

The Role of Media in Smoothing Smart City Development: Pathways, Opportunities, and Positive Impacts

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ABSTRACT

This study explores the role of media in the growth of smart cities, with a focus on comparing Singapore and Pune. Media acts as a bridge between governments, citizens, and technology, helping to share information, build trust, and encourage public participation. In Singapore, the media system is highly centralized, which allows information to be shared quickly and consistently. Campaigns like Seniors Go Digital, which trained more than 100,000 elderly citizens, and platforms such as SingPass Mobile, used by over 4.2 million people, show how media supports digital inclusion and service adoption.

At the same time, Singapore's depend on centralized media raises concerns about limited diversity of viewpoints and the risk of data breaches, such as the 2018 SingHealth cyberattack affecting 1.5 million records. In contrast, Pune shows the benefits and challenges of a different media system. Local newspapers, FM radio, and social media allow better outreach to different communities, and initiatives such as participatory budgeting received 2,279 citizen proposals, with nearly ₹137 crore allocated to projects. However, the lack of coordination among multiple agencies and digital literacy gaps in marginalized groups often slow down projects like the City Hub for Data Communication and adaptive traffic management. The study also identifies emerging trends such as AI and Big Data in media, influencer-driven campaigns, and integration with IoT-based services. It highlights research gaps, including the need for interdisciplinary studies and stronger government-media collaboration. Overall, media is not just an information tool but a key enabler for building inclusive and sustainable smart cities.

Keywords: Media ecosystem; Smart cities; Citizen engagement; Digital inclusion; Urban governance;

INTRODUCTION

A smart city is widely conceptualized as an urban ecosystem that integrates technological, social, and governance dimensions to enhance the quality of life for its citizens. Authors argue that a city becomes “smart” when investments is in human and social capital, as well as in both traditional (transport) and

modern information communication technologies (ICT) [1, 2]. This fuels sustainable economic growth and improve the quality of life through the efficient management of resources. Similarly, another study describes a smart city as one that infuses information into its physical infrastructure to enhance convenience, mobility, efficiency, and sustainability, while enabling collaboration across multiple entities [3, 4]. However, such definitions have been criticized for being overly technology-driven, often overlooking the socio-political complexities of urban life. Recent scholarship has emphasized the socio-technical perspective, framing smart cities as complex systems where technology, human capital, governance, and sustainability must be interwoven to achieve equitable outcomes [5, 6]. Building on this, the concept of the “societal smart city” underscores the importance of democratic values, social rights, and participatory governance alongside technological innovation, particularly in the post-pandemic era where inclusivity and resilience have become essential [7, 8].

Within this framework, media (ranging from traditional outlets to digital platforms and social media) emerges as a critical stakeholder in the development of smart cities. Media serves as a conduit for citizen awareness, enabling informed dialogue on infrastructure, sustainability, and civic innovation. Its role was particularly evident during the COVID-19 pandemic, where real-time social media communication through platforms like Twitter and WhatsApp facilitated the rapid spreading of public health guidelines, updates, and community support services [9]. Beyond crisis management, media has become a tool for crowdsourcing solutions, reporting service disruptions, and enhancing municipal accountability, while also promoting social cohesion and bridging cultural divides through inclusive narratives.

The rationale for studying the role of media in smart city development is grounded in the interaction between governance, citizen engagement, and technological innovation. Smart cities are socio-technical systems that rely not only on infrastructure but also on active citizen participation and transparent policymaking [10, 11]. By mediating information flows between municipal authorities and residents, media shapes narratives that can either strengthen or undermine the legitimacy and effectiveness of smart city initiatives. This role becomes particularly crucial

in the pursuit of democratic, inclusive, and sustainable urban futures, echoing the principles of e-democracy and social rights envisioned within the “societal smart city” framework [12]. Therefore, this review aims to clarify the multidimensional nature of smart cities through technological, socio-technical, and governance-focused lenses. Also, investigates how media functions as a key stakeholder in enabling awareness, participation, transparency, and citizen-centric governance. This article assess media contribution to emergency responsiveness, service delivery, social inclusion, and innovation. Furthermore, it identify emerging research gaps, including the integration of media strategies into governance models, the lack of longitudinal evidence on media impacts, and the ethical challenges of media-driven engagement. Through this systematic examination, the review seeks to position media as a constructive yet underexplored actor in advancing equitable, resilient, and citizen-focused smart cities.

2. Media as a Catalyst

The role of media in urban development is not a recent phenomenon. Historically, newspapers, radio, and television have been instrumental in shaping public opinion and influencing planning agendas [13]. In the early stages of urban modernization, media often highlighted infrastructure projects, housing policies, and governance reforms. Thus, generating awareness and mobilizing citizen support for urban initiatives [14]. Scholars argue that media historically acted as a bridge between policymakers and the public, which facilitates dialogue and creating accountability in planning processes.

This historical precedent underscores the enduring influence of media as cities transition into the digital and smart era, where information flows and communication infrastructures are even more critical [15]. In contemporary smart city development, the role of media has expanded beyond traditional mass communication to encompass digital platforms and social media ecosystems. Mass media continues to provide broad coverage of smart city policies and projects, but interactive digital platforms such as Twitter, Facebook, and LinkedIn have enabled participatory governance and citizen co-creation. These platforms allow stakeholders to share real-time feedback on issues like mobility, sustainability, and digital equity, thereby increasing transparency and inclusiveness [16].

Moreover, social media campaigns can accelerate citizen mobilization, as seen in initiatives advocating for smart transport systems or renewable energy adoption. By leveraging digital media, city administrations can engage residents more directly. In return, citizens can hold policymakers accountable. Such bidirectional communication reflects a shift toward collaborative models of governance in smart cities [17].

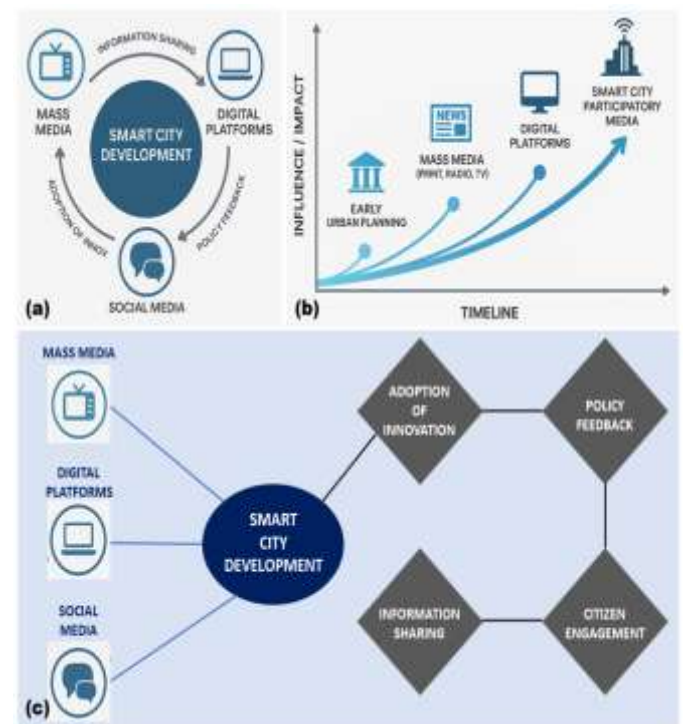


Figure 1. The role of media in shaping smart city growth. (a) Mass media, digital platforms, and social media support innovation, information exchange, and policy feedback. (b) Timeline showing how media influence has grown from traditional print and broadcast to participatory smart city media. (c) Connections between different media types and their impact on innovation, citizen engagement, information flow, and governance.

The catalytic role of media in smart city development is further highlighted when examined through the lens of communication theories [18]. The agenda-setting theory emphasizes how media shapes the salience of issues by determining which urban challenges dominate the public and political agenda [19]. For example, persistent media coverage of climate change and air pollution often pressures governments to prioritize sustainability in smart city agendas [20]. Similarly, framing theory demonstrates how the portrayal of technologies influences citizen perception, framing surveillance tools as “safety enhancers” rather than “privacy threats” can significantly affect public trust and adoption [21]. Meanwhile, the diffusion of innovation theory explains how new technologies gain traction within communities, with media acting as a key agent in accelerating adoption. By showcasing early adopters and amplifying success stories, digital platforms reduce resistance and legitimize the integration of smart solutions [22]. Collectively, the historical influence of media, its contemporary role in digital engagement, and its alignment with communication theories illustrate its catalytic function in smart city development. Media does not merely inform citizens about urban transformation, it actively shapes the narratives, participation mechanisms, and adoption pathways that define the success of smart city initiatives.

3. Positive Roles of Media

Media (spanning legacy outlets, e-governance portals, and social media) disseminates practical knowledge about smart infrastructure, sustainability practices, and citizen services through mobility apps and open data portals. Meanwhile, also building the digital skills that enable residents to actually use these tools.

Recent work on smart governance stresses that “smart citizens” require digital literacy, quality education, and app-based competencies, which positioned media communication and media literacy programs as foundational to inclusive adoption of smart services [23].

Additionally, public agencies and education networks are likewise scaling media/digital-literacy initiatives (NAMLE’s 2024 national snapshot) to counter misinformation and empower residents to critically evaluate urban data, AI claims, and platform content that increasingly mediate city life [24].

This linkage is confirmed by the city-level studies, local digital-literacy programs and campaigns correlate with greater readiness to use city platforms and safer online behaviour. This will reinforce a virtuous cycle between awareness campaigns, citizen trust, and uptake of smart services [25].

Furthermore, reviews of social-focus smart-city research further show that communication and literacy efforts improve perceived usefulness of smart solutions and strengthen social sustainability outcomes [26]. Furthermore, media acts as a bridge between policymakers and citizens by broadcasting reforms, explaining design choices (data governance or congestion pricing), and creating feedback loops that enhance transparency and accountability.

Contemporary smart-governance research outlines how digital communication and open platforms can institutionalize two-way engagement and strengthen public-sector performance when coupled with managerial digital readiness and digital leadership [23, 27].

Systematic and conceptual analyses of accountability in smart cities highlight the role of public communication (press briefings, dashboards, social media threads) in clarifying responsibilities, monitoring service levels, and surfacing grievances, key conditions for legitimacy and trust [28].

Cross-platform media studies (Singapore’s Smart Nation storytelling across news and social channels) show how narrative strategies shape the legitimization of smart-city reforms and can align public expectations with policy trajectories [29]. The positive roles of media are summarized in figure 2.

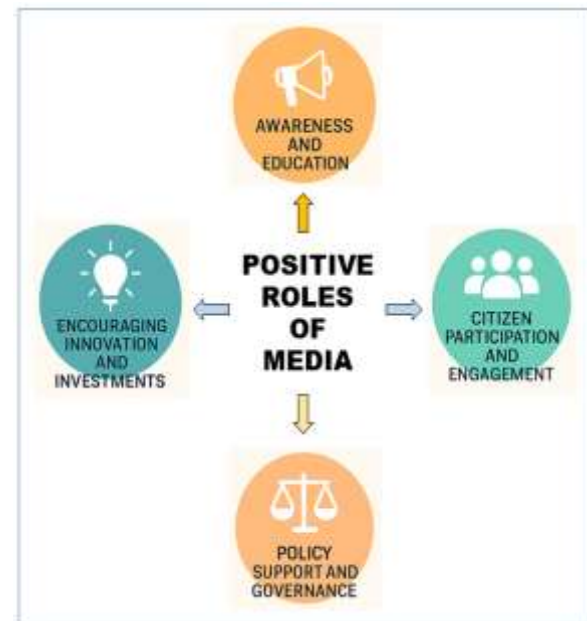


Figure 2. Positive roles of media in smart city development.

Media campaigns (from participatory budgeting explainers to neighbourhood challenge calls) are central to participatory governance because they lower entry barriers, publicize opportunities to co-produce solutions, and convert passive audiences into active contributors. A 2025 case analysis of Traffy Fondue (Bangkok) demonstrates how social-media-enabled reporting and feedback loops increased citizen participation and improved the responsiveness of urban problem solving—evidence that media channels can operationalize co-creation at scale [30]. A recent systematic review of social dimensions in smart-city research similarly finds that media-facilitated participation improves satisfaction, strengthens social cohesion, and advances equity outcomes when cities design inclusive communication pathways [26]. New SLRs on community-based smart cities (2020–2025 corpus) further underline that media-supported participation is a consistent success factor in inclusive, sustainable implementations [31]. Moreover, media visibility spotlights start-ups, pilots, and proofs-of-concept in domains like urban AI, mobility, energy, and civic tech, attracting investors and catalysing public-private collaboration.

A critical survey of PPPs in smart cities documents how communication and stakeholder alignment reduce transaction costs and risk perceptions, improving the pipeline from pilot to scale [32]. Industry and ecosystem reports (Startup Genome 2025) show that narratives around standout use-cases, demo-days, and challenge prizes help concentrate capital and talent in “hot” problem areas, accelerating diffusion and local capacity building [33]. New scholarship on startup-driven e-government collaborations adds that proactive media and policy signalling (regulatory sandboxes, open calls) can mitigate bureaucratic friction and encourage joint experimentation [34]. Complementary analyses of multi-stakeholder open innovation models

(Quadruple/Quattro Helix) emphasize that cross-media storytelling and platform communication are integral to aligning civil society, academia, industry, and government around shared urban missions [35]. Finally, media also shapes who is seen and served in smart cities. Inclusion-focused reviews warn that without intentional communication and outreach, digital transitions may widen inequalities—particularly for people with disabilities, older adults, and low-income communities—by limiting awareness of services or creating inaccessible interfaces [36]. Global policy playbooks (UN-Habitat; ITU) recommend targeted media campaigns, multilingual content, disability-inclusive formats, and trusted community media partnerships to bridge the digital divide and ensure that benefits reach underserved groups [37, 38]. Emerging work on “Urban AI” similarly argues that communicative inclusion—clear narratives about risks/benefits, open consultations, and participatory storytelling—will be decisive for equitable adoption of AI-driven urban services [39].

4. Case Study

4.1 Singapore

Singapore, widely recognized as one of the most advanced smart cities in the world, has built a distinctive media ecosystem that plays a central role in shaping its Smart Nation vision. The media landscape is tightly regulated, with leading outlets such as MediaCorp and Singapore Press Holdings (SPH) operating under government-linked entities, yet the country also enjoys one of the highest levels of digital penetration globally, with smartphone usage exceeding 89%, which allows for the efficient dissemination of smart city initiatives through digital platforms [40]. A clear example of this is the Gov.sg WhatsApp channel, launched during the COVID-19 pandemic to provide citizens with real-time updates on health advisories and policy measures, demonstrating how digital media has become a trusted tool for direct government communication [41].

Awareness and education have also been prioritized within the Smart Nation initiative, supported by structured outreach campaigns such as the SCOPE citizen co-creation platform and the “Seniors Go Digital” program, both designed to improve digital literacy and extend inclusion across diverse groups, particularly the elderly and marginalized populations [42]. Under the Seniors Go Digital program, for instance, more than 100,000 elderly citizens were trained between 2020 and 2022 to use smartphones, QR-based payments, and video-calling tools, showing the tangible impact of media-enabled literacy campaigns [43]. Alongside this, citizen engagement is strongly embedded through initiatives such as the Smart Nation and Digital Government Office’s Co-Creation Group, which involves persons with disabilities, seniors, and low-income families in the design and testing of new services, ensuring inclusivity in technological adoption [44].

A notable outcome of this approach is the MyResponder App, co-created with citizen volunteers, which allows users to respond to nearby cardiac arrest emergencies, highlighting how digital platforms can translate public participation directly into improved urban well-being [45]. Governance and policy support are equally strengthened by central coordination through GovTech under the Prime Minister’s Office, which aligns media communication, citizen outreach, and policy implementation into a coherent framework [46]. This coordination is exemplified by the success of the SingPass Mobile app, promoted through large-scale government media campaigns, which now provides secure digital identity access to more than 4.2 million residents and facilitates interaction with over 1,700 government and private-sector services [47].

At the same time, media has been instrumental in promoting innovation and attracting investments by highlighting advancements such as the Smart Nation Sensor Platform, Sing Pass, and cashless payment systems, while also nurturing startup ecosystems and encouraging public-private collaboration [48]. A widely cited example is the PayNow cashless payment system, whose adoption has spread to over 80% of households and small businesses, a success that was accelerated through coordinated media campaigns [49]. Importantly, Singapore’s media-driven approach also places emphasis on social inclusion, with multilingual outreach and targeted initiatives such as “Seniors Go Digital” ensuring that no community is excluded from the country’s digital transformation [50].

The Digital for Life Movement, launched in 2021, reflects this inclusive agenda by running multilingual campaigns and working with media partners to bridge digital gaps among seniors, low-income households, and migrant workers [51]. Taken together, these initiatives demonstrate how Singapore’s tightly regulated yet digitally empowered media ecosystem serves as a catalyst for building awareness, promoting citizen engagement, fostering innovation, and advancing inclusivity in the evolution of a smart city.

4.2 Pune

Pune’s media ecosystem is characterized by its diversity, encompassing local newspapers such as Sakal and the Indian Express Pune Edition, FM radio channels, regional television, and a rapidly growing influence of digital and social media platforms. Unlike Singapore’s centralized system, Pune’s fragmented media landscape enables localized communication and effective outreach across heterogeneous linguistic and socio-economic groups [52, 53]. A striking example is the integration of 450 smart CCTV cameras into the Pune police control room, an initiative widely reported by The Times of India and other outlets, which not only demonstrated the city’s adoption of surveillance-led safety measures but also highlighted how both traditional and digital media can build public awareness and encourage acceptance of smart infrastructure [54].

Awareness campaigns are a major pillar of Pune's smart city strategy, with the Pune Smart City Development Corporation Ltd. (PSCDCL) relying heavily on newspaper advertisements, FM radio jingles, and social media posts to inform citizens about projects on smart transport, energy efficiency, and waste management [55, 56]. A prominent case is the Adaptive Traffic Management System (ATMS), designed to synchronize traffic signals and ease congestion, which received wide coverage across regional media and in turn enhanced public understanding of its benefits, fostering trust in smart mobility interventions [57]. Citizen participation also forms a core element of Pune's smart city approach, often facilitated through media-driven outreach and participatory platforms [58]. The participatory budgeting initiative by the Pimpri Chinchwad Municipal Corporation (PCMC) serves as a notable example, where citizens submitted 2,279 proposals, of which 499 were approved with a total allocation of ₹136.98 crore; extensive media coverage of this initiative amplified public voices on priorities such as road safety, drainage, and CCTV installations, thereby reinforcing participatory governance [59].

Governance reforms in Pune are similarly supported through digital communication platforms and media outreach, with the launch of the City Hub for Data Communication (CHDC) in February 2025 standing out as a milestone; modeled on Tel Aviv's framework, this platform integrates real-time data to improve coordination and decision-making, and its extensive media coverage underscored how communication tools legitimize data-driven governance and enhance transparency [60].

Media has also played an important role in spotlighting urban innovation and drawing investment, as seen in the Rainfall and Flood Forecasting Early Warning System developed in collaboration with the Centre for Development of Advanced Computing (C-DAC), which provides 72-hour advance alerts for flood-prone zones; widespread reporting of this initiative emphasized Pune's growing role in climate-tech applications and showcased the importance of public-private collaboration in disaster resilience [61-63]. At the same time, the city has made efforts to address social inclusion and bridge the digital divide through technology-enabled media initiatives [64, 65].

A compelling case is the multilingual digital audio guide introduced at the Raja Dinkar Kelkar Museum, where QR codes allow visitors to access exhibit information in Marathi, Hindi, and English; extensively reported in local media, this initiative illustrates how digital tools can promote accessibility and cultural inclusivity within the broader smart city framework [66]. Additionally, a synthesized table 1 is presented below to compare different parameters of smart city development in Singapore and Pune.

Table 1. Comparative analysis of smart city media ecosystems and citizen engagement initiatives in Singapore and Pune.

S. No.	Parameter	Singapore	Pune
1	Media Ecosystem	- Centralized & regulated (MediaCorp, SPH) [40]. - High digital penetration (~89%) [40]	- Diverse: newspapers, FM, TV, social media [52, 53] - Localized outreach [52, 53]
2	Awareness & Education	- Seniors Go Digital, SCOPE [42, 43] - 100k+ seniors trained [43]	- Newspaper ads, FM jingles, social media [55, 56] - Adaptive Traffic System (ATMS) [57]
3	Citizen Engagement	- Co-Creation Group [44] - MyResponder App [45]	- Participatory budgeting: 2,279 proposals, ₹136.98 crore [59]
4	Policy & Governance	- GovTech coordination [46] - SingPass Mobile: 4.2M users, 1,700+ services [47]	- City Hub for Data Communication (CHDC) [60] - Media enhances transparency [60]
5	Innovation & Investments	- Smart Nation Sensor Platform [48] - PayNow adoption 80% [49]	- Rainfall & Flood Forecasting System (72h alerts) [61-63] - Public-private collaboration
6	Social Inclusion	- Multilingual campaigns, Digital for Life [50, 51] - Targets elderly/marginalized	- Multilingual digital museum guides [66] - Promotes accessibility & cultural inclusion

5. Challenges and Solutions

Despite significant advancements, both Singapore and Pune face distinct challenges in smart city development. In Singapore, although digital penetration is high, a segment of the elderly population struggles with adapting to new technologies, which can

lead to social isolation [42, 43]. For example, initiatives like Seniors Go Digital in Singapore provide training to over 100,000 seniors, teaching them how to use smartphones, government apps, and digital services. These programs help reduce social isolation and enable participation in smart city initiatives. However, many elderly residents still struggle with complex interfaces, limited access to devices, or lack ongoing support. As a result, the digital literacy divide persists, requiring continuous and adaptive strategies beyond initial training sessions [67]. Moreover, the extensive use of digital platforms such as SingPass Mobile and the Smart Nation Sensor Platform raises concerns about data privacy and cybersecurity, as highlighted by incidents like the 2018 SingHealth data breach [47].

In July 2018, Singapore experienced its largest cybersecurity incident when the SingHealth IT system was breached, exposing personal data of 1.5 million patients, including prescription records of 160,000 individuals and the Prime Minister's medical information. The attackers exploited unpatched software and insufficient cybersecurity training among staff, using customized malware to bypass existing defenses.

The breach prompted the government to accept 16 recommendations from the Committee of Inquiry, including enhancing security frameworks, improving staff cyber awareness, and implementing stricter patch management [68]. This incident highlights the risks associated with extensive digital platforms like SingPass Mobile and the Smart Nation Sensor Platform, emphasizing the need for robust cybersecurity measures. Furthermore, the highly centralized media ecosystem of Singapore, dominated by entities like MediaCorp and SPH, ensures efficient dissemination of information to over 5.6 million residents [40].

However, this concentration limits diversity of perspectives, potentially reducing community-driven innovation and public debate. Studies show that media ownership concentration can result in underrepresentation of minority voices, with some local issues receiving minimal coverage, affecting roughly 20–30% of community-relevant topics [69]. Addressing this requires promoting media pluralism, supporting local journalism, and encouraging alternative platforms to ensure inclusive and balanced information flow.

In contrast, Pune faces challenges primarily due to its heterogeneous and fragmented media and technological infrastructure. The diversity of newspapers, FM radio, regional TV, and social media platforms can result in inconsistent communication and uneven citizen engagement across the city's varied demographics [52, 53]. For example, citizen-led initiatives, such as tree mapping projects using apps like TrackMyTree, highlights how communities

compensate for gaps in official information dissemination [70].

While these efforts promote local participation and environmental awareness, they also highlight the need for more integrated media and technological systems. Strengthening coordination between government channels and community platforms can enhance outreach, improve transparency, and ensure inclusive smart city engagement. However, digital literacy gaps among marginalized communities in Pune (including low-income groups, older adults, and rural residents) limit their access to smart city services such as e-governance, online health, and education platforms [55, 56]. Limited access to devices, internet connectivity, and training exacerbates these disparities. Bridging this divide through affordable internet, device distribution, and targeted digital literacy programs is essential to ensure inclusive participation in smart city initiatives and equitable access to technological benefits [71, 72].

Furthermore, Pune's rapid urbanization and the involvement of multiple agencies in projects such as the City Hub for Data Communication (CHDC) often lead to coordination challenges, delays, and inefficiencies in implementing systems like adaptive traffic management and flood forecasting.

The CHDC initiative aims to centralize departmental data and improve inter-departmental coordination through analytics and artificial intelligence. While successes include a reduction in grievance redressal time via the Smart Sarathi app and a significant increase in property tax collections (from ₹628 crore in 2021-22 to ₹977 crore in 2023-24), citizens have reported unresolved civic issues, unresponsive grievance systems, and an over-focus on tax collection, highlighting the gap between digital initiatives and on-ground impact [60].

Similarly, the implementation of the ATMS in Pune has faced challenges. The first phase, covering 30 signals, was completed in 2023, with subsequent phases planned to install the system across 261 traffic lights. However, funding concerns and administrative delays have raised questions about the project's effectiveness and timely execution [73]. In flood forecasting, while the C-DAC has developed advanced systems offering forecasts up to 72 hours in advance, coordination among various departments remains crucial.

Effective implementation requires seamless collaboration between the water resources department, municipal corporations, and disaster management agencies to ensure timely responses and mitigate flood risks [74]. Collectively, these examples highlight that while Singapore benefits from strong governance, technological readiness, and centralized coordination,

it must address inclusivity and privacy concerns, whereas Pune's progress is tempered by infrastructural fragmentation, uneven digital literacy, and coordination hurdles, underscoring the need for context-specific strategies in smart city development. Moreover, key challenges and solutions are summarized in the table 2.

Table 2. Important challenges faced by Singapore and Pune along with their solutions.

S. No.	Location	Challenges	Solutions
1	Singapore	Digital divide among elderly citizens.	Digital Literacy Training - Over 100,000 seniors trained under Seniors Go Digital [42, 43].
		Cybersecurity vulnerabilities.	Cybersecurity Strengthening - Post-2018 breach of 1.5 million patient records led to 16 official recommendations [68].
		Highly centralized media ecosystem limiting diversity.	Media Pluralism: Supporting local journalism and alternative platforms to balance centralized ecosystem [69].
2	Pune	Fragmented media and communication channels.	Integrated Platforms - Citizen-led apps (such as, TrackMyTree) highlight need for stronger government-community coordination [70].
		Digital literacy gaps among marginalized groups.	Digital Inclusion - Affordable internet, device distribution, and literacy programs for low-income and rural groups [55, 56, 71].

		Coordination delays in multi-agency projects.	Multi-Agency Coordination - CHDC improved tax collection (₹628 Cr in 2021-22 → ₹977 Cr in 2023-24) but highlighted on-ground gaps [60]. Infrastructure Implementation - ATMS Phase 1 completed (30 signals) but delays remain for expansion to 261 signals [73], and flood forecasting improved with 72-hour early warnings [74].
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6. Critical Discussion

Media plays a central role in shaping smart city development, as it guides information flow, citizen engagement, and the adoption of technology. In Singapore, the media ecosystem is highly centralized, led by MediaCorp and Singapore Press Holdings (SPH). With digital penetration at about 89% and SingPass Mobile reaching 4.2 million active users and offering access to over 1,700 services, the government can deliver information to citizens quickly and effectively [40,41,47,49].

Media campaigns have also supported financial technology adoption, with PayNow now used by more than 80% of the population [47,49]. However, this centralization reduces diversity in perspectives and can limit local problem-solving. For example, studies note that 20–30% of local issues, such as neighborhood waste management or mobility barriers, receive little media coverage [69].

Cybersecurity also remains a major concern. In 2018, the SingHealth data breach exposed records of 1.5 million patients, including 160,000 prescription details and even the Prime Minister's medical data [68]. The breach was caused by unpatched systems and limited staff training, pushing the government to adopt 16 cybersecurity reforms [68].

This shows that while Singapore's centralized digital platforms improve efficiency, they also concentrate risks when security gaps emerge. In Pune, the media ecosystem is very different. The city depends on a mix of newspapers such as Sakal and the Indian Express Pune edition, FM radio, regional television, and social media platforms [52,53].

This diversity allows localized outreach and has supported participatory governance. For example, in

the 2017–18 participatory budgeting exercise, citizens submitted 2,279 proposals, leading to an allocation of ₹136.98 crore for local projects [59]. Similarly, social media has helped mobilize citizens for community activities like river cleaning and cycling campaigns [55,56]. Yet, fragmentation also creates problems. Communication about smart projects such as the adaptive traffic management system (ATMS) and the flood forecasting model has often been inconsistent, leading to delays and public confusion [73]. In addition, digital literacy is uneven. Surveys show that many marginalized groups, especially women and elderly residents in peri-urban areas, struggle to use e-governance apps for healthcare and utilities [71,72]. While awareness efforts through FM jingles, ads, and street campaigns exist, they have not fully addressed the digital divide [16,17].

Another limitation is coordination: projects like the City Hub for Data Communication (CHDC) require collaboration across multiple agencies, but this often leads to delays and inefficiencies [21,22–24]. Overall, Singapore and Pune show two contrasting models. Singapore demonstrates how a centralized media ecosystem ensures wide and fast adoption of digital services but risks suppressing diverse voices and concentrating cybersecurity threats.

Pune, in contrast, benefits from plural and inclusive media engagement, but faces challenges of fragmented communication, uneven digital literacy, and delays due to multi-agency involvement. For both cities, future progress depends on balance—Singapore needs more community-driven media and decentralization, while Pune must strengthen coordination and expand digital literacy training to include marginalized groups.

7. Emerging Trends and Research Gaps

New trends in media (shown in figure 3a) use for smart cities show how technology and citizen interaction are changing urban life. Artificial Intelligence (AI) and Big Data are now used to study large amounts of city data, such as traffic movement, energy demand, and waste collection. This allows faster and smarter planning for city services [75]. Social media influencers are also becoming important.

By sharing information about city programs, lifestyle changes, or local campaigns, they help reach younger and more diverse groups of people, making citizens more aware and involved in city projects [76, 77]. At the same time, IoT devices are being linked with media to give real-time updates—for example, live maps of

traffic, pollution alerts, and energy use reports—so that citizens can make better daily decisions [78].

A good example is Thailand’s Traffy Fondue system, which uses AI to organize over 1.37 million citizen complaints across 17,000 agencies and solved about 77% of them by giving feedback directly through mobile apps [30]. These developments show that smart city media is moving toward a model where AI, influencers, and IoT work together to make cities more connected, inclusive, and efficient.

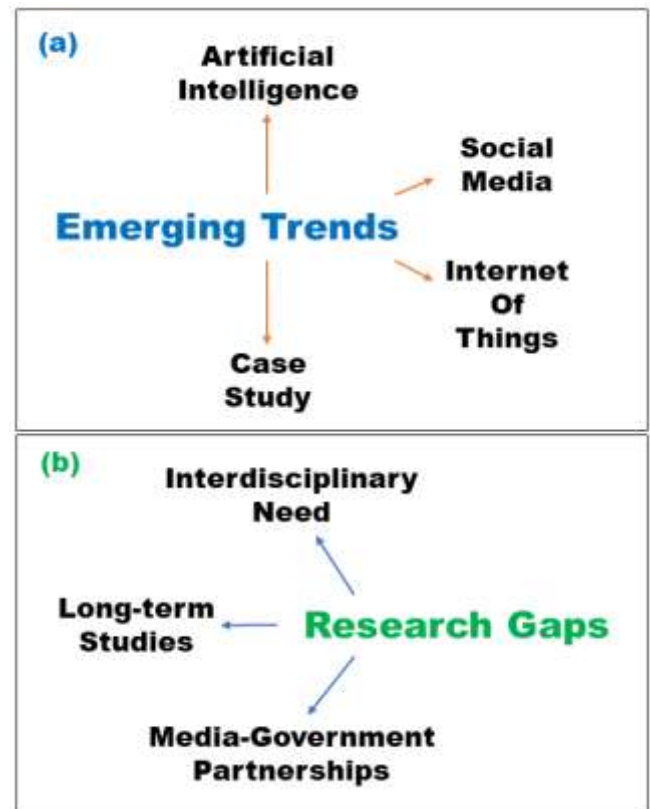


Figure 3. (a) Emerging trends and (b) research gaps in media use for development of smart cities.

Despite increased attention, research on media’s role in smart city development shows clear limitations (shown in figure 3b). First, interdisciplinary studies remain rare, few combine media studies with urban planning and ICT. The emerging field of urban informatics underscores the value of integrating these domains to truly address urban challenges, but such approaches are still uncommon in the literature [79]. Second, long-term studies are scarce. Most research captures only short-term outcomes of media campaigns or smart city initiatives, leaving us unable to understand their sustainment, legacy, or evolving citizen trust over time. Third, collaborative frameworks between media and government are under-explored. Evidence from institutional collaborations suggests such models are key to successful smart city governance, yet few documented frameworks show how media can partner with municipal systems to enhance transparency and public engagement [80, 81]. Filling these gaps, with interdisciplinary inquiry, longitudinal evaluation, and media–government partnerships, will strengthen the

ability of cities to communicate effectively, engage equitably, and sustain smart solutions.

CONCLUSION

This study shows that media plays an important role in building and running smart cities by connecting governments, citizens, and technology. The comparison of Singapore and Pune makes it clear that the type of media system strongly affects how people understand and take part in smart city projects. In Singapore, the media is centralized and well-regulated, which allows the government to share information quickly and consistently with its 5.6 million residents. With smartphone usage above 89%, digital campaigns have reached a large share of the population and helped the adoption of platforms such as SingPass Mobile, which has more than 4.2 million users and connects people to over 1,700 services. Similarly, PayNow, a cashless payment system, has been used by around 80% of households and small businesses. Programs such as Seniors Go Digital, which trained more than 100,000 elderly citizens to use smartphones and digital services, show how media can help reduce the digital divide, though challenges still remain for older and less tech-savvy groups. At the same time, Singapore's centralized media, mainly run by MediaCorp and SPH, risks limiting diversity of opinions, which may reduce space for community-led innovation.

The 2018 SingHealth cyberattack, which exposed data of 1.5 million patients including 160,000 prescription records and the Prime Minister's medical details, also highlights how dependence on digital platforms can create serious risks for privacy and security. Pune, on the other hand, represents a very different case. Its media system is highly diverse, with newspapers, FM radio, regional television, and fast-growing social media platforms reaching different groups of people. This diversity allows better localized communication, but it also creates uneven citizen engagement because not all groups receive the same level of information. Awareness campaigns for projects such as the Adaptive Traffic Management System (ATMS) and the City Hub for Data Communication (CHDC) have been supported by newspaper ads, FM jingles, and social media posts.

Citizen participation in Pune has been promoted through initiatives like participatory budgeting, where residents submitted 2,279 proposals, and ₹136.98 crore was allocated to 499 projects. This shows how media coverage can encourage people to get directly involved in decision-making. Media has also been useful in highlighting innovations, such as the rainfall and flood forecasting system developed with C-DAC, which provides 72-hour advance alerts and has been widely covered in news outlets. Still, Pune faces important challenges such as digital literacy gaps in marginalized groups and coordination issues between multiple agencies that delay projects like ATMS and CHDC. For example, although the first phase of ATMS

covered 30 signals in 2023, expansion to 261 signals has been slowed down by funding and administrative hurdles. In the future, new trends like using AI and Big Data in media, involving social media influencers in urban campaigns, and integrating media with IoT-based services such as real-time traffic and pollution updates, are reshaping the way smart cities engage their citizens. But research gaps remain. There is limited work combining media studies, ICT, and urban planning into a single framework, and few studies track the long-term impact of media on citizen trust and service adoption. Also, more collaborative models are needed where governments and media work together to create two-way communication and stronger accountability.

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