International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 06 | June - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

# Transforming Urban Emergency Services: The Proposal of Healthcare Corridors in Cuttack

**[1]Pravash Ranjan Rout, [2]Ar. Siddik Khan**

*[1]M.U.R.P Student, Faculty of Architecture & Planning AKTU, Lucknow, India*
*[2]Assistant Town Planner, Cuttack Municipal Corporation, Odisha, India*

---

**Abstract**

Cuttack, a historic city in Odisha, India, faces significant challenges in emergency healthcare delivery due to urban traffic congestion. This paper proposes the establishment of dedicated emergency corridors within Cuttack's core city region to enhance the efficiency and effectiveness of emergency medical services. The study identifies critical routes and junctions, analyzing current traffic conditions and infrastructure limitations. By designating specific lanes for emergency vehicles, the proposed corridors aim to ensure swift access to hospitals, trauma centers, and other healthcare facilities.

The research highlights the benefits of such corridors, including reduced response times, improved patient outcomes, and enhanced overall disaster preparedness. Key features of the proposal include coordination with traffic management systems, public awareness campaigns, and the use of advanced technology such as GPS tracking and vehicle-to-infrastructure communication.

Recommendations are provided for the implementation and optimization of these corridors, along with potential challenges and solutions. This innovative approach sets a precedent for urban centers facing similar issues, demonstrating the critical role of infrastructure planning in lifesaving emergency response.

**Keywords:** Emergency Corridors, Healthcare Delivery, Urban Traffic Management, Cuttack City, Infrastructure Planning

## Introduction

Cuttack, one of Odisha's oldest cities, is known for its rich cultural heritage and bustling urban environment. However, like many growing urban centers, Cuttack faces significant challenges in managing traffic congestion, particularly in its core areas. This congestion poses a critical threat to the timely delivery of emergency healthcare services. Ambulances, fire trucks, and other emergency vehicles often struggle to navigate through the dense traffic, leading to delays that can be the difference between life and death.To address this pressing issue, this research paper proposes the establishment of dedicated emergency corridors within the core city region of Cuttack.

These corridors are specialized lanes on key roadways that are kept clear for the exclusive use of emergency vehicles, allowing them to bypass traffic congestion and reach their destinations quickly and efficiently. The concept of emergency corridors is not new, but its application in Indian cities, particularly in Cuttack, requires careful planning and execution.

This paper aims to provide a comprehensive overview of the need for emergency corridors in Cuttack, backed by case studies from other cities that have successfully implemented similar systems. It includes detailed route analyses, traffic flow studies, and simulations to identify the most effective paths for these corridors. Furthermore, numerical

data and statistical models will be used to predict the impact of these corridors on emergency response times and patient outcomes.

By integrating advanced technologies such as GPS tracking, vehicle-to-infrastructure communication, and coordinated traffic signal systems, this proposal seeks to enhance the city's emergency preparedness and healthcare delivery. The ultimate goal is to create a sustainable and efficient urban environment where emergency services can operate without hindrance, ensuring the safety and well-being of Cuttack's residents.

**Background**

*Need of study*

Cuttack, a major city in Odisha, India, is known for its dense population and bustling urban life. However, the rapid urbanization has led to severe traffic congestion, especially in the core areas of the city. This congestion significantly hampers the efficiency of emergency medical services, often leading to critical delays in patient care.

Traffic Congestion: According to recent traffic studies, Cuttack experiences high levels of congestion, particularly during peak hours. Major thoroughfares like the Ring Road, Buxi Bazaar, and Badambadi face frequent traffic jams, causing significant delays for emergency vehicles (Singh et al., 2022). The average speed of ambulances during peak hours has been recorded at just 10-15 km/h, far below the required speed for timely medical response.

Emergency Response Delays: The time-sensitive nature of medical emergencies necessitates swift response times. Studies have shown that the survival rates of patients suffering from acute conditions such as heart attacks, strokes, and traumatic injuries decrease significantly with every minute of delay (Patel et al., 2021). In Cuttack, delays of up to 30 minutes have been reported, which can be fatal in critical situations.

Cities like Mumbai and Bangalore have implemented emergency corridors with notable success, reducing response times by up to 50% (Sharma, 2020). These precedents provide a robust framework for implementing similar strategies in Cuttack, tailored to the city’s unique traffic patterns and infrastructure. Modern technologies such as GPS tracking, automated traffic signals, and real-time monitoring can significantly enhance the effectiveness of emergency corridors. These technologies facilitate real-time coordination between emergency vehicles and traffic management systems, ensuring clear paths during emergencies (Rao & Kumar, 2021).

Given the high stakes involved, it is imperative to establish dedicated emergency corridors in Cuttack. This study aims to analyze the feasibility, design optimal routes, and propose an implementation strategy, drawing from successful case studies and leveraging advanced technologies.

*Understanding Emergency Corridors*

Emergency corridors are specially designated lanes on urban roads reserved exclusively for the use of emergency vehicles, such as ambulances, fire trucks, and police cars. These lanes are typically marked with clear signage and road markings to ensure they remain unobstructed. The primary function of emergency corridors is to provide a swift and unhindered passage for emergency services, thereby reducing response times and improving the chances of saving lives.

Functionality: Emergency corridors operate by designating specific lanes on key roadways that are kept clear for emergency use. Traffic management systems, including traffic lights and road signs, are synchronized to facilitate

the quick movement of emergency vehicles through these corridors. In some advanced implementations, GPS tracking and real-time traffic monitoring systems are used to dynamically manage traffic and ensure the corridors remain clear when needed.

*Advantages of Emergency Corridors:*

- Reduced Response Times: By providing a clear path for emergency vehicles, response times can be significantly reduced. For example, in Bangalore, the implementation of emergency corridors has cut down ambulance travel time by up to 50% during peak hours (Sharma, 2020).
- Increased Survival Rates: Faster response times directly correlate with higher survival rates for patients experiencing medical emergencies such as heart attacks or strokes. Timely arrival at the hospital can be crucial for effective treatment (Patel et al., 2021).
- Improved Efficiency: Emergency corridors enhance the overall efficiency of emergency services by reducing the time and effort required to navigate through congested traffic.
- Public Awareness: The establishment of these corridors often comes with public awareness campaigns, educating citizens about the importance of keeping these lanes clear, which can improve overall traffic discipline.

*Disadvantages of Emergency Corridors :*

- Implementation Costs: Setting up emergency corridors can be expensive, involving costs for road markings, signage, and technological integrations like GPS and traffic signal control systems.
- Public Compliance: Ensuring that the general public adheres to the rules and keeps the corridors clear can be challenging. In some cases, there may be resistance or lack of awareness among drivers.
- Maintenance and Monitoring: Continuous monitoring and maintenance are required to keep the corridors effective, necessitating additional resources and infrastructure.

**Case Studies:**

Mumbai, India: The city's implementation of emergency corridors on key routes has led to a notable reduction in ambulance travel times, especially during rush hours. The success of this initiative has prompted plans to expand the network of emergency corridors (Sharma, 2020).

Stockholm, Sweden: Stockholm has integrated advanced technologies such as GPS tracking and automated traffic signal systems to maintain clear emergency corridors. This has not only reduced response times but also improved overall traffic management (Rao & Kumar, 2021).

Bangalore, India: Bangalore's emergency corridor system, which includes designated lanes and synchronized traffic signals, has significantly improved the efficiency of emergency services, cutting response times by nearly half (Sharma, 2020).

**Need for emergency corridors with respect to Cuttack city and its healthcare facilities:**

Cuttack city serves as a hub for medical care, housing a network of hospitals, clinics, and healthcare centers catering to the needs of residents and neighbouring regions. These healthcare institutions play a pivotal role in providing timely medical attention to a diverse population. However, the ever-increasing traffic congestion and the urban

complexities within the core part of the city have led to challenges in ensuring swift healthcare movement during emergencies.

In recent times, the issue of delayed healthcare response due to traffic congestion has become more pronounced. Emergency vehicles,such as ambulances, medical personnel, and life-saving equipment, often find themselves hindered by the gridlock of urban traffic. This delay can prove to be detrimental, as timely medical intervention can be the difference between life and death.

The healthcare landscape in Cuttack includes a range of specialized medical facilities, including government hospitals, private clinics, and tertiary care centers. These institutions collectively serve as a lifeline to the city's residents. However, their effectiveness is compromised when emergency healthcare movement is hampered by traffic bottlenecks, narrow roads, and uncoordinated traffic management.

To address this pressing concern, the implementation of designated emergency corridors within the core area of Cuttack city is proposed These corridors would offer unobstructed pathways for emergency vehicles to swiftly reach their destinations, bypassing traffic congestion. By prioritizing the movement of healthcare services, Cuttack can significantly enhance its emergency response capabilities and ensure that critical medical attention reaches those in need without unnecessary delays.

This proposal aims to provide a comprehensive overview of the need for such corridors, addressing the specific challenges faced by Cuttack's healthcare facilities, and outlining the potential benefits that can be reaped through their implementation.

*Types of Emergency Corridors for healthcare services:*

1. Hospital Emergency Access Corridors - Dedicated lanes providing swift access to major hospitals and trauma centers. Ensures fast ambulance transit.

2. Prehospital Emergency Corridors - For efficient transit of EMTs/paramedics to reach medical emergencies quickly. Access to residences and public event sites.

3. Medical Evacuation Corridors - For mass evacuation and transport of injured/sick from disaster sites to healthcare facilities.

4. Medical Supply Corridors - Fast transit routes for medical supplies like blood, organs, oxygen, and vaccines between storage, hospitals, and labs.

5. Emergency Childbirth Corridors - Providing urgent access for pregnant women to hospitals with obstetric units.

6. Trauma Center Corridors - Specifically designated routes to trauma centers equipped to handle critical injuries, ensuring rapid response and specialized care.

**ROW of the major roads in core city:**

- Jail Road – 30ft ( Tinikonia Bagicha – Gouri Shankar Park)
- Haripur Road – 14-15ft (Seminar Chowk – Jagannath Mandir Chowk)
- Bajrakabati Road – 50ft (Two way)(Median Included – 7-8ft)

- Nuapatna Road – 28-30ft (Manglabag – Ranihat Chowk)
- Mission Road – 26-27ft (Buxibazar Chowk – Chandi Mandir)
- Kanika Road – 21ft (Chandi Mandir to Shelter Chowk)
- Sheikh Bazar Road – 12-13ft (Chandi Mandir to Alisha Bazar narrow corridor)
- Tinikonia Bagicha Road – 18-20ft (BuxiBazar Chowk – Tinikonia Bagicha)
- Link Road – 80ft (Two way) (Median Included – 7-8ft)
- Dolumundai Road – 50ft (Badambadi Square – Jagannath Mandir chowk) (Two way) (Median Included – 3-4ft)
- Malisahi Road – 27 ft (Canal Chhack to Nuapatna Road via BSE School)
- Canal Road – 57ft (Clock Tower – College Square)
- Cantonment Road – 17-18ft (Mastan Road Square – Stadium Square)

**Road and Vehicular Standards required according to MV Act and AIS-125:**

•Width: The overall width of an ambulance should not exceed 2.6 meters as per the Motor Vehicles Act. This allows the vehicle to navigate most roads.

•Turning Radius: The turning radius of an ambulance from lock to lock should not exceed 7.5 meters as per AIS-125 guidelines. This allows the vehicle to take tight turns and U-Turns on roads.

•Ground Clearance: Ambulances require a minimum ground clearance of 160 mm unladen as per AIS-125. This helps them navigate speed breakers and rough terrain.

•Right of Way: Ambulances have the right of way over all other vehicles as per the Motor Vehicles Act. Other vehicles are required to give way to ambulances with flashing beacons and sirens.

•Length: There is no prescribed length for ambulances under Indian standards. However, a ambulance length ranges from 5-7 meters to accommodate patients and equipment.

*Figure 1 Ambulance Standard Dimensions (AIS)*

typical


*Figure 2 Major Junction Nodal points*

**SITE PHOTOS:**

**Chandini Chowk Square**

**High Court Square**

**Badambadi Square**

**Badambadi Square – Kathajodi Road**

**Cantonment Road – Mata Matha**

**Stadium Road – Chandi Chhack**

**Mata Matha – Nuapatna Road**

**Chandi Chhack – Sheikh Bazar**

**Bajrakabati Road - Dolamundai Chowk**

**Bajrakabati Road Canal Chowk**

**Canal Road To Mali Sahi Road**

**Mali Sahi Road**

**Nuapatna Road To Ranihat Chowk**

**Tinikonia Bagicha To Jail Road**

**Mata Matha – Nuapatana Road**

**Jail Road – City Hospital Stretch**

**Kanika Chowk – Chandi Road**

**Kanika Chowk – Shelter Chowk**

**Shelter Chowk**

**Ranihat Chowk**

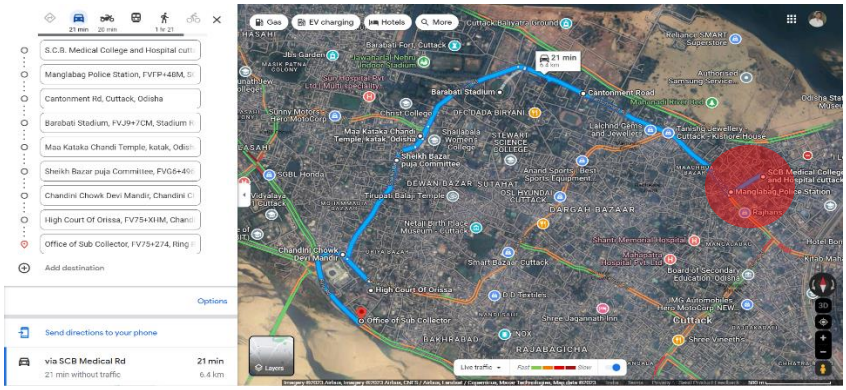
*Figure 3 Site Images*

*Major Junctions and Nodes identified:*

1. Chandi Chowk (Religious centric zone)
2. Chandini Chowk Square (Tertiary economy zone)
3. Cantonment Square (Institutional zone)
4. BuxiBazar Square (Tertiary economy zone)
5. Manglabag Square (Hospital and associated services zone)
6. Seminar Chowk (Residential and Fish godown zone)
7. Jhola Sahi – Rippon Road Chowk (Wholesale market)
8. Ranihat Chowk (Institutional zone)
9. Dolumundai Chowk (Tertiary economy zone)
10. Badambadi Chowk (Transit corridor zone)

**IDENTIFIED MAJOR ROUTES:**

***Route 1 : SCB – Manglabag – Nuapatna – Cantonment Road – Barabati Stadium – Chandi Mandir – Sheikh Bazar – Chandini Chowk – High Court***




**Impact**: Significant reduction in travel time by 80-85% will drastically improve emergency response efficiency.

*Figure 4 Route 1 Mapping*

**Normally it takes around 25-45mins considering variable traffic conditions in the day to cover the 6.4kms, but with corridor at min 60km/h speed it would take around 6-8mins. (Primary Survey and Google Maps)*

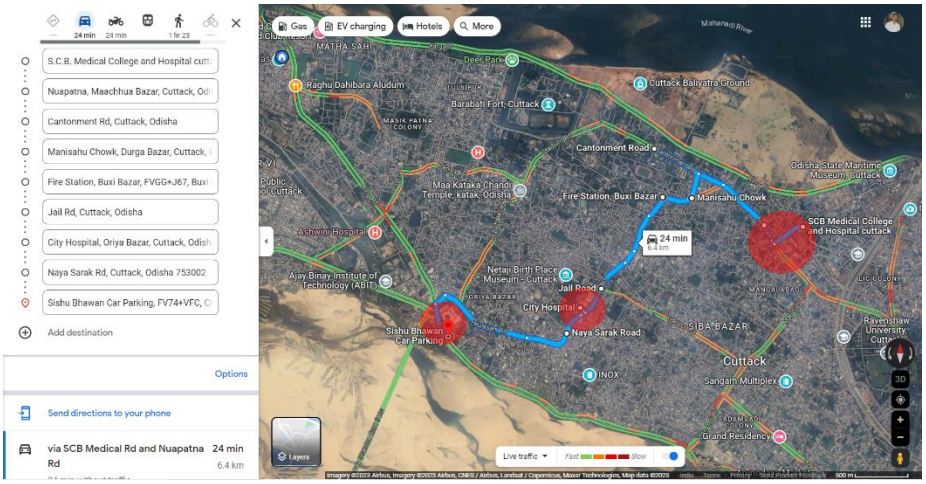
***Route 2 : Ring Road – Ashwini Hospital – Sati Choura – Kafla Chowk – Shelter Chowk – Kanika Chowk – Chandi Chowk – Mission Road - Buxi Bazar Chowk – Nuapatna – Manglabag – SCB***


**Impact**: This route covers multiple key healthcare facilities, ensuring quick access in emergencies.

*Figure 5 Route 2 Mapping*

**Normally it takes around 30-45mins considering variable traffic conditions in the day to cover the 6.5kms, but with corridor at min 60km/h speed it would take around 6-8mins. (Primary Survey and Google Maps)*

***Route 3 : SCB – Manglabag – Nuapatna – Cantonment Road – ManiSahu Chowk – Fire Station – BuxiBazar – Jail Road – City Hospital – NayaSarak – Sishu Bhawan***

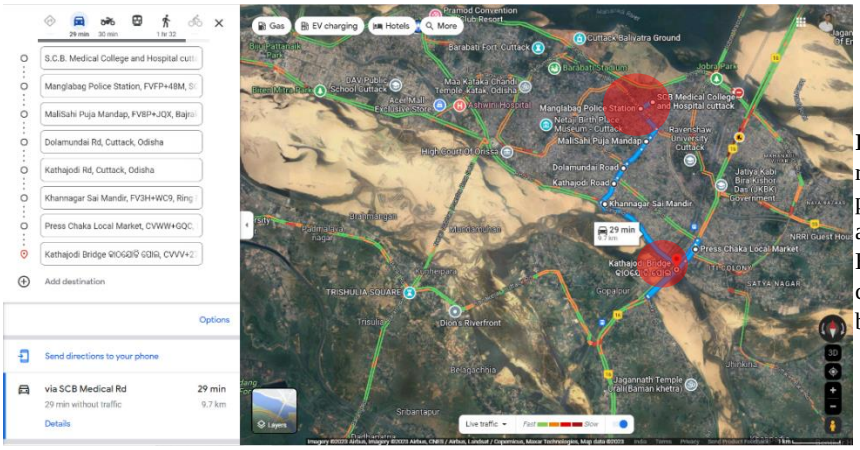



**Impact**: Essential for reaching paediatric care swiftly, minimizing delays in critical child health emergencies.

*Figure 6 Route 3 Mapping*

**Normally it takes around 30-45mins considering variable traffic conditions in the day to cover the 6.5kms, but with corridor at min 60km/h speed it would take around 6-8mins. (Primary Survey and Google Maps)*

***Route 4: SCB – Manglabag – Ranihat Chowk – Malisahi Road – Bajrakabati Road – Dolumundai Road – Kathajodi Road – Ring Road- Khannagar Road – Press Chaka Market – NH towards Bhubaneswar***

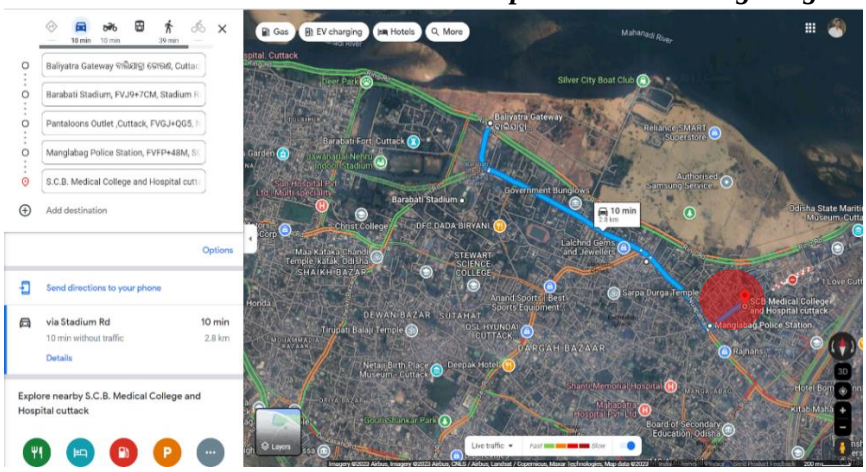



**Impact**: Facilitates rapid transfer of patients needing advanced care in Bhubaneswar, cutting travel time by about 70-75%.

*Figure 7 Route 4 Mapping*

**Normally it takes around 35-50mins considering variable traffic conditions in the day to cover the 9.7 kms, but with corridor at min 60km/h speed it would take around 10-12 mins to be on highway towards Bhubaneswar. (Primary Survey and Google Maps)*

***Route 5 : Ring road - Stadium Chowk – Mata Matha – Nuapatna Road – Manglabag Chowk - SCB***




**Impact**: Quick access route ensuring rapid response within core city areas.

*Figure 8 Route 5 Mapping*

**Normally it takes around 15-20 mins considering variable traffic conditions in the day to cover the 2.8 kms, but with corridor at min 60km/h speed it would take around 3-4 mins. (Primary Survey and Google Maps)*

*Inferences:*

The existing road infrastructure in both core and outer city area are dilapidated with time. With increasing urbanization and increase in number of amenities, the growth has slowly spewed the transit zone. Number of vehicles has also increased in magnitudes. This has crippled the transit infrastructure. As Cuttack is mostly favored for health infrastructure in both Odisha and eastern India due available of proper amenities, the inflow of health tourism has boomed over years.

The proposed emergency corridors in Cuttack are highly feasible given the city's traffic congestion and critical need for timely medical response. By drastically reducing travel times on major routes, these corridors will significantly enhance emergency healthcare delivery. The strategic implementation, leveraging existing roadways and advanced traffic management technologies, aligns well with Cuttack's urban layout and infrastructure capabilities. This approach will not only improve patient outcomes but also set a precedent for other urban centers in India facing similar challenges

**Stakeholder Engagement**

Stakeholder engagement is crucial for the successful implementation of emergency corridors in Cuttack city. Key stakeholders and their roles include:

1. Municipal Corporation of Cuttack (Overall project planning and execution, Allocating budget and resources)
2. Traffic Police (Managing traffic flow during implementation, Enforcing corridor rules and regulations)
3. Emergency Services (Ambulance, Fire, Police) (Providing input on route design and operational needs, Training staff on corridor usage protocols, Participating in drills and simulations)
4. Hospitals and Healthcare Facilities (Collaborating on corridor route planning, Preparing staff for improved emergency response times)
5. Local Residents and Commuters (Adhering to corridor rules and giving way to emergency vehicles)
6. NGOs and Community Organizations (Assisting in public awareness campaigns, Monitoring corridor effectiveness)
7. Urban Planners and Traffic Engineers (Designing optimal corridor routes, Addressing infrastructure challenges)

Effective engagement of these stakeholders involves regular meetings, workshops, and public consultations. The Municipal Corporation should lead a coordinated effort to gather input, address concerns, and build consensus among all parties.

Continuous feedback loops and performance monitoring will help refine the system over time, ensuring its long-term success and maximizing benefits for Cuttack's emergency healthcare delivery.

**PROPOSALS:**

**Classified emergency corridors according to the present ROW of the roads:**

*TYPOLOGY I: Two way road without median with One-Way Emergency corridor provision (Clearance width of 2.1ms emergency corridor)*

1) 10’ - 15’ Two Way Road Without Median
2) 15’ – 20’ Two Way Road Without Median


*Figure 9 Proposal Section 10'-20 roads'*

*TYPOLOGY II: Two-way road without median with Two-Way Emergency corridor provision*

3) 20’ – 30’ Two Way Road Without Median (Clearance width of 2.4ms emergency corridor)
4) 30’ – 40’ Two Way Road Without Median (Clearance width of 2.4ms emergency corridor)
5) 40’ – 50’ Two Way Road Without Median (Clearance width of 2.8ms emergency corridor)
6) 50’ – 70’ Two Way Road Without Median (Clearance width of 3.0ms emergency corridor)

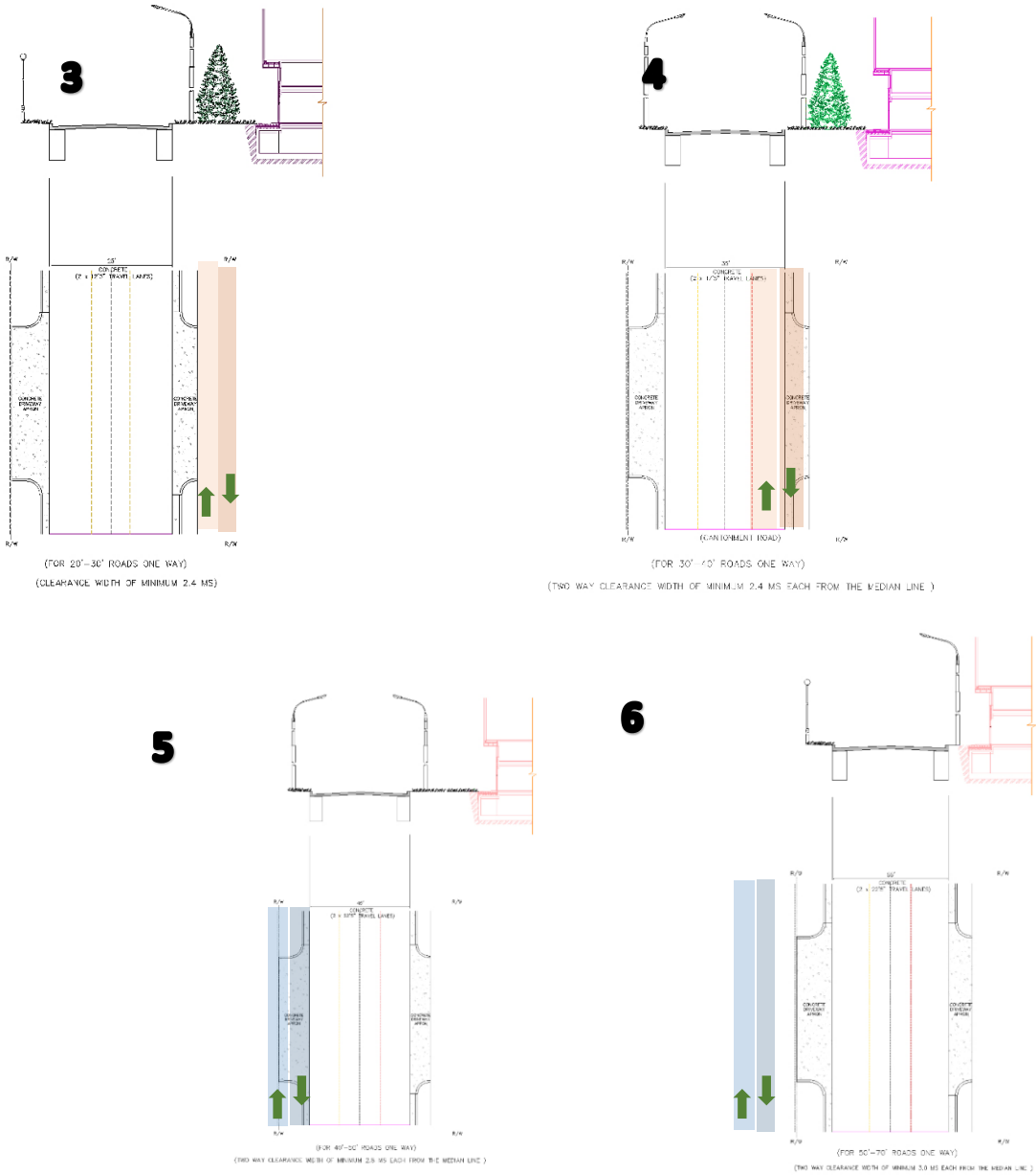



*Figure 10 Proposal Section 20' - 70' roads*

*TYPOLOGY III: Two-way road with median with Two-Way Emergency corridor provision*

7) 30' – 40' Two Way Road With Median (Clearance width of 3.1ms emergency corridor)
8) 50' – 70' Two Way Road With Median (Clearance width of 3.8ms emergency corridor)
9) >70' Two Way Road With Median (Clearance width of 4.9ms emergency corridor)

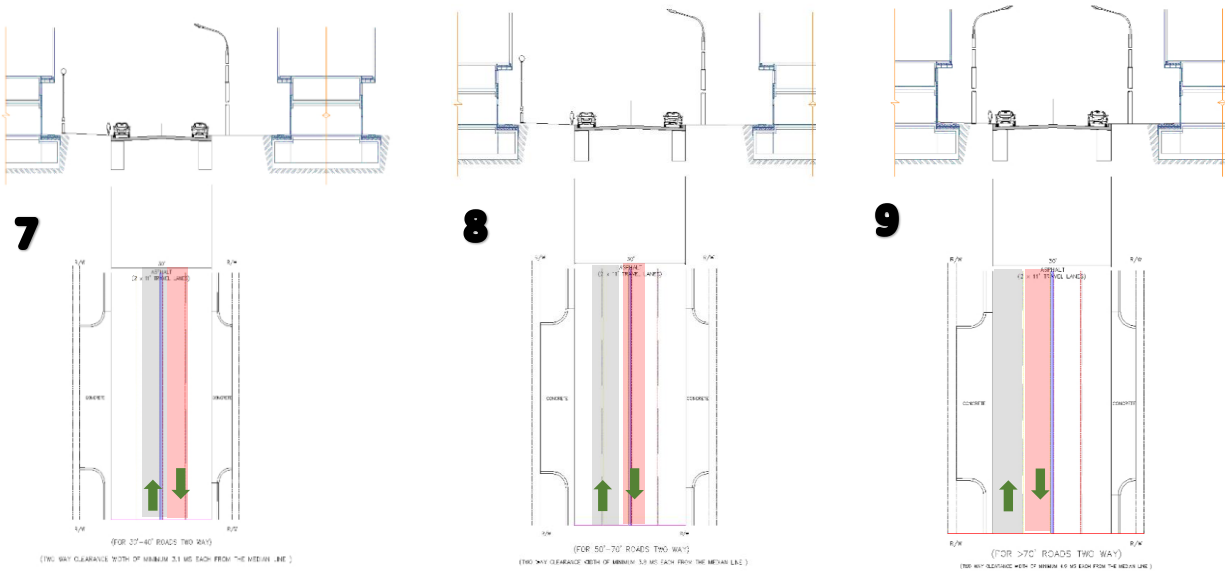



*Figure 11 Proposal Section 30'- 70' roads*

*TYPOLOGY IV: Bottlenecks and Width Crampage*

- Deploy mobile traffic police on bikes at the bottleneck corners to manually guide and alternate the flow of vehicles to give priority to the ambulance.
- Use portable traffic cones to dynamically change lane allocations and create space for the ambulance to pass through.
- Encourage private vehicles to pull over into building driveways or side lanes to maximize road space for the ambulance.
- For extremely narrow streets, stop traffic movement completely in both directions for the short time when the ambulance will be passing through.
- Create alternative narrower lanes for non-emergency vehicles during the green corridor times.
- Deploy portable traffic lights at blind corners to allow quick alternating one-way flow for the ambulance.

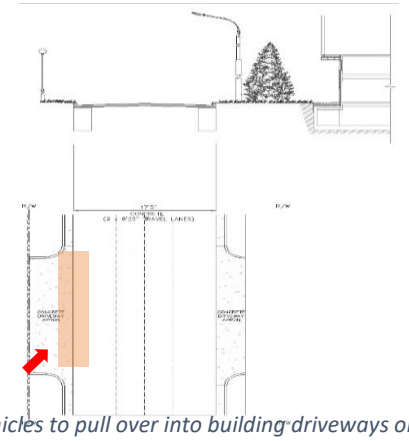


*Figure 12 Private vehicles to pull over into building driveways or side*

**3D simulation of the emergency corridor situations in different categories of road:**

*Nodal junction with two way road with median section: (e.g: Badambadi at-grade Intersection)*

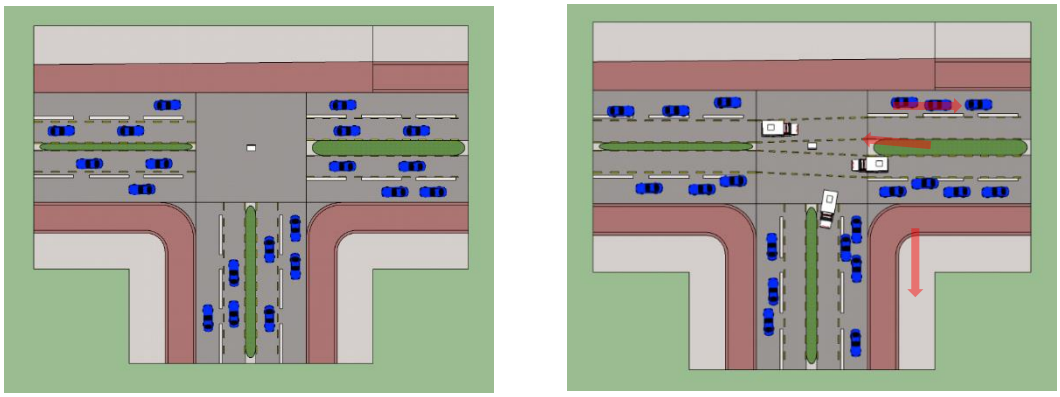


*Figure 13 Initial and Final situation for Nodal junction with two way road with median section*

a) Normal transverse of vehicles with emergency corridor marking on road length
b) Working mechanism of Emergency corridor

*Two way road without median section and marginal pavement: (e.g: Nuapatna Road)*

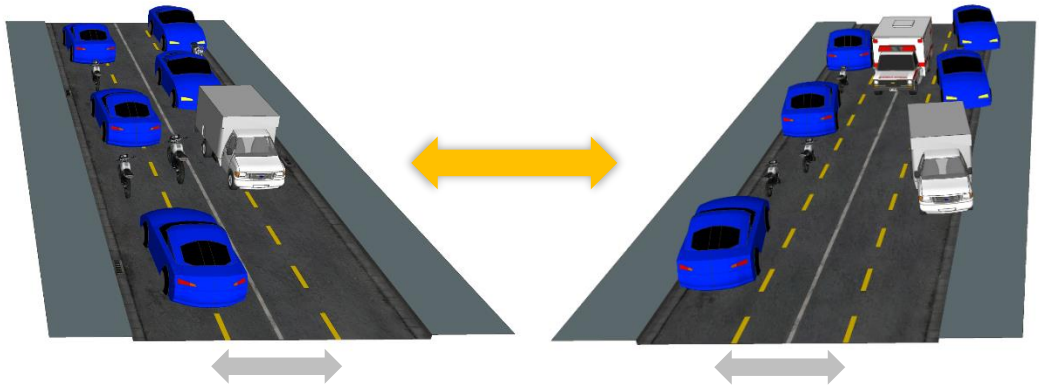


*Figure 14 Initial and Final situation for Two way road without median section and marginal pavement*

a) Normal flow of vehicles with emergency corridor marking on road length
b) Working mechanism of Emergency corridor (yellow marking)

*Two way road with median section: (e.g: Dolumundai Road)*

*Figure 15 Initial and Final situation for Two way road with median section*

a) Normal transverse of vehicles with emergency corridor marking on road length
b) Working mechanism of Emergency corridor (yellow marking)

**Estimated Cost-Benefit Analysis**

*Initial Setup Costs:*

- Infrastructure (road widening, signal systems): ₹50 crores
- Technology (traffic monitoring systems, GIS): ₹10 crores
- Training and Capacity Building: ₹2 crores
- Public Awareness Campaigns: ₹1 crore

*Annual Maintenance Costs:*

- Infrastructure Maintenance: ₹5 crores
- Technology Upkeep: ₹2 crores

*Benefits:*

- Reduction in Emergency Response Time: Average time saved per emergency trip is 30 minutes.
- Estimated Number of Emergency Trips Annually: 20,000
- Value of Time Saved: ₹2000 per minute (based on estimated cost of delayed treatment, lives saved, etc.)
- Environmental Benefits: Reduction in carbon emissions (equivalent to ₹1 crore annually)

**Step-wise Calculation**

*Initial Setup Costs:*

- Infrastructure: ₹50 crores
- Technology: ₹10 crores
- Training: ₹2 crores
- Awareness: ₹1 crore
- Total Initial Setup Costs: ₹63 crores

*Annual Maintenance Costs:*

- Infrastructure Maintenance: ₹5 crores
- Technology Upkeep: ₹2 crores
- Total Annual Maintenance Costs: ₹7 cror

*Annual Benefits:*

- Time Saved per Emergency Trip: 30 minutes
- Total Time Saved Annually: 30 minutes/trip * 20,000 trips = 600,000 minutes
- Monetary Value of Time Saved: 600,000 minutes * ₹2000/minute = ₹120 crores
- Environmental Benefits: ₹1 crore

**Total Annual Benefits: ₹121 crores**

**Net Benefits Calculation:**

*Year 1:*

- Costs: ₹63 crores (initial setup) + ₹7 crores (annual maintenance) = ₹70 crores
- Benefits: ₹121 crores
- Net Benefit (Year 1): ₹121 crores - ₹70 crores = ₹51 crores

*Subsequent Years:*

- Costs: ₹7 crores (annual maintenance)
- Benefits: ₹121 crores
- Net Benefit (Subsequent Years): ₹121 crores - ₹7 crores = ₹114 crore

*5-Year Projection:*

- Year 1: Net Benefit = ₹51 crores
- Year 2-5: Net Benefit = ₹114 crores/year
- Total 5-Year Net Benefit: ₹51 crores (Year 1) + 4 * ₹114 crores (Years 2-5) = ₹51 crores + ₹456 crores = ₹507 crores

***Summary***

Initial Setup Costs: ₹63 crores

Annual Maintenance Costs: ₹7 crores

Annual Benefits: ₹121 crores

Net Benefit (Year 1): ₹51 crores

Net Benefit (Subsequent Years): ₹114 crores/year

**Total 5-Year Net Benefit: ₹507 crore**

**Recommendations:**

- Use temporary traffic cones, barricades, or markers to reserve ambulance lanes on multi-lane roads. These should be at least 3.5 meters wide.
- Deploy traffic police at all intersections and signals to stop conflicting traffic and give priority to ambulances.
- Use electronic sign boards along the corridor to alert normal traffic about ambulance movement.
- Paint the ambulance corridor green on roads and highways to visually distinguish it. Use a bright green shade for maximum visibility.
- Install flashing green lights along the corridor at strategic locations to guide the ambulance drivers.
- Use GPS vehicle tracking to monitor ambulance movement and coordinate traffic signals accordingly.
- Develop right-of-way (ROW) protocols for ambulances to use bus lanes or contra-flow lanes wherever feasible.
- Encourage other vehicles to not just give way but also safely pull over to the side as much as possible.
- Earmark dedicated parking spots for ambulances along the corridor for quick stops if needed.
- Conduct public outreach and awareness campaigns to educate citizens to give way to ambulances. Encourage community participation.
- Maintain constant communication between ambulance drivers and traffic controllers to respond dynamically to any obstructions.
- Analyse post-implementation data to identify improvements in ambulance run times and refine the corridors further.

**Software-based solutions:**

1. Develop a central command center software to monitor ambulance movement and coordinate traffic signals.
2. Integrate GPS tracking of ambulances into the software for real-time visibility.
3. Allow ambulance drivers to trigger green corridor priority via mobile apps.
4. Use traffic simulation software to model and optimize ambulance routing and signal timings.
5. Employ V2I (vehicle-to-infrastructure) communication protocols for ambulances to "talk" to traffic signals.
6. Develop mobile apps to alert normal commuters about ongoing green corridor usage.

**Hardware deployments:**

1. Install roadside electronic sign boards that can be controlled remotely via software.
2. Deploy traffic cameras at intersections along the corridor for centralized monitoring.
3. Equip ambulances with GPS units and specialized beacons that emit V2I signals.
4. Install radio frequency transceivers along the route to enable long range low-latency wireless communication.
5. Use fiber optic networking for reliable high-speed data transfer between nodes.
6. Employ edge computing units for localized real-time decision making and control.

**Conclusion:**

The implementation of emergency corridors in Cuttack will proceed through several key stages:

1. Comprehensive traffic study and route identification
2. Corridor design and technological solution development
3. Infrastructure modifications (road markings, signage, signal upgrades)
4. Public awareness campaign launch
5. Pilot phase on select routes
6. Adjustments based on pilot feedback

7. Full-scale implementation

This phased approach ensures thorough planning and allows for necessary adjustments before city-wide rollout.

The establishment of emergency corridors in Cuttack marks a pivotal advancement in urban healthcare delivery.

Key aspects of this initiative include:

- Addressing critical traffic congestion issues impeding emergency response
- Significant reduction in ambulance travel times
- Improved patient outcomes through faster access to medical care

Drawing from successful implementations in Mumbai and Bangalore, Cuttack's system is customized to its unique urban landscape and healthcare needs. The multi-faceted approach combines:

Infrastructure modifications, Advanced technologies (GPS tracking, vehicle-to-infrastructure communication), Community engagement.

The project demonstrates a nuanced understanding of Cuttack's infrastructure through classified typologies of emergency corridors and designs accommodating varied road widths

The inclusive approach fosters collective responsibility and cooperation, crucial for sustainable implementation.

While challenges in implementation and maintenance are anticipated, the potential benefits are substantial. The emergency corridors will:

- Save lives through faster emergency response
- Set a precedent for urban planning prioritizing emergency services
- Potentially catalyze similar initiatives in other Indian cities

As Cuttack embarks on this transformative journey, it not only addresses its own urban healthcare challenges but also paves the way for a broader shift in emergency response strategies across India. The success of this initiative could inspire and inform similar projects in other cities, contributing to a nationwide improvement in emergency medical services.

**References**

- Singh, A., Gupta, R., & Kumar, S. (2022). Traffic Congestion Analysis in Cuttack City. Journal of Urban Transport, 14(2), 123-135.
- Patel, M., Jain, P., & Mehta, R. (2021). Impact of Delayed Emergency Response on Patient Outcomes. Indian Journal of Emergency Medicine, 10(1), 45-50.
- Sharma, V. (2020). Implementation of Emergency Corridors in Indian Cities: A Case Study of Mumbai and Bangalore. Urban Planning Review, 22(4), 321-340.
- Rao, K., & Kumar, P. (2021). Enhancing Emergency Response with Modern Technology. Technology in Healthcare, 5(3), 198-210.

- Ministry of Road Transport and Highways. (1988). The Motor Vehicles Act, 1988. Government of India. [Include the most recent amendment year if available]
- Automotive Industry Standards Committee. (2014). AIS-125: Requirements for Construction and Functional Safety of Ambulance Vehicles. Automotive Research Association of India, Ministry of Road Transport and Highways, Government of India.


**BIOGRAPHIES**

Pravash Ranjan Rout is an architect and urban planner with a Bachelor's in Architecture from VSSUT and Master's in Urban and Regional Planning from FOAP, AKTU. He has professional experience working on government infrastructure projects, master planning, and architectural design. Rout is a member of the Council of Architecture, Government of India and has expertise in geospatial technologies, climate resilience planning and urban policy formulation.