GOVT. OF ASSAM

IRRIGATION DEPARTMENT

सत्यमेव जयते

REPORT ON EXPOSURE TOUR TO THE STATE OF CHHATTISGARH WITH EFFECT FROM 24-09-2023 TO 30-09-2023

Submitted by :

ALL THE TEAM MEMBERS OF THE EXPOSURE PROGRAMME,

IRRIGATION DEPARTMENT,

ASSAM

REPORT ON EXPOSURE TOUR TO THE STATE OF CHHATTISGARH WITH EFFECT FROM 24-09-2023 TO 30-04-2023

TERMS OF REFERENCE :

This exposure programme has been framed out in pursuance of the decision taken in the meeting held under the Chairmanship of Honourable Chief Minister, Assam with the Irrigation Department 16th June, 2021 and Office Memorandum No. 218/Works/D-4/2026 Dated 11/9/2023 issued by the Chief Engineer, Hasdeo Basin, Water Resources Department, Chhattisgarh, Bilaspur with effect from 24-09-2023 to 30-09-2023 comprising with the following officers of the Irrigation Department, Assam.

Sl. No.	Name of Officer	Designation
1	Sri Dhrubajyoti Talukdar	Superintending Engineer, Barpeta Circle (Irrigation), Barpeta Road
2	Sri Sanjib Kumar Das	Executive Engineer, Sorbhog-Jania Division (Irrigation), Sorbhog
3	Sri Ramizuddin Ahmed	Assistant Executive Engineer, Sidli Sub Division (Irrigation), Garubhasa
4	Sri Kishor Kumar Barman	Assistant Executive Engineer, Barpeta Sub Division (Irrigation), Barpeta
5	Sri Sandeep Choudhury	Assistant Executive Engineer, Karimganj North Sub Division (Irrigation), Karimganj
6	Sri Ariful Haque	Assistant Engineer, Tezpur Circle (Irrigation), Tezpur
7	Sri Pankaj Bharali	Assistant Engineer, Dhekiajuli Sub Division (Irrigation), Dhekiajuli
8	Sri Romon Teron	Assistant Engineer, Diphu Division (Irrigation), Diphu
9	Sri Bhobojit Kemprai	Assistant Engineer, West Dima Hasao Division (Irrigation), Haflong
10	Sri Salil Sinha	Assistant Engineer, Hailakandi-Katilchera-Algapur Division (I), Hailakandi

INTRODUCTION :

The team visited various projects sites located at different Districts of the State of Chhattisgarh along with the concerned officers and staffs of the respective project to have an on spot experience of the different technical aspects such as design, operational and maintenance, innovative concept etc. and tried to explore all other essential relevant aspects such as present status and performance of different projects to the fullest potential.

A brief description of the various projects visited by the team has been mentioned below.

MANIYARI TANK PROJECT :

Brief Description of the project :

Maniyari Tank Project is situated in Mungeli District of state of Chhattisgarh. Maniyari Reservoir (Khudiya Dam) is one of the Major Irrigation Projects of the state of Chhattisgarh. This Project, situated along the banks of the Maniyari River, stands as a testament to British colonial Engineering prowess in India. The project is designed to serve as a critical water resource and irrigation scheme for the region.

The project was conceptualised and started in the pre independence era by the British Govt. in the 1924 and completed in the year 1930 to tackle the severe drought like situation prevailing during that period. This remarkable irrigation project, designed and executed under British rule, played a pivotal role in transforming the arid landscapes of the region into fertile farmlands. This report delves into the purpose, design, and impact of the Maniyari Tank Project, shedding light on its enduring legacy.

The primary objective of the Maniyari Tank Project was to harness the waters of the Maniyari River for irrigation, thereby enhancing agricultural output in the region. The project has several key goals such as :

Irrigation: To provide a consistent water supply to the surrounding farmlands, enabling year-round cultivation.

Economic Development: To stimulate economic growth by increasing agricultural yields, thereby improving the livelihoods of local communities.

Design and Construction:

The construction of the Maniyari Tank was a monumental Engineering feat for its time. The project involved the creation of a large reservoir by damming the Maniyari River. Various key design features included for the projects are :

Earthen Dam: A substantial earthen dam was constructed across the river, designed to withstand the force of the monsoon waters.

Canal System: A network of canals and channels was developed to distribute water from the reservoir to the fields.

Sluice Gates: Sluice gates were installed to control the flow of water, allowing for precise irrigation management.

Catchment Area: Extensive catchment areas were created to maximize rainwater harvesting, further replenishing the reservoir.

Salient Features of the Scheme:

1	Catchment area	854 sq.KM
2	Average rainfall	115 C.m
3	Type of dam	Earthen
4	Max. height of dam	28.96 M
5	Length of dam	2095 M
6	Top width of Dam	3.65 M
7	Type of waste weir	Submerged
8	Length of weir	78.60 M
9	Designed Flood	984.80 Cumec
10	Water spread area	25.27 Sq.KM
11	Gross storage capacity	151.26 M Cum
12	Live storage capacity	147.70 M cum
13	Dead storage capacity	3.56 M cum
14	Length of Main canal	7.55 KM
15	Length of Distributaries',	D1=55.26 KM D2=59.35 KM D3=25.45 KM
16	Head discharge	38.80 Cumec
17	C.C.A	64771 Ha
18	N.I.A	40485 Ha
19	No. of villages benefitted	327 nos
20	Total project Cost	99.40 lakhs *(circa 1930)*

MANIYARI SPILLWAY

MANIYARI HEAD REGULATOR

MANIYARI MAIN CANAL

KHARUNG TANK PROJECT :

Brief Description of the project :

Kharung Reservoir Project is a old completed medium tank project. This project was constructed between the year 1920 to 1930 across Kharung river in Bilaspur district of Chhattisgarh. The location of project is within the Latitude 22-17-21" & Longitude 83-13'-30".

Kharung Reservoir Project was originally designed to irrigate an area of 24291 Hectares of Paddy but the canals ware constructed for 32252 Hectares. Later on after the construction of Pondi and Malhar distributaries more area was brought under command and the designed area increased to 40485 Hectares, whereas actual irrigation achieved was 48800 Hectares by both right and left bank canal system together in 208 Villages against the agreemented area of 48783 Hectares. Another interesting aspect about the project is that the Kharung Reservoir Project is also leased out for 7 years to the Fishery Department at a cost of Rs.26 Lakhs per annum for bringing additional revenue to the Department. Annually 85 to 90 tonnes of fish production is done through this project.

Salient Features of the Scheme:

1	Catchment area	614 sq.KM
2	Average rainfall	113.9 C.m
3	Type of dam	Earthen
4	Max. height of dam	21.31 M
5	Max. Length of dam	396.24 M
6	Top width of Dam	3.05M
7	Type of waste weir	Ogee type Stone Masonry waste weir
8	Length of weir	121.92 M
9	Designed Flood	993.93 Cumecs
10	Water spread area	38.07 Sq.KM
11	Gross storage capacity	195.15 M Cum
12	Live storage capacity	190.32 M cum
13	Dead storage capacity	2.83 M cum
14	Length of Main canal	R.M.C=29.5 KM L.M.C=80.5 K.M
15	Length of Distributaries',	L.B.C=285.13 KM R.B.C=69.33 KM
16	Head discharge	43.64 Cumec
17	C.C.A	66401.62 Ha
18	N.I.A	48800 Ha

19	No. of villages benefitted	208 nos.
20	Total project Cost	10103.69 lakhs

KHARUNG SPILLWAY

KHARUNG HEAD REGLATOR

KHARUNG MAIN CANAL

HASDEO BARRAGE, DARRI

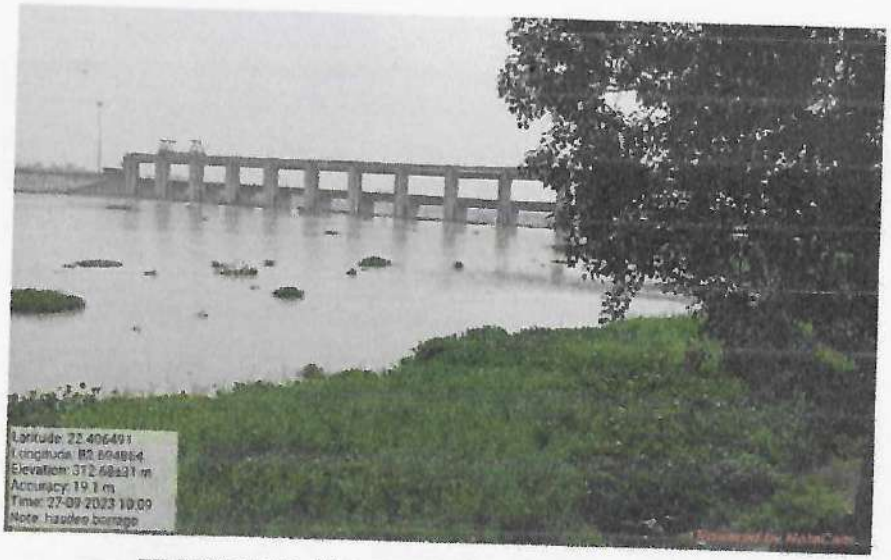
Brief Description of the project :

Hasdeo Barrage Project is a Major irrigation project. This project was completed in the year 1967 across Hasdeo river in Korba District of Chhattisgarh. The location of project is within Latitude 22-24-18" & Longitude 82-41'-48".

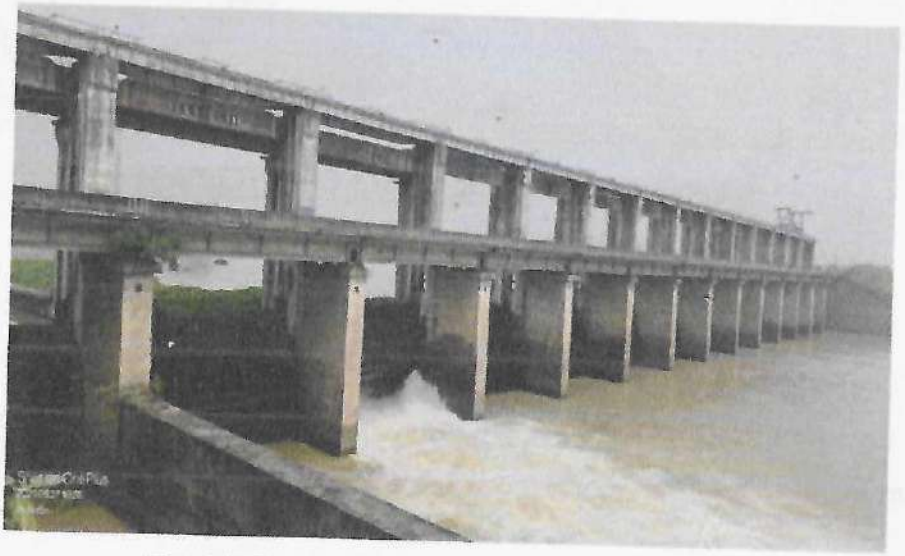
Hasdeo Barrage Project is designed to irrigate CCA of 247400 Hectares. This Irrigation Project adds to a significant infrastructure development of the state. Spanning a length of 283.77 meters, this project boasts 14 gates, making it a vital component of regional irrigation and water management. With a catchment area covering 7723 square kilometres, it plays a crucial role in harnessing water resources for agricultural and other purposes. Additionally, the earthen dam, measuring 609.60 meters in length, adds to the project's water storage and distribution capabilities, making it a vital asset for the region's agriculture and water supply needs.

Salient Features of the Scheme:

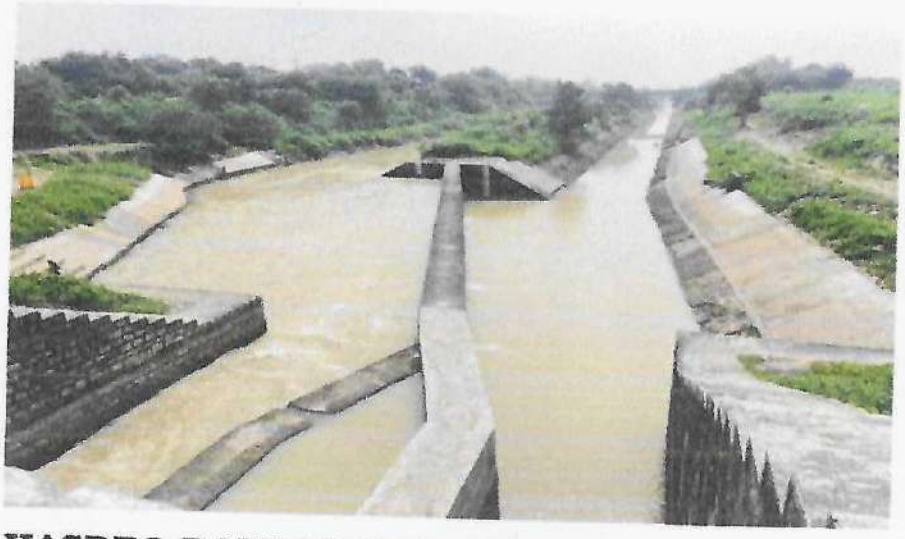
1	Catchment area	7723 sq KM
2	Total submergence area at MWL(Max water Level)	2670 Sq KM
3	Total submergence area at FRL(Full Reservoir Level)	2590 Sq KM
4	Average rainfall	133 C.m
5	Type of Structure	Gated
6	Designed Flood Control	19820 cumecs (1.00 lakh Cusec)
7	Full reservoir level	287.04 M
8	Highest flood level	283.77 M
9	No of barrage gates and size	14 nos (size-18.29x7.92M)
10	Lowest foundation level of dam	269.74 M
11	Drift surface	278.87 M
12	Road Barrage level	293.52 M
13	Pier highest level	303.27 M
14	Width of Road	7.32 M
15	Length of earthen dam	609.60 M
16	Reservoir level	275.08 M (902.50 feet)
17	Canal length(Right Bank)	48 KM
18	Canal length(Left Bank)	49 KM
19	C.C.A	247400
20	GCA	255000
21	Design Flood Discharge	19824.00 Cumecs



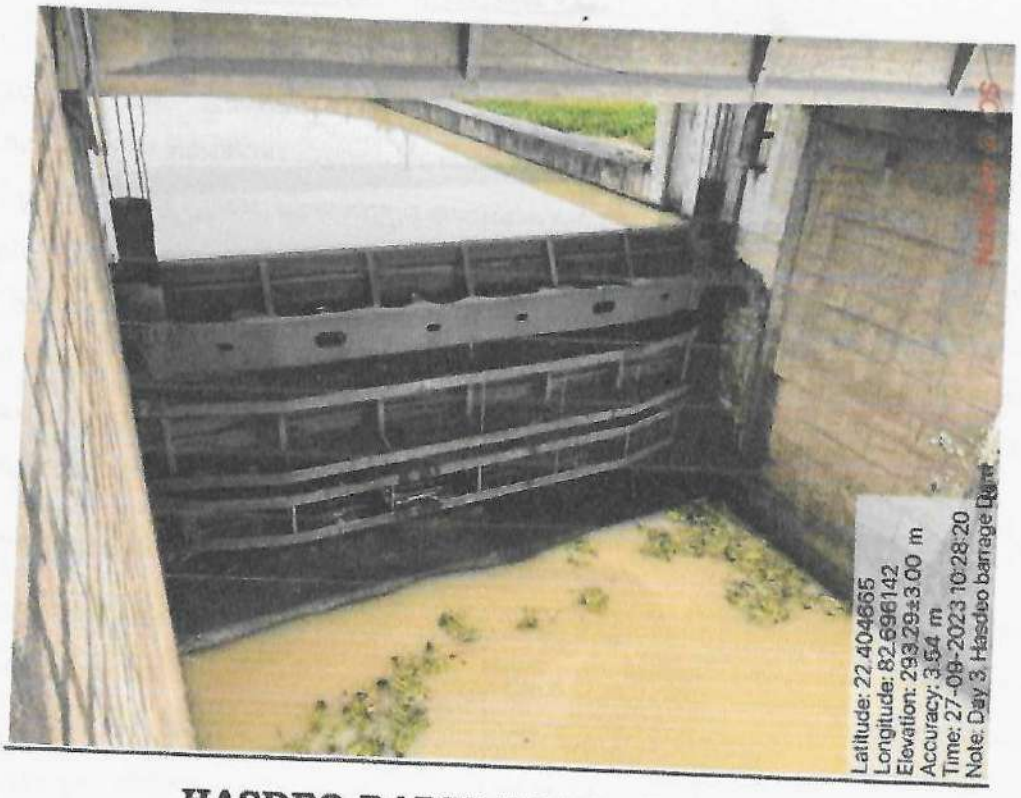
HASDEO DARRI BARRAGE U/S



HASDEO DARRI BARRAGE D/S



HASDEO DARRI BARRAGE LEFT MAIN CANAL



HASDEO DARRI BARRAGE GATE

HASDEO DARRI BARRAGE D/S ANICUT

This Anicut project has been constructed approximate 2.00 km D/S of the Hasdeo Darri Barrage. This is a concrete structure constructed across the river Hasdeo to retain approximately 22 million cubic meter of water at a cost of 56.00 crore and the water is used for drinking purpose of the locality.

GHONGHA RESERVOIR PROJECT:

Brief Description of the project :

The Ghongha Reservoir Project, situated in Takhatapur, Kota, is a remarkable endeavour in water resource management. Covering a catchment area of 43 square miles, this project plays a pivotal role in harnessing and conserving precious water resources for the region. The heart of this initiative is a homogeneous earthen dam, stretching over 720 meters in length and soaring to a maximum height of 17.88 meters. These impressive features make Ghongha Reservoir Project a vital infrastructure asset for irrigation, water supply, and flood control, ensuring sustainable development and improved livelihoods for the surrounding communities.

Sailent Features of the Scheme:

1	Catchment area	43 sq.KM
2	Average rainfall	196.6 C.m
3	Type of dam	Earthen
4	Max height of dam	17.88 M
5	Length of dam	720 M
6	Top width of Dam	4.50 M
7	Type of waste weir	Submerged
8	Length of weir	123.45 M
9	Designed Flood	23,520 Cusec
10	Water spread area	788 Ha
11	Gross storage capacity	1199.45 M cft
12	Live storage capacity	1060.74 M cft
13	Dead storage capacity	138.71 M cft
14	Length of Main canal, RBC	16.73 KM
15	Length of Main canal, LBC	12.55 KM
16	G.C.A	15002.359 Ha
17	C.C.A	10899.30 Ha
18	Total project Cost	963.849 Lakhs

GHONGHA RESERVOIR

GHONGHA SPILLWAY

ARPA BHAISAJHAR BARRAGE PROJECT

Brief Description of the project :

The Arpa Bhaisajhar Barrage Project is an ongoing project, which is located in the village of Bhaisajhar within the Kota tehsil of Bilaspur district, is a significant infrastructure initiative situated in the Arpa/Mahanadi basin. This ambitious project, which commenced in 2013 and is currently under construction, holds great promise for the region. With a vast catchment area spanning 1693.86 square kilometres, an impressive barrage length of 147 meters featuring 8 barrage ways, and an extensive canal system, including a 56.60-kilometer main canal and a 27-kilometer branch canal, this project is poised to positively impact the lives of residents across 102 villages by providing essential water resources for irrigation and sustainable development.

Sailent Features of the Scheme:

1	Catchment area	1693.86 sq.KM
2	Average rainfall	96.6 C.m
3	Type of Structure	Gated/ Under sluice bays of 12 M each
4	Length of Barrage	Overall length 147 m
5	Barrage Way	8 Nos (12mx10.00m)
6	Total no of Piers	9 Nos
7	Afflux Bund Level	305.00 m
8	U/S crest level of Barrage	292.25 M
9	Designed Flood	3402.16 Cumec
10	Designed Irrigated area	25000 Ha
11	Gross storage capacity	22.168 M cumec
12	Live storage capacity	16.409 M cumec
13	Dead storage capacity	5.759 M cumec
14	Length of Main canal	56.60 KM
15	Length of Branch canal	27 KM Distributory and Minor = 303.30 KM
16	Head discharge	35.20 Cumec
17	Total Commanded Area	31570.95 Ha
18	Total area under cultivation	25970.95 Ha
19	No. of villages to be benefitted	102 nos
20	Total project Cost	326.45 Crore, L.A .= 900 Crores

ARPA BHAISAJHAR BARRAGE

KARHANI ANICUT HYDRO-MECHANICAL PUMP-BASED LIFT IRRIGATION SCHEME

Brief Description of the project :

The Karhani Anicut Hydro-Mechanical Pump-Based Lift Irrigation Scheme is an innovative and vital water resource management project located in the village of Karhani, within the Marwahi district, along the Son River.

The Karhani Anicut Hydro-Mechanical Pump-Based Lift Irrigation Scheme stands as a testament to innovative engineering solutions in the field of water resource management. With its unique turbine pump setup, collaborative research and application, and its potential to transform agriculture in the Marwahi district, it represents a significant step toward sustainable development and improved livelihoods for the local population.

The following report provides an overview of the scheme, focusing on its unique features, components, and the collaborative effort that has gone into its design and implementation.

Project Overview :

The scheme is cantered around the Karhani Anicut, strategically positioned on the Son River. One of its distinguishing features is the installation of a turbine pump and ramp pump, positioned 90 meters downstream from the anicut. The design and supply of this specialized turbine pump setup were entrusted to the esteemed Indian Institute of Science (IISC) in Bangalore, highlighting the collaboration between research institutions and practical application in addressing water resource challenges.

Operational Process :

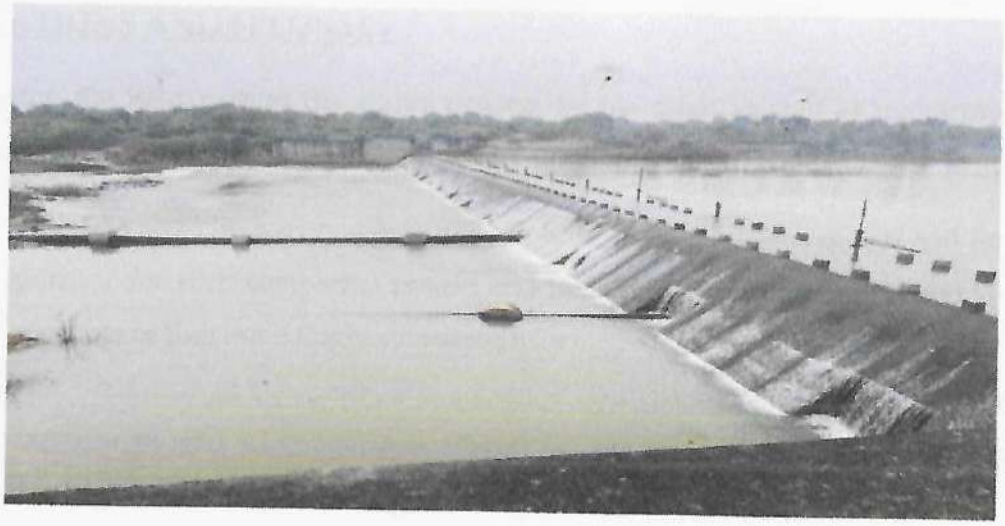
The heart of this scheme lies in the ingenious utilization of hydro-mechanical power. Water from the anicut is channeled into penstock pipes, which then feed into the turbine and pump setup. Here, the kinetic energy of the flowing water is harnessed to operate the pumps. These pumps, working in unison, exert pressure on the water, effectively lifting it to a storage tank located 16 meters above the river's surface. The storage tank, positioned 720 meters from the pump setup, serves as a crucial intermediate point in the water distribution process.

Water Distribution :

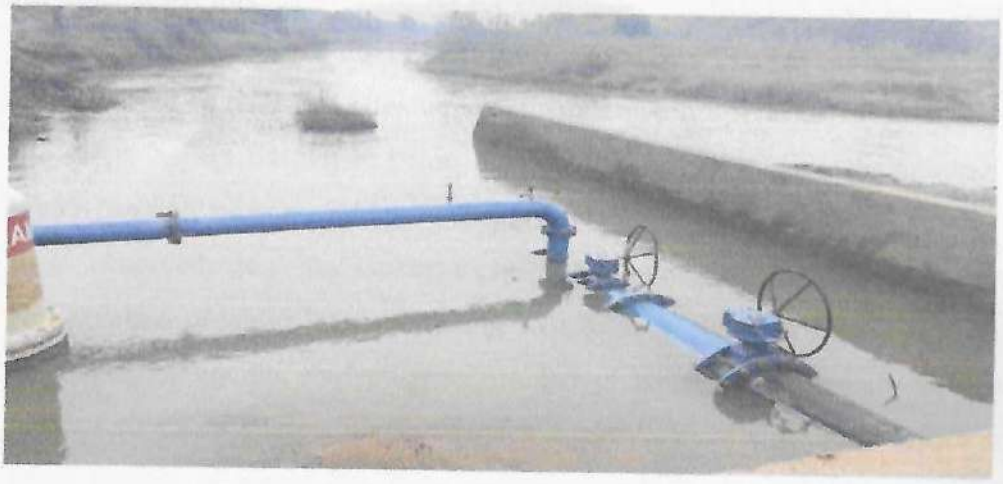
From the storage tank, the lifted water is distributed to agricultural fields through a network of well-designed field channels. This phase of the scheme ensures that the water resources are efficiently utilized for irrigation, promoting agricultural productivity and enhancing the livelihoods of local farmers.

Societal Impact :

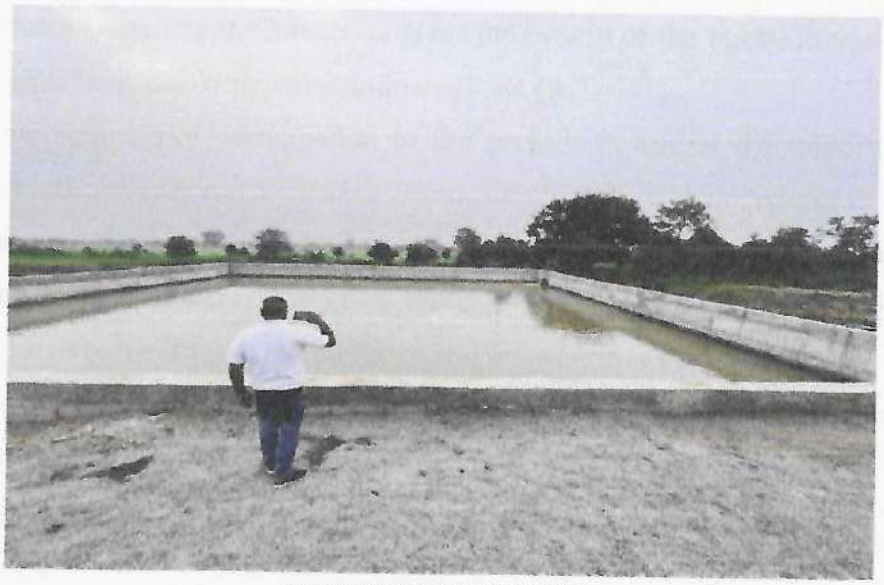
The Karhani Anicut Hydro-Mechanical Pump-Based Lift Irrigation Scheme is poised to make a substantial difference in the lives of the local community. By providing a reliable and efficient source of water for irrigation, it empowers farmers to cultivate their lands more effectively, ultimately contributing to food security, increased agricultural yield, and economic growth in the region.



KARHANI ANICUT



Hydro-Mechanical Pump-Based Lift Irrigation Scheme



STORAGE TANK

OBSERVATIONS AND FEEDBACK:

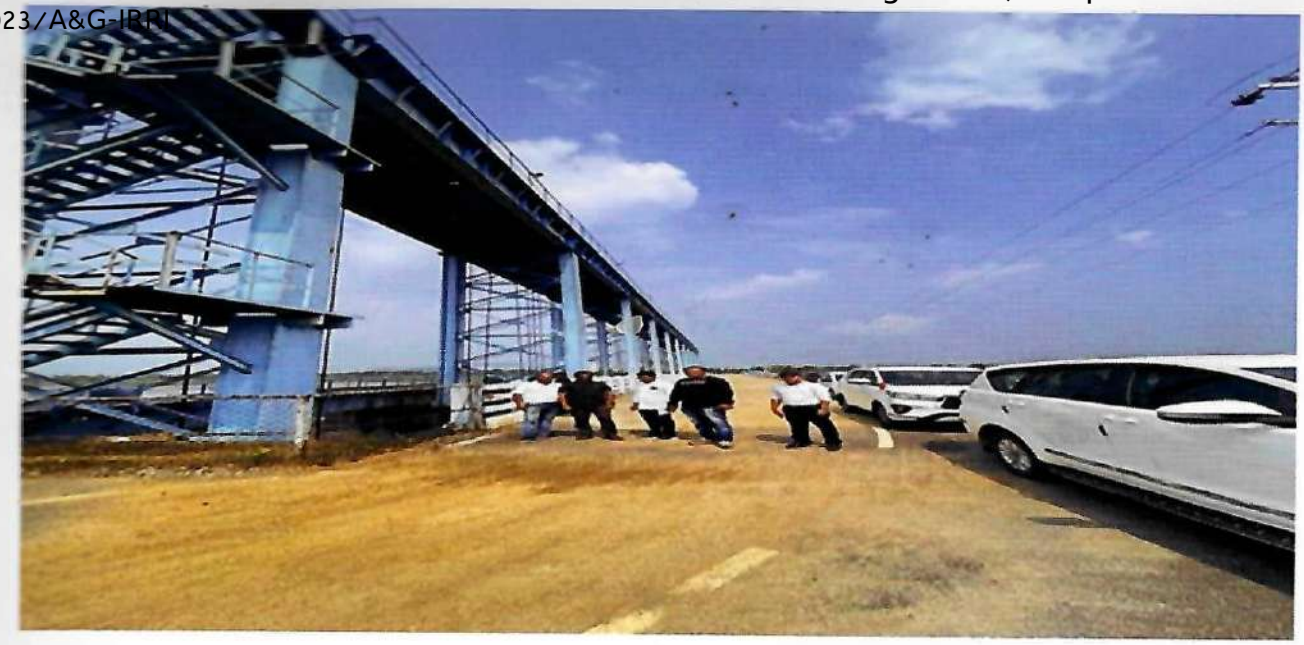
During the field visit to the above projects by the team as well as interaction with the various concerned officers of the projects following observations and feedbacks are made :

1. A fixed yearly budgetary allocation has been kept in for operational and maintenance purpose for each completed project and the allotted amount has been credited to the accounts of Executive Engineer quarterly.
2. The Civil part of the projects is executed and maintained by the Civil wing of the department and Mechanical & Electrical part is executed and maintained by the Mechanical and Electrical wings of the Department.
3. Innovative concept being utilised as per the site requirement and smooth operational facilities of the machineries etc. As for example, it is observed that the wheel for lifting the mechanical gates for the regulator for the canal system is provided along with the gates instead of over the gates which ensure smooth operation for the gates. Also, for the safety aspect the wheel being operated only with a specially designed key tool which can only be operated by the Departmental staffs.
4. It is observed that the Government of Chhattisgarh has emphasised much on conservation of water by constructing structures in different rivers. Further, it is also observed that for the said purpose number of anicut structures are also built across various rivers to successfully hold back a body of water through which millions of cubic meters of water has been conserved which is used for assured irrigation, providing drinking facilities as well as for recharge of ground water.
5. Natural water being judiciously utilised by various Departments with the help of Water Resource Department, Chhattisgarh for the benefit of the public in various fields such as agriculture, drinking water, industrial use etc.
6. Active community participation to the projects is one of the important ingredients observed.
7. Almost all the important projects of the State of Chhattisgarh have been covered with beautiful Rest Houses/Inspection Bungalow etc. with all modern essential amenities and services for smooth maintenance and inspection of each project.
8. The superannuation age for the state of Chhattisgarh for the Government Servant is 62 years.

CONCLUSIONS :

This exposure programme immensely benefitted both the states as far as exchange of experience, knowledge, bottlenecks encountered in execution as well as maintenance of various projects within the ambit of limited resources. The hospitality as well as cooperation extended by the official of the Water Resource Department, Government of Chhattisgarh is really praise worthy. The initiative taken by our Irrigation Department, Government of Assam for arranging such a beautiful as well as fruitful exposure programme for the officials of the Department is also extremely praise worthy. Such kind of endeavour not only enhances the bond between the people of two states but also enable to exchange knowledge, ideas and experience between the officials of both the states.

SOME PHOTOGRAPHS DURING THE VISIT TO CHHATTISGARH



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(Irrigation), Hailakandi

Report on Exposure Visit to Punjab

The following team of officers from Irrigation Department led by Shri Pabitra Ram Khaund, Secretary to Government of Assam, Irrigation Department visited Punjab during 30 November, 2023 to 4th December, 2023.

1. Shri Pabitra Ram Khaund, Secretary to the Government of Assam, Irrigation Department
2. Shri K M Gopal Sana Rajkumar, Chief Engineer, Irrigation, Assam
3. Shri Mayur Bhuyan, Addl. Chief Engineer, O&M (Minor), Irrigation, Assam
4. Shri Gopal Chetri, Under Secretary to the Government of Assam, Irrigation Department
5. Shri Monewsar Deka, Executive Engineer, Hajo- Jalukbari Division, Irrigation
6. Shri Bedanta Bora, Executive Engineer, Morigaon Division,Irrigatiion
7. Shri Akikul Aman, Asstt. Executive Engineer, Boko Sub-Division, Irrigation.

The objective of the Exposure visit was to understand the Irrigation Systems and Practices including the Organisational Structures, Implementation and O&M of Irrigation/ Water Resource Projects, Agriculture etc. in the State of Punjab and thereby acquire some knowledge that may be replicated in the Irrigation/Water Resource Sectors in Assam.

The visiting team arrived Chandigarh at 4 pm on 30th November, 2023 and was provided with the logistics (Accommodation and Transport) by the Water Resource Department, Govt. of Punjab. On the same day at about 5 PM, an interaction meet was held at BBMB Rest House, Chandigarh with Senior Officials of WRD, Punjabwherein a detail PPT presentation on Irrigation/Water Resource Department of Punjab was made by Shri Pawan Kapoor, Chief Engineer, Vigilance, WRD& MD, Punjab Water Resource Development Corporation (PWRDM) and his officials in charge of different verticals.

AT BBMB REST HOUSE, 30TH NOV, 2023

On 1st December, 2023, the visiting team was taken to Ludhiana District to give a physical insight cum field interaction on the **Sir Hind Canal**& it's Branch/ Distributary Networks. The Sir Hind Canal, one of the largest irrigation canal in the Indus River System was constructed by Punjab PWD during 1867-82 (inaugurated in 1882 CE). It begins at Ropar head works near Ropar city in Roopnagar district of Punjab and heads southwest to Doraha in Ludhiana district. At Doraha, the canal splits into three, **the Abohar branch**, **the Bathindaand Patiala Branch Canals**, each of these further divides to distributaries and minors extensively to irrigate a large swathe (about 5200 sq Km) of farm land of the Malwa region of Punjab. Once a partially arid zone, this area is now extremely fertile due to water distributed by the canal network. Sri Ashutosh Kumar, SE incharge of the Ludhiana Project WRD circle gave a PPT presentation and explained the details during the field visits to the Barrages, different branches and

distributaries etc. under the Sir Hind Canals system. Besides the SE, interaction was also made with the Executive Engineers and SDOs incharge of the Project.

On 2nd December, 2023, the visiting State Officials were taken to Bhakra Nangal Project which contains Bhakra Dam, Nangal Dam, Nangal Hydel Channel, Gunguwal and Kotla Power Houses. The development of Bhakra Nangal Project was begun in 1948 and was finished in 1963.Bhakra Beas Complex, now **Bhakra Beas Management Board** is one of the biggest Multi Purpose River Valley System in India. It comprises of Bhakra and Nangal Dam for water system and power age reasons. Bhakra Dam, the idea of which had been conceived in 1908 was constructed on Sutlej River in Bhakra village near Bilaspur in Bilaspur District , Himachal Pradesh with a total cost of Rs 245.28 Crores during 1948-63 as a Concrete Gravity Damwith 518.16m length and 226 m height. The catchment area is 56980 sq Km and is in Himachal Pradesh& Punjab, the upstream reservoir spreads for a length of 96.56 KM and surface area of 168.35 sq Km .The Dam constructed for storing excess rain water provides Irrigation and generates electricity (2 power houses with a total installed capacity of 1450 MW) for Punjab, Haryana, Rajasthan, Gujarat and Himachal Pradesh. It has a storage capacity of 9621 Million Cu m, known as Govind Sagar named after 10th Sikh Guru. There are flood spillways and 16 stream outlets (8 each in two levels) with a size of 2.64mx2.64 m that can release 8212 cumecs of rising waters. Nangal Dam is another Dam in Punjab constructed downstream of Bhakra. Both Bhakra and Nangal Dam are together called **Bhakra Nangal Dam**. Shri C. P. Singh, Chief Engineer, BBMB explained with a PPT presentation about the Bhakra Nangal Dam Project. He also took the visiting team to the BBMB Museum to show the different models of the project components, stages of implementation of the project including the conceptualization, Planning, designing, implementation, visits by various dignatories-both National and international. The team was taken for a short boat ride on the Govind Sagar, the Dam Reservoir including an inspection of the Power House to either side of the Dam and also the Dam Axis tilt measuring system. The Nangal Dam Reservoir to the Downstream of Bhakra Dam site was also seen.

After the Bhkara Nangal Dam Project, the team was taken to show a Lift Irrigation Scheme at Anandpur Sahib located downstream of Gunguwal Power House that uses the Sutlej River Water. There are 3x50 HP+ 3x25 HP Pumps that draws the water from the canal and lift to an overhead tank before it is supplied to farm land through underground PVC Pipes. Then the team was taken to Kotla Power House in Roopnagar District constructed on the Bhakra Main Line (BML).It could be known that the Plant has a total output of 77 MW, operated by BBMB and presently maintained by Punjab Energy Development Authority. The team also visited the Roper Head work inaugurated in 1882 CE on Sutlej river that diverts the river discharge to Sir Hind Canal through a Head Regulator so as to cater needs of Malwa Region .

On 3rd December, 2023, an interaction meet was arranged with the Officials of Punjab Ground Water Authority so as to have an idea of the authority, its organisational structures, Guidelines, Web Portal Development, Control and Regulation Practices, Revenue Generation and Budget, Penal Provisions and the difficulties faced during the implementation etc. Mr Maninder Singh, Ex Engineer of the PGWA explained the details of the authority which is the ASGWA which is presently in the nascent state.


On 4th December, 2023, the team had visited Amritsar and interacted with Sri Kuluinder Singh, SE, UBDC and his officials comprising EE, AEE and AE. The Upper Bari Doab Canal (UBDC) Project was explained in detail. It is one of the oldest canals in India that was first built by Emperor Shah Jehan in 1693 for carrying water of Ravi River from Madhopur to Lahore. Improvements in the canal system were made by Maharaja Ranjit Singh in 19thCentury. Later, the East India Company rebuilt the canals under the name UBDC. It has a canal network of 2955 Km with 7 Main/ branch canals and 247 distributaries having a culturable command area of 5.73 Lac hectares.


The visiting team completed the Exposure trip with positive and successful notes. It is worthmentioning that Government of Punjab extended full logistic and technical support to the visiting team during the entire visit

from 30 December, 2023 (AN) till it left Chandigarh on 5th December, 2023(FN).The following are the important take ways about the Irrigation System of Punjab.

Takeaways:

1. Punjab Irrigation Department, now named as Punjab Water Resource Department has the following wings:
(a) Canal Administration
(b) Drainage Administration
(c) Vigilance and Quality Control
(d) Shahpukandi Dam Design and Construction
(e) Directorate of Ground Water Management
(f) Punjab Water Resource Management and Development Corporation (PWRMDC)

2. Punjab is an agrarian state with an agriculture area of 44 Lac Hectare.

3. The Sutlej, Beas and Ravi rivers form the main drainage system in the state of Punjab.Other drainage channels include Ghagar, White & Holy Bein, Kiran Nalah, Chakki River, Sakki Nalah, Kasur Nalah and other numerous choes (seasonal rivulets) originating in Shivalik Hills. In area where natural drainage arelacking, artificial drains were dug for disposal of storm water and seepage from waterlogged areas.

4.Punjab has a 8 Nos. of Canal system with a total canal network of 14500 Km (Main-1512 Km, Disty/Minors-12988 Km) of which 10155 Km lined and rest unlined. Sir Hind Canal has the longest network of 3215 Km followed by UBDC which has 2955 Km. The rest are Sir Hind Feeder (1700 Km), Bhakra Main Line (1501 Km), Eastern Canal(856 Km), Bist Doab Canal (805Km), Shahnehar canal system(164 Km) and Rajasthan Feeder (149.53 Km).

5. There are mainly 4 Nos. of Irrigation Headworks - all are reservoir based operated by Dams/Barrages with motorised regulatory gates.

6. Of the 44 Lac Hectares of total cultivable land, area irrigated by canals is 30 Lac Hectare. Rest area is covered by electricity.

7. Punjab mostly follows double cropping – Predominantly Paddy and Wheat. Vegetables and Fruits are also grown in the state.

8.Automatic Water Level recorders are installed in the Headworks for real time monitoring of water levels in the Source Rivers. Tail Gauges are installed at the tail ends of the Distributory/Minors to check the water level. An App was also developed for monitoring tail gauge reports.

9. A systematic procedure based on water allowance decided on topography and water availability etc. is followed for release of water in canals which ranges from 1.95 – 7.00 Cusec/1000 acres for the 8 canal systems in the state.

10. Water is released as per demands by Farmers. Warabandi system is in place. A Deputy Collector (Ziledar)and Patwaris were appointed for mapping of the Command area and collection of Irrigation Service Charge(Water Cess) which is @Rs 50 per crop per acre in Irrigation Subdivision. The Deputy Collector prepares the Warabandi Plan for every 7 Days of Supply period.Separate Rates charged for commercial supplies.

11. SCADA is being implemented in the canal system for realtime monitoring and informed decision making.

12. Command area of each canal outlets (Chakbandi) are digitized by tracing of Chak boundaries from Chakbandi maps using Arc GIS software. The entire command area are geo referenced.

13. Digital Water Level Recorder (DWLR) with telemetry are installed on Medium and Deep Tubewells/Aquifers. Flow Meters are installed in canal to monitor the water recharge. Canal based Artificial Recharge system implemented in Groundwater Overexploited area.

Recommendation:

After a field study and interaction with Engineers of the Punjab WRD, the following recommendations are made.

1. As in the state of Punjab where maximum coverage of Agricultural land is through canal irrigation (3O Mha out of 44 Mha), the Irrigation Department should give more emphasis on Major/Medium Irrigation Projects by proper planning and investigations. This is important aspects of Irrigation Planning may have to be studied properly by floating a RFP to prepare a Master Plan for Irrigation Development in the State. This requires drainage/basin studies and also the topography of the state etc that may require the GIS and Remote Sensing Tools.

2. For O& M activities, a SOP may be framed which will guide the Ex Engineers to take up the regular maintenance work as follows.

(a) All EEs shall float a % age rate tender in the month of March of the preceding year to select a panel of Contractors and accept rates for executing different items of M& R works as in prevailing SOR for the next financial year. After allocation of budget and approval of O& M work by competent authority, the EE may issue the work order to the empanelled contractor as per the accepted rates. This will avoid the delay in floating and acceptance of tender.

(b) As for O& M works under revenue head, the Chief Engineer, Irrigation may be authorised to issue sanction (AA/FS) and allocate the budget to the concerned EEs based on some matrix to be developed on the data on Irrigation schemes for e.g., Nos, year of completion, year wise IPA/IPU,Water Cess, Past yearly expenditures including Original Cost, No of beneficiaries, WUAs etc.

3. The Original Major Work of development of Major/Medium/Minor Schemes of value exceeding Rs 20 Cr or above may be taken up on EPC mode. It will help the department to execute more numbers of Irrigation Projects with a better success rate as the entire responsibility of Engineering, Procurement and Implementation with certain period of O&M (Say 5 Years) may be entrusted to the Agency outsourced. The Departments role will be restricted to award of contract, supervision, monitoring, cost control, reporting and certification of works for payment etc. The chances of project failures and deviation of targets would be avoided when the EPC mode is carefully implemented.

4. As of now, the Departmental Engineers are preparing the bills for the work done through the contractors. This system has to be dispensed with giving the responsibility to the contractors who will raise their bills as per the measurement of works after joint verification with Departmental Engineer. Therefore, it becomes mandatory for a contractor or to engage /hire the services of non departmental Engineers to take the measurement of his

works and prepare his bills. The departmental engineers will simply check the measurements /certify the bills for payment and keep records of such payments for the measured work.

5. As our state has no of tributaries, rivulets, water bodies, we may take up MI schemes in the form of Tanks, Surface Flow, Lifts, Check Dams etc. If we can divert the untapped tributaries/rivulets at suitable location in the upstream by C/o Diversion Head Works (Barrages) to regulate the flows through canal systems across the districts, more and more area could be brought under Irrigation.

6. Where there are no alternate Surface sources, we may use ground water based on availability and demand.

7. We may have to install digital level recorder with telemetry for monitoring Ground Water in Deep/Medium Aquifers. Flow Meters/Water Level Recorders are also required to be installed in Surface Water/Canals/Source Rivers etc.

8. There may be a separate Design Wing headed by Addl. Chief Engineers (P&R). All Designs of Irrigation Projects irrespective of its category shall be done by this wing irrespective of Project location/division. The Wing should have minimum 2 SEs, 3 EEs, 3 AEEs and 9 AEs and 9 JEs etc. Hydrology shall be a part of design.

9. The Irrigation Department may create a common data central, for online monitoring of projects which will help in project implementation and assuring the Irrigation supplies in time.

10. SCADA may be implemented in Major/Medium Irrigation Projects of the State.

11. The position of Chief Engineer, Irrigation may be designated as Engineer in Chief and Chief Engineer, Minor Irrigation may be renamed as Chief Engineer, Irrigation. This will help the Department for better coordination with all Stakeholders in State and Central Governments. The Engineer in Chief will be single nodal agency in this case and he has to be given the administrative and financial authority in the Directorate. Chief Engineer, Irrigation may use only Technical sanction and apply supervisory, monitoring and quality control etc for the Irrigation Projects.

The exposure visit ended on 4th December, 2023 with a lot of appreciation to Government of Punjab in Water Resource Department.

Report on exposure visit to Telangana

In pusunace of Govt Order vide E File No 229019/315 dated 3rd January, 2023(ref . Annexure –1), a team of 7 Engineers of Irrigation Department, Assam made an exposure visit to Telangana State during 17-21 Januray, 2023 with an objective to interact with the officials of Irrigation & CAD Department and also visit the irrigation project sites of Telangana so that best practices of the State as regards to planning, implementation, Operation & maintenance, Monitoring and Control and application of latest technology thereof may be experienced.

As per the schedule (ref . Annexure 2), the visiting team participated in an interaction meeting with the team of Senior Engineers of Irrigation & CAD Department, Govt of Telangana under the chair of Engineer in Chief (General), I & CAD Department which was held in the Conference room of the Deptt in **Jalasoudha Building** on 18th January, 2023, (10 am – 1 pm). A PPT presentation was made by the I & CAD Dept, Govt of Telangana about the organisational structures, mandate, state profile and also the project details showing the current status, targets & achievements , budget, project output-outcomes, technological innovations/IoT /Latest tools application for monitoring and control for decision support system etc. Content of PPT is enclosed herewith (ref. Annexure –"X")

On the same day, the visiting team was taken to **Pocharam Dam site** in **Medak District** which is about 150 Km from Hyderabad. The Dam built over Allair, a tributary of Manjeera river during 1916-1922 by Hyderabad Nizam is still maintaining Full Reservoir Level (FRL) due to good inflows. Thereafter, the team was taken to **Nizamsagar proje**ct located in **Kamareddy di**strict. The Dam built across Manjeera river,a tributary of Godabari river during 1923- 1931 by Hyderabad Nizam is benefitting an area of **2,31,339 Acres**. The canal network extends upto **155.32 KM**.

On 19th Jnauary, 2023, the host officials took the visiting team to **Sri Ram Sagar Project**, a multipurpose Dam across Godabari river located in Nizam abad District . The project started in 1963 and completed in 1993 has 4 turbines each consuming 2200 cusec of water from the reservoir (90 TMC) has been generating 36 MW of hydropower besides having an ayacut of 14.4 Lakh acres. Next the team was taken to Kaddam Narayana Reddy Dam site in Nirmal District. The Dam was built by Nizam of Hyderabad on river Kadem, a tributary of Godabari is still supplying water to an ayacut of 68150 acres through a canal network of 81.26 Km. After that, the team was taken to Laxmi Barrage, a constituent part of

Kaleshwaram Project in Medigadda District. There are 85 Hydro Mechanical Radial gates in the 16 Km long Laxmi barrage with a storage of 16.17 TMC which is one of the largest dams in Telangana and was built by I & CAD Dept through L& T in just 24 months. The project takes a credit of setting the world record of concrete casting of 25,584 Cum in 72 hours. There are some huge pumping stations namely called **Kaleshwaram Lift Project (KLP)** , India's most ambitious lift irrigation projects located at Medigadda pumping station with 17 nos of Gigantic pumps, , Nandi pump station at Peddapali (4 Nos of pumps lifting Godabari water from Yellampally project) and Gayatri Pumping Stations (at Karimnagar district) and many others etc. mostly all underground, constructed by Megha Engineering Co. to draw water from intermediate source reservoirs (reverse pumping system to allow Godabari to flow upstream) several KMs ahead through tunnels and deliver to upper reservoirs at higher elevation of about 120 m and carry forward through gravity canals and tunnels to other pump stations to create artificial reservoirs . Pump capacity mostly ranges from 43 - 135 MW and are powered by Electrical and Gas based power substation.

Kameswaram Project taken up in 2016 and completed in 2019 at a cost of Rs 1.08 lakh Crores has an ayacut of 37.08 Lakh acres(8.257 Acres- New and 18.897- Stabilised).It has 3 barrages- one across river Godabari at Medigadda near Kalesharam (Laxmi Barrage) and two more between Medigadda and Sripada Yellamplaly Project at Annaram village and Sundilala village (Saraswati & Parvati Barrage) . The project considered to be life line of Telangana covers 13 districts and 31 constituencies through canals, tunnels, lift system, reservoirs and distributor network.

On 20th January, 2023, the visiting team was taken to Sri Ranganayak Sagar Reservoir and pump House in Siddipet District and then to another project namely, Sri Komaravelli Mallana Sagar Reservoir (50 TMC capacity), to augment Kaleshwaram Project. In the meantime, a Minor Irrigation tank with water tourism facilities created through State Tourism Department was also seen. On way back to Hyderabad, the visiting team was taken to **Kondapochamma Sagar Reservoir Project** (15 TMC) and **Markook Pump House** (Overground- 4 pumps) in Siddipet District built in 48 months. The project built under multistage Kaleshwaram Lift Irrigation Project is providing water to 2.8528 Lakh acres through 13 canals. Sri Venkatalaru and Sri B. Hariram, both Engineers in Chief accompanied the visiting team to Kalesharam Project sites and explained in detail about the various components of the project giving reference to the vision of

Hon'ble Chief Minister, Telengana as to how his dreams were translated into realities with the successful commissioning of the project. To ease the decision making support system, I& CAD Department, Telangana in association with VASAR Lab, Hyderabad has developed a robust online monitoring control Data Center at Hyderbad (SCADA) to capture the real time data on hydro-meterology, barrage ,pump details, images of the entire Kaleshwaram project . The working of the Monitoring model was shown to the visiting team after the interaction programme on 18th January., 2023 .

The tour ended with a valuable note of experiences about the achievements made by I& CAD Departmment, Telangana and lot of appreciations /gratitudes to the host team for their constant support and cooperation extended to the visiting team of Assam for making the tour a great success.

The visiting team returned to home state on 21st January,2023.

Few photographs and learning outcomes garnered during the exposure trip are given below at Annexure 3 & 4 .

Annexure -3

Learning outcomes garnered from the exposure trip

I. **Reorganisation of the Department**:

The I & CAD Deptt, Telangana was reorganised in 2014 and presently has a total sanctioned manpower of 15182 nos (present strrenth : 9438) including 4019 nos from Engineering cadres(present strenth - 2711)

The organisation has a Directorate headed by Engineer in Chief(General) and other 2 Engineers in Chiefs who independently look after Administration, O& M. Down the line there are 25 Chief Engineers, 3 are in the Directorate (Head Quarter) to look after General, Hydrology, ISWR, Dam Safety, Water and Land Management Institute

(WALAMTARI), heady by DG equivalent to CE rank, Vigilance & Enquiry, Central Design Organisation , Quality Control, 2 in Secretariat as Secretary (Technical) equivalent to CE rank and the rest are placed in the Territorial District to manage the Irrigation projects. Below CE, there are SE (47 Nos), EE (206) Nos and DEE (678 Nos)and AEE(2436) equivalent to AE level. Initial entry is at DEE level for graduate Engineer who are basically sub divisional level Officers. AEE is the entry level for the diploma holder and are the field level officer. The appointment, transfer and posting upto DEE level are made by Engineer in Chief (General) and for officers EE onwards, the establishment matters are managed by the Secretariat.All the technical support staff below AEE (JE level) are mostly field staff and are from ITI Cadres namely, Technical Officer(129 Nos), Asstt Technical Officer(173 nos), Junior Technical Officer(346 Nos) etc. Non technical Posts include Personal Asstt/Superintendant/Record Asstt etc.

Reco. -- The existing pattern of Irrigation Department, Assam may be relooked in comparison of above whereby the decentralisation of decision making authority as regards to project implementation, operation and maintenance etc may be given to down the hierarchical line to district authorities by redesignating existing Addl Chief Engineers of the state as Chief Engineers(Design/Hydrology/Planning &IT/Quality Control/Enquiry&Vigilance/ Project Implementaton (Minor) /Project Implementation(Major)/O&M/Electrical/Contract management/ Electrical/Mechanical and present status of Chief Engineer renamed as Engineer in Chief (General) and Engineer in Chief (O&M). Cases which require Govt approval and higher decision, matter may be refereed to higher authority i.e Engineer in Chief (General) and Engineer in Chief (O&M).

2. **Operation and management of Projects**:

There is a simplified procedure for operation and maintenance of Irrigation Schemes in Telangana. O& M is headed by Engineer in Chief (O&M). There is a robust online monitoring tool to collect the real time data on monitoring of the schemes through digital platform which is controlled through headquarter at Hyderabad so as to give quick decision on project operation/implementation based on the assessment of the current situation. Govt of Telangana every year provides an annual allocation (corpus fund) of Rs 280 Crores for O & M Works. As

for regulating the O&M works/O&M fund thereof , there is an O&M committee headed by Engineer in Chief (General) as chairman, Engineer in Chief (O&M) as Vice Chairman, CE (Central Design Organisation) as Member, CE (Concerned) as Member, SE (concerned) as Convenor. The Committee examines O&M proposal and issue administrative and Financial sanction, review budget and Ayacut development under existing Irrigation Projects. There is enhancement of sanction of Financial Powers of all Cadre Engineers for maintenance of all the irrigation system. As per the delegation, DEE (Rs 2.0 lakh per project with a maximum of Rs 5.0 lakh), EE(Rs 5.0 lakh per project with a maximum of Rs 25.0 lakh), SE(Rs 225.0 Lakh per project with a maximum of Rs 50.0 lakh), CE (Rs 50.0 Lakh per project with a maximum of Rs 5.0 Cr),Engineer In Chief (Rs 5.00 Cr per project with a maximum of Rs 25.0 Cr) can issue technical approval .As such there is no need to seek Govt approval to take up O&M works on case to case basis. Relevant Govt Orders related to O&M are attached at Annexures-"O&M"

Reco. The same model may be adopted for O&M works of Irrrigation Department, Assam so that timely repair may be addressed to ensure irrigation supplies.

3. **Inventory Protocol:**

Reco .

Irrigation Department can develop an inventory mechanism to capture all irrigation and Non Irrigation Assets/Information on Surface/Sub surface water sources for Irrigation Schemes in the District/State, etc. and record in Department/Govt website.

4**: Project Monitoring System :**

Reco : The scope of present level of IPMS may be expanded to develop online monitoring and control on real time basis. Aplication of SCADA system by creating a server to collate the data from Pump Dash Board, Barrage Dash Board, Hydro- Meteorology Dash Board, ReserevoirDash Board (Surface/ Sub Sourface) etc be developed with IoT integrating to Mobile Users (Engineers/Water Beneficiaries).

5. Convergence

Reco:

Convergence with other developmental schemes in the command area may be made to take up earthen canals, jungle clearance, water

saving technology (Per drop More Crop) in consultation with P&RD and Agriculture Deptt. Extension of Service of Irrigation Water for promotion of Fisheries and Dairy farming, Water Sports facilities etc.

6. Govt of Telangan has given highest priority for development of Irrigation infrastructure for creation of an Ayacut of 125 Lakh Acres (50.59 Lakh hectares) which is almost 75% of the cultivable area. The break up is as follows.

Sector	Total IP	%
Major	89.67	71.70
Medium	4.91	3.93
Irrrigation Tanks & water Bodies	25.71	20.56
IDC Schemes	5.05	4.0
Total	!25.00	100%

There are about 47000 Minor Irrigation Tanks in Telangana which were taken up/restrengthened & rejuvenated under " Mission Kakatiya" , a flagship programme of Govt of Telangana.

Reco.

The Irrigation Department should therefore give more emphasis on Development of Minor Irrigation tanks by rejuvenation of water bodies, creating reservoirs on Tributaries, take up surface and subsurface schemes for conjunctive uses, involve participation of farmers and identify big ticket projects (Major) for Surface lifts /Surface Flows through creating Reservoirs.

I & CAD Deptt makes the utilisation of resources throughout the cropping season, covering an area of about 64 lakh acres under Rabi & Kharif and similar coverage under Kharif Crop Season too. In Assam, lean period availability of source water may have to be studied and awareness/motivational drives have to be taken up in association with Agriculture Department, Institutional/NGO intervention etc so that the area under irrigation for Rabi & Prekharif crops may be enhanced.

7**. Capacity Building of Engineers & Technical Support Staff:**

Reco. Irrigation Department, Assam has to provide continuous training to build the capacity of Engineers and Support Staff. Institutional intervention may have to applied to update the Engineering Skills with Latest Technological Innovations/understanding the Latest

tols like GIS/Remote Sensing /LiDAR application besides the Establishment and Financial updates as required for effective project implementation. A training Cell may be created in Chief Engineer Office and annual calendar of training activities be planned in advance identifying the thematic area of interest.

8. **Establishment of Data Center**

A GIS/Remote Sensing Data Centre may be devolved to acquire, analyse and share the data for project formulation. All the project /water surface related data of the State may be archived.

9. **Enhancing the Annual Budget** :

The annual Budget size of the I & CAD Department, Govt Of Telangana is more than Rs 2.0 Lakh Crores.

Reco. Based on the present strength of manpower and analysing the need of Irrigation Development in the state the budget ,the size of annual budget of Irrigation Department may be enhanced considerably with a vision to have an accelerated growth of Irrigation Development in the state@ 10% per year.

ANNEXURE-4