

Final Thesis

Invisible by Design: Power, Productivity and Gender Absence in Smart Cities

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Introduction

Over the past two decades, the concept of the smart city has rapidly evolved from an ambitious technological vision into a dominant global model for contemporary urban development. While smart city initiatives in places like Toronto, Singapore, Barcelona, Vienna and Helsinki appear diverse on the surface, they all reveal a troubling common thread: the persistent absence of gender considerations in their development (Listerborn and Neergaard 2021).

Toronto's Quayside project tells a familiar story. Pitched by Sidewalk Labs as a bold model for urban innovation, the experimental smart community generated enormous initial excitement. That excitement soured quickly. The project's deep flaws were thrown into the open by the public resignation of a prominent female technology advocate from the consultation panel. Citing an alarming lack of transparency and a failure to serve the public interest, her protest exposed the massive gap between the project's marketing and its methods (Wylie 2020). Despite endless promises of "inclusive growth," the actual planning process rarely, if ever, stopped to ask how different social groups might experience the new space. Gender perspectives were simply left out of the conversation.

Looking at Singapore, it's known as a top smart city, are filled with sensors and data systems for efficiency and security. But this high-tech story has a huge blind spot. It completely ignores the hundreds of thousands of female migrant workers who sustain the country's domestic care sector. A cruel paradox defines their lives. Surveillance systems watch them constantly, making them hyper-visible. Yet in city planning, they are completely invisible. Their work is tracked by data and algorithms, but in the official story of the smart city, they simply don't exist.

Even cities with stronger equality traditions cannot be immune. Under Mayor Ada Colau's leadership Barcelona started integrating feminist perspectives into urban planning. Vienna, always being praised as a pioneer in gender mainstreaming. The recent

improvements to street lighting and public transport and park design in Vienna reveal an uncomfortable truth. The city implemented these changes to meet women's needs which indicates the previous urban design focused on a different demographic. The same questions exist about Helsinki's digital innovations because they might maintain existing biases while claiming to serve all citizens (D'Ignazio and Klein 2020).

This pattern stretches across continents and political systems. Gender absence in smart city development isn't a series of isolated mistakes. It's structural.

The rhetoric around smart cities certainly sounds inclusive. Technology gets positioned as neutral, objective, capable of delivering unbiased solutions to urban problems. Participation and inclusion are promised as core principles. Every citizen get the benefits, everyone get a voice in governance. But there's often a substantial gap between these promises and what actually happens on the ground.

The idea that technology is neutral doesn't hold up. When gender and other perspectives are missing from the design process, smart systems fail to help. they can make existing biases worse (Vanolo 2013). For example, voice recognition works better for male voices. Facial recognition makes more mistakes when identifying women of color than white men. These are not random errors. They show the limits and blind spots of the people who created the technology.

Then there's the question of who gets imagined as the "citizen" in smart city planning. Too often, it's an abstract, homogeneous figure with little resemblance to the diverse people who actually live in cities. The concrete needs of women, elderly residents, people with disabilities and other groups get overlooked in favor of this fictional universal user. Meanwhile, the panels and platforms making key decisions remain dominated by male technical experts.

"It's all about him. Genius, Tortured Genius, Genius-with-a-Conscience. This is exactly the position occupied by the contemporary techbro elite running corporations from Meta to OpenAI, who invent whatever and then want to work out how to manage its downsides themselves, while sacking the people (often women of colour) who have done the actual work of pointing out the problems with their creation." By Gillian Rose (2024) .

The promise of "participatory governance" faces the same fundamental issues. Cities develop apps, organize consultation meetings, establish feedback systems. Citizens appear to be involved in the process. But the underlying power dynamics remain intact. Government bureaucracies and tech companies continue to control the major decisions. Public participation often becomes more symbolic than substantive.

The Toronto case demonstrates this pattern clearly. When the advisory panel examined the Quayside project, they concluded that the master plan "did not place citizens at the center of the design process as originally promised." The project promoted ideals of neutrality, inclusion and participation. However, when corporate interests and financial pressures became prominent, these principles proved fragile. Such concepts may work in policy documents, but they struggle against established power structures and institutional inequalities (Wylie 2020).

So we are facing a basic question: is gender absence in smart cities just an oversight that better intentions can fix? Or is it something deeper, a structural problem built into how smart urbanism works?

I argue for the second option. Women and gender issues stay invisible in smart city development, but this is not accidental neglect. It comes from how these projects get managed, what values they put first and how they organize participation.

Look at governance structures first. Smart cities usually work through public-private partnerships, with global tech companies leading much of the innovation. This connects urban governance to competitive, business-focused city models. Decision-making focuses on technology and investment priorities. This leaves little room for ordinary citizens, especially people from marginalized groups. When women are missing from leadership positions and governance circles lack diverse voices, their needs and views do not reach the planning process.

Then there's the efficiency obsession. The smart city paradigm's emphasis on competitiveness often masks the essential role of social reproduction in urban life. Areas like care work get labeled as "non-productive" and have historically been assigned to women. Smart city agendas align closely with neoliberal urbanism, both

pushing for optimized, performance-driven urban visions. Success gets measured through growth metrics, innovation indicators and data-based performance measures, what can't be easily quantified and tends to get undervalued or even ignored. This reflects a key feminist critique: when cities are primarily seen as machines for economic output, women's vital contributions to sustaining urban life simply vanish from view.

The participation problem is equally revealing. Smart cities often substitute genuine democratic engagement with more symbolic forms of inclusion. Digital platforms and data-based participation systems require specific technical skills and resources. But digital divides persist, with women having less access to technology and lower representation in digital sectors. Many women also lack the time and energy for complex governance processes, given caregiving responsibilities. Even because participation in smart cities tends to be designed from the top-down way, which the elites still controlling the agendas and discourse. Even when participation opportunities exist on paper, the voices of women and minority groups often remain effectively silenced (Listerborn and Neergaard 2021; Vanolo 2013; Lombardi and Vanolo 2015).

These dynamics don't operate in isolation. They reinforce each other, creating smart city systems that don't just accidentally overlook gender perspectives but are structured in ways that make such neglect almost inevitable. Gender absence becomes an inherent outcome of how smart cities get designed and implemented. Without examining and transforming these underlying mechanisms, the pattern will keep repeating itself.

This thesis takes up that challenge. It starts with actual urban practices, using critical theoretical frameworks to understand how gender absence operates in smart cities. My approach combines case analysis with critical interpretation. I look at specific urban examples to see how gender issues get sidelined in particular smart city projects, then draw on feminist urban theory and related the critical frameworks to analyze the deeper institutional mechanisms at work.

The underlying assumption is that smart city technological governance isn't neutral. It reinforces existing gender disparities in subtle but significant ways. This means the analysis has to go beyond the visible aspects of smart city discourse and practice, things like policy documents and data strategies, to examine underlying power structures through a critical lens. The goal is to link concrete urban experiences with critical theory, moving past surface phenomena to reveal how "invisible by design" actually works in practice.

Here's how the analysis unfolds. Chapter 1 looks at smart city projects in cities like Toronto, Barcelona and Vienna, highlighting gender issues in governance, technology design and public participation. These city cases provide the groundwork for what comes next. Chapter 2 explores how smart city governance structures and the technology system exclude gender issues from institutional agendas, examining the connections between power operations and gender absence. Chapter 3 looks at how productivity-centered value systems overlook reproductive labor and care work, showing how this reproduces gender bias within dominant urban development visions. Chapter 4 analyzes how participation mechanisms formally include the public while restricting women's and marginalized groups' ability to meaningfully influence outcomes. It critiques the pseudo-democratic tendencies built into these systems. Chapter 5 shifts toward possibilities, exploring how gender-aware smart city pathways might actually be constructed using bottom-up feminist approaches. The conclusion pulls together the main arguments and considers future directions for advancing gender justice in smart cities and urban development more broadly.

Chapter 1 Gender Absence in Urban Practice: Illustrative Phenomena from Smart City Projects

1.1 Toronto

Governance Structure

Toronto wanted to build a smart city, the Sidewalk Toronto project was their big attempt. This was an experimental redevelopment of the Quayside waterfront area. The project started as a public-private partnership, but right away people wondered who was actually running things. In 2017, Waterfront Toronto (a government agency representing federal, provincial and municipal levels) teamed up with Sidewalk Labs, which is Google's urban innovation company. They planned to design a smart neighborhood on a 12-acre site along the eastern waterfront, with possible expansion across the whole area (Sidewalk Labs 2019).

Waterfront Toronto was supposed to provide public oversight. But in reality, Sidewalk Labs controlled most of the strategic and technical decisions. Critics called this an unbalanced governance model. The partnership mixed urban planning with corporate innovation in ways that made people uncomfortable. Important decisions often happened through informal, company-controlled channels instead of transparent public processes. This showed a pattern that many smart city projects follow: technical experts making decisions while claiming it's democratic planning.

Even in the official structures, there were problems. Waterfront Toronto's board was stuck between protecting public interests and promoting economic development (Olmstead 2025). These conflicting goals raised a basic question for Toronto: who really gets to design the city? Should it be citizens and their elected officials, or multinational tech companies working behind closed doors?

The answer came when public opposition grew too strong. In 2020, after intense criticism from citizens, Sidewalk Labs pulled out and the project ended.

Policies & Technologies

Sidewalk Labs had big plans for Quayside as a "living laboratory" for technological experimentation. The design included many smart city features: sensor networks monitoring traffic, air quality and waste patterns, LED lighting that adjusts based on usage, modular timber construction and heated sidewalks for Toronto's cold winters. Streets would become flexible corridors that could handle different types of transport, including autonomous vehicles. The main feature was an urban data platform, controlled by a public "data trust," that would manage all the information flowing from the district.

The project emphasized productivity and efficiency. Technological innovation would bring in talent, boost economic growth and improve city operations. Supporters believed the project would create a new tech ecosystem and strengthen Toronto's position in the global innovation economy. Sidewalk Labs predicted significant job creation and GDP growth by 2040 (Sidewalk Labs 2019).

However, when more details came out, problems became apparent. The amount of data collection planned was enormous. The regulatory rules were unclear. Privacy advocates and digital rights groups became worried about surveillance and data commercialization. Sidewalk Labs suggested independent oversight structures, but many people questioned whether these would actually have any power. The project showed the tension between experimental urbanism and democratic governance (Wylie 2020).

Gender & Intersectional Implications

Gender and intersectionality were strikingly absent from Sidewalk Toronto's discourse. The project celebrated high-tech living and innovation while completely failing to address how smart infrastructures might intersect with everyday inequalities. Questions about caregiving, gendered mobility patterns, or women's safety in public spaces simply didn't appear in the planning documents.

This wasn't an accident. It reflects an approach to urban design that systematically dismisses embodied, everyday experience in favor of abstract technological solutions

(Kern 2019). The emphasis on entrepreneurialism and innovation reflected what Rose calls the overwhelmingly male character of smart city leadership (Rose 2016). Elite technologists and consultants drove the planning process while women and marginalized voices were pushed to the sidelines.

The exclusion became visible through resistance. Saadia Muzaffar, a member of Waterfront Toronto's digital advisory panel and founder of TechGirls Canada, quit the project because she said it lacked transparency and ignored real public concerns. Bianca Wylie, an open government advocate, called the proposal a "hubristic, insulting, incoherent civic tragedy," criticizing how it failed to represent Toronto's diversity (Wylie 2020).

The Block Sidewalk movement that ultimately helped kill the project was led largely by women (Wylie and Bui, n.d.). They called for planning processes that would prioritize inclusivity and everyday needs over corporate tech visions. Their success represents something important: communities excluded from formal planning structures finding ways to reclaim urban authorship.

From a feminist perspective, Sidewalk Toronto exemplifies how innovation can reproduce existing power hierarchies while claiming to be neutral. The plan included robotic garbage collection and self-driving cars but gave no thought to the spatial and temporal routines of caregivers or basic safety considerations for women.

As Criado-Perez points out, data infrastructures are never actually neutral—they reflect the perspectives and blind spots of their creators (Perez 2019). When algorithmic frameworks get developed without feminist oversight, they tend to encode systemic biases through seemingly technical design choices (McCrary 2024). Sidewalk Toronto's smart city vision risked deepening exclusion by rendering inequality "invisible by design."

The project's cancellation can be read as more than just a policy failure. It was a public demand for urban innovation that's more inclusive, transparent and grounded in social reality rather than corporate fantasy.

1.2 Singapore

Governance Structure

In 2014, Singapore's Smart Nation initiative launched, it shows how centralized, technocratic smart city development works. The program runs from the Prime Minister's Office, coordinated through the Smart Nation and Digital Government Group (SNDGG) brings multiple state agencies under one digital strategy. The approach is completely top-down with a small group of senior officials and technical experts decides priorities with almost no public consultation.

This matches Singapore's long-standing political system, where centralized governance and limited civil dissent have existed for decades (Pinsent Masons 2017). The model allows quick implementation, but it also puts decision-making power in the hands of elite groups. Women's organizations, grassroots groups and social justice advocates have very little say. This is very different from more participatory governance systems in other places.

Public involvement stays minimal. Citizens become users of smart services rather than people who help create urban futures. The state sometimes asks industry or academic experts for advice, but broader civil society participation remains limited. The Smart Nation vision rarely includes everyday citizens like teachers, caregivers, or retirees. Their experiences are mostly missing from official discussions (Tan 2023).

Singapore's government values order and efficiency above social complexity and democratic input. When decision-making excludes diverse perspectives, especially women and marginalized groups, urban innovation usually supports existing power structures. It does not challenge them (Listerborn and Neergaard 2021).

Policies & Technologies

Singapore gets praised as a high-tech city. The city uses many sensors, algorithms and real-time data systems. The Smart Nation program uses technology in many different areas. It has digital identity through SingPass, facial recognition for verification, cashless payments, smart transport systems and predictive analytics for public housing and healthcare. There are many other examples. Data flows continuously through

surveillance cameras, QR code check-ins, mobile tracking and public infrastructure. An urban operations center integrates these streams, letting central authorities monitor and manage the city with extraordinary precision. The COVID-19 pandemic saw these efforts intensify. Wearable contact-tracing devices and wastewater testing were deployed, often targeting migrant dormitories more aggressively than the general population (CHRGJ 2022).

The state justifies these digital interventions as efficient, neutral and necessary for public good. Citizens are told they're getting a safer, more seamless urban experience in exchange for some privacy loss.

But critical observers point out that this vision is not neutral. Data infrastructures reflect political choices about what gets monitored, who gets regulated and whose needs matter most. The Personal Data Protection Act offers limited privacy protections, mainly aimed at private sector actors, at the same time, the government agencies retain expansive authority over citizen data with low transparency. Smart technologies often reproduce existing social hierarchies, embedding inequality directly into algorithmic systems (Academia SG 2020).

The heavy use of surveillance in Singapore fits its long-standing political system of control. Services like digital IDs or real-time transport data may improve efficiency, but at the same time they give the state more power over private life. The city runs on data instead of public discussion. This technical approach hides the political effects of design choices. These systems appear neutral but usually just support government authority.

Gender & Intersectional Implications

The Smart Nation vision is strikingly gender-blind. Its rhetoric emphasizes universality and optimization while largely ignoring gendered experiences and intersectional inequalities. Vulnerable groups simply don't appear in official strategy documents. Feminized labor, especially domestic and care work are structurally invisible within the smart city framework.

Consider the numbers, there are over 240,000 migrant domestic workers, mostly women from Southeast Asia, sustain Singapore's care economy by cleaning homes,

caring for children and supporting elderly residents. Yet their needs like mobility, safety, labor protections are excluded from digital policy planning. No smart sensors or apps are designed to safeguard their well-being (Oppi 2024). These women are essential to Singapore's urban productivity but keep unrecognized in the Smart Nation narrative.

The exclusion extends beyond domestic workers to migrant laborers more broadly. Long before the pandemic, these workers were housed in segregated dormitories under strict surveillance. During COVID-19, the government deployed wearable tracking devices and digital health tools specifically targeting migrant workers, while these technologies remained optional or less enforced for the general population. These selective interventions reveal how smart systems can become instruments of differential control. Marginalized groups often end up as test subjects for intrusive technologies (Ye 2021). The lack of political voice among migrants, especially women, leaves them vulnerable to being governed as data points rather than citizens.

Even within the domestic population, women face underrepresentation in tech sectors and digital governance (Chew and Tilley 2022). In Singapore's ICT workforce, women make up roughly a third and this proportion has been declining. As Criado-Perez points out, male-dominated design processes create default systems that overlook women's safety concerns, caregiving roles and mobility needs (Perez 2019).

The state invests heavily in crime prediction and surveillance technologies, but hasn't developed data-informed programs to address gender-based violence or improve nighttime safety for women. Public discourse frames smartness in terms of infrastructure and services while neglecting the lived experiences of those whose urban lives are shaped by care responsibilities or structural vulnerabilities.

Singapore's technocratic universalism tends to erase intersectional dynamics altogether. While the state emphasizes meritocracy and racial harmony, structural hierarchies persist across ethnicity, class and gender (Kong and Woods 2018). A wealthy citizen might experience smart services as convenience and safety. A Filipina domestic worker experiences the same infrastructure as a surveillance regime.

Without deliberate gender mainstreaming and intersectional analysis, smart city strategies risk reinforcing precisely those inequalities they claim to transcend (Sobey 2023).

1.3 Barcelona

Governance Structure

Barcelona changed its approach of smart cities completely. The city moved from a corporate-driven model to a participatory, feminist-focused governance system. The shift happened in 2015 when a housing activist named Ada Colau led her citizen platform Barcelona en Comú got victory in the municipal elections. Colau became the city's first female mayor and promised to reclaim urban technology for the public good (Roberts 2023).

The new government abandoned the previous technocratic approach. It promoted a governance philosophy based on collective intelligence and inclusive democracy (KateSB n.d.). The administration called itself a feminist government and promised to include gender equity in all municipal policy areas. The city backed this up with real action. It created concrete mechanisms for citizen participation, including neighborhood councils, public assemblies and the open-source digital platform Decidim, which helps residents, especially women and marginalized groups, participate directly in policymaking (Forster 2018).

Barcelona also created a Department for Feminisms and Equality, which formally brought gender equity into city governance. Women got key leadership positions in digital innovation, particularly Francesca Bria as Chief Technology and Digital Innovation Officer. She focused on social justice, digital rights and technological sovereignty instead of corporate efficiency (Cities for Digital Rights n.d.).

This leadership change moved away from typical smart city approaches. Instead of treating citizens as consumers of innovation, Barcelona made them partners in creating technological policy. Scholars note that power imbalances and bureaucratic resistance still create challenges, but Barcelona stands out for building feminist principles into its smart city institutions (Alizadeh et al. 2024).

Policies & Technologies

Barcelona's smart city policies try to connect digital innovation with social justice. The city made an important change by redefining data as a public good. Instead of letting companies profit from data extraction, the city developed open-source infrastructure and privacy-focused projects like DECODE, which give citizens control over their personal data (Cities for Digital Rights, n.d.).

The Digital City Plan promotes "technological humanism," trying to close digital gaps and include all residents. The Connectem Barcelona program works in underserved neighborhoods, providing free internet access, digital devices and training. A citywide Digital Divide Survey helped shape these programs by collecting data broken down by gender, age and income to find access problems (Kneeshaw and Norman 2019).

Barcelona set up ethical frameworks for its digital systems. In 2021, the city passed a Municipal AI Strategy that demands transparency in algorithms, human oversight and public accountability (Ababneh et al. 2025). When collaborating with technology companies, the contracts must respect the requirements about equity and anti-discrimination. The goal is to prevent gender and racial biases from being programmed into automated systems.

The city has also implemented practical gender-sensitive technologies. It installed smart lighting systems in public areas to improve nighttime safety for women (We Build Value 2018). Real-time transit information and better lighting at bus stops were added with women's mobility needs in mind. Barcelona's Superblocks program takes street space away from cars and gives it to pedestrians, helping caregivers, children and elderly residents (Sangiuliano 2017).

Barcelona also supports local civic tech projects that consider gender issues. The BCN Open Challenge funds platforms for sharing care work and mobile apps that show safe walking routes. The city works with international groups like the Cities Coalition for Digital Rights to promote internet access, data protection and non-discrimination globally (Cities for Digital Rights n.d.).

These programs show Barcelona takes participation seriously, but they have problems too. Many marginalized people still don't get involved in meaningful ways. Making democratic ideas work in daily life is difficult. Still, Barcelona focuses on inclusion and shared governance rather than just technical fixes.

Gender & Intersectional Implications

Barcelona takes gender issues in smart city planning seriously. The feminist government has put gender-mainstreaming strategies in place across all city departments and this has made real differences in policy and design (Roberts 2023). The city redesigned public spaces based on what women said they needed: better lighting, clearer sight lines in parks and cleaning schedules that match when women actually use these spaces. Through participatory budgeting, the city has moved money toward services that help women, like more childcare and better programs to prevent and respond to gender-based violence (Kneeshaw and Norman 2019).

The city doesn't ignore how gender connects with other issues. Barcelona recognizes that gender intersects with religion, class and immigration status. The city removed a ban on full-face veils, respecting Muslim women's rights and worked with sex worker organizations to improve their working conditions and safety (We Build Value 2018). Programs like BCN FemTech give women from disadvantaged backgrounds coding training. Public contracts now require gender equity and an internal women-in-tech team tries to make sure technology development includes diverse perspectives (Cities for Digital Rights, n.d.).

But problems remain. Digital participation still benefits educated, tech-savvy people, those who are usually men. They didn't realize older women, immigrants and caregivers often don't have the time, access, or confidence to use online platforms. Research shows these groups use digital tools less, which means they have less say in participatory systems (Ababneh et al. 2025). Barcelona has tried outreach and training programs, but full digital inclusion is still not achieved.

The city also struggles with procurement and technical capacity, even though it wants to depend less on big tech companies. It's hard to enforce gender-equal hiring in tech contracts when the whole industry has few senior women (Alizadeh et al. 2024).

Barcelona has changed how gender and urban technology relate to each other. Women now work not just as users but as designers and decision-makers in city projects. When the city evaluates policies, it looks at more than just efficiency. It also considers care, safety and accessibility. The city prioritizes buses that work for strollers, makes sure pedestrian routes have good lighting and adjusts public service hours to work with unpaid care responsibilities (Kneeshaw and Norman 2019).

Barcelona shows how feminist ideas can change the smart city from a tool of control into something that supports empowerment and equality. These changes are not complete and still face structural challenges, but the city provides a model for fighting against the erasure of gender in urban design and governance.

1.4 Amsterdam

Governance Structure

Amsterdam likes to talk about its collaborative, inclusive smart city governance. The reality? It's more complicated than the marketing suggests. Since the late 2000s, the city has built what it calls a networked approach through the Amsterdam Smart City (ASC) platform, bringing together municipal bodies, private companies, universities and community groups. On paper, the ASC facilitates bottom-up innovation through living labs and open calls, while the City's Innovation Department sets digital priorities.

But when you look at who actually holds power in this network, a familiar pattern emerges. Technical experts, private actors and startup communities dominate and these communities remain overwhelmingly male and native Dutch. Sure, the city has made symbolic gestures like adopting the Tada Manifesto and appointing a dedicated alderwoman for digital rights. Yet day-to-day governance of smart city projects continues to reflect remarkably narrow social perspectives (Amsterdam Smart City 2017; Meliani 2021).

A 2022 review of ASC's partner network told the story clearly: key leadership roles were disproportionately held by men, while community organizations had minimal influence over actual decisions. Initiatives like 75inQ and Women in Tech NL are trying to diversify the pipeline, but they can't solve the fundamental problem of who gets to set the agenda (Fresneau 2020).

The city declares to support participatory governance in its policy documents, but this has not changed the way power actually gets distributed. The reason gender absence keep still is not because women are purposefully left out, but rather because this inclusion is viewed as an addition to current systems rather than a necessary component of their operation.

Policies & Technologies

Amsterdam's smart city portfolio covers all the usual suspects: mobility, sustainability, civic participation and open data. Although most of these programs were not created with any real consideration for how different people might experience them differently, they are promoted as being beneficial to everyone. Real-time mobility platforms, smart energy meters and crowd-sensing in public areas have all been piloted with an emphasis on technical functionality and environmental goals, with the hope that innovation will somehow trickle down to benefit everyone equally.

The early evaluations told a different story. Open data platforms and digital participation tools were dominated by highly educated men, while women, immigrants and low-income groups barely engaged (Fraaije et al. 2023). This digital divide persisted even as the city kept expanding online tools for participatory budgeting and public feedback. Eventually, the municipality introduced hybrid models combining digital and in-person consultations, finally acknowledging barriers like time constraints and trust gaps that hit women particularly hard.

The mobility sector has been somewhat different. Amsterdam has shown more awareness around inclusive cycling infrastructure, cargo-bike sharing for caregivers and route lighting based on feedback from women cyclists. These changes suggest the city can do gender-aware planning when it tries (LUCI Association 2016).

However, the majority of smart technologies, such as AI for crowd monitoring and surveillance-based safety systems, are still being developed and tested in small groups of technical specialists (Wray 2021). Seldom is it possible to co-design with users who have intersectional vulnerabilities. Rather than being incorporated from the start, gender considerations are usually added as an afterthought, usually in response to criticism (Waag Futurelab 2018).

Gender & Intersectional Implications

Amsterdam calls itself a digitally just city, but its smart city results show problems between what it says about inclusion and what actually happens. Gender issues are especially clear in data use, tech development, and participatory design. The city leads in publishing municipal datasets and promoting algorithmic transparency, but mostly educated men use these resources (Fraaije et al. 2023).

When Amsterdam first tried participatory budgeting, far fewer women and immigrant communities participated. This follows a global pattern where smart platforms end up reflecting existing social hierarchies. The city responded with targeted outreach, translated workshops and offline meetings. This shows Amsterdam recognizes the problems, but the basic system has not changed (Waag Futurelab 2018).

Surveillance and digital ethics create more problems. Amsterdam has banned some predictive policing algorithms and started doing impact assessments for AI tools. But the city still uses technologies like crowd detection and adaptive lighting without fully considering how they affect different groups (Wray 2021). Feminist groups warn that these systems might increase surveillance in racialized neighborhoods or fail to address what actually makes women feel unsafe, even though they are supposed to improve safety (Feminist Climate Academy, n.d.).

It's good that Amsterdam collaborates with groups like feminist design groups and 75inQ. However, these collaborations remain at the periphery of urban planning. When the city purchases technology, plans projects and evaluates success, gender and intersectionality must be given top priority. Otherwise, the opinions of only a select

few will continue to be reflected in Amsterdam's smart city (Meliani 2021; Pelle Menke 2025).

More is required for digital equity than just technical solutions. It necessitates reconsidering the definitions of "user," "stakeholder," and "expert" in urban innovation.

1.5 Stockholm

Governance Structure

The governance of smart cities in Stockholm has been a bit of a wild ride, combining technocratic management with intermittent attempts to incorporate feminist urban policy. Through collaborations with private companies and EU-funded projects, primarily managed by the City Executive Office and technical departments, the city jumped on the smart city bandwagon in the 2010s. They were applied in a traditional top-down manner that efficiency and sustainability were the main goals (Pozdniakova 2018; Puttkamer 2023).

The Feminist Initiative (FI) then joined the municipal coalition, bringing about an intriguing political change between 2014 and 2018. The city abruptly made a formal commitment to mainstreaming gender issues in public planning and budgeting. Gender-neutral viewpoints were required in all departments by the 2017 budget. Even municipal housing companies were expected to incorporate feminist principles into neighborhood planning by 2018 (Jonsson n.d.).

This wasn't just symbolic. Gender impact assessments became part of project evaluations. Women residents were invited into consultation processes. A network of feminist policymakers and city officials, including a Deputy Mayor for City Planning and the Women's Equality Unit, actually worked to turn these commitments into practice (Listerborn and Neergaard 2021).

Some concrete initiatives emerged: the Feminist Urban Planning initiative in Husby and the Urban Girls Movement. In Husby, local women (many from immigrant backgrounds) worked directly with city planners and housing companies to redesign public spaces. The Urban Girls Movement engaged teenage girls in imagining safer

public spaces (UN-Habitat 2023; Sweco 2023). These projects showed how gender perspectives could reshape participatory governance in meaningful ways.

Figures like Ann-Margarethe Livh and Daniel Helldén championed changes like prioritizing sidewalk snow clearance to reflect how women and caregivers actually move through the city. This reordering of basic services represented a fundamental rethinking of who urban policy is supposed to serve (City of Toronto n.d.).

But here's the catch: these feminist gains didn't survive the next election cycle. After 2018, a new conservative-led coalition scrapped many of the gender initiatives. Feminist budgeting was discontinued and the focus shifted back to conventional smart city priorities: growth and innovation. Without permanent institutional structures like a dedicated office for gender in urban tech, the progress proved fragile.

Stockholm's decision-making structures reverted to being shaped by technocrats and consultants, with limited gender representation. The city offers a case study in temporary feminist integration, illustrating that real transformation requires structural commitments that can outlast electoral changes and individual champions (Wullf-Wathne 2024).

Policies & Technologies

The focus of Stockholm's smart city policies was on technological innovation in digital services, mobility and sustainability. The city tested digital key systems, IoT traffic management and smart lighting through EU initiatives like GrowSmarter (CORDIS n.d.; Raconteur 2019). By cutting emissions, streamlining waste collection and lessening traffic, the city aimed to increase efficiency. Smart systems were marketed by Stockholm as impartial answers to urban issues (Pozdniakova 2018).

The technology is impressive: traffic lights are adjusted based on real-time data about vehicle flow and air quality, and more than 11,000 sensors in public trash cans aid in the planning of waste collection routes. Although these systems are technically sophisticated, equity and gender issues were initially disregarded (Listerborn and Neergaard 2021).

This strategy is altered during the feminist era of government. The most significant example is gender-equal snow removal. Bicycle paths, bus stops and sidewalks has to be cleared before the major roads under this policy. That is because according to data, women are more likely to walk or take public transportation. Therefore this policy aims to lower injuries and enhance accessibility for not only women but also older adults, caregivers and kids .

People initially mocked the policy, especially after a harsh winter. But later studies showed it worked: fewer accidents and better accessibility. The policy became an example of how data and gender awareness could work together in urban policy.

Safety technologies began including gender considerations. Surveys found where women felt unsafe, which led to more lighting and CCTV in parks and transit areas. A night-time bus program allowed women to request stops closer to home after dark. These were simple changes, but they became examples of responsive service design in the city's smart city approach (Smart City Sweden n.d.).

Stockholm joined international digital inclusion efforts. The Her City toolkit, developed with UN-Habitat, was tested locally. Women and girls could map unsafe spaces through a digital platform. This information helped improve neighborhoods like Husby and Skärholmen (UN-Habitat 2023).

The city expanded open data portals and digital public services, but analysis showed a familiar problem: mostly well-educated, often male citizens used these resources. Programs like the Digital Female Hub addressed this through mentorship and coding workshops for women in tech. These programs were small, but they showed the city recognized that the smart city ecosystem needed to include more people to represent the broader public (Women in Tech Sweden 2023).

Gender & Intersectional Implications

When it comes to incorporating gender and intersectionality into digital cities, Stockholm demonstrates both what is feasible and what is vulnerable. Feminist organizations brought about significant changes between 2014 and 2018: improved

lighting in dangerous areas, safer sidewalks through snow removal policies, and increased participation of young women in planning processes (Jonsson n.d.).

These modifications demonstrated how gender considerations by planners could enhance daily city life, which is typically disregarded by technical planning. However, the response also revealed persistent opposition. The snow clearance changes were ridiculed by the media, which dismissed the gender-aware policy as pointless or absurd. This response demonstrates the significance of introducing and defending feminist reforms in smart city settings (Wulff-Wathne 2024).

Some awareness continued even after the political change. By 2020, city reports recognized different mobility patterns and discussed more inclusive transit planning. But the safety approach created concerns. Although safety apps and CCTV can make people feel safer, they also place the onus of self-monitoring and behavior modification on women. Instead of addressing the root causes of gender-based violence, some researchers caution that this "techno-optics of safety" may normalize surveillance.

Stockholm did important intersectional work with immigrant communities and older residents. The feminist pilot in Husby helped immigrant women shape public space through real collaboration on lighting, sight lines and social programs (UN-Habitat 2023). But when pilot funding ended and follow-up stopped, some participants felt abandoned.

Digital inclusion has similar problems. Sweden has high internet use, but elderly women and low-income groups still participate less in digital systems. As smart city services move online, these groups risk being excluded further without specific inclusive strategies (Puttkamer 2023).

Stockholm provides an important but mixed example of bringing gender and intersectionality into smart city development. The feminist planning period created tools, examples, and increased awareness among officials and citizens. But without permanent institutional support, much of this progress became vulnerable.

Stockholm shows that smart city policies alone cannot change existing power structures. To truly benefit all citizens equally in smart city, gender equity must be ingrained in funding, governance frameworks and cultural norms at the first step.

1.6 Seoul

Governance Structure

Seoul's smart city governance works within a strong municipal structure that has integrated gender perspectives for years. The Seoul Metropolitan Government (SMG) includes the Women & Family Policy Affairs Office, a formal government body that coordinates across departments to ensure gender considerations reach planning processes. Seoul stands out because of the 2007 Women Friendly City Project (WFCP), it is a citywide program that tried to include women's lived experiences in public space and services design (Seoul Metropolitan Government 2010).

The WFCP is not just symbolic. It created advisory committees that mixed experts with ordinary female citizens, giving women real access to policy discussions. In principle, every urban project like transportation, housing and safety work had to go through gender impact assessments (Jo et al. 2020). This is very different from typical technocratic approaches that treat smart city development as neutral and efficiency-driven.

Seoul created a system of governance in which gender equality and smart urbanism were prioritized together but not as distinct objectives. During the 2011–2020 term of Mayor Park Won-soon, the city partnered with UN-Habitat and other organizations to expand feminist urban governance, the city made inclusivity a key component of its smart city identity during this period (Lim et al. 2024; Seoul Metropolitan Government 2010).

After 2016, this relationship was further formalized with the establishment of the Seoul Digital Foundation (SDF). Innovation and digital transformation are the SDF's primary responsibilities, and its leadership frequently collaborated with gender equity offices. At least in its communications, the foundation placed a strong emphasis on inclusion in its public messaging. The gender disparity in STEM and ICT fields in South

Korea is reflected in the technical teams that actually oversee Seoul's smart initiatives are everthing still primarily composed of men (Seoul Metropolitan Government 2010).

This creates a contradiction between governance goals and implementation reality. Seoul has used its gender-focused institutions like the WFCP's advisory mechanisms to balance the male-dominated innovation system.

National policies also shape Seoul's approach, including South Korea's gender budgeting requirements and mandatory gender impact assessments for public programs. These provide a foundation for gender-sensitive smart city spending, especially at the district level where CCTV centers, safety programs and digital inclusion strategies get coordinated.

But this approach may not last long. Since 2022, prevailing frameworks for gender equity have been called into question by national political shifts and anti-feminist discourse. Such as feminist organizations denounced the city's 2023 announcement that it would rename "women-only" parking spots as "family parking," calling it a step backward. Basic frameworks for gender-responsive governance still exist, but the necessary part is the sustained political to continue to have an impact (Get My Parking 2023).

Policies & Technologies

Seoul's smart city strategy focuses on connectivity, real-time monitoring and personalized services. The city tries to include gender considerations in technology design, especially for safety.

The Ansimi mobile app, launched in 2016 as part of the Safe City for Women program, was made specifically to address women's fear of harassment in public spaces. Users can send emergency alerts to nearby CCTV centers by shaking their phones or pressing a panic button. The app connects with district surveillance systems for quick response and remote verification. Although all residents can now use it, the original design, materials, and rollout focused on women's safety needs (The Korea Herald 2022).

Seoul also invested heavily in urban surveillance infrastructure. By 2020, each of Seoul's 25 districts had CCTV control centers connected to smart sensors, emergency call boxes and public safety dashboards. These systems focus on areas identified in women's safety audits: parks, alleys, underpasses. The city also tested household security kits for women living alone, with motion sensors, door alarms and portable CCTVs (ssunha 2016).

These efforts were part of a broader "safe smart city" strategy, but the gender focus emphasized protection rather than empowerment.

Beyond safety, Seoul's smart infrastructure addresses mobility, access and digital equity. Policies from the WFCP period created gender-aware urban features like better-lit walking routes, pram-friendly public transport stops and public toilets designed to address gendered facility gaps. Open data platforms tracked installations and usage patterns, though initial data systems did not separate information by sex.

Recently, Seoul started using mobile phone and transport card data to understand gendered mobility patterns. The data shows women make more multi-stop, care-related trips, while men follow more direct work-based routes. This information has helped shape neighborhood safety programs and more inclusive urban design standards.

Programs to reduce the digital gender divide have also developed. Community centers offer tech literacy courses for older women and caregivers, while city-funded digital kiosks in public spaces include accessibility features for less tech-savvy users. Many of these programs are described as universal, but the people they reach like single mothers, elderly women, immigrant workers show their gendered nature.

Despite these developments, Seoul's major smart city projects like AI-based city dashboards or autonomous transit systems often lack clear gender frameworks. Few tech purchasing requirements demand proof of inclusive design. Male-dominated vendor relationships and policy advisory boards continue, suggesting inclusion is still treated as optional rather than essential (Lim et al. 2024).

Gender & Intersectional Implications

Seoul is often praised as a leader in gender-sensitive urban planning, but its smart city projects show familiar contradictions. Gender-responsive measures in safety and mobility have improved daily life for many women. Surveys report that women feel more confident using the city at night, and planners are now more aware of the spatial inequalities that shape everyday routines (Jo et al. 2020).

At the same time, gaps remain. Women's needs are still treated as "special cases," usually placed within safety or welfare programs instead of being built into the main agenda of urban innovation. The dominant user imagined by smart planning is still a mobile, tech-savvy individual without caregiving duties. This vision leaves out many residents, especially women with care responsibilities, migrants or disabled people.

Data disaggregation and participatory tools are becoming more common, but their influence is uneven and often reactive. Feminist critics have also warned against the reliance on surveillance as a stand-in for care. Cameras and emergency apps may help deter incidents, but they do not address the cultural or social roots of gender-based violence. These tools risk presenting women mainly as victims who need protection, rather than as active participants in shaping the city (Yang 2024).

Politics adds another layer of fragility. Backlash against feminist policies has recently led to the dilution or removal of gender-specific programs. The replacement of women-only facilities with so-called "family-friendly" versions reflects a shift toward neutral language that in practice often hides patriarchal assumptions (Withnall 2014).

The impact of these shifts is not evenly shared. Immigrant women, low-income caregivers and disabled residents are most affected, as their needs rarely fit within broad policy categories. For Seoul to move beyond this cycle of reactive inclusion, equity would need to be treated as a core criterion in assessing smart city projects, and planning would have to be co-created with the groups most affected.

1.7 Helsinki

Governance Structure

Helsinki's smart city governance gets shaped by Finland's legal and cultural emphasis on equality. The Gender Equality Act requires gender parity in municipal decision-making, with women well represented in city councils and administrative boards. But the city recognizes that representation doesn't guarantee inclusion (Juhola 2020).

To address structural bias, Helsinki created institutional mechanisms like the Gender Equality and Non-Discrimination Commission and an equality coordination group that reviews all policy domains, including digital governance. Each city department is responsible for mainstreaming equality into its own operations, moving away from isolated "gender units" toward distributed accountability (City of Helsinki n.d.).

Forum Virium Helsinki, the city-owned innovation agency, operates under municipal strategic goals aligned with SDG 5 of Gender Equality, ensuring tech development follows equity standards. Participatory governance is central, with the Helsinki Participation Model and participatory budgeting encouraging citizen involvement.

However, research shows that digital platforms like PPGIS can exclude certain groups, especially older or immigrant women, due to digital literacy gaps or caregiving burdens. In response, the city combines online and offline consultations, provides childcare at events and monitors demographic gaps in participation. The city recognizes that inclusive co-creation must address gendered constraints.

Policies & Technologies

Helsinki's smart city policies center on digital inclusion, accessibility and social sustainability. All municipal services are offered online, yet the city maintains phone and in-person options to accommodate users with lower digital confidence, many of whom are elderly women or immigrants. Free digital literacy courses target these groups and public interfaces are designed with usability in mind: large fonts, multilingual options, user testing with diverse populations.

Mobility policies reflect gendered travel needs. Public transport is free for caregivers with strollers and route planning for new systems includes safety audits and proximity to care-related destinations. Helsinki also applies gender-sensitive snow clearance based on data showing women are more likely to walk or bike. This insight influenced the city's smart street maintenance algorithms.

Smart safety measures like harassment reporting apps and motion-sensitive park lighting have been introduced with attention to avoiding victim-blaming and enhancing women's comfort in public space. Open data policies promote disaggregated datasets by gender and AI initiatives are subject to ethical audits. Smart procurement frameworks increasingly encourage gender-diverse project teams and the city actively supports women in tech through incubators and mentorship programs (Kuusisto 2021).

Gender & Intersectional Implications

Despite its progressive foundation, Helsinki still faces challenges of gender invisibility in practice. While smart services often reduce the time burdens of care work, freeing up time for women who handle disproportionate unpaid labor, the prevailing discourse on productivity risks sidelining relational or care-oriented values (Zaman et al. 2024).

Participation in co-design processes remains skewed toward highly educated men, especially in technical contexts and feedback loops can privilege users with more digital fluency. The city has responded by adapting outreach, such as targeting mothers during daycare hours, but gendered engagement barriers persist.

Intersectional gaps are also evident. Immigrant women and lower-income users may feel alienated from innovation spaces. Helsinki attempts to counter this by collecting inclusive data, expanding service filters like pram access, benches, and ensuring AI tools recognize diverse gender identities.

However, tech development still reflects broader industry imbalances. Finland's tech sector remains male-dominated and women in smart city teams often report subtle exclusion. Helsinki's ongoing efforts to incorporate a right-to-care ethos, evident in

pandemic-era mutual aid apps and mental health tools, suggest broader potential to reframe smart city priorities.

Yet as feminist scholars argue, visibility must be actively maintained, or gender and care risks being re-absorbed into the background of "neutral" efficiency.

1.8 Edinburgh

Governance Structure

Edinburgh's smart city agenda has been led by the City of Edinburgh Council under a multi-year Digital and Smart City Strategy. The Council's Policy and Sustainability Committee created the initial 2020-2023 plan, working with the University of Edinburgh's Data-Driven Innovation programme and various private firms. The city presented smart city development not as a tech-first project but as a tool for broader civic goals: sustainability, inclusion and reducing inequality. Council documents consistently described digital initiatives as public goods that should benefit all residents (The City of Edinburgh Council n.d.).

However, in practice, early governance structures lacked explicit gender representation. Officials and technical experts from traditionally male-dominated sectors made up most of the teams responsible for strategy and implementation. Smart city planning assumed universal benefit, with little formal consideration of how gender might affect access or outcomes. Although Edinburgh maintained a citywide Equality, Diversity and Inclusion Framework (2021-2025), this stayed disconnected from the digitalization agenda. Issues like women's safety, caregiving infrastructure, or representation in data governance were handled through separate community programmes rather than being embedded in smart city policy.

In 2023, the Council unanimously passed a motion to position Edinburgh as a feminist city. This created a cross-party working group tasked with applying feminist planning principles across urban strategies. For the first time, gender equity was officially integrated into the city's smart governance framework. The group brought together officials from departments including planning, transport, digital services and equality.

While still in early stages, this structure started connecting previously separate governance areas. Smart city leadership teams began working more closely with equity-focused committees, and digital policies were increasingly reviewed through a gender lens (The City of Edinburgh Council n.d.b).

Policies & Technologies

Edinburgh's smart city projects have mixed infrastructure upgrades with inclusion programs. The city expanded free Wi-Fi across public spaces and helped libraries lend devices and run digital skills workshops. Smart infrastructure included over 11,000 sensor-equipped waste bins, real-time traffic monitoring, air quality systems, and predictive dampness sensors in public housing units. The Council said digital systems were designed to improve service efficiency for everyone (The City of Edinburgh Council 2024a).

While this approach increased access and performance, it did not consider different social groups at first. Early strategies focused on reducing commute times or improving waste management, without thinking about who used these services and how. The city's open data portal and ethics advisory panel did not include sex-disaggregated data or intersectional usage patterns initially.

But digital inclusion policies started to change focus. Edinburgh launched programs to provide devices to all pupils from Primary 6 onward, free IT training for elderly citizens, and subsidies for low-income households. These efforts reached populations with many women, such as single mothers and female pensioners.

Gender became more deliberately integrated into smart city planning with the feminist city initiative. Public concern about safety led the Council to invest £12.5 million in street lighting, sidewalk improvements and safer public toilets. Although not always called "smart" technologies, these physical upgrades became part of the city's digital strategy as important additions to surveillance and safety apps (The City of Edinburgh Council 2024b).

The City Mobility Plan also started using insights from gender-sensitive travel data, recognizing that women are more likely to walk or use buses with children. Smart

displays at bus stops were redesigned for stroller accessibility and the upcoming city operations dashboard will include equity indicators such as service uptake by gender and neighborhood.

Gender & Intersectional Implications

Edinburgh's early smart city programs had good intentions, but they ignored gender differences. Programs were judged by overall usage rates and efficiency metrics, without considering how access might differ based on gender, age, income, or caregiving roles. CCTV systems were installed in "busy areas" assuming surveillance would ensure safety, yet many women reported continued discomfort in public spaces due to poor lighting and design (Perez 2019).

Feminist scholars call this the "default male" bias in urban data and planning. The user gets assumed to be a generic, rational commuter, not a woman managing childcare, night shifts, or safety concerns.

The feminist working group has started to challenge this approach. Public surveys showed that most women felt unsafe in certain streets and parks, so the Council moved funding toward care infrastructure. Investments in lighting, pedestrian crossings, and toilet facilities addressed issues that women residents raised directly, going beyond just digital surveillance (The City of Edinburgh Council 2024b).

This matches feminist planning approaches that focus on everyday safety and accessibility rather than symbolic technological progress.

The city has also become more aware of intersectional issues. The Council adapted Scotland's Place Standard Tool with a feminist perspective to assess how different groups experience neighborhoods. For example, pilots for a smart mobility app now include user testing by caregivers, elderly women, and ethnic minorities to check accessibility and usability. This found gaps in real-time stroller data, leading to interface changes.

The city's data governance team has started checking datasets for bias, responding to concerns about algorithmic inequalities. Conversations with groups like the Scottish

Alliance for Women's Rights and Black Edinburghers have also informed policy. These discussions highlight the risks of unchecked tech deployments, such as predictive policing tools, which may unfairly affect racialized youth (Klovig Skelton 2024).

Edinburgh has committed to equity impact assessments and closer examination of vendor technologies, ensuring that new systems don't repeat existing disparities.

Edinburgh is changing. The city started smart city development with a gender-neutral approach, assuming technology would benefit everyone equally. Recent years have shown growing recognition that without intentional design, gender and intersectional exclusions continue. By including feminist principles in governance structures and connecting digital projects with lived realities, the city has moved toward greater inclusion. It's unclear whether these changes can become permanent and expand, but Edinburgh has started to make gender absence visible and potentially fixable.

1.9 Vienna

Governance Structure

Vienna's smart city strategy uses a cross-departmental approach that reflects the city's long tradition of social-democratic urban planning. Since 2011, the City Planning Directorate has coordinated the Smart City Wien agenda, with supervision from the mayor's office. This approach means the smart city agenda includes housing, environment and social affairs, not just technical departments (Hunt 2019).

Smart City Wien, located within Urban Innovation Vienna, is the main coordination body. It connects public institutions, research centers, private companies and civil society actors. Public participation has always been part of Vienna's governance. Since the beginning, the city has organized regular stakeholder forums where people from different sectors discuss goals and priorities.

Gender equality became part of the agenda early, thanks to strong political support, especially from Deputy Mayor Maria Vassilakou. She argued that gender perspectives are necessary in urban planning to create a fairer city. Vienna already had strong institutional foundations for gender-sensitive planning before smart city concepts

became popular. The Women's Office was created in 1991, and by 1998, the city had established a Gender Mainstreaming Coordination Unit (Kneeshaw and Norman 2019).

These structures helped make gender a regular part of city planning. Today, the Gender Mainstreaming department still reviews all strategies to check if men and women can access public services equally. In Vienna, gender is not treated as a special issue but becomes part of broader inclusion and sustainability goals.

However, when the first Smart City Wien Framework was published in 2014, gender was not a central topic. The strategy focused more on energy, climate and innovation, with very little mention of social justice or gender inclusion (urbalize 2014). Like many other smart city documents at that time, it used the image of a neutral citizen and did not discuss gendered needs. This shows that even in Vienna, a city known for gender-aware planning, more effort was needed to make gender truly visible in digital and smart urban policy.

Policies & Technologies

Vienna's smart city policy follows a clear principle: maintain high quality of life for all residents while reducing resource use through innovation. Based on this idea, the city developed three main pillars: Quality of Life, Resource Preservation and Innovation. These principles guide many digital and environmental projects aimed at making Vienna more sustainable and livable (Monika Dimitrova 2024).

One example is Aspern Seestadt, a new lakeside district that works as a testing ground for smart technologies. The project combines high-efficiency buildings, green energy systems and mobility services based on real-time data. At the same time, it tries to follow inclusive planning ideas. The public space is designed with gender in mind: lighting is improved, seating is available in many places and paths are adapted for people with strollers or limited mobility. Streets and squares in Aspern are named after women as a symbolic way to promote visibility.

Vienna also introduced digital tools to connect mobility and infrastructure. The SMILE platform allows users to access different transport options (public transport, bike-sharing, car-sharing) in one single application. This helps people with complex travel

routines that often include caregiving stops. In the energy sector, the city created programs allowing residents to co-invest in solar or wind energy plants. These initiatives not only promote green energy but also invite citizens to participate in the transition.

Vienna's policies also address the gender gap in technology fields through mentorship programs and scholarships supporting women in digital careers. These actions show the city treats innovation as something that should be inclusive and socially meaningful (Dimitrova 2024).

Still, attention to gender in smart city policies isn't consistent. Many physical infrastructure projects include gender-sensitive thinking, but earlier digital strategies focused more on environmental goals and economic development. For a long time, there was little discussion about unpaid care work, gendered labor divisions, or bias in technology.

In 2019, Vienna updated its smart city strategy. The new plan connects to the UN Sustainable Development Goals and includes social equality more clearly. It now sets goals for equal pay, better working conditions and reducing inequality. This represents an important shift in the city's approach. But the question remains: how can these goals become real in digital systems like AI in public services or gender budgeting for tech projects? Vienna admits more concrete tools and collaborations are still needed (Kneeshaw and Norman 2019).

Gender & Intersectional Implications

Vienna has a long history of gender-sensitive urban planning. Since the 1990s, the city has carried out many pilot projects to improve public spaces, housing and transportation for women. These efforts were based on real data about how people use the city differently. One important survey found that most walking trips in Vienna were done by women, often because they were managing several tasks like shopping or picking up children. Meanwhile, men made most car trips, usually going straight from home to work (Hunt 2019).

This difference in mobility patterns helped the city understand that daily routines are gendered. In response, city planners made sidewalks wider, improved lighting, redesigned parks and upgraded access to public transport. Over time, checking gender impacts became a basic step in planning most city projects.

However, when Vienna first introduced its smart city strategy in 2014, many of these gender-sensitive ideas weren't fully included. The first policy documents talked mainly about technology, environment and innovation, with only very general statements about inclusion. Like many other cities, Vienna followed a trend of describing a "universal user" without recognizing this often means planning for male needs by default.

This was a surprising gap, especially given Vienna's reputation. Important topics like unpaid care work or gender inequality in digital access were missing from smart city discussions. Some researchers and planners criticized this approach, saying the city had taken a step back from its own achievements (Kneeshaw and Norman 2019).

After these criticisms, Vienna updated its strategy in 2019. The new version includes gender equality as a clear goal and adds more social targets. It shows the city started seeing care, diversity and equal participation as part of the smart city model.

Even so, it's still challenging to connect the city's inclusive design practices with digital systems that are becoming increasingly important. The technology and innovation sectors in Vienna, like many places, are still dominated by men. This creates a risk that digital tools, if not designed carefully, could repeat the same patterns of exclusion.

Some urban scholars point out that if women aren't part of decision-making, their needs often get forgotten. This applies to smart systems, not just physical spaces. Vienna's past success in gender planning came from political support, institutional change and training professionals to think differently. A similar effort may now be needed for digital innovation.

It's also important to remember that gender isn't the only factor. Some critics say gender-sensitive planning may sometimes confirm traditional gender roles instead of

challenging them. For example, making public spaces easier for caregivers is important, but shouldn't automatically assume only women do care work. Eva Kail, one of Vienna's leading planners, has said that good design helps everyone who does care work and this support can encourage men to share these responsibilities.

Recently, Vienna has started looking more at how gender connects with other factors like migration, age and climate risk. New policies on climate adaptation and social resilience include focus on vulnerable groups, many of whom are women, like single mothers or older women living alone (European Commission n.d.).

Vienna now faces the question of how to ensure gender inclusion remains a strong part of smart city development. There's a risk that gender goals get treated as something extra instead of a key part of planning. But the city's leadership has stated that inclusion and innovation must go together. This means applying gender-sensitive thinking to new areas like AI, digital platforms and technology budgets. It also means involving more women and marginalized groups in tech development itself.

Some projects already do this through participatory design, inclusive hackathons and gender-based evaluation tools. Vienna's experience shows that with clear policies and long-term commitment, gender inclusion can become part of how the city works. The next step is making sure digital systems and smart technologies follow the same path.

1.10 Configurations of Gender Absence Across Urban Projects

This section examines how structural exclusion operates across different smart city models. Despite differences in geography, political systems and governance traditions, the cities discussed in the previous section show recurring patterns of gender absence. Some follow centralized state-led approaches, others get driven by corporate partnerships or fragmented innovation networks. Still, across these varied models, similar blind spots emerge in how smart urban systems get designed and implemented. By grouping these cities into five configurations, this chapter highlights how exclusion isn't produced by a single mechanism but through multiple institutional pathways.

Singapore and Toronto represent two structurally different but equally exclusionary models of smart urban governance. In Singapore, the Smart Nation agenda operates through centralized authority. The program sits within the Prime Minister's Office and gets implemented through tightly coordinated state agencies. Policy decisions are made by a limited group of high-level officials and technical experts, with minimal involvement from civil society (Pinsent Masons 2017). Planning frameworks assume a universal citizen whose needs can be addressed through neutral, efficient service delivery. In practice, this model erases difference by design. Issues like gender, care and inequality aren't considered relevant categories in planning or data collection. Participation is allowed only within formalized and state-controlled channels, leaving little space for deliberation or community-led planning.

Toronto follows a different institutional logic but produces similar outcomes. Its smart city agenda has been shaped by public-private partnerships, most notably through the failed Quayside project led by Sidewalk Labs. Although public consultation was part of the process, key decisions were dominated by corporate interests focused on innovation, data monetization and infrastructure investment. The project didn't include systematic engagement with feminist organizations or gender experts. Planning documents made no meaningful reference to unpaid care work, safety, or digital exclusion. The user imagined by the system remained abstract, economically active and technologically fluent. Feminist concerns got sidelined as irrelevant to smart governance.

Despite clear institutional differences, both cities illustrate how gender absence can be built into smart city frameworks in different ways. In Singapore, it comes through centralized planning and an emphasis on statistics that present equality as sameness. In Toronto, it follows from market-driven priorities and weak mechanisms of public accountability. In both cases, there is little room for gender-sensitive planning or for forms of participation that would allow lived experiences to shape technological design.

Barcelona and Amsterdam both participated in the DECODE project, an EU-funded initiative aimed at promoting data sovereignty and decentralized digital infrastructure.

Despite this shared framework, the two cities show significant differences in how gender perspectives get integrated into smart city agendas.

In Barcelona, feminist urban planning has become an established part of municipal governance. Gender-sensitive perspectives are visible not only in public discourse but also within city departments and leadership structures. Participatory tools like Decidim provide channels for citizen engagement and feminist actors have played an active role in shaping aspects of the city's digital policy (Forster 2018). However, this influence remains uneven. Smart city programs often get developed separately from feminist planning departments and technical design processes don't consistently incorporate gendered patterns of use or care-based needs.

Amsterdam, in contrast, promotes open data and user-centered innovation but lacks formal structures for integrating gender expertise into digital governance. Smart city projects are typically led by technical professionals and academic partners. While inclusivity often gets stated as a guiding principle, there are few mechanisms to ensure this ambition translates into practice. Participation tends to reflect generalized user categories rather than differentiated needs related to gender, caregiving, or mobility.

The comparison illustrates that shared participation in a digital experiment doesn't guarantee shared outcomes. The internal governance structure of each city, the presence or absence of feminist planning expertise and the degree of coordination between participatory tools and institutional agendas all shape the result. In both Barcelona and Amsterdam, gender remains peripheral to how digital systems get designed, implemented and evaluated.

Stockholm gets seen as a leader in gender-aware urban policy, with long-standing efforts to mainstream gender perspectives in public services, housing and mobility. These practices are supported by strong institutional culture and national-level commitments to equality. The city has also contributed to global feminist planning through tools like Her City, a digital toolkit developed with UN-Habitat to support the participation of young women in urban design. This initiative reflects Stockholm's

engagement with inclusive planning and its willingness to experiment with new participatory methods.

However, the influence of gender-focused tools in Stockholm remains limited when viewed against the broader smart city agenda. Digital projects still emphasize efficiency, automation and system optimization, often based on user models that overlook care, safety or non-linear mobility. Her City shows the potential of gender-sensitive engagement, but it has not been fully carried into the design of smart infrastructure.

This creates a clear mismatch between the city's progressive values and the technical systems that guide its digital projects. Stockholm shows that having equality written into policy does not guarantee that technologies will be designed inclusively, especially when priorities are set by performance metrics instead of everyday realities.

Seoul offers a different picture. It is one of the few East Asian cities where gender equity has been written into long-term policy. The Women Friendly City Project brought gender impact assessments into planning and highlighted issues of safety, care infrastructure and mobility. Its recognition abroad and the steady participation of residents point to a governance model that acknowledges gendered experience in public space.

However, this orientation has not been sustained in Seoul's digital programs. Smart city initiatives are led mainly by national innovation agendas, with little coordination between technology agencies and local gender offices. Data platforms, transport systems and surveillance tools have been developed without integrating feminist planning. The WFCP continues to function, but it operates separately from smart urbanism and has little influence on digital infrastructure.

The outcome is a governance structure split in two: one track focused on gender equity and the other on innovation. Even in a city with formal commitments to inclusion, gender frameworks can be sidelined once digital priorities are defined elsewhere.

Helsinki has long been recognized for its institutional commitment to gender equality, shaped by Finland's early adoption of women's political rights and sustained support for gender mainstreaming across public sectors. The city's planning culture reflects this history, with policies that address care, mobility and spatial safety as fundamental aspects of urban life.

From this, Helsinki basically shares some goals with Barcelona, where feminist ideas have become more visible in recent years. The institutional roots, however, are different. In Barcelona, feminist planning grew out of a political shift led by activists. In Helsinki, the framework rests on long-standing legal and administrative traditions.

Even with this stronger foundation, Helsinki's smart city programs do not always match its equity principles. Many digital projects under Forum Virium Helsinki focus mainly on environmental innovation and system performance. Gender-disaggregated data is not consistently applied, and participatory formats often favor people who are already digitally skilled and civically engaged. As a result, gender perspectives, while present in conventional planning, remain peripheral in the digital sphere.

Helsinki shows how even established equality frameworks can weaken when technological innovation proceeds without direct integration of feminist planning.

Edinburgh sits at the opposite end. The city has cultural recognition and academic strength, but no coherent framework for digital governance. Smart projects are fragmented, often emerging from individual departments or temporary funding, rather than long-term strategies. Gender perspectives are almost absent. No institutional structures exist to ensure equity in urban technology projects. Participation is generally limited to short-term consultations, which rarely affect design or resource allocation.

This is very different from Vienna, another city with historical weight and institutional maturity. Vienna has embedded gender-sensitive planning for decades, shaping areas such as housing, mobility and public space. Its smart city strategy, Smart City Wien, builds on that tradition and extends it to the digital field. Flagship initiatives like

Aspern Seestadt and participation in EU innovation networks underline a commitment to inclusive and socially responsible technology.

However, this model carries clear tensions. Gender may appear in strategy documents, yet it is rarely built into the technical design of digital systems. Data infrastructures and algorithmic tools rely on standard metrics that fail to capture different needs. Participation frameworks often privilege expert or professional voices. As a result, The distance between what cities promise and what they actually implement is still striking.

The city shows both sides of this dynamic. Long-standing gender frameworks give the city a base for more inclusive smart urbanism, yet these frameworks can be sidelined if they are not continually reinforced in technical work and institutional routines.

Looking across the examples, what stands out are not only differences in capacity or political commitment but also a deeper pattern in how gender is treated. Cities with varied histories of feminist engagement such as Barcelona, Helsinki and Vienna show that strategic commitments rarely carry through to the operational level. Gender-sensitive goals are written into plans, but they seldom guide how digital systems are built or how participation is organized.

Taken together, these cases suggest that gender absence is not just the result of missing policies. It reflects structural tendencies in how governance is defined, how technologies are designed and how participation is framed.

Cities like Singapore and Toronto openly adopt centralized or corporate-led models where efficiency and innovation get treated as neutral goals. This leaves little space for questions about equity or social needs. Amsterdam, Stockholm and Seoul show more attention to inclusion, but their efforts are often fragmented, short-term, or disconnected from how smart technologies actually get developed. Edinburgh shows that even cities with cultural and academic strength can lack the basic structures needed to include gender perspectives in smart planning.

These patterns suggest that gender absence isn't simply about visibility in policy. It reflects deeper institutional logics: who makes decisions, whose needs get

recognized and what forms of knowledge get legitimized. When digital systems are developed without input from women, caregivers or marginalized groups, the smart city reproduces existing inequalities rather than addressing them.

The next three chapters will examine how these dynamics operate in practice: first through governance and technology, then through economic and productivity frameworks and finally through participation mechanisms. Each chapter explores how gender equity remains structurally excluded from the core design of the smart city.

Chapter 2 Power without Presence: How Smart City Governance and Technology Obscure Gender

Gender isn't simply missing from the smart city. It gets excluded through how power is organized. As the previous chapter showed, cities like Vienna, Seoul and Barcelona all include gender equality in their official rhetoric. Some have gender offices, female mayors, or urban safety policies. But these don't guarantee that gender gets integrated into smart city planning. In most cases, gender remains disconnected from the actual decision-making structures. The problem isn't a lack of women in power or a failure of specific policies. It's the deeper design of governance systems that makes gender structurally irrelevant.

This exclusion is hard to detect because it happens through formal procedures that appear neutral. Many cities claim their systems are designed for all citizens. They use terms like "universal access," "user-centered," or "data-driven." These concepts suggest objectivity. But they're based on a narrow definition of whose needs matter. Most smart city frameworks assume a standard urban subject, one who moves efficiently, consumes services and generates data. This universal citizen isn't explicitly named as male, but gets shaped by male-coded assumptions about mobility, productivity and public space. Needs related to care work, bodily safety, or emotional labor, which are often more visible in women's daily lives, rarely get included in these planning systems.

This chapter argues that gender absence in the smart city isn't accidental. It's the result of institutional systems that weren't designed to recognize difference. Patriarchal power hasn't disappeared. It has shifted into new forms. Instead of relying on explicit exclusion, it works through categories, procedures and divisions of labor. These forms appear modern and professional. But they continue to sort knowledge and authority in ways that exclude gendered experience.

Sylvia Walby defines patriarchy as a set of structures that produce and maintain male advantage across different social systems (Walby 1990). In her later work, she focuses on how public institutions, including the state, law and administration, are key to this reproduction (Walby 2009). Patriarchy today doesn't depend on individual men holding power. It depends on institutions that organize priorities, budgets and authority in ways that treat male-coded experiences as universal. In this framework, gender difference isn't actively rejected. It simply isn't seen as relevant.

Susan Fainstein makes a related argument about urban justice. She argues that inclusion must involve more than consultation or participation. It must change how resources and power get distributed (Fainstein 2010). Many smart city initiatives include participation platforms and gender offices. But these don't challenge the basic structures that decide what counts as valuable knowledge. In most cities, decisions about infrastructure, digital systems, or urban data get made in departments that don't include gender expertise. Gender policies often get managed by separate offices, with limited influence over strategic planning.

As Chapter 1 showed, this separation is visible in several cities. In Vienna, the smart city strategy gets led by technical and environmental departments, while gender expertise remains in other parts of the administration. In Seoul, the Women-Friendly City program exists, but it's isolated from smart infrastructure planning. In Barcelona, a feminist political platform holds power, but digital policy continues to follow a technical path. In each case, gender isn't fully excluded, but it gets placed outside the core mechanisms of governance. These patterns aren't isolated failures. They reflect how institutional structures divide responsibility in ways that weaken the impact of gender perspectives.

This chapter focuses on three mechanisms that sustain gender absence in the smart city. The first section looks at how state structures continue to reproduce patriarchal norms. Even when gender equality is part of the public agenda, the internal organization of government often blocks its integration into planning. The second section examines technological abstraction. Smart city systems get built around data, algorithms and optimization. These systems treat difference as noise rather than as a

necessary part of planning. The third section looks at symbolic gender policies. Many cities have programs that speak the language of inclusion, but these aren't structurally connected to governance. They're often underfunded, marginal, or limited to communication work.

These mechanisms aren't independent. Together, they form a system that recognizes gender as an issue of social concern, but not as a condition that shapes infrastructure, digital design, or institutional power. This system includes women as users or as subjects of safety measures. But it rarely includes them as political actors in defining urban futures. As Walby notes, modern forms of patriarchy aren't based on exclusion alone. They depend on systems that present themselves as neutral while relying on male-centered assumptions (Walby 2009).

To address gender absence, it isn't enough to insert gender into existing systems. It's necessary to examine how those systems were built, what they prioritize and how they define relevance. Gender can't be added as an afterthought. It must be recognized as something that governance structures currently filter out. This chapter analyzes how that filtering happens, not through explicit bias, but through the institutional design of the smart city.

Patriarchal Power

The persistence of gender absence in smart city governance isn't incidental. It reflects a structural logic in which gender gets treated as irrelevant to institutional design. As Sylvia Walby argues, patriarchy has evolved from a private system rooted in household dominance into a public form sustained by state institutions and bureaucratic routines (Walby 1990). In this framework, gender inequality no longer gets imposed through personal exclusion. It gets reproduced through policies, divisions of labor and organizational cultures that fail to consider difference as a planning category. Public institutions appear neutral, but they continue to be structured around assumptions shaped by male-coded experience. The smart city doesn't challenge this logic. It often reinforces it through formalism, standardization and the compartmentalization of authority (Amin and Thrift 2002).

In many governance systems, gender isn't openly excluded. It gets rendered institutionally irrelevant. State departments are typically organized by technical function like transport, housing, energy and infrastructure, with little cross-sectoral coordination. Gender equality often gets delegated to separate units with limited power. These units may run programs or advise on specific issues, but they don't shape core policy frameworks. Their separation from strategic decision-making reflects what Walby calls the segmented nature of public patriarchy. In this structure, inclusion occurs within bounded domains that don't disturb broader institutional hierarchies (Walby 2009). In smart city contexts, this segmentation becomes even more entrenched. Strategic planning gets increasingly driven by digital units, innovation departments, or executive offices with no formal obligation to integrate gender perspectives.

Fainstein emphasizes that justice in urban governance requires not only procedural inclusion but also a redistribution of institutional power (Fainstein 2010). When gender offices get placed at the periphery of planning, their ability to shape urban futures becomes constrained. Inclusion becomes symbolic. Participation gets invited at late stages or in advisory roles. Meanwhile, the foundational assumptions like what counts as urban value, who defines priorities and which needs get institutionalized remain unchallenged. In this way, patriarchal governance survives not through active resistance to equality, but through institutional routines that normalize exclusion.

This pattern appears across a wide range of governance models. In Singapore, the Smart Nation initiative gets managed directly by the Prime Minister's Office, with implementation coordinated through state agencies. Decision-making power is concentrated in executive offices and technical units. There's no institutional mechanism for gender integration within the Smart Nation governance framework. Gender equality gets treated as a matter of social policy, disconnected from digital strategy, planning, or infrastructure. The government's approach to equality is based on universalism. All citizens are presumed to benefit equally from digital services and difference gets considered politically irrelevant. This reflects a governance model in which neutrality gets defined through sameness. It assumes that gender-aware policy

is unnecessary if everyone gets treated equally. However, as Walby has shown, this logic preserves existing inequalities by masking them as technical or apolitical (Walby 2009).

A similar structure is present in Toronto. The Sidewalk Toronto project, while not state-led, was governed through a public agency, Waterfront Toronto, that reflects the formal logic of Canadian urban governance. The project was developed through a partnership with Sidewalk Labs, but its institutional oversight remained with a tripartite public body representing municipal, provincial and federal governments. Within this structure, no gender integration was required or implemented. Strategic priorities got shaped by economic development goals and innovation metrics, with little input from gender-oriented offices or equity-focused departments. Gender equality wasn't excluded through hostility. It got omitted through the segmentation of roles and the narrow definition of what planning is for. This kind of institutional design creates a governance field in which gender appears non-essential because it isn't embedded in any of the authoritative decision-making processes.

In both examples, the institutional logic is consistent. Gender isn't considered a central planning concern. Instead, it gets relegated to parallel structures like ministries of social development, equality offices, or public engagement units. None of these typically carry authority over spatial development, digital policy, or infrastructural investment. This reflects a deeper structural issue in how governance gets divided and what kinds of knowledge get considered valid. As Fainstein points out, democratic governance isn't only about who participates. It's also about who gets to define the terms of planning (Fainstein 2010). When gendered experience isn't part of those terms, inclusion becomes cosmetic.

The situation doesn't improve simply by having women in leadership positions or by creating gender-sensitive guidelines. Without institutional integration, such initiatives remain isolated. For example, in Barcelona, the presence of a feminist city administration and a dedicated Department for Feminisms has increased the visibility of gender in municipal discourse. However, key decisions in smart city development remain controlled by digital and infrastructural units where gender perspectives aren't

systematically applied. This suggests the problem isn't merely one of representation but of structural power. Feminist voices may be present, but their ability to intervene in the design of digital systems, the allocation of funds, or the definition of urban success remains constrained by how institutions are organized.

These dynamics aren't limited to any one political system. In centralized states like Singapore, authority gets consolidated at the top and planning follows a technocratic model where civil society plays a minimal role. In federal systems like Canada, authority gets fragmented across levels of government, but planning remains equally compartmentalized. In both cases, gender equality gets formally endorsed but procedurally sidelined. The smart city in these contexts gets governed through structures that define value in terms of economic growth, efficiency, or innovation. Gender, unless it fits those categories, gets left out.

This shows how public patriarchy continues to shape modern urban governance. Institutions are not gender-neutral just because they avoid talking about gender. What looks like neutrality is built through bureaucratic routines that split planning from care, strategy from embodiment and infrastructure from social life. These splits are not natural. They have been produced over decades of administrative practice, reinforced by funding rules, legal requirements and professional training. The smart city takes up these structures and often pushes them further, using new managerial tools that make it even harder to see who is left out.

Recognizing this dynamic is essential. If gender absence is to be addressed, it can't be treated as a matter of adding new voices to existing processes. It requires a rethinking of how authority gets distributed, how planning gets structured and what urban governance is meant to achieve. As long as smart city strategies continue to operate within patriarchal institutional frameworks, they'll replicate exclusion even when they claim to promote inclusion.

Governance Structures

While patriarchal authority persists in the organization of state power, a second mechanism of gender exclusion operates through the abstraction of governance itself.

In many smart city frameworks, decision-making gets increasingly transferred to systems designed to appear neutral. These systems prioritize data, algorithms and standardized procedures over situated knowledge. As a result, the lived realities of embodied subjects, including gendered experiences, become structurally invisible. This isn't merely a failure of inclusion. It reflects a transformation in the nature of governance, one that defines relevance through legibility, efficiency and abstraction rather than through social complexity.

A growing body of critical urban theory suggests that the abstraction of governance, particularly in smart cities, constitutes a powerful mechanism of structural exclusion. Saskia Sassen highlights how contemporary governance selectively renders certain domains hyper-visible like infrastructure, digital services, or financial metrics, while treating others as illegible or irrelevant. She describes this as a form of incomplete political structuration, in which state systems prioritize what's administratively manageable and technically integrable, often at the expense of embodied and relational aspects of social life (Sassen 2006). In such systems, gendered experiences like caregiving, unpaid labor, or spatial vulnerability rarely appear in datasets or influence algorithmic models. Their exclusion isn't accidental. It stems from institutional logics that define importance through visibility and standardization.

This distance from lived experience is sharpened by what Diana Coole calls a posthuman turn in political rationality. Governance is no longer grounded in the material conditions of life but in abstractions, models and disembodied forms of analysis. Coole warns that when the body disappears from political thought, power also changes form. It shifts away from dialogue with embodied subjects and moves toward remote, data-driven regulation (Coole 2013). In smart urbanism this translates into planning models built on predictive analytics and sensor networks. Cities are treated as calculable environments rather than as places of contested meaning. As automation spreads, the range of knowledge that counts becomes narrower. Gendered experiences are among the first to be filtered out.

This narrowing of priorities is reinforced by what Alberto Vanolo describes as *smartmentality*: a mindset that frames cities as systems to be optimized rather than as

collectives to be governed (Vanolo 2014). Smartmentality defines urban success through efficiency, innovation and control. What cannot be quantified like safety, care work, emotional life or gendered mobility, is pushed aside. These concerns do not disappear, but they are treated as background noise rather than as legitimate knowledge. The effect is a decision-making logic that sidelines precisely the aspects of urban life that feminist and intersectional scholars have long emphasized as central (Amin and Thrift 2002).

Even in contexts with more participatory governance, such as Barcelona, smart tools often reproduce the same abstraction. The open-source platform Decidim allows citizens to submit proposals and vote, but the process is constrained by digital legibility. Proposals are reduced to inputs that can be tallied and processed by algorithms. The layered, relational and embodied dimensions of gendered experience are left out. Decidim does not exclude women directly, but it also does not challenge the structural formats that make certain forms of knowledge invisible.

These patterns are reinforced by the way governance itself is organized. As planning becomes tied to digital departments and innovation offices, the types of expertise that matter also shift. Technical proficiency, data science and design thinking gain authority, while feminist planning, social work and intersectional analysis are treated as secondary or advisory. This is not always the result of deliberate exclusion. It reflects institutional priorities. When computational modeling becomes the core logic of planning, the very definition of expertise is restructured.

The cumulative effect is a governance structure that appears modern, efficient and inclusive. Yet its underlying assumptions continue to exclude embodied difference. Gendered experience isn't explicitly rejected. It gets categorized as outside the scope of relevance. Urban subjects get framed as statistically average, spatially mobile and digitally connected. This model aligns more closely with a masculine-coded figure of autonomy and productivity than with the realities of caregiving, vulnerability, or constrained mobility. The system's neutrality gets constructed through its abstraction.

This kind of abstraction isn't politically neutral. It's a form of power. As Sassen explains, what becomes visible in governance gets shaped by how institutions are designed, not by what actually matters in everyday life (Sassen 2006). For example, smart city systems often highlight financial flows, mobility data, or infrastructure performance, while ignoring activities like unpaid care work or reproductive labor. This isn't simply a technical omission. It reflects a deeper political choice about which forms of work and life get considered worth measuring.

Similarly, Coole reminds us that modern systems of governance don't eliminate politics. Instead, they shift political decisions into technical formats that are harder to question (Coole 2013). When cities rely on algorithms and predictive models, the assumptions behind those systems often go unexamined. Decisions that look objective may in fact be built on deeply biased ideas about what's normal, valuable, or efficient. As these systems guide more aspects of planning, they leave less room for public debate and alternative values.

Responding to this kind of exclusion takes more than adding gender categories to datasets. What is needed is a deeper shift in how governance decides what counts as relevant in the first place. If planning continues to work mainly through abstraction, optimization and standardization, it will keep overlooking the lived and embodied realities of gendered urban life. A feminist critique of governance has to start by asking how knowledge is produced: what is taken as evidence, whose experiences are included and how institutions frame decisions.

Symbolic Gender Policies

In many smart cities, gender equality appears to be part of the official agenda. Public strategies often include commitments to inclusion. Many cities have created gender offices, published equality guidelines, or introduced dedicated policies around care, safety and mobility. However, these measures often remain symbolic. They make gender visible in discourse, but leave it structurally disconnected from how decisions actually get made. Urban governance frameworks continue to treat gender as a separate topic, not as a central concern across planning, budgeting, or technological

design. This pattern reflects what Walby and Squires (2005) describe as the institutional paradox of gender mainstreaming. Gender gets included in formal language but assigned to organizational spaces that lack the power to shape outcomes.

In practice, this leads to a split structure. On one side, there are offices and programs dedicated to feminist goals. On the other, there are technical and strategic units making decisions about data infrastructure, spatial planning and investment. The two rarely interact in meaningful ways. Gender offices may advise, but they don't decide. Their role is consultative, not directive. This separation means that gender gets treated as something that can be managed at the edges of governance, while the main systems continue to operate through supposedly neutral criteria like efficiency, scalability, or innovation.

Barcelona offers a clear example of this gap. After the 2015 municipal elections, the city's new leadership declared its commitment to feminist urban governance. It established a Department for Feminisms and LGBTI Affairs, created gender equality plans and introduced new participatory mechanisms like the Decidim platform. These efforts demonstrated a shift in political language. However, the smart city strategy continued to be managed by separate technical teams. Francesca Bria, who led Barcelona's digital transition, promoted social justice goals in digital governance, but the institutional link between the feminism department and the smart city office remained weak. While the city invested in transparency and open-source systems, gender wasn't structurally embedded into how algorithms got developed or how data priorities got set. The result was a governance model where progressive discourse coexisted with limited institutional integration.

Vienna shows a similar tension. The city is known for its long-standing efforts to integrate gender into urban planning. Since the 1990s, Vienna has published gender-sensitive design manuals, conducted gender impact assessments and incorporated gender perspectives into housing and mobility projects. However, these efforts are primarily associated with spatial and social departments, not with digital or innovation offices. The Smart City Wien initiative gets coordinated by departments focused on energy efficiency, climate policy and technological modernization. Gender experts may

be present in parallel institutions, but they're not involved in the design of key digital infrastructure systems. This limits the scope of gender inclusion. It allows the city to maintain a reputation for equality while leaving the strategic core of smart city governance untouched.

Toronto represents a more explicit example of exclusion. During the Sidewalk Labs project, public debate focused on privacy, corporate control and data ethics. Although the project generated widespread concern about democratic accountability, few discussions addressed how the smart neighborhood design might affect women differently. There were no assessments of how surveillance systems might impact those at greater risk of public harassment, or how digital public services might overlook caregiving responsibilities. Toronto has formal gender equity units, but they weren't included in the planning process. The structure of the project, centered around a public-private partnership, left little room for intersectional concerns. Gender wasn't explicitly rejected: it was simply never considered relevant to innovation, technology, or economic development.

These three cities demonstrate different models of smart city governance, but they share a common pattern. Gender gets acknowledged through symbolic inclusion, but kept at the margins of strategic design. Offices, action plans, or public campaigns help create the appearance of institutional awareness. However, as Walby and Squires argue, when gender gets confined to the symbolic layer of governance, its political impact gets weakened. Gender becomes a topic of management, not of power. It doesn't get positioned to shape priorities, but rather to respond to them after the fact.

Fainstein's critique of procedural justice helps clarify why these symbolic structures are so persistent. She argues that many governance systems define inclusion as the existence of consultative mechanisms, without examining whether those mechanisms can actually change outcomes (Fainstein 2010). In this logic, cities get seen as inclusive if they allow different voices to be heard, even if those voices have no decision-making power. Gender offices may be invited to review a policy, but their suggestions can be ignored. Their presence fulfills a requirement, but doesn't influence structural

direction. In this way, governance systems maintain their legitimacy while preserving existing hierarchies of knowledge and authority.

This symbolic approach to gender also serves a strategic function in the global competition among cities. In international rankings, grant applications and policy networks, cities often get rewarded for having gender equality frameworks in place. The existence of a gender department, a published equality plan and a few high-visibility projects can be used to signal progressive values. This allows cities to maintain a positive international reputation without changing the institutional logic of how they operate. Symbolic gender policies function as reputational assets. They reduce political pressure by creating the image of inclusion, even when structural exclusion continues.

Moreover, the symbolic separation of gender from technical governance makes it difficult to raise critical questions. Once gender gets framed as a discrete issue managed by specialists, its relevance to broader planning processes can be dismissed. Concerns about surveillance, data bias, or accessibility get reclassified as outside the gender office's scope. This fragmentation prevents cross-cutting critiques. It limits the ability of feminist actors to challenge the core assumptions of smart urbanism, like who counts as a user, what forms of labor matter, or how public space gets imagined.

To move beyond symbolic inclusion, cities need more than departments and documents. Structural integration means embedding gender perspectives into the systems that define priorities, allocate funding and shape urban futures. This includes involving gender experts in algorithm design, platform governance and budgeting processes. It also means redefining what counts as technical knowledge. As long as gender gets treated as a soft issue, separate from innovation or planning, smart cities will continue to reproduce the same exclusions that feminist scholarship has long identified. Transforming this logic requires not only new actors, but also new institutional designs.

This chapter has shown that gender isn't missing from smart cities by accident. It gets excluded through how governance systems are designed and how institutional

decisions get made. In many cases, gender gets treated as a secondary issue, something to be addressed through consultation or reports, but not something that shapes core planning and strategy. This exclusion isn't always explicit. It happens through daily procedures, technical priorities and planning routines that claim to be neutral but are shaped by long-standing power dynamics.

The first section explained how political and administrative systems continue to reflect patriarchal structures. These systems often concentrate authority in centralized offices and formal procedures that don't recognize care, social responsibility, or gendered patterns of urban life as planning priorities. Even when governments commit to equality, the way they organize responsibilities and define expertise limits the ability of gender concerns to influence outcomes. Power remains tied to formal knowledge and hierarchical decision-making.

The second section focused on how digital systems and data-driven tools reinforce these patterns. Technologies used in smart cities, like urban sensors, digital platforms and algorithmic decision-making, often get designed without considering how gender shapes daily experience. These tools collect information about traffic, energy, or efficiency, but rarely about care work, safety, or informal use of space. When planning relies on these forms of data, the result is a city that responds to measurable problems but overlooks invisible labor and unequal risks.

The third section examined how gender often gets made visible through symbolic means but excluded from real influence. Many cities have gender departments or equality strategies, but these often get placed outside the decision-making process. They may write reports or run public campaigns, but they don't have authority over budgets or infrastructure. Gender becomes something to be acknowledged in public language, but not something that shapes how resources get distributed or how priorities get set.

These three mechanisms operate together. Formal power structures, technical systems and symbolic inclusion reinforce one another. Together they create a model of governance where gender gets treated as a side concern. This model may appear

efficient or objective, but it fails to address how cities are actually lived and experienced. When gender isn't included in how problems get defined, it can't be part of the solutions.

While this chapter focused on who holds institutional power, the next chapter will continue this analysis by looking at how cities assign value to different forms of work and activity. It will focus on how smart city strategies prioritize economic growth and innovation, often in ways that ignore or undervalue feminized labor. The chapter will examine how ideas of productivity shape what gets seen as useful or valuable in the city and how this continues to make gendered contributions invisible.

Chapter 3 Power without Presence: How Smart City Governance and Technology Obscure Gender

Smart city agendas are not only built on technology or governance frameworks. They are also shaped by assumptions about what counts as progress, what goals cities should pursue and which activities deserve support. Productivity sits at the center of these assumptions. In most strategies and policy documents, it is presented as the key measure of success. Cities are expected to become more efficient, more competitive and more innovative. These priorities are often treated as self-evident, justified by technical metrics and data-driven reasoning. Yet what is considered productive is never neutral. It reflects institutional norms, political values and gendered expectations about labor and contribution.

Toronto illustrates this logic. The Quayside project framed innovation as a strategy to grow the economy, draw global talent and support high-growth industries. Productivity gains were both the reason for technological experimentation and the main measure of success. Public consultation was included, but the underlying value system went unchallenged. Infrastructure optimization, startup incentives and market development defined progress in narrow economic terms.

Singapore follows the same logic in a different form. The Smart Nation initiative is tightly linked to national development goals. It promotes data integration, automation and real-time responsiveness as strategies to raise productivity. Public services are reorganized around predictive analytics and AI. But little attention is given to how these changes affect different groups. Female migrant domestic workers, for example, are central to Singapore's economy, yet their labor is absent from official metrics and smart policy design.

Even Barcelona, often praised for progressive governance, operates within this productivity framework. The city promotes digital rights and participatory tools, but smart city policy continues to focus on innovation and competitiveness. Feminist

planning has gained visibility in municipal programs, yet infrastructure projects still revolve around digital optimization. Platforms like Decidim, though designed for openness, rely on user models based on technical fluency and economic agency. In practice they work better for active, data-oriented citizens than for caregivers or service users whose routines fall outside the imagined productive subject.

In each of these cases, smart city development operates through an economic imaginary in which productivity is narrowly defined and institutionally enforced. The language of growth, innovation and performance operates as both a strategic direction and a system of classification. Feminist scholars have consistently challenged this framing. Kathi Weeks (2011) describes the modern work ethic as a moral economy in which paid labor appears as both a personal duty and a public virtue. This ideology naturalizes a specific form of work while excluding others from recognition and reward. It encourages individuals to internalize norms of discipline, output and autonomy, regardless of the material or social value of the labor being performed.

In parallel, Mariana Mazzucato (2018) argues that mainstream economic theory draws a line between "productive" and "unproductive" sectors in ways that reflect political priorities rather than empirical realities. Financial speculation and technological entrepreneurship appear as high-value activities, while social reproduction, community work and environmental maintenance are treated as costs or externalities. The result is an urban policy environment in which the allocation of attention and resources systematically excludes feminized labor.

Within smart cities, these hierarchies are reinforced through technical design. Metrics of success are built around indicators like GDP impact, app usage and system efficiency. Infrastructure is evaluated through performance data, not social impact. Leslie Kern (2019) notes that the dominant model of urban development assumes a subject who is economically active, spatially mobile and digitally engaged. This subject is implicitly male-coded. Caregivers, part-time workers, people with disabilities are often missing from planning models and design assumptions. Their labor isn't easily tracked, monetized, or rewarded.

Invisible labor isn't just omitted in practice. It becomes structurally disqualified by the way smart cities define value. Feminist critiques of economic rationality emphasize that unpaid labor isn't only unrecognized but also actively rendered irrelevant in systems designed around metrics and quantifiable outcomes (Criado-Pérez 2019). Planning processes rely on standard categories of efficiency and performance that don't account for the complexity of reproductive work or the interdependence of social life. The absence of care and relational labor isn't incidental. It's the product of a framework that treats visibility, speed and output as signs of worth.

This exclusion is not accidental. It grows out of the way smart city priorities are set and carried out. When productivity is used as the main measure of value, work only becomes visible if it fits economic models. Tasks that cannot be easily measured, automated or turned into profit are pushed aside. This pattern affects many groups, but its gendered impact is clear. Women carry most reproductive labor, and the invisibility of this work in smart city planning points to deeper structural bias.

This chapter looks at how gender absence is reproduced through a productivity logic that treats some labor as valuable and leaves other labor unseen. The first section examines how value is constructed through economic categories. The second looks at how creative economy and innovation discourses filter what kinds of work are recognized. The third shows how care and reproductive tasks are left out, not only in rhetoric but also in concrete planning and design. Together these sections show that gender absence is not the result of weak inclusion policies, but the outcome of how cities define progress itself.

Constructing Value through Biased Divisions of Labor

Smart city agendas often borrow from existing economic models to decide what counts as success. These models are not neutral. They rest on a long-standing divide between labor that is treated as productive and labor that is not. In most policy frameworks, productivity is tied to waged employment, market output and measurable efficiency. By contrast, unpaid care, social reproduction and community support are left out. This is not only a technical issue of what can be measured. It also reflects political choices

about which forms of work are recognized, which are funded and which are ignored. These choices shape how cities are governed and how resources are distributed.

The centrality of waged work in capitalist societies is not only an economic reality but also a cultural norm (Weeks 2011). Paid employment appears as a moral requirement, the condition for independence, adulthood and citizenship. Those who are outside the formal labor market are often described as dependent, passive or socially marginal. This framing hides the material dependence of the economy on unpaid labor. It also privatizes gendered forms of work, treating them as matters of the household rather than part of economic planning and public investment..

The organization of value is therefore not a reflection of output but a reflection of institutional preferences. Mariana Mazzucato (2018) critiques the foundations of neoclassical economics by showing how it arbitrarily assigns value based on contribution to profit, rather than to societal function. Finance, real estate and intellectual property are treated as productive because they generate monetary returns. Meanwhile, forms of labor essential to sustaining life (cleaning, caring, maintaining the environment) are written off as external costs. These classifications aren't based on objective criteria. They're institutional choices that prioritize capital accumulation over social maintenance.

Once these categories are accepted as default, they shape how policies are written and which types of labor are made legible in planning frameworks. Julie A. Nelson (1996) points out that the assumption of objectivity in economic categories often hides value judgments that are historically shaped by gendered social roles.

These distinctions aren't confined to abstract theory. They are implemented through administrative tools and policy instruments. Public sector programs that rely on cost-benefit analysis tend to reward initiatives that show a quantifiable return on investment. Labor that doesn't produce a measurable surplus is treated as a burden or inefficiency. This logic is present in the growing use of digital performance metrics in smart city management.

Platforms that track service delivery, mobility and user satisfaction often ignore or undercount care work, support networks, or domestic routines. These systems are designed to improve resource allocation, but they begin from an incomplete model of who contributes to the urban economy. Nancy Folbre (2001) argues that care work is systematically undervalued in public policy because it produces well-being, not profit and therefore doesn't fit into dominant accounting frameworks.

Smart city infrastructures reinforce this bias through the indicators they adopt. Urban dashboards typically collect data on transit, waste, energy, or productivity benchmarks. Few include information about caregiving burdens, intergenerational support, or emotional labor. Time-use data often is excluded from real-time governance systems. The result is a version of the city that centers economically active individuals and overlooks everyone else.

This affects policy outcomes. Housing policy that is optimized for labor mobility may overlook the need for multi-generational cohabitation. Public transit systems designed around peak commuting hours may ignore the travel patterns of caregivers, whose movements are more fragmented and time-sensitive. Doreen Massey (1994) reminds us that the separation of productive and reproductive spaces is a central mechanism through which gendered labor divisions are sustained.

Even when smart city initiatives aim to be inclusive, the framing of productivity remains narrow. Programs to support digital entrepreneurship are rarely accessible to those with part-time or unpredictable schedules. Innovation labs focus on high-tech sectors that already have gender imbalances. Recognition often is limited to forms of labor that align with the expectations of economic modernity. Informal economies, mutual aid networks and reproductive labor don't receive treatment as policy priorities because they don't fit the dominant indicators of success.

This isn't only a problem of exclusion. It's a mechanism of institutional reproduction. Once labor categories are codified in digital systems, procurement policies, or budgeting frameworks, they acquire a degree of permanence. Feminized labor becomes structurally invisible because there's no field in the database to record it, no

metric to track its contribution and no institutional actor responsible for its support. Even well-intentioned urban planners may overlook these gaps because the tools they use have already excluded them from view.

Sandercock (1998) has shown that planning tools themselves often carry embedded cultural assumptions, making structural exclusion appear procedural and therefore harder to contest.

The discourse of productivity gives this structure the appearance of objectivity. Targets, rankings and performance metrics suggest that priorities are based on technical efficiency rather than political preference. But as feminist economists have emphasized, value isn't a natural property. It is produced through institutional processes and cultural assumptions. Cowan (2015) argues that what doesn't count is rarely supported and the exclusion of care-related metrics leads to silent policy neglect.

In the smart city, where digital systems are used to translate strategy into code and procurement into platforms, these distinctions become infrastructural. They don't just reflect social bias. They encode it into the functioning of urban space.

Understanding this structure is essential to analyzing gender absence in smart cities. The exclusion of reproductive and feminized labor isn't accidental. It's the outcome of a model that defines value in narrow, economically reductive terms. It's a model that benefits from invisibility because visibility would require redistribution.

Innovation and Creativity as Selective Value

While productivity often is used to define what counts as useful labor, innovation and creativity are increasingly deployed to define what's considered desirable labor. Smart city agendas embrace these terms as markers of progress and transformation. Innovation is presented as both a goal and a method, shaping how urban programs are designed, funded and evaluated. Yet, the institutional embrace of creativity doesn't extend equally to all forms of labor.

Instead, it selects specific types of activity, usually those that are technologically framed, growth-oriented, or symbolically aligned with digital futures and excludes

others that are relational, care-based, or embedded in everyday life. This selective process reinforces a narrow cultural and economic template for what cities choose to reward.

The policy emphasis on innovation builds on earlier models of the "creative city," where urban regeneration strategies linked cultural capital to economic competitiveness. Within this model, creativity became a proxy for economic value and success was tied to the visibility of creative industries like design, media and digital technology. Feminist critics have noted that these frameworks often ignored the material and social conditions that support creative production, including unpaid labor and caregiving responsibilities (Gill and Pratt 2008). The celebrated figure of the creative worker, a flexible, mobile, self-managed individual, rarely corresponds to those whose labor is defined by interdependence, routine, or caregiving.

Smart cities extend this logic through digital infrastructure and platform ecosystems. Innovation is institutionalized through competitions, incubators and grants that reward scalable ideas, technical novelty and data-driven outcomes. These programs often are framed as open and inclusive, but their structure privileges individuals and teams who can translate social problems into technical formats. Creative contributions that rely on emotional labor, slow processes, or embedded community knowledge aren't legible within this format.

Rose (2017) argues that the aesthetics of smart innovation tend to favor legibility, modularity and abstraction, leaving embodied or place-based practices outside the frame of recognition.

This institutional preference shows up clearly in funding schemes and spatial planning. Cities design innovation districts and high-tech zone to attract high-tech firms, start-ups and creative professionals. These areas are well connected, heavily resourced and designed to project an image of openness and progress. At the same time, they also set boundaries. Informal labor, care work and small-scale cultural activity are rarely included in these spaces.

The choices that shape these spaces are not only about design. They also reflect decisions about which forms of labor count. Investment in transport links, new buildings and policy attention signals a clear hierarchy of value. As Mould (2015) observes, this model of innovation is performative: it rewards those who can present themselves as disruptive while hiding the dependencies and exclusions that sustain such performances.

The framing of creativity as disruption also has gendered effects. In many cases, it disqualifies labor that sustains rather than transforms. Feminist theorists like Haraway (1988) and Sandercock (1998) have argued that maintenance, adaptation and relational care are themselves forms of innovation, but they often are ignored because they don't align with the metrics or branding of innovation policy.

In smart city strategies, this tension becomes institutionalized. Projects that enhance efficiency or automation receive funding. Projects that build trust, maintain continuity, or address social fatigue are framed as welfare, not innovation. The labor behind them becomes infrastructurally invisible.

Digital platforms strengthen these dynamics by deciding who gets to be recognized as creative. Their systems reward visibility, speed and network reach. Users who post often, handle their data well and produce content in formats the system accepts gain access and influence. Those who create in quieter or more collective ways tend to be left out. This design shapes not only who gets support but also what kinds of contributions are judged as worth supporting.

As Rose (2017) notes, platform governance imagines an active and optimizing user. Community-based creativity, especially the kinds practiced by women, migrants or older people, does not fit this model and is often pushed aside.

Importantly, this is not random. Value is assigned through categories and evaluation tools built into administration. Grant applications for innovation funding, for instance, usually demand evidence of market potential, reproducibility or user impact. These criteria may look neutral, but they reflect an economic model that equates innovation with technical progress and large-scale scalability.

Projects that build on care, continuity or cultural specificity are hard to measure within this framework. They often get downgraded into the category of social services or excluded altogether. As feminist economic critics point out, the issue is not only that these projects are underrepresented. It is that certain kinds of labor are systematically coded as irrelevant to urban progress (Cowan 2015; Nelson 1996).

The outcome is a narrow and selective system of recognition. Even smart city projects that present themselves as inclusive may leave out forms of labor that do not fit the dominant criteria. Innovation, in this sense, works less as an open ideal and more as a filter. It decides which kinds of knowledge enter institutional debate, which kinds of labor are paid for, and which experiences are allowed to shape urban futures.

This dynamic is especially visible in feminized and racialized labor, often rooted in interpersonal care, interdependence and non-market value. These contributions do not align with mainstream innovation metrics and so remain marginalized in both policy design and implementation.

Seen this way, gender absence is reproduced not only by exclusion but also by reclassification. Work that does not match institutional formats is not debated or opposed. It simply becomes invisible through lack of funding, silence in policy language and technical systems that cannot register it. This is why smart city strategies can appear open while staying structurally exclusionary. They do not have to reject feminized labor outright. They only need to define innovation in ways that make it impossible to include.

Gendered Invisibility of Reproductive and Care Work

The invisibility of care work in smart city agendas isn't a matter of omission. It's a continuation of deeply rooted patriarchal structures that have long assigned reproductive labor to women and systematically devalued it. Feminist theorists like Fraser (2016) and Federici (2004) emphasize that the association between femininity and care isn't natural but historically produced. Patriarchal capitalism has relied on this division to sustain economic systems while externalizing the costs of social reproduction.

In this arrangement, women are expected to provide emotional, physical and domestic labor as a form of moral responsibility rather than institutional obligation. The smart city, with its promise of future-oriented efficiency, inherits these gendered divisions rather than confronting them. By defining value through economic output and digital innovation, smart governance reproduces the structural subordination of feminized labor, especially in the domain of care.

Reproductive labor includes the biological, emotional and social activities required to sustain life. It encompasses childcare, eldercare, domestic maintenance and affective support. Fraser (2016) argues that these activities form the hidden infrastructure of the formal economy, enabling the productive sector to function by ensuring that workers are cared for, families are maintained and social relations are reproduced over time.

Yet in most urban planning frameworks, this labor is treated as an externality. It's not seen as part of the urban economy. It's not reflected in resource distribution, digital platforms, or planning priorities. The smart city, with its emphasis on optimization and innovation, pushes care to the margins.

This marginalization is reinforced by the historical separation of production from reproduction. Federici (2004) describes how the emergence of capitalist economies depended on the confinement of women to the domestic sphere, where their labor would remain unpaid and invisible. The home became a site of affective and material maintenance, excluded from the metrics of economic value.

This division is echoed in smart city governance, where planning decisions focus on productive infrastructure (transportation, data flows, innovation zones) while care-related needs are left to informal networks. Weeks (2011) observes that the wage system continues to organize social legitimacy. Those who perform unpaid care are treated as non-contributors, even when their labor enables the functioning of every other domain.

Digital infrastructure compounds this invisibility. Urban data systems collect extensive information on mobility, energy use, safety and consumption, but they rarely include

indicators of care labor. Time-use surveys, emotional burdens, interdependence and unpaid contributions are difficult to code into algorithms and often are left out of real-time dashboards.

Cowan (2015) notes that what doesn't count doesn't receive funding. The absence of care from digital tools translates into its absence from governance decisions. In this way, technological systems reinforce structural neglect rather than correcting it.

Feminist economists like Nancy Folbre (2001) have argued that care labor isn't simply uncounted but actively devalued because it produces non-market outcomes. It generates well-being, solidarity and social resilience, but these don't receive monetization in traditional accounting. As a result, even when cities invest in digital services related to health or education, the care work that supports those services, often performed in homes or informal networks, remains unsupported.

This creates a contradiction. Smart cities rely on high levels of unpaid labor to function smoothly, yet they systematically refuse to acknowledge or redistribute the costs of that labor.

The moral framing of care further reinforces its exclusion. Tronto (1993) argues that care often is cast as a private virtue rather than a public responsibility. This framing positions caregivers as naturally inclined to serve others, obscuring the structural pressures and lack of choice that shape care work. Migrant women, racialized minorities and working-class communities are disproportionately tasked with care roles in the urban economy. Yet their contributions are hidden behind the language of familial duty or cultural tradition.

Gutiérrez-Rodríguez (2010) describes this process as affective labor migration, in which emotional and physical caregiving is outsourced across borders but not recognized in policy or urban design. Smart city programs that speak of global talent, innovation, or digital inclusion rarely address this transnational infrastructure of social reproduction.

Even when care is addressed in policy, it's often through highly selective mechanisms. Childcare subsidies or eldercare facilities are treated as social services rather than economic infrastructure. This classification limits their integration into planning systems. It also subjects them to budgetary fluctuations, political cycles and eligibility constraints.

Feminist critics argue that this institutional positioning of care creates fragmented support systems that reinforce inequality. Cruikshank (1999) notes that welfare systems frequently individualize need and responsabilize recipients. In smart cities, where service access is increasingly mediated by digital interfaces, these dynamics are intensified. Those who can't navigate complex platforms, lack stable access, or provide care informally are left outside systems of support.

The spatial design of smart cities also plays a role in marginalizing care. Urban layouts optimized for commuting, consumption and security often neglect the needs of those performing care work. Public transport networks are designed for peak-hour flows rather than multi-stop, time-sensitive travel common among caregivers. Housing developments prioritize efficiency and density over intergenerational living or accessibility for dependents. Public spaces lack amenities for rest, caregiving, or emotional labor.

These spatial omissions are not the result of simple oversight. They arise from a definition of urban functionality that places economic circulation above social interdependence. As Massey (1994) argues, spatial structures are never neutral, they reproduce power relations, including those rooted in gendered divisions of labor. When these divisions are built into urban design, the work of care is pushed out of sight.

The effects of this invisibility are felt well beyond planning texts. When care is not counted, it becomes fragile. Caregivers end up overburdened, working with too few resources and often in isolation. The quality of care falls, and its distribution becomes increasingly uneven. These outcomes run directly against the goals that smart city programs often claim to pursue, including well-being, sustainability and resilience. By

leaving care outside their frameworks of value and governance, smart cities build systems that are unjust in social terms and incomplete in practice.

The exclusion of care work is not a technical oversight. It is a political and epistemic choice. It reflects decisions about which forms of knowledge are considered relevant, which kinds of labor are counted as valuable and which bodies are seen as belonging to the city's future. Reproductive labor is not erased by force. It disappears through abstraction, standardization and silence.

The value system embedded in smart city projects does not emerge by chance. It is shaped by institutional practices that consistently reward activities tied to economic growth, technical efficiency and measurable outputs. This logic decides what counts as work, who is recognized as a contributor and which forms of labor are left outside the field of recognition and support.

Urban planning continues to draw on deep divisions between productive and unproductive labor. These categories make it possible to exclude care, domestic and emotional work from planning priorities because they do not fit growth-based metrics. While smart cities claim to innovate, their frameworks often reproduce older exclusions by rewarding only those forms of creativity that align with entrepreneurial models or scalable digital tools. The result is a narrow system of recognition in which feminized labor is consistently undervalued or ignored.

The invisibility of care work exposes the full reach of this logic. Productivity and innovation sometimes gain attention in policy debates, but care is almost never acknowledged. It receives no systematic support in spatial design, little to no representation in digital infrastructures and remains detached from economic planning. This exclusion is not a matter of technical limits. It is the outcome of political and epistemological choices that treat care as private rather than as a shared urban responsibility.

Taken together, these mechanisms form a system of urban valuation that not only erases the foundational labor of women and marginalized groups but also reproduces gender absence across policy, technology and spatial norms. The issue is not only

which activities receive support but also whose contributions are made visible within institutions.

Chapter 4 The Participation Illusion: Gendered Limits of Smart City Discourse

Participation is one of the most common promises made in smart city debates. Planners, governments and technology firms argue that digital platforms can deliver governance that is more transparent, responsive and inclusive. Through mobile apps, civic dashboards and open data portals, residents are encouraged to give feedback, report problems and suggest ideas. On surface, these tools look like transfer from top-down planning to more collaborative forms of management.

In practice, the language of participation often hides how engagement is structured and controlled. Access to a platform is not the real starting point. What matters first is being recognized as a legitimate subject of governance. In smart city projects, that recognition is shaped by technical systems, design rules and knowledge standards that make some groups and forms of experience visible while leaving others out. Feminized labor, embodied practices and care work are excluded not by oversight but because the very definition of participation ignores them.

To appear inside these systems, people must first be legible to the frameworks that define recognition. Visibility is not neutral or universal. As Gillian Rose (2016) explains, urban technologies often work through a masculinist visual logic that privileges what can be mapped, measured and abstracted. Smart governance tools are designed to capture quantifiable issues such as transport delays, potholes, street lighting or business permits. They rarely register the pressures of limited time, emotional strain or unpaid care work.

Caroline Criado-Perez (2019) documents how women's everyday experiences like traveling with children, combining multiple trip purposes, or managing unsafe public spaces get excluded from the datasets that inform infrastructure design. When participation requires measurable input, those whose lives get shaped by fragmented schedules, informal labor, or caregiving responsibilities are systematically left out.

Their needs aren't easily expressed through standard forms or digital menus and therefore remain uncounted and unseen.

This exclusion isn't limited to technical design. It gets reinforced by how participation itself gets framed. Feminist planning scholars have long challenged the idea that rational, procedural input is the only valid form of civic engagement. Leonie Sandercock (1998) emphasizes that dominant planning cultures value detached reasoning and policy language, while dismissing emotional, narrative and relational forms of knowledge.

In smart cities, this bias becomes embedded in platform design. Citizens get invited to report problems through standardized interfaces, but not to narrate complex realities or express collective memory. Women who navigate the city with children, elderly family members, or informal networks of care are unlikely to be recognized by systems that reward concise complaints and clear solutions. Their interactions with the city are ongoing and embodied, rather than episodic and abstract. The participatory ideal of the smart city doesn't accommodate these forms of presence.

Digital participation also presumes a specific temporal and spatial availability. Those who are overburdened by caregiving, working multiple jobs, or lacking stable internet access are less likely to engage with participatory tools. Judith Innes and David Booher (2010) describe how many planning processes rely on symbolic inclusion, where participation is procedural rather than substantive. Feedback gets collected, sorted and documented, but rarely shapes policy outcomes.

In smart cities the problem becomes more visible because of the speed and scale of data systems. Participation turns into a technical process detached from political debate. Residents can provide feedback but this feedback is filtered by algorithms that favor what is frequent, clear and compatible with existing policy. Concerns often expressed in feminized ways such as fear, exhaustion or hesitation rarely meet these standards. They are treated as vague and excluded from planning.

As platforms rely more on automated tools to process input these exclusions intensify. Algorithms are not neutral. As Ruha Benjamin (2019) explains systems that claim to be

objective often reproduce inequality under the label of efficiency. In smart cities training data reflects existing biases in infrastructure, public services and mobility. As a result the input of women migrants and informal workers is often given less weight or misclassified.

A platform may allow residents to report unsafe conditions but if it does not recognize issues such as poor lighting or the absence of public toilets these reports will not be treated as priorities. Algorithmic logic values standardization over context repetition over uniqueness and technical compatibility over lived complexity. This produces digital silencing where women's experiences are not censored but simply not recognized.

The outcome is a system of participation that looks open but works through exclusion. Feminized labor especially care work is disadvantaged by how engagement is defined and evaluated. Time constraints emotional labor and embodied vulnerability are not treated as valid input. Instead the smart city imagines an ideal participant: a rational autonomous tech-literate individual able to frame problems in system-friendly language.

This figure reflects older masculinist norms of citizenship where political voice is separated from dependence emotion and social reproduction. As Doreen Massey (1994) reminds us space is not just a container for action but the product of social relations. In smart cities space is produced through data-driven participation that marginalizes those who do not fit this model of the ideal citizen.

These exclusions have real effects. When participation platforms fail to capture the realities of women's urban lives they reinforce planning choices that ignore care infrastructure, safety or community-based mobility. The rhetoric of participation then becomes a way to legitimize decisions that are already fixed. Residents are invited to contribute but the agenda is set in advance the terms are controlled and the results are processed in ways that keep authority intact. Participation in this sense is less about redistributing power and more about performing democracy. Women are told they are included but the terms of inclusion do not match their lived realities.

To respond to this problem, it is not enough to add more women to existing platforms or to expand outreach to marginalized groups. The structure of participation itself needs to change. This means questioning the basic assumptions of civic engagement in smart city debates. What is recognized as knowledge? Who decides which issues matter? How is authority assigned, and by what criteria?

Feminist theorists argue that participation should also recognize interdependence, emotional labor, and informal expertise, not just formal complaints or policy language. Real inclusion requires more than adjusting digital interfaces. It calls for a shift in how governance defines and values different ways of living in the city.

Chapter 5 Reclaiming the City: Strategies to Address Structural Gender Absence

The previous chapters identified three mechanisms that sustain gender absence in smart city development: centralized governance, productivity frameworks that privilege certain forms of labor, and participation models that exclude many voices. These are not isolated problems. Together they form an institutional logic that presents itself as neutral while sidelining embodied experience. The spatial form of a city always mirrors its power relations, and in smart cities this power is reinforced through digital infrastructures that imagine a universal, context-free citizen (Massey 1994). Data systems and visual tools highlight what can be measured and mapped, while the realities of those whose work and lives do not fit these categories are left out (Rose 2016).

Gender absence comes from design choices, not oversight. While smart city initiatives often claim inclusivity, they rely on governance models that limit decision-making to a narrow circle of technical experts and political elites. Participation gets framed as access to feedback channels, not as real influence over institutional agendas. Data systems systematically ignore women's mobility patterns, care responsibilities, and time constraints, leading to urban plans that fail to accommodate their everyday needs (Criado-Perez 2019). These exclusions get reinforced by how productivity gets measured. Value gets attributed primarily to economic innovation and efficiency, while feminized forms of labor such as caregiving are excluded from city metrics altogether (Fraser 2022).

Together, these mechanisms do more than simply omit women from urban processes. They create conditions where women's contributions, constraints, and perspectives become structurally irrelevant. The city becomes a space where the very categories of visibility, participation, and value get defined in ways that obscure gendered experience. Any strategy for inclusion must operate within this institutional configuration. The central question is not how women can be added into existing

models, but how to challenge the knowledge assumptions that made them absent in the first place.

Strategies for gender inclusion in smart cities often rely on modifying existing frameworks through tools like participatory dashboards or gender-disaggregated data. While these measures appear inclusive, they operate within a system that continues to treat participation as procedural rather than political. Many participatory mechanisms reduce engagement to a formal search for consensus, which ultimately reinforces expert-driven agendas instead of redistributing institutional power (Innes and Booher 2010). Participation becomes a controlled channel of input, creating the illusion of openness while leaving foundational decision-making structures untouched.

Reformist approaches that seek to merely "add women in" through data corrections or advisory councils often fail because they do not address the deeper knowledge structures that caused the exclusion. Urban knowledge systems prioritize technical mastery and spatial abstraction, leaving no space for situated, embodied, or narrative forms of knowledge (Mattern 2020). These systems are not simply unrepresentative; they are built to exclude anything that does not conform to their logics. In this context, gender absence is not an outlier but a symptom of the underlying architecture of smart governance.

A meaningful response requires a bottom-up transformation of how participation gets conceptualized and structured. Ruha Benjamin points out that technocratic systems often conceal exclusion beneath promises of efficiency and neutrality, masking the politics embedded in digital infrastructures (Benjamin 2019). Overcoming structural gender absence demands far more than better interfaces or outreach; it calls for a redistribution of knowledge and institutional authority. This means not only inviting marginalized groups to speak, but fundamentally shifting the terms under which their knowledge gets considered valid and actionable. We need co-creation instead of consultation. We need power instead of just access.

This redefinition of participation cannot be achieved through procedural reforms alone. It requires a theoretical foundation that explicitly challenges the prevailing norms of

knowledge, legitimacy, and representation. Feminist theory offers this foundation. It confronts not only the exclusion of women from governance but also the deeper structures that determine whose experience counts. Feminist participation is not just about increasing the presence of women in decision-making spaces. It is about transforming the basic assumptions that underlie urban planning itself.

From this perspective, participation is a space of political conflict, not a neutral platform for technical input. Even when marginalized groups are included in participatory processes, the conditions of that inclusion often reproduce dominant norms like abstract reasoning and depersonalized argumentation (Young 2000). These norms systematically disadvantage those whose political agency gets shaped by care work or collective resistance. Feminist participation resists this model, insisting that emotion, narrative, and relationality are legitimate forms of public reasoning.

This argument has deep roots in feminist urbanism. Leonie Sandercock advocates for "planning in the vernacular," a mode of engagement that privileges lived experience over institutional abstraction (Sandercock 1998). Rather than requiring marginalized actors to translate their concerns into the language of the state, this approach allows communities to articulate political claims on their own terms. Feminist approaches recognize that social conflict and emotional labor are not barriers to governance but essential components of a democratic city.

One of the key contributions of feminist participation lies in repositioning care as a public, political concern. The subordination of care work is not merely economic but institutional (Fraser 2013). This labor has been systematically devalued because it contradicts the dominant conception of the citizen as an autonomous, productive individual. Feminist theory insists that participation cannot be meaningfully restructured without acknowledging the spatial and temporal burdens that care imposes.

Participation also takes place in space, and Certain bodies can appear "out of place" within established political settings because those spaces were never designed for them (Puwar 2004). This insight reorients participatory design away from simply

providing access and toward genuine transformation. It is not sufficient to invite more women into existing forums. The forums themselves must be reshaped to accommodate different kinds of knowledge and bodily difference.

Sara Ahmed's work on institutional difficulty supports this point. Ahmed suggests that feminism often enters institutions not as harmony, but as friction, by confronting structural violence and naming exclusion (Ahmed 2017). Feminist participation is also different in how it approaches knowledge. Donna Haraway's notion of "situated knowledge" critiques the fantasy of a universal, neutral observer, replacing it with partial and accountable perspectives (Haraway 1988). In a smart city, this means rejecting the claim that data can speak for itself and designing processes that are open to voices that speak through stories and emotions.

Feminist participation is not a supplement to smart urban governance. It is a structural alternative. It redefines who counts as a political actor, how knowledge gets produced, and what values govern urban decision-making.

Translating feminist participation into institutional practice demands more than symbolic commitments. It requires structural changes in how urban systems allocate decision-making power and define legitimate political engagement. Feminist-informed bottom-up strategies must be embedded structurally, not attached superficially.

Some urban programs have attempted to embody these principles, though with uneven results. In Barcelona, the Decidim platform was launched to support participatory democracy. While the city publicly embraced a feminist vision, the platform's effectiveness has depended less on its technical interface and more on the city's broader willingness to restructure power relations. Seoul's Women-Friendly City Project offers another case. The program aimed to integrate women's voices in shaping urban services, yet the process remained largely within a state-led model where participation was filtered through official agencies. These initiatives addressed visible aspects of women's daily life but rarely altered the structural conditions of urban governance.

Vienna's Smart City Wien strategy has similarly included gender equity in its planning goals. However, the participatory structures were often consultative rather than constitutive. As scholars note, feminist urban practice risks being diluted when integrated into governance structures that are not themselves transformed (Kern and Leszczynski 2020). The presence of gender-aware policies does not necessarily mean the presence of feminist participation.

A more recent attempt is the Her City Toolbox, developed by UN-Habitat. The project aims to center the voices of girls and young women in urban development, treating them as knowledge holders. However, it faces limitations in long-term policy integration, as many cities adopt the process as a one-time initiative without embedding its approach into ongoing governance.

These cases illustrate both the potential and the limits of institutionalizing feminist strategies. The key difference lies in whether feminist goals get treated as inputs into existing systems or as principles that reshape those systems from within. Where participation gets restructured to reflect community agency, feminist frameworks can alter how the city governs itself. This requires long-term commitment to knowledge plurality, distributed authorship, and structural care.

Without these structural commitments, feminist participation remains fragile. The feminist city is not built through policies alone, but through redefined norms of governance that prioritize negotiation over optimization, presence over abstraction, and shared authorship over centralized control.

Structural gender absence in the smart city is not a problem of representation, but one of fundamental design. It gets sustained through institutional logics that define whose experiences are valid, whose knowledge counts, and whose voices are structurally excluded from decision-making. Efforts to improve inclusion through technical fixes or symbolic representation cannot address this absence unless they confront these deeper mechanisms. A meaningful strategy requires not only access, but transformation: of how cities define expertise, organize governance, and allocate authority.

Feminist-informed bottom-up approaches offer a way to confront these foundations directly. By centering care, situated knowledge and relational time, they expose the limits of technocratic inclusion and introduce alternative models of urban authorship. These strategies are not only conceptually distinct; they demand material and institutional redesign. From reorganizing participatory formats to redistributing agenda-setting power, feminist participation redefines the terms under which the city becomes knowable and governable. Its success depends on whether cities are willing to treat feminist planning not as a corrective, but as a foundational logic.

Conclusion

The gender absence observed across smart city projects is not a coincidental oversight, nor a temporary gap that can be resolved by simply adding inclusive features. It is a structural outcome of how smart urbanism is designed, implemented and legitimized. The idea that technology is neutral, data is objective, and participation is open has been used to justify some specific viewpoints while pushing others aside. By focusing on efficiency and innovation, smart city frameworks keep repeating old hierarchies. They leave out lived experience, knowledge from care work, and the different needs of diverse groups.

The smart city is built on a specific vision of urban life. It imagines a citizen who is rational, productive, and self-managing. They think a person moves through space in predictable and optimizable ways, and the most essential thing is official documents rarely describe this figure in gendered terms. Yet the assumptions behind it are not neutral. The “universal” smart citizen reflects masculine norms of productivity, autonomy, and control over space. Within this model, reproductive labor, caregiving and informal knowledge are made invisible. That invisibility is not accidental. It is what allows the smart city model to hold together as it is practiced today.

At the same time, governance and participation systems strengthen this exclusion. Public-private partnerships give priority to technical expertise and commercial goals. This creates decision-making spaces where numbers matter more than lived concerns. Participation is often symbolic. It becomes a way to collect data, not a way to change results. The key spaces of decision-making like planning offices, design labs, investment boards stay out of reach for those with lived and gendered knowledge. Efforts to “include” women rarely address the deeper structures of power. These structures decide whose valid knowledge counts and who has the right to shape the urban futures.

The central argument of this thesis is that gender absence in smart cities is produced by interlocking institutional mechanisms. To addressing it needs more than inclusive language or small adjustments to current systems. It calls for a rethinking of how cities define value, distribute authority, and structure participation. The challenge is not to add gender as an afterthought. It is to confront the institutional designs that make its absence appear invisible. And here feminist theory offers the tools for this redefinition. It does not aim to create another universal model. Instead, it insists on partiality, plurality and the legitimacy of embodied knowledge..

The reason is this challenge requires more than just critique, it needs a different approach to how we study and understand cities. Most smart city research relies on abstractions like efficiency, connectivity, and resilience, which sounds technical and objective. But they're actually detached from the complex social relationships that make cities work. They focus on measurable outcomes and ignoring the ones excluded from the systems. To face these realities, urban research needs to center knowledge that emerges from everyday experience and the ongoing work of navigating urban life. And feminist approaches to knowledge make this possible by treating expertise not as detached objectivity, but as being accountable to particular, situated perspectives, let people "being humans in digital cities" (Georgiou 2024).

This shift changes how we think about participation. In many smart city projects, participation still means little more than consultation or giving feedback. Feminist approaches push for something different. They see participation as a political process that includes disagreement, conflict, and the possibility of real change. Barcelona's neighborhood assemblies and the Her City toolbox are good examples. They show how planning can be built on care and shared authorship, rather than on neutrality and top-down control. These projects are not perfect and they often meet resistance inside institutions. Still, they make clear that other ways of planning are possible, and in some places, they are already happening.

For these alternatives to matter in practice, urban planning needs to revisit its basic assumptions. A city is not a closed system that can simply be optimized, it is a contested space where shaped by overlapping forms of power and inequality. When gender is

missing from planning, it is not because it does not matter. It is because the rules of planning were set up in ways that make it disappear. Rethinking the smart city therefore means more than critique. It asks for a feminist reconstruction: a way of designing, governing, and imagining cities that treats care as infrastructure, time as political, and presence as a real form of authority.

Looking ahead, a more just urban future has to begin with this recognition. Gender-aware urbanism is not about fixing mistakes by adding more representation. It is about creating new ways of planning where care work, emotional labor, and embodied knowledge are seen as central to how cities function. At the same time, it must also recognize that women's roles in society are no longer confined to care work alone. As social and economic structures change, women participate across the full spectrum of production as well as reproduction, and urban planning must reflect this broader reality. This means developing new institutions, new forms of participation, and new standards for what counts as urban success. The focus needs to shift. The question is no longer how smart cities can be made more inclusive. It is which forms of knowledge and experience are currently left out, and how cities can be built around those values that have for too long been treated as marginal.

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