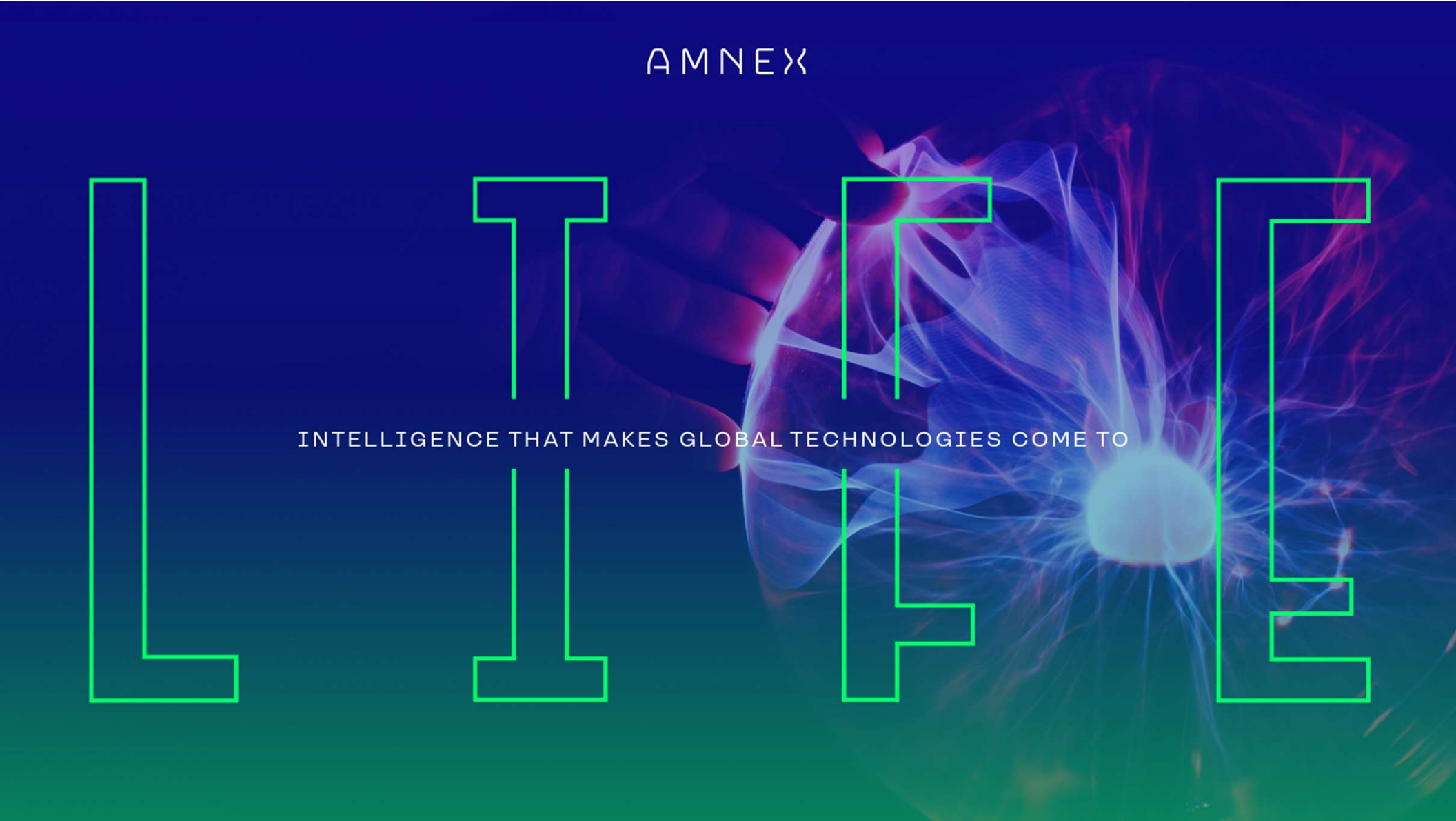# AMNEX

LIFE

INTELLIGENCE THAT MAKES GLOBAL TECHNOLOGIES COME TO

IMPACT CREATED IN REAL WORLD

27 Million +
Urban Population Benefitting From Our Smart City Solutions Across 20 Cities

21,22,244+ SQ FT
Building Area Digitized (BIM)

50 Million+ SQ FT
Land Area Digitized Using Geo-spatial Technology

20,00,000+ PCU
Volume of Traffic Optimized At The Junctions

5,000+
Parking spot connected

96,00,000
Farmers Benefit From Amnex Tech-enabled Agri Solutions

2,43,509+ SQ KM
Cultivable Area Monitored From Cultivation To Harvest

38,20,000+
Passengers Across The Country Take One Of Amnex's Technology Enabled Buses Everyday

82,000+
Daily Trips Optimized

3,00,000+
Daily Transactions Enabled

USD 1.4 Million+
Of Daily Mining transactions Facilitated On Our Mining Platform

2,06,000+ MT
Of Minerals Monitored Daily Across 1,743 Mines

20,000+
Street Lights Connected

60-70%
Energy Saving Achieved With Smart Street Light

1.5 Million +
IoT devices connected in various solutions spread across 16+ industries

4,85,000+
Property tagged

125+ KM
GPR Survey done till date

37,762 KM
Utility Mapped till date

1300+
Solid Waste Collection Vehicles Connected

25,000+
Smart Waste Bins Managed Daily

GEOGRAPHIC
DATA
SHAPES
AN EVOLVING
GLOBAL
LANDSCAPE

Intelligence

Is natural

Data Lake Demystified

A game-changer for the holistic Infrastructure Development

Enterprise Solution – Digital Platform for Infrastructure Project

Our Enterprise solution is a powerful **repository of data**. It is capable of receiving data from different sources and in different types, schemas and sources. It can store

- **Structured Data:** Databases
- **Semi Structured Data:** CSV files
- **Unstructured Data:** Text documents, images, videos, or logs

that is not processed or analysed, eliminating the need to arrange data in a specific format.

- It provides a **holistic view of the project** by data aggregation and **powerful visualization.**
- Once the data is added to the our enterprise solution, it can be used by anyone in the organization for various analysis purposes.
- It expedites the decision-making process by allowing users to harness data from central repository

End to End Enterprise solution covering entire project lifecycle right from conceptualization all the way up to execution and operations

Conceptualization | Project Preparation | Tendering & Contract Management | Execution | Operations & Maintenance

1. Collaborate, Aggregate & Visualize

2. Site Plan & Acquire

3. Data Acquisition Engine

4. Network Planning

5. Maintain & Manage

6. Decision Support System
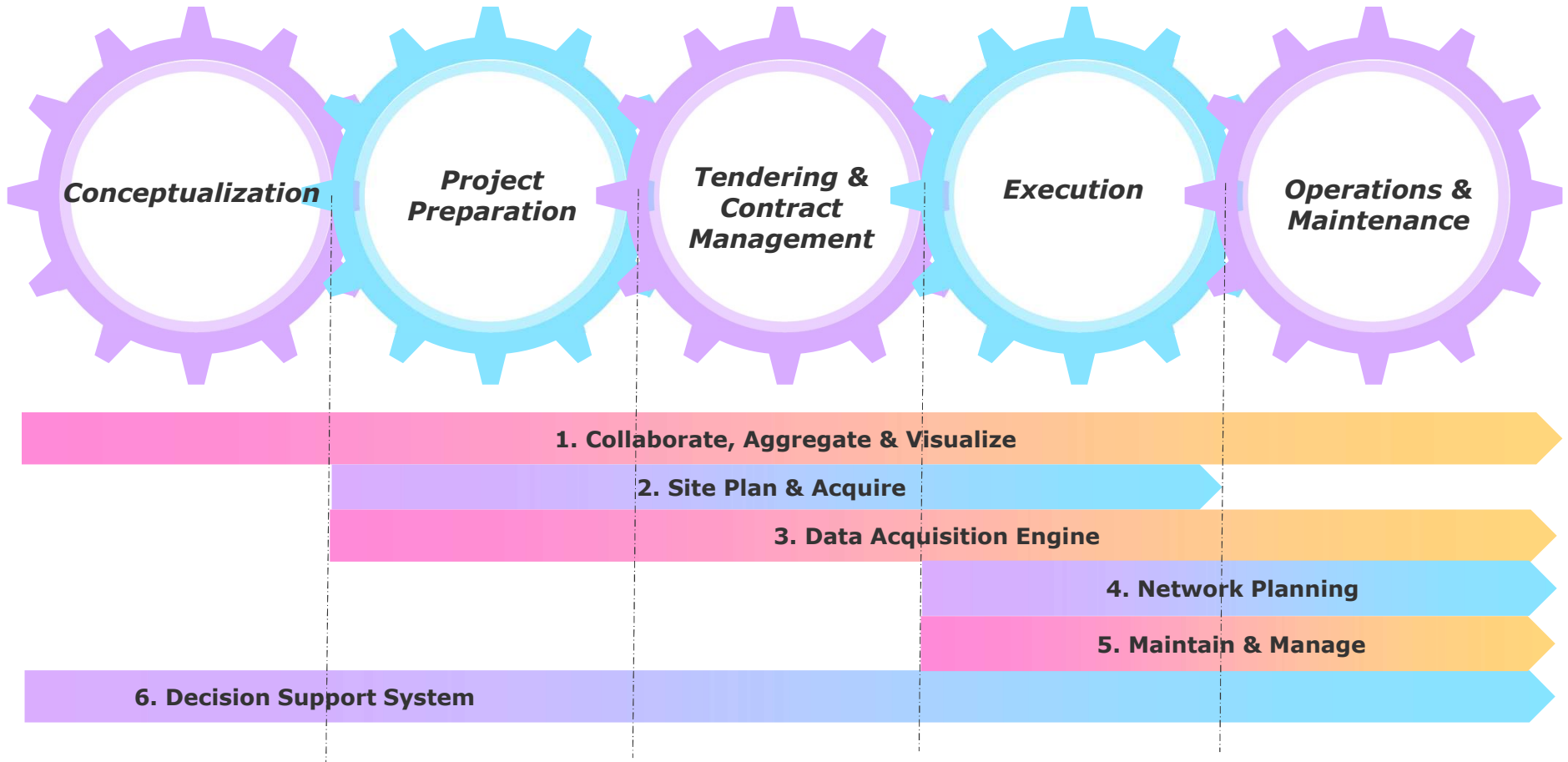
How DataLake – Brings Digital Transformation Across Key Stakeholders

Coordinate

Collaboration, Communication, Coordination, Correspondence

Contract

Contract Management, Budgeting & Expenditure Control, Project based Accounting

Comply

Compliance, Dispute & Settlement, Facilitate Design Correction, Control Quality

Local / Regional Governments

Nodal Project Agency

Collaborating Departments

Lending / Development Institutions

EPC Players/ Contractors

Project Management Teams

Civil Society

Conceptualization · Project Preparation · Tendering & Contracting · Execution · Operations & Maintenance

Common Operating Picture (Across Project Lifecycle) over multiple Service Channels

IPAT Core Modules

Collaborate, Aggregate & Visualize

Decision Support System

Site Plan & Acquire | Network Planning | Maintain & Manage

Data Acquisition Engine

Data Sources

Field Surveys | Remote Sensing Imagery | Drone / UAV Photogrammetry | Government Data-sets | IOT Data Sources | OT Data Sources

USE CASE - NHAI

Data Lake

INDUSTRY – Data Fabric
PROJECT NAME – Development and maintenance of NHAI's data lake and analytics engine
LOCATION –PAN India
CLIENT -NHAI
PRODUCT/SOLUTION TECHNOLOGY – LiDAR, Data Analytics, Geospatial Engineering , GPS, cloud computing, Big Data.

CONTEXT

- Technology solution to bring various stakeholders on the same platform.
- Solution for smooth project progression and minimal hindrance.
- Digitize processes for hassle-free record-keeping and easy document access.
- Enhance transparency in the end-to-end process by digitally tracking the project's progress.

SOLUTIONS IMPLEMENTED

- GIS Geotagging
- Automated APIs
- Dashboards for the display of crucial information and project tracking

IMPACT

- Data lake brought end-to-end transparency to the processes by facilitating communication and coordination between various stakeholders.
- It expedited project progress by providing contractors and concessionaires easy access to project documents, which was a time-consuming process earlier.
- It removed bottlenecks in project implementation, accelerated the construction work, reduced project costs by digitizing processes.
- It enhanced the level of services by improving claim settlement process.
- It enabled higher authorities to track key performance metrics of engineers, filtering misfits out of the system.
- It set up a robust support system by generating alerts in case of irregularities.

Total Road Length Monitor – **69,648 Km**

*Total Projects-***2,100**

Total Contractors/ DPR/AE/IE – **4,200+**

Total Officials – **400+**

Total Documents – **2 million +**
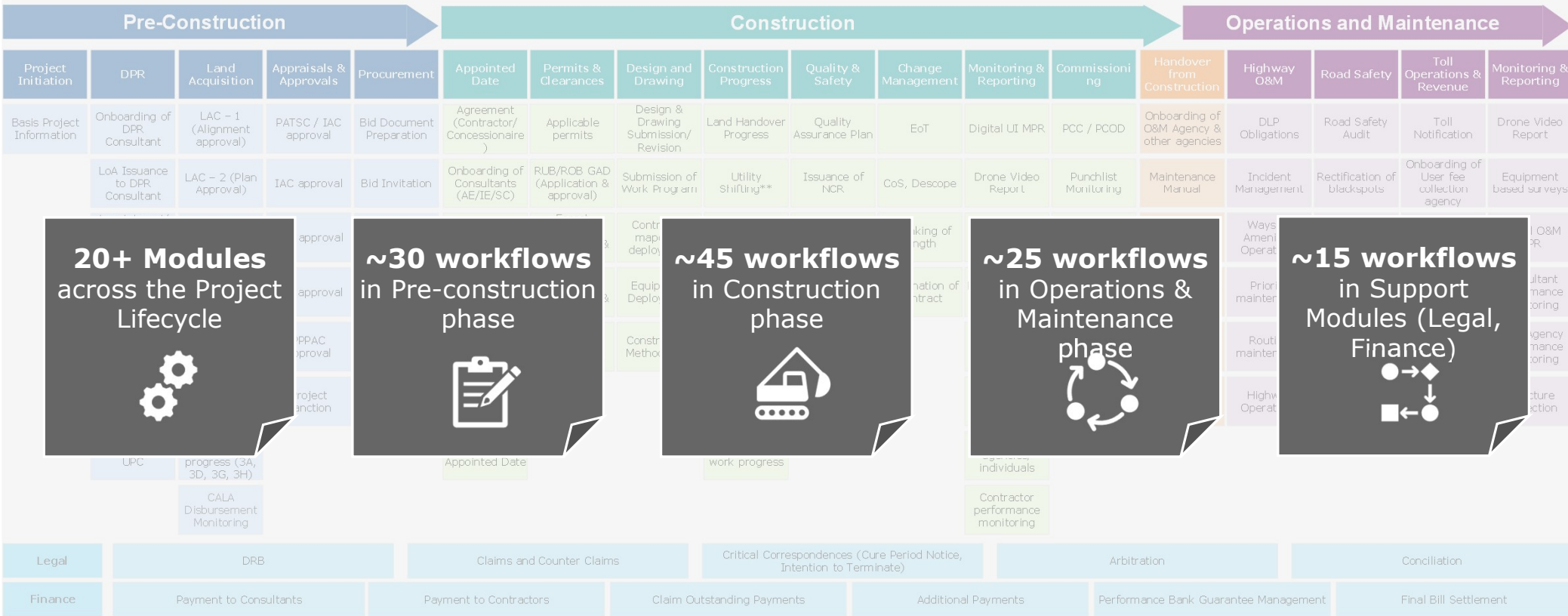
Total Size – **455 TB+**

End-to-end Project Development Framework of our Enterprise Solution

Project Development Framework

Pre-Construction | Construction | Operations and Maintenance

Project Initiation	DPR	Land Acquisition	Appraisals & Approvals	Procurement	Appointed Date	Permits & Clearances	Design and Drawing	Construction Progress	Quality & Safety	Change Management	Monitoring & Reporting	Commissioning	Handover from Construction	Highway O&M	Road Safety	Toll Operations & Revenue	Monitoring & Reporting
Basis Project Information	Onboarding of DPR Consultant	LAC – 1 (Alignment approval)	PATSC / IAC approval	Bid Document Preparation	Agreement (Contractor/Concessionaire)	Applicable permits	Design & Drawing Submission/Revision	Land Handover Progress	Quality Assurance Plan	EoT	Digital UI MPR	PCC / PCOD	Onboarding of O&M Agency & other agencies	DLP Obligations	Road Safety Audit	Toll Notification	Drone Video Report
LoA Issuance to DPR Consultant	LAC – 2 (Plan Approval)	IAC approval	Bid Invitation	Onboarding of Consultants (AE/IE/SC)	RUB/ROB GAD (Application & approval)	Submission of Work Program	Utility Shifting	Issuance of NCR	CoS, Descope	Drone Video Report	Punchlist Monitoring	Maintenance Manual	Incident Management	Rectification of blackspots	Onboarding of User fee collection agency	Equipment based surveys
Appointment/ Replacement of DPR Personnel	3a, 3A Notification	SFC approval	Bid Evaluation	LoA Issuance to AE/IE/SC	Forest Clearance (Application & Approval)	Contractor mapower deployment	Physical Progress	RFI	Delinking of length	Consultant performance monitoring	CC / COD	As-built Drawings	Wayside Amenities Operations	Road Accident Monitoring & Reduction	Toll Collection	Digital O&M MPR
DPR Deliverables & Submission	3D Notification	EFC approval	LoA Issuance to Contractor/ Concessionaire	Appointment/Replacement of key/sub personnel	Wildlife Clearance (Application & Approval)	Equipment Deployment	Financial Progress	Quality Inspection by SRDQ	Termination of Contract	PD/RO/GM Site Inspection	Change of Ownership	Quality Control Reports	Priority maintenance		Toll asset management	Consultant performance monitoring
DPR EoT	3G - Declaration of Award	PPPAC approval		Joint Verification (Handover Memorandum)	Other Approvals/ Clearances*	Construction Methodology	Critical issues and actions	Test, Daily Lab Testing Report		Monitoring of ALB Contracts		Other Reports (drone, safety audit, etc.)	Routine maintenance		Non-Toll Revenue	O&M Agency performance monitoring
DPR CoS	3H - Disbursement for LA	Project Sanction		Financial Closure (in PPP projects)			Strip charts (Chainage wise progress)	Safety Audit		Surplus Land Monitoring		Plantation Monitoring	Highway Operations			Structure Inspection
Creation of UPC	Land Acquisition progress (3A, 3D, 3G, 3H)			Issue of Appointed Date			IE/AE daily work progress			Blacklisting of agencies/ individuals						
	CALA Disbursement Monitoring									Contractor performance monitoring						

Legal	DRB	Claims and Counter Claims	Critical Correspondences (Cure Period Notice, Intention to Terminate)	Arbitration	Conciliation
Finance	Payment to Consultants	Payment to Contractors	Claim Outstanding Payments	Additional Payments / Performance Bank Guarantee Management	Final Bill Settlement

9

End-to-end Project Development Framework of our Enterprise Solution

Project Development Framework

| Pre-Construction | | | | | Construction | | | | | | | | Operations and Maintenance | | | |

Project Initiation	DPR	Land Acquisition	Appraisals & Approvals	Procurement	Appointed Date	Permits & Clearances	Design and Drawing	Construction Progress	Quality & Safety	Change Management	Monitoring & Reporting	Commissioning	Handover from Construction	Highway O&M	Road Safety	Toll Operations & Revenue	Monitoring & Reporting
Basis Project Information	Onboarding of DPR Consultant	LAC – 1 (Alignment approval)	PATSC / IAC approval	Bid Document Preparation	Agreement (Contractor/Concessionaire)	Applicable permits	Design & Drawing Submission/ Revision	Land Handover Progress	Quality Assurance Plan	EoT	Digital UI MPR	PCC / PCOD	Onboarding of O&M Agency & other agencies	DLP Obligations	Road Safety Audit	Toll Notification	Drone Video Report
	LoA Issuance to DPR Consultant	LAC – 2 (Plan Approval)	IAC approval	Bid Invitation	Onboarding of Consultants (AE/IE/SC)	RUB/ROB GAD (Application & approval)	Submission of Work Program	Utility Shifting**	Issuance of NCR	CoS, Descope	Drone Video Report	Punchlist Monitoring	Maintenance Manual	Incident Management	Rectification of blackspots	Onboarding of User fee collection agency	Equipment based surveys

20+ Modules across the Project Lifecycle

~30 workflows in Pre-construction phase

~45 workflows in Construction phase

~25 workflows in Operations & Maintenance phase

~15 workflows in Support Modules (Legal, Finance)

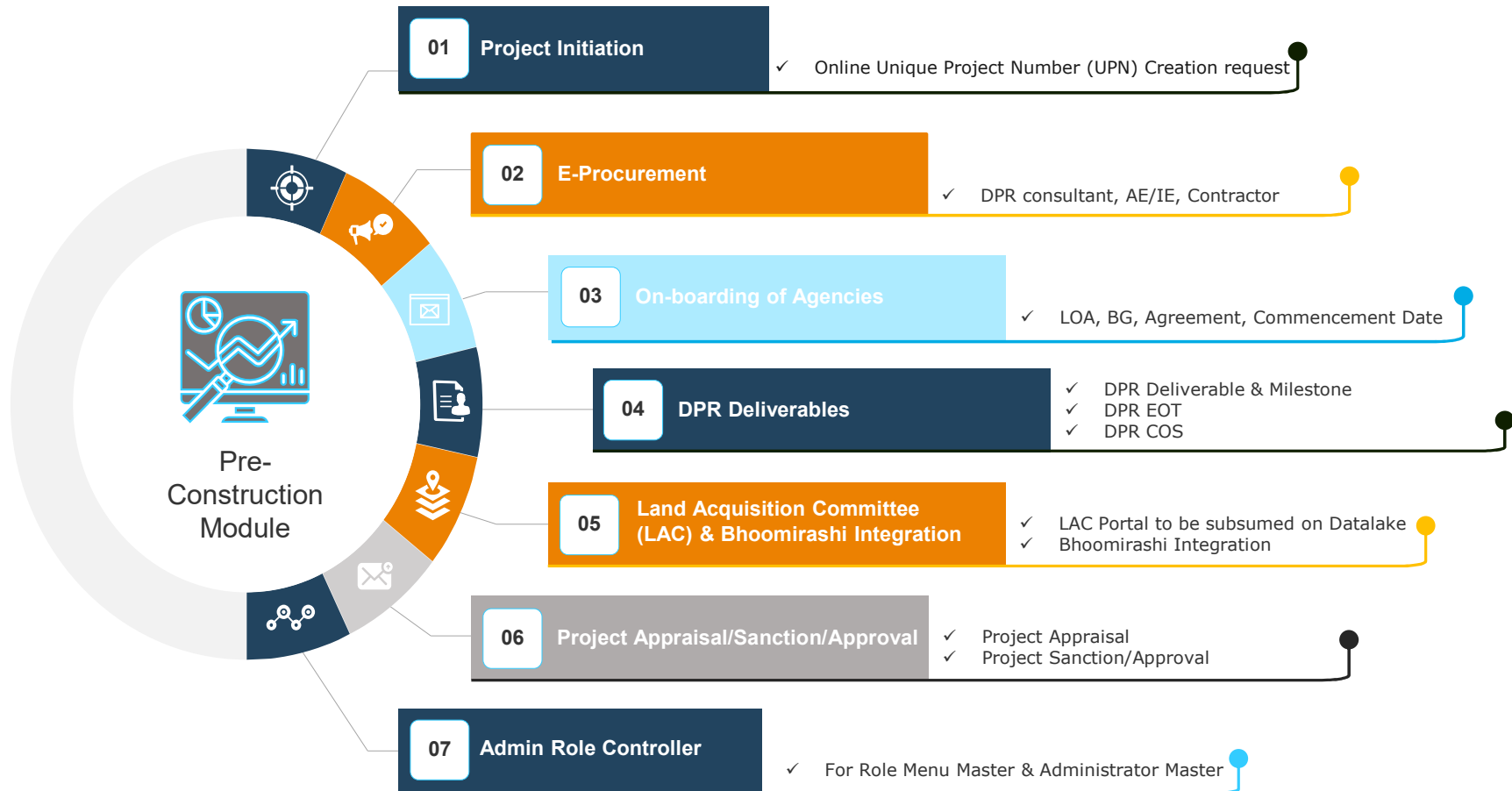| Legal	DRB	Claims and Counter Claims	Critical Correspondences (Cure Period Notice, Intention to Terminate)	Arbitration	Conciliation
Finance	Payment to Consultants	Payment to Contractors	Claim Outstanding Payments	Additional Payments	Performance Bank Guarantee Management	Final Bill Settlement

PRE CONSTRUCTION MODULE/COMPONENTS (PHASE 1)

Following listed module/components for the digitization of Pre Construction module which enables the services for the application initiation, pushing metadata to third party system and receive synchronized data digitally.

Pre-Construction Module

01 Project Initiation
- ✓ Online Unique Project Number (UPN) Creation request

02 E-Procurement
- ✓ DPR consultant, AE/IE, Contractor

03 On-boarding of Agencies
- ✓ LOA, BG, Agreement, Commencement Date

04 DPR Deliverables
- ✓ DPR Deliverable & Milestone
- ✓ DPR EOT
- ✓ DPR COS

05 Land Acquisition Committee (LAC) & Bhoomirashi Integration
- ✓ LAC Portal to be subsumed on Datalake
- ✓ Bhoomirashi Integration

06 Project Appraisal/Sanction/Approval
- ✓ Project Appraisal
- ✓ Project Sanction/Approval

07 Admin Role Controller
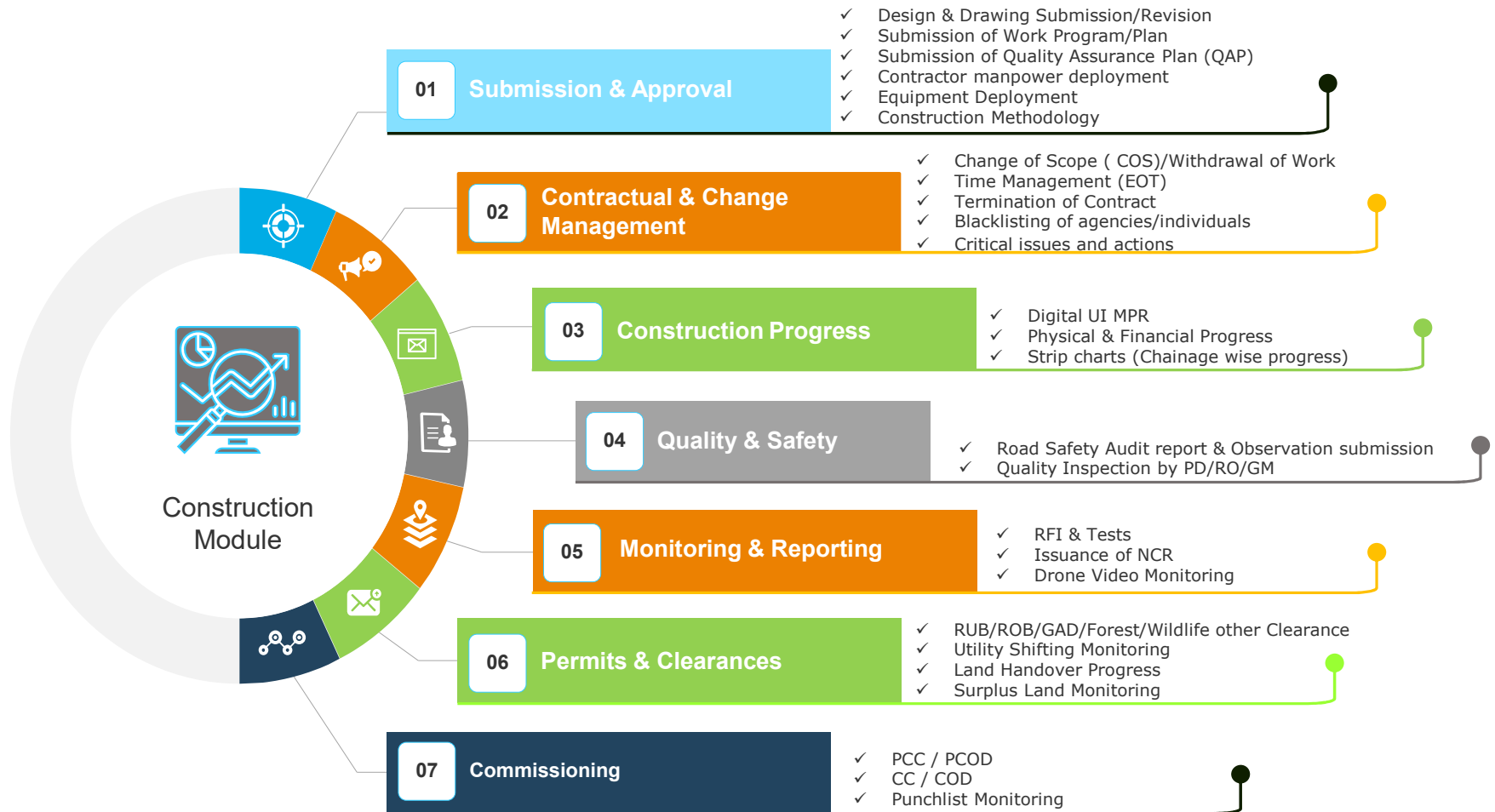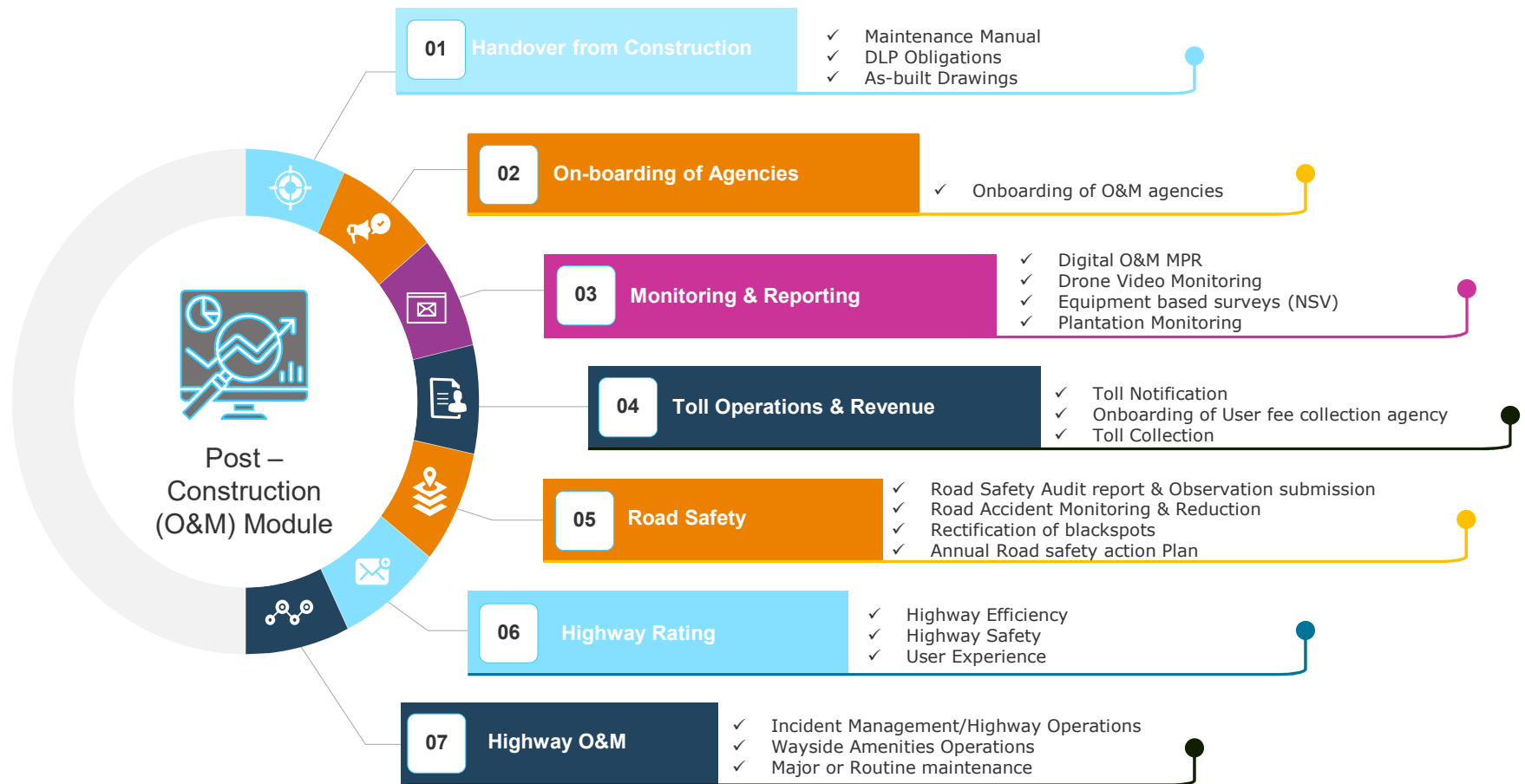- ✓ For Role Menu Master & Administrator Master

CONSTRUCTION MODULE/COMPONENTS (PHASE 2)

Following listed module/components for the digitization of Pre Construction module which enables the services for the application initiation, pushing metadata to third party system and receive synchronized data digitally.

Construction Module

01 Submission & Approval
- ✓ Design & Drawing Submission/Revision
- ✓ Submission of Work Program/Plan
- ✓ Submission of Quality Assurance Plan (QAP)
- ✓ Contractor manpower deployment
- ✓ Equipment Deployment
- ✓ Construction Methodology

02 Contractual & Change Management
- ✓ Change of Scope (COS)/Withdrawal of Work
- ✓ Time Management (EOT)
- ✓ Termination of Contract
- ✓ Blacklisting of agencies/individuals
- ✓ Critical issues and actions

03 Construction Progress
- ✓ Digital UI MPR
- ✓ Physical & Financial Progress
- ✓ Strip charts (Chainage wise progress)

04 Quality & Safety
- ✓ Road Safety Audit report & Observation submission
- ✓ Quality Inspection by PD/RO/GM

05 Monitoring & Reporting
- ✓ RFI & Tests
- ✓ Issuance of NCR
- ✓ Drone Video Monitoring

06 Permits & Clearances
- ✓ RUB/ROB/GAD/Forest/Wildlife other Clearance
- ✓ Utility Shifting Monitoring
- ✓ Land Handover Progress
- ✓ Surplus Land Monitoring

07 Commissioning
- ✓ PCC / PCOD
- ✓ CC / COD
- ✓ Punchlist Monitoring

POST CONSTRUCTION (O&M) MODULE/COMPONENTS (PHASE 3)

Following listed module/components for the digitization of Pre Construction module which enables the services for the application initiation, pushing metadata to third party system and receive synchronized data digitally.
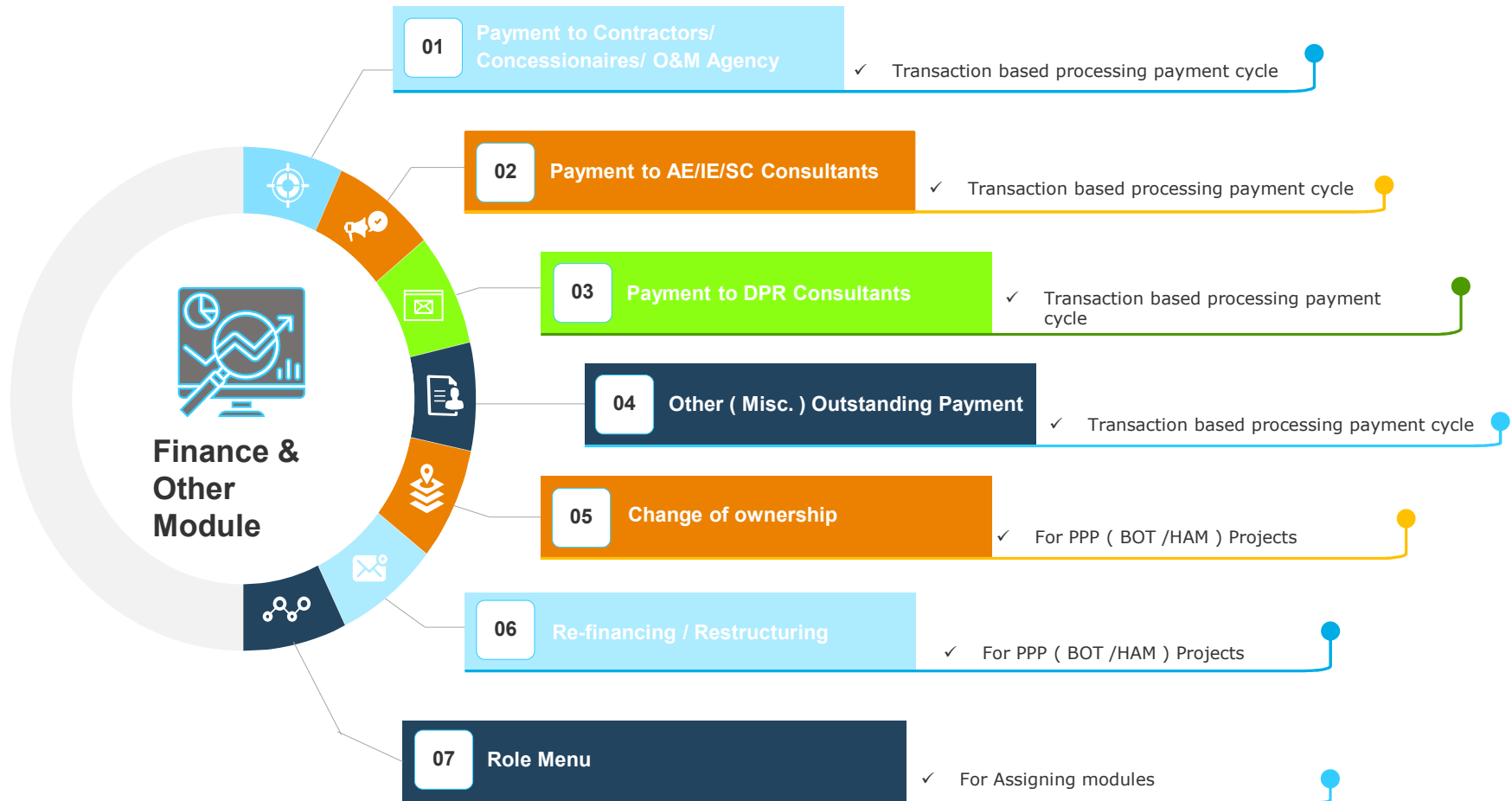
01 Handover from Construction
- ✓ Maintenance Manual
- ✓ DLP Obligations
- ✓ As-built Drawings

02 On-boarding of Agencies
- ✓ Onboarding of O&M agencies

03 Monitoring & Reporting
- ✓ Digital O&M MPR
- ✓ Drone Video Monitoring
- ✓ Equipment based surveys (NSV)
- ✓ Plantation Monitoring

04 Toll Operations & Revenue
- ✓ Toll Notification
- ✓ Onboarding of User fee collection agency
- ✓ Toll Collection

05 Road Safety
- ✓ Road Safety Audit report & Observation submission
- ✓ Road Accident Monitoring & Reduction
- ✓ Rectification of blackspots
- ✓ Annual Road safety action Plan

06 Highway Rating
- ✓ Highway Efficiency
- ✓ Highway Safety
- ✓ User Experience

07 Highway O&M
- ✓ Incident Management/Highway Operations
- ✓ Wayside Amenities Operations
- ✓ Major or Routine maintenance

Post – Construction (O&M) Module

FINANCE & OTHER MODULE / COMPONENTS

Following listed module/components for the digitization of Pre Construction module which enables the services for the application initiation, pushing metadata to third party system and receive synchronized data digitally.

Finance & Other Module

01 Payment to Contractors/ Concessionaires/ O&M Agency
- ✓ Transaction based processing payment cycle

02 Payment to AE/IE/SC Consultants
- ✓ Transaction based processing payment cycle

03 Payment to DPR Consultants
- ✓ Transaction based processing payment cycle

04 Other (Misc.) Outstanding Payment
- ✓ Transaction based processing payment cycle

05 Change of ownership
- ✓ For PPP (BOT /HAM) Projects

06 Re-financing / Restructuring
- ✓ For PPP (BOT /HAM) Projects

07 Role Menu
- ✓ For Assigning modules

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)

आज़ादी का
अमृत महोत्सव

TMCC Portal

NHAI Website

News & Updates | Achievement During 2021-2022 | Project Awarded - 2306 km | Length Constructed - 2000 km |

4,805 Km
Construction Target in CFY
2,000 Km
Achievement in CFY

XX No
Delayed Projects
EPC/X, HAM/X, BOT/X

XX No/ XXXX Cr
Arbitration Cases
XX No/ XXXX Cr
Cases Pending

8,338 Km
Award Target in CFY
2,306 Km
Achievement in CFY

XXXXX Cr
CFY Budget
XXXX Cr
Expenditure till last month

XX No/ XXXX Cr
Conciliation Cases Pending
XX No/ XXXX Cr
Cases Settled till date

30,628 Km
Bharatmala Length Sanctioned
17,024 Km
Awarded

31671 Ha
LA Required (CFY)
12,301 Ha
Land acquired till date

XXXX Cr
Monetization Target
XXXX Cr
Achieved

6,045 Km
NH (O) Award Target
3,206 Km
Awarded/ Under Bidding

34,701 Km/ 690 TP
Tollable Length
XXXX Cr
CFY Collection

30,450 Km
NSV Target Length
20,885 Km
In last 6 months

Madhya Pradesh

Details of KM Length	
Length with NHAI	69,835
Completed	48,346
Under Construction	12,535
Balance for Award	18,534
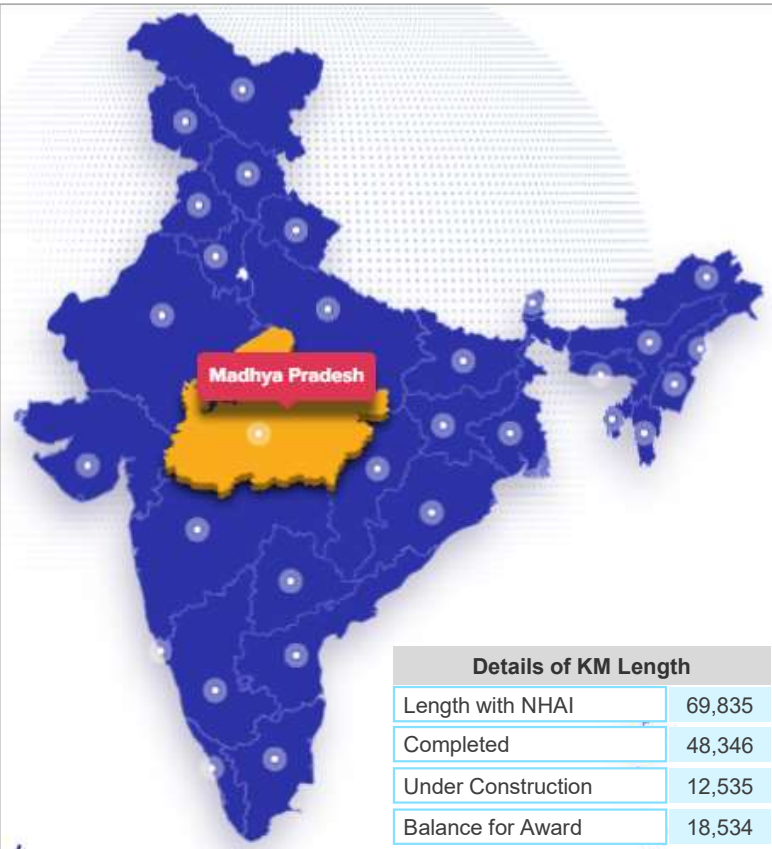
Videos of NHAI Projects

| **EOT/ COS Pendency** | **Appointed Date Status** | **Accidents, Safety Audits, Blackspot** | **Plantation Progress** | **AE/IE Digital MPR pending at PD** | **Surplus Land & Wayside Amenities** | **Staff Details** |

KPIs

Ability to drill down to lower dashboards on need basis

INDICATIVE KPIs

Level	KPIs
Chairman	*Tracking of overall portfolio* – Overall target, Delayed projects, Critical issues
Member	*Tracking of multiple ROs* – Member target, Delayed projects, Critical issues
GM/CGM	*Tracking of State Level Portfolio* – Approval Date., Appraisal Date, Award Date, Milestones, EOT, COS
RO ✓	*Tracking of RO Level portfolio* – RO Target, Appointed Date, Milestones, Performance Security, Utility Shifting, EOT, COS, O&M Contract
PD ✓	*Tracking of PIU Level portfolio* – Land acquisition stage wise, Appointed Date, Milestones, Utility Shifting, EOT, COS, O&M Contract
Project on a Page ✓	*Land acquisition, Utility shifting, Clearances, S-curve, Physical progress, EOT, COS, NCR, Punch List, Claims*

Data Lake Users

Role Wise Login	Total Active User
IE/AE	2,129
Contractor	1,500
Drone Agency	12
DPR Consultant	1,140
Project Directors	206
Quality Inspector	80
Division - HQ	140
F & A Unit	52
Regional Officer	26
Helpdesk Support	20
Guest	12
Members	6
Chairman	1
Safety Consultant	315
RAMS Cell	2
Total	**5,641**

Some of the significant advantages accrued by NHAI with the implementation of Data Lake system have been:

a) Real-time **tracking of construction progress**

b) Tracking and **expediting closure of pending Extension of Time** (EoT) and **Change of Scope** (CoS)

c) **Attendance Management System** integrated with Data Lake.

d) **Payment linked to key performance** metrics like attendance, monthly progress reporting and equipment-based surveys.

e) System-backed mechanism to capture **Network survey Vehicle (NSV) data** and monitoring of road conditions including tracking and closure of on-ground rectification works.

f) Remote visual inspection (incl. Right-of-Way (RoW), Encumbrances, road furniture and inventories) and **project update through drone video**

g) Real-time **tracking of toll collection** and Electronic Toll Collection Compliance.

h) **Automatic Storage of all documents** exchanged between the stakeholders in a digital library.

i) **Improved accountability and transparency** in communication.

j) **System-based validations** to help administer processing payments of the stakeholders as per prescribed milestones achievement.

DataLake– Dresorvoir is bringing digital transformation

NHAI junks paper communication, goes digital

Dipak K Dash | TNN | Nov 22, 2020, 10:41 IST

NEW DELHI: The National Highways Authority of India (NHAI) has gone digital for all its official communication with contractors, consultants and officials. Now all such communication needs to be uploaded by all the stakeholders on the web-link created by the Authority.

NHAI chairman S S Sandhu

All project documentation, contractual decisions and approvals are now being done through the portal only.

NHAI goes digital with cloud & AI-powered big data analytics platform

By: Our Correspondent

SHARE THIS ARTICLE

June 16, 2020: The National Highway Authority of India (NHAI) has gone 'fully digital', with the launch of cloud-based and artificial intelligence-powered big data analytics platform – Data Lake and Project Management Software.

Project management on portal only
The entire project management workflow of NHAI is transformed from manual to the online portal based, wherein the complete project execution operations including 'workflow with timelines' and 'alert mechanism' have been configured. All project documentation, contractual decisions and approvals are now being done through the portal only.

Forecasting delays & disputes
With advance analytics, the Data Lake software will forecast the delays, likely disputes and will give advance alerts. Thus apart from expediting the decision making, it will also facilitate in taking correct and timely decisions as the system is likely to predict financial impacts of different alternatives based on the historical data. This will reduce a lot of disputes.

Transparency with track & check
NHAI has a history of having a large number of arbitration cases pending with huge amount of claims and counterclaims. Majority of the disputes are generic in nature like delay in handing over of encumbrance free site, shifting of utilities, idling charges of plant, machinery, equipment, manpower and delay in decisions etc. These disputes can be minimized as the Data Lake software has provisions to keep track and check on all

News » Business » Companies

NATIONAL HIGHWAY AUTHORITY OF INDIA

NHAI becomes 'Fully Digital' with Data Lake and Project Management Software
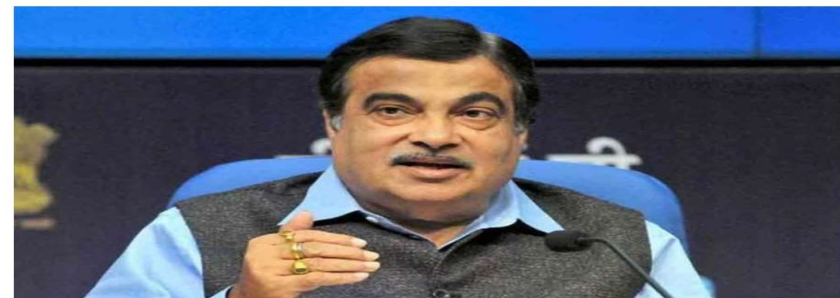
The NHAI's entire project management workflow is transformed from manual to the online portal based, wherein the complete project execution operations including 'workflow with timelines' and 'alert mechanism' have been configured.

NHAI Goes Digital, Will Leverage AI And Analytics For Construction Projects

BY ROHIT YADAV
18/06/2020

AMNEX

Thank You