Cultural accessible pedestrian ways. The case of faro historic centre

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Abstract:

In a historic city the existence of accessible pedestrian routes constitutes an essential feature to a true access to culture heritage, contributing for processes of social inclusion. It is necessary to create accessible pedestrian infrastructures network to hold a set of attributes that guarantee usability for all citizens. The creation and design of an accessible physical environment should be considered as a criterion of urban quality, which will make walking more pleasant not only for the elderly and people with disabilities but, also, for the entire resident population and tourists. In this case study it is ascertainable whether the physical characteristics of pedestrian infrastructures of cultural interest, located in the Historical Centre of Faro (Portugal), comply with the requirements of the National Law of Accessibility. There has, therefore, been created a methodology for evaluating the accessibility of pedestrian infrastructure through the construction of performance indicators. The analysis is achieved through a model of evaluation of the degree of conformity of the spaces, and presented, spatially, with appeal to a Geographical Information System, which is a tool to support the decision taking in the processes of urban rehabilitation, thus contributing to the choice of priority areas of intervention in the field of accessibility. The diagnosis confirms the existence of inaccessible pedestrian infrastructure and concludes the need to trigger processes of urban renovation.

Keywords: Accessible Culture Routes, Accessible Pedestrian Ways, Social Inclusion, Social Sustainability

Resumen:

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Caminos peatonales accesibles culturales. El caso del centro histórico de faro

En una ciudad histórica, la existencia de rutas peatonales accesibles constituye una característica esencial para un verdadero acceso al patrimonio cultural, contribuyendo a los procesos de inclusión social. Es necesario crear una red de infraestructuras peatonales accesibles para mantener un conjunto de atributos que garanticen la usabilidad de todos los ciudadanos. La creación y el diseño de un entorno físico accesible debe considerarse como un criterio de calidad urbana, lo que hará que caminar sea más agradable no solo para las personas mayores y las personas con discapacidad, sino también para toda la población residente y los turistas. En este estudio de caso se puede determinar si las características físicas de las infraestructuras peatonales de interés cultural, ubicadas en el Centro Histórico de Faro (Portugal), cumplen con los requisitos de la Ley Nacional de Accesibilidad. Por lo tanto, se ha creado una metodología para evaluar la accesibilidad de la infraestructura peatonal a través de la construcción de indicadores de desempeño. El análisis se logra mediante un modelo de evaluación del grado de conformidad de los espacios, y se presenta, espacialmente, con un sistema de información geográfica, que es una herramienta para apoyar la toma de decisiones en los procesos de rehabilitación urbana, contribuyendo así a La elección de áreas prioritarias de intervención en el campo de la accesibilidad. El diagnóstico confirma la existencia de infraestructura peatonal inaccesible y concluye la necesidad de desencadenar procesos de renovación urbana.

Keywords: rutas culturales accesibles, caminos accesibles, inclusión social, sostenibilidad social

1. INTRODUCTION

Accessibility for all is considered a key attribute of inclusive tourism and should be addressed in pedestrian infrastructure, building architecture, public transport (vehicles, terminals and bus stops), information and communication technologies and services.

The concept of "accessible tourism" meets this attribute as it "enables people with access requirements, including mobility, vision, hearing and cognitive dimensions of access, to function independently and with equity and dignity through the delivery of universally designed tourism products, services and environments. This definition is inclusive for all people including those travelling with children in prams, people with disabilities and seniors" (Darcy & Dickson, 2009: 34). So, the accessible tourism for everyone, is defined as a way of tourism, which develops leisure and spare time activities in such a way that it may be enjoyed by every type of people, regardless of their physical, social or cultural conditions.

The World Tourism Organization considers accessible tourism to be a beneficial segment (UNWTO, 2011) and has been promoting the concept and presenting examples of good practice. In addition to the right to accessibility to the built environment, it alludes to the right to have a cultural life.

It so happens that in the built urban environment there are many physical barriers which limit the tourist activity of people with reduced mobility. The chain of physical barriers considers the access to museums, theatres and historic centres. Consequently, the principles of universal design must be incorporated in the urban design of the cities and in the architecture of the edification so as to promote the social inclusion, being all this characteristic associated to social sustainability.

Some international studies presented methods to assess the accessibility of pedestrian networks in urban environment (Kockelman *et al*., 2000; Beale *et al*., 2000; Ferreira & Sanches, 2007; Evans, 2009; Wennberg, 2010; Teles & Silva, 2010). More recently, research on universal accessibility has been done on cultural routes (Rodrigues *et al*., 2017).

Our investigation considers that the accessibility in the historic centres is an important requirement for the displacement in the physical environment and it is focused on the conditions of physical accessibility of the sidewalks and pedestrian crossings considering people with physical handicaps.

In a historic centre, the existence of accessible pedestrian ways is a fundamental characteristic to guarantee attractivity and safety of these urban spaces. These accessibilities can also contribute for a better quality of life of the citizens, as well as enhancing processes of inclusion and social sustainability. In a context of social equity, every citizen must have the same equality of opportunities in using the space, regardless of his/her capacities and culture.

The aim of this article is to present the basic principles and operational criteria which rule the planning and design of an accessible pedestrian network, taking into account the wheelchair users. In specific objective terms, the purpose is to develop an analysis of the accessibility of the footpaths network of the historic centre of the city of Faro (Portugal). The footpaths with cultural interest are going to be examined, in order to examine the physical characteristics considered in the Portuguese Legislation on Accessibility (Decree-Law 163/2006 – 8th August). With this legislation it is compulsory to adopt a group of technical

norms for the elimination of architectonical barriers in public buildings, in collective equipment and in public spaces to enhance the accessibility for all.

The diagnosis is materialized through an assessment model of the degree of the conformity of the spaces according to the afore referred legislation. The methodology is applied through a System of Geographic Information and this system is expected to be a support instrument for decisions taken in processes of urban renewal, thus contributing to the choice designation of priority areas for intervention.

2. ACCESSIBILITY FOR ALL

The increase number of people with intellectual, emotional, sensorial, physical or communicational handicap, together with the ageing of the population is provoking the need of accessible spaces and equipment, as in their daily life, these people with handicaps are faced with physical barriers, which don't allow them to have an active life.

In this context, the concept of "universal design" or "design for all" appears to ensure the rights of accessibility for all, including people with special needs.

"Universal design" is a strategy, which aims to make the design and composition of different environments and products accessible and understandable, as well as usable by everyone, to the greatest extent, in the most independent and natural manner possible, without the need to adapt design solutions (The Center for Universal Design, 1997)

Thus, the design of a public space, according to the universal design, should take into consideration, the human diversity to attend to the needs of each citizen, without ever directioning them to segregational situations. Only in this way, will it be possible to have an effective integration of handicapped people in society.

The right of every individual to fully participate in the life of the collectivity, includes the right to having access, to use and to understand the built up surrounding environment.

The development of the universal design must take into account every interventions in the physical environment, so as to create accessible towns to everyone, from his/her birth to his/her old age, and thus providing the all population with the right of using their urban environment, in an equal way (Aragall *et al*., 2003).

These needs led the The Center for the Universal Design of the North Carolina State (USA) to develop, in 1997, the concept of "design for all". It was developed a project designated "Studies for the Promotion and Development of the Universal Design" that had the purpose to create a guide of universal design. It involved seven American institutions and a dozen expert professionals in this subject, including engineers, architects, product designers and researchers of environmental design. They developed the seven principles for the universal design: 1) equitable use; 2) flexibility in use; 3) simple and intuitive use; 4) perceptible information; 5) tolerance for error; 6) low physical effort; 7) size and space for approach and use. These principles must always be incorporated in the conception of products and physical environments, so as to create a fair built up environment, where all have the right to use it in the same way, any part of the built up environment, in an independent and natural way.

Thus, the design of a pedestrian infrastructure must be based upon basic principles of universal design, so as to enable its usability for all. These characteristics are fundamental in a

sustainable and in an accessible tourism, which takes into consideration elderly people, handicapped people, children, as well parents with baby prams.

According to the European Concept for Accessibility "accessibility is the characteristic of an environment or object which enables everybody to enter into a relationship with, and make use of, that object or environment in a friendly, respectful and safe way" (Aragall *et al*., 2003: 23).

A network of pedestrian ways must make sure, that every type of people has the right to move about in the public space, in a comfortable and safe way, bearing in mind the particular characteristics and necessities of everyone. For example, in the performance of an accessible for all pedestrian crossing, one must consider the needs of every user, by following the principle of equitative use. Thus, one must guarantee the access to people, who move in a wheelchair, by ramping the sidewalks, and also for those with a visual handicap (blind people and low sight people) where the danger alert must be understood through detectable warning surface or existing colour and texture contrast, so that they may cross in safety.

So as to be able to implement a network of accessible pedestrian ways, it is necessary to act upon the different constituent elements of the pedestrian infrastructures, namely:

- Pedestrian sidewalks (including infrastructures, urban furniture, traffic signals);
- Pedestrian crossings;
- Modal interface areas (including bus stops, terminals, reserved parking places for handicapped people).

These elements are an integrant part of the network of pedestrian ways and they must be designed, as an integrant part of a system (not as isolated elements), so as to ensure the accessibility in conditions of safety and comfort. They must be coherent and they must be articulated with the existing urban functions in the space.

Further operational criteria for the conception of pedestrian infrastructures that benefit the pedestrian are the following: speed control of the motor transport, reciprocal visibility for the different users of the public space, limitation of the risk of exposure of the pedestrian and ensure an adequate geometry of the pedestrian ways.

3. GEOMETRY OF THE ACCESSIBLE PEDESTRIAN INFRASTRUCTURES FOR WHEELCHAIR USERS

3.1 Pedestrian sidewalks and other footpaths

The sidewalks are urban infrastructures which bear the pedestrian walking and they must be dimensioned as a channel of pedestrian circulation. They must be projected on both sides of the street in all the urban zones, and be continuous, safe and free from obstacles.

The presence of obstacles on the footpaths interrupts the continuity of the sidewalk, which, very often, for people with reduced mobility, makes the continuation of their travel impossible and forces the pedestrian to tend to occupy the roadside, thus increasing the risk of an accident. It is necessary to have an accessible path of travel that allows a continuous and a barrier free movement that guarantees that anyone can use the public space. Thus, the dimensioning of sidewalks and other footpaths require a minimum width, free from obstacles.

The concept of "width free from obstacles" corresponds to the clearway effectively availability for the pedestrian displacement. It, also, considers a free unobstructed vertical space to allow proper and safe passage. So, it is translated into a space width and height without obstacles.

According to the Portuguese legislation on accessibility, the dimension of the clearway width, to adopt in the design of a pedestrian network, varies according on the category of the road. In main roads and distribution streets, where people intersect with each other occasionally, the clearway width dimension must be above 1.5 m. In the remaining lanes, it must be above 1.2 m over all its extension.

However, best practices recommend a useful width above 1.8 m, when people intersect continuously or when there are shop windows, so as to permit the crossing of people in wheelchairs.

The clearway width of a sidewalk may vary, but its continuity must always be guaranteed there. Are admissible narrowings of 0.90 m, but only as an exception, as is the case of small garden areas with extensions inferior to 7 m.

Where the clearway width of the sidewalk is less than 1.50 m, one must implement promptly (ideally 50 in 50 m), in areas with a free width above 1.80 m and with an extension of 2 m, so as to enable the intersection of users that are on a wheelchair and circulate on opposite directions.

The urban furniture on the sidewalks must be aligned along the edge of the sidewalk so as not to damage the free width, ie, the continuity of the sidewalk.

The presence of building facades, walls and shop windows also influences the free width, as the pedestrian tends to circulate away from these obstacles.

The height free from obstacles must be above 2.4 m.

Another aspect to take into consideration is the quality of the surface/pavement of a pedestrian way, as it is particularly important to ensure the accessibility and comfort of all pedestrians who walk on the public space. Such requires the maintenance and preservation of the surfaces, once the irregular surfaces with deformations dissuade walking and don't allow the displacement of pedestrians with reduced mobility.

For the construction of surfaces of pedestrian infrastructures, one must use materials which provide a stable, durable, firm, continuous and an anti-skidding surface. On the contrary, if these norms are not respected, those surfaces may cause accidents to pedestrians, mainly to those who move with the help of crutches, walkers, wheelchairs, baby prams, etc.

A surface is stable when it doesn't move, when subject to mechanical actions arising from normal use; it is durable, when it doesn't erode with the action of rain or with frequent washing; it is firm when it doesn't deform when subject to mechanical actions, arising from normal use; it is continuous, if it doesn't possess joints with a depth of more than 0.005 m.

The longitudinal and cross slope of the pedestrian spaces is another important factor for the movement of people, mainly for those with reduced mobility. The choice of suitable slopes for the pathways contributes to the creation of accessible pedestrian networks for all users,

influencing their speed. The legislation recommends that the longitudinal slope of the sidewalks doesn't exceed 5% and that the cross slope be inferior to 2%.

3.2 Pedestrian crossings

Another element of the pedestrian network that requires an adequate dimensioning concerning the accessibility for all, corresponds to the infrastructure, that enables the pedestrian to cross the roadway, beginning and ending at the footpaths, usually designated "pedestrian crossing". It is an essential infrastructure for the connectivity of the pathways.

It is a mixed zone where there is a sharing between different modes of travel, where the pedestrian usually has priority over the other modes. The crossing is the main point of conflict between the various modes of transport (pedestrian, motorized and by bicycle). So it becomes necessary to meet the needs of road traffic with the needs of pedestrians.

It is, therefore, necessary to have a balance, which provides safety and functionality to every type of user, bearing in mind that the pedestrian is the most vulnerable user. Thus, in the urban design of roads, it is necessary to adopt technical solutions, which minimize the exposition to the risk of the pedestrians, which enable shortening the distance that these go through to cross the roadway, increase the visibility of the pedestrians, control the speed of the motorized vehicles, leading, altogether, to the decrease of the risk of accident.

The crossings, as an integrant element of a pedestrian network, must fulfil some requisites, to ensure the accessibility and safety of the pedestrians. So their planning and design must be based on important characteristics to ensure the quality of the pedestrian network (AASHTO, 2004):

- Predictability: the location of pedestrian crossings must be predictable; the crossings must be located in a place where the pedestrian traffic is denser;
- Alignment: The pedestrian crossings must be aligned so as to provide to people a simple route and the most direct possible;
- Standby time: the pedestrian mustn't have to wait a long time to be able to cross;
- Enough time to cross: the time required for the pedestrians to cross the roadside must always be sufficient, independently of its characteristics;
- Accessible crossing: the pedestrian crossing must be clear of obstacles and totally accessible to everyone; the crossing place must be well illuminated, providing in this way visibility and safety.

Sometimes the road surface, at pedestrian crossings, can be raised to the same level as the pathway, so that wheelchair users do not have to overcome differences in height, although this is not always possible, because it depends on the volume of motorized traffic. In the places where the speed of the motorized traffic is less than 50 km/h, one may use a simple crossing, type "zebra".

The width of the crossing varies in function of the authorized speed for the motorized traffic on the spot, between 4 or 5 m and must never be less than 2.5 m. The longitudinal stripes on the road surface must have the dimension of the crossing and 0.5 m of width. The stripes are typically 50 cm wide. These must be separated between themselves by a space of 50 cm. The

crossing is still limited by a line of assigned passage, which must be placed across at a distance between 1.5 and 2 m, from the starting point of the crossing. The vertical signal pedestrian crossing must be located next to the assigned line of crossing.

Whenever the crossing is at the level of the roadway, the sidewalk in the immediately adjacent area to the pedestrian crossing must be ramped through the slope of curb ramp, so as to enable the safe and autonomous access of the pedestrian to the sidewalk and vice versa. This slope is essential to attend to the mobility of people with motor disabilities, specially, users of wheelchair.

The existence of an access ramp ensures the accessibility to all pedestrians, in a comfortable and safe way, and it permits the continuity of the crossing. When the ramp is not well executed, it can cause obstacles to the mobility, thus constituting an urban barrier.

The access ramp must be ensured on both sides of the crossing. According to the Portuguese legislation, for the design of access ramps, the following recommendations must be taken into account:

- The slope of the ramp can't be more than 8%, in the direction of the pedestrian travelling, and 10% on the curb of the sidewalk;
- The ramp must exist on all the width of the crossing, but it is acceptable, in already existing streets, to have a size above 1.2 m;
- The width of the central island must never be less than 1.2 m;
- The ramp curb mustn't interfere with the channel of the pedestrian movement which must be a clearway, without any urban furniture or obstacles;
- The height of the ramp curb, in all crossing width must be inferior to 0.02 m, with the recommendation that there isn't any rebound;
- The cross slope of the sidewalk and of the central islands must be less than 2%, measured in the direction of the pedestrian crossing.

Along the whole pedestrian crossing, the surface must be stable, durable, firm and continuous. For the access ramps to the sidewalks, the legislation foresees the use of covering material with a different texture and a contrasting colour or, ideally, with coloured and tactile marking strip to guide the pedestrian with impaired vision. It is specified, in this case, that a tactile surface of alert/presence must be installed. Furthermore, best practices also recommend that guide strips must be constructed to indicate the position of pedestrian crossings for the benefit of sightless pedestrians.

When there are pedestrian traffic signals, pushbuttons must be easy to locate and must be placed between 0.80 m and 1.20 m off the ground for the benefit of wheelchair users and children. The length time of the green signal that allows the pedestrian to cross the roadside, must enable the pedestrian to cross it at a speed of 0.4 m/s.

On streets with a high volume of motor traffic or which are intensely used by people, pedestrian traffic lights must be provided with clearly audible signals for the benefit of sightless pedestrians.

4. CASE STUDY: ACCESSIBILITY IN THE HISTORIC CENTRE OF FARO

4.1 Aims

This case study aims at studying the accessibility level of the historic centre of Faro, as this characteristic is fundamental in a context of social inclusion. We intend to investigate if the physical characteristics of existing public streets respect the demands of the Portuguese legislation on accessibility (Decree-Law 163/2006).

This study materializes an analysis through an assessment model of the degree of conformity of the spaces with the above referred law. This task was integrated in a Geographic Information System (GIS) so as to permit the spatial representation of the achieved results on classification maps.

The achieved results will constitute a support tool for the decision making of the management of street infrastructure, and will contribute to the choice of priority areas to be requalified and to be considered in the process of urban renewal, bearing in mind an accessible city for every citizen, including tourists.

4.2 Characterization of the study area

The city of Faro is located on the southern coast of Continental Portugal. It is the district capital and the head of the municipality of Faro. In 2011, it had a population of 44119 inhabitants, spread over 47% men and 53% women. The population density is of 310.8 inhabitants per square kilometre and the aging index is of 120.8% (INE, 2012). By being flanked by several marshes of the Ria Formosa (a natural park), it is inserted in an area which portrays a scenery of great beauty. It has a typically Mediterranean climate.

Through Faro Airport, this city constitutes a great external entry of the country. This fact confers to Faro a cosmopolitan character and a tourist and economic dynamics. This city offers good road accessibility standards. Improvement in the railway transport is awaited.

The city offers a great number of administrative services which are important for the region. It has multiple commercial and economic activities, due to its traditional capacity of attraction. It has a good network of cultural facilities and maintains good levels of supply of cultural events.

The historic centre of Faro constitutes an important centrality with a commercial and tourism potential. This city still portrays some of the relevant historic monuments which testify to the millenary history of this city which was inhabited by Phoenicians, from the VIII century BC, followed by the Greeks, Celts and Carthaginians. Between the centuries III BC and VIII AD, the city was under the domain of the Romans and of the Visigoths. In the year 713 CE it was conquered by the Moors, who built a ring of walls. In 1249, with the Christian Reconquest, Faro is integrated in the Portuguese territory. It increased its prosperity successively, due to its geographical position, to its fluvial port, to its exploitation and commerce of salt and to its agricultural products.

The old city – denominated Vila-Adentro - was structured around the Square of the Cathedral (Largo da Sé), the place where the old church of Saint Mary of Faro (Santa Maria de Faro) is situated. This church is, nowadays, the cathedral of Faro, and it was built in the centuries XIII/XIV. At the beginning of the XVI century, outside the tannery and near the coast, a very important urban expansion occurs, due to the installation of a new equipment in the city - a hospital, the Holy Spirit Church (Igreja da Misericórdia) and the Custom-house (Alfândega), among others. During the Restoration War (1640 - 1668) the city was surrounded by a new belt

of walls, which included the built up area and the farming lands. The XVII and XVIII centuries are also a period of urban expansion, which remained within the limits of this XVI century walls until the end of the XIX century.

Thus evolved inside the village (Vila-Adentro) and the adjacent Moorish neighbourhood (Mouraria), with artisanal and commercial tradition, and the Riverside neighbourhood (Bairro Ribeirinho) linked to the Ria Formosa and to its maritime activities (adapted from Paula and Paula, 1993).

Today urban renewal processes are taking place and it is recognized that there are problems of urban degradation, where pedestrian accessibility and mobility are a fundamental issue, felt particularly by elderly residents and by the tourists.

In Vila-Adentro, the sidewalks of the streets are very narrow when they exist, and they are usually made of natural stone pavement composed by white glazed calcareous, which requires maintenance. The motor vehicles circulation is conditioned and, sometimes, it coexists with the pedestrian mode.

The Mouraria (the Moors' quarter) was subject to a global intervention in the public space, which was concluded in 2001. Some structural axes become pedestrian ways, surfaces were rehabilitated and traffic calming techniques were implemented. This is the part of the historic centre that integrates narrow streets and pedestrian squares which are properly equipped with urban furniture support, which makes this part of the city an attractive place to stay and to rest. It is the area which presents the best state of conservation.

In the case of the Bairro Ribeirinho, this area presents a high number of buildings with patrimonial value and it assumes a more problematic role, due to urban degradation and to the activities which take place there, namely commerce and night life.

Some examples of barriers to the pedestrian accessibility in the historic centre of Faro are presented in Figure 1 and they show the existence of narrow sidewalks, the lack of connectivity in the pedestrian infrastructure, roadsides with surfaces made by irregular granite blocks, inadequate ramp curbs and cars parked on the top of the sidewalks.

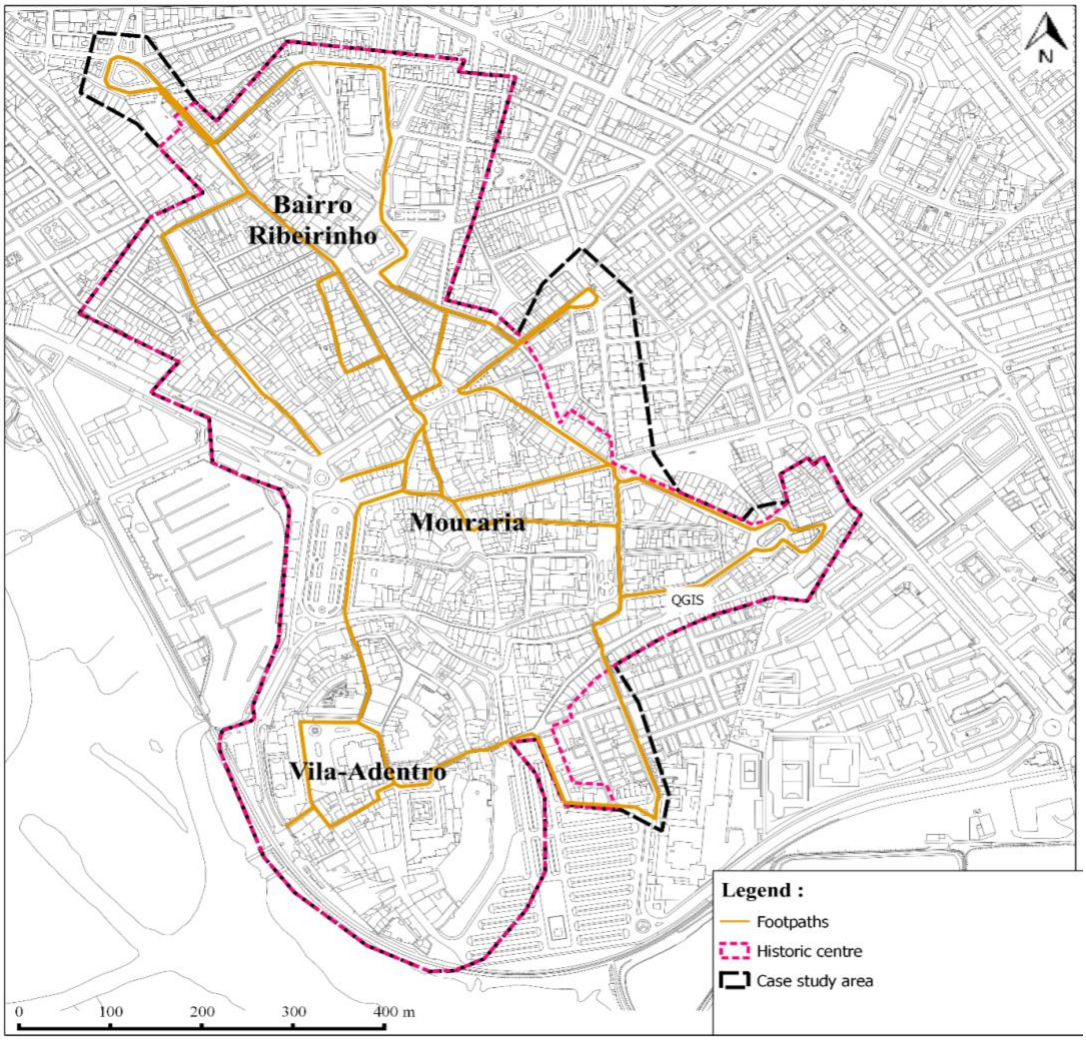
Figure 1: Examples of barriers to the pedestrian accessibility in the historic centre of Faro

Photos: Isabel Landim

4.3 Analysis of the study area

The accessibility analysis of the area study was done in stages. In the first place it was necessary to establish the footpaths to analyse, based upon the relevant points and itineraries enunciated by the Municipality and by the Tourist Office. These routes amount to 13.6 km, spread over several historic centre streets.

Figure 2: Study area and footpaths analysed in the Historic Centre of Faro



The survey in situ of the footpaths was done in a second phase. The following criteria were investigated:

- State of the surface/pavement;
- Width pedestrian clearway and cross slope (or when there were no sidewalks, the analysis was performed on the roadside);
- Existence of obstacles;
- Longitudinal slope of the streets;
- The existence of pedestrian crossings with access ramp curb to the sidewalks and the analysis of its geometry.

The survey took place between 4th January and 16th February, 2014. For the survey were used a digital measurer and a digital inclinometer.

A Geographic Information System, the Quantum GIS (version 2.0.1), was used, in the third phase, in which the vectorial cartography (granted by the Municipality of Faro) was introduced, from which the study area was extracted, and, afterwards, the classified footpaths were outlined.

The information obtained in the survey was inserted, introducing all the present obstacles, classifying them according to their type. The position of the obstacles enabled the assessment of the obstacles plant.

The following tables present the model of the assessment indicators of the accessibility of the pedestrian infrastructure for the "sidewalks and other footpaths" and "pedestrian crossings" (Table 1 and Table 2).

To finish with, the classification according to the assessed level of accessibility was made, having classified the pedestrian ways as "According to the Accessibility Law" and "Not according to the Accessibility Law".

The non-conformity refers to four situations:

a) Width of pedestrian clearway is inferior to 1.20 m;
b) The surface/pavement is degraded;
c) The width of pedestrian clearway is inferior to 1.20 m, and, simultaneously, the surface/pavement is degraded;
d) The width of pedestrian clearway is above 1.20 m, but, on which the surface/pavement is degraded;

The classification of the accessibility level resulted from separate analysis of the different attributes of accessibility of the public space, where the localized importance of each obstacle prevails.

Table 1: Assessment model of the accessibility of the pedestrian infrastructure for the sidewalks and other footpaths

Assessment Indicators adapted from Decree-Law 163/2006				
Public space	**Indicators**		**According to the Accessibility Law**	**Not according to the Accessibility Law**
Sidewalks and other footpaths	Surface state		Stable	Does not meet the requirements for full accessibility
			Durable	
			Firm	
			Continuous	
	Height of pedestrian clearway		≥ 2,4 m	< 2,4 m
	Slope	Longitudinal slope	≤ 5 %	> 5 %
		Cross slope	≤ 2 %	> 2 %
	Width of pedestrian clearway	In main streets In others streets	≥ 1,5 m ≥ 1,2 m	< 1,5 m < 1,2 m
		In planted zones with full length ≤ 7 m	≥ 0,9 m	< 0,9 m

Table 2: Assessment model of the accessibility of the pedestrian crossings

Assessment Indicators adapted from Decree-Law 163/2006			
Public space	**Indicators**	**According to the Accessibility Law**	**Not according to the Accessibility Law**
Pedestrian crossings	Surface state	Stable	Does not meet the requirements for full accessibility
		Durable	
		Firm	

			Continuous	
	Height of Pedestrian clearway		≥ 2,4 m	< 2,4 m
	Curb ramp	Height of depressed curb along pedestrian crossing	≤ 0,02 m	> 0,02 m
		Slope of curb ramp	≤ 8 %	> 8 %
		Slope of flared side	≤ 10 %	> 10 %
	Ramp surface		Detectable warning surface or existing colour and texture contrast	Does not meet the requirements for full accessibility
	Centre island	Width of centre Island	≥ 1,2 m	< 1,2 m
		Cross slope	≤ 2 %	> 2 %
	Pedestrian traffic signals	Height of pedestrian pushbutton	0,8 m ≤ h ≤ 1,2 m	Does not meet the requirements for full accessibility
		Green light signal (symbolizing WALKING PERSON)	Pedestrian crossing velocity must be no more than 0.4 m/s	
		Pedestrian traffic signals in street with high volume of vehicular traffic and/or intensity of use by pedestrian	They must have audible WALK signal	

The accessibility level of the sidewalks was represented on thematic maps (Figure 3). It shows the accessibility assessment of Vila-Adentro), by using two colours, marking the difference between those "According to the Accessibility Law" and "Not according to the Accessibility Law" green and red, respectively. In the identification of the obstacles, it was adopted the symbology proposed by Teles & Silva (2010).

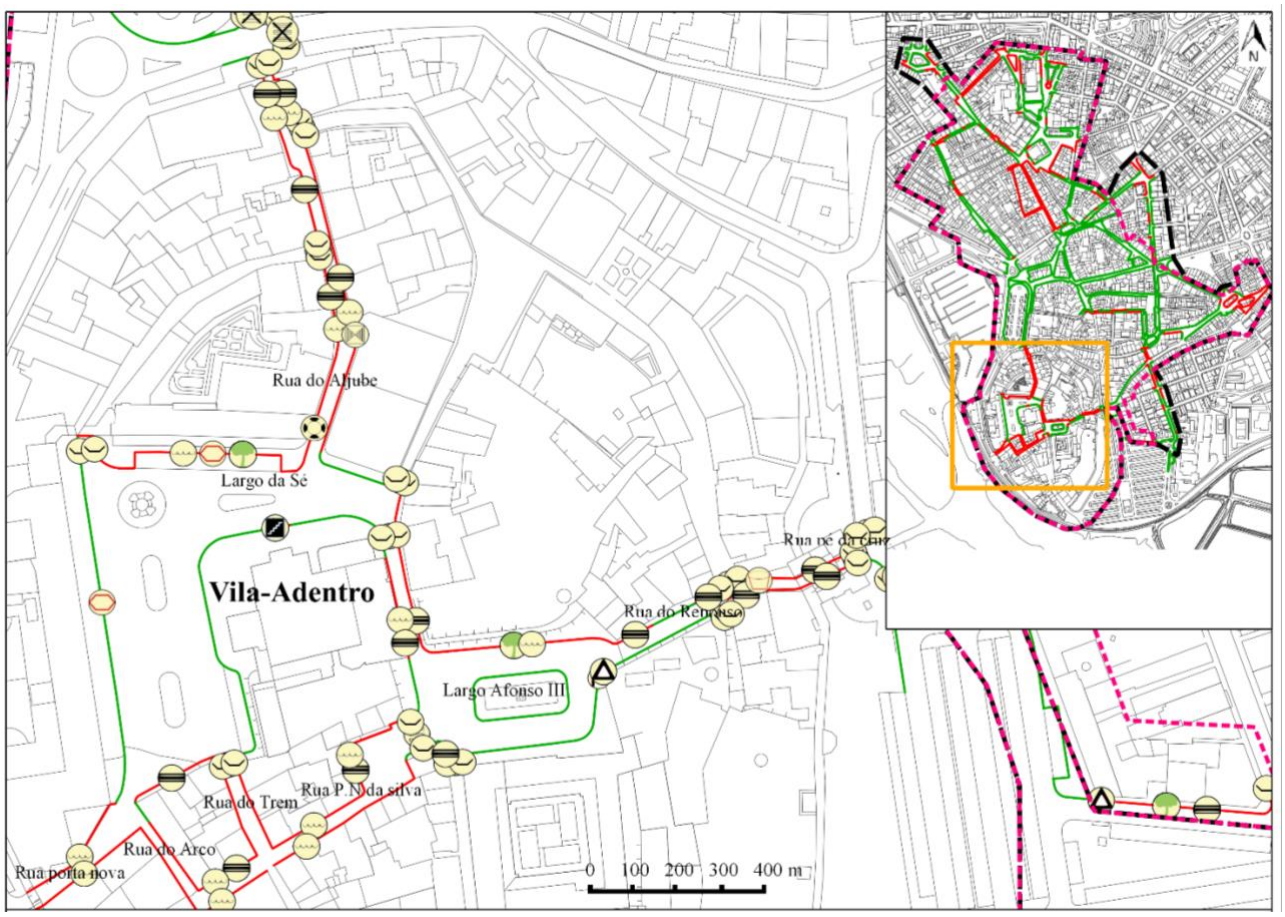
The software used enabled to built up a map of the sidewalks where the diverse critical points are identified. Through the map, the accessibility level of the pedestrian infrastructures is easily understood. The location of the main obstacles which hinder or don't allow the circulation of pedestrian with reduced mobility, in the study area, is also identify.

Based upon the studies carried out, in situ, about the longitudinal slope measured with the digital inclinometer, we analysed and classified the diverse slopes (Figure 4 shows the assessment of Vila-Adentro), by following the same method it was used for the accessibility assessment of the sidewalks.

We analysed the existing pedestrian crossings in the same way (Figure 5).

In spite of the "Sidewalks and other footpaths" and "pedestrian crossings" being classified by distinct indicators, it is necessary to consider both in the urban renewal process.

Figure 3: Accessibility assessment of the sidewalk infrastructures of Vila-Adentro



Legend:

- Historic centre
- Case study area
- Pedestrian clearway ≥ 1,20 m and adequate pavement
- It is not according to the accessibility

- Electricity or gas box
- Tree
- Fire Hydrants
- Bollard, wall
- Tree grate
- Lamp street lighting
- Dumpster
- Steps, stair or ramp
- Planter box
- Railing
- Mail post
- Mupi
- Litter can
- Parking meter
- Zebra crossing
- Bad design of zebra crossing
- Small sidewalk or no sidewalk
- Degraded pavement
- Bookstall
- Kerb ramps
- Traffic signal
- Improper parking on the sidewalk
- Civil work or fence
- Terraces or other trade barrier

Figure 4: Longitudinal slope assessment of Vila-Adentro

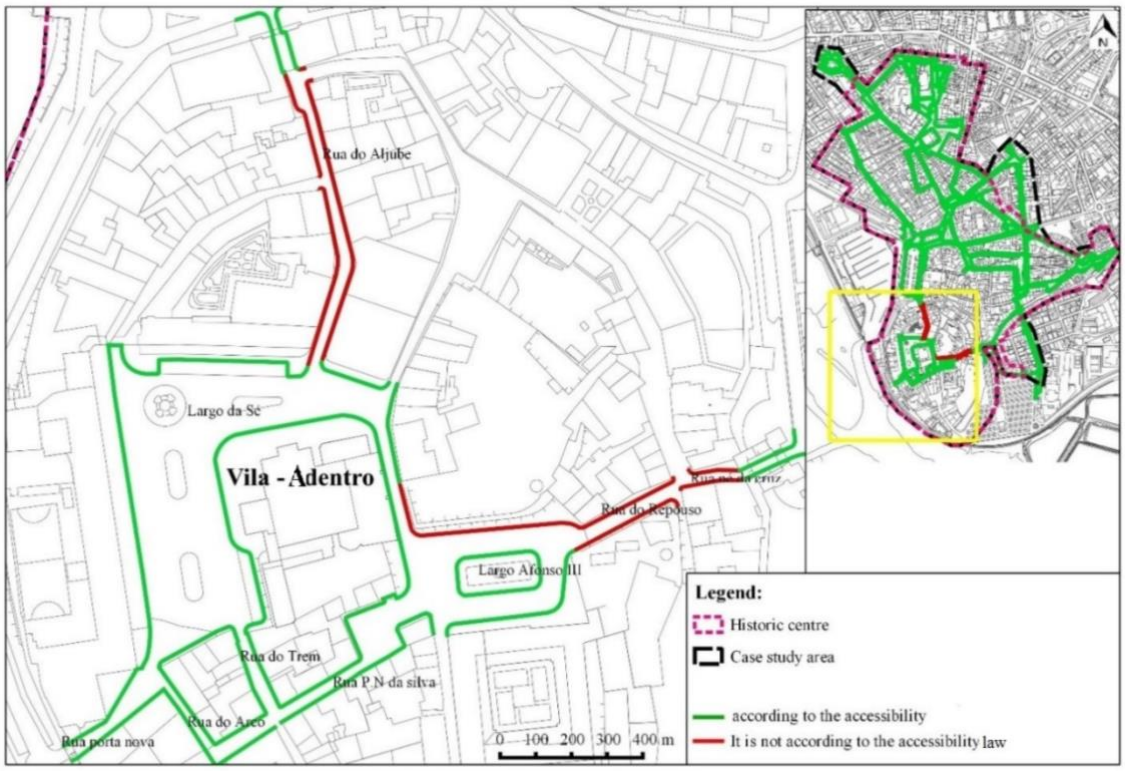
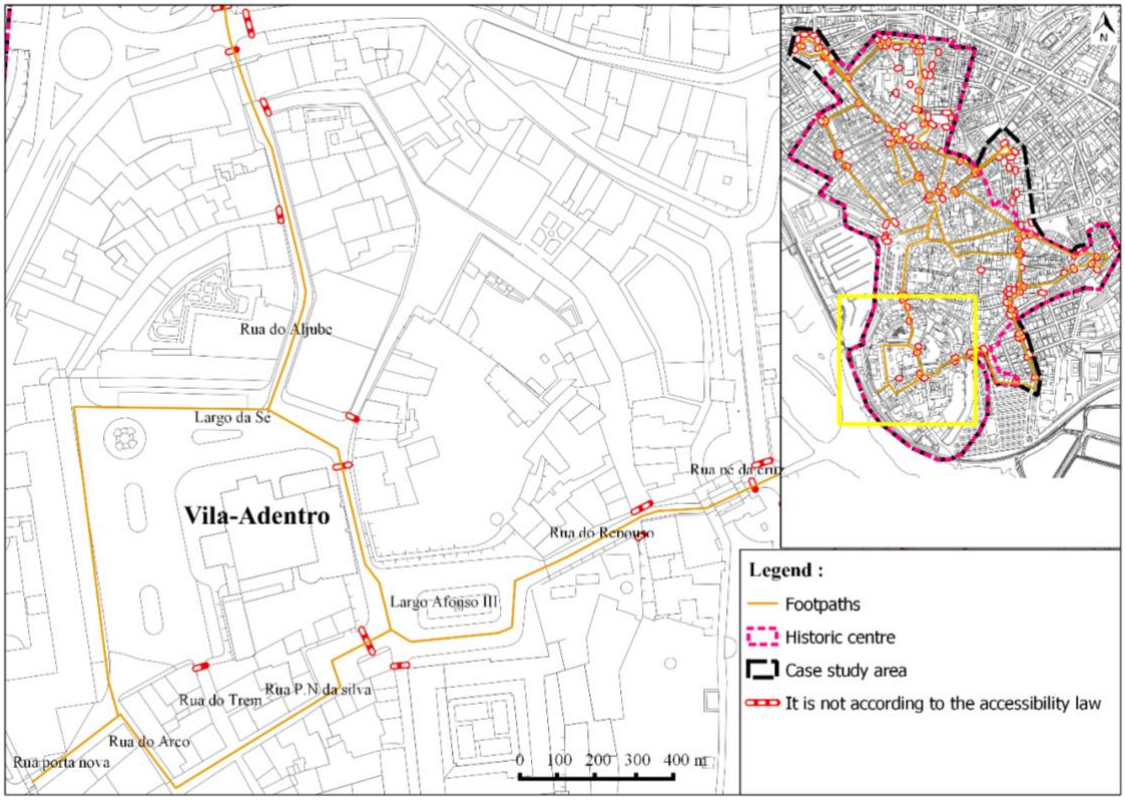


Figure 5: Map of accessibility assessment of the pedestrian crossings of Vila-Adentro



4.4 Results of the accessibility assessment

After the classification of the sidewalks and the pedestrian crossings, the statistic data was collected, according to the existing accessibility level. For the collection of statistic data *plugin* for the *software* GQIS "*Group Stats" Stats and analysis for vector layers data* was used. Through the assessment of indicators, we presented the accessibility level which exists on the pedestrian ways in the historic centre of Faro (Tables 3 and 4).

Table 3: Accessibility level of pedestrian ways

Accessibility level concerning the clearway of the sidewalks, existence of obstacles and quality of the surface	Total length of sidewalks (m)	Percentage (%)
According to the Accessibility Law	9603,27	70,6
Not according to the Accessibility Law	4004,42	29,4

Table 4: Accessibility level concerning the longitudinal slope of streets

Accessibility level	Total length of sidewalks (m)	Percentage (%)
According to the Accessibility Law	13124,135	96,4

Not according to the Accessibility Law	483,565	3,6

In spite of the obtained good results for sidewalks and other footpath, that accessibility is limited, due to the fact that 100 % of the pedestrian crossings are not according to the demands of the Portuguese legislation on accessibility. This is mainly due to the lack of ramp curbs to the sidewalks or to the wrong dimensioning of those, which makes it impossible or hinders the access of users of wheelchair to the historic centre of Faro.

In what concerns the central islands, which exists in this area, although fulfilling the regulation concerning the width and cross slope of the surface, they haven't, as a general rule, ramp curbs, and when they have the ramps, these don't fulfil the existing legislation.

In what concerns the surface of the curb ramps to the sidewalks/roadside, in the area immediately adjacent to the sidewalks, there's no tactile marking strips of alert or directional or contrasting surface colour and different texture, which hinders the access of blind and low sight citizens to the historic centre of Faro.

Therefore, the conclusion is that, in spite of the characteristics of the historic centre of Faro, concerning its little rough morphology of the street network, the accessibility for people with disabilities must be improved.

4.5 Intervention proposals

The construction of accessible pedestrian infrastructures is a vital requisite for the development of the historic centre of Faro, as the urban renewal to which it is associated, usually has a multiplying effect in terms of touristic and commercial attraction of these quarters. Thus, it is necessary to adapt the pedestrian ways to the requisites of social inclusion but without ever forgetting that these are important areas from the historic and cultural point of view. Thus the urban characteristics of the mesh must be maintained and the architectonic characteristics of the historic buildings must be preserved, so as to keep the cultural identity of the place.

The renewal of the historic centre of Faro must go through the reconstruction of the pedestrian ways ensuring more efficient connections among the different monuments so as to guarantee connectivity.

From the carried out analysis, we alert that it is necessary to requality the pedestrian infrastructures network, so as to supress the existing physical barriers in this area of study. The main measures are:

- To build curb ramps adjacent to the pedestrian crossings;
- To reinforce the horizontal stripes on the roadside;
- To remove the obstacles on the sidewalk and place them on a specific area – the urban furniture and planting zone must be located adjacent to the roadside;

- To increase the width of the sidewalks by decreasing the width of the roadside, if possible;
- To create sidewalks when these don't exist, in case the street has enough cross width;
- To assume the destruction of narrow sidewalks on historic streets with an inferior width of three meters, sharing between pedestrians and motor vehicles;
- To repave or rebuild the pavements of roadsides and sidewalks;
- To condition the motorized traffic on historical streets.

Therefore, it is necessary implement differentiated interventions on the sidewalks and promote the adequate installation of urban furniture, in order to offer accessibility conditions, pedestrian safety and aesthetics, so as to turn these spaces more appealing and attractive for residents and tourists.

The renewal of the pedestrian infrastructures must follow the recommendations of the legislation on accessibility. Furthermore, the design of the spaces and the urban furniture, to be installed, must take into account the necessities of the blind pedestrians who use the white walking stick to detect obstacles.

Beyond the implementation of measures which contribute to the promotion of accessibility for all, there are other important measures: public illumination must be reinforced, placards must be implanted at the beginning and end of each street, with the information of street network (configuration, distance, length of time of walking, degree of difficulty), seats for the pedestrians to rest, placed on strategic places, elaboration of a cleaning and maintenance chronogram of the streets, and furthermore, demand for the responsible entities the fulfilment of the laws, which have to do with the car parks.

The transport interfaces, in spite of not being analysed in this study, must be a priority for the users and contribute towards the tourist attraction of this study area.

In order to transform the historic centre into a space for the future, there is the need, parallel, to the urban regeneration process, of diversifying and promoting the cultural offer, through the creation and installation of new cultural equipment, by taking advantage of the existing buildings, which have, today, no definite or adequate use, and create and dynamise events, which contribute for promoting the utilization and the animation of spaces with heritage value.

5. CONCLUTIONS

Spatial accessibility and access to information are considered key attributes of cultural routes (World Tourism Organization, 2015).

The development of this study enabled us to understand the basic norms which rule the planning and design of an accessible pedestrian network and the operational criteria, which are needed for the design and building up of accessible pedestrian infrastructures, bearing in mind the sustainability and social inclusion of the cities. In this case study, the analysis of the accessibility of the pedestrian infrastructures was possible through a GIS, where it was possible to identify and map the barriers that exist on the sidewalks and pedestrian crossings in the historic centre of Faro. With this instrument it was possible to identify, in a clear way, the priority areas of intervention, which must be considered in the urban renewal process. The

applied methodology may be of use for a starting point towards the analysis of the accessibility of other pedestrian ways.

The implementing of universal accessibility conditions in a built environment urban area, in sequence of urban renewal processes, contributes, actively, to the urban sustainability, as it promotes the march on foot and a pleasant trip in a cultural walk.

The conception of accessible pedestrian ways is also an issue of political and communitarian interest, towards an effective social inclusion of all citizens and towards a better life quality and health and improvement of urban environment.

With this investigation, technical orientations are offered to all technicians and professionals, who intervene in the process of planning and design of a pedestrian network, based on the principles of social sustainability, which takes into account the needs of all persons.

The concept of Universal Design must constitute an integrant and compulsory part for the initial formation of all the professionals, who work in the area of the built environment: urbanists, engineers, architects and designers.

However, the consideration of technical norms on accessibility, doesn't guarantee, just itself, the universal accessibility. The success of any intervention in the urban space is also connected with the way the population perceives it. Therefore, the participation of handicapped people in the collaborative design process are fundamental. In what concerns the current Portuguese legislation, it is essential to promote its revision, to consider with greater emphasis on human diversity (for example, to emphasize the needs of the blind people) and particularize their adaptation to historic centres, where the preservation of these spaces must be well kept.

The promotion of the pedestrian accessibility in public spaces, bearing in mind the human diversity, the social inclusion and equity, beyond a citizenship imperative, is also an opportunity to innovate and to promote cultural life.

In the range of the Urban Sciences, GIS constitutes a fundamental tool for the understanding of social problems, by increasing the political and community perception towards these and, thus, contributing to their resolution.

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