KRS Infra Ventures Pvt. Ltd.

KNOWLEDGE PAPER

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Future Technologies in the Infrastructure Sector

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From Director Desk

Infrastructure Technology is not only reshaping the planning process but also enhancing the implementation & monitoring projects efficiency. At present there are numerous challenges faced in transport Infrastructure. In this process infrastructure technological huddles are addressed by experts.

Government of India is committed to include technologies in Infra-structure and allotted sufficient funds for R&D.

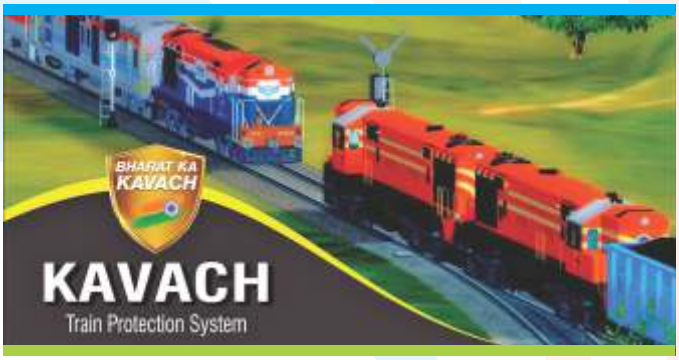
Keshav Gandhi
Executive Director
KRS Infra Ventures Private Limited

Indian Railway Technologies for Future

Indian Railways initiated significant technological transformation to enhance operational efficiency, safety, and sustainability. This transformation is driven

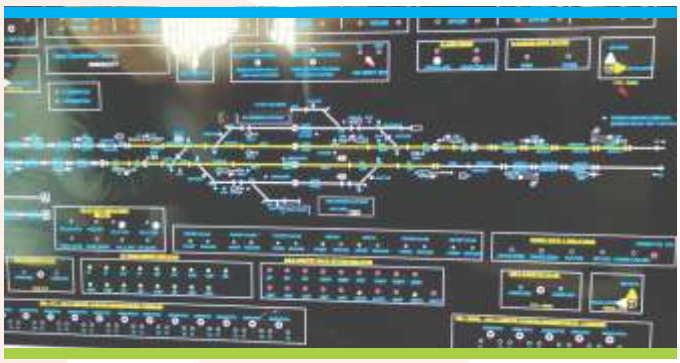
by the need to convert ageing infrastructure & modernize it to improve basic infra needs & passenger experiences, This will support economic growth through better freight services. Safety of operations needs enhancement with:

A) Kavach System: This advanced automatic train protection system aims to cover approximately 44,000 km of railway tracks by the next two years positively. Kavach will help prevent accidents caused by human error through automatic braking and real-time signal information for drivers.



B) Electronic Interlocking: A large-scale adoption of electronic interlocking systems is planned to enhance safety and operational efficiency by automating signal controls and reducing human error risks.

Indian Railways prioritize the Advanced Signaling Technologies. This initiative will support India's first semi-high-speed regional train, integrating advanced signaling systems like Communications-Based Train Control (CBTC), a railway signaling system that uses telecommunications between the train and track equipment for traffic management and



infrastructure control. CBTC allows a train's position to be known more accurately than with traditional signaling systems.

The Track Safety Monitoring will implement the (USFD) Ultra Sonic Flaw Detection technologies which will allow for high-precision scanning of rails to detect flaws early, ensuring proactive maintenance and enhancing safety standards. And many more advancements under plan, which will be implemented in future. ■

Future Technologies in Road and Highways

Government of India applying advanced technologies such as IoT integration, AI applications, adaptive traffic management systems, sustainable practices, enhanced safety features, smart tolling solutions, and predictive maintenance analytics to make smart roads concept in all future Road & Highway construction as well as modernizing built up interstate road network. These innovations promise to improve urban mobility significantly while addressing challenges related to congestion and road safety.

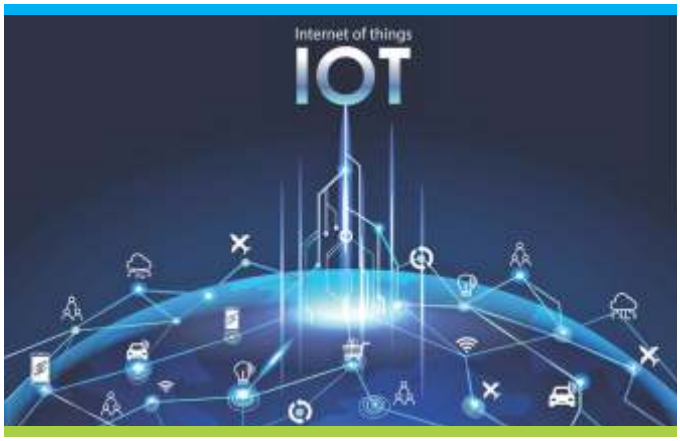
Future Roads need to be upgraded with communication, lighting and power transmission technologies that can support sustainability, improve safety and efficiency which in turn will help transform the driving experience.

The Smart roads use ioT (Internet of Things) devices to make driving safer, more efficient, and in line with Government objectives. Smart roads combine physical infrastructures such as sensors and solar panels with software infrastructure like AI and big data. Advanced

The future development and digital transformation to modernize transport infrastructure, the connected cars, self-driving cars, gps navigation, route optimization apps in the coming future. It should not be forgiven for thinking how the common road fits into this digital revolution, as it turns out, the road itself can be a platform for an amazing array of innovations.

systems will automatically detect accidents or hazardous conditions on the roads, alerting emergency services promptly and improving response times.

Technologies in roads can monitor traffic conditions in real time by using IoT sensors and cameras embedded in the road infrastructure. This data is then processed using edge computing, allowing traffic management



systems to respond immediately to changing conditions. And future adaptive traffic lights that adjust their timing based on real-time scanned traffic data & traffic flow and reducing waiting times at intersections will help reduce pollution & travel time.

Future Smart roads will have V2X (Vehicle-to-Everything) communication to allow vehicles to assess & interact with road infrastructure, creating real-time updates about road conditions, hazards, and optimal routes through AI usage.

The Government has set the internal target to bring the first tranche of 2,000 km of NH network under GPS based tolling system in 2025 and initially only commercial vehicles will be brought under this regime since these have vehicle location tracking devices.

Future Technologies in Indian Aviation Sector

Government focus on modernize airports development rapidly make key centers for multi-modal travel across Indian states. The surge in passenger volumes, increased flight frequency, and expanding connections to new destinations across globally are driving the expansion of airports and their services.

Cutting-Edge Aircraft Technologies Shaping the Future of Aviation-Digital Twin Technology

Digital twin technology enables the creation of virtual replicas of aircraft and their systems, allowing for real-time monitoring, predictive maintenance, and performance optimization.

Airlines can enhance safety, reliability, and operational efficiency by simulating various scenarios and analyzing data from sensors and onboard

systems. Digital twin technology also facilitates remote diagnostics, troubleshooting, and training, enabling airlines to minimize downtime and optimize fleet management.

Aviation Sector will have:

- Nearly 400 new jets will arrive between 2024-2043.
- India carries are expected to have 2000 plane by March 2025.
- Civil Aviation Ministry announcd that 4,000 New plane, 200 new airport soon come in India to meet rising demand.
- More airports will adopt CTX (Computed Tomography X-ray) machines.
- Airbus is doubling down with a $2.0 Billion investment in Indian Aviation, setting up a new campus and training hubs.

India, being the world's one of the largest civil aviation markets and soon plans to double the number of operational airports to 300 by 2047, driven by an eightfold rise in passenger traffic. India is set to see investments worth US$ 25 billion by 2027, with Indian carriers projected to double their fleet capacity.

The future of Ultrasonic Flaw Detection in India's aviation sector looks promising, characterized by technological advancements, increased regulatory scrutiny, and a growing emphasis on safety and efficiency. The advanced ultrasonic techniques such as Phased Array Ultrasonic Testing (PAUT) and Time-of-Flight Diffraction (TOFD) will become more prevalent in Indian aviation.

The Automation and Robotics like Autonomous Self-driving baggage carts and shuttle buses will enhance operational efficiency and reduce labor costs and Robotic Assistance: can assist with tasks like baggage handling, cleaning, and security checks, improving productivity and safety.

Generative AI is rapidly emerging as a key solution to these challenges, shaping the future of air travel. These AI tools can handle thousands of requests simultaneously, providing instant, contextual, and personalized responses. This reduces wait times, improves customer satisfaction and significantly reduces operational costs. The agility and scalability of Generative AI make it a vital component of future strategies for airport operators looking to enhance customer experience while maintaining efficiency.

Future Technologies for Ports

Indian Government is planning few steps in Port sector to using latest technology to improve ease of doing business & reducing logistics cost and enabling multi-modal shift and safe, sustainable and green maritime sector.

Government of India initiative to transform Indian Maritime infra with intelligent ports, adoption of Artificial intelligence (AI), Internet of Things (IoT), Machine Learning (ML), blockchain, big data analytics, etc. would simplify port operations, increase efficiency and improve safety aspects at ports across India.

Vessel Traffic Management Systems and introduction of Artificial Intelligence (AI) in Vessel Traffic Services. Installing IoT devices across ports, facilitating real-time data transmission and enhancing navigation systems. And using Robotic Technologies like drones for surveillance and inspection tasks is expected to increase, providing real-time monitoring capabilities without disrupting port operations.

The green ports initiative will focus on reducing carbon footprints using clean energy sources, electrification of port equipment, and adoption of green technologies.

A Smart Indian Port refers to a modern port that utilizes advanced technologies and data-driven solutions to enhance operational efficiency, safety, and sustainability. This concept is part of a broader initiative to modernize India's port infrastructure and improve its competitiveness in global trade. Smart port technologies would also promote port operations through inherent monitoring mechanisms for energy consumption and emissions, as well as waste management.

IWAI inland waterway: India's future in inland waterways is set to be shaped by innovative technologies that promote sustainability, efficiency, and economic growth. By investing in advanced navigation systems, eco-friendly vessels, sustainable dredging practices, and robust infrastructure development, India aims to position itself as a leader in inland water transport while contributing to broader environmental goals.

Future Technologies in Indian Shipbuilding Sector

The Government focus on Indian shipbuilding sector enhanced the need of technologies to shape the industry with following initial steps like the advanced robotics is increasing to automate labor-intensive tasks such as welding, cutting, and painting. This not only improves efficiency but also enhances safety by reducing the risk of injuries among workers.

The Robotics will also play a crucial role in ship maintenance, allowing for quicker turnaround times and improved service quality. The Green Shipping Technologies like Alternative fuels such as hydrogen, ammonia, and biofuels to reduce emissions, utilize electric or hybrid propulsion systems, contributing to the decarbonization of maritime operations, Immersive advance technology will transform the ship design process, enabling the creation of 3D virtual models and improving collaboration between teams. AI will optimize ship design, simulate operational conditions, and predict maintenance needs.

The Technology use in this sector will help ship building, ship operations, improving safety, efficiency, and reducing environmental impact.

Future Technologies in Energy Sector

The role of technology in the oil and gas sector plays a pivotal role. Indian Government move towards electric and solar-powered construction equipment is expected to further reduce the carbon footprint of infrastructure projects, aligning with global sustainability goals. The country is focusing renewal energy on expanding its solar power capacity, with projections to reach 512 GW by 2030. This is part of a broader goal to achieve 450 GW of renewable energy capacity by 2030.

The Future innovation in exploring Oil and Gas is vital as the world faces unprecedented challenges regarding energy transition, climate change, and global demand and supply trends.

Future Technology in Oil and Gas are rapidly evolving, driven by the need to improve efficiency, reduce costs, and address environmental concerns. Here are some of the future technologies that will shape the industry:

1. **Advanced seismic imaging**-The development of high-resolution photographs of the underlying geology made possible by advanced seismic imaging aids in discovering new oil and gas reserves. This technology is anticipated to lower costs, increase exploration efficiency, and lessen the adverse effects of drilling on the environment.

2. **Artificial intelligence and machine learning**-Oil and gas exploration and production will benefit greatly from artificial intelligence and machine learning technologies. These technologies can improve drilling and completion, forecast and analyze data, and increase the efficiency and safety of operations.

3. **Robotic exploration and drilling**-Drilling and exploration activities will be safer and more productive thanks to robotic technology. Robotic systems can work in challenging conditions, require less human involvement, and increase the accuracy of drilling and completion.

4. **Nanotechnology and nano sensors-**This can improve exploration and production, delivering precise and timely data on reservoir features. As a result, this technology can lessen the environmental impact of exploration and production, increase drilling efficiency, and lower prices.

5. **Use of drones for exploration and surveillance-**Drones can investigate and monitor reservoirs, pipelines, and oil and gas facilities. They can deliver sharp pictures, find leaks and anomalies, and boost operational efficiency and security.

6. **Digitalization and automation-** Digitalization and automation are expected to transform the oil and gas industry, improving safety, lowering costs, and optimizing processes. These tools can deliver real-time data analyses, automate repetitive procedures, and enhance decision-making.

7. **Enhanced Oil recovery techniques-** Through enhanced oil recovery techniques, existing reservoirs can be exploited to extract more oil. These methods can prolong the life of oil fields and boost production rates while lowering operational expenses.

8. **Carbon capture and storage-**Oil and gas extraction will be less detrimental to the environment using carbon capture and storage technology. This technique captures and stores carbon dioxide emissions in geological formations, lowering greenhouse gas emissions.

9. **Hydrogen and renewable energy integration-**Integration of hydrogen and renewable energy sources will be crucial in lowering the oil and gas sector's carbon footprint. In addition, this technique lessens dependency on fossil fuels by utilizing hydrogen and renewable energy sources to power oil and gas operations.

10. **Chemical and material innovations-** Innovations in chemicals and materials are predicted to increase the effectiveness and security of oil and gas operations. These developments include the creation of brand-new lubricants, coatings, and materials that can survive challenging conditions and minimize equipment wear and tear.

Future Technologies in The Power Sector

Technological input in power generation Involves generating electricity closer to the point of consumption, which reduces transmission losses and improves energy efficiency. And the Renewable energy like Solar, wind, and geothermal energy sources are becoming more accessible and cost-effective. Energy companies are now able to install and operate renewable energy systems more efficiently.

The power distribution sector has significantly increased its adoption of smart metering solutions, smart grid infrastructure and digital technologies to enhance both operational and financial performance. New and emerging technologies are being implemented to improve distribution infrastructure, increase grid reliability, integrate renewable energy and provide consumers with smart solutions.

These advanced solutions greatly enhance the efficiency and productivity of the power sector. Previously, most operations and distribution processes in the power sector were manual, leading to poor control, lack of transparency and unreliable information, which resulted in significant power losses.

Smart grids-Use digital technology to improve the efficiency and reliability of the electricity supply. Smart grids use two-way communication between the utility and the consumer to manage electricity delivery and respond to changing demand.

Artificial intelligence (AI)-Can process large amounts of data to accurately predict energy demand, optimize energy production and distribution, and detect outages.

Decentralized power generation-Involves generating electricity closer to the point of consumption, which reduces transmission losses and improves energy efficiency. Examples include rooftop solar installations, microgrids, and small-scale wind turbines.

Renewable energy-Solar, wind, and geothermal energy sources are becoming more accessible and cost-effective. Energy companies are now able to install and operate renewable energy systems more efficiently.

Upcoming Projects

1 Government of India has sanctioned Rs 27.98 billion for various road projects in West Bengal and Maharashtra. In West Bengal, the sanctioned an amount of Rs 16.06 billion for the Ghoshpukur-Salsalabari Four Laning Road Project (Package-||B Dhupguri-Falakata stretch) (NH-31,31D and 31C) to be executed on an engineering, procurement and construction (EPC) basis. In Maharashtra, MoRTH has sanctioned an amount of Rs 11.92 billion for the Sangli Phata-Chokak, Chokak-Ankali Four-laning Road Project (Kolhapur-Sangil strech) on NH-166 to be executed on a hybrid-annuity model basis.

2 The Telangana state Government has sanctioned a budget of Rs 242.69 billion for Hyderabad Metro Phase II. The project will be undertaken in a 50:50 joint venture (JV) between the Hyderabad Airport Metro Limited and the Central Government. The

project comprises five metro corridors spanning 76.4 km. The Telangana Government will finance Rs 73.13 billion of the total project cost, while the Central Government will contribute Rs 42.3 billion. Public – Private Partnership (PPP) Identity will provide Rs 10.33 billion. The remaining Rs 116.93 billion will be obtained through loans from International Financial Institutions.

3 Loan of $241.3 million to improve power distribution in West Bengal approved by Asian Development Bank (ADB).

These funds will undertake the replacement of low-tension overhead lines with aerial bundled cables and seprate electricity feeders from agriculatural and non-agricultural users. Further an integrated information and operation management system will be developed to improve power supply quality, performance monitoring and financial management, raising the operational efficiency of West Bengal State Electricity Distribution Company.

4 ADB approved a $434.25 million loan to support renewable energy development and strengthen energy security in Assam. Reportedly, the Assam solar project will establish a 500 MW grid-connected solar photovoltaic facility in Karbi Anglong district. Additionally, a grid-connected BSES will be developed to stabilize the grid and meet peak power demands. This project align with Assam's renewable energy goals, helping the state create a comprehensive renewable energy roadmap and increasing the state's solar capacity to meet its target of 3,000 MW by 2030.

5 Gujarat planned the development of 10 greenfield ports with an additional capacity of 500 mt. The state will also redevelop 200 mt capacity at ports controlled

by the Gujarat Maritime Board. Gujarat Government estimate investment of Rs 1.5 trillion, and in addition plans to have over 2,000 mt of handling capacity by 2047.

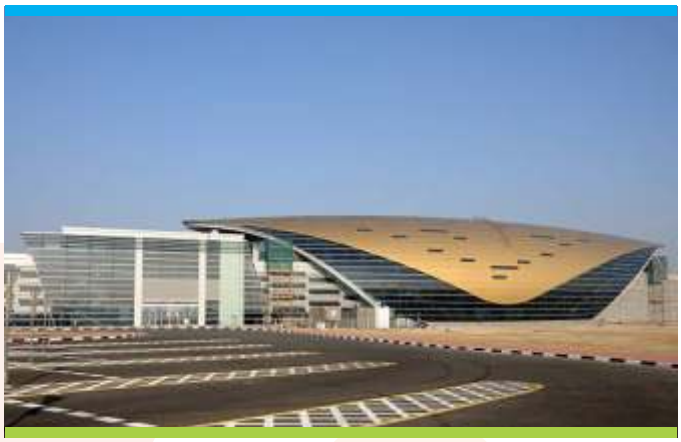
6 Cochin Shipyard Limited and the Deendayal Port Authority (DPA) plan to collaborate to construct a state-of-the-

art ship repair facility capable of dry docking capesize vessels in Vadinar, Gujarat. The facility will be constructed at an estimated investment of Rs 16 billion. DPA will construct a jetty at Vadinar, while Cochin Shipyard will provide a floating dry dock and oversee the operations and maintenance of the ship repair yard.

7 Government of India under National Electricity Plan for transmission with the aim to transmit 500 GW of renewable energy by 2030 and over 600 GW by 2032. The plan addresses the need for 47 GW of

battery energy storage systems and 31 GW of pumped storage plants. As per 10-year period from 2022-32, it aims to add more than 191,000 ckt km of transmission lines and 1,270 GVA of transformation capacity at 220 kV and above levels. It also includes plan to add 33 GW of high voltage direct current bipole links and increase interregional transmission capacity from the current 119 GW to 143 GW by 2027 and 168 GW by 2032.

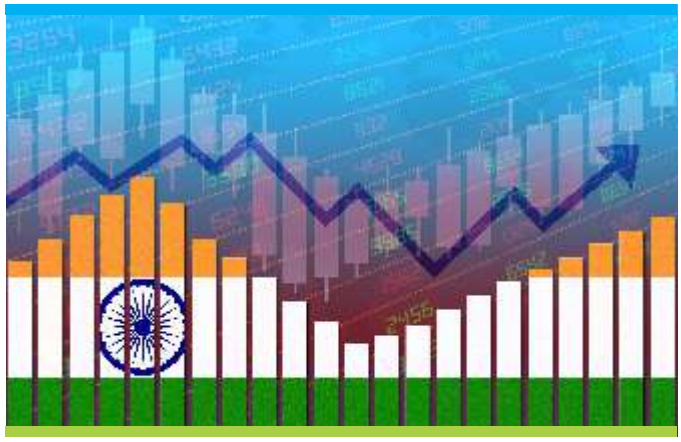
8 The Madhya Pradesh Government and AAI have signed an MoU for the development of Shivpuri Airport. The State Government is likely to transfer 292 acres of land to AAI for the project. The project involves the upgradation of the airport to accommodate 19- seater aircraft and further expand its capacity to handle ATR-72 aircraft.



9 The Telangana Government has proposed a Rs 260 billion intiative to upgrade and maintain 17,300 Km of roads over the next four years under the Public-Private Partnership (PPP) model.

10 Artificial intelligence (AI) use in Transport Infrastructure will boost the economy, some key infrastructure components important and growth of AI and cloud computing will give boost to Infrastructure Sector. Infrastructure broadly, including all of the equipment, structures, and facilities needed for the operation of everything surrounding and supporting AI and the cloud in near future. Globally most of the Infrastructure Equipment suppliers increased R & D funding to use AI in operation and this will help managing future installation tech ready and more effective.

The Indian Government is heavily investing in infrastructure development with ambitious targets aimed at achieving a $5 trillion economy by 2025. Key initiatives include: The National Infrastructure Pipeline (NIP), which plans an investment of INR 111 lakh crore by 2025, focusing on both urban and rural



infrastructure development. Public-Private Partnerships (PPP) are being promoted to accelerate infrastructure projects, enhancing competitiveness and resource utilization across sectors.

The integration of technology into India's infrastructure landscape is crucial for meeting the demands of rapid urbanization and economic growth. By leveraging advanced technologies across various sectors, India aims to build a resilient infrastructure that supports sustainable development and improves the quality of life for its citizens.

The KRS Group
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KRS MARKETING Partnership Proposal

Marketing Requirements

Handling business opportunities in India require various steps and Marketing Partnership will help you to understand the practice and management to work in India. Considering the promotion before official participation in business, few steps like promotion, introducing own product range to manage the requirement development accept our standard products or services, advance preparation of participation in Indian Opportunities, management of local vendor team, if required for joint participation, handling tenders, offers, negotiations, contract management support etc., the list is ongoing and KRS Infra Ventures Pvt. Limited ensure that our experience being in this trade from last three decades offer you wider experience base in INDIA.

Marketing Proposal

The KRS Group herewith introduce KRS Infra Ventures Pvt. Limited herewith offers the marketing partnership to your organization to promote you and yours associates interest in Indian Infrastructure Sector with following ways:

- Informing Business Opportunities in India for business scope of your organization.
- Promoting your organization with introducing and presenting details to various clients in Government and Private Sector and follow-up for acquisition formalities (tendering process, finalization of business, all assistance during implementation & after sales etc.)
- Informing the current scenario of market in view of Government Policies, Procurements plans etc.
- Advising the strategies required during promotion for successful business opportunities.

The partnership terms will require discussions to finalize, which will be second step after receiving your principal approval and suggest you to work on following options for understanding:

- Marketing Partnership Joint Venture-which means “KRS Infra Ventures” will be offering all Marketing support in India and your organization handle the technical & commercial need of the projects targeted and rest terms & conditions of arrangement will decided after in principal approval of partnership.
- Exclusive Agent in INDIA-KRS will be offered exclusive Agency Agreement for 3 years minimum to develop and managing business opportunities for your organization and terms & conditions of this agreement will be discuss after principal approval of working.

KRS Infra Ventures Private Limited

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