



KERALA INFRASTRUCTURE INVESTMENT FUND BOARD

# Newsletter

Vol 6

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May 2023





# Projects - Statistics

Department	KIIFB Approved Projects	
	No. of Projects Approved	Approved Amount (₹. in Crore)
PWD	485	₹ 29,551.39
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	₹ 2,901.18
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	₹ 658.04
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	₹ 6,487.80
<b>Total</b>	<b>1050</b>	<b>₹ 60,363.18</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	₹ 60,363.18
Projects under Land Acquisition Pool	7	₹ 20,000.00
<b>Total</b>	<b>1057</b>	<b>₹ 80,363.18</b>

Fund disbursed to projects (as on 30/04/2023)

₹ 24,273.01 Crore



## ***Chief Editor's Page***

On April 22nd, the world celebrated Earth Day, it served as a chance to reflect on how humanity has been treating our planet, and let's face it: we've been poor custodians. The Earth and its ecosystems are our common home, and it is necessary to promote harmony with nature in order to achieve a just balance among the economic, social, and environmental needs of present and future generations. The pandemic exposed us to a wealth of interconnections— between economic and environmental fragility, ecological and human wellbeing, as well as social inequality and health outcomes, to name a few. The consequences of these interconnections are reshaping not just the economy, but society as well.

Scientific studies around the world have identified that several planetary boundaries are being transgressed and others are at risk of being so in a business-as-usual world. Since the industrial revolution, nature has been treated as a commodity that exists largely for the benefit of people. In order to meet the basic needs of a growing population within the limits of the Earth's finite resources, there is a need to devise a more sustainable model for production, consumption, and the economy as a whole. Devising a new world will require a new relationship with the Earth and with humankind's own existence. KIIFB is fully committed to the endeavor of adopting sustainability in our projects.

On 25th April 2023, KIIFB was felicitated in recognition of Best Performance under the Urban Infrastructure category for the 2022-23 period by the Housing and Urban Development Corporation Limited (HUDCO). This is the second time we are being

felicitated with this award. As mentioned in the previous edition of the KIIFB Newsletter, the Government of Kerala kickstarted the "Ente Keralam" event on April 1st, 2023. KIIFB has been instrumental in the coordination of the event. So far the event has been successfully conducted in the districts of Ernakulam, Wayanad, and Idukki. More details on the event have been reflected in the article titled "Ente Keralam" submitted by the Administrative Inspection Wing of KIIFB.

The articles in this edition focus on an array of topics ranging from Green Bonds for Sustainable Infrastructure Finance to 3D concrete printing. The Green Bonds article submitted by the ESG Wing of KIIFB talks about the complex and evolving topic of sustainable finance. The Technical Inspection Wing focused their article on Isolation Wings and how the issues faced during the pandemic made the Central and State governments in India think about the augmentation of isolation facilities across the country as a precaution to meet the challenges arising out of any such pandemic situation in the future. In this issue, apart from the aforementioned articles, there are articles that shed light on technological aspects and the healthcare sector.

As we celebrate World Earth Day 2023, let us acknowledge the responsibility we all have for the planet and each other. More to come in the coming issues, stay tuned!

Happy Reading!

Regards  
**Chief Editor**



# Green Bonds for Sustainable Infrastructure Finance: Domestic standards in Indian Context

Mr. Suresh Babu K N, Project Manager, ESG Wing  
Ms. Peggy Nepram, Sustainability Expert, ESG Wing

Sustainable finance is the process of taking due account of the Environmental, Social, and Governance (ESG) factors of an economic activity or project while making a financial investment. It has become a powerful movement led by regulators, institutional investors, and asset managers globally. In the 2021 United Nations Climate Change Conference, more commonly referred to as COP26, held in Glasgow, Scotland, 197 countries, including India, have made enhanced commitments towards mitigating climate change, and promising more climate finance for developing countries to adapt to climate impacts. This means that sustainable finance will be the mainstay of world business, which in turn, will mean more demand for funds in this domain. In keeping with the ambition to significantly reduce the carbon intensity of the economy, the Union Budget 2022-23 announced the issue of Sovereign Green Bonds (para 103). The budget para 103 states: *“As a part of the government’s overall market borrowings in 2022-23, sovereign Green Bonds will be issued for mobilizing resources for green infrastructure. The proceeds will be deployed in public sector projects which help in reducing the carbon intensity of the economy.”*

## Emerging Global Trends in sustainable finance

Sustainable finance, however, is a complex and evolving topic. Many types of sustainability bonds have



Figure 1 Global Green Taxonomy



developed and evolved. Bonds like green bonds, social bonds, sustainability bonds, and sustainability-linked bonds have been carved out in such a way that proceeds from these bonds will be exclusively applied to finance or refinance green projects/ blue projects/ social projects or finance environmentally friendly projects. Many countries are slowly delving into sustainable finance, especially as a response to the Covid 19 recovery process. Green bonds in particular are debt securities designated to finance environmentally friendly projects. Climate change has been recognized as one of the most critical challenges faced by the global society and economy in the 21st century.

Recognizing the above facts, the financial sector can play a pivotal role in mobilizing resources and their allocation thereof in green activities/projects. Hence, green finance is also progressively gaining popularity in India.

### Green Finance

Renewable energy	<ul style="list-style-type: none"> <li>• Solar/ wind/ biomass/ hydropower energy projects that integrate energy generation and storage</li> <li>• Incentivizing the adoption of renewable energy</li> </ul>
Energy efficiency	<ul style="list-style-type: none"> <li>• Design and construction of energy-efficient and energy-saving systems and installations in buildings and properties.</li> <li>• Supporting lighting improvements (e.g. replacement with LEDs)</li> <li>• Supporting construction of new low-carbon buildings as well as energy efficiency retrofits to existing buildings</li> <li>• Projects to reduce electricity and losses</li> </ul>
Clean transportation	<ul style="list-style-type: none"> <li>• Projects promoting the electrification of transportation</li> <li>• Adoption of clean fuels like electric vehicles including building charging infrastructure</li> </ul>
Climate change adaptation	<ul style="list-style-type: none"> <li>• Projects aimed at making infrastructure more resilient to the impacts of climate change</li> </ul>
Sustainable water and waste management	<ul style="list-style-type: none"> <li>• Promoting water-efficient irrigation systems</li> <li>• Installation/ upgradation of wastewater infrastructure including transport, treatment, and disposal systems</li> <li>• Water resources conservation</li> <li>• Flood Défense systems</li> </ul>
Pollution prevention and control	<ul style="list-style-type: none"> <li>• Projects targeting the reduction of air emissions, greenhouse gas control, soil remediation, waste management, waste prevention, waste recycling, waste reduction and energy efficient waste – to – energy</li> </ul>
Green buildings	<ul style="list-style-type: none"> <li>• Projects related to buildings that meet regional, national, or internationally recognised standards or certifications for environmental performance</li> </ul>



Sustainable management of living natural resources and land use	<ul style="list-style-type: none"> <li>• Environmentally sustainable management of agriculture, animal husbandry, Fishery and aquaculture</li> <li>• Sustainable forestry management including afforestation / reforestation</li> <li>• Support to certified organic farming</li> <li>• Research on living resources and biodiversity protection</li> </ul>
Terrestrial and aquatic biodiversity conservation	<ul style="list-style-type: none"> <li>• Projects relating to coastal and marine environments</li> <li>• Projects related to biodiversity preservation, including conservation of endangered species, habitats and ecosystems</li> </ul>

Green finance refers to the financial arrangements that are specific to the use for projects that are environmentally sustainable or projects that adopt the aspects of climate change. Environmentally sustainable projects include the production of energy from renewable sources like solar, wind, biogas, etc.; clean transportation that involves lower greenhouse gas emissions; energy-efficient projects like green building; waste management that includes recycling, efficient disposal, and conversion to energy, etc. Moreover, the project defined sustainable under the disclosure requirement for Green Debt Securities includes climate change adaptation, sustainable waste, and water management, sustainable land use including sustainable forestry and agriculture, and biodiversity conservation (SEBI 2017). In order to meet the financial needs of these types of projects, new financial instruments such as green bonds; carbon market instruments (e.g., carbon tax); and new financial institutions (e.g., green banks and green funds) are being established. They together constitute green finance.

### SEBI & Green Bonds

Against the backdrop of the gaining popularity of sustainable finance in India as well as around the globe, the Securities and Exchange Board of India (SEBI) has put in place, operational guidelines on green bonds. In 2015, SEBI provided the frame-

work for the issuance and listing of municipal debt securities. The issue and Listing of Municipal Debt Securities (ILMDS) can issue green bonds in compliance with rules governing the issue and listing of non-convertible securities. A green bond is like any other bond where a debt instrument is issued by an entity for raising funds from investors. The proceeds of a green bond offering are earmarked for use towards financing green projects. The ILMDS rules do not define “green debt security”. However, SEBI’s norms define green debt security. Further, the regulator in 2021, came out with operational guidelines providing the initial and continuous disclosure requirements for entities issuing or proposing to issue green debt securities.

### Operational Guidelines by SEBI

A debt security shall be considered “Green” or “Green Debt Securities” if the funds raised through the issuance of the debt securities are to be utilized for projects or assets falling under any of the following broad categories:

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The issuer of a green debt security shall have a statement on environmental objectives. The proposed green investment shall have environmentally sustainable objectives. The issuer may appoint an independent third-party reviewer for reviewing the process including project evaluation and selection criteria. An issuer who has listed its green debt securities, along with compliances as under SEBI Regulations, 2015 shall provide disclosures along with its annual report. The disclosures include the utilization of the proceeds of the issue, as per the tracking done by the issuer using the internal process as disclosed in the offer document/ disclosure document. The utilization of the proceeds shall be verified by the report of an external auditor to verify the internal tracking method. Ultimately green debt securities are intended to avoid greenwashing with the utmost care for their investments or ESG practices.

### **Avoidance of Green Washing**

The avoidance of greenwashing is defined as the practice of channelling proceeds from green bonds towards projects or activities having negligible or negative environmental benefits. SEBI raised concerns over the malpractice of greenwashing by issuers. Greenwashing by issuers may also lead to significant reputational risk for socially conscious investors seeking to diversify their investment portfolios by investing in Environmental, Social and Governance (ESG) practices.

In view of the same, a new chapter IX-A has been introduced under the existing Operational Circular prescribing the Dos and Don'ts relating to green debt securities to avoid occurrences of greenwashing. This requires the issuer of Green Debt Securities (GDS) to ensure the following –

Continuous monitoring of whether the path undertaken towards a more sustainable form of operations is resulting in a reduction of the adverse

environmental impact and contributing towards a sustainable economy, as envisaged in the offer document.

Prohibition on utilization of funds for purposes that would not fall under the definition of GDS. The same may seemingly include the temporary placement of GDS proceeds as well.

Prohibition on the use of misleading labels, hiding trade-offs, or cherry-picking data from research to highlight green practices while obscuring unfavourable information

Maintenance of the highest standards associated with GDS issuance while adhering to the rating assigned to it.

Quantifying the negative externalities associated with the utilization of proceeds of GDS Prohibition on making untrue claims giving a false impression of certification by a third-party entity

### **Revised guidelines by SEBI -2023**

The revised guidelines mostly stress on disclosure requirements and responsibilities of the issuer. Disclosure requirements have been categorized into additional disclosure requirements and continuous disclosure requirements.

#### **1. Additional disclosure requirements**

This highlights the initial disclosure requirements for the issue and listing of green debt securities. This must include a statement on environmental sustainability objectives for the issue of green debt securities which must include brief details of the decision-making process followed/proposed for determining the eligibility of the project. Details of the system to be employed for tracking the deployment of the proceeds of the issue and details of the project where the issuer proposes to utilise the proceeds of the issue of green debt securities must also be in place. Details related to perceived social and environmen-

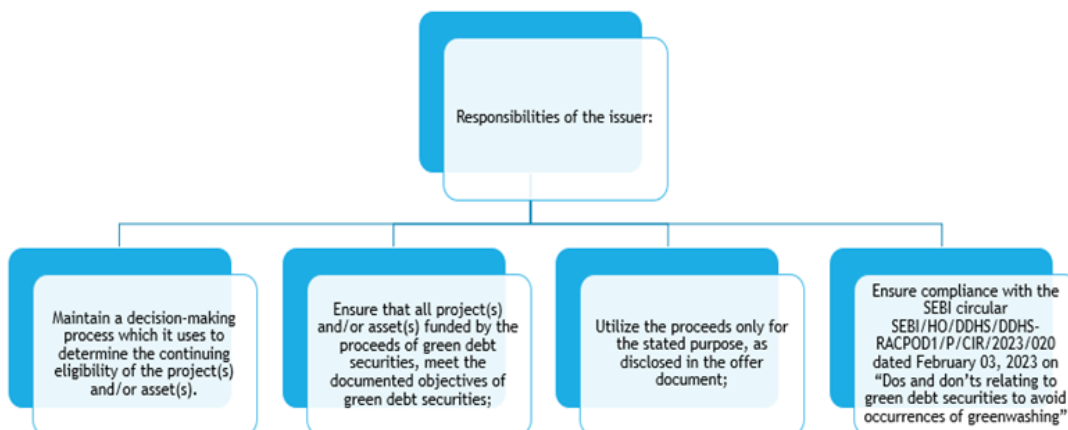


tal risks and the proposed mitigation plan associated with the project to be financed through the proceeds from the issue of green debt securities must be clearly highlighted. The importance of appointing an independent third-party reviewer/certifier for reviewing the process including project evaluation and selection criteria is stressed.

## 2. Continuous disclosure requirements

Continuous disclosure requirements call for utilization of the proceeds of the issue, as per the tracking done by the issuer using the internal process as disclosed in the offer document. This must include details of utilized proceeds including the temporary placement of unallocated and unutilised proceeds from each green debt security issued by the issuer. An annual report must also be prepared which must also include impact reporting. This is the information on a project – by project basis, pertaining to reporting of environmental impact of the projects financed by the green debt securities. Business Responsibility and Sustainability Reporting (BRSR) disclosures must be made in the reporting disclosure format.

## 2. Responsibilities of issuer





## Way Forward

KIIFB is in the process of issuing a listed green domestic bond to raise up to Rs 1000 Cr during this year. The preliminary procedure is in progress in terms of project identification and institutional arrangements have been made. In accordance with international best practices or in harmony with the Government of India's international commitments and environmental priorities, KIIFB is striving to adopt green practices on a best-effort basis keeping the State's developmental imperatives in mind. Aspects related to the supposed social and environmental risks and future mitigation plans associated with the projects proposed to be financed through the proceeds from the issue of green bonds shall be kept in focus. While receiving the green bonds, KIIFB commits to providing investors with transparent reporting on the allocation of proceeds of Green Bonds as well as on the environmental and social impact of projects funded by the proceeds. Also, shall be liable for annual updation of the allocation report until the full disbursement of Green Bond proceeds. The rise of green bonds provides a promising mechanism for sustainable finance, which is especially important for creating sustainable infrastructure in Kerala through KIIFB, to bridge the investment gaps on climate-friendly green projects.





# Isolation wards

Sajula G, Project Examiner, TIW

## INTRODUCTION:

COVID-19 infection had widely affected human lives and the economy worldwide and the situation was no different in our country as well. There were widespread infections and fatalities during the second wave of COVID-19 in India which had a huge impact on our health systems and economy being the most affected country. The country had faced many challenges in setting up specialized facilities to cater to the demand in view of the huge volume of population affected due to the pandemic. Limited availability of isolation facilities along with requirements like oxygen etc was the main challenge faced during the pandemic period. Normal wards in the existing hospitals, nearby schools etc were converted as isolation units, which has in turn affected normal healthcare systems, thereby affecting the routine treatment of other patients suffering from other ailments.

The issues faced during the pandemic made the Central and State governments in India think about the augmentation of isolation facilities across the country as a precaution to meet the challenges arising out of any such pandemic situation in the future. The government of Kerala has also initiated actions in line with these requirements and has initiated the creation of such basic infrastructure across the state to prevent the spread of any such viral infections.

As part of tackling the challenges posed by the pandemic, a COVID package of Rs. 20,000 crores was announced in the revised budget for the state presented in June 2021 with 'Health above all' as the strategy for development. As part of this package, it was decided to set up Isolation wards for contagious diseases, with 10 beds each in all Community Health Centers, Taluk, District, and General Hospitals within the state.

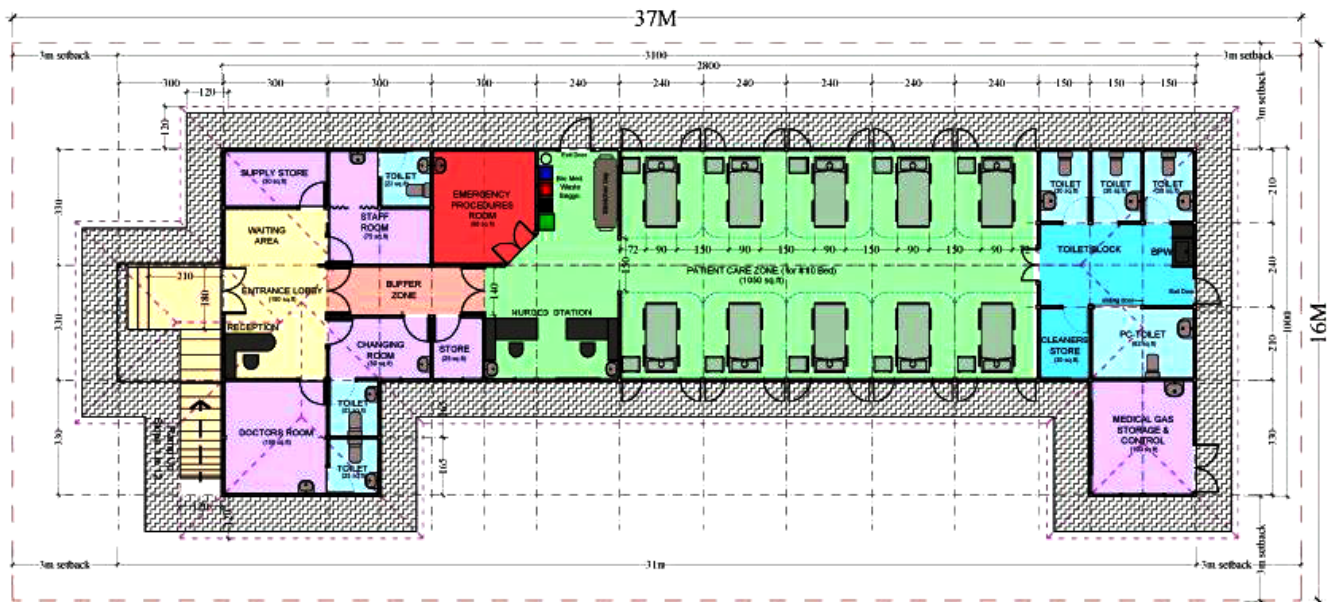
## PROJECT PLANNING

The main scope of the package involved the construction of an Isolation block with facilities like an Isolation ward, emergency procedure room, medical gas storage room, doctors & staff room, stores, toilets, etc. Isolation block consists of 10 bedded isolation wards for infectious disease with a dedicated centralized medical gas pipeline system, central suction, etc. complete to ensure 100% infection control in all health facilities mentioned above.

An isolation facility aims to provide a separation from the other services provided by the hospital so that the routine functioning of the health facilities will not be affected. Various options were considered for isolating patients affected by such infections. Patients can be isolated in individual isolation rooms/wards or negative pressure rooms with facilities for 12 or more air changes per hour. In this proposal, it was proposed to provide an isolation ward separat-

ed from the main buildings with 10 beds along with other facilities.

The Isolation blocks were constructed based on a plan prepared by the Chief Architect, the Public Works Department, Kerala considering all the requirements of various stakeholders like the Administrative Department and Directorate of Health Service (DHS). Each Isolation block was designed as a single-storey building having a total area of 223.20 sqm.



**FLOOR PLAN**  
Area= 223.20 m<sup>2</sup> (2400 sq.ft)

## SPECIAL PURPOSE VEHICLE FOR IMPLEMENTATION

KMSCL (Kerala Medical Services Corporation Limited) was appointed as the SPV by Government for the implementation of the project. The total cost of development of the project at 140 locations identified by the Director of Health Services, spread across 140 assembly constituencies of the state, was estimated to be Rs. 184.31 Cr with the cost of 1 unit as Rs. 1.31 Cr. The cost proposal includes physical infrastructure, medical equipment & furniture. Project funding is planned partly through Kerala Infrastructure Investment Fund Board (KIIFB) & partly through using MLA Special Development Fund (SDF), as approved in the Administrative Sanction &

Budget speech. The project is expected to result in social & health benefits only and revenue generation was not intended in the development of these isolation facilities.

A team from TRC of KIIFB was attached to KMSCL for identifying the suitable locations in various PHC, FHC, CHC, TH, and DH of the Health department. The team had identified that only at 84 locations, hindrance-free land was available for the construction and in consultations with MLAs and Administrative Department, the locations were finalized.

## EXECUTION METHEDODOLOGY

Pre-engineered construction methodology was adopted to optimise the construction time in com-



parison to the conventional mode of construction. The superstructure was designed with built-up steel sections, external and internal walls with Cement boards sandwiched with EPS panels, and roofing with Sandwich panel roofing sheets. The main advantage of adopting pre-engineered construction was to minimize the construction time, as the execution of the foundation, procurement of construction materials and fabrication of structural steel members can be parallelly taken up for multiple locations.

Project execution was taken up as an EPC contract and M/s. Thrissur District Labour Contract Society (TDLC) was selected as an EPC contractor for the work through limited tendering among Accredited agencies approved by Finance Department. The detailed engineering including, preparation and submission of the architectural drawings, designs of sub-structure & superstructure, MEP designs and drawings, and procurement of material and the construction was the responsibility of the Contractor. The detailed engineering design submitted by the EPC Contractor was verified and approved by the Technical Resource Centre of KIIFB.

Taking into consideration the geographical position of the proposed Isolation wards, the Contractor set up fabrication and painting facilities at various locations thereby parallel fabrication and painting of PEB structures was made possible. The same has also helped in managing the logistics, quality control as well as parallel working in multiple locations. A Project Management Unit (PMU) supported by KIIFB-TRC officials along with KMSCL was formed and positioned at various office locations for grass root level monitoring and coordination of procurement, fabrication, painting, erection, etc.

### **QUALITY CONTROL MONITORING**

Quality Control systems to be executed were established by the PMU team and all the processes as

per the Inspection test plan to be conducted were ensured by the PMU team at the site. Supervision during the execution of works as well as in the fabrication units was conducted by the PMU team.

### **PROJECT MONITORING**

Multiple-level project monitoring through weekly reviews of the PMU team and Contractors team was conducted continuously for the projects. Timely follow-up and required technical support were provided by Senior officers of TIW along with Project Management Unit. This monitoring has enabled us to identify the bottlenecks ahead of time as well as clear the same without affecting the progress of work.

### **ADVANTAGES AND CHALLENGES OF PRE - ENGINEERED TECHNOLOGY**

The use of Pre-Engineered technology has proven to be more viable than the normal method of construction due to various advances in design and construction technologies, combined with increasing emphasis on cost, schedule, and labour issues. Compared with cast in situ structures, site labour requirement was reduced by 50% to 80% using precast.

EPC Contract ensures implementation of the project to specified standards with a fair degree of certainty relating to costs and time while transferring the construction risks to a Contractor. It ensures the timely completion of projects without overrun costs. The Contractor is responsible for designing and constructing the project while adhering to output specifications and guidelines provided by the client, which leaves him enough room for innovation, implementing new technologies, and using standard designs in the construction to achieve lower costs and higher pace. EPC contract ensures better planning of the construction schedule for efficient use of manpower, equipment, and other resources as compared to

item rate contracts.

Implementation of new technology using structural steel was a major challenge. The wide gap in production vs demand for structural steel with constraints on logistics in sourcing raw materials paused a major challenge for the project. Scenarios like the non-availability of certain sections meeting the project delivery schedule have forced the EPC contractor for redesigning the structures. The pandemic-enforced skilled labour shortages were another major challenge in the project. The Contractor overcame the same by opening multiple fabrication and painting facilities and by mobilizing multiple erection crew teams etc.

## CONCLUSION

The project is spread across Kerala, and pandemic-driven constraints on raw materials as well as labour, have extended project completion from the expected duration of 140 days. However, various advantages like strict adherence to quality control parallel working in multiple work fronts without the impact of adverse weather conditions was a key takeaway of the project. The isolation wards being of standard footprint erected through bolted connections can very well be shifted to any new location provided the current location needs to be taken over for expansion of the current facility.









# 3D concrete printing

Rahul Ravindran, Project Engineer, PAD

## ABSTRACT

Concrete is the most widely used building material on our planet. The construction industry is expected to have great transformations with the introduction of 3D concrete printing technology (3DCP). In recent decades, concrete 3D printing technology has gained increasing momentum, allowing optimal design in the field of construction, and outstanding advantages compared to conventional construction methods such as reduction of overall construction cost and time, reduction of environmental pollution, and ensuring worker safety by reducing accidents on site. 3D printing is the technology of creating a 3D model of an object of any shape or size in layers using computer software. 3D printed concrete is a special concrete mix, specially prepared for flowability through the nozzle of the printing device. In recent years, various concrete 3D printing (3DCP) has evolved.

3D printers can complete the construction of a single-story building in 12 to 24 hours, allowing for rapid construction of structures. With advances in technology, structures built with 3D printing have been shown to have outstanding strength and durability that can withstand harsh exposure conditions. This method is more sustainable as most of the materials used in these processes are recyclable and reusable. In addition, the carbon emissions produced

by this method are much less than that of conventional methods. By creating prototypes of the desired structures using a 3D printer, the occurrence of errors can be eliminated.

## INTRODUCTION

3D-printed concrete is a special type of concrete that can be used for construction with just one 3D printer. It is a technology that turns three-dimensional digital drawings into three-dimensional objects according to the user's wishes through a 3D printer. 3D-printed concrete is a combination of shotcrete and self-compacting concrete. Concrete is pushed through definite 3D printer nozzles to form 3D printed layers. 3D printing concrete can print walls and frames of building units, bridges, benches, or any outdoor decoration, etc. 3D Printing technology is attracting attention because it is faster than traditional construction, less expensive, less work, and less room for error. The noble honour goes to engineer Chuck Hull, who designed and created the first 3D printer in 1984.

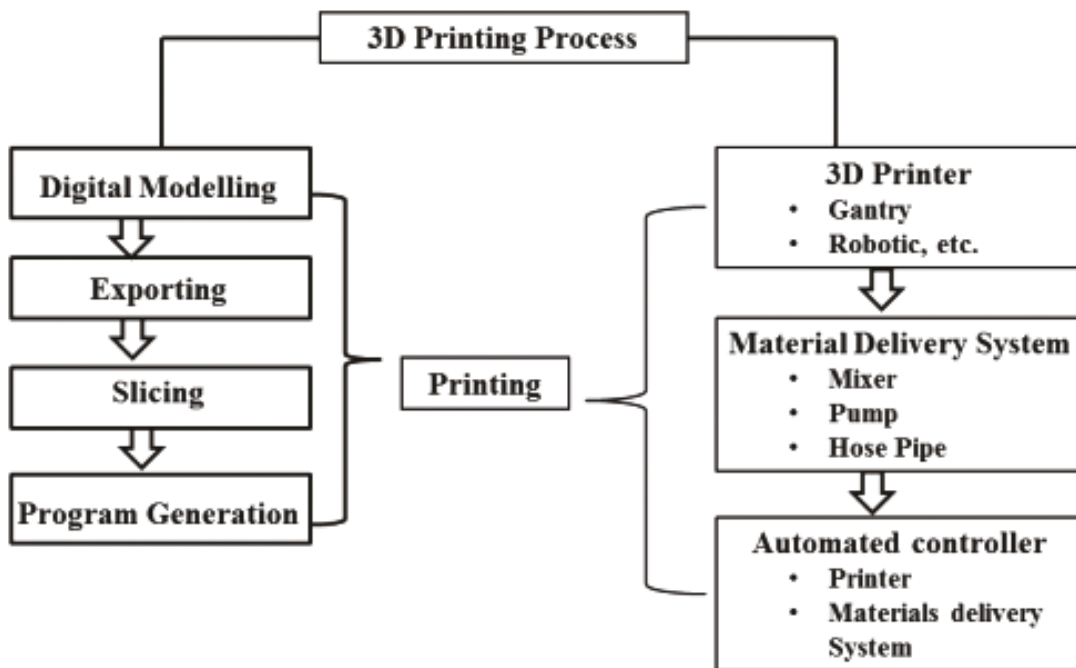
It is possible to produce structures with complex designs and various products on a small scale. The application of 3D printers has taken its place in the engineering field as the technology has emerged as a joint product of materials science, robotics coding, and architectural design research. Optimized cementitious mortar materials are used in 3D printers. In



order to be able to build overlapping layers without collapsing and to perform 3D printing without shrinkage cracks, the formulation of building materials must be prepared by achieving the proper mixing ratio. When placing building materials, layer-by-layer production is carried out without the use of moulds,

and the width and thickness of the printed layer are continuously controlled during the laying process. Fig.-2 shows various stages of the 3D printing process in the construction industry.

### Requirement of 3D Printing



**Fig. 2.** The process of 3D printing for construction industry.

Today’s concrete construction industry faces several challenges. One of them is the high cost associated. According to a recent study, formwork is responsible for about 80% of the total cost of concrete construction. The significant amount of waste generated in construction is another challenge. Formwork is a major source of waste, as sooner or later all is thrown away, contributing to the overall increase in waste in the construction industry. Great data has shown that the construction industry is responsible for generating about 80% of the world’s total waste.

In addition, the conventional approach of pouring concrete into the formwork limits the geometric freedom for architects to build in different geome-

tries unless paying very high costs for formwork. Another challenge is the slow build (i.e., long deadlines and hard to control). The construction of concrete usually involves several steps, including material production, transportation, and on-site formwork fabrication, and each step takes time.

In addition, today’s concrete construction industry is labour-intensive and has safety issues. Finally, today’s construction industry has serious sustainability issues. In general, current construction methods and materials are not environmentally friendly. The entire construction process, including off-site fabrication, material transportation, installation and assembly, and on-site construction, emits large amounts of



greenhouse gases and consumes large amounts of 'energy'. In addition, conventional concrete made from Ordinary Portland Cement (OPC) is not durable. The production of OPCs is very energy and carbon-intensive.

However, based on the sustainability assessment, it was found that 3DCP technology is more environmentally friendly because of the extraction of raw materials used in the production of cement and aggregates, the transportation of concrete and other materials. Other materials, CO<sub>2</sub> emissions, energy and water consumption, carbon footprint, and global warming potential can be minimized.

### Methods of printing 3D Printed concrete

There are several ways for generating 3D printed concrete, the most important of which are:

**1. Contour Crafting** - Contour Crafting is a technology based on the extrusion and deposition of 3D printed concrete. To create a closed section, the printer first prints the outside border of the structural component. The concrete is then poured into this portion for further construction. Other materials that are controlled by a computer and supplied into a nozzle system and mixed in the nozzle barrel can also be utilised in this approach. The trowel of this machine makes a smooth and very exact surface when the concrete is discharged from the nozzle. This method employs mortar or cementitious materials as basic materials. The printing pace is slow here, and it is employed for large-scale constructions. Its main advantage is that different materials can be used here, and the conduits can be embedded into the components to reach narrow spaces. Its main disadvantage is that due to low speed and low bonding strength between layers caused by the

intervals, the construction process gets hindered.

**2. Concrete Printing** – Except for a few minor differences, this printing process is based on the same premise as Contour Crafting. In this case, the printer may print the complete geometry of a layer rather than just the outer border. To construct a certain structural component, the raw material is premixed and stored inside the pump located outside the printer. Meanwhile, a tiny hopper located above the nozzle holds the printed materials and is connected to the pump through a conduit. It is faster than Contour Crafting and has a higher strength. The sole downside is that the setup and hardening time have high performance requirements.

**3. D-Shape** - This approach is based on the powder deposition concept, in which the structural component is formed by the bonding of the powder and the chemical agent (binder). The printing head, which consists of a few nozzles and can distribute both the chemical agent and the solid powder, is at the heart of the system. First, the printing head uniformly spreads a powder layer of a specified thickness, and the rolling cylinders provide homogenous pressure to the powder layers. The chemical agent is then applied to the powder layer in the predetermined place. Because the distance between the nozzles is greater than the drop diameter of the chemical agent, the printing head must be rotated.

### Concrete for 3D Printing

Designing the right machine that can act as a 3D printer for concrete mixing is critical to the success of the project. Several criteria must be considered during the design process, as the machine must consider both the freshness and imprinting properties of the concrete discussed earlier. Basically the machine is composed of 3 main components: concrete tank and pump mechanism, print nozzle, and motion control system. The concrete begins its journey at the

storage tank and is manually pumped to the nozzle, where the concrete is poured. The machine is designed to move on a three-axis (x-y-z) plane to print a 3-D element. The concrete mix must be designed to meet certain essential criteria that have a direct relationship with the concrete printing method. Therefore, it is essential to ensure additional connectivity between the designs of the mix and the printer. The five most important aspects of the mixture studied are extrusion, flowability, buildability, compressive strength, and opening time.

- **Extrudability:** It refers to the ability of the concrete to be extruded out of the hose. This is judged on how far the paste can be printed without clogging the nozzle. In addition, printed stickers must be free of cracks and splits.

- **Compressive strength:** Target concrete strength is determined by BS 1881-116:1983 and 5x5 concrete block. Durability is especially important because what is printed is a multi-layered structure, not all at once. Since the set time must be assumed to be instantaneous and the printing takes only a few minutes, the target strength and

intensity gain should be high.

- **Flowability:** The flow capacity measurement is obtained by performing a deflection test. Concrete is spread from an inverted cone. The time it takes for the mixture to spread a particular diameter is measured and then a flow rate can be obtained. An easily expandable mix corresponds to greater fluidity and workability.

- **Buildability:** This is measured by the number of layers of the printed pattern that can be achieved without sagging. The target average number of layers is 5.

- **Open Time:** This criterion is very important because stamped concrete is not poured at the same time as the traditional method. In the latter case, the initial and final setting times are more representative but do not have much to do with the impression of the concrete. Therefore, the opening time measurement is a better representation of the evolution of the workability of the concrete over time. It is calculated using deflection testing to achieve fluidity over specific time-periods.



*A typical arrangement of 3D printing*



## Microstructure and mechanical properties

Unlike traditional concrete, where mix design is primarily determined by the strength and longevity of structures, 3DCP mix design has extra unique criteria in both fresh and hardened stages. Extruded 3DPC components are always orthotropic, with weak spots at interfaces between printed layers or horizontally juxtaposed filaments. The “morphology, ratio, size, and distribution of pores” are closely connected to the amount of orthotropic behaviour in 3DPC.

Concrete materials for 3D printing are made up of gel materials, aggregates, water, and additives. The performance of 3D printing concrete materials changes when the mixing ratio of basic ingredients are modified or doped with fiber materials. By adjusting the concrete material mixing ratio, doping steel fibre, and adding a water reduction agent, researchers were able to create a type of ultra-high-performance concrete appropriate for 3D printing buildings. This type of concrete does not contain coarse aggregate,

and its compressive and flexural strengths are higher than those of conventional concrete materials. Because the inclusion of steel fibres improves the adherence of adjacent printing layers as a 3D printing material, and the performance is particularly appropriate for large-scale concrete 3D printing.

High-strength fibre-reinforced concrete (HS-FRC) was produced, and the effects of nanoparticles, carbon fibres, steel fibres, and glass fibres on its performance were investigated. The results reveal that adding nanoparticles and fibres may improve the rheological characteristics of concrete and that adding steel fibres has lower extrusion pressure and greater form retention ability to print components than carbon fibres and glass fibres. The use of a suitable number of nanoparticles promotes interlayer bonding, enhancing the bonding strength between layers of printing components. The doping of carbon fibres, steel fibres, and glass fibres increases the compressive strength of printed components, with steel fibres having the most noticeable impact. Printing component compressive strength doped with steel fibres can reach more than 120 MPa.

## Worldwide examples on 3D concrete printed Structures

### World's largest 3D Printed Building in Dubai

Dubai Municipality has won the UAE Ideas Award organized by the Dubai Quality Group under the slogan, ‘Nothing is Impossible,’ for the category of ‘Innovation in the field of inventions’ for constructing the World’s largest 3D Printed Building. Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, launched the Dubai 3D Printing Strategy as a unique global initiative. The initiative aims to construct 25% of Dubai’s buildings with 3D printing technology by 2030.

The structure of the building was built directly on-site without any extra assembly works. The 3D printing process was done in natural weather conditions, this meant that there was no tent covering the printing area. The main goal of this project was to conduct extensive R&D dedicated to testing the equipment under harsh climatic conditions, in this case, heat and humidity. But also developing the 3D printing material and construction technologies and testing the equipment over a long period of time.



*India's first 3D-printed home, built by alumni of IIT-Madras*



It seems the future has arrived for the construction industry, as India's first 3D printed home is now ready. T-vasta Manufacturing Solutions has built a full-scale 3D house using 3D Printing technology, focusing on substantial construction, and providing low-cost solutions for housing needs.



*China Has Built World's 1st 3D Printed Concrete Bridge in Shanghai in Just 450 Hour*





*Germany's first printed house*

Germany's first printed house is ready for occupancy. At the end of July 2021, the single-family house printed by PERI using a COBOD BOD2 printer was officially opened in Beckum, North Rhine-Westphalia.



*India's first public building in Bengaluru, using 3D-printing technology*



The building, a post office sprawled over 1,100 square feet, is being 3D-printed at a cost of Rs 23 lakh over 45 days.

## Conclusion and Future scope

The development of 3D-printed concrete is revolutionary, with several techniques for using it introduced. D-Shape, CC, and Concrete Printing are the most common printing technologies. They have all successfully printed components without the need for formwork or vibration. The high printability of 3D printed concrete is heavily reliant on its high workability and mechanical properties, both of which can be optimized through material selection (such as various types of fibers, admixtures, and high-quality sand) and printing parameters (such as rest time, nozzle moving speed, and nozzle standoff distance). Researchers discovered ideal mixing proportions and provided a system for assessing the printability of concrete used in large-scale 3D printing. Furthermore, several additional materials such as copper tailings, geopolymer-based material, and regolith, on the other hand are also found to prepare 3D-printed concrete.

3D-printed concrete technology will usher in a new age of sustainable construction, characterized by great building efficiency, cheap labour costs, and reduced construction waste. It may be used to build military shelters in the wild, inexpensive homes in low-income nations, in-situ material on the Moon or Mars, and to print complicated structures where the formwork is difficult to make, repair, or restore. Furthermore, when combined with nanotechnology and advanced material composition technology, 3D-printed concrete technology is better suited to produce (ultra) high-performance and smart/multifunctional concrete, such as reactive powder concrete, fiber-reinforced composites, polymer-modified concrete, nano-engineered cementitious composites, self-sensing concrete, and self-healing concrete. Many structures have been successfully printed and even placed into use at this point, however it still requires a lot of effort to promote the development of 3D printed concrete technology.

### Reference:

- *Effects of composite cementation system on rheological and working performances of fresh 3D-printable engineered cementitious composites.*  
*Journal of Building Engineering, Volume 65, 2023, Article 105801*
- *Nanomechanical characterization of 3D printed cement pastes*  
*Journal of Building Engineering, Volume 66, 2023, Article 105874*
- *Assessment of materials, design parameters and some properties of 3D printing concrete mixtures; a state-of-the-art review*  
*Construction and Building Materials, Volume 365, 2023, Article 130102*
- *Buildability assessment of mortar with fine recycled aggregates for 3D printing*  
*Construction and Building Materials, Volume 367, 2023, Article 130313*



# HEALTH INFRA PROJECTS AN OVERVIEW

## Introduction

Health is a fundamental right of every human being and the term “Health” refers to optimal functioning of an individual in the absence of disease, illness, impairment or injury. Health constitution was coined and laid down by the World Health Organization (WHO) in 1948 and it declared that “enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being irrespective of his race, religion, political, economic and social conditions.” Hence, nations across the world have developed several healthcare strategies to ensure health security of their citizens. However, present concern in both developed and developing countries is not only to reach the whole population with adequate health services but also to secure an acceptable level of health for all, through the application of health and family welfare measures.

Healthcare sector in Kerala is one of the few regions in the developing world, which has achieved substantial progress in the realm of education and health. This achievement, surprisingly, has been at a low level of per capita income and state domestic product. Kerala has achieved a good health status compared to other States in India. Easy accessibility and coverage of medical care facilities, apart from other factors such as high literacy rate, well-functioning public distribution system, utilization

of labour due to the presence of workers’ organizations etc have played a leading role in influencing the health system in Kerala. The State has made significant gains in health indices such as high life expectancy, low infant mortality rate, birth rate, and death rate. Comparative figures of major health indicators at the State and National level are given below

Table 1: Health Indicators of the State in comparison with India

Sl. No.	Particulars	Kerala	India
1.	Population Density (per sq. km.)	860	382
2.	Birth Rate	14.7	22.5
3.	Death Rate	6.8	7.3
4.	Infant Mortality Rate (per 1000 live births)	12	50
5.	Maternal Mortality Ratio (per lakh live births)	81	212
6.	Sex Ratio	1084	940
7.	Life expectancy at Birth (In years)		
	Male	71.40	62.60
	Female	76.30	64.20

(Source: National Health Mission, Ministry of Health & Family Welfare, Govt. of India, 2011 Census Economic Review)

From the formation of the State, quality health care was one of Governments’ top priorities and the system was developed in a way that both western and traditional medicine was accessible to the people. Broadly, the healthcare facilities are divided into three categories in view of service of care: Allopathy (western medicine), Ayurveda & Homeopathy and into three categories in view of the ownership; Public, Private and Cooperative sectors.

### Kerala follows three tier healthcare systems;

1. Primary Health Centres (PHCs), which are aimed to serve population at rural level with



basic health services,

2. Community Health Centres (CHCs) to serve comparatively larger rural population with preventive and curative medical facilities,
3. The high level healthcare institutions comprising Taluk Hospitals, District Hospitals, General Hospitals and Medical Colleges for providing secondary and tertiary health services.

Patients from PHCs and CHCs are often referred to Taluk/District/General Hospitals or the Medical College Hospital, whichever is located nearby.

According to the Healthcare Statistics 2014, there are 11 Government Medical Colleges, 16 District Hospitals, 18 General Hospitals and 79 Taluk Hospitals/Taluk HQ Hospitals 230 Community Health Centres, 852 Primary Health Centers, including 24x7 primary health centers in the State.

The Health Status Progressive Report, 2018 states that Kerala stands first amongst all States followed by Punjab, Tamil Nadu and Gujarat, in terms of health index, which is a weighted composite index of health outcomes, health governance and information and key inputs and processes with given weightage of 70%, 12% and 18%, respectively.

Despite the achievements as mentioned, the major challenges in the present health scenario of the State are the simultaneous presence of widespread infectious diseases and noncommunicable diseases, mainly attributed to lifestyle, such as diabetes mellitus, hypertension, cardiovascular diseases, cancer, etc., increase in healthcare cost and deepening marginalization of the poor. Furthermore, the infrastructure required at public healthcare institutions including equipments, medicine, furniture etc are often found inadequate to serve the general masses.

Kerala has the highest private expenditure on health compared to other States of India. The pro-

portion of people approaching private medical institutions is 63% while that towards public health institutions is 37%. The major reasons attributed are:

1. Inadequate diagnostic and treatment facilities
2. Lack of advanced and sufficient medical equipments
3. Lack of periodic/annual maintenance of infrastructure facilities
4. Lack of adequate manpower
5. Shortage of medicines and drugs
6. Inadequate infrastructure (electrification, water, sanitation facilities, etc)

In order to reverse the trend of people's approach and to strengthen the public healthcare system in the State, the Government has taken several steps including:

- Strengthening of medical education and improving infrastructure in Medical College Hospitals & other Government Hospitals
- Filling the vacant posts including that of Doctors
- Ensuring procurement of quality medicines, medical equipment and furniture through formation of the Kerala Medical Services Corporation Limited (KMSCL)
- Reduce out-of-pocket expenditure for drugs and medicines through introduction of Karunaya Community Pharmacy
- Introduction of schemes like Karunaya Benevolent fund for treatment of kidney problems, heart diseases, brain related diseases and cancer

The initial period of growth in healthcare was dominated by the public sector owing to the stewardship role that successive governments have played. Later, the private sector paired for growth and it took the lead in the growth of healthcare facilities in Kerala. However, the majority of State's popu-

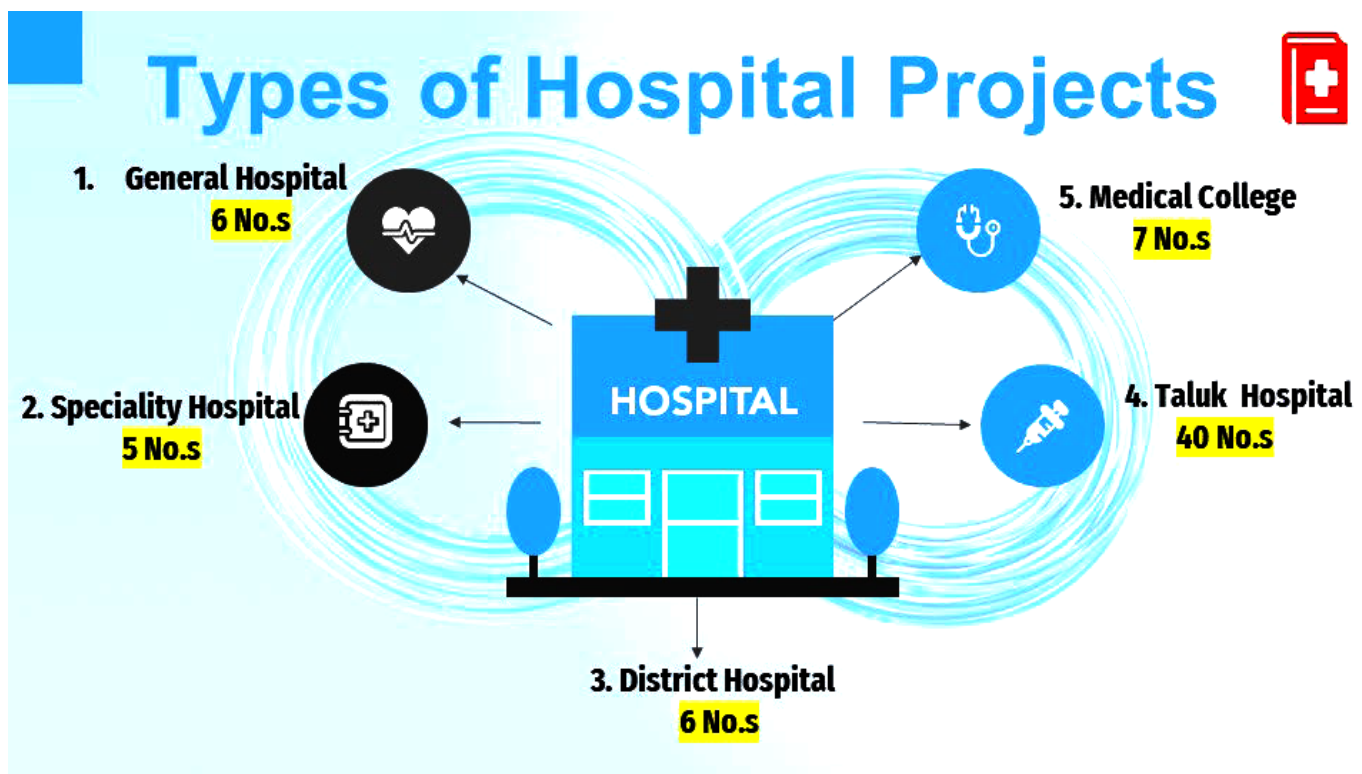
lation is still dependent on public healthcare facilities and the State Government is committed to provide the common man, quality health care at affordable cost.

There is a high demand to equip the public health-care institutions with facilities to provide medical assistance in terms of both diagnosis and treatment. The facilities at government hospitals need to be redefined with good infrastructure including modern equipments and furniture. In order to foster the public healthcare sector, through Budget Speeches 2016-17, 2017-18 an amount of Rs 3,450Cr worth projects were announced through KIIFB funding.

**Summary of KIIFB-H&FWD projects till date**

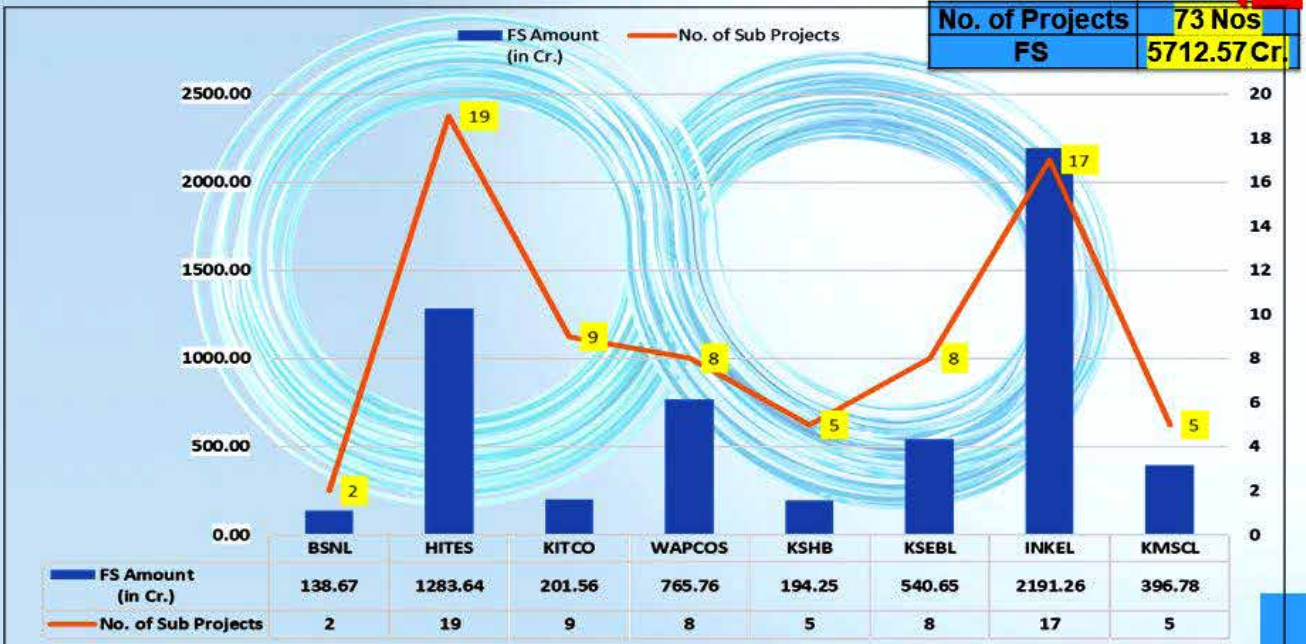
Administrative Sanction issued by AD	Rs 10,575.31Cr
Financial Sanction issued by KIIFB	Rs 5,712.57 Cr.
Projects Under Appraisal in KIIFB	Rs 507.00 Cr

SPVS Under HFV		
S.N	SPV	Category
1	BSNL	Hospital building and its ancillary facilities
2	HITES	Hospital building and its ancillary facilities
3	INKEL	Hospital building and its ancillary facilities
4	KITCO	Hospital building and its ancillary facilities
5	KSEBL	Hospital building and its ancillary facilities
6	KSHB	Hospital building and its ancillary facilities
7	WAP-COS	Hospital building and its ancillary facilities

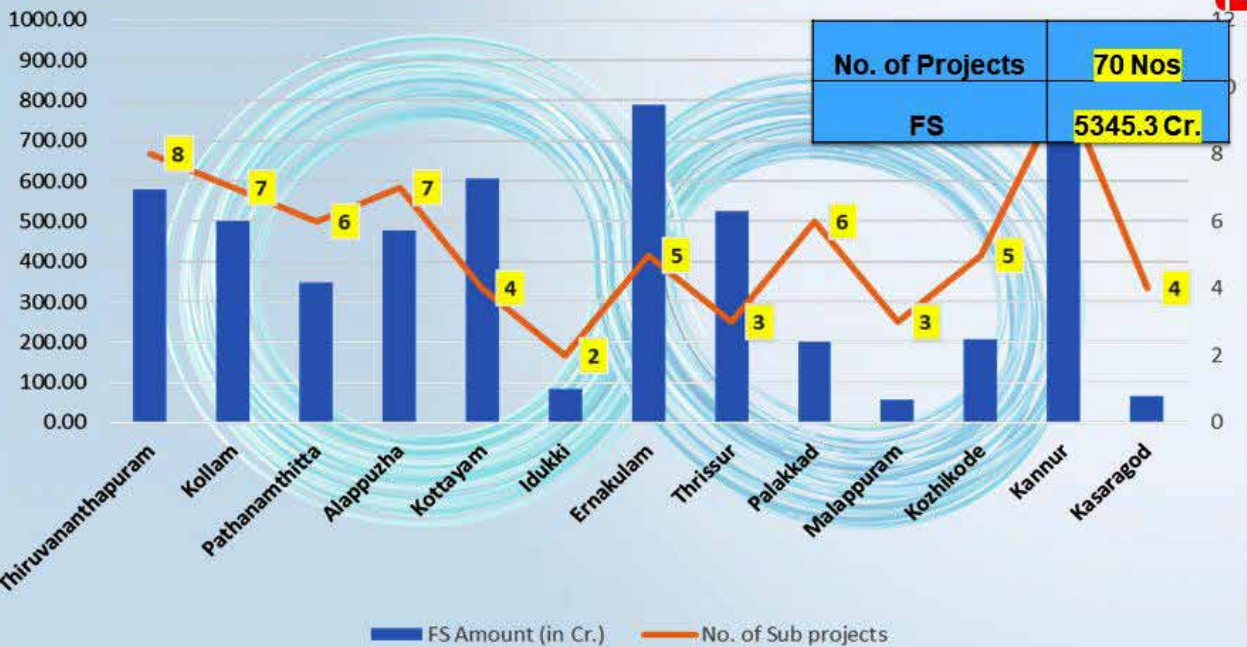


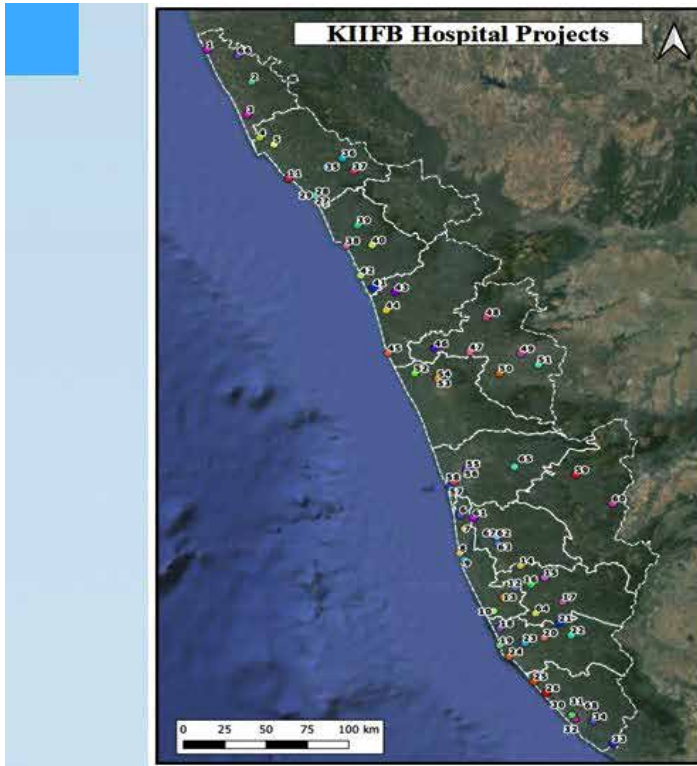


## KIIFB Approved Projects under HFW



## District wise Project details(excl. KMSCL projects)





- KIIFB Hospital Projects**
- 1- Taluk Head Quarters Hospital, Mangalpadu
  - 2- Taluk Hospital, Bedadka
  - 3- Taluk Hospital, Neeleswaram
  - 4- Taluk Hospital, Payyanur
  - 5- Medical College, Paryaram
  - 6- Government Taluk Hospital, Thuravoor
  - 7- Taluk Head Quarters Hospital, Cherthala
  - 8- Taluk Hospital, Chettikad
  - 9- GH Alappuzha
  - 10- Government Taluk Hospital, Kayamkulam
  - 11- Hospital, Kannur
  - 12- District Hospital, Chengannur
  - 13- Dist. Hospital, Mavelikkara
  - 14- Taluk Hospital, Mallappally
  - 15- Taluk Hospital, Ranni
  - 16- District Hospital, Kozhencherry
  - 17- Government Medical College, Konni
  - 18- Taluk Hospital, Karunagapally
  - 19- Taluk Hospital, Neendakara
  - 20- Taluk Hospital, Kottarakara
  - 21- Taluk Hospital, Pathanapuram
  - 22- Taluk Hospital, Punalur
  - 23- Taluk Hospital, Kundera
  - 24- District Hospital, Kollam
  - 25- Taluk Hospital, Varkala
  - 26- Taluk Hospital, Chirayinkeezhu
  - 27- Malabar Cancer Centre, Thalassery
  - 28- Malabar Cancer Centre, Thalassery
  - 29- Women and Child Hospital, Thalassery
  - 30- G.M.C., Thiruvananthapuram
  - 31- General Medical College, Thiruvananthapuram
  - 32- General Hospital, Thiruvananthapuram
  - 33- Taluk Hospital, Parassala
  - 34- Taluk Hospital, Malayinkeezhu
  - 35- Speciality Hospital, Mattannu
  - 36- Taluk Hospital, Initty
  - 37- Taluk Hospital, Peravoor
  - 38- Taluk Hospital, Koyilandi
  - 39- Taluk Hospital, Perambra
  - 40- Taluk Hospital, Balusseri
  - 41- Taluk Hospital, Feroke
  - 42- General Hospital, Kozhikode
  - 43- Taluk Hospital, Kondotty
  - 44- Taluk Head Quarters Hospital, Tirurangadi
  - 45- Taluk Hospital, Ponnani
  - 46- Taluk Hospital, Pattambi
  - 47- Taluk Head Quarters Hospital, Ottapalam
  - 48- Taluk Head Quarters Hospital, Mannarkkad
  - 49- District Hospital, Palakkad
  - 50- Taluk Hospital, Alathur
  - 51- Taluk Hospital, Chittur
  - 52- Taluk Hospital, Kunnamkulam
  - 53- Medical College, Thrissur
  - 54- Medical College, Thrissur
  - 55- Medical College, Kochi
  - 56- Cancer Centre
  - 57- Government Maharaja's Taluk Hospital, Karuveppady
  - 58- General Hospital, Ernakulam
  - 59- Taluk Hospital, Adimali
  - 60- Taluk Hospital, Nedukandam
  - 61- Taluk Hospital, Vaikom
  - 62- Government Medical College, Kottayam
  - 63- Govt. General Hospital, Kottayam
  - 64- GH, Adoor
  - 65- TH Kothamangalam
  - 66- G.M.C, Kasargode
  - 67- Government Medical College, Kottayam
  - 68- General Medical College, Thiruvananthapuram

**GENERAL HOSPITAL ERNAKULAM**





## GENERAL HOSPITAL ERNAKULAM



## TALUK HOSPITAL PUNALUR



**TALUK HOSPITAL PUNALUR**



**TALUK HOSPITAL PUNALUR**





## TALUK HOSPITAL PUNALUR



## MEDICAL COLLEGE TVM - PHASE 1 - Improvements to External Infrastructure-Elevated corridor







**MEDICAL COLLEGE TVM - PHASE 1 - Improvements to External Infrastructure-Elevated corridor and Internal roads**



**MEDICAL COLLEGE TVM - PHASE 1**





## MEDICAL COLLEGE TVM - PHASE 1



# **Ente Keralam - A Venue for presenting Governments Activities, Developments, and the display of energetic private entrepreneurs**

Public awareness of government activities can be created in several ways and the Ente Keralam exhibition is one among them. After the pandemic, the public refrained from gathering in public places due to general fear, as well as the lack of opportunity. By conducting the Ente Keralam 2022, the Government has opened the avenue for public gatherings and the economy has been kick-started. The response from the public at that time was overwhelming. The cultural events that were staged were a stimulus for the artists and stage performers who are idle since the beginning of 2020 due to Covid. This year, though only six Districts have been completed so far, the response from the public is huge. The representations from Departments, PSUs Governmental organizations are tremendous. The private firms participating in the event are also reaping for their hard labour. There are good business opportunities for PSUs also.

From the first year itself, this Government was very particular in that its activities and developmental programmes were presented before the public to create awareness. We can see that this initiative of the Government has precedence with KIIFB's "Kerala Nirmithi", which tried to create awareness about KIIFB's activities in the years 2019 and 2020.

The Ente Keralam event was first conducted in 2022 in connection with the First Anniversary of the Government, in all the Districts except Ernakulam.

It was a grand success mainly because of the participation of all the Government Departments, PSUs, Universities, quasi-government organizations, and above all private entities. The general public had also embraced the program with live participation in the exhibition and cultural activities. The theme of 2022 was Heritage, Proud, and Expectations- Past, Present, and Future with the developmental programs. KIIFB was a major attraction in 2022 in the event, mainly due to the unique presentation of its projects most innovatively and technologically using VR, GIS, and Videos in the LED Walls.

This year, in 2023, the main theme is "Kerala's Youth" while the sub-theme is "Kerala First" and like last year KIIFB has been directed by the Government to provide infrastructure and media support for the Ente Keralam 2023. The major achievements of the State in Health, Sustainable Development Goal of Niti Aayog, Socio-Economic Indices, etc. are displayed. The completed development activities as well as those undertaken by departments like PWD, Irrigation, Tourism, Health, Agriculture, Fisheries, etc., are presenting their might in a big way. KIIFB is also playing a major role in the exhibition by using VR, GIS, and Videos on the LED Walls like last year. Kudumbasree provides tasty food at the venue. The Sports Council and District Industries Center are encouraging private entrepreneurs to play their role in



the event. Seminars are being conducted in the main auditorium as well.

KIIFB is instrumental in creating the infrastructure for the event in all the Districts and the Indian Institute of Infrastructure and Construction is the partner for KIIFB in this endeavor. All the wings of KIIFB like the Technical Inspection Wing, Project Appraisal Division, Finance and Administration, Technical Resource Centre, and Administrative Inspection Wing are actively participating in the event and putting their effort into making this event a great success



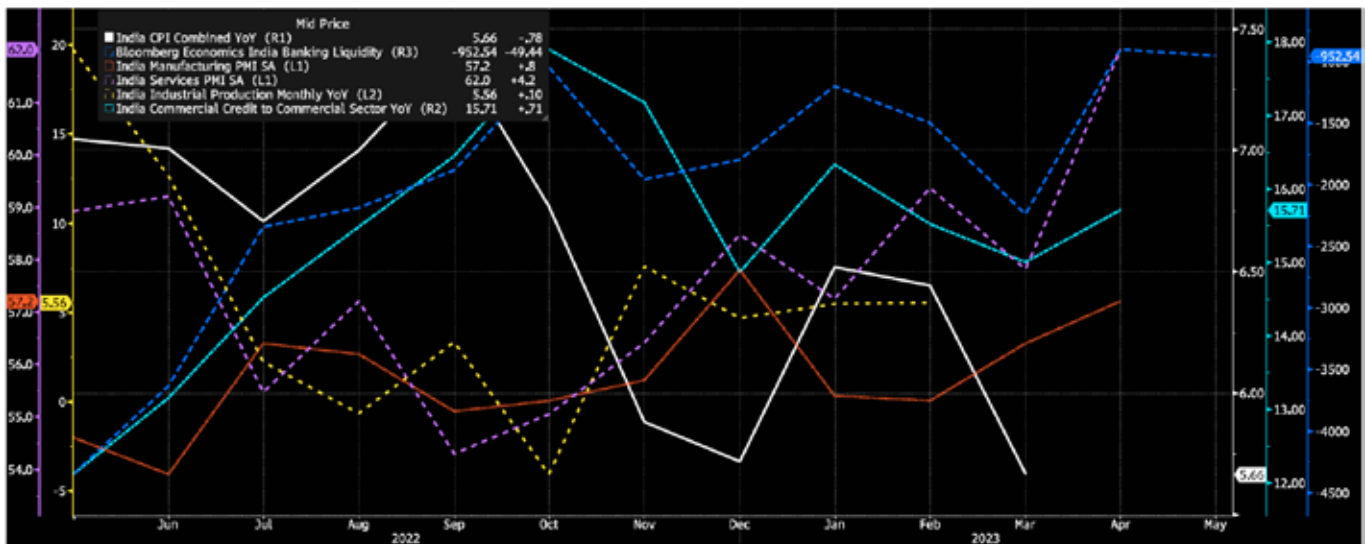


# Economy & Market Watch

Ajosh Krishnakumar  
DGM, Finance & Administration

In this edition of economy & market watch, we look at a few high frequency indicators of real economic activity in the country to analyse how the Indian economy has fared in the last 12 months.

The following chart shows how the India Services & Manufacturing Purchasing Managers Index (PMI), growth in credit to commercial sector, growth in Index of Industrial Production, India Banking System Liquidity, India Inflation (Combined CPI YoY) fared in the past year.



The S&P Global India Manufacturing Purchasing Managers’ Index (PMI), Seasonally Adjusted (SA), came in at a four-month high of 57.2 in April 2023 compared to 56.4 in March 2023. Moreover, Manufacturing PMI has been consistently above 50 in the last 12 months, indicating growth/ expansion.

The S&P Global India Services PMI (SA) improved to a 13 year high of 62.0 in April 2023, compared to 57.8 in March 2023. It may be noted that Services PMI has also been consistently above 50 in the last 12 months, indicating growth/ expansion.

Bank commercial sector credit growth on a year-on-year basis was at 15.71 % in April 2023 compared



to 16.33% in January 2023 and 13.2% YoY in June 2022. During the period of study, the growth of credit to commercial sector was lowest ~ 12% YoY in May 2022.

India's Industrial growth, basis provisional estimates of IIP for February 2023, was 5.6% YoY, compared to a growth of 5.2% YoY in January 2023 (revised) and 7.3% YoY in November 2022. The growth in IIP in February 2023 was primarily on account of growth in Manufacturing sector (5.3%), Power Generation (8.2%) and mining sector (4.6%).

India's headline inflation rate based on the Consumer Price Index (CPI) YoY came in at a 15-month low of 5.66% in March 2023 compared to 6.44% in February 2023. During the period under consideration, CPI headline inflation on a YoY basis had hit a high of 7.41% in September 2022.

**Monetary Policy Committee (MPC) at its meeting held between 3rd to 6th of April 2023, decided to keep the policy repo rate under the Liquidity Adjustment Facility (LAF) unchanged at 6.5%.** As per the resolution of MPC, this revision is in consonance with the objective of achieving the medium-term target for consumer price index (CPI) inflation of 4 per cent within a band of +/- 2 per cent, while supporting growth.

As per MPC's resolution, *"CPI inflation is projected at 5.2 per cent for 2023-24, with Q1 at 5.1 per cent, Q2 at 5.4 per cent, Q3 at 5.4 per cent and Q4 at 5.2 per cent, and risks evenly balanced". In terms of economic growth, according to MPC, "the real GDP growth for 2023-24 is projected at 6.5 per cent with Q1:2023-24 at 7.8 per cent; Q2 at 6.2 per cent; Q3 at 6.1 per cent; and Q4 at 5.9 per cent, with risks evenly balanced."*

In MPC's view, *"With CPI headline inflation ruling persistently above the tolerance band, the MPC decided to remain resolutely focused on aligning inflation with the target. It is essential to rein in the generalisation of price pressures and anchor inflation expectations. An environment of low and stable prices is necessary for the resilience in domestic economic activity to be sustained. While the policy rate has been increased by a cumulative 250 basis points since May 2022, which is still working through the system, there can be no room for letting down the guard on price stability. Taking these factors into account, the MPC decided to keep the policy repo rate unchanged at 6.50 per cent in this meeting, with readiness to act, should the situation so warrant. The MPC will continue to keep a strong vigil on the evolving inflation and growth outlook and will not hesitate to take further action as may be required in its future meetings."*

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



Fund Mobilization Status	
Particulars	Amount (₹Cr.)
Contribution from Government of Kerala	₹ 15,410
Fund mobilized from financial market	₹ 17,754
<b>Total</b>	<b>₹ 33,174</b>

\* Provisional figure as on 30-04-2023



**PRAVASI Chitty  
Statistics as of  
30<sup>th</sup> April 2023**

Total number of customers	173724
Total number of subscribers	52290
Total amount collected	INR 2564.15 Cr
KIIFB Deposit bond subscribed	INR 768.00 Cr
KIIFB Security bond subscribed	INR 162.63 Cr



**PRAVASI  
Dividend Scheme**

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

# ENTE KERALAM - 2023

