



# Indian Railways Infrastructure Status and Road Map Ahead

**B. P. Awasthi & Amit Mehrotra**  
**Indian Railways**

# Indian Rly. – Life Line of Nation

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- No. of trains operated-
  - Passenger trains : 13,000(+) per day
  - Freight trains : 9,200(+) per day
- Freight carried : 1,106 mn tonne per annum  
(1500 million tonne by 2019-20)
- Passenger carried : 22(+) mn per day
- Passenger-km : 1,150 bn (**highest in world**)  
(Expected to be 3,300 billion per-km by 2030)
- Revenue(2016-2017) : Rs 1,653 billion or  
US \$ 24.3 billion.

# IR - Network and Infrastructure

- Mixed Traffic (Passenger and Freight on same track)
- Route km : 67,368
- Track km : 121,407
- Electrified route : 37% (25,367 km).  
(Addition of 8000 km in next 4 years.)
- Predominantly broad gauge (1676 mm) : 92%
- No. of stations : 7,349
- Network Expansion by 2019 : 4,000 km
- Additional DFC Route : 3,300 km (2019-2020)

4<sup>th</sup> Largest in the world  
after USA, China and Russia



# IR - Network Expansion

Items	1950-51	2016-17	Increase
Total Track (Km)	77,609	1,21,407	56 %
Passenger-Km (In Billion)	66	1,150	1642 %
Freight Carried (Million Tonne)	73	1,106	1415 %

# IR - Network Usage Pattern

Route	% of Total Route KM	% of Total Traffic carried
Golden Quadrilateral & Diagonals	15 %	68 %
Other Routes	85 %	32 %



# Dedicated Freight Corridor (DFC)



- 2 corridors : Eastern & Western under construction
- Eastern : 1,839 km
- Western : 1,499 km
- Target for commissioning : (2019-2020)
- Expected completion cost : US\$ 14 billion

# DFC Plan (Future)

- Feasibility study for additional four corridors:
  1. North south corridor (Delhi-Chennai) : 2,343 km
  2. East West Corridor (Howrah-Mumbai) : 2,328 km
  3. East Coast Corridor (Kharagpur-Vijayawada) : 1,123 km
  4. Southern Corridor (Chennai-Goa) : 899 km
- 1<sup>st</sup> three are in planning stage
- Exp. cost : US\$ 32 billion



# IR - Organisation (BIG)

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- IR comprises of –
  - 17 Zones,
  - 68 Divisions &
  - 11 Production Units
  - 9 Functional departments
- 1.33 million employees  
(2<sup>nd</sup> largest employer of country)
- 14 Public Sector Undertakings / SPV, etc under the umbrella of Ministry of Railways.
- JVs & SPVs with States being formed for network expansion catering to local needs



# IR - Assets

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- Route : 67,368 km
- Track : 121,407 km
- Stations : 7,349
- Bridges : 144,698
  - 680 Important bridges
  - 11,915 Major Bridges
- Level (Grade) Crossings : 27,181
- Locomotives : 11,461
- Wagons : 277,987
- Passenger Coach(es) : 70,937

# IR - Assets

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## ■ Signaling Infrastructure :

- Stations Panel Interlocking (no.) : 4,150 (+)
- Station Electronic Interlocking (no.) : 1,140 (+)
- Route Relay Interlocking (no.) : 281

## ■ Telecommunication Infrastructure :

- OFC Network : 51,000(+) km
- Circuits for PRS (no.) : 10,839
- FOIS Circuits (no.) : 2,210
- VHF Sets (no.) : 153,465 (appx.)
- CUG Mobile (no.) : 225,000(+) (**largest in world**)

# IR - Asset Management

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- IR Civil Engineering Portal
  - Track Management System (TMS)
  - Land Management System (LAMS)
  - Bridge Management System (BMS)
- Signaling Management System (SMS)
- Traction Distribution Management System (TDMS)
- Loco Management System (LMS)
- Production Units and Workshops Applications
- Project Management & Information System (PMIS)

# IR – Process & Customer Mgmt.

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- Processes IT / Web Enablement -
  - IR-Project Sanctioning & Monitoring System (IRPSM)
  - Rail Road Crossings System (RORACS)
  - Private Sidings Approval & Monitoring (PSAMS)
  - Freight Operation & Information System (FOIS)
  - Control Office Application (COA)
  - Integrated Coaching Management System (ICMS)
  - Crew Management System (CMS)
  - Railway Line Crossings Approval
  - e-Procurement System (IR-EPS)
- IT/Web Enablement of Customer Interface
  - Passenger Reservation System (PRS)
  - National Train Enquiry System (NTES)
  - Freight Customers Interface


# IT Enablement– Ingredients/Challenges

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- Single source of data/information (ne Truth) at all levels
- Machine networked enabling data acquisition
- Traceability of Inspections, work process & quality information
- Interactive role based dashboard
- Real time visibility and performance monitoring
- Management of **CHANGE**


# IR – Civil Engineering Portal

Skip to main content Sign In -A A +A A A हिन्दी




**Indian Railways**  
Civil Engineering Portal


सत्यमेव जयते




ABOUT US




DOCUMENTS




PURCHASE ORDERS



NATIONAL PROJECTS





CONTACT US




🔍

• Member users can logon to their respective applicator







**TMS**  
Track Management System




**IRPSM**  
Indian Railways Projects Sanctions and Management




**RORACS**  
Rail-Road Crossing GAD Approval System




**Railway Line Crossing**  
Crossing of Pipeline, Cables, etc.



**PSAMS (beta version)**  
Private Sidings Approval & Monitoring System



**LRSBB**



**PMIS (beta version)**

# Track : Conventional System

- Track Data kept in more than 100,000 Registers spread all over country



# TMS : Transformation to IT Platform

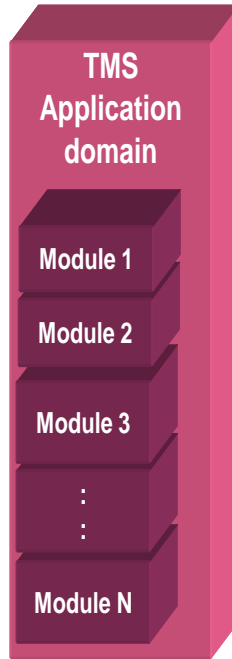


**Netbooks to Field Engineers**



- 1. Landline broadband internet in offices
- 2. Mobile datacard

## Central server



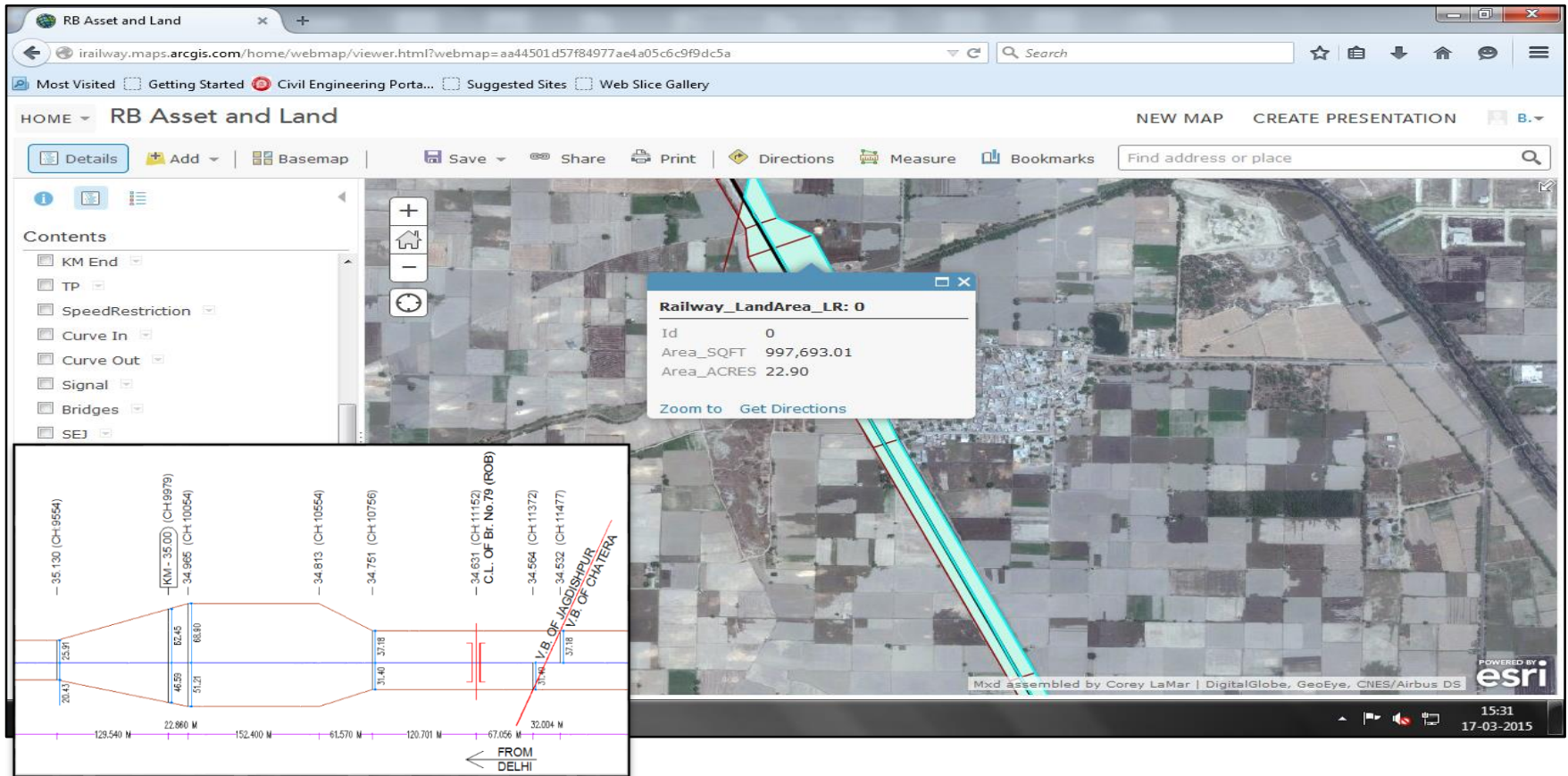
**Zonal/Divisional Offices with Management Users**

Deployment View



# IR-LAMS (Land Asset Management System)

- Web based module for Land Management System involving GIS mapping.



# IR-LAMS (Land Asset Management System)

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- Land bank ( > 55,000 Land Plans) digitised and being put on IT Application & GIS platform
- Satellite Imagery being used for mapping railway land
- Leasing / licensing of land to be monitored
- Monetisation & Commercial exploitation

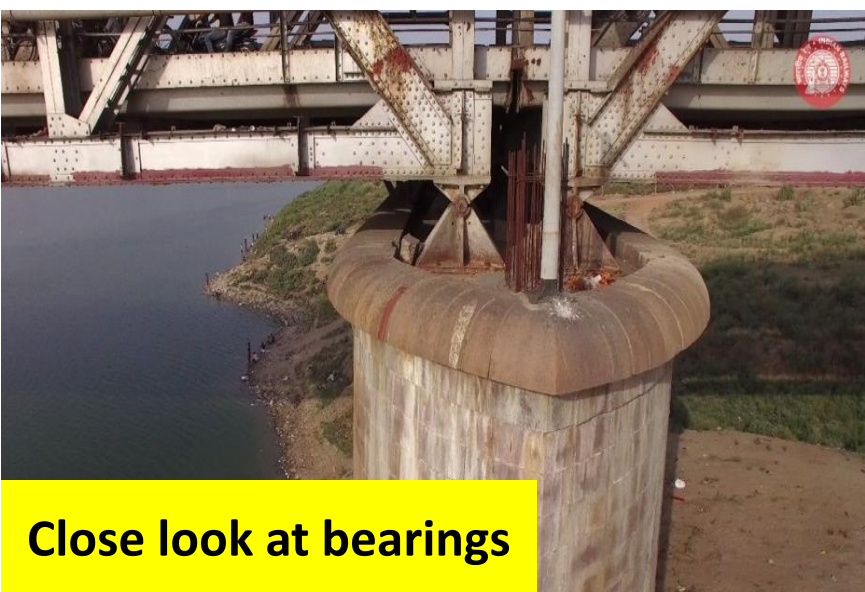
# IR-BMS (Bridge Management System)

- Data for 144,698 bridges is maintained in thousands of registers by 5000+ field engineers.
- BMS is a web based IT platform for bridge inspection, maintenance, monitoring, etc.
- Availability of online various reports, drawings, registers, certificates etc. along with training.



# Bridge Inspection

IR : Infrastructure Status and Road-Map Ahead



# IR-RORACS

- Web enabled application for approval of crossing of railway line and highways

The screenshot displays the web application interface for the Rail-Road Crossing GAD Approval System. The header features the Government of India emblem on the left and the Ministry of Railways emblem on the right. The main title is "Rail-Road Crossing GAD Approval System". Below the title, there is a photograph of a railway track crossing under a concrete bridge. To the right of the photo is a login form with the following elements:

- A "Login" heading with a folder and padlock icon.
- Input fields for "Login Id" and "Password".
- A "Login" button.
- A note: "Organization/Department Registered with Ministry Of Railways can only Login."
- A link: "How to apply for registration and getting Login ID and Password?"

At the bottom of the interface, the copyright notice reads "© Ministry of Railways, 2014" and the footer text states "Designed & Developed by Centre for Railway Information System" with the CRIS logo.

# IR-Railway Line Crossing

- Web enabled application to facilitate crossing the utilities across the railway line

**Application for Crossing Railway Line (Pipeline, Cables, etc.)**

GOVERNMENT OF INDIA | MINISTRY OF RAILWAYS

### Crossing Railway Line (Pipeline, Cables, etc.)

- Click here for Online Application
- Click here to view status of your application
- Draft Agreement (PDF)
- Draft Agreement (Word)
- Railway Board Policy Letter-1
- Railway Board Policy Letter-2

**For Railway User**

- Railway user has to login to Track Management System (TMS) to [view reports & update status](#) of Crossing Railway Line (Pipeline, Cables, etc.) Application.
- Sr.DEN (SE land) of division is authorised to update the status of application.
- Click here to login to ["TMS"](#).

### Guidelines

- Click on the link "Click here for Online application"
- Fill the particulars and submit the application.
- Print the duly filled form, sign and submit to DRM/Engg. enclosing a copy of rough sketch, draft agreement signed on each page and Demand Draft/ MR in original.
- Application form without rough sketch, draft agreement duly signed by applicant on each page and registration fee (Rs.2000/-) shall be considered incomplete and be summarily rejected.
- The formal registration will be done after receipt of duly signed application form.
- The Demand Draft should be prepared in favour of Senior Divisional Finance Manager (Sr. DFM) of the concerned Division payable at the divisional head-quarter station.

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# IR-PSAMS

- Web enabled application for Priate railway Siding's Approval and Monitoring of construction

Status Of Private Siding Proposals INDIAN RAILWAY															
Sr#	Proposal ID	Proposal Date	Name of Work	Division/ Railway	Station	Party	Anticipated Cost	Application Registration	Deposit of Codal Charges by Party	Submission of feasibility report	In Principle Approval	Submission of DPR & Codal Charges	Approval of ESP	Approval of SIP	Approval of OHE layout plan & Energisation plan
								1	2	3	4	5	6	7	8
1.	<a href="#">NCR-AGC-2014-01</a>	29/09/2014	New Siding	AGC/NCR	AGC	Sushil Kumar Verma	234567	✓	✓	✓	✓	✓	✓	✓	✓
2.	<a href="#">NCR-AGC-2014-02</a>	08/10/2014	Test Siding Project	AGC/NCR	BAD	Test Organisation	2000000	✓	✓	✓	✓	✓	✓	✓	✓
3.	<a href="#">NCR-AGC-2014-03</a>	09/10/2014	test siding project	AGC/NCR	BAD	test organisation	13123200	✓	✓	✓	✓	✓	✓	✓	✓
4.	<a href="#">NCR-AGC-2014-04</a>	04/10/2014	dfhdfhdhdfhdfh	AGC/NCR	AGC	sgsedg	100000	✓	✗	✗	✗	✗	✗	✗	✗
5.	<a href="#">NCR-AGC-2014-05</a>	10/10/2014	sdhgsdhsdh	AGC/NCR	AGC	rshyeryewr	200000	✓	✗	✗	✗	✗	✗	✗	✗
6.	<a href="#">NCR-AGC-2014-06</a>	10/10/2014	sreyheryeyey	AGC/NCR	AGC	ryewryer	10000	✓	✗	✗	✗	✗	✗	✗	✗
7.	<a href="#">NCR-AGC-2014-07</a>	14/10/2014	Private Siding Project	AGC/NCR	AGC	Test Organisation	50000000	✓	✗	✗	✗	✗	✗	✗	✗
8.	<a href="#">NCR-AGC-2014-08</a>	16/10/2014	Test Siding Project	AGC/NCR	AGC	TATA	50000000	✓	✗	✗	✗	✗	✗	✗	✗
9.	<a href="#">NCR-AGC-2014-09</a>	16/10/2014	AZgdasgasdgdsg	AGC/NCR	AGC	wertyte	250000	✓	✗	✗	✗	✗	✗	✗	✗
10.	<a href="#">NCR-AGC-2014-10</a>	16/10/2014	Test	AGC/NCR	AGC	TATA	50000000	✓	✗	✗	✗	✗	✗	✗	✗
11.	<a href="#">NCR-AGC-2014-11</a>	16/10/2014	abc	AGC/NCR	AGC	Test	3254325	✓	✗	✗	✗	✗	✗	✗	✗
12.	<a href="#">NCR-AGC-2014-12</a>	16/10/2014	Test Project	NCR	AGC/NCR	AGC	Test Siding Project-V	50000000	✓	✓	✓	✓	✓	✓	✓
13.	<a href="#">NCR-AGC-2014-13</a>	13/11/2014	sdfa	AGC/NCR	BAMA	sdfsdf	34535	✓	✓	✓	✓	✓	✓	✓	✓
14.	<a href="#">NCR-AGC-2014-14</a>	13/11/2014	sdfgsdg	AGC/NCR	AGC	45645	35345	✓	✓	✓	✓	✓	✓	✓	✓
15.	<a href="#">NCR-AGC-2014-15</a>	13/11/2014	dfgdfgd	AGC/NCR	AGC	6756756	325423534	✓	✗	✗	✗	✗	✗	✗	✗

**BRIEF PROPOSAL DETAILS**

**Proposal ID: NCR-AGC-2014-01 Dated: 29/09/2014**

Name of Party/Organisation : Sushil Kumar Verma

Applicant Party (Authorised Signatory, Email, Phone No. , Mobile No) : , sushilcris@gmail.com, 8130797594

Address : e-3/754 sector h , Lucknow, Uttar Pradesh, 226012

Name of Project : New Siding

Brief Description of Project : New Siding to be constructed for coal mine

Consultant : NullEines Corporation (NCR)

Location (Railway, Division, Station) : North Central Railway, Agra Cantt, Agra Cantt

Total Length of Private Siding : 123 m

Length of Private Siding on Railway Land : 12 m

Anticipated Cost of the Siding Project : ₹ 234567

TIME LINE FOR THE PROPOSAL : NCR-AGC-2014-01					
Sr#	Authority	Activity	Proposal Received for Action on	Action Taken On	Actual Days Taken
1	APPLICANT PARTY	Application for private siding	29/09/2014	29/09/2014	
2	CTPM/NCR	Application Registered	29/09/2014	09/10/2014	9
3	CTPM/NCR	Updating Inward/Outward traffic & name of work	23/01/2015	23/01/2015	1
4	CE(G)/NCR	Revision of anticipated Cost & informing party for deposition of codal charges	23/01/2015	23/01/2015	1
5	CE(G)/NCR	Deposit of codal charges by party	23/01/2015	23/01/2015	1
6	DRM/AGC	Forwarding proposal to branch officers	23/01/2015	23/01/2015	1

# IR-PSM

- Web enabled application for Project Sanctioning and financial & physical Monitoring.

**IRPSM**  
Indian Railways Projects Sanctions & Management

Welcome to IRPSM

**Login to IRPSM**

User Name :

Password :

**Submit**

Logged off successfully

Internet Explorer 9 or above is recommended.  
**Running in IE10 and above**

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# PMIS: Project Monitoring & Information System

- Line and Point Projects monitoring using TILOS
- Web-enabled IT- Application to manage the entire lifecycle of complex railway projects.

The image displays two screenshots of the PMIS web application. The left screenshot shows the login page with a 'Login' button circled in red. The right screenshot shows the 'Dashboard' with various project metrics and a table of 'Project Major Items'.

Project Major Items	Planned Start Date	Planned Finish Date	Actual Start Date	Scheduled Finish Date
Clearance	05/09/2012	05/09/2012	05/09/2012	05/09/2012
Account Classification	Tunnel	05/09/2012	05/09/2012	05/09/2012
Implementational Agency	IRCON International Limited	05/09/2012	05/09/2012	05/09/2012
Project Current Status	Work in Progress	05/09/2012	05/09/2012	05/09/2012
Chief Contractor	M/S HCC Ltd	05/09/2012	05/09/2012	05/09/2012
Contract Value	Rs. 1,816,971,723.00	05/09/2012	05/09/2012	05/09/2012
Payment Made To	Rs. 1,756,251,729.00	05/09/2012	05/09/2012	05/09/2012
Mechanical Contractor	Not to be Awarded	05/09/2012	05/09/2012	05/09/2012
Electrical Contractor	Not to be Awarded	05/09/2012	05/09/2012	05/09/2012
Signaling & Telecom Contractor	Not to be Awarded	05/09/2012	05/09/2012	05/09/2012
Automation Contractor	Not to be Awarded	05/09/2012	05/09/2012	05/09/2012
Ballast Lays Track Contractor	Not to be Awarded	05/09/2012	05/09/2012	05/09/2012

Project Information and Collaboration, Management Dashboard

# Project Monitoring

- High Resolution Drone Imagery & Videos



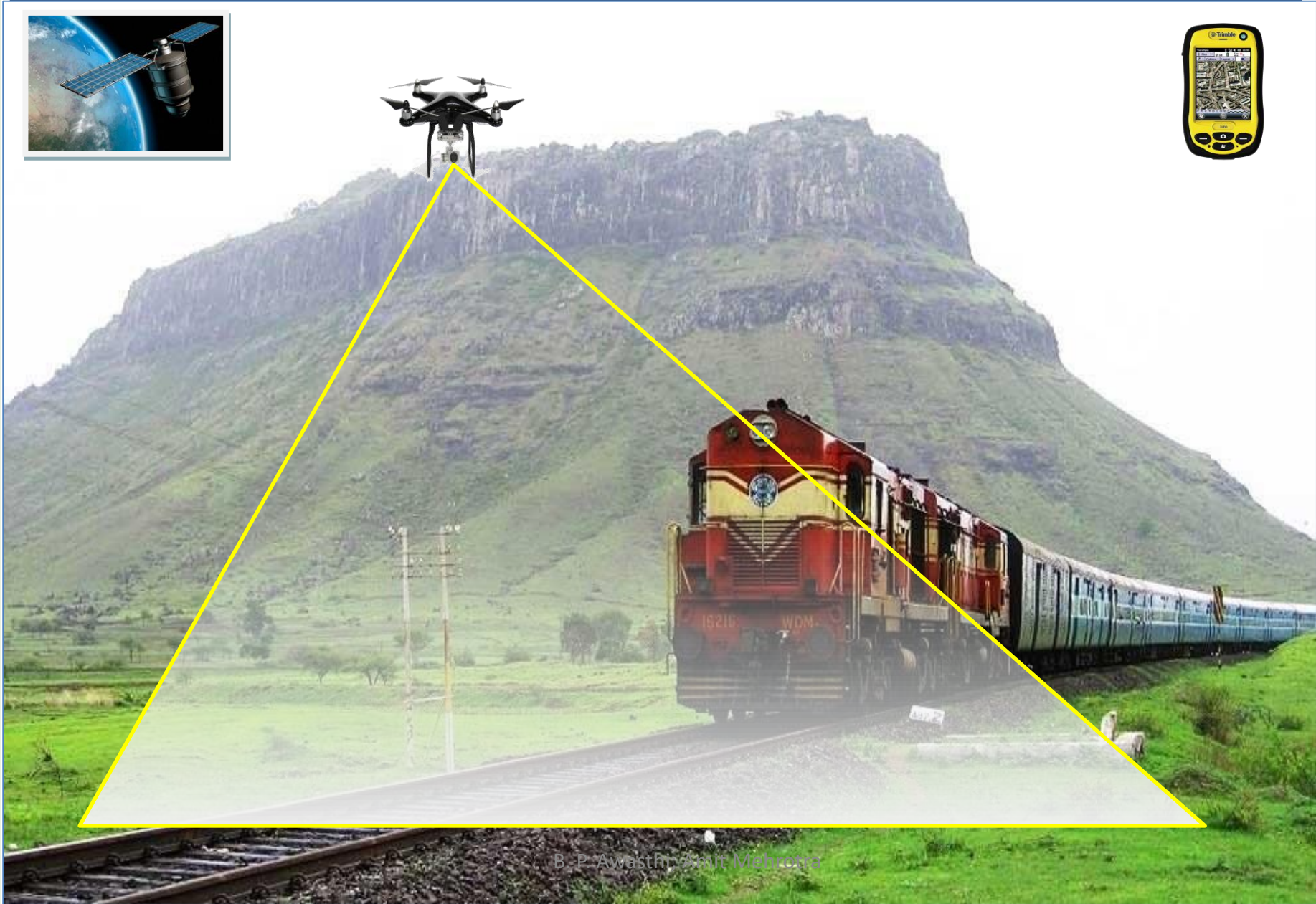
Drone Survey Date 27  
Feb 2016



Drone Survey Date 3<sup>rd</sup>  
April 2016

# GIS Based Data Collection

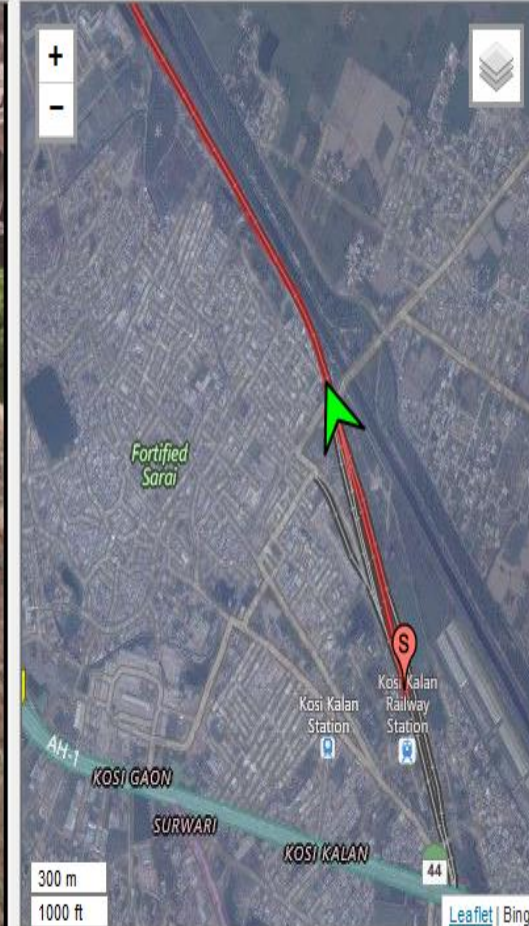
IR : Infrastructure Status and Road-Map Ahead



# Route Mapping by UAS

Demo 26-May-16 10:51 5.0km 32.4km/h

File View Playback Zoom ?



High Resolution Drone Video Sync with MAP

# Use of Photogrammetry (3D)

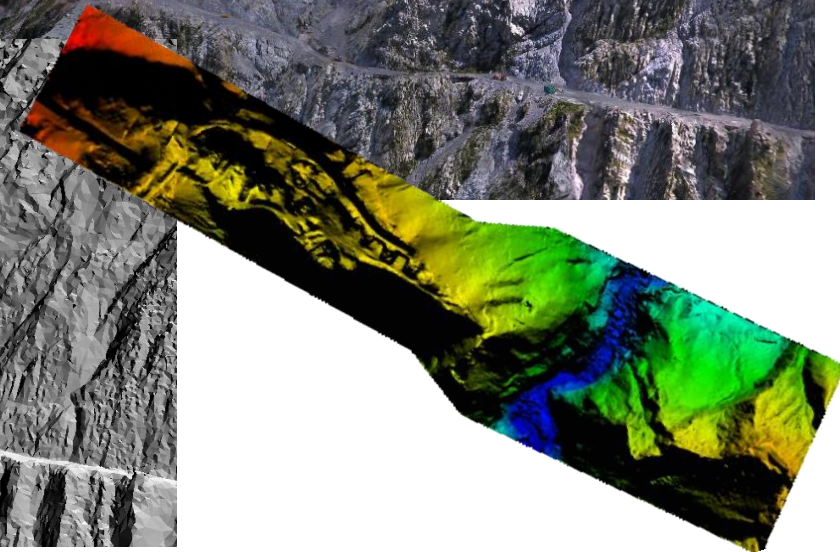
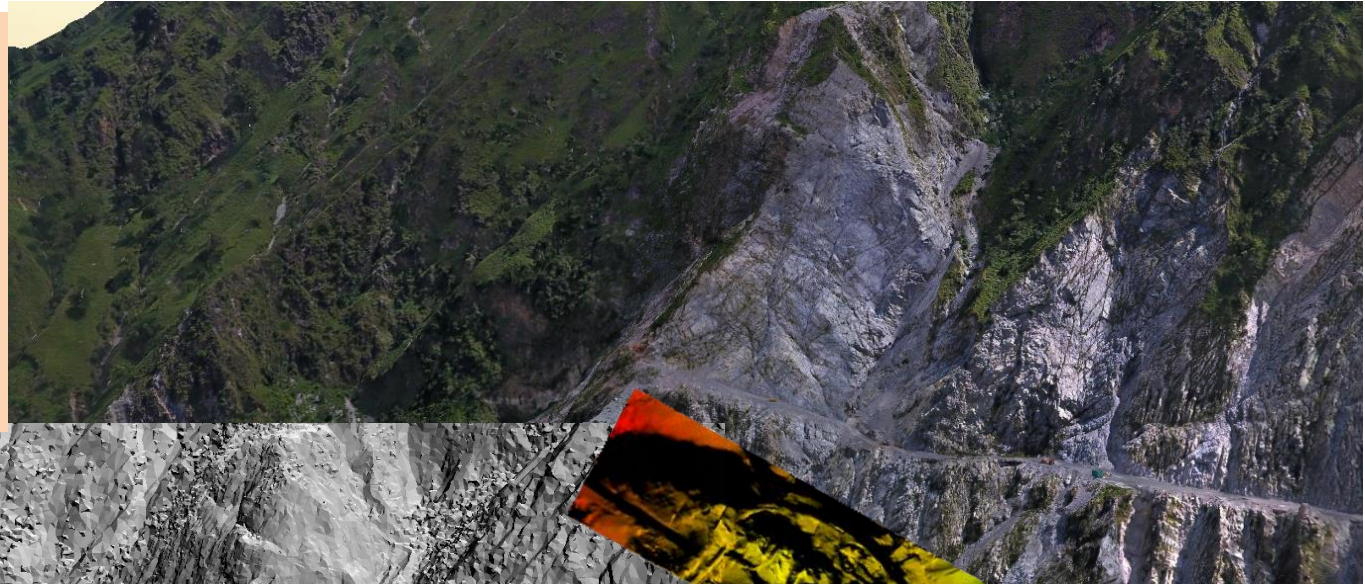
- Drone survey + Context Capture
- 3D Interactive Models
- Precise measurement for better planning
- Yard Mapping
- Encroachment assessment



# Use of Photogrammetry (3D)

- Survey of difficult project locations
- Analysis of site details with DEM

**Insight on Existing Infrastructure, Slope, Geology, Rock, Water, Vegetation etc.**



# Future Focus

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- Revenue generating projects
  - Dedicated Freight Corridors
  - Large scale doubling
  - Mine and port connectivity
- Terminals (passenger & freight) & logistic parks
- Projects for enhancing safety
  - Track renewal – mechanized laying, inspection & maintenance
  - Signalling – Train Protection Warning System/Train Collision Avoidance System
  - Elimination of unmanned level crossings
  - Access Control to improve safety
- Throughput Enhancement works
- Higher HP locos, higher axle loads, high capacity wagons, light weight coaches, train sets;
- Higher Speeds – Dedicated routes and on existing routes
- Integrated ICT Application & Monetisation of Footfalls

# Expected Outcomes

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- Higher average speeds
- Network expansion
  - 1700 km new line, 8100 km doubling
  - Commissioning of Dedicated freight corridors – Eastern & Western
  - Redevelopment of stations to international standards
- Rolling Stock
  - Operationalisation of train sets
  - Production of state of the art locos
- Safety
  - Elimination of 5000 unmanned level crossings & 1200 manned level crossings
  - Access control Fencing
- Electrification & carbon footprints
  - Conversion of 10,000 kms of electrification; additional electrified double tracks
  - 1000 MW of solar power generation



# Introduction of Higher Speeds

- High Speed Trains (Bullet Train)
  - Mumbai to Ahmedabad - 1st corridor to be implemented
  - Speed : 300/350 km/h
  - Cost: USD 15.4 bn
  - Construction period 2017-2023
  - Feasibility studies for 6 new HSR corridors
- Semi High Speed (160 kmph) –
  - 9 corridors identified
  - Delhi- Agra (implemented),
  - Feasibility Studies for 8 in progress



# Station Redevelopment

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- Developing over 400 stations to international standards with modern facilities & passenger amenities on lines of **PPP** airports
- Land and space-rights of station buildings to be leveraged
- Multiple options – PPP, foreign railways, multilateral funding, etc.
- Over US\$ 15bn investment expected in next four years

# Investment Plan

SN.	Item	5 years
		USD bn
1.	Network Decongestion (including <b>Dedicated Freight Corridor</b> , Doubling + electrification & traffic facilities)	33.22
2.	Network Expansion (including electrification)	32.17
3.	National Projects (North Eastern & Kashmir projects)	6.50
4.	Safety (Track renewal, bridge works, Road Over Bridge, Road Under Bridge and Signal & Telecom)	21.17
5.	Information Technology / Research	0.83
6.	Rolling Stock (Locomotives, coaches, wagons – production & maintenance)	17.00
7.	Passenger Amenities	2.08
8.	High Speed Rail & Elevated corridor	10.83
9.	Station redevelopment + logistic parks	16.67
10.	Others	2.20
	<b>TOTAL</b>	<b>142.67</b>

**Thanks**