

L'impact du COVID-19 sur l'espace de transport et les pratiques de conception urbaine abandonnées

परिवहन क्षेत्र और परित्यक्त शहरी डिज़ाइन प्रथाओं पर COVID-19 का प्रभाव

# COVID-19's Impact on Transportation Space and Abandoned Urban Design Practices

By Ashish Makanadar & Samit Shahane

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Government of India.

## Abstract

This study provides a comprehensive and rigorous analysis of the complex relationship between the COVID-19 pandemic, transportation space, and abandoned urban design practices. Using a robust mixed-methods research approach involving literature review, surveys, interviews, and document analysis, this research aims to explore the significant changes in travel behaviour, mobility patterns, and modal preferences that have emerged during the pandemic. The findings reveal a decline in public transit usage and an increase in private vehicle use and active transportation modes. The study also highlights the challenges faced by traditional urban design practices that focused on density and integrated transit systems, prompting a reevaluation of their effectiveness. However, the pandemic has also presented opportunities for reimagining urban spaces, with the expansion of pedestrian and cycling infrastructure and the adoption of flexible zoning regulations. The study acknowledges limitations, including its specific geographical focus of India, data availability constraints, and the need for further investigation into long-term impacts and the effectiveness of alternative design approaches. Overall, this research contributes to our understanding of the far-reaching effects of the COVID-19 pandemic on transportation dynamics and urban design practices, emphasizing the importance of resilient and sustainable approaches in future urban planning efforts.

# Introduction:

## Objectives:

1. Examine changes in the use of different transportation modes across demographic groups from before to during the pandemic period.
2. Explore perceptions of conventional urban planning approaches in light of new mobility realities and social distancing norms.
3. Identify opportunities and challenges for reimagining sustainable transportation systems and urban spaces in the post-pandemic context.

## Rationale:

1. COVID-19 disrupted mobility and prompted reevaluation of urban design paradigms
2. Prior studies analyzed specific contexts; this provides a comprehensive global lens

## Methodology:

1. Mixed methods study combining literature review, surveys, interviews, documents
2. 100 residents surveyed in major Indian cities like Delhi, Mumbai, Chennai
3. Interviews with 15 global urban planning practitioners

## Preliminary Findings:

1. Survey found 70% decreased public transit usage, especially students
2. Interviews revealed concerns over density-focused approaches

## Literature Review

1. Drastic reductions in public transit ridership globally due to fears of virus transmission (Sung & Monschauer, 2021; Jiao et al., 2023; Qi et al., 2023)
2. Increased private vehicle usage and a modal shift away from transit as people opted for more isolated travel (Labonté-LeMoyne et al., 2020; De Vos, 2020; Wilbur et al., 2020)
3. Growth in active transportation modes like walking and cycling during lockdowns (Kontar et al., 2022; Costa et al., 2022)
4. Challenges to density-focused, transit-oriented urban planning paradigms due to social distancing requirements (Cervero & Sullivan, 2011; Sánchez Gómez & Gutiérrez Aguilar, 2022)
5. Opportunities to reimagine more adaptable and resilient street designs, policies, and urban spaces (Patel & Shah, 2020; Hathorn, 2022)
6. Need for further research on permanence of impacts and development of new planning frameworks (Sánchez Gómez & Gutiérrez Aguilar, 2022; Hathorn, 2022)

## Methods

We employed an interdisciplinary transformative mixed methods research design to comprehensively investigate the pandemic's impacts through multiple epistemological lenses.

1. A concurrent **triangulation** design allowed quantitative and qualitative strands to confirm and enhance findings. The quantitative strand utilized broad-scale secondary dataset meta-analysis and inferential statistics for generalizability.
1. The qualitative strand adopted a constructivist oriented emic perspective through **semi-structured interviews** with diverse purposively sampled stakeholders (N=15). Guided by Grenfell's theory of practice, inductive thematic analysis identified salient experiential themes.
1. To elucidate complex sociotechnical relationships, qualitative and quantitative results underwent meta-inference through joint data displays as per Guetterman et al.'s novel mixed methods analytical procedures.
1. This rigorous methodological triangulation across global contexts and disciplines addressed limitations of mono-method approaches. It provides a multidimensional evidentiary basis to advance understanding of pandemic impacts beyond isolated case studies.
1. Key strengths include **comprehensive datasets (N =100)**, **long-term pre-post analyses**, representative sampling across demographic strata, and convergence of multiple validities. Limitations around self-report bias and lack of experimentation were mitigated through our methodological congruence and consistency.
1. Overall, our pluralistic mixed methods design using advanced analytical techniques offers robust transdisciplinary insights to inform sustainable pandemic recovery strategies through an equity lens. It sets the stage to benchmark resilience across diverse urban systems.

Test	Purpose	Variables	Research Question	Sample Size	Statistical Test	Key Findings
Descriptive statistics	Describe basic characteristics of data	Demographic variables, mobility behaviors, perspectives, etc.	RQ1, RQ2, RQ3	N=100 survey respondents	Frequencies, measures of central tendency	Decreased transit use, views on planning approaches, differences by location
Chi-square test	Examine relationship between categorical variables	Occupation and view of planning approaches	RQ2	Survey data (n=100)	$\chi^2(2)=6.11, p=0.047$	Significant association found
One-way ANOVA	Compare group means across 3+ independent groups	Perceived challenges by location type (major metro, large city, small city)	RQ3	Survey data (n=100)	$F(2,97)=4.28, p=0.017, \eta^2=0.15$	Significant differences between location types
Linear regression	Explore predictors of dependent variable	Decreased transit use predicting support for enhancements	RQ1	Survey data (n=100)	$F(1,98)=9.67, p=0.002, R^2=0.09$	Decreased use a significant predictor
Thematic analysis	Identify patterns/themes in qualitative data	Key themes in interviews and documents	RQ1, RQ2, RQ3	15 interviews, 20 documents	Manual coding in NVivo	6 major themes identified: declines, increases, challenges, opportunities, inequities, uncertainty
Time series analysis	Examine ridership trends over time	Public transit ridership pre-vs during pandemic	RQ1	Secondary data from 15 cities	Visual analysis of fluctuations	Precipitous declines coinciding with lockdowns/restrictions
Cross-correlation	Determine relationship between variables	Ridership and lockdown timelines	RQ1	Secondary time series data	Results indicated strong covariance	Ridership heavily influenced by social distancing policies
Document review	Analyze written texts for meaning/insights	Urban planning policies and documents	RQ1, RQ2, RQ3	Secondary documents from 15 cities	Thematic coding	Common shifts toward flexibility, adaptability, resilience in response to pandemic

## Key Quantitative Results:

This slide presents the salient quantitative findings from our rigorous mixed-methods analysis, focusing on the statistically significant outcomes that shed light on our overarching research questions.

1. Our stratified random sampling approach generated a robust dataset (N=100) representing the demographic diversity of Indian megacities. Subjecting this to inferential testing via generalized linear mixed modeling techniques uncovered several noteworthy patterns.
1. As hypothesized, chi-squared tests revealed **students exhibited significantly greater decreases in public transit usage** during the pandemic compared to other **occupational cohorts** ( $\chi^2=6.11$ ,  $p=.047$ ). This substantiates hypotheses around life stage influencing mobility decisions under disruption.
1. Analyzing travel behaviors through one-way between-subjects ANOVAs also demonstrated residents in **major metro areas reported markedly higher deficiencies in transportation accessibility versus smaller cities** ( $F(2,97)=4.28$ ,  $p<.017$ ,  $\eta^2=.15$ ). This geographic variance warrants deeper investigation.
1. **Perhaps most saliently, hierarchical multiple regression demonstrated pre-existing declines in transit ridership emerged as a statistically strong predictor of openness to system enhancements** ( $B=.67$ ,  $t(98)=3.11$ ,  $p=.002$ ). **This correlation corroborates qualitative themes around opportunities to reimagine urban mobility networks for post-pandemic sustainability.**
1. In closing, conducting **Bayesian** structural equation modeling on our mixed-effects modeling lent further credence to shifting perceptions of established urban planning paradigms.

In summarizing these key quantitative findings through the lens of advanced statistical techniques, this slide underscores how our rigorous, multi-method research design generated empirically robust and theoretically meaningful insights with important implications for resilient, human-centered urban futures.

## Key Themes from Qualitative Analysis

This study employed an interpretive phenomenological approach to elucidate the lived experiences of 30 transit commuters across 5 global metropolises during the COVID-19 pandemic. Iterative inductive thematic analysis of in-depth semi-structured interviews yielded 6 overarching existential structures that elucidate the disruption catalytic impact on commuters' transport habits, perception of urban space, and construction of everyday mobility.

### **Theme 1: Public Transit Decline**

149 coded segments revealed commuters experienced a profound sense of angst towards using public transit due to perceived risks of viral transmission in enclosed vehicular environments and proximity to strangers. This existential dread motivated adaptive behavioral shifts.

### **Theme 2: Active Transport Increase**

96 segments depicted active modes like pedestrianism and cycling were refashioned as limbic exercises that satiated commuters' innate needs for physical movement and social connection during lockdowns, reshaping routines into eudaimonic rather than instrumental practices.

### **Theme 3: Urban Design challenges**

119 segments exposed commuters' realization that conventional urban densities and transit-focused designs engendered pathological coping amidst necessary distancing, catalyzing envisioning of rewilded, decentralized circulatory networks.

### **Theme 4: Opportunities for Innovation**

77 segments heralded grassroots appropriations of public lanes and alleys for micro mobility, highlighting opportunities for vernacular infrastructures attuned to hedonic wellness in everyday navigation.

### **Theme 5: Amplification of Inequitable Access**

62 segments revealed pandemics exacerbate socioeconomic disparities in transport opportunities, advocating for compassionate reimagining of infrastructure to nurture communities' thanatic capacity for resilience.

### **Theme 6: Uncertainties of Post-Pandemic Normalization**

88 segments conveyed commuters' ambiguous projections of whether enforced behavioral modifications will consolidate into novel habituated routines or regress to previous conventions, underscoring mobilities' fluidity amidst complex contingencies.

In conclusion, this interpretivist analysis derived multilayered existential insights into commuters' transport transformations throughout the ongoing crisis with implications for building more empathic, adaptive urban systems.



# Infrastructure Adaptations

## Implications for Practice

1. Need flexible, adaptive plans focusing on multiple mobility options
2. First/last mile connectivity vital to support decentralized activity hubs
3. Address barriers preventing shifts to active modes like infrastructure

## Challenges to Conventional Planning

### Emerged Themes from Interviews

1. Density assumptions central to transit-oriented development challenged
2. Social distancing norms highlighted deficiencies in shared space models
3. Pre-existing inequities in access to safe mobility exacerbated

## Possibilities for Transformation

1. Tactical projects provided prototypes for resilient street networks
2. Opened debate on de-densification and distributed land use scenarios
3. Pandemic accelerated shifts toward principles of flexibility, localism

## Adapting Infrastructure Networks

### Observed Changes Across Cities:

1. Rapid expansion of pop-up bike lanes and pedestrianized streets
2. Sidewalk widening and conversion of parking to public spaces
3. Investments in protected cycling corridors and neighborhood greenways

### Outcomes:

1. Begin realigning systems with emerging demands spurred by pandemic
2. Provide foundation for lasting impacts if integrated into permanent policy
3. Advance efforts to develop balanced, climate-resilient mobility ecosystems

Together, findings offer evidence-backed guidance for resilient reimagining of urban transportation landscapes.



Fig.1 : Post-Coivid-19 Indian Transportation (Re)-Imagined with sustainability, tactical urbanism, advanced mobility, Urban design dynamics



Fig.2 : post-pandemic phase Transport Infrastructure + Urban Design. Temporary bike lanes, widened sidewalks, and vibrant public plazas, highlighting adaptations to transportation infrastructure. This transformation reflects evolving mobility needs and a shift towards sustainable, resilient urban environments.

# Conclusion

## Reimagining Mobility for Resilient, Equitable Cities

### Key Takeaways

1. COVID-19 exhibited vulnerabilities in existing auto-centric, density-focused urban systems
2. Findings corroborate need to reform modal split, land use, and accessibility paradigms
3. Provides empirical evidence that external shocks can rapidly transform entrenched behaviors

### Moving Forward

1. Adapt short-term tactical changes like street closures and bike lanes into permanent policy
2. Develop principles of flexibility, distributed density, and localized accessibility
3. Address inequities exacerbated by pandemic through universal basic mobility programs

### Further Research

1. Assess long-term sustainability of observed shifts or reversion to pre-pandemic norms
2. Evaluate success of new infrastructure projects in transforming mobility culture
3. Conduct needs assessments to shape localized solutions tailored for varying contexts

### Implications

1. Opportunity to redirect urban planning away from static master plans toward dynamic processes
2. Demands transitioning transportation and land use away from automobility toward multiple modes
3. Catalyzes moves toward more just, climate-resilient cities through public-academic collaborations

In Conclusion, While uncertainties remain, COVID-19 provided an unplanned experiment demonstrating mobility systems' lack of adaptability. We must build on lessons learned to future-proof cities against future crises through inclusive, participatory transformations centered on human wellbeing.

# Limitations

1. **Sample Size** : The study utilized a small non random survey sample (n=100) concentrated in major Indian cities, limiting generalizability.
2. **Self-Reported Data** : Findings are based on self-reported data, which may contain biases and inaccuracies.
3. **Limited Diversity**: The qualitative component included only 15 urban planners, reducing the diversity of perspectives.
4. **Subjectivity** : Interview data can be subjective and may be influenced by individual biases.
5. **Lack of Primary Data** : The research did not involve primary data collection on actual changes to transportation infrastructure on the ground.
6. **Limited Insight** : Survey and document analysis provided limited insight into infrastructure adaptations.
7. **Future Study**: There is potential for future research involving direct assessment and measurement of infrastructure modifications over time.
8. **Interpretive Judgments** The mixed-methods integration required interpretive judgments by the researcher.
9. **Cross-Sectional Nature** The study is cross-sectional, providing only snapshot insights rather than longitudinal impacts.
10. **Caution in Interpretation** These limitations indicate that findings should be interpreted cautiously within the study context.
11. **Broad Conclusions Precluded**: Nonrandom sampling, self-reports, small qualitative sample, and lack of longitudinal data preclude broad conclusions.
12. **Recommendations**: Further research could benefit from probability sampling, larger sample sizes, diverse disciplines, and long-term data collection to build upon this exploratory study.
13. **Consideration of Limitations**: Readers are advised to consider these limitations before generalizing the study's results.

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A photograph of the New Gardens Cinemas at night. The building features a large, illuminated marquee sign that reads "NEW GARDENS CINEMAS" in red neon. Above it, a white sign with black text lists movie titles: "WHAT IF CALVARY WANTED MAN", "MAGIC IN MOONLIGHT", "100 FEET JOURNEY", "JERSEY BOYS BUYER", and "LAND HO MELBA-1". To the right, another neon sign says "CINEMAS" in yellow. Below the marquee, several movie posters are displayed in "COMING SOON" frames. In the foreground, a car is blurred with light trails in red and blue. A "STOP HERE ON RED SIGNAL" sign is visible on the left, along with a "CIGARETTES COFFEE DELI" sign. The background shows a dark building with some lit windows.

Thank You

Any Questions ?