

CHAPTER 1

INTRODUCTION

1.0 Introduction

As per International Union of Railways (UIC), the Council of the European Union, in their directive no. 96/48/EC, has defined the term 'high speed' covering all railway express services operated at speeds above 200 kmph (kilometre per hour) range. This includes railway lines:

- (i) Built specially for high speed generally equal to or greater than 250 kmph.
- (ii) Specially upgraded for high speed travels of the order of 200 kmph (*UIC, 2014*).

As per a press release by the Ministry of Railways in the Press Information Bureau (PIB), Indian Railways (IR) has briefly defined the terms 'high speed trains' (popularly referred as Bullet trains) and 'semi-high speed trains' as the trains that will run at speeds of above 350 kmph and 160 to 200 kmph respectively (*PIB, 2014*).

Presently, top speed (maximum permissible speed) of passenger trains on Indian Railways (IR) is 150 kmph. Bhopal Shatabdi runs at this speed on some specified sections between Delhi and Agra. Rajdhani/Shatabdi trains have maximum permissible speed of 130 kmph and other mail/express trains of 110 kmph. A chronological

progress of peak speed of passenger trains on IR has been presented in the Table 1.1.

Table 1.1: Chronological Progress of Maximum Speed on IR

| Year | Maximum Speed (kmph) | Milestone | Observation/Present Scenario |
|------|----------------------|---|---|
| 1853 | 32 | First train run between Mumbai and Thane | |
| 1906 | 96 | Frontier Mail on some sections between Bombay and Peshawar | |
| 1969 | 130 | First Rajdhani Express between Delhi and Howrah | Presently, 21 pairs of Rajdhani Trains. Only about 3000 km of route fit for 130 kmph. Maximum average speed is achieved by Mumbai Rajdhani at 90.5 kmph |
| 1972 | 130 | Rajdhani Express between Delhi and Mumbai | |
| | 140 | Speed reduced to 130 kmph in 2002 due to an accident on Eastern Railway | |
| 2005 | 150 | Bhopal Shatabdi between Delhi and Agra | Only train touching maximum speed of 150 kmph |

(Source: Presentation by HSRC to Railway Board on Nov 24, 2014)

As would be seen from the Table 1.1, there has not been any significant change in the speed of passenger trains on IR network, ever since introduction first Rajdhani Train between New Delhi and Howrah in 1969.

The White paper presented by IR in the Parliament in Dec 2009 (*Govt. of India, 2009a*), mentioned slow speed of passenger trains and excess journey time as a cause for concern and one of the shortcomings in the passenger services on IR. This paper highlighted absence of policy for high speed passenger services or separate high speed corridors as one of the issues in passenger business segment.

Passenger services in India are slow by international standards. Maximum permissible speed of Rajdhani/Shatabdi and mail /express trains at 130 kmph and 110 kmph respectively are low as compared to 200 kmph on several European railways on conventional networks and more than 300 kmph on high speed corridors (Govt. of India, 2009b).

IR's Vision 2020 aimed at raising the speed of regular passenger trains to 160-200 kmph on segregated routes to bring about a major transformation in train travel and reduce journeys like Delhi-Kolkata and Delhi-Mumbai to overnight travel. It also envisaged running of at least four high speed Bullet trains at 250-350 kmph, one in each region of the country and planning of at least eight more such corridors connecting commercial, tourist and pilgrimage hubs.

India is unique among the major countries of the world viz. China, Germany, Italy, France, Turkey, Taiwan, Belgium, Spain etc., by not having a single high speed rail corridor capable of running trains at speeds of over 250 kmph. High speed corridors have played a major role in revitalisation of Railways in Japan and Europe. Countries like China and Taiwan have significantly expanded high speed rail networks. Indian Railways proposed to follow a two pronged approach in this respect; first to raise the speed of segregated passenger corridors on trunk routes using conventional technology to 160 to 200 kmph and second high speed corridors for speeds upto 350 kmph through Public Private Partnership (PPP) mode in partnerships with

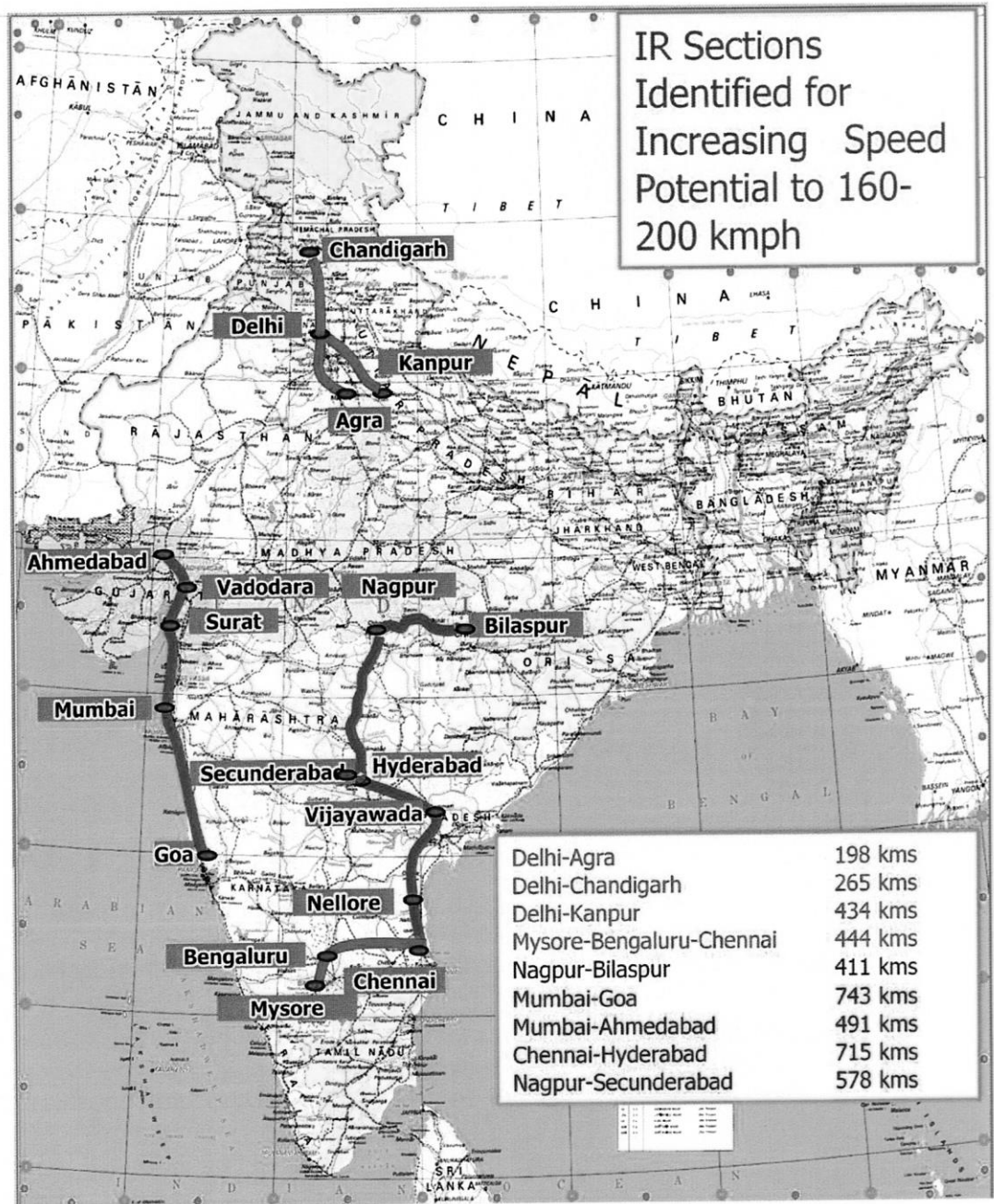
State Governments on intercity routes. Faster trains will also help to release additional capacity on the existing saturated high density network of Indian Railways i.e. Delhi-Mumbai-Chennai-Kolkata, popularly known as the Golden Quadrilateral (*Govt. of India, 2009b*).

IR's Vision 2020 estimated an investment of Rs 25000 Crore for raising the speed of passenger trains on conventional segregated routes and Rs 20000 Crore for High Speed Corridors (2000 km).

Minister of Railways, in his Budget Speech 2014-15, on Speed of trains announced that "while bullet trains would require completely new infrastructure, higher speed for existing trains will be achieved by upgrading the present network. Hence, an effort will be made to increase the speed of trains to 160-200 kmph in select sectors so as to significantly reduce travel time between major cities. These identified sectors are Delhi-Agra, Delhi-Chandigarh, Delhi-Kanpur, Nagpur-Bilaspur, Mysore-Bengaluru-Chennai, Mumbai-Goa, Mumbai-Ahemdabad, Chennai-Hyderabad and Nagpur-Secunderabad".

A presentation of these routes has been shown on IR's map in the Figure 1.1. It can be seen that of the two passenger routes i.e. Delhi-Kolkata and Delhi-Mumbai, on which IR had envisioned in Dec 2009 to reduce travel time to overnight affair, only Delhi-Kanpur (434 km) and Delhi-Agra (198 km) have so far been covered in this plan. Present day maximum permissible speed of trains on each of these nine routes along with the details of fastest train and average speed of

such trains and Zonal Railways to which these routes pertain have been summarised in Table 1.2.



(Source: HSRC's Presentation to Railway Board on Nov 24, 2014)

Figure 1.1 Existing Routes Identified for Raising of Speed to 160-200 kmph

Table 1.2: Routes Identified for Upgradation to Semi-High Speed

| SN | Section | Route km | Maximum Speed (kmph) | Average Speed of Fastest Train (kmph) | Zonal Railways | Fastest Train |
|----------|-------------|----------|----------------------|---------------------------------------|----------------|---------------------------|
| 1 | NDLS-AGC | 198 | 150 | 93.8 | NR, NCR | Bhopal Shatabdi |
| 2 | NDLS-CDG | 265 | 110 | 73.2 | NR | Chandigarh Shatabdi |
| 3 | NDLS-CNB | 434 | 130 | 100.2 | NR, NCR | Dibrugarh Rajdhani |
| 4 | BCT-ADI | 491 | 120 | 73 | WR | Ahemdabad Mumbai Shatabdi |
| 5 | BCT-MAO | 743 | 120 | 62 | CR, KRCL | Trivandrum Rajdhani |
| 6 | MYS-SBC-MAS | 495 | 110 | 70.7 | SWR, SR | Chennai-Mysore Shatabdi |
| 7 | MAS-HYB | 715 | 110 | 55 | SR, SCR | Hyderabad Chennai Express |
| 8 | NGP- SC | 578 | 120 | 75.8 | CR, SCR | Bangalore Rajdhani |
| 9 | NGP-BSP | 411 | 110 | 66 | CR, SECR | Bilaspur Rajdhani |
| Total km | | 4330 | | | | |

(Source: EDME/Infra/Railway Board's presentation to Railway Board on Nov 24, 2014)

First section mentioned in the Table 1.2 is NDLS-AGC (New Delhi to Agra Cantt) lies in NR (Northern Railway) and NCR (North Central Railway). It is 198 km long and present maximum permissible speed of trains on this section is 150 kmph. Fastest train on this route is Bhopal Shatabdi and its average speed is 93.8 kmph.

As per Indian Railways Vision 2020 document, IR is facing constraint in raising speed of trains due to over saturated capacity on the trunk routes. Out of 1219 sections on the high-density network (railway routes connecting metros), capacity utilisation of 492 is of the order of

more than 100% and between 80% and 100% of another 228 sections. As a result, there is always a train on the track leaving no time for its maintenance. Average speeds of the trains also reduce, with every additional fast train on an oversaturated route, due to speed differential of trains. IR has to run fast trains like Rajdhani/Shatabdi, slow passenger and goods trains on same tracks. As per IR Budget Speech 2015-16, it has prioritised to significantly increase capacity on the existing high-density routes by 2019-20 as improving capacity on existing routes is cheaper and faster than laying new lines due to no major land acquisition issues. The speed of above nine railway corridors will be increased from existing 110 and 130 kmph to 160 and 200 kmph respectively (Govt. of India, 2015b).

1.1 Statement of the Problem

While there is no denying of the fact that India needs semi-high speed trains (160-200 kmph) and is already running behind schedule as compared to other major railway systems of the world like Japan, China and USA etc. There does not seem to be significant progress in this direction since 2009, when IR presented its White Paper and Vision 2020 to the Parliament with running of trains at semi-high speed (160-200 kmph) on existing routes as one of the vision for passenger services.

The proposed research study aims to identify various issues and challenges in raising speed of passenger trains in India to 160-200

kmph so as to facilitate speedy planning and execution of related works and realisation of IR's Vision in this area by 2020.

1.2 Purpose of Study

1. To study the proposed plans of Indian Railways for raising maximum permissible speed of passenger trains to 160-200 kmph (semi-high speed) on exiting lines.
2. To explore, study and identify issues and challenges in upgrading speed of passenger trains in India to semi-high speed.
3. To prioritize the barriers identified for policy decision.

1.3 Research Questions

1. What are the IR's plans and approach for raising speed of passenger trains to semi-high speed level i.e. 160-200 kmph?
2. What are the issues and challenges that are being faced by Indian Railways in this endeavour?
3. Which are the most significant ones?

1.4 Scope and Limitations

The proposed study attempts to explore and analyze macro level issues like approach, strategy and constraints etc. as concerning to raising speed of passenger trains to semi-high speed level (160 to 200 kmph). Study of High speed corridors with speed more than 200 kmph is limited to the extent found to be relevant for semi-high speed.

1.5 Methodology

The proposed study is exploratory and descriptive in nature. Research methods adopted in the present study are

- i. Study of Indian Railways' reports, publication and secondary data on high speed and semi-high speed from year 2005 onwards published by Government of India.
- ii. Review of other academic research articles and documents, related to high speed and semi-high speed passenger trains, as available from other sources viz. Government publications, websites of various railway systems of the world, national and international journals on railways etc.
- iii. Face to face discussions with concerned railway expert(s) working in the Ministry of Railways and other railway offices in Delhi.

1.6 Document Flow

The dissertation has been organised in five chapters. The first chapter is on introduction of the topic giving background of the problem, research purpose and questions and research methodology. The second chapter contains details of literature review. The literature review was conducted with respect to issues in semi high speed rail. The third chapter explains research methodology and research methods with details of ISM (Interpretive Structural Modelling) technique for examining inter-relationship among the issues impacting the problem. The fourth chapter contains detailed ISM modelling of

issues (barriers) being faced by IR in raising speed of passenger trains to semi-high speed. The fifth and the last chapter contains conclusions and the recommendations based on the research study.

1.7 Conclusion

As per UIC, high speed railway lines are those that have been specially built for running passenger trains at a speed equal to or greater than 250 kmph or existing rails upgraded for train operation at 200 kmph or more. Semi-high speed rail refers to tracks upgraded for passenger train operation at 160-200 kmph. IR has not made significant progress in the speed of passenger trains since 1969, when first Rajdhani train was introduced between Delhi and Howrah at 130 kmph. In Dec 2009, IR presented its Vision 2020 document in the parliament which envisaged raising speed of regular passenger trains on the segregated trunk routes at 160-200 kmph. IR has identified nine routes for upgradation to 160-200 kmph. IR is facing several issues and challenges for raising speed on existing trunk routes resulting to slow progress on semi-high speed projects. This research aims at study of issues and challenges being faced by IR in raising speed of trains on existing tracks to semi-high speed and inter-relations of such issues for a better insight, that would be beneficial for policy makers of IR.