

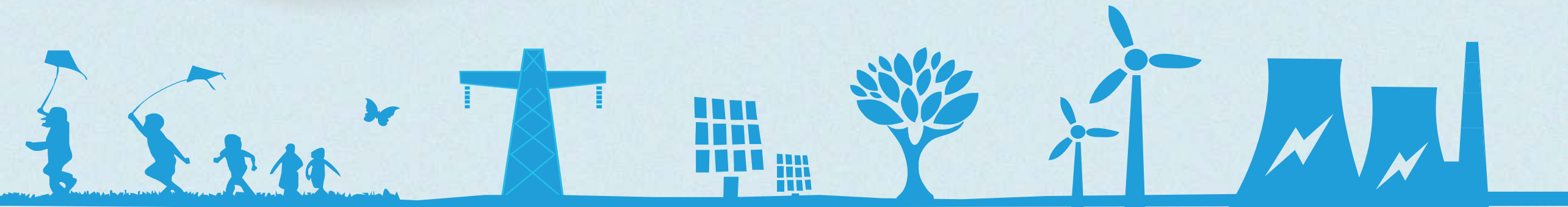
Powering India through  
More Power per Drop



# NTPC Water Conservation Compendium

22<sup>nd</sup> March 2023

Compiled by  
Corporate Environment Management Group



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## MESSAGE FROM CMD

Rapid economic growth and climate change are triggering enormous water availability challenges across the world. Traditionally water has been undervalued for quite some time and investments in water efficiency and conservation has not historically scaled with economic growth. The looming water crisis has led to water becoming another important commodity.

We are at a critical juncture that calls for the restructuring of business-as-usual approaches and switching to sustainable practices. As a responsible corporate, we are taking all the possible steps including process innovations and design optimizations for reducing our water footprint. With concentrated efforts, we could bring down the specific water consumption by 5 % (y-o-y).

The recently commissioned North Karanpura Thermal Power Station with Air Cooled Condenser is a testimony to the company's efforts towards the reduction of fresh water consumption.

The 2<sup>nd</sup> edition of "NTPC Water Compendium" reinforces our commitment towards improving water sustainability by highlighting best practices and initiatives.

I am sure that our stakeholders will find this publication valuable, and it will enhance their trust.

**Gurdeep Singh**  
Chairman & Managing Director



## MESSAGE FROM DIRECTOR (OPERATIONS)

Water is a precious resource that sustains our existence, however out of the total water available on earth only around 2.75% is fresh water suitable for human use. As the global population continues to grow, the demand for fresh water resources will increase, leading to severe water shortages around the world. In 2015, the world committed to SDG 6, which promises safe water and sanitation for all by 2030. This year's World Water Day theme is "Accelerating Change," emphasizing the need for urgent action to address fresh water availability and shrinking natural resource.

NTPC is signatory of the "CEO water Mandate" and is taking conscious efforts to minimize fresh water uses. NTPC stations are reducing its fresh water foot print by using Water efficient technologies such as Air-Cooled condenser, Dry bottom ash disposal, Higher Cycles of Concentration (COC) for CT, High concentration ash slurry disposal (HCSD), use of treated sewage water, real time monitoring of water consumption, better O&M practices, reducing water evaporation through installation of floating solar PV plants.

NTPC is implementing Zero Liquid Discharge and rainwater harvesting at all its stations to reduce fresh water needs from natural resources. We are also working towards making our townships water positive.

It gives me immense pleasure that our Environment team at Corporate Centre in collaboration with all our stations has brought 2<sup>nd</sup> edition of the "NTPC Water Conservation Compendium" which documents our water conservation practices. Sharing of our best water conservation practices will motivate all our internal and external stakeholders to improve their planning and implementation processes for saving this precious natural resource.

**Ramesh Babu V**  
Director (Operations)



## MESSAGE FROM RED (WR II) & ED(OS)

As we celebrate World Water Day, it is imperative that we recognize the importance of water conservation and take necessary steps to conserve it for future generations.

NTPC has been at the forefront of this cause, and I am delighted to introduce the 2<sup>nd</sup> edition of the “NTPC water conservation compendium” compiled by the Environment team at the Corporate Centre. This compendium is a testament to NTPC's commitment to sustainable development and highlights the various initiatives taken by the company to conserve water.

NTPC has adopted several innovative measures, such as installing air-cooled condensers, using dry bottom ash disposal systems, running at higher COC, and using real-time water dashboards for monitoring water consumption. These efforts have led to a decreasing trend in specific water consumption, and the company is exploring further improvements through better O&M practices.

This compendium is a valuable resource for all stakeholders interested in water conservation, and it highlights the best practices that can be adopted to conserve water. Efforts of Environment team at CC for compiling this compendium are commendable.

Let us conserve water and make it a part of our daily lives. Let us work together to ensure a sustainable future for ourselves and future generations.

**Ashwini Kumar Tripathy**  
RED (WR II) & ED(OS)



## MESSAGE FROM ED(SSEA)

All the species on this planet needs water to live and survive. Out of the 70% of the water that is available, only 0.03% is made up of freshwater. Water shortages already exist in many regions, with more than one billion people without adequate drinking water.

As a responsible corporate, NTPC understands the importance of Water and commits itself to the cause of water conservation and usage optimization. NTPC has a dedicated Water Policy, which commits NTPC to proactively conserve the most precious natural resource and address water sustainability issues through its implementation and serves as a directive for establishing water management strategies, systems, processes, practices, and research initiatives.

In fact, NTPC became one of the first Energy Majors to sign CEO Water Mandate. Accordingly, all NTPC stations have taken up many initiatives to generate “**More Power per drop**”.

This year's theme for World water Day is “**Accelerating Change**”. Adaption to newer technologies for water optimisation is the key to remain relevant in changing power sector. Therefore, NTPC has adapted newer technologies like ACC (Air cooled Condensers) in its upcoming stations, which will help in reducing specific water consumption.

From Dec 2022, India has assumed Presidency of G20. Sustainability is at the forefront of all the discussion. Therefore it becomes imperative for all of us to not only meet the statutory norms but to exceed the stakeholder's expectations by achieving better results in water consumption and all other portfolios of ESG.

Accordingly, NTPC has included Water Consumption and Optimization as an important KPA in its Brighter Plan 2032.

Further, I would like to congratulate my Team at Corporate Environment Management, for continuing this initiative in collaboration with stations, to consolidate the various initiatives and bringing out this 2<sup>nd</sup> edition of “**Water Conservation Compendium**” on **World Water Day**. This document will help in sharing knowledge and will also benefit in building awareness in public domain.

**With Best Wishes.**

**MVR Reddy**  
ED(SSEA)

# World Water Day 2023

Accelerating Change



**BE THE  
CHANGE  
YOU WANT  
TO SEE IN  
THE WORLD**



The World Water Day 2023 campaign, called **Be the change**, encourages people to act in their own lives to change the way they use, consume and manage water.

In 2015, the world committed to Sustainable Development Goal (SDG-6) as part of the 2030 Agenda – the promise that everyone would have safely managed water and sanitation by 2030.

Dysfunction throughout the water cycle is undermining progress on all major global issues, from health to hunger, gender equality to jobs, education to industry, disasters to peace.

Rapid, transformative change is needed and everyone can play their part. Every action – no matter how small – will make a difference.

## Story of Hummingbird



One day in the forest, a fire broke out. All the animals ran for their lives. They stood at the edge of the blaze, looking at the flames in terror and sadness. Up above their heads, a hummingbird was flying back and forth to the fire, over and over again. The bigger animals asked the hummingbird what she was doing. "I am flying to the lake to get water to help put out the fire." The animals laughed at her and said, "You can't put out this fire!" The hummingbird replied, "I'm doing what I can"



NTPC Kawas

# Water Conservation at a Glance

# Our Strategy for Water Conservation

NTPC is committed to proactively address water sustainability issues through implementing Water Policy, which will serve as a directive for establishing water management strategies, systems, processes, practices and research initiatives.

Water is a prime resource, and we use water in judicious and sustainable manner.

Water consumption of the NTPC stations is continually being optimized by practicing 3R principles (Reduce, Reuse & Recycle), which is the core of our Water Policy.

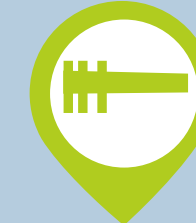
As per our water policy we are "Committed to become one of the most water efficient power company globally by generating more power per drop".



## Our Water Conservation Strategy



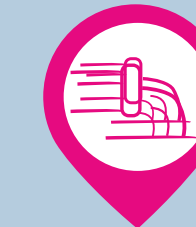
R&D Efforts



Air Cooled Condenser (ACC)



Treatment and reuse of sewage Treated Water



Liquid Waste Treatment Plant (LWTP)



Ash Water Recirculation System (AWRS)



Rainwater Harvesting



Zero Liquid Discharge



Increasing cycles of concentration

## 3R Principles : Reduce, Reuse & Recycle

### Reduce

- ❖ Through various water efficiency and innovative measures we have been able to reduce our specific water consumption in recent times.
- ❖ We are implementing rainwater harvesting systems as part of our dedicated Rainwater Harvesting policy in all our plants to bring down the withdrawal level of fresh water from various sources. At all locations, Rainwater harvesting is being implemented to either recharge ground water or for surface water storage.
- ❖ In almost all our Thermal Power Plants, water is used in a closed cycle cooling system with cooling towers. In this system, very little loss is incurred through various processes except in the cooling water system where loss is in evaporation, drift and blow down.



NTPC Vindhyachal

- ❖ We are increasing Cycles of Concentration (COC) to efficiently use water and reduce amount of blow down. The high TDS blow down water is reused in other processes.
- ❖ Water consumption is being monitored 24x7 through water dashboard developed at NTPC stations.
- ❖ Water Audit and Water Balance study is being carried out through internal and external agencies on regular basis and recommendations are being implemented to reduce the specific water consumption.
- ❖ Dry Bottom ash handling system is being installed in our new units at Patratu and North Karanapura to reduce water consumption. This concept is being adopted in other NTPC Stations also.
- ❖ Air cooled condenser is being installed at NTPC North Karanapura & Patratu which will reduce Water requirement by 55%. ACC has already been commissioned in unit 1 of NTPC North Karanapura.



- ❖ Floating solar has been installed at water reservoir of NTPC Station which also serve for reducing water loss in the reservoir.

## Reuse

- ❖ We have installed Ash water recirculation system (AWRS) to reuse the decanted ash slurry water & toe drain water from ash pond for meeting the requirement of ash handling and service water.
- ❖ In ESP area, the ash laden water is collected separately in the dedicated pit/sump(s) and the water led to Ash slurry sump/tank either by gravity or pumping system for effective reuse of water.
- ❖ We have been implementing the Zero Liquid Discharge (ZLD) at all our stations. Through ZLD, cascaded use of water for suitable use as per the quality, is being adopted.



## Recycle

- ❖ The process water generated from various sources in the plant are collected in central monitoring basin after treatment in Liquid Waste Treatment Plant (LWTP). The treated water conforming to stipulated standards is re-used for various purposes in operation of plants such as ash handling, service water, etc.
- ❖ The coal laden water generated from the Coal Handling Area is treated in Coal Slurry Settling Pond and treated water is being used for Dust Suppression System.
- ❖ Sewage Treatment Plant has been provided for treatment of plant and township sewage water. The treated water is being used for horticulture purpose in the township as well as in plant area.



## Reuse & Recycle of 97% Water by NTPC

| Description                                    | Unit    | FY 2021-22     |
|--|---------|----------------|
| Rain Water                                     | Lakh KL | 69.26          |
| Surface water storage                          | Lakh KL | 59.63          |
| Ground water Recharge                          | Lakh KL | 9.63           |
| <b>Waste Water Reuse &amp; Recycling</b>       |         |                |
| <b>Waste Water Generated</b>                   | Lakh KL | <b>3441.38</b> |
| <b>Waste Water Reused (No Treatment)</b>       | Lakh KL | 2592.43        |
| <b>Waste Water Treated</b>                     | Lakh KL | <b>857.11</b>  |
| Primary treatment                              | Lakh KL | 34.45          |
| Secondary treatment                            | Lakh KL | 820.14         |
| Tertiary treatment                             | Lakh KL | 2.52           |
| <b>Waste Water Recycled</b>                    | Lakh KL | <b>760.59</b>  |
| Primary treatment                              | Lakh KL | 22.85          |
| Secondary treatment                            | Lakh KL | 735.59         |
| Tertiary treatment                             | Lakh KL | 2.15           |
| <b>Waste Water (Treated) Discharged</b>        | Lakh KL | 98.01          |
| <b>Percentage of recycled and reused water</b> | %       | 97%            |

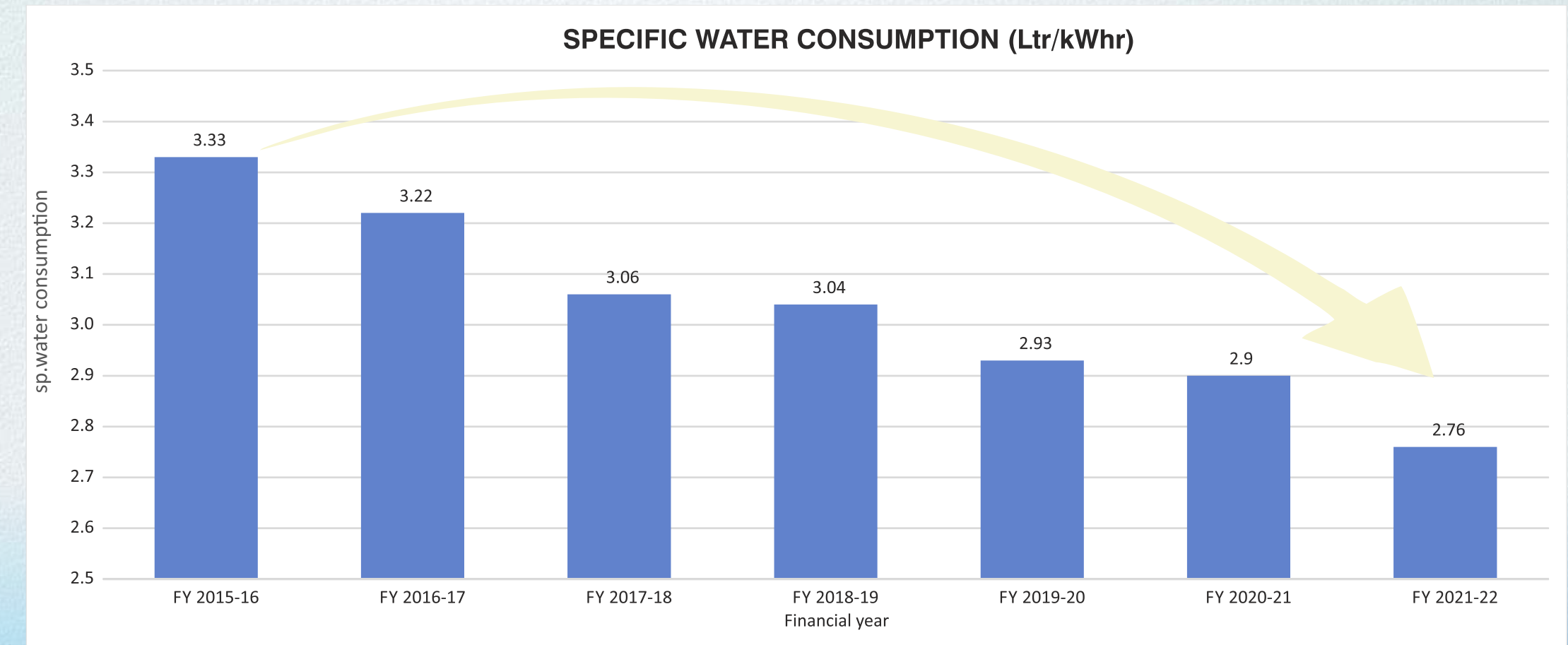
## Fresh Water Drawl

- ❖ For operation of our plants, water is drawn from various sources of water bodies such as rivers, reservoirs, canals. Sea water is used by our coastal plants.
- ❖ Increasing reuse and recycling of effluents has also led to a decrease in freshwater withdrawal requirements over the years.

| Description   | Unit    | FY 2021-22 |
|---|---------|------------|
| Surface Water (Rivers, lakes, reservoir, wetland) total | Lakh KL | 9972.17    |
| Total Ground Water                                      | Lakh KL | 0.00       |
| Water from third party                                  | Lakh KL | 1.50       |
| Sea Water   | Lakh KL | 725.06     |
| Total Fresh Water Consumption                           | Lakh KL | 9973.67    |
| Specific Fresh Water Consumption                        | l/kWh   | 2.76       |

## SPECIFIC WATER CONSUMPTION

Specific Water Consumption has been reduced over the years and targeted to achieve Sp. Water consumption of 2.5 (ltr/kWhr) by 2032.



The North Karanpura plant will have a total capacity of 1980 MW, 3 units of 660 MW each. This plant is based on one of the Most efficient Super Critical Technology and being a pit head plant (10 Km from coal source) will supply economical power to the states of Jharkhand and Bihar

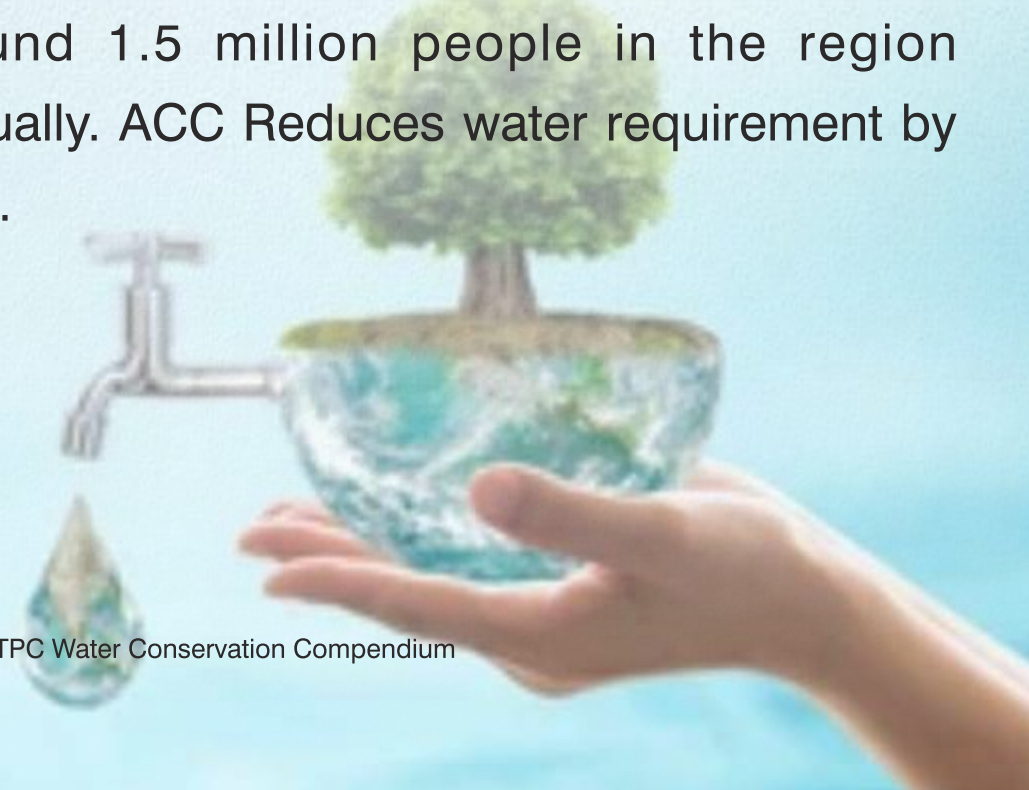
NTPC North Karanpura

## Commissioning of Air-Cooled Condenser at NTPC North Karanpura

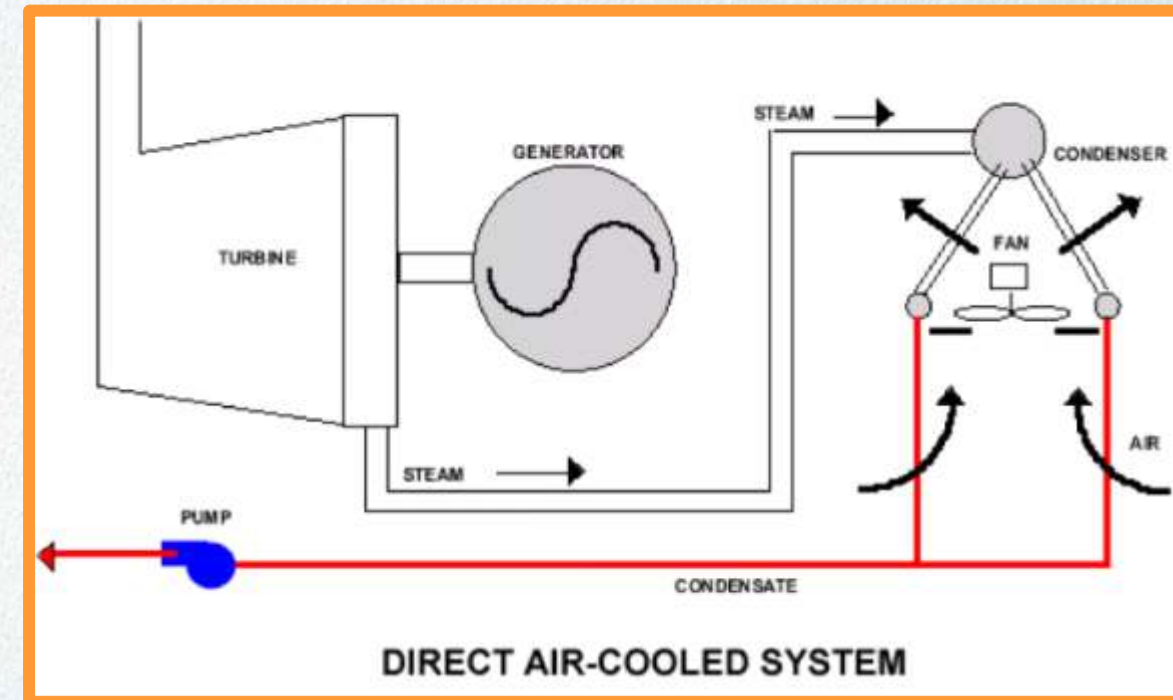
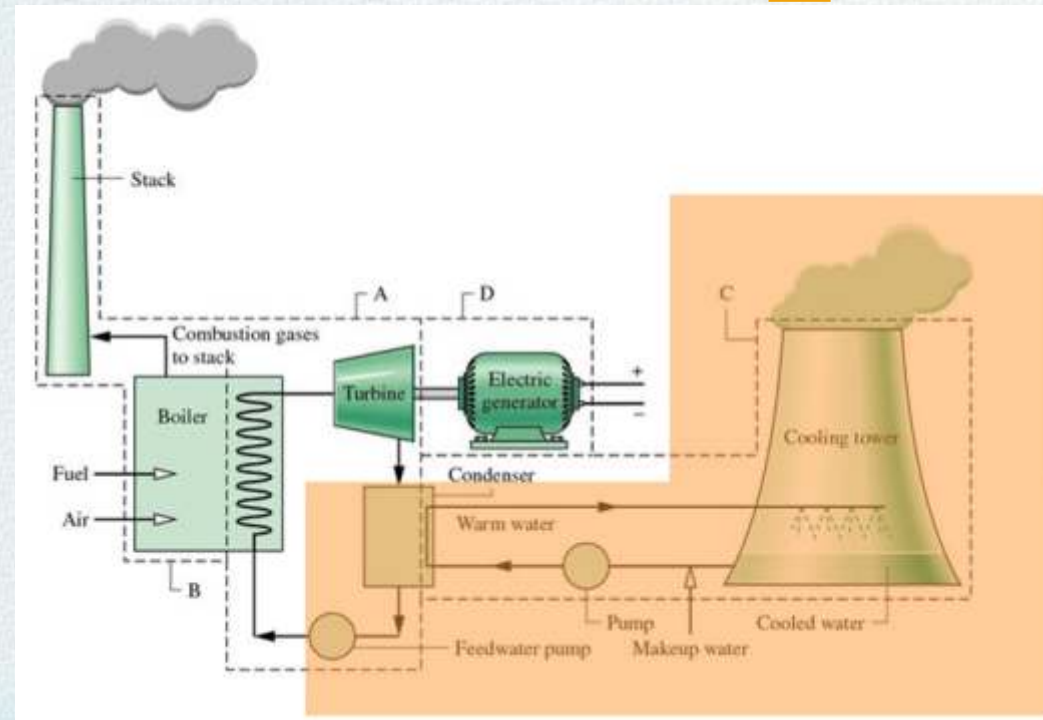
NTPC North Karanpura has commissioned Air Cooled Condenser in its 1<sup>st</sup> Unit of 660 MW on 01<sup>st</sup> March 2023. Air cooled Condenser will also be installed in 2<sup>nd</sup> and 3<sup>rd</sup> units at NTPC North Karanpura.

This project has been envisaged with Air Cooled Condenser (ACC) which has almost 1/3rd water footprint as compared to the unit having a conventional Water Cooled Condenser (WCC).

This would result in a water saving of around 30.5 MCM annually thus fulfilling the needs of around 1.5 million people in the region annually. ACC Reduces water requirement by 55%.



## Philosophy : Cooling of exhaust steam from turbine is done by atmospheric air instead of cooling water



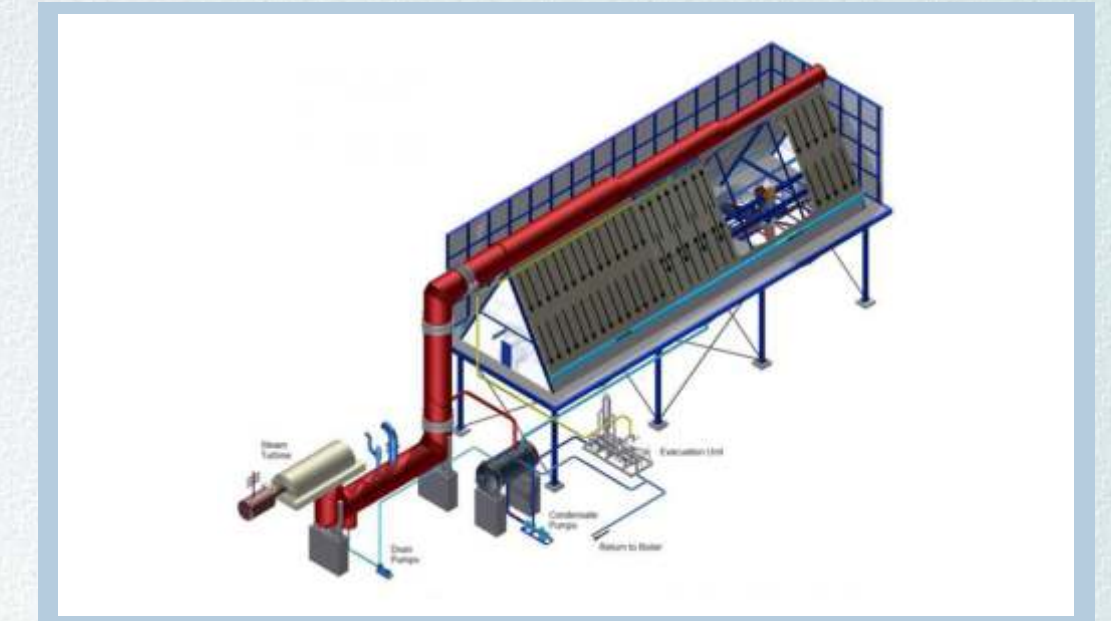
### Air Cooled Condenser

North Karanpura STPP (3x660 MW) is equipped with Direct Air Cooled type Condensers (ACC), A-frame configuration with single row, flat finned tubes and mechanical ventilation. Turbine exhaust steam flows through the steam headers and tube bundles. The Cooling air passes over the outer surface of the finned tubes by axial flow fans to condense exhaust steam. The condensate will be pumped by the Condensate Extraction Pump (CEP) to condensate system.

The ACC consists of 10 “A” frame type streets of finned tube elements. Each street contains 9 modules (7 primary and 2 mixed modules). Each module is composed of bundles of finned tubes. In a street there is a combination of Condensing or “K” type and Dephlegmator or “D” type tube bundles. The top of D - Bundles is connected to vacuum system for removal of non-condensable gases.

### Initial Temperature Difference (ITD)

The ACC design point is frequently characterized by the difference between Condensing Temperature ( $T_{cond}$ ) and Entering Air Temperature ( $T_{a \text{ inlet}}$ ), known as the Initial Temperature Difference (ITD).



$$ITD = T_{cond} - T_{a \text{ inlet}}$$

For a given ACC, the Heat Load  $Q$  is related to ITD by :  
 $Q/ITD = \text{Constant}$

### Logarithmic Mean Temperature Difference (LMTD)

The LMTD is a logarithmic average of the temperature difference between the hot and cold streams at each end of the exchanger. The logarithmic mean temperature difference is used to determine the temperature driving force for heat transfer in flow systems, most notably in heat exchangers. The larger the LMTD, the more heat is transferred. The use of the LMTD arises, straightforwardly, from the analysis of a heat exchanger with constant flow rate and fluid thermal properties.

## Components of Air Cooled Condenser

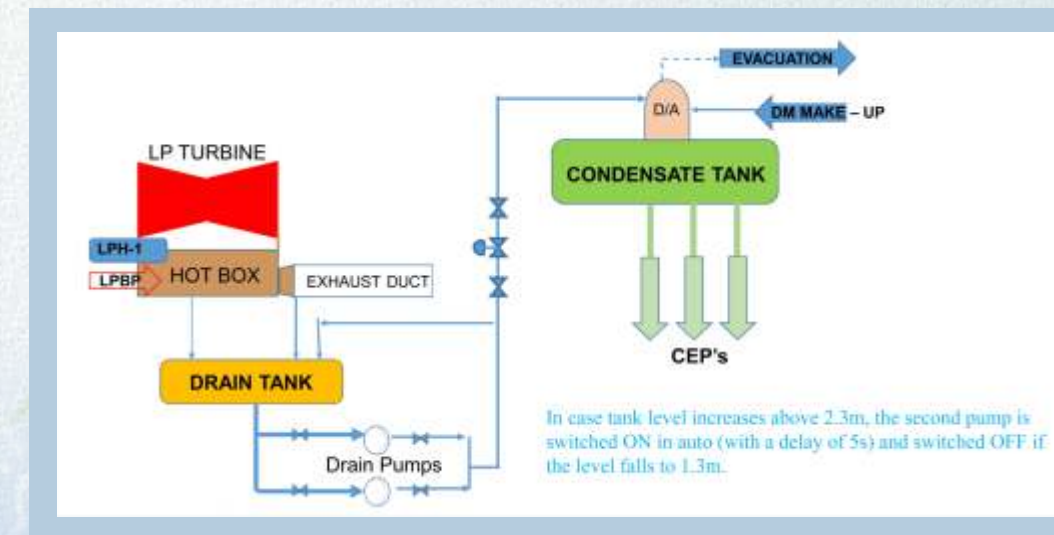
1. Main Exhaust Steam Duct
2. Rupture Disks
3. Steam Distribution Manifold
4. Drain Tank
5. Drain Pump
6. Drain Pump Discharge Control Valve & motorized by-pass valve
7. Drain Pump Recirculation motorized valve
8. Steam Isolating Valve
9. Condensate Isolating Valve
10. Air Extraction isolating valve
11. Air Extraction butterfly valve of exhaust steam duct
12. Steam Risers
13. Fans

## Main Exhaust Steam Duct

The exhaust steam pressure and temperature are measured for monitoring, fan control and alarm on the main exhaust steam duct.

## Rupture Disks

Rupture Disks are used for protecting ACC from an over pressure condition. The disks are designed to explode and provide full opening and instantaneous pressure relief and allow discharge of steam flow rate in case of high pressure.

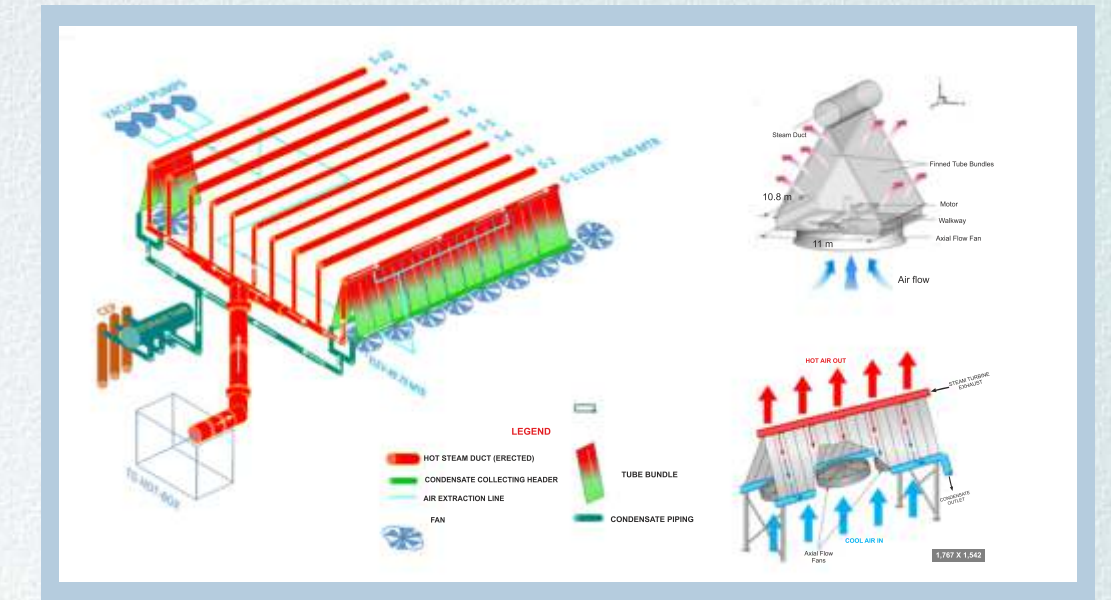


## Fans

- ❖ The Fans are driven directly by the double speed Asynchronous motors through reduction gears.
- ❖ The Fan motor is operated on speed 1 or speed 2 and switched off in case of low load conditions.
- ❖ Switching “On and Off” of a respective fan unit is done automatically.
- ❖ The governing signals are derived from the governing group control logic of the ACC (GC ACC).
- ❖ The fan units are switched in a specific sequence according to the FAN STEP CONFIGURATION CHART.
- ❖ Each fan unit is arranged in its Individual group control logic in which all necessary protection measures of that specific unit are arranged.

## Condensate Tank with Deaerator

- ❖ Condensate from the ACC is collected and conducted by gravity to the condensate tank.



- ❖ The deaerator is arranged as cylindrical dome over the condensate tank.
- ❖ Make-up water and condensate is sprayed at the top of the deaerator.
- ❖ The freed non-condensable gases is discharged to atmosphere via the vent openings at deaerator top.

## Drain Tank and Drain Pump

The drain tank is used to collect condensate from the exhaust steam duct and hot box and drain pumps are used to pump the collected condensate to the condensate tank.



NTPC Simhadri

# Rainwater Harvesting

Rainwater Harvesting Storage Facility at NTPC Simhadri



# NTPC Rainwater Harvesting Policy

Rainwater harvesting (RWH) is a way of collecting and storing rainwater either for reuse or for ground water recharge. It possesses tremendous potential to reduce freshwater consumption and act as a reliable secondary source of water. NTPC shall prioritize surface water storage and reuse over ground water recharge.

To strengthen its water conservation initiatives, NTPC has developed Rainwater Harvesting Policy which would act as the major guiding document for rainwater harvesting. This policy is integral to NTPC Water Policy and shall be considered as its extension. Considering the importance of water as a shared resource, this policy can be further used as a reference for the various water conservation initiatives taken up by NTPC under CSR/ SD projects.

## Objective

To promote the installation and periodic upkeep of RainWater Harvesting system in locations of and near to NTPC establishments.

## Principles

This Policy is guided by following principles:

Rain water harvesting (RWH) system, though functional only for a brief duration in a year, is useful as a secondary source of water.

Adoption of right combination of superior state-of-the-art technologies and global best practices shall increase the quantity and quality of harvested rainwater.

Provision of accountability for all locations and mechanism to respond to any aberration from the policy objectives shall yield superior results.

Promotion of RWH through inclusiveness, capacity building and regular knowledge sharing with concerned stakeholders shall result in capturing of increased quantity of rainfall that would have gone unused otherwise.

- ❖ All NTPC stations are provided with Rainwater Harvesting facilities.
- ❖ In order to have 100% potential utilization of Rainwater, RWH Studies at NTPC stations are being carried out through reputed institutes.
- ❖ Surface water storage facilities are being created wherever recharging is not possible due to high water table.



*Rainwater Harvesting Storage facility at NTPC Barauni*



*Rainwater Harvesting Storage facility of 50000 m<sup>3</sup> capacity at NTPC Vindhyachal.*

# Use of Rainwater as Cooling Tower makeup at NTPC Sipat

# Use of Rainwater as Cooling Tower Makeup

NTPC Sipat usually gets a rainfall of approx. 1300 mm in a year. Rainfall in this area can be a reliable source of water for the township, throughout the year. Ground water recharge is not technically feasible due to shallow ground water table present in this area. The only option is surface type collection / storage of rain water, for later use.

At NTPC Sipat, an innovative method of RWH is being implemented using existing infrastructure, in-house expertise in a short duration, with the concept of modular type of RWH facilities. The cost effective modular type of RWH facility is simple to install, operate and maintain, which is found sustainable. Moreover, it has a potential to replicate in other stations as well with least effort.

Three modular RWH facilities are installed at NTPC Sipat, these facilities help the station to reduce water consumption and reduce water intake from external source.

The storm water channel those are located inside the plant boundary is covering most of the area of the plant

and connected to various drains, suitable to be used as storage of rain water. Hence instead of creating a huge civil infrastructure to collect and store water, it was decided to use storm water channel for this purpose. In order to store the rain water in the channel, a wall has been constructed at the end of channel, inside the plant boundary, as shown below:



*Use of Storm Water Channel as Rain Water Storage Facility*

## Initial study

A study has been conducted and it was found that, the storm water channel located in the switchyard side of the plant usually handles rain water due to its large catchment area. The test results also confirm that the water is primarily of rain water. Previously this water was going out to nearby river as storm water.

## Right place to use Rainwater

A site survey revealed that, this switch yard side storm water channel is located adjacent to the Stage-I CW channel and CT. The quality of rain water collected in this storm water channel is found to be superior in quality compared to CW water. Hence it was decided to use this rain water as CT make up water, as storm water channel and CT are located nearby.

Moreover, both the switch yard side storm water channel and Stage-I CW channel are running parallel to each other and close by, which make the design simpler, to divert Rainwater into CT forebay, without the need of elaborate piping layout with less pumping power.

By design, the storm water channel is open at the top, hence it is exposed to atmosphere. In order to bring down/remove the foreign particles such as leaves and vegetation, it was planned to install a gravity sand bed filter.



## Modular concept

Although the potential to harvest rainwater is huge in this area, establishing a dedicated Rainwater harvesting with an elaborate infrastructure is difficult due to space constraints. Moreover, the size of the storm water channel (approx. 5 m by 4 m by 2500 m) itself is sufficient enough to hold large quantity of water.

Hence it was envisaged to build a wall at the exit point of the storm water channel to collect and store the water in huge quantity. The storm water channel becomes the storage facility for the rain water to get it collected during rainy season. It helps to do away with the requirement of huge civil infrastructure, otherwise required for storing rain water.



Use of Storm Water Channel as Rain Water Storage Facility



RWH - Facility



Cooling Tower



RWH - Filter

- ❖ NTPC Sipat has established RWH facility near CT 1B, CT 2B, and CT 3B, each can harvest approx. 200 m<sup>3</sup>/hr of water.
- ❖ Due to its modular construction, the fabrication and installation become easier.
- ❖ The standard/modular design has helped the maintenance departments to fabricate the facility with locally available manpower/resource

| Sl. No. | Plant Area                               | Capacity               |
|---------|--|------------------------|
| 1.      | Installed on 28 August 2022 near CT 2B   | 200 m <sup>3</sup> /hr |
| 2.      | Installed on 08 October 2022 near CT 1B  | 200 m <sup>3</sup> /hr |
| 3.      | Installed on 24 December 2022 near CT 3B | 200 m <sup>3</sup> /hr |
| 4.      | Stage I CW forebay – under installation  | 200 m <sup>3</sup> /hr |

# Advantages

- ❖ Increased freshwater availability for surrounding villagers/farmers – Reduced water intake.
- ❖ Cold rain water makeup improve the performance of CT.
- ❖ Promote effective use of water thereby conserve water, reduced water footprint.
- ❖ Use of existing infrastructure (storm water channel) to collect rain water.
- ❖ In-house design and fabrication - Modular solution - Easy to replicate with in-house expertise.
- ❖ Motivation – Involvement and level of accomplishment among employees.



Team NTPC, Sipat

NTPC RGPPL

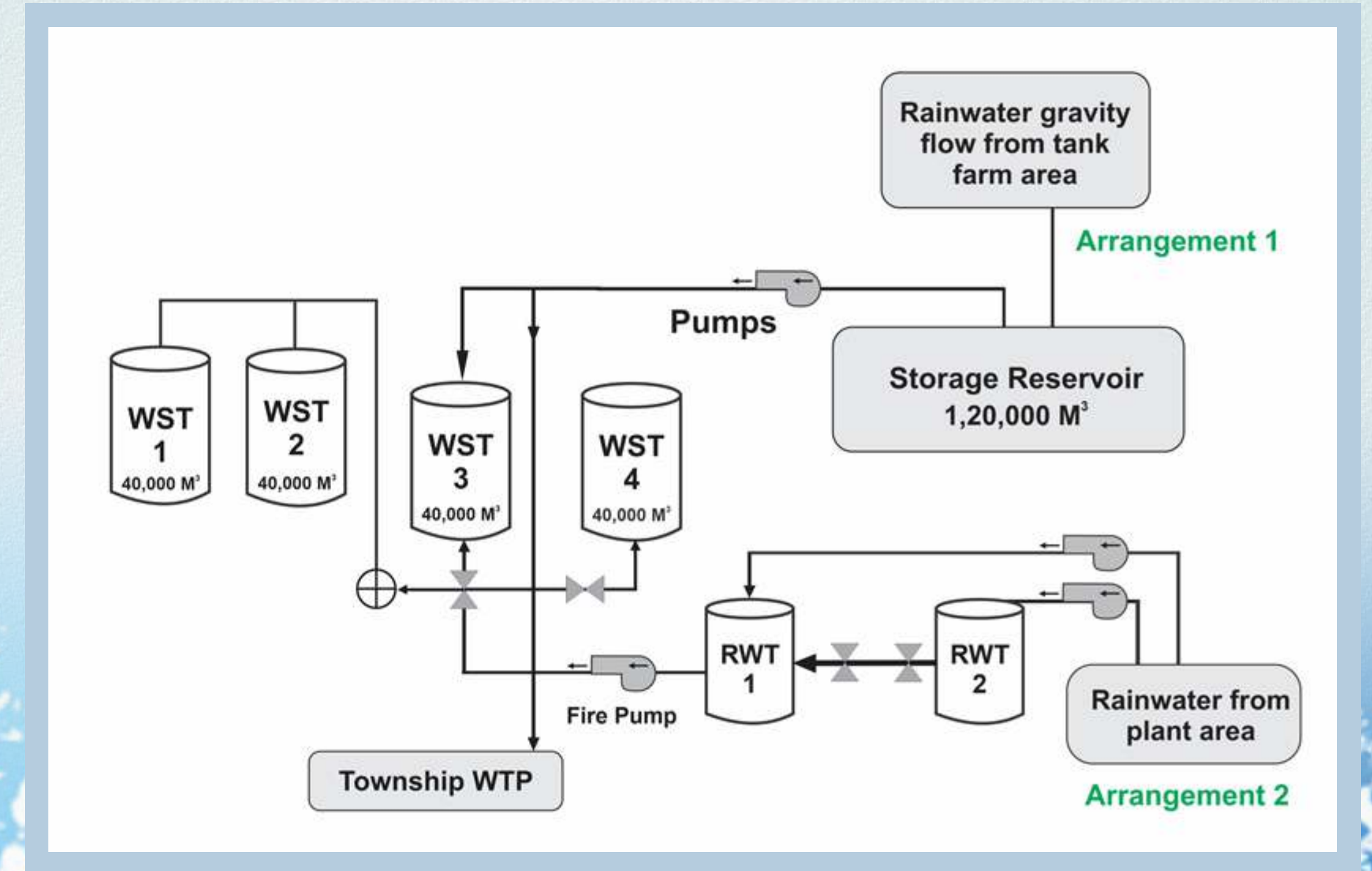
**NTPC - RGPPL**  
**Winner of UNGCNI's Best**  
**Practices Challenge on Water**  
**Management & Wash in**  
**India 2022**

## NTPC - RGPPL - Winner of UNGCNI's Best Practices Challenge on Water Management & Wash in India 2022

United Nations Global Compact Network India (UNGcNI) invited entries for the Best practices challenge on Water management & wash in India for the year 2022. NTPC Mauda, NTPC Sipat, NTPC Ramagundam & NTPC - RGPPL were selected as finalist for the challenge among selected 10 entries for final. RGPPL has been declared as the winner of the UNGcNI's Best practices challenge on Water management & wash in India for the year 2022.

- ❖ RGPPL has made it a mission to achieve 100% self-sufficiency for its sweet water requirement without drawing any sweet water from River Vashishthi through strategic actions taken for rainwater harvesting and water reuse in plant processes.
- ❖ RGPPL has taken many steps including the construction of check-dams, bunds in storm-water drains, roof drain connections, etc.
- ❖ The total rainwater collected in the year 2021-22 is 3.25 Lakh m<sup>3</sup> and the total consumption of sweet water in the year 2021-22 is 3.13 Lakh m<sup>3</sup>. The various RWH storage facility at RGGPL is given below :

| SL No.              | STORAGE TANK/ RESERVOIR     | CAPACITY (m <sup>3</sup> ) |
|---------------------|-----------------------------|----------------------------|
| 1.                  | Raw water tank 1 (RWT 1)    | 7500                       |
| 2.                  | Raw water tank 2 (RWT 2)    | 7500                       |
| 3.                  | Water Storage Tank 1 (WST1) | 40000                      |
| 4.                  | Water Storage Tank 2 (WST2) | 40000                      |
| 5.                  | Water Storage tank 3 (WST3) | 40000                      |
| 6.                  | Water Storage tank 4 (WST4) | 40000                      |
| 7.                  | Water Storage Reservoir     | 120000                     |
| <b>Total volume</b> |                             | <b>2,95,000</b>            |



Rainwater Harvesting Scheme



*Lining of Water Reservoir of 1.2 Lakh m<sup>3</sup>*



*Storage tanks with total capacity of 1.6 Lakh M<sup>3</sup>*



*Gravity channel water collection in Water Reservoir*





← *Geo-membrane lining*

*Successfully collected 3.25 Lacs m<sup>3</sup> at RGPPL water in FY 21-22*



# NTPC Khargone A Water Positive Township

Khargone Super Thermal Power Station is a coal-based thermal power project of NTPC Ltd. having capacity of 1320 MW (2x660 MW), located at village Selda in Khargone district in State of Madhya Pradesh. It is the India's first ultra-super critical thermal power plant.

### Steps towards Water Positive Township

NTPC-Khargone thermal power plants meet its water requirement from Omkareshwar Dam on river Narmada located at 42 Kms from plant site.

NTPC-Khargone has made it a mission to achieve net water positive target for its beautiful township "Shivalik Nagar" with an area of about 93 acres of land. About 350 families, it's employees & associates are residing in the township.

Through strategic actions for rainwater harvesting, other water reuse and conservation practices, NTPC-Khargone replenished higher quantity of the water to the environment than withdrawal for township consumption in the year 2022-23.

Rainwater harvesting against total Raw water requirement at township for year 2022-23 is given below :

**Water Consumption for Township: 0.3 MCM**

**Rain Water Harvesting in the station: 0.4 MCM**

### Brief details of Projects / Actions towards becoming Water Positive.

#### 1. Rainwater Harvesting

- ❖ The normal annual rainfall for Khargone district is 740.6 mm. The climate of the area is semi-arid, the minimum and maximum temperature of the area is 9.5°C and 42.7°C respectively.
- ❖ To make full use of rainfall without affecting the population in the downstream, NTPC-Khargone has taken many steps including construction of rainwater harvesting through roof drain collection, open area and storm water drains collection etc.
- ❖ Detailed Hydrogeological investigations and Rainwater Study has been carried out to observe hydro geological condition of the area, access



recharge possibility to ground water and make improvement in groundwater levels at plant premises.

- ❖ Total recharge potential of 0.84 MCM (i.e., recharge from rooftop, road and paved walk area and open area storm water) has been envisaged in the study. The expected recharge potential is approximately 42% of the total recharge potential.

- ❖ About 0.40 MCM of rainwater recharge is done in year 2022-23 considering the actual rainfall of 825.2 mm at Khargone through recharge structures.
- ❖ Rainwater harvesting through recharge tube wells is proposed in rainwater harvesting study to improve ground water regime of the project area and to contribute to positive water environment. Recharge through recharge shaft is effective in the project area as the weathered rocks are exposed on ground surface.
- ❖ An approval from the Central Ground Water Authority (CGWA) has also been obtained for the establishment of Rainwater harvesting scheme.
- ❖ Accordingly, Rainwater harvesting scheme with total 44 recharge structures constructed to recharge the ground water.
- ❖ As per CGWA guidelines Ground water regime monitoring through 02 nos. of Piezometers i.e., one deep Piezometer of 90 m depth and one shallow Piezometer of 30 m depth are also provided.
- ❖ Further, Rainwater harvesting structures for the recharge of about 0.08 MCM is under construction and township shall also contribute further in ground water recharge.


## 2. STP Treated Water Reuse

Sewage treatment plant (STP) of capacity 500 KLD is provided at township with advance Moving Bed Bio Reactor (MBBR) technology. Domestic wastewater is collected and transferred to the STP and treated up to the prescribed quality norms. 100% of sewage generated from the township is treated at STP and treated water is reused for watering saplings/ trees, garden and stadium.



## 3. Drip Irrigation and Water sprinkler system

- ❖ Efficient automatic Drip irrigation and water sprinkler system is provided with dedicated piping network with pressure valves and control valves for watering to horticulture and roadside tree plantations. Drip irrigation & sprinkler systems with water efficiency of 85-95% helps in water conservation by reducing evaporation and deep drainage in comparison to the conventional watering practices.
- ❖ Pop up type with adjustable rotary nozzles of various types are provided for water sprinklers in lawns capable of covering required pressure and matched precipitation nozzles with double pop mechanism to avoid clogging.



**एनटीपीसी  
NTPC**

### Khargone Smart Water Management

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| <p><b>Live: Data</b></p> <ul style="list-style-type: none"> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Hydraulic Network</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">UGT-1</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">STP</li> </ul> | <p><b>Live: Trends</b></p> <ul style="list-style-type: none"> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">UGT-1</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">STP-Other</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">STP-Quality</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Buildings</li> </ul> | <p><b>Reports: Reservoir</b></p> <ul style="list-style-type: none"> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Daily Report Final</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Weekly Report final</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Monthly Report final</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Alarms</li> </ul> | <p><b>Reports: Water Consumption</b></p> <ul style="list-style-type: none"> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Blockwise Consumptions</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Building Consumptions Final</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Building hourly, Daily</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">Monthly Consumption</li> <li style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">AMR DATA</li> </ul> |
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## 4. Water Management

- ❖ NTPC Khargone has implemented zero liquid discharge (ZLD) system.
- ❖ NTPC Khargone has adopted one of the effective ways to conserve water. Central metering and sub-metering for water is provided up to the each dwelling units.
- ❖ Electromagnetic/Ultrasonic Water meters are provided and connected through SCADA software to the smart township control room for efficient water management. Water SCADA software stores and

process data, generates reports, alerts for leakages and abnormal consumption.

- ❖ Automation in irrigation- Smart Watering enabled based on Soil moisture, ET Calculations, Time based scheduling and Zone wise report/status is generated. All this data and information available at Central Server.
- ❖ Storm water collection-Excess storm water from the township is harvested and collected in 6000 m<sup>3</sup> capacity of RWH pond at township and used for watering of the tree plantations.



*SBT Bioreactor-1 of NTPC Kahalgaon*

# Soil Bio Technology Based Sewage Treatment Plant at NTPC Kahalgaon

## Soil Biotechnology STP

Soil Biotechnology (SBT) based STP has been installed and commissioned at NTPC Kahalgaon. SBT has been developed & patented by Chemical Engineering Department, IIT Bombay. The plant has a capacity of 1 million liters per day and treats the wastewater from the Township. This is unique and first of its kind of Sewage Treatment Plant in NTPC, which is popularly known as SBT-STP.

The plant consists of a primary treatment unit and a secondary treatment unit. The primary unit consist of a bar screen chamber. There is an existing sewage treatment plant based on conventional technology. The primary unit of the conventional technology sewage treatment plant have a grit removal unit.

The secondary treatment unit of plant consist of two bio reactors to treat the sewage.

SBT-STP is a terrestrial system for sewage treatment, which is based on the principle of trickling filter. In this system, combination of physical processes like sedimentation, infiltration and biochemical processes are carried out to remove the suspended solids, organic and inorganic contents of the sewage. Suitable mineral constitution, culture containing native micro-flora and bio-indicator plants are the key components of the system .



*SBT Bioreactor-1 of NTPC Kahalgaon*

## Working of SBT

Combined grey water and black water streams are collected and transported via sewerage system up to raw water storage tank. Raw sewage is then pumped and distributed over the SBT bio reactors through a network of pipes.

Primary, secondary and tertiary treatments are all achieved in the SBT process in a single/multiple pass reactor.

The processed water (after multiple passes, if necessary) is collected in intermediate collection tanks. The final treated water is taken for storage & distribution as required.

Natural mineral additives are added at specified point to regulate the process.

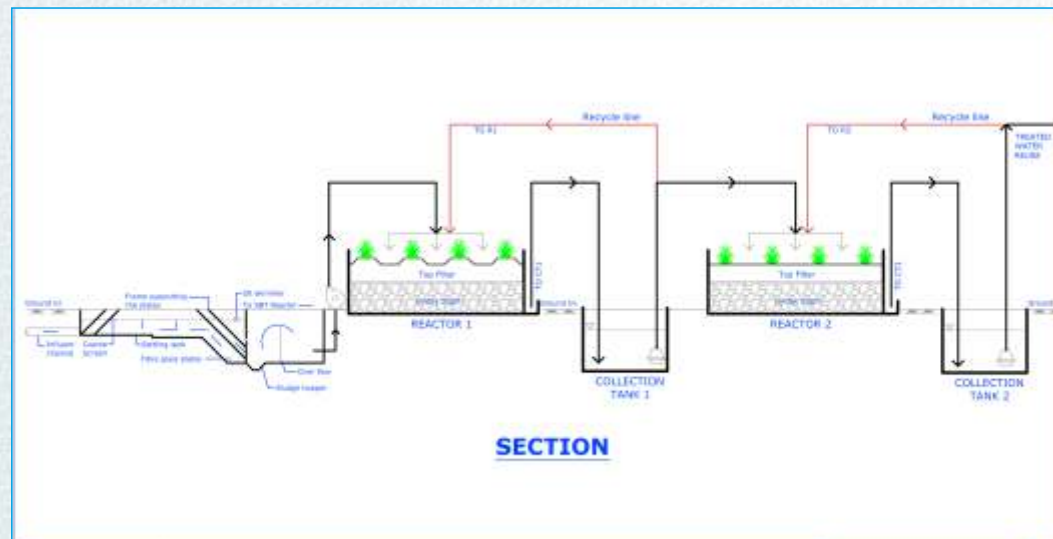
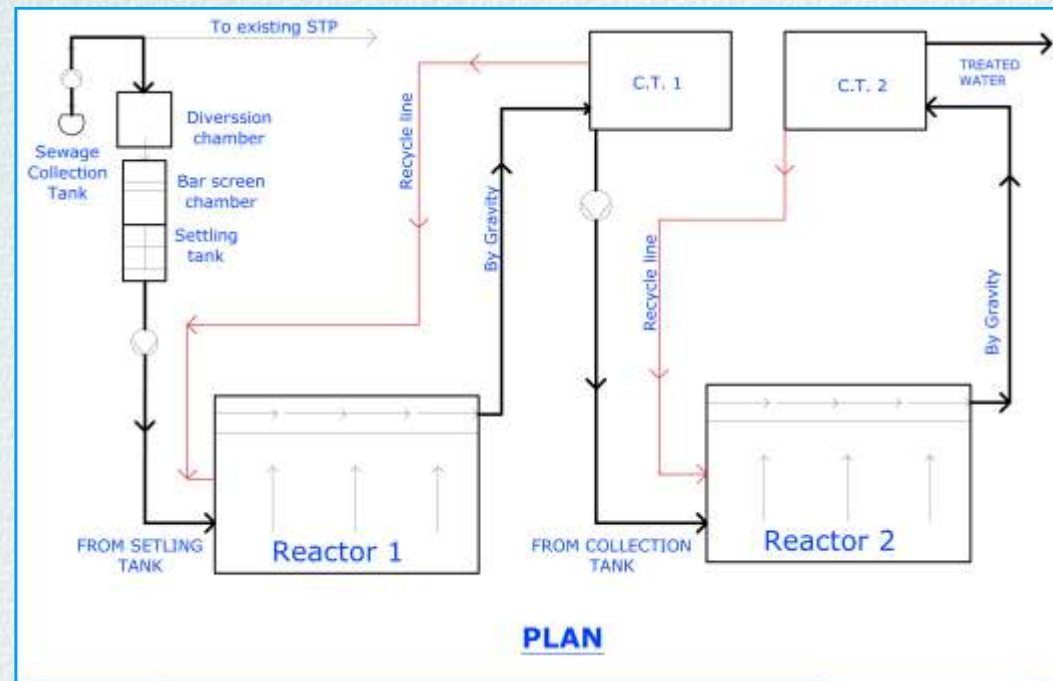
## Science of SBT

SBT synergistically engages photosynthesis, respiration and mineral weathering- the three fundamental process of nature to bio- convert organic and inorganic in sewage.

This is achieved by soil micro-organism and regulated by soil macro-organism viz. geophagus earthworms etc. As a consequence, the organic waste constituents of the raw water are consumed and simultaneously water of desirable quality is produced.

SBT removes BOD, COD, ammonia, nitrogen, nitrate, suspended solids, bacteria, color, odor- all this in a single “all green” system open to atmosphere.

The plan and section of SBT is given in the below diagram



SBT Bioreactor-2 of NTPC Kahalgaon

## Process about Soil Bio Technology

The technology is based on a bio-conversion process where fundamental reactions of nature, namely respiration, photosynthesis & mineral weathering take place in a media housing micro & macro organisms which bring about the desired purification. SBT is an oxygen supplying biological engine and so the process can treat all types of water – domestic municipal & industrial. SBT is suitable for treating water with salinity <2500 mg/L. When salinity levels exceed, reaction rates in the SBT system are lower and hence the system design is adjusted suitably to achieve the purification desired. If salinity is very high an additional facility using RO technology can also be included.

The process requires Mesophyllic temperatures; so where the ambient temperatures are low/ very low a greenhouse infrastructure appropriate for the local conditions houses the SBT plant. However the process can work at high ambient temperatures.

The facilities of a treatment process for water & waste water consists of a raw water tank, bio-reactor containment , treated water tank and associated piping, pumps & electrical system.



# Narmada Landscape Restoration Project



Narmada Landscape Restoration Project (NLRP) is a 4-year project supported by NTPC Ltd. and United States Agency for International Development (USAID) in Khargone, Madhya Pradesh. The project is being jointly implemented by Indian Institute of Forest Management (IIFM) and the Global Green Growth Institute (GGGI).

The project will improve quantity and quality of water of selected river Narmada tributaries through inclusive and sustainable landscape management interventions. Through demonstration in Barwaha block, Khargone district of Madhya Pradesh (MP), the project's interventions are bringing a positive change in the lives of forest-dependent and agrarian communities in areas like improved access to natural resources, enhanced water quality and availability, enhanced livelihoods and reduced chemical exposure. These positive changes is incentivizing the catchment communities to participate and sustain these interventions. At the same time, the improved water quality and quantity in the river Narmada's tributaries because of the project's interventions is generating evidence for end-users. In this case the citizens of Indore and the Indore Municipal Corporation to invest in sustainability of incentive mechanisms. Such a land-use based incentivization approach is a better alternative to address risks to the water supply and health of the residents of Indore and the catchment communities.

The project is currently executing several natural resource management infrastructures in the catchment with an aim to impact 10,000 hectares of forest and agriculture landscape.

NLRP has created a detailed project report (DPR) for 12000ha area after mapping the different streams flowing through micro watersheds and feeding water to Nani and Vanshavali tributaries of river Narmada. Based on hydrological modelling, potential location for NRM structures were identified. This was followed by ground truthing surveys including digitization of revenue maps, plot-wise net planning for soil conservation and NRM works, preparation of detailed cost estimation of NRM structures, adopting digital tools such as GIS software (QGIS), remote sensing data (using aerial imagery, digital elevation models, etc.), GIS-based mobile (Qfield) to capture the detailed information in digital formats to finalize the DPR. Detailed survey to map the aquifers feeding water to the river during non-rainy season have been carried out in detail.

### Field Execution of NRM Works

Based on the DPR report multiple structures have been taken for construction. They are mentioned as below.

1. The stop dam of Arsi village falling under the Gram Panchayat Katora (South Bank) was in a dilapidated



condition and was no longer functional. Seeing the urgency and potential impact on the area's groundwater, the construction was taken on priority and completed. The structure has been completed and is already benefitting nine (9) farmers and their families directly covering a total irrigated area of about 8.34 Hectares with a storage capacity of 7625 m<sup>3</sup>.

2. The construction of two gabion structures in the village of Dhabad (South Bank) has been completed. They cover a total area of ten (10) and five (5) hectares as per the calculations respectively targeting two (2) beneficiaries directly.
3. Loose boulder structure construction is ongoing in the

village of Lachora (South Bank), benefitting five (5) community members while covering a total area of 19 hectares.

4. Three (3) new Stop dam construction in North Bank villages namely Bagdara and Gulawad is ongoing. The first structure is in the village Bagdara which is 95% completed, with a total irrigated area being 6.16 hectares with a storage capacity of 4838 cubic meters. As per the record, it is impacting nine (9) direct beneficiaries. The other two stop dams are located in the village of Gulawad, where the construction is ongoing as per the record they cover a total irrigated area of 9.24 and 7.55 hectares each.

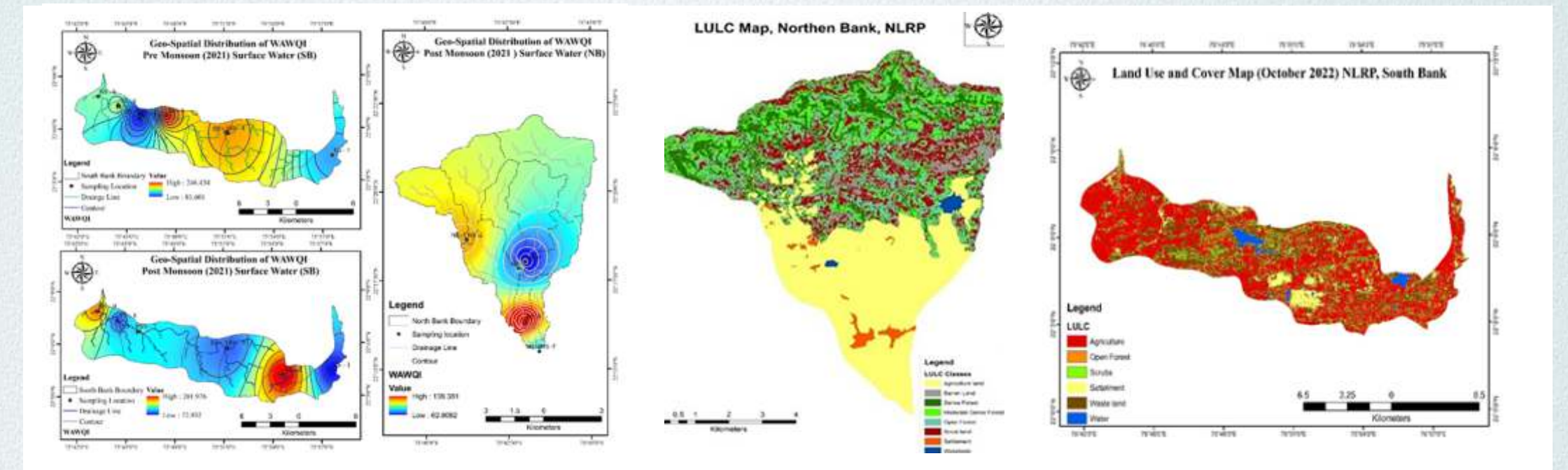


## Hydrological Data (Primary) Analysis - Completed

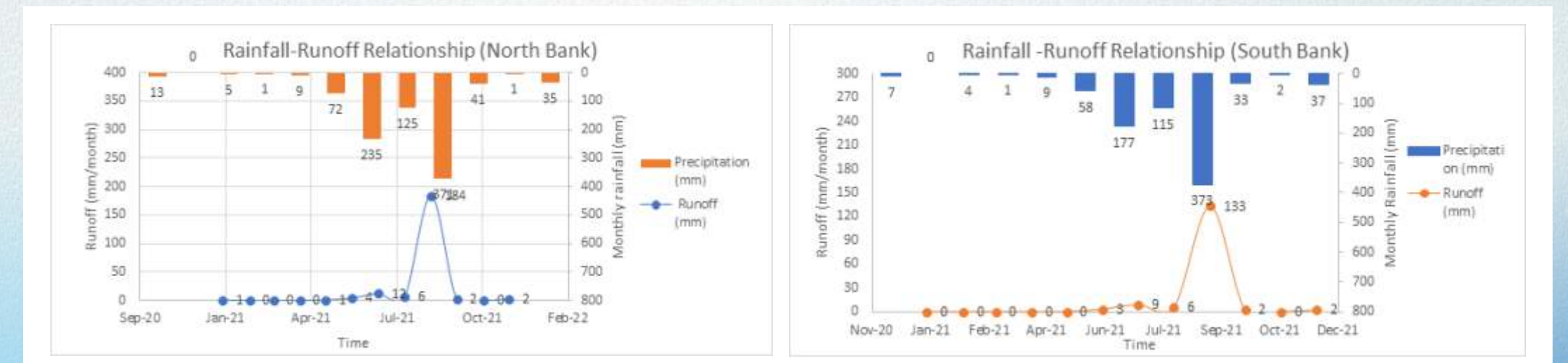
All the sub-activities under the hydrological data analysis from secondary sources have been completed. Rain fall data for the past 20 years and groundwater data for the past ten years have been collected from secondary sources. The drainage network has been analysed using GIS with a spatial resolution of 30 meters. Secondary data on hydrology, including surface runoff, groundwater, water quality, and water utilization, has been gathered from secondary research. For pre-monsoon and post-monsoon data collection, surface and groundwater data for quality and quantity measurement are completed for the baseline report. The first Monitoring and Evaluation baseline report to assess water quality and quantity under NLRP will show all details mentioned for data analysis in the previous QPRs.

## Hydrological Data (Secondary) Collection and Analysis - Ongoing

The temporal (second) set of pre and post monsoon data for water quality and quantity has been completed and submitted to the laboratory for the updated results. Regular monitoring for all water parameters is being recorded and analysed.



The rainfall and runoff estimation of the water quantity parameters.



## Training and Capacity Building

For soil and watershed management, two trainings have been conducted so far. The team organized an awareness campaign in three villages namely Julwaniya, Arsi and Dhabadh to spread awareness of the importance of soil health and encourage the adoption of sustainable landscape practices like organic farming. Approximately 60-70 farmers including women farmers participated in the event. The women farmers were provided the platform to share their roles and involvement in maintaining the quality of the soils. Another training focused on water user groups and managing the NRM structures. Under the Capacity building, need assessment surveys were done with the communities to understand their requirement for water and its utilization.



*Meeting in the veklya farmer field and discussing about organic cultivation*





Stop Dam Renovation - Near Tarachand Bhai Farm at Village - AARSI, Panchayat - Katora



# Awareness for Water Conservation



# Awareness Programs for Students

The awareness program on water conservation with various competitions has been conducted for students in and around the NTPC Stations.



# Awareness Programs in Surrounding Villages

Awareness Program has been conducted in nearby villages for making them aware of water conservation



# Awareness among NTPC's Associates

Water conservation awareness program has been conducted among NTPC's associates.





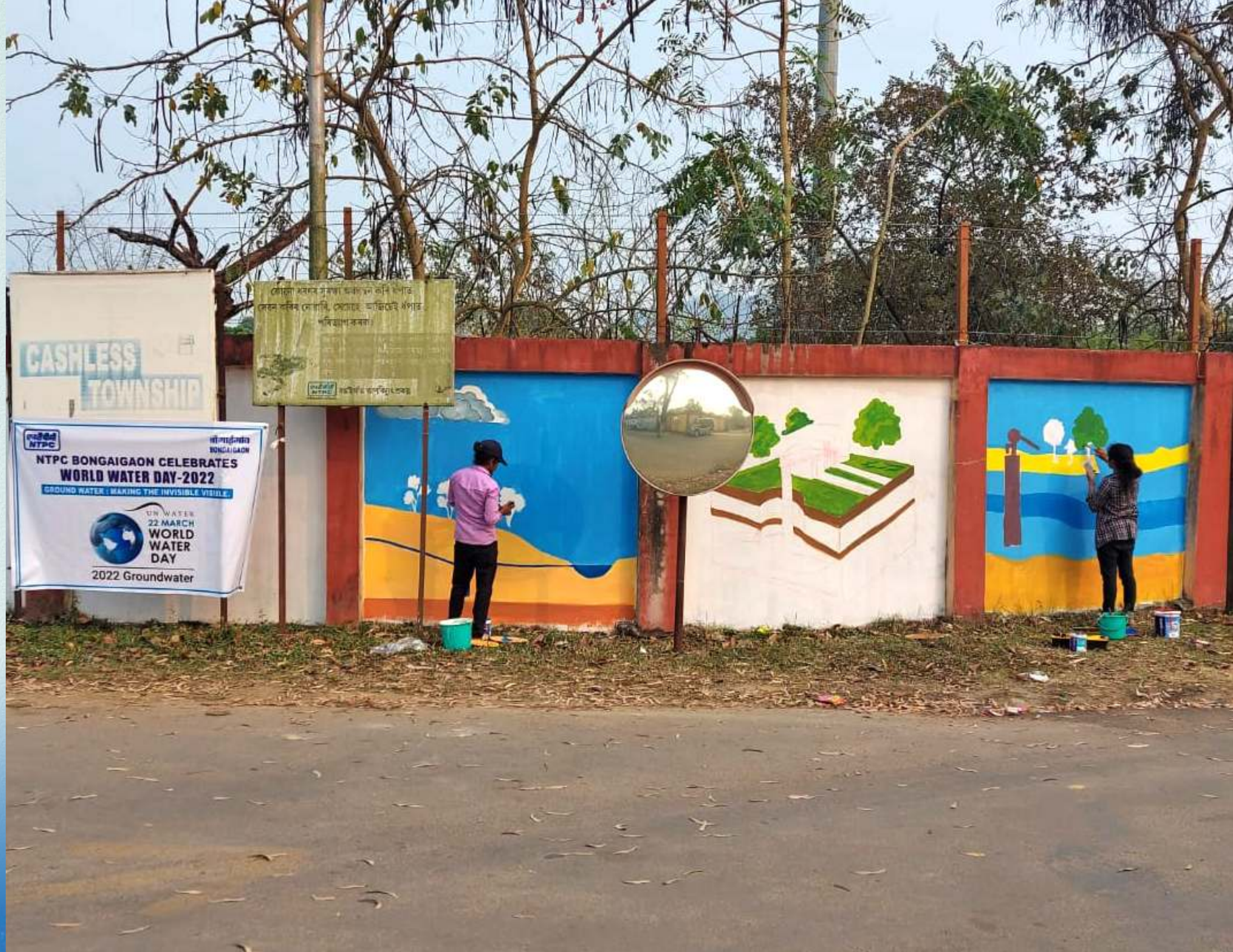
# Encouraging Family Participation in Water Conservation Programs

On the occasion of world water day, all Children, CISF and Township Residents participated.



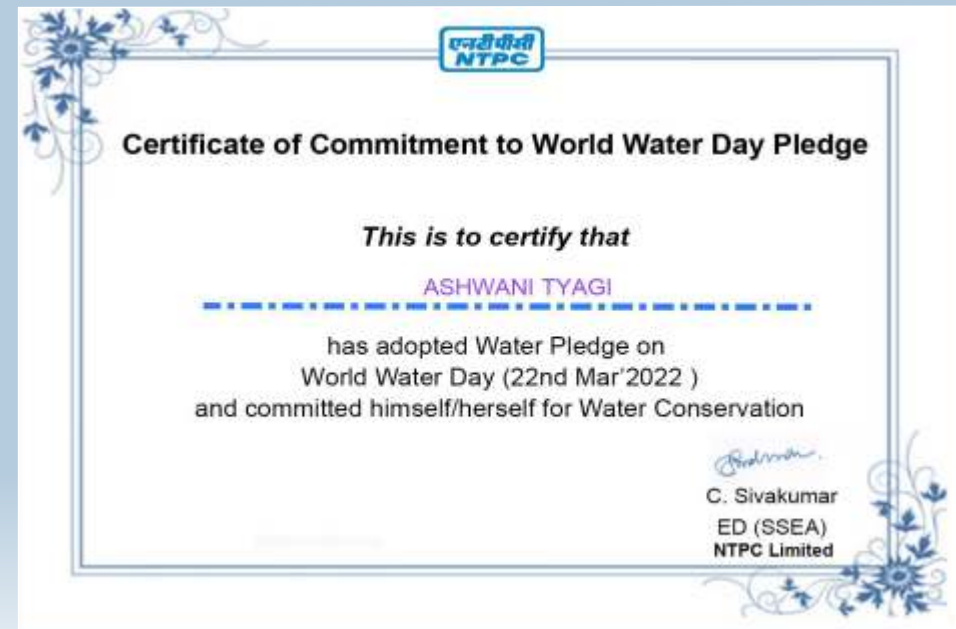
# Awareness Through Wall Paintings

Students participation in water conservation awareness through wall paintings.



# Pledge on World Water Day

All NTPC employees take pledge to conserve water on World Water Day.





# News Clippings



## विश्व जल दिवस पर एनटीपीसी मौदा ने ली जलसंरक्षण की शपथ

संवाददाता | मौदा

विश्व जल दिवस पर एनटीपीसी मौदा में मंगलवार 22 मार्च को जल संरक्षण और पानी का विवेक पूर्ण उपयोग करने की प्रतिज्ञा ली गई। प्रतिज्ञा मुख्य महाप्रबंधक हरिप्रसाद जोशी ने दिलाई। 'भूजल का सही उपयोग एवं उसका स्तर बढ़ाना'। विषय पर एनटीपीसी मौदा में पहले से ही कार्य हो रहा है। एनटीपीसी मौदा के उत्कर्ष नगर टाउनशिप में रोजाना पानी सीवेज ट्रीटमेंट प्लांट में री-साइकल किया जाता है और बागवानी के लिए उपयोग

किया जाता है। परिसर में कई जगह रेन वाटर हार्वेस्टिंग तकनीक स्थापित की गई है, ताकि पानी का नुकसान रोका जा सके। इस दौरान जल संरक्षण के महत्त्व के प्रचार-प्रसार के लिए कर्मचारियों, उनके पारिवारिक सदस्य और छात्रों के लिए निबंध लेखन, वीडियो मेकिंग आदि स्पर्धा भी आयोजित की जा रही है। इस अवसर पर महाप्रबंधक रमाकांत पंडा, पीए पीके, एके बारी, मंगेश काले, बीएसवी भास्कर, अपर महाप्रबंधक सागर रंजन साहू, अभियंके चौहान, उप महाप्रबंधक धर्मेन्द्र कुमार, मनीष निपाने आदि मौजूद थे।



## कांटी बिजली उत्पादन निगम लिमिटेड में "विश्व जल दिवस" का आयोजन

22/03/2022 | Kanti

दिनांक 22 मार्च 2022 को विश्व जल दिवस के अवसर पर कांटी बिजली उत्पादन निगम लिमिटेड में प्रभात फेरी का आयोजन किया गया। इस बार विश्व जल दिवस का थीम- "भूजल: आइए अदृश्य को दृश्यमान बनाएं" था। इस अवसर पर पेंटिंग, निबंध प्रतियोगिता, पुरस्कार वितरण, वृक्षारोपण एवं संगोष्ठी कार्यक्रम का भी आयोजन किया गया, साथ ही भूजल संरक्षण के लिए शपथ लिया गया। इस कार्यक्रम में श्री के. एम. के. घुष्टि, महाप्रबंधक (ओ एंड एम), श्री आनन्द बैनर्जी, महाप्रबंधक(मेंटेनेंस), श्री मनोज सिन्हा, महाप्रबंधक(सी एंड एम), श्री रंजीत भट्टाचार्य, अपर महाप्रबंधक(वित्त), श्री पीयूष श्रीवास्तव, अपर महाप्रबंधक(ई एम जी/ रसायन), संघमित्रा महिला मंडल की सदस्याओं एवं अन्य वरिष्ठ अधिकारीगण भी भाग लिये।



प्रती नीडि बोट्टुसु बडिसि पड्टी बिसयोंगो-मुक्तीवाथि - ఎన్టీపీసీ రామగుండం సిజిఎం సునీల్ కుమార్ కృతివంగల్, ప్రభాతవార్త.

ప్రతి నీటి బొట్టును ఒడిసి పట్టి వినియోగించుకోవాలని ఎన్టీపీసీ రామగుండం సిజిఎం సునీల్ కుమార్ అన్నారు. మంగళవారం ప్రపంచ నీటి దినోత్సవాన్ని సుందరంగా మార్చుకునే ఉద్దేశ్యంతో రాష్ట్ర నీరద్రుహింబి నీటి అవకత్యతపై అవగాహన కల్పించారు. ఈ సందర్భంగా ముఖ్య అతిథిగా పాల్గొన్న సునీల్ కుమార్ మాట్లాడుతూ... ప్రకృతి వైపరీత్యాలతో ప్రపంచంలో ఎక్కడా ప్రక్షాల్నం నీరు లభించక అల్పమతున్న వనరులను అక్షయంగా ఉంచుకోవాలని సునీల్ కుమార్ పేర్కొన్నారు. ఈ సందర్భంగా పాల్గొన్న వ్యక్తులను ప్రశంసించారు. ఈ సందర్భంగా పాల్గొన్న వ్యక్తులను ప్రశంసించారు. ఈ సందర్భంగా పాల్గొన్న వ్యక్తులను ప్రశంసించారు.

## एनटीपीसी नॉर्थ कर्णपुरा में मनाया गया विश्व जल दिवस

समूह महाप्रबंधक तजिंदर गुप्ता ने कर्मियों को जल संरक्षण की दिलाई शपथ



दिल्ली (आवाज)। एनटीपीसी नॉर्थ कर्णपुरा के समूह महाप्रबंधक तजिंदर गुप्ता ने अपने कर्मचारियों को जल संरक्षण का संकल्प दिलाया। उन्होंने संबोधित करते हुए कहा कि इस वर्ष विश्व जल दिवस का थीम भूजल के उद्देश्य को दृश्यमान बनाना है। गिरते जलस्तर के बारे में पड़ोसी समुदाय को जागरूक करने के लिए जागरूकता अभियान के हिस्से के रूप में एनटीपीसी ने स्थानीय वनांचाल महाविद्यालय में मौजूदा जल परिदृश्य पर एक वार्ता का आयोजन किया। जल संरक्षण के क्षेत्र में विशेषज्ञ रतन पद्म ने भूजल के रिचार्ज के माध्यम से जल संरक्षण की आवश्यकता पर व्याख्यान

## एनटीपीसी नॉर्थ कर्णपुरा में मनाया गया विश्व जल दिवस

दिल्ली (आवाज)। एनटीपीसी नॉर्थ कर्णपुरा के समूह महाप्रबंधक तजिंदर गुप्ता ने अपने कर्मचारियों को जल संरक्षण का संकल्प दिलाया। उन्होंने संबोधित करते हुए कहा कि इस वर्ष विश्व जल दिवस का थीम भूजल के उद्देश्य को दृश्यमान बनाना है। गिरते जलस्तर के बारे में पड़ोसी समुदाय को जागरूक करने के लिए जागरूकता अभियान के हिस्से के रूप में एनटीपीसी ने स्थानीय वनांचाल महाविद्यालय में मौजूदा जल परिदृश्य पर एक वार्ता का आयोजन किया। जल संरक्षण के क्षेत्र में विशेषज्ञ रतन पद्म ने भूजल के रिचार्ज के माध्यम से जल संरक्षण की आवश्यकता पर व्याख्यान

## तकनीकी गड़बड़ी चालू उद्योगों को बंद करने का आधार नहीं

नई दिल्ली, श्रेष्ठ। सुप्रीम कोर्ट ने शुक्रवार को कहा कि देश की अर्थव्यवस्था में योगदान देने वाले और आजीवनिक प्रदान करने वाले उद्योग को केवल तकनीकी अविश्वसनीयता (यूएन) पर्यावरणीय संजरी) के आधार पर बंद नहीं किया जा सकता है। न्यायमूर्ति जस्टिस मनोजी और न्यायमूर्ति एलएस् जोषणा ने पीठ ने कहा कि पर्यावरण अविश्वसनीयता, 1986 आद में पर्यावरणीय संजरी देने से रोक नहीं लगता है। उद्योग अद्यतन ने यह दिखाने की राहें दिखाया कि न्यायव्यवस्था के उच्च आदेश को खारिज करते हुए भी, निशर्त हरियाणा में उन उद्योगों को बंद करने का निर्देश दिया गया था, जिसके पास पूर्व पर्यावरणीय संजरी नहीं थी। पीठ ने कहा, यदि ऐसी पर्यावरणीय पर्यावरण संबंधी मानकों का शतन करती है तो अद्यतन पर्यावरण संजरी के अनुरोध और पर्यावरण पर निर्भर लोगों को आजीवनिक की रक्षा करने की आवश्यकता से बेखबर नहीं हो सकती है।

# Water Awards 2022-23



- ❖ **NTPC - RGPPL** has been declared **Winner of UNGCNI's Best Practices Challenges on Water Management & Wash in India 2022**
- ❖ **NTPC** Received **Platinum award** from **The Energy Environment Foundation** for **outstanding achievement in operational excellence and Zero Liquid Discharge.**
- ❖ **TERI-IWA UNDP Water Sustainability Awards for the year 2022-23**
  - ❖ **NTPC Rihand** : Runners up award under the category 'Excellence in Water Use Efficiency - Industrial Sector
  - ❖ **NTPC Barh** : Runners up award under the category 'Wastewater Treatment & Safe Reuse'
  - ❖ **NTECL Vallur**: Joint Winner award under the category "Excellence in Water use Efficiency - Industrial Sector





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