

NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

SUB-STATE SITE - NAGPUR - MAHARASHTRA

Revised Draft (Aug '02)

1) Introduction

i) Brief background of SAP

More than 50% of India's population would be living in urban areas and surrounding hinterland within the next few decades. Quality of life of majority of India's population will therefore depend upon the environment within our towns and cities, and how these towns and cities interrelate with the surrounding rural areas. In India, Maharashtra is among the states with highest rate of urbanization and within Maharashtra Nagpur is among the fastest growing urban centres.

Urbanization is responsible for unprecedented degradation of environment and deprivation and mutilation of hinterland around towns and cities. For example, 75% of pollution load in the rivers in India is due to urban wastewater as per CSE's (Centre for Science & Environment, New Delhi) report 'Dying Wisdom'. However, due to pressures and complexities involved, little attention is paid to these aspects in the town planning processes and management practises of urban areas.

VNHS Centre had been studying these issues as applicable to Nagpur City. Nagpur has already taken some small steps towards environment and biodiversity conservation. Highlights of these attempts are:

- In-depth study leading to development of Ecocity Concept as applicable to Nagpur City
- Holistic Concept that takes into account ecological, economic, social, technological etc factors simultaneously
- Consistent working of a competent team of experts and concerned citizens drawn from diverse backgrounds
- Inclusion of Natural Precincts in the official 'Heritage List' of Nagpur City (First in India - as brought out in a study done by the Bombay Environmental Action Group)
- River revival and pollution abatement project formulated under Ecocity Concept

ii) Scope of SAP

To understand the natural setting of the city from national to regional level and plan for future development keeping this natural setting, especially biodiversity corridors, in focus.

To prepare an integrated project for sustainable development in Nagpur, aimed at conserving its natural and cultural resources.

Traditional planning of Nagpur, which had provided a means of sustainable development within the city, has been disregarded in the headlong rush for a different, more modern development model, where sustainability is at the lowest priority. One of the aims of this project is to formulate an integrated project in order to reverse this trend.

VNHS Centre believes that Nagpur City has a better potential than other cities in the similar phase to become an **Ecocity** – a city, where both **Economic** and **Ecological** development can be ensured in a balanced way, on a sustainable basis.

Study of urban sprawl during the last few decades and effects of the same on agricultural areas surrounding the city and suggest measures to control / monitor the same.

Suggest general guidelines for other would-be-metros based on case study of Nagpur City.

iii) Objectives of SAP

To attempt development of Nagpur City as the 'Garden City of Maharashtra' –
Appropriate to and worthy of being the 'Gateway to the Central Indian Forests' and
cultures.

To utilise this potential, along with the favourable location factor ('Zero Mile City' –
Centre of the Indian Peninsula) for promoting the city as a city of Hospitality
(Conference Centres), Interchange (Trade Commerce & Business) and Tourism
(Rather than an Industrial City)

iv) Contents of SAP

Data Base	- Collate information regarding bio-geographical characteristics historical development, contemporary development and related issues
Analysis	- Assessment of the present situation determining the nature of intervention
Solutions	- To formulate policies and plans for proposed interventions (in terms of development / revival / reconstruction strategies)

v) Methodology

Phase I (Simultaneous exercises)

- ❖ Detailing of the aims and objectives
- ❖ Building up a wider working group
- ❖ Listing, Mapping and preliminary analysis

- ❖ Interaction with citizens / agencies / authorities / stakeholders
- ❖ Data base compilation, analysis and editing

- ❖ Formulation of Broad strategies, management Guidelines
- ❖ Formulation of specific tasks / action Plans

Subsequent Phase/s (follow up of NBSAP)

- ❖ Mechanism for monitoring of strategy and action plan
- ❖ Mechanism for continuation of SAP process
- ❖ Detailing of projects for conservation of species / habitats
- ❖ Projects for detailed studies, surveys in specified areas
- ❖ Execution of specific tasks / action plans

More detailed description of process adopted for preparation of BSAP, including list of working group members and contributors, stakeholders involved, meetings held etc is given in Annexure A. List of NGO's with addresses with whom interaction was held regarding Nagpur BSAP is given in Annexure B. List of issues discussed with various authorities (in the form of a questionnaire) is given in Annexure C.

Annex
A

Annex
B

Annex
C

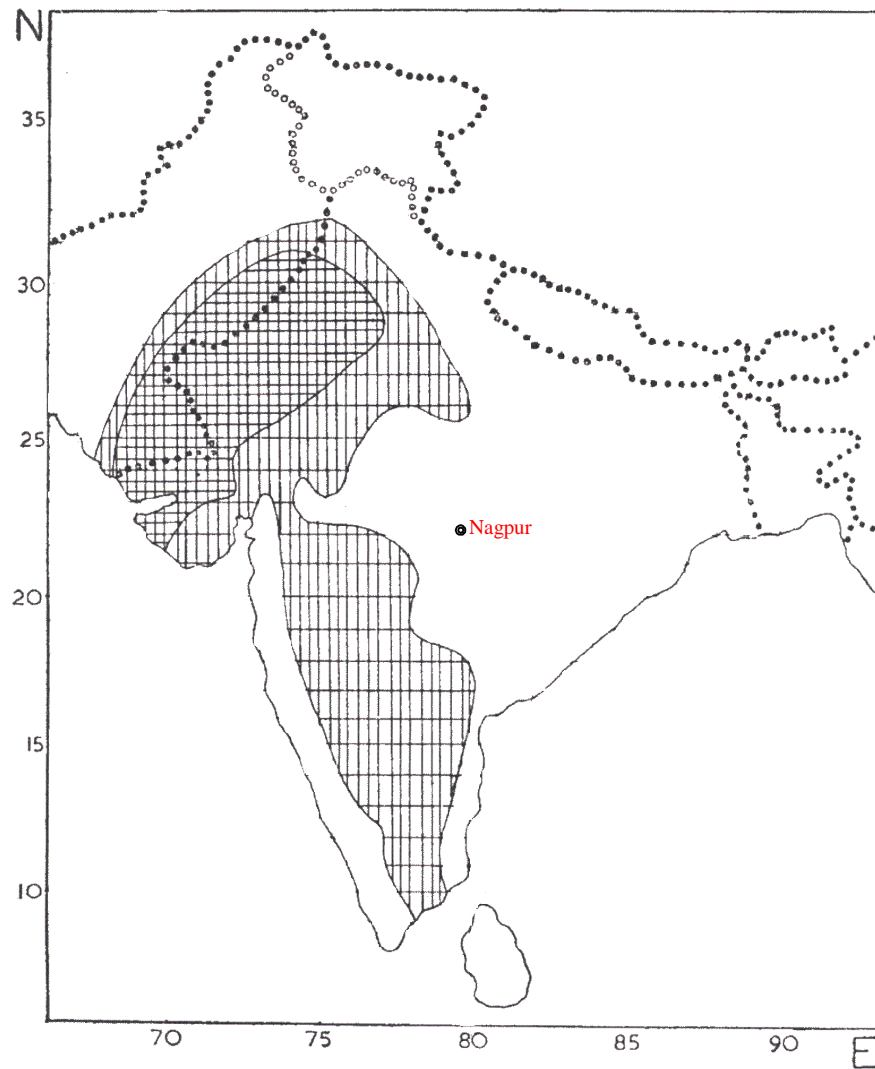
2) Profile of area

i) **Geographical Profile (National level Biodiversity Corridors and Biogeographic Zones)**

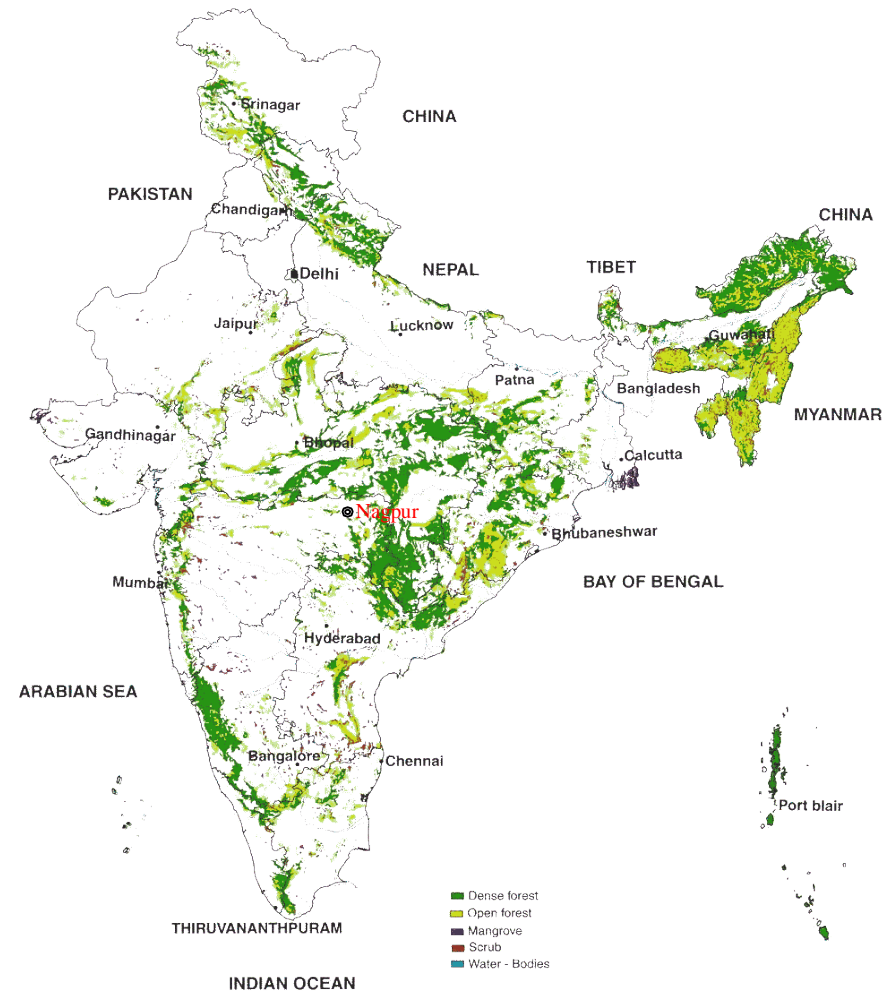
From the biodiversity angle with a National perspective, the most important feature of Nagpur City is its strategic location close to the centre of a very prominent national level 'biodiversity corridor zone' (as our team at VNHS Centre prefers to call it). This corridor, roughly coinciding with the Satpuda and Vindhya ranges connects the Western Ghats and Aravali Ranges in the west to the forests of the Northeast and the Eastern Ghats via the Central Indian Forests. This can be seen on the map on the next page. Nagpur City and its developing metropolitan region lie in the way of this important corridor. In fact, in this region this corridor seems to have narrowed and weakened. Whether this corridor continues to survive and thrive in spite of rapid urbanization of this region is a crucial question to be examined as a part of this strategy and action plan.

Yet another important biogeographic system right close to the city is the extensive grassland of the Deccan plateau, extending from Rajasthan to Andhra Pradesh. Although Nagpur Metropolitan Region is slightly away from the 'arid zone', yet the character of the country to the west and south of the city can best be described as scrubland and grassland.

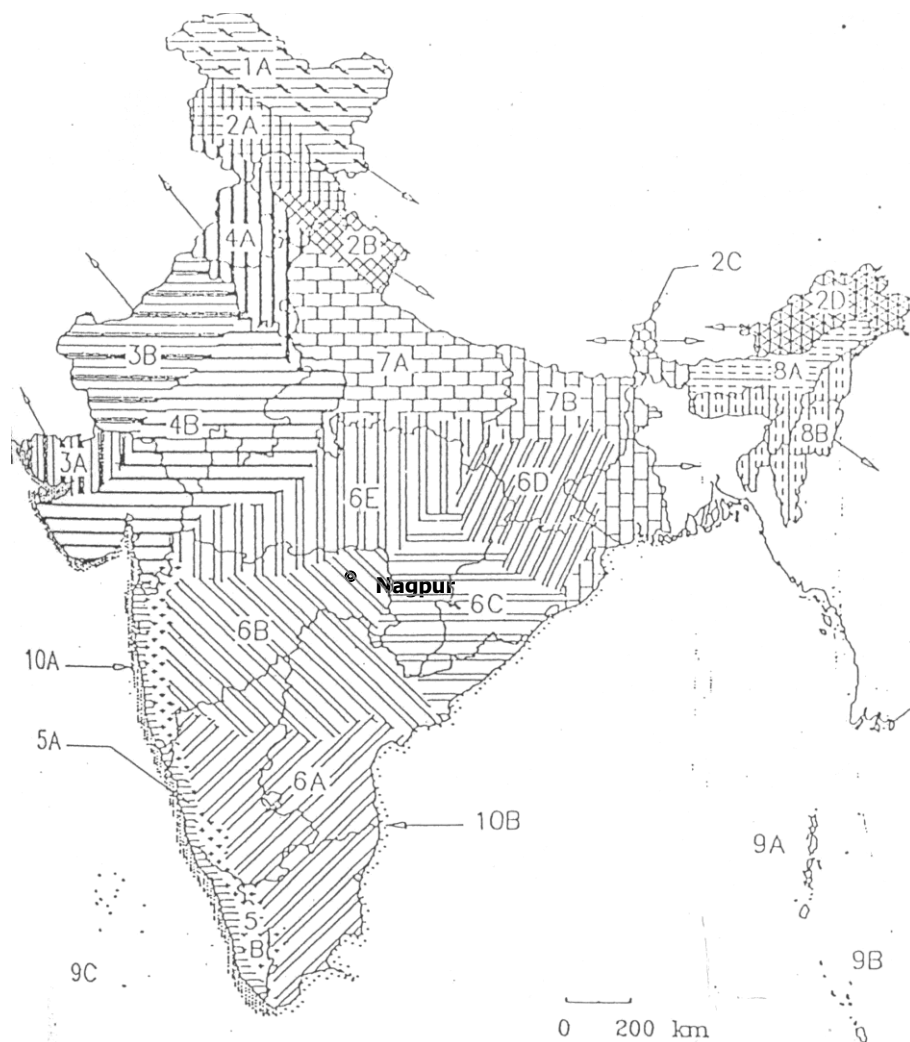
As per biogeographic zoning done by Wildlife Institute of India (WII), Nagpur City appears to lie at the confluence of three biogeographic provinces, named 6-E, 6-C and 6-B in the report on biodiversity conservation prepared by WII. Zone 6-E represents the dry-deciduous forest type of 'Central Highlands', 6-C represents the 'Eastern Plateau', part of which is evergreen forest, while 6-B is the 'Central Plateau' an extensive tract of semi-arid and arid regions of Deccan Peninsula in Maharashtra and is covered with tropical thorn forest (Please refer attached map).



Arid Zones of the Indian Subcontinent
Source: Tourism and Wildlife Society of India



Distribution of Forest Cover in India
Source: Forest Department of India



THE BIOGEOGRAPHIC CLASSIFICATION OF INDIA

Biogeographic Zone		Biotic Province	
1	Trans-Himalayan	1A	Tibetan
2	Himalayan	2A	North West Himalaya
		2B	West Himalaya
		2C	Central Himalaya
		2D	East Himalaya
3	Desert	3A	Kutch
		3B	Thar
4	Semi-Arid	4A	Punjab
		4B	Gujarat-Rajwara
5	Western Ghats	5A	Malabar Coast
		5B	Western Ghat Mountains
6	Deccan Peninsula	6A	Deccan Plateau South
		6B	Central Plateau
		6C	Eastern Plateau
		6D	Chhota-Nagpur
		6E	Central Highlands
7	Gangetic Plain	7A	Upper Gangetic Plain
		7B	Lower Gangetic Plain
8	North-East India	8A	Brahmaputra Valley
		8B	Assam Hills
9	Islands	9A	Andaman Islands
		9B	Nicobar Islands
		9C	Lakshadweep Islands
10	Coasts	10A	West Coast
		10B	East Coast

Regional setting

Geo-strategic location: Nagpur City, the second capital of Maharashtra State, is situated at latitude $21^{\circ} 9'N$ and $79^{\circ}6'E$ and it is practically located at the geographical centre of India and is therefore also called as 'Zero Mile' City. **Geographically, Nagpur City lies at the origin (vertex) of a 'V' shaped Nag River Basin with its vertex at the edge of Deccan Trap Plateau and arms spread eastward in the alluvium plain up to the mighty Wainganga River. 'Nagpur' City derives her name from the Nag River.**

This is a well-demarcated drainage with a continuous downward slope from west to east. This demarcation is prominently visible in the city and especially at its western edge. Not only does the Nagpur city lie at the head of this Basin but within its municipal boundaries lie the origins of Nag River and its main tributary, the Pili River which are the main rivers in this basin.

The Nagpur District Gazetteer of 1908 describes the account of **geology and natural watershed system of the District**, which is quite significant for the City of Nagpur and is of special importance for understanding the topography, water regime and biodiversity:

*'Roughly speaking, the District can be divided into two main areas, **namely the country to the west of Nagpur occupied by the Deccan Trap formation and the country to the east of Nagpur occupied by the metamorphic and crystalline series**; the two other formations, the Lametas and the Gondwanas, are found only along the junction of trap and crystallines'...*

'The town of Nagpur stands upon the eastern edge of the undulating trap country, the cantonment and civil station of Sitabuldi being, for the most part, built upon the trap itself. The Country to the west does not

rise into the hills of any great height, though it is interspersed with low ranges, and both these and the valleys between are covered with black soil, much mixed with stones'... 'Southward the country is similar to that to the west.' 'To the south east, east and the north east the surface is, for the most part, a plain covered with alluvial deposits of the Kanhan and its tributaries.'

Nagpur and its surrounding are often referred to as 'Geologists' Paradise', as all major geological formations are observed in this region. **A more detailed description of the Geomorphologic features of Nagpur District with a map is included as annexure D in this report.**

Annex D

Remnants of the eastern edge of the rolling Mahadagarh Hills, which are themselves extension of the more prominent Satpura Ranges, can be seen in the city in the form of Seminary Hill, Starky Point Hill, Ramnagar Hill and the Sitabuldi Hill.

At the western edge of the city, on a rim of high elevation of these hills are located the major tanks from which two rivers appear to rise and flow eastward. The eastward slope extends right up to the mighty Wainganga, which is about 80 km away.

The situation of Nagpur is truly unique as far as its wetland system is concerned. All the major tanks, among which are the important reservoirs ensuring the flow of two rivers flowing through the city are located within the municipal limits of the city. (The true origin of the rivers is just outside the city limits, but controlled by the revenue department to some extent by seeing to it that this area does not get built over in the form of housing colonies. In this NBSAP report we are suggesting to include these areas from where the rivers rise into the city limits, so that better control could be exercised.)

Downward the rim of lakes, the ground water availability is more than the surrounding region. The groundwater level in the area thus recharged varies from 3 meters to 6 meters below ground level. However, the rivers have been turned into sewage nallahs and all the tanks are declining, some of them being on the verge of extinction. Unless it is urgently revived this strong wetland system will die a slow death.

Upward of the rim, towards Mahadagarh Hills, groundwater is scarce, where the ground water level immediately drops to more than 12 meters. Some recent extensions of the city in these surrounding areas experience acute water scarcity during summers. Town planning exercise has not considered this aspect while making new additions to the city.

In the city proper, especially along the rivers, astonishing amount of greenery and open space is available which can be used for eco-development. Together with open spaces and greenery, heritage of this old city (temples, ghats, and crematoriums) is closely associated with existence of rivers, lakes, and tanks.

Interesting stories of development of important tanks in the River Basin through Gond, Bhonsale, and British periods and the subsequent neglect - partly during the British period and mainly after Independence - give an insight into possible ways of their revival. Their revival is perhaps the key to revival of the rivers.

The Ambazari Lake, Telangkhedi Tank, Pandharabodi, Sonegaon and Sakkardara were strategically located at the very edge of the trap country from where different streams of the Nag River originate. Creation of these reservoirs meant that Nag River flowed throughout the year, also ensuring plentiful groundwater throughout the narrow but fertile Nag River Basin. Hydrogeology of the city is described in detail in Annexure E.

Nag River is described in the following manner in the Nagpur District Gazetteer of 1908: '***A tributary of Kanhan which arises in the hills to the west of Nagpur and flows in a serpentine course past Nagpur City, joining the main river at Saongi in the east of the district. The river probably derives its name (Nag, a cobra) from its sinuous course, and in turn gives a name to Nagpur City***'.

Two parallel edges of the Nag River Basin are distinctly visible within the city of Nagpur itself.

These edges run west to east. The northern boundary roughly matches the **High Land Road** that starts near the Starkey point and travelling at the top of Seminary Hill ends near the Government House hill. Beyond this northern boundary lies the catchment of Gorewada and the Pili River in the North of the city. The Pili River merges into the Nag River near Pawangaon, just outside the Municipal Limits of the City.

The Southern edge begins right near the south end of Ambazari embankment and continues on a comparatively low profile ridge marked by another road, - **the South Ambazari Road**. This edge continues further and joins the road behind Medical College Campus, where it is actually named as the '**Ridge Road**'. Beyond this ridge lie the small tributaries of Pohra River, flowing out of the city at its south-eastern edge. Pohra River also meets the Nag River about 20 Kms from the city.

ii) Socio-economic Profile

Today, with a population of 2.2 million, Nagpur is among the 15 largest cities in India. The Regional Plan of the Nagpur Metropolitan Region prepared in early seventies had projected that the population of Nagpur would be 13 lakh in 1991. However 1981 census itself showed a population of 12.19 lakh. As it turned out, the population as per 1991 census was 16.24 lakh. This shows that rate of expansion of the city is quite rapid. Due to such growth, largely uncontrolled, the urban environment of Nagpur is fast deteriorating like most other similarly placed Indian cities. However Nagpur has been fortunate enough to escape the worst, as it has not taken off as an industrial city.

People of Nagpur, and of Vidarbha region in general, are well known for their friendly and hospitable nature. If one were to assume (and a number of parallels could be shown) that the state of environment does shape the basic characteristics of people, the nature of people does also indicate that the state of environment is favourable.

Due to the nature of its people, better level of harmony and safety, and also due to its central location, Nagpur City is a preferred destination for migration from all over the country, from all categories of people. This has given the city a distinct cosmopolitan character without any particular community in a predominating position. This is unlike other cities in rest of Maharashtra. However it must also be mentioned that the people are not so well known for their industriousness.

Nagpur is also the second capital of Maharashtra, even though it is lesser in importance and clout than Pune. Being one of the few metropolitan (million plus) cities in Central India, it has considerable influence on the hinterland. Nagpur City's hinterland contains extensive agricultural areas as well as forested areas.

Being the largest trading place in an orange growing belt, Nagpur is also known as the 'Orange City'. Other important traditional trades deal with cotton and timber.

Due to its location it is home to a number of premier educational institutions within the country. Large number of outstation students, many of who make the city their home, also contributes to the migration factor.

One drawback in any community based conservation work that is experienced by activists in urban areas is that the large proportion of migrant / resettled population naturally has lesser attachment to the city, leading to apathy regarding local development and management issues. The task of changing the mindset of the people and orienting / committing them towards conservation is therefore that much more challenging.

To deal with this, VNHS and Vidarbha Heritage Society has recognised the need for highlighting the plus points of the city in order to awaken a sense of pride in the city as the first step to ensuring people's participation in improving the urban environment. Meanwhile, as a damage limiting exercise, some citizens' groups are, also insisting upon adherence to legal provisions like the Heritage Regulations, Development Control Regulations, and Maharashtra Urban Areas Preservation of Trees Act etc. However in the absence of wider vocal support and in the face of antipathy of the official agencies, these efforts are meeting with limited success.

iii) Political Profile

Nagpur became Capital of the Gond kingdom in 1702. The Bhonsalas took over as rulers around 1740 and held dominion in the late 1700s over one of the largest of the Maratha kingdoms. The British too left their mark on Nagpur creating two distinct divisions – East and West, the Indian and the Colonial.

During the British period Nagpur was capital of Central Provinces and Berar. (Berar is derived from 'Varhad', presently better known as Vidarbha). At one time the British were toying with the idea of making Nagpur the Capital of the Country, which is why they designed a large 'Civil Lines' area with a ceremonial road, lined with well designed stately buildings set into large gardens. However, after the States reorganization, Vidarbha was amalgamated with Maharashtra and lost its Capital Status and also much of its importance. Vidarbha, which included a large proportion of Hindi speaking population, never completely identified with Maharashtra, although majority of people were Marathi speaking. Maharashtra has been accused often enough of giving step-motherly treatment to Vidarbha while preparing development budget and of exploiting this region in other ways.

Vidarbha is proportionately much richer in forest wealth and biodiversity compared to rest of Maharashtra. As a result, in order to maintain the mandatory forest cover in the whole state, status of Vidarbha's forestlands cannot be changed. Recently very serious demands have been made for separating Vidarbha from Maharashtra. Majority of people and political leaders cutting across party lines seem to favour separate state of Vidarbha. If at all such separation comes about, special efforts would have to be taken by the conservationists to see that this may not have a negative effect on the forest cover of the region.

Overall development of a city in Maharashtra State is guided by the city's 'Development Plan', which is prepared by the 'Planning Authority'. This plan is also examined, modified and then passed by the State Government.

Nagpur Improvement Trust (NIT) was till recently acting as the planning authority. It was also designated as 'Local Authority' in order to allow it act as the planning authority, although NIT is a wholly State Government controlled body. There were serious lacunae in the working of NIT, much to the detriment of the proper development of the city. In February 2002, the Nagpur Municipal Corporation (NMC) was finally designated as the Planning Authority in place of NIT, after sustained pressure from citizens. However NMC would have to brace itself and undertake lot of capacity building before the city can realise the positive effects of this measure. Considering past experiences (it took more than a decade for the Government to pass the Development Plan) it is expected that only in the next Development Plan due in 2011, some departure from the previous sub-standard and inconsistent planning might be possible.

Some active citizens of Nagpur have been seeking implementation of the provisions of the 74th Amendment of the Indian Constitution as applicable to the Nagpur City. This significant legislation provides for extensive public participation in the planning and development process in urban areas. This is the subject matter of a Writ Petition pending in the Nagpur High Court, synopsis of which is enclosed here as Annexure F. However, even after the amendment becomes applicable, much of its positive results would depend, in respect of both, - proper planning of urban areas, as well as empowerment of local-self government, - upon the spirit with which provisions of the 74th Amendment are actually applied by the State.

Annex F

So far, the role of both NIT and NMC has been quite negative as far as nature and biodiversity conservation are concerned. Both have presided over 'reclaiming' of land by filling up waterbodies (Pandharabodi, Gandhibag Tank and parts of Jumma Tank, Sakkardara Tank and Lendi Talao; have converted tributaries of rivers into sewage nallahs and have indulged in unmindful cutting of trees (even carefully planted tree avenues were removed) for ill-conceived building and road development.

Nagpur Municipal Corporation has set up the 'Heritage Committee' after much persuasion, (including seeking directions from the High Court) by committed activists. As per directive of the Ministry of Environment and Forests, Natural Precincts were also included in the 'Heritage List' as reproduced below (Please also refer map on next page)

LIST OF NATURAL FEATURES AND PRECINCTS (Included in the draft Heritage List)

S. No.	Item	Boundaries / Description	Ownership
1.0	RIVERS		
1.1	Nag River	Tributaries' course & contiguous land	NMC (?)
1.2	Pili River	- Do -	- Do -
2.0	LAKES / TANKS		
2.1	Ambazari Lake	Lake embankment, Hingna road, Hingna MIDC, Amaravati road	Forest Deptt / NMC
2.2	Gorewada Lake	Embankment, Water works, Garden, Bharatwada Road, Reserved forest	Forest Deptt / NMC
2.3	Telangkhedi Precinct	Starkey point, Amravati Rd, Futala Basti, Bharatnagar, Vayusenanagar	PKV - (Punjabrao Krishi Vidyapeeth)
2.4	Jumma Tank	Subhash Road, Mahal, Ruikar Road, Empress Mills, Raman Sci. Museum	NMC
2.5	Sonegaon Tank	Tank Bunds along with catchment streams, contiguous area, temples	Private (proposed to be acquired)
2.6	Sakkardara Tank	Tank Bunds along with catchment slopes, temple precinct	NIT
2.7	Baradari Tank	Tank Bunds along with catchment slopes, temple precinct	Nazul / Private (?)
2.8	Pandharabodi	As per High Court orders	NIT, Housing Society
3.0	HILLS		
3.1	Starkey Point Hill	Amaravati Road, Wadi, Telangkhedi catchment, Dabha Road	Forest Deptt.
3.2	Seminary Hill	Telangkhedi Road, Govt. House, Katol Road, Vayusenanagar	Forest Deptt/ Private
3.3	Ramnagar Hill	Hill Road, Fukatnagar, Verma Layout, Ambazari, University Campus, LIT hill	NIT housing layouts
3.4	Sitabuldi Hill	Station road, Ansari road, Wardha road, Shrimohini complex, RBI Sq.	Territorial Army
4.0	OPEN SPACES		
4.1	PKV Fields	Large tracts throughout west Nagpur	PKV
4.2	Park/ Playgrounds	Spread in various layouts, localities	NIT, NMC, Societies

Heritage Regulations have the potential of being a very important tool for saving the important natural features (also biodiversity hotspots) in the city. However NMC officials look upon these regulations as unwanted interference in their 'official' domain and are campaigning to remove the natural precincts from the heritage list, leading to bitter conflict with the heritage activists and environmentalists.

Map showing heritage precincts in Nagpur
Prepared by the Vidarbha Heritage Society



Telankhedi lake



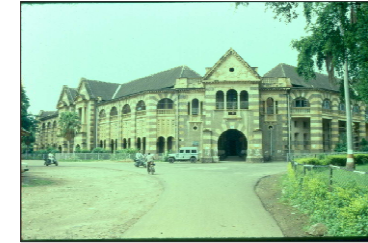
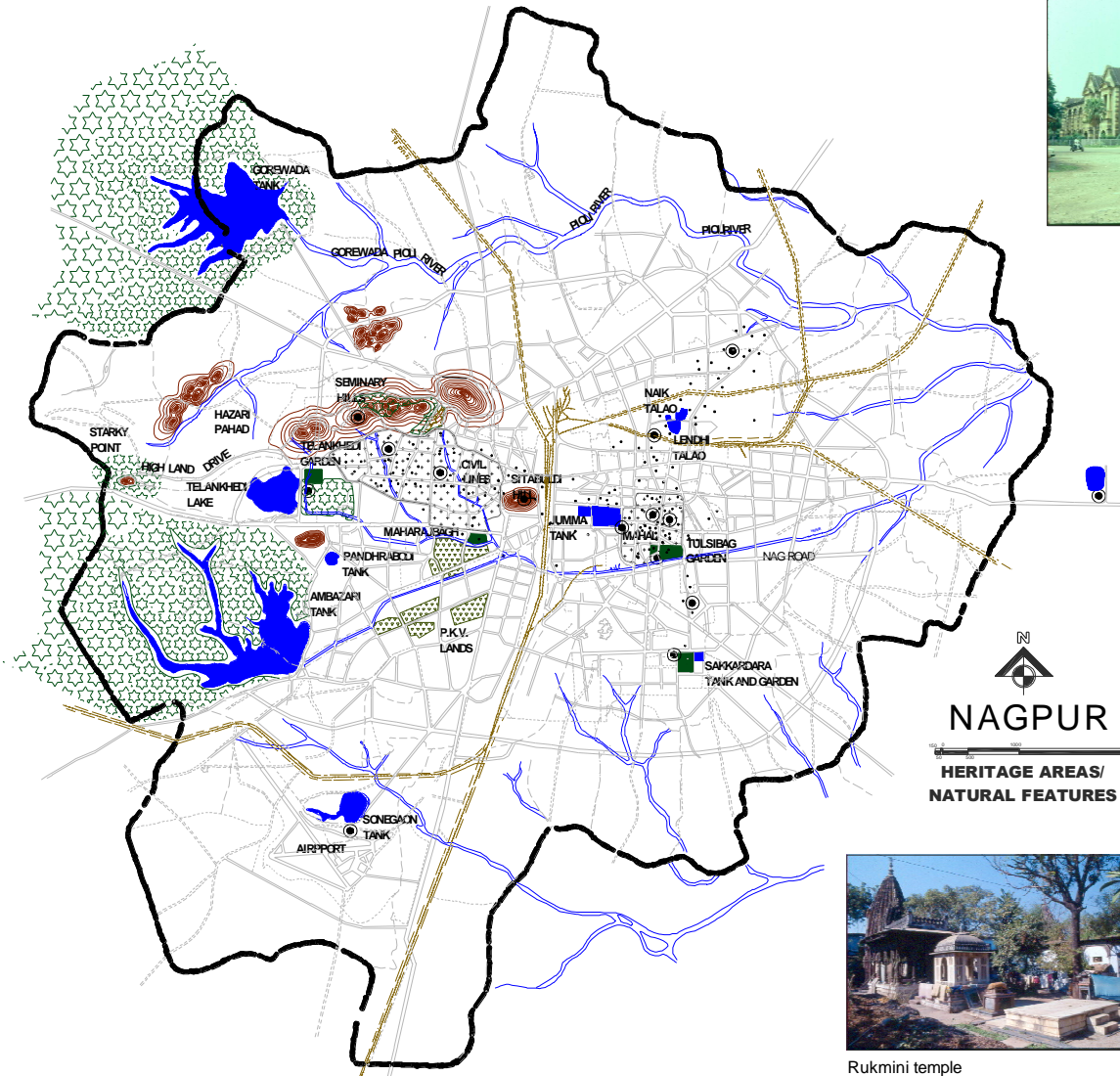
Telankhedi forest



Kasturchand Park Pavilion



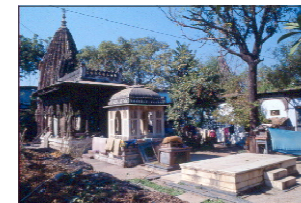
Pardi lake and temples



Old Secretariat building



General Post Office



Rukmini temple

iv) Ecological Profile

Nagpur, like most traditional cities was planned on the basis of a balanced and sustainable relationship with the environment. Up to the beginning of the 20th Century, Nagpur could be categorised as an Ecocity. During successive regimes of the Gond, the Bhonsale and the British, Nagpur was a city with vast green zones and rich water sources viz.-perennial rivers (Nag and Pili) and ten strategically located lakes. Thick forest area abounded in close vicinity in virtually all directions. The British used to call this city as 'Gateway to the Central Indian Forests'. Signs of this natural heritage are in existence even today.

Although Nagpur is thus better placed than most of the other Indian Metropolitan cities to be able to be revived as an ECOCITY, gradual degradation that is taking place has already taken a heavy toll of its natural resources. The precious sources of water are the worst hit .The rivers are polluted. Some of the tanks (notably the Shukrawari tank in the center of the city) have shrunk in size and some water bodies like Gandhi Bag Tank and the Pandharabodi have vanished. Also, some of the heavily built up areas of the old city as well as new layouts developed by the authorities have very little tree cover.

Today Nagpur is one of the fastest growing cities in India. It is necessary to take some urgent steps in order to stop the DECOCITY (term coined to denote the opposite of ECOCITY) process set in motion by lack of regional planning, uncontrolled urbanisation and general apathy towards ecological principles of environmental viability and sustainability. Fortunately the essential ingredients of ecosystem in the city are not fragile and could be recovered fully even today, if urgent steps are taken.

The strength of its ecosystem lies, first and foremost; in its geographical and natural setting. Nagpur City lies at the southeastern edge of the rolling Mahadagarh Hills, which together with the more prominent Satpura Range are home to some of the richest forests in Central India. At the very edge of these hills, on the western fringe of the City a series of lakes and ponds were created, at a slightly higher level than the city.

Development of these water sources began in the Gond period and continued through the Bhonsale and the British period. Till Recently, these reservoirs were capable of fulfilling the water requirement of the city. Their degradation has started recently, due to wrong plans and policies. If proper plans are made this degradation can be arrested.

Two rivers rise from this necklace of reservoirs. The Pili Nadi originates in the Gorewada tank and skirts the city on its northern edge while the Ambazari and the Telangkhedi give rise to two streams of the Nag river which flow through the city and meet at the 'Sangam' near the city. The District Gazetteer of 1908 had described this river as having a serpentine course, a course that was aesthetically beautiful, resulted in a better drainage and ensured proper distribution of water. However this river was first turned into a canal and then into a nallah. Today, on the city map, one cannot distinguish this river from a road, as all prominent bends have been removed by canalisation.

Even so, there are a few locations in the city where the river retains its beauty and some of its original qualities and these are all located within the extensive agricultural lands in the city, belonging to the Punjabrao Krishi Vidyapeeth. These places can be properly utilized for improving the city life.

All along the Nag River one can find abundant evidence of the rich past of Nagpur City, in the form of temple complexes, ghats and gardens. Revival of this river is closely linked with conservation of the man made heritage of the city.

Along the rivers, and especially in the reservoirs, one can find a great variety of bird life. Winter migrants and resident ducks flock to the reservoirs in thousands. A phenomenal 240 bird species are found in the municipal limits of Nagpur city as per checklist prepared and updated from time to time by the Nisarg Seva Sangh of Nagpur.

As recently as fifteen years back animals like the fox, blackbuck and hares could be encountered at the outskirts of the city. In the 70's a crocodile was caught in the Nag River in the centre of the city and a panther was sighted near the University Campus by the side of busy Amaravati road.

The abundance and the variety of flora within the city proper are equally phenomenal. Throughout 'West Nagpur' (physically and ecologically cut off from East Nagpur by the railway line), continuous chains of 'green spaces' exist in the North-South as well as well as East- West directions.

On the North-South axis a major protected reserve forest area stretches on the entire western rim coinciding with the belt of water reservoirs. A few years back these areas were illegally exploited for murrum but after protection was given as a 'reserve forest' (in lieu of forest submerged in the Gosikhurd project) and the areas were fenced off, excellent grasslands and the woods are developing in this area.

Midway in this particular stretch of protected area is the hillock of 'Starkey Point' which is a patch of millions of year old original semi-deciduous forest. Today this treasure is acting as a gene pool for regenerating the surrounding area.

Starkey Point and the surrounding slopes form the water catchment area for the Telangkhedi reservoir from where one branch of the Nag River originates. The Starkey hillock with semi-deciduous forest, the water catchment area on its lower slopes with a small evergreen forest, still lower, the gentle slopes where agriculture is practiced, the Telangkhedi tank itself with reeds as well as deep waters having it's own biosphere (human activity included), the stream of Nag river with a heavily wooded nursery and the garden alongside, and finally, the stream flowing out into the city. In this age and time this perfect and vibrant ecosystem still survives on the edge of this city.

More or less similar system must have existed when the Sitabuldi Fort Hill was not cut off from the Shukrawari Tank. But ever since the railway tracks were laid on a bund between the tank and the fort, the Shukrawari Tank has been continuously shrinking. This tragic example and the Telangkhedi exist in the same city where one can study the causes and effects of human actions of ecosystem and learn suitably. Fortunately Sitabuldi Hill has been protected from encroachments and heavily greened (having been handed over to army battalion) even though it is near the busy commercial area in the city.

Parallel to the system described above two or more such major green networks exist in the city. One of them, the Seminary Hill is the extension of hillocks in the west, but covered with very old teak plantations, rather than with the original forest. A naturalist can easily study the contrast in the poor biosphere (in spite of greenery) that plantations create as opposed to the forests having greater diversity, right here in the city.

However a few gardens and nurseries sprinkled in with the plantations, the Seminary Hill is changing for the better and together with heavily greened Civil lines area bordering it (which the British had developed during their stay), it is a large and precious ecosystem.

The third and most important system originates in the large catchment of the Ambazari. In this area a major industrial area has been set up in the most thoughtless manner. (Fortunately the number of industries is limited.) From here the major stream of the Nag River originates. The river enters the city through a very large and heavily wooded VRCE campus. Being protected from grazing and encroachments, and with enlightened approach of the VRCE management, the campus has developed into a virtual bird sanctuary. Birds found in the forests, gardens, and grasslands, along waterways and also living by the side of human habitations can all be found here in heavy concentration and in great variety.

Where the wonder of VRCE ends, the miracle of PKV (Punjabrao Krishi Vidyapeeth) begins. PKV lands, planned during the British regime as the dividing tracts along river tributaries between the 'Civil Lines' and the 'Native localities' now act as the most important green spine within the built up areas of the city. In spite of considerable pressure, PKV has been able to retain vast stretches of land where agriculture is practiced right next to the city centre.

In summary, a positive balance sheet can be shown regarding Nagpur's ecological profile:

Existence of rich biological diversity.

Hills and healthy / revivable wetland systems.

Vast green belts and open land (PKV lands, Seminary hill).

Favourable land to population ratio.

**Desirable land use pattern
as suggested in the manual of Town and Country Planning Organisation, (TCPO) New Delhi**

No.	Land Use Particulars	Land Percentage
1	Residential	40 %
2	Industrial	8 %
3	Commercial	3.5 %
4	Parks, playgrounds and open spaces	10 %
5	Transportation and Communication	24 %
6	Public and semi-public	10 %
7	Others	4.5 %
		100 %

Norms worked out by Shri Ulhas Rane for local (city level) land use pattern after looking at the global and national scenario as part of the sub-thematic working group on urban biodiversity, NBSAP, as reported in his draft report:

Natural Ecosystem (forests etc., no human intervention) – 10%
Green areas (parks, gardens etc.) – 15%
Open areas for infrastructure (roads, railway, services etc.) – 25%
Residential & Public development – 40%
Commercial & Industrial development – 10%

As against this, in Nagpur City a significant percentage of land is still under the 'Open Category' as shown below:

AREA ANALYSIS OF LAND USE MAP AS ON 25/9/1984

Source: Revised Development Plan of Nagpur City – 1986-2011

S. No.	Major Land use Purpose	Area in Ha.	% To Developed Area	% To Total Area
1	Residential	3500	41.966	16.08
2	Commercial	185	2.218	0.85
3	Industrial	225	2.697	1.03
4	Public Purpose	2100	25.179	9.66
5	Roads	555	6.654	2.55
6	Railway	440	5.275	2.03
7	Airport	525	6.294	2.42
8	Garden & Playground	150	1.798	0.69
9	Developable Vacant Land	660	7.919	3.03

Total (1 to 9)

8,340

100.00

38.34

10	Agriculture	8000		36.78
11	Forest	225		1.03
12	Water Tank	456		2.09
13	Nallah (River tributaries)	380		1.74
14	Non-developable vacant land	4355		20.02

Total (10 to 14)

13,316

00.00

61.66

Total (1 to 14)

21,756

100.00

100.00

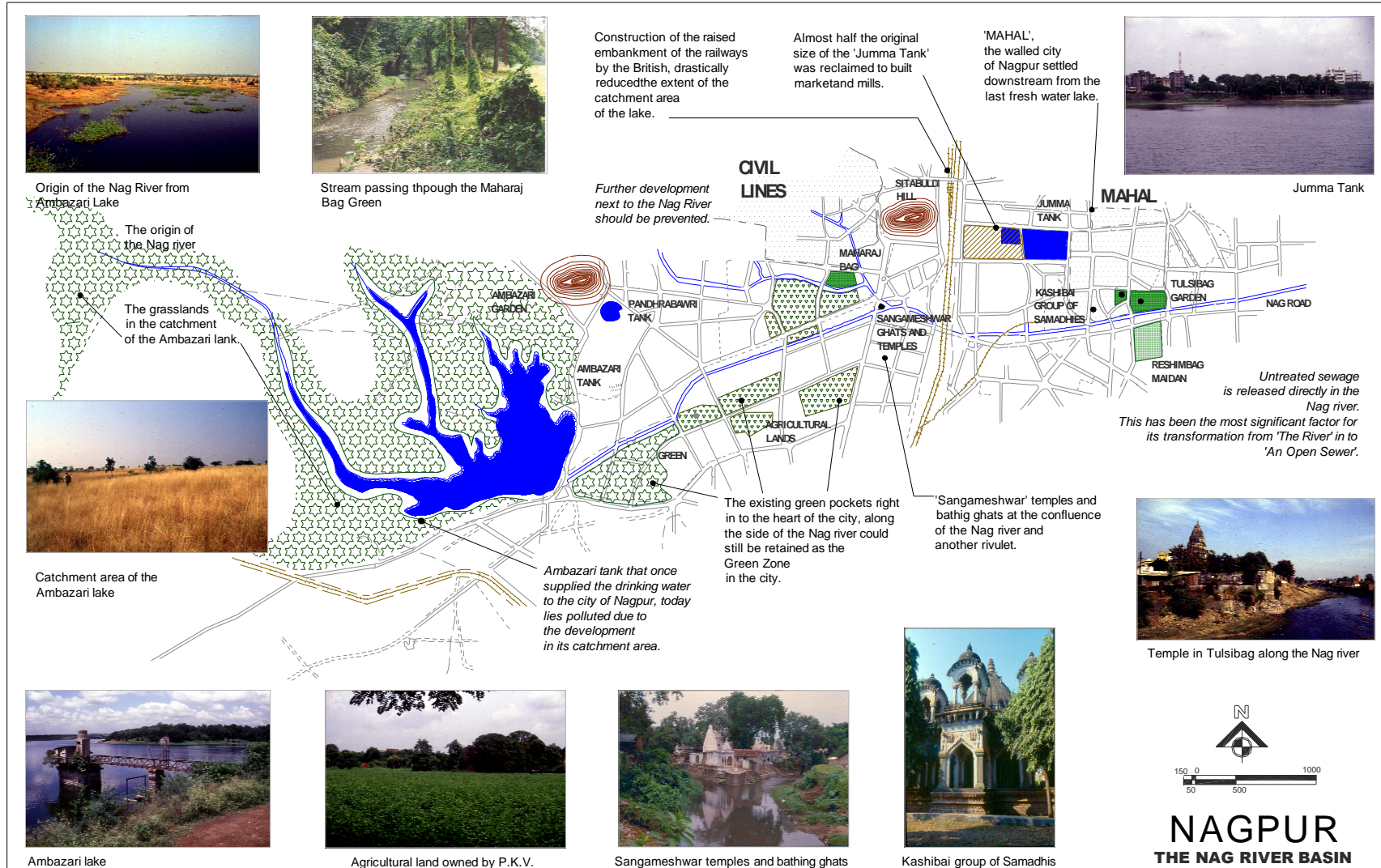
NOTE: Green spaces in Institutional Areas are included as Public Purpose.

With retention of such positive ingredients and imaginative eco-development of some areas (with active help from PKV, forest deptt. etc.), it should be possible to create an environment that will become the envy of other cities. The scale of Nagpur City and its economy is such that shaded parkways for pedestrians and cyclists could become extremely useful and popular. If Nag River is cleaned and small water bodies are created, the same would help in conserving surface water and improving ground water level and if imaginatively used, they would bring much liveliness and delight to otherwise drab areas near the centre of the city and elsewhere.

Unfortunately in East Nagpur there are less possibilities for undertaking such measures. However, with a change in policy regarding further extensions of the city, the factor of ecologically lopsided development could be tackled more seriously. All things considered, further development of the city should logically take place towards the downward slopes in the eastern direction (rather than upland, on the Mahadagarh hills on the west). Along the River, opportunities can also be found for overcoming the daunting task of ecological integration of east and west Nagpur. Many Heritage Sites exist along the main tributary of Nag River (please refer map on next page). Their conservation and use will be linked with revival of the river. The VNHS Centre and 'Vidarbha Heritage Society' are working on this. The statutory Heritage Committee and the NMC are also being urged to help in this task. Such heritage sites are more common in the eastern parts of the city.

The VNHS Center is committed to the cause of developing Nagpur as a Model Ecocity. The basic aim of its work is to find how a balance can be found so that both economic and ecological development is possible. The immediate concerns and areas of urgent studies are of course to stop degradation of dwindling bio-diversity and ecological resources. The long-term action plan is to motivate the people to promote the principles of ECOCITY by active participation in the planning / development processes and to persuade the authorities to not to ignore the Eco-development issues while drafting land use / town development and other management plans.

Map prepared by the Vidarbha Heritage Society showing
heritage sites along the main tributary of Nag River

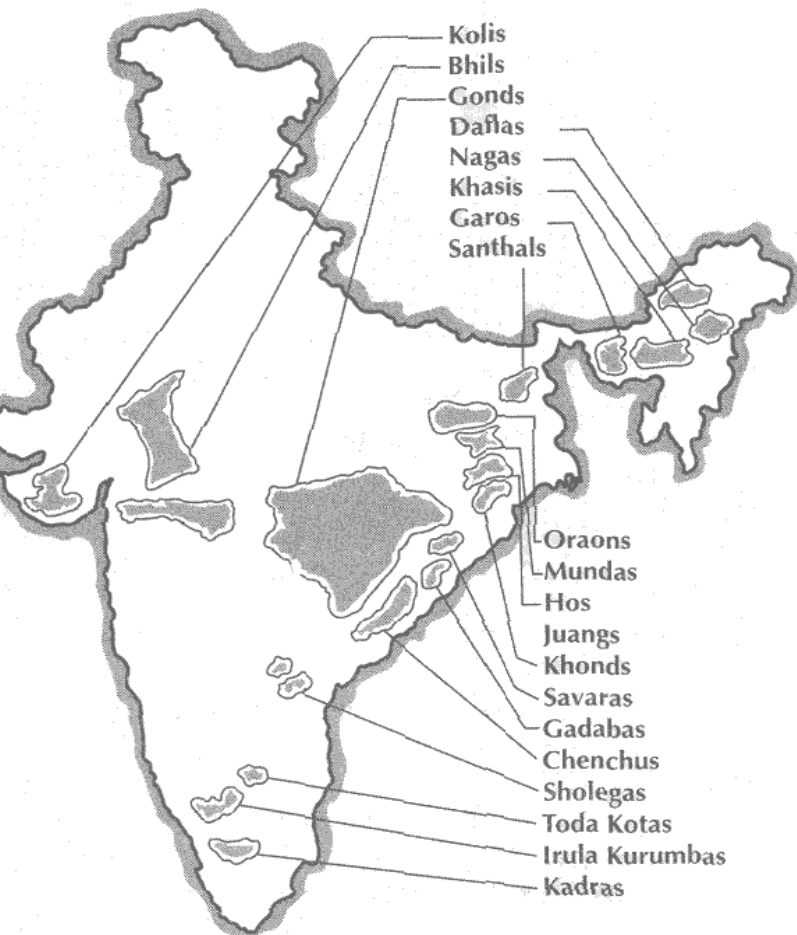


v) **Brief History**

Fairly well recorded historical references regarding development of Nagpur and its surrounding region are available for the last 300 years or so of the `Gond' (Tribal Kings), Bhonsales (Branch of the Marathas originally under the Peshwas of Pune) and the British and post-independence period. Before this period this area has seen the rule of various dynasties, among which the Satvahanas, Vakatakas and the Rashtrakutas were prominent. The Gond kingdom was the largest tribal kingdom in India, coinciding with the area now represented by the biogeographic zone `central highlands' more commonly referred to as central Indian forests. This was the region that the Bhonsales first annexed and then extended their influence beyond upto Orissa and Bengal (please refer map on the next page). The Bhonsales however retained Nagpur as their Capital even though it was on the western fringe of their kingdom.

Jatba, the Gond king of Deogarh near Chhindwara, had extended his rule upto Rajapur - Barsa (now Nagpur) during the reign of Akbar. His great grandson Chand Sultan (1706-1735) was so much fascinated by the situation surrounding this place that he decided to develop the area as his seat of administration. Accordingly, it is believed that he renamed the place as Nagpur (may be due to ample `Nagphani' flora growing in the area) and erected a fortification around it. Thus the origin of Nagpur is regarded to be the areas around the Gond king's fort. Some historians believe that before Chand Sultan, Bakht Buland Shah established the city of Nagpur in 1702, and hence the tercentenary of Nagpur City is to be celebrated in the current year (2002).

Raghuji Bhonsale was invited by Chand Sultan's widow in 1739 to help her fight an illegitimate son of Bakht Buland called Wali Shah. In 1743 Raghuji was again called to help the elder son of Chand Sultan Burhan Shah, after which in 1744 he constituted himself as the protector took all real power in his hand and established the Bhonsale regime. At the height of their power Bhonsale kingdom was one of the largest kingdoms under control of the Marathas in the area that came to be known as Central Provinces and Berar. Under Raghuji new localities started coming up beyond the original fortification walls, which had gates on all sides, `Jumma Gate' was (even today it is there) on the western side.



Source: CSE's 2nd Citizens' Report

Tribes of India

Tribal populations of peninsular India fall into three main geographical clusters. The larger cluster consists of the central Indian group such as Bhils, Gonds and others spread over extensive areas of deciduous forests. The eastern Indian group includes the Munda-speaking populations — Munda, Ho, Savaras, Santhals — of Orissa and Chhotanagpur area, located within the evergreen sal forest area. The third and smallest cluster consists of populations belonging to south India located in the Eastern and Western Ghats, south of the river Krishna.



Source: Bhonsale Kaleen Nagpur, by Historian Dr. B.R. Andhare

The official British colonial presence in Nagpur is dated back to 1798 in the form of a permanent Resident (Mr. Colebrook) at the Court of the Bhonsales. In 1803, Raghuji II who had allied himself with Scindia was defeated and lost large part of his territories. In 1811 the British again defeated Appasaheb Bhonsale in the Battle of Sitabuldi. The British annexed the Kingdom in 1853 after Raghuji III died without an heir.

The British concentrated all their attention on establishing entirely new localities. The first major step taken by them was laying of the present railway line (1867), which now splits the city into two - the old east Nagpur and the new West Nagpur. Even after Independence, little understanding or vision was shown regarding town planning and development till it was almost too late. Of late some of these issues are being slowly addressed, often as a result of concerted efforts of some concerned citizens. Otherwise the administration does not seem to care and the public at large is disinterested as well as helpless.

Map showing gradual development of the city over last 300 years is shown in the map on the next page. This map was prepared by Shri Sameer Deshkar as a part of his dissertation in Environmental Planning.

The single most important factor for development of a large urban centre is presence of adequate water, either as a river system and/or reservoirs, which in turn create a suitable ground water regime. Water is also the single most important factor deciding the abundance and composition of biodiversity. In Nagpur's case also, history of the city's development and status of its biodiversity is very closely linked with development of its water sources.

The Tribal (Gond) King Chand Sultan made an important gift to Nagpur. Thinking that it would make a beauty spot so also it would provide a source of water supply, he made arrangements to divert streams of water; which were earlier flowing down the slopes into the Nag River, to form a water reservoir. Being a person inclined towards religion he named it as 'Jumma' tank indicating that it was the gift of the almighty.



Map showing gradual development of Nagpur City over last 300 years prepared by Sameer Deshkar, (Environmental Planner)

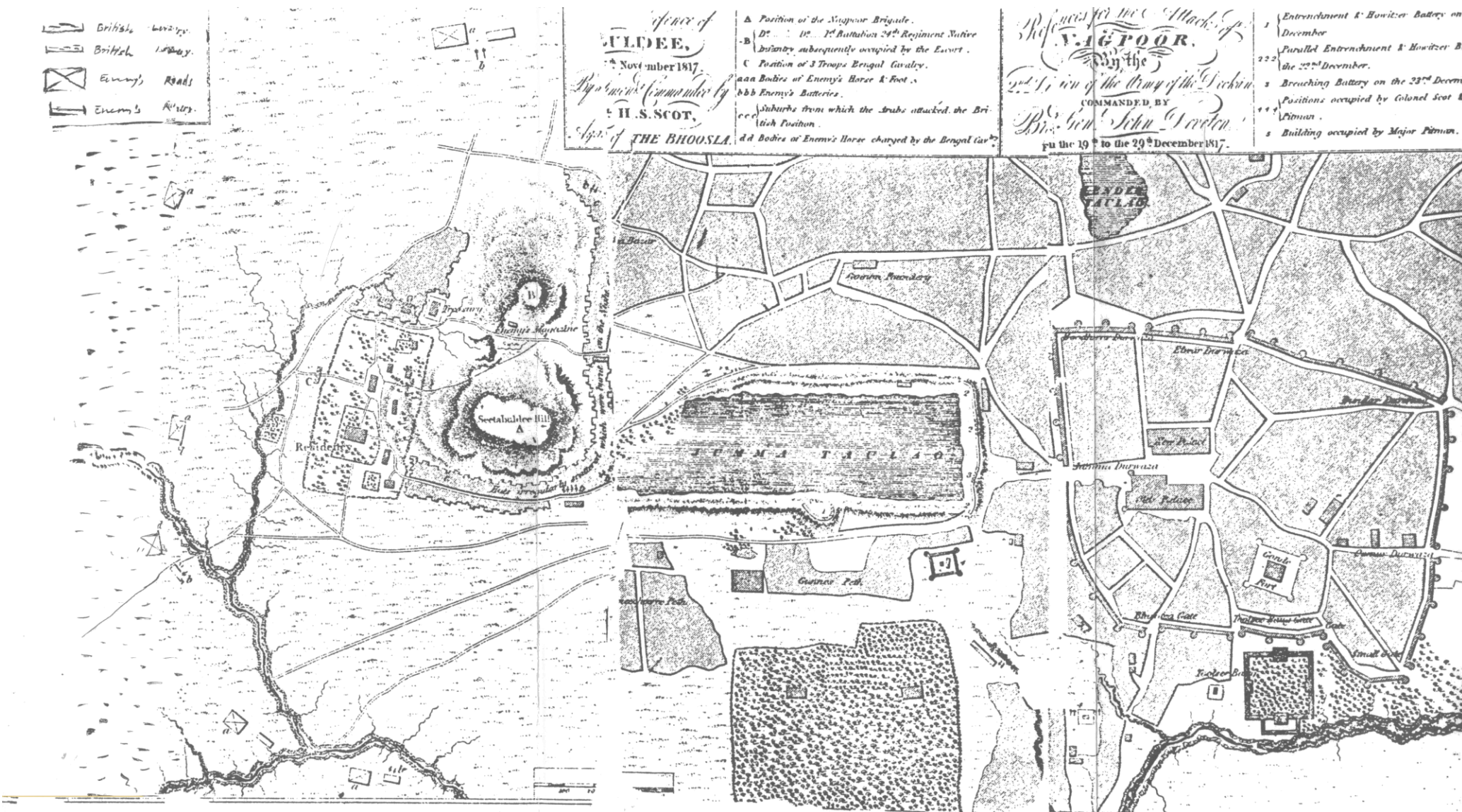
HISTORICAL EVOLUTION OF NAGPUR

Jumma Tank subsequently came to be known as 'Shukrawar Talao' during Bhonsale and British periods and now 'Gandhi Sagar' was thus built nearly 300 years ago. Mahal and Itwari areas were subsequently developed during the Bhonsale period.

To facilitate the formation of new localities and to add the usefulness and the beauty of the lake the Bhonsales arranged to construct retaining walls on three sides, including well-designed and well-built Ghats. To reclaim some of its portions they made bunds on the eastern southern and northern sides, making the tank into a rectangular shape, while on the west its waters reached the base of Sitabuldi Hill. (Please refer to map on the next page reproduced from the Nagpur District Gazetteer of 1908, showing extent and shape of the Tank in 1817). A road leading to Sitabuldi and another leading towards Mahal areas were constructed.

However the British did not pay any attention to the Jumma tank in the old town. In fact, for construction of the Railway station, its yard and adjoining localities, they cut eastern and southern portions of the Sitabuldi Hill and also reclaimed quite a big chunk of the Jumma Lake, thus ending the direct relationship between the hills and the lake. They did not make any substitute water supply arrangements for feeding the lake although it would have been possible. The British constituted a Municipal Committee for Nagpur in 1864 and handed over the civic improvements, including of the lake to it.

Following this city had an important addition, according to the colonial / industrial model of economic development, that of the textile mills. Without giving due consideration for the maintenance of the lake the civic bodies split asunder the lake making it's western parts available to the Empress mills for it's need for water. Thus its magnificent form was annihilated for the second time. Labour colonies of the mills sprang up and it was inevitable that the uneducated new residents occupying them having little to do with the upkeep and sanitation of the area further harmed the reservoir.



Sitabuldi Hill, Jumma Tank and the walled city in the year 1817 (Source – District Gazetteer published in 1908)

Subsequent to this, the municipal committee took up the Ambazari water supply project in hand and Nagpur had its first experience of tap water on 20th May 1872, when the scheme was inaugurated. With the source of water supply to it already gagged 'Jumma Lake' receded further in the following years. Empress Mills arranged for separate water supply line from the Ambazari Lake. Even today the mills can take water from the Jumma Tank; but there is hardly any occasion when they take any as would cross the free water supply limit granted to them by the corporation.

Due to favourable lay of the land, recognised very early by the Gond and the Bhonsale regimes, the water reservoirs, particularly Ambazari and Telangkhedi were effectively used for supplying water to the city. The British also conducted scientific surveys and on that basis increased the capacity of Ambazari before starting supply of water through pipelines. They kept supplying raw water to the native old city. For their own use they constructed a modern dam on the Pili Rver and also built water purification plants. This large reservoir is called 'Gorewada' (referring to house of the whites). Presently this lake is used as a storage tank for water brought from Pench River, which is 80 Km away. This is presently the main source of water supply to the city.

Presently Nagpur is in danger of losing its cultural identity due to a rapidly increasing population. This has resulting in a proliferation of slums, unauthorised construction, pollution, garbage, etc. The many layers of its history are rapidly disappearing as historic buildings are demolished and lakes filled in due to urban pressures. In an effort to save these structures and maintain the identity and character of Nagpur, the Nagpur Heritage List and regulations were published. This is a regulatory measure but has involved little public participation. It was intended to arrest the immediate problem of demolitions. However in order to really conserve and enhance the urban environment of a city it is not at all sufficient to prescribe top-down regulations. It is acutely felt that citizens participation, with of a sense of concern and pride in the strong points in the city - can only bring about conservation of urban environment.

3) Current range and status of biodiversity

i) State of natural ecosystems and plant /animal species

Studies and strategies related to the state of natural ecosystems is central to formulating strategies for saving of biodiversity and therefore various aspects of the same are being discussed in detail throughout this report. In the current chapter and related annexures, the status of biodiversity is first established by preparation of lists of flora and fauna (enclosed as annexure).

From the studies and experiences of the field scientists strategies are suggested in the form of immediate action points and proposals for long term study and action programmes.

Overall, the present study shows that the composition of biodiversity in Nagpur is quite rich, but its protection cannot be taken for granted any more. Also, if special efforts are made, possibilities to improve the situation by recovering and reconstructing some of the lost elements of biodiversity do exist.

Summarised reports of the study carried out by our expert teams for flora and fauna are reproduced below. (Dr. M.B. Padhye led the `Flora field team' while Dr. Dilip Sawarkar and Shri R.J. Andrews coordinated `fauna field team'. Shri Ramesh Ladkhedkar and Dr. Anil Pimplapure prepared special note on birds, study of fishes was undertaken by Shri Bhrushundi while the note on invertebrates is prepared by Shri R.J. Andrews.)

FLORA OF NAGPUR CITY

It is a great surprise to realize that the vegetation of the ever expanding, fast developing city of Nagpur is fairly rich and varied. Almost all major groups of the plant world are represented in the flora, the dominant component being the Angiosperms or the flowering plants. (Please refer to lists in Appendix 1 – Flora of Nagpur City.)

Appendix
1- Flora

There are around 850 plant species of the flowering plants distributed among the two major classes – the Dicots and the Monocots. The former outnumber the latter in respect of Families, Genera and Species. The Dicots are represented by over 100 families while the Monocots by 22 families. The number Genera included under these two groups are 450 and 125 respectively. The five dominant families are the Leguminosae, Poaceae (Graminae), Cyperaceae, Compositae and Euphorbiaceae.

The tree cover of Nagpur often mentioned as one of the “green cities” of the Country is quite rich. There are over 160 species of trees, some of them bearing beautiful flowers (list enclosed as part of Appendix 1). These are dispersed in different Parks & Gardens, a few protected forest areas and along avenues and roads. The trees are broad leaved and deciduous. Most trees flowers during summer months.

Angiosperms (Flowering Plants)

Group	Families	Genera
Dicots	100	450
Monocots	22	125
Trees	160 Species	
Grasses	150 Species	
Medicinal Plants	225 Species	

Besides the moderate sized trees, the woody component consists of several shrubs and a few woody climbers. The grass cover of the city – appearing after the onset of the monsoon in July and continuing till December-January- comprises as many as 150 grass species (List enclosed). Many among these serve as fodder for cattle. The survey reveals that a few grasses are becoming rare. These include Chloris barbata, Chrysopogon acicularis, Iseilema prostratum, Avena ludoviciana, Echinochloa colonum, and Coix lachryma – jobi.

Several herbaceous taxa flourish during this period, the dominant monsoon component of herbaceous taxa reaching maximum number during September-October. The herbaceous cover is practically absent during summer months. The pond vegetation of the few large perennial lakes/tanks and seasonal ponds is fairly rich. The wasteland flora and weeds of cultivation (monsoon & autumn weeds) are also significant. Special attention is focused on plants of medicinal importance growing in and around Nagpur. Their number is quite substantial (around 225 plant species). Of these Gymnema sylvestre and Chlorophytum spp. are becoming rare.

The roadside vegetation, quite abundant few decades back, appears badly hit by urbanization. There is considerable reduction in plant populations of once very common road side/open land/waste land species. These mainly include Cassia tora, C. occidentalis, Tephrosia purpurea, T. villosa, Solanum xanthocarpum, Aregemone mexicana, Corton bonplandium, Echinops echinatus etc. This is the result of construction/widening of roads on a large scale undertaken by the local authorities as also introduction of exotic weed such a Parthenium hysterophorus.

Algae of Nagpur

A limited survey indicates that the Algal flora that forms an important component of aquatic ecosystem is well represented by over 200 members belonging to four major groups viz. Cyanophyceae (15 genera, 75 species), Chlorophyceae (21 genera, 70 species), Basillariophyceae (17 genera, 50 species) and Eugleniaceae (2 genera, 8 species) (List enclosed at Appendix 1). The last group is rather poorly represented mostly in fresh water bodies.

Group	Genera	Species
Cyanophyceae	15	75
Chlorophyceae	21	70
Bacillariophyceae (Diatoms)	17	50
Euglenophyceae	2	8

The algal flora of a few isolated polluted streams/rivulets appears rather different from that of fresh water bodies. Dominant members of polluted water bodies include species belonging to Oscillatoris, Phormidium, Chroococcus, Lyngbya, Tetraspora, Characium, Chlorella, Scenedesmus, Chlorella, Closterium, Cosmarium, Ankistrodesmus, Spirogyra etc.

Some algal forms commonly observed in both – fresh and polluted-water are Trentepohlia abietina, Ulothrix tenerrima, Chlorella vulgaris, Scenedesmus bijugatus, Spirulina plantensis, Nitzschia frustulum etc.

The farmers in and around Nagpur are using a few biofertilizers to augment nitrogen needs. These include Aulosira fertilissima, Nostoc muscorum, Anabaena fertilissima and A. variabilis.

The survey reveals that a few members of the Chlorophyceae such as Trentepohlia abietina, Ulothrix tenerrima, Characium sp., Cosmarium sp., Scenedesmus sp. are becoming rare.

Fungi of Nagpur

The fungi are a very important component of terrestrial as well as aquatic ecosystems, being the dominant decomposers along with Bacteria and Actinomycetes. There are around 110 species of fungi belonging to Myxomycetes, Oomycetes, Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes (List enclosed). Except Myxomycetes and Zygomycetes the other 4 groups are well represented.

Sr. No.	Group	No. of Species
1.	Myxomycetes	2
2.	Oomycetes	10
3.	Zygomycetes	3
4.	Ascomycetes	18
5.	Basidiomycetes - Rusts	38
	- Smuts	26
6.	Deuteromycetes	16

The Basidiomycetes & Ascomycetes are dominant. Though fungal diversity can be attributed to availability of vast variety of host plants and their debris. Over 80 species are parasite on flowering plants while the rest are saprophytic.

Species of genera such as Albugo, Erysiphe, Uncinula, Phyllochora, Phyllactinia, Uromyces, Ravenalia, Puccinia, Sphacelotheca, Ustilago, Cercospora, Alternaria, Helminthosporium, Fusarium and Aspergillus are very common on cultivated plants, grasses and weeds.

The survey points out that a couple of species of fungi are threatened mainly because of huge decline of host plants.

Threatened Species of Fungi

Sr. No.	Name	Host
1	<i>Cerotelium fici</i>	<i>Ficus carica</i>
2.	<i>Melampsora lini</i>	<i>Linum usittassimum</i>
3.	<i>Ustilago coicis</i>	<i>Coix sp</i>

Members belonging to Bryophytes, Pteridophytes and Gymnosperms are rather poorly represented in the flora of Nagpur City. Amongst Gymnosperms, species of Cycas, Thuja, Cupressus and of late Araucaria are cultivated in many gardens, parks and homesteads.

The Pteridophytes are represented by a few species of *Selaginella*, *Equisetum* and *Isoetes*. Noteworthy ferns include species of *Nephrolepis*, *Adiantum*, Silver fern & *Ophioglossum*. Species of *Azolla*, *Marsilea* and *Salvinia* represent aquatic ferns. Mosses and Liverworts are limited to a few species of *Funaria*, *Porella*, *Polytrichum* and *Riccia*.

The present limited survey indicates that urbanization, industrialization and pollution have resulted in loss or disturbances in natural habitats and consequent loss or rarity of plant species. In the accompanying box are enlisted the various rare / threatened plant species that need special attention and further detailed study for their conservation.

Sr. No.	Name	Local Name
	Trees	
1.	<i>Saraca asoka (Roxb) de Wilde</i>	Sita Ashok
2.	<i>Adenсонia digitata L.</i>	Gorakh Chinch
3.	<i>Ceiba pentandra</i>	Chopdi sawar
4.	<i>Pterocarpus marsupium Roxb.</i>	Bija
5.	<i>Prosopis sinararia (L) Druce</i>	Shami
6.	<i>Sterculia foetida L.</i>	Jangli Badam
7.	<i>Acacia modesta Wall</i>	
8.	<i>Michelia champaka L.</i>	Son champha
9.	<i>Cochlospermum religiosum (L) Alston</i>	Gongal
10.	<i>Buchnanian lanzan Spreng.</i>	Charoli
	Grasses	
11.	<i>Chloris barbata Sw.</i>	Gonde gawat
12.	<i>Chrusopogon aciculatus(Retz) Trin</i>	
13.	<i>Avena ludoviciana Dur</i>	Wild oat
14.	<i>Echinochloa colonum (L) Link</i>	Sawa
15.	<i>Coix lachryma jobi</i>	--
16.	<i>Iseilema prostratum (L) Anders</i>	Mushel
	Medicinal Plants	
17.	<i>Gumnema sylvestre</i>	Gudmar
18.	<i>Chlorophytum spp.</i>	
19.	<i>Utricularia sp</i>	Bladderwort of aquatic/marshy habitats
20.	<i>Equiselum sp</i>	--
21.	<i>Ophioglossum sp</i>	--

In and around Nagpur city there exist a number of agricultural fields, hilly areas (Sitabuldi hill or Fort area, Seminary hills, Starkey Point Hazari pahad, experimental fields of PKV etc) where natural vegetation is even now seen. Old and unique tree species grow in several areas of the city such as Maharaj Bag, Ambazari, Telangkhedi, Seminary Hills etc.

It cannot be denied that the role played by a tree in a natural forest can not be substituted by a tree in a “concrete jungle”. But the trees, shrubs, climbers planted in parks / Gardens / road side / waste areas will definitely compensate, albeit partly, the loss of natural forests. In this context, it is the urgent need of the hour that Nagpur City preserves and conserves “the well known, original vegetationally sound areas” because tree cover in such areas does help other smaller plants to grow and thrive with it besides sheltering a variety of animals, birds, insects etc. In view of the above, following areas of the city need further, thorough scientific study. This is all the more necessary because of the implementation in the near future of the just published Development Plan of the Metropolitan City of Nagpur.

Green Area of Nagpur needing further scientific study for conservation of Biodiversity

Sr. No.	Areas
	Centrally located
1.	Sitabuldi Hill or Fort area
	Western Side
2.	Telankhedi, Gorewada lakes, Forest area, grassland
3.	Starkey Point, Wayusenagar
4.	Seminary Hill / Hazari Pahad Forest area
5.	Ambazari lake, forest area, catchment area, University campus
6.	Maharaj Bag, Agriculture/Experimental farms, P.K.V.
7.	V.R.C.E. Campus
8.	Aerodrome – surrounding areas, Wardha Road
9.	Central Jail/NEERI/Gorakshan
	Eastern Side
10.	Sakkardara lake, surrounding areas
11.	Grasslands, Umred Road.

FAUNA OF NAGPUR

Faunal characters are the most reliable indicators of ecosystem (hawk & worth -1995). In Nagpur, within the corporation boundaries the definition of land and water habitats is arrived, through personal observations, discussions and literature survey. The habitats specified are macro habitats. These are about 12 fresh water bodies and two rivers, hot spots like VRCE, NEERI, Maharajbag, Gorewada, various PKV fields etc. All these come under 25 kms radios from Zero Mile Stone & fall within 625 Sq. Kms.

CHORDATA

The Chordates, animals with backbone, consists of five different classes. *Pisces*, *amphibia*, *reptilia*, *aves* and *mammalia*.

The fresh water fish fauna of this area is described up to species level. In all about 50 species identified. Out of this economically important, *Pabda (Ompak bimaculatus)* is on the decline, from all the water bodies. *Belone (xenentodon concilla)* and *Puntius (Puntius puntius)* are also becoming rare and also *Singhal (Heteroph uestus)* has nearly disappeared due to introduction of *chinese carp* and other exotic species.

Amphibians are probably the best indicators of environmental health of all vertebrates, being extremely sensitive to temperature and humidity. Present survey describes 10 amphibian species belonging to 4 genera. Of these one is extinct and two of genera *Rana* have become rare.

In all 17 species of reptiles belonging to 3 orders are described. Except lizards, the population of snakes and turtles has gone down as per studies carried out by Dr. Murhar of Zoology Department.

Species of mammals are second largest in number, next to birds. In all 36 mammalian species belonging to 8 orders have been listed. Despite urbanization, population of fruit bat is increasing, and that of black buck, cheetal, fox etc. is declining. Tiger is extinct from this urban area and panther is rare.

BIRDS OF NAGPUR

Introduction:

Generally the most comprehensively studied component of fauna is the avifauna or birds. Nagpur is no exception to this worldwide phenomenon. Enthusiastic birdwatchers belonging to formal and informal organizations / NGOs in Nagpur have carried out birdwatching activity since 1975. This activity was for a long time restricted to identification of bird species. VNHS Centre then went a step ahead and conducted a systematic study of the birdlife of the city as well as the surrounding region. After ten years of this study, VNHS Centre published a checklist of birds in and around Nagpur in 1986 mentioning therein the birds' occurrence, residential status, preferred habitats etc. This was the first post-independence scientific publication on the avifauna life of the region.

Since 1986, VNHS Centre engaged itself in coordinating mid-winter waterfowl census of Vidarbha region for the Asian Wetland Bureau (AWB). This annual activity was conducted over a number of years to generate sufficient and authentic data; by utilization of which. Further systematic study of winter migration pattern of waterfowl communities of the region was planned.

The information gathered through these background studies is used in this chapter for assessing the current range and status of bird life of Nagpur City.

EARLIER WORK

The only authentic pre-independence work published on this subject was 'Birds of the Central Indian Provinces' (1923), which was compiled by Mr. E.A. D'Abreau, then curator of the Central Museum, Nagpur. The compiler has mentioned that the major share of information of the Handlist was collected in and around Nagpur. The Handlist contains information about 430 bird species that was gathered from all over the Central Provinces. The Handlist contains certain important historical records of the 19th Century regarding some endangered species such as Bar

Headed Goose (--), Siberian Crane (--), Great Indian Bustard (--) etc. A comparative overview of this valuable information is further discussed in detail on subsequent pages.

BIRDLIFE IN NAGPUR

The updated checklist of Birds of Nagpur (Appendix III) compiled by the VNHS Centre contains information regarding 235 bird species of 50 families. The information about occurrence and present population status of bird species is mentioned in tabular form in the checklist. For better understanding of the present status of birdlife of Nagpur, certain aspects such as occurrence, familywise distribution, residential status, population status, status of endangered species etc is herewith discussed in detail.

1. BIRD SPECIES AND FAMILIES

About 50 families of avifauna are represented in the checklist of Nagpur, indicating rich diversity of bird community in the city. Different niche users such as ground dwellers, canopy users, as well as arboreal species are widely represented. Bird species associated with different habitats such as forest, grassland (or savannah), wetlands, human habitation, are all present.

Apex bird species (arboreal hunters/raptors/scavengers) are represented by 17 species, which is another indicator of rich diversity of bird species.

Out of these 50 families. Muscicapidae with 33 species leads the table (refer table 1, below) followed by Phoenicopteridae and Accipitridae with 17 species each and Charodriidae with 13 species as well as Arideidae with 10 species.

Table 1

Sr. No.	Name of the family	No. of sp.	Sr. No.	Name of the family	No. of sp.
01	Podicipedidae	02	26	Meropidae	02
02	Phalacrocoracidae	02	27	Coraciidae	01
03	Ardeidae	10	28	Upupidae	01
04	Ciconidae	05	29	Bucerotidae	01
05	Threskiornithidae	04	30	Capitonidae	01
06	Phoenicopteridae	17	31	Picidae	05
07	Accipitridae	17	32	Pittidae	01
08	Falconidae	01	33	Alaudidae	06
09	Phasianidae	06	34	Hirundinidae	06
10	Rallidae	04	35	Laniidae	04
11	Otididae	01	36	Oriolidae	02
12	Jacaniidae	02	37	Dicreridae	03
13	Recurvirostridae	02	38	Sturnidae	06
14	Burhinidae	02	39	Coriidae	03
15	Glareolidae	02	40	Campephogidae	05
16	Charodriidae	13	41	Irenidae	03
17	Laridae	05	42	Pycnorotod	03
18	Pteroclididae	01	43	Muscicapidae	33
19	Columbidae	07	44	Paridae	02
20	Psittacidae	03	45	Motacillidae	08
21	Cuculidae	09	46	Nectarinidae	03
22	Strigidae	04	47	Zosteropidae	01
23	Caprimulgidae	02	48	Plocidae	08
24	Apodidae	01	49	Tringillidae	01
25	Alcedinidae	03	50	Emberizidae	03

2. OCCURRENCE

About 2/3rd of bird species (163 nos) are quite common in the city. One fifth of the species (47 nos) are categorised as uncommon. Only 14 nos of the total recorded species are categorised as rare birds. This indicates that commonly seen bird species are the dominant communities. These communities are present in the city throughout the year and in good numbers.

3. RESIDENTIAL STATUS

Out of the 235 bird species listed in Nagpur, 175 species (75%) are resident birds. Local migrants/visitors are also included in this category. Winter migrants constitute almost the entire remaining population (55 nos, 23%). Most of the species in this category are associated with waterbodies of Nagpur. Some of these birds are waterfowl and remaining ones are waders. The remaining 2% (5 Species) are categorised under 'breeding migrants'. All these breeding migrants are from the Cuckoo family, the parasite breeders that migrate to this region during monsoons.

4. POPULATION STATUS

It is observed in the city during the last twenty-five years that certain changes are taking place in the population status of certain bird species. These changes are mentioned in the second column of Appendix III. The largest group of bird species of Nagpur has a stable population. The numbers of such species is 185 (789). This indicates that the avifauna of Nagpur is in a healthy state.

The number of species whose population is declining is 45 (21%). Out of such species, 16 species are already recorded in the Red Data List of Indian Peninsula (SACON). For further information, a comparative study of the species on local, regional, as well as national level is necessary.

Surprisingly, the population status of 2 species (1%) of the city shows an improvement. It seems that the population graph is moving in a positive direction.

5) Endangered bird species of Nagpur

The checklist of birds of not to be a nature center is being relief presented by sixteen bird species That have included in the trade data list of board of Indian peninsula (SACON). The following table (Table 2) shows a competitive status study of these sixteen endangered species of Indian peninsula and their local residential occurrence and population status. Competitive analysis of these factors leads to certain conclusions discussed herewith.

Table 2

Sr. No.	Name of Bird	Residential Status	Occurrence Status	Population Status	Remark
1	Great Crested Grebe	M+	R	--	
2	Darter	RM	UC	D	Moderate
3	Painted Stork	LM*	R	D	
4	Open-billed Stork	RM	UC	D	Alarming
5	White-necked Stork	RM	C	D	
6	Black Stork	LM*	R	D	Moderate
7	Black-necked Stork	RM	R	D	
8	White Ibis	LM*	UC	D	
9	Glossy Ibis	M+	R	D	
10	Bar-headed Goose	M+	UC	D	
11	White-eyed Pochard	RM	UC	--	
12	Nakta	RM	UC	D	
13	King Vulture	RM	UC	D	
14	Indian White-backed Vulture	RM	C	D	Alarming
15	White Scavenger Vulture	M+	UC	D	
16	Osprey	RM	UC	D	
17	Painted Partridge	RM	C	D	
18	Great Indian Bustard	RM	UC	D	
19	Black-bellied Tern	RM	UC	S	?

R – Resident – Seen almost throughout the year. Breeding around Nagpur or in the surrounding region.
 LM – Local Migrant – Seen in a specific period and breeding in Vidarbha region or somewhere in the country.
 M – Migrant – Seen mostly in winter season and breeding outside country.

Discussion

As far as Nagpur is concerned the conservation status of four migrant species it is still not confirmed. Occurrence wise, these species in the city were always either rare or uncommon. It is true that during the last decade their number has certainly declined. Thus, no further conclusion is possible due to lack of information about these species.

The conservation status of four local migrant species is yet not finally concluded. In Nagpur, these species are recorded as a rarely occurring. Their population decline in and around the city in the last decade is well documented. During last twenty years Black-necked Stork was recorded only twice or thrice around Gorewada reservoir. Moreover, during the last ten years it is almost absent in the Vidarbha region. The Black-necked Stork has presently become the rarest visiting specie of the region. The remaining three species also have become very rare in the city. Secondly, are sometimes seen commonly in the surrounding area of Nagpur. Hence, no authentic comment about the conservation status of these species is possible.

Amongst the eleven resident species mentioned in table 2, the conservation status of White-necked stock and Indian-white backed vulture has reached an alarming state. These two species are very regularly seen in and around Nagpur in good numbers. They also are recorded as regularly breeding in and around Nagpur. During the last five years the population of Indian white-backed vulture has suddenly gone down, and now they are almost absent from Nagpur city's scenario. During last one or two years no nests in the city has been recorded.

Population of certain bird species that are not recorded in the Red Data List is also getting unstable. During the last five years, the Indian Crow and the Blue-rock pigeon are surprisingly disappearing from Nagpur City. Whether these species are emigrating from loss of their traditional habitats or their population is under threat is not yet known.

6) Birdlife in Nagpur – The Past and the Present

D'Abreu's list of birds deals with bird life of Nagpur dating to end of the 19th century to first quarter of the 20th century, while the VNHS center's checklist of birds of Nagpur deals with the last quarter century of the twentieth century.

D'Abreu	VNHS Centre
Great Indian Bustard	
Mentioned the Great Indian Bustard's presence in Nagpur. The egg taken at Nagpur measured 3.4' ← (foot ?) by 2.15' ← (foot?). B.E. = Both bird specimen and egg collected (page 53).	Study Team resighted Great Indian Bustard near city boundary in 1982, 1995 and 2002. Study Conclusion Great Indian Bustard Habitat around Nagpur City still exists. Possibility of re-establishment of Great Indian Bustard community still exists.
Siberian Crane	
A stray winter visit to Gorewada Reservoir recorded in 1895.	Possibility of visit in future cannot be ruled out. A single bird strayed to Karira (???) Lake in 1989/90 in Madhya Pradesh, a neighbouring state to Vidarbha Region.
Flamingo	
Flocks of Flamingos are none and they are seen flying over or sitting in the Nagpur lakes. On the 9 th June 1912, a large flock was observed on the Ambazari Tank and on 27 th June 1921, I obtained a specimen out of a flock at Gorewada Tank.	In the early eighties then college students and members of VNCS Nagpur (presently forest officer) recorded a stray winter visitor at Gorewada Tank.
Bank Myna	
Resident in Narmada valley and in eastern portion of the Provinces. I found it common in Kanker (???) State and it extends west to Ramtek and Kamptee (page 21).	A few stray Bank Mynas were first sighted in the early eighties by bird watchers. After decade-long regular monitoring, Bank Myna was recorded as a resident breeder of the city during the nineties.

A preliminary comparative study about D'Abreu's world of birds of Nagpur in the early 21st Century as well as the present status of bird life in Nagpur is already in process. The VNHS centre proposes to launch a project of detail study on this subject.

IV Avifauna Species Diversity across Habitat Types in Nagpur City

A – Zonation

For the conduction of this study the Nagpur City was classified into three zone such as:

- i) Urban Zone

Where the land use wise human habitation as well as developmental activities dominates which results into human interference, which, in case of biodiversity is of very high degree.

ii) Rural Zone

Where land use pattern is dominated by agriculture as well as grazing activities, human interference is comparatively moderate.

iii) Wilderness Zone

Where in land use pattern nature dominates, and human interference is less.

B – Bird Habitats

During the bird diversity study the following bird habitats were identified based on Natural Heritage Precincts (refer list on page - - - and map on page - - -).

i) Close Habitat

(Forest, Plantation, Gardens, etc.)

ii) Open Habitat

(Agriculture, Grasslands / Scrubland, Savannah tape public utility lands)

iii) Wetland Habitats

(Reservoirs, Lakes, Streams and Rivers etc.)

The information regarding distribution of bird diversity across habitat types of the city was collected through a sample survey. The information is displayed herewith in Table 3.

Table 3

Zones	Close Habitat	Open Habitat	Wetland	Total
Urban	95	20	71	186
Rural	110	30	35	175
Wilderness	116 (- - - %)	32 (- - - %)	71 (- - - %)	225

Discussion

Table 3 reveals certain useful information regarding changing pattern of both the bird communities as well as their habitats.

In the urban zone of the city due to certain positive changes such as plantation or creation of new public gardens etc. both the density and diversity of board communities is improving, even in certain crowded urban packets.

Due to heavy developmental human activities optimum habitat changes, rather, ecological degradation, takes place in suburban as well as in the central zones of the city. Such human interference brings unwanted changes in the community pattern of birds. For example, due to heavy construction activities, open habitat dwellers such as quails, partridges, lapwings etc. are losing their traditional breeding grounds.

Due to some unknown biotic pressures on the traditional habitats either far away or on the periphery of the city, certain bird communities are seen in immigrating into the city. A flock of winter migrating Great Crested Grebe is trying to be settled at Ambazari Lake since the winter of 1985.

Certain positive changes are also taking place in bird life of the busy urban zone. For example, the Black Drongo has already immigrated into urban zone. This versatile specie is now trying to adapt nocturnal feeding habit perhaps due to shortage of

food during daytime. Black Drongos can be seen foraging and feeding in the late evenings around the street lights. These brave birds do not hesitate to compete even with the traditional nocturnal hunters such as the Spotted Owlet.

Summary

If compared with D'Abreu's world of birds in Nagpur of the early 20th century, the present range and status of bird diversity in the city is not encouraging. It is true that due to some positive ecological development in the city certain new avifauna communities have immigrated into the city.

Habitat fragmentation degradation and destruction due to do to the ruthless urbanisation is the principal cause of the decline of bird life in Nagpur. With effective application of regulations such as Heritage Conservation Regulations Ecologically Sensitive Areas (ESA's), regulations etc. by state authority, a positive change is possible.

However, the birdlife of the city is an assured indicator of health and environment of the city it is not at all on the agenda of the present planners and managers of the city. With NGO initiatives and citizens' participation a proper strategic change at state level has to be attempted.

The causes of decline in the population of birds or negative changes in bird life of the city are not properly studied. Yet, a state initiative through a NGO sector in study and research is the need of the hour.

It has been an important observation of VNHS members that the bird watching and study activities tend to bring together nature lovers. As a result these activities committed conservationists then come forward to work on a more regular basis. This is a formula that could be tried in places where conservation activities are at a low key.

INVERTEBRATA

Animals that lack backbone (spine) cover almost 95% of the animal kingdom. So, for every vertebrate specimen we have 20 sp. of invertebrates. Invertebrates are divided into 11 major and 20 minor phyla depending upon number of species and its participation in animal community.

Most projects, whether Government or Non-Government initiative, are aimed at large vertebrates, amphibians, reptiles, birds and mammals. Probably it is so because it is easy to pass-on information regarding their importance to a layman.

But we cannot afford to forget these tiny vertebrates because (although they lack backbone) these form the backbone of any ecological system. The sight of dragonfly mating or a congregation of butterflies easily matches the thrill of encountering a tiger in the wild and it is unfortunate that Indian conservation lobby does not pay sufficient attention to these creatures. Considering that they make up-nearly 80% of the nation's biodiversity and we'd love to see a project of a Butterflies & Dragonflies in the lines of project tiger.

Nagpur City has got its own hot -spots for invertebrate fauna. The Ambazari, Telankhedi, Gorewada lake and its surroundings, The Seminary Hills, NEERI Campus and of course the famous Nag Nadi, Pili Nadi & its smaller tributaries. There are innumerable other spots which cannot be listed, depends upon how you look at it.

Till date under the present programme VNHS working group has been able to identify and record (updated) about 450 species of Invertebrates as per Phylum:

PROTOZOA -21

PORIFERA-1 SPONGILLA & FRESHWATER SPONGE

COELENTERATA-4

PLATYHELMINTHES- 22

ASCHELMINTHES- 48 as parasites of vertebrates of Nagpur

ROTIFERA -35 from ponds of Nagpur City.

ARTHROPODA- Crustaceans -10 sps.

Scorpion- 2 identified, 2 unidentified.

Mites and ticks-5

INSECTA: Butterflies- 60 sps.

Moths- 40 sps. Mostly crop pest.

Bugs- 25 sps.

Termites- 7 sps.

Beetles -28 sps.

Cockroaches- 4 sps.

Crickets- 4 sps.

Grasshoppers- 12 sps.

Ants-5 Identified

Bees- 4 sps.

Wasps- 3 identified

Thrips- 5 sps.

Flies- 19 sps.

Others- 15 sps. (Louse, Silverfish, St.insect, preymantis)

Dragonflies & damselflies- 43 sps, from Nagpur City, out of 63 recorded from Central India. We have for the first time in India, recorded and proved the existence of sperm competition in a damselfly, *Ischnura aurora*. This research paper is included in this report as Annexure G.

Annex
G

The lists of invertebrates presented here is quite incomplete, the proverbial tip of the iceberg. Many species are still to be documented from this second greenest city of India.

List of Flora of Nagpur City compiled by VNHS field team during NBSAP exercise (excluding the list of birds) is inclosed as Appendix 2.

Appendix
2 - Flora

List of birds first compiled by `Nature Lovers` and `Nisarg Sewa Sangh` and added by VNHS Centre over a much longer period extending nearly 20 years is enclosed separately as Appendix 3.

Appendix
3 - Birds

While the lists of flora and fauna excluding lists of birds would need extensive rechecking and updating for a few more years, the bird list can be taken as a final list, having already undergone checking and updating over two decades.

A more detailed study, as suggested in the form of various proposals in the annexures is necessary for updating the lists of flora and fauna and for also for suggesting specific measures for conservation of phenomenal range biodiversity in the Nagpur City.

ii) **State of agricultural ecosystems and domesticated plant/animal species**

Interrelationship of urban areas with agricultural ecosystems has to be studied at three levels:

1. At regional (macro) scale, growth of almost every urban area in India takes place at the expense of agricultural land. This in itself proves to be an environmental disaster, especially because major decisions are taken without sufficient planning. This is very persuasively discussed in the book titled 'Environmental Consciousness and Urban Planning', a relevant extract from which is reproduced in Annexure H. Certain recommendations from this book are adopted as strategies with regard to the process and outcome of regional planning, especially with regard to agricultural lands around the City.
2. At the next level, the immediately surrounding agricultural areas around the city get influenced in various ways because of proximity to the city. This study is carried out in established villages located in different situations on the fringe of the city.
 - a) Bharatwada / Gorewada, at the upstream side near the catchment areas of reservoirs
 - b) Hingna, undergoing change because of industrial and educational estates
 - c) Jaitala, slated to be affected by Cargo Hub proposals
 - d) Pardi / Pawangaon, in the downstream areas where 'sewage farming' has come into vogue.
3. At local (micro) level, study of agricultural lands belonging to the PKV is very important for study of biodiversity within the city. These lands are peculiar to the city of Nagpur and they have been included in the Heritage List of the city. Their significance for conservation of environment (and biodiversity) has been covered in an earlier chapter in this report.

4) Statement of problems relating to biodiversity

i) Proximate causes of the loss of biodiversity

a) Habitat destruction and conversion

During the planning and development process in urban areas existing natural conditions such as topography, geology, water regime, climate, vegetation and important biodiversity hotspots are not given sufficient consideration. This was not always so. In the past these factors, especially water regime, enjoyed great importance. Rivers and some lakes were sanctified. There were many functions that were automatically assigned to water bodies. A note on 'holistic significance of wetlands' discusses this in greater detail in Annexure I.

Rivers are 'canalised' and then converted into sewers, often as a result of 'planned' action. Nag River has bathing ghats and temples lining its banks, which were in active use only a few decades back. However, for reclaiming land, and to allow people to settle on its very edges, the river was canalised. Subsequently, after sewers were constructed, the sewage was let into the tributaries of Nag River all over the city. Presently people refer to this river as Nag Nalla and for most, it is difficult to imagine that it was once a river.

Small tanks, encircled and choked, become cesspools. That has been the case of Naik Talao, Dhobi Talao and Lendi Talao. Some of the smaller tanks, namely Gandhibag Tank and Pandharabodi have already been filled up by the authorities themselves. Simultaneously, larger reservoirs, no longer utilised for water supply, have been converted to marshlands on account of continuous neglect. Examples of these are Sakkardara Tank and Sonegaon Tank. Jumma Talao, which was suffering from similar fate was recently desilted and refilled with rainwater mixed with sewage. Larger tanks (Ambazari, Telangkhedi) are also neglected and require urgent attention.

NMC had commissioned NEERI in '92-'93 to prepare a project report on 'Water Supply and Sanitation of Nagpur: Master Plan for the Year 2025 AD'. Executive Summary of this report is enclosed here as Annexure J. However this report has been put into cold storage because of unviable costs involved.

Annex
J

On the other hand Ecocity Foundation floated by the VNHS Centre had prepared a proposal for decentralised sewage treatment which would distribute the cost of treatment among citizens and also ensure, unlike conventional systems, that the system works effectively and prevents the local river streams from getting polluted. These proposals are discussed in detail elsewhere in this report. VNHS team also believes that optimum utilization and recharge of Groundwater would soon become unavoidable. We have therefore been promoting an action plan that the wells, existing in very large numbers in the city, should be effectively used for recharging of the groundwater by diverting the roof rainwater to them. The local authorities NMC and NIT have recently realised this and has announced that sanction to all new buildings would be given only if they make provision for rainwater harvesting.

Trees and other vegetation is routinely destroyed to make way for habitation and other construction. Recently hundreds of trees were cut down for wholesale widening of roads. This was done by the concerned authorities by consciously circumventing the 'Maharashtra Urban Areas Preservation of Trees Act, 1966', in spite of concerted efforts of citizens to save the trees. The 'Trees Act' also envisages annual census of trees in urban areas, (as per a government circular annexed hereto as Annexure K), which has never been done. In fact the improperly constituted 'Tree Authority' works more as 'tree cutting authority' than 'tree preservation authority'.

Annex
K

The unprecedented 'operation' carried out under direct supervision of the Administrator Dr. T. Chandrashekhar (IAS) also reportedly endowed with a doctorate in 'urban ecology' is worth a special mention, because application of his unique 'method' can cause ruin in other cities also, especially in Maharashtra.

Manipulation of the Maharashtra Urban Areas Preservation of Trees Act, 1966 and violation of the norms prescribed by the Indian Road Congress during Integrated Road Development Project in Nagpur City:

The Maharashtra Urban Areas Preservation of Trees Act stipulates that if trees are coming in the way of road widening, the authorities have to transplant such trees. However, in probably the worst ever operation of its kind, the authorities removed all the tree avenues, comprising thousands of fully-grown large trees, and `transplanted' the same in a matter of few nights.

The so-called transplantation method was quite unique and most violent. It involved cutting of all branches and trunks of the trees except a token portion of the main trunk. Pulling with heavy machinery, the remaining trunk of the tree was then yanked out without bothering to loosen the roots. This stump was then thrown away and subsequently erected like a pole in some designated pit. Surprisingly enough, even after enduring such violence, about 5% to 10% of such trunks (of particularly hardy species) have sprouted leaves.

This tragic drama was carried out so that as per deliberate misinterpretation of the administrator of the city, by undertaking such `transplantation', the administration was absolved of following other important provisions in the Act, especially those, which stipulated calling of objections and suggestions from the public.

Had such suggestions/objections been invited from the public, many people would have pointed out that tree avenues as well as a certain portion of non-asphalted areas (as provided for in other cities like Delhi) allowing for their proper growth have to remain as an integral part of the `integrated road development project' especially in a very hot place like Nagpur. Design norms of IRC & other authorities on the subject could also have been cited.

At present however, not only have all tree avenues gone, but the presently the administration has more or less ensured by acquiring and asphaltting entire width of roads, that no tree avenues can be planted any more in future also.

b) Introduction of exotics and monocultures

EXOTICS

Many plant species are consciously or unconsciously introduced in the country for a variety of purposes / reasons and eventually get naturalized here. The exotic weeds introduced during import of food grains over the last several decades, have proved to be quite troublesome. These weeds are established firmly in a short time and spread all over like wild fire. Important among these are Parthenium hysterophorus, Argemone mexicana, Acanthospermum haspidum and recently introduced Alternanthera tenella. It is interesting to note that Lantana camera has not spread in Nagpur city as compared to other weeds. Plant populations of several indigenous species are fast declining under the influence of these exotic weeds. These weeds are found on wastelands, pastures, garden beds, cultivated and fallow fields, river banks, marshy places etc. As such they have adversely affected the biodiversity of the urban areas. A reference to this aspect is briefly made in the body of the Report.

Important exotic trees naturalized in Nagpur city are Acacia auriculiformis, Cassia javanica, Couroupita guianensis, Ceiba pentandra, Delonix regia, Parkinsonia auriculiformis, Peltophorum pterocarpum etc. Among the shrubs may be mentioned Desmanthus vergalus and Hibisucs schizopetalous besides Lantana camera.

MONOCULTURE

Sometime back the Forest Department resorted to monoculture in certain areas where mixed forests were cleared and revenue generating species like Teak/ Eucalyptus were planted. This was also experimented in forest area of Ambazari & Gorewada in Nagpur city by Teak plantation. It is observed that monoculture practices result in ecological imbalance and adversely affect biodiversity of natural mixed forest as also the associated wildlife. Fortunately the Forest Department has realized this aspect and, it is hoped, monoculture practice will not be resorted to in future.

c) Pollution/Poisoning

Environmental pollution refers to all the ways that human activity harms the natural environment. In an urban area all types of pollutions are very much evident and therefore study of effects of pollution in urban areas on biodiversity is a very relevant factor. Unfortunately such studies have not been conducted in sufficient measure even though various 'pollution control boards' have been in existence for many years and 'Environmental Impact Assessment Reports' are required to be churned out year after year.

Most people associate environmental pollution to an open rubbish bin or a factory pouring out black smoke. However, pollution can also be invisible, odourless, and tasteless. Some kinds of pollution do not actually dirty the land, air, or water, but they cause harm to humans and to biodiversity. For example, noise from traffic and machinery or excessive lights in cities can be considered forms of pollution that adversely affect living things.

The main sources of air pollution are artificially created wastes in the form of smoke resulting chiefly from the burning of fuel in motor vehicles. They also come from industrial processes and the burning of solid wastes. Air pollution causes harm to all species, including floral species. However some of the floral species fare better and can act as pollution sinks. This is of great significance for urban roads. *(Suitability and effectiveness of different species of plants in Nagpur City for pollution control on roads are discussed in a report prepared jointly by three scientists of city based National Environmental Engineering Research Institute and Institute of Science. Please refer **Annexure L.**)*

Annex L

Water pollution is one of our most serious environmental problems in cities. 75% of pollution in Indian rivers is caused by untreated sewage let into the streams. Due to relatively well-laid sewerage systems in urban areas, entire sewage is carried to the rivers. Cities can be said to be the worst offenders in this aspect. It is ironic that this cleaning agent brought to cities from very long distances finally ends up in spoiling the city environment as

well as the countryside. Surface water pollution eventually ends up polluting the ground water also. Water pollution not only leads to undesirable changes in biodiversity, but also results in health hazards, discomfort and loss of invaluable public amenity. *(Ecocity Foundation floated by the Ecocity Cell of the VNHS Centre has conducted a special study to address this problem and has reached a conclusion that promotion of decentralised sewage treatment by using household or community level 'SAF Reactors' – or similar scientifically developed and tested form of septic tanks – is perhaps the only answer to this problem. For a more detailed note on this project titled 'Nag River basin Eco-development Project', and technical note on decentralised sewage treatment please refer Annexure M.)*

Soil pollution is the destruction of the earth's thin layer of healthy, productive soil, where much of our food is grown. All plant species, a large number of micro-organisms, a number of small animals, and especially birds who feed on insects and other small life forms are adversely affected by soil pollution. Polluted soil does also lead to pollution of ground water and vice versa.

Noise pollution comes from such machines as aeroplanes, motor vehicles, construction machinery, and industrial equipment. Noise does not dirty the air, water, or land, but it can cause discomfort and hearing loss in human beings and other animals. The Environmental Status Report of Nagpur City suggests that some identified roads of the city be declared as 'silence zones' to prevent high noise levels. Light scatter (especially due to excessive lighting on roads is yet another form of pollution. However compared to other problems in the city, noise and light pollution are hardly taken note of by the administration and the people alike.

ii) Root causes of the loss in biodiversity

a) Unsustainable model of development

Urban Development, commonly perceived and referred to as 'concrete jungles', takes place as a result of unnatural, non-holistic policies and practises. These policies and practises are continuously at loggerheads with nature conservation efforts. Planning and development of urban areas are largely carried out without giving due consideration to the existing natural conditions. 'Planning' is mostly undertaken as an exercise in statistical allocation of areas and finances. Quite often such planning and development is nothing more than reaction to some crisis situation. Approach to solving complex problems is piecemeal (non-holistic) and therefore has little chance of success on long-term basis.

Unnatural concentration of population is drawn to the urban centres by concentrated economic opportunities and simultaneous lack of resource allocation to rural areas, destruction of rural areas resource base by urban demands and expansion and consequent migration of villagers. Availability of cultural, educational, medical etc amenities and well-developed basic infrastructure is an added attraction. To avail these, urbanites have to accept certain hardships as well, such as a tense lifestyle, pollution, commuting problems etc.

Ability of the natural systems and resources to clean – renew – refresh – sustain themselves decreases as the scale and concentration of population increases. The economic base of population in urban areas and the amenities and facilities available there are largely independent of the natural conditions and resources. This leads to lack of adequate attention, which makes this problem more acute. There are ways to reduce the burden that urbanites put on the nature. One way is to use non-conventional sources of energy (especially solar

energy) as urged in an a note cum appeal enclosed as Annexure N. Many more such efforts and and models are possible and they are the need of the day.

b) Alienation of citizens

Majority of people in urban areas are either unconcerned or helpless regarding control of their immediate and/or overall development.

Among urban population groups it is very difficult to have a uniformly acceptable purpose, intent or line of action regarding public related issues because of existence of a wide range of legitimate as well as vested interests. While a select group of politicians and bureaucrats thrive because of this situation, among common masses such complexities add to the feeling of powerlessness. Often, when it comes to conservation issues, it is experienced that while most citizens prefer to take only a bystander's position, the destructive vested interests prove to be much more organised and effective than the handful of conservationists.

Lack of broader participation as well as a general sense of helplessness arise from a combination of lack of understanding, absence of responsibility put on the citizens and denial of citizens' empowerment, including lack of institutional mechanism for participation, lack of transparency of decisions taken by those in power and lack of citizens' access to information.

c) Social, political and economic inequities

People in urban areas, as an elite/powerful/resourceful group, generally command overwhelming rights over resources of the surrounding region, leading to deprivation/denuding of the hinterland of urban areas. Very often this leads to serious environmental, economic and other problems in the surrounding villages, inducing further migration of people from surrounding rural areas into the urban area.

Within the city the status and condition of localities ranges from `high-class' to `slum', starkly representing the chasm between the rich and the poor. Such inequities are among important root causes of much of the social as well as environmental degradation.

d) Ethical / moral changes

Fast paced, self-centered lifestyle leaves no scope for showing concern about issues beyond immediate personal stakes. Traditional practises and concerns for conservation of environment and biodiversity are discarded at a faster pace in urban societies.

Since resources are bought, and brought from outside, there is no incentive for developing / conserving locally available resources.

Increased `paying capacity' for consumer goods and services puts pressure on not only immediate and surrounding environment but also on resources in far away places.

Prosperity leads to increased wasteful tendencies. Manufacturers' and dealers' lobbies supported by service agencies promote such tendencies aggressively.

(As an example, consumerism is most vividly and clearly reflected in the current trends in architectural and interior design. Architecture happens to be an elitist profession practised mostly in urbanised areas. Like many other fields this discipline ends up in exploiting the natural resources for pampering the rich. Analysis of social, political, economic, ethical and moral changes in the Indian society as applied to the field of architecture is

analysed in the article titled 'From Quackery to Wholeness – Agenda for the 21st Century' – **Annexure O**.

Without doubt, many aspects of trends applicable to architecture are very much applicable to other disciplines.)

d) Inappropriate or contradictory policies and laws

Several policies and laws are devised to control planning and development in urban areas. Often the laws / regulations are well intentioned, but implementation and practical application leaves much to be desired. Also there are a few loopholes / special privileges incorporated within the laws, which are blatantly misused with impunity. Too often, the Government and the authorities are the biggest violators, without any accountability.

State Government – Maharashtra is among the most backward of the Indian states as far as empowerment of the people is concerned. It is a large state with hegemonistic tendencies where most of the matters are decided in the State Capital Mumbai. Some small concessions were granted to the citizens in this respect by way of calling of public opinion on issues pertaining to planning and development in the MR&TP Act (Maharashtra Regional and Town Planning Act 1966). However when some citizens (of Pune) asserted their rights to have an approved proposal of the government turned down by bringing court action, the government immediately responded by scrapping the particular clause (37- (b)) under which court action was brought. However, Far more serious, from biodiversity and environment conservation point of view, is the Non-implementation of the 74th Amendment of the Indian Constitution Act 1992.

The 74th Amendment of the Constitution provides for a) vigorous participation of citizens in planning process through strong local bodies, b) spatial and economic planning through district, metropolitan and local level planning committees to reduce urban-rural divide by ensuring equitable and appropriate allocation of resources and c) involvement of experts (member-environment among other expert members) and NGOs in the planning committees. The Institute of Town Planners India (ITPI) has published volumes and volumes of literature as to

how the 74th Amendment should be actually brought into practise, including, by suggesting changes in the relevant laws in most of the states. To make the provisions of the Constitution 74th Amendment applicable to Nagpur City, Nagpur Metropolitan Region and Nagpur District, some citizens had filed a PIL in August 1997. However the High Court has not provided any succour so far. The petition was admitted without any replies being filed by the respondent authorities and has since been kept pending. (Synopsis of the petition can be seen in **Annexure F**)

Annex
F

Planning Authority / Town Planning – Negative role of the existing planning authority towards proper planning is discussed in the text of petition mentioned above. Town planning rarely rises above statistical allocation of areas for different land uses. Vested interests play a major part in preparation and subsequent modification of the Development Plan. Very often, not unlike in many other cities in India, the result is ‘sprawl’ rather than planned ‘development’. There is a complete lack of vision as far as creation of a sustainable, eco-friendly and non-parasitic city is concerned. Out of the 173 page Development Plan document, last 2½ pages of the text are devoted to a chapter on ‘Environmental Planning’ which is reproduced here as **Annexure P**)

Annex
P

Maharashtra Urban Areas Preservation of Trees Act – Tree Authority formed under the Act was supposed to have carried out a census of all trees in the municipal jurisdictions before 31st December 1995 and then follow it up by a census every five years (As per government circular dated 8.2.1995 reproduced in **Annexure K**). This has not been done so far. On top of this, the local authorities have themselves indulged in mass tree cutting without following due procedures for obtaining citizens’ views as provided for in the Act. In the latest example, the City’s administrator most blatantly twisted the provisions of the Act (as already mentioned elsewhere in this report) in order to bypass the law and cut down thousands of trees for his pet road development project. Even approaching the courts of law was found to be of little help.

Annex
K

Heritage Regulations – A detailed note (Annexure Q) describes the efforts put in by some NGOs to bring the regulations in force in spite of considerable opposition. However, even after the regulations are brought into force, they are being violated with inaction and / or tacit support of the administration. After a spate of demolition of very prominent listed heritage monuments, citizens again approached the Courts. Due to the resultant pressures from the administration as well as from the other side by heritage activists, the Chairman of the statutory Heritage Committee chose to resign in January 2002. Presently the fate of the list hangs in balance as the administration as well as a judge of the Nagpur High Court has showed inclination towards pruning the list.

Annex
O

The Pollution Control Board – has generally proved ineffective, and does not bother to act when faced with government projects. It is supposed to have sufficient powers, but its presence is hardly felt.

Wildlife Protection Act – can apply to urban areas as well. However, forest department officials do not readily accept designated forest areas with municipal boundaries or tree species in the urban areas as their domain for taking swift action; citing existence of other laws such as the Urban Areas Preservation of Trees Act and Development Control Regulations.

Contrary to **Development Control Regulations**, Nagpur's planning and development authorities have 'reclaimed' some tanks in the past for allowing builders to develop the same. In future, the recent judgment of the Supreme Court, preventing conversion of catchments of reservoirs for residential use can come handy for preventing such action by the authorities. (The judgement is enclosed as **Annexure R**). Another serious violation is to allow construction (including houses for the privileged Municipal Corporation Employees and some other major constructions sponsored by the authorities) in the vicinity of the Major River Courses. This has so far gone unchallenged.

Annex
R

At policy level, there are well known serious contradictions. Our government as well as foreign governments aggressively promote consumerism while paying lip service to conservation and environmental protection.

e) Over centralization of decision making

Urban Lands being 'gold mines' capable of producing so much 'revenue', the government is unwilling to let the controls go to the general public. On the contrary it keeps making / revising laws that are contrary to the spirit of public participation in planning as envisaged in the constitution amendment. In Nagpur, rumours are floated from time to time that the city area would be extended much beyond its present boundaries and that the NIT (Nagpur Improvement Trust) which is a wholly government controlled body with little public representation would be made in-charge of the increased area by calling it the Nagpur Metropolitan Region Development Authority (NMRDA).

Apart from being contrary to the spirit and letter of the Indian Constitution, centralised decision making does not leave any scope / time for the authorities to attend to conservation issues, which are generally the lowest on their priority.

f) Lack of administrative coordination

Various agencies work in an urban area in addition to the planning and development authority and the municipal corporation. These are the Town Planning Department, Revenue department, Forest department, Irrigation Department, Fisheries Department, Agricultural departments and research institutes, Environmental engineering research institute, Remote sensing centres, Ground water board, bureau of soil survey and land use planning etc. Proper co-ordination between these departments can lead to solution of many vexing and intricate problems. However, such co-ordination is rarely attempted.

5) Major actors and their current roles relevant to biodiversity

i) Governmental

Town planning of an urban area in Maharashtra is supposed to be done by a 'designated local authority'. However as per the Indian Constitution (74th Amendment) such planning is to be done by various 'Peoples Committees' working at various levels from Metropolitan Region Committees down to Ward Committees. For the City, the Municipal Corporation, being seat of 'local-self government' is supposed do the planning. However at present Nagpur Improvement Trust, which has Government appointed members on its Board does the planning. Such planning is done without even an architect-planner being appointed on the planning team, leave alone other expertise such as environmentalists, economists, technologists, geographers, historians, sociologists etc. This has led to preparation of a generally sub-standard town plan in which Biodiversity Conservation is not even an issue under consideration. This being so, there is an urgent need to rectify the lacunae in the town planning process. At the cost of repetition it must be again stressed that application of the provisions of the 74th Amendment would be one of the important factors, because it would cause awareness and promotion of action at local level.

Also, in many countries around the world, governments work to help clean up the pollution spoiling the land, air, and water. Such efforts come from local, state and national governments. In some of the world's largest and most polluted cities, local governments have set out plans to reduce air pollution. Such plans include measures to restrict the use of private motor vehicles and to encourage the use of mass transportation. Local governments can also pass recycling laws. In some of the Indian cities, citizens have to separate biodegradable and non-degradable waste at source. In some advanced cities, Vienna for example, citizens must separate their rubbish into containers for paper, plastic, metal, Aluminium cans, clear glass, coloured glass, and food and garden waste. However in most Indian cities, including Nagpur, the Local Self Government is yet to reach this level of up to date visionary thinking and capacity building.

List of issues identified and discussed with various Govt./Semi-Govt. authorities are listed in Annexure C in the form a questionnaire.

Annex
C

ii) Citizens' Groups and NGOs

Different types of groups are active in the city, either in the form of NGOs or as formal or informal citizens' groups. These groups work in diverse fields such as popularisation and awareness raising, conducting of studies and research, activism for conservation and action on the ground. There are other groups in urban areas like professional institutes, clubs etc that may not be directly connected with biodiversity conservation but they do have considerable potential to make a positive difference, provided the conservation agenda is accepted by them. A brief listing of NGOs and their activities are mentioned below. More detailed information regarding this is mentioned under s. no. 6) ii).

Activist groups for protecting trees	-	Paryavaran Suraksha Samiti / Environment Global / informal groups etc
Activist groups for protecting tanks	-	Vasundhara / Sonagaon (and other) Talao Bachao Samitis
Heritage Conservationists	-	Vidarbha Heritage Society, VNHS
Tree Plantation	-	Vanrai / High Court Committee/VNCS
Study and research projects	-	VNHS, VNCS, Nisarg Sewa Sangh
Awareness raising	-	Green Movement - comprising several schools based initiatives, VNCS
General	-	WWF, Nature Clubs

iii)Local Communities

Unlike in forest, tribal and even rural areas, the local communities that are directly dependent on natural resources are perceived as 'not-belonging' and mostly treated as encroachers. Because of this mindset, integration of such groups (even though very much needed for their services) is hardly ever attempted. Study of such groups and results of interaction with them is mentioned under s.no. 6) iii) and discussed in Annexure.

iv)Donors

Mandatory contributions made by Industry and Corporate sector mostly go into tree plantation programmes. Most of the trees planted under such programmes are of quick growing and exotic varieties. If such donors work in close coordination with a network of NGOs, a more fruitful result could be obtained by directing the donations to required area according to priority. Combination of unbiased and forward looking voluntary organizations supported by locally based or government departmental donors have a good potential to make a positive difference by piloting conservation projects.

v) Industry and Corporate sector

Many companies have discovered that it makes good business sense to pollute less. Some have found that reducing pollution gives them a better public image and saves money. Others have developed environmentally safe products or packaging to satisfy consumer demands. Still others develop pollution control systems because they believe that laws will soon force them to do so anyway. And some companies limit pollution because the people running them choose to do so. Scientific effort, largely as an outcome of business and industry and in some cases due to efforts of the Government, Environmental organizations and NGOs is a very important factor, especially for controlling pollution. Increasing concern over the environment has caused scientists and engineers to look for technological solutions. Some research seeks ways to clean up or manage pollution. The goal of other research is to prevent

pollution. Many industrial researchers are finding more economical ways to use fuels and other raw materials. As a result of their research, some European cities now use waste heat from power plants or garbage incinerators to warm homes. New car engines burn petrol much more cleanly and efficiently than older engines. Researchers have also developed cars that use such clean-burning fuels as methanol (a type of alcohol) and natural gas. Scientists are also developing cars that can use hydrogen gas as fuel, because Hydrogen creates almost no pollution when it is burned. Serious research is also taking place to do away with soil pollution problems created by use of chemical fertilizers.

Areas where concrete action from this sector should be targeted are:

Effluent treatment, Recycling

Restoration of disturbed mining sites

Research and development

Meaningful and well-directed donations, contributions

6) Ongoing biodiversity related initiatives and their efficacy

i) Governmental

Town Planning Department – The State town planning office is located in Pune City. There is a Dy. Director of town planning in Nagpur who has to look after preparation / approval of town plans. Since the plan preparation of the City is entrusted to specially designated `planning authority, role of the town planning department is limited to examining and forwarding the city plan to the government for approval after it is prepared.

Even so, there is greater concern and awareness in the town planning department regarding environment conservation than there is within the planning authority. The Dy. Director of Town Planning has proposed special regulations for the city's Civil Lines area in order to protect its relatively open and green character. This proposal is reproduced in the report as Annexure S. From other urban centres also, some positive indications are obtained. Proceedings of a National Seminar held in New Delhi on `Greening of Cities' and guidelines issued by the Ministry of Urban Affairs and Poverty Alleviation are reproduced here as Annexure T and Annexure U respectively.

Annex
T&U

Annex
S

Nagpur Municipal Corporation – NMC has recently been designated as the new planning authority of Nagpur City. However so far it has only worked as a service agency and it would require capacity building as well as awareness raising about environmental concerns before it can effectively start making a positive difference to the city. As of today, its officers are more interested in commercially exploiting the public areas and natural precincts in the city than in ensuring long-term protection of the same.

Nagpur Improvement Trust – Till recently NIT was the planning authority. Its performance as protector of environment in the capacity as the planning authority was quite dismal. NIT not only neglected the lakes and tanks of the city but it was directly responsible for annihilation of the Pandharabodi tank and partial destruction of the Sakkardara Tank. During its tenure the River was `canalised' and then turned into a sewage nallah. During its tenure the hillsides as well as the green belt of the city also got encroached upon due to continuous neglect.

Collector (Revenue deptt) – A `Paryavaran Suraksha Samiti' was constituted under the chairmanship of the collector some years back. However for the last year or more this committee has not been reappointed and has become defunct. The collector had however taken note of some of the environmental protection issues, notable among them being, control on the area where the Nag and Pili Rivers are originating at Lava Village, just outside the boundary of the City.

(To be completed)

Forest Department -

Irrigation Department -

Heritage Committee -

MRSAC (Remote Sensing) -

ii) NGOs

ONGOING INITIATIVE OF NGO SECTOR IN NAGPUR CITY

A BRIEF HISTORY

At Nagpur rise NGO sector that is committed to Nature / Biodiversity conservation began in mid seventies which incidentally coincides with the United Nations Stockholm Conference for global environmental conservation held in 1975.

The first NGO initiative for nature / biodiversity conservation took place mainly due to the arrival of WWF-India, Nagpur unit to the city. This is how a small group of active nature loving youths initiated the nature conservation movement in Nagpur. This group of youth after separating from WWF unit of Nagpur in 1988 formed Vidarbha Nature Conservation Society (VNCS) with nature conservation as its principal priority.

Another initiative in 1978 came up from a small group of citizens under the banner of 'Nature Lovers'. The members associated with this group were basically trekkers, hikers and bird watchers. Study of nature was the first priority of this group. The preliminary study about nature of the group further developed into a systematic study of Avifauna in particular and nature in general. During eighties members of this group floated Nisarga Seva Sangh as well as Vasundhara (NGO) which played valuable role from mid eighties in nature / biodiversity conservation movement at Nagpur.

Nisarga Seva Sangh founded in 1986 was committed to Gandhian (Sarvodaya) thought and deep environmentalism on one hand as well as it had also adopted Dr.Salim Ali's (A renowned ornithologist) scientific approach for the study of natural history. Lately this group founded Vidarbha Nature & Human Science (VNHS) Centre in 1999. Since its foundation the Centre has played a major role in a systematic study of biodiversity of the city as well as of the region. Further 'Ecocity Nagpur' concept was successfully floated by the Centre through which the project proposal of 'BSAP- Nagpur City evolved in 2001.

'Vanrai' which was founded by Hon. Shri. Mohan Dhariaji at Pune branched out to Nagpur in 1990 as Vanrai Vidarbha. Vanrai with dedication to the construction of nature and its professional approach in tree plantation work could successfully set an ideal model for urban areas in large scale tree plantation with active participation of citizens, administrations as well as corporate sector.

The above mentioned brief history of NGO sector of the city reveals that there are few main streams of NGO groups committed to specific objectives and influence the biodiversity conservation movement of Nagpur. And these influential groups of committed workers have mainly shaped the NGO sector of the city and its activities as well. These groups are expected to lead in the future.

THE ROLE OF NGO SECTOR IN NAGPUR CITY

In Conservation and Construction of Biodiversity (1975—2001)

INTRODUCTION

In light of the above discussion let us review the role played by NGO sector of the city during last quarter century for the conservation and construction of biodiversity. To properly understand the role of NGO sector, a table of activities such as education, study and research, conservation and construction as well as the related major actors (NGOs) is given below. The table is further discussed below to evaluate the role of major actors (NGOs) as well as the role played by NGO sector.

ABOUT THE TABLE (TO BE INSERTED)

A. THE ACTIVITIES

Col. No.1. Education Activities

This column contains certain educational activities such as – nature camps; popularization activities, functions, students and teachers oriented activities as well as creation of nature education materials etc.

Col.No.2 Study and Research Activities

The study and research activity of the NGO sectors in Nagpur was mainly limited to bird life during seventies and early eighties. During late eighties it developed into ecological studies. Further during nineties a systematic biodiversity study of Nagpur began to take shape. During late nineties a holistic concept on a project proposal of 'Ecocity Nagpur' was evolved by VNHS Centre, a leading nature study and research organization of the region.

Col. No. 3 Conservation Activity

This column contains conservation activities which included issue based awareness campaigns, people's movement, advocacy and lobbying as well as public litigations. An evolving trend of issue based NGO networking after mid-eighties can be observed herewith.

Col.No. 4. Construction Activity

The column mentions that during seventies and eighties the activity of construction of biodiversity was limited to plantation i.e. greening of the city. During late nineties a holistic concept of revival / restoration of ecosystems as

well as biodiversity of the city was introduced in Nagpur through an ambitious project of 'Ecocity Nagpur' evolved by VNHS Centre in 1999.

B. TABLE

C. DISCUSSION

The column-wise analysis of the above table reveals certain trends about performance of the NGOs.

1. ABOUT THE PERFORMANCE OF THE NGOs

During last two decades certain quantitative as well as qualitative growth in NGOs has taken place. A growth in number of NGOs can easily be traced from the table. The growth in variety of activities indicates qualitative improvement on NGOs of the city.

- It seems that specific trend of prioritization about the objectives has evolved among NGOs during last two decades. Upto eighties, NGOs were not specific about their objectives hence were engaged in various types of activities at a time. During nineties a positive change occurred. NGOs started focussing on specific objectives. As a result affiliation of certain NGOs with specific activities became evident.

It seems that interaction within NGOs as well as the other stakeholders such as administration, citizen groups, educational institutions, professional agencies etc. has sufficiently grown during the journey of a quarter century of native conservation movement in the city.

Upto mid-eighties NGOs of the city seemed to reach a socially matured stage. As a result an issuebased networking process among NGOs started to emerge. Emergence of various committees to particularly save wetlands and Paryavaran Suraksha Samiti to tackle multiple ecological issues etc. are some of the model examples of this positive interaction process among NGOs.

During nineties some of the NGOs started actively participating in conservation committees established by the administration, such as Paryavaran Vahini (Distt.Collector), Nagpur Heritage Conservation Committee (NMC) etc. Such participatory initiative of certain NGOs has strengthened the biodiversity conservation movement of the city.

Ecocity Project (evolved by VNHS Centre) was a step ahead in the participatory process. Nagpur Municipal Corporation (NMC) and VNHS Centre took up the Ecocity Project as a joint venture. Such joint venture was perhaps the first of its kind in the history of NMC. The joint venture added new dimension to the biodiversity conservation movement in Nagpur.

On the basis of analysis of the above table the performance of NGOs has been discussed in detail herewith. Performance of entire NGO sector of the city is being further discussed below. For evaluation of the NGO sector the major gaps or shortcomings during last two decades are considered. Required improvements for better future performance are also suggested. Lastly future leads from certain NGOs which are guessed on the basis of there past performance are also indicated.

2. ABOUT THE NGO SECTOR

(GAPS, REQUIRED IMPROVEMENTS & FUTURE LEADS)

1. EDUCATION

Gaps : General in character not properly highlighted the issues of Nagpur city.

Improvement: A master plan (of NGOs) 'Ecocity Nagpur'2025 be prepared. Activities addressed to this plan be evolved.

Future Leads : VNHS Centre, Vasundhara, Nisarg Seva Sangh, Vanrai, VNCS, VHS and NSC.

2. STUDY & RESEARCH

Gaps: *a.* Information with Government, professional research institutes, and Universities are not properly used.

b. Administration of the city is not properly involved.

Improvement: *a.* Follow up program for joint implementation (NGOs & Administration) of recommendations should be evolved.

b. Establishment of NGOs joint information centre.

Future leads: VNHS Centre, VHS and VNCS

3. CONSERVATION

Gaps: *a.* late action due to lack of advance information.

b. Ineffective due to lack of people's participation.

Improvements: *a.* Preparation of 'Advance Eco – Crises Management Plan' of the city.

b. Preparation of Future Strategy Plan (NGO Sector) for people's participation as well as political lobbying and advocacy.

Future leads: VNCS, Vanrai, Vasundhara, Nisarg Seva Sangh, VHS and VNHS.

4. CONSTRUCTION

Gaps *a.* No long-term plan about greening of city available.

b. Restoration and revival of ecosystem of the city is not properly addressed.

Improvements Eco-development master plan (by NGOs) of Nagpur be prepared.

Future Leads Vanrai, VNHS, VHS and VNCS.

III. SUMMARY

Growth of NGO sector and biodiversity conservation movement satisfactory. Though partial success and certain failures.

The NGO sector is sufficiently matured.

Along with protests active participation with city management has grown.

Communication within NGO sector and interaction with citizens is growing.

Study & Research though with limited participation is moderately growing.

Future Role.

- # Co-ordination initiative by expected NGO sector-between Administration, citizens, professional agencies etc.
- # Ecodevelopment master plan of the city.
- Formation of collective strategy as well as joint action plan.

iii)Communities and people's movements

Interaction with stakeholder communities as well as unorganised citizens reveals a negative and picture as far as biodiversity conservation is concerned. The Common citizens and their groups, except of course the committed NGOs, show very little concern for such issues.

The direct stakeholders with whom we had interaction included the fisherfolk, the milkmen and the agriculturists while views of other citizens' groups such as womens' organizations and professional institutes were also obtained.

Fisherfolk Community:

In a Fisherfolks get together organised at Dharampeth Science College, the field scientists and fisherfolk discussed the status of 30 different types of fishes of Télankhedi and Ambazari tanks. They expressed concern that the fish 'Pabda', which gives more income to them, is found in less and less number. A committee was formed under VNHS to carry out further activities about fish fauna of Nagpur City. Mr, Bhrushandi is the chairman, Mr. Lonkar is the patron and Dr. Sawarkar, Dr. Andrew, Mr Mahavir Gour and Shridhar Gour are the members of this committee. This meeting was attended by many representatives of NGOs of Nagpur City. Outline of action plan and projects worked out by this committee are spelt out in the Annexure **Z** as part of future project proposals.

Gaolis (Milkmen) and Agriculturists:

Interaction with Gaolis and agriculturists took place during field visits to the fringe of the city. In case of both these stakeholder groups, there are some common laments and some specific observations expressed by them:

Gaolis:

- The land on which these people subsist are the first ones to be declared suitable for other hazardous uses such as land suitable for industries. Major Industrial Estates close to the city, - namely the Hingna Industrial Estate and the Buti Bori Industrial estate have come up on such lands.
- In some cases the land is acquired by the Forest Deptt for afforestation in lieu of de-forestation elsewhere. Such actions have led to bitter and sometimes violent fights.
- Not unlike other resources like water, surrounding rural areas are deprived of milk in order to supply the same to the city. In spite of such known dichotomy, there is no policy framed to see that these communities can survive and carry on their function.

Agriculturists:

- Agricultural land is usually converted to N.A. (Non-Agricultural) without much thought given to such conversion in the official domain. Such conversion takes place in a piecemeal manner for development of layouts on the fringe of the city. This phenomenon is also discussed separately elsewhere in this report.
- Close to the city, crops and vegetable production and quality are adversely affected due to air and water pollution. Closer to industries with smoke bellowing chimneys, this phenomenon is more serious.
- City folk as well as people on the fringe of the city consume proportionately more water for domestic use. This leaves very little water for irrigation in villages on the fringe of the city, leading to abandonment and conversion of more and more fertile lands.

Womens' Organizations:

- During an interaction with a group of socially conscious women involved in work related womens' emancipation revealed that Environment conservation is not even on the agenda of these organizations. On

the other hand, women, especially from the middle and upper classes are in the forefront to promote consumerism (e.g. food products, detergents, increased water consumption etc) that causes depletion of resources and pollution.

- It was further discussed that women from the have-not strata as well as from the semi-rural, rural areas on the fringe or in the slums of the city have to cope with the same problems that tribal women have to endure, e.g. collection of fuel wood for the hearth.
- The participants in the meeting readily accepted and decided that some attention of the women's organizations ought to be focused on these issues.

Professional Disciplines / Institutes:

- Study and assessment of work done by various professional bodies and their basic approaches reveal that most of these institutes representing elite professions in the society are too businesslike to promote social and environmental issues. There are only a few small exceptions:
- The Indian Institute of Architects, Nagpur Centre has been interested in Town Planning issues that go beyond their 'professional' interests. More architects are involved in NGO work than from any other single similar profession.
- The Indian Water Works Association keeps organising meets that express concern regarding depleting surface and ground water resources. However such organization do not have effective extension activity in order that they might make any impression on both, - the management and the people.
- Institutes like the Indian Medical Association should be coming forward to address health and hygiene related issues, however they hardly ever show any inclination of doing so. There is not even any reaction to any positive or negative policies pursued by the administration.

Research Institutes:

- Interaction with professional research institutions is very difficult because their set up does not promote ready dissemination of information or any sense of social responsibility beyond commercially approved projects. This has been the experience regarding NEERI as well as CICR.
- MRSAC (Mah. Remote Sensing Service Centre) Director, in a clear departure from this trend promised help in the NBSAP process. Imagery, maps etc provided by MRSAC are reproduced in Annexure V.

Annex V

7) Gap analysis

i) Gaps in information

Scattered information

Difficulties placed in the way

Deliberate denial of information (limited copies etc)

ii) Gaps in vision

Skewed objectives (Development vs Environment)

Thoughtless implementation of ill-conceived projects (more money spent is greater measure of achievement)

Break with the indigenous practises, (and with the past)

iii) Gaps in policy and legal structure

Inadequate accountability of officials

Inadequate laws

Inappropriate implementation

Lack of concern / contradictory views of judiciary

iv) Gaps in institutional and human capacity

Identification with the issue (lack of commitment)

Lack of training (regarding concerned issue/regarding efficient management)

Lack of inter-departmental coordination (Also officials help officials to cover up)

Identification of these gaps does immediately prompt ways & means to fill each one of them separately. However, in order to be really effective, it is essential to understand that these gaps are symptomatic of basic flaws (that are identified and extensively described in this report). The basic malady is these flaws, while the gaps are only symptoms of the malady. Moreover, the fallout of the basic flaws as well as the gaps is the resulting degradation of environment, which is our primary concern. Therefore it would be more fruitful, even for bridging these gaps, to find solutions that address the basic maladies.

8) Major strategies to fill these gaps and to strengthen ongoing measures

It should be our endeavour to first address the basic disorders so that suitable environment is created for effectively bridging the gaps. However, to criticise the disorders, or to vigorously attack the symptomatic gaps would be like trying to shoot from the wrong end of the barrel.

Therefore our basic approach is to identify and analyse the problem to a degree where most people would be able to understand and appreciate the exact nature of the problem and then, equally importantly, to simultaneously suggest viable solutions that might be readily acceptable.

The basic premise behind such an approach is that majority of people - citizens, officials, planners and leaders - are also worried about these glaring defects and are looking or would soon be looking for viable solutions, and we intend to be ready with such solutions.

The key recommendations / strategies are categorised as follows:

- a) Regional and Town planning measures**
- b) Possible legal framework**
- c) Social empowerment**

- d) **Economic prudence**
- e) **Technical inputs**
- f) **Conservation projects**
- g) **Philosophical / theoretical base**

a) Regional and Town planning measures

- **Understanding the regional setting from biodiversity zoning point of view**
- **Adjust the current administrative boundaries according to the natural setting**
- **Adopt policies for conserving major and minor biodiversity corridors during planning**
- **Identify and conserve biodiversity hotspots during planning and development**
- **Adopt policies to reduce conversion of agricultural lands to permanent non-productive use**

Recognise 'Biodiversity Corridor Zone' (on lines of CRZ) and adopt suitable regulations for guiding all development within the zone.

Nagpur City lies at a critical location, considering a major biodiversity corridor in the country. It is important to understand the links of this corridor passing through the city or near the city (in the form of natural habitats like river tributaries, extension of hill ranges) and allow these links to survive during the evolution of the city.

Modify approach to 'Regional and Town Planning' at district, metropolitan and city levels:

- Redfine administrative boundaries according to natural setting / conditions and also considering major planning and development proposals:

E.g., in case of Nagpur, the Nag River and Pili River originate just outside the city (in Lava Village boundaries) and also meet in at a confluence just outside the city (near Village Pawangaon). Another example is that the boundary of the city passes through middle of Gorewada Lake. Also there are areas just

outside the city which are developing as appendages of the city (namely: Hingna Industrial Estate, Villages Wadi, Dabha, and Pardi etc. All these areas should be included in the city plan for effective planning and implementation.

- At the same time, provisions of the 74th Amendment must be made applicable to ensure that the city does not exploit or does not develop at the expense of the surrounding rural areas. More equitable allocation of natural as well as fiscal resources can only be ensured by faithful application of this Constitution Amendment.

Check List:

Revision of Metropolitan and City boundaries

Town Planning Principles – Mohalla as a unit / Natural conditions as guiding factor for locating mohallas

Formation of Mohalla wise implementation / monitoring structure (under 74th Amendment provisions)

Stricter enforcement of Heritage Regulations

Implementation special regulations in Heritage zones and precincts

Actions at City Level:

Assess the development of the city in the distant and the immediate past, and suggest suitable and sufficiently strong measures for inclusion in the Development Plan

Specific steps to be taken in this direction include:

Prepare Integrated Conservation Plan for Nagpur

Preparation of a base map for Nagpur with the help of satellite imagery and survey plans

Preparation of natural precincts and heritage zone plans.

Preparation of special regulations for natural features

Integration of the conservation plan in the Development Plan of the city

Increase People's Participation

Increased interaction with the stakeholders

Create public awareness, increase participation, improve understanding/knowledge

Development of local expertise

Creation of an information database

Develop in-house expertise within the Local Authorities

Conservation

Special fund for conservation / also find private sponsors for funding conservation

Protection of natural features from degradation, encroachments and pollution

This will involve a study of various other civic activities that are directly connected to conservation, such as garbage disposal, waste- water disposal, rainwater harvesting.

Special recommendations

THE PROBLEM OF PLENTY

Due to use of the Gorewada tank as the Balancing Tank for the water brought from various rivers, the tank now remains full all the time irrespective of the seasons. This has adversely affected that wildlife and bio-diversity which depends on seasonal fluctuations in the water level. VNHS Centre has made these observations mainly by studying the bird life over the years. Could the excess water be distributed over a larger number of reservoirs in the city?

ECOSENSITIVE ZONES

One important and step in conserving these Natural Precincts is to recognize their importance and impart more and more legal protection to them. In addition to the Heritage Regulations, declaration and regulations for 'Environmentally Sensitive Areas ESA (or zones, EZA)' under the section 3 (2) (v) of the Environment Protection Act and Rule 5(v) thereof, as also declaration and regulations / guidelines for 'Biodiversity Corridor Regulations Zones' (BCRZ on the lines of CRZ) can prove to be a very effective legal tools for this.

Put River Revival Project in motion with local inputs as well as under the National River Conservation Plan

9) Required actions to fill gaps and to strengthen ongoing measures

Actions to conserve and put natural ecosystems to sustainable use

Conservation Projects:

- *Conservation of rare threatened species (included in the red book) with their microhabitat*
- *Rediscovery of critically endangered species earlier reported in the area*
- *Conservation of habitats for ensuring livelihood of stakeholders*
- *River revival and pollution abatement project*
- *Restoration of existing surface reservoirs*
- *Creation of new surface reservoirs*
- *Conservation / protection of hills and important open spaces*
- *Conservation of Civil Lines area by applying special regulations*
- *Conservation of Agricultural Lands within and around the city*
- *Field survey of Nagpur Metropolitan region for landuse planning with conservation angle*

Within the above categories, or supporting these projects, VNHS Centre has already formulated the outline of following projects. Summarised checklist of issues and tasks as part of the Ecocity Vision and Action Plan are tabulated in Annexure W. Outline of the projects is also discussed with many other NGOs as part of 'Tercentenary Agenda for promotion of environmental issues', reproduced here in Annexure X. More detailed project proposals are spelt out in Annexure Z.

Annex
W

Annex
X

Annex
Z

Conservation of rare threatened species (included in the red book) along with their microhabitat

- 1) Restoration / conservation of important local species of fish now becoming rare, namely – Belone or Chachi (*Xenentodon cancilla*), Singhan (*Heteropheustis fossilis*) and Pabda or Googly (*Ompok bimaculatus*) by habitat conservation.
- 2) Conservation of local amphibian species and breeding of rare amphibian species, namely – *Rana cynoflectis*, *Rana lychnocharis*, *Rana tigerina*, *Microhyla ornate*.
- 3) Conservation of dragonflies and butterflies by habitat conservation.
- 4) Study and conservation of threatened bird species of the Indian Peninsula (from red data book, among which about 35 species are found in this area)

Rediscovery of critically endangered species earlier reported from the study area

- 1) Rediscovery of critically endangered species namely
 - *Haplobatrachus tigerinus* (Largest frog of India), *Spongilla* sp., *Coelenterates* (Hydra), and
 - Smallest bat in the world.

Conservation of species and their habitats directly resulting in improved economic returns

- 1) Application of biometry (management practises + drug therapy) for improving fish catch in the local water bodies of Nagpur resulting in direct benefit to the fisherfolk.
- 2) Habitat conservation and management practises of grasslands benefiting the local traditional Gaolis or Milkmen.

- 3) Conservation and breeding of earthworm for producing compost from biodegradable garbage by using composting and vermiculture techniques.
- 4) Study medicinal plants and conservation of selected species.

River revival and pollution abatement project

Ecocity Foundation floated by VNHS Centre have helped NMC to formulate proposals whereby people will directly benefit from revival of the Nag River. The key to success of all such projects is not so much in terms of dependence on government agencies, but a change in the mindset of the people at large - by improved understanding of the situation through concerted awareness raising campaigns, putting greater responsibility on people by empowering them to take decisions – supported by appropriate research and development.

Restoration and renovation of existing surface reservoirs

The case of each of the existing lakes, namely Ambazari, Gorewada, Telangkhedi, Jumma Tank, Sonegaon, Sakkardara, Baradari, Dahegaon, Naik talav, and Pandharabodi needs to be tackled separately, as each one is faced with a different problem. Details of history, present status and efforts so far for revival are enumerated separately in the Annexure. The case of Ambazari and Gorewada are dealt with separately because from their catchment the two rivers originate. Possible revival strategies for other tanks, requiring feasibility studies are also discussed.

Creation of new surface reservoirs

Nine out of the ten notable reservoirs in Nagpur were created by past generations, most of the lakes tanks being about 275 years old. However during the last 100 years or so, there has been no attempt to develop local surface reservoirs. In today's town planning, probable locations for creation of new waterbodies are completely missing.

VNHS Centre intends to carry out studies in this respect. An important aspect of this study would be to try and improve the ecology of older eastern parts of Nagpur.

Conservation of Civil Lines area by applying special regulations

The Dy. Director of town planning has already prepared a note proposing separate bylaws for this area. This note is reproduced in Annexure R.

Annex
R

Conservation / protection of hills and important open spaces

Hills and major open spaces are listed under the Heritage Regulations, but even with the regulations being in force they are in the danger of being built unless the Heritage Committee's guidelines in this respect are adhered to. A note on this issue and draft guidelines prepared for this are reproduced in Annexure Y.

Annex
Y

i) Actions to conserve and put agro-ecosystems to sustainable use

Study of the phenomenon of conversion of agricultural lands indicate some clear actions

At Regional Level:

- Detailed survey is required to be carried out in the Metropolitan region of the city to find out as to which lands are more suitable for urbanization and which lands are not.
- Efficient planning and monitoring system should be put into operation (probably Metropolitan Planning Committee as stipulated in the 74th Amendment would be the most appropriate authority for this).
- Economic / educational / medical and cultural development of satellite centres existing around the city.

At City Level:

- Policies (such as FSI, built up areas) have to be devised to ensure that optimum utilization of land (and service infrastructure) takes place within the already urbanized areas.
- Stricter enforcement of `Green Belt` regulations is required. Usually the authorities deliberately overlook the fringe areas of the city, where unscrupulous politicians `establish` slums as also unauthorised layouts until nothing much except regularising of the same remains to be done. In Nagpur there are close to 5000 such layouts out of which 572 layouts were recently regularised and 1900 more are to be regularised soon.
- Perhaps the only solution to control of `green belt` is to convert it into a `red belt`. A sufficiently wide tract of land could be given over to authorities which require large campuses, e.g., Army, Police departments, airport authority, Forest Department etc. This tract on the periphery of the city would have better chance of remaining green and unencroached.
- Maintain the status of existing agricultural lands within the city, especially the PKV land.

10) Follow up

i) Coordination mechanism to oversee implementation of the action plan

- Initiate Information / Education / Communication (IEC) training programmes for awareness raising and orientation of citizens, people's representatives, officials, judicial officers
- Creation of data base covering conservation & development related themes for easy accessibility information
- Creation of displays / exhibitions / museum for inspiration
- Translation of relevant material into local (Marathi) language
- Pilot projects to serve as model for others

ii) Monitoring mechanism, including periodic evaluation and review of SAP

- Citizens' Annual Environmental Report prepared through participatory process
(prepared by NGO in coordination with authorities)
- First such report should be prepared as part of the Tercentenary documentation
- Student – Teacher based research and action projects to be integrated into their curriculum
- Participation of citizens in tree census
- Participation of citizens (especially students) in bird count and similar activities

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11) List of Annexures

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| APPENDIX 1 | – Listings of Flora of Nagpur City |
| APPENDIX 2 | – Listings of Fauna of Nagpur City |
| APPENDIX 3 | – Listing of Birds of Nagpur City |
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|-----|------------|--|
| 1. | Annexure A | – Process of BSAP preparation, list of working group members and details of meetings held |
| 2. | Annexure B | – List of NGOs with addresses with whom interaction was held regarding Nagpur BSAP |
| 3. | Annexure C | – List of issues discussed with various authorities (in the form of a questionnaire) |
| 4. | Annexure D | – Geomorphological features of Nagpur District |
| 5. | Annexure E | – Geology and groundwater resources of Nagpur City and its surrounding area |
| 6. | Annexure F | – Synopsis of 74 th Amendment PIL |
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| 8. | Annexure H | – Environmental Consciousness and Urban Planning – Comparison of land use in urban and rural areas |
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| 12. | Annexure L | – Plants as indicators of Air pollution (report prepared by scientists of NEERI in Nagpur) |
| 13. | Annexure M | – Studies and strategies for pollution control and revival of water regime |
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| 19. | Annexure S | – Special D. C. Regulations in Civil Lines Area (draft prepared by the Dy. Director, Town Planning) |
| 20. | Annexure T | – Proceedings from National Seminar on Greening of Cities |
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| 22. | Annexure V | – Remote sensing imagery / vegetation cover map and report from MRSAC |
| 23. | Annexure W | – Ecocity Vision and Action Plan – Check list of issues to be addressed and tasks to be performed |
| 24. | Annexure X | – Tercentenary Agenda for Promotion of Environmental Issues in Nagpur City |
| 25. | Annexure Y | – Can we save our hills & open spaces? / Framing of guidelines for preserving them |
| 26. | Annexure Z | – Detailed Project Proposals |