

Advances in Science, Technology & Innovation  
IEREK Interdisciplinary Series for Sustainable Development

Hocine Bougdah · Antonella Versaci · Adolf Sotoca ·  
Ferdinando Trapani · Marco Migliore · Nancy Clark *Editors*

# Urban and Transit Planning

A Culmination of Selected Research Papers from IEREK  
Conferences on Urban Planning, Architecture and Green  
Urbanism, Italy and Netherlands (2017)

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# **Advances in Science, Technology & Innovation**

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*Editors*

Hocine Bougdah  
University for the Creative Arts  
Canterbury, UK

Adolf Sotoca  
Technische Universität Luleå  
Luleå, Norrbottens Län, Sweden

Marco Migliore  
Università degli Studi di Palermo  
Palermo, Italy

*Series Editor*

Mourad Amer  
International Experts for Research Enrichment  
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Universitaria  
Enna, Italy

Ferdinando Trapani  
Department of Architecture  
Università degli Studi di Palermo  
Palermo, Italy

Nancy Clark  
School of Architecture  
UF College of Design, Construction & Planning  
Gainesville, FL, USA

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## Foreword

The cultural value of everything has severely deteriorated and weakened. The environment was also exposed to various types of negligence that threatens the existence of the human race. Accordingly, this book focuses on tackling major issues in order to mitigate their effects on the human beings and the environment and improve the quality of life. As a culmination of professional and academic views, the chapters within this book, while dealing with theoretical and practical matters, offer exposure to diverse interventions in cities, assessment methods and proposed solutions to issues we face today.

The book focuses on urbanism and architecture, for they are—apparently—in direct relationship with the human being. Unveiling the advanced plans and policies to rehabilitate and improve the architecture and planning of several regions and areas is one of the major axes of the book. Such an approach is intertwined with the policymaking processes, which is thoroughly covered in some chapters. And so, this collection of research articles serves as a handbook to students and professionals who wish to make use of the latest trends and urban challenges faced today. Its value lies within the multiple approaches and perspectives offered by the different authors rather having imposed a single perspective or narrow editorial authority. This alone guarantees the precise reflection on the environmental, social, and economic challenges of today.

Moreover, this book aims to enhance and carefully maneuver through the many roles of transportation in urban areas and its related environmental and social impacts, as a topic of significant concern for policymakers in both municipal and central government as well as for the urban citizens who need effective and efficient transport systems. Therefore, transportation and urban planning are crucial for developing countries in that sense that they should be tackled and challenged by researchers and practitioners. Thus, this book provides a perfect example for conversations and debates initiated by each of the authors in hopes of reflecting the urban problems of today as well as potential solutions.

Composed of the best-selected research papers submitted to IEREK's international conferences, each chapter of this book has gone through two sets of rigorous peer review processes. To conclude, the editors are responsible for the structure of the content of this book and for having diligently worked to produce high-quality publication. Despite having thoroughly reviewed all contributions, the content is attributed to the authors who have generously and eloquently shared their knowledge and ideas.

Cairo, Egypt

Mourad Amer

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## Preface

Urban and transportation planning systems not only shape our activities and social life but also affect our well-being. Research in planning—a process focused on the sustainable development and use of our built environment—considers several factors, such as control mechanisms affecting development, process management, stakeholders’ perceptions, and citizen participation. Referred to as regional planning, town planning and city planning or urban development, depending on differences in administrative boundaries, urban planning prioritizes the effectiveness of a community’s built environment, transportation networks, infrastructure, distribution networks, urban areas, and public welfare as primary concerns. It addresses long-term issues of land use, growth, and transportation in different parts of the world. It also deals with short-term issues such as the movement of people, street furniture design, use of alternative and recycled materials, and renewable energy sources. This book is meant to contribute to a better understanding on different aspects of transport and urban planning by informing its readers of the different concepts, approaches, and tools used today for successful planning, development, and management.

A culmination of research papers of high quality that aim to educate readers is brought together by a large number of international leading academics, practitioners, and stakeholders who have contributed with their knowledge and expertise by writing and co-authoring one or more chapters. The book is a compilation of meticulously selected papers submitted to IEREK’s international conferences on Urban Planning and Architectural Design for Sustainable Development, Urban Transit and Sustainable Networks, and Resilient and Responsible Architecture. The chapters of this book, collectively, provide in-depth debates on subfields such as environmental planning and management, sustainable urban land use, transportation planning, and renewable energy generation. It aims to bridge the gap between theory and practice in the planning and development processes. Furthermore, it addresses key issues, proposes diverse and innovative approaches to sustainable urban development, energy-efficient urban areas, sustainable transportation networks, and adaptive and resilient architecture, and provides urban solutions.

This book is a useful resource for academics, researchers, and practitioners seeking pioneering research as it provides clear approaches as to how urban design and architecture can contribute to enhanced environments, active transportation, and economic development. Additionally, this book showcases various case studies taken from diverse countries and cities that tackle several common, yet distinct, issues in the field. It acts as a handbook of research on innovative pedagogical innovations for sustainable urban and transit planning for an audience looking to update its knowledge.

**Acknowledgements** We would like to thank the authors of the research papers that were chosen to be added to this book. We would also like to thank the scientific committee of reviewers who helped us select these papers and the editors of this book. Lastly, special thanks go to the IEREK team for supporting the publication of the best research papers submitted to the conference.

Canterbury, UK  
Enna, Italy  
Luleå, Sweden  
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Palermo, Italy  
Gainesville, USA

Hocine Bougdah  
Antonella Versaci  
Adolf Sotoca  
Ferdinando Trapani  
Marco Migliore  
Nancy Clark



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## Sustainability and the Built Environment

The first part of this book begins by focusing on the built environment as well as the effects of taking sustainable approaches and practices to improve the quality of life in urban areas. Rapid population growth, urbanization, and industrialization of cities have become some of the main challenges of the world today. As a result of uncontrolled growth, natural resources are being severely depleted and the ecology suffering. In the chapter titled “[Built Environment Assessment of a Disaster Resilient University: A Case Study of the University of Santo Tomas](#),” the university is used as a case study to analyze the components of a disaster resilience and focuses on the existing built environment.

According to the authors of the chapter titled “[Ecological Urban Planning and Design Process with Strategic Planning Approach in Ünye City](#),” the ecological city concept is introduced and defined as one of three main pillars of sustainability. The authors, in this paper, take a strategic planning approach as an attempt to create a dynamic city by careful and considerate planning and designing for the built environment. It is also an attempt to solve some of today’s spatial, economic, social, and cultural problems in Ünye, Turkey.

In this section, the chapter titled “[Understanding Streetscape Design and Temporary Appropriation in Latin American Cities: The Case of Mexico City Centre](#)” and the chapter titled “[The Innovative and Sustainable Streetscape Design Based on Community Participation in Surabaya, Indonesia](#),” both, discuss sustainable streetscape design as an effective tool in sustainable urban planning and design in different parts of the world. The first aims to establish an understanding of streetscape design and temporary use

within heritage city centers specifically, while the latter seeks stakeholders’ inputs to identify issues of and potentials to developing an action plan that transforms streetscape design and improves circulation in Kembang Jepun.

In Chapters “[‘Kharja’ The Lung of the Traditional House—The Case of Makkah](#)” and “[The Impacts of Sustainable Practices on Affordable Housing Developments: Residents’ Perspectives](#),” new elements proposed such as the “kharja,” an element similar to a courtyard, are being assessed. Meanwhile, the author of the chapter “[The Impacts of Sustainable Practices on Affordable Housing Developments: Residents’ Perspectives](#)” assesses the funded project of “Green affordable housing” in the USA and examines the users’ perceptions of the benefits they offer as well as their own personal experiences. It attempts to address user’s perspectives of surrounding communities.

Moreover, indoor environmental quality in urban communities is a key assessment tool that helps measure the level of comfort and environmental aspects present in communities, also a topic of discussion within this section. The chapter titled “[Parametric Assessment for Achieving Indoor Environmental Quality in Egypt’s New Urban Communities: Considering New Borg El-Arab City \(NBC\) Urban Morphology and Openings’ Specifications](#)” assesses the efficiency of opening’s specifications in achieving indoor environmental quality by using a tool known as building performance simulation. Designing and planning for urban communities requires similar assessment tools to support the field studies and the implementation of environmental treatments for the traditional and non-traditional housing.

# Understanding Streetscape Design and Temporary Appropriation in Latin American Cities: The Case of Mexico City Centre

J. A. Lara-Hernandez, Alessandro Melis, and Silvio Caputo

## Abstract

A vast amount of literature discusses the physical attributes of a built environment for the purposes of creating lively and inclusive public spaces for the sake of its temporary appropriation by citizens. Here, the term temporary appropriation is defined as the act in which people use public spaces to carry out individual or collective activities other than the purpose for which the space was originally designed. The paper reviews relevant literature and analyses urban design elements of the streetscape that are related to the temporary appropriation. This paper identifies elements supporting temporary appropriation in the context of Mexico City Centre. The main aim of the study is to explore this relationship by assessing the softness of the streetscape and the diversity index of temporary appropriation in Mexico City Centre. The analysis and the study of the selected area may provide insight and contribute to a better understanding of this relationship within heritage city centres in Latin American cities.

## Keywords

Temporary appropriation • Mexico city centre • Streetscape design

## 1 Introduction

Mumford (1938) claims that, among the physical spaces where the inborn human need to interact occurs (town, village and the city), the city, above all, else represents the theatre of social action. The creation of environments that support social interaction in places is, therefore, a fundamental aim of urban design (Mehta 2013). Mumford's

aforementioned definition suggests the existence of a dialogue between people and physical space or environment, which is spatialised through people's activities occurring in the space. This dialogue has been defined differently over time through expressions such as "street ballet" by Jacobs (1961), "social landscape" by Hillier and Hanson (1986), "social interaction" by Mahdzar (2008) or the "space of contact" by Choay (2001), all of which capture the idea of a space where a variety of different social encounters happen, e.g. people playing, walking, sitting on a table drinking a coffee. According to Anderson (1986b), the expectation of daily human contact that public space offers is unique. When public spaces do not allow this contact, one of the possible risks is the rise of alienation, which contributes to social stress, space neglect and an increase in crime rates (Gehmann 2009). Moreover, since motor vehicles have taken over most of the street space, the only place where the street ballet occurs is on the sidewalks. For instance, almost 88% of daily commuters in the USA use private vehicles (Downs 2004). Another example could be Mexico City, where the number of vehicles has increased from 3.7 in 2005 to 9.5 million in 2015, i.e. 159% within a decade.

Over time, the street has proved to be a spatial typology able to accomplish the role of public space. This accomplishment is reflected on the meaning of public space which is given by society and generated through urban design, planning and management; but more importantly, it is produced through the use and appropriation by the users (Mehta 2013).

The street, as a spatial element of the city, is versatile and susceptible to transformations because, even when its use is constrained, the street can still host a high degree of activities and a variety of uses, it can be reshaped and its boundaries redefined. For instance, streets can host activities such as temporary markets, parades, political events or even social protest. Despite that the street is often perceived as an element for transportation purposes or as a mere urban border (Lynch 1960), other scholars, such as Jacobs (1961), Appleyard et al. (1981), Jacobs (1993) and Gehl (2011),

J. A. Lara-Hernandez (✉) · A. Melis · S. Caputo  
School of Architecture, University of Portsmouth, Portsmouth,  
UK  
e-mail: jose.larahernandez@myport.ac.uk

have highlighted the relevance of the street as space for urban life. People depend on the street for functional, social and leisure activities.

In 1987, UNESCO declared Mexico City Centre (MCC) as a world heritage site because of its urban and cultural landscapes. The declaration has triggered the beautification of the built environment through urban design transformations in order to improve the quality of urban life (Cossa 2016). However, scholars (Díaz Parra 2014; Oehmichen 2010; Ramirez Kuri 2015) have pointed out that, since the temporary appropriation (TA) of streets is an essential characteristic of public spaces in the Mexican context, urban transformations have triggered a deterioration of public space.

The Mexico City government has supported inclusivity and universal design via prescriptions with regard to the use of public spaces (squares and streets), and how accessible they are for citizens who do not have any impediments or distinctions (Gobierno del Distrito Federal 2013). However, Delgado (2014) argues that regulations over the use of public space have been imposed on areas that had already been renovated. The application of the regulations follows three patterns: first, as a juridical framework that allows the government to displace users (informal use, suspicious behaviour or misbehaving). Second, as a cultural agenda that systematically occupies the public space by free cultural and amusement events (also promoted by the government) that erode the social dimension of public space. A public space that is already occupied by events as a top-down approach diminishes the plural realm of the place. Lastly, a zero-tolerance agenda, which includes the increment of police officers and surveillance in the area.

The paper will explore the relationship between elements of the streetscape design and TA in the context of renovated urban areas in MCC, in order to acquire understanding and acknowledgement of the importance of the appropriation of public spaces as a need to improve the well-being and lives of citizens in the Latin American context. In fact, the pre-Hispanic civilisation shows a cultural specificity in the use of the public space still evident today. The change of this starting condition, which is an integral part of the cultural heritage in several Latin American cities, including Mexico City Centre, risks compromising the quality of life and the characteristics of its identity.

The methodologies used to address the aims of the present research vary according to the different cultural aspects, taking into account and including the measurement of the softness of the streetscape and the diversity of TA.

## 2 The Relevance of Appropriation in the Urban Context, A Theoretical Approach

Here, the terminology “temporary appropriation” refers to the act where individuals use a public space to conduct collective or individual activities, aside from the purpose for which the space was originally designed (Fonseca Rodriguez 2015). This section describes, from different theoretical approaches, the concept of appropriation of the street as public space. It also illustrates the relevance of this theoretical concept to understand the relationship between people and public spaces. Even though there is not a consolidated theory on appropriation, other theories incorporate and approach the concept, claiming that it plays a key role in the bond between people and places and, therefore, in the social construction of the public space.

In 1976, the term “appropriation” was used by the scientific community in the area of environmental psychology. Korosec-Serfaty (1976) defined appropriation as a temporary occurrence, meaning that it is an interactive, dynamic process between the environment and individuals. Graumann (1976) stated that the appropriation of the built environment is a socio-spatial demand innate to the individual. Advocates of appropriation claim that the individual constructs himself through his own actions in the space immersed in a socio-cultural historic context. Pol Urrútia (2002) proposed a dual model to conceptualise the term appropriation, describing the relationship between people and space: these relationships are action transformation and symbolic identification. The action transformation is the action of people or groups in which they transform the space by leaving their trace as an expression of their identity. The implementation of religious objects or altars in public spaces could be a good example. The symbolic identification is related to affective, cognitive and interactive processes of people or groups, in which they identify themselves with the environment. Appropriation is a crucial concept in which philosophical reflections have been left (Lefebvre 1971, p. 164). Humans interact with environmental appropriation (Yory 2011, p. 13) as a connatural condition. Regarding the urban context, the appropriation of public spaces in every society is pivotal: without appropriation, there is no social development within society (Madanipour 1996).

Lefebvre (1971) argued the actions of human groups in spaces have two modalities: the domination and the appropriation of the environment. The author emphasises that, without appropriation, the domination of environment does

not make sense. Thus, it implies that, in an urban context, there is no urban realm if public spaces are not appropriated. Moreover, without appropriation, while the economic and technological development of society is possible, the social development remains null (Lefebvre 1971). Following the ideas of Lefebvre (1992), Purcell (2002) argues that the appropriation of public space is embedded within the second aspect of the right to the city, which includes the right of inhabitants to physically access, occupy and use urban space. Moreover, “not only is appropriation the right to occupy already-produced urban space; it is also the right to produce urban space so that it meets the needs of inhabitants” (Purcell 2002). Therefore, in a broad sense, appropriation is established by the interaction between citizens and their city (public space), and between the social realm and the physical realm (Contreras 2008). Both realms are constantly interacting as different layers of the urban landscape in the city; the product of this interaction is the expression of urban life.

Yory (2011) incorporates the notion in his definition of topophilia, which is “the act of co-appropriation generated between the man and the world; through which the world becomes the world, at the opening realised by the man within its historic-spatial nature and human becomes human through its spatialisation” (2011, p. 15). The author develops topophilia as a philosophical concept, claiming that it is an inborn necessity of humans. This inborn necessity is what triggers the creation of the bond between people and places. The term topophilia was introduced by Tuan (1974) from a different perspective, which has emotional characteristics reduced to an emotive and affective relationship between man and place. Yory (2011) pushes forward the concept and brings the term to the spatial and geographic realm, which concerns urban design as we have in earlier definitions. The lack of topophilia erodes the bond between people and places. Moreover, the absence of appropriation is characterised by the denotation of the lack of congruence between the physical landscapes and place meanings, held within broader physical, cultural and emotional contexts (Ujang 2012). Therefore, TA is a key concept for theoretically establishing the link between people and places.

Scholars such as Jacobs (1961), Whyte (1980), Jacobs (1993), Low (1999), Loukaitou-Sideris and Mukhija (2014) and Araya Diaz (2016) and practitioners such as Gehl (2010), Lydon et al. (2014) and Project for Public Spaces (2017) have discussed and analysed the physical attributes of built environment for the purpose of creating lively and inclusive public spaces for the sake of appropriation. In the Latin American context, scholars such as García Espinosa (2005), Carrion (2013), Hidalgo et al. (2014) and

Hernández-Bonilla (2008) have analysed the effect of transformation of the built environment and the use of public spaces in city centres. However, few of them consider it from the perspective of the street and their TA and even less explore the urban design elements that could be implicated.

### 3 Issues in the Inclusiveness and Temporary Appropriation in Public Spaces: The Case of Mexico City

Currently, a broad discussion concerning the use and function of public spaces in Latin American cities, and their role in supporting a vibrant and inclusive urban life, involves several scholars (Carrion 2007a, b; Ramirez Kuri 2008; Sequera 2014). Among them, Gutierrez de Velasco Romo and Padilla Lozano (2012) have analysed the TA of public spaces in central areas, focusing especially on the Mexican context. They found that public spaces located in central areas of the city are used by a wide range of people, and they appropriate such spaces through different activities (eating, selling, waiting for other people, shoe-bowling, singing, performing, reading, etc.). They also suggest that the urban design of public spaces should contemplate those different forms of appropriation in order to achieve more inclusive spaces. If the different forms of TA of public spaces are not considered by urban design to practise social inequity, urban segregation and social exclusion in a determinate area could increase (Vidal Moranta and Pol Urrútia 2005), as in the case of city centres in Latin America, such as Buenos Aires and Mexico City (Capron and Monnet 2013). In *Xalapa* (the capital city of the state of Veracruz, located in the Gulf of Mexico), the spatial configuration (*land use, complexity*) of streets located in central areas was changed through urban design interventions, that users are now claiming they have been deprived of the possibility of appropriating them (Hernández Bonilla and Gómez Gómez 2015).

#### 3.1 Heritage Protection in Public Space in Mexico City Centre

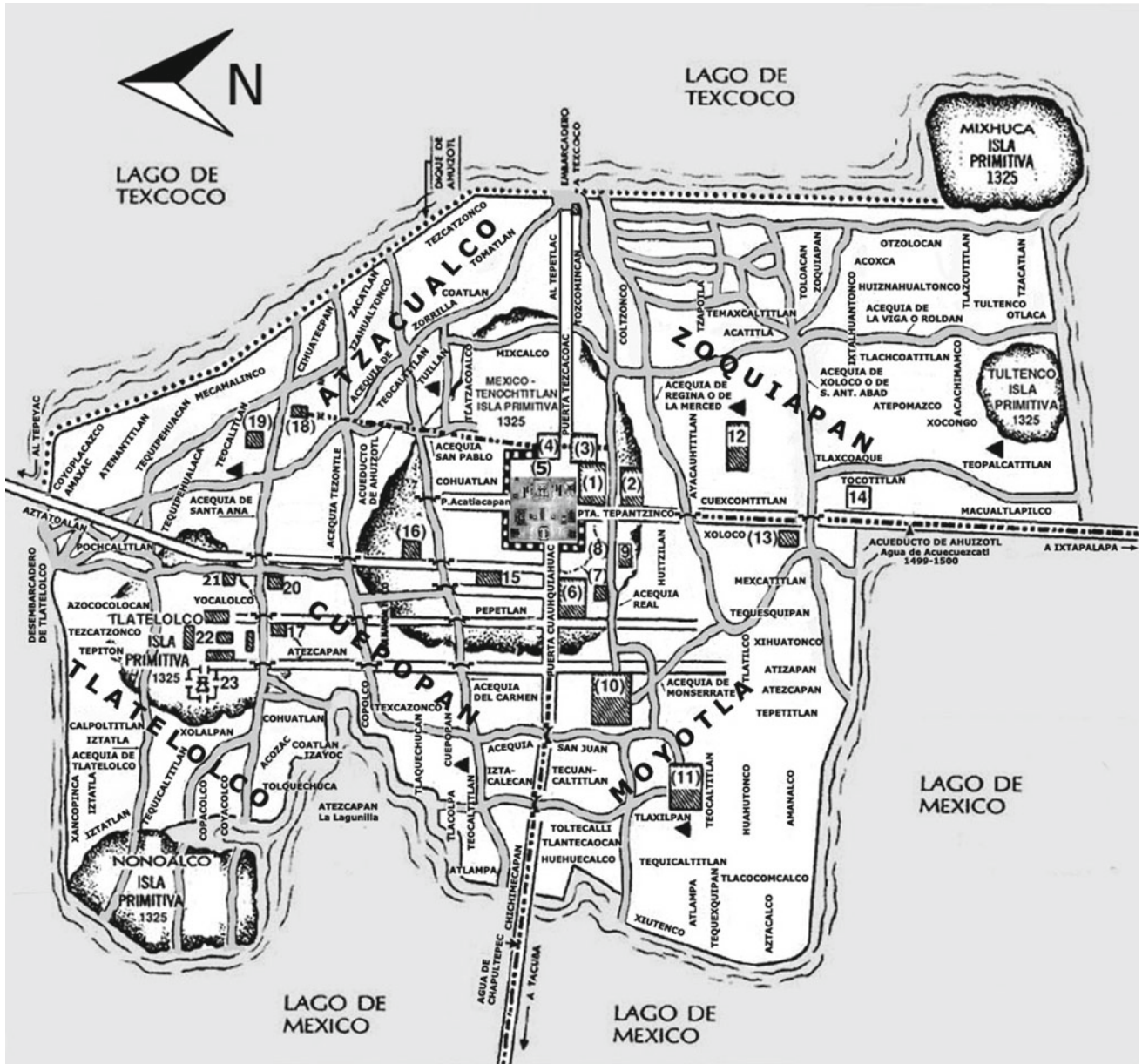
As mentioned above, within the context of Latin American cities, MCC provides a good example of the urban design transformation processes of public spaces in world heritage centres.

In 1987, MCC was declared a world heritage site by UNESCO, thanks to its uniqueness, authenticity and integrity of the built environment and culture. In order to preserve the place (built environment and culture) for future



generations, the main objective of the declaration is to preserve the quality of the existing physical and social realm (UNESCO 2013). This declaration leads to a commitment between the Mexico City government and UNESCO (2015), aimed at the conservation of the built environment and the protection of the local culture. Regarding the built environment, the objective is addressed through continuous maintenance of façade, and through urban design transformation

of the public spaces. Culture refers instead to the particular uses, expressions and meanings of the people. Those particular uses, expressions and meanings demonstrate the local culture through the people’s daily actions taking place in public spaces, which are acts of spatial appropriation (Casakin and Bernardo 2012; de Certeau 1984). The simplicity of people’s daily actions is part of the local identity (Belanger et al. 2012).



**Fig. 1** Tenochtitlan. Schematic representation 1325–1519 (left) (Source Carrera Stampa 2002), MCC (right) (Source Autoridad del Centro Historico 2011)



**Fig. 2** Great Tenochtitlan by Diego Rivera in Palacio Nacional in Mexico City (Rivera 1945)

### 3.2 Streets as Public Space in the History of Mexico City

Mexican city streets are public spaces which have been vital for urban life, even before colonisation by the Spanish. Pre-Hispanic civilisations were characterised by the use of outdoor spaces for daily activities (Keller 2006; Suárez Pareyón 2004). Regarding urban patterns, Tenochtitlan (Fig. 1, left) was created by streets, blocks and channels. The Aztecs communicated by using these channels, while streets were used for a diverse range of activities, for instance leisure, trade, religious celebration or potentially sacrifices (Leon Portilla 1995). The streets were a public area where the religious, economic, political and social lives of people were manifest (Webster and Sanders 2001). Informal activities are an important component of street life, particularly in common society (Cossa 2009). Figure 2 shows the quotidian life in Tenochtitlan.

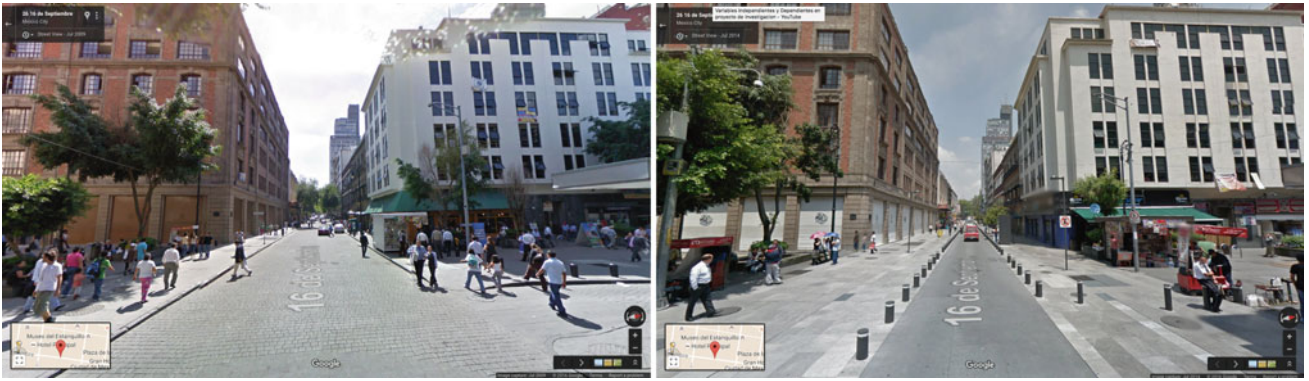
During the sixteenth century, while Spanish colonisation was taking place, a new planning pattern was founded in Tenochtitlan, which transformed the city (Stanislavski 1947). The conquerors attempted regulation of the informal activities (religious expressions, playing, trading, etc.) occurring on particular streets for each of the activities with a singular order (Nelson 1963), by restricting them to particular places, e.g. traditional Spanish squares. They were

successful for a brief period, however as the city grew, confining informal activities was no longer a viable option. Monnet explains (1995, 1996) that these TA types remain tangible in the Mexico City streets.

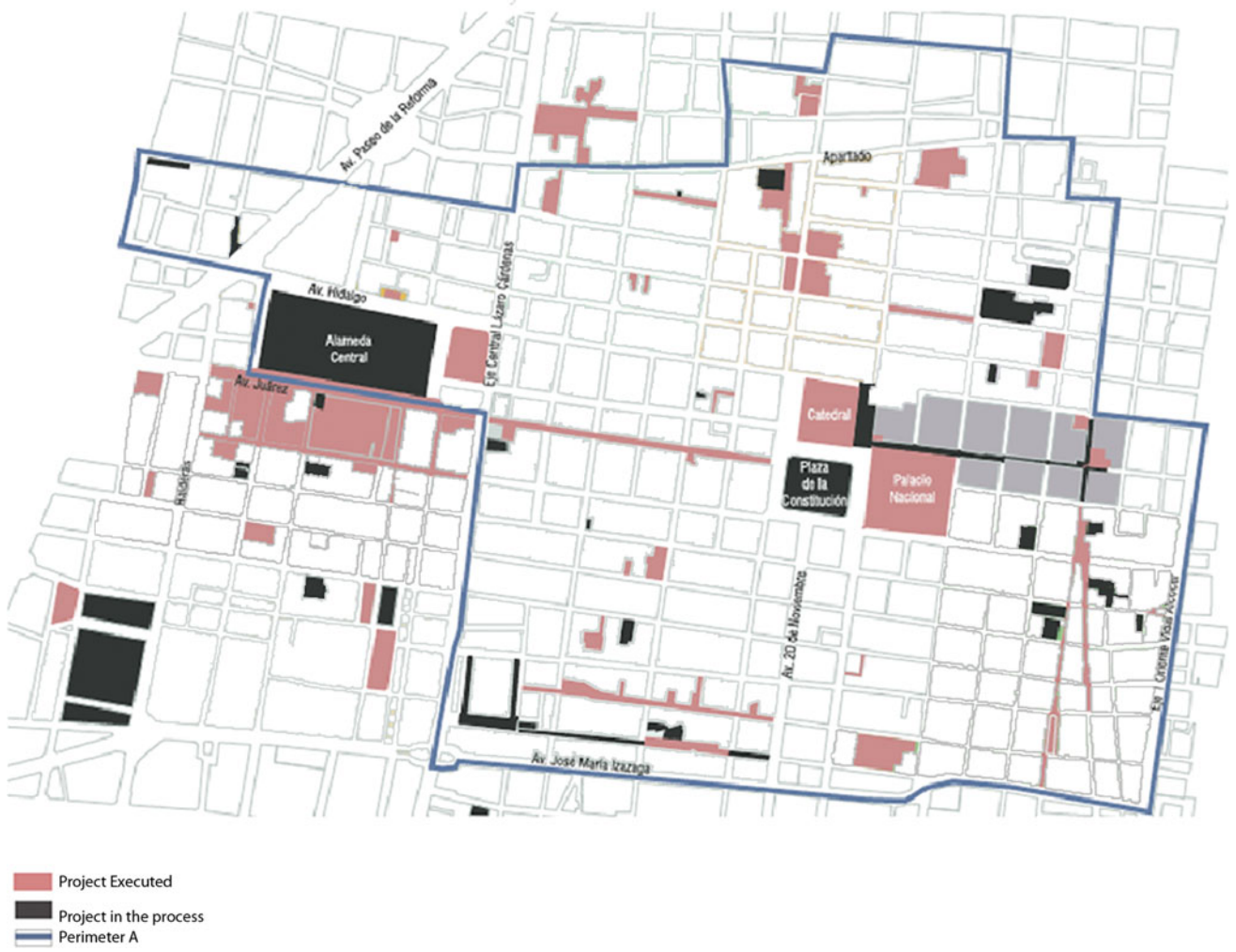
### 3.3 Inclusiveness and Temporary Appropriation of the Streets in the Mexico City Centre

Returning briefly to the current management condition over the use of public spaces in MCC, scholars such as Saraví (2008), Ramirez Kuri (2008, 2016) and Alessandri Carlos (2014) claim that this new set of rules threatens the inclusive and pluralistic nature of the public space. This situation puts at risk the TA of public spaces, which, according to Purcell (2002), is one of the key elements to exercise the people's right to the city as citizens.

Within the Mexican context, MCC has been physically preserved (buildings' façades), transformed (public spaces) and the most invested in Delgado (2014). According to the report of *Autoridad del Centro Histórico* (2014), between 2007 and 2014, an approximate 82,579 m<sup>2</sup> and 10.3 km of public space (streets) have been upgraded with an economic investment (public-private) of more than \$5,340,200,000.00 pesos (3654.46 USD per m<sup>2</sup>) while in Oaxaca in 2015 \$16,000,000.00 pesos were invested in an approximate area



**Fig. 3** 16 de Septiembre St. taken on July 2009 (left) and July 2014 (right) (Source Google Maps 2014)



**Fig. 4** Executed projects and projects in process in MCC. Data from 2015 (Source Gobierno de la Ciudad de Mexico 2016)

of 5200 m<sup>2</sup> (168.42 USD per m<sup>2</sup>) (Redacción ADN 2015). The urban design intervention, carried out in association with private institutions, includes: change of pavement, pedestrianisation, sidewalk expansion and the addition of urban furniture, lighting and trees which are transforming the spatial configuration. Figure 3 (left) shows the condition of *16 de Septiembre* Street in 2009 before any urban design transformation. After the urban design transformation took place in 2013, pavement was substituted with new and more attractive patterns, street lighting was improved, trees were planted, and urban furniture and elements for the disabled were added. Figure 3 (right) shows the current situation of *16 de Septiembre St.*, in which the spatial configuration of the built environment was transformed. Streets such as *Madero*, *Regina*, *5 de Mayo*, *Del Niño Dios*, *Talavera*, *Leandro Valle*, *Mariana Rodríguez del Toro de Lazarín*, *Dolores* and *Independencia* have undergone similar urban design interventions. According to Gobierno de la Ciudad de Mexico (2016), which is an autonomous and decentralised institution that manages urban design interventions in the MCC, other streets, such as *Seminario*, *República de Guatemala*, *Tacuba*, *Avenida Hidalgo* y *Puente de Alvarado*, *San Jerónimo*, *Vizcaínas*,

*Aldaco*, *Jiménez*, *Callejón Esperanza* and *Meave*, are planned to be transformed in the near future. Figure 4 illustrates the transformed areas, areas under process of transformation and areas for future transformation in MCC.

#### 4 Temporary Appropriation and Elements of the Spatial Configuration of Street

Moudon (1991) stated that the built environment's spatial configuration is a culturally specific display. It is claimed that each of the societal types causes specific behaviours and that this is reflected in how people make use of the street. Which urban design elements of the spatial configuration of the street may affect TA? Based on the literature reviewed, the following paragraphs describe urban design elements of the street (land use diversity, softness, visual complexity, sedibility) that are strongly related to the TA of public spaces. Table 1 summarises the literature.

However, there are uncountable activities occurring on the street. Hence, what kind of activities happening on the streets are ones that people can appropriate?

**Table 1** Elements of the spatial configuration of street related to the TA

Element	Description	Relevant author
Land use	The main activity taking place in a building facing the street at ground floor level	Jacobs (1961), Gehl (2011), Bentley et al. (1985), Mahdzar (2008)
Softness	It is split into two: (1) transparency corresponds to the possibility of engaging visually from a building's interior to the street (glass windows or doors). (2) <i>Transitional space</i> is the space visually accessible from the public realm such as stoops, porticos, entry setbacks and balcony awnings	Jacobs (1961). Gehl (2011), Porta and Renne (2005) Anderson (1986a)
Visual complexity	Here the visual complexity of the built environment (street) is referred to as the variety of the streetscape at a multi-dimensional level (colours, street furniture and street pavement)	Bentley et al. (1985), Gibson (1986), Kärholm (2007)
Sedibility	It is the possibility for places for seating that a public space offers (benches, chairs, curbs, stairs, etc.)	Whyte (1980), Gehl (2011), Salazar Trujillo (2010)

**Table 2** Elements of the spatial configuration of street related to TA

Activity	Description	Relevant author
Trade/work	Work or/and trade activities taking place on the street	Ramirez Kuri (2010), Gutierrez de Velasco Romo and Padilla Lozano (2012)
Leisure	Activities related to leisure, such as arts or sports, occurring on the street	Cranz (1982), Crouch (1998), Mouffe (2007)
Sacralisation	Religious symbols (mostly Catholic) placed in public space. This appropriation is characterised by the installation of crosses or altars in public space where people pray. See Fig. 1	Portal (2009)



**Fig. 5** Altar on street in MCC (Source Authors)

#### 4.1 Activities and the Temporary Appropriation

Academics such as Sansot (1976), Kim and Kaplan (2004), Bolio Arceo (2012) and Carmona (2014) claim that people only appropriate places in which they feel identified. Torres (2009) supports such claims by arguing that the appropriation of public space has a strong value for people since it is culturally constructed by everyday activities. This implies that appropriation of the space plays a key role for peoples' cultural identities and their interactions with their environment. Thus, by not allowing it there is a risk of losing such cultural dimension.

Even though there is a wide amount of literature (Alessandri Carlos 2014; Fonseca Rodriguez 2015; Gutierrez de Velasco Romo and Padilla Lozano 2012; Korosec-Serfaty 1976) describing the importance of the use of the space in which people, through activities, appropriate public spaces, few studies have really specified or classified such activities. Table 2 identifies and makes an attempt to classify these activities happening in public spaces that lead to TA (Fig. 5).

#### Materials and Methods

This research could be defined in terms of Groat and Wang (2013) as a correlational study of the elements that make up the spatial configuration of the street that encourages/inhibits the TA within MCC. Two layouts are produced and overlapped. Firstly, the spatial configuration analysis, and secondly, the TA mapping. Lastly, the diversity index of the TA is obtained in order to compare both streets. The elements of the spatial configuration of the street are studied through images with a method introduced by Porta and Renne (2005). The TA is studied by a snapshot observation technique known as "activity mapping" (Francis 1984; Mahdzar 2008). The following section describes this process in detail.

According to the premises and the aims of the paper, the correlational study's methodology has been adjusted to the specificity of the cultural context of Mexico City.

#### 4.2 Streetscape Design Analysis

Elements of the spatial configuration were analysed using a method developed by Porta and Renne (2005), which identifies the formal elements of the built environment that interplay directly with the social realm of the street as public space. These elements are identified as indicators that are represented in plans, bird-eye views (i.e. photographs) and sections. The street indicators taken into consideration include land use diversity, softness, visual complexity and sedibility.

These indicators are individual components that, as a whole, are related to the TA of the street. This separation will help us to understand the design features that support higher levels of diversity of TA. The measurements were taken using photographs along the street, 25 m apart from one another. The camera was attached to a tripod at eye level to be sure that each picture captures the same field of view. Each photograph was analysed to collect the measurements for the indicators. Table 3 illustrates and describes the indicators and how they were assessed. As a part of ongoing research, the present article only illustrates the analysis and results of the *softness* indicator.

#### 4.3 Temporary Appropriation Mapping

The diversity of activities as the expression of the TA occurring on the selected areas of study was observed and mapped. Table 4 illustrates in detail the type of observed

**Table 3** Spatial configuration indicators description

Indicators	Sub-indicators	Outcome
Land use diversity	Commercial (products, food, shopping centres, markets), health clinic centres, education, religious places, recreation and cultural centres, hospitality, places for public security and justice and parking	The value of land use diversity is calculated using the Shannon–Wiener diversity index (See Table 5). The high diversity value of land uses the higher the value of diversity of activities
Softness	Transparency corresponds to the measurement of the window space/area that faces the street which allows the viewing of the inside and outside of buildings	Transitional space and transparency are measured independently, and the result of each will be averaged to obtain a single measure of softness. Polylines will be drawn using AUTOCAD to identify the presence of transparency and transitional spaces for their calculation. Both sub-indicators belong to a different nature, hence the data will be normalised <sup>a</sup> before calculating the average
	Transitional space is a measure of spaces visually accessible from the public realm such as stoops, porticos, entry setbacks and balcony awnings	
Visual complexity	Colours (high contrast, brightness, richness and the number of different colours)	This indicator is based on personal judgement. Each picture will be evaluated three times (one for each field) with reference to 1–5. The output will be calculated as the average of all three sub-indicators
	Street furniture (seating art, attractive lamp post, raised planters, etc.)	
	Street pavement (changes in texture, colour, material, patterns and attractive ending)	
Sedibility	Primary seating refers to the objects made for people to sit which includes benches and chairs (movable chairs have a slightly higher rating)	This indicator is rated 1–5 giving priority to the primary seating
	Secondary seating refers to objects not specifically made for seating purposes, but in which people are very likely to sit on. This encompasses walls, stoops, fountain borders, ledges, planters, sculptures, etc.	

Adapted from Porta and Renne (2005)

<sup>a</sup>The term normalisation originates from statistics and eliminates the unit of measurement by transforming the data into new scores with a mean of 0 and a standard deviation of 1. These transformed scores are known as Z-scores (Abdi and Williams 2010)

**Table 4** Activities in public related to TA

Category	Commerce/service		Leisure			Sacralisation
Description	Any activity in which a person or group uses the public space in order to obtain an economic benefit, directly or indirectly		Any activity in which a person or a group uses the public space for leisure purposes			Any activity in which a person or a group uses the public space for religious purposes
Sub-category	Work	Trade	Sports and games	Artistic expressions	Rest	
Individual or collective	Advertising or promoting services, waiting, engaging or attracting possible clients	Selling or buying products (food, handicraft, clothes, etc.)	Skateboarding, football, cards, marbles, <i>hopscotch</i>	Playing music, dancing, painting, acrobatics, reciting and singing	Eating, resting	Processions, praying, lighting candles and putting flowers

activities. Activities occurring in the public space related to criminal behaviour (vandalism, etc.), to political protest and to transit purposes were not analysed.

This research employs a technique known as “activity mapping”, which analyses the ground floor in relation to use

of the street and its physical elements (Francis 1984). This technique aids the understanding of the “temporal city” occurring in the urban space. The theory of this technique emphasises the interactive process between the physical environment and individuals. Such observations were

**Table 5** Observation method

Observation analysis			
Days of observation	Time of observation	Observation technique	Diversity analysis
Monday and Sunday	1. 7:00–9:00 am. The first period of observation is selected according to the “rush hour” in MCC. Offices, shops and schools usually start their operation at this time of the day 2. From 2.00–4.00 pm: The second period will be lunchtime. Many people use this time to take a break, to go out, and have lunch; therefore, the chances of observed diversity of activities in public spaces are higher 3. From 6.00–8.00 pm: The third period is when the majority of the people end their activities	A three-round observation of two-hour periods will be carried out each day. Each two hours consists of 2 rounds of 15 min walking (to and from, totalising 30 min in each hour); i.e. 4 rounds per 2 h slot. These rounds of observations are conducted in 6 snapshots at two 15 min walking snapshots, per hour, per area, in a one-day observation	The diversity of TAs is calculated using the Shannon–Weiner diversity index, which the formula comes as follows: $H' = -\sum p_i \ln p_i$ in which $p_i = 1/\log S$ ( $S$ = total number of elements). Thus, the higher the value of diversity index, the higher level of TAs. After calculating the diversity value of each street, the results can be compared and show which of the analysed streets have the higher value and, therefore, higher TA

noticed during the week and at five timepoints within the day and in one hour period during these. The activities are mapped as a TA expression. The resulting map displays the precise time and location of the TA happening in the public space. The TAs which shape urban areas from a local context were the subject of the research. The observation was as follows (Table 5):

#### 4.4 The Sample, Data Collection and Analysis

The purpose of the case study was to provide a scenario in which the relationship between urban design interventions and the appropriation of public space can be explored. MCC is currently in the process of urban transformations, and the majority of the interventions have taken place in a well-defined area, which is perimeter “A” of the city centre. Therefore, it was the perfect time to analyse the spatial configuration changes and their impact on the appropriation of the street. The selection of streets is explained in the following section.

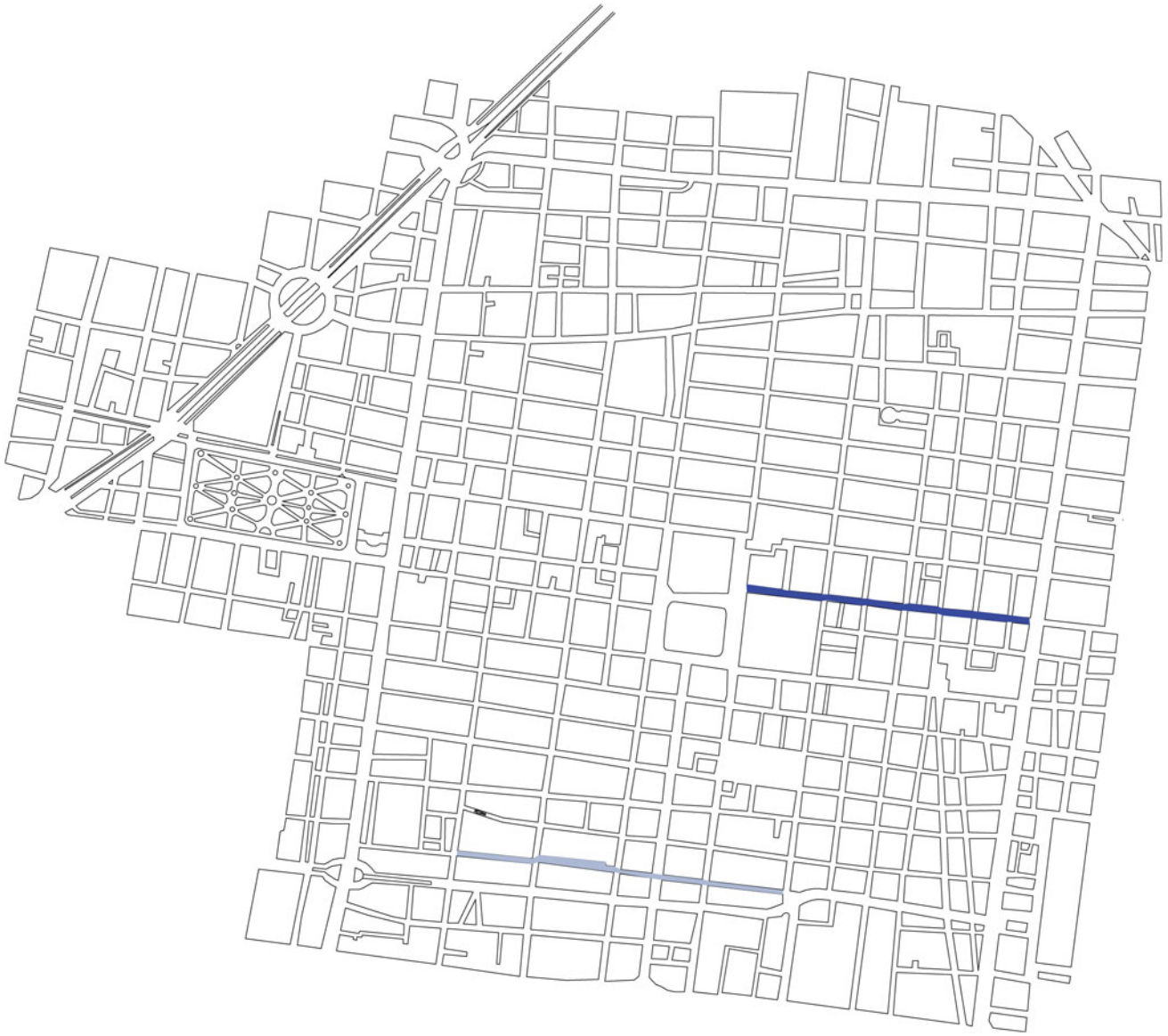
##### 4.4.1 Selected Sample of Streets

Even though it is very difficult to compare two different urban areas, two streets that shared similar urban morphology and land use/function are proposed for the two case studies. Moneda Street and San Jerónimo Street share similar urban conditions listed as follows:

- Both streets are located within the same urban area. They are in Perimeter A of MCC and they are part of the master plan of urban design interventions orchestrated by the Gobierno de la Ciudad de Mexico (2016).
- Both streets connect an avenue and a square. Moneda St. links *Eje 1 Vidal Alcocer* and *Plaza de la Constitucion*, and San Jerónimo links *José María Izazaga Av.* and *Plaza de las Vizcaínas* (Fig. 6).
- Both streets equally are populated and present a segment that is designated for pedestrian use only (source: Autoridad del Centro Historico 2011).

#### 4.5 Mapping and Analysing Data

The streetscape design and TA were processed in order to produce maps and a database of the two cases. The use of the AutoCAD and ArcView will allow the linking of polygons on maps of Moneda and San Jerónimo with the database. The resulting graphics were used for developing layouts for a deep comparison, indicator by indicator, for each of the two streets. The first layout corresponds to the photo-by-photo map, and it was categorised following an average-and standard-deviation basis; the legend indicates three tones of gray colour, one tone indicating the values below the average, another indicating the average value and the final tone indicating the values above the average.



**Fig. 6** Moneda and San Jeronimo St. (Source Autoridad del Centro Historico 2011)

The TA map was overlapped to each of these maps to understand the correlation with the spatial configuration analysis. The latter allows an effective way to understand the overall characteristics of the two cases and the identification of the main differences.

## 5 Results

### 5.1 Softness and the Temporary Appropriation

Figure 7 shows an overview of the softness indicator and the TA in San Jerónimo St. A total of 388 TA activities was

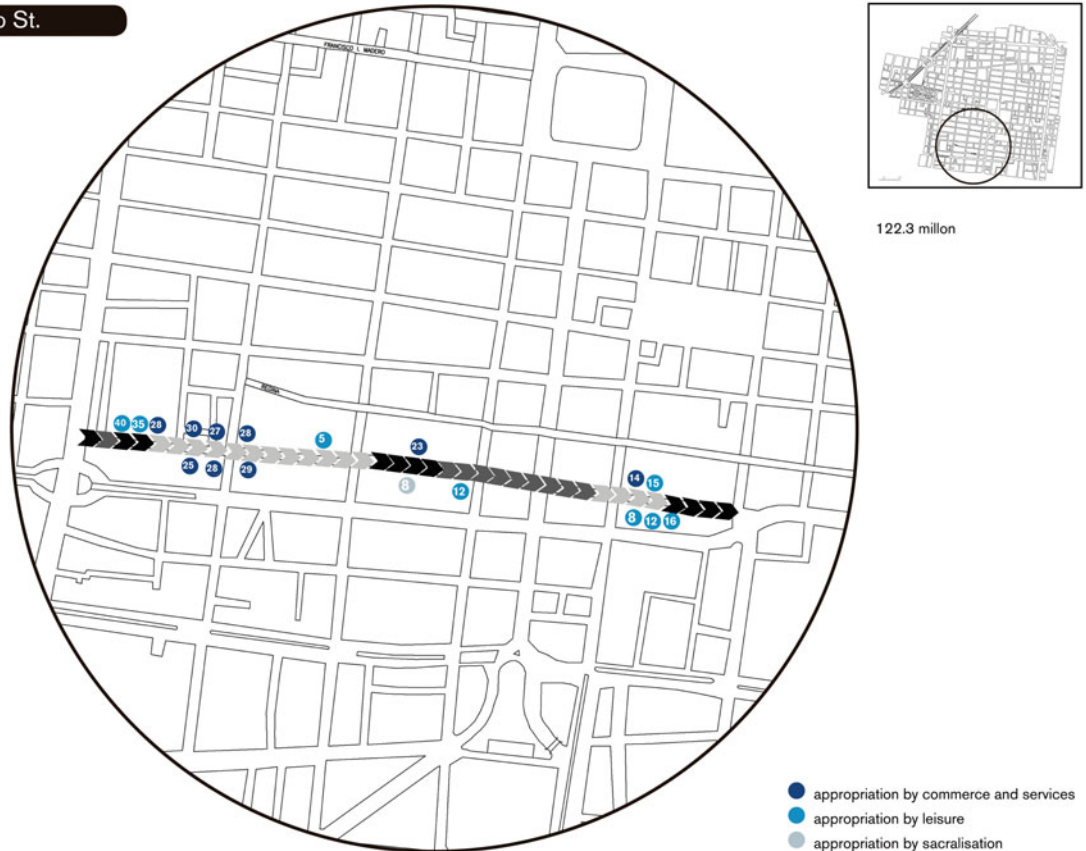
observed. From this total number, 232 (59.7%) correspond to the TA by commerce/service, 148 (38.1%) were classified as TA by leisure and 8 (2.2%) as TA by sacralisation. On the one hand, the TA by commerce/services is strongly related to high levels of softness. On the other hand, the TA by leisure does not show any correlation to this urban design element. What is striking is that the TA by sacralisation seems to be present where the lower levels of softness are within the whole street.

Figure 8 presents the results obtained from the preliminary analysis of the softness attribute in Moneda St. A total number of 111 TA activities was observed. From this total, 62 (55.8%) correspond to the TA by commerce/service, 148



## MEXICO CITY/CENTRE

San Jeronimo St.



**Fig. 7** Softness and TA in San Jerónimo St.

(44.2%) were classified as TA by leisure and no TA by sacralisation was observed. The results of the correlational analysis can be compared by two figures. Overall, TA in Moneda St. is more than three times lower in comparison with San Jerónimo St. It is apparent from this figure that TA in general is less observed in places with lower levels of softness. Even though Moneda St. presents lower levels of softness, in general this trend is consistent with San Jeronimo St.

Table 6 illustrates the Shannon–Weiner diversity analysis from both streets. The results indicate that San Jerónimo St. presented a more diverse TA in comparison with Moneda St.

Additionally, there is a surprising new variety of TA by commerce or services in Moneda St. First, Fig. 9 shows a woman who was selling food hiding behind a phone cabin in Moneda St. As soon as a policeman approaches, she closes

the portable device and pretends just to be waiting for something. Another variety of TA by commerce/services is shown in Fig. 10, which illustrates a man who is using his own wheelchair as a mobile store.

If we now turn to TA by sacralisation, this type of appropriation was not observed. There is a significant difference between two streets. First, the observed number of TAs is lower in Moneda St., even though the street has been physically improved. A comparison between the two figures reveals that the number of TAs observed is significantly different. San Jerónimo St. presents higher level and variety of TA in relation to the softness indicator. Taken together, these results suggest firstly that there is an association between high levels of softness and TA by commerce and services, and secondly that there are new types of TA at the streets of MCC.

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Moneda St.



**Fig. 8** Softness and TA in Moneda St.

## 6 Discussion and Conclusion

Legeby (2013) argues that public spaces have an assertive capacity to enable different overlapping uses, which is highly relevant for urban design research. If such capacity varies, and such deviation could be identified and described, the variations in the capacity of places could be established (Legeby 2013). Cities are in a constant process of transformation, and the way in which they are designed and redesigned might affect the rationale use of public spaces and its TA.

Some scholars such as Brown and Lombard (2014), Carmona (2015) and Ferguson et al. (2013) and practitioners

such as Gehl and Svarre (2013), Project for Public Spaces (2017) and BCNecologia (2019) argue that the improvement of the physical dimension of the environment through urban design interventions leads to positive effects on social well-being (health, safety, sense of community, etc.). However, urban design interventions that transform the spatial configuration of protected heritage central areas in Latin American cities have led to different outcomes (Carrion 2007a, b). These different outcomes are key to the research gap and need to be investigated thoroughly. There is a lack of understanding of how the spatial configuration affects the TA of public spaces (streets) within this specific context (heritage city centres). The consequences may negatively

**Table 6** Shannon–Weiner diversity analysis of TA

TA activity	Moneda St.		San Jerónimo			Pi*(LN(Pi))
	#	Pi	Pi*(LN(Pi))	#	Pi	
Selling products	10	0.090	−0.22	82	0.21	−0.33
Selling and preparing food	15	0.135	−0.27	55	0.14	−0.28
Advertising	18	0.162	−0.29	67	0.17	−0.30
Promoting services	19	0.171	−0.30	28	0.07	−0.19
Skateboarding	5	0.045	−0.14	23	0.06	−0.17
Football				10	0.03	−0.09
Playing cards	2	0.018	−0.07	2	0.01	−0.03
Hopscotch				3	0.01	−0.04
Marbles				2	0.01	−0.03
Playing music	2	0.018	−0.07	15	0.04	−0.13
Dancing	1	0.009	−0.04	10	0.03	−0.09
Singing	2	0.018	−0.07	20	0.05	−0.15
Painting				2	0.01	−0.03
Acrobatics	2	0.018	−0.07	3	0.01	−0.04
Reciting	1	0.009	−0.04	8	0.02	−0.08
Eating	22	0.198	−0.32	23	0.06	−0.17
Resting	12	0.108	−0.24	27	0.07	−0.19
Praying				4	0.01	−0.05
Lighting candles				3	0.01	−0.04
Putting flowers				1	0.00	−0.02
	111			388		
		SW Div	2.16		SW Div	2.42

affect the local cultural expressions, which the UNESCO declaration is trying to protect and preserve.

An initial objective of the project was to identify urban design elements of the spatial configuration of the street that support TA. Results clearly show that softness is, to some extent, an urban design element of the configuration of the street that contributes to the TA. The TA by commerce/services shows a clear relationship to softness. In general, therefore, it seems that the higher the levels of softness, the higher chances are of TA by commerce/services. Surprisingly, other activities, such as new types of TA, were found. This was

unexpected and suggests that the way in which people temporarily appropriate the street in MCC is changing. This finding further supports the idea of Crossa (2009), who claims that the TA by commerce/services will remain in MCC even despite the efforts by authorities. Future studies on the current topic are, therefore, recommended.

The research is an initial contribution to codify elements pertaining to urban design, such as materials, urban furniture and landscaping, while assessing their capability of encouraging an informal use of public space. This type of analysis builds on existing analytical tools, which are



**Fig. 9** Woman selling food hiding behind phone cabin (Source Authors)



**Fig. 10** Man in wheelchair selling candies (Source Authors)

typically used to analyse formal indicators and sustainability, and sociability and accessibility of the street. The novelty of this study is to adapt these tools for the purpose of the study which is, mainly, to identify the urban design elements of the spatial configuration of the street that supports the TA. This study has identified a relationship between softness as an urban design element and the TA in MCC. The second major finding was that there are emerging new types of TA that challenge formal prescriptions as counter spaces or spaces of resistance. In general, these findings suggest that, though aesthetically pleasing for tourist and visitors, the urban design interventions conducted in MCC in conjunction with changes in the urban landscape (physical and social) have resulted in the eviction of urban actors, thus eliminating lively social dynamics to which they were contributing. For instance, before urban design interventions, the public spaces used to be more diverse with different people carrying out distinct activities (domestic workers chatting, indigenous groups gathering, families playing, religious groups preaching, vendors, clowns and mimes entertaining). This diversity of activities in public spaces is the expression of the TA. Activity diversification also means more inclusiveness and more opportunities of TA, which currently are being decreased in the areas of intervention.

Though the current outcome enhances our understanding of the relationship between the TA and the urban design in world heritage city centres and adds to a growing body of literature on appropriation within the specific context, the scope of this study was limited in terms of urban design elements. Further research could usefully explore how other elements of the streets encourage spatial configuration. The present research is, therefore, intended as a first step aimed at establishing a methodology, within the defined theoretical framework, that is potentially extendable to other streets in MCC. This is in order to map the city extensively and develop, in the future, urban tools taking into consideration the appropriation as a fundamental element in the use of the street as public space.

Further, the approach can be extended to other Latin American contexts where the understanding of the pattern of informal TA is pivotal to the improvement of the quality of life in the city whose roots lie in pre-Hispanic culture. In fact, the aforementioned cultural specificity in the use of the public space, still evident today, is common to several Latin American cities. Its understanding will limit the risks in

compromising the quality of life and the identity characteristics as well as helping to inform future planning policies.

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