे हुए थे जो
~ सूर्यकांत त्रिपाठी "निला"

अब यह चिड़िया कहाँ रहेगी
~ महादेवी वर्मा

लू के झाँकों झुलसे हुए थे जो,
भरा दोंगरा उन्हीं पर गिरा।
उन्हीं बीजों को नये पर लगे,
उन्हीं पौधों से नया रस ढ़िरा।

उन्हीं खेतों पर गये हल चले,
उन्हीं माथों पर गये बल पड़े,
उन्हीं पेड़ों पर नये फल फले,
जवानी फिरी जो पानी फिरा।

पुरावा हवा की नमी बढ़ी,
जूही के जहाँ की लड़ी कढ़ी,
सविता ने क्या कविता पढ़ी,
बदला है बादलों से सिरा।

जग के अपावन घुल गये,
ढेरे गड़ने बाले थे घुल गये,
समता के द्रग दोनों तुल गये,
तपता गगन घन से घिरा।

अब यह चिड़िया कहाँ रहेगी?
हमने खोला आलमारी को,
बुला रहे हैं बेचारी को।
पर वो ची-ची करती है
घर में तो वो नहीं रहेगी!
अब यह चिड़िया कहाँ रहेगी?

घर में पेड़ कहाँ से लाएँ,
कैसे यह घोंसला बनाएँ?
कैसे फूटे अंडे जोड़े,
किससे यह सब बात कहेगी?
अब यह चिड़िया कहाँ रहेगी?
सकल बन फूल रही सरसों ~ अमीर खुसरो

वे भगवान के दाकिये हैं,
जो एक महादेश से
दूसरे महादेश को जाते हैं।
हम तो समझ नहीं पाते हैं,
मगर उनकी लायी चिठ्ठियाँ
पेड़, पौधे, पानी और पहाड
बॉँचते हैं।
हम तो केवल यह आँकते हैं
कि एक देश की धरती
दूसरे देश को सुगन्ध भेजती है।
और वह सौरभ हवा में तैरती हुए
पक्षियों की पाँखों पर तिरता है।
और एक देश का भाप
dूसरे देश का पानी
बनकर गिरता है।

पक्षी और बादल ~ रामधारी सिंह "दिनकर"

The yellow mustard seeds
bloom in every field,
Mango buds click open,
flame of the forest trees blossom,
The koyal chirps from branch to branch,
And the fair maiden puts on her make-up,
The gardener-girls have brought bouquets,
The yellow mustard seeds bloom in every field.
With assorted flowers in arrangements,
Devotees arrive, bouquets in hand,
To Nizamuddin's doorstep,
But Shokh Rung, who had promised to come,
Hasn't turned up - it's been many years.
The yellow mustard seeds bloom in every field.
कदम्ब का पेड़ ~ सुभद्राकुमारी चौहान

यह कदम्ब का पेड़ अगर माँ होता यमुना तीरे।
मैं भी उस पर बैठ कहनें बनता धीरे-धीरे॥
ले देती यदि मुझे बांसुरी तुम दो पैसे वाली।
किसी तरह नीची हो जाती यह कदम की डाली॥
तुम्हें नहीं कुछ कहता पर मैं चुपके-चुपके आता।
उस नीची डालो से आम्मा ऊँचे पर चढ़ जाता॥
वहीं बैठ फिर बड़े मजे से मैं बांसुरी बजाता।
अम्मा-अम्मा कह वंशी के स्वर में तुम्हें बुलाता॥
सुन मेरी बंसी को माँ तुम इतनी खुश हो जाती
मुझे देखने काम छोड़कर तुम बाहर तक आती
तुमको आता देख बांसुरी रख में चुप हो जाता
पत्तों मे छिपकर धीरे से फिर बांसुरी बजाता॥
गुःसा होकर मुझे डाटती, कहती "नीचे आजा"
पर जब में ना उतरता, हंसकर कहती, "मुल्ला राजा"
"नीचे उतरो मेरे भईया तुंझे मिठाई दूँगी,
नये खिलौने, माखन-मिसरी, दूध मलाई दूँगी"
बहुत बुलाने पर भी माँ जब नहीं उतर कर आता।
माँ, तब माँ का हृदय तुम्हारा बहुत विकल हो जाता॥
तुम आँख फैला कर अम्मा वहीं पेड़ के नीचे।
ईश्वर से कुछ विलसी करती बैठी आँखें मीचे॥
तुम्हें ध्यान में लगी देख में धीरे-धीरे आता।
और तुम्हारे फैले आँखें नीचे छिप जाता॥
तुम घबरा कर आँख खोलतीं, पर माँ खुश हो जाती।
जब अपने मुल्ला राजा को गोदी में ही पाती॥
इसी तरह कुछ खेला करते हम-तुम धीरे-धीरे।
यह कदम्ब का पेड़ अगर माँ होता यमुना तीरे॥
Behold the city whose immortal fame
Glows in Avanti's or Visala's name!
Renowned for deeds that worth and love inspire,
And bards to paint them with poetic fire;
The fairest portion of celestial birth.
Of Indra's paradise transferred to earth;
The last rewards to acts of virtue given;
The only recompense then left to Heaven.

Here, as the early Zephyrs waft along,
In swelling harmony, the woodland song;
They scatter sweetness from the fragrant flower
That joyful opens to the morning hour.
With friendly zeal they sport around the maid
Who early courts their vivifying aid;
And, cool from Sipra's gelid waves embrace
Each languid limb and enervated grace.

Here should thy spirit with toils decay,
Rest from the labours of the wearying way:
Round every house the flowery fragrance spreads;
O'er every floor the painted footstep threads;
Breathed through each casement, swell the
Scented air,
Soft odours shaken from the disheveled hair;
Pleased on each terrace, dancing with delight,
The friendly Peacock hails thy grateful flight:
Delay then! certain in Ujjain to find
And that restores the frame, or cheers the mind.

Hence, with new zeal, to Shiva homage pay,
The god whom earth and hell and heaven obey:
The choir who tend his holy fane shall view
With awe, in thee, his neck's celestial blue:
Soft through the rustling grove the fragrant gale
Shall sweets from Gandhavati's fount exhale;
Where with rich dust the lotus-blossoms teem,
And youthful beauties frolic in the stream.

They who, with burning feet and aching arms,
With wanton gestures and emblazoned charms,
In Mahadeva's fane the measure tread,
Or wave the gorgeous chowrie o'er his head,
Shall turn on thee the grateful speaking eye,
Whose glances gleam, like bees, along the sky,
As from thy presence, showers benign and sweet
Cool the parched earth, and soothe their tender feet.
**Monographs Published by the Division**

- Ecological Inventory of Yamuna River in NCT Delhi
- Naturalizing Delhi: A plan to Enhance Climate Resilience, Biodiversity and Habitats
- A Monograph on National Geo-Heritage Monuments of India
- The Manimahesh Sacred Landscape: A Monograph
- Conservation of Waterbodies in Delhi
- Urban Biodiversity and Conservation Seminar
- The Sherthukpens of Arunachal Pradesh
- The Lepchas of Dzongu Region in Sikkim
- The Nomadic Bakarwals of Jammu & Kashmir
- Rainwater Harvesting Manual
- Natural Heritage Listing Reports
- Narratives of Environment of Delhi
- National Workshop on Natural Heritage
- A Monograph on the Sacred Woods used in Traditional Religious Ceremonies in India
- Traditional Methods of Weather Forecast in Jaisalmer
- Upper Ganga Region—Cultural Mapping
- Exploratory Foray in the Upper Yamuna Region: A photo Documentation
- Naturalizing Jaipur: A Plan for Enhancing Climate Resilience, Urban Biodiversity and Habitats
- Reviving Hindon River: A Basin Approach
- Sambhar Lake: An Important Wetland and Natural Heritage
- The Manimahesh Sacred Landscape - A Plan for Management and Conservation
- INTACH Lake Series #1: The Najafgarh Jheel
- Understanding Rivers - Definitions & Terminologies
- Celebrating The Spirit Of Rivers - An Anthology of Select River Poems

**Video Documentation Released by the Division**

- Cleansing the Assi River, Varanasi: A pilot Project [Link](http://youtube.com/watch?v=wPh8gK41Yq&feature=youtu.be)
- Saving the Chinkara: An Initiative in the Thar Desert [Link](http://youtube.com/watch?v=J4QPUSHE2F0&feature=youtu.be)
- INTACH Rooftop Garden [Link](http://youtube.com/watch?v=0HvYrUbdK1A&feature=youtu.be)

**Our Team**

- Manu Bhatnagar, Principal Director
- Dr. Ritu Singh, Director
- Sajid Idrisi, Project Officer
- Abhishek Kumar, Project Officer
- Nimisha Deshwal, Project Associate
- Abhishek Upadhyay, Project Associate
- Bharti Sarin, Project Associate
- Meenakshi Singh, Project Associate
- Devendra Singh Rawat, Group Support Officer
- Bhagwan Das, Field Assistant
- Bhupender, Field Assistant
- Ramprakash, Field Assistant
About INTACH

The Indian National Trust for Art and Cultural Heritage (INTACH) is India's largest non-profit membership organization dedicated to conservation and preservation of India's natural, cultural, living, tangible and intangible heritage. It is a registered society under the Societies Act since 1984 and is recognized as a Centre of Excellence by the Government of India. It has been founded by the Government of India and has the Secretaries of the Central Ministries of Environment, Forests and Climate Change, Urban Development, Culture on its Governing Council. INTACH's vision is to spread heritage awareness and conservation in India. In the past 30 years, INTACH has pioneered the conservation and preservation of not just natural and manmade heritage but tangible and intangible heritage as well.

The Natural Heritage Division’s unique niche is at the intersection of nature and culture with the focus on:

- stimulating awareness among the public for preservation of the Natural Heritage of India;
- undertaking measures for the preservation and conservation of natural resources;
- documenting natural heritage;
- initiating pilot conservation project.

"Nature holds the key to our aesthetic, intellectual, cognitive and even spiritual satisfaction." E. O. Wilson

Membership at a Glance

<table>
<thead>
<tr>
<th>Category</th>
<th>Admission Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>Rs. 5,000</td>
</tr>
<tr>
<td>Ordinary</td>
<td>Rs. 1,200 on admission thereafter Rs. 200 per year</td>
</tr>
<tr>
<td>Donor (Individual)</td>
<td>Rs. 10,00,000</td>
</tr>
<tr>
<td>Donor (Govt. Organization/ Authority/ Body)</td>
<td>Rs. 2,00,000</td>
</tr>
<tr>
<td>Public or Private Sector Corporation</td>
<td>Rs. 10,00,000</td>
</tr>
<tr>
<td>Institutional (New)</td>
<td>Rs. 10,000 (for 10 years)</td>
</tr>
<tr>
<td>Overseas (Individual)</td>
<td>US$ 200 or equivalent</td>
</tr>
<tr>
<td>Overseas (Institutional)</td>
<td>US$ 150 or equivalent</td>
</tr>
<tr>
<td>Student 18-25 years (non-voting category)</td>
<td>Rs. 300 (one time)</td>
</tr>
</tbody>
</table>

Membership form can be downloaded from website– www.intach.org

Donations to INTACH are exempt from income tax to the extent of 50% of the donation under Section 80-G of the Income Tax Act, on the basis of certificates issued for the donated sum by the INTACH central office.