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Case Study IJSEA

Case Study on Wai to Pratapgad Road Using Alternate Route of Underground Tunnel (Wai+Jor+Pratapgad)

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Abstract

The project proposes constructing an underground tunnel from Wai (Jor) to Pratapgad to address acute traffic congestion, regular road accidents, and long travel time on present mountainous roads. The present highway, with its steep curves and ascents, fails to support growing vehicular movement, resulting in traffic congestion and safety hazards, especially during peak tourist periods. The tunnel will provide a straight and unbroken journey, less reliant on the meandering ghat roads and lowering travel time drastically. For this purpose, an extensive traffic volume survey was done in Pratapgad, evaluating vehicle traffic, congestion rates, and accident statistics over the past few years. This information assisted in realizing the current road conditions and justifying the construction of a safer, more efficient route. The tunnel will not only improve road safety but also help in sustainable development by cutting down on vehicle emissions and fuel usage.

Keywords: Underground tunnel, traffic, detectors, construction, transportation

INTRODUCTION

The main aim of the project is to construct an underground tunnel from Jor (Wai) to Pratapgad which will reduce travel and will reduce fuel consumption also. This will also boost economic development in that area. In this project we will analyze traffic issues and will also study accident prone area and on that basis a proposal will be given to the government for future. Meanwhile, construction of an alternate route will be undertaken which will be an underground tunnel. A project is created to draw attention to the transportation issues, especially on weekends. After construction of this tunnel, it will boost economic development of that area. Not just that, this project will help everyone to reach the destination "Pratapgad" in very short time. As it is known, Pratapgad is a historical place, a symbol of greatest Maratha warriors. Therefore, it attracts many tourists. Because of traffic issues, tourists cannot reach them on time, but this tunnel will help them to reduce all such issues. In this project, the researcher explains design parameters of this tunnel and will present an analysis of accident and traffic study [1–3].

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STUDY AREA

The study area represents the Pratapgad area location, this is a Konkan region in Maharashtra. Jor to Pratapgad is in Wai district, western Indian state of Maharashtra. The location is NH 965DD, Maharashtra. The latitude and longitude of the location are 17.9371° N & 73.5782° E, respectively. The study area lies in the western Indian state of Maharashtra characterized by ghats, hills, etc. This region experiences heavy rainfall, particularly between June and September, with an average of 650 to 7000 mm per year which causes

landslides and rock blockage. Pratapgad is a historical hill fort located in the Satara district of Maharashtra, near the popular hill station Mahabaleshwar. Its elevation is about 1080 meters (3540 feet) above sea level in the western ghats. The location is surrounded by deep valleys, steep hills, dense forest, because of that it is bit challenging for road transport. The road connecting Wai to Paratpgad passes through narrow, winding roads, with sharp curves and steep slopes. This stretch is a key route for tourists coming from Pune, Satara, and Mumbai. The area connects to Mahabaleshwar, Ambenali Ghat, Poladpur and Mahad, and supports the local economy through tourism, farming and small businesses (Figure 1).

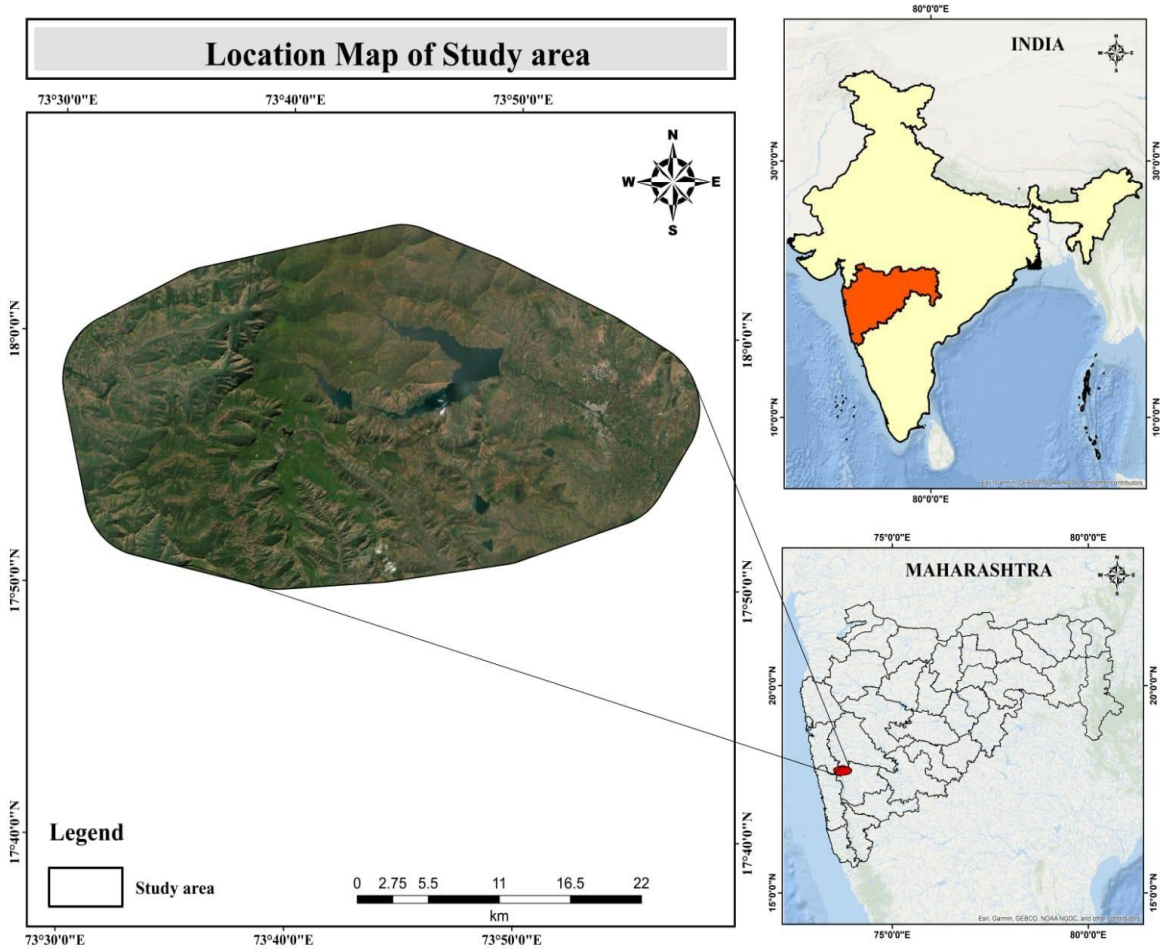


Figure 1. Location map of study area.

LITERATURE SURVEY

Planning of Tunnel to Reduce the Traffic Congestion at Hazarat Ganj Chauraha, Lucknow

- Aim of the research was to plan a tunnel to reduce the traffic congestion at Hazarat Ganj Chauraha in Lucknow region. The objective was to evaluate how a tunnel could improve road capacity and reduce travel time.
- The researchers have undertaken a detailed review of literature regarding tunnel planning for decongesting traffic, with emphasis on the Hazarat Ganj Chauraha junction in Lucknow. They examined different studies to determine the likely advantages of constructing tunnels to alleviate traffic congestion in urban areas.
- Hence, it can be concluded here that the review finds that building a tunnel in overpopulated cities, such as Hazarat Ganj Chauraha, can go a long way towards alleviating traffic congestion and optimizing traffic flow. Nevertheless, the study calls for thorough feasibility studies, such as traffic volume surveys and accident analysis, prior to embarking on such projects [1].

Tunnel Systems as a Critical Alternative in Solving Transport Problems

- The Aim of the research was to evaluate whether tunnel system can serve as an effective solution to urban transport problems, compared to road expansion projects. It focused on safety, capacity, and environmental benefits.
- The researchers compared the efficiency of tunnel systems and conventional road expansion in alleviating traffic congestion. They compared case studies in which tunnels were used to solve urban traffic problems based on safety, capacity, and environmental considerations.
- Therefore, it is concluded that tunnel systems were shown in the study to be effective at reducing traffic congestion, enhancing safety (accident rates around 50% less than on open roads), and reducing environmental disruption in urban centers [2].

Can Tube Tunnel Crossings Relieve Urban Congestion Problems? A Simulation-Based Assessment for Izmir, Turkey

- The Aim of the research was to assess whether tube tunnel crossing can effectively solve urban traffic congestion issues in Izmir, Turkey region. The objective was to determine their role in improving road efficiency.
- The methodology adopted was simulation models which were used in this study to analyze the possible effects of tube tunnel crossings on traffic congestion in urban areas in Izmir, Turkey. The authors compared traffic flow, capacity gains, and the overall efficiency of such projects.
- *Conclusions*: The results showed that tube tunnel crossings may provide slight improvements but may not be enough to properly address congestion issues without proper urban planning and sustainable mobility measures [3].

Optimization of Tunnel Tolls in Land Use and Transport Planning

- The aim of the research was to determine the optimal toll pricing strategy for tunnels that balance traffic demands, land use, and transportation planning. The objective was to balance transport efficiency with economic feasibility.
- The researchers used optimization models to identify optimal tunnel tolls that reconcile traffic demand, land use, and transportation planning goals. They compared the impact of toll pricing on traffic flows and congestion levels.
- The research concluded that the right setting of tunnel tolls was able to effectively control traffic demand, lower congestion, and enable sustainable urban development [4].

Urban Main Road Capacity Reduction: Adaptations, Effects, and Consequences

- The aim of the research was to examine the impact of reducing urban road capacity on traffic congestion and city mobility. The objective was to assess whether reducing road space encourages alternative transport.
- Methodology explanation goes, like the researchers, empirically evaluated urban regions whose principal road capacities were lowered intentionally. They assessed traffic adjustments, impacts on congestion, and wider implications for city mobility.
- At the end, it is concluded that the authors discovered that traffic evaporation, where traffic diminishes or reappears in alternate modes, can result from lessened road capacity, possibly diminishing congestion. This indicates that the planning of tunnels needs to consider some wider traffic management strategies [5].

Aggregated Risk of a Series of Tunnels on Mumbai–Pune Expressway

- The aim of the research was to assess the accident risk of the multiple tunnels on the Mumbai–Pune Expressway using statistical models. Objectives include analyzing accident patterns, identifying risk factors, and suggesting safety improvements.
- The methodology adopted by the researchers was to analyze and observe how frequently major accidents occur in the route of the Mumbai–Pune Expressway. A Monte–Carlo simulation

technique (a computer-based technique) was adopted for risk assessment and to analyze past accident records. The main objective of the research was to identify the statistical model that is best suited to them and to determine different patterns of accident rates.

- The conclusion drawn from this research is that the accident data got properly arranged in different patterns and was best explained by logged distribution, in which it is determined that the accident risk was not uniformly distributed, and a different pattern was seen. Later, the knowledge of this accident data was used for improving the safety measures during the construction of tunnel [6].

Relationship of Mainstream Traffic Operating Speed Towards Percentage of Heavy Vehicle During Entering and Exiting Meru Tunnel: A Case Study Meru–Menora Tunnel

- The aim of the research was to analyze how the speed of regular traffic is affected by the entry and exit of heavy vehicles at the Meru–Menora tunnel. Objectives include monitoring vehicle movement, measuring speed variations, and recommending solutions.
- The methodology was to collect the traffic data at four different locations around the Meru–Menora tunnel mainly focusing on vehicle speed and percentage of heavy vehicles. The data were collected in the interval of every 5 minutes using different tools like radar, laser guns and others. The data were gathered and was analyzed using statistical software to determine how much impact would be on traffic speed during the tunnel entry and exit of heavy vehicles.
- The conclusion drawn from this paper was that the operating speed of main traffic reduces in the presence of heavy vehicles. The author recommends implementing traffic management strategies, like improving traffic flow and safety in tunnel areas, dedicated lanes for heavy vehicles and all [7].

A Statistical Approach to Estimate Severe Accident Vehicle Collision Probability Inside a Multi-Lane Road Tunnel with Unidirectional Traffic Flow

- The aim of the research was to estimate the likelihood of severe vehicles collision in multi-lane road tunnels with one-way traffic flow. Objectives include understanding how vehicle behavior affects accidents and suggesting safety measures.
- The methodology adopted was traffic simulation and statistical modelling was conducted in Bhutan tunnel along the Mumbai–Pune Expressway. The scientists applied computer simulations to determine how frequently cars overtake one another and how it raises the risk of accidents. They simulated traffic models for a year, sweeping through approximately 13 million vehicles, and employed statistical measures to forecast accident threats.
- The conclusion drawn from this study was that the risk of accidents goes up when cars keep overtaking one another in tunnel. Stricter lane discipline and more effective road markings are recommended by the authors to curb accidents within tunnel [8].

Evaluation of Tunnel Ventilation and Air Quality Control Measures

- The aim was to analyze various ventilation and air quality control methods employed in tunnel construction for improved air management. Objectives include analyzing air pollution levels, testing ventilation efficiency, and recommending improvements.
- The methodology adopted for the research was comparison of various tunnel ventilation systems and their effects on air quality through environmental monitoring equipment.
- The study concludes that mechanical ventilation is necessary in long tunnels to avoid air pollution accumulation and guarantee driver safety [9].

Effect of Tunnel Construction on Groundwater and Surrounding Soil Condition

- The aim was to study the impact of tunnel construction on groundwater levels and soil stability. Objectives include evaluating soil stability, monitoring groundwater flow, and minimizing environmental damage.
- The researchers carried out geotechnical surveys and observed groundwater movement prior to and after tunnel excavation.

- The study finds that tunnel construction can disturb groundwater flow and cause soil displacement, which must be managed through drainage and reinforcement techniques [10].

GAPS IN LITERATURE REVIEW

The researchers mentioned opening tunnels in India to lower traffic congestion and accidents but neglected a few significant points. All of them make use of computer models and historical data but never gave actual real-time traffic updates or true road conditions of India.

Though the researchers emphasized how tunnels can benefit, they didn't contrast them with alternatives, such as flyovers or metro systems, which could be less expensive and equally effective. They also didn't discuss much about the impact of tunnels on local businesses, housing, or city development. Knowing these effects is crucial before deciding to construct a tunnel.

Another problem is that most research work does not consider the total expense of constructing and keeping tunnels. Some refer to toll charges, but they do not provide an exact understanding of how much it would cost in the long term or whether the government and the public will financially gain.

The effect on the environment is not also talked about sufficiently – things, such as upsetting ground water, construction pollution, and air within the tunnel, need to be researched more. Safety is also a huge issue. Most papers fail to discuss key issues such as sufficient lighting within tunnels, fire exits, and accident prevention within them.

Aside from this, legal and policy issues are largely overlooked. Securing government permission, land acquisition, and addressing people's issues are huge challenges that are not even talked about. Another omitted aspect is how tunnels can be integrated with other transportation networks, such as buses and metros, to make travel simpler for all. If future studies incorporate real traffic data, popular opinion, intelligent tunnel technology, and improved planning, tunnels have the potential to be more than merely a traffic-reducing means – they can also enhance cities and make transportation smoother and safer for all.

METHODOLOGY

The project starts with the Wai (Jor) and ends to the fort of Pratapgad. Therefore, some of the data are being collected primarily like location and connectivity of the project. Then the traffic data are also collected. As the major accidents data were collected from the sources, major accidental data have been collected from past years. The traffic trends were also studied. For the total completion of the project, certain methodology was adopted. The detailed methodology followed during the project completion is given Figure 2.

Methodology followed during the completion of the project is as follows.

Before starting all the other work, researchers decided to do the geological and topographical analysis of the study location that's why contour maps of the study location were maintained and analyzed for the geology of the area, pattern of land slope, topographical view analysis and all.

Geological and Topographical Analysis of the Study Location

This contour map shows the elevation and shape of the land in the study area of our project location. This contour map gives a clear view of how rugged and uneven the study area is. Map shows the dense contour lines which means the steep terrain or sudden changes in elevation (mountains, cliffs). The wide spaced contours of the map explains that there are gentle slopes or flatter land.

The closed circular contours which are present on the map may represent hills (if elevation increases inward) or depressions/craters (if elevation decreases inward, though these are usually marked with hachures). The southwestern and central parts appear to have higher elevations, based on

closer and denser contour lines (up to ~1100 m). The eastern side has slightly wider spacing, indicating gentler slopes (Figures 2 and 3).

This contour map shows both the elevation and the geological type of land within the tunnel study area. The contour interval here is 100 meters, meaning each line represents a 100-meter change in height above sea level. This helps us understand the height and slope of the land. Paleocene-Cretaceous Extrusive Rocks (as shown in the brown color on the map) These are hard volcanic rocks, mainly basalt, which is common in the Deccan Plateau region. Since they are formed from lava, these rocks are very strong and stable, good for tunneling because they do not easily collapse. Resistant to erosion and weathering. This type of geology is commonly found in Western Maharashtra, and it is suitable for heavy infrastructure like tunnels and bridges (Figure 4).

This 10-meter interval contour map gives accurate information regarding the elevation and topographic variation of the study area. Steep slopes are represented by closely spaced contour lines, whereas gentler terrain is represented by wider spacing. The direction of general slope, ridges, valleys, and probable drainage patterns, as well as elevation estimation at any point within the area, can be ascertained from this map. It is particularly valuable in analyzing terrain attributes, like plateaus, hills, and depressions, and may be used for planning construction, agriculture, watershed management, and environmental conservation work because of its high degree of detail and accuracy.

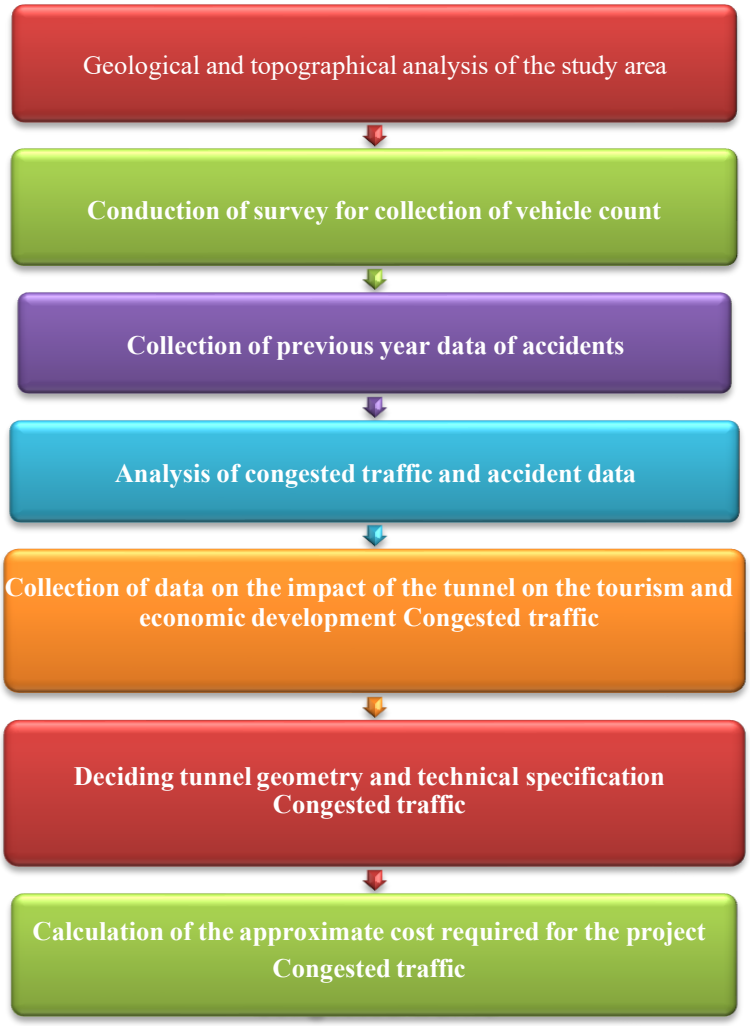


Figure 2. Methodologhy format.

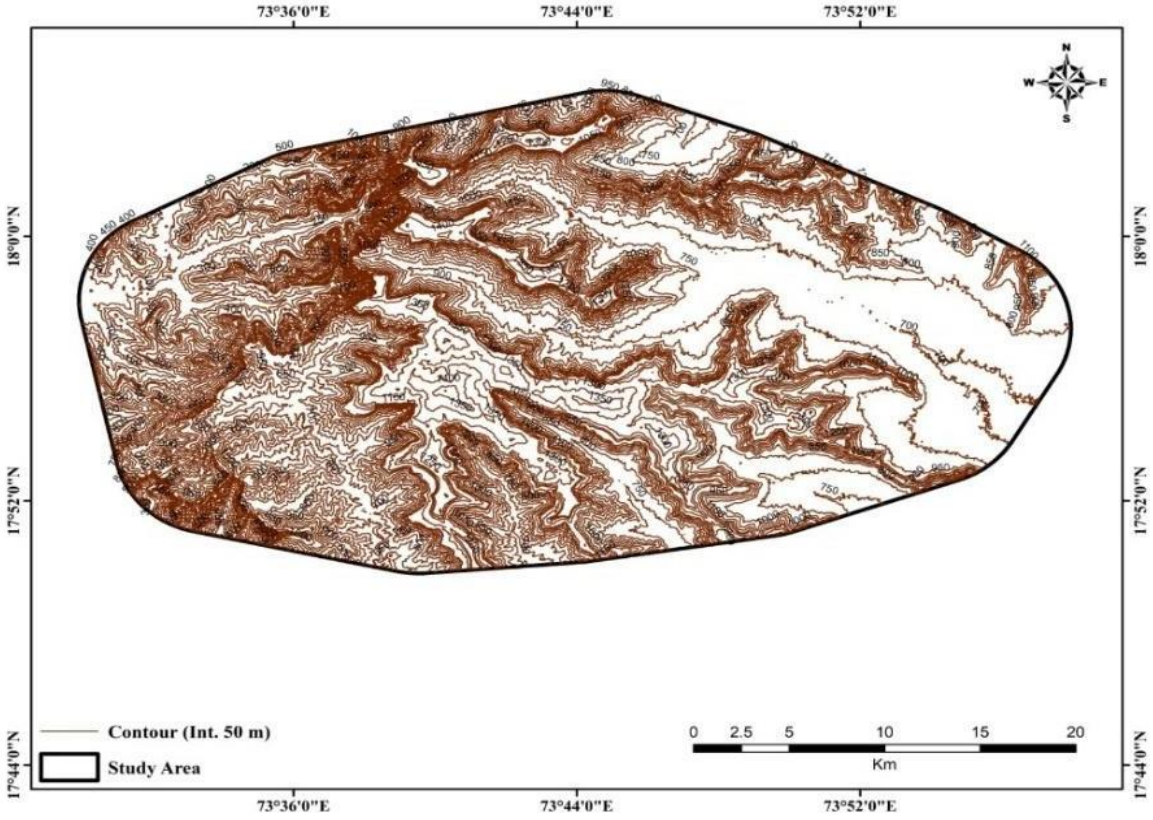


Figure 3. Contour map representing the slopes.

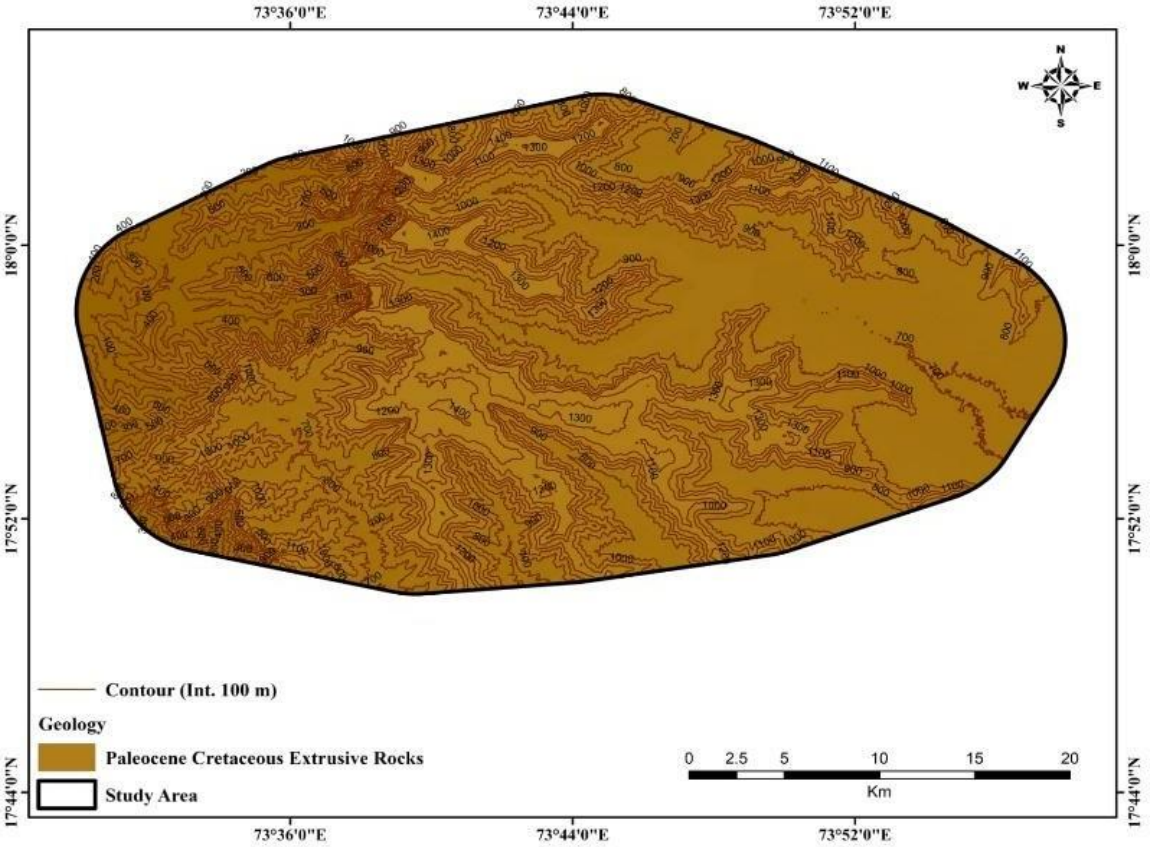


Figure 4. Contour map showing geological type of land.

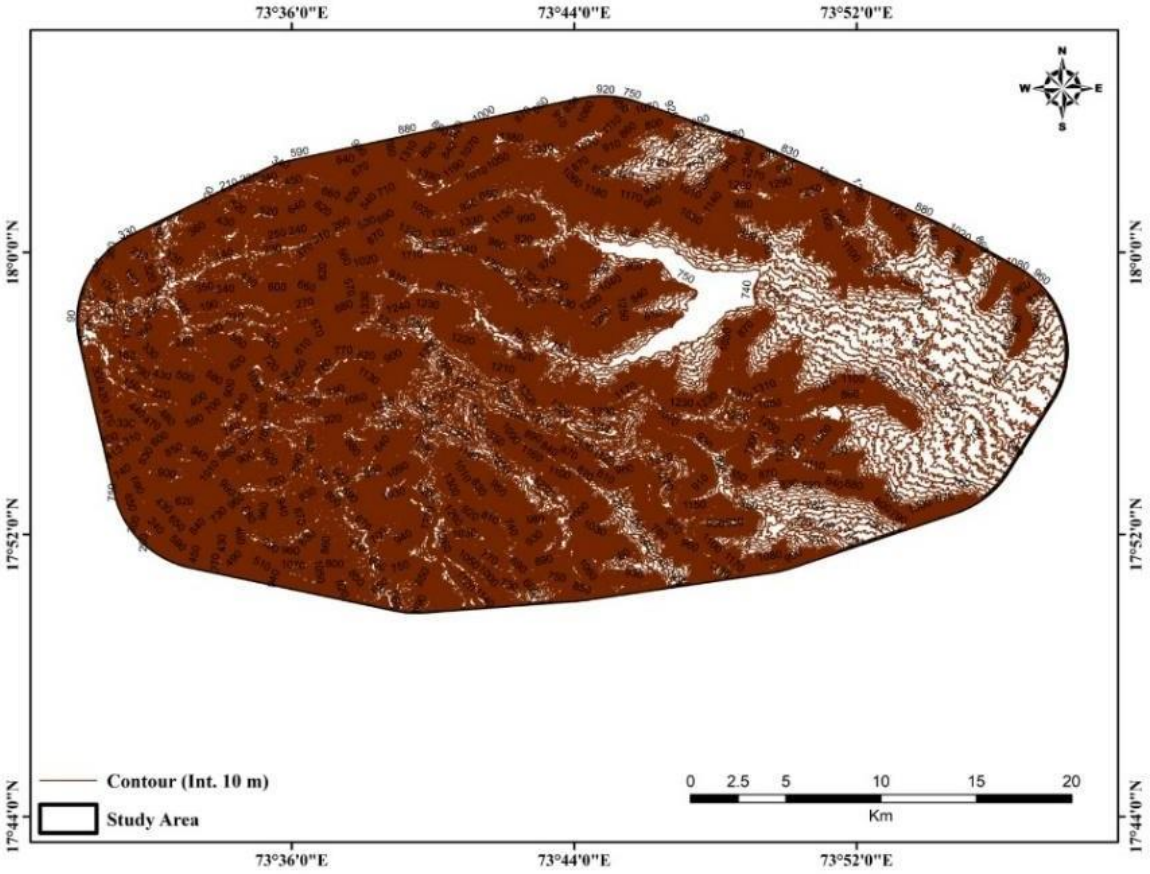


Figure 5. Contour map showing topographic variation of the study area.

Conducted Survey for Collection of Vehicle Count

A traffic survey is being conducted in Pratapgad area to collect vehicle count data. It includes counting and recording the number of vehicles passing through this location during the observation period. the type of vehicles (Car, Truck, Bus, Motorcycle, etc.) and the direction of travel. This data will help to inform future traffic planning, infrastructure development and improve traffic flow.

Collection of Previous Year Data of Accidents

The collection of previous year's data of accidents was done from police station of Mahabaleshwar – Pratapgad area which gave them yearly count of the traffic volume of vehicles. Here, it can be seen that April–May have more frequency of vehicles visiting Mahabaleshwar, Pratapgad area. Whereas the month of October–November had the least frequency in the year. April has 9678 vehicles volume and May has 7567 vehicles data in a year. A graph was plotted in which the value VS month of the year is plotted. This graph is being drawn to have a graphical understanding of the vehicles' volume of a year. Therefore, it can be concluded that if there is more frequency of vehicles in April–May, then there will be obviously more accidents. The data of accidents that took place in 2023 was collected. Therefore, this is an important step in understanding traffic safety and identifying areas for improvement. This data are obtained from police reports which provide valuable approach to the frequency and causes of accidents. Accident data collection involves information on factors such as accident location, time of day, weather conditions, vehicle type and injured persons count (Figure 5).

Analysis of Congested Traffic and Accident Data

The analysis of congested traffic and accident data are an important component of transaction planning and safety management. By examining the relation between traffic congestion and accident frequency, high risk location and time, such as rush hours and highway intersection with limited visibility, can be easily identified.

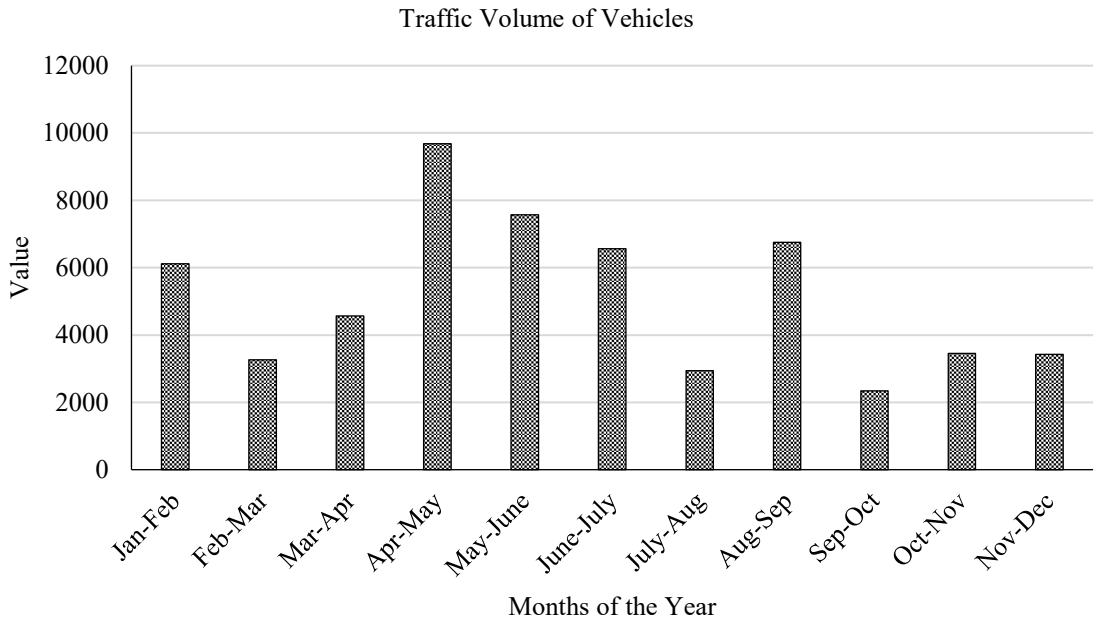


Figure 6. Graph of annual vehicle count.

Collection of Data on the Impact of the Tunnel on Tourism and Economic Development

The collection of data on the impact of the tunnel on tourism and economic development is essential to assess its effectiveness in stimulating local growth. This involves gathering data on various indicators such as tourist arrivals, hotel rates, revenue generated from tourism related activities and local business development. Additionally, surveys and interviews with local people, tourists and business owners can provide valuable approaches into the tunnel impacting on the local economy and tourists. The data collected will help evaluate the tunnel's contribution to job creation, infrastructure development and overall economic growth.

Deciding Tunnel Geometry and Technical Specifications

Determining the tunnel geometry and technical specifications is an important step in the tunnel design process. This step involves defining the shape, size, and layout of the tunnel and choosing the right technical systems and components. The purpose for which the tunnel is to be used, geological condition, and environmental factors need to be thoroughly assessed so that the design of the tunnel follows the necessary safety, functional, and maintenance criteria. After study, all these factors decided the semicircular shape of the tunnel. The geometry and technical specifications of the tunnel will also determine the construction method, cost, and duration. The approximate geometry of the tunnel would be given as, height-5m, diameter-10 m width-7.5 m for 2-lane tunnels of circular shape. For the construction methodology of the tunnel, drilling method with minimum blasting (or no blasting) is suggested with cut & core method. And the shape of the tunnel should be crown shape as it is best suited for this location.

Calculation of the Approximate Cost Required for the Project

Tunnel Construction Cost Estimate – 8 km Crown-Shaped Tunnel (Cut & Core Method) Project

Specifications

- *Location:* Mahabaleshwar region (hilly, possibly rocky terrain)
- *Dimensions:* Length: 8 km (8000 m) Cross-Section: Crown-shaped Width: 7.5 meters Height: 5 meters Excavation Diameter (equivalent): approx. 10 meters
- *Methodology*: Cut and Core method

- *Blasting:* Minimum or No Blasting (mechanical excavation prioritized)
- *Cost Considerations*: In the absence of blasting, mechanical excavation increases equipment and labor cost, especially in rocky areas. Estimated cost per km (as per 2024–25 trends in India) (Table 1).

Table 1. Tasks and Approximate Cost Per Km.

Tasks	Approximate Cost Per Km
Excavation (cut & core)	130–160 crore Rs
Concrete lining & support	30–50 crore Rs
Waterproofing	10–15 crore Rs
Electrical/lighting systems/ventilation	8–12 crore Rs
Drainage & safety systems	7–10 crore Rs

- *Total per km (approx.):* ₹185 – ₹240 Crores, Total for 8 km: ₹1480 – ₹1920 Crores.
- *Recommended Project Estimate:* ₹1600 Crores (±10%), depending on exact geology and design.
- *Relevant IS Codes:* IS 5878 (part 1 to 4) complete guidelines on tunnelling methods, equipment, design, and safety. Part I: Tunneling by cut-and-cover, NATM, etc. Part II: Construction Equipment. Part III: Design of support systems. Part IV: Safety during tunneling IS 4091 Design and construction of underground rock caverns. It is useful for crown-shaped tunnels in rocky terrain. IS 456:2000 Code for plain and reinforced concrete used for lining and structural design IS 3370 (Part 1–4). Concrete structures for water-tightness are important for waterproofing tunnels IS 1200 (Part 27). Method of measurement for tunnel work IRC SP 91 IRC Guidelines for Road Tunnels (important for transport infrastructure tunnels).

RESULT

The researchers visited the location of the Pratapgad area and did traffic count of 3 days of morning, afternoon and evening. There it was discovered that in the morning the frequency of vehicles coming to the Pratapgad is more and in the afternoon the graph slightly comes down and, in the evening, it can be seen that the frequency of vehicles coming to the Pratapgad is much less.

On the other hand, while analyzing the graph of data of vehicles coming from Pratapgad is converse to what is seen in vehicles data of those going to Pratapgad. In this vehicles coming from Pratapgad has much frequency in the evening, less frequency in the afternoon and medium frequency in the morning of 3 days. After gathering all the information, it was structured in the form of graphs and tally sheets so that it would be simpler to interpret. The graphs reflect trends, such as rush hours, types of vehicles, and road usage overall, while the tally sheets assist with monitoring the raw counts. It was observed that times of day have high congestion, particularly on roads that are narrow and on busy intersections, from what was found. This data will be beneficial to create improved traffic solutions and to make alterations for smoother movement in Pratapgad. The researchers generated a graph in which the total vehicle count in 3 days was noted in the morning, afternoon, and evening period. The frequency for 3 days was somewhat same, but the total count of vehicle was different and, therefore, a traffic volume count survey in the Pratapgad area to comprehend the movement of vehicles and find congestion points also using a pie chart of the traffic count of vehicle type. The graph of the vehicle count is as given Figures 6–9.

One team recorded the data of vehicles going to Pratapgad and another team recorded the vehicle coming from the Pratapgad and that data were recorded in the form of the tally sheets and at the end of the survey add the data of 3 days survey were compiled in one single sheet for both criteria and that tally sheets are mentioned above and researchers carefully recorded the number of cars, two-wheelers, buses, and heavy trucks moving through important locations. To make the study more comprehensive, photographs were taken during the survey, showing real-time traffic conditions. These photos assisted in visually examining road usage, bottlenecks, and traffic density at various times of 3 days.

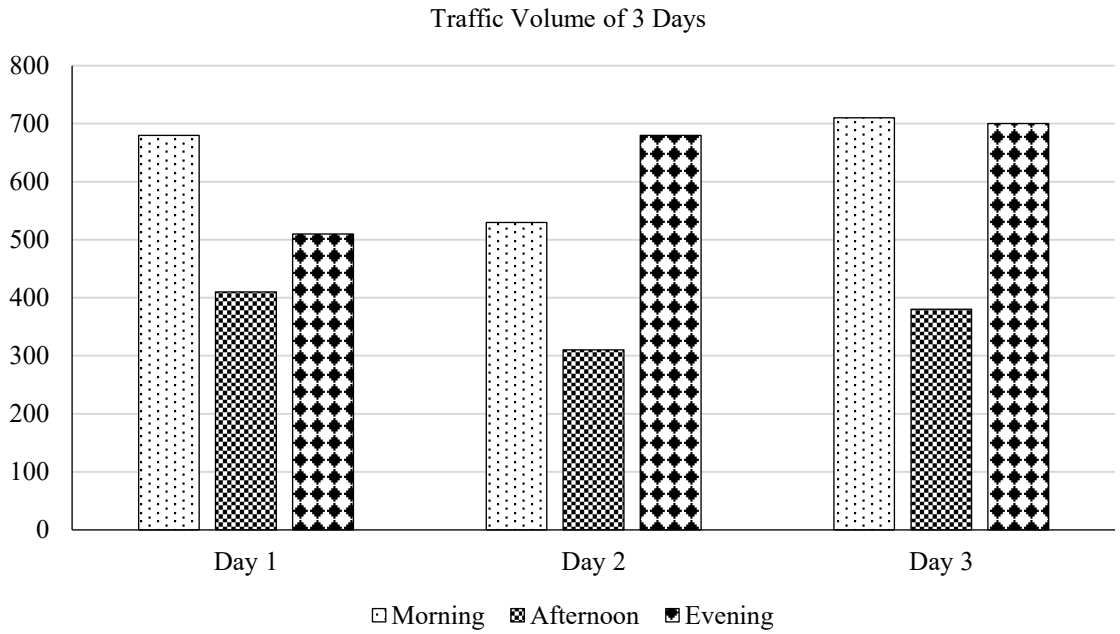


Figure 7. Traffic volume of 3 days.

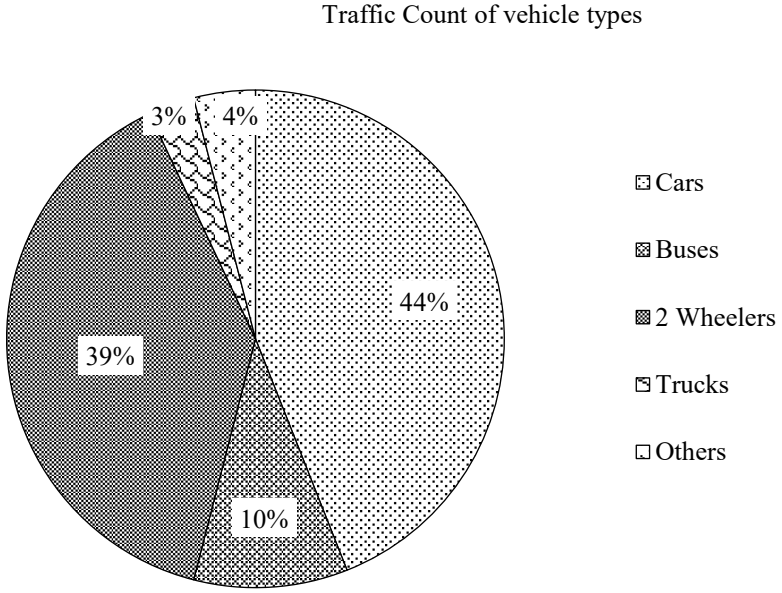
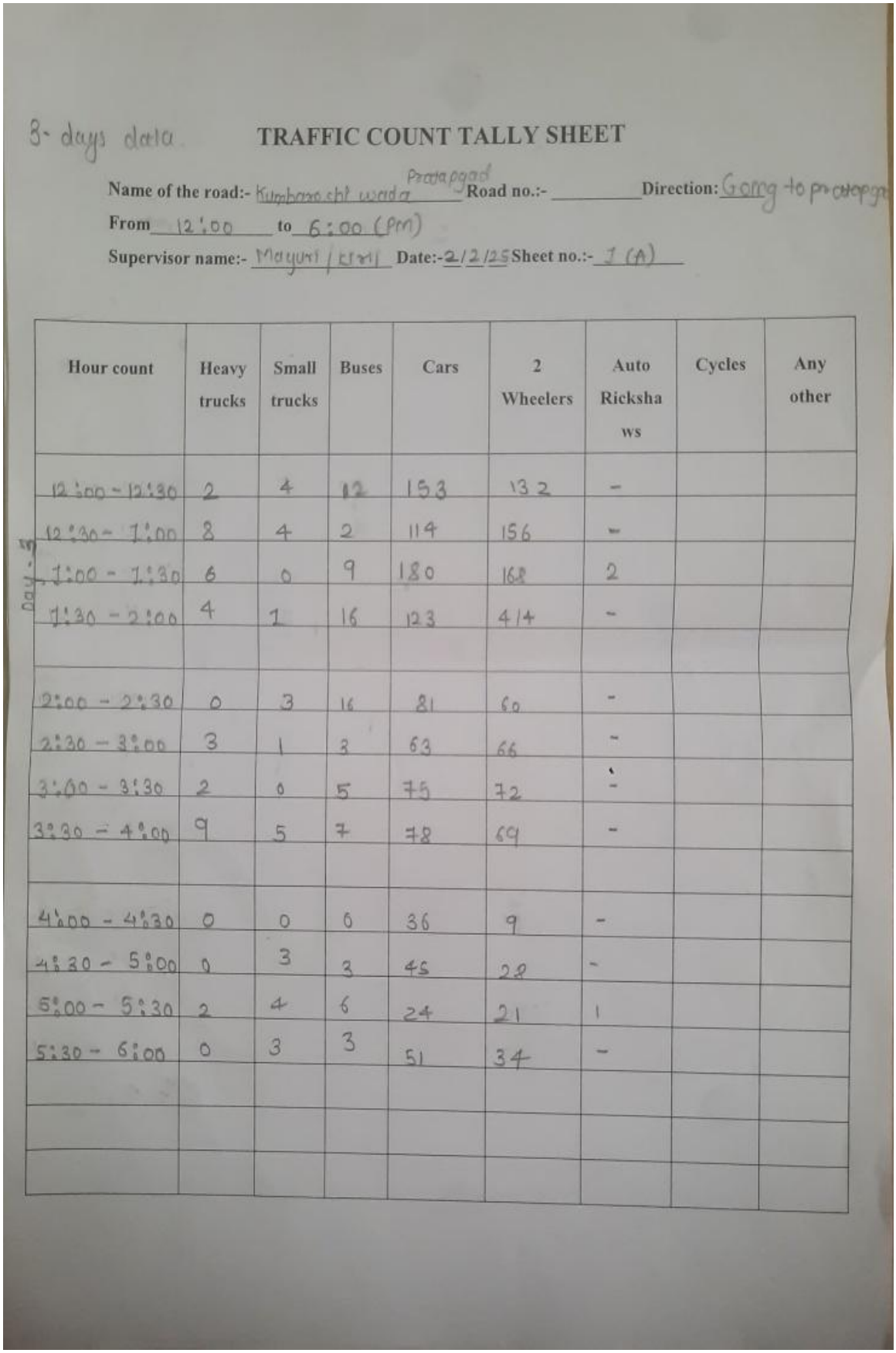


Figure 8. Traffic volume of vehicle type.

The data were collected during the non-peak season. After gathering all the information, it was structured in the form of graphs and tally sheets so that it would be simpler to interpret. The graphs reflect trends, such as rush hours, types of vehicles, and road usage overall, while the tally sheets assist with monitoring the raw counts. It was observed that times of day have high congestion, particularly on roads that are narrow and on busy intersections, from what was found. This data will be beneficial to create improved traffic solutions and to make alterations for smoother movement in Pratapgad (Figures 10–14).



8- days data

TRAFFIC COUNT TALLY SHEET

Name of the road:- Kumbarachi wada Pratapgad **Road no.:-** _____ **Direction:** Going to pratapgad

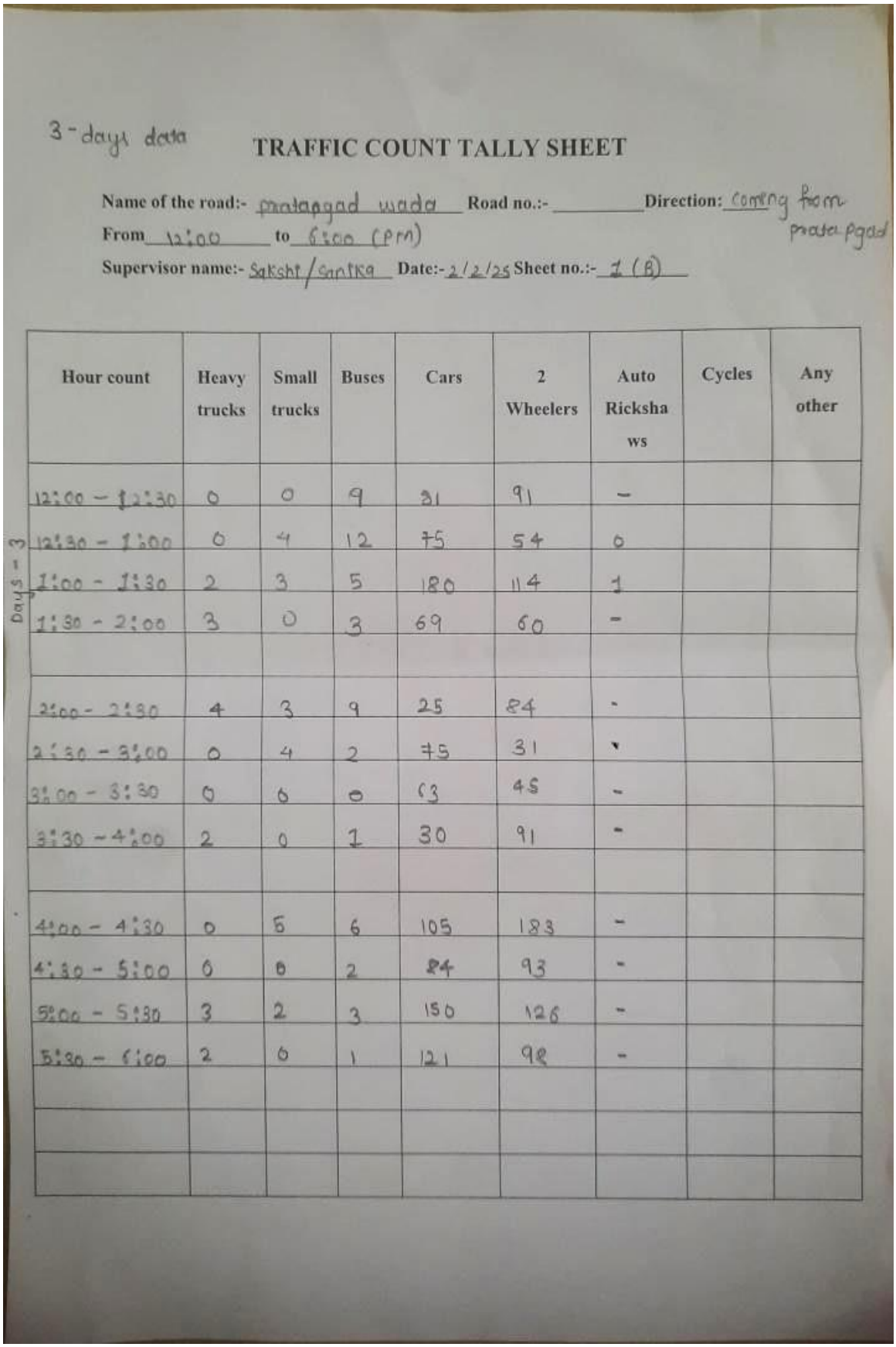
From 12:00 **to** 6:00 (PM)

Supervisor name:- Mayuri / Kiran **Date:-** 2/2/25 **Sheet no.:-** 1 (A)

Day: 5

Hour count	Heavy trucks	Small trucks	Buses	Cars	2 Wheelers	Auto Rickshaws	Cycles	Any other
12:00 - 12:30	2	4	12	153	132	-		
12:30 - 1:00	8	4	2	114	156	-		
1:00 - 1:30	6	0	9	180	168	2		
1:30 - 2:00	4	1	16	123	414	-		
2:00 - 2:30	0	3	16	81	60	-		
2:30 - 3:00	3	1	3	63	66	-		
3:00 - 3:30	2	0	5	75	72	-		
3:30 - 4:00	9	5	7	78	69	-		
4:00 - 4:30	0	0	6	36	9	-		
4:30 - 5:00	0	3	3	45	28	-		
5:00 - 5:30	2	4	6	24	21	1		
5:30 - 6:00	0	3	3	51	34	-		

Figure 9. Tally sheet of vehicle going to Pratapgad.



3-days data

TRAFFIC COUNT TALLY SHEET

Name of the road:- pratapgad wada **Road no.:-** _____ **Direction:** coming from pratapgad

From 12:00 **to** 6:00 (PM)

Supervisor name:- Saksht/Sanika **Date:-** 2/2/25 **Sheet no.:-** 1 (B)

Days - 3

Hour count	Heavy trucks	Small trucks	Buses	Cars	2 Wheelers	Auto Rickshaws	Cycles	Any other
12:00 - 12:30	0	0	9	31	91	-		
12:30 - 1:00	0	4	12	75	54	0		
1:00 - 1:30	2	3	5	180	114	1		
1:30 - 2:00	3	0	3	69	60	-		
2:00 - 2:30	4	3	9	25	84	-		
2:30 - 3:00	0	4	2	75	31	-		
3:00 - 3:30	0	0	0	63	45	-		
3:30 - 4:00	2	0	1	30	91	-		
4:00 - 4:30	0	5	6	105	183	-		
4:30 - 5:00	0	0	2	84	93	-		
5:00 - 5:30	3	2	3	150	126	-		
5:30 - 6:00	2	0	1	121	98	-		

Figure 10. Tally sheet of vehicle coming from Pratapgad.

Figure 11. Photographs of collection of vehicles count survey.

Figure 12. Photograph of location of survey done.

Figure 13. Meeting with the head of police station to collect previous years data.

Figure 14. Measurement of total width of the road of Pratapgad.

Also, the aim of the project is to reduce the accidents of the current route. Collecting data of the accident from police station and it was clear that there are lot of accidents taking place in Pratapgad area. Hence to reduce the accident, this project will play a vital role. The main reason of accident

taking place in that area is that area has a narrow width of the current road, the width of current road is 6.20 m, also the total width being narrow was analyzed as the main reason for lots of accidents happening. The data collected are as mentioned below: Mahabaleshwar to Pratapgad Road 2022 – Total accidents-14 major death-11, Minor accidents-3, Mahad checkpoint Sahyadri Dhaba Haroshi Meth tale Petrol Pump Accident Information. 2023 – Total accidents-10 Minor accidents-most of those at Apsara Hotel Mahabaleshwar 2024 – Total accidents-11 Minor accidents 2025 – Total accidents-8 Minor accidents-mostly at Wada Kumbharoshi. From the police station of Mahabaleshwar-Pratapgad, the recent accident data of the Pratapgad were found and that data are mentioned below.

Accident Data

- *25-03-2024:* The tempo driver who comes for a test ride on Mahabaleshwar Pratapgad ghat road in the limits of Mettale village lost control of the vehicle and tempo broke the guardrail and fell into a deep including the driver, the company's engineer and two injured.
- *14-01-2023:* A horrific road accident occurred. A tempo carrying labors from Buldhana and Akola for work fell into a road Ditch on a steeply slopping road. Initial information has been received. That, there are about 40 labors in this tempo. There is news that small children & two pregnant women were also travelling in this tempo.
- *25-03-2024:* A horrifying accident happened as a tempo carrying passengers, plummeted into a 400-foot gorge in Ghat. The incident sparked rescue operation by The Tracker tear.
- *01-12-2022:* There was a head-on collision between a bus and a car on Wai to Pratapagad road, Mahatrashtra. The collision was so strong that the car was blown to pieces. In the accident travelling 4 people died on the spot. The car driver was saved when the air bag opened.

CONCLUSIONS

The construction of this tunnel will help to reduce the time travelled from Wai (Jor) to Pratapgap by almost 60% and this way increasingly tourist will get attracted towards this place and the economic value of the place will also increase. There will be increase in various businesses like hotels, resorts, entertainment, manufacturing, and shopping, etc. Therefore, it will automatically generate employment in the nearby area. After the construction of this tunnel, the cost of nearby land will increase, and the development of area will also take place. It will contribute to economic growth by generating income and employment. It accounts for the global GDP and will employ one in ten worldwide. After the construction of this project, the rate of international visitors will increase which will help to spread the historic value of Pratapgad fort worldwide. And this can lead to significant sources of foreign revenue for the nation. In this way this tunnel will be beneficial for the place.

- It will improve the connectivity and will reduce traffic congestion.
- It will reduce accidents on the road.
- It will boost economic development in that specific area.

Hence, it can be concluded that after the completion of this project, all these objectives will be achieved, and implementation of the project will take place.

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