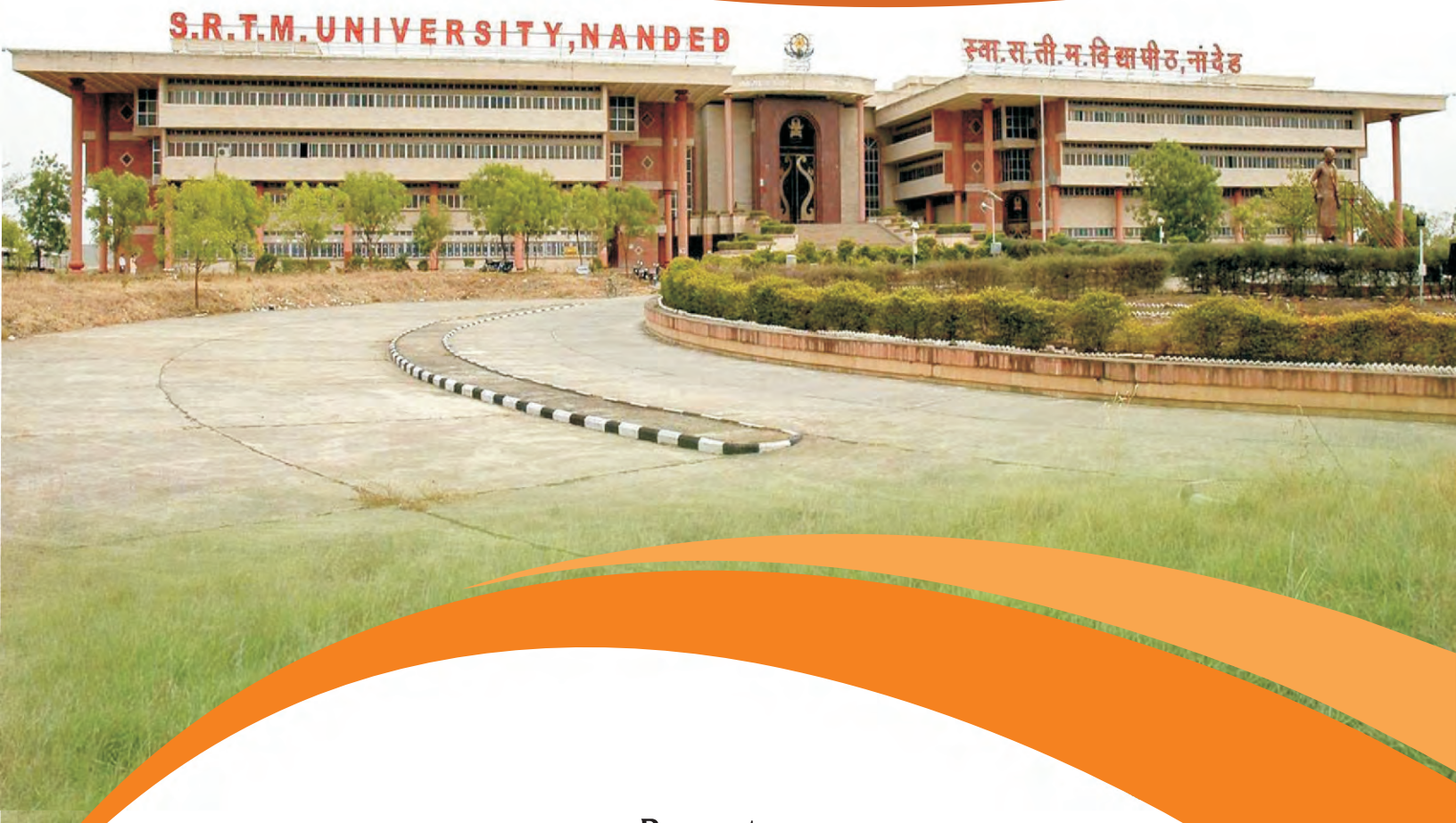
स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED (MAHARASHTRA)



Report on

University Rain Water Harvesting Structure

Under the

Green & Clean University Campaign

(Mission for Natural & Artificial Water Harvesting, Water, Soil & Energy Conservation and Sustainable Greenery Development)

December, 2020

Vision

Enlightened Student: Source of Immense Power

Mission

“Swami Ramanand Teerth Marathwada University pledges itself to uphold zealously its mission of promoting acquisition and dissemination of knowledge through fearless and sustained pursuit of excellence aimed at moulding personalities of students entering its portals to grow with an upright character filled with enlightenment and to be the value adhering members of a just and humane society”.

Introduction

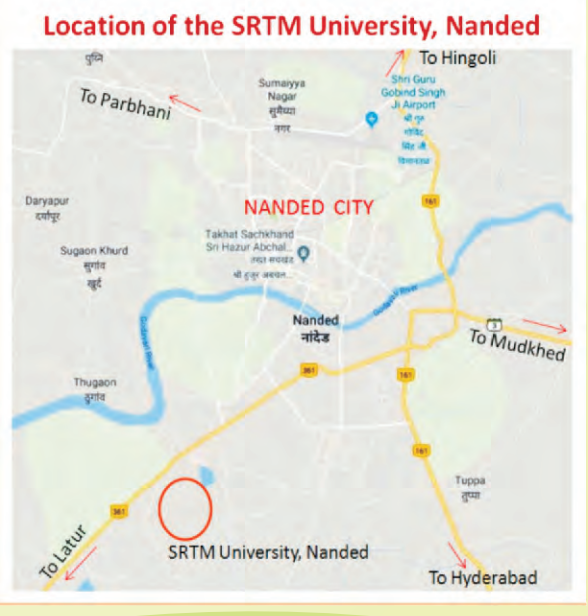
Water resource management has a long and rich tradition in India, with the important place that agriculture occupies in the history and culture of the Indian sub continent. This is underlined by the fact that Indian rivers and water bodies find mention throughout the record of Indian history, both official and popular. Indians have long recognized the importance of water resources, as is proven by the religious, popular and mythological narratives around Indian rivers and lakes, giving them a holy status or deifying them. Just as the West has celebrated the importance of fire to human civilization through the Greek tale of Prometheus stealing the fire of the Gods and bringing it to Earth, India has its own story of King Bhagiratha's efforts to bring the river Ganga to Earth from the Heavens.

Many activists and social workers have devoted their whole life to the work of water conservation and promoting cleanliness. They have contributed to the Watershed Management mission with the aim of creating a clean, beautiful and green India. Our current Prime Minister, Honourable Mr. Narendra Modi has been continuously motivating people and trying to increase awareness about sustaining natural resources for a clean and green India. To this end, Mr. Narendra Modiji and his ministers, especially the Ministry of Jal Shakti, have prepared and implemented a number of innovative action plans under this mission. Direct and indirect financial assistance has been provided by the Government for numerable schemes at various levels involving various stakeholders - the citizens, social activists, charitable trusts and educational institutes. In addition to this, after receiving the "Acceptance and Participation of the People", the mission has become popular and is active as a "Common Man's Mission". In short, the dream of "*Har Ghar Jal* with Clean and Green India" is well on its way to becoming a reality.

It is the duty of universities of India, in their role as educators, to participate in this goal of a Clean and Green India by engaging with their various stakeholders such as students, local population, local industries and local organisations. The universities must design and implement their own the 'Green and Clean University Campaign' at the institutional level. We believe that the university campus and its affiliated colleges should be proactive in conserving rainwater and maintaining cleanliness and greenery. In addition, eco-friendly approach towards the utilization of natural resources should be strengthened. The university needs to take a proactive role in soil, water and forest conservation. With these goals in mind, the Vice-Chancellor of Swami Ramanand Teerth Marathwada University, Nanded, Dr. Udhav Bhosle has launched the "Green and Clean University Campaign" in December 2018, especially for rainwater harvesting and maintenance of greenery and cleanliness. He has formed a core committee to design and implement a long-term scientific plan. The purpose of this plan is to promote soil-water-forest conservation, manage the use of electricity and other energy resources, implement environment-friendly water disposal, solid waste classification and management and maintain a plastic free environment in the institution. In addition, feasible proposals from various stakeholders will be invited and implemented by the university.

The University at a Glance

Swami Ramanand Teerth Marathwada University, Nanded (SRTMUN) is established on 17th September 1994, on the occasion of Marathwada Mukti Sangram Day. Last year (2019), the University celebrated its Silver Jubilee Year. The jurisdiction of the University covers four districts of Marathwada Region - Nanded,



Latur, Parbhani and Hingoli, one of the main water scarcity zones of Maharashtra. 370 colleges spread over these four districts are affiliated to the University. The University's main administrative and educational campus is located at Nanded, on the Nanded - Latur road, occupying about 550 acres of land. The climate is hot and dry, reaching temperature of 45 degrees Celsius in summer. According to Indian Meteorological Department, Pune, over the last 42 years, the region has experienced on an average, 52 hot days and 3-4 long heat wave days annually. The annual average rainfall of the district is about 925 mm. However, during the monsoon period, 773 mm annual average rainfall has been recorded in the last 3 decades, which is received mainly from June to September.

Currently, the number and depth of bore-wells in the region has become a matter of concern. According to the Ground Water Survey Department, the increasing ground water depth has become a major issue, as has the loss of forests and overall vegetation cover. In fact, the naturally fruitful region with rich biodiversity is now suffering from scarcity of water and deforestation resulting from non-awareness about water conservation, soil erosion etc.

The campus of the Swami Ramanand Teerth Marathwada University has gradually undergone the same degradation in the last two decades. The geographical conditions, increasing natural changes, irregularities in meteorological factors, increased pressure on natural resources, overall high water demand, lack of water conservation work and awareness are among the causes resulting in the depletion of groundwater and loss of biodiversity. In short, there has been a remarkable change in the land use and land cover (LULC), which the present report has analysed, comparing the situation before and after December 2018.

University Campus: Geographical Setup

The undulating topography of the University campus is divided into two catchments areas by small and first ordered streams. The low-lying area in the southwest, northwest, north and northeast part of the campus is flat and covered by deep-black soil, while the rest of the area in the east, southeast, south and central parts is hilly and has shallow soil. There is a high rise belt that connects the upper and lower areas. Each catchment area has a main stream flowing from south to north, originating with first order streams up to maximum of third order in the campus.

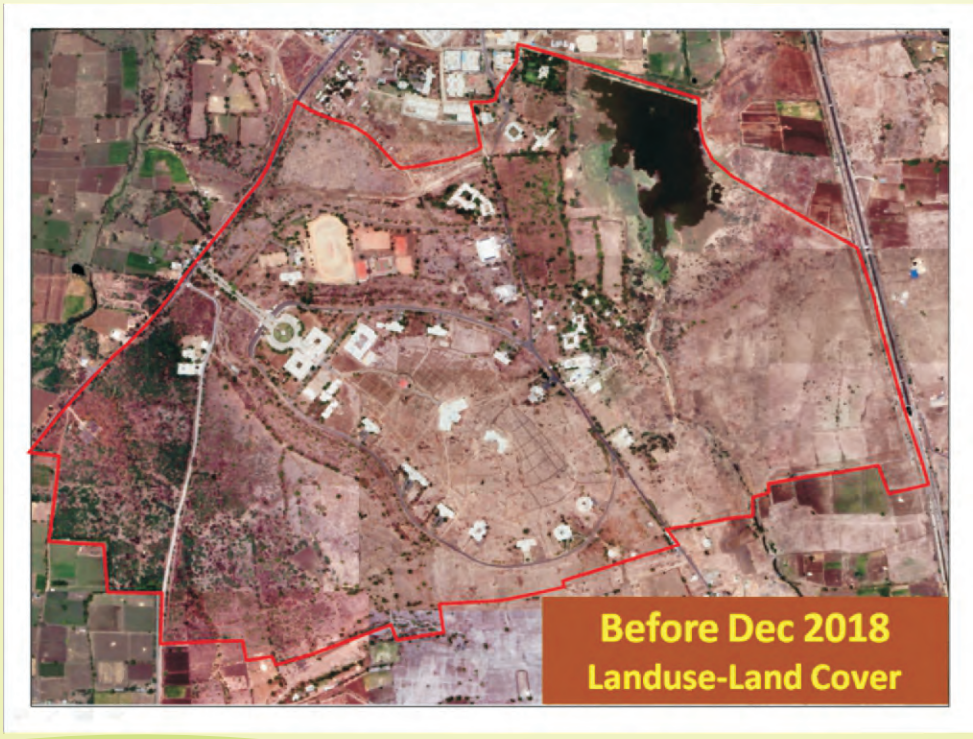
More than 94 percent of the total geographical area of the university campus is under natural land use - land cover. The area under roads, buildings and play grounds is still relatively very low. The burden and actual effect of the land use of the University's work on the present watershed management project is negligible. Along with the main administrative building of the university, there are a total of 45 buildings in use as schools, hostels, libraries, sports areas, residences etc. The given map of the SRTMUN campus shows the geographical location, natural streams and water bodies along with roads and academic buildings (as on December 2018).

The total length of completed concrete / tar roads is about 7 km and an additional 3 km of roads are in the planning/construction stage, at present in raw condition. The area under all these developmental activities is not more than 6% of the total geographical area of the campus. No major change has been carried out in the surrounding surface structure of other areas. Typically, the design and maintenance of the underlying geo-structure has not changed much.

However, due to changes in the day-to-day use, the depletion of groundwater, loss of biodiversity and other corresponding changes are found in the land system. Taking in to consideration alia these factors, there is an urgent need for soil, water and forest conservation on the campus. Therefore, the Vice Chancellor has launched the "Green and Clean University Campaign" with special focus on Rain Water Harvesting, Greenery and Cleanliness in December 2018.

Background and Aim of the Campaign

The given image-map, from September 2018, shows the land use cover of the campus. As shown in the image, most of the area has no tree and grass cover, which is necessary for maintaining the campus ecosystem.



The image shows that there are unnecessary and harmful thorny bushes and other vegetation cover of such type in the sloppy and low-lying areas. The image of September 2018 shows that the proportion of pernicious types of thorns was high. The density of plant life was just negligible in the downstream and highlands. Many trees were partially or permanently damaged in the gardens planted by the university. In particular, the green belt was not available in the university premises or could not be formed due to various factors. The movements of the Watershed Development (Blue Revolution) were extremely low. Only one or two reservoirs were found at minimum capacity with long term high sedimentary / mud depositions. In addition, there were only some wells and bore wells, 50 percent of which were not recharged or not repaired/not in use, due to lack of material and depletion of ground water.

It is against this background that the "Green and Clean University Campaign" launched in December 2018 to work on the sustainable development of the SRTMUN campus. The campaign is designed with multi-dimensional foci for achieving long-term multi-faceted benefits. It will develop a role model for the students, researchers and the region that may be replicated in institutions across the region. It is planned that the entire area of the university campus will be under plant cover in the next two years, which will be watered through its own harvested rainwater reservoirs and allied systems. This blue and green revolution will be accomplished by refreshing all the existing water sources, refilling and refining the necessary facilities and by developing all suitable sites for rainwater harvesting. The work of watershed development and management will be based on sustainable geo-scientific approaches. With a Researcher - Teachers 'Study Group' and a Administrative staff's 'Action Group' created in December 2018 for the actual work in Phase I – 2019, this campaign has made a well planned start.

Phase I: January-December 2019

Vice Chancellor of the University Dr Udhav Bhosle, immediately after joining on 05 November 2018, visited all the educational and administrative offices and minutely observed the natural set-up of the whole university campus. He realized that there was an urgent need to become a "*JALYUKT SHIVAR* AND *SWACHH-HARIT PARISAR*" from his visits and discussions with senior staff. He proposed that:

- the work should be socially oriented,
- design and implementation should be scientific and systematic,
- the involvement of staff, students and researchers will be the strength of this campaign,
- the campaign will completed in 3 years (3 phases) and
- will provide a scientific model to the region and researchers.

The actual ground work was started with collection of information and data regarding the topography of the campus and its proper geographical mapping. The preliminary work of watershed development activities have been initiated in January 2019 with the removal of unnecessary bushes, removal of stones and levelling of the areas. At the same time, for generating awareness about the campaign, number of students, parents, social and governmental organisations have been invited to contribute in the Watershed and Greenery Development process. The Office of District Collector, Nanded along with Irrigation, Forestry and Social Forestry Divisions of the districts, charitable trusts like Suryodaya Foundation, Mumbai and Social Group, Nanded and some local such groups, along with many activists and researchers have participated in the campaign. The university has worked hard to involve various components of society in the conservation process through this campaign. In order to increase community spread and awareness, the university has organised a number of activities and also participated in governmental and social programmes related to watershed and gram development.

Preliminary work of watershed development

In January 2019, the actual work for watershed development was started, with with 'Bhumi-Poojan' at the auspicious hands of the Vice-Chancellor and team. The first stage of Phase I began with removal of unnecessary bushes, vegetation and stones. Ground levelling work was carried out to facilitate smooth and planned soil use.

Work	Tractor Hours	Area in Acre
Removal of Bushes	425	19.77
Removal of Stones	25	11.50
Ground Levelling	75	32.50

For this, tractors with hydraulic ploughs were hired for systematic and proper work in January-February 2019. The details of this work are tabulated in the data box 1. The aim of ground levelling work was to prepare maximum suitable area for different kinds of natural and artificial rainwater recharge methods and also for plantation. Such type of plantation in large areas will help in increasing good quality vegetation cover, maintaining soil ecosystem and minimizing soil loss by controlling runoff.

Removal of Sedimentary/ Sludge Deposits:

The campus has two percolation tanks. The medium and small sized tanks are located on the campus in the eastern catchment area and western catchment area respectively. Before December 2018, both percolation tanks were found to be less efficient used due to a sedimentation of more than 50%. From January to March 2019, the sedimentary/sludge deposition was removed.

Removal of Sludge from Existing Tanks		
Removal of Sedimentary Deposition from Tanks	Total Truck Trips	300
Total Soil used for Garden	in Brass	1020

The removed sedimentary/ black soil, which is highly fertile, was used for garden development. In this way, a very large amount of fertile black soil has been stored and utilized in the planned gardens on the campus. Every effort has been made to reap the maximum benefit for the campus from this work.

Contour Bunding and Closed Small Sized Trenches:

Contour bunding, closed small sized trenches and bunds for controlling rainwater runoff have been developed on the inclined areas and other suitable sites in March 2019. At the time of this work, teak plantation on the campus has also been planned.

Percolation Box Pits:

In the foothill zones, 18 different sized open percolation storage pits have been constructed. For these series of pits, about 22683 cubic meter work was completed from March to May 2019.

Open Percolation Trenches :

Open percolation trenches of about 2200 meter length and 1 to 2 meter depth and width were developed in the foothill zone and between the playing grounds for controlling rainwater runoff and rainwater storage through percolation.

Rooftop Rainwater Harvesting Percolation Pits :

cement-concrete play grounds etc., there is no need to construct closed concrete tanks for rainwater harvesting as is the case in highly dense population zones of urban colonies or any residential society.

As the campus land use and land cover is mainly under natural uses and not much disturbed by man-made activities and developmental projects like roads, buildings,

Therefore the university authorities and study group of the project decided to construct open percolation pits / small sized box-tanks near buildings for collection and storage of rainwater. The University has constructed about 9

open percolation pits for rainwater harvesting in May-June 2019. Rooftop rainwater of some buildings was diverted to such special pits or diverted towards the nearby Farm Pond / percolation tank of the building.

Percolation Tanks / Farm Pond (*Shet-Tale*) :

The given bird-eye-view photograph shows two medium-big sized percolation tanks / Farm Pond and prepared land for plantation.

The construction of small to medium sized and medium to large sized box type percolation tanks was initiated in April 2019 and 9 such tanks were completed in July 2019. The information table given later in this report provides the details about size, shape and digging work along with the location of the tanks.

Two Tanks located between School of Earth Sciences and School of Mathematical Sciences

For sample videos of our University Water Conservation, refer the following videos: https://youtu.be/NZGJBtgokks https://youtu.be/ZJvRycn9hgw

Work for Rain Water Infiltration, Soil Conservation and Plantation :

It is necessary increase the infiltration rate with suitable geographical methods, which in turn will enhance the overall development and sustainability of the watershed project. Improvement in vegetation cover with specific plantations will strengthen the soil and plant ecosystem. Such types of activities are part of the work of watershed development.

With these considerations in mind, about 17500 pits for plantation were made ready between April and June 2019, with a target of an additional 10000 pits to be prepared before September 2019. Under the banner of 'Green University, Clean University Movement', the plantation work on campus was initiated.

In the monsoon season of 2019, the entire planned plantations were completed with the help of Social Forestry and Forestry Nanded Division, other social groups, university staff and students.

Plantation (June - Sept 2019)

- Teak plantation = 12000
- Bio-diversity Park Plantation = 3200
- Road and Building sides = 2300

Teak Plantation near Botanical Garden

Activities for Social Awareness, Participation and Orientation: 2019

In 2019, the University decided to highlight the watershed development and greenery activity in the staff-student community of the university and local society. The university, as an educational and research institution, has the primary objective of spreading knowledge among its students and other direct and indirect beneficiaries. In this regard, the following activities were organised for encouraging the involvement of of various stake holders.

Involvement in the Campaign - Green and Clean University
Mainly focused on
Watershed and Greenery Development
(Social Awareness towards Rainwater Conservation)

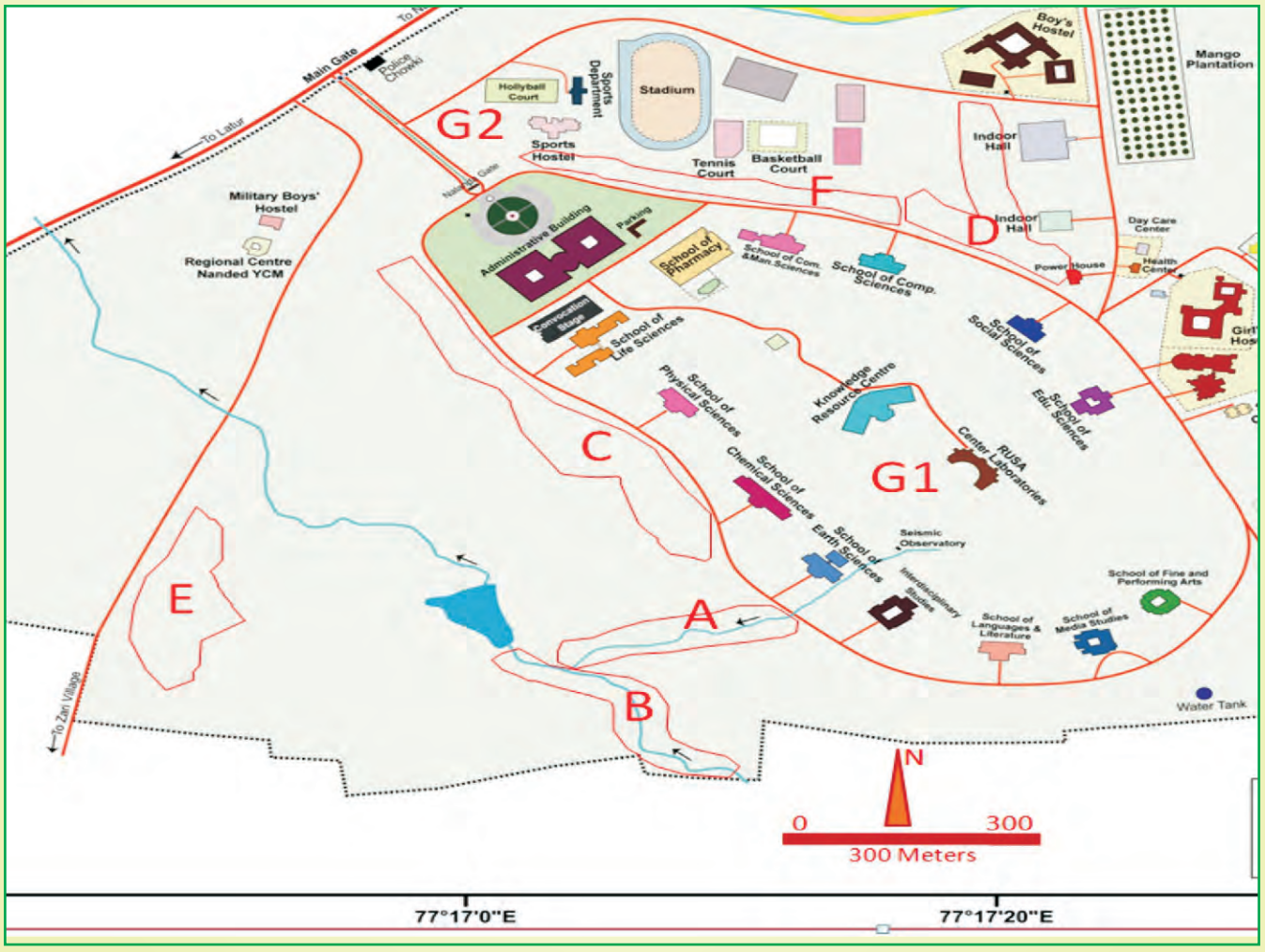
In the light of the Government of India's, 'Swachh Bharat Abhiyan' this 'Green and Clean University Campaign' also focuses on complete cleanliness. Campuses, all affiliated educational complexes, colleges and institutions must work to maintain cleanliness along with proper water conservation and greenery development. In order achieve this, institutions need to make concerted efforts.

For this, the "Mahashramadan Campaign (*Shibir*)" was organized on February 12, 2019. 2200 teachers and students from 16 colleges of Nanded participated in this programme.

Awareness Rally and Campaign Organized for Staff and Students

Strengthening Association with Regional Charitable Organizations

Summary of Work done for Watershed Management: January to December 2019



Map showing location of Sites (A, B, C, D, E, F, G1 and G2)

Site A: Soil Work on Earth Science Stream

Sr. No.	Series of Water storage pits/ blocks on the stream (1 to 6)	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Pit / Percolation storage tank– 1	17.5 X 11 X 2	385	288750
2	Pit / Percolation storage tank– 2	8.5 X 7.5 X 2.5	159	127500
3	Pit / Percolation storage tank– 3	8.5 X 7.5 X 2.5	159	127500
4	Pit / Percolation storage tank– 4	18.5 X 8.5 X 2	314	251600
5	Pit / Percolation storage tank– 5	20 X 20 X 3.1	1240	1100000
6	Pit / Percolation storage tank– 6	9.25 X 18 X 2.5	416	359362
Total soil work for developing storage pits			2673	2254712

Site B: Soil Work on Western- Pangra Stream

Sr. No.	Series of Water storage pits/ blocks on the stream (1 to 5)	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Pit / Percolation storage tank–1	17.5 X 9 X 2.9	457	409500
2	Pit / Percolation storage tank–2	17 X 13 X 2.2	486	442000
3	Pit / Percolation storage tank–3	15 X 8.5 X 2.5	206	280500
4	Pit / Percolation storage tank–4	100 X 80 X 1	8000	4800000
5	Pit / Percolation storage tank–5	70 X 3.25 X 1	227	136500
Total soil work for developing storage pits			9376	6068500

Site C: Soil Work at Western Foothill Zone

Sr. No.	Water storage pits/ blocks, Open and Closed Deep CCT at Foothill Zone	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Pit / Percolation storage tank–1	11.5 X 13 X 1.7	254	209300
2	Pit / Percolation storage tank– 2	12.5 X 9 X 1.9	214	168750
3	Pit / Percolation storage tank – 3	20 X 8.5 X 1.5	255	204000
4	Pit / Percolation storage tank – 4	14.5 X 17.5 X 2	507	431375
5	Pit / Percolation storage tank – 5	15.5 X 14.5 X 2.1	472	404550
6	Pit / Percolation storage tank – 6	29 X 10.5 X 1.5	457	365400
7	Open Deep CCT/Nalla widening – 1	260 X 2.1 X 1.2	655	546000
8	Open Deep CCT/Nalla widening – 2	77.5 X 2.1 X 0.9	146	113925
9	Open Deep CCT / Nalla widening – 3	100 X 2.5 X 0.6	150	125000
10	Closed Deep CCT with Pine-line	660 X 1 X 1.2	792	594000
Total soil work for developing storage pits and DCCT			3902	3162300

Site D: Soil Work at Northern Foothill - Sloppy Zone

Sr. No.	Water storage pits/ blocks and DCCT at Foothill - Sloppy Zone	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Pit / Percolation storage tank – 1	16 X 17 X 3	816	734400
2	Pit / Percolation storage tank – 2	22 X 13 X 2	572	486200
3	Pit / Percolation storage tank – 3	20 X 30 X 2	1200	1020000
4	Open Deep CCT	215 X 2 X 1	430	301000
5	Pit / Percolation storage tank – 4	70 X 3 X 1	210	147000
6	Pit / Percolation storage tank – 5	77 X 2 X 1	154	107800
Total soil work for developing storage pits and DCCT			3382	2796400

Site E: Soil Work on Bio-Diversity Park Stream

Sr. No.	Series of Water storage pits/ blocks on the stream (1 to 4)	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Pit / Percolation storage tank – 1	20 X 10 X 1.5	300	240000
2	Pit / Percolation storage tank – 2	20 X 10 X 2	400	320000
3	Pit / Percolation storage tank – 3	20 X 10 X 2	400	320000
4	Pit / Percolation storage tank – 4	30 X 25 X 3	2250	1950000
Total soil work for developing storage pits			3350	2830000

Bird-eye-view Showing Percolation Tank / Shet-Tale, Open Trenches and Natural Rainwater Harvesting Pits

Site F: Soil Work at Northern Foothill Zone

Sr. No.	Water storage Open Deep CCT / Pits at Foothill Zone (1 to 18)	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in Liters
1	Open Deep CCT / pits – 1	26 X 2 X 1	52	36400
2	Open Deep CCT / pits – 2	19 X 2 X 1	38	26600
3	Open Deep CCT / pits – 3	20 X 2 X 1	40	28000
4	Open Deep CCT / pits – 4	19 X 2 X 1	38	26600
5	Open Deep CCT / pits – 5	17 X 2 X 1	34	23800
6	Open Deep CCT / pits – 6	7 X 2 X 1	14	9800
7	Open Deep CCT / pits – 7	10 X 2 X 1	20	14000
8	Open Deep CCT / pits – 8	18 X 2 X 1	36	25200
9	Open Deep CCT / pits – 9	21 X 2 X 1	42	29400
10	Open Deep CCT / pits – 10	20 X 2 X 1	40	28000
11	Open Deep CCT / pits – 11	16 X 2 X 1	32	22400
12	Open Deep CCT / pits – 12	12 X 2 X 1	24	16800
13	Open Deep CCT / pits – 13	5 X 2 X 1	10	7000
14	Open Deep CCT / pits – 14	25 X 2 X 1	50	35000
15	Open Deep CCT / pits – 15	13 X 2 X 1	26	18200
16	Open Deep CCT / pits – 16	16 X 2 X 1	32	22400
17	Open Deep CCT / pits – 17	14 X 2 X 1	28	19600
18	Open Deep CCT / pits – 18	15 X 2 X 1	30	21000
Total soil work for developing Open Deep CCT / Pits			586	410200

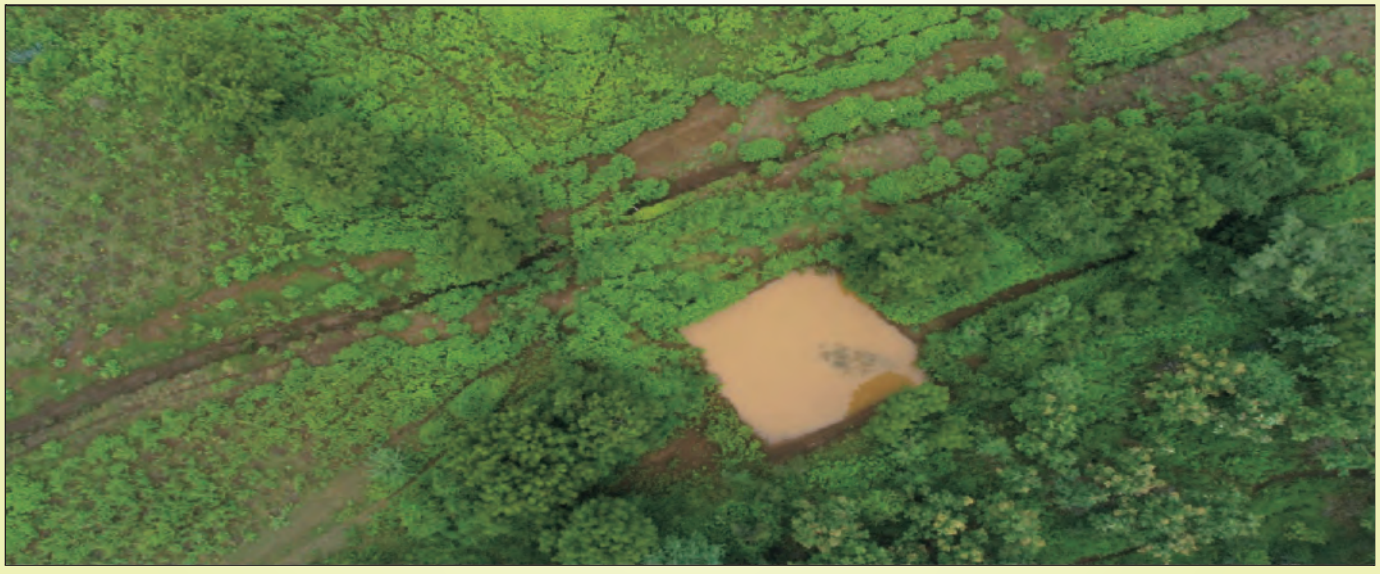
Mr. Sayaji Shinde (Multi-Lingual film actor) and Mr. Arvind Jagtap (Marathi Script Writer) visited university and appreciated the work done related to water and greenery development and motivated students for tree plantation.

Site G1 and G2: Development of Percolation Tank / Shet-Tale

Sr. No.	Percolation Tank / Shet-Tale	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in liters
1	School of Earth Sciences–Front Right	23X22X1.20	607	455400
2	School of Earth Sciences–Back Right	45X27X1.50	1823	1458000
3	School of Mathematical Sciences-Right	60X21X2.50	3150	2772000
4	School of Social Sciences	28X20X2.50	1400	1232000
5	Nalanda Gate Road – East	35X21X3.50	2573	2278500
6	Nalanda Gate Road – West	27X12X2.50	750	680400
7	GGS Adhyasan Foothill zone–no.1	24X21X3.00	1512	1360800
8	GGS Adhyasan Foothill zone–no.2	38X19X3.00	2166	1949400
Total soil work for developing Percolation Tank / Shet-Tale			13981	12186500

Site G1: Development of Natural Open Rainwater Harvesting Pits

Sr. No.	Natural Open Rainwater Harvesting Pits	Size (Length, Width & Depth in meter)	Work in Cu.Mtr	Filled capacity in liters
1	School of Life Sciences	15X6X1.20	108	90000
2	School of Physical Sciences – Left side	9X6X1.20	65	54000
3	School of Physical Sciences – Right side	15X10X2.25	338	300000
4	School of Chemical Sciences	15X8X2.75	330	264000
Total soil work for developing Open Rainwater Harvesting Pits			841	708000



Completed First Phase (2019) of Watershed Development

Phase II : January-December 2020

The work of watershed development was carried out as per the planed objectives of the mission. A number of academic and public events and brain-storming sessions were conducted, with high participation from stakeholders and valuable guidance and assistance from various experts. Even though the COVID -19 pandemic has severely impacted regular activities in 2020, this work has progressed with full enthusiasm. It was decided to carry out strengthening, widening-deepening and construction of long-life storages in 2020 along with development of new artificial water recharges. The following are the main highlights of year 2020:

Cement Bund / Bandhara:

The construction of Cement Bund / Bandhara was started in January 2020. Simultaneously, the work of stream deepening and widening was also initiated for ensuring maximum water storage.

Cement Bandhara – 1 is constructed on Earth Science Stream near the southern corner of the Bio-diversity Park.

https://youtu.be/zlKCAkWXkvA

Cement Bandhara – 2

is constructed on Boys' Hostel Stream, in front of Sports ground.

Sr. No.	Cement Bandhara	Size (Length, Width & Height in meter)	Length of Water Storage in Meter	Filled capacity in liters
1	Cement Bandhara 1	12.5 X 13 X 3	107	3060200
2	Cement Bandhara 2	21.5 X 14 X 3	135	6385500
	Total		242	9445700

Dug-Wells and Bore-Wells :

There are existing 6 dug-wells and 13 bore-wells on the University campus. Because of lack of recharge methods and developed watershed, the ground water level was decreasing steadily. Hence, most of these wells were not suitable

for use in watering the gardens or for fulfilling the other needs of the institution. The natural structures of these wells were also in a state of collapse.

Before December 2018, only 2 dug-wells and 4 bore-wells were in partial working condition. Therefore the maintenance work and application of water recharge methods for these wells were initiated in January 2020.

All the dug-wells were reconstructed with brick-stone walls, RCC walls and applied recharge methods with closed-ring trenched and jacket boxes.

At the same time, all bore-wells in a state of collapse have under gone repair /restoration work, electrification and application of water recharge methods. This work was completed in June 2020. As a result, all the dug-wells and bore-wells are fully recharged and are in use. **The water level of all dug-wells has increased on an average from 9 meters to less than 1 meter.**


Photo-plates showing restoration of dug-wells by recharge methods and quality construction, which results surface level ground water.


Road-side trenches :

The open and closed trenches are important in watershed development work. They help to control rainwater run-off, to increase infiltration rate, to store rainwater and maintain the overall ecosystem of the region. Therefore, this work was carried out between March and June 2020.

The average width and depth of these open and closed trenches is about 1.4 meter and 1.5 meter respectively. The closed trenches can also be used for development of foot-path tracks and underground irrigation and water supply pipe-lines for domestic-laboratory purposes.

The provisions have been made for the same. The open road-side trenches have been developed mainly for controlling rainwater runoff and increasing infiltration rate. So the trenches are beaked as per the contour level and nature of the surface structure.

These road-side trenches are present mainly on middle top (central area) of the campus, which is located around the Central Knowledge Library building.

Sr. No.	Road-side Trenches	Size (Length, Width, Depth in meter)	Work in Cu.Mtr	Filled capacity in liters
1	Central Library to School of Chemical Science (both sides)	160 X 0.75 X 1	240	90000
2	Central Library to School of Social Science (both sides)	180 X 0.75 X 1	270	101250
3	Central Library to School of Educational Science (both sides)	180 X 1.75 X 1.2	756	315000
4	Central Library to CIC building (both sides)	75 X 1.75 X 1.2	315	131250
5	CIC building to School of Fine & Performing Arts (both sides)	300 X 1.75 X 1.2	1260	525000
Total			2841	1162500

Trenches / DCCT :

Like the open or closed road-side trenches, open land natural trenches have also been developed along the streams and between the play and garden grounds for controlling excess water logging, controlling rainwater run-off for soil losses, storage of rainwater for maintaining high infiltration rate. It has also been used to divert water flow towards percolation Shet-tale tanks by maintaining the contour slope. The average width and depth of these DCCT is 1.2 meters and 1.4 meters respectively. Total length of these DCCT is approximately 4.5 km on the campus.

Trench connecting Shet-Tale and controlling Over-water Logging

Trenches diverting rainwater and connecting Shet-Tale

Deepening of Last Year's Percolation Tank:

The work completed in Phase-I (Jan to Dec 2019) was the initial and experimental work carried out by the University. After analysing the work of 2019, some changes and re-construction were carried out in 2020 on the basis of first year's experiences and better understanding of rainwater flows and natural processes.

Sr. No.	Work for Deeping and Structural Changes on Earth Science Stream	Size (Length, Width, Depth in meter)	Work in Cu.Mtr	Filled capacity in liters
1	Upper Stage – Storage pit 1	18 X 12 X 2.5	540	453600
2	Upper Stage – Storage pit 2	9 X 8.5 X 2.5	191	160650
3	Middle Stage–Storage pit 3	9 X 8.5 X 2.5	191	160650
4	Middle Stage–Storage pit 4	19 X 7 X 2.5	332	279300
5	Middle Stage–Storage pit 5	25 X 25 X 3.75	2444	2000000
6	Middle-Lower Stage–Storage pit 6	20 X 11 X 3.75	825	880000
Total Soil work for Deepening the pits			4523	3934200

The work for modification and changes in previous work included structural change, increase in storage capacity and developing in-lets and out-lets as needed. The work listed below was completed from January to June 2020 and special efforts were also taken in the rainy season between July and September 2020.

This work was mainly concentrated on improving the existing facilities and structures located near Bio-diversity Park and on the Earth Science Stream.

Percolation Tanks / Shet-Tale at new sites :

In the year 2020, watershed development activities were started in January 2020 with construction of new percolation tanks and channel development for support of sustainable watersheds.

In addition to this, excavation work in all kinds of soil was carried out, including digging of the stony areas and collection of surface boulders for channel / canal development, seating of embankments, filtering of drain / catchment water and neatly pitching the excavated stuff zones. The newly constructed percolation tanks are mainly located in the northern part of the campus, between Boys' Hostel and sports grounds. The total area occupied by the work, completed in June

2020 is approximately more than 35 hectares, and includes actual tanks, trenches, back water of cement bund / bandhara, diversions, embankments, plantations, etc.

The geographical site of the work is the highest ordered stream zone on the campus, it's at northern boundary. So the area is fully used for such work including maximum sized percolation tanks connected to each other. This will facilitate dug and bore-well recharges and maximum storage of rainwater.

Stone Pitching :

Stone pitching in percolation tanks is necessary for increasing the strength of the soil-walls of the tank and controlling leakages. There fore, stone pitching are a part of watershed development activities for minimising soil erosion, particularly at the steep sloping zones and sloping zones at the sides of roads.

It can also help protect gardens and orchards of the university. So the collection of stones from whole campus and their use for stone pitching was initiated in March 2020. This work is in progress and will be completed in the next six months.

Garden and Orchard Development :

As previously mentioned, the sedimentary soil deposits were removed from the existing natural soil tanks in 2019. The removed sedimentary soil, around 1020 brass of highly fertile black soil, was used in developing gardens on the campus, particularly the ornamental garden in front of the main administrative building of the university.

Beautiful Garden Developed in front of Main Administrative Building

This garden is developed on an area of approximately one hectare. Soil activities, landscaping, levelling and boundary constriction work along with systematic plantation was carried out from January to October 2020. 100 per cent survival rate of plantation and developed surface greenery patches has been observed.

In addition, the mango orchard with about 1500 mango plants has been developed with existing and new plantation. University developed a Bio diversity park in 4 acres of land with 4000 plants in 2019 and 25000 teakwood plants through Forest department. More than 8000 plants were planted at campus schools and administrative building surroundings.

Phase III: January-December 2021 – Proposed Work

The work to be carried out in Phase – III of the Watershed and Greenery Development Campaign is planned with a scientific approach, based on the experience of the past two years, for ensuring long term sustainable development. The main focus will be on development of permanent structures for water storage, like Cement Bandhara, Kolhapur Type (KT) Weirs and stone pitching in the soil percolation tanks. Removal of siltation in previous tanks and enhancement of their water storage by deepening and expanding the water storage area is also planned. The list of proposed activities is as below:

Sr. No.	Nature / Type of Work and Site	Size (Width, Length, Height in meter)
1	Construction of Cement Bunds / Bandhara	
	1) Upper zone – Earth Science Stream	15 X 12 X 3.5
	2) Middle zone – Earth Science Stream	15 X 12 X 3
	3) Lower-Middle zone – Earth Science Stream	12 X 10 X 3
	4) Lower Play Ground Stream	15 X 12 X 3.5
2	Construction of KT Weirs	
	1) Upper zone – Pangra East Stream	40 X 12 X 3.75
	2) Middle zone – Pangra East Stream	30 X 12 X 4.5
3	Stone Pitching in Percolation Tanks	Expecting for all major percolation tanks
4	Enhancing Storage Capacity of all Suitable Percolation Tanks, developed in 2019 and 2020	About 11 tanks (approximately)
5	Enhancing Storage Capacity of Cement Bandhara, developed in 2020	2 Bunds
6	Development of Botanical Garden and Bio-diversity Park, with the applications of natural watershed recharge methods for soil and water conservation	Botanical Garden 4 hector Bio-diversity Park 10 hector

Expenditure :

The University has received support from Suryodaya Foundation, Mumbai and the Collector Nanded by providing JCB for levelling, cleaning, making water storage pits / blocks, open and closed deep CCT etc. University has incurred approx. 5.5. lakhs on fuel for JCB. Additional Rs. Rs. 4.00 lakhs (approx.) towards JCB rental charges. Rs. 10.00 lakhs for construction of cement, Kolhapuri / Cement Bandhare and other work related to water harvesting activities on campus.

Summary :

The campaign "Green and Clean University", launched by Vice-Chancellor, Dr. Udhav Bhosle in December 2018, has successfully completed two years. The campaign for the green revolution of the SRTMUN has focused on sustainable development, conservation and management of water, soil and energy and increasing the vegetation cover of the campus, all affiliated institutions and surrounding region. The campaign has generated great expectations in the hearts of its stakeholders and society at large. Through this campaign, SRTMUN has promoted and undertaken to use green concepts and ecologically sustainable methods in its functioning. This campaign has given SRTMUN the opportunity to engage all stakeholders of society in working towards the ideal of sustainable development and a Clean and Green India. The huge and healthy public participation of the stakeholders in University's activities has contributed greatly to the success of this campaign over the past two years and will be the key to its future success. Through this campaign, the University made the campus into an innovative and pioneering live laboratory which can serve as a model for other institutions of the region. Here are some highlights and achievements of this "Green and Clean University", SRTMUN:

- The university is annually harvesting more the 8 crore litres of rainwater.
- There are fully recharged 6 dug-wells and 13 bore-wells.
- The University is a Tanker-Free Campus. It is self-sustaining in terms of supply of water to all laboratories, hostels, residential and administrative buildings for their domestic purposes, etc.
- Development of the capacity to maintain greenery by watering in all seasons. Area surrounding the campus is also benefited by strengthening of the ground water level.
- Greenery has been fully developed with geo-environmentally suitable plants.
- A number of study groups and researchers are visiting the campus in order to understand the successful implementation of the watershed program.
- Regional and village level authorities and activists are motivated by the Water Harvesting Campaign of the University to carry out similar activities.

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(MAHARASHTRA)

Significant Efforts of:

- **Dr. Avinash Kadam**
  Associate Professor
- **Mr. Tanaji Hussekar**
  I/c Executive Engineer
- **Mr. Ramdas Pedewad**
  Assistant Registrar

Report Prepared by :
Dr. Avinash Kadam
Associate Professor

Report Published by :
Dr. Sarjerao Shinde
Registrar