



KERALA INFRASTRUCTURE INVESTMENT FUND BOARD

# Newsletter

Vol 6

Issue 8

August 2023





# Projects - Statistics

Department	KIIFB Approved Projects	
	No. of Projects Approved	Approved Amount (₹. in Crore)
PWD	485	₹ 29,999.29
Agriculture	1	₹ 21.43
Animal Husbandry	1	₹ 10.24
Ayush	2	₹ 183.06
Backward Classes Development Department	1	₹ 17.73
Coastal Shipping & Inland Navigation	10	₹ 2,239.58
Culture	17	₹ 477.28
Devaswom	2	₹ 138.51
Fisheries and Ports	26	₹ 521.64
Forest	4	₹ 458.82
General Education	143	₹ 2,984.16
Health & Family Welfare	73	₹ 5,712.57
Higher Education	61	₹ 1,752.35
Home	6	₹ 225.19
Industries	1	₹ 62.16
Information Technology	3	₹ 1,412.86
Labour & Skills	5	₹ 85.91
Local Self Government	23	₹ 701.48
Power	18	₹ 5,200.00
Registration	6	₹ 88.65
Revenue	2	₹ 32.62
SC/ST Development	10	₹ 182.23
Sports & YA	39	₹ 834.86
Tourism	12	₹ 506.11
Transport	3	₹ 600.98
Water Resources	96	₹ 6,548.92
<b>Total</b>	<b>1050</b>	<b>₹ 60,998.61</b>

## Projects under Land Acquisition Pool of ₹ 20,000 Crore

PWD-NHAI	1	₹ 6,769 .01
Industrial Parks - 3 projects - ₹13988.63 Cr	6	₹ 16,108.16
Taking over of land from HNL - ₹ 200.60 Cr		
Kochi - Bangalore Industrial Corridor & Gift City - ₹1918.93 Cr		
<b>Total</b>	<b>7</b>	<b>₹ 22,877.17</b>

## KIIFB Approved Projects Grand Total

Infrastructure Projects	1050	₹ 60,367.45
Projects under Land Acquisition Pool	7	₹ 20,000.00
<b>Total</b>	<b>1057</b>	<b>₹ 80,998.61</b>

Fund disbursed to projects (as on 31/07/2023)

₹ 25,445.19 Crore

# Chief Editor's Page

This edition of the KIIFB newsletter deals with the topic of hill highways. We explore the completed hill highway projects, discuss the challenges, and examine how we can leverage the strategic positioning of these hill highways and unlock a host of opportunities to preserve its natural heritage, and ensure social progress for generations to come.

Hill highway is 1166 KM long from Parassala in Thiruvananthapuram district to Nandarapadavu in Kasaragod district in which KIIFB is funding 793.68 Km and the remaining stretches are executed by KSTP (74 KM), NHAI (99 KM) and PWD under various schemes.

Hill highways holds immense significance, playing a vital role in transforming the state's connectivity, accessibility, and overall development. Nestled amidst lush green landscapes and scenic hills, Kerala's terrain poses unique challenges for traditional road construction. However, these well-engineered hill highways cut through the undulating terrain, linking remote and hilly regions to bustling urban centres and picturesque tourist destinations. Kerala, blessed with its enchanting hill highways traversing through lush green landscapes can utilize the immense potential of these transportation arteries for a multitude of advantages.

Hill highway provides north south connectivity to the hilly terrain of Kerala. It improves connectivity to the towns, commercial centres, schools, hospitals, and transportation hubs. It reduces travel time between different locations. Access to markets and enhanced business opportunities in the area is another advantage. Of course, the most important advantage is going to be a boost in tourism and hospitality sectors. Hill Highways also contribute to

disaster management efforts, offer opportunities for infrastructure development, and promote social integration, making them an essential lifeline for the state's progress and prosperity.

Government of Kerala planned the entire Hill highway based upon free surrender by people. The property value in an around the hill highway is expected to go up significantly and that is why the free surrender of land is possible. There are stretches where landowners are not forthcoming to free surrender. It is the biggest challenge in over a stretch of around 90 KMs. Coordinated efforts are being made by Political leaders, Bureaucrats and Technocrats to sort this out. The Coordinated efforts of all stakeholders led by Hon'ble MLAs in their respective constituencies in getting the free surrenders is praiseworthy.

This edition covers quality audit and its significance by QA team of HITES. HITES team has shared its experience in handling EPC Contract with respect to Kottayam Medical College with other SPVs last month. This month, they will share quality audit and manpower placement in different projects with other SPVs to align their processes with KIIFB' requirements.

This edition has articles on Green Credit Program, Water Supply Alternative Technologies also. KIIFCON, a 100% subsidiary of KIIFB, has bagged two prestigious projects of KSRTC, this news item is also covered.

Happy reading!

Regards  
**Chief Editor**



# Hill Highway: Realising the long-cherished Dream of Kerala

Saleel K, Transportation Engineer  
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Project Appraisal Division

## Project Background

Geographically, the State of Kerala is divided into three different regions of land viz. Coastal area, Mid-land, and High range. When compared to the other two regions, the high ranges have limited road connectivity. To enhance connectivity between different regions in hilly areas allowing easier access to isolated communities, improving their connectivity with urban centres, and promoting economic development and to facilitates the movement of goods and services between regions, the Government of Kerala has envisaged to develop a Hill Highway along the eastern side of the Kerala State.

With the development of the proposed hill highway, distance from many production centres in the hilly regions to major market and commercial centres of the State gets reduced drastically. Accordingly, the Government through the Budget Speech 2017-18 (Para - 151) had announced a main project 'Hill Highway' under KIIFB-funding.

Hill highway is one of the prestigious projects of Kerala which starts from Parassala in the Thiruvananthapuram district and ends at Nandarapadavu in the Kasaragod district, passing through 13 districts of Kerala except Alappuzha. The total length of hill highway is 1166.27 km, out of which 793.68 km is

being funded by KIIFB. Remaining stretches are developed under various other schemes of Government of Kerala, and some are overlapping with National Highway alignment.

Subsequently, Administrative sanction was issued by the Public Works Department vide G.O (Rt) No. 942/2017/PWD dated 10-07-2017 at a cost of Rs.3,500 Crore for the entire Hill Highway stretch. Out of this, for the execution of 55 stretches included under KIIFB funding, Kerala Road Fund Board (KRFB) is designated as the Special Purpose Vehicle (SPV) for executing the project.

## Alignment of Hill Highway`

Since the declaration of Hill Highway back in 1997 and notifying the same as SH-59 in 2000, the Kerala PWD along with the National Transport Planning and Research Centre (NATPAC) has conducted multiple alignment studies and feasibility studies for the project and finalised the hill highway route with a total length of 1267 km. Based on suggestions from various stakeholders viz. landowners, elected representatives, etc., the route has been modified with a length of 1166.27 km, which spreads across 70 stretches. The present alignment of hill highway, subject to the final approval from the Kerala PWD is indicated in the map given below:



Fig 1: Alignment map of Hill Highway



## Design Aspects

Constructing highways in hilly terrain presents numerous challenges due to the steep and uneven topography and geological features of the region. Most of the roads traverse through steep slopes, sharp curves, and rocky terrain, necessitating meticulous design considerations. Major aspects considered in the design phase for Hill Highway works are:

- **Geometric Design:** Gradient correction and curve correction is essential for hill roads for ensuring smooth and safe traffic flow. Even though the availability of land is a constraint, special attention is given to gradient and curve corrections.
- **Slope Stability:** Hilly terrain is susceptible to frequent landslides and rockfalls which can pose significant threats to the road structure and the safety of users. To address this, construction of extensive retaining walls and breast walls were provided to ensure the stability of the road structure (Eg:- Kuttikkanam - Chappath, Kolichal - Cherupuzhja, Kodanchery – Kakkadampoyil, etc.)
- **Cutting and Filling:** Cutting and filling play a very crucial role in achieving the desired ruling gradient,
- **Effective Drainage System:** A well-planned and properly executed drainage system including culverts in hill roads plays a vital role in preventing landslides, ensuring road safety, and preserving the natural integrity of the hilly terrain.
- **Topographical issues:** To ensure the stability and resilience of the structure, comprehensive soil investigations are imperative in designing embankments, retaining walls, and breast walls to mitigate future risks of possible landslides and pavement failures.
- **Environmental Impact:** Careful planning, Environmental assessments, and mitigation strategies are necessary to minimize the impact on biodiversity as most of the stretches pass through environmentally sensitive areas.
- **Traffic Management:** Alternative arrangements for diverting traffic and/or adopting stage-wise construction methodology become necessary as complete closure of the traffic flow during the construction period is not feasible.
- **Construction Costs:** In comparison with the roads in plain and rolling terrains, construction in hilly terrain incurs higher costs due to extensive earthwork, specialized engineering techniques, protective works, and implementation of additional safety measures.
- **O&M Strategy:** All the maintenance works will be carried out by the contractor during the defect liability period (three years for Roads and five years for Bridges) and thereafter by the Custodian of the road.

## Typical Cross Section for Hill Highway

For every road project, maintaining a uniform cross section is paramount to ensure optimal safety, efficient drainage system, smooth traffic management, structural stability, and aesthetic appeal. For Hill Highway Roads, KIIIFB has adopted a consistent Right-of-Way (RoW) width, which helps to ensure a cohesive and harmonious road design throughout its entirety. KIIIFB follows a typical cross section for roads and bridges in Hill Highway

alignment across the state.

### Roads

Roads coming under the Hill Highway will be developed to 12m Right of Way with a 7m Carriage Way, 1m shoulder and 1.5 m footpath cum drain on either side.

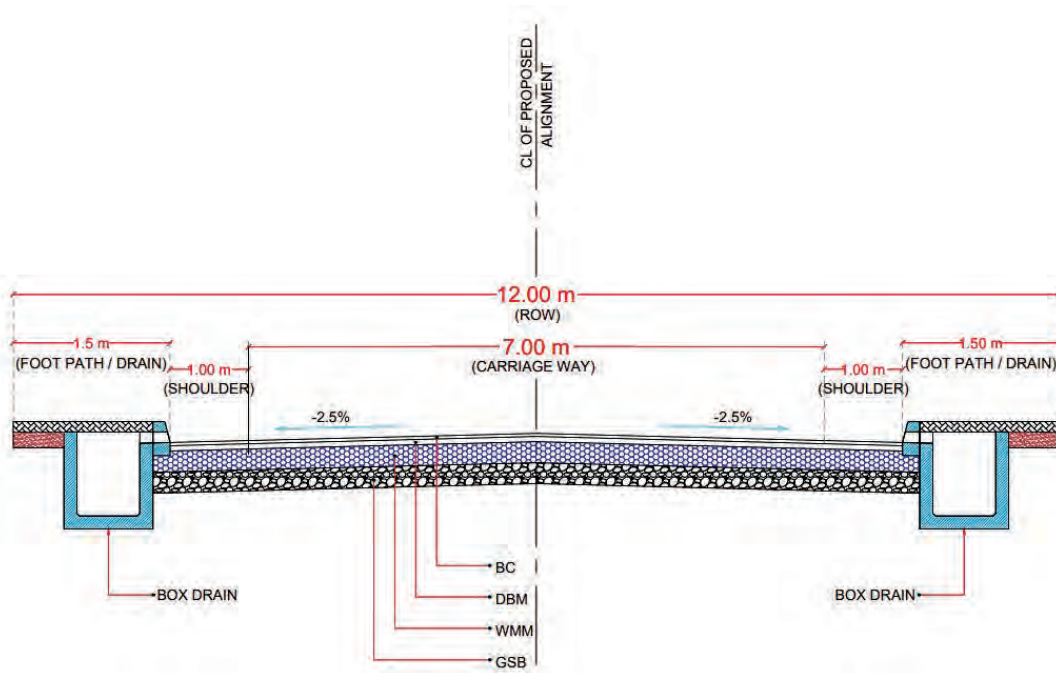


Fig 2: Typical Cross Section for Hill Highway Roads

### Bridges

Bridges under Hill Highway will be developed to 12.5m width with 9.00m carriage way, 1.5 m footpath cum utility space and 0.225 m handrail on either side.

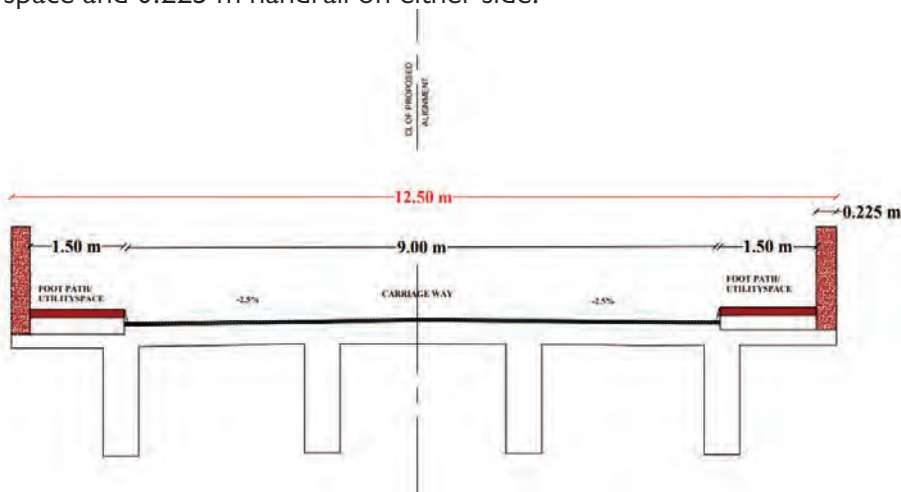


Fig 3: Typical Cross Section for Bridges in Hill Highway



## Brief Status of Projects

Out of the total 55 stretches executed by KRFB under KIIFB funding, KIIFB has accorded financial sanctions for 52 stretches and the DPR for the remaining 3 stretches submitted by the SPV is currently under appraisal by KIIFB. Status of the stretches developed under KIIFB funding is given below:

Stage	No of Stretches	Length in Km
Total Stretches	70	1166.27
Executed by KRFB under KIIFB funding	55	793.68
FS issued	52	735.93
TS issued	30	473.68
Tender Floated	30	473.68
Work Started	23	410.63
Work Completed	5	133.68

## Projects Approved by KIIFB

So far, the Executive Committee and Board of Directors, KIIFB have granted approval for the following 42 sub-projects under the Hill Highway project, encompassing 52<sup>#</sup> out of the total 55 stretches proposed to be developed by KRFB using KIIFB funding for 709.425 km<sup>#</sup> at a total of Rs. 3156.19 Crore as detailed below:

Sl No	Description	Length in Km	Project Cost (Rs in Cr)	Status (As on 13/07/2023)
<b>Thiruvananthapuram District</b>				
1	Kollayil (Challimukku) - Palode - Vithura – Iruthalamoola - Aryanad – Kallikkadu Road	21.080	₹ 54.71	Work Completed
2	Kallikadu – Parasala Road	26.093	₹ 118.14	Work in Progress
3	Peringamala – Vithura – Koppam Road	9.450	₹ 50.81	Work in Progress
<b>Kollam District</b>				
4	Punalur KSRTC Junction –Kollayil(Challimukku) Road	46.100	₹ 201.67	Work Completed
<b>Kottayam District</b>				
5	Karimkallumoozhy (Erumely) - Plachery Road	7.500	₹ 33.20	Work Tended
<b>Idukki District</b>				
6	Kuttikanam – Chappathu Road	19.000	₹ 104.58	Work Completed



7	Iruttukanam - Myladumpara Road (Stretch 1: Ellackal - ValiyaMullakkanam)	5.250	₹ 39.80	Work in Progress
8	Peerumede - Devikulam Road and Thodupuzha - Puliyanmala Road	27.717	₹ 144.10	Work in Progress
<b>Ernakulam District</b>				
9	Cheranganal – Neriamangalam Road	13.700	₹ 65.57	KIIFB Approved
10	Chettinada - Panamkuzhy Junction – Payyal – Cheranganal Road	17.000	₹ 76.264	KIIFB Approved
11	Vettilappara – Nellichode - Manjapra - Eucaly Junction Road: Stretch 1 & 2	23.269	₹ 105.02	Free Surrender of land in Progress
12	Vettilappara - Eucaly Jn – Abhayaranyam(Stretch 3: Eucaly Junction - Illithode)	6.160	₹ 34.84	Free Surrender of land in Progress
13	Vettilappara - Eucaly Jn –Abhayaranyam(Stretch 4: Illithode–Chettinada)	1.895	₹ 32.09	Free Surrender of land in Progress
<b>Thrissur District</b>				
14	Pattikad – Vilanganur – Mannamangalam – Pulikanni – Vellikulangara - Vettilappara Road	5.300	₹ 21.37	Work in Progress
15	Vellikulangara - Vettilappara Bridge Road	19.000	₹ 124.69	Work Tended
16	Vilanganoor – Vellikulangara Road	30.840	₹ 136.50	Free Surrender of land in Progress
<b>Palakkad District</b>				
17	Kanjirampara Masjid –Kumaramputhur Road	18.100	₹ 91.41	Free Surrender of land in Progress
18	Gopalapuram – Nedumani Reach 1: Gopalapuram - Kannimarimedu)	14.860	₹ 73.21	Free Surrender of land in Progress
19	Gopalapuram – Nedumani Reach 2: Kannimarimedu – Nedumani)	15.730	₹ 82.56	Free Surrender of land in Progress
20	Kollengode - Vadakkancherry Road (Stretch 3A: Panangattiri – Vithanassery)	7.057	₹ 33.18	Free Surrender of land in Progress



21	Kollenkode - Vadakkancherry Road (Stretch 3B: Nenmara Bypass end –ThankomJn)	15.210	₹ 75.83	Free Surrender of land in Progress
<b>Malappuram District</b>				
22	Pookottumpadam – Kalikavu –Karuvarakundu Road	21.010	₹ 131.62	Work in Progress
23	Pookottumpadam - Moolepadam Bridge Road	20.500	₹ 55.29	Work in Progress
24	Chirakkal – Melattur Road &Ucharakadavu-Kanjirampara Road	12.275	₹ 40.60	TS Stage
<b>Kozhikode District</b>				
25	Kodanchery – Kakkadampoyil Road	35.350	₹ 198.35	Work Nearing Completion
26	Thalayad – Malappuram – Kodenchery Road	16.820	₹ 106.09	Work in Progress
27	Thottilpalam - Thalayad Road (Stretch 1)	6.800	₹ 50.32	Free Surrender of land in Progress
28	Thottilpalam - Thalayad Road (Stretch 2: Peruvannamuzhi - 28th Mile Junction)	15.650	₹ 71.94	Work Tended
29	Thottilpalam - Thalayad Road (Stretch 3: Mullankunnu – Peruvannamuzhi)	6.400	₹ 38.40	Free Surrender of land in Progress
30	Thottilpalam - Thalayad Road (Stretch 4: Thottilpalam - Mullankunnu)	8.060	₹ 29.77	Free Surrender of land in Progress
31	Kunhome - Niravilpuzha - Thottilpalam (Stretch 2: Chunkakkutty - Poothampara Bridge)	5.446	₹ 38.47	Free Surrender of land in Progress
32	Kunhome - Niravilpuzha - Thottilpalam (Stretch 2: Poothampara Bridge –Thottilpalam)	7.225	₹ 45.34	Free Surrender of land in Progress
<b>Wayanad District</b>				
33	Kottiyoor - Boys Town Road, Boys Town - 43rd Mile - Valad - Kunkichira Road and Thalasseri - Bavali Road	43.000	₹ 142.56	Work in Progress
34	Pachilakkad – Kainatty -Kalpetta Bypass – Meppadi - Chooralmala - Arunappuzha, Mananthavady - Kalpetta Road from 24/600 to 30/800, KalpettaBypass Road	16.750	₹ 62.88	Work in Progress

35	Kunhome - Niravilpuzha - Chunkakkutty Road	8.521	₹ 36.52	Free Surrender of land in Progress
<b>Kannur District</b>				
36	Vallithod - Ambayathod Road	25.300	₹ 57.04	Work in Progress
37	Ambayathodu - Boys Town Road	5.760	₹ 35.67	Free Surrender of land in Progress
<b>Kasargod District</b>				
38	Nandarapadavu - Chevar Road	23.000	₹ 54.76	Work Completed
39	Chevar - Edaparamba Road	49.635	₹ 86.64	Work in Progress
40	Kolichal - Cherupuzha Road	30.377	₹ 89.24	Work in Progress
41	Kolichal - Edapparamba Road	24.400	₹ 85.15	Work Nearing Completion
<b>Total</b>		<b>709.425#</b>	<b>₹ 3156.19</b>	

#A total of 26.5 Km funded by KIIFB under other main projects has been included tentatively in Hill Highway alignment & a total of 60.19 km (Pullavai-Thottillpalam Road & Pookkottumpadam–Thampurattikkallu Munderi Seed Farm Gate Road) and 8.72 km [Vettilappara - Chettinada Road (Stretch I: Vettilappara to Kappela)] have been excluded provisionally from Hill Highway alignment subject to final decision at Government level.

## Benefits of the Project

- ✓ **Better Connectivity:** Provides improved connectivity to commercial centers, schools, hospitals, and transportation hubs.
- ✓ **Reduced Travel Time:** Smoother and faster traffic flow, reduces travel time which leads to improved productivity and reduced transportation costs.
- ✓ **Easy Access to Markets:** Easy access to the mainstream markets will augment the trade and transportation of spices and agricultural products of high ranges.
- ✓ **Increased Property Value:** With enhanced accessibility, the area becomes more desirable for residential and commercial purposes which lead to higher returns on real estate investments for the local people.
- ✓ **Overall Development and Enhanced Business Opportunities:** Improved Road infrastructure



attracts more businesses to the area and the area becomes more attractive to developers and the local people/landowners will benefit from new job opportunities, increased demand for commercial properties, and rental income.

- ✓ **Tourism and Hospitality Boost:** In areas with tourism potential, High-standard roads can attract more visitors and leads to increased demand for accommodation, dining, and other hospitality services which will benefit the local people.
- ✓ **Allied Infrastructure Upgradation:** Road improvement projects often come with allied infrastructure upgrades viz. better drainage system, lighting, and pedestrian pathways enhancing overall livability and safety of the area.
- ✓ **Attracting Investments:** High-standard roads can trigger the local governments to improve the area's infrastructure which can attract more investments in the region, leading to overall economic growth and development.
- ✓ **Community Development:** Improved roads can improve connectivity of tribal settlements and will pave the way for greater integration of the communities with the mainstream.

### Challenges faced during execution

Hill highway project has achieved very good progress across the state, thanks to the close monitoring and regular review of the projects at various administrative levels in the State Government, KIIFB and to the active participation of the Kerala Road Fund Board, the Special Purpose Vehicle (SPV).

However, progress of the project is affected due to various constraints including availability of land through free surrender and delay in obtaining statutory clearances etc.

### Free Surrender of Land

The land required for the development of Hill Highway is to be obtained through free surrender process. At initial stages, obtaining land through free surrender was a tedious process since landowners were emotionally attached to their property and has concerns about losing their home/business. However, development of Hill Highway brings number of socio-economic and financial benefits to the local people as described above. Nowadays, with enhanced accessibility provided by the development of hill highway, the area becomes more desirable for residential and commercial purposes that lead to higher returns on real estate investments for the local people which paved way for willful surrender of their land.

### Forest Clearance

Some stretches of the Hill Highway Road pass through forest land where the required RoW of 12m is not available. In such cases, it becomes necessary to acquire forest land for which clearance from the Forest Department must be obtained. The process of forest clearance involves Stage 1 and Stage 2 clearance. If the area of forest land required is less than 1 hectare, approval will be issued by the State Government and if the area exceeds 1 Hectare, the approval will be issued by the Forest Regional Office, Bengaluru.

For Stage I clearance, SPV should submit online proposal with essential documents such as KML files, topo sheet drawings, and geo-reference maps through “Parivesh Portal” hosted by the Ministry of Environment, Forest and Climate Change, Government of India. The Forest Department will thoroughly review the proposal submitted by the SPV, and a site inspection will be conducted by the concerned Divisional Forest Officer (DFO) to verify the demarcated land details and ensure their accuracy. After confirmation of demarcation, SPV should furnish information regarding compensatory land to be handed over to Forest Department for afforestation. Stage I clearance will be granted after the verification of the details of compensatory land by the authority.

When Stage I clearance is obtained, the SPV should make necessary payments and upload compliance reports, if any, as requested by the issuing authority through the “Parivesh Portal”. After verification of these documents, the Stage 2 clearance will be issued, and then only work can be carried out on the acquired forest land.

The complete process of obtaining clearance from the Forest Department is tedious in nature and requires great co-ordination between the implementing agency and the clearance issuing authority. The complete process takes a lot of time which is affecting the progress of work very badly and often requires the work to be foreclosed by leaving the forest clearance awaited portion. Holding the entire work for want of forest clearance in a small portion is also not a wise choice, as it may invite criticism from the public, elected representatives, media, Hon’ble court etc., and may result in escalation of the cost as well. The SPV must play smartly for the smooth completion of the project.

The status of 10 applications submitted by the Kerala Road Fund Board for obtaining clearance from the Forest Department is as given below.

Sl. No	Hill Highway Stretches	Length through forest (in km)	Stage I	Stage 2	Remarks
1	Kolichal- Cherupuzha - Road Km 0/000 to 31/200 in Kasaragod District	2.78 km	Obtained	Obtained	CA land of 0.641 Ha obtained
2	Kolichal – Edapparamba road at KM 0/000 to 24/400 in Kasaragod District	3.61 km	Not obtained	Not obtained	CA land of 4.332 Ha identified
3	Ambayathodu to Boys town in Knnur District	1.617 km	Obtained	Not obtained	CA land of 0.429 Ha identified; Payment remitted
4	Kuttiyadi Churam stretch in Waynad District	0.882 km	Obtained	Not obtained	CA land of 0.0092 Ha identified; Payment remitted
5	Kuttyady Churam stretch in Kozhikode District	2.759 km	Obtained	Not obtained	CA land of 0.182 Ha identified; Payment remitted
6	Myladi-Moolepadam-Kakkadampoyil stretch in Malappuram District	4.766 km	Not obtained	Not obtained	CA land of 3.088 Ha to be identified
7	Vilangannur – Vellikulangara – Vettilappara-Pattikkad in Thrissur District	16.99 km	Not obtained	Not obtained	CA land of 18.5 Ha to be identified

8	Vettilappra Bridge-Nellichodu- Cutting Jn- Vettilappara-Edakkadu-Chully – Manjapra-Eucali Jn – Kadappara – Illithodu-Chettinada through Abayaranyam in Ernakulam District	16.35 km	Not obtained	Not obtained	CA land of 12.5364 Ha to be identified
9	Chettinada – Cheranganal-Neriamangalam in Muvattupuzha Divison - Ernakulam district.	2.977 km	Not obtained	Not obtained	CA land of 4.0497 Ha to be identified
10	Karimkallumuzhy-Plachery in Kottayam district	5.75 km	Obtained	Not obtained	CA land of 0.27 Ha identified; Payment will be remitted soon

## Completed Stretches in Hill Highway

### I. Kuttikkanam – Chapath Road

The road comes in Peerumade constituency in Idukki District, with a total length of 19 km serves as a major connection between Kottayam & Kattappana and acts as connecting link for two other roads: one from Thodupuzha and another from Pala through Wagamon. The road also leads to several globally recognised tourist destinations renowned for their scenic beauty viz. Thekkady, Wagamon, Idukki Arch Dam, Munnar, Mattupetty. The entire works was completed on 28-02-2023 including formation of road, construction of necessary culverts, retaining walls, widening of bridges, drains, protection works, traffic safety works, etc.





## **2. Punalur KSRTC Junction –Kollayil (Challimukku) Road**

This road comes in the Punalur and Chadayamangalam constituencies in Kollam District provides connectivity between Pathanapuram, Punalur, Anchal, Kulathupuzha, and Madathara towns. The road had existing carriage way width varying from 5 to 6 m and is developed to with 7m carriage way width and 1.5 m wide paved shoulder on either side. Through this work 46.1 km length is improved to Hill highway standards by the KRFB under KlIFB funding.



### 3. Nandarapadavu–Chevar Road

This road comes in Manjeshwar constituency in Kasargod District starts from Nandarapadavu and passes through Sungthakatta, Morathana, Baikatta, Paivalike and ends at Chevar is having a total length of 23 km. The project has improved inadequate widths of carriage way and cross drainage system, geometrically deficient curves, congested junctions, and lack of road safety measures. This is the shortest route for the people of Vorkady and Paivalike Gram Panchayats to Taluk headquarters of Kasargod and Kannur. The work has been completed on 27-02-2021.





#### **4. Kollayil (Challimukku) Road**

This road having a total length of 21.08 km comes in the Vamanapuram, Aruvikkara and Parassala constituencies in the Thiruvananthapuram District starts from Kollayil (Challimukku) and passes through Palode, Peringamala guard Station, Thennur, Koppam, Vithura, Iruthalamoola, Aryanad, and ends at Kallikkadu. The work has been completed on 30-06-2021.

#### **Ongoing Hill Highway Stretches**

##### **Kolichal – Edaparamba Road**

This road comes in Kasargod, Udma, and Kanhangad constituencies in the Kasargod District is having a total length of 24.4 km. The road serves as the shortest route for the residents of Delampady, Kuttikkole, West Eleri, and Kallar Gram Panchayats, to the district and taluk headquarters of Kasargod and Kannur. The work has been completed, except for the 3.37 km stretch passing through forest area, for which, clearance from Forest Department is awaited.





## Kodanchery – Kakkadampoyil Road

This road comes in Thiruvambady constituency in Kozhikode District is having a total length of 35.35km passes through the main destinations and markets; Nellipoyil, Pulloorampara, Punnakkal, Koodaranhi, Koompara, Thazhe Kakkadand and ends at the Kakkadampoyil town. This is a rural agricultural area in the eastern hilly region of the Kozhikode district. Vertical gradient correction by cutting and filling at several reaches will be performed to keep the road within the limit of permissible gradient thereby avoiding blackspots. The work is nearing completion with a physical progress of 96% including retaining structures as per site condition.





### **Kolichal – Cherupuzha Road**

This road comes in Kanhangad and Trikaripur constituencies in the Kasargod District is having a total length of 30.377 km starts from Kolichal of the Hosdurg – Panathur road and ends at Cherupuzha. This road provides easy access to Mangaluru International Airport, Historical monument Bakel Fort, Ananthapura Lake Temple, and Malik Dinar Masjid. The work is nearing completion with a physical progress of 85% including retaining structures as per site condition.



# Hill Highways - Geometric Design Challenges

Sajimon Lukose, Senior Project Advisor, TRC

## Introduction

Hill highways are the highways that run closer to the hilly areas, connecting multiple hilly locations. Hill highways could be running parallel to the mid-land highways or coastal highways. Hill highways thus provide the residents of the hilly locations faster access to highways. Hill highways could traverse not only hilly terrains, but also other terrains.



## Geometric design of hill highways

Hill roads in general have several geometric design challenges due to the following constraints.

- High fill on valley side
- High cut on hill side
- Unstable cut slopes
- Delicate ecosystem

In hill roads design these challenges are mitigated by reduced design speeds resulting in tighter hori-

zontal curves and steeper gradients. Reduced design speeds for hill roads are generally acceptable as these roads only serve the hilly areas and normally are not continued further beyond the hilly destinations.

Whereas the Hill highways require higher design speeds in line with respective highway category.

Higher design speeds will result in increased cut or fill, high retaining walls, extensive slope stabilization, and increased impact on the terrain and ecosystem.

## Special design considerations for hill highways

Hill highways can carry a significant number truck traffic. Truck operations in hilly terrain are having their own challenges, which demands special geometric accommodations such as climbing lanes and escape ramps etc.

- Climbing lanes



When the gradients are steeper, the truck loose speed as it climbs. Depending on the length of climb

and steepness of gradients, the trucks can crawl, affecting other vehicle movements. In such situations, the capacity of the highway reduces significantly, and additional lanes are required to accommodate the crawling trucks so that other vehicles can travel at normal speeds. Generally, climbing lane is provided in the ascending direction. But in very critical gradients, climbing lanes may be required in the descending direction also, as the trucks can go very slowly as they descend, thus affecting the movement of other vehicles.

#### ➤ Escape ramps

In very steep and long descending gradients, the trucks can lose control, especially at sharp curves. In such situations, an escape ramp may be required to reduce the speed of the truck. Escape ramps generally run at an ascending slope on arrester bed to reduce the speed of the trucks and bring them to safe stop.



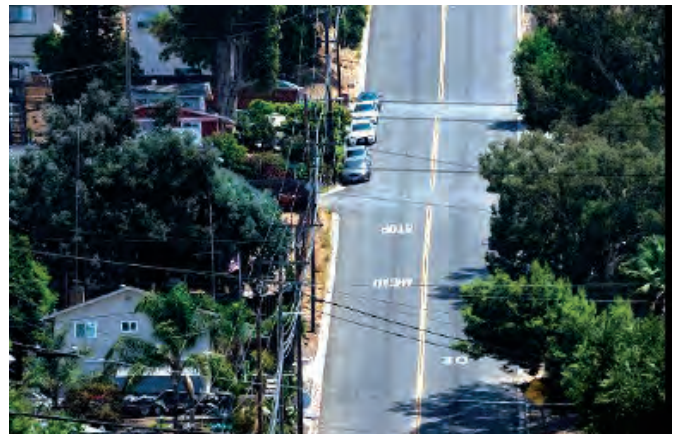
#### ➤ High Containment Barriers

Due to the risk of vehicles losing control on hilly terrain and falling in deep valleys, high confinement measures are required at critical locations. This is achieved by extending the heavy-duty barriers over the standard height



#### ➤ Controlling critical gradients

Trucks lose speed as they go uphill. On a continuous and steep ascent, the trucks can crawl. To pick up speed from the point of crawl, they need flatter gradients for a certain length. Therefore, the continuous steep gradients are broken with flatter gradients at regular interval, to help trucks maintain a safe speed along hill highways.



### Conclusion

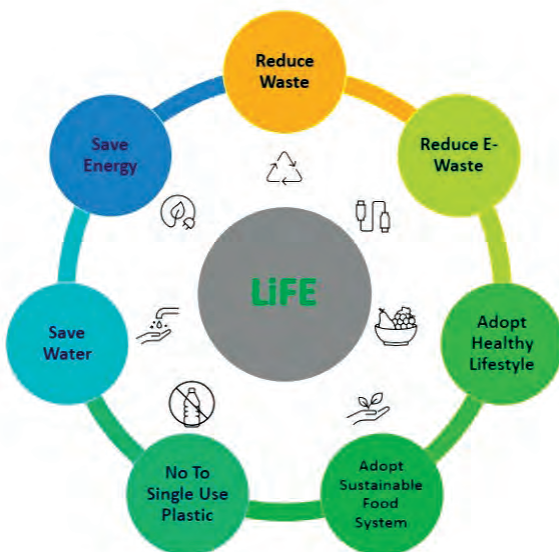
Hill highways offer increased mobility for residents of hilly areas. The geometric design of such roads requires special focus on vertical and horizontal geometry to optimize the speed with minimum impact on the terrain and without compromising the essential safety requirements. Considering the above mentioned aspects, while developing geometric design can help develop a safe and efficient hill highway with reduced investment and impact on the terrain.



# The Green Credit Program – A Step towards Lifestyle for Environment (LiFE)

Ms. Peggy Nepram, Sustainability Expert, ESG Wing

Lifestyle for Environment (LiFE) was launched by the Prime Minister of India on World Environment Day (5th June 2022). The idea of LiFE was introduced by the Prime Minister during the 26th United Nations Climate Change Conference of the Parties (COP26), 2021 in Glasgow. The idea promotes an environmentally conscious lifestyle that focuses on ‘mindful and deliberate utilization’ instead of ‘mind-



less and destructive consumption’. Mission Lifestyle for Environment recognizes that Indian culture and living traditions are inherently sustainable. The importance of conserving precious natural resources and living in harmony with nature is emphasized

in the ancient scriptures. Mission LiFE seeks to channel the efforts of individuals and communities into a global mass movement of positive behavioral change. Sustainability and climate change issues come to the forefront when infrastructure development is done with no proper regard for the environment or the people. The optimal solution would give importance not only to growth but to other aspects such as livelihood, employment, and dignity. *“Parampara – India’s Culture of Climate Friendly Sustainable Practices”* a report published by the LiFE mission under the Ministry of Environment, Forest & Climate Change (MoEFCC) and NITI Ayog, emphasizes the significance of solar & wind energy, organic agriculture, biodiversity conservation, traditional sustainable food systems, uniqueness of Indian medical heritage, traditional practices of shelter building, water conservation techniques, sustainable textile & clothing. Hence, Mission LiFE stands for nudging individuals and collective action towards a lifestyle for the environment.

## The Green Credit Programme

The Ministry of Environment, Forests, and Climate Change (MoEFCC) proposed the Draft Green Credit Programme Implementation Rules in July 2023 as a step towards realising the vision of “Mission LiFE” and developing India’s new sustainable de-



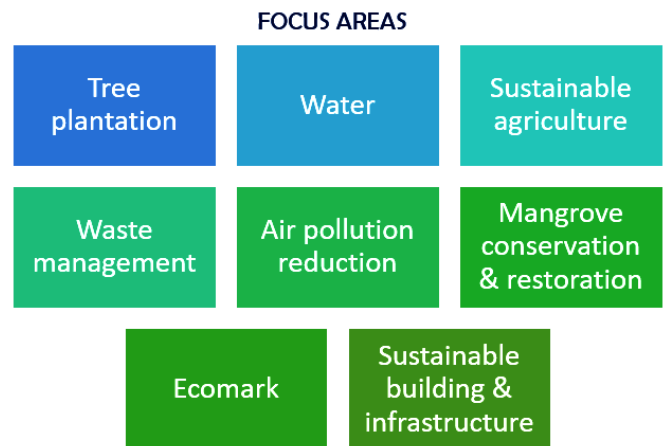
velopment paradigm. The primary objective of the proposal is to establish a voluntary domestic market mechanism known as the Green Credit Programme. This innovative program offers stakeholders, including individuals, Farmer-Producer Organizations (FPOs), industries, and local bodies, a unique opportunity to earn green credits for undertaking specific activities that contribute to a positive impact on the environment. By introducing the Green Credit Programme, the government seeks to complement the domestic Carbon Market and reward companies, individuals, and local bodies for their sustainable actions through a unique unit of incentive called the 'Green Credit.'

Unlike traditional carbon credit systems, the Green Credit System goes beyond CO<sub>2</sub> emission reductions to encompass a broader range of environmental obligations. These green credits will be tradable, creating a potential market platform where participants can sell their earned credits. The program offers a diverse array of Green Credit Activities, including tree plantation-based green credit, water-based green credit, sustainable agriculture-based green credit, waste management-based green credit, air pollution reduction-based green credit, mangrove conservation and restoration-based green credit, ecomark-based green credit, and sustainable building and infrastructure-based green credit.

### Indicative Approach for Developing a Green Credit Mechanism

To create a significant impact and steadfast path toward a net-zero future, the green credit program will need a mechanism (Policy and Regulation) aligned with the domestic and international carbon market. An indicative green credit mechanism shall include legal frameworks or legislations in addition to high-quality projects in priority sectors like forest

ecosystem services, water, waste management, and transport. The Carbon component of green credits could be supplied under Article 6, CORSIA (Carbon Offsetting & Reduction Scheme for International Aviation), and domestic/international voluntary carbon market. Article 6 of the World Bank pertains to the establishment of international compliance on carbon markets governed by the Paris Agreement. Countries to voluntarily cooperate with each other to achieve emission reduction targets set out in their



Nationally Determined Contribution (NDCs). This means that, under Article 6, a country (or countries) will be able to transfer carbon credits earned from the reduction of GHG (Green House Gas) emissions to help one or more countries meet climate targets. CORSIA offers a harmonized way to reduce emissions from international aviation, minimizing market distortions.

The market infrastructure shall also be revamped to facilitate green credit trade or transfer. Existing trading infrastructure should enable trade of green credits, and demand side management strategies should ensure market stability should be aligned to global best practices. Potential types of credits under the green credit program could be Forest & Ecosystem Credits, Air Quality Credits, Water Quality and

Access Credits, Waste Management Credits, Energy Efficiency Credits, and Renewable Energy Generation Credits among others. These credits are additional to domestic (Indian) emission trading system carbon credits under EC Act 2022 (Energy Conservation Act), international voluntary carbon credits, Article 6 carbon credits under Paris Agreement, and plastic credits under EPR (Extended Producers Responsibility) Regulations. EPR aims to place responsibility on stakeholders for the proper disposal of plastic waste. EPR certificate is mandatory for Indian manufacturers/importers dealing with E-waste.

### Management of Green Credits

To ensure the effectiveness and integrity of the programme, the Indian Council of Forestry Research and Education (ICFRE) is designated to act as the program administrator. They will develop guidelines, processes, and procedures for implementation, including the establishment of thresholds and benchmarks for each Green Credit activity. Moreover, the Green Credit Programme encourages private sector industries, companies, and other entities to meet their existing obligations by aligning their actions with those

relevant to generating or purchasing green credits.

### Core Idea

This innovative instrument, the first of its kind, aims to value and reward multiple ecosystem services. By doing so, it allows green projects to achieve optimal returns beyond carbon reductions alone. The guidelines bring together mechanisms to quantify and support ecosystem services, making them invaluable to organic farmers and Farmer Producer

Organizations (FPOs). Ultimately, the programme serves as a catalyst for sustainable actions and sustainable living, empowering individuals, companies, and local bodies to make a positive impact on the environment.

### Concerns about the Programme

Despite its good intent on paper, there exists a potential for Greenwashing within the market-based mechanism of green credits. Greenwashing involves making false or exaggerated claims about environmental sustainability to create a positive image without delivering significant environmental bene-

fits. There is a fear that some companies or entities may engage in superficial activities solely to generate green credits, neglecting the need for genuine efforts to address environmental issues. Additionally, questions arise about the efficacy of these mechanisms in

**Lifestyle for Environment (LiFE) was launched by the Prime Minister of India on World Environment Day (5th June 2022). The idea of LiFE was introduced by the Prime Minister during the 26th United Nations Climate Change Conference of the Parties (COP26), 2021 in Glasgow.**



achieving urgent emissions reductions and whether resources should be allocated to monitoring and fraud prevention or directed towards more transformative government-led efforts.

### **Checks & Balances.**

To mitigate these concerns, it is essential to establish robust methodologies and standards for the Green Credit System. Moreover, it is crucial to create additional strategies that generate enough demand for green credits, ensuring the viability and stability of the market. A careful assessment and implementation of the program, particularly regarding tree plantation and afforestation, is vital. Factors such as unresolved forest ownership and governance rights, ecological and biodiversity challenges, and global critiques of carbon credit schemes need to be carefully considered. Internal discussions and public consultations play a pivotal role in addressing these aspects.

### **Way ahead**

The Green Credit Programme serves as a powerful tool for incentivizing sustainable actions and promoting sustainable living among individuals, companies, and local bodies. While concerns about effectiveness and the risk of Greenwashing exist, the programme's range of Green Credit Activities can help address various environmental challenges. To ensure its success, it is crucial to establish robust methodologies and standards and implement additional strategies that generate sufficient demand for green credits, ensuring the viability and stability of the market. The Green Credit Programme represents a significant step towards a greener future, fostering environmental consciousness and responsibility. KIIFB has been striving to incorporate all practices that are socially and environmentally sustainable, particularly in aspects of climate resilience in project design and execution, green transportation corridors, green building initiatives, and energy efficient and green buildings green energy initiatives including Green Hydrogen, etc. into the entire infrastructure systems. It is essential to develop a sustainable strategy that includes mitigation, adaptation, and the creation of resilient infrastructure development to further contribute to green credit activities.



# KIIFCON TAKES UP TWO CHALLENGING KSRTC PROJECTS

KIIFCON was appointed as the Transaction Advisor for the Land Monetisation of KSRTC Land Parcels Project, as per the government order, GO(Rt)No. 328/2022/TRANS dated 05.08.2022 and vide the KSRTC letter no. AB6/001376/22 dated 09.02.2023. Also, KSRTC has requested KIIFB to avail services of a competent consultant for Route Rationalisation and Data Analysis vide letter No. ML3/0016679/16 dated 24/08/2088 and KIIFCON has agreed to take up the work vide letter no, IA-4/4682/2022/KIIFB by 2022. Subsequently, an agreement was executed for these two projects between KIIFCON Pvt. Ltd. and KSRTC on 13th July 2023. The agreement was signed by Sri. Biju Prabhakar IAS, CMD, KSRTC and Sri. Satyajeet Rajan, CEO, KIIFCON in the presence of Dr. K.M. Abraham CFA, Chairman, KIIFCON. The ceremony was also attended by Directors of KIIFCON, Sri. K. P. Purushothaman and Sri. S. J. Vijayadas, and KSRTC officials Sri. Pramod Sanker, IOFS (Joint MD-KSRTC), Sri. Chandrababu (Executive Director - KSRTC), Smt. Beena Begam (General Manager-Finance)-KSRTC)



*Agreement signed by Sri. Biju Prabhakar IAS, CMD-KSRTC and Sri. Satyajeet Rajan, CEO-KIIFCON*

The **Land Monetization of KSRTC Land Parcel Project** intends to develop and thereby monetize selected land parcels owned by KSRTC through Design Built Finance Operate and Transfer (DBFOT) mode under the Public Private Partnership (PPP) scheme. Objectives of the project includes the identi-



fication of suitable land parcels owned by KSRTC after necessary site investigations and preliminary feasibility studies. In the business model, the basic requirements of the client, i.e., KSRTC, for each of the project sites will be sought and the same shall be facilitated along with development. Based on the above, an Expression of Interest (EOI) will be called from global private potential investors who are interested in investing in the project while facilitating the requirements of KSRTC. On receiving EOIs, KIIFCON shall float Request for Proposals (RFPs) for the selection of potential bidders based on Quality & Cost Based Selection (QCBS). Subsequently, KSRTC shall enter into a lease agreement of land parcels with the respective successful investors selected through a bidding process. In this PPP mode, it is planned to go for a 35 year lease period, in which the selected investor can come up with revenue-generation infrastructure projects like hotels, shopping complexes, malls, office spaces, etc. The model shall be formulated in such a way that KSRTC shall receive an upfront amount from the developer based on the anticipated investments, thereby KSRTC can meet a part of prevailing debts and to find the same as alternate source of income for their regular expenditure.

The **Route Rationalization Study for KSRTC** focuses on optimizing the current route network of KSRTC buses using network optimization techniques and Geographic Information System (GIS) Software. The primary objective of this project is to ensure that KSRTC provides the most efficient and well-connected bus services for the public. By reviewing and analyzing the existing route network, the project seeks to identify opportunities for the improvement and design of an optimal route network that enhances the overall travel experience. An outline of the key activities and the final output is given below.

1. **Creation of GIS Database:** A consolidated digital database of KSRTC's route network will be created using GIS Software. This database will serve as a valuable resource to visualize and manage the entire bus network effectively.
2. **Analyzing Current Route Network and understanding demand patterns:** The existing route network will be comprehensively studied to identify the spatial and temporal overlaps across different services. After identifying the stage-wise demand for different bus routes, the route network will be optimized to align with passenger demand more effectively.
3. **Long-Distance Route Network Planning:** KSRTC's long-distance bus routes will undergo a thorough network planning process to ensure smoother and more efficient travel for passengers traveling between different cities. The optimum network of long distances services will be identified using the hub and spoke method of network planning. The district-to-district or town-to-town chain services and ordinary services will be used to fix the gaps in service provision on the basis of the analysis of data. The headways and frequency between the services will be fixed to ensure the adequacy of services during peak and off-peak to avoid bunching of buses and shortages of supply in any sector.

The final output of this project will be a revamped and optimized route network that ensures better connectivity, improved reliability, and efficiency, and reduced operational costs for KSRTC.

# QUALITY AUDIT AND ITS SIGNIFICANCE IN PROJECTS

QA Team, HITES

## Introduction:

Quality audit is a systematic assessment of construction processes, materials, and workmanship to ensure compliance with established standards, specifications, and regulations. It focuses on verifying that construction projects are executed in a manner that meets quality requirements and industries best practices. Quality audits are a crucial aspect of construction project management, ensuring compliance, driving continuous improvement, and ultimately enhancing project outcomes.

HITES, being one of the Special Purpose Vehicles (SPVs) of KIIFB, has been entrusted with several projects across the State. The organization is diligently implementing all necessary measures to ensure the delivery of the projects with utmost quality. In order to achieve this motto, HITES has formulated a Quality Audit Cell (QAC).

The principles and standards adopted by HITES for quality audits are as follows;

## Independence

- Conducted by independent and impartial auditors who are free from any conflicts of interest.

## Compliance with Standards

- Assess compliance with relevant standards, regulations, guidelines, IS Codes and HITES quality manual

## Documentation

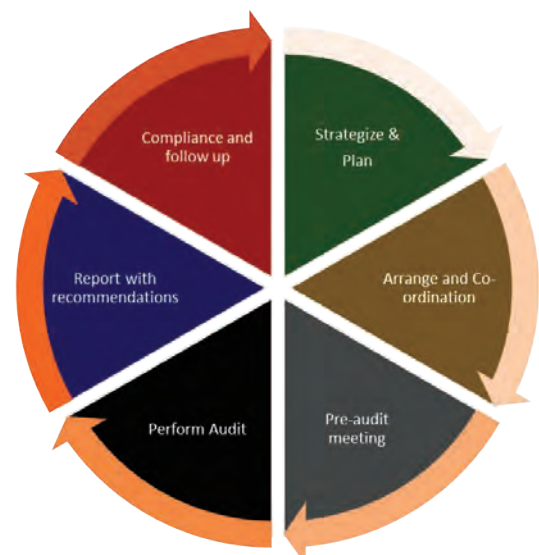
- Systematic approach to gather information, perform inspections, and assess compliance.

## Reporting and Recommendations

- Concise report, highlighting areas of non-compliance, deficiencies, and recommendations for improvement.

Quality Manual of HITES serves as a guiding document for conducting quality audits, in addition to this, the CPWD and KIIFB guidelines are also followed. The audits are scheduled when project progress reaches physical milestones of 20%, 40%, 80%, and 100%.

## Steps for performing the Quality Audit





1. **Strategize & Plan:** Developing a strategic approach, comprehensive plan, determine the audit team composition and resources required based on the scope of audit.
2. **Arrange and Co-ordination:** Scheduling the audit activities, coordinating with project team and issue of check list to site.
3. **Pre-audit meeting:** QAC conducts an opening meeting with the auditee to explain the objectives, and scope of the audit. This will have an open lines of communication and create a collaborative environment for the audit process.
4. **Perform Audit:** The audit team assesses the auditee's procedures and documents against the defined HITES quality manual, CPWD, and KIIFB norms. Information is gathered through observations and document reviews, to evaluate the compliance.
5. **Report with recommendation:** A detailed audit report is prepared, documenting the findings, conclusions, and recommendations. This is reported to competent authority for further actions.
6. **Compliance and Follow-up:** Follow-up activities may include monitoring the progress of corrective actions and conducting subsequent audits to verify compliance and track improvement.

### Conclusion

By systematically evaluating and examining various aspects, the quality audit helps to identify areas of improvement and also strengthen the quality management systems.

A comprehensive audit report should summarize the audit process, highlight non-conformities, and provide clear recommendations for improvement. This report serves as a valuable tool for site/execution heads, enabling them to take corrective actions, enhance project efficiency, and maintain consistent quality standards.

HITES Quality Audit Cell is a proactive approach to maintain and improve quality in our projects, thereby achieving quality objectives and enhancing customer satisfaction.

#### Documentation and Record-Keeping

- Documents to be maintained at site and updated periodically
- This includes all registers/documents as stipulated in the HITES quality checklist

#### Compliance with Regulations and Codes

- Statutory regulations such as permits, licenses, and certifications are verified

#### Equipment Inspection

- Machineries and laboratory equipment calibration certificate has to be verified.
- All calibration should be done by NABL accredited laboratory or Government Institutions.



# Familiarizing Alternative Technologies In Water Supply Pipelaying

Megha S Thampi, Junior Consultant, TRC

Water supply pipelaying is a vital aspect of civil engineering and infrastructure development that entails the building of pipelines to transport potable water from its source to various consumers such as residential, commercial, industrial, and public facilities. This method is critical for providing community access to safe and clean drinking water, enhancing public health, and fostering economic prosperity.

In water supply pipelaying, several common construction technologies were widely utilised. These strategies have been tried and proven over time and are still used in a variety of applications. The open trench method is one of the most frequent traditional construction technologies. It is one of the oldest and most widely used ways for laying water delivery pipes. It entails digging a trench following the pipeline's planned route, laying the pipes, and then backfilling the trench. This approach is appropriate for a variety of soil types and allows for easy pipeline access during installation and maintenance.

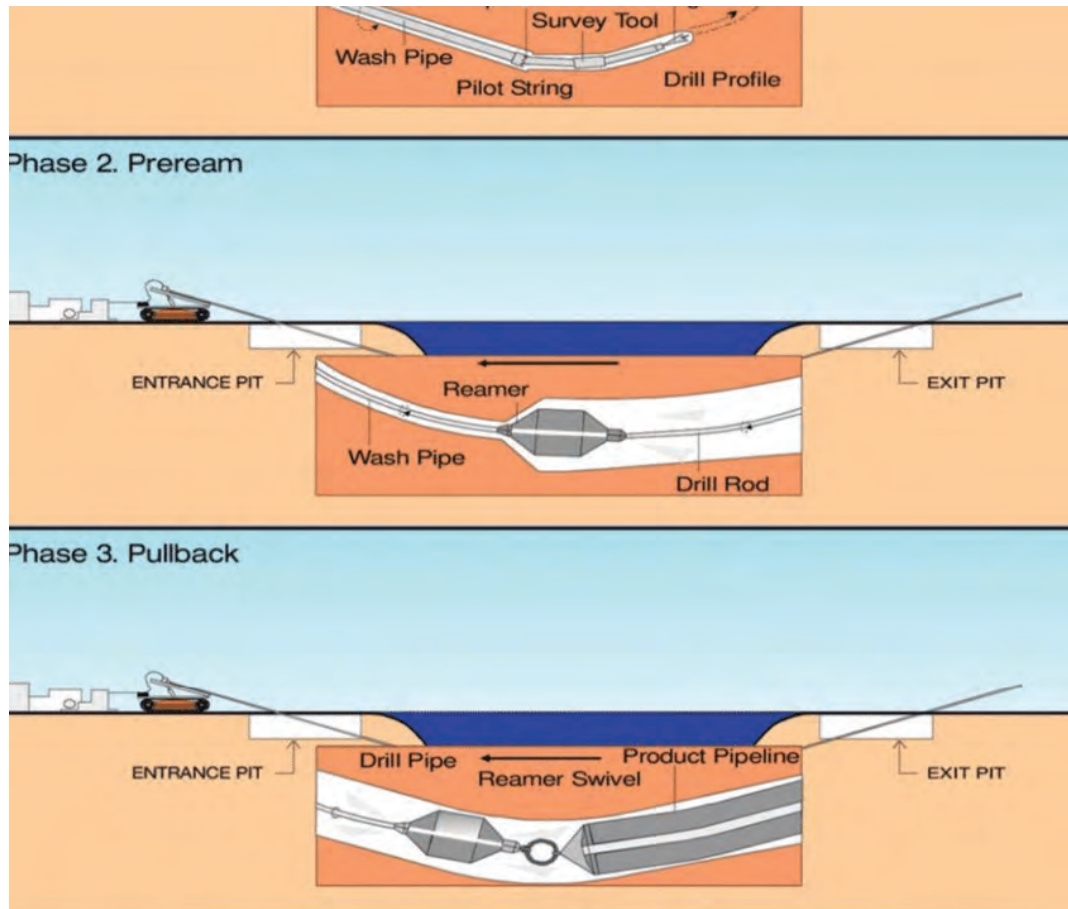
While open trench pipelaying methods have been widely used, they also come with their fair share of challenges such as Environmental Impact, Traffic Disruption, Soil Settlement and Subsidence, Corrosion and Deterioration, Water Loss, Limited Adaptability, Labor and Cost Intensive, Groundwater Contamination, Pipe Joint Integrity, and Project Delays.

Addressing these challenges often requires a combination of better construction practices, improved materials, and the integration of more advanced technologies. As a result, newer techniques like trenchless technologies, advanced pipe materials, and leak detection systems have gained popularity due to their potential to overcome some of these challenges and enhance the efficiency and sustainability of water supply pipelaying projects.

There are several innovative construction technologies and trenchless methods used in water supply projects to install pipelines and conduits more efficiently and with minimal disruption to the environment. Some of these new construction technologies include:

## **I. Horizontal Directional Drilling (HDD):**

Horizontal Directional Drilling (HDD) is a trenchless construction technique used in water supply projects to lay underground pipelines without the need of open-cut trenches. HDD involves drilling a pilot bore horizontally underground along a preset path, and then installing the pipeline within the bore.



1. HDD Construction Procedure- Schematic representation

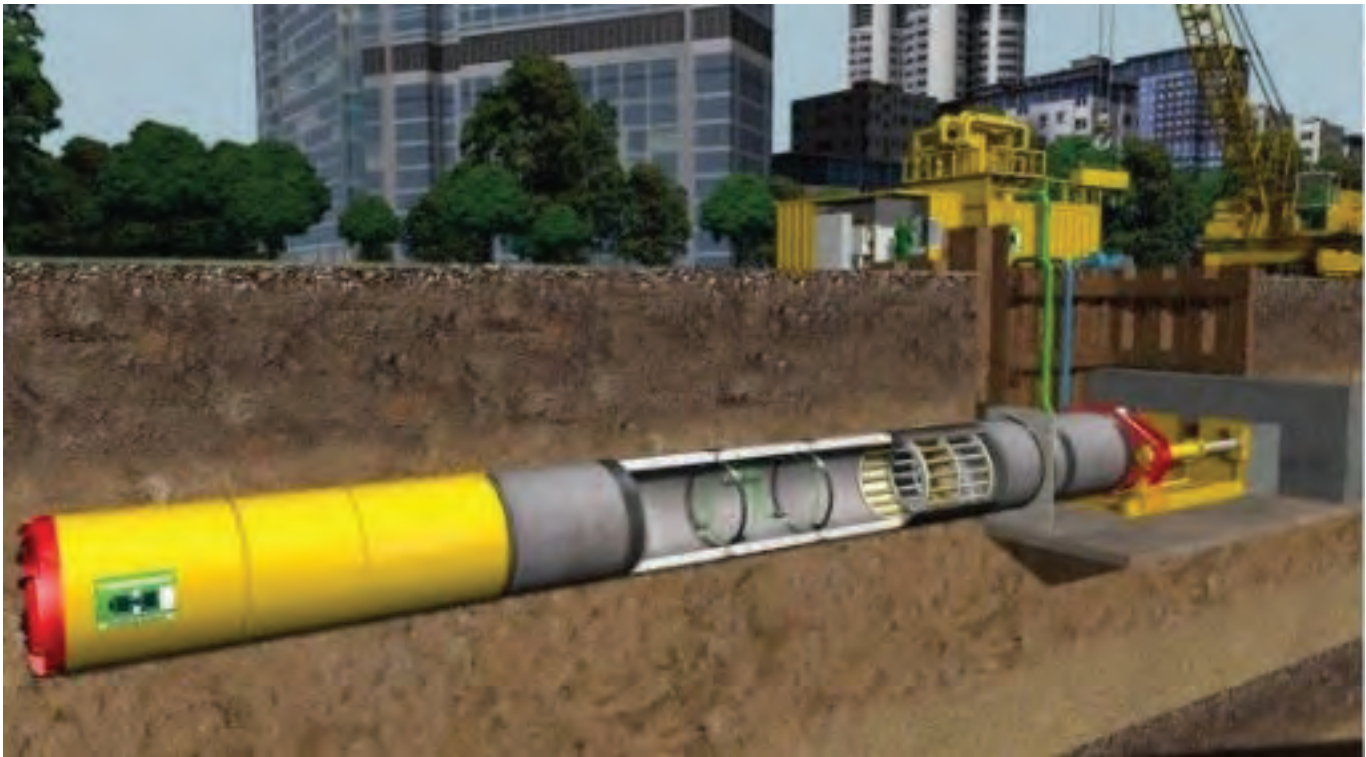
### Advantages of HDD in Water Supply Projects:

1. **Minimal Surface Disruption:** HDD significantly reduces disruption to the surrounding environment, making it ideal for urban areas, river crossings, and environmentally sensitive locations.
2. **Cost-Effectiveness:** While HDDs may have greater initial expenses, they can be more cost-effective in the long run since they minimize the need for costly restoration and surface repair.
3. **Reduced Environmental Impact:** HDD minimizes soil disturbance, preserves vegetation, and reduces the potential for soil erosion and sedimentation.
4. **Versatility:** HDD is suitable for a variety of ground types, including soft soils, clay, sand, and even rock formations.
5. **Faster Installation:** Compared to traditional open trenching, HDD can result in faster project completion times.

Overall, Horizontal Directional Drilling is a valuable trenchless technology used in water supply projects to install pipelines while minimizing disruption efficiently and effectively to the environment and surrounding infrastructure. It is well-suited for various water supply applications, such as river crossings, road crossings, and installations in urban and sensitive areas.

## 2. Micro tunnelling:

Micro tunnelling is a trenchless construction process used in water supply projects to lay underground pipelines for water distribution or other water-related infrastructure. It entails using a micro tunnel boring machine (MTBM) to produce an underground tunnel through which a pipeline can be put with precision and minimal interruption to the surface.



*2. Micro Tunnelling- Schematic representation*

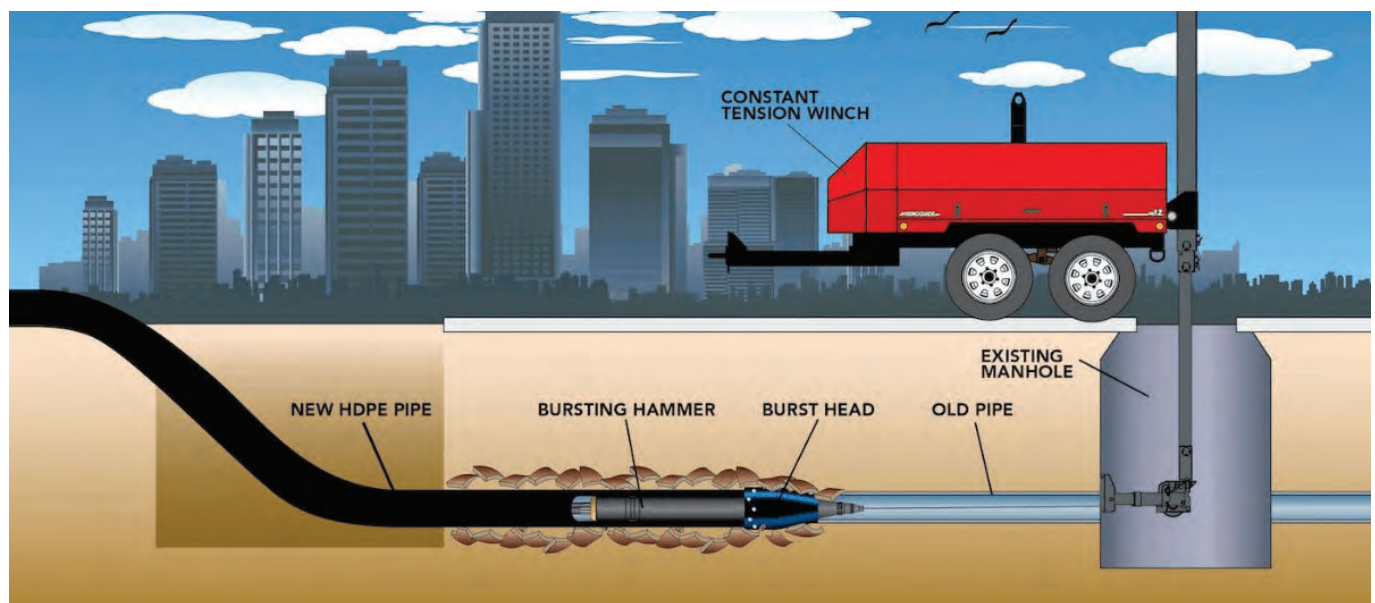
### **Advantages of Micro tunnelling in Water Supply Projects:**

1. Precision and Accuracy: Micro tunnelling allows for precise alignment and grade control, ensuring the pipeline is installed with minimal deviations.
2. Minimal Surface Disruption: Micro tunnelling causes little disruption to the surface, making it suitable for urban areas and environmentally sensitive locations.
3. Reduced Environmental Impact: The method minimizes soil disturbance, preserves vegetation, and lowers the potential for soil erosion and sedimentation.
4. Versatility: Micro tunnelling can be used in a variety of ground conditions, including soft soils, clay, and rocky formations.
5. Efficiency: Micro tunnelling is an efficient method, often resulting in faster project completion times compared to traditional open trenching.
6. Safety: As most of the construction takes place underground, micro tunnelling provides better safety conditions for workers and the public.

Micro tunnelling is commonly used in water supply projects to install water mains, sewer pipelines, and other conduits. It offers numerous benefits, making it an attractive option for projects that require precise alignment, minimal surface disruption, and reduced environmental impact.

### 3. Pipe Bursting:

Pipe bursting is a trenchless construction technology used in water supply projects to replace or repair old pipelines without considerable excavation. It entails breaking the old or broken pipe and pulling in a new pipe of the same or larger diameter.



*3. Pipe Bursting Method- Schematic Representation*

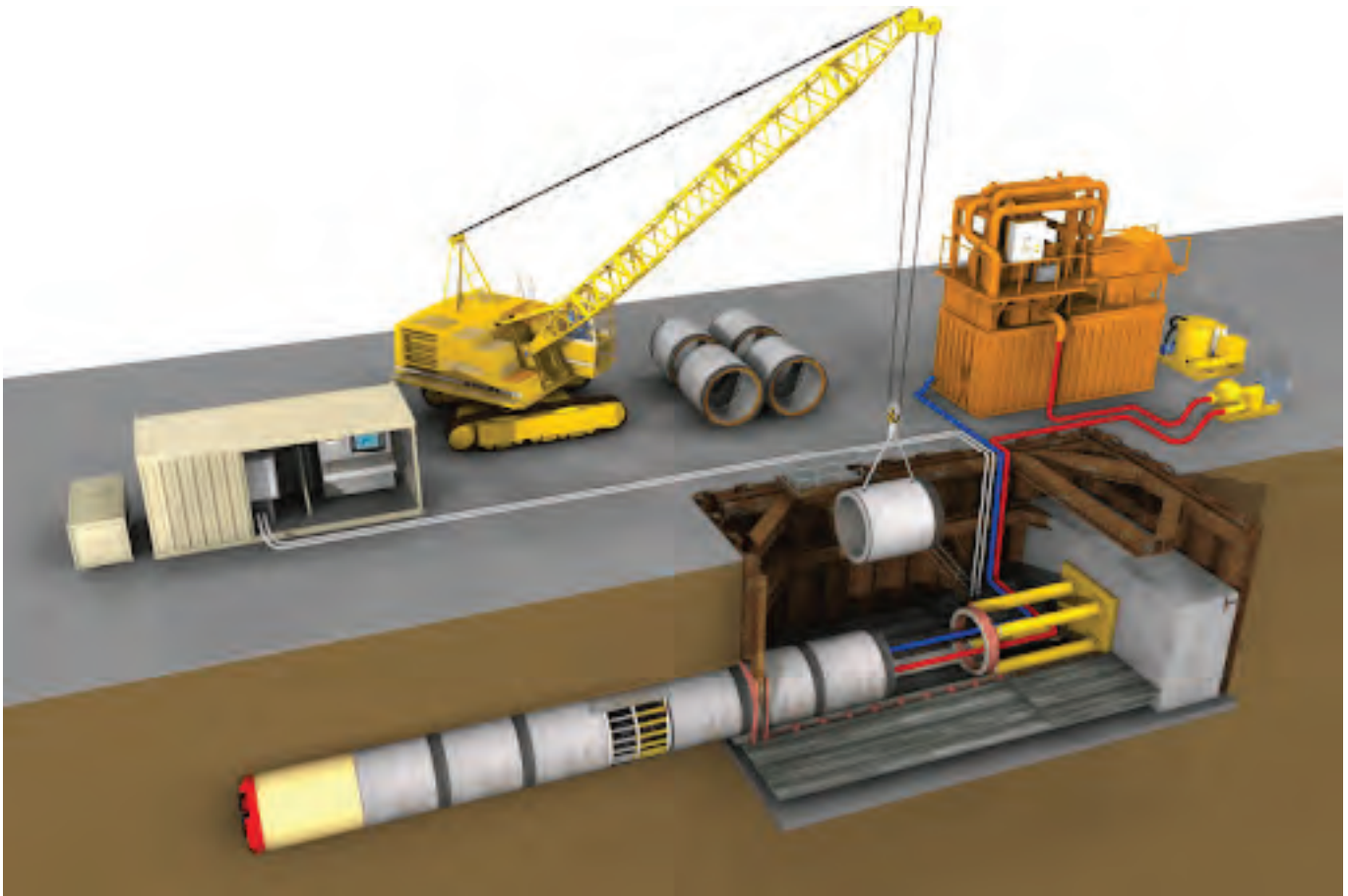
#### **Advantages of Pipe Bursting in Water Supply Projects:**

1. **Minimal Surface Disruption:** Pipe bursting eliminates the requirement for open-cut excavation, causing minimal interruption to the surface and nearby infrastructure.
2. **Faster Installation:** Pipe bursting is typically faster than traditional open trenching methods, resulting in shorter project durations.
3. **Cost-Effectiveness:** While pipe bursting has higher upfront expenses, it can be more cost-effective in the long term due to reduced restoration and surface repair needs.
4. **Improved Pipeline Capacity:** Pipe bursting allows for the replacement of an old pipe with a new one of the same or larger diameter, increasing the capacity of the water delivery system.
5. **Rehabilitation of Existing Pipes:** Pipe bursting can rehabilitate old or damaged pipelines, extending their service life without the need for complete replacement.
6. **Environmental Benefits:** The reduced excavation and soil disturbance help preserve vegetation and minimize the environmental impact of the construction process.

Pipe bursting is a valuable trenchless method in water supply projects, especially when dealing with aged, deteriorated, or undersized pipelines. It offers numerous benefits, making it a preferred choice for pipeline replacement and rehabilitation in various water supply systems.

#### 4. Pipe Jacking:

Pipe jacking is a trenchless construction method used in water supply projects to install underground pipelines without the need for extensive excavation. It involves using a micro tunnel boring machine (MTBM) or a similar jacking system to push or jack precast concrete or steel pipes into the ground as the machine advances.



*4. Pipe Jacking Method*

#### Advantages of Pipe Jacking in Water Supply Projects:

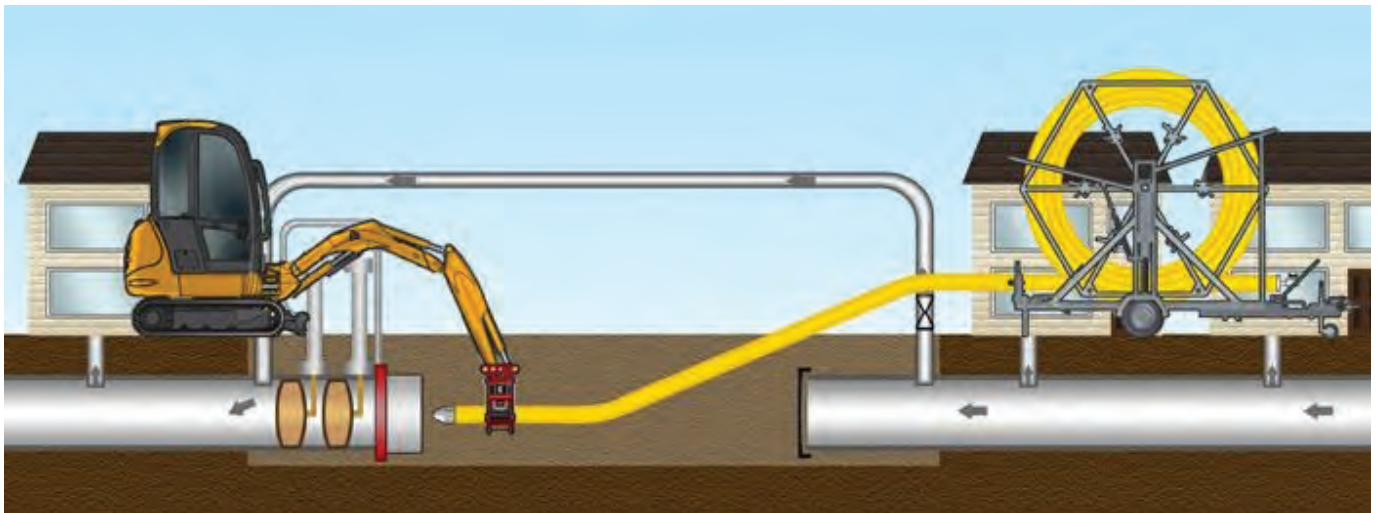
1. Minimal Surface Disruption: Pipe jacking causes little disruption to the surface, making it suitable for urban areas and environmentally sensitive locations.
2. Precision and Accuracy: Pipe jacking allows for precise alignment and grade control, ensuring the pipeline is installed with minimal deviations.

3. **Reduced Environmental Impact:** The method minimizes soil disturbance, preserves vegetation, and lowers the potential for soil erosion and sedimentation.
4. **Versatility:** Pipe jacking can be used in a variety of ground conditions, including soft soils, clay, and rocky formations.
5. **Efficiency:** Pipe jacking is an efficient method, often resulting in faster project completion times compared to traditional open trenching.
6. **Safety:** As most of the construction takes place underground, pipe jacking provides better safety conditions for workers and the public.

Pipe jacking is commonly used in water supply projects to install water mains, sewer pipelines, and other conduits. It offers numerous benefits, making it an attractive option for projects that require precise alignment, minimal surface disruption, and reduced environmental impact.

## 5. Slip lining:

Slip lining is a trenchless rehabilitation method used in water supply projects to restore or reinforce existing pipelines. It involves inserting a new, smaller-diameter pipe (known as the liner) into the existing host pipe, essentially creating a new pipe within the old one. Slip lining is typically used when the existing pipeline is structurally sound but requires improvement, such as reducing leaks, corrosion protection, or increasing flow capacity.



*5. Slip Lining Method*

### **Advantages of Slip Lining in Water Supply Projects:**

1. **Non-Intrusive:** Slip lining is a non-intrusive method that avoids the need for extensive excavation, minimizing surface disruption and environmental impact.
2. **Cost-Effective:** Slip lining can be a cost-effective rehabilitation method compared to full pipeline replacement, as it reduces material and labour costs.

3. Improved Pipeline Performance: Slip lining restores the integrity of the existing pipeline, reducing leaks, preventing corrosion, and improving flow capacity.
4. Faster Rehabilitation: Slip lining can be quicker than traditional open trench rehabilitation methods, leading to shorter project durations and less service disruption.
5. Extending Service Life: Slip lining extends the service life of the existing pipeline, providing a viable solution for pipelines that are still structurally sound but need improvement.

Slip lining is a valuable trenchless technology in water supply projects, especially for rehabilitating existing pipelines without the need for complete replacement. It offers various benefits, making it an attractive option for improving water distribution systems while minimizing disruption to the surrounding environment.

These innovative construction technologies in water supply projects offer numerous benefits, including reduced construction time, cost-effectiveness, environmental preservation, and improved safety for workers and the public. They have become increasingly popular alternatives to the open trench method due to their versatility and ability to tackle various project challenges. Engineers and project managers can select the most appropriate technology based on factors such as project scope, ground conditions, environmental impact, and budget considerations.



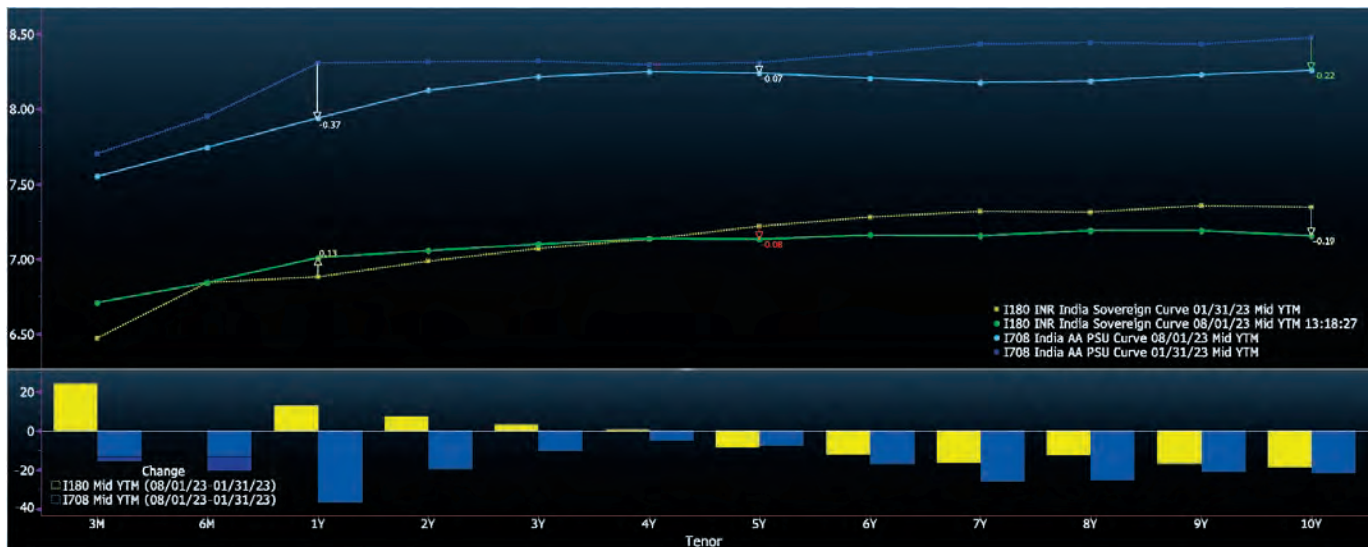


## Economy & Market Watch

Ajosh Krishnakumar  
DGM, Finance & Administration

In this edition of Economy & Market Watch, we do a study of India sovereign yield curve and AA PSU yield curve to analyse how the yield curves has evolved since the beginning of calendar year 2023.

The following chart depicts the India Sovereign yield curves and AA PSU yield curves at the beginning of calendar year 2023 and at the beginning of August 2023.



As may be seen from the chart, there has been a significant change in the shape of the India Sovereign yield curve in the last 7 months, i.e., from a traditional upward sloping yield curve at the beginning of the year to an almost flat yield curve (spread between 1Y and 10 Y yields at ~ 25 bps) currently. During the period, while the short-term yields for India sovereign bonds have increased marginally by ~ 13 bps for 1Y tenor, the yield curve made a downward shift for tenors beyond 4 years, with long-term yields (10 -Y tenor) for India sovereign bonds dropping by ~19 bps. Additionally, we may also note a slight inversion in the current sovereign yield curve between tenors 4Y – 5Y, 6Y – 7Y and 8Y – 10Y.

For AA PSU yield curve, there has been a downward shift in the yield curve (across all tenors) when compared to the yield curve at the beginning of the calendar year 2023. While the yield for 1Y tenor has dropped by 37 bps, the yields for 5Y and 10Y tenors have dropped by 7 bps and 22 bps respectively. As in the case of the sovereign yield curve, there is an inversion in the current AA PSU yield curve between tenors 4Y – 7Y.



**A brief overview of Monetary Policy Committee (MPC) resolutions from December 2022 to June 2023:** During the December 2022 MPC meeting, held between 5th to 7th of December, MPC resolved to increase the policy repo rate by 35 bps from 5.90% to 6.25%. Accordingly, since May 2022, RBI has cumulatively hiked the repo rate by 225 bps i.e., from 4% prior to May 2022 MPC to 6.25% during the December 2022 MPC.

In the February 2023 meeting, MPC resolved to increase the policy repo rate by 25 bps to 6.50 % with immediate effect.

In the April 2023 meeting, MPC decided to keep the policy repo rate under the Liquidity Adjustment Facility (LAF) unchanged at 6.5%.

Subsequently, MPC in its meeting held on June 6th -8th, 2023 decided to maintain status quo in terms of the policy repo rate and kept the same at 6.5%.

In terms of outlook, according to the June MPC, inflation is projected at 5.1% for FY 2023-24, with Q1 at 4.6 per cent, Q2 at 5.2 per cent, Q3 at 5.4 per cent and Q4 at 5.2 per cent, and risks evenly balanced.

On domestic economic growth, June MPC projected the real GDP growth for 2023-24 at 6.5 per cent with Q1:2023-24 at 8.0 per cent; Q2 at 6.5 per cent; Q3 at 6 per cent; and Q4 at 5.7 per cent, with risks evenly balanced.

The June MPC also decided to remain focused on withdrawal of accommodation to ensure that inflation progressively aligns with the target, while supporting growth.





## Hill Highway - Kuttikkanam - Chapathu Stretch



**Fund Mobilization Status**

Particulars	Amount (₹ Cr.)
Contribution from Government of Kerala	₹ 16,063
Fund mobilized from financial market	₹ 19,634
<b>Total</b>	<b>₹ 35,697</b>

\* Provisional figure as on 30-06-2023



**PRAVASI Chitty  
Statistics as of  
31<sup>st</sup> July 2023**

Total number of customers	182732
Total number of subscribers	55066
Total amount collected	INR 2964.18 Cr
KIIFB Deposit bond subscribed	INR 852.00 Cr
KIIFB Security bond subscribed	INR 178.87 Cr



**PRAVASI  
Dividend Scheme**

Total number of registrations	47934
Total no. of depositors	4003
Total amount deposited	INR 314.02 Cr

കേരള  
വികസനത്തിന്റെ  
ചാലകശക്തി



ഉറപ്പാക്കുന്നു  
ധനലഭ്യത  
ഗുണനിലവാരം  
സമയക്രമം

