

Enhancing Sports through Efficient Transport and Connectivity

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Abstract: *Transport and connectivity are important for the development and accessibility of sports in India. The economic impact of transport infrastructure on sports is extensive, as major events like the Indian Premier League (IPL) and international cricket matches attract thousands of attendees, boosting local economies through tourism, hospitality, and related industries. The construction and maintenance of sports infrastructure create job opportunities and stimulate economic growth. The Union Budget 2024-25 emphasizes government investments in transport and sports infrastructure, highlighting their critical role in India's economic growth. Efficient transport networks, including roads, railways, and air travel, enhance accessibility for athletes, coaches, and fans, facilitating regular training, competitions, and talent scouting. In urban areas, the development of metro lines and bus services has significantly eased commuting to sports facilities, while transport connectivity in rural areas is key to discovering hidden athletic talent. Transport and connectivity also promote social and cultural integration through sports, bringing together people from different regions and backgrounds, promoting unity and a sense of community. Efficient transport networks enable fans to travel and support their teams, creating a vibrant and universal sports culture, especially during national and international events. Despite progress, challenges such as inadequate transport facilities in certain regions and accessibility issues for disabled sports fans persist. Addressing these challenges requires continued investment in transport infrastructure and innovative solutions, such as Geographic Information Systems (GIS), which can enhance sports accessibility by mapping facilities and transport networks, optimizing routes, and planning new infrastructure. In conclusion, transport and sports connectivity are integral to the growth and development of sports in India, enhancing accessibility, driving economic growth, and promoting social and cultural integration. Addressing existing challenges and investing in efficient transport networks will ensure that sports in India continue to grow and achieve new milestones.*

Keywords: Transport and connectivity, Sports development, Accessibility, Urban transport, Transport challenges, Disabled accessibility, Geographic Information Systems (GIS)

1. INTRODUCTION

The role of transportation and connectivity in shaping the landscape of sports in India is undeniably significant. India's diverse geography and extensive population present distinct challenges and opportunities in establishing an effective transport network that facilitates sports development. This network's importance transcends mere convenience, influencing economic advancement, social cohesion, and the overall quality of life. The country's varied terrain, which includes mountainous regions, sprawling urban areas, and isolated rural locales, poses unique logistical hurdles. A well-functioning transport system has been essential in overcoming these geographical barriers, ensuring that sports facilities and events are reachable for everyone, irrespective of their location. Athletes hailing from remote villages have particularly depended on dependable transport solutions to access training facilities and competitions located in urban centers.

With a population exceeding 1.3 billion, the complexity of transport planning has intensified, necessitating infrastructure that meets a diverse array of needs, including those related to sports travel. This demand has highlighted the necessity for a robust and adaptable transport network capable of accommodating large audiences during significant sporting events. The interplay between transport infrastructure and sports development is multifaceted, with one of the most prominent effects being economic. Major sporting events such as the Indian Premier League (IPL) and international cricket matches draw in large crowds, generating substantial revenue for local economies. This surge of visitors invigorates various sectors, including tourism, hospitality, and retail, thereby creating job opportunities and supporting local enterprises.

Investments in transport infrastructure yield long-term economic advantages. Enhanced connectivity diminishes travel times and expenses, facilitating easier access to sports venues and events. This improved accessibility encourages greater participation in sports, both from athletes and spectators, contributing to the expansion of the sports industry and its associated economic benefits.

Furthermore, transport infrastructure is crucial in fostering social and cultural integration through sports. Sporting events serve as a platform for individuals from diverse regions and backgrounds to unite, cultivating a sense of collective identity and national pride. Efficient transport networks enable the movement of fans, athletes, and officials, ensuring that everyone can

engage in and experience these events. During national tournaments or international matches, supporters travel from various corners of the country to cheer for their teams, enriching the sports culture with vibrancy and inclusivity. This movement not only enhances the experience of events but also promotes cultural exchange and understanding among different communities.

Accessibility to sports facilities is vital for both athlete development and fan enjoyment. A well-organized transport network allows athletes to consistently attend training sessions, competitions, and talent scouting events without encountering significant logistical obstacles. This is especially crucial for young and aspiring athletes who depend on accessible training venues to refine their skills. For fans, convenient access to sports arenas improves their overall experience and encourages higher attendance rates at events. Public transportation options, including metro lines and bus services, have been instrumental in providing affordable and convenient travel to sports venues. Such accessibility has cultivated a dedicated fan base and contributed to the commercial viability of sports events.

Recognizing the essential role of transport infrastructure in sports development, the Indian government has prioritized investments in this area. The Union Budget for 2024-25 has highlighted the significance of transport and sports infrastructure, allocating considerable resources for the enhancement and expansion of these networks. Government initiatives aim to improve connectivity, stimulate economic growth, and elevate the quality of life for citizens. These investments are not confined to urban settings; they also target the enhancement of transport infrastructure in rural and remote regions. By doing so, the government seeks to foster a more inclusive sporting environment where athletes and fans from all regions of the country can access and benefit from sports facilities and events.

In summary, transport and connectivity have been integral to the evolution and accessibility of sports in India. An efficient transport network has bridged geographical gaps, driven economic growth, encouraged social and cultural integration, and improved accessibility for both athletes and fans. Acknowledging these advantages, the Indian government is committed to investing in transport and sports infrastructure, ensuring that India continues to thrive as a nation that promotes and celebrates sports at every level. The relationship between transport infrastructure and sports development in India is profound; it serves as a foundational element supporting the country's sporting ambitions and accomplishments.



Fig -1: Transportation

1.1 Need of Study

- I. India's diverse geography and vast population pose unique challenges and opportunities for creating an efficient transport network for sports development.

- II. Major sporting events like the IPL generate substantial revenue and create job opportunities, highlighting the economic impact of transport infrastructure.
- III. Transport networks promote social and cultural integration by allowing people from different regions to attend sporting events, fostering unity and national pride.
- IV. Reliable transport options ensure athletes can regularly attend training and competitions, while fans have easy access to sports venues.
- V. The Indian government prioritizes investments in transport and sports infrastructure to enhance connectivity, stimulate economic growth, and improve quality of life, including in rural and remote areas.

2. Tools and Methodologies

A multi-faceted approach is essential to thoroughly investigate the impact of transport and connectivity on sports development. To achieve a comprehensive understanding, the following tools and methodologies are employed.

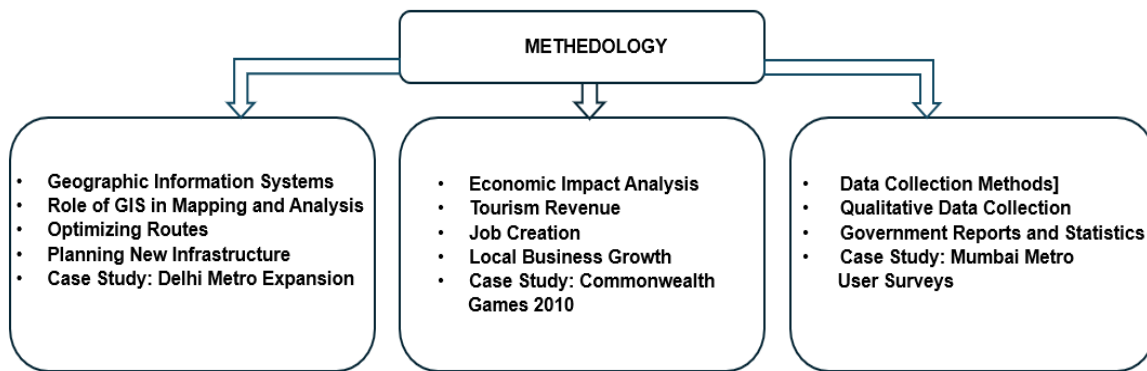


Fig -2: Methodology segregation

2.1 Geographic Information Systems (GIS)

Role of GIS in Mapping and Analysis: Geographic Information Systems (GIS) technology is instrumental in visualizing and analyzing spatial data related to transport networks and sports facilities. GIS allows for the creation of detailed maps that highlight the locations of sports venues, existing transport routes, and areas lacking adequate connectivity. This spatial analysis is crucial for identifying gaps in infrastructure and planning new projects to enhance accessibility.

2.1.1 Optimizing Routes:

GIS can optimize travel routes for athletes, coaches, and fans by analyzing traffic patterns, road conditions, and other relevant factors. By determining the most efficient paths, GIS helps reduce travel time and costs, making it easier for individuals to reach sports facilities. For example, GIS can suggest alternative routes during peak traffic hours or identify the shortest paths between different venues.

2.1.2 Planning New Infrastructure:

GIS is also valuable for planning new transport infrastructure projects. By overlaying demographic data with existing transport and sports facilities, planners can identify high-demand areas that require new infrastructure. This ensures that resources are allocated effectively, and new projects are developed where they are most needed.

2.1.3 Case Study: Delhi Metro Expansion:

In Delhi, GIS technology was used to plan the expansion of the metro network. By analyzing population density, traffic patterns, and the locations of key sports venues, planners were able to design routes that maximized accessibility and minimized disruption. The resulting metro lines have significantly improved connectivity to sports facilities across the city.

2.2 Economic Impact Analysis:

Economic impact analysis is essential for evaluating the economic benefits of transport infrastructure investments. This involves assessing various factors such as tourism revenue, job creation, and local business growth. By quantifying these

contributions, the analysis provides a clear picture of the economic benefits that transport infrastructure brings to the community.

2.3 Tourism Revenue:

Major sporting events attract tourists from across the country and abroad, generating substantial revenue for local economies. Economic impact analysis measures the financial contributions of these tourists, including spending on accommodation, food, transportation, and entertainment. For example, during the IPL season, cities hosting matches experience a surge in tourism, boosting the hospitality and retail sectors.

2.4 Job Creation:

Transport infrastructure projects create numerous job opportunities, both during construction and in the long term. Economic impact analysis evaluates the number of jobs created, their duration, and the sectors benefiting from these opportunities. For instance, the construction of new metro lines requires skilled labor, engineers, and administrative staff, while the ongoing operation and maintenance of these services provide sustainable employment.

2.5 Local Business Growth:

Improved transport connections can lead to increased footfall for local businesses, stimulating economic growth. Economic impact analysis examines how new transport infrastructure influences consumer behavior and spending patterns. For example, easier access to sports venues can attract more visitors to nearby restaurants and shops, boosting their revenue.

2.6 Case Study: Commonwealth Games 2010:

The Commonwealth Games held in Delhi in 2010 had a significant economic impact on the city. Economic impact analysis revealed that the event generated substantial tourism revenue, created thousands of jobs, and stimulated local business growth. The improved transport infrastructure, including the expanded metro network, played a crucial role in these economic benefits.

2.7 Data Collection Methods

2.7.1 Qualitative Data Collection:

Qualitative data collection methods involve gathering descriptive information that provides deeper insights into the experiences and perspectives of individuals. Interviews with key stakeholders, such as transport planners, sports administrators, and athletes, offer valuable qualitative data. These interviews can explore the challenges and benefits of transport connectivity in greater detail, uncovering issues that may not be evident from quantitative data alone.

2.7.2 Government Reports and Statistics:

Government reports and statistics provide valuable secondary data for the study. These documents include information on transport infrastructure projects, funding allocations, and performance metrics. Analyzing this data helps to understand the broader context of transport and sports development and to benchmark the progress against national and international standards.

2.8 Case Study: Mumbai Metro User Surveys: User surveys conducted on the Mumbai Metro provide a wealth of quantitative data about passenger experiences. These surveys collect information on travel times, ticket costs, and satisfaction levels, helping to identify strengths and areas for improvement. Additionally, interviews with metro staff and city planners provide qualitative insights into the operational challenges and successes of the metro system.

So, by employing a multi-faceted approach that includes GIS technology, economic impact analysis, and comprehensive data collection methods, the study provides a thorough investigation into the impact of transport and connectivity on sports development in India. These tools and methodologies ensure that the analysis is robust, data-driven, and capable of informing effective policy recommendations and infrastructure planning.

2.8 Literature Review and Case Studies

Efficient transport networks are essential for enhancing accessibility, driving economic growth, and promoting social and cultural integration in sports. This synthesis lays the groundwork for informed decision-making and strategic planning to improve transport connectivity and support the growth of sports in India.

Successful sports events and infrastructure projects in both India and internationally. By examining specific examples, the study aims to extract valuable insights and identify best practices that can inform future projects.

2.8.1 Indian Case Studies:

Metro Lines in Delhi and Mumbai: The development of metro lines in these urban areas has significantly improved accessibility to sports facilities. For instance, the Delhi Metro provides convenient and affordable transport options for fans attending events at major venues such as the Jawaharlal Nehru Stadium. Similarly, the Mumbai Metro has enhanced connectivity to sports complexes, reducing travel time and congestion.

Commonwealth Games 2010: Hosted in Delhi, the Commonwealth Games 2010 required substantial investment in transport infrastructure. The government expanded the metro network, improved road conditions, and upgraded public transport services to accommodate the influx of athletes and spectators. The event demonstrated the positive impact of transport improvements on the successful hosting of a major sports event.

2.8.2 International Case Studies:

London Olympics 2012: The London Olympics serve as a prime example of how integrated transport planning can support large-scale sporting events. The city invested heavily in upgrading its transport networks, including the expansion of the London Underground, construction of new railway lines, and enhancement of road infrastructure. These efforts ensured seamless movement of athletes, officials, and spectators, contributing to the overall success of the games.

Sydney Olympics 2000: Sydney's transport strategy for the 2000 Olympics focused on maximizing public transport use and reducing reliance on private vehicles. The city introduced new bus and rail services, improved existing infrastructure, and implemented traffic management measures. This approach not only facilitated efficient transport during the event but also left a lasting legacy of improved transport infrastructure for the city.

2.8.3 International Comparisons

By comparing the transport and sports infrastructure strategies of other countries, the study aims to identify potential strategies that India can adopt. International comparisons provide a broader perspective on best practices, innovative solutions, and successful integration of transport and sports infrastructure.

2.8.4 United Kingdom:

The UK's extensive transport network has played a crucial role in hosting major sporting events such as the Olympics and Commonwealth Games. The government's proactive approach to transport planning, investment in infrastructure, and emphasis on public transport have set a benchmark for other countries.

2.8.5 Australia:

Australia's experience with hosting the Sydney Olympics and the Commonwealth Games offers valuable lessons in transport planning and infrastructure development. The country's focus on public transport, sustainable practices, and community engagement provides a model for enhancing transport connectivity in support of sports development.

By synthesizing the insights gained from the literature review, case studies, and international comparisons, the study aims to develop a comprehensive understanding of the interplay between transport infrastructure and sports development. This understanding will inform recommendations for policy and practice, ensuring that India can effectively leverage transport connectivity to foster sports growth and achieve new milestones.

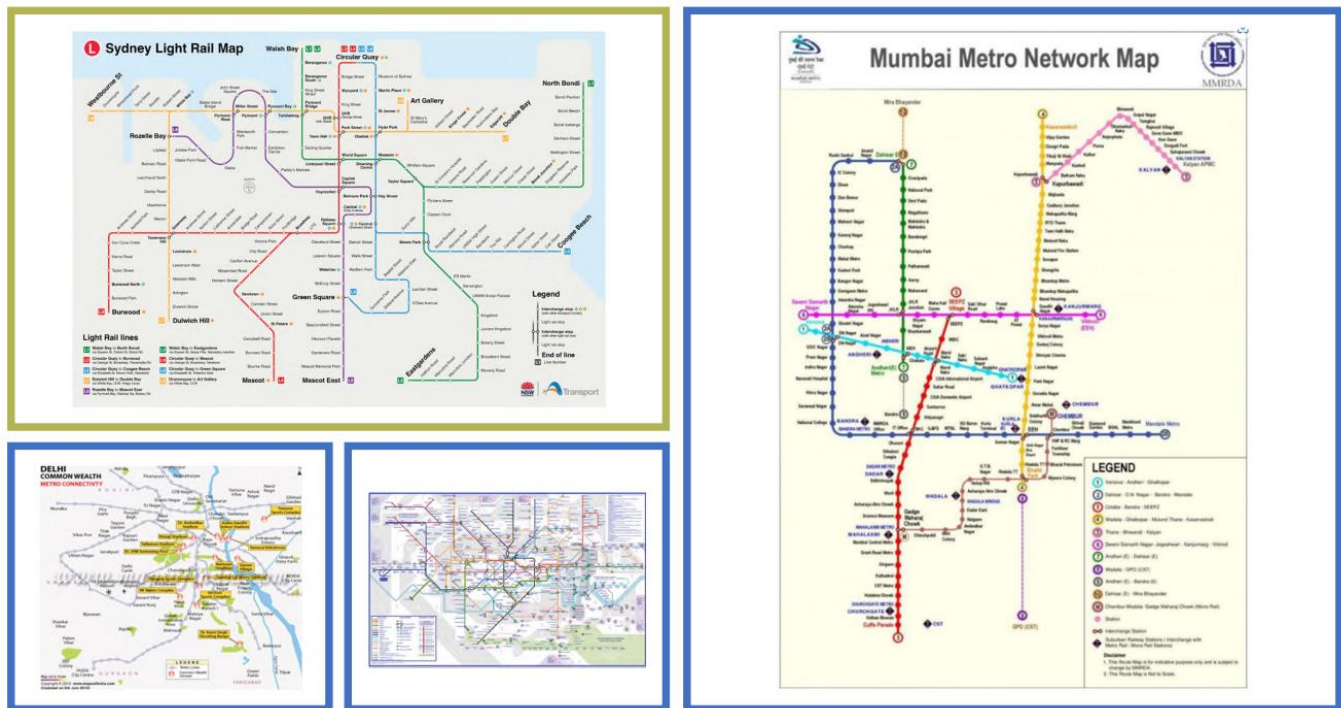


Fig -3: Sydney Metro Map, Mumbai Metro Map, Delhi Metro Map, London Metro Map

Table -1:

Comparison					
Property	Delhi Metro (India)	Mumbai Metro (India)	Commonwealth Games 2010 (India)	London Olympics 2012 (UK)	Sydney Olympics 2000 (Australia)
Event /Project	Metro Development	Metro Development	Commonwealth Games Infrastructure	Olympics Infrastructure	Olympics Infrastructure
Location	Delhi, India	Mumbai, India	Delhi, India	London, United Kingdom	Sydney, Australia
Main Focus	Improving urban transport	Enhancing urban transport	Expanding metro network, improving roads	Upgrading transport networks, new rail lines	Public transport use, reducing private vehicles
Impact on Accessibility	Significantly improved accessibility to sports facilities	Enhanced connectivity to sports facilities	Facilitated movement of athletes and spectators	Seamless movement of athletes, officials, and spectators	Efficient transport during the event, lasting legacy of improved transport
Economic Impact	Reduced travel time and costs, boosted local businesses	Reduced congestion, increased public transport use	Generated tourism revenue, created job opportunities	Boosted local economy through tourism and infrastructure development	Stimulated economic growth through infrastructure projects
Social and Cultural Integration	Facilitated attendance at sports events,	Improved accessibility for diverse	Enhanced national pride, promoted cultural exchange	Fostered a sense of community, supported	Promoted social cohesion, engaged local communities

	promoted community engagement	populations, fostered social cohesion		cultural integration	
Challenges Addressed	Traffic congestion, inadequate transport options	Urban traffic, long commute times	Infrastructure gaps, transport inefficiencies	Overcrowding, transport delays	Traffic congestion, over-reliance on private vehicles
Innovative Solutions	Expansion of metro lines, integration with other transport modes	Introduction of new metro lines, improved existing infrastructure	Upgraded public transport services, expanded metro network	Expansion of London Underground, construction of new railway lines	Introduction of new bus and rail services, traffic management measures

3. Findings

The findings of the study reveal several key points that underscore the critical role of transport infrastructure in the development of sports in India. Here is a detailed elaboration on these points:

3.1 Enhanced Accessibility

Efficient transport networks, including roads, railways, and air travel, are essential for enhancing accessibility for athletes, coaches, and fans. This accessibility facilitates regular training, competitions, and talent scouting, which are vital for the development and promotion of sports.

3.1.1 Urban Areas:

The introduction of metro lines in urban areas, such as Delhi and Mumbai, has significantly reduced travel time and costs for people traveling to sports facilities. This has made it easier for athletes to attend training sessions and for fans to attend sporting events. For example, the Delhi Metro has connected several key sports venues, making them more accessible to the public.

3.1.2 Rural Areas:

In rural areas, improved transport connectivity has helped uncover hidden athletic talent by making it easier for scouts to travel to remote locations and for athletes from these areas to access training facilities. For instance, the development of better road networks in rural regions has enabled young athletes to travel to urban centers for training and competitions, providing them with opportunities that were previously unavailable.

3.2 Economic Growth

The development of transport infrastructure has a significant economic impact. Major sporting events attract tourists, generate revenue for local businesses, and create job opportunities.

3.2.1 Tourism and Hospitality:

Major sporting events like the Indian Premier League (IPL) draw thousands of attendees, boosting local economies through tourism, hospitality, and related industries. Hotels, restaurants, and retail businesses benefit from the influx of visitors, leading to increased sales and profits.

3.2.2 Job Creation:

The construction and maintenance of sports infrastructure create numerous job opportunities, both temporary and permanent. For example, the development of new stadiums, training centers, and transport links requires skilled labor, engineers, and administrative staff. Additionally, the ongoing operation and maintenance of these facilities provide sustainable employment opportunities.

3.2.3 Revenue Generation:

Events like the IPL contribute to the local economy through ticket sales, merchandise, and tourism. The spending by visitors and fans during these events boosts local businesses and generates significant revenue for the host cities.

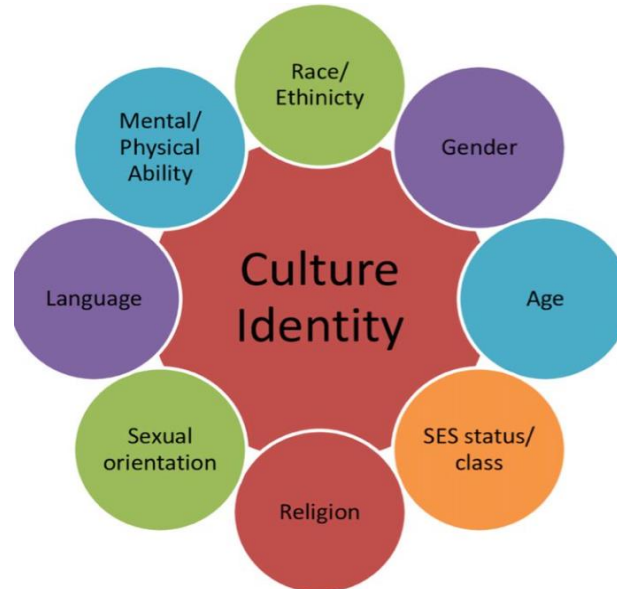


Fig -5 : Social and Cultural Integration

3.3 Social and Cultural Integration:

Transport infrastructure promotes social and cultural integration by bringing together people from different regions and backgrounds. Sporting events provide a platform for cultural exchange and foster a sense of community and national pride.

3.4 Cultural Exchange:

During national and international sports events, fans travel from various parts of the country to support their teams, promoting cultural exchange and understanding. This movement of people helps break down regional barriers and fosters a sense of unity and national identity.

3.5 Community Building:

Sports events create a sense of community and belonging among fans. The shared experience of attending a live event, cheering for a team, and celebrating victories together fosters social cohesion. Efficient transport networks facilitate this by making it easier for people to come together and participate in these communal activities.

4. Challenges:

Despite the progress made in improving transport infrastructure, several challenges persist.

4.1 Inadequate Facilities:

Inadequate transport facilities in certain regions, particularly rural areas, limit accessibility to sports facilities. This disparity in infrastructure development creates barriers for athletes and fans from these areas, preventing them from fully participating in sports activities.

4.2 Accessibility Issues for Disabled Sports Fans:

There are significant accessibility issues for disabled sports fans. Many transport facilities lack the necessary infrastructure to accommodate individuals with disabilities, such as accessible buses, trains, and stations. Addressing these issues requires continued investment and innovative solutions to create a more inclusive environment.

4.3 Traffic Congestion:

Urban areas often face traffic congestion, which hinders the smooth movement of athletes and fans. Insufficient public transport options further exacerbate this problem, leading to longer travel times and increased frustration for commuters.

The study concludes that transport and connectivity are integral to the growth and development of sports in India. They enhance accessibility, drive economic growth, and promote social and cultural integration. Addressing the existing challenges requires continued investment in transport infrastructure and innovative solutions like Geographic Information Systems (GIS) to optimize routes, plan new infrastructure, and improve connectivity.

Table -2:

The key findings of the study:	
Category	Details
4.1 Enhanced Accessibility	Efficient Transport Networks: Essential for athletes, coaches, and fans. Urban Areas: Metro lines in cities like Delhi and Mumbai reduce travel time and costs. Rural Areas: Improved connectivity helps uncover hidden athletic talent.
4.2 Economic Growth	Tourism and Hospitality: Major events boost local economies. Job Creation: Development of infrastructure creates jobs. Revenue Generation: Events like IPL contribute through ticket sales, merchandise, and tourism.
4.3 Social and Cultural Integration	Cultural Exchange: National and international events promote cultural exchange. Community Building: Sports events foster a sense of community and national pride. Challenges: Persistent issues in transport infrastructure, particularly in rural areas. Inadequate Facilities: Limits accessibility to sports facilities. Accessibility for Disabled Fans: Lack of necessary infrastructure. Traffic Congestion: Urban areas face congestion issues.

This table provides a concise overview of the study's findings on the role of transport infrastructure in the development of sports in India.

5, Results and Conclusion

The study concludes that transport and connectivity are integral to the growth and development of sports in India. They enhance accessibility, drive economic growth, and promote social and cultural integration. Addressing the existing challenges requires continued investment in transport infrastructure and innovative solutions.

5.1 Innovative Solutions

Geographic Information Systems (GIS) offer a powerful tool for enhancing sports accessibility. By mapping facilities and transport networks, optimizing routes, and planning new infrastructure, GIS can help overcome current challenges and improve connectivity.

5.2 Policy Recommendations

The study recommends the following policy measures:

5.2.1 Increased Investment in Transport Infrastructure

Targeted Investment: Allocate more funds to develop transport infrastructure in underserved regions, especially rural areas, to improve accessibility to sports facilities. This can help uncover hidden athletic talent and promote sports participation in these regions.

5.3 Urban Transport Development:

Continue to invest in and expand urban transport networks, such as metro lines and bus services, to enhance connectivity and reduce congestion. Prioritize projects that connect key sports facilities to ensure easy access for athletes, coaches, and fans.

5.3.1 Inclusive Transport Solutions

Accessibility for Disabled Individuals: Implement inclusive transport solutions to ensure accessibility for disabled sports fans. This includes accessible buses, trains, stations, and walkways. Develop policies that mandate accessibility features in all new transport infrastructure projects.

Training and Awareness Programs:

Conduct training and awareness programs for transport staff to assist disabled individuals effectively. Promote a culture of inclusivity and sensitivity towards the needs of all passengers.

5.4 Integration of Sports and Transport Planning

5.4.1 Collaborative Planning:

Foster collaboration between transport and sports planning authorities to create synergies between the two sectors. Ensure that sports facilities are well-connected by public transport and that transport planning takes into account the needs of sports events and facilities.

5.4.2 Infrastructure Development:

Integrate sports facility development with transport infrastructure projects. For example, when planning new metro lines or bus routes, consider proximity to existing or planned sports facilities to enhance accessibility.

5.5 Adoption of Best Practices

5.5.1 Learning from International Examples:

Study and adopt best practices from countries that have successfully integrated transport and sports infrastructure, such as the UK and Australia. Implement strategies that have proven effective in enhancing accessibility and supporting major sports events.

5.5.2 Sustainable Transport Solutions:

Promote sustainable transport solutions, such as public transport, non-motorized transport options (e.g., cycling and walking paths), and electric vehicles. Encourage the use of public transport during major sports events to reduce traffic congestion and environmental impact.

5.5.3 Utilization of Geographic Information Systems (GIS)

Route Optimization:

Utilize GIS technology to map sports facilities and transport networks, identify areas with inadequate connectivity, and plan new infrastructure. GIS can help optimize routes, making it easier for athletes, coaches, and fans to reach their destinations efficiently.

5.6 Resource Allocation:

Use GIS data to allocate resources effectively, ensuring that investments are directed towards areas with the highest need for improvement. GIS can provide valuable insights for strategic planning and decision-making.

5.6.1 Economic Incentives and Support

Public-Private Partnerships:

Encourage public-private partnerships to fund and develop transport infrastructure projects. Private sector involvement can bring in additional resources, expertise, and innovation, contributing to the overall success of infrastructure development.

Incentives for Development:

Offer economic incentives, such as tax breaks and subsidies, to companies that invest in transport infrastructure projects that support sports development. This can attract more investment and accelerate the development of essential infrastructure.

1) Community Engagement and Awareness

Public Participation:

Engage local communities in the planning and development of transport and sports infrastructure projects. Involve stakeholders in decision-making processes to ensure that their needs and concerns are addressed.

Awareness Campaigns:

Conduct awareness campaigns to promote the benefits of improved transport connectivity for sports development. Highlight the economic, social, and cultural advantages of investing in transport infrastructure to garner public support and participation.

By implementing these policy recommendations, India can enhance the synergy between transport infrastructure and sports development, driving economic growth, promoting social and cultural integration, and ensuring inclusive accessibility. Continued investment, innovative solutions, and collaborative planning are essential to achieving these goals and fostering the growth of sports in India.

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