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The Reproduction Commute: Commute-Time Extraction and the Graduated Sorting of Mobility in Mumbai, 1853-Present

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***Abstract*: This essay argues that Mumbai's transport system does not merely distribute access unequally across space; it extracts time. Focusing on the suburban railway that carries roughly 7.5 million passengers a day, the paper develops the concept of commute-time extraction: the process by which the city's spatial order compels its peripheral working poor to surrender large, uncompensated, and unrecoverable quantities of reproductive time sleep, care, rest, sociality to transit, so that their hours subsidise the accumulation concentrated at the centre. The suburban commute, on this account, is not simply a cost of economic participation but a site of dispossession in its own right: a temporal analogue to the spatial dispossession David Harvey describes, and a lived instance of the unequal "power-chronography" that Sarah Sharma theorises. The paper traces the mechanism that produces and sustains this extraction a graduated sorting apparatus that assigns bodies to differential mobility tiers across three regimes: the racialised carriage classes of the colonial railway (from 1853), the distance-from-work tiers of the postcolonial suburban system, and the algorithmic surge zones of contemporary ride-hailing platforms. Reading these together, the paper reframes mobility inequality in Mumbai as neither a technological deficit nor a purely spatial injustice but a durable structure of temporal extraction, and it argues that transport scholarship's dominant framing around access and distance obscures the axis-time-along which that injustice is most acutely lived.**

***Keywords*: commute-time extraction, temporal dispossession, power-chronography, social reproduction, suburban railway, transport-related social exclusion, platform mobilities, Mumbai, colonial railways.**

1. Introduction

"How does a city move, and who does it move?" is the question with which an earlier version of this essay began. The question this version asks is narrower and, I will argue, more revealing: whose time does the city take? Every weekday, roughly 7.5 million people ride Mumbai's suburban railway, and a large share of them those pushed by the city's land economy to its far northern and eastern peripheries spend between three and four hours a day inside its carriages. Transport economics records those hours as a cost, a friction to be minimised; this essay argues that they are better understood as a yield. Mumbai's spatial order does not merely distribute access unequally. It extracts time: it compels the peripheral working poor to surrender large, uncompensated, and unrecoverable quantities of what social life needs sleep, care, rest, sociality to the daily work of getting to work, so that their hours underwrite the accumulation concentrated at the centre. I call this process commute-time extraction, and I take the daily journey that performs it the long, exhausting, structurally mandated passage of the reproductive body across the city to be the reproduction commute.

To name commuting an extraction is to make a claim the dominant framing in transport scholarship cannot easily accommodate. That framing, developed most influentially in the literature on transport-related social exclusion [1], understands mobility injustice as a problem of access and distance: some people are too far from opportunity, or too poor to reach it, and the remedy is to close the gap. This is true and important, but it measures injustice along a spatial axis and treats time as the neutral medium in which distance is crossed. The wager of this paper is that time is not neutral, that it is itself distributed by power, and that in a city like Mumbai the deepest register of mobility injustice is temporal rather than spatial. The worker from Karjat is not merely far from the Bandra-Kurla Complex; she is early to rise and late to return, arrhythmic, sleep-poor, and structurally deprived of the hours in which a life outside work is made. The distance is the alibi; the time is the injury.

Reading the commute this way requires bringing together two bodies of theory that the field usually keeps apart, and reading both through a third. From Henri Lefebvre's rhythm analysis [2] the paper takes the insight that institutional timetables do not merely constrain bodies but "dress" them that the suburban schedule is constitutive of the commuter's domestic and biological life, not an external imposition upon it. From David Harvey [3] it takes the analysis of accumulation through dispossession, the way capital resolves its crises by producing inequality as a structural feature of the built environment rather than an unfortunate by-product. What the paper adds and what turns the juxtaposition of these two into a single argument rather than two parallel applications is Sarah Sharma's insight, in her account of power-chronography [4],

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that time is a medium of power precisely because some people's time is arranged so as to produce the temporal ease of others. The peripheral commuter's lost hours are not simply lost; they are the temporal substrate on which the centred city's productivity rests. David Bissell's study of the commute as a transformative, quasi-laborious practice [5] supplies the final term: commuting is not dead time but a kind of work, and the question is who is made to perform it and under what conditions. Bissell's Sydney commuters and Mumbai's Karjat commuters inhabit the same category and radically different fates, and that difference is the point at which a mobilities theory built in the global North [6] must be revised to meet the Southern megacity.

If commute-time extraction is the mechanism, the paper's second task is to explain how it is produced and why it persists. Here the essay draws on the historian's method: it identifies a sorting apparatus and traces its mutations across regimes. Mumbai's transport systems have, across a century and a half, continuously performed the same operation the assignment of bodies to differential mobility tiers, each tier carrying a different temporal fate. Under the colonial railway (from 1853) the tiers were the racialised carriage classes that reserved the first-class compartment for Europeans and the wealthy and consigned labourers to the third. Under the postcolonial suburban system the tiers became distances from work: the ability to live near one's employment, purchased at the price of central land, against the compulsion to commute from Virar or Kasara. Under the contemporary ride-hailing platform the tiers are algorithmic surge-priced zones that concentrate service where it is most profitable and thin it where it is most needed. The apparatus is graduated, in something adjacent to Aihwa Ong's sense [7], but what it grades is not sovereignty; it is time. This continuity is not a metaphor. It is a specific, describable machinery for converting where one is allowed to live into how much of one's life one is required to spend moving.

The paper proceeds accordingly. It first reconstructs the graduated sorting apparatus across its three regimes, showing in each the tier structure and the temporal fate it assigns. It then develops the concept of commute-time extraction as the apparatus's central effect the process by which spatial sorting is translated into the bodily, temporal experience of the reproduction commute. It closes by arguing that the environmental and political questions usually treated as separate congestion, emissions, the right to the city become legible, once the temporal axis is made visible, as further dimensions of the same extraction. To claim the right to the city, in Mumbai, is inseparable from claiming the right to one's own time.

2. Colonial Governance, Railways, and the Making of Modern Bombay

The apparatus's first tier was the carriage class. In colonial Bombay the railway sorted travellers into compartments that reproduced and hardened the social order first-class effectively reserved for Europeans and wealthy Indians, third for labourers and the poor so that the same journey was, depending on the body making it, a different experience of comfort, safety, and time. This is where the machine that this paper tracks was first assembled: an infrastructure that sorted bodies into tiers and assigned each a distinct passage through the city.

The railway revolution in the 19th century altered not only transportation logistics but also the perception of time, space, and social order. Beaumont and Freeman (2007) argue that the railway was the most powerful. Capitalism's standardisation of timetables, distances, and schedules led to increased surveillance, social segregation, and displacement, despite promising universal progress [8]. According to Wolfgang Schivelbusch, railways transformed human perception by compressing space and accelerating time, disrupting traditional travel and social patterns [9].

The relationship between modernity and railways was, from the start, contradictory. The Industrial Revolution, which started in England around 1760 and was fuelled by railways, relied on the ability to quickly transport raw materials from hinterlands to port cities, and manufactured goods back out. The steam engine, improved by James Watt from Thomas Newcomen's design, enabled mechanised locomotion. George Stephenson's Liverpool to Manchester railway in 1830 established the template that spread across Europe and North America in a generation. Railways produced suburbanisation, commuting, and the geographic expansion of cities beyond what was walkable and they simultaneously produced new forms of social stratification embedded in the physical infrastructure of the railway carriage itself.

In colonial India, this contradiction was sharpened by the asymmetries of imperial governance. The colonial government introduced railways in 1853 primarily to facilitate the extraction of raw materials from the Indian interior to port cities such as Bombay, Calcutta, and Madras [10]. Manu Goswami has demonstrated that the colonial railway network reorganised the economic geography of the subcontinent to serve metropolitan interests, binding Indian agricultural and mineral production to the rhythms of the global market rather than local need [11]. Anushree Gupta's research on transport in Bombay shows that the city's infrastructure grew from a combination of colonial and indigenous capital, producing a spatial geography that served commercial and administrative functions while entrenching social divisions [12].

It is important to be precise about what 'colonial governance' means in this context, and how its logic has persisted beyond formal decolonisation. In Bombay, railways served the movement of middle-class and wealthy populations from northern residential suburbs to the southern commercial and administrative core the 'town' of Victoria Terminus, the Fort district, and the mill areas of Parel and Lalbapur. Carriage classes were organised to reflect and reinforce social hierarchy: first-class compartments were effectively reserved for Europeans and wealthy Indians, third-class for labourers and the poor. The railway station became a site of social sorting as much as of transportation. The need to standardise time zones for train schedules also forced a linear, capitalist rhythm of productivity on everyday life. As Lefebvre would later say, the timetable "dressed" the commuter's body.

The contradictions Beaumont and Freeman identify in the

European railway experience the simultaneous enabling of movement and the creation of new mechanisms of control were thus reproduced in colonial Bombay in an accentuated form. Railways enabled the economic integration of the city while institutionalising the social and racial exclusions of colonial governance. This template infrastructure that serves accumulation more than access, and that produces spatial inequality as a structural feature rather than a side effect would persist into the postcolonial period and, this paper argues, into the digital present.

3. Social Inclusion and Mobility Inequality in Mumbai

The apparatus's second tier is distance from work. The postcolonial city retired the formal carriage-class hierarchy but replaced it with a subtler and more consequential sorting: the market in central land, which grants those who can pay the privilege of a short commute and compels those who cannot to absorb the long one. Where the colonial tier was marked on the compartment, the postcolonial tier is marked on the map the minutes of the central resident against the hours of the commuter from Virar or Kasara and it is this tier that most directly performs the commute-time extraction analysed below.

The postcolonial transformation of Bombay into Mumbai did not dissolve the unequal spatial logic of the colonial railway system; it extended and adapted it. The suburban railway network running on the Central and Western lines is the circulatory system of the city's economy, carrying approximately 7.5 million passengers daily. For the vast majority of Mumbai's working population, particularly those in lower-income brackets, the suburban train is the only financially viable means of covering the distances that the city's geography imposes.

The spatial scale of these distances is significant and deserves contextualisation. Workers commuting from Karjat or Kasara the distant northern terminuses of the Central Line, roughly 100 kilometres from the city centre or from Virar the terminus of the Western Line, approximately 60 kilometres from the centre to employment hubs in South Mumbai or the Bandra-Kurla Complex (BKC) may spend between three and four hours daily on trains. BKC, developed in the 1990s as Mumbai's answer to a postmodern central business district, houses the National Stock Exchange, major multinational corporations, and government offices; it represents a spatial concentration of economic power that is accessible primarily by rail for those who cannot afford to live nearby.

A World Bank study by Baker et al. (2005) found that 44 per cent of Mumbai's workers walk to their place of employment a figure that rises to 63 per cent among low-income workers [13]. This pattern reflects an inability to afford even the modest fares of public transport, revealing the extent of what scholars have termed 'mobility poverty': the condition of being structurally excluded from the networks of movement on which economic participation is based. Mobility poverty in Mumbai is not distributed randomly; it is mapped onto existing inequalities of class, caste, gender, and spatial location, focusing on those who live in informal settlements on the city's outskirts, those with disabilities who face inaccessible infrastructure, and women who face safety risks that limit their use of public space, particularly at night.

Women-only compartments on Mumbai's suburban trains represent one official recognition of the gendered dimensions of mobility, but they address symptoms rather than causes. The deeper issue is that transport infrastructure in Mumbai, as in most postcolonial cities, was not designed around the needs of its most vulnerable users. Informal settlements home to a large proportion of Mumbai's population are frequently located at a distance from rail stations and are poorly served by the bus networks that could provide last-mile connectivity. The result is that those who most need access to transport are most likely to be excluded from it.

4. Economic Geographies and Spatial Inequality

Harvey's concept of the 'spatial fix' provides a powerful lens for understanding the relationship between Mumbai's transport infrastructure and economic inequality. According to Harvey, capital resolves its tendency toward overaccumulation by investing in built environments such as roads, railways, airports, and metro systems, which open up new territories for profitable activity while displacing those who had previously inhabited or used the land (Harvey 1973, 22-44). Infrastructure investment thus simultaneously expands the geography of capital and produces new forms of dispossession.

The metro system in Mumbai has grown a lot since the early 2000s, which is a good example of how this works. The metro has made it easier to get to places that didn't have good train service before, and property values along its routes have gone up a lot. But this rise in value has forced both current residents and businesses to leave. To construct Metro Line 4 (Chembur-Kasarvadavli), residential and commercial properties in Chembur's Amar Mahal neighbourhood had to be demolished. Despite the fact that this benefited property developers and middle-class commuters, it harmed communities that were already struggling financially.

Long commutes also cost money, which is something that traditional transport economics doesn't take into account. A worker who travels from Karjat to CSMT or from Virar to Churchgate may spend three to four hours a day on the road, which means they can't do productive work, spend time with family, rest, or get involved in their community.

Harvey's later work on the 'right to the city' insists that questions of transport and urban space are fundamentally questions of political power: who gets to shape the city, in whose interests, and at whose expense (Harvey 2008, 23-40). In Mumbai, decisions about where to build metro lines, which neighbourhoods get bus service, how fares are set, and whose land is taken by force are all examples of how power works and how it stays the same. If you only think of these as technical or financial issues, you are taking the politics out of what is really a fight over the right to live in and move around the city.

5. Platform Capitalism and Algorithmic Mobility

The apparatus's third and newest tier is algorithmic. Digital mobility platforms do not abolish the sorting logic of rail; they

automate and privatise it. Surge pricing concentrates service in the zones and hours where it is most profitable and thins it where need is greatest, sorting passengers by their capacity to pay in real time and sorting drivers into the absorption of waiting and risk. The tier is no longer a compartment or a postcode but a dynamically priced zone, yet its function is continuous with the two that precede it: it decides whose movement is smoothed and whose time is spent.

The emergence of digital mobility platforms Ola, Uber, and Rapido has introduced a new layer of complexity into Mumbai's transport economy, one that Kuttler (2025) characterises as 'platform urbanism': a mode of governance in which algorithmic systems mediate the relationship between workers, users, and urban space [14]. These platforms represent the most recent phase of a longer history in which mobility has been organised to serve accumulation, and their analysis requires the same attention to structural power that this paper has applied to colonial railways and postcolonial infrastructure.

Kuttler's research demonstrates that platform companies in Mumbai have penetrated and transformed the existing taxi economy, particularly the kaali-peeli (black and yellow) taxi sector, by appropriating existing workers' local knowledge, social networks, and driving skills while passing on market risks to them. Drivers bear the costs of fuel price fluctuations, vehicle maintenance, and fluctuating demand, while platform companies profit from data and service fees. Kuttler's application of Lefebvre's spatial theory to this context is instructive: he shows that platform drivers navigate and resist algorithmic control by creating 'differential space' within the platform's homogenising framework, carving out zones of autonomy and social solidarity even within a system designed to automate and monitor them (Kuttler 2022, 361-377) [15].

This analysis expands upon the colonial governance framework delineated previously in this paper. Colonial railways took value from the Indian subcontinent and made new ways to control people. Digital mobility platforms take data and extra value from workers and cities while making new ways to watch and discipline people using algorithms. Here, the spatial fix is not done by building physical infrastructure, but by making digital architectures that move people from areas that are not well served to areas that are more profitable. Surge pricing, for example, concentrates ride-hailing services in wealthy neighbourhoods during peak hours, deepening the mobility divide rather than narrowing it.

Castells' network society framework is relevant here: it demonstrates that platform companies wield power not because they own things, but because they control the network infrastructure through which information, money, and people move (Castells 1996) [16]. Individuals who are excluded from this network or are only included under adverse conditions experience a new manifestation of the disconnection that Castells described as the essential divide of the information age. This disconnect in Mumbai corresponds to established geographies of class, caste, and spatial location, exacerbating structural inequalities identified in previous sections of this paper dating back to the colonial era.

6. The Reproduction Commute: Commute-Time as Extraction

Transport economics has a category for the hours a commuter spends in transit: it calls them travel-time costs and, in the cost-benefit analysis of infrastructure, assigns them a monetary value derived from wages. The framing is revealing. Time in transit is treated as a friction a deadweight loss to be reduced by faster trains and better roads and its value is indexed to the productive time it displaces. What this accounting cannot register is that the time lost to the commute is not, for the most part, productive time at all. It is reproductive time: the hours in which people sleep, eat with their families, rest their bodies, care for children and elders, and sustain the social relations without which labour cannot be renewed. When the worker from Karjat surrenders four hours a day to the railway, she does not mainly lose wages; she loses the conditions of her own reproduction. To see the commute clearly, one must move from the ledger of travel-time costs to the analysis of social reproduction, and ask not what the lost time would have earned but what its loss makes impossible.

Lefebvre supplies the first tool. His rhythm analysis distinguishes the cyclical rhythms of the body and the day from the linear rhythms imposed by capitalist production, and insists that the two are not merely in tension but that the linear works upon and reshapes the cyclical that the timetable, as he puts it, "dresses" the body (Lefebvre 2004, 25–40). Mumbai's suburban railway is among the most powerful rhythm-imposing machines any city has built. The pre-dawn trains from Virar and Kasara — some running before five in the morning do not simply carry workers; they set the hour at which entire households wake, eat, and sleep, organising domestic and biological life around the demands of the schedule. Lefebvre's term for the breakdown that results when imposed and lived rhythms cannot be reconciled is arrhythmia, and arrhythmia is the chronic condition of the peripheral commuter: the exhaustion of a body that cannot synchronise the rhythms of work, transit, and reproduction, because the transit has been made to consume the time the other two require.

But Lefebvre describes the imposition of rhythm without fully theorising its distribution without asking whose rhythm is disciplined so that whose may be eased. For that the paper turns to Sarah Sharma's power-chronography (Sharma 2014). Sharma's argument is that time is not a uniform medium in which all equally live but a differential and political one: the temporal experience of some is actively produced by the labour and the temporal subordination of others. The business traveller's seamless, cared-for time is made possible by the taxi driver's waiting, the flight attendant's scheduling, the maintenance worker's night shift. Applied to Mumbai, the insight is exact and severe. The productivity that the Bandra-Kurla Complex concentrates the traders, the executives, the offices of multinational capital rests on a workforce many of whose members have already spent two hours travelling before the working day begins, and will spend two more returning. Their arrhythmia is the condition of the centre's eurhythmia. The commute is not a neutral distance that happens to fall more heavily on the poor; it is a mechanism by which the time of the

periphery is spent to produce the time of the centre. This is what it means to call the commute an extraction.

The concept must be distinguished carefully from a superficially similar one. Harvey's "spatio-temporal fix" names the way capital defers its crises of overaccumulation by displacing them across space and into the future through credit, through investment in the built environment, through geographical expansion (Harvey 2008). Commute-time extraction is not that. It is not capital's management of its own time but its appropriation of the worker's; not a deferral of crisis but a daily transfer of lived hours from those who can least spare them to a centre that could not function without them. The relation to Harvey is nonetheless intimate, for commute-time extraction is the temporal face of exactly the process Harvey analyses spatially. When infrastructure investment produces spatial inequality when the metro raises land values and pushes the poor further out, when central land is priced beyond the reach of those whose labour the centre requires the inequality it produces is not only a matter of where people end up. It is a matter of how much of their lives the ending-up costs them. Spatial dispossession, followed to its lived consequence, is temporal dispossession. Harvey's displaced populations do not merely lose their place; they lose their hours.

Bissell's account of the commute completes the frame by refusing the assumption that transit time is empty. In his study of Sydney commuters, Bissell shows that commuting is a practice bodily, habitual, sometimes skilled, and quietly transformative of the people who do it and the cities through which they move (Bissell 2018). This is an indispensable corrective to the travel-time-cost model's image of the commuter as a passive parcel in transit. But Bissell's setting also marks the limit of a mobilities theory developed in the affluent North. His commuters have hard journeys; Mumbai's peripheral commuters have journeys of a different order longer, more crowded, more dangerous, and far more consequential for the possibility of a life, because they are performed by people for whom the lost hours cannot be bought back in any form. The Southern megacity does not merely offer a more extreme instance of the same phenomenon; it reveals a dimension the Northern case can leave implicit. Where Bissell's commuter is transformed by the journey, Mumbai's is depleted by it, and the difference is not one of degree but of what the commute is for and whom it serves. To extend the mobilities paradigm to Mumbai is therefore not to apply it but to revise it: to insist that the category of the commute contains, at its Southern extreme, a relation of extraction that the paradigm's founding cases render invisible.

The temporal cost, finally, is distributed exactly as the spatial one is by the tier into which the sorting apparatus has placed the traveller. The resident who can afford central land commutes for minutes; the resident compelled to Virar commutes for hours; the platform passenger who can pay the surge moves when and where she wishes, while the driver who cannot refuse the fare absorbs the waiting and the risk. Each tier is a different temporal fate, and the apparatus that assigns them carriage class, distance from work, algorithmic zone is, across all three of its historical forms, a machine for deciding whose time is spent so that whose may be saved. Commute-time extraction is the name for what that machine produces. It is the mechanism by which the abstract fact of spatial inequality becomes the concrete, daily, bodily experience of a life with its reproductive hours taken; and it is the axis along which, this paper contends, the injustice of urban mobility is most acutely lived and least often measured.

7. Environmental Paradoxes and Sustainable Futures

The relationship between mobility and environmental sustainability complicates the analysis. Despite its overcrowding and inequalities, Mumbai's public transport system is far more energy- and carbon-efficient per passenger-kilometre than the private car uses it partially replaces. According to Kuttler (2025), the expansion of ride-hailing platforms has led to worsened traffic congestion and increased urban emissions, contradicting the concept of platform urbanism.

The city's population growth and expansion have led to increased demand for motorised mobility, which public transportation has struggled to meet. Those who can afford it shift to private vehicles or platform services, while those who cannot continue to rely on an overburdened and underfunded public system. Investing in accessible, affordable, and low-carbon public transportation is essential for both environmental sustainability and urban equity.

8. Transport as Political Infrastructure

This paper contends that Mumbai's transport networks are fundamentally political rather than merely technical or administrative: they articulate and perpetuate power dynamics, serving as arenas of continuous contestation regarding the rights to inhabit and traverse the city. Harvey's notion of the right to the city posits that this struggle is not marginal to urban politics, but rather fundamental to it that the creation of urban space is fundamentally a matter of democracy and justice (Harvey 2008).

Decisions about route planning, fare structures, land acquisition, and capital investment all reflect and reinforce specific power dynamics. Protests in Mumbai against fare increases, land acquisition for metro depots, and community displacement due to highway construction are not isolated grievances, but rather expressions of a larger conflict over the city's spatial logic. The political infrastructure of transport who decides, who benefits, who bears the costs is as significant as the physical infrastructure of rails and roads.

Colonial governance, as this paper has argued, established a template for transport politics in Bombay in which infrastructural investment served accumulation over access, and in which the bodies of working-class and poor populations absorbed the costs of a city organised for elite mobility. Postcolonial developmentalism reproduced this template while extending its spatial reach, and neoliberal platformisation has extended it further into the algorithmic governance of everyday movement. Recognising this continuity is a precondition for imagining and building a genuinely different relationship

between transport, mobility, and urban citizenship.

9. Conclusion

This essay has argued that Mumbai's transport systems perform a single, durable operation across a century and a half of technological change: they sort bodies into graduated tiers of mobility and, by doing so, extract time from those they place at the periphery. Commute-time extraction the compelled surrender of uncompensated, unrecoverable reproductive hours to the daily work of reaching work is the mechanism by which the city's spatial inequality is translated into the bodily experience of its poorest residents. The reproduction commute is where that extraction is performed and felt.

Reframing mobility injustice along the temporal axis does more than add a variable; it reorganises the paper's other claims. The environmental question the carbon efficiency of mass transit against the congestion and emissions of platform-induced private travel is, seen temporally, also a question of whose hours are protected: the shift of the affluent to private and platform mobility buys them time while worsening the conditions of the system on which the poor depend. The political question Harvey's right to the city acquires, on this account, a temporal clause. To have a right to the city is not only to have a right to inhabit and shape its space; it is to have a right to one's own time, to a life whose reproductive hours are not confiscated at the door of the labour market. The graduated apparatus that this paper has tracked from the colonial carriage to the algorithmic surge zone is, in the end, a machine for deciding whose life will be spent moving. To dismantle it is not a technical problem of faster trains or better roads. It is the political problem of refusing an order in which the time of the many is the infrastructure of the few.

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