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Leveraging 4IR for Governance and Urban Development in Johannesburg

By Dr Mmabatho Mongae

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Executive summary

Johannesburg's ability to harness the transformative potential of the Fourth Industrial Revolution is hindered by persistent governance and administrative weaknesses. While the city scores well for service delivery and economic development, its poor rankings in planning, leadership, and administration on the Governance Performance Index suggest challenges in execution and institutional efficiency. While Johannesburg has demonstrated foresight in adopting 4IR policies – such as the Smart City Strategy – these efforts risk being undermined if governance bottlenecks remain unaddressed.

This briefing highlights the critical role of strong leadership and efficient administration in ensuring that 4IR-driven initiatives do not exacerbate inequality, but instead respond to Johannesburg's urban challenges.

To maximize the benefits of 4IR, Johannesburg must strengthen governance structures, improve policy coordination, and foster equitable implementation, ensuring that technological advancements enhance service delivery, economic growth, and urban resilience for all residents.

Recommendations

1. **Enhance citizen engagement** through AI-driven feedback platforms that allow real-time communication between residents and municipal officials.
2. **Improve service delivery** by adopting real-time data analytics for waste management, transport planning, and infrastructure maintenance.
3. **Build trust and accountability** through blockchain-based transparency tools that track municipal spending and prevent corruption; make these publicly available and accessible.
4. **Address weak leadership** and administrative inefficiencies by building a customised governance training programme that enhances decision-making, service delivery, and 4IR-driven urban management.

Introduction

Like previous industrial revolutions, the Fourth Industrial Revolution (4IR) presents opportunities to drive social and economic transformation, improve quality of life, and enhance governance. However, these benefits are not guaranteed. Their realisation depends on the quality and strength of local governance and institutions, which play a critical role in harnessing technological advancements effectively. Given high rates of urban migration¹, city governance will become an increasingly important conduit for delivering the potential benefits of new technologies.

4IR's uniqueness lies in its integration of technologies across physical, digital, and biological realms. This offers Johannesburg both opportunities and challenges – while governance can improve through 4IR, issues like political instability, income inequality shaped by apartheid, fragmented administration, and decaying infrastructure may hinder progress.

This policy briefing outlines strategies for integrating 4IR into Johannesburg's governance systems to enhance inclusive development and quality service delivery. While technology alone cannot resolve governance shortcomings, it can catalyse better service delivery, citizen engagement, and urban development. Drawing from successful examples in other African and global cities, this briefing provides recommendations for overcoming governance challenges and unlocking 4IR's potential in Johannesburg.

Governance reform as a prerequisite for 4IR in Johannesburg

Good Governance Africa's 2024 Governance Performance Index (GPI)² highlights that while the City of Johannesburg (CoJ) performs relatively well in service delivery and economic development, it struggles with administration & governance, leadership & management, and planning, monitoring & evaluation. This creates misalignment between policy ambitions and execution.

While much of the 4IR discourse focuses on private-sector growth, its role in governance transformation is under explored. South Africa's National Development Plan (NDP)³ outlines a vision for digital governance and smart cities, but its implementation requires political stability, leadership, and efficient coordination across government departments.

However, this is not enough to ensure that the benefits of 4IR are broad-based or evenly spread⁴. Smart governance and strong leadership will play a central role in achieving collaboration, effective resource management, and coordination between the different departments. According to the GPI, the city of Johannesburg ranks 5th among South Africa's eight metros.

Table 1: Overview of the 2024 GPI Metropolitan Rank

GPI 2024 RANKING	METROPOLITAN MUNICIPALITY	MOST FAVOURABLE GPI CATEGORY	LEAST FAVOURABLE GPI CATEGORY
1 of 8	City of Cape Town	Service Delivery	Economic Development
2 of 8	Ekurhuleni	Leadership & Management	Economic Development
3 of 8	eThekweni	Economic Development	Administration & Governance
4 of 8	Nelson Mandela Bay	Service Delivery	Leadership & Management
5 of 8	City of Johannesburg	Service Delivery	Planning, Monitoring & Evaluation
6 of 8	Buffalo City	Service Delivery	Leadership & Management
7 of 8	City of Tshwane	Service Delivery	Leadership & Management
8 of 8	Mangaung	Economic Development	Leadership & Management

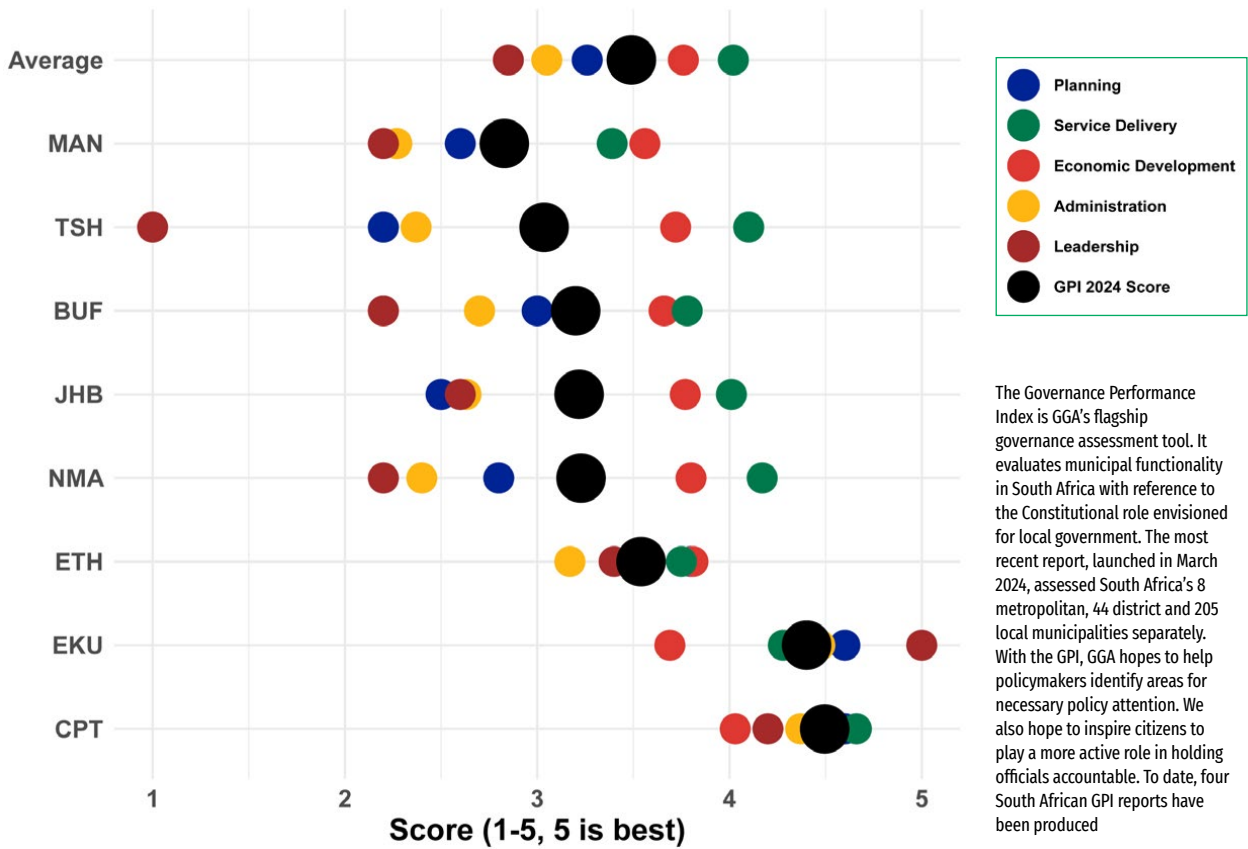
1 Anton Cartwright et al., Developing prosperous and inclusive cities in Africa, Working Paper. (African Centre for Cities, 2018), https://newclimateeconomy.net/sites/default/files/2023-08/CUT18_Africa_NatUrbanPolicies_final.pdf, accessed 19 February 2025.

2 Good Governance Africa, Governance Performance Index – South Africa 2024 (Johannesburg: Good Governance Africa, 2024). <https://digitalmallblobstorage.blob.core.windows.net/wp-content/2024/03/Enhanced-GPI-2024.pdf>, accessed 19 February 2025.

3 National Planning Commission, National Development Plan 2030: Our future – make it work (Pretoria: National Planning Commission, 2012)

4 Mmabatho Mongae, e-services in South Africa exacerbate inequality through digital barriers. Johannesburg: Good Governance Africa, 2024. <https://gga.org/e-services-in-south-africa-exacerbate-inequality-through-digital-barriers/>.

Metropolitan Municipality GPI 2024 Scores



The five categories used to assess metropolitan municipalities are: administration & governance, economic development, planning, monitoring & evaluation, service delivery (weighted most heavily) and leadership & management. Johannesburg ranks higher for service delivery and economic development, but scores lower for administration, leadership, and planning. This suggests that while the city can maintain a certain level of economic activity and provide essential services, it struggles with strategic governance, policy consistency, and institutional efficiency.

The CoJ has demonstrated foresight in embracing 4IR through initiatives such as the Smart City Strategy⁵ and

the Global Future Cities Programme⁶, which aim to enhance technological innovation, economic growth, and service delivery. However, 4IR is not just about adopting new technologies.

Governance challenges limiting 4IR's success in Johannesburg

The potential of 4IR to improve governance in Johannesburg is undermined by governance weaknesses – including political instability, fragmented administrative systems, frequent leadership changes⁷, coalition governments⁸, and policy inconsistencies that threaten the effectiveness of

5 City of Johannesburg, The City of Johannesburg Smart City Community Innovation Challenge and Awards. Johannesburg: City of Johannesburg, 2024. <https://joburg.org.za/Documents/The-City-of-Johannesburg-Smart-City-Community-Innovation-Challenge-and-Awards.pdf>.

6 City of Johannesburg, Prosperity Fund's Global Future Cities Programme Responds to COVID-19 Crisis in South Africa. Johannesburg: City of Johannesburg, 2020. https://joburg.org.za/media/_Pages/Media/Media%20Statements/2020%20Media%20Statements/May%202020/Prosperity-Fund%E2%80%99s-Global-Future-Cities-Programme-responds-to-COVID-19-crisis-in-South-Africa.aspx.

7 Stuart Morrison, Law must evolve as politics changes. Johannesburg: Good Governance Africa, 2024. <https://mg.co.za/thought-leader/opinion/2024-08-17-law-must-evolve-as-politics-changes/>.

8 Morrison, Stuart and Mischka Moosa, Reforming South Africa's civil service: A path to depoliticization and professionalism, Good Governance Africa, 2024. <https://gga.org/improving-citizens-trust-policy-priorities-for-incoming-policy-makers/>.

these initiatives. These structural challenges disrupt long-term planning, weaken investor confidence, and prevent the smooth adoption of smart technologies.

Urban inefficiencies such as transport inaccessibility, pedestrian safety and waste management failures are serious infrastructure problems. However, these problems have their roots in weak governance and therefore, are unlikely to be solved – even with the best engineering technology – unless the underlying governance deficiencies are addressed first.

Applying 4IR to address governance and urban challenges

Public transport accessibility and efficiency

A significant portion of Johannesburg’s workforce walks to work, with the proportion increasing from 11% in 2013 to 14.1% in 2020⁹. Gauteng-wide, approximately 570,000 workers rely solely on walking as a mode of transport, with Johannesburg having the highest concentration (44.6%)¹⁰. About 60% of households spend more than 10% of their income on transport. Additionally, Johannesburg recorded the highest waiting times in Gauteng, with 12% of workers waiting more than 15 minutes for their first mode of transport.

In response to this, real-time passenger information systems, available via mobile apps or digital boards at taxi ranks, can be implemented to enhance commuting experiences by reducing uncertainty. For efficiency, the coordination between different departments and stakeholders such as the department of transport, Johannesburg Road Agency, and taxi industry associations, will be essential.

Pedestrian and cycling infrastructure

Walking remains a primary mode of transport – of the 3.5 million daily trips, 800,000 are made by walking. The CoJ has increasingly promoted road safety through various efforts and initiatives such as Road Safety Awareness campaigns¹¹, advancing law enforcement and crash management¹², operation restore¹³, and traffic signal backup power initiatives¹⁴. However, little attention has been paid to townships. In a township environment where walking may be the dominant mode of transport, sidewalks can have a positive effect on pedestrian safety and have proven to reduce pedestrian fatalities¹⁵. The city can also adopt a traffic analysing system to reduce traffic collisions and monitor traffic patterns to identify and suggest interventions to enhance road safety¹⁶. The system can also be used to detect* maintenance issues like potholes and potential hazards such as floods and fires and can help identify high traffic pedestrian zones and determine where investments in infrastructure are most needed.

Waste management and illegal dumping

In 2018/19, more than 290,000 tonnes of waste were illegally dumped in neighbourhoods across the city¹⁷, and this is expected to worsen as the city’s four legal landfills reach capacity within the next three years. The lack of basic infrastructure such as waste bins in high foot-traffic areas contributes to street littering and illegal dumping.

The city can introduce a green exchange initiative where residents can exchange recyclable waste to receive rewards such as transit tickets or fresh food. Geospatial mapping can also be widely adopted to track illegal dumping sites and provide authorities with real-time insights on waste hotspots.

9 Khetho Lomahoza, General travel patterns of Joburg residents, last modified June 2022, https://joburg.org.za/documents_/Documents/Statistical%20Briefs/Issue%2031%20Transport%20in%20the%20city%20FINAL.pdf

10 Lomahoza, General travel patterns of Joburg residents

11 Imperial. "Road safety awareness," <https://www.imperiallogistics.com/road-safety.php#:~:text=Scholar%20road%20safety%20awareness,and%20law%20Dabiding%20road%20users.> (accessed February 18, 2025)

12 Lavan Pijoos. "Gone are the days' of getting away with speeding as City of Joburg signs new contract for cameras." News24, March 22, 2022, <https://www.news24.com/news24/southafrica/news/gone-are-the-days-of-getting-away-with-speeding-as-city-of-joburg-signs-new-contract-for-cameras-20221222#:~:text=The%20City%20of%20Johannesburg%20has,steering%20fines%20since%20May%202021.>

13 Kelebogile Mafa. JRA operation restore tackles road safety in region C, 2024. https://joburg.org.za/media_/Newsroom/Pages/2024%20News%20Article/October/JRA%E2%80%99s-Operation-Restore-tackles-road-safety-in-Region-C.aspx#:~:text=The%20project%2C%20initiated%20by%20MMC,service%20delivery%20in%20Region%20C.

14 Unathi Nkajeni. City of Johannesburg, Vodacom in joint initiative to keep traffic lights on during load shedding, 2023. [https://www.timeslive.co.za/news/south-africa/2023-07-07-joburg-jra-vodacom-team-up-to-keep-traffic-lights-on-during-load-shedding/.](https://www.timeslive.co.za/news/south-africa/2023-07-07-joburg-jra-vodacom-team-up-to-keep-traffic-lights-on-during-load-shedding/)

15 Devon Naicker and Marion Sinclair. "The effectiveness of sidewalks on pedestrian safety in a township environment" in The 40th Annual Southern African Transport Conference (Pretoria:2022), https://repository.up.ac.za/bitstream/handle/2263/87383/2D_04.pdf?sequence=1

16 Tiago Diaset et al., 2023. "From Data to Action: Exploring AI and IoT-driven Solutions for Smarter Cities." Springer Nature Switzerland 1:44-53. https://doi.org/10.1007/978-3-031-38333-5_5.

17 Melanie Samson, "Johannesburg Is Threatening to Sideline Informal Waste Pickers – Why It's a Bad Idea," Wits University News, May 2021, <https://www.wits.ac.za/news/latest-news/opinion/2021-05/johannesburg-is-threatening-to-sideline-informal-waste-pickers-why-its-a-bad-idea.html>

* These detectors could be in the form of sensors embedded in road surfaces, intersections to detect vibrations, temperature fluctuations, and surface degradation.

Lessons from Medellín, Colombia

Cities with challenges akin to Johannesburg have successfully improved governance and urban resilience through targeted policy reforms and digital innovation. A compelling case study is Medellín, Colombia,¹⁸ which has undergone significant transformation through strategic governance¹⁹, participatory policymaking, and smart urban planning²⁰.

Medellín's transformation was the result of a comprehensive governance strategy that integrated citizen participation, public-private partnerships, and smart urban planning. Johannesburg, which already has multiple initiatives in place – such as the Smart City Strategy,

Global Future Cities Programme, and e-Government initiatives – can refine and expand these policies by incorporating key lessons from Medellín.

Strengthening public participation governance

Medellín's government recognised that top-down governance²¹ was insufficient for addressing its socioeconomic challenges²². The city implemented a participatory budgeting model, allowing residents to influence public fund allocation. Structured neighbourhood discussions and citizen-led forums enabled people to propose and vote on local projects and initiatives, enhancing accountability and resource allocation efficiency in communities.



Photo: Alexander Cherkashin/Getty Images

Medellín city, in Colombia, has undergone a dramatic transformation with the construction of transport networks, libraries and parks.

18 Tobias Franza. 2017. "Urban Governance and Economic Development in Medellín: An "Urban Miracle"?" *Latin American Perspectives* 44(2): 52-70. Doi: 10.1177/009458x16668313

19 Maria Saldarriaga and Pedro Mejía, "How Medellín became Latam's hub for the Fourth Industrial Revolution," *The Org*, February 15, 2023, https://theorg.com/iterate/how-medellin-became-latams-hub-for-the-fourth-industrial-revolution?utm_source=chatgpt.com. (accessed February 13, 2025).

20 Tobias, "Urban Governance and Economic Development in Medellín: An "Urban Miracle"

21 Daron Acemoglu and James A. Robinson. 2013. "Economics versus Politics: Pitfalls of Policy Advice." *Journal of Economic Perspectives* 27(2): 173-92. Doi: 10.1257/jep.27.2.173

22 The Hague academy for local governance. "Medellín: leading the way for smart and resilient cities." Accessed February 13, 2025. <https://thehagueacademy.com/news/medellin-leading-the-way-for-smart-and-resilient-cities/>.

Johannesburg already has Integrated Development Plans (IDPs)²³ that allow for some degree of public consultation, but these processes can be enhanced through technology-enabled participation mechanisms, such as:

- **Expand participatory budgeting** using digital platforms and AI-driven feedback tools to allow citizens to directly influence local spending on infrastructure, smart city initiatives, and service delivery projects.
- **Use blockchain technology** to create a transparent public ledger for municipal spending, ensuring accountability and reducing corruption risks.
- **Leverage AI-powered data analytics** to identify citizen priorities in different neighbourhoods, ensuring resources are allocated where they are most needed.

Rethinking informal settlements

Rapid urbanisation in Medellín led to informal settlements with inadequate infrastructure. Instead of mass evictions, the city legalised informal housing and provided tenure security, strengthening local agency and reducing illegal activities. The government also invested in public spaces and community projects in marginalised neighbourhoods.²⁴

While the City of Johannesburg has housing and urban development programs, they often struggle due to bureaucratic inefficiencies, land disputes, and governance challenges. To improve, Johannesburg should legalise select informal settlements and implement digital land registries for tenure protection. Expanding the Smart City Strategy into marginalised areas could include smart public spaces and AI-driven urban planning. Data-driven modelling should predict urban expansion to prevent new unplanned settlements.

Integrating public transport and infrastructure using 4IR

Medellín successfully integrated metro, bus, and cable car systems to improve accessibility for marginalised communities²⁵. This system reduced travel times, improved economic access, and allowed marginalised communities to safely engage with the city's economic hubs²⁶.

This increased the safe movement of people from the most marginalised neighbourhoods. Medellín also invested in gardens and public parks along the city's borders, providing public spaces for informal settlements while controlling urban expansion²⁷.

Conclusion

For 4IR to truly transform Johannesburg, it must be underpinned by governance reforms that rebuild institutional structures, enhance administrative capacity, and cultivate strong leadership. Without this, the city risks implementing isolated and short-lived digital initiatives that fail to deliver long-term impact. Technology alone does not drive progress – effective governance does.

The success of 4IR in Johannesburg will depend on the city's ability to integrate digital innovation with sound governance, ensuring that technological advancements improve service delivery, urban infrastructure, and economic opportunities while addressing existing inequalities. To achieve this, the city must prioritise leadership and administrative capacity-building, strengthen institutional stability, and refine existing policies to maximize the benefits of 4IR.

Moving forward, Johannesburg must adopt a governance framework that ensures policy consistency, embraces digital transformation, and fosters strategic public-private partnerships. This will be essential in building a resilient, efficient, and globally competitive city that fully harnesses the transformative potential of 4IR.

23 City of Johannesburg. "City of Johannesburg: draft integrated Development Plan 2022/2027." https://joburg.org.za/documents_/Documents/2022-27%20Draft%20IDP/2022-27%20Draft%20Integrated%20Development%20Plan.pdf.

24 Veyom Bahl. "Murder Capital to Modern Miracle? the Progression of Governance in Medellín, Colombia". The Institute of Development Studies and Partner Organisations, December 31, 2012. <https://hdl.handle.net/20.500.12413/11792>.

25 Ferrari Garcia, Harry Smith, Françoise Coupe, & Helena Rivera. 2018. City profile: Medellín. *Cities*, 74, 354-364. <https://doi.org/10.1016/j.cities.2017.12.011>

26 Ferrari Garcia, Harry Smith, Françoise Coupe, & Helena Rivera. 2018. City profile: Medellín.

27 The Hague academy for local governance, "Medellin: leading the way for smart and resilient cities"



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