

PROJECT FORMULATION AND APPRAISAL FOR PROPOSING A RAIL OVER BRIDGE

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ABSTRACT

To address heavy traffic congestion from Silk-mill bus-stop to Gudiyattam compound road bus-stop during peak hours, a new rail over bridge adjacent to the existing one has been proposed. This aims to enhance Katpadi, Vellore's transportation infrastructure by reducing travel time, ensuring safety and improving traffic flow. The bridge will foster economic growth by enhancing connectivity and facilitating smoother movement of goods and services. Comprehensive feasibility studies, including technical, financial, market and economic aspects, have been conducted. In the planning phase, software like AutoCAD and SketchUp are utilized for design and visualization.

Key Words- Traffic congestion, rail over bridge, transportation infrastructure, feasibility analysis, economic growth.

1. INTRODUCTION

The construction of a rail over bridge at Katpadi marks a significant leap in addressing the escalating traffic congestion in Vellore city. As urban populations surge, the need for efficient transportation systems becomes critical. The proposed rail over bridge is designed to alleviate traffic congestion, reduce travel time and enhance the overall commuting experience. Vellore, a vibrant city, has witnessed rapid urbanization and industrial growth in recent years. This growth has strained the existing road networks, leading to increased traffic demand. Specifically, the stretch between Silk-mill bus-stop and Gudiyattam compound road bus-stop has become a notorious bottleneck, causing frustrating traffic jams and delays for commuters and goods transportation alike.

The rail over bridge project is poised to provide a much-needed solution to this problem. By addressing congestion and reducing travel time, it will significantly improve the safety and efficiency of the city's transportation infrastructure. The separation of traffic flows will minimize the risk of accidents and collisions, benefiting both motorists and pedestrians. Pedestrians, in particular, will enjoy improved sidewalks and pedestrian crossings, ensuring their safety while navigating the area.

Moreover, the rail over bridge will have a substantial positive impact on the region's economic development. By easing traffic congestion, it will facilitate the movement of goods and services, bolstering local businesses and industries. Enhanced connectivity within the city will make Vellore a more attractive destination for investment and development. However, constructing a rail over bridge of this magnitude requires meticulous planning and thorough feasibility studies. Essential components of the project include traffic analysis, environmental impact assessments and structural engineering evaluations. The construction process itself must be managed efficiently to minimize disruptions to the existing road network and ensure the safety of both commuters and construction workers.

In summary, the rail over bridge at Katpadi represents a critical infrastructure project aimed at improving transportation efficiency, safety and economic growth in Vellore. With careful planning and execution, this project has the potential to transform the city's transportation landscape and support its continued growth and development.

ROAD STUDY AREA:

Constructing a rail over bridge at Katpadi will have a significant impact on the transportation infrastructure in Vellore. Here are some important road study details to consider for this construction project,

- 1. Traffic Management:** During the construction phase, it is crucial to have a well-planned traffic management strategy in place to minimize disruptions and ensure the smooth flow of traffic. Temporary diversions, alternative routes and clear signage should be implemented to guide commuters and minimize congestion. "HERE WE DON'T NEED AN ALTERNATIVES WHERE AS THE EXISTING BRIDGE WILL PERFORM ITS TASK WITHOUT DISRUPTION OF CONSTRUCTION WORKS".
- 2. Road Widening:** The construction of a rail over bridge often involves widening the existing roads to accommodate the elevated structure. This may require acquiring additional land and modifying the existing road alignment.

Proper planning and coordination with local authorities will be necessary to ensure a smooth transition and minimize inconvenience to commuters.

3. **Intersection Design:** The design of the rail over bridge should consider the existing intersections along the route. The rail over bridge should integrate seamlessly with these intersections to ensure smooth traffic flow and minimize conflicts between vehicles using the rail over bridge and those on the ground level. Proper signage, traffic signals and lane markings should be implemented to guide traffic effectively.
4. **Pedestrian Facilities:** The construction of the rail over bridge should also prioritize the safety and convenience of pedestrians. Provision for pedestrian bridges, sidewalks and designated crossings should be incorporated into the design to ensure safe passage for pedestrians across the rail over bridge and at ground level.
5. **Public Transportation Integration:** The rail over bridge should be designed to accommodate public transportation systems such as buses and taxis. Provision for bus stops, taxi stands and appropriate drop-off/pick-up points should be considered to ensure seamless integration of public transportation services with the rail over bridge.
6. **Cycling and Non-Motorized Transportation:** The design of the rail over bridge should also consider the needs of cyclists and non-motorized transportation users. Dedicated bicycle lanes or shared pathways can be incorporated into the design to promote sustainable and active modes of transportation.
7. **Lighting and Signage:** Proper lighting and signage should be installed along the rail over bridge to ensure visibility and safety, especially during nighttime. Clear directional signs, speed limit signs and lane markings should be in place to guide motorists and enhance traffic safety.
8. **Monitoring and Maintenance:** Once the rail over bridge is constructed, regular monitoring and maintenance should be carried out to ensure its structural integrity and safety. This includes regular inspections, repairs and necessary upgrades to ensure the longevity and efficiency of the rail over bridge.

2. OBJECTIVES

- To identify and analyze the feasibility of the project.
- To develop a plan and 3d view.
- To prepare a detailed estimate.
- To arrive the cost benefit analysis for the project

3. LITERATURE REVIEW

Meera R Krishnath et al.(2014) conveys an analysis and design of a railway over bridge at Kumaranellur, Kerala, focusing on the use of prestressed girders for long span bridge construction. The bridge aims to streamline traffic control in the area, particularly at Kumaranellur junction, which experiences heavy traffic congestion due to frequent railway crossings. The design includes a composite bridge with prestressed I girders and an RCC deck slab, following relevant codes such as IRC 5-2000, IRC 6-2000, IRC 18- 2000 and IRC 21-2000. The bridge has an overall length of 312m, a width of 12m and a longest span of 33m. The design details cover aspects such as load calculations, deck slab design, girder design, pier design and other structural elements. The paper concludes that the structure is capable of handling external loads and forces safely and upon completion, the project is expected to reduce traffic congestion on Kumaranellur-Kudamalloor road.

Rajiah Murugasan et al.(2017) phrased the study "Time Delay and Cost Overrun of Road Over Bridge (ROB) Construction Projects in India" examines the complex nature of ROB construction projects in India as well as the causes of delays and overruns in terms of budget. The investigation found 29 causes for these problems and factor analysis was used to classify these causes into 7 categories. The elements include concerns with cost, payment, price and contracts, they also include poor planning, poor management, unrelated circumstances, difficulties implementing the project and obstacles related to land acquisition also the law. Poor technical research, imprecise contracts and insufficient project planning were identified as major causes of delays and cost overruns. The study highlights that in order to effectively manage these concerns and lessen the effects of delays and cost overruns in ROB projects in India, stakeholders must make proactive decisions.

Ashoke Kumar Sarkar et al.(2017) verbalizes the management of level crossing safety and the financial assessment of a rail over bridge (ROB) project at the Loharu rail level crossing are covered in this paper. It emphasizes how important it is to lower the number of accidents, shorten travel times and use less fuel. Vehicle delay calculations, gate closure timings and volume count surveys are examples of data collection methods. In addition to estimating ROB construction costs, economic analysis takes trip time savings and idling fuel costs into account. For economic evaluation,

the Benefit Cost Ratio (B/C Ratio) and Net Present Value (NPV) are utilized. The B/C Ratio is almost 1 and the NPV is positive, demonstrating the viability of the project. The study concludes that building a ROB at Loharu can improve efficiency and safety, highlighting the significance of thorough economic analyses for projects involving railway infrastructure.

Ashish K. raut (2017) articulates the study offers a comprehensive analysis of construction management strategies with a particular emphasis on railway over bridge (ROB) projects. It highlights how crucial it is to use resources effectively, especially when it comes to cost, material, machinery and quality control. Numerous facets of ROB construction, including substructure, superstructure and diversion, are covered in detail. Feasibility studies and design codes are cited to emphasize the importance of the planning, design and analysis phases. Alongside material optimization tactics like EOQ, cost management strategies like

budgeting and estimation are examined. The use of machinery, maintenance techniques, quality control procedures and the function of technology are all covered. In construction, waste management and risk assessment are also covered. Key findings are summarized in the paper's conclusion, highlighting the importance of all- encompassing management strategies for successful ROB construction projects.

Dr. Bharat Nagar et al.(2018) asserts this research paper explains deep into the estimation of Vehicle Operating Costs (VOC) through a Railway Over Bridge (ROB) at LC-70, Sitapur, Jaipur. By utilizing the HDM-VOC program, the study predicts VOC components based on various road and vehicle characteristics in free-flow traffic conditions. Additionally, Indian Road Congress parameters are employed to evaluate VOC for different vehicle types. The primary objective of the research is to assess the VOC of the ROB and present the findings in a user-friendly computer program. This analysis contributes significantly to enhancing the understanding of VOC implications for transportation infrastructure development, ultimately aiding in more effective planning and management of road projects.

Anjan Dutta et al.(2016) enunciates a particular railway overbridge (ROB) located in a high seismic region is the subject of a fragility curve-based seismic vulnerability assessment. To create fragility curves that take into account the structural response to seismic excitations, analytical methods are utilized. When two structural models—lumped mass and distributed mass—are compared, the fragility curves exhibit notable variations, especially at higher damage levels. Damage parameters are ascertained through the use of nonlinear time history analysis and static nonlinear analysis. A lognormal distribution is used to construct fragility curves, which show the likelihood of surpassing particular damage thresholds for different peak ground accelerations (PGA). In order to make well- informed decisions about bridge maintenance or retrofitting, the study emphasizes the significance of structural modelling in seismic vulnerability assessment.

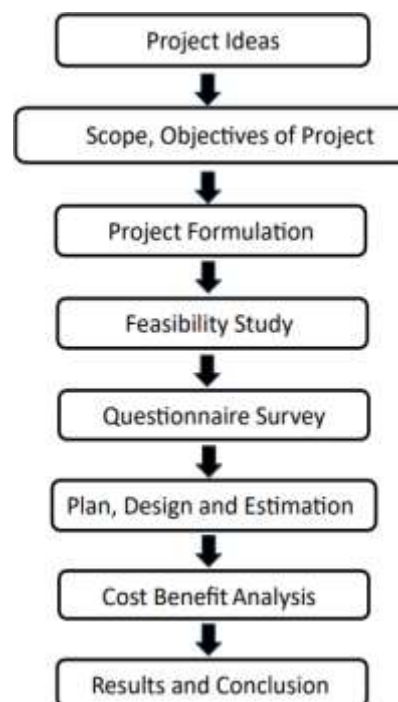
Dr Omprakash Netula (2017) values based on geometric parameters, the study estimates the vehicle operating costs (VOC) for a railway overbridge (ROB), with a particular emphasis on LC-70, Sitapur, Jaipur. In order to identify the most economical geometric design, the study compares VOC at speeds of 65 and 80 kmph using both the World Bank's HDM- VOC models and Indian Road Congress (IRC) guidelines. The lower VOC at 65 kmph, according to the results, influences the choice of design speed. Differences in VOC estimation is highlighted by comparing the HDM-VOC and IRC guidelines. The study promotes the use of the HDM-VOC model as a tool for fuel-efficient highway design and emphasizes the significance of VOC assessment in infrastructure planning. By citing multiple studies and guidelines, the study provides an extensive summary of VOC estimation techniques, highlighting their function in improving cost-effective and environmentally friendly infrastructure development.

Parthkumar K. Patel et al.(2015) voices this paper investigating the efficiency of an overbridge to reduce traffic congestion at the Ahmedabad IIM-A intersection. By using field surveys and data analysis, it evaluates fuel savings and user travel time, offering valuable information about the overbridge's financial advantages. The research shows known yearly savings in both travel time and fuel consumption by compare the current situation with an alternative in which the overbridge is parallel to the 132-feet ring road. It is concluded that even more advantages would result from building the overbridge parallel to the ring road. The study highlights the significance of economic assessment in transportation initiatives and emphasizes the effective role of overbridges to reduce traffic congestion.

Gokul Mohandas V (2020) explains the design and analysis of prestressed concrete girders for bridges is examined in this study by Gokul Mohandas V. and Dr P. Eswaramoorthi, which was published in the International Research Journal of Engineering and Technology. It points out the advantages of prestressed concrete girders over conventional reinforced concrete in terms of stability, serviceability and structural efficiency. The study analyses parabolic and straight tendon profiles using MIDAS CIVIL software and it finds that curved tendon profiles greatly minimize stress and deflection. The analysis complies with IRC requirements, verifying that the prestressed concrete girder design satisfies long-span bridge safety and efficiency standards, notably in managing a range of loading circumstances.

Ms. Vrushali Garde (2021) says the analysis and design of bridges have been the subject of numerous studies, with a particular emphasis on the structural efficiency and cost of various bridge types. After comparing the costs of prestressed concrete (PSC) and reinforced cement concrete (RCC) girders, Dr. Sudhir S. Bhadouria et al. (2017) came to the conclusion that PSC girders are more cost-effective for spans longer than 25 meters. In their evaluation of continuous precast concrete girder bridges, Mary Beth D. Hueste et al. (2012) suggested appropriate continuity connections for common Texas bridge girders. In a 3D analysis of long-span box girder bridges, Mohammad Omar Faruk Murad et al. (2016) found that post-tensioned box sections outperform pre-tensioned inverted T-girder sections in terms of structural properties. Comparing designs with IRC:112-2011 and older IRC codes, Phani Kumar et al. (2016) highlighted the advantages of limit state hypothesis. A thorough design example for prestressed concrete girder bridges, including multiple structural elements and design calculations, was given by Wagdy G. Wassef et al. in 2003. Together, these studies demonstrate the progress made in the field of bridge engineering, highlighting the structural and financial benefits of prestressed concrete girders as well as the significance of careful design considerations.

4. METHODOLOGY



Questionnaire Survey:

The questionnaire survey on constructing a rail over bridge (ROB) aimed to gather community opinions and feedback regarding its necessity, benefits, concerns and expectations in the city. It began by assessing the community's perception of the ROB's necessity, followed by inquiries into the frequency of traffic congestion in the proposed area to gauge its impact. Participants were queried on their beliefs about the ROB's potential to alleviate traffic congestion, aiming to understand expectations. Additionally, respondents identified anticipated benefits for the local community, highlighting priorities and positive impacts. The survey also addressed concerns and drawbacks, aiming to uncover potential challenges. Overall, it sought diverse perspectives to inform decision-making and stakeholder discussions on the ROB's construction.

Vehicle survey:

Types of Vehicles	Number of vehicles per day	Number of vehicles per week
Two wheelers	1400	9800
Car	750	5250
Goods vehicles	140	980
Auto Rickshaw	475	3325
Bus	230	1610
Bicycle	100	700

FEASIBILITY SURVEY:

A feasibility study is a thorough analysis of a proposed project to see if it's likely to succeed. It considers all the important aspects of the project to determine if it will be profitable enough to justify the investment.

In technical feasibility, the high traffic volume at the crossing point, necessitating infrastructure improvements. Frequent daily crossings highlight the need for reliability

bridge. Key improvements include avoiding heavy vehicles for safety and congestion reduction and coordinated school and college timings. A strong recommendation exists for an additional parallel bridge to manage current and future traffic. The community believes the rail over bridge would significantly enhance safety for pedestrians and motorists, underscoring the project's importance.

In Financial feasibility, community support for additional taxes or tolls indicates financial commitment, crucial for funding infrastructure. Collaboration between government and private investors offers diverse funding, easing public financial strain. Anticipated property value increases suggest economic benefits and returns on investment. Prioritizing rail over bridges aligns with growth priorities, highlighting strategic importance. Despite construction disruptions, community readiness supports the project's financial viability and sustainability.

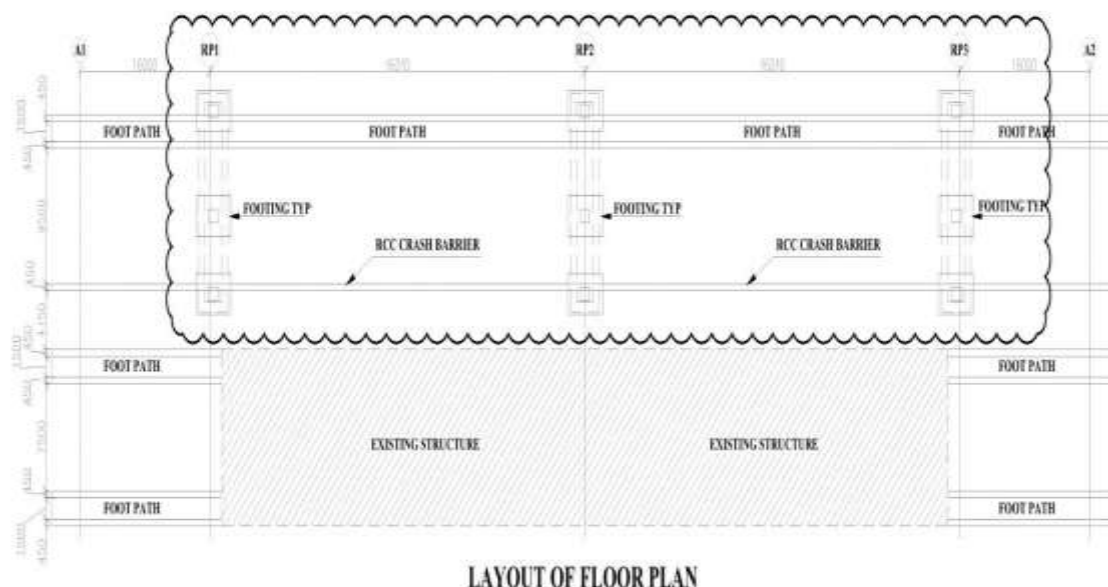
In economic feasibility, prioritizing the rail over bridge aligns with growth priorities, addressing traffic congestion and safety effectively. Anticipated property value increases and local business boosts promise significant economic gains. Community readiness to endure construction inconveniences shows strong support for long-term benefits. Exploring public-private partnerships can ease public financial burdens, ensuring sustainable funding. Overall, the project's economic feasibility highlights its strategic importance and makes it a wise infrastructure investment.

In market feasibility, community awareness of proposed benefits like enhanced road safety and increased property values shows positive anticipation. Businesses expect streamlined operations with reduced transportation delays and improved logistics. The project is seen as attracting more investments, indicating economic potential. These factors demonstrate strong market support for the bridge project, validating its role in local economic growth and infrastructure development.

5. PROJECT FORMULATION

The rail overbridge (ROB) Detailed Project Report (DPR) provides background information and justification for the project, emphasizing the need to improve safety and reduce traffic at the current railway crossing. The project description gives an extensive overview of the suggested ROB, including information about its size, design, materials and technology. The detailed cost estimates include an extra fund to cover unexpected cost and break down costs associated with personnel, equipment and site acquisition. The project's financial sustainability is ensured by the financing plan with the help of government fundings. The building phases, a comprehensive timeframe and the project management structure required to monitor the project's advancement are all outlined in the implementation plan. Ultimately, the risk assessment makes sure that the project can move forward without delays and is successfully finished by identifying potential risks and outlining measures for their reduction.

PLAN:



PROJECT APPRAISAL:

The key processes are included in project appraisal, which is the process of carefully analyzing numerous project-related factors to determine their feasibility. The project identification phase is usually conducted by the corporation and the project finance phase is involved as well, where banks and other financial organizations evaluate the project critically. By evaluating the feasibility of an idea from economic, technical, financial and social angles, the project evaluation seeks to improve long-term profitability, minimize risks and improve project quality.

ESTIMATION:

Project estimation is the process of forecasting the time, cost and resources needed to deliver a project. It typically happens during project initiation, planning and takes the project's scope, deadlines and potential risks into account. Here the quantities are calculated by the detailed estimation and the total cost is calculated using abstract estimation. Project appraisal is the process of carefully examining several project-related elements. It primarily aims to evaluate a project's viability. Such an evaluation typically involves two steps.

- > The phase of project identification, which is typically handled by the company.
- > During the project funding stage and financial institutions evaluate the project critically.

SI NO	DESCRIPTION OF WORKS	UNIT	QUANTITY	RATE	AMOUNT
1	Earthwork excavation (machinery and labors charges)	u.m. at Rs.	3123.803	144.3	50764.7729
2	Construction of embankment	u.m. at Rs.	2709.0858	168.4	456210.0487
3	Construction of sub-grade and earthen shoulders (MCW)	u.m. at Rs.	651.354	453.5	295389.039
4	Construction of Granular sub base	u.m. at Rs.	1231.87	3936.68	4849477.992
5	Dry lean cement concrete sub-base	u.m. at Rs.	49.5	6227.44	308258.28
6	Cement Concrete Pavement	u.m. at Rs.	123.75	11068.67	1369747.913
7	Wet Mix Macadam	u.m. at Rs.	1447.025	2655.94	3843211.579
8	Tack coat on bituminous surface.	qm. at Rs.	5199.51	13.62	70817.3262
9	Primer coat with bitumen emulsion on granular base	qm. at Rs.	5298.1	48.32	256004.192
10	Tack coat with bitumen emulsion	qm. at Rs.	5298.1	16.63	88107.403
11	Providing and laying dense grade bituminous macadam (80mm Thick)- Grade II	u.m. at Rs.	275.2	10682.69	2939876.288
12	Providing and laying dense grade bituminous macadam (50mm Thick)- Grade II	u.m. at Rs.	122.53	11425.62	1399981.219
13	Providing and laying bituminous concrete (40mm Thick)	u.m. at Rs.	285.0244	12761.31	3637284.726
14	Providing and laying bituminous concrete (30mm Thick)	u.m. at Rs.	99.318	12761.31	1267427.787
15	Construction of cement concrete kerb	(Rm)	460	341	156860
16	Sand filling (foot path)	u.m. at Rs.	53.8125	3134.07	168652.1419

COST BENEFIT RATION:

A cost-benefit analysis (CBA) for the rail over bridge (ROB) project at Katpadi Junction compares the estimated costs of construction, maintenance and operation with the anticipated benefits to justify its economic and social value. The estimated costs, including design, construction and ongoing maintenance, are crucial factors in determining the feasibility of the project. These costs are weighed against anticipated benefits such as reduced travel time, improved traffic flow, enhanced safety for pedestrians, motorists and increased economic activity due to smoother logistics and connectivity. Quantifying these benefits, such as savings in fuel and vehicle maintenance costs, reduced environmental pollution and enhanced productivity due to reduced congestion, will demonstrate the ROB's overall positive impact on the community. A positive CBA would indicate that the benefits of constructing the ROB significantly outweigh the costs, ensuring the project's long-term sustainability and its ability to effectively address traffic congestion and improve overall transportation infrastructure in Katpadi, Vellore.

S.No	Vehicles	Charged per vehicle	No of vehicle passing	Per day	Per month	Per years
1	Bus	100	95	9500	2,85,000	34,20,000
2	Lorry	150	135	20250	6,07,500	72,90,000
3	Heavy truck	250	245	61250	18,37,500	2,20,50,000
4	40-wheel vehicle	500	1	500	15,000	1,80,000
			Total	91,500	27,45,000	3,29,40,000

6. RESULTS & DISCUSSION

The aim of our project is to enhance the current transportation infrastructure in our city by constructing a well-organized and well-planned rail over bridge (ROB) at Katpadi Junction that meets all necessary requirements and provides essential amenities. This solution involves investing time, money, ideas and efforts, significantly benefiting both commuters and the community. Through improved infrastructure, enhanced aesthetics and community involvement, the new ROB will become a crucial part of the city's transportation network, facilitating smoother traffic flow and enhancing connectivity. The proposed ROB addresses issues of congestion and commotion by eliminating unnecessary traffic delays caused by level crossings and providing a seamless route for vehicles and pedestrians. The structure will promote smooth traffic flow, reduce travel time and enhance safety for all users. The ROB will accommodate heavy traffic volumes, especially during peak hours and festive seasons, providing a robust solution to current congestion problems. The new system will generate revenue through toll collection, unlike the current system and elevate the standard of living by promoting infrastructure development. The economic benefits will manifest once the initial investment is recouped through toll revenues, which will also cover maintenance costs. Implementing the BOOT (Build-Own-Operate-Transfer) technique could simplify the process for the government by transferring construction risks to the private sector, facilitating easier monitoring and promoting adjacent area development, leading to overall development.

7. CONCLUSION & FUTURE SCOPE

Many local transportation infrastructures need to be updated because they are outdated and cannot meet the changing needs of the population. This includes improving facilities, updating infrastructure and adding eco-friendly and energy-efficient features. As cities grow, new transportation projects like rail over bridges are needed to serve the increasing population. Construction companies have the opportunity to build these projects in prime locations.

In planning these projects, functionality and sustainability are top priorities. Using advanced technologies and equipment, future transportation infrastructures will be more organized and efficient, moving towards environmental goals. These projects will help various areas in the state grow, benefiting the overall economy.

Rail over bridges can be part of a broader infrastructure development plan that includes residential, commercial and recreational spaces, creating vibrant community hubs that attract residents and visitors. Maintenance is crucial for keeping these structures safe and functional and the income generated from tolls and other sources will help with this. Working on these projects will lead to more innovative infrastructure designs with enhanced safety features, meeting future needs.

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