

The Fragile Night.

Infrastructural Fragility and Urban Inequality in Johannesburg

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Abstract

Infrastructure systems are inherently fragile. Their functioning depends on routines of repair, replacement, and management. Infrastructure embodies networks of political power, capital, and territorial reconfiguration. Through the concept of *instrumentalising fragility*, I examine infrastructural vulnerability not as a concealed weakness, but as a condition to be acknowledged and actively deployed to reform systems in socially responsive ways. Using Johannesburg as a case study – focusing on public lighting infrastructure – I explore how infrastructure has been used to divide and subjugate black residents historically. While today’s infrastructural challenges differ, their effects echo these past injustices. By uncovering and working strategically within the failings of infrastructural networks, designers are empowered to intervene, repair, and reshape these systems to better serve both human and non-human communities. This reframing sees fragility as a site for adaptive, hybrid, and strategic design – one that prioritises care, visibility, and transformation, offering pathways to more equitable and sustainable urban futures.

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“Dawn breaks like a bull through the hall” is a lyric from the 2001 song *New Slang* by The Shins (Mercer, 2001). It references the now uncommon English term “daybreak” or “break of dawn” to indicate the moment the night is broken by the first glow of the rising sun. The Shins amplify this with dramatic effect, building on the dynamic experience of a new day and all that it holds. Implicit in the notion of daybreak is a cyclical rhythm where night does not slowly disappear into the day but is broken. The fragile night is shattered by the rising sun. Calling the night fragile may seem counterintuitive. Its pervasive darkness and all-encompassing dominance have significant control over life on Earth, connecting us to our celestial existence and enforcing cycles of rest and renewal for diurnal species.

However, the night has long carried associations of risk, uncertainty, and even danger, particularly for women and communities on the urban socio-economic margins (Whitzman, Andrews et al., 2014; Parikh, 2018). Our dominant human visual sense is impeded in the darkness, and we generally retreat to places of warmth and safety. For millennia, human fragility in the night has been countered by fire in its various guises and electricity since the 19th century. As Kenny recounts, 19th century industrialisation brought with it the large-scale illumination of cities worldwide, but concurrently deepened social inequality through the unequal and variegated installation of urban lighting:

The play of the light through the evening mist, shimmering off windows or glimmering along an animated boulevard, forged an important affective connection to the city, while shadowy corners and dark alleys aroused fear and suspicion, exposing the subjectivities that underlay the putatively rationalist planning imperative, and serving to justify the denigration of urban dwellers on the margins of middle-class respectability (Kenny, 2016: 94).

Nighttime lighting infrastructure enables more equitable, safe and liveable environments, particularly in urban areas. However, an illuminated street or park depends on an extensive and often brittle physical network, which, as extreme climate-change related weather events occur, and mismanagement and underinvestment in public infrastructure con-

tinue, becomes increasingly fragile. Indeed, many urban areas worldwide are today in infrastructure crises, where the scale of infrastructure investments required vastly outnumbers governmental budgets (Thusi, Mlambo, 2023; Hughes et al., 2018). In this sense, our human attempts to hold back the night are increasingly fragile, and the effect of losing safe and reliable access to urban areas at night can result in the retreat of nighttime cultures and economies, with a significant social toll.

This paper is inspired by my many years living in Johannesburg, South Africa. Through almost a decade of general infrastructural decline in the city, I have witnessed the direct correlation between our infrastructure systems' increased brittleness and the urban night's enclosure. This slow but sustained change is deeply spatial and architectural as repair, fabrication, and design processes are intrinsic to creating robust and flexible lived environments active into the night. But if Johannesburg is a foretelling of our planetary futures, as Gabrielle Hecht (2023) describes, how does greater infrastructure fragility restructure the urban? What are its effects on attempts to create more inclusive public spaces? How can we as designers and urban residents instrumentalise fragility to rebuild a socially and ecologically responsive urban environment? I examine these themes through this paper, focusing on nighttime infrastructure in Johannesburg. I begin by reviewing infrastructure more broadly, introducing Johannesburg's infrastructure challenge, and finally, I examine the notion of "instrumentalising fragility" to reframe fragility as an opportunity for strategic intervention and socially responsive design.

Illuminated dark

In much of the world, the nighttime illumination of public spaces and roads is an unambiguous public service. Streetlights, pedestrian lighting and public space lighting comprise central parts of any new square, park, or road. This service forms part of a municipality or city's basket of public provisions. Public lighting is a fundamental service as it supports the safe and inclusive use of an urban environment during dark hours. Public lighting can be understood as a major urban infrastructure, a network of cables, poles, switch boxes, bulbs, maintenance teams, and

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management systems. As an infrastructure network, it mediates our human social and economic interactions in and with urban space. However, as is commonly debated in infrastructure literature, the breakage or impairment of this almost invisible and fragile infrastructure renders it most visible (Larkin, 2013; Star, 1999). While the causes are a concern of this paper, the outcome is the same regardless: dark streets, parks, and public spaces, as well as attendant feelings of anxiety, retreat, and collapse among urban residents.

The need for public lighting is an ancient human-urban response to nighttime. The history of public lighting in all its guises is well-studied (Bouman, 1987; Kenny, 2017), and many examples worldwide demonstrate how, as humans, we have come to conquer darkness. Much has been lost as bright nights interfere with other ecological systems (Sordello, Busson et al., 2022; Ciach, Fröhlich, 2017), myths and legends of the dark dissipate, and with it, the Gothic imaginary of the unknown and unseeable. Indeed, our contemporary urban condition is so replete with illuminations that the night sky is largely lost to many urban dwellers. Extreme nighttime advertising on billboards, buildings, and in public transport intensifies the over-illumination of the night as the dark becomes an advertising canvas, focusing eyes on the brightest content. Much has been gained, too, as public lighting has enabled a longer day, pulling usable time out of the dark for sporting and recreation, cultural events, extended economic activity, and greater safety for all road and public space users.

Public lighting design, rollout and maintenance are inherently political. As Mbembe (2001) notes, in many contexts, the awarding of infrastructure projects has more to do with political access than technical know-how. The design decisions implicit in these systems are equally political. The form these systems take can significantly affect their user communities. As Ebbensgaard (2020) argues, different lighting qualities in socially provided housing in the UK can directly affect people's attachments to the spaces they inhabit, and as Petrova (2017) presents in a study of post-2008 Greece, politically enforced "lighting poverty" deeply influences social identity. Similarly, the bulbs used in streetlights can significantly affect feelings of safety

and comfort in an urban setting (Peña-García, Hurtado et al., 2015). Streetlight design, installation and maintenance in peripheral or low-income communities may be intentionally insufficient, limited or non-existent. The high-mast lights of South Africa's apartheid townships are a lingering case in point. Their omnipresence blasts light on all below as a relic of a state security apparatus, not to ease movement and facilitate a public nighttime space (Briers, 2024), but to control and monitor a displaced population (Fig. 1).

Studies of infrastructure systems in sociology, geography, urban theory and architecture have analysed the ontology of these at once material and systemic phenomena. An infrastructure network is not a hidden series of cables and conduits (Neuman, 2010). It is not flat, neutral or ubiquitous but political and negotiated (Hughes, 1987). Indeed, infrastructure is intrusive and present, immediate, active, material, and socially constructed. It has a material and spatial history, a significant effect on human lives, experience, and culture, and the logics that underpin an infrastructure network transmute through it. Infra-

An infrastructure network is not a hidden series of cables and conduits.

Fig. 1 - A resident of Soweto escaping tear gas during the Apartheid Soweto Student Uprisings. Note the high-mast light in the distance (Kumalo, 1976).



Infrastructure is certainly not always invisible and mute in its interactions with human society and environments. In many contexts, infrastructure presence is a major force in the human structuring of the world.

structure can embody a colonial apparatus (Mbembe, 2001; Graham, Thrift, 2007), and the built forms of a network can restructure a social landscape (Bélanger, 2009; Davies, 2021). Indeed, infrastructure is certainly not always invisible and mute in its interactions with human society and environments. In many contexts, infrastructure presence is a major force in the human structuring of the world (Larkin, 2013).

New infrastructure embodies communal aspirations for many populations, not just in the global south (Harvey, Knox, 2012). Still, infrastructure collapse can cause major public concern, as infrastructure networks only function due to careful (often advanced) design and construction. Routines of repair and maintenance by adequately trained teams, regular planning and monitoring by managers and engineers, and larger strategies to manage contingencies and other threats, ensure their continued operation (Graham, Thrift, 2007). Therefore, the break in a system is not just a broken cable, for example, but a failure of multiple components. Drawing on Actor-Network Theory, the human-material relationships within a complex infrastructure system are vast, varied, and actively intersect with social, environmental, political, and economic contexts, all engaged in complex motions (Latour 1996, 2007). A routinely dark street embodies a visible and socially consequential infrastructural breakage. The seemingly robust network of copper and concrete revealed as fragile in a context of disrepair and mismanagement. The infrastructural rendered mute through human inaction. But public lighting does not only serve road users – it is one of the most spatially consequential and intentionally designed urban infrastructure systems.

Lighting requires a sophisticated network from generation to illumination, and its effects are wielded to immense political, social and economic ends. For example, public monument spotlighting creates a nighttime urban hierarchy, dedicated pedestrian lighting in a park or square can support community activity, and multilevel illuminations can electrify a street market deep into the night. The opposite is true: the lack of public illumination at night impedes navigation and ease of movement, walking in a neighbourhood can feel intimidating, and urban economic activity can cease with the sun. While lighting has a foundational

effect on the experience of an urban environment, they are part of a similarly negotiated and political infrastructural formation.

Ruptured urban

In Johannesburg, infrastructure carries multiple social meanings. Indeed, South Africa's infrastructure history is overwhelmingly dominated by the expansion of networks serving colonial extension, resource extraction, and labour exploitation. Johannesburg's tethering to ports such as Maputo or Durban by railway and the mines in Kimberley eased the flow of materials, skills, and wealth required for industrial gold extraction (Fourie, Herranz-Loncán, 2015). While the growing industrial city was served by all manner of electrical, gas, and communications infrastructure through the early 20th century, its form was inherently racialised; quaint suburban roads and tram lines enabled northward suburban expansion for the white middle classes. At the same time, black communities were marginalised into peripheral 'locations' defined by tight street grids with an infrastructure scarcity, unless we refer to the mechanised exploitation of black labour in the form of mine worker hostels or labour compounds, where infrastructures of control and subjugation were constantly active (Vosloo, 2020). The city's first gas streetlight was erected on 17 November 1892 by the Johannesburg Lighting Company, followed by the first electric streetlamp in October 1895, placed on the corner of Rissik and President Streets. These followed the city's first railway (to Boksburg) in 1888, the first paved road in 1889, and the first telephone system in 1894 (City of Johannesburg, n.d.) (Fig. 2). The latter half of the 20th century saw the deepening of racial segregation under apartheid. The white city experienced major investment and growth with the completion of a world-class airport, a massive peripheral freeway ring, significant white suburban expansion, and industrial development. Black township areas also saw considerable expansion with little of the social and economic infrastructure that benefited their white counterparts. Indeed, housing for black residents was a monumental infrastructural project that deepened economic isolation while providing basic dwellings (Crankshaw, 2005). Township areas became the urban incarnation of

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Fig. 2 - A balloonist's photograph of rapidly developing Johannesburg. The urban street grid, mines, and rhythm of streetlights are clearly visible (Spelterini, 1911).

An infrastructure crisis has replaced the triumphant image of infrastructure development in a modernising “World Class African City”.

apartheid policy writ large. Black people were physically removed from the city, collectively isolated, and controlled by limited access points and state security infrastructure. Pass laws limited their movement, and their presence was physically disconnected from the white city through natural and artificial barriers such as the mine waste landscape that remains dominant in Johannesburg, freeway networks, and industrial zones. The insidious transformation of urban infrastructure into racial barriers is a major feature of apartheid cities.

Democracy in 1994 brought with it a sense of national optimism. The project of building a *new* South Africa was based on remedying apartheid’s most destructive effects, such as improving access to quality education, healthcare, and social services for South Africa’s black populations, but also transforming the economy to support and empower black professionals and women in particular. Implicit in democratic rebuilding was constructing the new state and the governmental institutions that supported it. New provincial legislature buildings, universities, court complexes, and memorial sites followed in the subsequent decades, each with its forms of symbolic expression (Noble, 2011). So, too, new infrastructural projects in Johannesburg sought to facilitate a more connected post-apartheid geography, using infrastructure to transcend old apartheid barriers and reintegrate the city region (Kakana, Mphambukeli, Makoni, 2025).

In the past decade, however, an infrastructure crisis has replaced the triumphant image of infrastructure development in a modernising “World Class African City” (BusinessTech, 2013). Inadequate national and local infrastructure planning and maintenance have seen a slow and, in some cases, dramatic decline in electricity generation and, in many places, water management. This was exacerbated by a period known as state capture under the Zuma presidency, where private interests and corrupt officials co-opted large parts of the government, specifically hollowing out state-owned enterprises, which were responsible for service provision, by and large (Swilling, Ngcaweni, & Ndletyana, 2023). The effects of this period run deep, and its impact has been felt most by economically and spatially marginalised communities. While strides have been made in remedying this decline, infrastruc-

ture systems remain brittle and pose a significant risk to residents should any climate catastrophe befall the city. Public lighting remains a major component of this urban decline, and Johannesburg's night has become an elusive and precarious place.

Ravaged body

“Nightfall comes like a dreaded disease seeping through the pores of a healthy body and ravaging it beyond repair,” an extract from Oswald Mbuyiseni Mtshali’s poem *Nightfall in Soweto* (1971) describes the terror residents felt as the dangers and uncertainties of the night engulfed the township under apartheid. Mtshali describes a healthy body ravaged every night, beyond repair. The contemporary night embodies a major functional, economic, and cultural urban shift. In Johannesburg, fashionable restaurants and party districts emerge and disappear; braziers appear in winter to warm the bitter cold, residents brave the dark streets for opportunity, and security vehicles patrol. Nighttime has changed throughout the city’s history. Specifically, though, in apartheid, the city’s night

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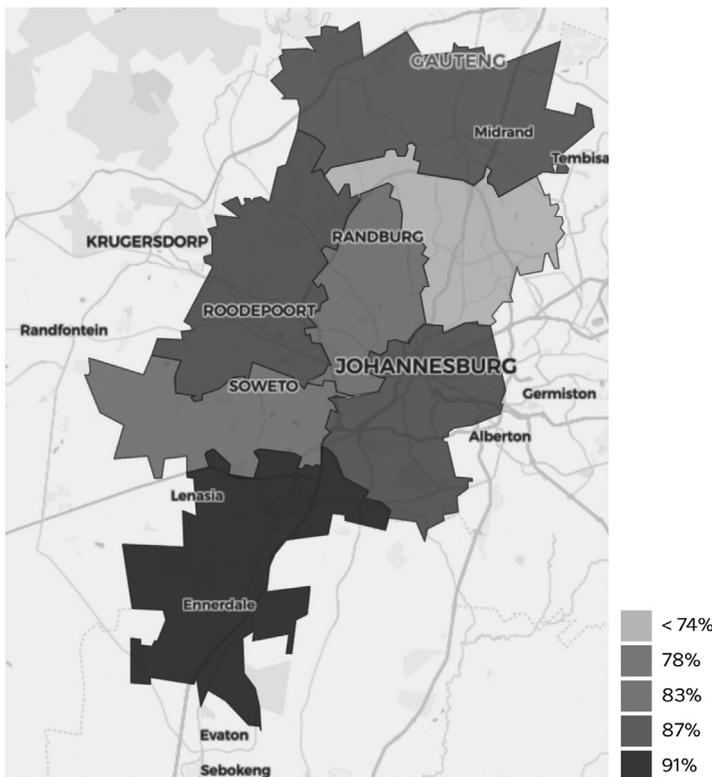


Fig. 3 - GIS map demonstrating the residence of respondents who indicated they felt unsafe during the night (GCRO, n.d.).

At night, large portions of the city fall into darkness. Traffic lights cease, streetlights darken, and computers and TVs shut down.

demarcated a harsh control on urban residents. A resident's place of rest was deeply racialised, and night forced any semblance of daily racial mixing back into apartheid's order. As captured in the political art of David Koloane (1998) and Santu Mofokeng (1986), the arduously rhythmic and often gendered migration of black labour into and out of the city daily along roads and train lines defined these starkly different modes. The urban night today unsurprisingly embodies this split. Still, the city's night has seen significant change since managed electricity blackouts, or load-shedding, began in 2008 due to reduced national electricity generation capacity.

At the start of load-shedding, few anticipated its duration, and even fewer residents anticipated the urban effects of routine electricity outages. At night, large portions of the city fall into darkness. Traffic lights cease, streetlights darken, and computers and TVs shut down. At the start of load-shedding, ill-prepared hospitals and other essential infrastructures couldn't function, particularly at night (Fokazi, 2022). Instead of the city functioning as an urban machine driven by

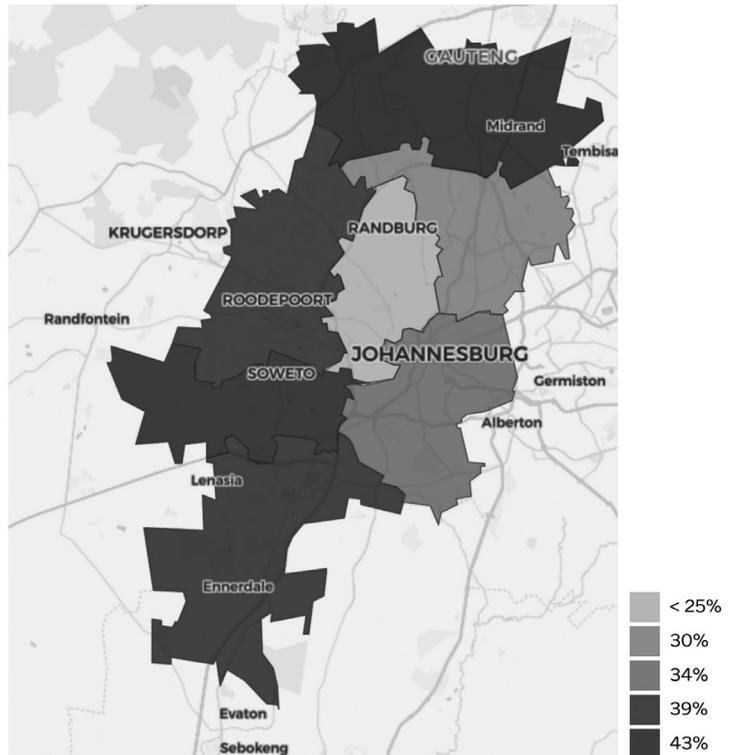


Fig. 4 - GIS map demonstrating the residence of respondents who indicated they were dissatisfied with streetlights (GCRO, n.d.).

economic engines and cultural cogs, these shut down, restart, and shut down again. Load-shedding is a strategy implemented by the national government and the single electricity utility and parastatal Eskom, and its effects penetrate downwards into every corner of society: offices, streets, and homes. While load-shedding enacted a counter rhythm against the standard operations of the city, copper syndicates used its predictability to harvest inactive copper lines from our urban infrastructure: traffic lights, streetlights, electricity supply cables, and in extremely brazen acts, several hundred kilograms of underground substation cabling in a single armed robbery (Tech Central, 2022). Poor infrastructure maintenance, load-shedding and cable theft changed Johannesburg's night, making the city less safe to traverse as a pedestrian or in a vehicle at night. Every two years, the Gauteng City-Region Observatory (GRCO) runs a Quality-of-Life Survey (see GCRO, n.d.). When asked about their safety experience at night, 72% of Johannesburg respondents indicated that they felt unsafe in 2017/18. This increased to 84% in 2023/24 (Fig. 3). Similarly, when asked about their

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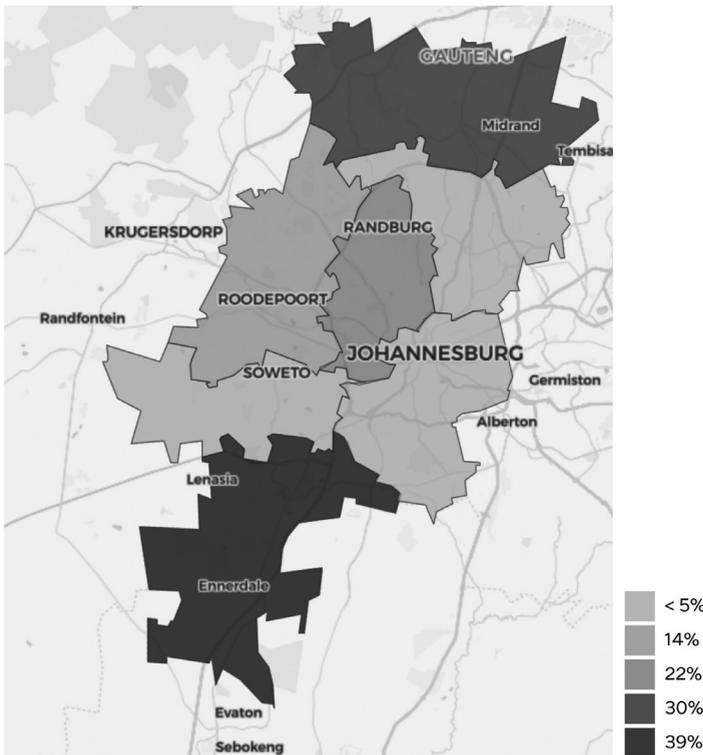


Fig. 5 - GIS map demonstrating the residence of respondents who indicated there were no street lights (GCRO, n.d.).



Fig. 6 - A dark street in Johannesburg's Parktown suburb (Mbele, 2024).

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satisfaction with streetlights as a municipal service in 2017/18, 23% of respondents said they were dissatisfied, and 9% said there were not any street lights. In 2023/24, this increased to 39% and 17% respectively (GCRO, n.d.) (Fig. 4, 5).

This survey demonstrates the parallel decline of street lighting and feelings of public safety at night. This has a significant effect on residents and businesses. With increased feelings of danger at night, residents are less likely to engage in nighttime economic and cultural activities. This was further exacerbated during the COVID-19 pandemic, when lockdowns were bolstered by curfews and alcohol bans. The urban night was darker and more dangerous due to loadshedding, and its socio-cultural joys (theatre, restaurants, clubs, taverns, house parties) were also shut down. The city has slowly returned from COVID-19, with restaurants and bars remaining open later. Still, Johannesburg's public realm remains fragile, reminiscent of Ntshali's "dreaded disease," as residents regularly face planned or unplanned electricity outages, and a fragile infrastructure network instils uncertainty. However, despite the economic, social and

cultural effects of a darker night, possibly the most damaging impact – the deepening of socio-economic division – is seldom mentioned. The failures of nighttime infrastructure in Johannesburg have instilled an infrastructural barrier, much like apartheid freeways, between income and race groups. Instead of a hard, impenetrable formation, this barrier is defined by its absence or inadequacy. When night falls, a major resource disparity is both enforced and revealed between its residents. Wealthy people have their own generated light, private security, cars, CCTV cameras, and other infrastructures to mitigate the darkness. While poorer residents face the dark with extremely limited resources, forced to walk, study, or cook in the dark or under a dim torch or candle, many living in contexts where toilets and water points are communal and detached from homes, a walk in the dark away. Indeed, returning to the GCRO survey, Johannesburg's more economically peripheral regions have higher scores of nighttime feelings of unsafety (91% in region G, for example) (GCRO, n.d.). As Vladislavić (2024: 4) accounts, in Johannesburg:

In a blackout, those who can afford such things worry about electric fences, security cameras, burglar alarms that aren't working; those who can't, worry about walking down unlit streets, or having to unlock doors in the dark, or the neighbour knocking over a candle.

While solutions to mitigating darkness exist, the comparative resource disparity is stark. Still, the night eviscerates the public realm for all, ravaging the pavement, parks, roads, and shopping strips, forcing a retreat inward behind locked doors and secured perimeters (Fig. 6). The potential of the urban as a racially mixed and income-inclusive economic engine, diversified by the 24-hour operation, is halted. Mtshali's fears – from half a century ago – reemerge, and the urban is lost to the night. While the lingering and deep effects of apartheid are made more apparent, much of the city's nighttime stasis is self-perpetuated by municipal mismanagement, revealing our reliance on fragile infrastructure systems and their cascading effect on our unequal social fabric. Today, nighttime fears of ungoverned streets, untrustworthy police, and hidden danger are entrenched.

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Instrumentalising fragility

Johannesburg harbours an apartheid infrastructure legacy, deepened by the fragility and failure of those infrastructure systems – such as urban lighting – that support public spaces and promote urban diversity, culture and nighttime economies. Indeed, public nighttime lighting in Johannesburg exemplifies how often abstract and invisible infrastructure systems have a major bearing on societies, in this case, exacerbating social, spatial and economic inequality. In charting a path forward, Deborah Cowen notes:

Infrastructure demands a focus on what underpins and enables formations of power and the material organization of everyday life. Visions, ideas, and analyses are important, but the future must be built, and “concretized” in ways that sustain sociality. A focus on infrastructure insists that we ask how power works, in its most mundane and practical ways (2017, p. 19).

As an expression of power and a “material organisation of everyday life,” societies deeply rely on infrastructure systems and networks. Still, these socially produced systems fundamentally restructure society, as they do landscapes and the urban (Cowen, 2017). It is easy to consider how our lives are moulded into interactions with networked service points, whether to purchase food, travel abroad, receive a vaccination, or transfer money. These fundamental human infrastructures are implicitly fragile, and their collapse can be dangerous and life-threatening. Indeed, fragility is an implicit condition of infrastructure networks. Major effort goes into developing contingency planning, repair and maintenance. But what happens when fragility becomes the overriding infrastructural condition, repair and maintenance fail, and vast and once-robust systems become tenuous and unpredictable?

Implicit in fragility is the potential of collapse, breakage, loss, and the sense of care, protection, and nurture. Acknowledging infrastructural fragility diminishes the power implicit in infrastructure systems: the system is vulnerable and can break. Similarly, the components of the infrastructure are made visible. The vast and impenetrable power generation network in South Africa, for example, is revealed to be largely

reliant on the complex schedules of repair (Harding, 2023). Finally, acknowledging fragility enables or empowers intervention. This may be careful, fine and surgical – Kintsugi – or radical and demonstrative – Standing Rock (Tabor, n.d.). To this end, fragility can be instrumental in restructuring infrastructure networks to serve human and non-human communities better.

Studio BASAR's projects in Romania and Teddy Cruz and Fonna Forman's projects on the US/Mexico border, respectively, provide insights into how architecture can intervene in infrastructural systems by instrumentalising fragility. Working in Bucharest, Studio BASAR developed a series of urban interventions, such as mobile benches, a public swimming pool, temporary shelters, and informal public infrastructure. Rather than waiting for a systemic overhaul, these temporary designs make visible and support urban residents, embracing fragility as a mode and condition of practice (Studio BASAR, 2014).

Teddy Cruz and Fonna Forman's civic infrastructure projects along the San Diego–Tijuana border intervene in a very fragile context through the participatory design of field stations on both sides of the divide that participate in research and activism together. These projects highlight how designers can reclaim political agency by working within, rather than against, conditions of infrastructural breakdown (in the case of Studio BASAR), and over-bearing infrastructural determinacy and social marginality (in the case of Cruz and Forman), transforming fragility into an opportunity for social activation and collaborative resilience (Cruz & Forman, 2020).

Akin to expanding the repair-oriented approach that Jackson (2014) and Al-Shihabi (2022) advocate, instrumentalising fragility looks beyond repair to a new, possibly hybrid, infrastructural formation. For architects, the infrastructural becomes a site of intervention, not just a system to be acknowledged, replaced or avoided, but an opportunity for physical systemic reform. The approach demands co-consideration of harder infrastructure networks and softer environmental, human and non-human systems. Instrumentalising fragility must not enforce complacency or inaction for fear of upsetting a condition or process, and instead, it centres strategic repair as a means for

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intervention. In the example of Johannesburg, as I now conclude, understanding the social and economic fragility of the night, the brittle nature of infrastructure networks, and the tenuous political conditions that supported inaction instead of repair all support nuanced and resilient solutions.

Fragile infrastructures

Architects have long debated alternatives to deterministic top-down urban approaches. Modernist strategies for intervening in the urban fabric have resulted in such schemes as major public plazas, mass social housing, and public transport infrastructure worldwide. However, they generally exist on several problematic assumptions, including a socio-cultural fixity (populations and habits do not change), resource abundance (water, electricity, fossil fuels), climate predictability (major climate events are far and few between), and permanence (engineered to last forever). All four misconceptions have been proved wrong through the 20th century as urban environments worldwide face major population, resource, and climate changes. These brittle and fixed infrastructures of the past are proving less reliable and ill-suited to our changing environments. Much 21st century scholarship on urban resilience, green infrastructure, and ecosystem multifunctionality has built convincing arguments for greater infrastructural adaptability built on a passive or at least sustainable energy backbone (Sneddon et al., 2021; Ramyar et al., 2021).

The electricity generation challenges in South Africa are an obvious example of a failing infrastructure backbone. The over-reliance on coal-powered generation and the constant issues regarding coal quality and power station maintenance mean that very little resilience is built into the grid. However, despite national challenges, the decline of electricity – and as I present in this paper – streetlight provision is far more variegated, revealing sustained local patterns of municipal mismanagement across roads, power, public spaces/parks, and public safety. In many cases, an urban retreat has occurred as residents feeling unsafe at night self-limit going out too late. This is further exacerbated by Johannesburg's apartheid spatial legacies, which the dark night reinforces, deepening socio-economic and racially divided geographies.

The example of Johannesburg's infrastructure fragility and its radical effects on the city's cultures and communities underscores the deep entanglement between urban systems and human life. For architects and urban designers, fragility should be deployed as a driver for more responsive interventions that accommodate the significant change and various stressors our future holds: replacing hard with soft, solid with porous, and singular with multiple, by creating infrastructures, such as lighting in this case, that are not dependent on large national grids. Still, perhaps with localised green power production, public spaces can remain more accessible, active and safe late into the night despite large-scale power interruptions. Building 21st century infrastructure systems that repair and adapt existing human and non-human networks and become more localised, responsive, and integrated into communities will support a much more resilient human future and significantly limit our reliance on major centralised (and often environmentally and socially destructive) energy backbones. Foregrounding sensitive and thoughtful design approaches will counter the harsh scenarios Johannesburg already presents for our planetary urban condition. Designers must move beyond notions of permanence and control, and instead embrace fragility as a generative condition. This means designing for adaptability, decentralisation, and care and foregrounding localised, participatory interventions that respond to infrastructural breakdown not with retreat but with repair and reinvention. By instrumentalising fragility, designers can reimagine infrastructure as a technical system and as a civic and ecological interface, shaping more inclusive, responsive, and resilient urban futures.

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