

Original Article

# Impact of Metro Infrastructure on Emergence and Growth of Commercial Hubs: The Case of Jammu, India

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**Abstract** - Facilities for transit are now more than just forgotten about. They have an impact on many sectors and have grown to be a significant link in the development chain throughout time. India has seen urbanisation without infrastructure due to unplanned expansion and urban sprawl, a pattern of low-density, haphazard growth that strains resources, especially in developing cities like Jammu. Because of its growing population and spatial fragmentation, the city must be developed within the context of the surrounding area. New improvements are progressively addressing these deficiencies in infrastructure facilities. The city is currently considering a transformative project: constructing a metro system, defined as a high-capacity rail network designed to integrate land use and transportation planning. This study addresses two core research questions: How does metro infrastructure reconfigure mono-nodal commercial zones in historically unplanned cities like Jammu? The performance of the transport network is determined by the availability of technological space, whereas the viability of development is determined by commerce regions and the interest of investors in it. Understanding the interaction between commercial hubs and transit nodes in Jammu City helps build the research base. This aids in comprehending the objectives set forth to accomplish the same and the future requirements of the commercial zones. The metro construction will increase potential opportunities, according to current development plans. The future of the business zones may, therefore, be significantly altered. This paper contributes to understanding the impact of metro development and envisions a decentralized, multi-nodal future for Jammu's commercial zones.

**Keywords** - Metro infrastructure, Urban development, Commercial hubs, Urban planning, Jammu, India.

## 1. Introduction

One important source of change in our environment is development. Planning ahead is essential for successful growth in growing cities like Jammu, India. The building of a metro is one of the city's main development goals. In recent decades, the Metro development in metropolitan areas has significantly impacted urban development and spatial growth. One clear benefit of this type of development is the enhancement of the employment hubs, shopping areas, and public utilities [1]. Creating effective movement patterns for both people and products, encouraging public transportation, and integrating land use and transportation planning are the goals of the metro development. The benefits of this building will extend beyond transportation and support the expansion of other adjacent industries. One of the industries that would be affected by the arrival of the metro is commercial zones. The majority of the commercial zones in the unplanned city are mono-nodal, with a historical core [2]. The existing studies on the subject of metro systems have been largely confined to the metropolitan cities of the country; thus, there is a lack of understanding of the potential of metro systems in Tier-II cities such as Jammu, where unplanned urban

sprawl and mono-centric commercial systems challenge spatial equality and sustainability of growth [3]. The urban form of the city is impacted by the growing business activity. Planning for multi-nodal business zones is a key component of future growth plans; therefore, the metro construction would be advantageous. However, empirical evidence of the extent to which metro-driven transit-oriented development (TOD) can decentralise commercial activity in cities with entrenched mono-nodal structures, and particularly in contexts without integrated land-use policies, is limited [4, 5]. The commercial developments that the metro construction would bring to the city will be the main subject of this investigation [6]. In order to have a better understanding of how a new construction like this might affect the city's commercial image, the analysis will try to determine how it can affect future developments.

The study fills this gap by assessing how the new metro project of Jammu has the potential to reconfigure the mono-nodal commercial geography of the city, presenting lessons for balancing infrastructure-led development with equitable spatial planning in Tier-II Indian cities.



## 2. Literature Review

Numerous studies have investigated the symbiotic relationship between urban transit infrastructure and economic development, especially in the context of developing countries, such as India, where rapid urbanization often outpaces planned infrastructure, resulting in unplanned sprawl and fragmented growth [7, 8]. For instance, cities like Jammu face such challenges of urban sprawl, which puts pressure on transportation networks and commercial hubs while worsening inefficiencies in both land use and accessibility of services [9]. Metro systems have been widely identified as boosters of economic regeneration and have demonstrated the capacity to alleviate such challenges through enhancing connectivity, attracting investment, and transit-oriented development (TOD) [10-12]. Indeed, in Indian cities such as Delhi and Bengaluru, metro corridors proved successful not only in terms of mass transport but also in encouraging commercial clusters and amplifying land values in certain localities. However, the success of any such initiative lies in combined transport planning aligned with equitable urban policies to avoid gentrification [13]. The concept of “node-place” dynamics, balancing mobility and urban function [14], is critical for Jammu’s proposed metro, where aligning infrastructure with regional development plans could transform commercial zones into the nucleus of a vibrant center, a similar approach to Transit-oriented development in Ahmadabad [6, 15]. However, Jammu must address fragmented networks and stakeholder engagement gaps, drawing lessons from Kochi’s adaptive planning [16]. By synthesizing global and local insights, Jammu’s metro project could redefine its commercial landscape, provided it prioritizes integrated, inclusive strategies to harness transit-induced opportunities while mitigating socio-spatial disparities.

## 3. Relationship between Transportation Nodes and Commercial Zones

### 3.1. Relationship between Transportation Nodes and Commercial Hubs

Due to the interdependence of all the parts, developments are complex processes. Because of this, the advantages or disadvantages of any component affect how well the others work, depending on how much interdependency each component has. Better access to places is made possible by transportation, which raises the value of those places. Developments such as transit hubs offer benefits not only to transportation but also to the surrounding infrastructure [17]. A well-designed traffic distribution system has led to increased service frequency and effective traffic flow [18]. Due to all of this, transit hubs are becoming destinations that have increased investment and the local economy. Due to their equation, commercial zones-another crucial link in the development chain-share the advantages of these transit advancements, albeit these advantages differ from city to city [19]. The Indian city of Jammu has an

uncontrolled urban growth pattern. The population has increased unexpectedly in recent years due to both the expansion of industrial and commercial districts and the gradual exodus from the valley. This has inevitably increased the demand for services and opportunities for the city's residents, highlighting the need for improvement [20].

Central Business Districts, or CBDs, are the hubs of the city's current business districts, which are predominantly mono-nodal and surround the historic core [21]. The local community and tourists alike frequently visit these regions, which is why the focus of commercial zones is on craft and tourism. The city's commercial zones comprise shopping centres, movie theatres, clubs, and big markets. Public transit is vital in providing access to these regions, which is necessary for their proper operation. The city offers the general public a network of roads and trains for transit inside the city [22]. While tourists can choose between luxury coaches and cab services, the local populace uses buses, cars, and mostly minibuses. There is a lot of room for growth in the city's transport industry because one of its main shortcomings is that it does not adhere to international standards. The city comprises Central Business District sections, which house several sectors' activity in one location, including government, business, education, health, and especially commerce [23]. As a result, there is increased traffic in and around these districts. Due to the similar growth patterns of these places, the business districts are eventually surrounded by noise and traffic congestion, which causes problems with the environment and how these zones operate. Narrow road networks, frequent landslips, and short workdays are some of the additional problems that the city's economic zones deal with.

### 3.2. Commercial Zones in the Peripheral of Existing Transit Hubs

Bus terminals and train stations are examples of transit hubs because the city relies on both road and rail networks for mobility [24]. Because of the city's ongoing population increase, the neighbourhoods surrounding these hubs have changed over time. The city's general bus terminal is located in the city's densely populated and congested centre. The bus terminal, multi-level parking, and commercial spaces above and surrounding the station were recently restored to make the city more pedestrian-friendly and traffic-free. This project has benefited the neighbourhood surrounding the bus station and brought attention to the advantages planned transport and business developments may have for the community. As a result, plans are underway to create further multi-level parking projects featuring commercial zones in the future years. In addition, the Interstate Bus Terminal, or ISBT, is being moved from the city's centre to its periphery to reduce traffic [25]. Encircling the city's railway station are a number of small eateries, lodging facilities, hotels, resorts, fruit and vegetable markets, and public rest areas for visitors. These locations are accessible to both locals and visitors. Due to the

narrow roadways in the neighbourhood are frequently congested with both people and cars, making it a dangerous place.

It is not convenient to access the commercial area surrounding the station because there are no designated parking spaces or drop zones available outside of it. These transit hubs now in place serve as examples of how the surrounding areas are thought to present favourable business opportunities. The way these transit hubs are organized strategically will have a significant impact on these areas' efficiency. Public transport routes are important because they determine how readily people can access other parts of the city without using private vehicles, just like the locations of transit hubs [26]. Due to users' volume, variety, and regularity, the business districts surrounding transit hubs are the easiest to view and access. The problem occurs in locations where the city's disorganized public transportation network prevents access to public transportation. Gandhi Nagar's Bahu Plaza in Jammu, India, is one of the city's best examples of a commercial hub. It offers adequate parking space, a good road network, and accessibility for both private and public vehicles. One of the major outdoor destinations and commercial hubs of Jammu City, Bahu Plaza is designed to minimize traffic and pedestrian congestion.

### 3.3. Parameters that Influence Commercial Hubs

Every day, commercial hubs expand across the city, and they are impacted by a range of outside variables that can either speed up or slow down these hubs' internal development. A well-planned commercial sector draws more people and infrastructure to a region and benefits the local population by providing greater amenities.

However, this may cause these hubs to proliferate unintentionally, reducing their functionality and that of the surrounding area. On the one hand, the city has witnessed business growth in locations first served by public transportation. Conversely, certain business districts contribute to the enhancement of surrounding public transportation systems. This emphasizes how crucial it is to have a well-planned development without disregarding the other factors that could impact it. Access and access routes to these business zones would be one of the interconnected components.

The commercial sections are primarily lengthy rows of businesses along the roadways, with a lot of foot traffic and private vehicles because the city has fewer complexes and more independent stores [27]. The majority of this lacks the essential elements for risk-free access because walkways, drop-offs, and parking have not been planned for. When all the amenities are in one place, the traffic and congestion worsen, impairing the area's ability to function efficiently. Due to these frictional factors, the majority of the city's commercial sections are developing and growing less significantly, which is improving the city less overall.

## 4. Future Aims for the Development of Jammu Town

### 4.1. Present Needs of the Jammu's Commercial Areas

The development process isn't complete without evaluating present and future requirements and figuring out previous problems. An area's needs are highlighted by this kind of examination. Given that Jammu City is expanding along major transportation routes and that existing development is not meeting current needs, it is imperative to comprehend the limitations of the current state of affairs in the city [28]. The city has grown commercially in a number of areas and given its residents access to basic amenities. The state of the city's business districts, however, serves as an illustration of how inadequate space and services are for a zone to operate effectively and productively. The business districts have little effect on the city's reputation, even in the wake of commercial expansion. The city has grown without strategic plans, one of the main causes. This has resulted in a number of business areas with safe and orderly exteriors but subpar inside. Once a growth pattern begins, it persists for years, and regions with traffic, crowding, and noise result from a non-functioning growth pattern. The middle of the city is where all the amenities are located, but it doesn't have adequate pathways, parking, effective circulation, or even enough space to stand in certain places. All of this is a result of the area's ongoing uncontrolled expansion.

Table 1. Existing commercial area distribution

S. No.	Zone	Area (Sq. Km.)	Percentage (%)
1.	Old City Core	12	34%
2.	Bahu Plaza	6	17%
3.	Gandhi Nagar	4	11%
4.	Trikuta Nagar	3.5	10%
5.	Narwal Transport Hub	5	14%
6.	Emerging Commercial Zones	7	14%

The current road system and the methods used to address issues with it have an impact on business areas and the city as a whole [29]. Although modern developments are also the result of a slow development period, they do not necessarily follow any pattern, in contrast to the ancient city's restricted road networks [30]. Commercial zones are affected by the efficiency of commercial facilities, which make up around 18% of the road network. The city needs to stop at the existing growth patterns and plan strategically for future developments to give places like the ancient city solutions for increased efficiency. For increased user convenience and safety, both in cars and on foot, good circulation is essential. The presence of traffic is also a result of inadequate public transport options in certain places. Public transport must be easily and conveniently accessible in some regions,

particularly areas with high traffic. Many of the city's business sectors are inaccessible to pedestrians due to improper parking, as private vehicles are used to access these places. This puts pedestrians' lives in danger and exacerbates traffic congestion. The segregation of pathways and roadways that lead to designated parking places is necessary in these regions for proper vehicular circulation. The commercial zones beside major roadways require well-designed drop-off locations for improved traffic flow. A business district with ample space and amenities will also serve the city's future needs. It will, however, also encourage the development of regions so that meeting the fundamental needs of the commercial zones won't be taken into account in isolation from the development process [31].

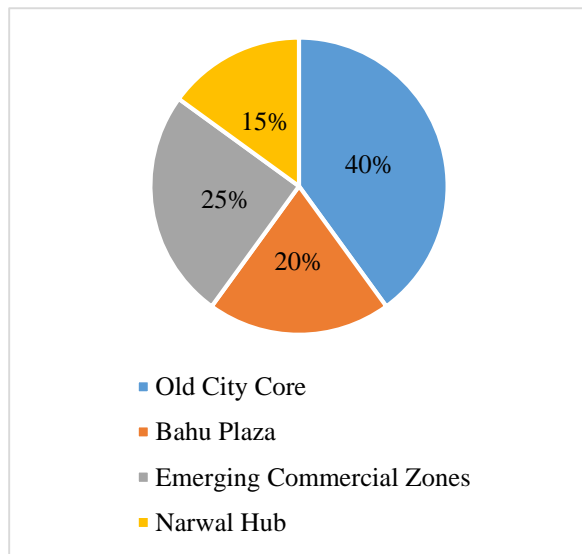


Fig. 1 Commercial zone share in economic activity

#### 4.2. Aims of Master Plan 2032 Regarding Commercial Areas

Since 1974, Jammu City, India, has seen numerous gaps in the development and execution of the city's master plan. Even after all these years, there are still numerous areas in which the city's Master Plan for 2021 falls short of offering organised and workable answers to the city's problems. The city's centre is regarded as a "Special Zone" under Master Plan 2001-21, and mixed land use is permitted there. To keep the centre vibrant and prevent it from degenerating into an urban wasteland, no growth control laws were offered [22]. The lack of control and ambiguity in land use and building restrictions have led to an uncontrolled growth pattern. The Right of Way (ROW) roadways that are wider than forty feet are designated for mixed land use, but they lack crucial details regarding the width and kind of the road. Clear mixed land-use policies have not been made available to the city; hence, the associated developments have not produced positive outcomes. The fact that many places under Master Plan 2021 have not considered the city's previous land use is

another major factor contributing to the public's confusion about the land use. As a result, the land use map contains numerous inaccurate details. While some commercial areas, like the Nehru market, were designated for residential developments, other residential neighbourhoods, including Channi Rama and Durga Nagar, are green spaces.

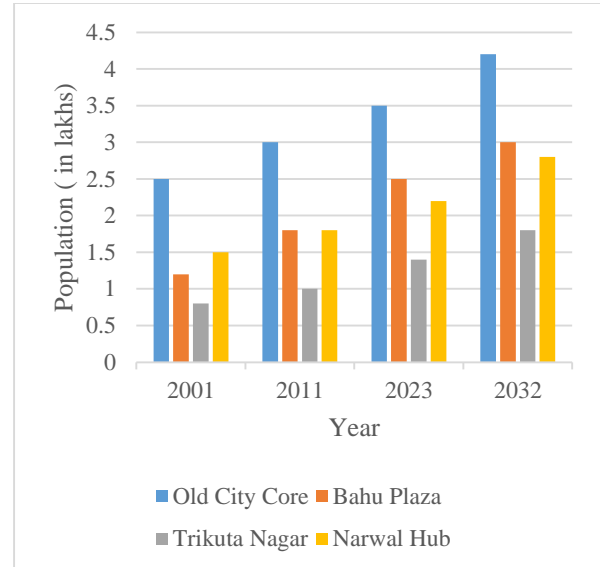


Fig. 2 Projected population growth in commercial zones (2001-2032)

This is the reason that after years of development, the city is unable to alter the previous pattern of growth, as most goals and solutions have been imprecise and ill-considered. The city has another chance to work on updated goals and solutions with the Master Plan 2032. The updated Master Plan intends to promote economic and general urban expansion with the required infrastructure while advancing development and considering the current land use and natural resources. The Master Plan 2032 also takes into account the lack of a reliable transport system due to the current limited roadways, subpar public transport, and insufficient parking availability. It is intended that the city will expand in a compact and planned manner, with commercial zones being one of the mixed-used areas, in accordance with Transit Oriented Development (TOD) criteria [32]. Furthermore, it will promote design that is bike and pedestrian-friendly.

Additionally, mixed-use designs for residential communities with commercialization along major thoroughfares will be suggested. The commercial zones, which make up 5.43% of the total area, are intended to have higher-order roads. Public transport will also receive attention to improve its functionality and efficiency. Public utility buildings, business headquarters, city-level facilities, wholesale enterprises, exhibition spaces, and bus depots will be inside the commercial zones. Polynodal business districts are planned for the city, as the current commercial zones are mono-nodal. Four further sub-CBDs are planned for the city

in addition to the planned extension of Bahu Plaza, a sub-CBD zone, to the north. Many people engage in informal commercial activity, such as shopping by the side of the road, in addition to formal commercial activity. Since street vendors are not properly listed in the database, the Master Plan seeks to maintain database updates to establish a specific space for these unofficial business ventures. This will provide them with security in the workspace and assist in making the areas more organized and functional. 15% of any formal business space must be set aside for unofficial marketplaces. The areas will be used for bazaars, vegetable markets, and Sunday markets. Decentralization of the region and its activities is suggested as a solution to the issues in the CBD or old city. If needed, the major operations of the old city would be moved to new locations.

## 5. Potential Future Vision of Commercial Zones in Jammu

### 5.1. Examining the Potential Gains for the Commercial Hubs Following Metro Construction

The road network and transport play a major influence in determining the degree of access to commercial hubs. The majority of Jammu City's road network is either surrounded by residential complexes or business centres. According to the 2011 land-use map, just 2.9% of the land is covered by circulation, while 4% of the area is used for commercial purposes. This justifies the necessity and significance of building a brand-new transport system, such as the metro, which might promote fresh opportunities and enhance current circulation. If vehicular mobility is effectively controlled, an area with traffic signals a location with greater public access, which instantly makes that area capable of providing strategic facilities like commercial zones. In order to effectively manage the crowds and traffic, peak traffic locations and hours in the city are considered during the design of metro stations. The flow of traffic from metro stations to the existing infrastructure is just as crucial as the locations of the stations themselves. The city plans to provide pedestrians with 1.8 metres to 3 metres of space, depending on land use. In addition, plans are underway to demarcate drop-off zones, zebra crossings, tabletop crossings, and relocate encroachments. This will meet the current demand for convenient access and safer transit in the city's business regions.

Since the metro would be built in accordance with TOD regulations, amenities like bike lanes close to transit hubs are thought to be necessary. These facilities are crucial for fusing land use and transportation planning. Planning for sustainable urban growth centres, which will start building new commercial zones deliberately, is also scheduled to receive more attention. More pedestrian and vehicular facilities will be added as a result of the metro's construction, as the city will now have three distinct transit options for getting around. The metro building process aims to facilitate passenger interchange while minimising conflicts between the

pedestrian and vehicular infrastructure of various forms of transportation. In order to do this, adequate parking spaces and sidewalk and road widths that can accommodate the city's traffic levels must be assigned. The city's intermodal integration of existing transportation modalities will encourage greater public transportation usage. This will help create spaces free of traffic, another essential need for newly developed or current business zones. The city's integrated multimodal urban transport system is suggested to have aspects like integrating public transport services and providing suitable infrastructure. In addition to all of this, the construction of the metro is intended to improve the city's environmental quality because improved accessibility results in less fuel use, better building conditions, easier maintenance, shorter travel times, and an overall higher standard of living.

### 5.2. Possibilities for Multi-Nodal Commercial Hubs

A key element of the expanding cities brought about by the introduction of technology and cultural shifts has been mixed land use. Without social and economic diversity, smart growth is incomplete; mixed land use provides both, creating thriving urban districts [33]. A region having a variety of land uses and access to transportation infrastructure can be designated as a Central Business District, thereby serving as the financial hub of the city. The CBD has the highest traffic since most of them have a large population concentration [34]. In Jammu City, India, the historic core surrounds the Central Business District (CBD), creating mono-nodal commercial zones. However, mono-nodal commercial zones may limit the growth of commercial hubs due to the increasing opportunities and demand. However, mono-nodal commercial zones may limit the growth of commercial hubs due to the increasing opportunities and demand.

The goal of the city is to use polynomial commercial development and planning. Decentralization of the core areas and the creation of additional sub-CBDs are intended to accomplish this. New economic zones with more clearly defined land use will result from decentralization. New business centres will be encouraged and built as a result of the metro's construction, creating opportunities for more core areas. In addition to assisting economic hubs in growing strategically, the planning of separate commercial zones would ease traffic in the city's central business district.

In contrast to the current major commercial hubs, new transit hubs can aid in the promotion of smaller economic nodes. Polygonal commercial zones can facilitate better circulation, population division, and the development of fresh ideas for key regions. Since the construction of a metro will result in significant changes to the city's land use, transportation, and pedestrian patterns, another advantage is the chance to regenerate regions that do not require decentralization.

### 5.3. Potential Effects of Recent Commercial Developments on Existing Commercial Centres

Emerging nations are home to new constructions, which are also significant since they catalyse the slow but steady transformation of the local infrastructure. Every new building that is introduced affects the previous ones, depending on how superior or inferior it is in comparison. The city's current transit options will be impacted by the metro building in Jammu City, India. New opportunities will arise, and commercial development will also be enhanced. Any development that prioritizes meeting the wants and requirements of the public before doing something that upsets the status quo would benefit the public the most. Future plans call for the metro development and the city's master plan to be centred around the demands and circumstances of the present. The goal of the metro's construction is to support and enhance the effectiveness of the current transportation network, not to replace it. Enhancing the city's transport network is the goal of the metro construction, including improved pedestrian/road networks and multimodal integration with current modes. The city's economy is expanding as well, and in order to make its commercial centre effective, strategic planning is required. The city hopes to create commercial hubs in order to enhance the current state of the city's economy as much as the transit system.

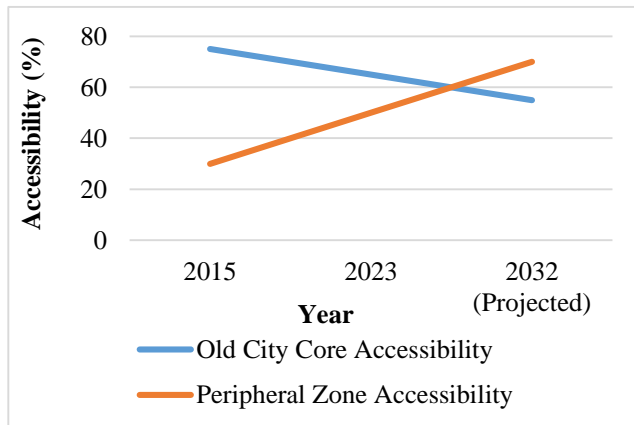


Fig. 3 Projected metro impact on transit nodes

Solutions like decentralizing the old city's central CBD will not only benefit the new centres; they will also primarily assist the old city in preserving its vitality and value more functionally and sustainably. The old city will gain from removing some aspects of each and carefully structuring it around another hub, which will help with everything from the traffic of people, cars, and facilities to the circulation and land use. In order to meet the needs of the population, the commercial zones will also be poly-nodal. Not only would the new business zones aid in easing traffic and crowding from the older ones. On the other hand, they might also contribute to setting a better example in terms of improved traffic flow, strategic planning, the availability of drop zones, the network of pedestrian areas, and the accessibility of

public transport. Bahu Plaza, the city's current commercial centre, will serve as inspiration for the goal of adding more sub-CBDs. Being a fresh development, the new sub-CBDs might have better features and concepts that could also apply to Bahu Plaza, the sub-CBD that is now in place. The new commercial hubs may contribute to highlighting environmentally sustainable commercial area solutions in addition to their infrastructure benefits. Because the current infrastructure has been used for many years, it must remain balanced for the new development to function well. If they meet the current conditions and aid in the development of the current hubs, new commercial hubs have the potential to dramatically alter the commercial performance and image of the city.

## 6. Research Findings

The findings from this research showcase the substantial impact of the metro infrastructure on commercial hubs in Jammu City. The metro system has not only improved accessibility and reduced traffic congestion but has also acted as a catalyst for economic growth. Commercial hubs around metro stations have experienced increased property values and real estate development, and they have witnessed shifts in social and demographic dynamics, resulting in diverse and vibrant communities. These findings offer valuable insights for urban planners, policymakers, and stakeholders seeking to harness the potential of metro infrastructure for sustainable urban development and the revitalization of commercial areas.

### 6.1. Impact on Accessibility

The analysis of the impact of the metro system on accessibility to commercial hubs reveals a significant enhancement in connectivity. Proximity to metro stations facilitated easier and faster access to these areas, reducing commuting times.

Commuters and residents reported a substantial shift from private vehicles to the metro, contributing to decreased traffic congestion around commercial hubs. This improvement in accessibility was seen as a key factor in attracting a diverse and larger population to these areas.

### 6.2. Economic Activity and Growth

The findings demonstrate a considerable boost in economic activity and growth within the commercial hubs near metro stations. Businesses operating in these areas reported increased footfall and higher revenue.

Consumer behaviour exhibited a preference for the convenience of metro-accessible commercial hubs. This increase in economic vitality resulted in job creation, expanding existing businesses, and establishing new ventures. The metro system was unequivocally viewed as an economic catalyst for these commercial hubs.



### 6.3. Property Values and Real Estate Development

Analyzing property values and real estate development near metro stations revealed a positive trend. Property values in the vicinity of these stations exhibited a noticeable increase, making them more attractive for real estate investment. Developers capitalized on the metro's presence, leading to a surge in the construction of mixed-use developments, residential complexes, and commercial spaces. The real estate landscape around metro stations was transformed, and property owners benefited from appreciation in the value of their assets.

### 6.4. Social and Demographic Changes

Introducing the metro system has brought about notable social and demographic changes in areas surrounding commercial hubs. The improved accessibility and economic opportunities led to an influx of residents and businesses. Diverse communities emerged, fostering a vibrant and inclusive atmosphere. Residential preferences shifted towards areas near metro stations, and migration patterns inclined towards these neighbourhoods. The social fabric of these communities evolved, characterized by increased cultural exchange and social interactions.

## 7. Analysis of Results

Because of the growing population and demands, the unplanned city of Jammu will include a significant metro building project to meet the city's transit needs. This construction and other factors will also impact the city's business sector. Due to their lack of strategic planning, the current commercial districts must be better designed to meet their varied needs. Frictional components for the commercial zones include traffic, congestion, inadequate accessibility for public transportation, absence of drop-off zones, and inadequate pedestrian infrastructure. The current state of the city's commercial hubs can be significantly improved with the help of the metro construction. In addition to working

towards intermodal integration with the current transportation system, the metro construction is centered on enhancing the flow of people and products. This will encourage public transport and safe driving practices around pedestrians. In addition to causing new business developments surrounding its transportation hubs, the metro construction will also help balance the needs of the current commercial infrastructure. It will be incorporated into the new construction and serve as a model for improved growth for the current commercial hubs. The metro project may be a useful instrument in reshaping the city's and the business areas' uncontrolled growth.

## 8. Discussion

The Metro Infrastructure in Jammu City is a transformative catalyst that fuels the growth of commercial hubs through increased accessibility, economic activity, and higher property values around stations. However, this progress is accompanied by risks of gentrification, inequitable access, and displacement, requiring concerted efforts to achieve growth and equity-using tools like mixed-income zoning, last-mile connectivity investments, and participatory planning. While the metro supports sustainability by reducing congestion and emissions, unmanaged expansion may strain infrastructure, underscoring the need for integrated policies that redirect property value gains into community benefits and prioritize marginalized voices in decision-making. Future studies should look into the longer-term socioeconomic consequences of this phenomenon, how other countries are developing user-friendly systems of transit-oriented development, and how informal economies can be protected. A lesson from Jammu is the experience of urbanization in India, which manifests how a metro must be rethought as a tool for equitable, resilient urban futures rather than being treated merely as a facilitator of growth.

Table 2. Potential gains for commercial hubs post-metro construction

Parameter	Current Status	Post-Metro Projection	Impact
Accessibility	Moderate	High	Reduced travel time, increased footfall
Economic Activity	Medium	High	Increased revenue and business opportunities
Property Values	Moderate	High	Appreciation in real estate prices
Employment Opportunities	Limited	Significant	Growth in retail, hospitality, and services
Urban Development	Unplanned sprawl	Planned and organized	Mixed-use development and reduced sprawl

**Table 3. Discussion, integrating key arguments, implications, and supporting examples**

Aspect	Key Findings	Implications	Examples
Transformative Role	Metro infrastructure reshapes commercial hubs by enhancing accessibility, economic activity, and property values.	Accelerates urban growth but risks spatial inequities and gentrification.	Delhi Metro's impact on commercial corridors like Rajiv Chowk; rising rents in Bengaluru.
Equity Challenges	Disproportionate benefits for higher-income groups; displacement of marginalized communities.	Requires policies to ensure inclusive growth (e.g., mixed-income zoning).	Gentrification trends near Mumbai Metro stations; displacement in Kolkata.
Sustainability Trade-offs	Reduces congestion/emissions but risks infrastructure strain in high-density zones.	Integrated planning is needed to balance density with resource allocation.	Overcrowding in Delhi's metro-adjacent areas; Curitiba's BRT-linked density management.
Policy Interventions	Value capture mechanisms can reinvest property value gains into public amenities.	Ensures equitable redistribution of metro-driven economic benefits.	Tokyo's transit-funded public infrastructure; Mumbai's TDR (Transfer of Development Rights).
Future Research Needs	Long-term socioeconomic impacts on informal economies; lessons from global case studies.	Guides adaptive strategies for inclusive transit-oriented development (TOD).	Studies on street vendors near Chennai Metro; TOD best practices from Copenhagen.
Broader Urban Context	Aligns with India's Smart Cities Mission but risks replicating metro-city inequities.	Calls for metro systems to prioritize inclusivity in planning frameworks.	AMRUT's focus is on equitable infrastructure and Pune's participatory metro planning.

## 9. Conclusion

Building a metro system would greatly assist Jammu City, India, which is now experiencing uncontrolled expansion. It would also promote strategic planning. The city's commercial centres, which have seen rapid expansion in recent years, can take advantage of this building to transition from unplanned to sustainable and functional development. It can profit from the upgraded transit system in the city as well as any upcoming new business initiatives that the city may take on. If the new commercial projects successfully balance with the current commercial hubs by meeting the needs of the current situation and fostering strategic growth, the city can grow considerably.

In conclusion, this research highlights the profound impact of metro infrastructure on commercial hubs in Jammu

City. The metro has significantly improved accessibility, spurred economic activity, increased property values, and fostered diverse communities. It has transformed the city's urban landscape. However, to ensure balanced development and sustainability, policymakers must consider equitable access to benefits and comprehensive urban planning. This study provides valuable insights for urban development and policy, and future research can explore long-term impacts and effects on residential areas and marginalized communities experiences. The findings underscore the transformative potential of metro systems in urban contexts.

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## References

- [1] Reza Kheyroddin, Aliakbar Taghvaei, and Amir Forouhar, "The Influence of Metro Station Development on Neighbourhood Quality: The Case of Tehran Metro Rail System," *International Review for Spatial Planning and Sustainable Development*, vol. 2, no. 2, pp. 64-75, 2014. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [2] Pengpeng Liang et al., "High-Speed Rail Effects on Station Area-Level Business Commercial Agglomeration: Evidence from 110 Stations in China," *Frontiers in Environmental Science*, vol. 10, pp. 1-16, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [3] Tarek Abdel-latif Aboul-Atta, and Sally Bahaa Eldin Elmaraghy, "Factors Affecting Performance Improvement of the Metro System in Cities," *Journal of Engineering and Applied Science*, vol. 69, pp. 1-18, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]



- [4] Mohammad Hamed Abdi, and Patxi J. Lamiquiz-Daudén, “Transit-Oriented Development in Developing Countries: A Qualitative Meta-Synthesis of its Policy, Planning and Implementation Challenges,” *International Journal of Sustainable Transportation*, vol. 16, no. 3, pp. 195-221, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [5] Zijiang Chen et al., “Comparative Analysis of Transit-Oriented Development (TOD) Types in the Metropolitan Region along the Middle Reaches of the Yangtze River,” *Sustainability*, vol. 16, no. 22, pp. 1-24, 2024. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [6] Dong Lin et al., “Metro Systems: Construction, Operation and Impacts,” *Tunnelling and Underground Space Technology*, vol. 143, pp. 1-18, 2024. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [7] *India’s Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth*, McKinsey Global Institute, pp. 1-232, 2010. [[Google Scholar](#)] [[Publisher Link](#)]
- [8] Deepak Baidur, Urban Transport in India: Challenges and Recommendations, *The Indian Institute for Human Settlements*, pp. 1-42, 2015. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [9] Parvaiz A. Bhat et al., “Urban Sprawl and its Impact on Land Use/Land Cover Dynamics of Dehradun City, India,” *International Journal of Sustainable Built Environment*, vol. 6, no. 2, pp. 513-521, 2017. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [10] Robert Cervero, “Linking Urban Transport and Land Use in Developing Countries,” *Journal of Transport and Land Use*, vol. 6, no. 1, pp. 7-24, 2013. [[Google Scholar](#)] [[Publisher Link](#)]
- [11] Robert Cervero, and Cathleen Sullivan, “Green TODs: Marrying Transit-Oriented Development and Green Urbanism,” *International Journal of Sustainable Development & World Ecology*, vol. 18, no. 3, pp. 210-218, 2011. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [12] Kala Seetharam Sridhar, and Anjali Mahendra, “Economic Benefits of the Metro and Relaxed Floor Area Ratio: Evidence from Bengaluru, India,” *Case Studies on Transport Policy*, vol. 19, pp. 1-12, 2025. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [13] Niraj Sharma, Rajni Dhyani, and S. Gangopadhyay, “Critical Issues Related to Metro Rail Projects in India,” *Journal of Infrastructure Development*, vol. 5, no. 1, pp. 67-86, 2013. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [14] L. Bertolini, “Spatial Development Patterns and Public Transport: The Application of an Analytical Model in the Netherlands,” *Planning Practice & Research*, vol. 14, no. 2, pp. 199-210, 1999. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [15] Philipp Rode et al., *Accessibility in Cities: Transport and Urban Form*, Disrupting Mobility: Impacts of Sharing Economy and Innovative Transportation on Cities, pp. 239-273, 2017. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [16] Madhu Bharti, and Pavithra Velechettiar Bhaskaran, *Impact of Metro-Rail Projects on Land Use and Land Value in Indian Cities-The Case of Chennai*, Railway Transportation in South Asia, pp. 43-65, 2021. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [17] Mohamed Elassy et al., “Intelligent Transportation Systems for Sustainable Smart Cities,” *Transportation Engineering*, vol. 16, pp. 1-18, 2024. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [18] Marwa A. Khalifa, and Mohamed A. El Fayoumi, “Role of Hubs in Resolving the Conflict between Transportation and Urban Dynamics in GCR: The Case of Ramses Square” *Procedia - Social and Behavioral Sciences*, vol. 68, pp. 879-893, 2012. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [19] Daniel Hörcher, and Alejandro Tirachini, “A Review of Public Transport Economics,” *Economics of Transportation*, vol. 25, pp. 1-34, 2021. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [20] Rani Mughal, Javed Manzoor, and Rouf Ahmad Wagay, “Growing Urbanization in the Jammu Province of Jammu and Growing Urbanization in the Jammu Province of Jammu and Kashmir, India: an Environmental and Social Interpretation Kashmir, India: an Environmental and Social Interpretation,” *Journal of Bioresource Management*, vol. 11, no. 2, pp. 1-14, 2024. [[Google Scholar](#)] [[Publisher Link](#)]
- [21] G.A. Rice, “Central Business District,” *International Encyclopedia of Human Geography*, pp. 18-25, 2009. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [22] Jammu Development Authority and Jammu development Authority, Jammu Master Plan-2032, pp. 1-249, 2017. [Online]. Available: <https://jda.jk.gov.in/page/innerpage/master-plan.php>
- [23] Vijay Lakshmi, and Nazim Tariq, “Causes and Effects of Urban Sprawl: A Case Study of Jammu City,” *International Journal for Research in Applied Science & Engineering Technology*, vol. 11, no. 4, pp. 7-13, 2023. [[CrossRef](#)] [[Publisher Link](#)]
- [24] Alice Lunardon, Doroteya Vladimirova, and Benedikt Boucsein, “How Railway Stations can Transform Urban Mobility and the Public Realm: The Stakeholders’ Perspective,” *Journal of Urban Mobility*, vol. 3, pp. 1-10, 2023. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [25] Mass Rapid Transit Corporation, Alternatives Analysis Report for Jammu MRTS, Government of Jammu & Kashmir, pp. 1-153, 2020. [Online]. Available: [https://jkpwdrb.nic.in/pdfs/AAR\\_JAMMU\\_MRTS.pdf](https://jkpwdrb.nic.in/pdfs/AAR_JAMMU_MRTS.pdf)
- [26] Nezir Aydin, Sukran Seker, and Betül Özkan, “Planning Location of Mobility Hub for Sustainable Urban Mobility,” *Sustainable Cities and Society*, vol. 81, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [27] Simon Elias Bibri, John Krogstie, and Mattias Kärrholm, “Compact City Planning and Development: Emerging Practices and Strategies for Achieving the Goals of Sustainability,” *Developments in the Built Environment*, vol. 4, pp. 1-20, 2020. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]

- [28] Tahir Malik, Manzoor A. Rather, and Arshad Amin, "Urban Land Use Dynamics and Its Future Prospectus (A Case Study of Jammu City)," *International Journal of Engineering Research and Development*, vol. 9, no. 6, pp. 50-55, 2013. [[Google Scholar](#)] [[Publisher Link](#)]
- [29] Anupriya, Prateek Bansal, and Daniel J. Graham, "Congestion in Cities: Can Road Capacity Expansions Provide a Solution?," *Transportation Research Part A: Policy and Practice*, vol. 174, pp. 1-29, 2023. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [30] Morten Welde, and Eivind Tveter, "The Wider Local Impacts of New Roads: A Case Study of 10 Projects," *Transport Policy*, vol. 115, pp. 164-180, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [31] Daina Mazutis, and Lauren Sweet, "The Business of Accelerating Sustainable Urban Development: A Systematic Review and Synthesis," *Journal of Cleaner Production*, vol. 357, pp. 1-17, 2022. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [32] Comprehensive Mobility Plan for Jammu, Government of Jammu & Kashmir, pp. 1-211, 2020. [Online]. Available: [https://jkpwdrb.nic.in/pdfs/Jammu\\_CMP.pdf](https://jkpwdrb.nic.in/pdfs/Jammu_CMP.pdf)
- [33] Simon Elias Bibri, "Compact Urbanism and the Synergic Potential of its Integration with Data-Driven Smart Urbanism : An Extensive Interdisciplinary Literature Review," *Land Use Policy*, vol. 97, 2020. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [34] Mary Amoah et al., "Space Use in Central Business District of Emerging Economies: Regulation or Rationale?," *Urban Governance*, vol. 3, no. 4, pp. 315-329, 2023. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]