Heritage Tree Census of

Nashik Municipal Corporation

INDEX

1. Introduction

In view of "The Maharashtra (Urban Areas) Preservation of Trees Act (1975), for better preservation, protection and plantation of trees on Urban areas, it is binding to the Municipal Corporation to carry out a census of trees in all lands within the jurisdiction once before 1996 and thereafter once in very five years. This is the reason why this activity has been taken up by the concerned authorities.

When we think of the heritage of cities we usually think of historical monuments, statues of famous people, or buildings of architectural value. But there is another kind of heritage—the living heritage comprising trees in our towns and cities. These heritage trees can be found in a variety of urban spaces—along roads, in parks, alongside water bodies, amidst wooded groves, in religious spaces and even in private property.

These heritage trees are important, of course, for their biological value, but so also for their cultural value. Heritage trees are historical artefacts—connecting urban residents to the past and providing a sense of belonging in cities that can otherwise be stressful places to live in.

What are heritage trees?

There are a range of criteria that designate a tree as a heritage tree. These attributes—both material and non-material—makes the tree stand out. The material attributes could be age or size of the tree. It could also be the result of the form or shape of the tree. Further, it could be that the tree is a rare species or a tree at risk of being lost. The non-material criteria relate to cultural and aesthetic aspects. It could be that the tree has a historical or cultural association either with a person, an event or a place. It could also be a tree associated with myth or folklore. A comprehensive definition of a heritage tree by Aird (2005) is given below:

*"A **notable specimen** because of its **size, form, shape, beauty, age, colour, rarity, genetic constitution, or other distinctive features**; a living relic that displays evidence of **cultural modification** by native or non-native people, including strips of bark or knot-free wood removed, test hole cut to determine soundness, furrows cut to collect pitch or sap, or blazes to mark a trail; a **prominent community landmark**; a specimen **associated with a historic person, place, event or period**; a representative of a crop grown by ancestors and their successors that is **at risk of disappearing from cultivation**; a tree associated with **local folklore, myths, legends or traditions**; a specimen **identified by members of a community as deserving heritage recognition**."*

Anyone or even a mix of the criteria can result in the tree being accorded the status of a heritage tree.

Heritage trees in Indian cities

Trees of large sizes, or antiquity, or connected with a person or an event are found across cities in India. Some of these have received recognition, but of many others we know little of their very existence, let alone the importance of the trees in the landscape and the history of thecity.

In Benglauru city, the capital of Karnataka, is situated a 150 feet tall New Caledonian Pine or Cook Pine (also known in Asia as the Christmas tree) (*Araucaria columnaris*). The tree, brought to the city from New Caledonia in the late eighteenth century stands tall and easily identifiable in the Lal Bagh garden in the centre of the city. Also in Bengaluru is the Dodda Aalada Mara or the Big Banyan (*Ficus benghalensis*) estimated to be around 400 years old and whose canopy supported by aerial roots extends over 4 acres. There are other famous banyans across the country such as the 550-year-old banyan in the Bal Samand Palace in the desert city of Jodhpur, Rajasthan, that has a huge colony of bats roosting amongst its branches. Others are the banyan in Kolkata Botanical Garden, in Kolkata in West Bengal, with a canopy extending across 4.67 acres, and the 450-year-old banyan in Chennai, Tamil Nadu. Another ancient banyan is found inside the Allahabad Fort and is protected by the Indian Army. The tree is visited by hundreds of pilgrims during the Kumbh Mela, which is held once in 12 years.

The tamarind may be a part of everyday Indian cuisine. But this tree originally from Central Africa has attained iconic status in some sites. A tamarind tree in Gwalior, in the central Indian state of Madhya Pradesh, is planted on the tomb of Tansen, the famous singer and one of the jewels in the court of emperor Akbar. The tree does not have many leaves. This is owing to the belief that a decoction made from the leaves and bark will make one's voice as melodious as that of Tansen—thus people are said to have plucked the leaves extensively to consume them. Another tamarind stands in the premises of the Osmania General Hospital in Hyderabad, Telangana, with a plaque that says, *"This tree saved 150 lives"*. During the devastating flood of 1908 in Hyderabad nearly 15,000 people were killed. But 150 people survived by climbing onto the tamarind tree. Believed to be more than 300 years old, every year on September 28th a programme is held at the tree to pay homage to those who lost their lives in the floods.

The Clock Tower in Dehra Dun, Uttarakhand, is a landmark for locals and tourists alike. But few know that the peepul tree adjacent to the Clock Tower is said to have been planted by the freedom fighter and poet known as the Nightingale of India, Sarojini Naidu. While Dehra Dun may still be a small town, heritage trees are also present in crowded megacities such as Mumbai, the business capital of India and capital of the Maharashtra state. Scattered across the city are around 120 baobabs (*Adansonia digitata*), African trees believed to have been brought to India a thousand years ago by Abyssinian and Portuguese traders. These are extremely rare 'green monuments' and are classified as to be protected according to a tree census conducted of trees in Mumbai.

Not only single trees but groves too are of heritage value because of their antiquity. The Nallur Amarai grove located in peri-urban Bengaluru, close to the international airport, extends across an area of 53 acres. This grove has over 300 trees believed to have been

planted during the time of the Chola dynasty. The oldest tree today in the grove is around 400 years old. A strange feature of the tamarind trees in this grove is that like the banyan prop emerge from the trunk of the tree and provide support to these ancient trees. Some of the trees also have interesting markings and the trees themselves are considered as a gene bank of tamarind trees. This grove is the first Biodiversity Heritage site in the country declared so under the Biodiversity Act of 2002. In Sabarmati Ashram, in the city of Ahmedabad, Gujarat, Gandhiji's residence and the site from where he led the iconic Salt Satyagraha (Dandi march) are several old and towering neem trees (*Azadirachta indica*).

In spite of the variety and number of heritage trees in our cities, there is very little acknowledgement of their importance—resulting in trees being destroyed. Often trees fall victim to ill-planned urban development projects be it a road, flyover, metro and so on. Even trees that could be saved with small changes such as realignments to the constructions such as roads are lost for ever.

Of course, there are natural causes too that are a threat to the trees. For example, the Great Banyan in the botanical gardens in Kolkata was struck by lightning during the Cyclone Amphanin May 2020. Some parts of the tree were thus damaged.

But more often the development of city infrastructure is prioritized over heritage trees. And instances of threats to heritage trees are available from across cities in the country. The pimpal tree next to the Clock Tower in Dehra Dun was under threat of being cut for a road-widening project. But thanks to the efforts of local citizens and NGOs this was stopped. The foreign baobab that has made its home in urban Mumbai suffers many threats—concretization around roots, nailing of posters and are also at risk of being chopped down for road widening and construction of the metro. Many heritage trees in Lutyens Delhi planted during the time of the British too have been lost due to lack of care and maintenance, during the digging of trenches for laying underground cables and for road widening. Many of these trees were planted between 1920 and 1935 when Lutyens Delhi was under construction—old and majestic trees witness to several historic events have been lost for posterity.

There are many such heritage trees that are in danger of being lost in Indian cities—unmarked and undocumented. But, why do we need to protect heritage trees?

Why protect heritage trees? Uses and value of heritage trees

Trees in cities have many uses. They provide shade, help keep the climate cool and reduce the effects of the urban heat island. They settle the dust on the roads, and absorb toxic gases from vehicular and industrial pollution. Trees help prevent soil erosion by binding the soil, especially along urban water bodies. Trees serve as a habitat for biodiversity. At the same time, they are a source of food, medicine and raw material for us and are also of cultural and sacred significance.

But heritage trees, in addition, to all of the above also provide other benefits. For one, heritage trees while valuable from an ecological perspective, are also living cultural artefacts that connect the city's past to the present. There is no better way to take civic pride in our

cities than through heritage trees that are part of the history of the city itself.

Heritage trees are also of value in tourism. Many nature lovers visit heritage trees in cities often taking part in tree walks, while a tourist may inadvertently visit the tree in a park taking away memories of the tree. Not just tourists, but local communities who live alongside heritage trees also attach cultural value to trees, along with aesthetic or ecological values such as shade.

Heritage trees can play an important role in creating awareness about the importance of both heritage trees, as well as other trees in an urban landscape. Many of the heritage trees especially the Ficus are keystone species in the environment. The old trees serve as important roosting, nesting sites or as a food source for many species of wildlife.

An ancient tree is also an invaluable gene bank of a tree species.

Protection of heritage trees

- Legal protection in the form of inclusion in existing Acts, new Acts or issue of government orders that will accord the highest level of protection from being cut or lopped.
- If of tourism or sacred value no structures should be allowed to be built that will damage any part of the trees (roots, trunk or branches).
- Drawing up rules with regard to actions that will be deemed harmful to heritage trees—for example driving of nails into trees, the concretization of the base.
- Clear responsibilities of protection and maintenance to specified departments.
- Budgetary allocations for heritage tree monitoring, protection and maintenance.

Criteria of Tree for Census

A plant, by habit, having woody stem or trunk having minimum girth of 10 cm at chest level and has a height of 1.3 m above the ground level (Maharashtra Tree Act 1975 & Various Flora / Field Books on plants).

Outcomes of the Tree census work

It is one of the best tool for the management and maintenance of city's green cover as well as native biodiversity. It also helps in understanding the species composition of the studied area, tree to human population ratio, monitoring and maintenance, management of defective trees, carbon sequestration potential, etc.

Objectives of the Tree census work

- To survey the trees in all lands, inclusive of government, private and corporation property, bycounting each and every tree using census method.
- To provide the information on the secondary attributes like botanical name, family, floweringseason, colour of the flower, aesthetic/ economic value, etc.

2. Materials and Methods

The first and foremost important step while conducting the field study is collecting the proper and appropriate quality raw data. This primary data proves to be the base for whole of the project and helps in deducing various conclusions during the entire project process.

Thus, keeping these things in mind, we started collecting the primary data. In order to collect the primary data from the field, a mobile based geo enabled survey application was developed named as 'VrukshSharad'. The ward boundaries from the Nashik Municipal Corporation, Nashik were procured andcalibrated in the survey application.

Simultaneously, the data collected using mobile application was synchronized with the web-based application. This helped in transfer of collected data on the field directly from the mobile application to the main server. The data transfer activity was an ongoing activity.

Mobile application

The application was installed in the geo enabled mobile devices (Make: - Moto, Model: Moto G Turbo Edition) and these devices were handed over to the field officers. The field officers were trained botanists/taxonomists, who can identify tree species on field. In case if tree remains unidentified on the field, the photographed were shared with experts to identify as well as using flora and other field guides. The areas were allocated to respective teams and the survey was carried out.

A survey form was prepared and used to conduct the survey, the details of the same are mentioned below. While conducting the survey, every field officer first identified the tree species and filled in the name of the tree species in the survey form. The actual girth of tree species at chest level (in metres) was measured using a measuring tape and was filled in the survey form. Various other attributes like approx. height and age, condition of the tree, canopy diameter were filled in the survey form. By the end of the day, the data was uploaded by the field officer and thereby it was submitted to the server. Before moving towards the next tree individual, every tree individual was marked with an oil pastel colour in order to understand whether the tree individual has been censuses or not.

If in case, the tree was not identified on the site, the photographs were clicked of the leaf, stem, fruit, flower, canopy etc and were send to the subject expert. The Flora of the Presidency of Bombay (by Sir Theodore Cooke), The Flora of Maharashtra (by Dr. Almeida) and various field guides were used for identification of these species. Thus, the data collected during the field visit is uploaded by the field officer, which was transferred directly to the main server. An overview of the mobile application page is shown below: -

The main screen of the application named "VrukshSharad". The login credentials (username and password) are filled in by the respective field officers for carrying out the tree census work.
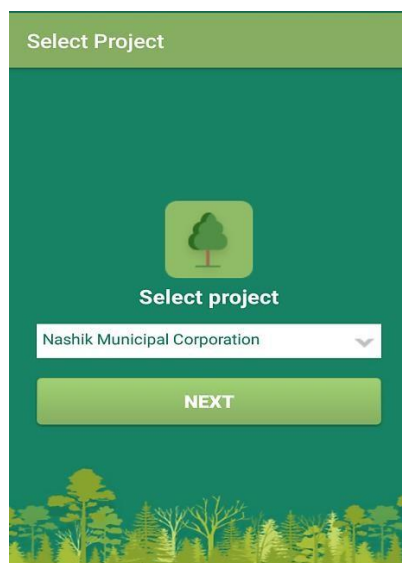
The home screen of the application consist of 4 main options namely Summary, Add a tree, Map and Analytics. Before, the field officer fill in the survey form, the device checks the accuracy and thereafter allows the surveyor to conduct the activity.

As one clicks on the option - Add a tree - a form will be displayed on the screen which will mention the Ward no and field officer's name. The later details like Landmark, Common name, Ownership, Girth, Height, Age, Canopy diameter, Condition, etc is filled in by the field officer. After completing the survey, one can find the details of the censuses tree in the option named Summary. The treeid with the physical attributes are shown here. The data is thereby uploaded by the field officer by clicking the "upload" button.
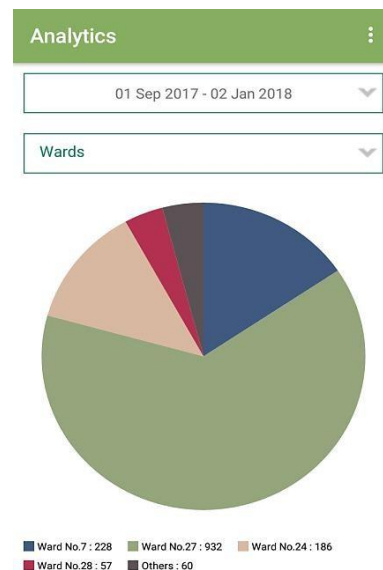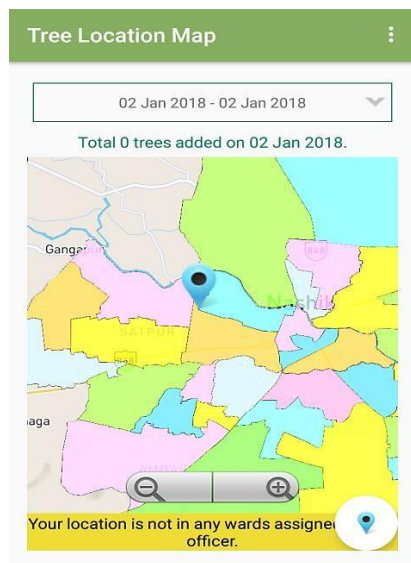
The third option is Map which helps to identify and relocate the field officer in the respective ward. The map options majorly helps during the count at ward boundaries. The fourth option is Analytics which helps the field officer to understand the tree count and its related data for a given period with various statistical features.

Web application

After the data has been collected from the field by the respective field officer, it is uploaded and directly transferred to the main server or the web portal named as "VrukshSharad". The url for this web application is **https://treecensus.locobuzz.com/** The main page will ask for the login credentials which after one can login in to the home page of this web application.
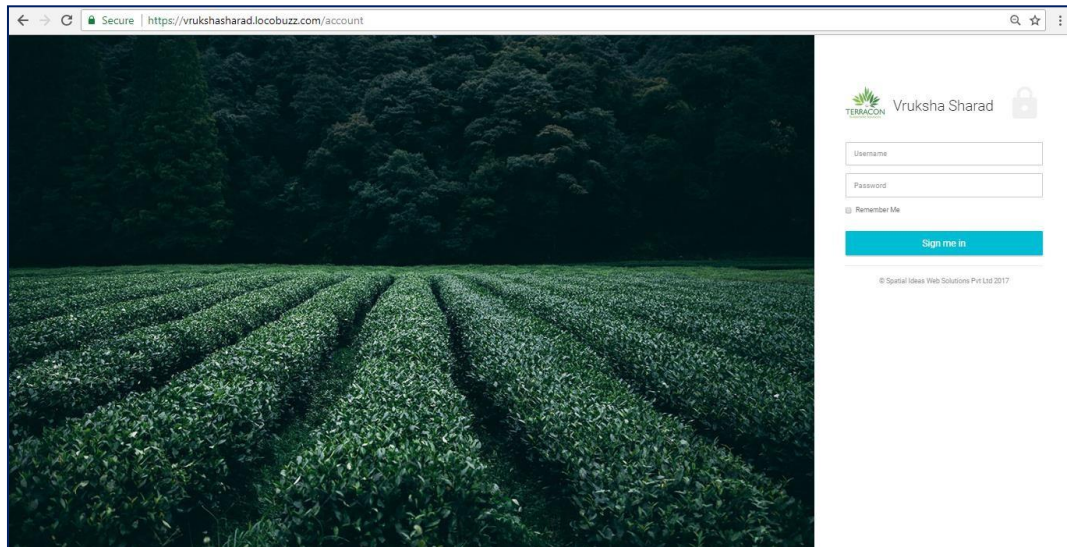
After reaching to the home page of VrukshSharad, you will find two options namely Dashboard and Map. The dashboard will take you the screen which reflects the ongoing work with various analysis reports and pie charts. The map will take you the screen where the schematic representation of the tree census can be visualized.
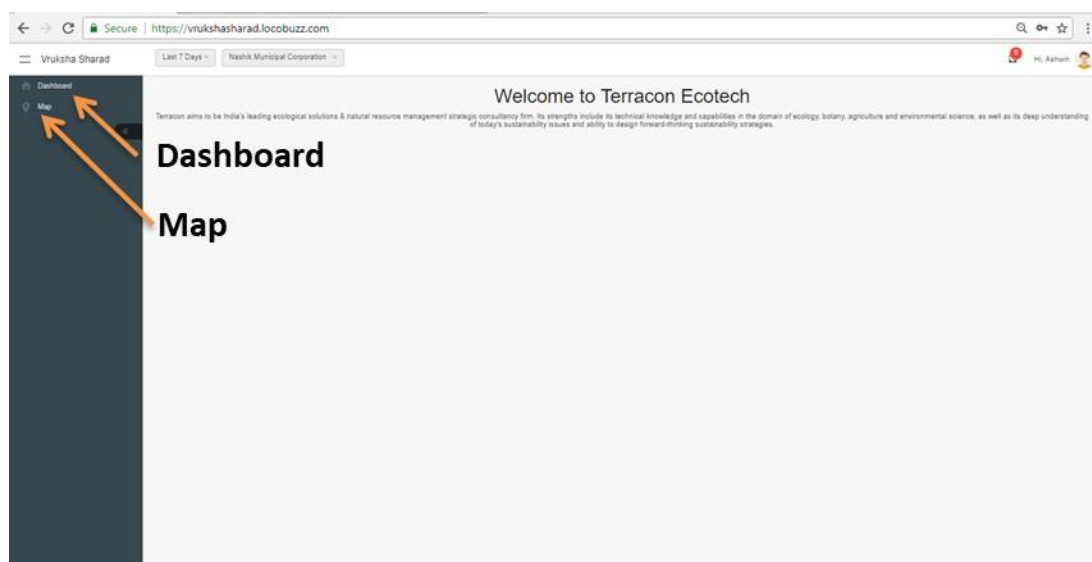
a. Dashboard

This option envisages various analytics and are visualized in the form of pie charts. The total number of field officers on work on a given day can be seen, the total count of the given day can be seen and thereby the total count till date can be seen on the dashboard.

The timeline option is available on the dashboard which will help to understand the trend of the work being done. Similarly, a pie chart reflecting the top 5 field officers based on their tree count can be seen.

Various other pie charts depicting the Tree condition, the ongoing wards, common and uncommon trees can be seen on the dashboard.
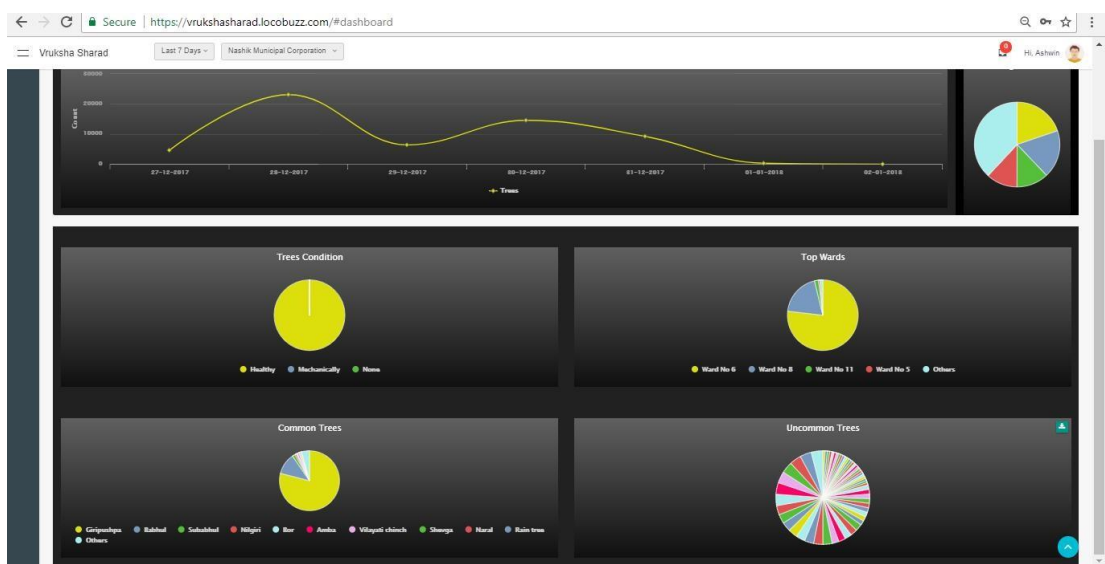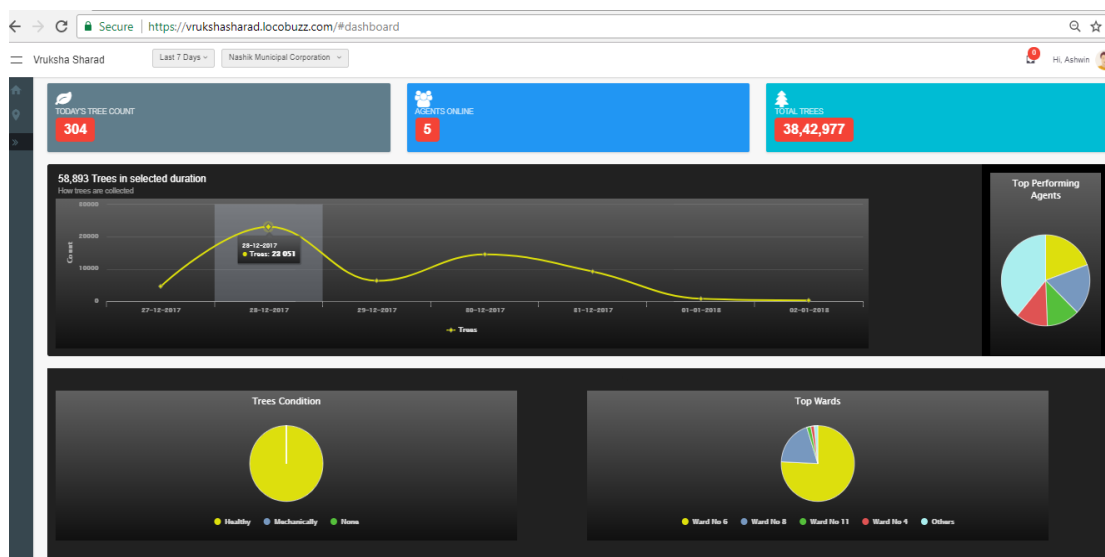
b. Map

The map gives the visual representation of the tree census work. The corporation and ward boundaries of the Nashik are assigned in the map. Thus, based on this the area covered and percentage completion of the work can be understood.
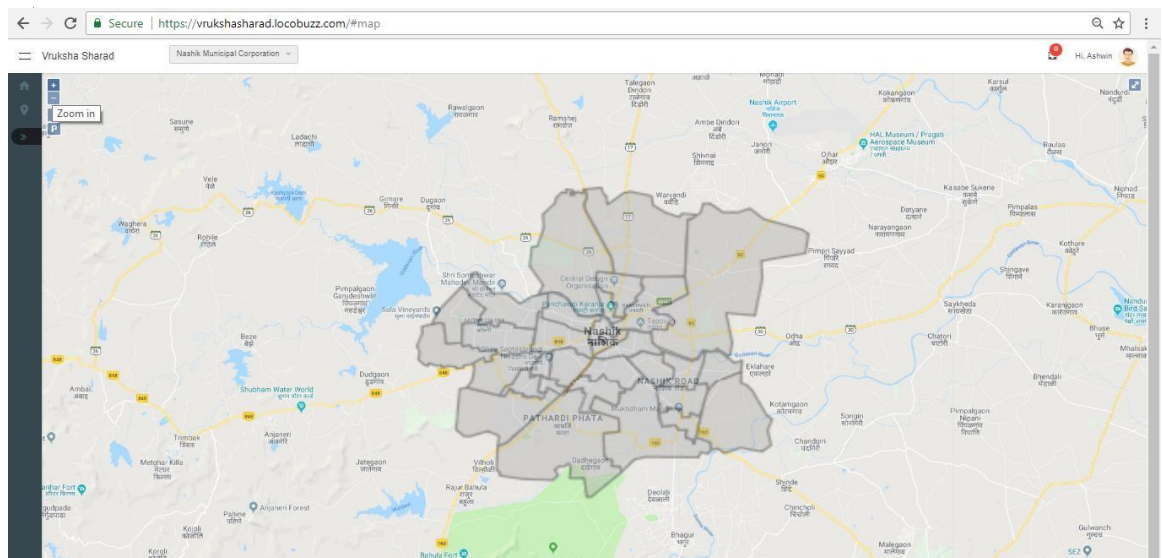
The map is equipped with four major options namely Zoom in (**+**), Zoom out (**-**), Search (**S**) and Polygon (**P**). The zoom in and out options helps to enlarge or lessen the map size.

The search (**S**) option is enabled with various attributes which helps in understanding the actual data. These attributes helped in searching the data using any attribute like - on the basis of tree id, ward no, enumerator, landmark, common name, girth, height, age, canopy diameter, condition of the tree, remarks, survey date or comment. Thus, as per the requirements different kinds of reports can be generated from the search option.
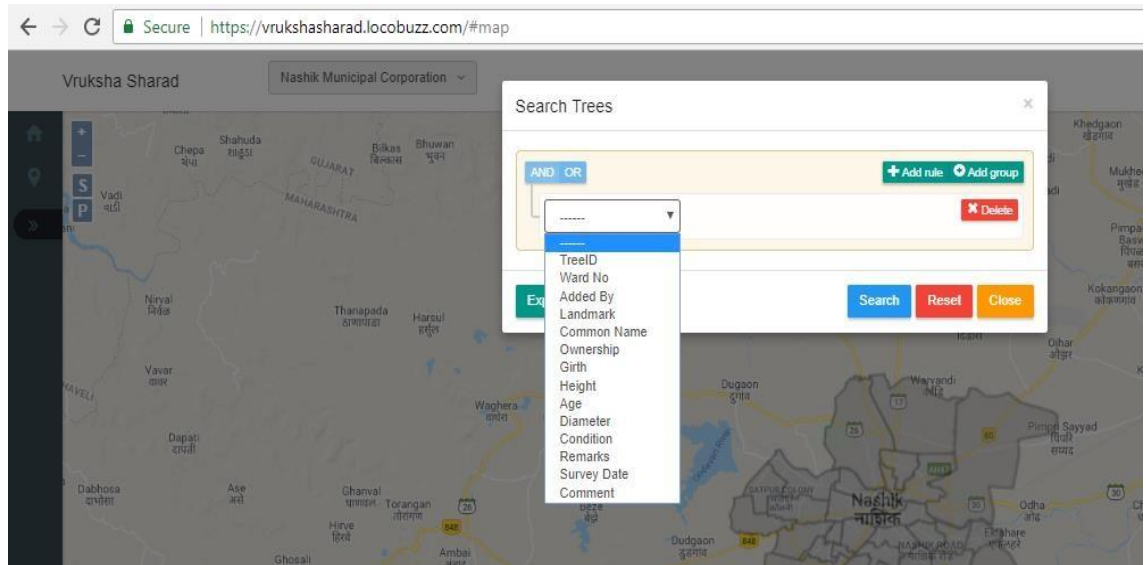
The polygon (P) option can be used in a way where the data is required of a specific area. The polygon can be plotted in this context to understand the tree census in the area of choice.

In the whole process the data is collected with the help of mobile application and is uploaded. The uplola022ded data is transferred to the web application and is reflected on the dashboard and map. The data can be segregated on the basis of various filters available in the search option. Finally, data is extracted from the web application or server for further verification. After verification, the curated data was transferred to the server again which will be available for further use.

For more technical information on mobile application and web application, please find the manual attached.

3. Results and Conclusions: -

A data set consisted of heritage tree data of 1,528 individuals. The results are obtained based on individual tree count, ward wise tree count, ownership wise, height wise, age wise, canopy wise and condition wise. The results obtained are as follows

a. Individual Wise Tree data:

Pimpal was the most dominant tree species with (29%) occurrence to the entire population of heritage trees within the city. It was followed by Vad (24%), Amba (21%) and Kaduneem (13%).

Induvidual Tree Wise

Legend
■ Pimpal
■ Vad
■ Amba
■ Kaduneem
■ Babul

Pie chart values: Pimpal 29%, Vad 24%, Amba 21%, Kaduneem 13%, Babul 13%
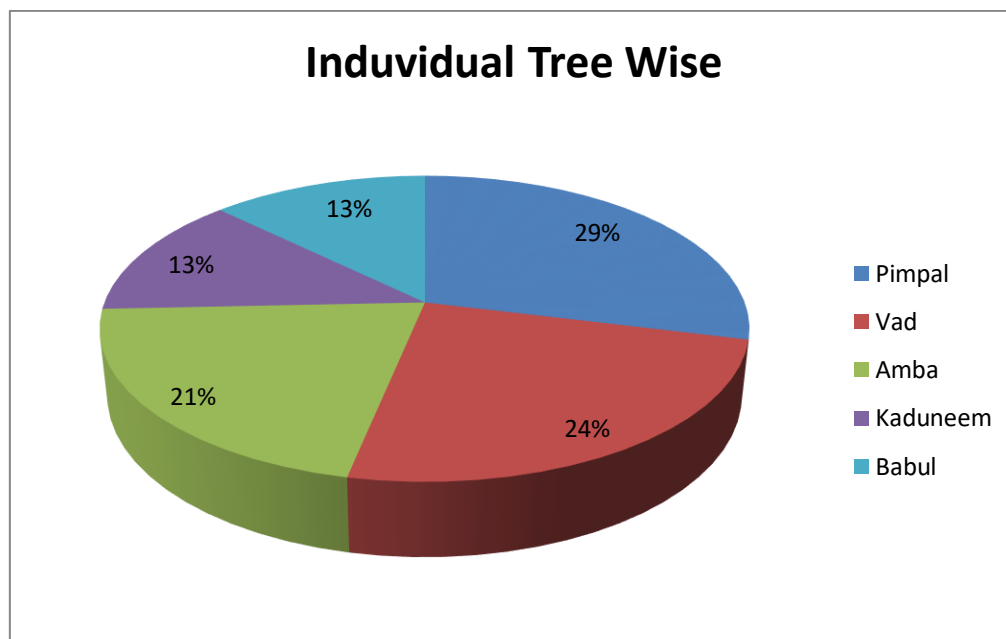
b. Ownership wise tree data:

Maximum trees were recorded from Private sector. 51% of the trees are on government owned land followed by Government (25%), Roadside (22%), Industry (2%). The Government land is divided into Forest land, Defence land and land under Municipal Corporation i.e. NMC, Nashik.

Ownership wise

Legend:
- Government/ NMC
- Industry
- Roadside
- Private

(25%, 2%, 22%, 51%)
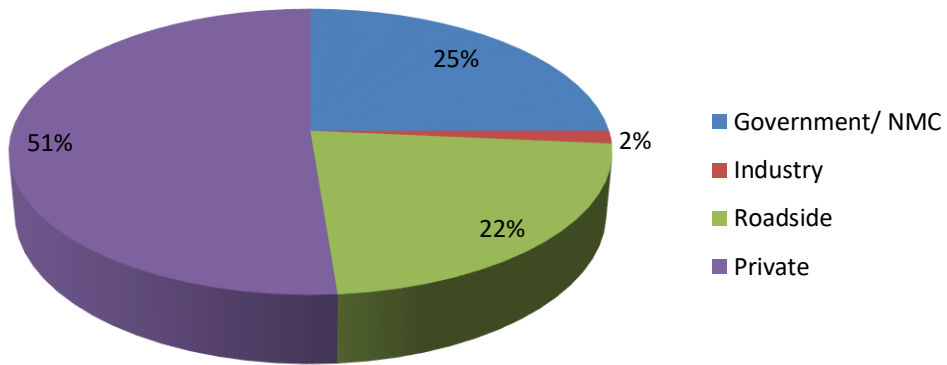
c. Native Wise Tree data:

Out of the total 1528 Heritage trees 82% of heritage trees are indigenous and 18 % of heritage trees are Exotic in Nature..

Native Of Tree

- Native (82%)
- Exotic (18%)
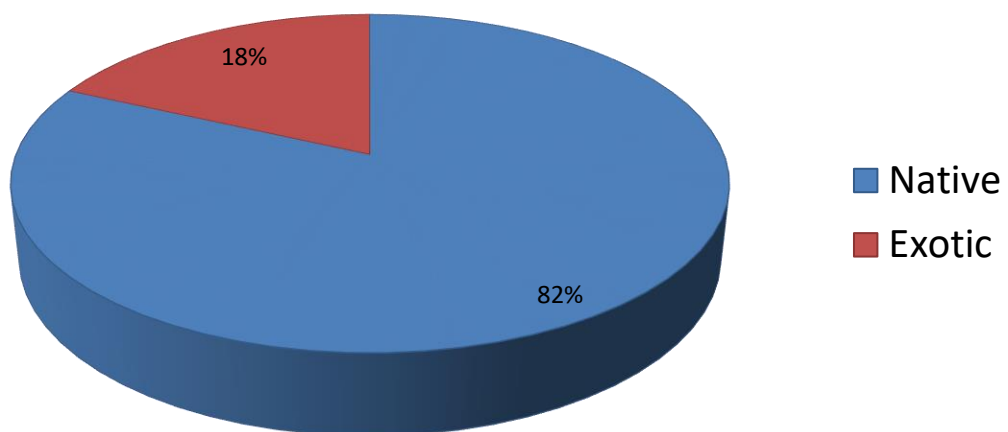
Individual wise Heritage Tree Count

Sr. No	Marathi Name	Total	Sr. No	Marathi Name	Total
1	Khaya	2	37	Dalimb	1
2	Pichkari	8	38	Karanj	17
3	Chendu Phul	6	39	Ratrani	1
4	Bakneem	1	40	Rain tree	95
5	Vad	207	41	Royal bottle palm	9
6	Mohogani	16	42	Pimpal	245
7	Neelagiri	40	43	Sago palm (Cycus)	1
8	Neel Mohar	1	44	Chandan	1
9	Kadamb	1	45	Chikku	9
10	Christmas tree	2	46	Bramhadand/Varvanta	4
11	Umber	78	47	Saptaparni	2
12	Naral	6	48	Kashid	17
13	Sonmohar	12	49	Chopdi Savar	3
14	Sitaphal	3	50	Silver oak	11
15	Shevga	2	51	Shiras	6
16	Australian Babul	1	52	Vilaytichinch	28
17	Gulmohar	57	53	Chinch	94
18	Peru	4	54	Umbrella Tree	1
19	Babul	108	55	Unidentified	1
20	Badam	1	56	Suru	8
21	Akashneem (Buch)	14	57	Chapha	2
22	Vaval	4	58	Pandhri Savar	1
23	Bor	2	59	Jangli Badam	2
24	Shami	2	60	Jangli Chincha	20
25	Paras pimpal	1	61	Kavath	6
26	Shisam	5		**Total**	**1528**
27	Maharukh	3			
28	Bhend	9			
29	Jambul	36			
30	Amba	179			
31	Kanak chapha	1			
32	Ashok	8			
33	Giripushpa	1			
34	Kaduneem	110			
35	Ramphal	10			
36	Ritha	2			

Indigenous Tree Spp

Sr. No	Marathi Name	Total	Sr. No	Marathi Name	Total
1.	Chendu Phul	6	2.	Amba	179
3.	Bakneem	1	4.	Kanak chapha	1
5.	Vad	207	6.	Ashok	8
7.	Mohogani	16	8.	Kaduneem	110
9.	Kadamb	1	10.	Ramphal	10
11.	Umber	78	12.	Ritha	2
13.	Naral	6	14.	Dalimb	1
15.	Sitaphal	3	16.	Karanj	17
17.	Shevga	2	18.	Ratrani	1
19.	Peru	4	20.	Pimpal	245
21.	Babul	108	22.	Chinch	94
23.	Badam	1	24.	Suru	8
25.	Akashneem (Buch)	14	26.	Chapha	2
27.	Vaval	4	28.	Jangli Badam	2
29.	Bor	2	30.	Jangli Chincha	20
31.	Shami	2	32.	Kavath	6
33.	Paras pimpal	1	34.	Chandan	1
35.	Shisam	5	36.	Chikku	9
37.	Maharukh	3	38.	Saptaparni	2
39.	Bhend	9	40.	Kashid	17
41.	Jambul	36	42.	Shiras	6
				Total	**1250**

Exotic Tree Spp

Sr. No	Marathi Name	Total	Sr. No	Marathi Name	Total
1.	Khaya	2	2.	Pichkari	8
3.	Neelagiri	40	4.	Neel Mohar	1
5.	Christmas tree	2	6.	Sonmohar	12
7.	Australian Babul	1	8.	Gulmohar	57
9.	Giripushpa	1	10.	Rain tree	95
11.	Royal bottle palm	9	12.	Sago palm (Cycus)	1
13.	Bramhadand/Varvanta	4	14.	Silver oak	11
15.	Chopdi Savar	3	16.	Vilaytichinch	28
17.	Umbrella Tree	1	18.	Unidentified	1
19.	Pandhri Savar	1	**Total**		**278**

Heritage Tree Age Wise Count

Sr. No	Marathi Name	50-59	60-69	70-79	80-89	90-99	100-120	121-140	141-160	161-180	181-200	more than 200	Total
1	Khaya						2						2
2	Pichkari	6	2										8
3	Chendu Phul	6											6
4	Bakneem							1					1
5	Vad	76	37	17	27	11	16	6	8	7	2		207
6	Mohogani	16											16
7	Neelagiri	28	8	1			2					1	40
8	Neel Mohar	1											1
9	Kadamb			1									1
10	Christmas tree	1	1										2
11	Umber	55	13	4	2	1	1	1				1	78
12	Naral	2						2				2	6
13	Sonmohar	8	4										12
14	Sitaphal						2		1				3
15	Shevga	2											2
16	Australian Babul	1											1
17	Gulmohar	38	12	7									57
18	Peru						4						4
19	Babul	23					85						108
20	Badam										1		1

21	Akashneem (Buch)	14											14
22	Vaval	4											4
23	Bor	2											2
24	Shami				2								2
25	Paras pimpal								1				1
26	Shisam	4	1										5
27	Maharukh	2	1										3
28	Bhend	5	4										9
29	Jambul	20	14	2									36
30	Amba	56	99	2	4	2	4		5		5	2	179
31	Kanak chapha		1										1
32	Ashok	2					6						8
33	Giripushpa		1										1
34	Kaduneem	83	21	1			4		1				110
35	Ramphal		5						5				10
36	Ritha	2											2
37	Dalimb						1						1
38	Karanj	14	3										17
39	Ratrani						1						1
40	Rain tree	64	19	7	4							1	95
41	Royal bottle palm	9											9
42	Pimpal	108	46	26	20	8	22	10	4			1	245
43	Sago palm (Cycus)	1											1

No.	Name												Total
44	Chandan								1				1
45	Chikku		9										9
46	Bramhadand/Varvanta	4											4
47	Saptaparni		2										2
48	Kashid	4	3								10		17
49	Chopdi Savar	2			1								3
50	Silver oak	11											11
51	Shiras	2	3		1								6
52	Vilaytichinch	23	2	2								1	28
53	Chinch	57	24	10	2		1						94
54	Umbrella Tree	1											1
55	Unidentified	1											1
56	Suru								8				8
57	Chapha						1		1				2
58	Pandhri Savar	1											1
59	Jangli Badam						2						2
60	Jangli Chincha	8	7				1			1		3	20
61	Kavath	5	1										6
	Total												1528

4. Discussion

The recent Heritage tree census revealed that it possesses around 61 different species. Out of these 82 % species are indigenous/ native and remaining 18 % are of exotic origin. Out of the counted 1528 counted trees, top five heritage tree spp. are the indigenous species, Pimpal (29%), Vad (24%), Amba (21%) Kaduneem (13%) and Babul (13%). Overall city's tree census specifies that the 60% of the city's vegetation is contributed by exotic species which is an alarming situation for the city. Thus necessities better management of city's native biodiversity.

5. Photographs of Some Heritage tress in Nashik city
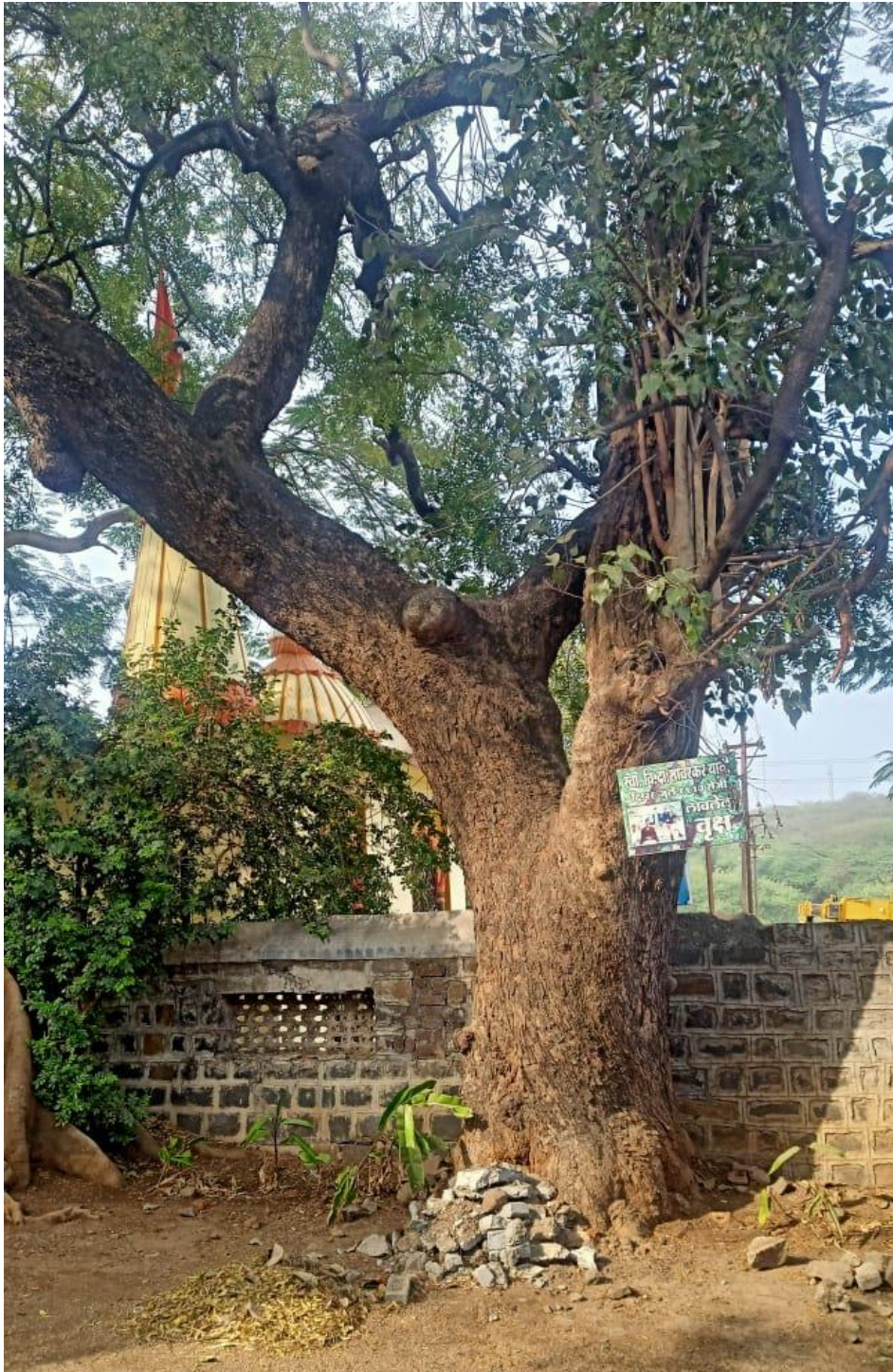
Kadunnem Tree Planted by Swatantryaveer Vinayak Damodar Savarkar Date : 26/07/1937

Chinch

Vad

Chinch

Pimpal

Kaduneem

Pimpal

Vad

Vad