स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(MAHARASHTRA)

Report on

University Rainwater Harvesting Structure

Under the

Green & Clean University Campaign

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

September 2023

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VISION & MISSION

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".

About SRTM University

Swami Ramanand Teerth Marathwada University, Nanded was establishedon September 17, 1994 by the Government of Maharashtra. It is situated in the eastern part of Marathwada region in Maharashtra. Nanded, Latur, Parbhani and Hingoli are the four districts which come under the jurisdiction of SRTM University. There are 14 Schools on the main campus in Nanded which is spread over 550 acres of land. SRTMUN has its sub-centre in Latur as well that consists of 4 Schools. There is also a sub-campus at Parbhani and a New Model Degree College at Hingoli. Apart from this, there are a few academic and research centres on the main campus like Dr. Babasaheb Ambedkar Chair and Study Centre, Shri Guru Govind Singhji Adhyasan Sankul and Research Centre and Women's Study Centre. Moreover, it also has "Late Uttamrao Rathod Tribal Development and Research Centre" which is situated at Kinwat, district Nanded. As mentioned earlier, four districts of Marathwada region come under the jurisdiction of the university and some 370 colleges spread over these districts are affiliated to SRTMUN. The university offers a number of programs in the faculty of science and technology, humanities, commerce and management and interdisciplinary studies. The International Students Centre was established in 2009 with an aim to address the needs and issues related to foreign students enrolled to various programs on the campus as well as in affiliated colleges. The university has received financial assistance from RUSA, DST, UGC, etc for the development of infrastructure, academics, research and extension activities on the campus. The university is reaccredited with grade "B++" by NAAC, Bengaluru.

Teachers of SRTMUN have invented, patented and commercialized many ideas and have undertaken a number of research projects which have turned out to be extremely valuable and remarkable both at the academic and social level. At the same time, teachers, students and research scholars have got many publications in reputed peer reviewed journals and received recognition at the national and international level. The university also has a Centre of

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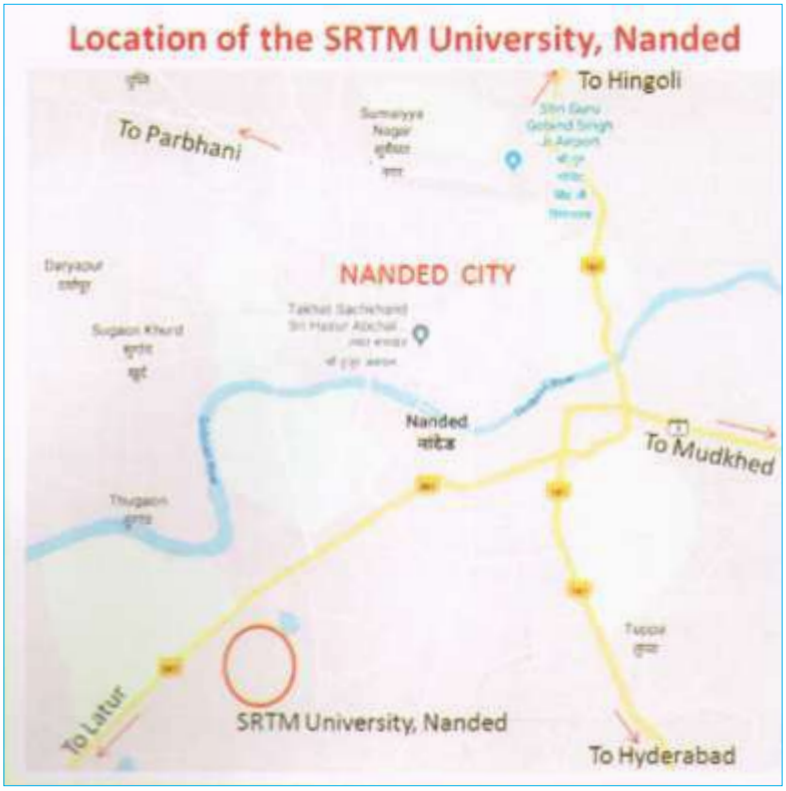
Excellence in Seismology, advanced research instrumentation facilities, collaboration with Inter- University Centre for Astronomy and Astrophysics and MoUs with national and international institutions. SRTMUN also practises credit transfer policy and reimburses fees to the successful students who opt for the courses offered on NPTEL, SWAYAM, and other MOOC platforms. The university has been adjudged as an 'Active Local Chapter' by NPTEL, IIT Madras. It has signed a MoU with the Virtual Labs project, an initiative of MHRD, NMEICT, IIT Delhi and IIT Bombay.
This will allow a paradigm shift in the ICT-based education.

SRTMUN carries out Academic and Administrative Audit (AAA) on a regular basis. It also conducts energy, green and gender audits regularly. With the mission of drought-free Marathwada, the university started the "Soil, Water and Biodiversity Conservation Project" and created facility to store about 10 crores litres of water on the campus. Under the "Green and Clean University Campaign" it has inaugurated a 33-crore tree plantation program and a Bio-diversity Park aswell. It has also installed a 287 KW capacity roof top solar power plant which caters to 40% of the electricity requirement of the campus.



Necessity to initiate a "Green and Clean University Campaign"

Today the entire world is facing unprecedented environment related challenges such as climate change, global warming, pollution, biodiversity crisis, water and waste mismanagement etc. Hence, under such circumstances, initiatives like "Green and Clean University Campaign" can contribute significantly in order to face such grave challenges which have turned out to be a serious threat to the entire mankind. Therefore, it's high time to consider and adopt the concept of sustainable development in every sphere of life. In this context, academic institutions too can play a significant role in order to preserve and restore ecosystems. A "Green and Clean Campus" can be an experimental model for sustainability that can provide a healthy environment for learners as well as researchers. It offers an opportunity to redefine its environmental concern and develop new paradigms by creating sustainable solutions to environmental and social needs of the people.

As we know that the majority of Indian population depends upon agriculture and water resource management plays an invaluable role. In fact, it has a very long and rich tradition in our country which is underlined by the fact that Indian rivers and water bodies have been often cited in our religious, popular and mythological narratives. There are also several instances of activists and social workers who have devoted their entire lives for the cause of water conservation and watershed management. Hence, it's indispensable that we take certain measures in order to conserve rain water and subsequently contribute in promoting greenery and cleanliness at the university level as well. The university needs to play a pivotal role in soil, water and forest conservation.

SRTM University is basically located in the Marathwada region of Maharashtra state and it has been facing the problems like a drought prone area for several years. Initially the campus and surrounding region was bare, open undulating with hillocks which used to have

extreme scarcity of water particularly during summer. It mainly consisted of scrub jungles all around. Usually, the climate here is extremely hot and dry and the maximum temperature even touches 45 degrees Celsius during summer. In addition to this, there is so much of scarcity of water in this entire region and the annual average rainfall is about 925 mm. Hence, water tankers from outside sources were often used in order to fulfil the needs of the campus. More or less, this dire situation prevailed till the year 2019. Among other notable factors, one may highlight the depth of bore-wells that has been quite alarming. According to the "Ground Water Survey Department", constantly increasing ground water depth has turned out to be a matter of grave concern for the entire region. It resulted into deforestation and shortage of water on the campus as well. Unawareness related to water conservation, soil erosion and soil loss have been a major concern for the people residing in this part of the world.

SRTMUN Campus too has been severely affected by the above mentioned factors and has gradually undergone the same degradation particularly in the past 2 decades. Its geographical condition and location, increasing natural changes, irregularities in meteorological factors, increased pressure on natural resources, overall high water demand, negligence in water conservation work and lack of awareness are some of the main reasons that have contributed in the depletion of groundwater and loss of biodiversity. All this has led to a remarkable change in the land use and land cover (LULC) of the campus.

The given image-map (September 2018), shows the land use cover of the campus. As reflected in the image, there was neither tree nor grass cover in most of the areas, which is considered to be one of the important components for maintaining the campus ecosystem. The image also shows that there were unnecessary and harmful thorny bushes (Acacias) and other such vegetation cover in the sloppy and low-lying areas. The density of plant life was just negligible in the downstream and highlands. Many trees were partially or permanently damaged. The green belt was not available in the university premises. 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 just a few wells and bore-wells. Even half of them were not in use due to the lack of material and depletion of ground water.

Taking into account the above mentioned scenario which was a matter of grave concern for the entire ecosystem of the campus, the Hon'ble Vice- Chancellor of SRTM University, Dr. Udhav Bhosle took note of the deteriorating water situation and decided to launch the "Green and Clean University Campaign" in December 2018 for a sustainable development of the SRTMUN campus. The said initiative was particularly aimed at rainwater harvesting, providing water supply facility, increasing tree cover, maintenance of greenery and cleanliness on the campus. A core committee was formed which was given the responsibility to design and implement a long-term scientific plan. The purpose of this plan was 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 to maintain a plastic free environment in the institution. It was meant to develop a role model for teachers, students and researchers that could be replicated in institutions across the entire region. It was planned that the entire area of the university campus would be under plant cover in the following two years, which would be watered through its own harvested rainwater reservoirs and allied systems.

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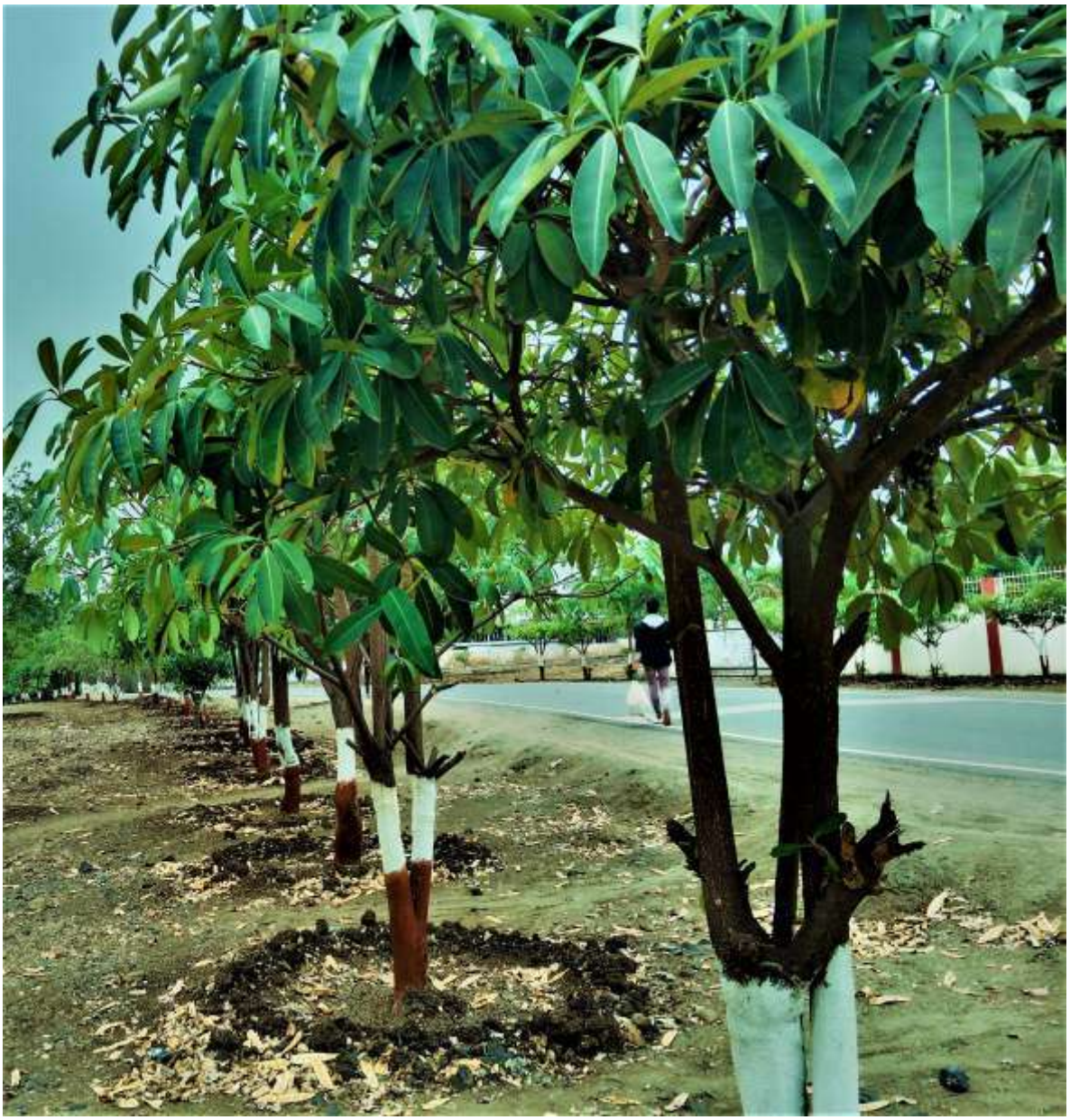
Green Audit Report

Green Audit Report was prepared by the committee constituted by IQAC under the dynamic leadership of the Hon'ble Vice-Chancellor of SRTMUN, Dr. Udhav Bhosle. The committee inspected the actual total built-up zones, geo-hydrological aspects and flora and fauna from the open lands on campus. A series of discussions were held with students, staff members, authorities and experts in order to identify the major green and clean lacunas across the campus. Based on the feedback from all stakeholders, the committee came up with invaluable suggestions and recommendations to undertake environmental auditing/practices in order to improve the quality of ambiance on the campus.

The purpose of the green audit is to introduce the green policy on the SRTMUN campus. The methodology used to carry out this audit includes physical inspection of the campus, observation, review of the documentation and interviews/talks with key persons. The committee presented a detailed report and data related to various parameters with regards to "Green and Clean University Campaign". To mention a few are as under:

- Air quality and water sources measurement.
- Water, Waste and Energy management.
- Landscape / Green cover on the campus.
- Habit: Tree, Shrubby, Herbaceous and Climber species.
- Selected species for plantation on the campus.



Important Recommendations of the Committee are as under

- Environmental (air) auditing may be conducted by the university after every two years. Activities like plantation of trees and herbal plants should be carried out on a regular basis.
- To uplift the underground water level by proper water harvesting techniques including percolation tanks at various places on campus.
- To prevent the wastage of huge amount of water through leaky taps across the campus, it is recommended to replace leaky taps after a regular inspection.
- Restoration program for green campus needs to be implemented by planting indigenous trees, herbal plants etc. All schools should develop gardens in front of the building and tree plantation activity should be carried out frequently.
- The campus currently does not have any proper waste management system. Hence, specific waste dumping ground/place must be identified and developed accordingly. It must have specific areas for specific wastes such as chemical bottles (glass or plastic), metal waste, wooden waste, electronic waste etc. The dumped material can be reused (if in good condition) or discarded after regular inspections.
- Specific chemical wastage disposal plan is required to dispose outdated or expired chemicals/drugs across few schools on the campus.
- A special bio-gas plant must be initiated on the campus for food/organic/bio waste coming from hostels, staff quarters, guest houses etc.
- A high temperature oven is required for burning the waste generated during animal and other such experiments.
- A huge amount of paper is used on the campus for various academic, research, administrative and examination related purpose. Instead of burning the papers, a separate section on the campus must be developed which will be given the responsibility to collect and

cut them into small pieces using shredder machine. This shredded paper can be supplied to the paper making companies as a raw or recyclable material. Moreover, a paper

- recycling plant must be installed and initiated on the campus so that the shredded waste paper may be reutilized to produce certain stationaries like files, card boards, packing materials etc. which can be used for various office purposes.
- For efficient utilization and environment protection, one side blank paper can be reused for daily paper work among various sections.
- Motion sensor based automatic ON/OFF switching system may be used in order to reduce the wastage of electricity on the campus.
- Proper use of natural sun light in the buildings must be increased. Solar panels must be installed on the top of buildings to generate electricity.
- Use of public or shared transport should be adopted as an ideal practice for a "Green and Clean Environment". Moreover, a solar driven auto rickshaw/van can be efficiently used on the campus.
- Addition and implementation of the green agenda in the syllabi of all campus schools.

Green Audit Report further recommended that social workers, parents, senior citizens, farmers etc. from the vicinity of the university must be encouraged to contribute in this noble mission through "Active Public Participation". The University should also develop a "Green Club" in order to keep the campus "Clean and Green". The said club should consist of students, research scholars, teachers, administrative officers, experts and common masses. The committee also noted that volunteers from National Service Scheme (NSS) have been actively engaged for the maintenance of cleanliness and greenery on the campus.

Implementation of Green Cover of SRTM University

Dr. Udhav Bhosle, Hon'ble Vice-Chancellor of the University, immediately after taking charge as the Vice-Chancellor of the University 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 should be the strength of this campaign,
- the campaign should be completed in 3 years (3 phases) and
- should provide a scientific model to the region and researchers.

Accordingly, the Green and Clean University Campaign was designed with multi-dimensional foci for achieving long-term multi-faceted benefits. This blue and green revolution envisaged refreshing all the existing water sources, refilling and refining the necessary facilities and by developing all suitable sites for rainwater harvesting on the campus. The work of watershed development and management was based on sustainable geo-scientific approaches.

The Green and Clean University Campaign, divided into 3 phases spread over 3 years, was flagged off with the creation of a Researchers - Teachers 'Study Group' and an Administrative Staff 'Action Group' in December 2018 and based on recommendations from the Green Audit Committee Report held in January 2019.

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Phase I: January-December 2019

The actual ground work 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 were 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 were 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 district, charitable trusts like Suryodaya Foundation, Mumbai and Social Group, Nanded and other local groups, along with many activists and researchers participated in the campaign.

The university took efforts to involve various stakeholders of local society in the conservation process through this campaign. In order to increase community awareness and participation, the university organised a number of activities and also participated in governmental and social programmes related to watershed and gram development. In January 2019, the actual work of watershed development was started, with 'Bhumi-Poojan' at the auspicious hands of the Vice-Chancellor and team. The work carried out in Phase I-2019 is as follows:

1. Preliminary work of watershed development

The first stage of Phase I began with removal of unnecessary bushes, vegetation. Ground levelling work was carried out to facilitate smooth and planned soil use. For this, tractors with hydraulic ploughs were hired for systematic and proper work in January-February 2019. The details of this work are tabulated below.

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

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. The aim was to carry out appropriate type of plantation in large areas in order to increase good quality vegetation cover, maintain soil ecosystem and minimize soil loss by controlling runoff.

2. Removal of Sedimentary/ Sludge Deposits from existing tanks

At the time of launch of this campaign, the campus had two percolation tanks. These medium and small sized tanks were located on the campus in the eastern catchment area and western catchment area respectively. It was observed that before December 2018, both percolation tanks could not be very efficiently used due to sedimentation of more than 50%. From January to March 2019, process of removing sedimentary / sludge deposition from these tanks was carried out. The removed sedimentary/ black soil, which is highly fertile, was used for garden development.

Removal of Sludge from Existing Tanks

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

In this way, a very large amount of fertile black soil was stored and utilized in the planned gardens on the campus. Every effort was been made to reap the maximum benefit for the campus from this work.

3. Contour Bunding and Closed Small Sized Trenches

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

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4. Percolation Box Pits

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

5. Open Percolation Trenches

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

6. Rooftop Rainwater Harvesting to Percolation Pits

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, cement-concrete play grounds etc., there was 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. Given the situation of the campus, 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 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 Shet- Tale / percolation tank of the building.

7. Percolation Tanks / Shet-Tale

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.

8. Work for Infiltration, Soil Conservation and Plantation

It was necessary to increase the infiltration rate with suitable geographical methods, which in turn would enhance the overall development and sustainability of the watershed project. Improvement in vegetation cover with specific plantations was needed to strengthen the soil and plant ecosystem. Therefore, such types of activities were part of the work of watershed development on campus.

About 17500 pits for plantation were prepared 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: A Movement', the plantation work on campus was initiated. In the monsoon season of the same year, the entire planned plantations were completed with the help of Social Forestry and Forestry Nanded Division, other social groups, university staff and students. Plantation between June and September 2019 included Teak plantation (12000 trees), Bio-diversity Park plantation (3200 trees) and Roadside and Building surrounding plantation (2300 trees).

9. Activities for Social Awareness, Participation and Orientation in 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 and good practices among its students and other direct and indirect beneficiaries. In this regard, the following activities were organised for encouraging the involvement of various stake holders. In the light of the Government of

India's, 'Swachh Bharat Abhiyan' this 'Green and Clean University Campaign' also focused on complete cleanliness. Campuses, all affiliated educational complexes, colleges and institutions were motivated to work to maintain cleanliness along with proper water conservation and greenery development. In order to achieve this, institutions were guided to make concerted efforts. A "Mahashramadan Shibir" was organized on February 15, 2019 for cleaning the environs of the university and adjoining locality. 2200 teachers and students from 16 colleges of Nanded participated in this programme. Initiatives such as awareness rally and by university staff and students and joint action with local charitable organisations were carried out to spread awareness about rainwater conservation, cleanliness and the university's Green and Clean University Campaign in 2019.

The below bird-eye-view photograph shows two medium-big sized percolation tanks / Shet-Tale and prepared land for plantation. Two Tanks located between School of Earth Sciences and School of Mathematical Sciences 'Green and Clean University Campaign' also focused on complete cleanliness. Campuses, all affiliated educational complexes, colleges and institutions were motivated to work to maintain cleanliness along with proper water conservation and greenery development. In order to achieve this, institutions were guided to make concerted efforts. A "Mahashramadan Shibir" was organized on February 15, 2019 for

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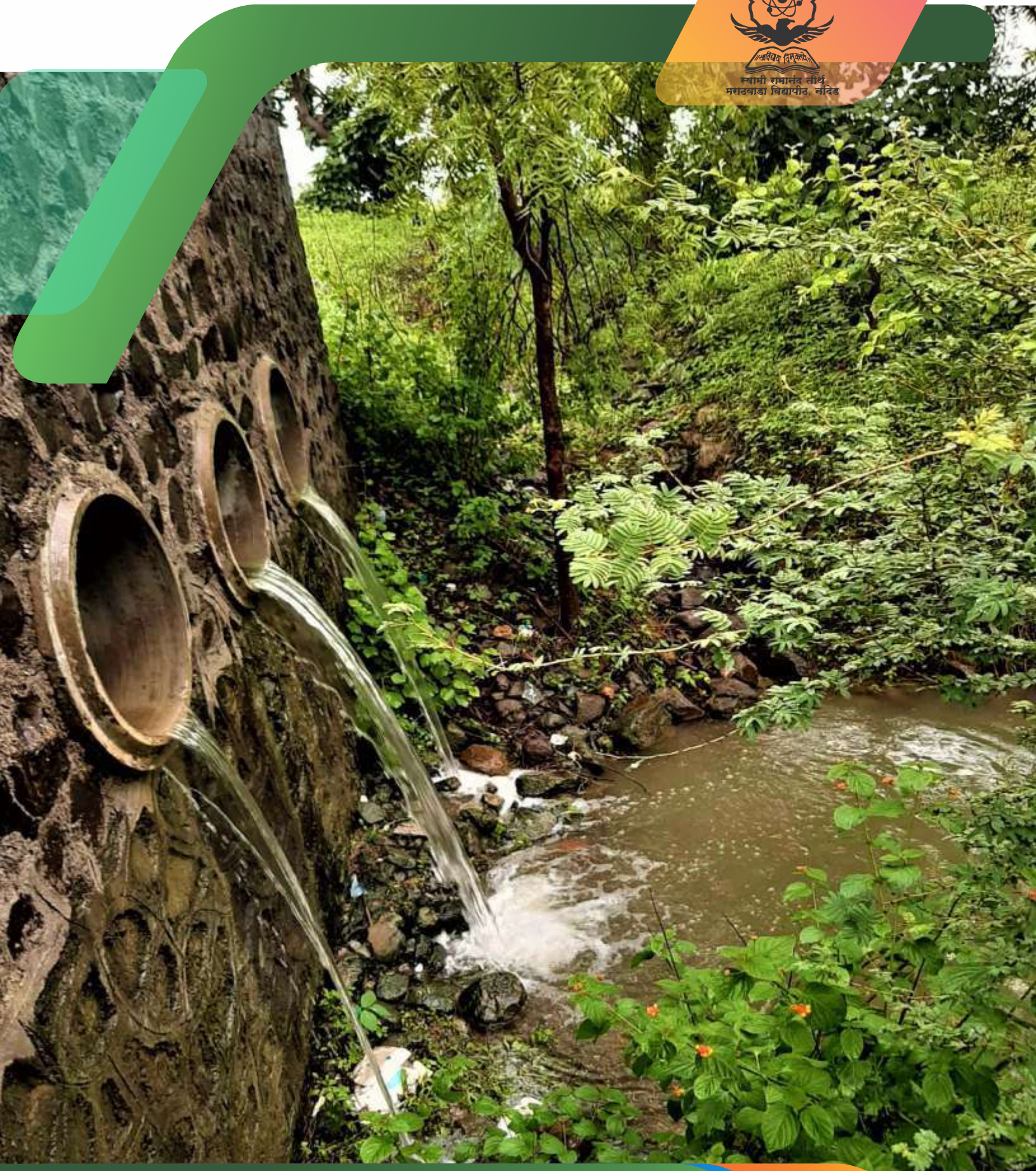
Summary of Work for Watershed Management: Jan. to Dec. 2019

Site A	Series of Water storage pits/ blocks on the Earth Science Stream
Site B	Series of 5 Water storage pits/ blocks on the Western-Pangrastream
Site C	6 Water storage pits/ blocks, 3 Open and 1 Closed Deep CCT at Western Foothill Zone
Site D	5 Water storage pits/ blocks and 1 DCCT in Northern Foothill - Sloppy Zone
Site E	Series of 4 storage pits/blocks on Bio-Diversity Park Stream
Site F	18 Open Deep CCT /pits in Northern Foothill Zone
Sites G1 and G2	8 Percolation Tank / Shet-Tale at sites G1 and G2 4 Natural Open Rainwater Harvesting Pits at site G1

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

Phase II: January - December 2020

Even though the COVID -19 pandemic has severely impacted regular activities in 2020, watershed development work was carried out with full enthusiasm. It included strengthening, widening-deepening and construction of long-life storages along with development of new artificial water recharges. The main work carried out in Phase II-2020 is as follows:



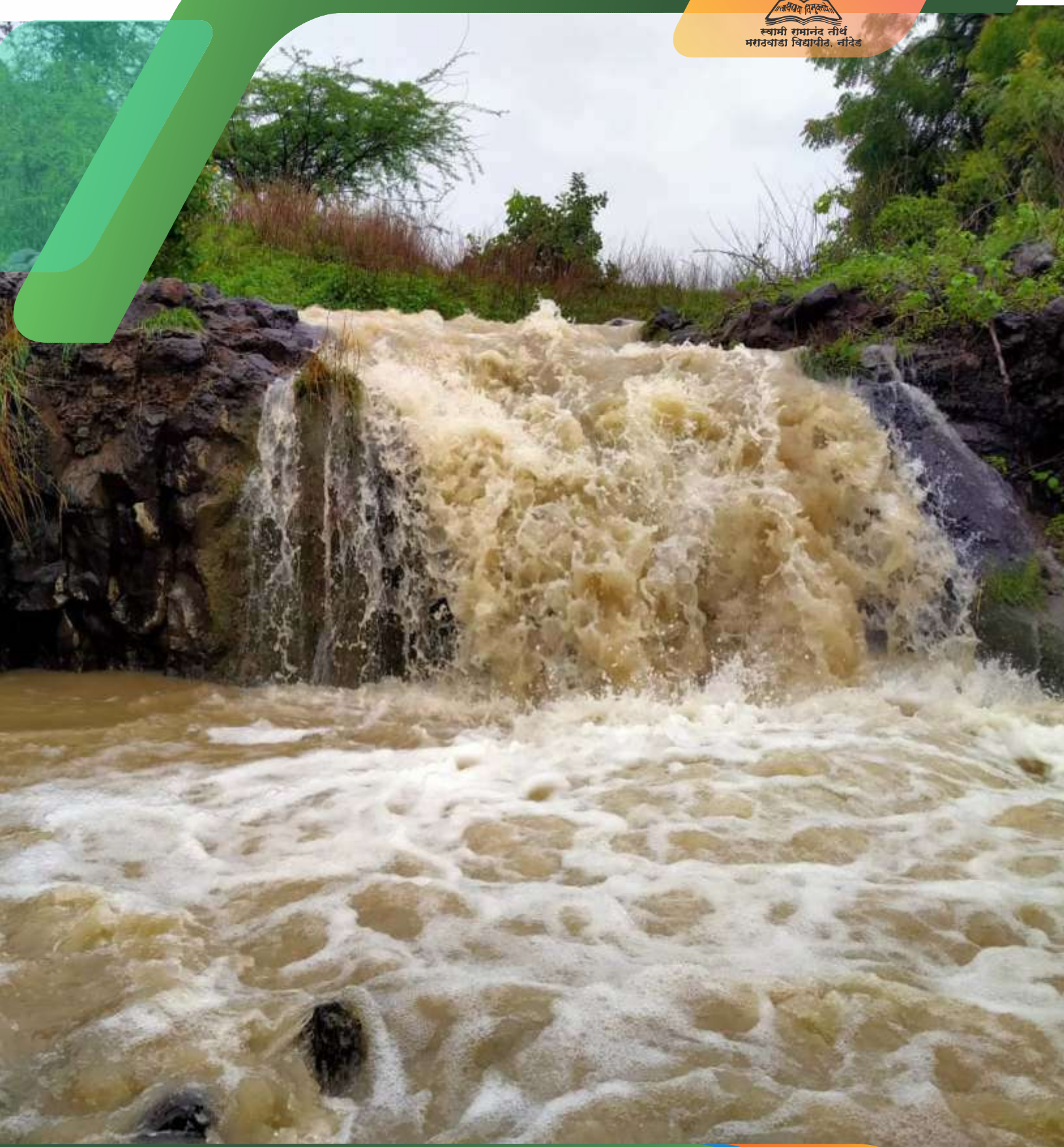
1.Cement Bunds / Bandhara

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 was constructed on Earth Science Stream near the southern corner of the Bio-diversity Park. Cement Bandhara – 2 was constructed on Boys' Hostel Stream, in front of the Sports grounds.

2.Dug-Wells and Bore-Wells

There were existing 6 dug-wells and 13 bore-wells on the University campus. Because of lack of recharge methods and under-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 to these wells was initiated in January 2020.All the dug-wells were reconstructed with brick-stone walls, RCC walls and recharge methods with closed-ring trenched and jacket boxes was used. At the same time, all bore-wells in a state of collapse underwent 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 now fully recharged and in use. The water level of all dug-wells has increased on an average from 9 meters to less than 1 meter.



3.Road-side trenches

The open and closed trenches are important to watershed development work as they help to control rainwater run-off, increase infiltration rate, 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. As 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, provisions were made for the same.

The open road-side trenches were been developed mainly for controlling rainwater runoff and increasing infiltration rate. So, it was ensured that the trenches were beaked as per the contour level and nature of the surface structure. These road-side trenches were built mainly on the middle top of the campus, which is located around the Central Knowledge Library building.

Trenches were built along both sides of the following routes: the routes radiating from the Central Library to School of Chemical Sciences, School of Social Sciences, School of Educational Sciences and the Central Instrumentation Centre (CIC) building and from the CIC building to the School of Fine and Performing Arts.

4. Trenches / DCCT

Like the open or closed road-side trenches, open land natural trenches were also been developed along the streams and between the Sports grounds and garden grounds for controlling excess water logging, controlling rainwater run-off for soil losses, storage of rainwater for maintaining high infiltration rate and 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.

5.Deepening of Last Year's Percolation Tanks

The work completed in PhaseI-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 to the storage pits1 to 6 in the Upper, Middle and Middle-Lower Stages of the campus. The work for modification and changes in previous work also included structural change, increase in storage capacity and developing in-lets and out-lets as needed. This work was completed from January to June 2020and between July and September 2020, work for improving the existing facilities and structures located near Bio-diversity Park and on the Earth Science Stream was carried out.

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6. Percolation tanks / Shet-Tale at new sites

From January 2020, construction of new percolation tanks and channel development for support of sustainable watersheds, excavation work in all kinds of soil, 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 was also carried out. These 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 was the highest ordered stream zone on the campus, located at northern boundary. Therefore, this area was fully used for such work including maximum sized percolation tanks connected to each other in order to facilitate dug and bore-well recharges and maximum storage of rainwater.

7. Stone Pitching

Stone pitching in percolation tanks is necessary for increasing the strength of the soil-walls of the tank and controlling leakages. Therefore, using stones collected from the whole campus, stone pitching was done for minimising soil erosion, particularly at the steep sloping zones and sloping zones at the sides of roads. This also helps protect the gardens and orchards of the university.

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8. Garden and Orchard Development

The sedimentary soil deposits removed from the existing natural soil tanks in 2019 and stored for future use was used in developing gardens on the campus in 2020, particularly the ornamental garden of about one hectare in front of the main administrative building of the university. 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 was developed with existing and new plantation.

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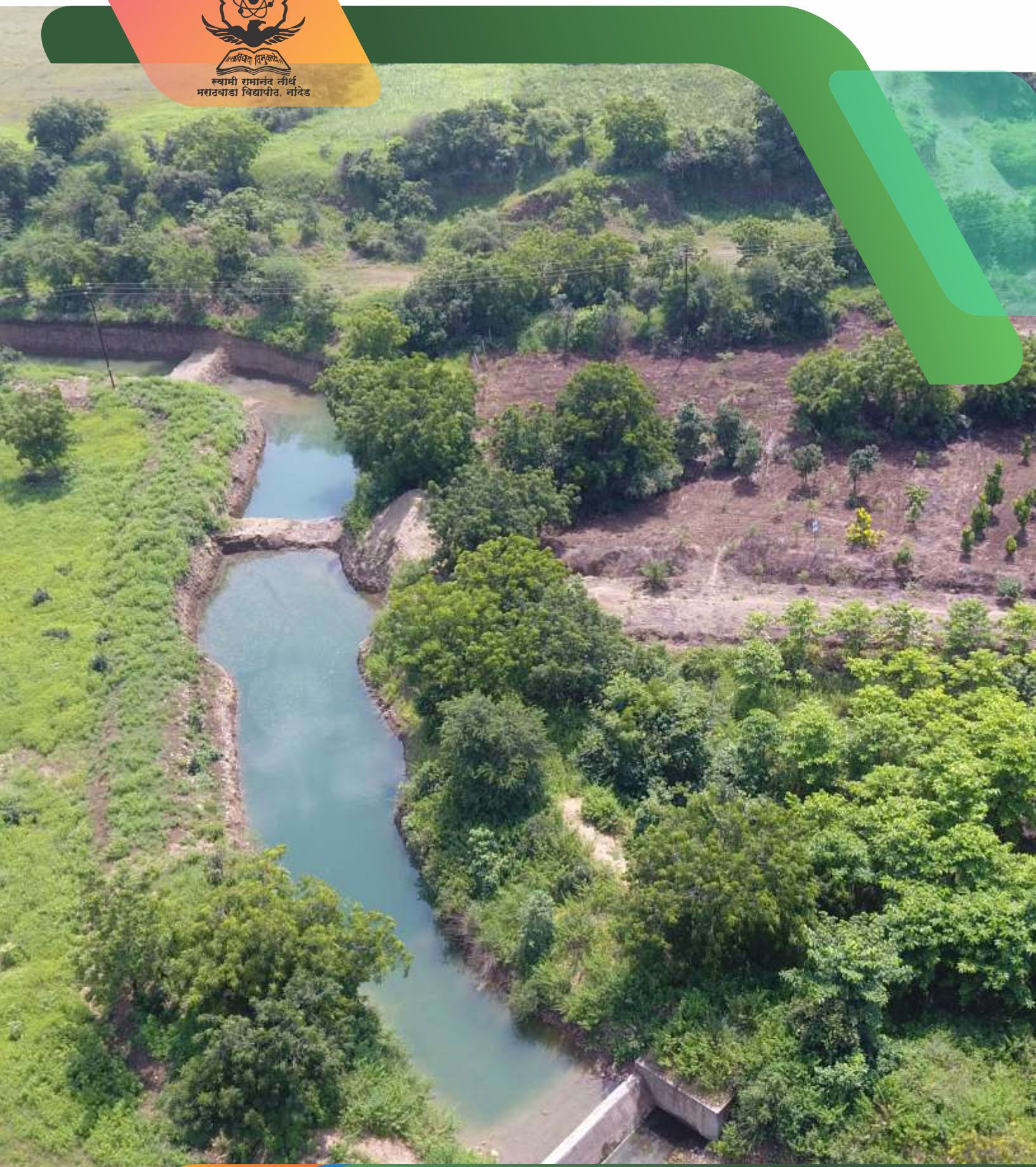

Phase III: January-December 2021

The work to be carried out in Phase III – 2021 for Watershed and Greenery Development also followed a scientific approach, based on the experience of the past two years, in order to ensure long term sustainable development. The main focus was on development of permanent structures for water storage, like Cement Bandhara, Kolhapur Type (KT) Weirs and stone pitching in the soil percolation tanks. The main work carried out in Phase II –2021 is as below:

1.Construction of Cement Bunds/ Bhandara

Two more sites for construction of Cement Bhandara Weirs were identified and construction of Bhandaras 3 and 4 was carried out in 2021. Bhandhara -3 was built in the southern part of the campus on the first order stream behind the Shri Guru Gobind Singhji Adhyasan Sankul and Research Centre (SGGSASandRC).Inorder to protect the widened stream from siltation debris flow and soil-based side collapse, teak plantation in catchment area was done along with maintenance of surface grass and local varieties of vines on the banks of the stream. Bhandara -4 was constructed on the Earth Science Stream at its middle stage. Due to the slope and the rock structure of the stream bed, it was ideal to construct a series of ponds in the upper part of

this Bhandara, and thus, Bhandhara -4 was divided in to three parts with natural bunds. This helped in minimizing the flow of sediments, reducing siltation to negligible amount and dividing the load of the storage, thus enhancing the durability and sustainability of Bhandara-4.

Enhancement of work of previous phases

Stone pitching for all major percolation tanks was continued in 2021.Removal of siltation in previously constructed tanks and the work of enhancing of the water storage capacity of tanks developed in Phases I and II by deepening and expanding the water storage areawas also carried out in 2021. Work was also carried out to increase the storage capacity of Cement Bhandara developed in 2020.The work of development of Botanical Garden and Bio-diversity Park, with the applications of natural watershed recharge methods for soil and water conservation was continued in 2021.

Impact of "Green and Clean University Campaign"

The "Green and Clean University Campaign" made a huge impact at various levels, be it environmental, social, cultural or religious. It contributed in enhancing the academic and research activities on the campus. There was a drastic improvement with regards to water facility on the campus. Earlier, there were only 2 water bodies which were silted and used to remain completely dry particularly during summer. An NGO named, Suryodaya Foundation, Mumbai also came out to offer help for this noble cause and with their support both silted water bodies were cleaned and the mud derbies were also removed. The extracted mud was converted into fertile soil and later on gardens were developed opposite to the administrative building of the university. This fertile mud was extensively used to cultivate various types of native trees on the campus. As a result of all these efforts, the amount of water storage in both the water bodies constantly kept on improving. It is important to highlight the fact that in the subsequent years, none of the water bodies ever dried up even during the summer period. It also played a significant role in increasing the water level of open wells and bore-wells on the campus.

The impact has been quite evident at various levels. Earlier, it was almost impossible for the students to stay on the campus during summer because of extreme scarcity of water. Hence, the students were unable to stay in the hostels during summer season and it used to affect their studies to quite some extent. But initiatives taken under this campaign fulfilled the water requirements on the campus during summer as well. As a result, students were not forced to leave the hostels during this period. This entire changed scenario actually enhanced the academic and research ambience on the campus. The university was also benefitted at financial level because of this initiative. Earlier, the university used to spend lakhs of rupees every year in order to hire water tankers from outside. This initiative actually brought a permanent solution to this problem and helped to strengthen the university financially by saving a lot of money which was earlier spent to fulfil the water needs on the campus. A number of artificial water tanks have been developed over the past couple of years where a large amount of water is always preserved to fulfil the needs of the campus as required from time to time.

Now the SRTMUN campus has become self-dependent as far as the water management is concerned. Since 2020, the campus has never faced any scarcity of water. Thus, massive tree plantation has also become possible because of the increased water availability. In the process, it has immensely improved the green cover and plantation of trees on the campus. A garden was developed opposite to the administrative building of the university covering around one hectare of land consisting of various types of mixed tree plantation like Bahava, Neem, Jamun, Umbar, Peepal, Neelmohar, Gulmohar, Sonmohar etc. Also, it consists of a large number of ornamental shrubs such as Ixora, Euphorbias, Hibiscus, Dusanta, Bougan villias etc. In addition to this, various types of trees were planted along road side on the campus. In Botanical garden, the plantation was carried out on four hectare land with Karanj, Sitaphal, Ramphal, Jamun, Awala, Arjun, Hirda, Behada, Tamhan etc. With an active participation of the forest department, some 25000 saplings of Sag were planted on the campus. 75% of them survived and their appropriate care was taken in the subsequent years.

Keeping in mind the social, medicinal and religious benefits, the Biodiversity Park was

developed with a great amount of support and sponsorship by the forest department. Dense forest development concept (Miyawalei) was developed in the Biodiversity Park. As a result, massive plantation of Vad, Peepal and Kadamb was done on a large scale. All this has led to the development of an excellent forest cover in the area. In order to increase the green cover on the campus, the concept of mixed plantation was implemented. Thus, different species of fruit yielding, shade giving, evergreen and ornamental trees were planted such as Tamarind, Peru, Karanj, Mango, Anjir, Mosambi, Santra, Dalimb, Sagwan, Bakul, Chapha, Coconut, Bamboo etc.

Mainly in the Biodiversity Park, a large number of trees having religious importance have been planted like Vad, Peepal and Umbar. These species are regularly used for Hindu religious purposes. Such plants also release a great amount of oxygen and thus help in keeping the environment fresh. Because of an extensive tree plantation drive of various species, the average temperature recorded on the campus is usually 5 degrees Celsius less than the region located outside the campus. Many plants grown on the campus are of great medicinal importance as well. Some of them like Jamun and Arjun (antidiabetic), Awala (Vitamin C), Indian noni, Hirda, Behada, Arantmul, Ailanthus, Kadamb can be easily found on the campus that carry a significant medicinal value. Many ornamental trees like Neelmohar, Gulmohar, Sonmohar, Temple tree (Shapha) and ornamental shrubs like Hibiscus, Bogninvillia, Kanchan have also been developed which add an aesthetic value to the campus.

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मराठवाडा विद्यापीठ, नांदेड

Major Achievements of "Green and Clean University Campaign"

- Storage of more than 12 crore litres of rain water.
- Controlled more than 75% of surface rainwater runoff.
- Improvement in Infiltration Rate and groundwater level.
- Minimized and controlled evaporation and soil losses.
- Improved soil moisture and permanent biomass.
- A tanker-free SRTMUN campus.
- Watering of more than 30000 new plants.
- Developed 2 hectares of Lush Garden for beautification of the campus.
- Recharged dug-bore wells.

As we are aware that promoting environmental education and research in Higher Educational Institutions is one of the key recommendations of the National Education Policy (NEP-2020). According to it, environmental awareness has to be an integral part of the curriculum. In 2020, the University Grants Commission (UGC) proposed a sustainable campus framework and emphasised the need of a green and sustainable campus environment for Higher Education Institutions. Thus, in line with the NEP-2020 suggestions, the model adopted and implemented by SRTMUN has set an example for many other institutions. This model can be replicated in other universities as well which have been facing the shortage of water resources like in Solapur. In this context, the initiatives taken by SRTMUN over the past few years have been highly commendable which will constantly keep on contributing and improving in order to strengthen the idea and mission of a "Green and Clean University".

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Report on University Rainwater Harvesting Structure