



Kevadiya Rail Project ***Rail Connectivity to Statue of Unity***

It was 6th September, 2020. The Chief Administrative Officer (Construction) (CAO (Con)) of Western Railway (WR), Chief Engineer (CE) (Con), the Divisional Railway Manager (DRM), Vadodara and the Deputy Chief Engineer (DyCE) (Con) were ensconced in a meeting to prepare for the review of the Kevadiya Rail Project by Shri Piyush Goyal, Minister of Railways (MR). The next review was to happen on 12th September, 2020. This project would provide rail connectivity to the Statue of Unity (SoU) at Kevadiya, 80 kms from Vadodara. Exhibit 1 gives a map of the Kevadiya rail project. The project included the upgradation for a higher speed on the existing broad gauge (BG) line between Pratapnagar (PRTN) and Dabhoi (DB) (30 kms), the conversion of the existing narrow gauge (NG) line from DB to Chandod (CDD) (18 kms) to BG, a new BG line from CDD to Kevadiya (KDCY) (32 kms) and new railway station buildings at DB, CDD and KDCY.

The officers were under pressure to complete the project by 15th December, 2020 for inauguration by the Honourable Prime Minister (PM), Shri Narendra Modi. It was just in July 2020, keeping in view the delays in land acquisition, labour shortage due to the Covid-19 pandemic and possibility of slower work during the monsoon, they had received approval for the completion of the project by 31st March, 2021, instead of the original deadline of 31st October, 2020. In fact, a completion date of 30th June, 2021 had been sought. Subsequent to this, they were informed about the revised deadline. The team was facing a double whammy not only because of the 15th December deadline, but also because the rains in August were heavier than usual, leading to loss of man days.

They had to decide how to expedite the project activities and if required, postpone certain activities, but yet ensure safe train operations from 15th December. In terms of operations, while the original plan was to run shuttle services between Vadodara and Kevadiya, they had been told that direct connectivity would have to be provided to major cities in India including, Ahmedabad, Mumbai, Chennai, New Delhi, and Varanasi.

The team would need to assess the project status and craft the future road map for remaining activities. Apart from the complexity due to coordination among multiple players and approvals from various agencies, the project had green infrastructure development challenges. Overall, the risks under the revised scope of the project would need to be assessed.

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This case is prepared as a basis for class discussion and is not designed to present illustrations of either correct or incorrect handling of administrative problems.

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Statue of Unity (SoU)

The Statue of Sardar Vallabhbhai Patel, known as the Statue of Unity, was situated in the Indian state of Gujarat. Patel (1875–1950) was the first Home Minister of India. This was the world's tallest statue standing at a height of 182 meters. This unique idea was a tribute to Patel, also known as the Iron Man, being instrumental in integrating more than 500 princely states and creating a united India.

The SoU project was initially conceptualized and announced in 2010 when Modi was the Chief Minister of Gujarat. Its construction began in October 2013. The statue was designed by Padmashree (to be checked) Ram V. Sutar, a sculptor of eminence. It was located on the banks of Narmada river facing the 163 metre Sardar Sarovar Dam which itself was Patel's vision. This dam was a crucial water lifeline for Gujarat, providing irrigation to 9% of the state's area. This was the world's second largest dam in terms of the concrete used. The construction of the dam began in 1987 and was brought to a height of 80 metres in 1995. After multiple legal battles, by 2017, the dam height was increased to the final 163 metres in stages.

The contract for construction of the statue was bagged by Larsen & Toubro (L&T) who emerged as the lowest bidder quoting a value of Rs 2989 crores (cr). The 182 metre statue had a viewing gallery at 135 metres. Modi, as Prime Minister of India, inaugurated the statue on 31st October, 2018, the 143rd birth anniversary of Patel. Soon after inaugurating the statue, the PM announced the plans to link SoU with the rest of the country with a new railway line to Kevadiya.

Exhibit 2 shows the traffic data for the first 11 days starting 1st November, 2018 and then up to the lockdown for Covid-19 on 21st March, 2020. It also gives information on earnings. The first six days witnessed a total traffic of 22,000, of which nearly 8000 were on Sunday the 4th November. The traffic increased from Wednesday, 7th till Sunday, 11th, these being the holidays of Diwali, Gujarati New Year, Bhai Dooj, followed by the weekend. The footfalls started from a little over 11,000 on Diwali till a peak of 28,000 on Saturday, followed by 25,000 on Sunday. The maximum capacity to access the viewing gallery was 5000. Those who could not go to the gallery still got a close up view of the statue at the feet level, along with the museum at the base of the statue. On an average, 37% of the visitors went up to the viewing gallery.

The average daily traffic during the first year of operation from 1st November, 2018 to 31st October, 2019 was a little over 8500. On Janmashtami, 24th August, 2019, there was a peak of 34,000 visitors. The PM visited Kevadiya on 31st October, 2019 to celebrate the first anniversary of SoU. During the month of November 2019, the daily average was about 15,000, a 74% increase over November 2018. This number is higher than the average number of visitors to the Statue of Liberty in New York, which receives an average of 10,000 visitors a day. The weekends at SoU registered more than 22,000 visitors per day. During the 13 month period from 1st November, 2018 to 30th November, 2019, SoU witnessed nearly 30 lakh visitors. Of these, nearly 58% of the visitors went up to the viewing gallery. Over a period of time, the capacity of the viewing gallery was increased to 7500 per day.

The ticket price per person for entering the SoU campus was Rs. 150. The price including the viewing gallery was Rs. 380. These prices included the shuttle bus services. The total earnings for the first 13 months amounted to Rs. 85.57 cr.

A nationwide lockdown was announced on March 21, 2020 due to the Covid-19 pandemic. The total number of visitors during the first 17 months till the lockdown was around 43 lakhs. The daily average for the last four months before the lockdown was approximately 11,500. The SoU was expected to reopen in October 2020, initially with a daily cap of 2500 visitors and 500 being permitted to the viewing gallery with pre-slotted entry timings.

In addition to SoU and the Sardar Sarovar Dam, Kevadiya offers other attractions like the Sardar Patel Zoological Park, Children's Nutrition Park, Valley of Flowers, Cactus Garden, Butterfly Garden, Zarwani Waterfalls and Panchmuli Lake. Apart from the attractions, there was focus on enriching the experience through activities like river rafting, cruises, designer lighting, sound and light show, boat and helicopter ride, riverfront cycling and jungle safari. These attractions have been built over the past two year, and with the perspective of adding more. Exhibit 3 gives a brief on the various attractions at Kevadiya. There has also been a focus on improving facilities like accommodation (hotels for different customer segment including a tent city), food courts and bus services to connect various points

The dam construction and area management were under the Sardar Sarovar Narmada Nigam Limited (SSNNL). The idea of developing tourist attractions and facilities in the Kevadiya area had begun in the early 2000s. To give greater focus to this development, the Kevadiya Area Development Authority (KADA) was set up in 2006. The KADA and then the SoU project had faced opposition from 70 tribal villages for land acquisition.

With the increasing need of not only development but also day to day governance, the Government of Gujarat, through an act of legislature, set up the Statue of Unity Area Development and Tourism Governance Authority (SOUADTGA) on 20th December, 2019. The objective of the Act was "to provide for the development of the area and management of Tourism in and around the Statue of Unity at Kevadiya in the state of Gujarat by providing necessary civic infrastructure through effective planning, administration, and the matters connected therewith and incidental thereto."

The SOUADTGA encompassed the KADA, and earlier responsibilities of the district administration and the Gujarat Forest Department in that area. The defined Area included 14 villages. The Authority had 20 members (Exhibit 4) representing various stakeholders and had the provision to co-opt upto three more members. It was to be headed by a Chairman, supported by four Vice Chairmen and a Member Secretary (all ex-officio), and a Chief Executive Officer. There was no representation from the railways.

Railway Line Project

The idea of a railway line to Kevadiya had first been proposed in February 2017, with a financial allocation of Rs 10 cr for the 2017-18 budget and an overall sanction of Rs 692 cr. The allocation for the 2018-19 budget was Rs 50 cr. The construction of the project in a 'public' sense happened when the bhoomipujan of the Kevadiya railway station was performed on 15th December, 2018 by Hon'ble President of India Shri Ram Nath Kovind. 15th December was the death anniversary of Patel. Among various dignitaries, Piyush Goyal, the Minister of Railways and Vijay Rupani, Chief Minister of Gujarat were present. The year wise budgetary allocation from 2017-18 to 2020-21 is provided in Exhibit 5.

The conversion from DB to CDD included five kms of new track at the DB end. The project had a total of seven stations of which two were intermediate crossing stations (DB and CDD) and KDCY was the terminal station. The four minor non-crossing stations were Vadaj (DB-CDD), Moriya, Tilakwada and Garudeshwar (CDD-KDCY). Of these seven, the four after CDD were new stations. There were eight major bridges, 82 minor bridges, nine road-over bridges and 31 road-under bridges. The railway station at KDCY was being developed as IR's first green railway station.

This project was being executed by the WR construction department headed by the CAO (Con) located in Mumbai. The CAO (Con) oversaw the field activities which were headed by the CE (Con), Churchgate and DyCE (Con) located in Vadodara. The team of CAO (Con), CE (Con) and DyCE (Con) was supported by DRM/BRC and his team of Branch Officers.

On 14th November, 2019, Shri Suresh Angadi, the Minister of State for Railways visited the SoU and took stock of the progress of the project. As of then, the completion date of the project was 31st October, 2020. Subsequent to this, there were delays due to land acquisition, the lockdown due to Covid-19 and consequent shortage of labour in April and May 2020, and heavier than usual monsoon in August 2020.

Exhibit 6 indicates the status of land acquisition based on a review meeting held on 5th August, 2020. The land acquisition was completed by 31st July, 2020 though the earlier committed date was 15th August, 2020. This was the physical part of the land acquisition, while the financial formalities were yet to be completed. This could happen with support from the district authorities of Vadodara and Rajpipla. The acquisition work commenced on 14th August, 2018. The progress was slow due to this being in a tribal area. This was given a major thrust during the period from January to July 2020 and acquisition was completed within seven months including the Covid-19 pandemic period. The total land required was 222 hectares constituting 47 hectares of government land and 175 hectares of private land. Efforts were made to maximize utilization of non-agricultural land.

The workforce including engineers and contractors resumed work after the lockdown by following all the stipulated protocols of Covid-19. Around this time, the project scope was modified to increase the maximum speed from 110 kmph to 130 kmph and to have electric

traction. Due to these delays and the modified scope, a revised completion date was sought for 30th June, 2021. However it was agreed only up to 31st March, 2021. Soon after in July 2020, the project deadline was advanced to 15th December, 2020, for inauguration by the PM.

The project activities were progressing before heavy rains started from 4th August, 2020. The heavy rains extended till 31st August, 2020 and the region recorded rainfall between 600 to 835 mm against the annual average rainfall of 100 to 200 mm. No work could happen during this period. At a manpower strength of 690, 19,320 man days were lost. In spite of this, contractual payment of Rs 27.73 cr and material payment of Rs 17.5 cr were made.

The CAO (Con), CE (Con), DRM and DyCE (Con) were reviewing the status of the project and the remaining duration of various activities. Exhibit 7 gives a list of these activities, with the remaining duration and the technological precedence. They had gathered inputs on how these activities can be expedited, or if required postpone without affecting the ability to start train operations on the day of inauguration i.e. 15th December, 2020. Given that even up to a week would be required for the Commissioner for Railway Safety (CRS) to complete their safety compliance requirements, the team figured that they have 90 days to prepare for inauguration. They would have to be ready with their intended approach for the review meeting with the MR. While time for starting train operations was most critical, there would be a material modification to the budget which would require approval.

There was already experience of modifying processes for expediting projects. For example, even in this project, when there were delays in land acquisition, major bridge construction had started even before the approaches could be worked on. There was a possibility of constructing minor bridges for water flow using locally available RCC Hume pipes, though certification by a technical agency (IIT Bombay was a possibility) would be essential. There was also a scope to reduce the installation time of the signals by innovatively using virtual mode for testing rather than onsite. Regarding electrification, while normally the centre line, which was a requirement for measuring and locating poles, would be drawn after the track was laid, there was a possibility of doing it once the earthwork was in place. This would enable the foundation and mast erection to happen in parallel to track laying. However, the measurements would need greater attention and precision.

Wherever possible, more modern equipment could be sourced for earth moving, ready mix concrete, welding, track laying and overhead wiring to reduce the durations in a reliable manner. Additional resource mobilisation for activities like earthwork, minor bridges, road under bridges (RUBs) would be essential. It was important that the contractor provide the additional capability and capacity for this. Coordination with local and state authorities would be critical to ensure that encroachments and public utilities would be shifted in time, apart from providing electrical connections and temporary road access for the project.

The team was also considering that initially the track could be readied for 110 kmph rather than 130 kmph, since certain precision works and testing requirements would be reduced. KDCY, being a terminal station, was to have maintenance facilities for rakes which cannot be completed in the required time period. Postponing it would enable better use of resources for

other activities, though there would be operational implications of doing the maintenance at PRTN. The trains would have to go back empty to PRTN and then return empty to KDCY after maintenance. Similarly, a few road over bridges (ROBs) which were in the early stages of construction cannot be completed. Instead, signalised level crossings (LCs) would have to be planned. It should be noted that the activities of increasing the speed to 130 kmph and construction of ROBs, if postponed, would have implications for train operations when being executed.

Train Operations

When this project was first approved without OHE, the plan was to run diesel electric multiple unit (DEMU) shuttle services between Vadodara (BRC) and KDCY. Subsequently, with the policy of electrification, mainline electric multiple units (MEMU) were to be operated. The recent requirement from the Railway Board (RB) was to provide direct train services to multiple destinations across the country. Given the limited time frame for inauguration, getting additional rakes would be an issue. The DRM assessed that there would be traffic for daily services from Vadodara, Ahmedabad, and Mumbai. For Vadodara and Ahmedabad, one additional rake each would be available. Depending on the running time and timings, upto three and two daily round trips to Vadodara and Ahmedabad were possible if the traffic could be justified. Travel time between Vadodara and KDCY could be about 90 minutes and Ahmedabad and KDCY could be upto 200 minutes.

While the services to Mumbai would be daily, services to New Delhi would be bi-weekly, and Chennai and Varanasi would be weekly. He was considering using the existing rake links of services to these cities for planning additional or extended services to KDCY. The trains and rake link details for the services being considered are given in Exhibit 8. Given the nature of the rake link, he was also considering whether a weekly service to Rewa would be feasible. Another issue regarding the non-daily trains that crossed the DRM's mind was to ensure that the trains came to KDCY on different days of the week, not only to balance the traffic load, but also to balance the rake maintenance scheduling. As far as possible, he wanted the long distance trains to arrive at KDCY in the mornings and depart in the evenings.

One of the larger concerns was, though the direct connectivity to major cities would provide comfort to the SoU visitors, a significant share of passengers in these trains could actually be for Vadodara. If that were indeed the case, then the alternate service pattern considered earlier of frequent MEMU shuttle services from Vadodara, providing connections to the long distance trains terminating or passing through Vadodara, may be more efficient.

He was also worried that the train travel time between Vadodara and KDCY should be minimised. As per the existing rail network, all the trains to KDCY would have to undergo a reversal at DB. Further, as seen in Exhibit 1, the trains approaching from the south of BRC including Mumbai, Chennai and Varanasi would undergo a second reversal at BRC. A typical reversal using the same locomotive would take 30 minutes. This would be significant for the BRC-KDCY run, where the travel time could be 60 minutes without the reversal. It was

important to note that the road travel times were similar due to the presence of a four lane highway with a slightly shorter distance and leading right upto SoU. If a second locomotive was available and positioned appropriately for easy shunting, the reversal time could be brought down to 20 minutes. While this was possible at BRC, having additional locomotives at DB would lead to poor loco utilization. In order to obviate this, he was considering attaching a second locomotive in the rear of the trains from BRC (except the MEMU) for smooth operations at DB. The issue of crew change at DB would still remain. There was the possibility of both locomotives having their own set of crew. A related question would be whether both locomotives should run on power. The target would be to reduce the reversal time to under 10 minutes.

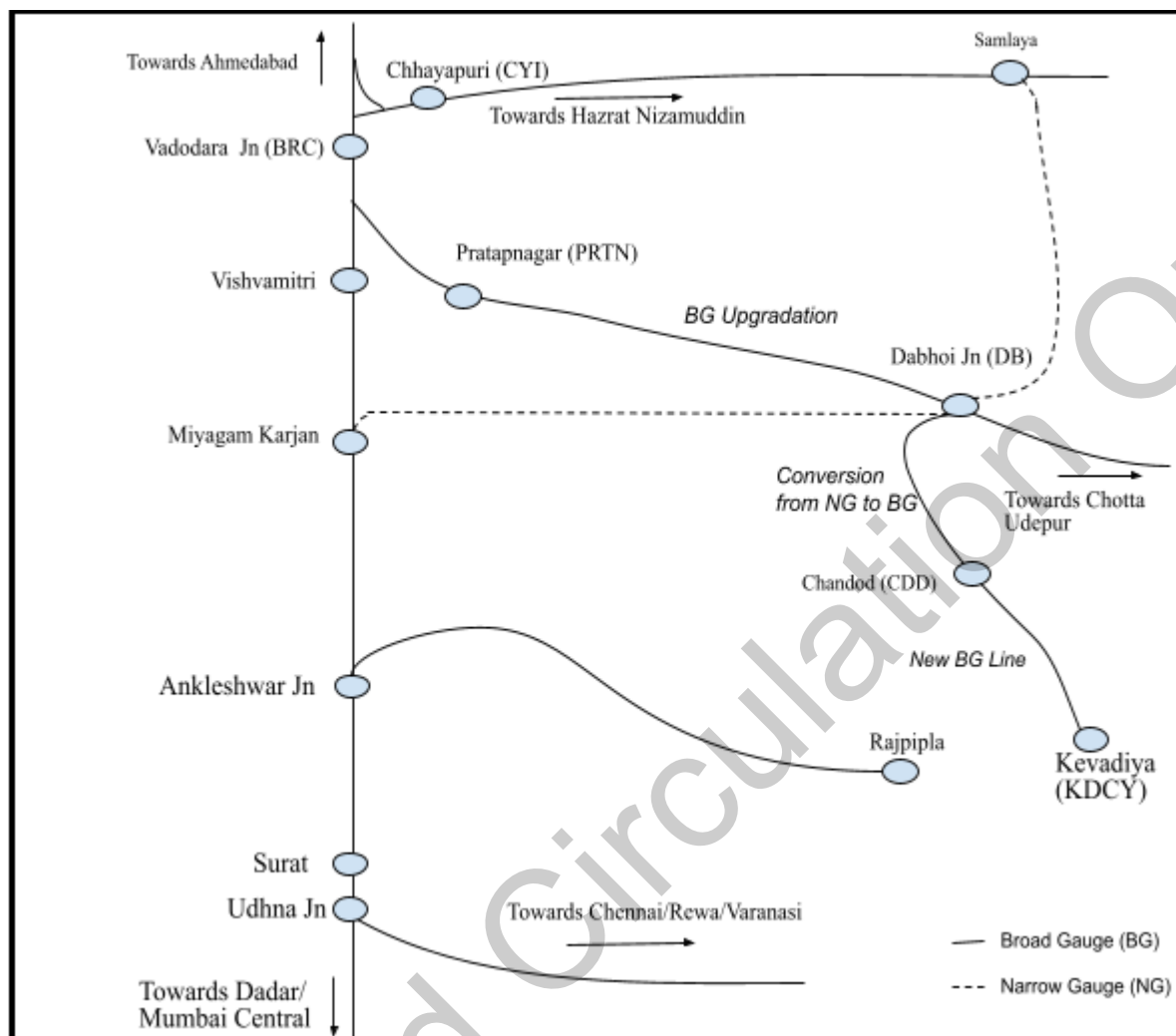
Traffic Management

The DRM was concerned about the actual traffic that would use the train services in the new line and what factors would determine it. Fundamentally it would depend on the total traffic coming to SoU and the share that would use rail. From among the rail users, there could be a share that uses rail to Vadodara and then by road to SoU, and the share that would come from using the train services on this line. He knew that a significant amount of road traffic coming by bus were part of tour packages, mostly from Vadodara and some from Ahmedabad, Surat, and Mumbai. Hence it was important to examine whether tour packages can be organised by rail, possibly with the support of IRCTC. Apart from attracting traffic by rail, it would bring in additional revenues through value added services. There would be the issue that if sightseeing were to be clubbed with locations in or around Vadodara and/or Ahmedabad, roads may be a preferred option to SoU. Alternatively, there could be tours where special trains could be run to cover different locations like the Jyotirlinga package, which could include KDCY as the rail destination for SoU. He was also exploring how additional revenues can be generated by leveraging the specially designed railway station at KDCY (Exhibit 9).

Conclusion

The CAO (Con), on his part, was concerned about the post inauguration remaining project activities. Along with the DRM, he was also wanting to list possible project activities that would improve train operations and access to SoU in the long run.

As the meeting of the team ended, they received confirmation of the review meeting with the MR. Further they also received information that the PM would visit the SoU on 31st October for the second anniversary after which the lockdown to visit SoU would be lifted. There was also a hint that the inauguration of the rail line project may be postponed to 14th January, 2021 when the PM was expected to visit Gujarat for the Kite Festival.

Exhibit 1: Kevadiya Rail Project Map (not to scale)**Exhibit 2: Traffic to SoU**

Date Until	1st Nov 2018	2nd Nov 2018	6th Nov 2018	9th Nov 2018	11th Nov 2018	31st Oct 2019	30th Nov 2019	21st Mar 2020
Cumulative Traffic	2737	5036	22,115	75,000	1,28,000	26,39,643	30,90,723	43,00,000
Cumulative Earning (Rs lakhs)	5.46	9.54		176			8557	

(Source: Various news articles)

Exhibit 3: Key Attractions and Experiences at Kevadiya

Sardar Patel Zoological Park and Jungle Safari	The park is spread over an area of 375 acres at seven levels ranging in altitude from 29 metres to 180 metres. Currently houses more than 100 species of animals and birds. It is expected to hold around 1100 species.
Children's Nutrition Park	The park is billed as the "world's first technology driven Nutrition Park". It will offer a "nutri-train" ride on a 600-m track around the 35,000 sq m park, passing through five theme-based stations: "Phalshaka Griham", "Payonagari", "Annapoorna", "Poshan Puram" and "Swastha Bharatam". The stations have interactive games to instill the value of healthy foods in children. There is also a five-minute-long 5D animation film on India's "unity in food diversity", with animated characters talking of food habits in the West, East, North and South of India.
The Gardens	The Cactus Garden is a grand greenhouse with 450 national and international species of cacti and other plants from 17 countries. The area of its dome is 836 sq m, and the garden has an open area of 25 acres. There are 6 lakh plants, including 1.9 lakh cacti, 1.6 lakh succulent plants, and 2.5 lakh ornamental plants. The Aarogyavan is spread over an area of about 17 acres, has 5 lakh plants of 380 different species. It also has an aarogya kutir, set up in association with the Thiruvananthapuram-based Santhigiri Wellness Centre. This is a traditional Kerala treatment facility that provides modern holistic healthcare, ayurveda, siddha, yoga and panchkarma.
Carnival Look	The 8.5 km stretch of road from Ekta Dwar to the Sardar Sarovar Dam is decorated with colourful motifs and lights that lend the area a festive, carnival appearance after sunset. The Unity Glow garden, spread over around 3.61 acres, is a unique theme park developed with glimmering installations, figures, and optical illusions.
The Cruises	A ferry boat service called the Ekta Cruise, goes from Shrestha Bharat Bhavan to the Statue of Unity, covering a distance of 6 km downstream on the Narmada over 40 minutes. The cruise has two vessels: Unity-1, a two-deck catamaran certified to carry 200 passengers, and which can provide a dinner cruise with a 160-sq-foot performance stage on the upper deck; and Unity-2, a high-speed monohull boat that can carry up to 25 passengers, with a travel time of 25 minutes.

Exhibit 4: Key Members of SOUADTG

1. The Chairman who is appointed by the state government;
2. Vice Chairman - Managing Director of Sardar Sarovar Narmada Nigam Limited, ex-officio;
3. Vice Chairman - Secretary / Principal Secretary / Additional chief secretary of Urban Development Department, ex-officio;
4. Vice Chairman - Secretary / Principal Secretary / Additional Chief Secretary (Narmada), ex-officio;
5. Vice Chairman - Secretary / Principal Secretary / Additional Chief Secretary of Tourism Department, ex-officio;
6. Member-Secretary - Managing Director of Tourism Corporation of Gujarat Limited, ex-officio;
7. Secretary, Roads and Buildings Department, ex-officio;
8. Joint Managing Director, Sardar Sarovar Narmada Nigam Ltd., and Member-Secretary, Sardar Vallabhbhai Patel Rashtriya Ekta Trust (SVPRET), ex-officio;
9. Chief Executive Officer - Chief Administrator - SOU, ex-officio;
10. Collector, Narmada District, ex-officio;
11. District Development Officer, Narmada District, ex-officio;
12. Chief Town Planner, Gujarat, ex-officio;
13. Superintendent of Police, Narmada District, ex-officio;
14. Principal Chief Conservator of Forest (Wild Life), ex-officio;
15. Deputy Conservator of Forest, Kevadiya, ex-officio;
16. Chief Engineer (Dam and Vadodara), Sardar Sarovar Narmada Nigam Ltd, ex-officio;
17. Chief Engineer, Gujarat Water Supply and Sewerage Board, Surat, ex-officio;
18. Chief Engineer, Daxin Gujarat Vij Company Ltd., Surat, ex-officio;
19. President, District Panchayat, Narmada;
20. Three experts who possess experience and knowledge in area development or Tourism to be nominated by the State Government.

Exhibit 5: Budget Allocation for the Kevadiya Rail Project

	Rs Crores			
	2017-18	2018-19	2019-20	2020-21
Proposed	10	50	150	300
Revised	10	27.5	145	474
Actual	9.58	49	253.61	448.32
Sanctioned	691.84	663.29	663.29	811.07

(Source: Indian Railways Pink Book of the years 2017-18 to 2020-21)

Exhibit 6: Status of Land Acquisition (During MR Review on 5th August, 2020)

1. Team WR had promised to complete the land acquisition by **15th August, 2020**.
2. Team WR completed the land acquisition on **31st July, 2020**.
3. **One patch** possession was taken with police protection in Vadodara District.
4. **Two patches** possession were taken with Notarised Affidavit for balance payment for borewell and excess area by the State Government.
5. **Complete land** was in physical possession and work in progress for the entire length.

Steps Taken for Fast Track Execution

1	Chief Project Manager-Ahmedabad/WR who was appointed as liasioning officer for land acquisition on 17th January, 2020 and held regular meetings with Secy (Land and Revenue (L&R)).
2	The General Manager (GM) regularly interacted with Chief Secy and Secy of Land Reforms, Government of Gujarat for expediting land acquisition.
3	DyCE Vadodara conducted regular weekly/fortnightly meetings with Secy L&R, concerned District Collectors
4	During Lockdown, CAO for construction held regular fortnight/monthly video conferences with the contractual agencies.
5	DRM Vadodara held a meeting with the Chief Minister of Gujarat.
6	To get over the shortage of manpower during lockdown, more machinery was deployed to expedite the progress.

Exhibit 7: Project Activities (as on 6th September, 2020):

	Activity	Remaining Duration (Days)	Predecessor	Remarks
1	Land Acquisition	NIL		Completed
2	Earthwork and Blanketing excluding above RUBs (CDD-KDCY)	130		Completed from DB to CDD and partially done from CDD to KDCY. This duration could be reduced to 55 days by having, (i) four sections of work simultaneously rather than the current two and (ii) night working.
3	Minor Bridges (47) (CDD-KDCY)	150		Completed cement concrete structures from DB to CDD and partially done from CDD to KDCY. This duration could be reduced to 65 days by having, (i) four sections of work simultaneously rather than the current two, and (ii) night working. Going forward, there was also the possibility of using locally sourced Hume pipes (instead of cement concrete structures) subject to structural testing and approval. IIT Bombay, had the necessary expertise. The total duration for this including the earthwork and blanketing could be 45 days.
4	Major Bridges (4) (CDD-KDCY)	130		Completed from DB to CDD and partially done from CDD to KDCY. This duration could be reduced to 55 days by having, (i) four sections of work simultaneously rather than the current two and (ii) night working.
5	RUB box installation (33)	125		This duration could be reduced to 55 days by having, (i) four sections of work simultaneously rather than the current two and (ii) night working. This activity includes the earthwork and blanketing above the box.
6	ROBs (3) (DB-CDD)	300		There was a possibility of postponing this activity by upgrading and signaling the existing LCs, which could take a total of 20 days. LCs were permitted only if the MPS was 110 kmph. Constructing the ROBs later after train operations have begun, would require more time for the girder above the tracks and speed

				restrictions for train operations.
7	ROBs (5) (CDD-KDCY)	180		Coordination with external agencies could cause delay. Alternative was to plan for signalized LCs for those ROBs where the delay probability was high. With LCs, the duration could be 30 days. LCs were permitted only if the MPS was 110 kmph. Constructing the ROBs later after train operations have begun would require more time for the girder above the tracks and speed restrictions for train operations.
8	Station buildings including KDCY lines 1,2,3	55		
9	KDCY lines 4,5 and a pitline	180		Likelihood of KDCY station building getting delayed due to the complexity of simultaneous activities was high. There was a possibility of postponing this activity. The major implication would be for the maintenance of rakes which would then not happen at KDCY, but at PRTN by moving the empty rakes.
10	Final <i>additional</i> works for track linking	30	2,3,4,5 8,9 (additionally 6 and 7, if LCs are used)	A significant amount of track laying (prior to track linking) could happen along with activities 2,3,4,5,8 and 9. If the MPS were to be 110 kmph, the final <i>additional</i> works could be completed in 15 days.
11	Final <i>additional</i> works for welding, tamping and de-stressing	20	10	A significant amount of welding, tamping and de-stressing could happen almost immediately after or along with track laying. If the MPS were to be 110 kmph, the final <i>additional</i> works could be completed in 10 days.
12	On site testing of signal locations and approval of circuit drawings	30	2,8	Doing these tests (Factory Acceptance Test and Sight Acceptance Test) virtually was a possibility. In such a case, the activity could be done simultaneously with 2 and 8.

13	Signal cable laying, equipment and signal posts installation, and initial testing	55	12	
14	Final <i>additional</i> works for centre line marking for OHE installation	5	10	Normally, centre line marking would be done with the track in place since electrification usually happens on existing track alignments. There was a possibility of doing this before track laying, but with greater attention to measurements. This could happen after completion of activities 2,3,4,5,8 and 9 but simultaneously with activity 10. However, the final <i>additional</i> works could be completed in 10 days.
15	Foundation and OHE mast erection	45	14	If done simultaneously with activities 2,3,4,5,8 and 9, final <i>additional</i> works could be completed in 10 days.
16	Final testing of tracks, signals and OHE wiring, and adjustments	20	11,13, 15	If the MPS were to be 110 kmph, this activity could be completed in 10 days.

The data in the above exhibit should not be viewed as reflective of actual requirements, but as indicative for conceptual issues.

After completion of all activities, a minimum of one week inspection and certification by the Commissioner of Railway Safety (CRS) would be essential before trains start running for the public.

The material modifications cost, if the project were to be completed by 15th December, 2020, would be Rs 147.78 crores. This would need approval by the MR.

Exhibit 8: Trains Being Considered for Extension for KDCY Service

Train No.	From	To	Frequency	Rake Link (No. of Rakes)	Dep and Day(s)	Arr and Day(s)	At BRC/CYI	Possible time at KDCY
12927	DDR	BRC	Daily	A (4)	23:50	05:25		07:25
12928	BRC	DDR			23:05	05:30		21:25
12961	MMCT	INDB			20:55	09:55		
12962	INDB	MMCT			17:00	06:30		
12918	NZM	ADI	Tri-weekly	B (1)	13:25 (Tue, Thu, Sat)	03:35 (Sun, Wed, Fri)	01:05/01:10	03:20
12917	ADI	NZM			15:30 (Mon, Wed, Fri)	05:45 (Tue, Thu, Sat)	17:00/17:05	15:20
19419	MAS	ADI	Bi-weekly	C (3)	20:30 (Sun, Thu)	05:45 (Tue, Sat)	03:26/03:31	05:25
19420	ADI	MAS			09:40 (Wed, Sat)	16:00 (Sun, Thu)	11:15/11:20	09:40
12948	PNBE	ADI			23:45 (Wed, Fri)	03:50 (Sun, Fri)	01:25/01:30	
12947	ADI	PNBE			21:50 (Mon, Wed)	04:10 (Wed, Fri)	23:30/23:35	
20904	BSB	BRC	Weekly	D (1)	05:25 (Fri)	07:15 (Sat)		09:15
20903	BRC	BSB			20:35 (Wed)	23:10 (Thu)		18:55
20906	REWA	BRC			20:55 (Sun)	15:40 (Mon)		17:40
20905	BRC	REWA			20:35 (Sat)	17:15 (Sun)		18:55

Legend:

ADI - Ahmedabad

CYI - Chhayapuri

KDCY - Kevadiya

NZM – Hazrat Nizamuddin

BRC - Vadodara

DDR - Dadar

MAS - Chennai Central

PNBE – Patna

BSB - Varanasi

INDB - Indore

MMCT – Mumbai Central

REWA - Rewa

Exhibit 9: Salient Features of Kevadiya station

Kevadiya Railway Station will be developed as a green building, to be registered with the Indian Green Building Council (IGBC). The IGBC norms for railway stations were put in place in April 2020. Kevadiya is expected to be the first railway station to be certified so.

Energy:

- Use of insulated puff panel as roofing material ensures heat insulation under roof covering.
- The insulation in puff panel is 40 mm
- Entire roof covering of around 6000 sqm
- Solar reflective paint to be provided on roof panels to ensure heat reflection
- LED lights and star rated branded electrical appliances will save electricity.

Water:

Water management through rainwater harvesting, sewage treatment plant, eco-waterless urinals, and drip irrigation.

- Narmada river being in close vicinity to this railway station, it is advisable to not store water but recharge ground water
- Considering rocky strata, it is required to perform ground strata survey to ensure, groundwater recharge is performed at correct location
- The water bore to be used during construction, will be converted into recharge well #Reuse

Waste Management:

- The segregated green waste at source will be reused to produce fertilizer and reduce waste.
- Waterless urinals

Facilities:

- Three passenger train handling platforms.
- Passenger facilities such as AC Waiting rooms and VVIP Lounge in the ground and first floor.
- Space for a restaurant on the first floor.
- The second floor houses a viewing gallery from which tourists can have a good view of the Statue of Unity. Tribal art gallery is also being developed here.
- A 12 feet tall replica of the statue is installed at the prime location of the station circulating area. It is also designed by the same sculptor Shri Ram V. Sutar who designed and created the SoU.
- The surrounding area has vast parking space, landscaping, thematic park with selfie zone, solar light poles, wide traffic way, horticulture plants, food courts and children's play area.



Gati Shakti Vishwavidyalaya (GSV), Central University is India's first and only University in Transportation and Logistics Sector established by Ministry of Railways, Government of India. GSV is a driving force behind the ambitious Gati Shakti National Master Plan. The University has a unique mandate to contribute in all the modes of transportation including Rail, Road, Aviation, Water, and Ports and Shipping with a focus on all three dimensions – Technology (Infrastructure), Management (Services) and Policy (Regulations). GSV offers uniquely designed academic programs at all levels - B.Tech, M.Tech., MBA, PhD to strengthen the ecosystem of transportation and logistics sector.

GSV is poised to become a global leader in transportation. The University has established strategic collaborations both at national and international level with prestigious organizations such as St. Petersburg State Transport University, Russia, Monash University, Australia, JJTRI, Lucchini RS S.p.A, Italy, Indian Defence Forces (Army, Air Force, Navy), Airbus, Jacobs, Nokia, Plasser India, Nippon Koei and others.

Gati Shakti Vishwavidyalaya is strengthening the ecosystem of multimodal logistics in India under the dynamic leadership of Honorable Vice Chancellor Prof. (Dr.) Manoj Choudhary and Honorable Chancellor and Union Minister Shri Ashwini Vaishnaw, Minister of Railways, Minister of Information and Broadcasting and Minister of Electronics and Information Technology.

About the Authors:



Prof. G Raghuram is a distinguished academician and former Director of the Indian Institute of Management Bangalore (IIM-B). He was a Professor at IIM Ahmedabad, where he spent over three decades contributing significantly to the fields of infrastructure, transportation, and logistics. He was a Chairperson of the Public Systems Group at IIMA, Dean (Faculty), IIMA, Vice-Chancellor of the Indian Maritime University, and Indian Railways Chair Professor. Prof. Raghuram was also a Principal Academic Advisor at Gati Shakti Vishwavidyalaya. He specializes in infrastructure and transport systems, and logistics and supply chain management. He researches the railway, port, shipping, aviation, and road sectors. He has published over 35 refereed papers in journals and written over 200 case studies. He has published six co-authored books. He was awarded (i) 'Life-time Achievement Award' for Transport Excellence, by Mahindra and Mahindra, supported by the Ministry of Road Transport and Highways in 2018 (ii) 'MC Puri Memorial Award' for contribution to Operational Research in India in 2016 (iii) 'Lifetime Achievement Award' for contribution to Logistics and Infrastructure by EXIM News in 2014 and (iv) 'Academician of the Year' by the Chartered Institute of

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