SHAPING THE FUTURE OF URBAN TRANSPORT:*IN HYDERABAD*

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Abstract : This research paper examines the feasibility of establishing the Multi-Modal Transit Hubs (MMTH) to develop a sustainable and efficient solution to the urban mobility issues prevailing in the city of Hyderabad. Further, the concept of MMTH already established in other countries has been discussed to emphasize the fact that a successful plan on MMTH will provide a better experience to the users, promoting the usage of the public transport system and decreasing the reliance on personal vehicles along with the reduction of the overall greenhouse gas emissions. The paper also emphasizes the regions prevailing with less connectivity among the intermodal nodes and lack of connection to the last mile. The research results indicate that strategically located MMTH can be an important Tool for initiating sustainable transformation of Urban Development and creating inclusive, resilient and transit-oriented development in Hyderabad.

Indian cities are experiencing rapid urbanization, resulting in issues such as increased roads, pollution, and several gaps in the transportation systems. Issues in Indian cities can be illustrated with the help of Hyderabad. Due to the rise in population and the rise in the number of vehicles owned, there was pressure on the systems of Hyderabad. Though Hyderabad had multiple Transport systems: Metro, Suburban, Bus, and Intermediate, the gaps in coordinating the various transports made accessibility to them, along with efficient movement, very poor.

Key words :- [*public transport , multi model integration , transit hub , sustainable transport]*

INTRODUCTION

Transportation in a city is analogous to the human body's nervous system because it provides means for people to move, connect and create an economy. In megacities of India, where urbanization is occurring very quickly, horizontal urban sprawl has produced longer travel distances and more congestion. This highlights t he need for a cohesive and integrated public transport system, rather than having isolated modes of transport. As discussed further in the report titled Multi-Modal Transport Hubs: The Future of Urban Transit in India, multi-modal transport hubs are junction points that integrate different modes of transport (e.g., road transport, rail transport, metro transit, bus transit, etc.) to help facilitate ease of commuting while also reducing the overall use of private motor vehicles and improving mobility efficiency. Multi-modal transport hubs also combine other passenger service functions (i.e., ticket purchasing, waiting spots) to reduce the number of people on the streets and the resulting traffic congestion and environmental pollution in our cities.

Now, in Hyderabad, the MMTS, Metro Rail, Outer Ring Road, and even large bus terminals exist, but in spite of that, the association of one complete integration of multimodalism in transportation has been a stumbling block on travel within the city and has made last-mile connectivity quite complicated, having over-dependence on a private car. The proposal by the experts is to not just integrate the first and last mile, but also the tube stations at stations along the routes. Pedestrian access to buses, metros, and feeder services will then result in these metro stations having multi-modal hubs. Big cuts can be made in time for movement with such connections and facilities for the pedestrian and may also day remove to some extent the same amount of traffic on our roads thus establishing more sustainable and user-friendly urban mobility. Hyderabad, for example.

1.1 WHAT'S MULTI MODEL TRANSIT HUB ?

Multi-Modal Transit Hubs are facilities that provide services for passengers to transfer between different modes of transportation, such as buses, trains, etc. These transit hubs allow for multiple vehicles carrying passengers and cargo, which reduces the amount of time it takes to get to a destination and makes it easier for people to transfer from one vehicle to another.

In addition, many transit hubs offer services to assist customers with their transfer experiences, including ticket taking, waiting areas, food services, etc., which is referred to as "intermodal" services. Around the globe many of the world's smartest cities are now incorporating multi-modal transit hubs into their transportation models in order to promote reduced dependence on personal vehicles.

The COVID-19 Pandemic has accelerated the trend toward increased personal vehicle usage among people due to the need to maintain safe physical distances between individuals, and this has created a growing need for a better public transportation system that individuals can rely upon. The growing global demand for safer, cleaner, and more effective transportation systems makes multi-modal transit hubs the future of urban transportation.

2. AIM

To design and develop a sustainable, effective, and integrated Multi-Modal Conveyance mecca in Hyderabad that enhances connectivity between colorful modes of transportation, reduces traffic, and promotes flawless civic mobility while supporting socio-profitable development and reducing environmental impact.

3. OBJECTIVES

- To converge multiple modes of transit including bus, metro, rail, car and non-motorized transport together into a cohesive hub.
- To provide accessibility universally to all user types, including differently-able, elderly or young individuals.
- To encourage and develop sustainable urban mobility by applying eco-friendly design concepts to maximize the use of public transport.
- To establish a dynamic open space supporting social interaction, commercial activity and community engagement.

4. SCOPE OF PROJECT

- Integrating different road services & creating a flexible interchange between them
- Connecting to the site & responding to the existing context especially towards the existing commercial establishments there
- Creating & promoting commercial activities at the Transit Hub to generate economy for the functioning & maintenance of the Transit Hub

5. ANALYSIS OF POPULATION

Hyderabad's metropolitan region is home to about 11 million people. The city's rapid growth started in 1950 and has been adding about 269,000 people each year, giving it an average growth rate of 2.43%. These numbers come from the most current revision of the UN World Urbanization Prospects. The statistics capture the Hyderabad Urban Geographic area that consists of the city of Hyderabad and its connected suburbs and outlying areas, which provide the bulk of the demand and supply for transportation services in Hyderabad.

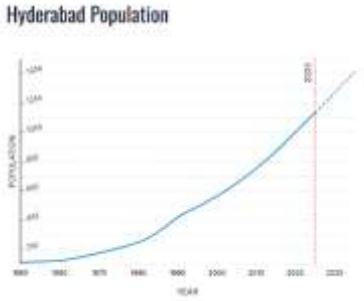


fig 1: population

6. HISTORY

The journey of Hyderabad's transport history can be traced through a series of phases starting from the traditional methods and casting a glance at the present day through the Nizam-era railways and the Nizam State Rail & Road Transport Department (NSRRTD) in the 1930s, down to the buses and suburban MMTS of the Telangana State Road Transport Corporation (TSRTC) today and the privately funded Hyderabad Metro, signaling tremendous progress in city access and transportation to modern urban areas.

6.1 Early Days & Colonial Era:

Nizam's State Railway: The development of the transportation infrastructure was one of the major accomplishments of the Nizams as the Nizam's Guaranteed State Railway built the most significant tracks and lines, including the Hyderabad Deccan station, which became the hub for trains coming to and going from the city.

NSRRTD (1932): The Nizam State Rail & Road Transport Department was set up as the railway's, and it also started state-run bus services with a meager fleet which were the initial public road transport.

6.2 Post-Independence & Growth:

TSRTC (1950s onwards): The NSRRTD turned into the Telangana State Road Transport Corporation (TSRTC), which served diverse bus services and became the major means of transport for the city and inter-city travel.

Road Networks: Urbanization brought about the need for new and better roads, with Hyderabad expanding its road network to provide access to and link the twin cities and the surrounding areas.

6.3 Modern Mass Transit (Late 20th/21st Century):

MMTS (2003-2005): In order to tackle the problem of increasing traffic, the state government along with South Central Railway introduced the Multi-Modal Transport System (MMTS) for suburban rail that began in 2003 and fully operational by 2005.

Hyderabad Metro (2015 onwards): The innovative Public-Private Partnership (PPP) model allowed the construction and operation of the Hyderabad Metro, which is India's first private metro system, providing elevated rail transit and revolutionizing urban transport.

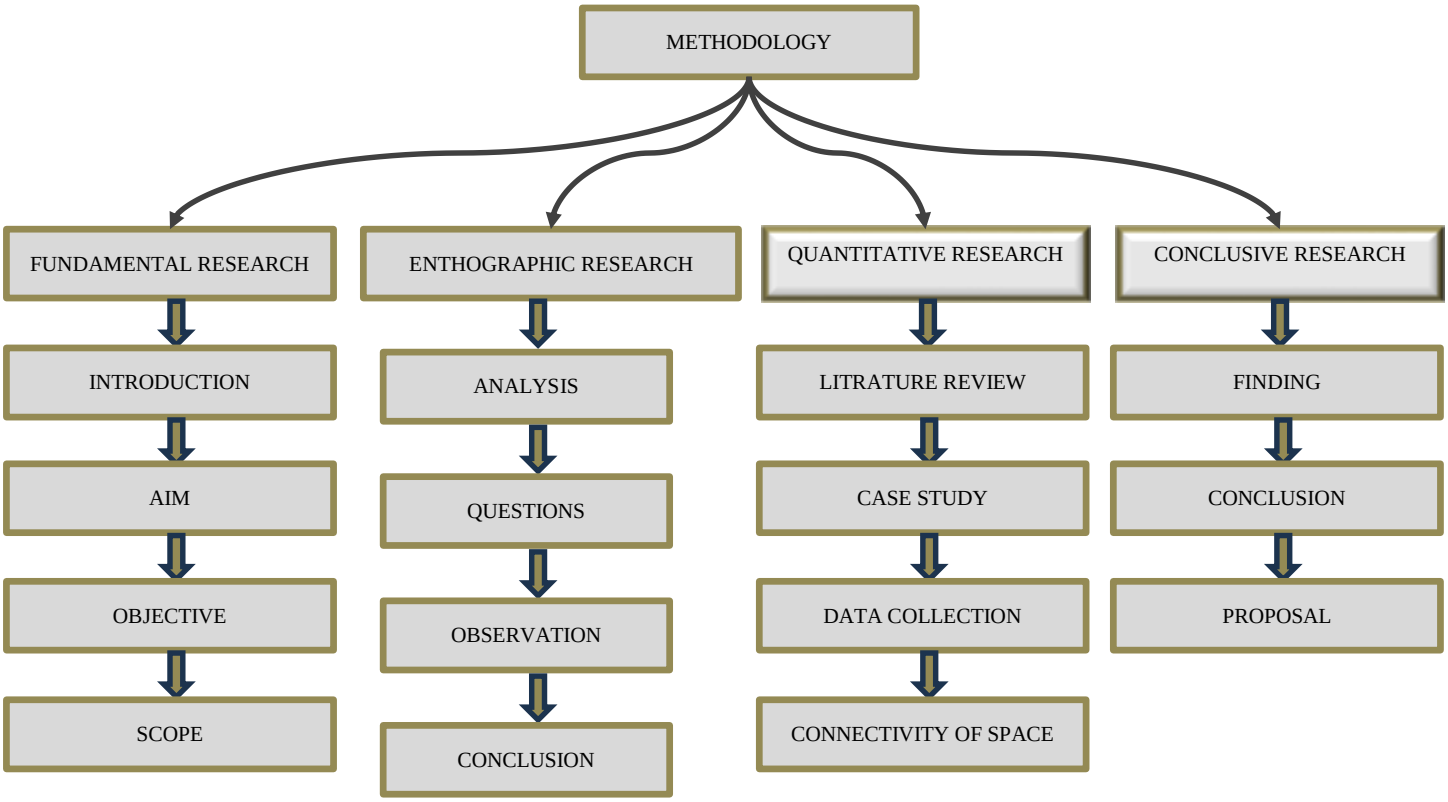
6.4 Cultural Heritage and Education

Hyderabad, alongside its IT achievements, has a glorious past and among the best schools and colleges in the country. The fusion of the uninhibited locations and the contemporary facilities makes an exciting area for a new culture. The city's identity as an educational hub has further assured its position as the best place for young professionals and families.

6.5 Expanding structure

Hyderabad's ongoing infrastructural development, which includes the expansion of transportation networks and commercial centers, has improved city connectivity and living conditions.

RESEARCH METHODOLOGY



7. LITERATURE REVIEW

TRANSIT-ORIENTED DEVELOPMENT: A REVIEW OF RESEARCH ACHIEVEMENTS AND CHALLENGES:
Among the attempts made worldwide to foster civic and transport sustainability, conveyance- acquainted development (TOD) clearly is one of the most successful. Since the TOD conception appeared in the late 1980s, it has entered adding attention from experimenters and interpreters as a way to combine together transport engineering and planning, land- use planning, and civic design for furnishing comprehensive results to contemporary civic problems

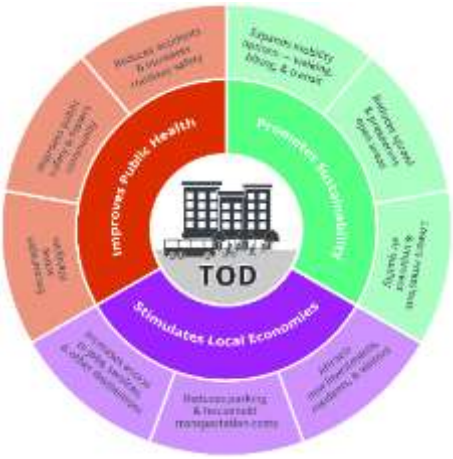


fig 2: transit oriented development

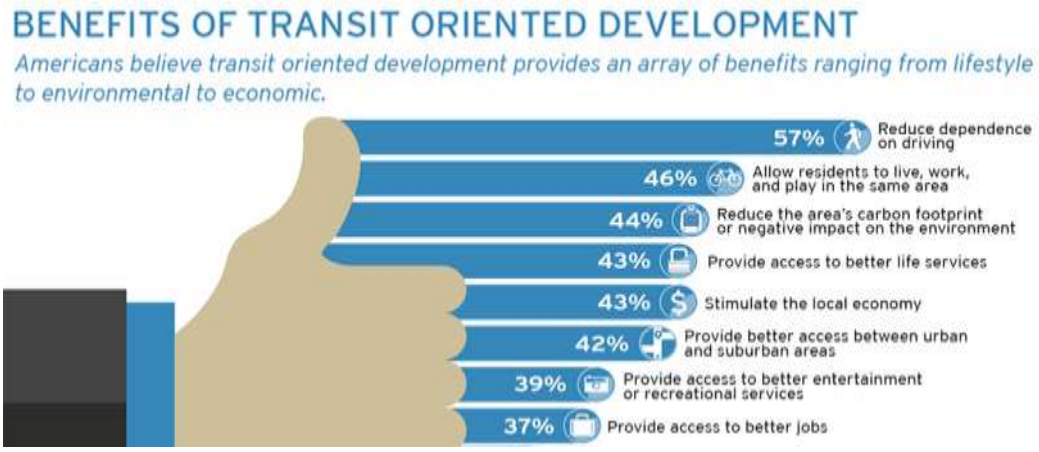


fig 3: benefits of tod

8. LITERATURE CASE STUDY

8.1 ANDHERI RAILWAY STATION, MUMBAI

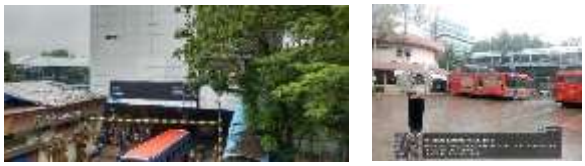


fig 4 : andheri railway station, bus stop

Andheri Railway Station is situated central western Mumbai . It is a reflection of the city's growth and the increasing demand for transportation. The station has turned over the years into a transport system that integrates the suburban rail, metro services, machine networks, and other modes of transport in a dense urban area. The design, use of horizontal and vertical movement, and the link with the adjacent building are evidence of a well-thought-out way of coping with large daily traffic. However, the station confronts significant issues like traffic, low services, lack of a common design, and disorganized governance among different stakeholders.

On the one hand, developments such as skywalks and the integration of Metro Line 1 provide convenience to the commuters, but on the other hand, there are still problems regarding user-friendliness, access for the disadvantaged, and last mile connections. Hence, Andheri is not merely a case of problematic infrastructure, but also an opportunity for sustainable and user-friendly changes in urban transport.

8.2 MAJESTIC BUS STATION, BANGLORE

fig 5 : majestic bus station, banglore

Kempegowda Bus Station (KBS) is Bengaluru's largest bus terminal and a major hub for transportation in southern India. KBS facilitates the interchange of different types of transportation by linking many local Bengaluru Metropolitan Transport Corporation (BMTC) buses to the Karnataka State Road Transport Corporation (KSRTC) and the northwest Karnataka Road Transport Corporation (NWKRTC), as well as the north-east Karnataka Road Transport Corporation (NEKRTC). This makes KBS a major point of entry and exit for all types of daily commuters and intercity travelers.

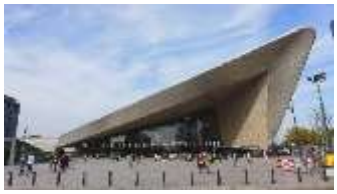
The station's central location adjacent to the Bengaluru railway station and its direct link to the Namma metro lines (Purple and Green lines) makes it an effective multimodal transit hub. This reduces the amount of time people spend traveling within Bengaluru and provides increased access to various parts of the city and the state of Karnataka.

Over the years, KBS has had an enormous impact on the way people travel around Bengaluru by serving thousands of passengers each day. However, many challenges remain, such as overcrowding, strain on the existing infrastructure, traffic congestion in the surrounding area, and. Additionally, with Bengaluru continuing to grow as an urban area, ongoing improvements at KBS must

continue to keep pace with the continued growth of the city. More specifically, improvements will be necessary in four major areas: digital information systems, smart tickets, organized circulation, and sustainable design measures.

Thus, KBS is not simply a transit terminal, but rather a landmark in Bengaluru and a testament to the city's transportation connectivity.

8.3 ROTTREDAM CENTRAL STATION , NETHERLAND



Rotterdam Central Station exemplifies how a transit hub can transcend the traditional functions of a transit station's entry and exit purposes to create a lasting impression and significance on the architectural and urban landscape. Completed in 2014, Rotterdam Central Station integrates innovative design features with an emphasis on operational performance, capturing and illustrating Rotterdam's future-oriented nature.
The unique form of the roof directs people to the City above. The Central Station has the largest

fig 6 : Rotterdam central station, Netherland

Concourse and the most advanced integration of train, metro, tram, bus, and bike networks of any European city, making it one of the most effective transportation facilities within Europe. It has more than 110,000 passers-by every day, allowing people to circulate freely throughout the facility, has excellent opportunities for social interaction and has a well-established sense of place.

In addition, Rotterdam Central Station is designed and constructed for sustainability, incorporating renewable energy sources (solar panels), maximizing natural daylight use (daylight optimization) and using water management systems consistent with Rotterdam's sustainability objectives. In addition, surrounding land is being developed as a vibrant business centre and cultural hub. Rotterdam Central Station illustrates how this new approach of integrating transportation infrastructure with Sustainable Design + Active Public Space + Architectural Expression can act as a catalyst for positive urban change. Rotterdam Central Station also provides valuable lessons related to Mobility, Identity, and Resilience for other rapidly evolving cities throughout the globe and positions itself as a prototype for future Multimodal Transportation Hubs.

8.4 WEST KOWLOON STATION

Through its successful integration with its surroundings, as well as demonstrating the potential of innovative architecture, the West Kowloon Terminus for High-Speed Rail is an example of how to develop infrastructure that serves multiple functions and roles. In addition to providing transit service between Hong Kong, Mainland China and other countries, the facility serves as a Cultural Destination through Regional Connectivity and Economic Exchange
The open and inter-connected approach of the design promotes efficient movement of passengers through the facility and creates vibrant, interactive and relaxing user spaces that encourage participation and engage the user with the urban environment.

fig 7 : West Kowloon station

West Kowloon High-Speed Rail Station exemplifies the combination of Functional Engineering, Environmental Design Strategies, and User-Centred Design as an emerging standard for the development of contemporary transit facilities. It illustrates that a Transportation Project can serve other purposes beyond it's basic function(s), thus becoming a Force for Community Growth, Mobility and Cultural Identity.

Finally, the West Kowloon Station is an example of the Future of High Speed Rail Travel as being technologically advanced, Sustainable (Environmentally Friendly), and Closely Tied to the Fabric of a City.

DATA COLLECTION

9. ECONOMICAL GROWTH OF HYDERABAD

Hyderabad has changed dramatically over the last few decades. Once a historic city, it is now a very large metropolitan and economic center. It has become the administrative, commercial and industrial backbone of India's state of Telangana. The Telangana Government's commitment to building world-class IT infrastructure and Biotech infrastructure has been an important component in making Hyderabad the hub of global companies, skilled professionals and investment.

Hyderabad is also a major Centre for Pharmaceutical and Life Sciences. As a result, Hyderabad accounts for over 30% of India's total pharmaceutical production and nearly 20% of the total exports of pharmaceutical products; thus, making Hyderabad one of the largest pharma centers in India. The establishment of Genome Valley marks the first fully designed Life Sciences Cluster in India; it is home to leading Bio-tech, Pharmaceutical and Research organizations from around the world, and it has further enhanced the global reputation of Hyderabad for Biotech Innovation and Research. Besides developing an Industrial and business environment

in Hyderabad, the city is also an entertainment and cultural Centre. Additionally, it is the place where Ramoji Film City, the world's biggest film studio complex, is located and is one of the leading contributors to the growth of both the Film and Tourism industries. As a result of the combined contributions of these sectors, Hyderabad is developing as a unique, vibrant, and robust economy that is expanding rapidly

fig 8 : economic growth on map

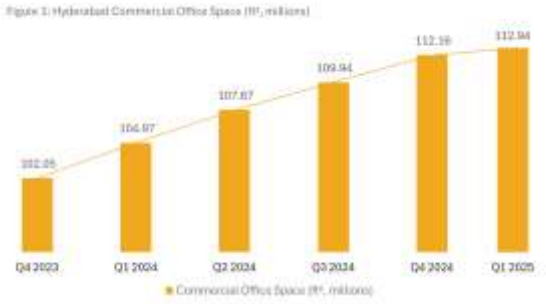


fig 9 : economic growth graph

9.1 Infrastructure and IT Growth

Digitization During the COVID- 19 lockdown, the Telangana Government utilized it's free time from exerting and gave a new face to megacity by completing critical systems in most minimum time. This futuristic vision of the city has been influencing since and continues to influence in Hyderabad real estate demand making it more attractive for business as well as Investment.

Hyderabad now serves as the largest Centre of information technology industry in India followed by Bangalore, and is a major global technological Centre. IT development has been encouraged through the state government's strategic initiatives, and many multinational companies such as Google, Microsoft, Samsung, Oracle, Amazon and Facebook have set up facilities in the city.

Microsoft alone is set out to invest Rs. 15,000 crore (US$1.93 billion) in Hyderabad over next 15 times for establishing its biggest DC in the country. It is also 20 of total pharma import into India," Naidu said. Hyderabad megacity also enjoys having world's largest Incubation Centre for launch- ups, T- mecca which has put Hyderabad on the map as city of invention and entrepreneurship. IT boom in Hyderabad, has generated great demand for being al ones and therefore there are many good Management colleges and B-schools to cater to this industry. One particular district, Gachibowli, is due to open 23 million square bases of office space over the next three times as one of India's foremost commercial requests.

10. TRANSPORTATION CHALLENGES IN HYDERABAD

10.1 CARBON EMISSION

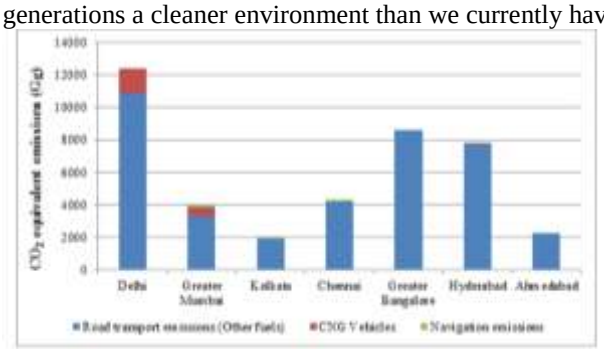
Despite being home to lesser number of vehicles as compared to the other metro metropolis' including Delhi, Bengaluru and Pune, Hyderabad's air pollution levels are increasing at an alarming rate. Now numbers reveal that Hyderabad's pollution has actually overtaken these mega cities, triggering great concerns among experts and the residents.

It has been reported that France's pollution level is growing due to a high number of old vehicles owned by the public. Older cars have other noxious feasts besides — including nitrogen oxides and carbon monoxide — as a byproduct of bad fuel-burning. The nitrogen oxide levels in Hyderabad are almost four times over and above than the acceptable World Health Organization-safe limit. Emissions of carbon dioxide and carbons monoxide — which are emigrants, also! --, nearly double that of other metro metropolises. A large part of this can be attributed to the poor quality of public transport. That's a far cry from Bengaluru, and Delhi with thousands of state-aided motorcars; or a more developed metro network when compared to Hyderabad with just about 100 multicabs and an emaciated rail line.

Many people believe that they cannot be stopped from finding out exactly what it is like to return to their vehicles and endure the darkness of being trapped on congested highways during rush hour, drenched in smog, by government authorities, including police departments. The management of industry and the business of lending, coupled with the practice of marketing to disaster recovery, make for an extremely complex problem, one that offers significant opportunities for new ventures in the marketplace and the destruction of existing enterprises. Furthermore, the additional health impacts of pollution include illnesses caused by the inhalation of chemicals, including sulphur dioxide and particulates, that are associated with air pollution. States and cities should allow for all available avenues to limit air pollution.

The best way for both states and cities to help limit air pollution is to increase the regulations on automobile emissions and provide better public transportation services and to operate businesses more effectively and efficiently. "The fact that the pollution in Hyderabad could lead to serious long-term health consequences for its entire population indicates that, at a minimum, there are reasons to act urgently regarding the improvement of this city's environmental quality," said Colin Robertson, a researcher with IIT Delhi's Centre for Atmospheric Sciences, "While improving the air quality in Hyderabad may give us time to adjust to it and improve

the quality of life here in Hyderabad, it is also necessary to make changes now to ensure that we create and provide for future generations a cleaner environment than we currently have."



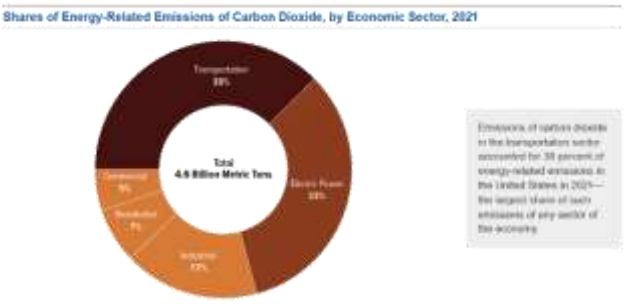


fig 10 : graph of carbon emission according to metro cities

10.2 Last-Mile Connectivity Is Very Limited

Raidurg metro station and the Cyber Towers area form the primary transit locations of this particular locale. A mere ten percent of office buildings are situated within walking distance to either of the stations. The employees who want to get to Gachibowli or any of the newer office areas such as Kokapet and Narsingi find it quite difficult to ensure a swift access to their place of work, for the distance is quite far for grabbing the metro and reaching on time. Bus services do operate, yet for many office locations, buses do not provide sufficient last-kilometer connectivity.

10.3 Traffic Congestion

The issue of traffic congestion continues to be a problem, notwithstanding the extensive infrastructural developments comprising several flyovers and underpasses. It is primarily the result of the large numbers of vehicles coming into Cyberabad during the office hours, which is when all the IT professionals arrive into and leave from their offices. The situation is exacerbated for the commuters' road journey when it is monsoon, as rain causes a significant hindrance to the traffic flow.

10.4 Dependency on Private Vehicles

The population department has no alternative but to rely on private vehicles, such as cars, motorbikes, and also hired cabs, in the Cyberabad region, owing to the lack of or very unreliable public transportation system.

11. VEHICLE ANALYSIS

Hyderabad As a result of the inadequate public transport systems, the poor last-mile connectivity, and the commuters' preference for certain vehicles, Telangana is experiencing a very fast increase in vehicle registrations. The state has already recorded more than 3,000 new private vehicles daily on its road network.

Based on the figures provided by the regional transport authority (RTA), Telangana has almost reached 1 million new vehicles on its roads during the last year. The number of vehicles went up from 1.63 crore at the end of the 2023-24 fiscal year to 1.73 crore on March 31 this year. Moreover, during the last four years, the state has added as many as 30 lakh vehicles. If that were not enough, out of a total of 1.73 crore vehicles, Greater.

Hyderabad comprises about half with around 85 lakh vehicles. The city's vehicle population has undergone a tremendous increase, going up from 25 lakh vehicles twelve years ago. By 2018, the number of private vehicles (two-wheelers and four-wheelers) in the city had risen to 50 lakh, while the number of buses had already crossed 10 lakh in the same time.

" Telangana has been consistently increasing the number of vehicles over the years. The building of quality infrastructure, along with the state's becoming a major IT hub, has made this rise easier. There has also been considerable migration along with the city expanding. A few years ago, daily vehicle registrations were around 1,000, but these figures have gradually gone up and are now exceeding 1,500 registrations per day in Hyderabad," a senior RTA official said.
Experts in business believe that the lack of public transport and poor connectivity are the main reasons for the increasing number of private vehicles. The city's population is about 1.2 crore, and public transport is used by less than one-third of the total population.

"The increasing number of vehicles on the road structure generates concerns about the deteriorating business traffic. Besides, the increase in the number of high-speed vehicles implies a potential increase in accidents. Data show a steady increase in road accidents in the state." I. T. Reddy, a retired officer from the National Highway Research Institute, and a transport planning expert said, "Authorities should always consider RTC motor cars on the more congested routes to make their operation more effective and at the same time persuade the public to use public transport rather than their own cars."

fig 11 : no. of vehicles in state

12. PSYCOLOGICAL IMPACT ON SPACES IN ARCHITECTURE

Architecture is not simply about functionality or aesthetics-it profoundly affects our mental and emotional health. The psychological effect of the architectural design penetrates into subtle but influential realms of human experience, influencing the way we feel, think, and interact in a space.

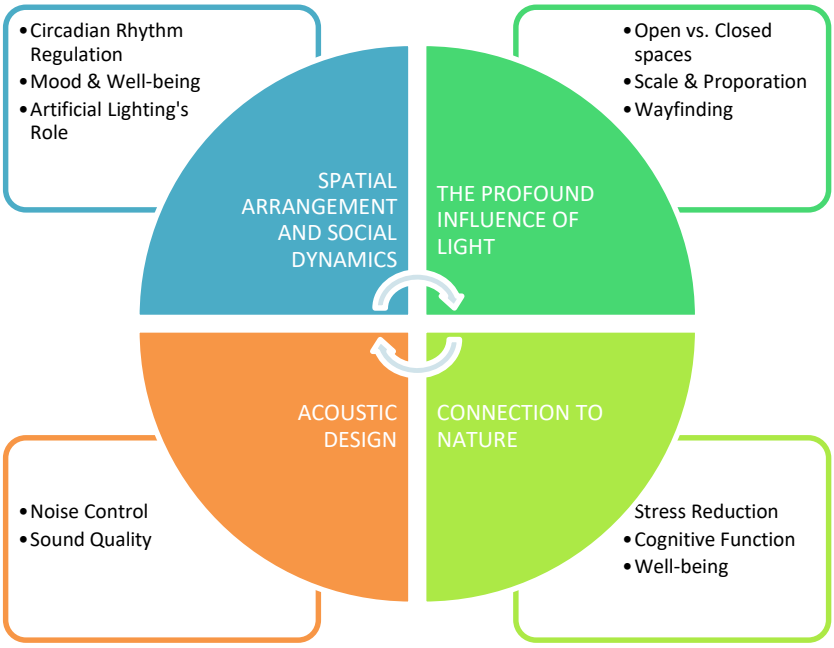


fig 12 : *as per relation between space and architecture with their psychological impact*

13. SUSTAINABLE TRANSPORT

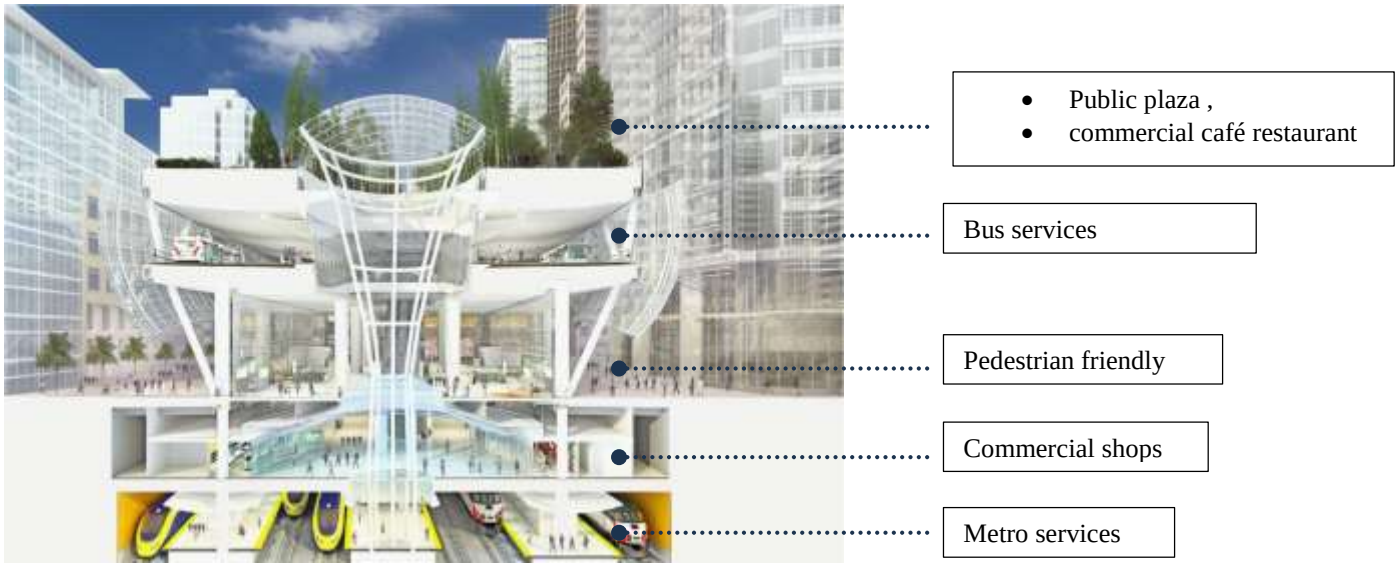


fig 13 . :- example of sustainable mmth (transbay transit Centre , san francisco)

14. PROPOSALS AND FUTURE SCOPE

Hyd metro draws up first plans for JBS transit hub

Ashresh Marupaka / Feb 3, 2025, 00:27 IST

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Hyderabad: Amid the growing demand for metro services, the Hyderabad Airport Metro Limited (HAML) has started work on the model metro hub at Jubilee Bus Station (JBS) in Secunderabad — a first for the city. The project, which is expected to hit the floors in around two years, will see three metro lines converge in a state-of-the-art integrated facility and will be spread over 30 acres of state and defence land.

fig 14 . :- proposals

Jubilee Bus Station Proposal: The data indicates that Hyderabad has presented a proposal for the 30-acre Jubilee Bus Station transformation into a multi-modal transit hub that connects two metro stations.

Economic and Social Integration: The range of these kinds of projects is not limited to transport only, but they also involve the creation of lively open spaces that can be used for socializing, commercial activities, and community generating revenue for the maintenance of the hub.

15. CONCLUSION

The study emphasizes that the placement of MMTHs at strategic locations is a prerequisite for starting a sustainable process of urban development change in Hyderabad. However, the city can deal with present problems like horizontal urban sprawl, traffic jams, and last-mile connectivity issues by creating the Metro, suburban rail (MMTS), and bus services all under one cohesive hub. The hub can thus act as a solvent that not only improves public transit and reduces the use of private cars, but also results in lower CO2 emissions. In the end, the authorities consider the success of such a plan as a means of providing urban transportation that is safer and more effective globally, thereby complying with the requirements of the world for urban transportation that is safe and effective.

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