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공학 석사학위 논문

Smart City Solutions to Gender Inequality

성 불평등 해소를 위한 스마트 시티 솔루션

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Smart City Solutions to Gender Inequality

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Abstract

Smart City Solutions to Gender Inequality

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With the increasing number of cities worldwide, urban social problems have become a topic for discussion. Urbanization is generally associated with women's emancipation and greater opportunities in the areas concerning economic, social, and political life that otherwise would not be in sight. However, in cities, they still face constraints and limitations based on their gender. Inequalities can be observed in citizens' daily lives, especially regarding public space, services, governance, and participation. A city is a social space influenced by existent hierarchies, values, symbolic domains, and power relations. There are differences between how men and women use public transportation and public space. Moreover, women are much less active when it comes to participating in

community life and city governance as they are less likely to become decision-makers or be voted for a political position.

The Smart City concept promotes building an efficient living urban space with the introduction of various technological solutions and methods to improve the quality of life of its citizens. Its agenda includes sustainable and inclusive growth based on social inclusion and delivering equal opportunities for all the residents, no matter their gender. Although the concept concerns interdisciplinary research fields, gender issues' relevance has not been widely discussed. Smart Cities can address the currently existing gender disproportions in cities and be a way of bridging the gap through the introduction of technology solutions and gender-sensitive governance. Therefore, the importance of Smart City initiatives for achieving greater gender equality should be discussed and analysed.

Keywords: Smart City, Social Innovation, Gender Equality, Inclusive Growth

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Chapter 1. Introduction

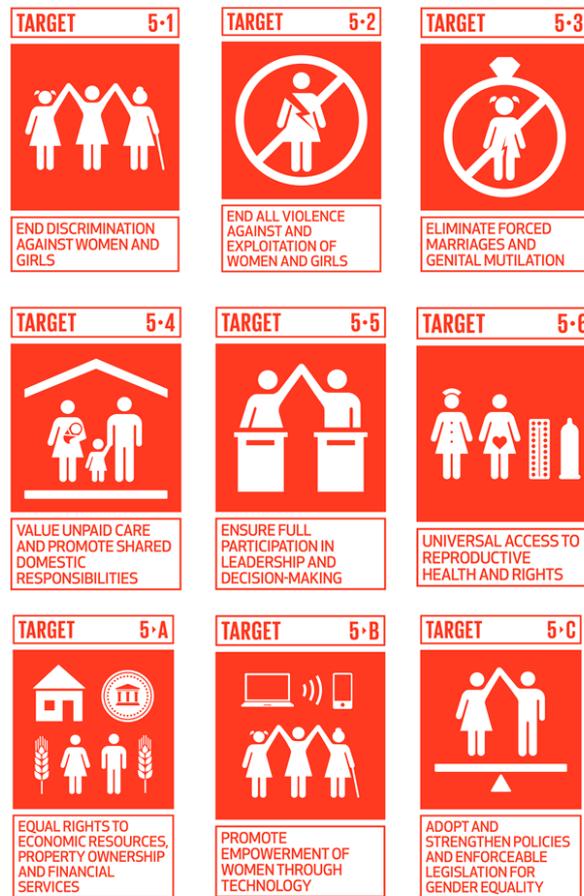
1.1 Research Background

Over the last decade, immense improvements have been made regarding women's rights and access to equal choices; however, the world is still far from achieving universal gender equality. Although urbanization has been generally associated with increased opportunities for women and decreasing gender gap, women nowadays still face challenges, hydrants, and issues in urban spaces related to their gender (Chant, 2013).

Urban studies have shown that gender inequality and related issues are present in the cities' space. Historically, cities were designed and planned by male creators, who preserved already existing societal gender, race and class disparities in urban zones, creating an unequal, patriarchal and divided space. Therefore, cities built on such fundamentals have reciprocated those archetypes – prioritizing men in access to transportation, public space use, communal participation, and decision making. With the increase of women studies related research, academics presented that although women have gained rights and opportunities, which they did not have in the past, gender gaps in the urban space persevered and may not be easy to eradicate (Terraiza et al., 2020).

Currently, there are many international organisations working towards fighting discrimination against women in many areas of life on a global scale. Their actions are targeted to combat harmful stereotypes and ensure equal opportunities for girls and women worldwide. One of the most recognized institutions operating in this area is the United Nations branch focused on women's issues - UN Women (United Nations, 2021).

Gender equality is one of the United Nations' Sustainable Development Goals, which include ending poverty and hunger, good health and quality of life, good quality education, gender equality, clean water and sanitation, clean and accessible energy, economic growth and decent work, innovation, industry and infrastructure, a decrease of inequality, sustainable cities and communities, responsible consumption and production, climate action, life under water, life on land, peace, justice and strong institutions and partnerships towards the goals. The UN initiative concerns actions aimed at economic development, social belonging, and sustainable development in order to fight poverty and improve the well-being of society. The gender equality goal has twelve sub-points characterizing areas in which action should be taken to ensure women and girls have equal rights and opportunities as their male counterparts (United Nations, 2017, 2021).



Source: <https://www.globalgoals.org>

Figure 1. Sustainable Development Goal 5

Source: United Nations, 2017, globalgoals.org

According to the UN Agenda 2030, achieving gender equality is necessary because it establishes a foundation for creating a peaceful and prosperous world (United Nations, 2021). As Figure 1 presents, with increased equality comes greater prosperity in the form of GDP per capita. European Institute for Gender Equality (EIGE, 2016) forecasts that improving the gender equality situation in

the European Union member states would positively affect its economic position – with an increase from 6% to 9% of GDP per capita. Although the prognosis varies between the countries due to their individual characteristics –gender equality differs between the countries, and the most equal ones already have achieved a good situation; therefore, the improvement would be more visible in the states with more disparities.

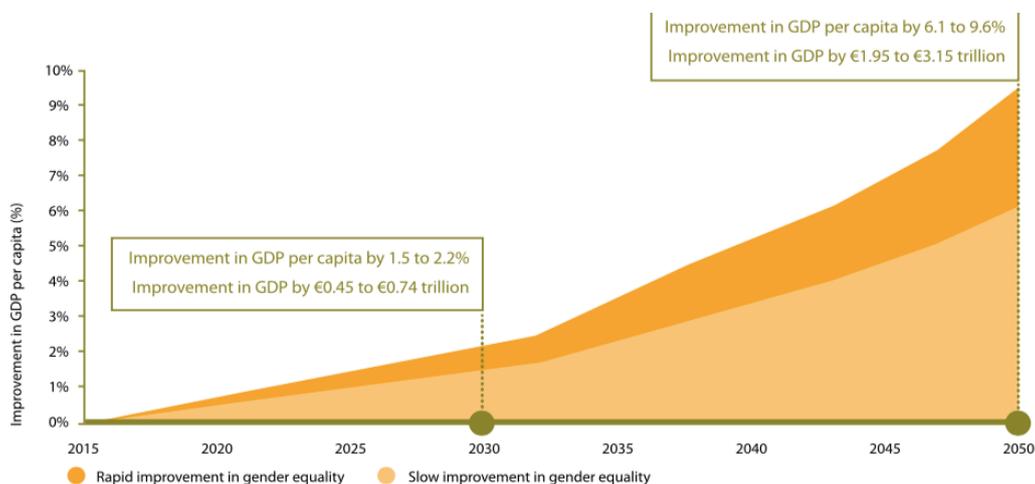


Figure 2: Effect of increased gender equality on prosperity (GDP per capita)

Source: EIGE, 2016

Policies and regulations play a role in targeting gender inequalities and setting a base for a more egalitarian society. When it comes to city governance initiatives, there are organizations promoting an inclusive approach for city dwellers. First of all, the UN Habitat program focuses on the aspect of gender discrimination in the

urban space and highlights the importance of introducing anti-discrimination policies for that matter – especially on the local level (Artuso, 2010; Nesti, 2019). European Union also promotes gender-sensitive policies in its regions and cities. It has proposed greater inclusion of women in the urban space through the introduction of initiatives and regulations such as equal treatment legislation, policies including gender mainstreaming and gender perspective in all aspects, and specific measures for greater empowerment of women (European Commission, 2020). Apart from international initiatives coordinated by global institutions, gender inequality problems have been discussed on a local level, with municipalities worldwide addressing the need to introduce solutions aiming at solving the issues in their areas (URBACT, 2019a).

In the cities, there are many emerging urban social problems involving inequalities in society, unemployment, lack of education, exclusion, poverty, safety etc. Social innovation can pose as an instrument to address those problems and introduce solutions which will bring about a change in the society and its members' interactions, benefiting not only the disadvantaged groups of individuals but society as a whole. The core aspect of social innovation is the inclusion of all the citizens and providing access to the benefits of technological changes equally among the members of society to avoid creating or enlarging the already existing gaps between them. It comes from the point in which it is

believed that everyone should have the same opportunities no matter their status (Smart Urban Intermediaries, 2018).

In the last years, authorities worldwide have shown increased interest in introducing smart solutions in their municipalities, as a part of Smart City, with the primal focus on technological advances improving urban infrastructure (Wirtz et al., 2021). The Smart City has become one of the new, modern ways to tackle issues present in the urban space and provide opportunities for citizens. Although technological progress has changed people, the speed of societal change has not matched the one of industrialization, resulting in remaining problems in this regard (Asteria et al., 2020).

When it comes to a social perspective, the Smart City can provide a vast number of social innovations concerning different areas of life. Technology potentially has an impact on living conditions regarding very physical aspects of living, such as home equipment, health services and transportation, but it can also affect the humanity aspect of cities. Therefore, digital social innovation addresses the benefits technology has on the relations between human beings and values, which can be taken into consideration by the authorities of cities pursuing such changes. Social innovation in the Smart City tries an approach towards empowerment of people through technology and, at the same time, changing their lives and

interactions within the city as opposed to a corporate-centred approach with a focus on the corporate image of a city (Bokolo, 2020; Smart City Hub, 2021).

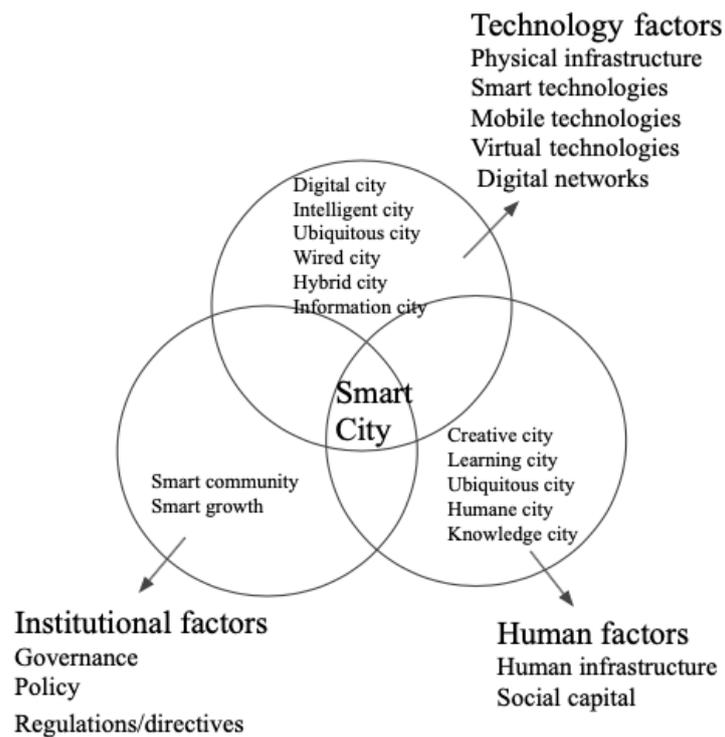


Figure 3: Smart City Components

Source: Nam and Pardo, 2011

Social innovations affect the relations and behaviours of society members; they increase the participation of citizens in the city's life and their influence on decisions that are being made in this regard by the authorities governing the city. Actions that are being conducted take into consideration social structure and

interactions and promote policies that can affect the social issues, for example, through redistribution policies or other programmes. In the case of Smart Cities, the main aspect that is being described concerns technological innovation. However, there is no disparity between social and technological innovation, and the state can pursue both in a mutual connection. Both factors can be linked together and change the conventional Smart Cities into Human Smart Cities in which technological solutions benefit all the members equally (Kim et al., 2021).

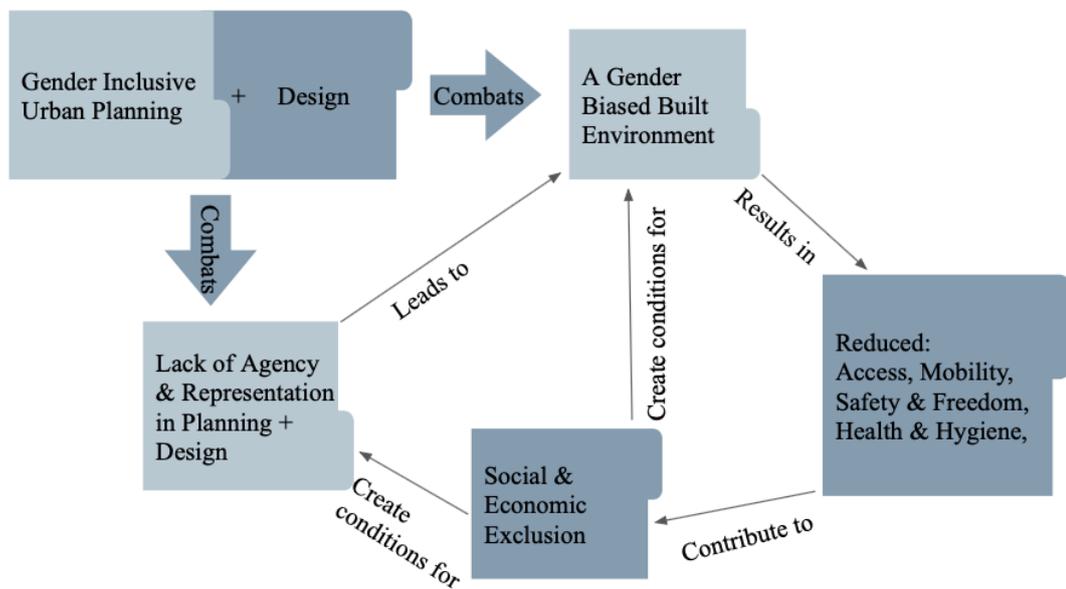


Figure 4: Conceptual framework of gender and urban design relation.

Source: World Bank, 2020

Smart City is a place where innovations are constantly being created and implemented in order to improve living conditions. New technological solutions and changes serve the purpose of answering the needs of citizens as well as addressing the issues that the city was struggling with. They also implement changes in order to pursue a sustainable and environmentally friendly way of living and bring less burden to nature. All of those changes are supposed to serve society and build new, connected cities in which everyone lives a better life. Therefore, when pursuing such a vision, it is important to remember that a city will not offer better living conditions until everyone can have access to those improvements and benefits that technology brings about. Social innovation is a mean of addressing the inequalities and social problems visible in the today's cities to create a humane living space because everyone should have a right to access basic living conditions and face the same chances and opportunities as other citizens even if they are coming from disadvantaged backgrounds (Smart City Intermediaries, 2018; Kim et al., 2021). Smart Cities have an opportunity to improve the situation in cities struggling with urban problems in various areas through the introduction of a smart environment, smart mobility, smart people, smart living and smart governance (Asteria et al., 2020).

1.2 Research Problem

The following describes urban issues in regard to the gender perspective:

- a. Gender blind urban planning,
- b. Limited participation of women in cities,
- c. Gender dimension of problems faced by citizens (Sangiuliano, 2015).

Problems faced by women in the urban space can be divided into four dimensions due to their characteristics, and those are related to public services, public space, governance and participation (as shown and described in Table 1).

Table 1: Dimensions of discrimination in the cities

Category	Description
Public services	Problems with accessing services, safety issues, lack of adjustment for needs, different patterns of use not answered (e.g., mobility)
Public space	Lack of adjustments for needs, safety issues, dominantly men-focused space, limited access to urban spaces
Governance	Minority on decisive positions, minority in politics and city ruling, lack of gender perspective when making decisions
Participation	Lack of community inclusion and participation, women as less active community members

Source: Sangiuliano, 2015; Chant, 2013; URBACT, 2019a

One of the goals that Smart City pursues is applying a sustainable, inclusive growth model, and solving emerging problems, with the use of technology. The concept of sustainability in cities is broad and covers economic, social and environmental aspects (Asteria et al., 2020).

Social innovations require collective actions and cooperation of the agents involved to create a common good and improve living conditions for everyone. Regarding Smart Cities, social innovation can be achieved by providing platforms for interaction between citizens where they could socialize. Moreover, technology can facilitate market matching and exchanging information, bringing benefits for all the involved parties. Thirdly, it can address the existing inequalities and design solutions tailored to them. Social innovation can be an answer to problems that market and government failed to solve through their conventional actions, as the social situations of citizens is not always a priority factor for those institutions (Kim et al., 2021).

Moreover, Smart City governance is focused on citizens' needs and their evaluation. Smart City facilitates the use of new technologies, innovations and policies in order to battle the challenges arising in cities more effectively. Due to the opportunities and potential brought about by Smart City, it can be assessed that it could be successful in introducing solutions to gender inequality issues in those urban areas.

1.3 Purpose of the research

The following are some examples of studies that have been conducted and have shown the potential of including gender equality agenda in Smart City planning:

Nesti (Nesti, 2019) argues that although citizen inclusion is a part of the Smart City agenda, gender inequality issues in the urban space are not addressed by the existing literature on this topic. Her paper addresses possible areas of intervention to reduce gender problems prevailing in Smart Cities and tries to identify the main challenges regarding the application of gender equality strategies. According to Sangiuliano (Sangiuliano, 2015), there is not enough attention paid to gender aspects of innovations and Smart City discourse. Authors argue that especially sectors of mobility and transport and policy interventions concerning them could pose as an example of integrating gender issues and Smart City. Another study (Schiebinger, 2014) discusses the importance of gendered innovations and gender analysis in stimulating new ideas, knowledge flows and technology solutions as well as opening a space for further research in this area. Martin (2020) also highlights that Smart City's agenda is getting increasingly popular, and more and more cities are being built to provide better conditions for citizens with the solutions brought about by technological advances. However, many of those initiatives do not implement a gender-sensitive approach, therefore not only tackling but also reinforcing already existing problems. As they possess the

resources and innovative technologies, more effort should be put into integrating them with the gendered approach.

Furthermore, research in the field regarding fighting gender-related issues in the cities can be relevant for Smart City governance institutions and public officials, policy analysts and policy makers, politicians, and researchers interested in the further study.

1.4 Research Questions

- How can Smart Cities address and challenge existing gender issues in the urban areas (in the public space and services)?
- Why is Smart City potentially better suited for successfully introducing solutions for gender inequality issues (in the public space and services)?

1.5 Originality

The vast majority of studies concerning the topic of Smart City show an interdisciplinary approach, which includes a wide variety of issues discussed. However, still, gender inequality in a city is not broadly covered. Although gender equality has become an increasingly popular research topic, also included in the social innovation mainstream, it is not yet visible in the Smart City discourse. Therefore, more focus should be put on that side of the study (Nesti, 2019).

Considering the above aspects, dimensions for promising research in this area are the following:

- **Gender Equality Agenda:** although a lot of research is focused on the Smart City topic, in an interdisciplinary debate on smart cities, a specific gender dimension is not fully taken into consideration;
- **Sustainability:** gender equality and participation of women in decision making is included among the sustainability goals that a Smart City pursues for sustainable, inclusive growth;
- **Social Innovation:** innovation studies and practices share a normative frame of understanding which needs to be challenged to improve the wellbeing of citizens of all genders; Smart Cities aim to empower its citizens and combat social problems.

Moreover, the relevance of gender equality in the case of Smart City design could become one of the indicators of inclusiveness. Considering Smart City's approach towards inclusive growth and offering equal opportunities for its citizens, there is a need for more gender-related research to be conducted in this area (Sangiuliano, 2015).

Chapter 2. Literature Review

2.1 Literature reviews

This chapter provides an in-depth review of previous studies regarding the topic of the research – gender issues in the cities in relation to the Smart City agenda. The chapter is divided into four sub-categories, each focusing on a different area – gender issues occurring in cities, the concept of sustainable urbanization, social innovations aspect and discovering the gender context in the Smart City.

2.1.1 Gender Issues in Cities

Although many papers have discussed new opportunities women have gained as a result of urbanisation, being a catalyst for female empowerment (Bolzendahl et al., 2004; Chant, 2013; Chant & Sweetman, 2012; Evans, 2018; Hickel, 2014) and compared the situation to rural areas characterized by much slower social changes (Chhoeun et al., 2008; Elmhirst, 2002; Monkman et al., 2007; Bock, 2015; Zhang & Gao, 2014), the problems for women in cities in the 21st century have still been identified. Urban study researchers have published numerous studies on the presence of gender disparities in the cities. Feminist urban studies have tackled the issues regarding gender relations and their evolution in urban spaces throughout history, gender-blind urban planning and issues faced by women in

cities, power disparities between the genders and social engineering and policy's relevance in promoting equality in the urban space.

Scholars focusing on the gendered paradigm in cities also highlighted that the urban design is predominantly male and exclusive towards minorities (DeSena, 2008; McDowell, 1999; van den Berg, 2017). According to Chant (Chant, 2013), regardless of the opportunities and freedoms gained by women in the last decades, gender inequality issues are still persistent in today's urban areas. Van den Berg (van den Berg, 2017) refers to the gender revolution's impact on women's positions and spatial relations, which were affected by women's empowerment in the second half of the 20th century. She states that with the changed engagement of women in society, their urban lifestyle patterns also transformed with new challenges emerging along the way.

The problems faced by women in the urban space have few dimensions. Women are more likely to experience challenges in the urban lifestyle as well as a higher risk of becoming victims of violence. In the city, female citizens are prone to being sexually harassed, robbed or killed. Another aspect regards public space, mobility and connectedness. Women have more limited access to urban spaces than men, face challenges with transportation due to different commute patterns than men – relying more on public transportation and taking multi-stop trips, and

have additional needs related to taking care of other family members – children or elderly. Women tend to do most of the household's unpaid and reproductive work, which also affects their time spending and lifestyle. It tends to be omitted and undervalued that apart from having a full-time job, women also engage in additional work, which is fundamental for the community. However, they face hindrances in conducting those tasks and are offered fewer opportunities (Chant, 2013). URBACT (URBACT, 2019a) also groups problems faced by women in the cities and identifies the following categories: representation and participation, governance, economic equality, public services, planning and public space, and lastly, migrant integration.

According to Chant (Chant, 2013), there are also visible relations between power, gender, and urban poverty. Citizens' activity and participation in the community's life influence their prosperity and are connected to gender. Women are found to be less active in engaging in the city's activities and are in the minority when it comes to holding decisive positions in local government. Although there has been an increase in the number of women in politics over the years, the majority of municipalities are still ruled by mostly male authorities.

2.1.2 Sustainability

Sustainability is a concept of using resources for current needs, considering the future generations and environmental state so that it does not get destroyed by over-exploitation (Giovannoni & Fabietti, 2013; Goodland, 1995; Jamieson, 1998; Lubin & Esty, 2010). Sustainable development is defined as a process connecting socio-economic areas, considering ecological balance and environmental protection (United Nations, 2021). Since the 1980s, researchers have been exploring a connection between sustainability and women, including the influence of gender on resource management. Also, a branch of ecofeminism emerged, pointing out the relation between women and nature and comparing the oppression of women to that of the natural environment (Cruz-Torres & McElwee, 2012; Meinzen-Dick et al., 2014).

Sustainability has been promoted by numerous international organizations and NGOs, including the United Nations, which has published the Sustainable Development Goals agenda and picked areas in which countries should put efforts to develop in order to achieve a more sustainable and inclusive society. One of the goals identified by the UN is achieving gender equality when all girls and women will be provided with equal opportunities as their male counterparts (United Nations, 2021).

Meinzen-Dick et al. (2014) argue that there is a distinctive connection between sustainability and gender; however, most initiatives concerning the promotion of sustainable development fail to address the social issues regarding disparities between men and women. The paper also states that authorities are gender blind and more prone to cooperating with male representatives, strengthening the inequalities. According to Martine and Villareal (1997), gender relations have the biggest impact on sustainability at the local level.

Sustainable urbanization is an aspect of the broader sustainable development agenda. In order to decide whether a city is sustainable, measures have to be taken to assess whether the sustainable development principles are being met (Shen et al., 2012). Sustainability in relation to the city explores different economic, social and environmental aspects, such as community participation (Hassan & Lee, 2015; Egger, 2006; Rees, 1997). A sustainable city involves all the members of society, including women, in its urban planning and management practices (Asteria et al., 2020; Cruz-Torres & McElwee, 2012).

2.1.3 Social and Gendered Innovation

The contemporary study of innovation has a broad and multidimensional scope, with research on social aspects gaining popularity (Alsos et al., 2013). Social innovation has already been a matter of research for some time and is not a novice. Its objective is to address the issues and improve the state of communities and

involves, apart from innovative solutions' implementation, the empowerment of groups in the society (Astheria et al., 2020). According to Johnson Ross and Goddard (2015), the key characteristics of socially innovative changes include: newness, addressing a social need, translating it into practice, engaging and mobilising stakeholders and transforming social relations.

As the studies focus on social problems, including inequalities in society, the term gendered social innovation has emerged in recent years to highlight the goal of applying innovative solutions for targeting gender discrimination. Lindberg (Lindberg, 2016) analyses a trend of applying social perspective to innovation policies, its contrast with purely technological innovation, gendered approach, and its potential to disrupt existing gender structures. Several other papers also explore the gendered dimensions of social innovation (Alsos et al., 2013; Danilda & Granat, 2011; Lindberg, 2012; Lindberg et al., 2015; Ranga & Etzkowitz, 2010). Schiebinger (Schiebinger, 2014) studies the aspects of applying gender and sex analysis to the broader research context. According to the paper, more knowledge can be stipulated and technological solutions targeting those areas developed through this application. "Gendered Innovations" have the potential to increase the level of creativity, innovations and gender equality. The author presents possible methods of applying gender analysis and gives examples based on case studies. On the other hand, Alsos et al. (Alsos et al., 2013) state that although it

has been around 20 years since gender and innovation studies emerged, the literature on the topic is scarce and lacking and therefore overlooked.

2.1.4 Smart City Context

Multiple research papers have highlighted the importance of a gender-sensitive approach in the current increasingly popular topic of Smart City, simultaneously criticizing the lack of such focus in this interdisciplinary area (Giffinger et al., 2007; Nesti, 2018; Nesti, 2019; Sangiuliano, 2015). Giffinger et al. (2007) state that all the main components of Smart City and its policy are affected by gender relations. Nesti (2018) argues that due to cultural and tradition aspects, existing inequalities can be reproduced in the newly established Smart Cities, negatively affecting their communities' overall prosperity and disadvantaging women.

Nesti 2019) provides a complex literature review on the topics relevant to gender equality in smart city governance and lists the percentage of presence. The paper groups literature into three categories:

- **1st category:** need to involve women and women associations in the governance of smart cities (e.g., by participation in local institutions) (5 out of 25 papers),

- **2nd category:** opportunities associated with smart technologies (e.g., IoT, connectivity, smartphones and applications) in designing products and services for women (6 out of 25 papers),
- **3rd category:** importance of considering gender as a variable influencing habits and the fruition of services (e.g., education, gender roles, culture, patterns, technology adoption) (12 out of 25 papers).

Sangiuliano (2015) argues that Smart City discourse is an interdisciplinary debate which involves a variety of dimensions involving smarter urban planning agenda; however, it happens to not pay enough attention to one of the inclusiveness factors – gender equality. The author points out a few relevant points associated with the importance of gender study being applied to the urban innovation agenda, including women’s representation in local politics, female professionals in the ICT sector and gender digital divide, gender blind innovation and smart solutions, low participation of women in the community and civic consultations in regards to smart city projects, gendered nature of problems modern society struggles with, and finally, gender and social innovation discourse. The researcher also gives examples of possible interventions regarding the mobility sector and policy interventions.

Nesti (2019) also argues that since inclusion and sustainable development are some of the goals that are being pursued within a Smart City agenda, more focus should be put on the issues concerning gender equality and an increased number of initiatives providing equal opportunities for the citizens should be implemented. She further elaborates that with the use of new technological solutions such as ICT, local authorities can involve citizens in actively participating in the community's life. It is also stated that gender-sensitive policy should be integrated into the smart strategy. The paper suggests that promoting a gender-sensitive approach within Smart City governance would have positive effects on the overall quality of answering civic needs and, therefore, their wellbeing, efficient allocation of public resources and legitimacy. It highlights the importance of smart technology integration in specific policies pursuing reducing the gender gap.

Martin (2020) also highlights that a Smart City's agenda takes into account providing equal opportunities for all citizens; however, it tends to omit the gendered aspects of such declarations. The study criticizes the passiveness of Smart City initiatives, mostly located in the Asian-Pacific area, and failing to use technology and resources' potential to tackle gender issues.

The dimensions of the studied literature are presented in Table 2.

Table 2: Reviewed literature

Category	Papers	Comment
Gender Disparities in Cities	Bock, 2015; Bolzendahl et al., 2004; Chant, 2013; Chant & Sweetman, 2012; Chhoeun et al., 2008; DeSena, 2008; Evans, 2018; Hickel, 2014; Elmhirst, 2002; McDowell, 1999; Monkman et al., 2007; URBACT, 2019a; van den Berg, 2017; Zhang & Gao, 2014;	Urbanisation's role in bringing social change and decreasing disparity Gender inequalities persevere in urban space, characteristics and factors influencing the situation
Sustainability, Gender and Cities	Asteria et al., 2020; Cruz-Torres & McElwee, 2012; Egger, 2006; Hassan & Lee, 2015; Giovannoni & Fabietti, 2013; Goodland, 1995; Jamieson, 1998; Lubin & Esty, 2010; Martine & Villareal, 1997; Meinzen-Dick et al., 2014; Rees,	The connection between sustainability and women's studies Sustainable urbanization as a part of sustainable development agenda

	1997; Shen et al., 2012; United Nations, 2021;	
Social and Gender Innovations	Alsos et al., 2013; Danilda & Granat, 2011; Johnson Ross & Goddard, 2015; Lindberg, 2016; Lindberg, 2012; Lindberg et al., 2015; Ranga & Etzkowitz, 2010; Schiebinger, 2014;	Goals and approach of social innovation Innovative solutions targeting existing gender issues
Smart City and Gender	Asteria et al., 2020; Giffinger et al., 2007; Martin, 2020; Nesti, 2018; Nesti, 2019; Sangiuliano, 2015	Integrating a gender-sensitive approach into smart cities governance Technology's role in bridging the gender gap. Technology applications in gender-sensitive perspective Smart cities pursue goals including solving urban problems, climate change solutions and social inclusion; Social innovation in smart cities includes targeting challenges in women's access and participation in community development

As indicated by the previously mentioned authors and presented by the literature review of previous research in the Table 2, there is a gap concerning studies of smart city solutions to discrimination which the following paper aims to address.

Chapter 3. Methodology

3.1 Methodology

The approach for conducting this paper's research is discussed in this section. This paper aims to assess the overall potential of Smart City to integrate a gender-sensitive approach through smart solutions targeting gender inequality-related issues in the urban spaces. The analysis of such an approach is discussed based on the examples of already introduced innovative solutions in several cities worldwide.

This paper follows a multiple case analysis approach as well as systemic literature review. Rationalizing the methodology choice, thorough study of the mentioned method had been conducted, examining previous literatures on it. The method has been studied and described in detail in the previous works of scholars, especially Merriam (1998), Yin (1981, 1984, 1994, 1999, 2003, 2005, 2014) and Stake (1978, 1994, 1995, 2005, 2008). Case study has been named as one of significant strategy in the qualitative research field and separated from other methods (Crotty, 1998; Hatch, 2002; Martens, 2005). The study mostly follows Yin's approach to conducting a case study with a comprehensive outline of case study design (Yin, 2014).

3.2 Research Design

This study aims to find similarities between the cases and the potential for broader implementation of smart solutions to gender inequality problems in the cities.

The methods used in this paper include a literature review of Smart City's approach to gender disparities and analysis based on multiple case studies for the gender issues solutions in cities with a comparison with each place, considering distinctive characteristics such as the country's development, gender inequality status and location. The intention is to discuss the solutions, and their "smartness" and assess the potential for broader implementation with the opportunities provided by Smart City. The study collected the data through literature, research papers, governments' and cities' websites and international reports. The case study analysis particularly focuses on the solutions implemented in public spaces and services.

The multiple case study analysis approach has been selected due to its advantages, including complex explanations of issues set in real-life settings, naturalistic design, bounded context of phenomenon, and case selection-related opportunities for the research (Yin, 2014).

Table 3: Case Study approach relevance in the research

Case Study Approach	Research Relevance
<ul style="list-style-type: none"> ● Selecting the cases ● Collecting the data ● Analysing and interpreting 	<p>Cases from cities that introduced solutions targeting gender inequality issues</p> <ul style="list-style-type: none"> - selection, - analysis of introduced solutions, - comparison, - establishing Smart City relation, - analysing the potential for broader implementation, - confronting alternative explanations and limitations.

Source: Yin, 2014

Multiple case design has been chosen for this research as it is a method commonly used in innovation studies. Due to the number and diversity of existing solutions targeting gender issues in the cities and the complexity of the subject to specify the research objective, cases regarding public space and public services have been selected as a base for the study.

Moreover, in order to rationalize, connect and interpret the findings from analysed cases, this paper follows theories on sociospatial relations. They focus on

understanding the processes transforming relations and their dynamics within a given space/time/time-space. Those theories look into understanding interrelations within urban social spaces and their multidimensions (Jabareen & Eizenberg, 2020).

3.2.1 State of the Art Study

The study began the investigation with the review of previous literature, documentation and reports and data collection regarding the cases. It has also addressed additional information concerning case characteristics – development level and gender equality state. The following are the steps that have been taken in preparation for the study:

1. Overview of literature, documentation, archives and reports
2. Data collection concerning cases
3. Screening, analysing and selecting the right cases for the study
4. Further analysing selected cases
5. Findings, discussion and confronting limitations

3.2.2 Data collection regarding gender inequality in selected cases

The gender Inequality Index (GII) is a tool allowing measurement of gender inequality based on three areas in human development – reproductive rights,

empowerment and labour market status. GII can be used to assess the position of women in a given country, show gender gaps, compare with other states and propose policy changes and interventions targeting the problems (United Nations Development Programme, 2022).

A motivation for this analysis is that the differences in characteristics, including gender inequality status (indices) in chosen countries, may have a role in explaining the motivation for introduced solutions and their uptake. The selected and later described 10 cases have been chosen from 9 countries of 3 different continents with various states of gender equality. The chart below presents the measures of the gender inequality index (GII) retrieved from the UN database in the locations of: Sweden, Austria, Spain, South Korea, Japan, Mexico, Argentina, El Salvador, and Colombia. The measures are shown from the smallest (the most equal) to the highest (biggest inequality). The data suggests that the most equal are the countries situated in Europe, followed by Asian highly developed states, and then the Latin countries experiencing much more significant disparities (UN data, 2020).

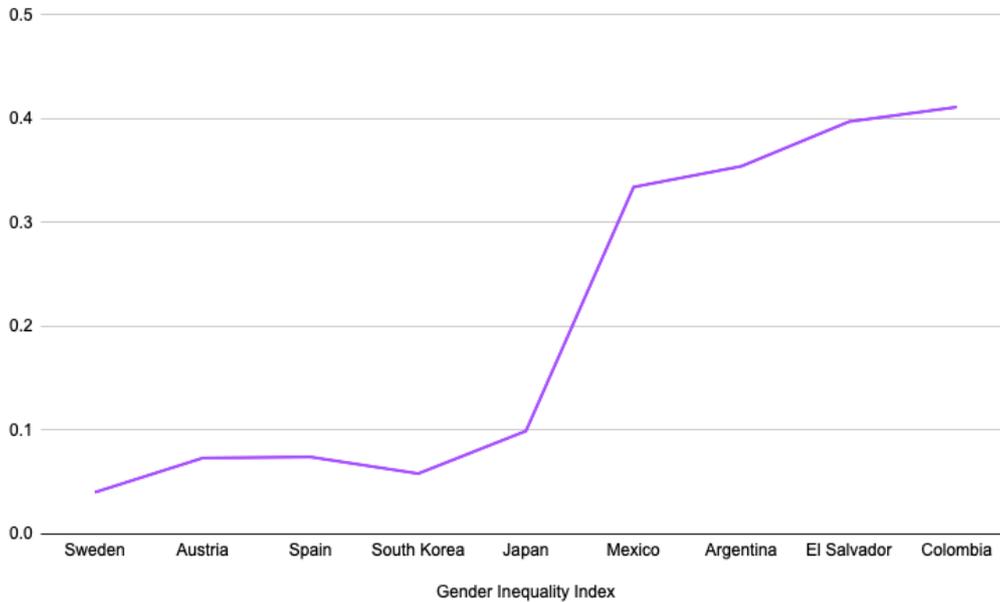


Figure 5: Gender inequality index in chosen cases

Source: Based on UN data, 2020

Moreover, the gender equality situation differs in relation to the country's development, with less developing countries experiencing higher levels of gender disparities (Jayachandran, 2014; Muralidharan & Sheth, 2013; Mammen & Paxson, 2000; Fernandez, 2014). Therefore, to better understand the characteristics of cases, data regarding the development of each location has been studied. According to international organizations, countries from the studied 9 cases can be categorized as either developed – Europe (Austria, Spain, Sweden) and Asia (Japan and Korea) or developing – Latin America (Mexico, Argentina, El Salvador, Colombia) (United Nations, 2020; The World Bank).

3.3 Design and Architecture

3.3.1 Cases selection and criteria

This section discusses the process of selecting the right cases for the research. Based on the research's objective, having analysed gathered information about diverse solutions to gender inequality problems in cities, 10 cases have been selected for the study. Regarding desired features of cases, that is, public space/services relevance and technology's role in implementation, cases in three regions, Asia, Europe and Latin America, have been selected. The data collected through those ten cases aims to explore the potential of integrating gender-sensitive approaches within the Smart City.

3.3.2 Cases

This section covers the cases selected for the study. Ten cities' solutions have been chosen for the study: Umea, Vienna, Madrid, Barcelona, Sejong, Nagareyama, Mexico City, Mendoza, San Salvador and Bogota. Implemented solutions in the given cities have been divided into categories regarding safety, transportation, public space, access to services and awareness. The cases are presented in Table 4, grouped into regions and presenting the measure of gender inequality indices in the presented countries.

Table 4: Selected cases

Region	Municipality	Gender Inequality Index	Category
Europe	Umea, Sweden	0.040	Safety, transportation, awareness, public space
	Vienna, Austria	0.073	Safety, access to services, awareness
	Madrid, Spain	0.074	Safety, transportation
	Barcelona, Spain	0.074	Safety, transportation, awareness
Asia	Sejong, South Korea	0.058	Safety, access to services
	Nagareyama, Japan	0.099	Transportation, access to services
Latin America	Mexico City, Mexico	0.334	Transportation, safety
	Mendoza, Argentina	0.354	Safety, transportation, public space
	San Salvador, El Salvador	0.397	Safety, transportation
	Bogota, Colombia	0.411	Safety, transportation, access to services

Source: Smart City Sweden, 2022; City of Umea, 2022a; Smart City Sweden, 2020; Hundson, 2018; URBACT, 2019a; Tyrens, 2016; City of Umea, 2022b; City of Vienna, 2013; European Charter for Equality of Women and Men in Local Life; Challaby, 2017; URBACT, 2019b; World Bank, 2020; UN Women, 2018;

Garnham, 2017; Tzvetozar, 2021; Libertun de Duren et al., 2018; City of Barcelona, 2017; Women4climate, 2022; Smart City Korea, 2019; Chang et al., 2022; Sejong City, 2017; City of Nagareyama, 2010; Mexico City, 2022; World Population Review, 2022; Reuters, 2018; UN Women, 2016; Mendoza City, 2022; City Population, 2019; Kounkuey Design Initiative, 2018; Dekovic, 2019; The District Secretariat for Women in Bogota, 2020; Lam, 2021; Bogota City, 2021; UN data, 2020

The qualitative research design of multiple case study analysis aims to understand the phenomena in a context-specific setting. Therefore, in this research, the study focuses on those 10 cases described as follows:

Umea, Sweden

Umea is a Swedish city of 130.000 inhabitants. Its governance focuses on the importance of social sustainability and inclusiveness in urban planning (Smart City Sweden, 2022; City of Umea, 2022a). Umea has been implementing a gender-sensitive approach since the 1980s and has gained international recognition for its efforts and a position of a leader in equal urban development in Europe. The municipality, in its operations, has introduced a set of solutions targeting gender disparities in different areas. According to the Gender Equality Office of Umea, the city integrates a gendered approach to everything related to urban planning and infrastructure. First of all, the city recognizes and addresses safety issues and concerns of its female citizens by implementing a gender

approach in urban design – improving lightning, safety conditions, building infrastructure with a sense of security, e.g., new tunnel for bicycles and pedestrians (Smart City Sweden, 2020; Smart City Sweden, 2022). Another example of changes introduced by the municipality regarding transportation and mobility concerns the introduction of more transportation connections, such as new railway lines, which allowed the citizens to commute to their workplaces more easily, especially women who constitute the majority of commuters increase (Hudson, 2018). Moreover, during the winter season, the city collected and conducted a deep analysis of its citizens' transportation patterns to introduce an innovative snow-clearance system. Having analysed the data, they found out that women are the first to use roads in the morning, not always in cars, but often on bikes and commuting to conduct caregiver duties. Based on this analysis, the authorities decided to prioritize clearing the snow from bicycle lanes used by women and then proceeding with roads. The decision was dictated by providing better mobility conditions and meeting female citizens' needs (URBACT, 2019a). When it comes to girls' and women's participation in the public space, Umea collaborates with female organizations in the city to analyse their female citizens' needs and expectations and adjust public spaces to them, e.g., Freezone park (Frizon), which was designed as a meeting space for girls. The company responsible for the project, Tyrens, held a workshop for girls to listen to their experiences and ideas on building a sphere for them and then implemented them

in the construction process, creating a secure, open, adaptable, and “free from expectations” zone (Tyrens, 2016). The city also puts effort into sharing awareness of gendered paradigms in the city. The authorities have also launched a program “the gendered landscape of Umea,” which shows the importance of gender equality in the urban space, presenting practices and changes brought by them in the city and discussing the challenging areas. The initiative shares information on power structures within cities and their influence on city planning and shows the result of gender-sensitive approach introduction over time (City of Umea, 2022b; Smart City Sweden, 2022).

Vienna, Austria

The Austrian capital has been a pioneer in implementing gender-sensitive approaches and has introduced it as early as 1991 – starting with an exhibition regarding women in cities and public space, which initiated the discussion about city planning with a focus on gender differences. The women’s office of the city was set up a year later with the objective of inclusive city design. The city’s goal is to provide a positive change and meet its citizens' needs (City of Vienna, 2013; European Charter for Equality of Women and Men in Local Life). Having incorporated gender perspective into its planning, Vienna introduced several solutions targeting gender issues in the city and conducted more than 60 projects concerning gender mainstreaming for urban design practices. In order to

understand different patterns of functioning in the city of men and women, the authorities have conducted studies by gathering gender-related data (e.g., surveys on gendered transportation use, sociological analysis of boys' and girls' access to play spaces). Then, the gender-differentiated analysis was integrated into all consecutive projects regarding planning new infrastructure. Based on the data analysis, the city was able to identify key differences and needs of citizens and then introduce new solutions (Challaby, 2017). In order to bring a change in citizens' daily life, the municipality has introduced changes regarding providing a better lightning system on streets and in the parks, improving accessibility for women and girls to shared spaces and playgrounds, widening sidewalks and re-timing street crossings, creating new paths for the most common routes connecting, e.g., apartment buildings with schools, improving safety features in residential areas and alleys, enabling access to transportation, changing criteria for public buildings' design (URBACT, 2019b). The city has been continuously sharing awareness regarding gender equality by funding programs, training, and introducing guidelines and manuals for public sector employees (World Bank, 2020).

Madrid, Spain

Madrid is one of the cities participating in the UN's "Safe Cities and Safe Public Spaces Global Programme Initiative," which targets sexual harassment and

violence against women. It especially highlights the need to solve problems in public spaces and transportation (UN Women, 2018). The authorities have introduced a 'Plan International' initiative consisting of gathering and analysing the data on the situation and then making a positive change – make the city safe and inclusive (Garnham, 2017). Due to women's safety concerns, Madrid created 'puntos violetas' violet stands present in neighbourhoods, parties, and festivals as a refuge for people feeling unsafe. The city has also been spreading awareness about gendered violence through campaigns and in setting up 'equality spaces'. Madrid has also launched a platform where women can point to areas where sexual harassment incidents have been happening using maps and crowdsourcing. Participating in the "DIVERCITY" project, the city has also introduced a mobile application for improving community participation of women (URBACT, 2019a). Another way of improving safety was by studying women's transportation patterns and introducing on-demand stops to reduce their journey and easily and safely get home (Tzvetozar, 2021). Finally, to bring a social change, the city launched a map showing alternative tourist spots highlighting women's role in Madrid's history (Libertun de Duren et al., 2018).

Barcelona, Spain

Barcelona is another Spanish city with a gender-sensitive approach to urban planning (City of Barcelona, 2017). In 2016 the city introduced a Plan for Gender

Justice concerning four areas: institutional change, economy, city of rights, and liveable neighbourhoods. The city has launched solutions regarding conducting safety audits in districts, improving bus network, analysing gendered data on mobility patterns and needs to incorporate new public-transport services as well as sustainable transportation for all, incorporating a gender perspective in other ongoing projects, and sharing awareness through training, manuals and experts control (Women4climate, 2022).

Sejong, South Korea

Sejong city is a part of the national pilot smart cities in South Korea (Smart City Korea, 2019). Sejong is divided into districts, which differ in introduced initiatives. District Saerom-dong was planned as a “Special designed zone for women,” offering an urban environment planned in accordance with a gender-sensitive approach. The first focus was on safety and building spaces preventing risks for women. Sejong highlights that safety is one of the city’s main objectives and promotes the creation of a safe local community. Apart from introducing a women-friendly policy, the city has also introduced social safety devices (such as emergency bells connecting video and audio) for public spaces and infrastructure, decreased the distance to transportation stops, implemented more streetlights, and improved monitoring system using smart solutions. Secondly, the city focuses on providing easy access to services, with schools, stores and other facilities located

close to residential areas. The area was designed to comfortably access the necessary locations and have a clear vision of the surroundings for increased safety (Chang et al., 2022; Sejong City, 2017).

Nagareyama, Japan

Nagareyama is a 180.000 citizens city located near Tokyo, in Chiba Prefecture (City of Nagareyama, 2010), which advertises itself with a slogan: “Think Motherhood, Think Nagareyama”. Due to its declining population and fiscal issues, the municipality decided to introduce innovative urban solutions for women and young families to change the negative trend. The city has launched a series of projects and initiatives aiming to create a family-friendly and women supporting environment. First, Nagareyama focused on improving the transportation system and introducing a child drop-off/pick-up centre to save parents’ time. Parents could then bring the child there, and it would be transported to a day-care by bus or train. Moreover, the city introduced a marketing department to advertise its services to young parents deciding on a place to live. Especially, the city highlights the opportunities working parents have in Nagareyama, as well as their children when it comes to education. The authorities conducted a study regarding women’s needs in the city and decided to integrate the findings into their management of the city. Apart from the mobility system, they also have improved access to services within the city and provided additional

opportunities for working women, such as public working spaces (Libertun de Duren et al., 2018).

Mexico City, Mexico

Mexico City is the capital of Latin state Mexico with almost 9 million citizens (Mexico City, 2022; World Population Review, 2022). The city has been struggling with gender disparity issues, especially regarding sexual harassment and violence against women. In 2018, Mexico City's transportation system, used daily by 5.6 million people, has also been voted the most dangerous for women out of most commuting cities. The women admitted that assaults were happening very often and did not feel safe (Reuters, 2018). In response to the state of public transit in the city, authorities, in collaboration with women's organisations, introduced solutions to improve women's safety. In 2000 they introduced Pink Transportation – means of transport dedicated only for women, children and the elderly, in the form of divided subway carriages and special buses (World Bank, 2020; UN Women, 2016).

Mendoza, Argentina

The Argentinian, almost 2 million population city, is the capital of the Mendoza region in the west of the country (Mendoza City, 2022; City Population, 2019). The city has collaborated with the Kounkuey Design Initiative (KDI), the World

Bank and the Argentine Ministry of Interior on initiatives regarding designing cities to fit the informal settlements and provide opportunities for women and girls in the public spaces. They have prepared reports regarding gender within the urban space and worked on activities such as walk audits, daily life tours and surveys studying the patterns of women in cities. Based on the insight from such experiences, women were then involved in designing concept plans for spaces answering their needs. Those projects included improving lightning systems, widening walking paths and crosswalks, and introducing solutions for women's safety and mobility (Kounkuey Design Initiative, 2018). The project involved introducing gender-inclusive plans for redesigning public space – starting with Plaza Aliar, involving citizens in determining and shaping the urban space around them and voicing their needs to the authorities. The community prepared plans to redesign Plaza into a multifunctional service centre, integrating existing spots with answering citizens' needs in the areas of education, culture, politics, transportation, health, recreation and society (World Bank, 2020).

San Salvador, El Salvador

San Salvador is another example of a Latin American city struggling with safety issues, which has introduced pink transportation as an answer to improve women's situation in transit. The developing country of El Salvador is among the countries with the biggest gender inequality issues, with some of the highest rates

of femicides in the region. The public transportation system is a place with numerous sexual harassment incidents happening to women and girls daily; therefore, the pink line introduced a mobility solution operated and used by women to improve their safety. The female-only taxi line is supposed to offer safe and convenient mobility. To increase efficiency, the company has a database with information on frequent clients, as well as introduced guidelines for phone call operators and drivers to confirm their address, the drivers are provided with safety training and cars can be monitored by GPS and tracked. The technology also enables to scan the area, analyse information from location and route tracking, and identifying high-risk areas and the best routes (Libertun de Duren et al., 2018).

Bogota, Colombia

The last of the analysed cases is in the Colombian capital of Bogota. Bogota has implemented several urban solutions in various areas of citizens' life. First, the city has been tackling the problem of people not having access to public spaces and services, which was addressed by improving public transportation infrastructure but did not solve the issue. Women in the city were still not feeling safe traveling and were confined to domestic space, which limited their options and opportunities; therefore, the study regarding women's experience in public spaces and transit was conducted. Then, the city launched a collaboration with an application, SafetiPin, allowing citizens to mark whether they feel safe in the city

and create a crowdsourced map of risky locations. Moreover, the authorities conducted an analysis of risk factors perceived by women in the urban space, such as lack of streetlights and difficulties in access to address them by introducing a solar lights system in the parks (Dekovic, 2019; The District Secretariat for Women in Bogota, 2020). Bogota has also introduced a public policy goal in bringing equality to cycling, answering safety concerns of female cyclers and different patterns of bike trips between men and women, including commuting. The city was also the first example of introducing safety audits in cycling (Lam, 2021). Thirdly, the city has implemented innovative solution for the care system. In Bogota, women disproportionately are affected by traditional gender roles and do most of the chores and unpaid work; therefore, the city proposed in 2020 the District Care System to improve the care services and access to them. ‘Blocks of Care’ and ‘Mobile Care Units’ have been introduced to provide services to those in need, as well as training opportunities and accreditation to those offering care. Finally, the city has integrated the development plan, which would take a gender-sensitive approach into account in all the forthcoming projects and policies (Bogota City, 2021).

Chapter 4. Analysis of Results and Discussion

In order to draw conclusions about the Smart City's potential to integrate gender-sensitive perspectives, the ten cases described in the previous chapter and their characteristics have been analysed. The discussion has been divided into three parts – regarding location characteristics, introduced solutions' analysis, and lastly, arguments for Smart City application.

4.1 Gender equality and the country's situation

The study covers ten cases from locations with different characteristics regarding development and gender equality. More than half of the cases are from developed countries – Europe and Asia; the remaining are developing Latin American states. All European cases described are located in the European Union member states and are the leaders regarding gender equality – with the lowest inequality measure meaning that women in those states face fewer problems due to their gender. They are followed by Korea and Japan, both developed OECD countries, with slightly higher gender inequality measures compared to Europe. The Latin American countries covered in the study stand out and have much higher inequality indices than the remaining cases indicating serious problems with gender disparity issues in those countries. Therefore, the GII measures of the analysed cases are

compatible with the hypothesis that less developed states experience more gender inequality.

4.2 Analysis of introduced solutions

The presented research concerned solutions introduced addressing gender issues in cities. Most cases included in the case study analysis regard safety solutions, followed by transportation, access to services, awareness and public space. Safety is a dominant concern for developing countries of Latin America, public space and awareness are a focus for developed European states, and Korea and Japan highlight the importance of design and access to services in the city.

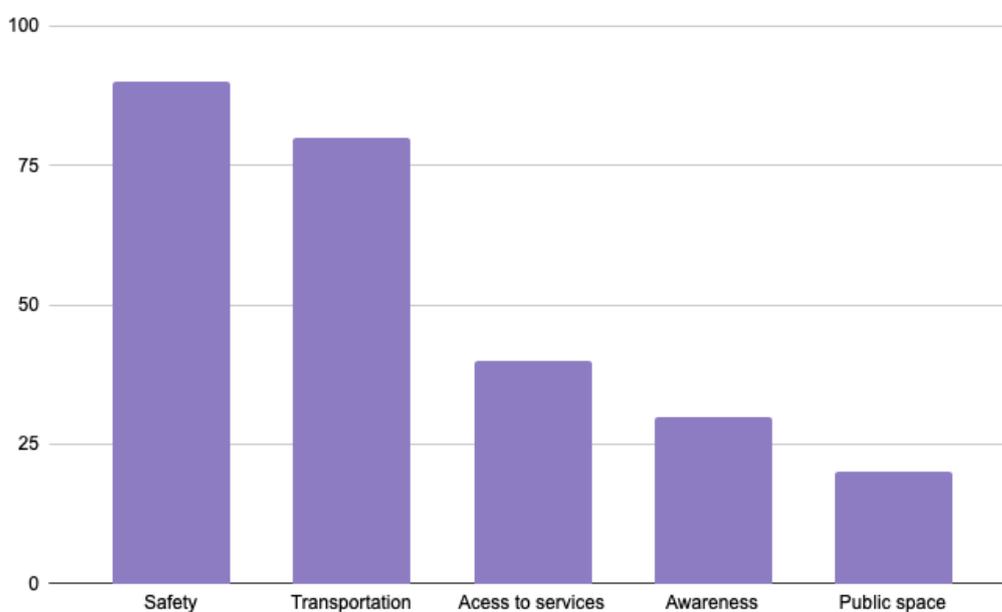


Figure 6: Solutions' categories overview

The analyzed cases show different ways of utilizing technology and innovative approach for addressing the existing gender issues within cities. The municipalities distinguish various areas of actions depending on the specifics of a given location, although there are some common problems targeted by different locations. Improving safety is the main focus in the majority of cases (9 out of 10), and the cities analyzed highlight its importance. Safety is the main concern addressed by the introduction of solutions for women who are endangered in the cities by sexual assaults, attacks, or murders. Latin American countries in the analysis are especially struggling with violence against women, who face harassment in the urban spaces, including the transportation system, and are therefore excluded from various aspects and opportunities of city lifestyle, which incentivizes the introduction of methods for improving their safety. Transportation follows safety as the area of most introduced urban solutions, present in eight out of ten cases. Safety and transportation solutions interpenetrate and address some similar concerns. The relation between the two is especially visible in the cases of Latin American countries, in which pink transportation is a visible trend. Moreover, transportation solutions address different patterns of mobility between women and men, such as the use of bicycle lanes and the purpose of travel, to better adjust the systems within the city to those differing travel characteristics. The data analysis conducted on the mobility patterns has shown some differences between men and women in the functioning of cities in a broader perspective.

Access to services came 3rd as the most introduced solution in analyzed cases. Enabling and improving access to services within the cities is present in 4 out of 10 cases addressing those issues. Designing the city in a way that would offer easy access to services has been a priority for Asian cities, which addressed citizens' needs to improve convenience and as a result, their well-being. Vienna has also launched new routes to shorten the distance between necessary services. Bogota has introduced an innovative way of providing services, using its resources to reach unprivileged citizens. Awareness is mostly a visible concern in the case of the European region. Spreading awareness has been introduced in 3 out of 4 European members of the study. Therefore, sharing information on gender equality has been a priority for countries that already stand out in the inequality index measures as among the most equal ones, unlike the developing countries with bigger discrimination issues, prioritising more ad hoc solutions. The least often implemented solution regarded public space and has been only introduced in 2 cases – Umea and Mendoza. Although the use of public space is correlated to the previous solution – access to public services, the actions concerning strictly designing public zones for the use of women have not been widely introduced in the studied cases.

Furthermore, as for the overview of each of the ten cases separately, the remarks concerning their approach to the gender discrimination issues are the following:

- Umea is a prime example of inclusive and sustainable city, with its governance focused on all of the citizens' needs and considering and targeting existing disparities, creating solutions for women and designing the city in such a way to provide equal opportunities to all. The city listens to its citizens and their needs regarding use of the space.
- Vienna has a long history of implementing gender sensitive approach in its municipality, it has been conducting multiple projects targeting inequalities in different fields, as well as studies to identify to understand existing disparities using the data.
- Madrid has also incorporated data analysis methods and determined safety threats for women in the city to bring about appropriate measures in targeting them. The city has also gained social activity through a platform.
- Barcelona is another European city which has included gendered agenda. The city launched legislation and projects to improve situation in different fields of city life.
- Sejong is a Korean city which created a special zone dedicated to women's needs focusing on their safety and providing easy access to services, using technology for bringing about the solutions.
- Nagarayema prioritizes solutions targeting young families and women with children, improving the access to services, creating supportive environment, and providing additional opportunities for working parents.

- Mexico City focuses on providing safety solutions, targeting transportation system which is one of the main spaces where harassment happens.
- Mendoza studied urban space interrelations and then introduced projects and solutions for their citizens, involving them in the process of bringing about change and consulting decisions with the citizens.
- San Salvador has also focused on making transit system safer for women, and introduced a mobility system which uses a database, route scans and analysis to improve the safety.
- Bogota has launched safety audits and focused on improving the safety for its citizens, as well as increasing the access to services. The city has answered people's needs regarding their daily lives in urban spaces and provided solutions to their concerns.

All in all, the above mentioned cases are examples of how cities can address the existing disparities within their municipality and bring about solutions tailored for each place. Moreover, what makes it more significant is that the cities use technology to facilitate the process, especially when it comes to data collection and analysis, incorporating scans, cctv and other devices or bringing the citizens together and enabling them to share their opinions through platforms and applications.

4.3 Arguments for Smart City applications

Based on the literature review and profound analysis of cases, this paper aims to indicate why Smart City is suited for introducing urban solutions efficiently targeting gender inequalities. To answer that question, the following characteristics of Smart City have been identified in relation to enhancing gender equality:

- Cities built from scratch can be planned more innovatively,
- Smart city technology is capable of helping cities operate more efficiently and gather data more easily,
- Focus on launching new technological solutions which tackle problems present in urban areas,
- Implementing sustainable and inclusive development agenda and policies as well as governance focusing on inclusion and participation.

Table 5: Smart City’s potential in selected areas of urban gender issues targeting solutions

Characteristic of Smart City	Area				
	<i>Safety</i>	<i>Transportation</i>	<i>Services</i>	<i>Awareness</i>	<i>Public Space</i>
Building from scratch	Designing considering safety factors,	Designing considering different mobility	Designing considering easy access to services	Gender mainstreaming policies considered in	Designing considering needs of men and women

	decreasing the distance	patterns and needs, improving accessibility		design plans	
New technologies (including camera systems, radars, sensors, devices, applications)	Improving safety by installing lightning and cameras, applications and devices for women feeling unsafe and for determining dangerous areas	Improving safety in the transit system with cameras and sensors, ICT infrastructure enabling efficiency	Enabling access to services with the use of technology, increasing efficiency and inclusiveness	Sharing information more efficiently, enabling citizens to contribute	Introducing improvements and solutions for the public space use
Data collection, analysis systems capabilities	Conducting safety audits, identifying women's safety concerns, dangerous areas, lifestyle patterns	Smart mobility and traffic management, data collection and analysis regarding mobility patterns (time and use) and needs	Identifying patterns of using services, concerns and needs, issues with lack of access	Analysing awareness levels of community (approach to gender disparities, own experiences etc.)	Identifying and analysing public space usage patterns differences between genders and different needs
Governance focused on	Introducing manuals and	Gender sensitive	Gender mainstreaming	Introducing equality	Adjusting public space

citizens' needs	requirements regarding safety	approach regarding mobility patterns and different needs	in designing and planning, providing services addressing special needs	education, sharing information, initiatives, trainings	for better use of all the citizens, including communities in design phases
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All in all, the case study analysis results show that there are different ways a city can address the gender-related problems within a city and introduce solutions to meet its citizens' needs and improve their quality of life. It has also shown that methods and priorities differ between the cases located in less and more developed and gender-equal countries, with the latter ones introducing rather extemporary solutions, whereas the more egalitarian cities put more efforts into awareness and education. Moreover, Smart City provides many opportunities which can enhance the improvement of gender equality, apart from innovative and connected technology enabling easier data collection and analysis; it also pursues policies and approaches complying with gender equality, enabling easier integration of gender-sensitive perspectives into its design, planning and operating activities.

Chapter 5. Conclusion

The paper has discussed the issue of gender-related problems in the urban areas and addressed methods of tackling them in relation to the Smart City Agenda. With regard to the first research question, the study has shown, based on a case study analysis, possible ways of introducing solutions for gender inequality issues in the area of public space and public services. It has presented methods targeting issues in different urban dimensions. As far as the second research question is concerned, this paper has proposed actions Smart City could take as well as analysed its potential to be more efficient due to its characteristics in their implementation.

Overall, Smart City literature mostly focuses on the technological side of the matter, partly omitting other important issues, such as bringing equality for all the citizens. Although the study has some remaining issues for further research, it presents possible solutions and suggests ways in which Smart City could implement such applications. Although Smart City research is an interdisciplinary field, the gender perspective is not fully addressed or visible, which is a paradox to the agenda followed by Smart City concerning sustainable development and inclusiveness for all the citizens. When following a social-oriented approach, municipalities should focus on solving existing issues in the urban area and

providing equal opportunities for all. Therefore, the analysed cases in this study provide guidance and illustrate strategies implemented in the cities as an example that other municipalities can follow.

For the further study concerning the topic brought up in this paper, the following limitations should be confronted: time span difference of introduced solutions and problems with identifying the positive effects of it, differences between analysed cases and their motivations.

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