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The urban fabric and fear of crime: The case of the compact city of Bilbao, Spain

Abstract

This research examines the influence that a compact city's urban fabric can have on fear of crime. To this end, the Spanish city of Bilbao, a compact city where the population's fear of crime is higher than might be expected given low rates of victimization, was taken as a case study. Based on a comparative study of five of the city's neighborhoods, the research used an inter-scalar analysis. Surveys were used to gather data about individuals' fear of crime and places they avoided; and an observational and morphological analysis was carried out to analyze the urban characteristics of these places. The study produced two main results: first, Bilbao witnesses little fear of crime during the day and moderate fear at night, usually centered around the same spaces; second, the spaces avoided are usually related to singularities in the urban fabric, which include hermetic buildings, large green areas, urban borders, and interruptions. We concluded that some aspects of fear of crime at an environmental level are related to shortcomings in urban planning at the territorial and district levels. The study contributes to the field by providing a methodological tool addressing a gap in research connecting individual fear of crime and urban planning.

Keywords: Morphological Analysis, Urban Planning, Inter-scalarity, Urban Singularities, Fear of Crime.

Introduction

Fear of crime can be understood as the fear or apprehension that an individual has of becoming a victim of a crime (Hale, 1996). It includes psychological discomfort that generates restrictions in behavior (Garofalo, 1979) and includes different emotional states, attitudes and perceptions (Warr, 2000).

There are a number of different approaches to understanding fear of crime (Doran & Burgess, 2011; Garofalo, 1979). One group of theories can be categorized as demographic (Farrall et al., 2000), and explain fear of crime in relation to past experiences of direct victimization (Crank et al., 2003; Garofalo, 1979; Skogan & Maxfield, 1981), indirect victimization (rumors, media, reputation, etc.) (Rountree & Land, 1996), or structural considerations of vulnerability in terms of gender, age or socioeconomic status (Hanson et al., 2000; Lagrange & Ferraro, 1987; Perkins et al., 1996; Skogan & Maxfield, 1981). A second group of theories, categorized as social, center on the risk society hypotheses (Beck, 1992; De Cauter, 2004; Hollway & Jefferson, 1997), social disorganization (Hunter, 1978), subcultural diversity (Merry, 1981), community deterioration (Garofalo & Laub, 1978) and lack of integration and neighborhood cohesion (Crank et al., 2003). Finally, a third category of theories, the environmental approach, encompasses the disorder/incivilities hypotheses (Rountree & Land, 1996; Skogan & Maxfield, 1981), the crime signs perspective (Innes, 2004), and the threatening and safe environments hypothesis (Brantingham & Brantingham, 1993; Cozens et al., 2005; Cozens & Love, 2015; Crowe, 2000; Fisher & Nasar, 1995; Nasar & Fisher, 1993; Nasar & Jones, 1997; Newman, 1972; Wekerle & Whitzman, 1995).

This paper is primarily based on the threatening and safe environments hypothesis, within an environmental approach. This branch of theory facilitates the use of an "all-encompassing label for (…) objects and acts that generate fear of crime" in the city (Doran & Burgess, 2011). The seminal work by Jane Jacobs (1992 [1961]) in

the field of environmental studies proposed natural surveillance, pedestrian activity and human interaction, amongst others, as key factors that can generate safe urban spaces. These concepts became the basis on which further concepts have been developed by a number of researchers (Brantingham & Brantingham, 1993; Cozens et al., 2005; Cozens & Love, 2015; Crowe, 2000; Newman, 1972; Wekerle & Whitzman, 1995).

According to a bibliometric analysis of the literature there is a growing interest in the relationship between urban environment and fear of crime (Kawshalya et al., 2020). Criminological and psychological research on the urban environment and fear of crime has focused mainly on the environment as perceived by the individual (Austin et al., 2002). Less research has been carried out by architects and urban planners, analyzing the impact of the urban fabric itself on environments perceived as unsafe (Hillier, 2008; Kamalipour et al., 2014; Strandbygaard et al., 2022). Other research, including walkability studies, relates physical features of the city to comfort and security (Ewing et al., 2006). However, we believe that in addition to physical features, morphological features of the urban fabric on a larger scale also have an impact on individual experiences of fear of crime.

Of specific interest to this paper is a gap in research linking urban planning at a macro level to individual's fear of crime at a local level. Often, urban planning does not take into account space as experienced by people and, therefore, there is a split between "conceived space" (abstract space, conceptualized by urban planners through maps and technical plans) and "lived space" (the physical space of material existence, experienced directly by people) in the production of the space of cities (Lefebvre, 2013[1974]).

Apart from this issue, relatively little research has been focused on compact cities, despite this being the most common urban pattern in continental Europe. Studies on fear of crime from an environmental approach are mainly focused on low and

medium density suburban residential areas (Crank et al., 2003; Foster et al., 2010), areas close to shopping centers (Doran & Burgess, 2012), university campuses (Nasar & Jones, 1997), and green areas (Sreetheran & van den Bosch, 2014). To address this gap in the literature Bilbao, a medium-sized compact city, was taken as a case study.

Bilbao is a post-industrial city located in Northern Spain, in a valley at the head of the Nervión estuary (Figure 1), surrounded by a series of mountainous folds, which generate differences in elevation and other geographical features. In 2019, the city had 347,083 inhabitants (Ayuntamiento de Bilbao, 2020b). The average urban density of Bilbao as a whole, excluding the peripheral suburban areas, is above 75 dwellings/hectare (Diputación Foral de Bizkaia, 2020) and it has a compactness (ratio of public space to total area) of between 47-55. Over the last two decades, Bilbao has undergone a major transformation from industrial to service city. This rapid urban transformation together with its geographical features has produced abandoned or unresolved spaces in different areas of the city.

According to the *Perceptions of Safety and Victimization Study* (Ayuntamiento de Bilbao, 2020a), in 2019 only 7.8% of the population was a victim of a property crime or attempted crime in the city[1]. However, rates of fear of crime seem not to reflect this, as a significant section of the population has identified crime and citizen insecurity as the problem "that most concerns them personally at the moment" (27% of responses) (Ayuntamiento de Bilbao, 2020a). Indeed, this research confirms residents avoid specific areas of their neighborhoods because of fear of crime. This suggests that Bilbao may represent an example of the fear of crime paradox (Garofalo, 1979), where a low victimization rate does not correspond with reduced fear of crime. As Warr argues, fear

[1] According to the Ministry of Interior and the National Institute of Statistics, the average crime rate of the ten largest Spanish cities in 2019 was 65.23, while Bilbao's was 66.14 (INE, 2019; Ministerio de Interior, 2019).

of crime affects far more people than crime itself, and there are compelling reasons to treat crime and fear of crime as distinct social problems (Warr, 2000). Consequently, this research focuses on the perception of insecurity and not on crime itself.

Taking the gaps in existing research identified above into consideration, this paper analyses the relation between individual perceptions of crime and the urban fabric of the compact city of Bilbao. This includes not only physical but also morphological features of the city that impact environmental conditions, including natural surveillance, pedestrian activity and human interaction.

Methods

The research was carried out between 2018 and 2020. The first step was to select five neighborhoods of Bilbao. Subsequently, using a survey, fear of crime was measured and areas avoided were identified in the five selected neighborhoods. Finally, we conducted an exploratory analysis in order to understand the morphological and physical factors impacting the neighborhoods. We carried out an observational and morphological analysis using a series of maps and perspective sections to analyze urban morphology, physical conditions and urban qualities of the neighborhoods. Maps and perspective sections facilitated an inter-scalar analysis, from the macro urban scale of the neighborhood (morphological analysis), to an intermediate scale identifying urban design qualities, to a micro-scale analysis from the street-level perspective of a pedestrian (Figure 2).

Five neighborhoods in Bilbao

The selection of five geographical areas for the research was based on existing data from a number of sources (Ayuntamiento de Bilbao, 2015, 2017b, 2017a, 2020b).

This data was available with respect to 18 neighborhoods in Bilbao.[2] The following variables were taken into account: a) geographical location, b) average age of housing stock, and c) socio-economic indicators (average family income) (Table 1). First, we divided neighborhoods into two categories, central non-central, with central neighborhoods being those geographically located in the central and busiest areas of Bilbao. The housing stock in central neighborhoods has an average age of more than 58 years. Subsequently, we categorized family income into three bands, low (0 to 37,000 euros per year), medium (€37,001 to €60,000/year) and high (more than €60,000/year) (Eustat, 2018). For the research, two central neighborhoods, one high and one low income, were chosen. The second group of non-central neighborhoods included those surrounding the central neighborhoods. The medium-age of housing stock in these areas fell into two bands, between 27 and 58 years old, less than 27 years old. In all these neighborhoods, income was either medium and low. In order to address a representative sample, we choose two middle-income neighborhoods (one featuring mid-aged housing and one newer housing) and a low-income neighborhood, containing both middle-aged and newer housing stock. This total of five different neighborhoods was selected as a representative sample of the city.

Surveys: measuring fear of crime

The survey used to measure fear of crime was designed and validated by researchers from the Faculty of Psychology from the University of the Basque Country, Vozmediano, San Juan and Subiza-Pérez (San Juan et al., 2010; Subiza-Pérez et al., 2020). The objective evaluation of the survey was based on the Spanish adaptation of

[2] We were able to locate sufficient data for only for 18 of the city's 27 neighbourhoods, thus nine were excluded from the selection process.

the Pedestrian Environment Data Scan (PEDS) (Clifton et al., 2007; Ricci et al., 2011). As part of the survey, respondents were asked about their gender, age, years of residency in the neighborhood, if they avoided any places in their neighborhoods during the day or at night, and to identify these places. The total population of the selected neighborhoods was 77,372 in 2017 (Table 2). Given that the question about avoiding certain places were analyzed under two possible answers (yes or no), a minimum of 382 respondents was needed to reach a confidence level of 95%. Accordingly, 100 people were interviewed in each neighborhood, giving a total of 500 surveys[3]. Frequency (%) and distribution, mean ± standard deviation (SD) were used to describe the sample.

The survey used in the research asked about avoidance behavior (Lagrange & Ferraro, 1987) because the avoidance of places due to their physical-spatial or social characteristics is one of the most common behaviors evidencing fear of crime (Garofalo, 1981). In addition, measurement based on avoidance offers a way to address the subjectivity associated with cognitive or emotional approaches (Rountree & Land, 1996). Obtaining concrete geographical references of avoidance allowed us to effectively locate "places of fear" in the neighborhoods.

Observational analysis: analyzing urban design qualities

Observational analysis had the aim of identifying urban characteristics that, in accordance with environmental theories, contribute to generating safe places. With this aim, the following elements were assessed in each neighborhood:

- Natural surveillance: This can be understood as a way to deter and prevent possible crimes by the presence of people in surrounding buildings. The

[3] Although 342 surveys were required to reach a minimum level of confidence, we decided to conduct 500 surveys to ensure the confidence and reliability of the survey, and to homogenize the samples by neighborhood.

configuration of buildings and the location of windows and entrances determines, to a large extent, the presence of "eyes on the street" (Jacobs, 1992[1961]). For this research, we operationalized this concept as facades with sightlines towards the street (windows, balconies, terraces and gardens). Places not subject to natural surveillance, including areas with abrupt changes in elevation such as retaining walls, underpasses, etc. were also identified. This information was drawn on maps (Figure 3.B). We were aware that this working definition can be partially subjective, as while the presence of sightlines towards the street does enable surveillance, we were unable to determine its exact level. This said, sightlines were used the most objective means available to achieve to quantify natural surveillance.

- Human Interaction: This is the level of human activity in the street, which can be boosted by the presence of active frontages. As part of this study, we identified shops and services at street level that could generate human activity. This information was also drawn on maps (Figure 3.B). As with sightlines, that active frontage increases human interaction at street level relied on reasonable assumption rather than extended systematic observation in this research.
- Pedestrian flow: Can be understood as the number of people transiting a specific public space. For this study, transit along different streets was observed in order to establish the number of people who passed through per minute during the day. The pedestrian flow count was conducted in June 2020 in the afternoon (5 pm to 7 pm) on weekdays.[4] To estimate pedestrian flow, a researcher performed a manual count. This person moved along a length of street counting number of

[4] At that time, there were no mobility restrictions in Bilbao due to COVID-19.

people moving past them in a 5-minute period. Successive counts were made at different locations, in order to arrive at an average measurement of flow in people/minute. Four pedestrian flow bands were established: very low (<5 people/minute), low (5-25 people/minute), medium (25-50 people/minute) and high (> 50 people/minute). Only people travelling at speeds below 30 km/h (on foot, by bicycle, or by car) were counted, as travelling at a higher speed precludes stopping to offer assistance or to exercise natural surveillance. This information was drawn on maps (Figure 3.C). Due to the scope of the research and the funds available, the study had some limitations on this point, specifically that the measurement of pedestrian flow was limited to a single daytime observation. We believe that in future studies, more rigorous measurement would contribute valuable information about variations in pedestrian flow at different times of the day and night.

Morphological and physical analysis

Morphological analysis had the objective of understanding the urban fabric. We aimed to identify the main activity areas in the neighborhoods which tend to encourage the presence of people, since these can generate spaces perceived as safe (Wekerle & Whitzman, 1995). For this study we identified: large green areas (with vegetation), public space (streets and squares), main uses (housing and facilities) and transportation nodes (metro stations and bus stops). This information was drawn up into maps (Figure 3.A).

In addition, a perspective section (section of the street in which its surroundings can be seen) was used to apply the analysis on a smaller scale, specifically to the areas which were identified in the surveys as places to be avoided during the day by more than two people, which always implied higher rates of avoidance at night. In this way,

physical characteristics (street width, the height of buildings, width of sidewalks, etc.) and environmental characteristics (vegetation, parking, type of business, etc.) of the selected streets were identified (Figure 4). This in turn made it possible to establish specific factors at street level that influenced fear of crime, including a poor image, entrapment spots, movement predictors, and a lack of visibility.

Results

The surveys comprised 500 respondents, of which 50.6% were women and 49.4% men, with an average age of 46.52 ± 18.61, which coincides with data for Bilbao overall. Average residency in neighborhoods was 25.98 ± 18.76 years (Table 3). The results indicated that 15.4% of respondents avoided certain places during the day in their neighborhoods. By contrast, the number of respondents avoiding specific areas at night was much higher (42.7%) (Table 4). This notable difference between day and night was especially pronounced in non-central neighborhoods (Deusto, Rekalde and Txurdinaga).

Respondents also identified specific places avoided due to fear of crime that can be found in Table 5. The places avoided during the day were mostly the same as those avoided at night, but avoidance occurred with greater intensity and a bigger radius of influence after dark.

Discussion

Compact cities have been analyzed from various perspectives. Some benefits claimed for this urban model include sustainability, better social activity, walkability, and greater social justice. Certain authors assert that compactness and continuity can mitigate fear (Strandbygaard et al., 2022; Wedmore & Freeman, 1984), since these contribute to having a greater human presence on the street and, therefore, greater

natural surveillance of public space.

This paper partly supports these assertions. Residents of the five neighborhoods analyzed reported low to moderate levels of avoidance related to fear of crime during the day. In addition, the complementary morphological and observational analysis carried out by this study found that the standard urban fabric of the compact city does not seem to be a source of fear of crime in itself. Bilbao's central neighborhoods continue to attract a lot of activity, which implies a high level of natural surveillance and consequently low levels of fear of crime. However, non-central neighborhoods with less juxtaposed activities exhibited moderate avoidance rates during the day.

Thus, the dynamism and autonomy of neighborhoods identified in this study, which seems to be a feature of compact cities, can be counted among the factors that help to generate higher pedestrian flows, more human activity in the street, and natural surveillance, which consequently can mitigate fear of crime.

Although the five neighborhoods had low or moderate rates of fear of crime overall, one of the main findings of this paper showed that when fear of crime is present it is related to urban singularities. We believe that these singularities are one of the generators of feelings of insecurity in the city.

Times of fear

Results from the surveys demonstrated an increase in rates of avoidance at night, a phenomenon already identified in existing research (Brantingham & Brantingham, 1993; Daigle et al., 2021; Thomas & Bromley, 2000). As indicated above, the increase in levels of avoidance at night is higher in non-central neighborhoods than in central ones. In non-central neighborhoods, more than half of the people surveyed avoided going out in certain parts of their neighborhoods at night.

One of the reasons behind this difference could be the lack of night-time activity in these areas, which during the day are very dynamic. Most streets in Spanish compact cities have commercial activity on the ground floor of buildings and living spaces on upper stories. This reinforces the flow of pedestrians and ensures a constant presence of people and surveillance in most public spaces during the day. This is not true at night, outside business hours. By contrast, the central neighborhoods of the city host nocturnal activities, particularly leisure spaces that ensure a minimum flow of people at all times. Although debated, extended hours activities could be behind the smaller avoidance gap between night and day (Bromley et al., 2000).

As was mentioned in Methods, observation as well as cross-checking with morphological analysis and surveys were applied only at daytime. The results of the surveys showed that most of the places avoided during the day were the same as those avoided at night, with a change in avoidance rates. This finding, coupled practical limitations on the research, led us to focus on daytime analysis. We believe that a night-time analysis could confirm and extend the findings, so one avenue to explore in future research would be to apply night-time observational analysis into this study.

Places of fear

Although compact cities seem to generate little fear of crime during the daytime, when it is present, it tends to occur around certain urban singularities. Overall, the places avoided in all the neighborhoods can be organized into four categories of singularity: a) hermetic public facilities and large stores, b) large green areas, c) borders of the urban fabric, and d) interruptions in the urban fabric. We observed that each of these categories corresponds to different scales in city design decision-making. Thus, hermetic public facilities and large stores are defined by architectural projects; large green areas and the borders of the urban fabric are defined by local governments

through a combination of urban planning and urban design projects; while interruptions in the urban fabric are related to urban planning or territorial scale planning of transport infrastructure.

Interestingly, the results revealed an overlap between the places avoided identified in the surveys and the factors identified by the observational and morphological analysis tools. In most cases, areas avoided coincided with areas with low pedestrian flow, poor interaction at street level, and a lack of natural surveillance (see Figure 3 and Table 5).

Hermetic public facilities and large stores:

Many public facilities including schools, cultural centers, etc., as well as most large stores, shopping centers and supermarkets, have perimeters almost completely closed towards the street. They have few openings in their facades, either windows or accessways.

The creation of safe and controlled internal spaces generates endless blind walls externally, which in turn engenders public spaces with little or no natural surveillance or human activity. As other studies corroborate, it seems that the perimeter of many facilities are usually sensitive places when no elements exist which compensate for the lack of surveillance, pedestrian flow, and human activity at street level (Heffernan et al., 2014; Strandbygaard et al., 2022).

One good example is San Felicísimo Road (Figure 4.A), where an avoided space is delimited by the blind wall of a school without elements that compensate for natural surveillance.

Large green areas:

Large green areas (urban parks) are extensive public spaces that are an exception in the

urban pattern, often with little pedestrian flow. Through the morphological analysis, different types of green spaces were identified (Table 5). . In the cases analyzed, parks were mainly avoided at night, although access is permitted 24 hours a day.

Various authors have analyzed parks as urban spaces and their relation to fear of crime (Chapin, 1991; Iqbal & Ceccato, 2016; Newman, 1972; Wekerle & Whitzman, 1995). Theories emphasize diverse issues: the characteristics of park boundaries (uses around the park, night closure and accessibility), the dimensions of the park (central areas without natural surveillance) (Jacobs, 1992[1961]), the characteristics of the landscaping (presence of vegetation and/or topographical features that generate interruptions in sightlines) (Nasar & Fisher, 1993), image, and lighting (Bogacka, 2020).

The difference in the avoidance rate for Europa Park in Txurdinaga (Figure 5) during the day and at night is notable. This park is located on a steep hillside, which does not favor visibility or pedestrian flow. Furthermore, access to the park is via pedestrian underpasses, which are both places of entrapment and predictors of movement. Europa Park meets several of the considerations indicated above, including a bad border and poor orographic/landscape conditions. It is not perceived by the population as a centrality, but rather as a void in their mental maps (Lynch, 1960).

Borders of the urban fabric:

From a morphological point of view, the edges of urban fabrics are singular places where the urban fabric ends. These include borders with non-urban land, transport infrastructure, and geographical limits. Similar to what has been found in other studies, avoided edges were found in non-central neighborhoods more than central ones (Strandbygaard et al., 2020). Examples identified in this research included a suburban road running parallel to a highway at Rekalde, and Morgan Street in Deusto, which

parallels the waterfront area next to the estuary. These urban edges are desolate places, so they tend to have very low human activity and low pedestrian flow.

Urbanists should pay special attention to wastelands at the urban limits, and to areas close to large scale infrastructures. These are often empty spaces, avoided by a significant part of the population, especially at night. These places give a negative image of the environment, encouraging abandonment and transmitting negative signals (Cozens et al., 2005). These types of edges tend to remain unresolved for decades as administrations do not put resources into finding tools to manage "the meantime".

Interruptions in the urban fabric:

We understand interruptions as singularities produced in the urban fabric, including tunnels (Txurdinaga), pedestrian underpasses (Deusto), passages under major roads (a highway in Rekalde), and abrupt changes in elevation (Deusto, Txurdinaga). These interruptions, often poorly resolved by urban design, tend to have very little natural surveillance, low levels of human activity at street level, relatively low pedestrian flows, and often a poor image (Loukaitou-Sideris, 2011; Strandbygaard et al., 2022). Moreover, litter and graffiti are reoccurring features in the vicinity of many urban stairways and tunnels.

It was also observed that majority of interruptions were generated by a combination of the rugged orography of the city and the presence of supra-municipal transport infrastructures. These both impact at a territorial scale. Planning at this scale does not usually consider the detailed impacts generated at street level in the public space of cities, so these places, often created as a result of the implementation of large-scale infrastructures, turn out to be sensitive places in terms of fear of crime (Figure 7).

On a somewhat smaller scale, urban planning does not usually address the impact of certain urban elements such as avenues or main streets in detail (Collantes,

2021). This is the case of the Txurdinaga tunnels under the main avenue (Figure 7) and the abrupt changes in elevation so common in Bilbao, which are often poorly resolved.

Geographical juxtaposition to mitigate fear of crime

The results of the research indicate that the places and hours of fear detected tend to be associated with a high degree of avoidance, especially if there is no other activity or node nearby that generates positive "geographical juxtaposition" (Cozens & Love, 2015; Newman, 1972).

Geographical juxtaposition, a concept rarely applied by researchers (Cozens & Love, 2015), can be positively accomplished through the presence of small stores at street level, nearby transport nodes, socio-cultural and health facilities, or other uses that activate public space, encouraging pedestrian flow and natural surveillance in adjacent spaces and expanding the hours of activity. As mentioned above, the closure of stores and activities at street level at night-time means dramatically reducing this geographical juxtaposition. This may be the reason for increased rates of avoidance outside daylight hours. This hypothesis could be corroborated through further research.

Urban planning should avoid generating spaces and hours of isolation in general, but especially when projecting singularities and exceptions. In other words, continuity should be given to the urban fabric so that singularities do not imply marked interruptions.

In the case of Bilbao, an absence or a marked interruption in commercial use at street level seems to exacerbate fear of crime when it coincides with other singularities in the urban fabric mentioned above.

The most recurrent urban typology in Spanish urban planning takes for granted the presence of shops at ground level. This type of commercial street is very suitable for central areas of the city since there is a large pedestrian flow and a critical mass of

people that enables commercial activities to subsist, especially during the day. In non-central neighborhoods with less pedestrian flow and insufficient critical mass, it seems impossible for businesses to prosper on the ground floor of all residential buildings. This is especially true if malls or large stores are established in these areas. At present, the available shopfront spaces in many areas of the city are not in use, and have even been semi-permanently boarded up. Thus, it seems necessary to look for alternative housing designs to provide active frontages at street level.

Urban planning should ensure that facilities and nodes articulate the city, generating useful public spaces. Thus, facilities should have a well thought out relationship with the street. This can be achieved through greater interior-exterior continuity, avoiding the use of blind walls and inactive frontage.

Inter-scalarity and transversality

This research has shown that fear of crime seems to be partially concentrated around large, territorial and district scale singularities. These include interruptions in the urban fabric produced by large transport infrastructure and the poor implementation of urban development across rugged topography.

These results go beyond existing research since a majority of studies that analyze fear of crime and urban space limit their analysis to environmental characteristics. This study has revealed the importance of taking into account large-scale interventions that have long term implications in this regard when investigated on a smaller scale.

Current urban planning has a top-down vision since technical plans read and represent the city from a bird's-eye perspective. This rupture between “conceived space” and “lived space” is reflected in everyday issues such as fear of crime. The lack of attention to all scales when designing and implementing urban projects, result in spaces

that are difficult to resolve at a street level micro-scale, which are not even recognized as singularities, and therefore not addressed by specific urban design projects in urban planning.

As discussed above, fear of crime is related to ruptures in public space when local commercial, services and social activity are reduced. Thus, human presence in the street should be encouraged through mixed use urbanism and by generating a network of proximity between housing, facilities, services, commerce and workplaces (Collantes, 2021). This is consistent with what has been previously identified in urban gender studies. The objective should be an inclusion of the concerns of daily life, taking into account people's mobility, cohesion, and social integration (Bofill, 2008; Col-lectiu Punt 6, 2019). This transversely affects the perception of safety of both collectives and individuals.

Old areas, sensitive places

The results of the research further indicate that the historic urban centers are a special case with respect to fear of crime, since avoided areas are not related to urban singularities or to a lack of pedestrian flow, interaction or natural surveillance.

The urban fabric of San Francisco and Luzarra Street in Deusto is pre-industrial, pre-twentieth century, very compact, high density, and with narrow streets.

These streets have great natural surveillance, a lot of human activity and a medium or high pedestrian flow. However, housing located in this type of urban fabric is usually old and presents different problems including limited accessibility and poor lighting and ventilation.

When road traffic, parked vehicles, bulky items such as garbage containers, and a decayed environment are present in the narrow streets of historic areas they can generate poor visibility, a feeling of entrapment, and a poor image (Hunter, 1978;

Skogan, 2015; Wilson & Kelling, 1982). These in turn can increase fear of crime. In addition to physical problems in the environment, social issues come into play. According to different studies, urban areas with low income levels tend to have a lesser perceived safety level in public (Pantazis, 2000; Scarborough, 2009; Taylor & Hale, 1986; Vauclair & Bratanova, 2017). The lower price of housing in these areas tends to attract people with low incomes and higher levels of social vulnerability. The majority have short-term leases which contributes to instability in the demographic profile of these neighborhoods (Skogan, 1986). This does not contribute to cohesion and social integration. Additionally, some authors suggest that residential status influences fear of crime, with areas of homeownership areas having higher levels of territoriality and social control than areas of rented accommodation (Greenberg et al., 1982; Strandbygaard et al., 2020).

The observations above suggest that the urban fabric of the historic town center does not generate fear of crime in itself. Avoidance in these neighborhoods must instead be attributed to a combination of environmental factors including the decrepit image of deteriorated buildings and public spaces, interruptions in sightlines, entrapment spots, and movement predictors (lack of alternatives in transit), among others (Nasar & Jones, 1997; Thomas & Bromley, 2000; Wekerle & Whitzman, 1995).

Local governments should undertake proactive management implementing ongoing renovation and improvement of both housing and public spaces, as well as promoting commercial activity. From a social point of view, it is important to address structural problems (Saville & Cleveland, 1997), such as structural racism, marginalization and gender inequality, to generate more resilient neighborhoods, putting the life at the center, and avoiding both the generation of ghettos and gentrification.

Reducing fear of crime through urban planning

Based on the findings detailed above, it appears that many of the problems around fear of crime in compact cities arise due to city planning carried out at territorial and district scales. This leaves unresolved singularities in the urban fabric. Therefore, addressing fear of crime from a purely environmental perspective is not sufficient. Urban planners and architects need to understand safety as transversal (Ceccato, 2020). This study has contributed to this objective, through the design of methodological tools that analyze fear of crime in an inter-scalar way, relating conceived space (the specificities of urban morphology) and lived space (the fear of crime). In this way, a limited environmental view of the fear of crime is expanded on in order to integrate the influence of the morphology and the physical features of the city.

Finally, in addition to integrated cross-scalar planning, it is vital to promote public policies for an effective planning and regeneration of historic urban centers from a broader and more inclusive perspective.

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(See "main document with authors info")

Conflict of interest

The authors of this paper do not have any conflict of interest or perceived conflict of interest.

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Tables

Table 1: Selection of the five representative neighborhoods

Geographical location	Age of housing	Socio – economic factor (familiar income)	Neighborhoods
Central neighborhoods	Old	Low	Atxuri / **Bilbao la Vieja (San Francisco)**
		Medium	Casco Viejo
		High	Indautxu / **Abando**
	Medium age	Low	
		Medium	
		High	
	New	Low	
		Medium	
		High	
Non-central neighborhoods	Old	Low	
		Medium	
		High	
	Medium age	Low	**Rekalde** *centro* / San Ignacio / San Adrian / Otxarkoaga / Olabeaga / Santutxu
		Medium	**Deusto** / Ametzola / Basurto
		High	
	New	Low	**Rekalde** *berri*
		Medium	**Txurdinaga** / Miribilla
		High	

Table 2: Comparative data for the five neighborhoods addressed

	Deusto	Txurdinaga	Rekalde	Abando	San Francisco-Bilbao La Vieja
Inhabitants	20,340	15,891	16,139	23,920	10,832
a) Geographical location in the territory					
Location	Non central	Non central	Non central	Central	Central
b) Average age of housing					
Age of housing (2)	27-58 years	<27 years	27-58 years	59-74 years	>75 years
c) Socio-economic level					
Average income (euros/family) (3)	48,367	42,918	32,469	73,730	28,501

Sources:

(1) Observatorio de Barrios de Bilbao 2017.
(2) Eustat 2017.
(3) Anuario Socioeconómico 2017.

Table 3: Sociodemographic variables of the respondents

	Deusto	Txurdinaga	Rekalde	Abando	San Francisco-B. La Vieja	AVERAGE
Age	50.26 (20.41)	54.68 (16.35)	43.07 (19.38)	43.20 (17.89)	42.35 (15.97)	46.52 (18.61)
Years living in the neighborhood	28.17 (18.64)	27.19 (13.56)	29.26 (19.62)	27.07 (20.83)	18.98 (18.40)	26.13 (18.21)
Gender						
Female	51%	51%	48%	56%	50%	51%
Male	49 %	49 %	52 %	44 %	50 %	49 %
Occupation						
Student	12%	3%	12%	22%	3%	9.8%
Worker	48%	54%	44%	58%	33%	43.3%
Unemployed	7%	2%	22%	8%	46%	15.7%
Housework	10%	14%	2%	12%	18%	10.5%
Retired	23%	27%	20%	13%	13%	18.6%
Economic status						
Low	2%	0%	11%	1%	50%	12.9%
Low-medium	11%	6%	30%	4%	26%	15.4%
Medium	77%	87%	58%	75%	24%	64.2%
High-medium	8%	6%	1%	18%	0%	6.5%
High	0%	1%	0%	1%	0%	0.4%

Table 4: Avoidance during the day and night

	Deusto	Txurdinaga	Rekalde	Abando	San Francisco-B. La Vieja	AVERAGE
% of people surveyed who AVOID some places in their neighborhood during the DAY	20%	23%	18%	0%	16%	15,4%
% of people surveyed who AVOID some places in their neighborhood during the NIGHT	66%	52%	60%	4,4%	31%	42,7%

Table 5: Places avoided due to fear of crime.

	Avoidance frequency (day - night)	*Natural surveillance*	*Active frontage*	*Pedestrian flow (day)*
HERMETIC BUILDINGS				
San Felicisimo Road (Deusto)	5 - 14	Yes (one side)	No	Very low
Supermarket zone (Rekalde)	2 - 8	Yes (both sides)	No	Very low
Orueta Path (Txurdinaga)	1 - 9	No	No	Very low
LARGE GREEN AREAS				
Europa Park (Txurdinaga)	6 - 23	No	No	Low
Doña Casilda (Abando)	0 - 3	Yes (some kiosks)	No	Moderate
URBAN EDGE				
Botica Vieja (Deusto)	0 - 4	Yes (one side)	No	Low
Morgan Street (Deusto)	4 - 14	Yes (both sides)	Yes	Very low
Artazubidea (Rekalde)	2 - 5	No	No	Very low
INTERRUPTIONS				
Madariaga tunnels (Deusto)	5 - 16	No	No	Very low
Highway underpass (Rekalde)	7 - 17	No	No	Very low
Tunnels under main avenue(Txurdinaga)	4 - 14	No	No	Very low
Garaizar/Galindez streets (Txurdinaga)	1 - 3	No	No	Very low
OLD AREAS				
2 de mayo/Hernani (San Francisco)	10 - 19	Yes (both sides)	Yes	Moderate
Cortes (San Francisco)	2 - 5	Yes (both sides)	Yes	Moderate
Luzarra (Deusto)	3 - 11	Yes (both sides)	Yes	Low
Ramón y Cajal (Deusto)	1 - 2	Yes (both sides)	Yes	Low

Figures

Figure 1: Aerial view of Bilbao. The five neighborhoods analyzed are indicated.

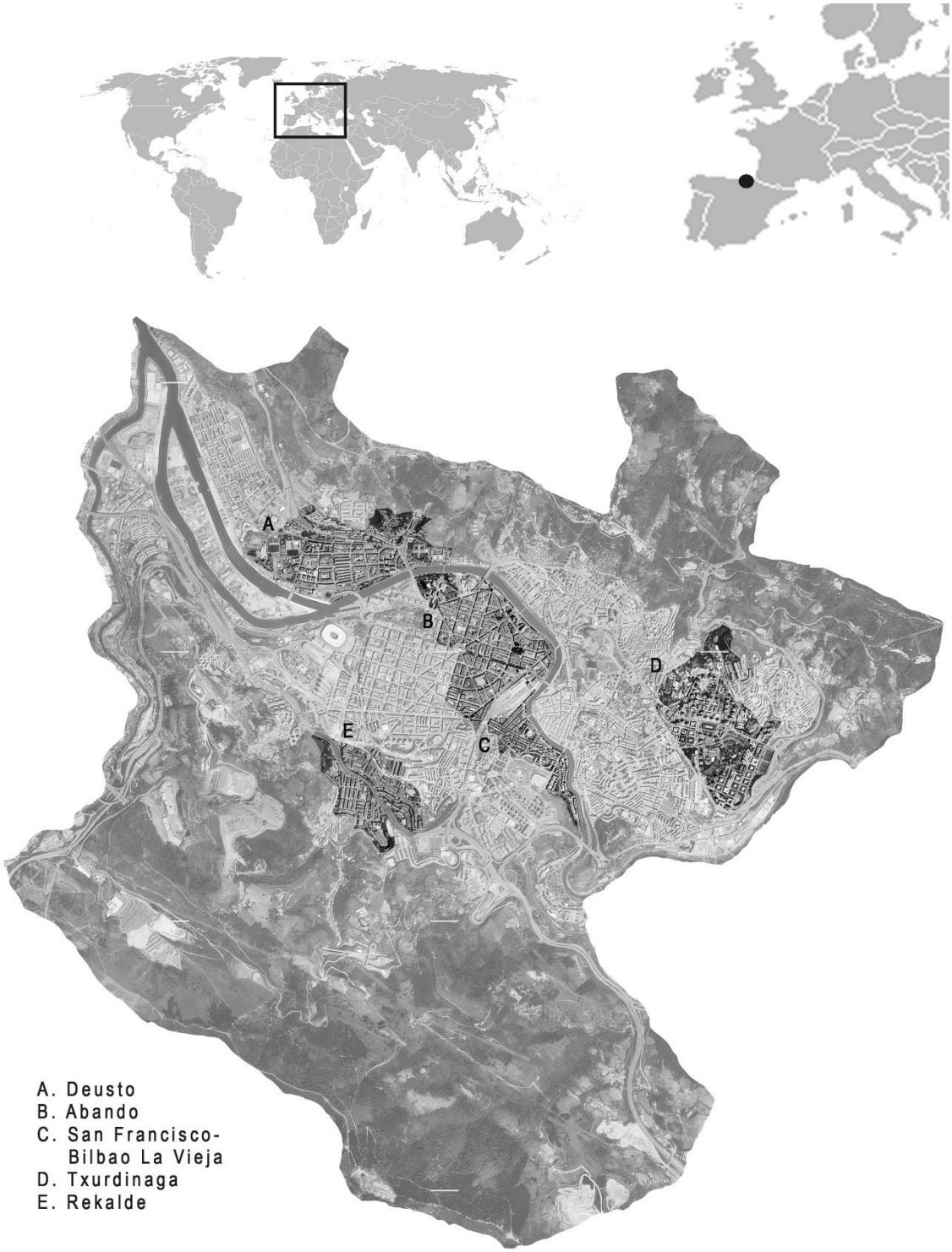

Figure 2: Conceptual framework.

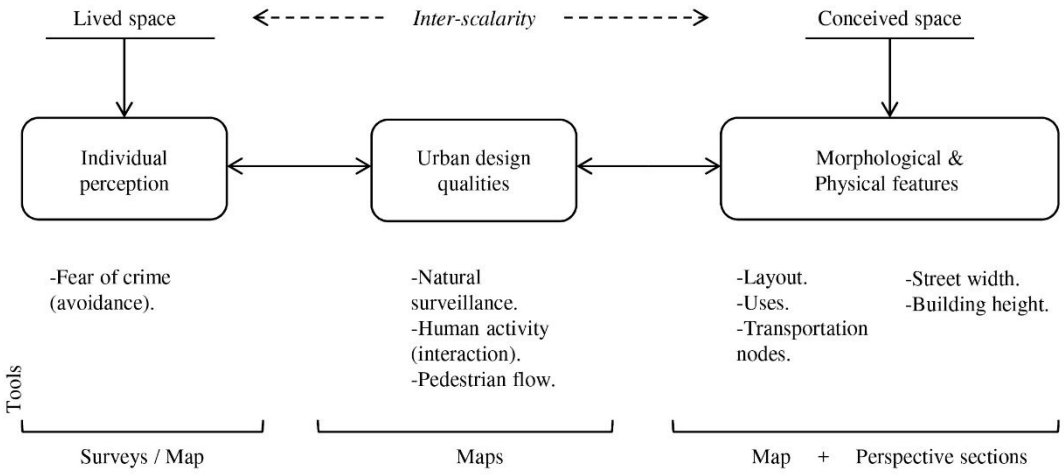

Figure 3: Deusto analysis: A) Land uses of the urban fabric; B) Natural surveillance and active frontage; C) Pedestrian flow, and D) Places avoided identified in surveys.

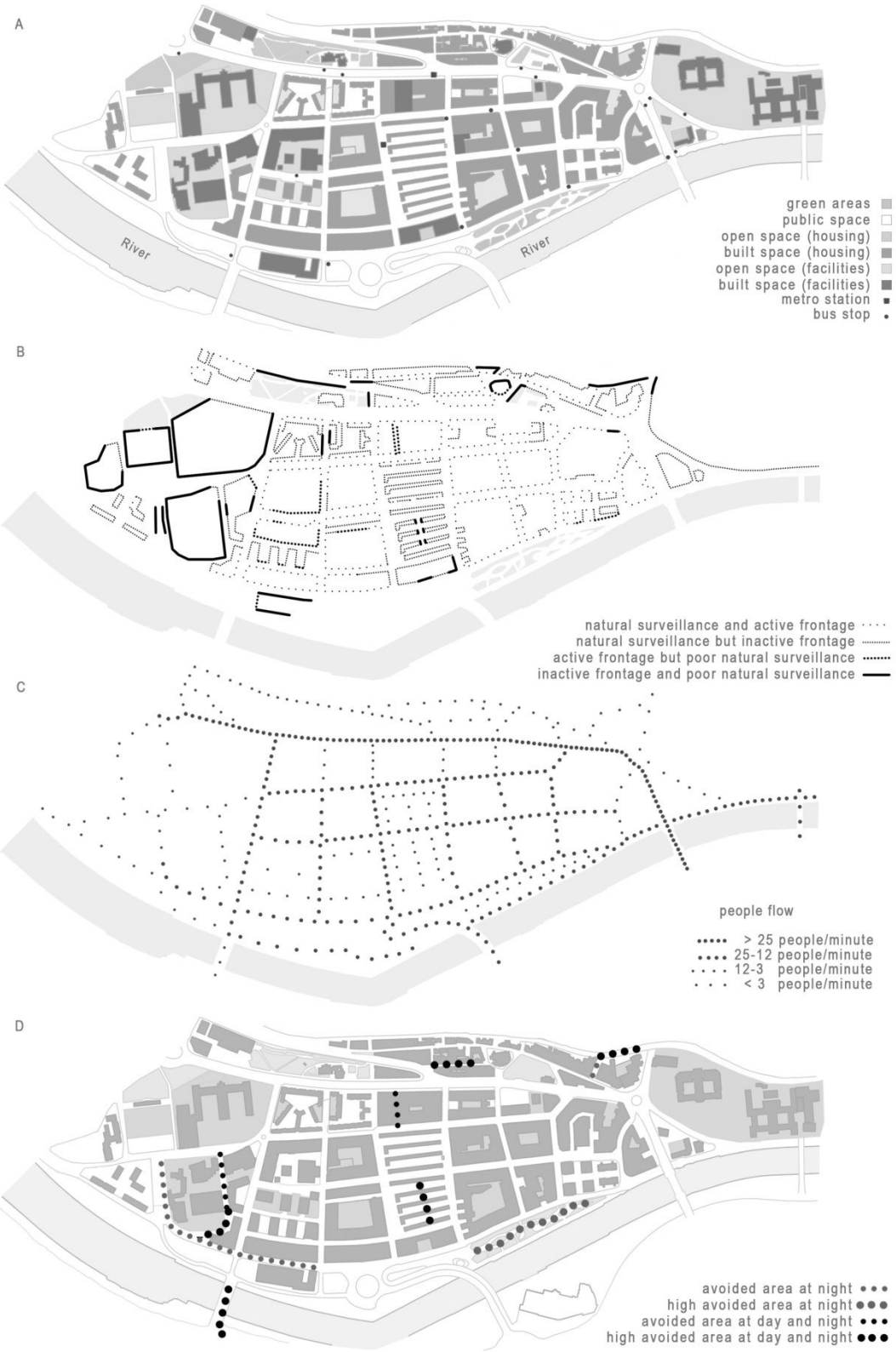

Figure 4: Morphological and environmental analysis of the streets of Deusto through perspective sections.

Figure 5: The Europa Park accessways in Txurdinaga are seen as entrapment spots.

Figure 6: Highway through Rekalde.

Figure 7: Underpass under one of the main avenues of Txurdinaga.