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OUTLOOK 2025

GOVERNMENT-LED SMART CITY STRATEGIES IN THE GULF: A SYSTEMATIC LITERATURE REVIEW ON POLICY FRAMEWORKS, DIGITAL INNOVATION, AND SUSTAINABILITY

PROFESSOR JOSEPH M. NTAYI
Faculty of Economics, Energy and Management Sciences
Makerere University Business School, Kampala, Uganda
Email: ntayius@gmail.com
ORCID: 0000-0003-3223-2036

DR JAMES MUBANGIZI
Faculty of Economics, Energy and Management Sciences
Makerere University Business School, Kampala, Uganda
Email: mubangizi.james@mubs.ac.ug
ORCID: 0009-0000-3471-806X

DR GIDEON NKURUNZIZA
Department of Education, Makerere University Business School, Kampala, Uganda
Email: gnkurunziza@mubs.ac.ug
ORCID: 00

DR NAZARIOUS RUKANYANGIRA
Department of Marketing and Logistics Management, Muni University, Arua, Uganda
Email: n.rukanyangira@muni.ac.ug
ORCID: 0000-0002-5882-9730

KENNETH BYANGWA
Foundation for the Next Generation Learning Communities Kampala, Uganda
Email: kbyangwa@gmail.com
ORCID: 0009-0002-0064-8571

CITATION: Ntayi, J.M., Mubangizi, J., Nkurunziza, G., Rukanyangira, N. and Byangwa, K. (2025): Government-Led Smart City Strategies in the Gulf: A Systematic Literature Review on Policy Frameworks, Digital Innovation, and Sustainability. In Ahmed, A. (Ed.): *United Nations: What Next After 2030 Agenda and SDGs.* World Sustainable Development Outlook 2025, Vol. 21, pp.143-166. WASD: London, United Kingdom.

RECEIVED: 28 October 2025 / **REVISED:** 27 November 2025 / **ACCEPTED:** 29 December 2025 / **PUBLISHED:** 30 December 2025

DOI: 10.47556/B.OUTLOOK2025.23.11

ABSTRACT

PURPOSE: This study presents a systematic literature review of government-led smart city strategies in Gulf Cooperation Council (GCC) countries, focusing on policy frameworks, digital innovation, and sustainability.

METHODOLOGY: Using a hybrid PEO + SPIDER framework with PRISMA and SALSA guidelines, 41 peer-reviewed studies were systematically selected (December 2023-March 2024) from Scopus, Web of Science, IEEE Xplore, ScienceDirect, and GoogleScholar.

FINDINGS: Although GCC countries prioritise the development of smart cities, notable gaps exist in policy consistency, inclusivity, and sustainability. These gaps are evident in the uneven progress, as manifested by discrepancies among policy convergence, technological innovations, and environmental demands. The study highlights the critical role of key policy frameworks, digital innovations, and sustainability integration practices, while also examining cross-national similarities and divergences that influence outcomes.

ORIGINALITY: The study adds comparative and systematic contributions to support academia, policy, and the practice of government-led smart cities, highlighting gaps, challenges, and improvement strategies.

KEYWORDS: *Smart Cities; Gulf Cooperation Council (GCC); Policy Dimensions; Digital Innovation; Sustainability Lens; Systematic Literature Review.*

INTRODUCTION

Over the last decade, the smart city concept has evolved into a core governance strategy, especially in rapidly growing regions. The Gulf Cooperation Council (GCC) countries, UAE, Saudi Arabia, Qatar, Oman, Kuwait, and Bahrain, have become frontrunners in state-led smart city initiatives promoting digital innovation, sustainability, and institutional modernisation. Landmark projects, such as Masdar City, NEOM, Lusail, and Digital Oman Vision 2040, illustrate the integration of smart city planning into national development agendas (Ajaj *et al.*, 2024; Alshuwaikhat *et al.*, 2022; Mutambik *et al.*, 2023a).

Despite this progress, no comprehensive comparative synthesis exists on the formulation, implementation, and evaluation of Gulf smart city strategies. Most existing studies focus on single-country cases, conceptual frameworks, or technology-centred analyses, often overlooking governance, socio-political and contextual factors (Alamoudi *et al.*, 2023a; Yigitcanlar *et al.*, 2018). Furthermore, it remains unclear how effectively GCC smart city strategies integrate inclusive, resilient, and sustainable urban development principles, despite alignment with global frameworks such as the UN Sustainable Development Goals (SDGs), particularly SDGs 9, 11, and 16 (UNFCCC, 2016).

Using a systematic literature review, comparative analysis, and thematic synthesis, this article makes three key contributions. First, it advances the literature on smart governance by examining non-Western, state-led models of digital urbanism. Second, it provides policy-makers with insights into implementation challenges and contextual enablers within smart city policies. Third, it addresses the growing gap between technology deployment and sustainability integration, calling for a more holistic and co-ordinated approach to future smart city planning in the GCC.

 DOI: 10.47556/B.OUTLOOK2025.23.11

METHODOLOGY

Review Framework and Rationale

This study used a systematic literature review to identify, assess, and synthesise scholarly work on the conceptualisation, implementation, and evaluation of smart city strategies in GCC countries. The approach was chosen for its rigorous, transparent, and reproducible methodology, covering both peer-reviewed and relevant grey literature (Page *et al.*, 2021). The review followed the PRISMA 2020 protocol and applied the SALSA framework (Search, Appraisal, Synthesis, Analysis) to ensure methodological transparency and replicability (Mengist *et al.*, 2020; Page *et al.*, 2021). A hybrid PEO-SPIDER design enhanced inclusivity and analytical flexibility (Khaled *et al.*, 2020).

Formulating Research Questions

This systematic literature review aims to answer four key questions:

1. What are the main policy frameworks and governance models for smart city development in the GCC?
2. How are digital innovations, such as IoT, data analytics, and e-governance platforms, implemented in GCC smart city initiatives?
3. To what extent are environmental, social, and economic sustainability goals integrated into planning and implementation in GCC smart city initiatives?
4. What are the cross-country similarities and differences in smart city strategies among the UAE, Saudi Arabia, Qatar, and Oman?

Search Strategy and Sources Selected

A systematic search was conducted from December 2023 to March 2024 across Scopus, Web of Science, IEEE Xplore, ScienceDirect, and GoogleScholar, with secondary searches in ResearchGate, SSRN, and selected institutional repositories. These databases were chosen for their wide coverage of peer-reviewed research (Birkle *et al.*, 2020; O'Brien, 2021; Burnham, 2006; Elsevier, 2016). Boolean search strings included terms such as "smart city" AND "GCC", "digital governance" AND "urban planning", and "sustainable cities" AND "Middle East". Filters limited results to English-language manuscripts published between 2010 and 2024 to capture both foundational and recent studies.

DOI: 10.47556/B.OUTLOOK2025.23.11

Inclusion Criteria and Eligibility Procedures

The eligibility criteria ensured consistency between sources and research objectives. Studies were included if they examined smart city development in GCC countries or offered relevant methodological or policy insights from international cases. Accepted materials included conceptual papers, policy analyses, case studies, empirical research, and mixed-method reviews addressing at least one of four dimensions: (i) infrastructure and ICT integration, (ii) digital governance, (iii) sustainability planning, or (iv) citizen participation. Studies lacking analytical rigor, urban relevance, or explicit smart city frameworks were excluded. Only institutionally endorsed grey literature, such as government or UN-Habitat reports, was considered.

Material Collection

An electronic search identified 1,268 records, from which duplicates and non-peer-reviewed entries were removed, leaving 953 records. Title and abstract screening narrowed these to 263 full-text articles, and 41 studies met all inclusion criteria. These 41 qualifying studies are detailed in Figure 1.

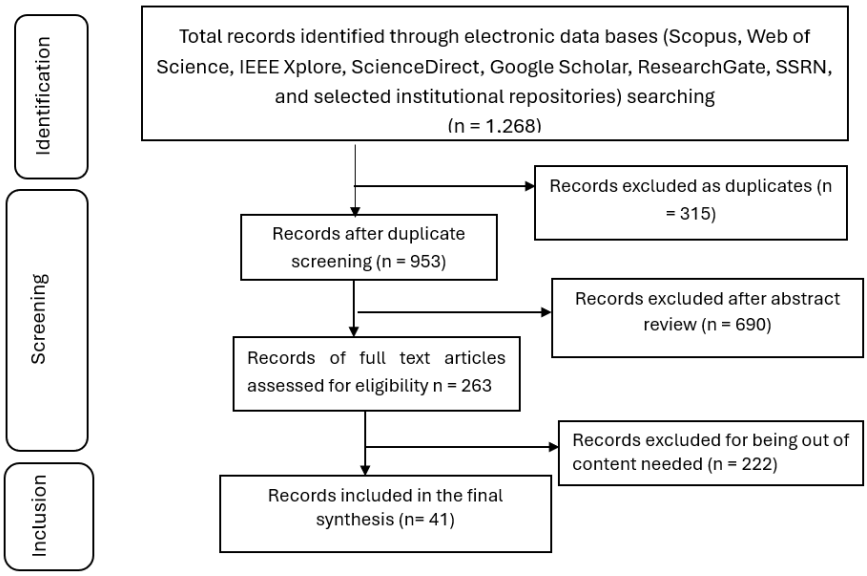

Figure 1: PRISMA flow chart

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

Data collection and synthesis

Data were extracted using the Utstein template (Ringdal *et al.*, 2008), documenting author, year, geographical scope, study perspective, smart city components, and implementation level. The synthesis applied the SALSA framework (Mengist *et al.*, 2020), with clustering outcomes presented in the table and figure in the Appendix.

RESULTS

Characteristics of Eligible Studies

A total of 41 studies were systematically reviewed using predefined inclusion criteria. As shown in the table and figure in the Appendix, 44% are conceptual with no field implementation, 27% are fully implemented, and the remainder are in progress or planned. This distribution highlights a dominant focus on theoretical and planning aspects, with limited empirical research on fully developed smart city systems.

Results RQ1: Models of Governance Frameworks and Policies in Gulf Smart Cities

The survey results show that Gulf smart cities operate within a complex yet structured mix of governance regimes, combining central state control with emerging adaptable, participatory, and sustainability-focused models, as presented in Table 1 and Figure 2.

Table 1: Governance Frameworks and Policy Models in Smart City Development (N = 41)

No.	*GCC Country*	*Governance Model or Policy Framework*	*No of Papers*	*Percentage*
1	UAE	Agile governance model	1	2.4
2	UAE	ICT policy integration	1	2.4
3	UAE	Barrier-focused planning gaps	1	2.4
4	UAE	Data-informed governance	1	2.4
5	UAE	Smart governance architecture	1	2.4
6	UAE	Strategic governance integration	1	2.4
7	UAE	Inclusive design policy	1	2.4
8	UAE	Eco-integrated urban planning	1	2.4
9	UAE	Renewable-focused digital regulation	1	2.4
10	UAE	PPP-based investment regulation	1	2.4
11	UAE	Green infrastructure alignment	1	2.4

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No.	*GCC Country*	*Governance Model or Policy Framework*	*No of Papers*	*Percentage*
12	UAE	Tech adoption governance	1	2.4
13	Saudi Arabia	Lifecycle strategic model	1	2.4
14	Saudi Arabia	Community engagement framework	1	2.4
15	Saudi Arabia	Futuristic regulatory sandbox	1	2.4
16	Saudi Arabia	Citizen-centric planning	1	2.4
17	Saudi Arabia	IoT-centric regulatory design	1	2.4
18	Saudi Arabia	Safety and healthcare regulation	1	2.4
19	Saudi Arabia	Comparative framework analysis	1	2.4
20	Saudi Arabia	Urban attribute framework	1	2.4
21	Saudi Arabia	Adoption and behaviour governance	1	2.4
22	Saudi Arabia	AI-driven governance	1	2.4
23	Oman	Participatory governance planning	1	2.4
24	Oman	Feedback-driven planning	1	2.4
25	Qatar	Cloud governance and cybersecurity	1	2.4
26	Qatar	ITS policy co-ordination	1	2.4
27	Qatar	Urban tech regulation strategy	1	2.4
28	Bahrain	Sustainability governance mix	1	2.4
29	GCC	Open government data policy	1	2.4
30	GCC	Comparative institutional analysis	1	2.4
31	GCC	Policy benchmarking study	1	2.4
32	GCC	Specialised city framework	1	2.4
33	GCC	Leadership-focused open data governance	1	2.4
34	GCC	Low-carbon policy co-ordination	1	2.4
35	GCC	Multilevel sustainability governance	1	2.4
36	GCC	Walkability governance strategy	1	2.4
37	GCC	Perception-driven digital participation	1	2.4
38	GCC	Urban resilience models	1	2.4
39	GCC	Integrated sustainability policy	1	2.4
40	UAE, Turkey, Canada	Global governance comparison	1	2.4
41	UAE, Singapore	Digital twin simulation governance	1	2.4
	Grand Total		**41**	**100.0**

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

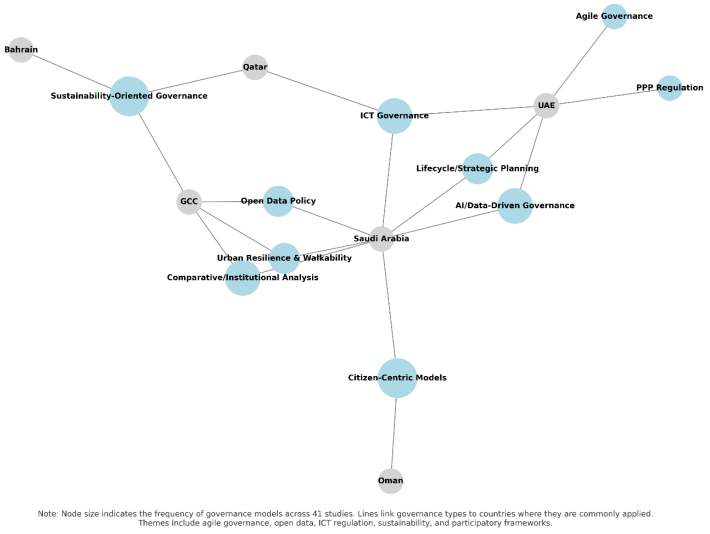

Figure 2: Governance Strategy Map – Thematic Distribution of Policy Frameworks in GCC Smart Cities

Source: Constructed by authors

Results RQ2: Implementation of Digital Innovations across Gulf Smart Cities

Table 2 provides a detailed overview of the technologies and implementation practices identified in the 41 reviewed studies, while Figure 3 illustrates the frequency of their deployment across operational, planned, and conceptual stages.

Table 2: Digital Innovations Matrix for RQ2

No.	*Country/ Region*	*Digital Innovation(s) Explored*	*Implementation Practice*	*No of papers*
1	UAE	IoT, sensors, big data	Pilot programme in Dubai Smart Gov	1
2	UAE	RFID, ICT cloud integration	Conceptual modelling with RFID	1
3	UAE	ICT barriers in implementation	Identified challenges with legacy systems	1
4	UAE	Cybersecurity systems, IoT	Deployed in select UAE cities	1
5	UAE	Smart living platforms	Fully implemented in Dubai	1
6	UAE	Digitised mobility infrastructure	Policy strategy phase	1
7	UAE	Gendered smart city design	Not yet deployed	1
8	UAE	Smart building and transport tech	Operational in Masdar	1
9	UAE	E-gov and renewable data layers	Active in UAE ministries	1

DOI: 10.47556/B.OUTLOOK2025.23.11

No.	*Country/ Region*	*Digital Innovation(s) Explored*	*Implementation Practice*	*No of papers*
10	UAE	PPP-fintech and digitisation	Adopted in PPP contracts	1
11	UAE	Green infrastructure data	Active in Masdar City	1
12	UAE	Integrated platform layers	Operational in Masdar	1
13	Saudi Arabia	Sustainable infrastructure platforms	Framework stage in Riyadh	1
14	Saudi Arabia	Citizen engagement platforms	Model proposed for citizen co-design	1
15	Saudi Arabia	e-Participation frameworks	Proposed participation strategy	1
16	Saudi Arabia	Smart grid, blockchain, AI	Planned deployment in NEOM	1
17	Saudi Arabia	IoT layers	Conceptual framework	1
18	Saudi Arabia	Smart emergency services	Deployed in medical ICT settings	1
19	Saudi Arabia	Digital benchmarking tools	Cross-city benchmarking only	1
20	Saudi Arabia	Smart city KPIs and dashboards	Proposed framework in Najran	1
21	Saudi Arabia	Digital adoption models	Proposed tech diffusion models	1
22	Saudi Arabia	AI, e-services, predictive analytics	Partially deployed in e-government	1
23	Qatar	Cloud platforms, AI analytics	Fully operational systems in Qatar	1
24	Qatar	ITS and smart transport	Early-stage ITS in Lusail	1
25	Qatar	Digital infrastructure policy	Under regulatory review	1
26	Oman	Digital planning tools	Conceptual toolkit only	1
27	Oman	Feedback tech interfaces	Digital simulation stage	1
28	GCC	Open government data	Active portals in UAE, KSA, Qatar	1
29	GCC	GovTech systems	Proposed strategy only	1
30	GCC	Comparative platform mapping	Comparative analysis of practices	1
31	GCC	Niche city platforms	Theory-based analysis	1
32	GCC	OGD systems	Active across GCC e-portals	1
33	GCC	Low-carbon planning tech	Policy planning documents	1
34	GCC	E-gov and transport integration	Integrated in transport planning	1
35	GCC	Pedestrian tech frameworks	Conceptual model	1
36	GCC	Digital inclusion tech	Conceptual user analysis	1
37	GCC	Smart resilience infrastructure	Implemented in smart planning	1
38	GCC	Tech-integration frameworks	Not yet deployed	1
39	Bahrain	Water and energy tech systems	Policy documents only	1
40	UAE, Turkey, Canada	Global governance tech models	Analytical framework only	1
41	UAE, Singapore	Digital twin systems	Conceptual application	1
	Total			**41**

Source: Constructed by authors

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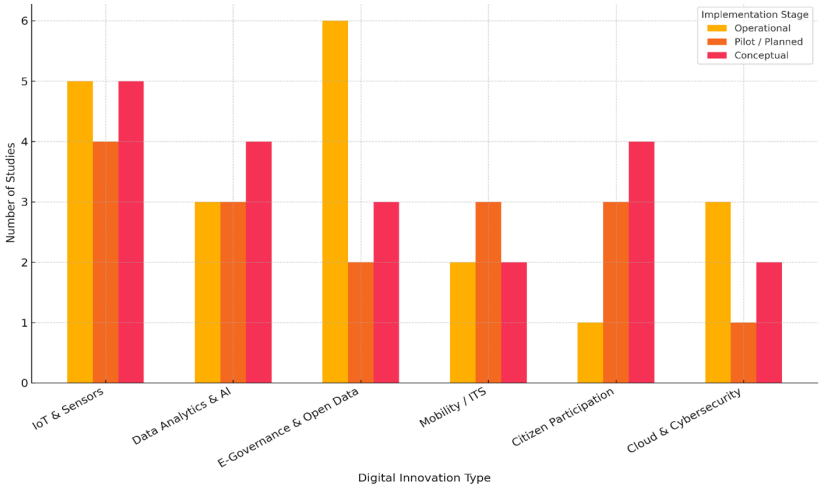

Figure 3: Digital Innovation Implementation across GCC Smart City Projects

Source: Constructed by authors

Findings RQ3: Integration of Sustainability Goals in Gulf Smart Cities

Table 3 and Figure 4 illustrate how environmental, social, and economic sustainability goals are integrated into the planning and implementation of smart city projects across GCC countries.

Table 3: The Sustainability Integration Matrix for RQ3

No	*Sustainability Domain(s) Addressed*	*Depth of Integration*	*Evaluation or Measurement*	*No of papers*
1	Analytical framework	High	Performance KPIs	1
2	Behavioural alignment	Conceptual	Comparative framework	1
3	Comparative ESG indicators	Moderate	Cross-case themes	1
4	Comparative smart dimensions	Moderate	Smart attribute rating	1
5	Conceptual only	Conceptual	Not measured	1
6	Cybersecurity as enabler	Moderate	Framework mapping	1
7	Digital governance with minor sustainability focus	Low	Qualitative review	1
8	E-Gov + infrastructure sustainability	Moderate	Integrated planning analysis	1
9	Environmental	Low	Descriptive framework only	1
10	Environmental (NEOM resilience)	Planned	Vision 2030 alignment	1
11	Environmental (policy)	Moderate	Policy review	1

DOI: 10.47556/B.OUTLOOK2025.23.11

No	*Sustainability Domain(s) Addressed*	*Depth of Integration*	*Evaluation or Measurement*	*No of papers*
12	Environmental barriers	Low	Barrier mapping	1
13	Environmental, economic	Moderate	Narrative evidence	1
14	Environmental, economic	Moderate	Urban planning metrics	1
15	Environmental, economic	High	Quantitative data models	1
16	Environmental, economic	High	Infrastructure metrics	1
17	Framework only	Low	Behavioural study	1
18	Governance intent only	Low	Not measured	1
19	Green buildings, carbon planning	High	Sustainability KPIs	1
20	Green innovation, renewable energy	Moderate	Policy evaluation	1
21	Inclusion planning	Moderate	Feedback loops (planned)	1
22	Mobility-environment link	Planned	Planning proposal only	1
23	Not specified	None	None	1
24	Open data relevance to ESG	Moderate	OGD impact theorised	1
25	Public perception of sustainability	Low	Citizen perception data	1
26	Public safety and healthcare	Moderate	Case study comparison	1
27	Smart grid + transport efficiency	Not specified	ESG AI metrics	1
28	Smart tech and environmental design	Low	Technology capacity rating	1
29	Smart zoning and green infrastructure	High	Sustainability zoning indicators	1
30	Social engagement	Moderate	Conceptual toolkit	1
31	Social equity	Low	Social equity narrative	1
32	Social inclusion	Moderate	Participation metrics proposed	1
33	Social transparency	Moderate	User perception feedback	1
34	Social trust	Low	Theoretical linkage	1
35	Sustainable PPPs	Moderate	PPP integration metrics	1
36	Transport sustainability	Moderate	Mobility indicators	1
37	Urban digital twin efficiency	Conceptual	Digital model proposal	1
38	Urban resilience, infrastructure	High	Infrastructure resilience model	1
39	Walkability and urban quality	Moderate	Walkability indicators	1
40	All three: E, S, Ec	High	Strategic model outcomes	1
	Total			**40**

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

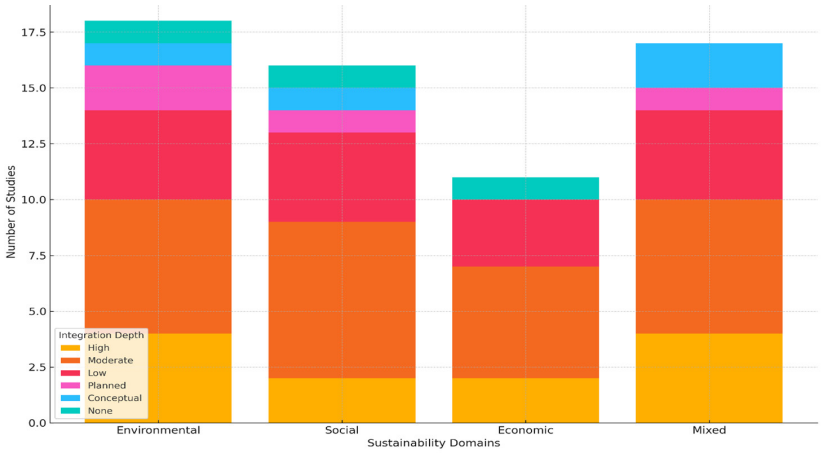

Figure 4: Levels of Sustainability Integration across Domains in GCC Smart City Studies

Source: Constructed by authors

Findings RQ4: Cross-Regional Similarities and Differences in Gulf Smart City Strategies

Table 4 and the radar chart in Figure 5 summarise the cross-country similarities and differences in smart city strategies across the UAE, Saudi Arabia, Qatar, and Oman.

DOI: 10.47556/B.OUTLOOK2025.23.11

Table 4: Cross-Regional Smart City Strategy Matrix for RQ4

Country	*Key Smart City Projects*	*Common Challenges*	*Success Factors*	*Contextual Adaptations*	*Policy Integration Level*	*Sustainability Orientation*
UAE	Dubai Smart City, Masdar City, Abu Dhabi Smart Services	Data privacy, inter-agency co-ordination, legacy infrastructure	Strong government vision, international partnerships, robust ICT infrastructure	Tailored AI laws, blockchain-based services, Arabic-first e-services	High	Advanced (Masdar, green codes, SDG indicators)
Saudi Arabia	NEOM, Riyadh Smart City, multiple regional projects	Cultural readiness, regulatory bottlenecks, centralisation	Top-down governance support, Vision 2030 alignment, megaproject funding	Integration with Islamic finance principles, regional decentralisation trials	Moderate to High	Strategic (Vision 2030, NEOM ESG goals)
Qatar	Lusail Smart City, Msheireb Downtown Doha	Scalability, digital divide, citizen engagement	High-tech pilot projects, sustainability mandates, national innovation agenda	Focus on climate resilience, green building certification, tech in education	Moderate	Moderate (green transport, smart energy)
Oman	Muscat Smart City, Digital Oman Vision	Limited institutional capacity, funding constraints, and low uptake	Policy experimentation, planning reforms, e-government baseline	Use of cloud services for cost-efficiency, grassroots digital literacy programmes	Emerging	Conceptual (policy-level ambition, partial indicators)

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

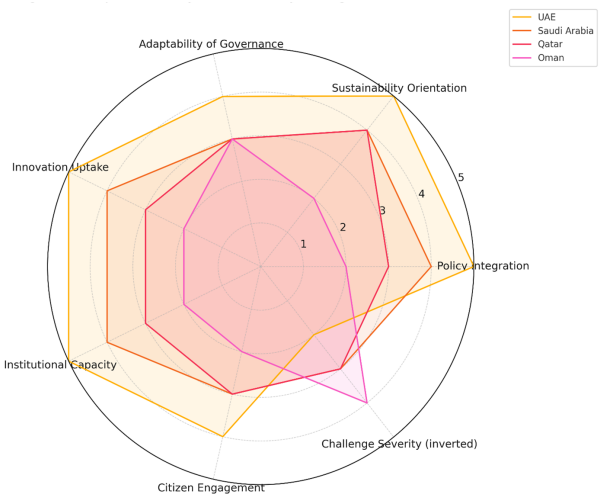

Figure 5: Comparative Analysis of Smart City Strategies across GCC Countries
Source: Constructed by authors

DISCUSSION

Based on 41 reviewed studies, this section critically analyses the four research questions and situates the findings within broader academic and policy debates.

Discussion RQ1: Policy Frameworks and Governance Models: The Rise of Centralised, Vision-Driven Governance

Smart city development in the GCC is largely driven by centralised, vision-oriented governance aligned with national strategies such as UAE Vision 2021, Saudi Vision 2030, and Qatar National Vision 2030. While this top-down model ensures rapid mobilisation and alignment with long-term goals, it also creates rigidity and co-ordination challenges. Fragmented institutions, especially in Saudi Arabia and Oman, hinder adaptive governance, although limited hybrid initiatives such as Abu Dhabi's TAMM platform and NEOM's regulatory sandbox suggest emerging flexibility (Alshuwaikhat *et al.*, 2022; Mutambik, 2023; Yigitcanlar *et al.*, 2020).

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Discussion RQ2: Digital Innovation Implementation: High Infrastructure, Variable Uptake

GCC countries have strongly advanced digital technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), data analytics, and e-Government systems. The UAE and Qatar lead in digital adoption, while Saudi Arabia's NEOM integrates advanced AI and digital twins. However, regional disparities persist, particularly in Oman, due to a "technology-first" approach emphasising infrastructure over institutional capacity, leading to weak service continuity and limited citizen participation (Elidrisy, 2024; Kalra, 2019; Ali, 2024; Ibrahim, 2024; Onyusheva *et al.*, 2024; Mutambik, 2024).

Discussion RQ3: Sustainability Integration: Prioritised but Uneven Across Domains

Environmental sustainability dominates GCC smart city initiatives, notably through energy-efficient buildings, waste management, and green zoning. However, social and economic sustainability remain under-developed. Social equity, gender inclusion, and public engagement lack institutional backing, while economic sustainability is seldom evaluated through measurable models, making sustainability more rhetorical than practical (Alotaibi *et al.*, 2024; Sankaran and Chopra, 2020; Alamoudi *et al.*, 2023b; Jayashree *et al.*, 2019).

Discussion RQ4: Cross-Regional Comparison: Divergence in Maturity and Capacity

Smart city strategies vary in maturity and capacity. The UAE excels in coherent policies, innovation, and sustainability metrics; Saudi Arabia focuses on ambitious megaprojects but faces regulatory constraints; Qatar adopts a hybrid model strong in pilot innovation yet limited in reach; Oman remains in early policy development. Common challenges include data interoperability, privacy gaps, and limited interagency co-operation, with inconsistent adaptation to cultural and regulatory contexts (Al Khalifa, 2021; Tahmasseby, 2022).

IMPLICATIONS FOR THEORY AND PRACTICE

The study bridges policy and practice by illustrating how vision-driven governance influences outcomes in non-Western contexts. It differentiates between technology availability and adoption, provides a nuanced understanding of sustainability, and introduces a comparative framework for assessing regional diversity in the Gulf.

DOI: 10.47556/B.OUTLOOK2025.23.11

CONCLUSIONS AND POLICY IMPLICATIONS

This review reveals that while GCC nations prioritise smart cities in their development agendas, implementation and policy maturity remain uneven. The UAE and Qatar lead in infrastructure and sustainability, while Saudi Arabia and Oman face institutional and participatory constraints. To advance, GCC countries must institutionalise smart governance, improve regulation, ensure data interoperability, and enhance accountability. Policy-makers should promote inclusion through participatory budgeting, civic technology, and digital literacy programmes. Integrated performance metrics aligned with SDGs 9, 11, and 16 are essential, together with adaptive models for secondary cities. For researchers, the framework supports evaluating smart city governance in non-Western contexts. Ultimately, equitable and resilient urban futures in the GCC will depend on embedding inclusivity, adaptability, and sustainability into the governance of innovation, rather than focusing solely on technological expansion.

REFERENCES

Abubakar, I.R., and Alshammari, M.S. (2023): Urban planning schemes for developing low-carbon cities in the Gulf Cooperation Council region. *Habitat International*, Vol. 138, p.102881.

Ajaj, R., Buniya, M.K., Wuni, I.Y. and Yousif, O.S. (2024): A case study on the barriers towards achieving sustainable smart city for Abu Dhabi. *IET Smart Cities*, Vol. 6, No. 2, pp.112-128.

Al Khalifa, F.A. (2021): Sustainable smart urbanism indicators in Bahrain. In *2nd Smart Cities Symposium (SCS 2019)* (pp.1-6). Bahrain, Institute of Engineering and Technology (IET).

Alamoudi, A.K., Abidoye, R.B. and Lam, T.Y.M. (2023a): Implementing Smart Sustainable Cities in Saudi Arabia: A Framework for Citizens' Participation towards Saudi Vision 2030. *Sustainability*, Vol. 15, No. 8, p.6648.

Alamoudi, A.K., Abidoye, R.B. and Lam, T.Y.M. (2023b): The Impact of Citizens' Participation Level on Smart Sustainable Cities Outcomes: Evidence from Saudi Arabia. *Buildings*, Vol. 13, No. 2, p.343.

Ali, J. (2024): Integration of smart cities technologies for future urban development planning. *Natural Resources Forum*, Oxford, UK: Blackwell Publishing Ltd.

Alotaibi, A., Alsubaie, D., Alaskar, H., Alhumaid, L., Thuwayni, R. Bin, Alkhalifah, R. and Alhumoud, S. (2022): Kingdom of Saudi Arabia: Era of Smart Cities. In *2022 2nd International Conference on Computing and Information Technology (ICCIT)* (pp.285-292). IEEE.

DOI: 10.47556/B.OUTLOOK2025.23.11

Alotaibi, B.S., Elnaklah, R., Agboola, O.P., Abuhussain, M.A., Tunay, M., Dodo, Y.A., Maghrabi, A. and Alyami, M. (2024): Enhancing Najran's sustainable smart city development in the face of urbanization challenges in Saudi- Arabia. *Journal of Asian Architecture and Building Engineering*, Vol. 24, No. 4, pp.2905-2935.

Alreshidi, E. and Alyami, S.H. (2020): End-users' requirements underpinned by IoT layered architecture to the development of smart sustainable cities. *The Journal of Engineering*, Vol. 2020, No. 11, pp.1065-1073.

Al-Saidi, M. and Zaidan, E. (2020): Gulf futuristic cities beyond the headlines: Understanding the planned cities megatrend. *Energy Reports*, Vol. 6, pp.114-121.

Al-Saidi, M. and Zaidan, E. (2024): Smart cities and communities in the GCC region: from top-down city development to more local approaches. *Frontiers in Built Environment*, Vol. 10, p.1341694.

Alshuwaikhat, H.M., Adenle, Y.A. and Almuhaidib, T. (2022): A Lifecycle-Based Smart Sustainable City Strategic Framework for Realizing Smart and Sustainability Initiatives in Riyadh City. *Sustainability*, Vol. 14, No. 14, p.8240.

Badran, A. (2023): Developing Smart Cities: Regulatory and Policy Implications for the State of Qatar. *International Journal of Public Administration*, Vol. 46, No. 7, pp.519-532.

Birkle, C., Pendlebury, D.A., Schnell, J. and Adams, J. (2020): Web of Science as a data source for research on scientific and scholarly activity. *Quantitative Science Studies*, Vol. 1, No. 1, pp.363-376.

Biygautane, M. and Clegg, S. (2024): Constructing smart cities through the use of public-private partnerships: The case of Dubai in the United Arab Emirates. *Journal of Infrastructure, Policy and Development*, Vol. 8, No. 6, p.3668.

Burnham, J.F. (2006): Scopus database: A review. *Biomedical Digital Libraries*, Vol. 3, No. 1, pp.1-8.

El Hendy, M., Atalla, S., Miniaoui, S., Daradkeh, M., Mansoor, W. and Bin Hashim, K. F. (2022): Hybrid Approach for Developing Strategic ICT Framework for Smart Cities—A Case Study of Dubai's Toll Gates (Salik). *Smart Cities*, Vol. 5, No. 4, pp.1554-1573.

Elidrisy, A. (2024): Leveraging Cloud Services and Digital Transformation for Sustainability: Insights from Cases of Qatar. *Journal of Innovative Research*, Vol. 2, No. 1, pp.20-28.

Elsevier (2016): *ScienceDirect User's Quick-Start Guide*. Available at: https://supportcontent.elsevier.com/RightNow%20Next%20Gen/ScienceDirect/ScienceDirect_User_Guide.pdf 18pp.

Hegazy, I.R. and Mahboob, A. (2024): Evaluating Riyadh's smart city initiatives: insights from the IMD Smart City Index framework. *International Journal of Low-Carbon Technologies*, Vol. 19, pp.2446-2460.

 DOI: 10.47556/B.OUTLOOK2025.23.11

Hu, Y. (2022): Accessing the Sustainable Potential of Urban Projects Towards Smart Cities in Japan and the Middle East. *Journal of Human Geography and Regional Development*, Vol. 1, No. 1, pp.12-18.

Ibrahim, N.M.H. (2024): Artificial Intelligence (AI) and Saudi Arabia's Governance. *Journal of Developing Societies*, Vol. 40, No. 4, pp.500-530.

Jayashree, P., Hamza, F., El Barachi, M. and Gholami, G. (2019): Inclusion as an Enabler to Sustainable Innovations in Smart Cities: A Multi-Level Framework. *2019 4th International Conference on Smart and Sustainable Technologies (SpliTech)* (pp.1-9). IEEE.

K'Akumu, O.A. and Alhamoudi, A. (2025): The Smart City as Policy Concept in the Arab World: A Critical Research into the Strategic Visions of Urban Development in Abu Dhabi. *Journal of Asian and African Studies*, Vol. 60, No. 3, pp.1456-1470.

Kalra, D. (2019): Impact of Digitization on Smart Living: A Case of Dubai. *International Journal of Business & Applied Sciences*, Vol. 8, No. 3, pp.31-36.

Kamel, M.A.E. (2013): Encouraging walkability in GCC cities: Smart urban solutions. *Smart and Sustainable Built Environment*, Vol. 2, No. 3, pp.288-310.

Khaled, K., Tsofliou, F., Hundley, V., Helmreich, R. and Almilaji, O. (2020): Perceived stress and diet quality in women of reproductive age: A systematic review and meta-analysis. *Nutrition Journal*, Vol. 19, No. 1, p.92.

Khodr, H. and Reiche, D. (2012): The Specialized Cities of the Gulf Cooperation Council: A Case Study of a Distinct Type of Policy Innovation and Diffusion. *Digest of Middle East Studies*, Vol. 21, No. 1, pp.149-177.

Lopes, N.V.M. and Rodrigues, J. (2020): Smart Methodologies for Smart Cities: A Comparative Analysis. In Lopes, N.V.M. (Ed.): *Smart governance for cities: Perspectives and experiences* (pp.3-15). Springer.

Mathew, B.P. and Bangwal, D. (2024): People centric governance model for smart cities development: A systematic review, thematic analysis, and findings. *Research in Globalization*, Vol. 9, p.100237.

Mazzetto, S. (2024): A Review of Urban Digital Twins Integration, Challenges, and Future Directions in Smart City Development. *Sustainability*, Vol. 16, No. 19, p.8337.

Mengist, W., Soromessa, T. and Legese, G. (2020): Method for conducting systematic literature review and meta-analysis for environmental science research. *MethodsX*, Vol. 7, p.100777.

Mutambik, I. (2023): The Global Whitewashing of Smart Cities: Citizens' Perspectives. *Sustainability*, Vol. 15, No. 10, p.8100.

DOI: 10.47556/B.OUTLOOK2025.23.11

Mutambik, I. (2024): Culturally Informed Technology: Assessing Its Importance in the Transition to Smart Sustainable Cities. *Sustainability*, Vol. 16, No. 10, p.4075.

Mutambik, I., Almuqrin, A., Alharbi, F. and Abusharhah, M. (2023a): How to Encourage Public Engagement in Smart City Development—Learning from Saudi Arabia. *Land*, Vol. 12, No. 10, p.1851.

Mutambik, I., Lee, J., Almuqrin, A. and Zhang, J. Z. (2023b): Transitioning to Smart Cities in Gulf Cooperation Council Countries: The Role of Leadership and Organisational Culture. *Sustainability*, Vol. 15, No. 13, p.10490.

Mutambik, I., Lee, J., Almuqrin, A., Alkhanifer, A. and Baihan, M. (2023c): Gulf Cooperation Council Countries and Urbanisation: Are Open Government Data Portals Helping? *Sustainability*, Vol. 15, No. 17, p.12823.

O'Brien, K. (2021): *ResearchGate: Resource Review*. 8-10 *October*. Available at: https://doi.org/10.5195/jmla.2019.643

Onyusheva, I., Dudukalov, E., Shatila, K., Voronina, A. and Ushakov, D. (2024): RETRACTED: Optimizing urban eco-efficiency: Exploring the interplay of data analytics, iot integration, and cybersecurity in smart cities of the UAE. In *E3S Web of Conferences* (Vol. 549, p.03007). EDP Sciences.

Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., McGuiness, L.A., Stewart, L.A., Thomas, J., Tricco, A.C., Welch, V.A., Whiting, P. and Moher, D. (2021): The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, Vol. 372.

Pandita, A., Pradeep, A., Anjukandan, R. and Vignesh, T. (2024): Exploring Masdar City: Smart Innovations and Future Eco-City Model in Urban Sustainability. In *2024 Advances in Science and Engineering Technology International Conferences (ASET)* (pp. 01-06). IEEE.

Pilipiszyn, A.C. and Hedjazi, A.B. (2016): Implementation of the Sustainable Development Goals in the GCC countries via application of sustainability oriented innovation to critical infrastructures. In Azar, E. and Raouf, M.A. (Eds): *Sustainability in the Gulf: Challenges and opportunities* (pp.78-102). Routledge.

Ringdal, K.G., Coats, T.J., Lefering, R., Di Bartolomeo, S., Steen, P. A., Røise, O., Handolin, L. and Lossius, H.M. (2008): The Utstein template for uniform reporting of data following major trauma: a joint revision by SCANTEM, TARN, DGU-TR and RITG. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, Vol. 16, No. 1, p.7.

 DOI: 10.47556/B.OUTLOOK2025.23.11

Salem, F. (2016): *A Smart City for Public Value Digital Transformation through Agile Governance – The Case of 'Smart Dubai'*. World Government Summit Publications, Available at SSRN: https://ssrn.com/abstract=2733632

Sameer, N., Alalouch, C., Saleh, M.S., Al-Saadi, S. and Saleem, A. (2022): Towards sustainable smart cities: A contextual study on digital participatory planning policies and readiness assessment in Oman. *Proceedings of the Institution of Civil Engineers-Urban Design and Planning*, Vol. 175, No. 2, pp.72-90.

Sankaran, V. and Chopra, A. (2020): Creating Global Sustainable Smart Cities (A Case Study of Masdar City). *Journal of Physics: Conference Series*, Vol. 1706, No. 1, p.012141.

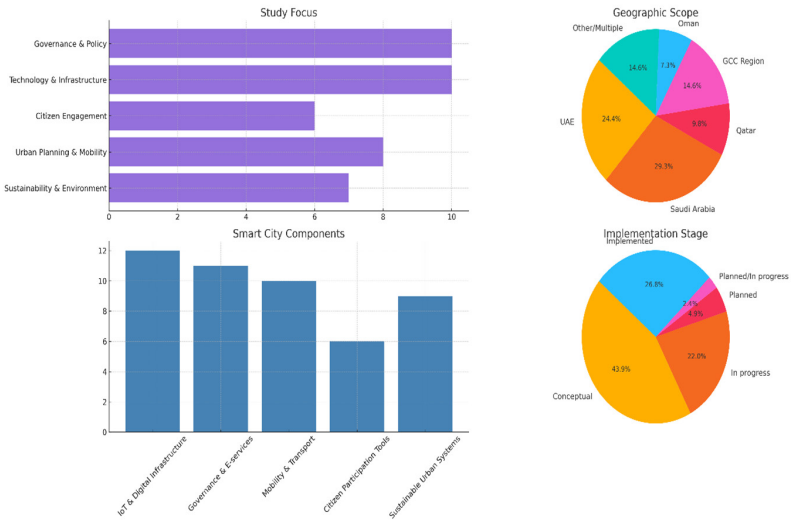
Saxena, S. and Al-Tamimi, T.A.S.M. (2018): Visioning "smart city" across the Gulf Cooperation Council (GCC) countries. *Foresight*, Vol. 20, No. 3, pp.237-251. Available at: https://doi.org/10.1108/FS-11-2017-0068

Tahmasseby, S. (2022): The Implementation of Smart Mobility for Smart Cities: A Case Study in Qatar. *Civil Engineering Journal*, Vol. 8, No. 10, pp.2154-2171.

United Nations Framework Convention on Climate Change (UNFCCC) (2016): *Final list of proposed Sustainable Development Goal indicators*.

Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., da Costa, E.M. and Yun, J.H.J. (2018): Understanding 'smart cities': Intertwining development drivers with desired outcomes in a multidimensional framework. *Cities*, Vol. 81, pp.145-160.

Appendix



Appendix Figure 1: distribution of Study Focus, Scope, Components and Implementation Stage

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

Appendix Table 1: Characteristics of Included Studies (N = 41)

No.	*Study*	*Study Focus*	*Geographic Scope*	*Smart City Components*	*Implementation Stage*	*Full Text Retrieved*
1	Salem, 2016	Smart city transformation	Dubai, UAE	Technological infrastructure, regulatory frameworks, and organisational structures	In progress	Yes
2	Mutambik *et al.*, 2023a	Open government data portals	GCC countries	Data accessibility, citizen empowerment	Implemented	Yes
3	Alshuwaikhat *et al.*, 2022	Smart sustainable city strategies	Riyadh, Saudi Arabia	Transportation, governance, infrastructure, energy, environment	In progress	Yes
4	El Hendy *et al.*, 2022	ICT framework for smart cities	UAE	ICT infrastructure, RFID-based transportation systems, e-government services	Conceptual	Yes
5	Alamoudi *et al.*, 2023b	Citizens' participation framework	Saudi Arabia	Stakeholder management, citizen inclusion metrics, digital interfaces	Conceptual	Yes
6	Sameer *et al.*, 2022	Digital participatory planning	Oman	Participatory planning policies, public platforms, social engagement tools	Conceptual	Yes
7	Mutambik *et al.*, 2023c	Public engagement in smart cities	10 Saudi cities	Citizen-centric governance, digital feedback mechanisms, and transparency	Conceptual	Yes
8	Ali, 2024	Smart city technologies	NEOM, Saudi Arabia	Internet of Things (IoT), smart infrastructure	Planned	Yes
9	Ajaj *et al.*, 2024	Barriers to sustainable smart cities	Abu Dhabi, UAE	Governance barriers, environmental limitations, legal frameworks	Conceptual	Yes
10	Al Khalifa, 2021	Smart sustainable urbanism	Bahrain	Wastewater systems, water management, population sustainability	Conceptual	Yes
11	Elidrisy, 2024	Cloud services and digital transformation	Qatar	Big data analytics, IoT, cloud computing, cybersecurity	Implemented	Yes
12	Alreshidi and Alyami, 2020	End-user requirements for smart cities	Saudi Arabia	IoT architecture, system interoperability	Conceptual	Yes
13	Onyusheva *et al.*, 2024	Data analytics, IoT, and cybersecurity	UAE	Data analytics platforms, IoT ecosystems, cybersecurity protocols	Implemented	Yes
14	Kalra, 2019	Digitisation impact on smart living	Dubai, UAE	Infrastructure digitisation, e-governance platforms	Implemented	Yes

DOI: 10.47556/B.OUTLOOK2025.23.11

No.	Study	Study Focus	Geographic Scope	Smart City Components	Implementation Stage	Full Text Retrieved
15	K'Akumu and Alhamoudi, 2025	Smart city policy analysis	Abu Dhabi, UAE	Smart governance systems, integrated transport, policy digitisation	Implemented	Yes
16	Tahmasseby, 2022	Smart mobility	Lusail City, Qatar	ITS systems, transportation innovation, mobile connectivity	Planned	Yes
17	Jayashree *et al.*, 2019	Gender inclusivity in smart cities	Dubai, UAE	Gender-responsive urban design, inclusive public space planning	Conceptual	Yes
18	Hegazy and Mahboob, 2024	Smart city initiatives evaluation	Riyadh, Saudi Arabia	Public safety systems, medical ICT services, broadband connectivity	Implemented	Yes
19	Mazzetto, 2024	Urban Digital Twins	Singapore, Dubai	Urban simulation, real-time modeling, digital twin platforms	Conceptual	Yes
20	Sankaran and Chopra, 2020	Sustainable smart city case study	Masdar City, UAE	Energy efficiency systems, smart transport, green architecture	In progress	Yes
21	Pilipiszyn and Hedjazi, 2016	Sustainability-oriented innovation	GCC countries	E-government tools, renewable energy, smart infrastructure	Implemented	Yes
22	Mathew and Bangwal, 2024	Smart city governance models	GCC countries	People-centered governance, accountability tools, policy indicators	Conceptual	Yes
23	Saxena and Al-Tamimi, 2018	Smart city initiatives	GCC countries	Innovation platforms, e-services, smart growth programmes	Conceptual	Yes
24	Khodr and Reiche, 2012	Specialised cities	GCC region	Sector-driven city models, urban specialisation, strategic planning	Conceptual	Yes
25	Badran, 2023	Smart city regulation	Qatar	Policy frameworks, health-tech, infrastructure modernisation	Planned/In progress	Yes
26	Mutambik *et al.*, 2023b	Leadership and organisational culture	GCC countries	Open data systems, leadership impact frameworks	Implemented	Yes
27	Abubakar and Alshammari, 2023	Urban planning for low-carbon cities	GCC region	Green buildings, solar energy, smart mobility	In progress	Yes
28	Al-Saidi and Zaidan, 2024	Smart communities	GCC region	Transport systems, e-governance, infrastructure, sustainability	Implemented	Yes

DOI: 10.47556/B.OUTLOOK2025.23.11

No.	*Study*	*Study Focus*	*Geographic Scope*	*Smart City Components*	*Implementation Stage*	*Full Text Retrieved*
29	Kamel, 2013	Walkability in smart cities	GCC cities	Pedestrian-focused design, public space, walkability metrics	Conceptual	Yes
30	Alotaibi *et al.*, 2022	Smart city dimensions	Riyadh and global cities	Cross-city component benchmarking, ICT infrastructure, transport	Conceptual	Yes
31	Mutambik, 2023	Citizen perspectives on smart cities	GCC countries	Public perception, digital literacy, participation effectiveness	Conceptual	Yes
32	Sameer *et al.*, 2022	Digital Participatory Planning	Oman	Digital planning tools, citizen feedback systems, inclusion models	Conceptual	Yes
33	Al-Saidi and Zaidan, 2020	Urban development models	GCC cities	Digital planning, infrastructure frameworks, urban resilience	Implemented	Yes
34	Biygautane and Clegg, 2024	Public-private partnerships	Dubai, UAE	PPP governance, infrastructure investment, digital contracting	Implemented	Yes
35	Hu, 2022	Sustainable urban development	Fukuoka, Japan and Dubai, UAE	Green infrastructure, smart zoning, sustainability tech	Implemented	Yes
36	Alotaibi *et al.*, 2024	Smart city attributes	Najran, Saudi Arabia	IoT sensor networks, smart utilities, infrastructure design	In progress	Yes
37	Yigitcanlar *et al.*, 2020	Sustainable smart cities	Not specified	Technology integration, sustainable design, governance models	Conceptual	Yes
38	Mutambik, 2024	Technology acceptance in smart cities	Saudi Arabia	User adoption models, perceived usefulness, digital behaviour	Conceptual	Yes
39	Lopes and Rodrigues, 2020	Smart city methodologies	Dubai, Istanbul, Montreal	Strategic urban models, governance frameworks, technology platforms	Conceptual	Yes
40	Pandita *et al.*, 2024	Smart technology integration	Masdar City, UAE	Smart grid, clean energy, transport tech	Implemented	Yes
41	Ibrahim, 2024	Artificial Intelligence and Governance	Saudi Arabia	AI in governance, predictive analytics, automated service delivery	Implemented	Yes

Source: Constructed by authors

DOI: 10.47556/B.OUTLOOK2025.23.11

BIOGRAPHY

Professor Joseph M. Ntayi is the Dean, Faculty of Economics, Energy and Management Science at Makerere University Business School. He holds a PhD (Marketing), an MBA (Marketing) and a Bachelor of Commerce (Marketing). He has over 31 years' experience in research, consultancy and teaching at the university, over 20 years of administrative work at the university, and 5 years of managing international projects. His teaching and research interests are in procurement, supply chain management, business ethics, leadership, occupational health and safety, marketing and financial inclusion. Professor Ntayi is on the editorial boards of several scholarly journals, a reviewer of many international journals, and a distinguished international scholar publishing over 150 journal articles in refereed journals. He has worked on Improving the Youth Entrepreneurial Mindset, Corporate Strategy, Coaching and Mentoring, Gender Mainstreaming, Public Sector Administration and Management, Assessing and Monitoring Universities and Higher Institutions of Learning, Curriculum Review and Development, Training and Assessment and Strategy. Professor Ntayi is also an Eminent Entrepreneur.

James Mubangizi is a Lecturer and Head of the Department of Oil and Gas at Victoria University, Kampala, Uganda. He is currently pursuing a PhD by coursework and research in Energy Economics and Governance at Makerere University, Kampala, Uganda. James' doctoral research focuses on the nexus between economic growth, renewable energy consumption, environmental degradation, and climate change in Uganda. The thesis aims to provide evidence-based insights to inform sustainable energy policies and climate change mitigation strategies in developing economies. His work contributes to the growing body of knowledge on energy economics and environmental governance in Africa.

Dr Nazarious Rukanyangira holds a PhD in Business Administration (Marketing) and additional qualifications in marketing and business management. He is a Senior Lecturer of Marketing at Muni University, Uganda, and serves as Managing Director of Muni University Investment Company Ltd. He has extensive experience in academic leadership, having served in senior roles including Dean of the School of Business Administration. Beyond academia, Dr Rukanyangira has provided leadership and advisory services in both public and private sector organisations, contributing to institutional governance, strategic planning, and service delivery improvement. His research interests include marketing strategy, transparency and accountability, education service delivery, entrepreneurship, and organisational performance. He has published in peer reviewed journals and supervised postgraduate research at master's and doctoral levels, while also engaging in consultancy and capacity building initiatives that bridge theory and practice.

DOI: 10.47556/B.OUTLOOK2025.23.11

Kenneth Byangwa is a Ugandan engineer and business professional with extensive experience in energy, manufacturing, and downstream petroleum marketing. He holds an MSc in Computer Science and a BSc in Mechanical Engineering from Makerere University. His career spans senior technical and commercial roles with multinational firms, including Chevron Uganda and Hass Petroleum. He combines engineering expertise with sales strategy, customer relations, health, safety, environmental compliance, and leadership, and is recognised for operational revitalisation and process improvement across industries. He seeks to strategically apply his technical and professional expertise in advancing Sustainable Development Goals (SDGs) 1, 7, 8, and 13 (which focus on poverty eradication), expanding access to affordable, reliable, sustainable, and modern energy, fostering sustained, inclusive, and sustainable economic growth alongside full and productive employment and decent work, and supporting urgent action to address climate change and its associated impacts.

DOI: 10.47556/B.OUTLOOK2025.23.11