THE IMPORTANCE OF PEDESTRIAN SPACES
The City of Porto

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To the City of Porto and to everyone who has made it unforgettable.

Capas negras de saudade,
No momento da partida.
Segredos desta cidade
Levo comigo para a vida.

Balada De Despedida Do V Ano Jurídico 1989
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RESUMO

Este trabalho visa aferir a importância dos Espaços Pedonais na cidade do Porto e compreender o seu papel no tecido urbano.

O presente projecto começa por apresentar uma base teórica onde se focam os conceitos de Pedonabilidade e Espaço Pedonal. Pretende-se, assim, mostrar de que modo o espaço pedonal influencia a articulação dos diversos elementos do espaço urbano. Focam-se as razões que levam à subestimação do espaço e do tráfego pedonal, reúnem-se breves considerações acerca da estrutura que este deve respeitar e refere-se o impacto que o tráfego automóvel tem sobre o espaço urbano e sobre os utilizadores do mesmo, nomeadamente, os peões. Tecem-se algumas ponderações acerca da implementação de espaços unicamente pedonais, dos benefícios da pedonalização e apresentam-se alguns exemplos de sucesso europeus.

Segue-se uma abordagem prática à problemática do espaço pedonal, distinguindo-se o ponto de vista do planeador, do ponto de vista do utilizador.

Apresenta-se, de seguida, uma metodologia de avaliação do carácter de pedonalização de espaços urbanos. Esta metodologia baseia-se essencialmente na óptica do utilizador, sendo depois sujeita a uma análise em correspondência com a óptica do planeador.

Esta metodologia é então aplicada a uma zona central da baixa da cidade do Porto, pelo que se caracterizam cerca de 50 ruas que depois de cotadas de acordo com os critérios definidos, são ordenadas em função do seu carácter de pedonalização.

Procede-se posteriormente a uma cuidada análise dos resultados obtidos a partir da qual se tecem algumas conclusões e recomendações.

ABSTRACT
This project aims at assessing the Importance of Pedestrian Spaces in the city of Porto and understanding their role within the urban tissue.

Firstly, in this project, a theoretical basis is presented, making an introduction to concepts like Walkability or Pedestrian Space. The purpose is to realize the way pedestrian spaces influence the articulation of the various elements of the urban space. The reasons that lead to general underestimation of pedestrian traffic and pedestrian space are gathered, and some guidelines for pedestrian spaces design are drawn. The conflict between pedestrian and road traffic is also mentioned, especially the impact of the car on the city and, most of all, on pedestrians. Some considerations are gathered about implementing pedestrian-only spaces, along with its advantages and some European examples are shown.

Then a practical approach to this issue is presented, considering both planner’s and user’s point of view. A methodology for urban space analysis is worked out based on pedestrian comfort, and then analysed from a planner’s viewpoint.

The case study is about the centre of Porto – the methodology previously made is applied to nearly 50 streets which are scored along with the established criteria and are, thus, organized according to their pedestrianisation potential.

The results are carefully analysed and some conclusions and recommendations are then drawn.

KEYWORDS: Walkability, Pedestrian Space, Pedestrian, Public Space, Porto.
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1

INTRODUCTION

Walking: a mode of transport – but so much more. Beyond transportation walking is a potential recreational activity. And surely walking is nearly always a social activity as well. While walking you have the time and short distances, which enables you with your senses to see objects, details and indeed other people. (Gehl, 2001)

Porto is a social city in all its sense. People interact and live the city with such intensity that it’s almost impossible not to acknowledge a strange kind of feeling while wondering the streets.

Ancient buildings and streets resemble old lives and thoughts; some of those buildings still lodge mythic places where people gather in the comfort of knowing that it will never change. Development and progress show up in every corner making promises of a more efficient and easier life towards innovation and social improvement.

Past, present and future ruling the city, at ease, enabling its unique character.

Once walking downtown I realized that the streets were empty. How can that be?! How can people not want to enjoy the majesty of our beautiful city? Therefore, I started thinking what would make people run away from the city centre. Why don’t people rejoice in wondering the city centre like they used to? Why are people running away towards shopping malls instead of going shopping in traditional commerce?

When the time came for me to choose the theme for this project the decision was obvious: The Importance of Pedestrian Spaces – The City of Porto.

My work has been established in four main phases. First a theoretical approach is presented, in which all theoretical background used in writing this report is presented and explained. Secondly, a practical approach is put together, in which the issue is seen either from a planner’s point of view or a pedestrians/user point of view. That practical approach will act as a support for the case study, in which several streets belonging to a specific central area of Porto are analysed and ranked according to their pedestrianisation skills. Later on, and according to the results obtained from the case study, there will be outputs and findings, in which some assumptions are made, leading to a few final conclusions.
2 WALKABILITY & PEDESTRIAN SPACES

2.1. DEFINING WALKABILITY

Considering this concept is one of the most important for a good understanding of the entire report, shall it be defined and explained before any other exposition. Thus, walkability arises as the main concerning issue when it comes to pedestrians, so its meaning must be clearly explored.

All technical disciplines have their own terminology and vocabulary. Moreover, the technical words associated with walking have to cross professional disciplines like engineering, planning, and health. These words also have to be understood by the community, and many have probably been developed in the community and picked up in daily life.

When it comes to walking, the Oxford University Press Dictionary shows the following definition: “...to move or go somewhere by putting one foot in front of the other on the ground, but without running”.

Well, this may be a quite restrictive concept, so The Land Transport New Zealand draft ‘Pedestrian Network Planning and Facilities Design Guide’ (PNPFDG) goes a little further defining ‘walkability as ‘walking’ and the inclusion of ‘...on foot or on small wheels, or assisted by additional aids.”

Considering the theme one is dealing with, this last definition will be the most proper as it includes all kind of pedestrian movement.

‘Walkability’ and ‘Walkable’ are words often touted but their definition is less clear.

Neither of these words is defined in the Oxford Dictionary although ‘walk’, ‘ability’ and ‘able’ are all described.

All things considered, ‘Walkability’ is referred to and generally defined as “...the extent to which walking is readily available as a safe, connected, accessible and pleasant mode of transport”. This definition has been copied from the Mayor of London and Transport for London (TfL) ‘Making London a Walkable City: The Walking Plan for London’ although other practitioner definitions are also available – most of them result from plenary sessions or congresses, so the definition is in constant transformation.

A paper presented to the 2004 USA Transport Research Board AGM by Livi and Clifton summarised recent work undertaken in describing ‘Walkability’, referring to other research
importance of pedestrian spaces – the city of porto

approaches including “...localities of interest regarding how “friendly” they are to pedestrians (...)...some aspects are objective, and therefore easily measurable, but others are subjective”.

This friendliness will be categorized in terms like “functional”, “safety”, “aesthetic” and “destination” as well as “safety”, “security”, “comfort” and “convenience”, “continuity”, “system coherence”, and “attractiveness”.

This categorization of friendliness will enable the possibility of creating an easier way of evaluating a pedestrian, walkable space in a more organized way.

Nevertheless, other definitions of walkability come up in which it is considered “a measure of the urban form, quality and availability of pedestrian infrastructure contained within a defined area. Pedestrian infrastructure includes amenities developed to promote pedestrian efficiency and safety such [as] sidewalks, trails, [and] pedestrian bridges.”

So, according to this concept, brought up by Seilo (2004), “Walkability” is about moving efficiently in a pedestrian way.

According to all these concepts combined the definition of Walkability is: the extent to which the built environment is walking-friendly – enabling pedestrian to move safely and efficiently around city space. (Abley, 2007)

2.2. why walking is undervalued

When talking about urban planning, pedestrians are often forgotten and walking is often despised as a mode of transport. As a result, the fact of non-consideration of the pedestrian movement leads to an overall indifference towards it and, thus, non-predictability of its impacts, problems and needs.

Under-spending on bicycle and pedestrian programs results from a combination of under-valuation of non-motorized transport modes, undercounting of non-motorized trips, and inaccurate data on pedestrian.

However, while it is true that most motorway expenses are funded by user fees, roughly 40% still comes from general taxes and bonds. Moreover, most local roads, where 90% of walking and bicycling occur, are funded primarily through general taxes that residents pay regardless of how they choose to travel.

Compounding the under-valuation of non-motorized transportation is the fact that many trips made by walking or bicycling, including short-trips that link walking or bicycling to other modes of transport, tend to be undercounted or not considered in transportation planning.

Thus, even when funds are available, it can be difficult to justify spending when data is so sparse and investment outcomes difficult to predict. (Cerréño, 2006)

So it’s easy to see that there are several reasons why walking and walkability tends to be undervalued in conventional transport planning. Thus, some aspects leading to this situation are easily sought out and can be understood by common sense.
2.2.1. DIFFICULT TO MEASURE
Walking tends to be more difficult to measure than vehicle travel, and walkability tends to be more
difficult to evaluate than motor vehicle traffic.

Travel surveys often collect little information on total walking activity, and it is relatively easy to
count vehicles, measure traffic speeds and incorporate vehicle travel into travel models. However,
counting pedestrians isn’t all that easy. Pedestrians don’t follow definite routes: they wonder from
and to the places that are the most interesting to each one of them. Besides, pedestrians are easily
distracted by several things, from music to movements, from lights to posters, so their path isn’t
strict at all – on the contrary, it’s random and unpredictable.

Generally, when pedestrian movement is taken into consideration it is simplified into defined into
routes which allows a significant degree of uncertainty, making it difficult for planners to rely on
the information collected through that kind of approximation.

As a result, walking is invisible to transportation planners.

2.2.2. LOW STATUS
Walking is often considered as a low status activity compared with motorized travel. Civic leaders
and transportation professionals generally prefer to be associated with improvements to air travel,
driving conditions, and major transit service, since they are perceived as more important, instead of
being related to implementation of walkability and enhancement of pedestrian spaces.

As it is used by lower-income people, walking seems to be stigmatized while motorized transport
seems to be associated with success and progress.

2.2.3. LOW COST
One of the reasons that walking tends to be overlooked is that it is so inexpensive. Due to that, there
is not an organized walking industry as with car and air transport, so there is little dedicated
funding.

Improved walkability can provide consumer cost savings: the more pedestrian infrastructures are
implemented, the less money will be spent not only in fuel and car maintenance but also in general
environmental urban measures.

On the other hand, such avoided costs are difficult to predict and are often given little consideration.

2.2.4. "WILL TAKE IT CARE OF ITSELF"
It is often assumed that walking can take care of itself, as it always did, in the past. Seeing
pedestrian spaces as an urban issue in need for government intervention, is a very recent concept
and so it is often disregarded.

For example, it is possible to walk along most roads, either in the roadway or on dirt paths that
grow along road shoulders, even if they lack sidewalks and paths. As a result, many communities
are built without sidewalks, and few communities devoted significant resources to upgrading
walkability in built-up areas.

Such insensitivity to walking conditions is misplaced: areas with poor walkability tend to have
significantly less walking and more driving than more walking areas. (Litman, 2003)
Considering the combination of all these factors it is easy to understand why walking and walkability are so underestimated and, therefore, so often put aside by governments and planners. Even though, it is very important that people acknowledge that there are misconceptions which only delay the overall urban development.

2.3. **Walkability & The Evolution Of The City**

When it comes to the city it is crucial that the pedestrian movement is not forgotten. Walking is the most ancient mode of transport and has, consequently, followed the evolution of the cities from the very beginning to nowadays. It is, above all, fundamental to focus attention on pedestrians as they play a major role in the city dynamics.

Just as Adibi (1977) said: “A city is a place, which satisfies the citizens’ needs in the best possible way through social arrangements, balance of the macro organization in the society and labour division which leads the society towards its present goals. From the very beginning of history, cities have existed all over the world, and this causes the city to be seen as an old phenomenon.”

In the beginning all cities and towns were compact, and relied on walking and other ‘soft’ forms of transportation. (Clark, 2005) People were able to walk where they needed to go, meeting, trading, talking and taking in the sights all in the same trip through town. The uses of the city were conducted simultaneously in the same public space. (Gehl, 2001)

Looking back into the history of cities, public spaces have traditionally had three important functions in relation to the life of the cities.

1. Meeting place - the city has always been a place for people to meet and greet each other, a place to exchange information about the city and society, a place where important events were staged: coronations, processions, feasts and festivals, town meetings and executions.

2. Marketplace – as a location where goods and services were exchanged. The traditional market square is a city square where traders set up stalls and buyers browse the merchandise. This kind of market is very old, and there are still some markets in operation around the whole world.

3. Access / traffic space – the city was a thoroughfare providing access to and connecting the various uses of the city. People walked about and goods were hauled from one place to another.

People were talking, exchanging merchandise or moving about. All functions were vital, and in traditional cities these three functions occurred side by side in the same spaces in a fine balance. (Gehl, 2003)

Nevertheless, conditions for the three main uses of city space changed. New patterns of traffic, trade and communication were so radical that they interrupted centuries of tradition as to how people used the city: uses that had been in balance for centuries were now in open conflict. (Gehl, 2001)
The city as meeting place has suffered a great transformation. In an era when information and communication systems are in astounding development people meet and gather in a very different way. It’s now very usual for people to get in contact, have business meetings and socialize using internet and mobile phone resources. Still, not only internet has induced this kind of changes: individual transportation at low cost has provided new and irreverent opportunities for people to meet – the traditional role of the city has been transformed.

The city as marketplace underwent dramatic changes in the last century as well. Trade which formerly happened on open booths was gradually moved to small shops along streets and squares, then to increasingly larger shops and supermarkets, and finally to giant shopping centres, usually far from the heart of the city. In those cases where shopping centres were established within the city, they closed in on themselves and were no longer part of the public arena.

Also our entrance in the Age of Information has made it possible to provide people with an endless stream of information about the community and the wider world. The traditional role of the city as an important meeting place for its citizens has changed completely as there’s no need, nowadays, to get out of the comfort of their own home in order to feel connected to the outside world.

In the present, despite the many developments and changes in patterns of use, as a marketplace and meeting place, the efficient city continues to offer a significant alternative, a valuable supplement to pedestrians’ options. (Gehl, 2001)

However, for this to happen, pedestrian facilities and spaces must be stimulated so that activities may grow in the same direction as pedestrian spaces.

As far as traffic is concerned, a similar situation occurred. In the Middle Ages, streets were adapted to foot traffic and squares tailored to uses that needed space: markets, town meetings, military parades, religious processions and so on. Even today, particularly in Europe, there are still many cities whose structure was formed during that period, and thus the centres of many European cities still have the character of the Middle Ages – these are usually called, traditional cities.

Common to the cities and city spaces of that period are that they are still well suited for all types of pedestrian activities. The scale of these cities, the dimensions of the streets, the distribution of uses along streets and squares, the scale and detail of buildings are in harmony with human proportions and opportunities for movement, and they support the comings and goings of pedestrians in the most proper way.

Figure 1 – Marketplace (Venice).
In these cities throughout time, city spaces have served simultaneously as meeting place, marketplace and thoroughfare. In those cities in which car traffic has not been allowed to take over, we can still see modern versions of the traditional uses of city space. (Gehl, 2001)

Due to the modern tendency of self-improvement and high-efficiency, there must be some concerns towards social isolation and its impact on the city: if people don’t gather in a traditional way anymore, city life may be at risk.

On the other way round, if spaces are not planned and correctly arranged for people to make proper use of them, they won’t be attracted to it and they will be abandoned or, at least, misused.

So, the three main uses of the city must always be taken in consideration in order for urban space to function properly and be developed in a strong and complete way that calls people to get back and live the city as a whole.

2.4. PEDESTRIANS & PUBLIC SPACE

Pedestrians are essential to the life of a large city. When one talks about how “alive” a city seems, what one means is the number of pedestrians in the city’s public space.

The cities that are widely considered to be the greatest to live in or visit, such as London or Paris, are those one can walk around in for days with pleasure. If a city wants to fulfil the desire to be a great city, it has to bring its citizens out into the street — not only in a few prize downtown locations, but throughout the city. (Reid, 2005)

The primary focus of most planning, policy, and design is safety. This is especially true in the large central cities where a great deal of pedestrian movement is already the norm. Different types of pedestrians require different measures and concerns. Nowadays, with such information flow and being so easy for people to travel it is fundamental that measures towards physically impaired people are taken.

If the city is built for everyone to live in it must be suitable for all kinds of users.

Secondary to safety is encouraging greater pedestrian movement, though they are related goals since increasing safety can help engender more walking and more walking often requires the need for additional safety. (Cerreño, 2006)

What makes pedestrians distinctive is that they are open and slow. These qualities enable walkers to truly experience and interact with their urban environment.

Encased in a vehicle, we are separated by a shell and travelling too fast to experience the city — we can see it, but not absorb it. It is on foot that we can get the tactile sensation of how a city works and fits together. Equally, only on foot are we open and accessible enough to interact with other people who inhabit our city and therefore learn to feel comfortable and secure with them.

Without walkers in its public spaces, an urban environment retreats into the private spaces of home, car and workplace, becoming merely a series of isolated silos that do not form a coherent whole. It is walking that knits the structures, spaces and people of a city together. (Reid, 2005)

However, large central cities differ from other urban areas, as well as from rural and suburban, environments in several quantitative and qualitative ways that may have a direct impact on planning
and policy related to pedestrians (Cerreño, 2006). Characteristics like the amount of motorized vehicles, the intensity of commercial activity and the public transports network available to the majority of the population bring panoply of complex variables which influence the behaviour of urban tissue.

There are two direct purposes in walking in a city — for transportation, in order to get to a particular destination; or for pleasure, in order to look at interesting sights or to get exercise.

These two purposes can be combined. We might choose a particular route to our destination because it is more attractive. Or we might select a destination for our pleasure walk in order to give it some structure.

But there is also a kind of walking in the city that transcends these two purposes – walking as a way of living the city, without a single purpose or destination. It includes being out on the street to see and be seen, to shop or eat or drink at multiple locations which you may not even have in mind when you set out, to cross paths and hang out with friends, to do tasks or explore new spaces as the opportunity arises.

Other forms of transportation, even bicycles, bring you to specific destinations or achieve specific goals. Only with walking can you browse a city, interact with it, and truly get to know it (Reid, 2005).

Large central cities are more likely to have multiple modes used by single transportation customers than are other places. It is not uncommon for people living in these cities to bike or walk to transit; and for people commuting to these cities, using an car or bus to link to commuter rail or express bus and then further linking to subways or buses and/or walking within the city is the norm. Thus, making sure that transit systems are easily accessible and that they are integrated into the roadway system in a way that makes it safe for pedestrians or bicyclists to access is particularly important. (Cerreño, 2006)

We can think of this kind of walking as deep pedestrianism. It is when a city spawns this kind of walking that it begins to achieve greatness, because this is when its inhabitants and visitors appreciate it as an integrated whole, not simply as a place to accomplish tasks. To achieve this state, it is not enough to simply have a few pleasant walks, whether a pretty shopping street or a lovely nature trail. Neither way is it enough to simply plan residential areas within walking distance of useful destinations, such as retail or employment.

Therefore, in order for deep pedestrianism to thrive, the city as a whole must be integrated into a great pedestrian experience and must seek to seduce pedestrians into its public space. (Reid, 2005)

In addition, diversity presents another complicating factor for large central cities. Even as cultural diversity is a draw for many, multiple languages make encouraging stakeholder involvement, improving safety through education, and communicating policies and regulations more difficult.

Another way in which large central cities differ is the degree to which transportation must function within a built urban environment.

Specifically, in older central cities, like Porto, facilities date back several centuries and were not designed to accommodate the types of traffic and traffic patterns we face today (Figure 2). As a result, there is often limited right of way and widening sidewalks or streets in some places is impossible without razing buildings on either side.
Decisions must be made on a daily basis as to which is more important for the overall capacity of the system (Cerreño, 2006).

All the way, through this document, two types of pedestrian spaces will be analysed:

- Pedestrian streets – spaces where only pedestrian traffic is allowed;
- Pedestrian sidewalks and similar infrastructures – spaces for pedestrian circulation in streets where both pedestrians and road traffic must coexist.

Depending on each of these cases the way pedestrian space is observed and organized is, obviously, different.

2.5. DESIGN AND FEATURES

Walkability considers the quality of pedestrian facilities, roadway conditions, land use patterns, community support, security and comfort for walking.

At a street or neighbourhood level, it is affected by the existence of sidewalks and crosswalks, and roadway conditions (road widths, traffic volumes and speeds. (TDM Encyclopedia, 2007)

A sidewalk, pavement, footpath or footway is a path for pedestrians that is situated alongside a road or formed like sidewalks that are alongside roads (such as a cement footpath through a park).

They are usually made of concrete, asphalt, brick, stone or (increasingly) rubber, are designed for pedestrian traffic and are often found running alongside a road.

Just as a roadway will not be designed for one type of vehicle, the design of sidewalks should not be limited to a single type of pedestrian user. Since the sidewalk is the basic unit of mobility within our overall system of transportation, every route and facility must be usable.

A good sidewalk system is crucial to enhance the pedestrian environment. Benefits include increased pedestrian mobility, a higher perception of safety and security, aesthetic appeal, and improved connections to transit and other transportation modes.
Temporary altered pedestrian routes where sidewalks are obstructed by work zones must meet accessibility standards, as well. Pedestrians who must cross the street and then cross back again in order to continue on their destination will be exposed to significantly increased danger from vehicles.

In order to improve pedestrian space design, an amount of rules has been gathered so that all factors concerned can be correlates (Boodlal, 2003).

2.5.1. SIDEWALK CORRIDORS

The “Sidewalk Corridor” is the portion of the pedestrian system from the edge of the roadway to the building edge, generally parallel to the street.

Sidewalks in central business districts and downtown areas need to be designed to accommodate many uses and types of users. People walk alone, in groups, walk pets, push strollers and carts, run, skate, stop to gaze and talk, play and eat on sidewalks and paths. Although a person walking alone may only need 45-60 centimetre of width, other users and uses require more space. A couple walking side-by-side, a person in a wheelchair, pushing a cart or using a walker, a runner or bicyclist all require more space.

In addition, sidewalks and paths contain various types of “furniture” such as signposts, parking meters, mail boxes, garbage cans and sometimes café seating.

Although a sidewalk or path may have a generous nominal width, its functional width may be much smaller due to these obstacles within its right-of-way. A sidewalk or path should be designed and managed to accommodate various uses and users, taking into account real uses and conditions. (TDM Encyclopedia, 2007)

The width of the sidewalk corridor is one of the most significant factors in determining the type of pedestrian experience that the sidewalk provides.

In some areas, the paved portion of the sidewalk corridor is set back from the street by a surface, such as grass, which is not intended for pedestrian travel. Planting strips (sidewalk setbacks that are grass or another type of vegetative cover) provide (US Department of Transportation, 2001):

- Shade;
- space for utilities and traffic control equipment and signs;
- space for trash cans and newspaper boxes;
- separation from roadway;
- Aesthetic relief.

In order to make all the main purposes of the sidewalk coexist in an efficient way the sidewalk corridors will be divided in three distinct zones (Figure 3).
Building Frontage Zone

The building frontage zone is the area between the building wall and the pedestrian zone. Pedestrians don't feel comfortable walking directly adjacent to a building wall or fence. At minimum pedestrians prefer to keep at least 0.6 m of "shy distance" away from the building wall.

Depending on the use of this area, the frontage width should be increased and physically separated from the pedestrian zone (example, allow extra space for a door opening into the frontage area, sidewalk cafes, etc.).

People with vision impairments frequently travel in the frontage zone and use the sound from the adjacent building for orientation. Some use the building edge as a guide for a white cane, travelling between 0.3 m-1.2 m from the building.

The frontage zone should be free of obstacles and protruding objects. If not, obstacles in the frontage zone should be detectable by people who use long white canes. Level landings are required at building entrances and around sidewalk furnishings such as drinking fountains, benches, etc.

Pedestrian Travel Zone

The pedestrian zone is the area of the sidewalk corridor that is specifically reserved for pedestrian travel. This area should be free of all obstacles, protruding objects, and any vertical obstructions hazardous to pedestrians, particularly for individuals with vision impairments.

The pedestrian zone should be at least 1.8 m-3.0 m wide or greater to meet the desired level of service in areas with higher pedestrian volumes. This allows pedestrians to walk side by side or for pedestrians going in the opposite direction to pass each other.
The pedestrian zone should never be less than 1.2m, which is the minimum width required for people using a guide dog, crutches, and walkers.

Wheelchair users need about 1.5 m to turn around and 1.8 m to pass other wheelchairs.

![Figure 4 – Pedestrian Travel Zone Example.](image)

**Planter/Furniture Zone**

It lies between the curb and the pedestrian travel zone. This area provides a buffer from the street traffic and allows the consolidation of elements like utilities (poles, hydrants, telephone kiosks, etc), and street furniture (benches, signs, etc).

The intent is to ensure that the pedestrian travel zone is free of all obstacles. On local and collector streets, 1.2 m is preferred and on arterial and major streets 1.8 m is preferred.

Additional space will be required for transit stops and bus shelters which may include a boarding pad typically 1.5 m x 2.4 m.

**Curb Zone**

The curb zone is the first 0.15 m of the sidewalk corridor, located adjacent to the roadway. It is an integral part of the road/drainage system and keeps excess water off the sidewalk corridor.

The curb zone also discourages motor vehicles from entering/exiting the sidewalk corridor except at designated locations and is a valuable safety and guide cue for pedestrians with vision impairments.

**2.5.2. Grades**

Grades are often difficult to control in the sidewalk environment because sidewalks follow the path of the street. The sidewalk grade ideally should not exceed 5 percent (Bloodlal, 2001). If the grade must exceed this maximum, a ramp can be constructed.

It is important to note, however, that sidewalks and walkways located along roadways within the right-of-way, may follow the grade of the roadway and are not considered ramps even when grades exceed limits. (Thibault, et al., 2003)
Design parameters developed for ramps on buildings and sites, permit a maximum grade of 8.3 percent for a distance of 9.1 m before a level landing must be installed. Where the sidewalk grade approaches or exceeds that of the maximum permitted for a ramp, it is good practice to provide a level rest area.

The slope of the level landing should not exceed 2 percent in any direction (Figure 5).

The dimensions of the level landing should be at least 1.5 m x 1.5 m to allow wheelchair users to stop and rest without blocking the flow of pedestrians. This area can be greater with the inclusion of other amenities such as benches, hand rails, and drinking fountains.

In areas with steep slopes, it shall be considered the installation of wide sidewalk corridors that permit the wheelchair user to travel in a zigzag motion (Bloodlal, 2001).

However, these requirements do not apply to pedestrian facilities within public rights-of-way that follow the street grade, although the sidewalk grade may not exceed the grade of the adjacent street. (Thibault, Lois E., 2003)

2.5.3. CROSS SLOPES
Cross slope is a geometric feature of pavement surfaces; the transversal slope with respect to the horizon. It is a very important safety factor – one of its tasks is to make water run off the surface to a drainage system, thereby preventing skid accidents.

The maximum cross slope permitted should be 2 percent, which is flat to the unassuming eye. It is not uncommon during a site inspection to find cross slopes in excess of 10 percent, a path many cannot easily use.

Severe cross slopes require wheelchair users and other pedestrians to work against the effects of gravity to maintain their lateral balance.

Pedestrians using crutches or canes may be forced to turn sideways in order to keep their base of support at a manageable angle. Severe cross slopes can cause wheelchair users to turn towards the curb and into the street (Figure 6).

The impact of cross slopes is compounded when combined with steep grades and uneven surfaces.
Designers and those constructing facilities need to understand the impact of grades and cross slopes and take particular care to stay within construction tolerances as well as within design standards.

For sidewalks with steep cross slopes the designer can create a level area of at least 0.9 m within the pedestrian zone or increase the height of the curb (Figure 7). The latter case can create problems for curb ramp design and on-street parking (car doors may not be able to swing over the curb).

Typically, extreme cross slopes occur at the intersection of a sidewalk and a curb ramp where the route along the sidewalk continues across the slope of the curb ramp. In this case, the running slope of the curb ramp, which is permitted to be up to 8.33 percent, is also the cross slope of the accessible route across curb ramp.

Depending on the site conditions, it may not always be possible to achieve compliant running slopes.

For example, extremely hilly land surface may prevent developers from installing a route with a compliant running slope, but where a compliant route is achievable, it must be provided. For example, a site may have a hilly area and an area that is relatively flat. Including dwelling units in the area of the site that is hilly to avoid the inclusion of accessible routes may be considered deliberate manipulation to avoid compliance.
2.5.4. **Sidewalk Surfaces and Materials**

Surface is defined as the material on which a person walks or wheels in the pedestrian environment. The type of surface often determines how difficult an area is to negotiate. For example, wood floors can be traversed without much difficulty by most people, while a gravel surface can be impossible for some people, especially wheelchair users, to cross ([www.fhwa.dot.gov](http://www.fhwa.dot.gov)).

The sidewalk surface should be stable and relatively smooth yet not slippery, so as to provide proper traction (Gibbons, 1999).

Factors that affect the usability of the sidewalk surface include:

- Surface materials
- Changes in level
- Firmness, stability, and slip resistance
- Dimensions of gaps, grates and openings
- Visual consistency

Surface materials generally consist of concrete or asphalt; however, tile, stone, and brick are also used (Boodlal, 2001).

Typically, sidewalks of concrete and asphalt have the ability of being brushed, textured, scored, inlaid or stamped to provide textural variety and improve pedestrian safety – they are firm, stable, and fairly slip resistant when dry.

A broom finish used on concrete sidewalks increases the slip resistance. Surfaces that are not slip resistant are especially difficult for people who use wheelchairs or walking aids to travel across. Crutch users, for example, rely on being able to securely plant their crutch tip to travel effectively on the sidewalk.

Surfaces that are not visually consistent (all one colour and texture) can make it difficult for pedestrians with vision disabilities to distinguish the difference between a change in colour and pattern on the sidewalk and a drop off or a change in level.

Decorative surface materials such as paints and surface materials, polished stones or exposed aggregate rock, are not as slip resistant and should be avoided. Paint and thermoplastic materials, commonly used to mark crosswalks, are generally not as slip resistant when wet. Slip resistant contact is more difficult to achieve when the sidewalk material is wet or icy. Texture added to the thermoplastic will improve the slip resistance.

Brick and cobblestone may improve the aesthetic quality of the sidewalk, but may also increase the amount of work required by pedestrians with mobility impairments. These decorative surfaces may also create a vibrating bumpy ride that can be uncomfortable and painful for those in wheelchairs.

Brick and cobblestone may heave or settle, creating unsafe changes in level or become a tripping hazard for pedestrians, especially those with vision and mobility disabilities.
Decorative textured surface materials can make it more difficult for pedestrians with vision impairments to identify detectable warnings, which provide critical information about the transition from the sidewalk to the street. For these reasons, brick and cobblestone are not recommended. Creative alternatives include smooth walkways with brick trim, and colour concrete (Boodlal, 2001).

Changes in level/elevation are vertical rises between adjacent surfaces. Causes of changes in level include:

- tree roots pushing upwards;
- uneven transitions from street to gutter to ramp;
- heaving and settling due to frost;
- Buckling due to improper sub-base preparation.

Changes in level/elevation can cause major problems for:

→ pedestrians with mobility impairments-difficulty lifting feet, or crutches, or detecting elevation changes, (causing tripping);
→ pedestrian using wheelchairs-small front caster wheels swivel sideways and cannot climb over;
→ Pedestrian using wheelchairs-difficult time rolling over large changes in elevation.

Changes in level/elevation requirements:

→ up to 6 mm – can remain without bevelling;
→ 6-13 mm – bevel the surface with a maximum grade of 50%;
→ Greater than 13 mm – remove or install a ramp with a maximum grade of 8.3% (Boodlal, 2001).

Most changes in level are a result of poor maintenance. Some changes in level, such as a lip at the bottom of a curb ramp, are no longer recommended as a detection of the street ending and the sidewalk beginning. Any existing elevation changes should be ramped with smooth transition points. In addition, maintenance programs should be established for new construction to address future changes in level as they occur.

Changes in level that currently exist should be addressed through a maintenance program. Whenever possible, the cause of the change in level should be removed. For example, if the cause of the change in level is an overgrown tree root, the sidewalk should be rerouted around the tree with additional right-of-way or ramp up and over the roots. If rerouting is not a viable solution, changes of level should be ramped to provide a smooth surface (US Department of Transportation, 2001).
A grate is a framework of latticed or parallel bars that prevents large objects from falling through a drainage inlet but permits water and some debris to fall through the slots.

A gap is defined as a single channel embedded in the travel surface of a path. Gaps are often found at intersections where railroad tracks are embedded into the road surface (www.fhwa.dot.gov).

Wheelchair casters, inline skating wheels, as well as bicycle wheels often get caught in openings and gaps wider than 1.2cm or which are incorrectly aligned. In these cases there is potential for the person to be suddenly pitched forward (Figure 8).

Walking aids such as canes and crutches can also get caught in grates and gaps. When the cane tip slips through an opening, the pedestrian can become unstable and risk falling.

Grates should be placed within the planter/furniture zone away from the pedestrian travel area, and also away from the bottom of crosswalks and curb ramps.

Gaps and grates should be designed so that:

→ Openings do not allow the passage of a 13 mm (0.5 in) sphere.

→ The long dimension of the opening is perpendicular or diagonal to the dominant direction of travel.

Trees are generally planted because they improve the pedestrian experience, improve the aesthetic appearance of the streetscape, serve as a visual and auditory buffer between pedestrians and traffic, provide shade, and may have a traffic calming effect – trees need a minimum of 1.2 m x 1.2 m.

They are also one of the most common causes of sidewalk cracks and changes in level. When water is limited, tree roots tend to push through the surface and spread out rather than down to look for new water sources.

Tree branches should be maintained to hang no lower than 2.0 m as low hanging branches can be a safety hazard, especially for pedestrians with vision impairments who may not detect them.
Other pedestrians with mobility impairments may have difficulty bending under them. Careful selections of tree type, their placement and maintenance can provide a comfortable and safer environment for all road users including pedestrians. (Boodlal, 2001)

2.5.5. STREET FURNITURE
Street furniture is a collective term for objects and pieces of equipment installed on streets and roads for various purposes, including benches, bollards, post boxes, phone boxes, streetlamps, street lighting, traffic lights, traffic signs, bus stops, grit bins, tram stops, taxi stands, public lavatories, fountains and memorials, and waste receptacles. An important consideration in the design of street furniture is how it affects road safety.

While sidewalks are generally built for pedestrians they end up being used for other functions which narrow the actual space for those who are walking.

A list has been gathered along with most of those (mis)uses:

- artwork;
- awnings and supports;
- barricades;
- benches;
- bus shelters and queues;
- construction scaffolding and storage;
- dining;
- driveways;
- kiosks and bulleting boards;
- hydrants;
- mailboxes;
- meters and fee vendors machines for parking;
- newspaper stands;
- parking bicycles;
- poles;
- recycling bins and boxes;
- signposts;
- traffic signal poles;
- Water fountains.

(Cerreño, 2006)
It’s clear that all of these are facilities usually needed in any city, and the sidewalk corridor always seems to be the most adequate place to settle them. However, this shall be carefully planned in order for pedestrians not to be severely bothered by them.

Objects that protrude into the sidewalk corridor above 2m are generally a problem for pedestrians with vision impairments (See Figure 9).

Pedestrians who use long canes will usually detect and avoid objects on the sidewalk that extend below 0.7 m. However, obstacles that protrude into the sidewalk corridor between 0.69 m-2 m and do not extend to the ground are more difficult to detect and avoid.

Pedestrians with vision impairments often travel using the edge of the building line. Objects mounted on the wall, post, or side of a building, should therefore not protrude more than 0.1 m into the sidewalk corridor (Figure 9).

Obstacles in the pedestrian zone may be harmful, not only to blind pedestrian but also to every other ones.

This kind of obstacles create an incoherent path which may not be expected by distracted pedestrians who will take a smooth way for granted and not be cautious about the sidewalk surface.

Also wheelchair users will be uncomfortable towards such obstacles, as it may be very difficult for them to move around them in order to make their way (Boodlal, 2001).
2.5.6. **Driveway Crossings**
Driveway crossings allow cars to cross the sidewalk and enter the street. They are for cars what curb ramps are for pedestrians.

Therefore, they consist of many of the same components found in curb ramps. It is the driver's responsibility to give way to the pedestrian at the driveway-sidewalk interface. Unfortunately, drivers are not always this sensible and pedestrians are put at risk. Minimizing the number of driveway crossings in a sidewalk significantly improves pedestrian safety. (US Department of Transportation)

Designers need to remember that as they change the grade to allow cars to effectively negotiate the elevation change between the street and the sidewalk, they must not compromise good pedestrian design practice. Unfortunately, this happens quite often and pedestrians using wheelchairs and other walking aids are sometimes put at risk of becoming unstable and falling.

Driveway crossings are often built with grade changes in the sidewalk corridor that have cross slopes greater than 2 percent which, according to what’s been mentioned earlier, cannot be.

Driveway crossings without level landings force users to travel over the sidewalk flare. This design results in rapid changes in grade and cross slope.

Wheelchair users can lose control and possibly tip over as the front wheel loses contact with the ground followed by the opposing back wheel.

Pedestrians with vision impairments may not detect the difference in slope of the driveway flare and veer towards the street and may enter the street without realizing it (Figure 11).
Driveway crossings should be designed with the following guidance:

→ cross slope = 2.0% maximum;
→ level manoeuvring space
→ changes in level = flush (0.6mm maximum);
→ Flare slope =10% maximum.

Driveway crossings along a street to accommodate vehicular access means the pedestrian has to stop for a car turning in, has to move around a car waiting to enter traffic, or, at least, must be on the alert for these situations. The more frequently this occurs, the less the walkway is perceived to be a continuous pedestrian route. Therefore, minimizing driveway crossings and consolidating driveways will help keep the pedestrian route intact (www.mag.maricopa.gov).

2.5.7. CURB RAMPS
A curb ramp is an accessible transition from the low side of a curb to the high side.

Curb ramps are necessary for access between the sidewalk and the street for people who use wheelchairs and must be installed at all intersections and midblock locations where pedestrian crossings exist.

However, curb ramps can create a barrier for people with vision impairments who use the curb to identify the transition point between the sidewalk and the street. Because curb ramps eliminate the vertical edge of the curb used by pedestrians with vision impairments, it is necessary to install
detectable warnings to mark the boundary between the sidewalk and street (Error! Reference source not found.).

For some pedestrians who use walking aids such as canes, walkers or crutches, curb ramps may be difficult to access. The pedestrian must have strength to lift his or her body up over the supporting device. A wider crosswalk to allow use of curb and curb ramp will enhance access for all users.

Curb ramp types are usually categorized by their structural design and how they are positioned relative to the sidewalk or street. Selecting a curb ramp design depends on site conditions. Curb ramp types include perpendicular, diagonal, parallel, combination, and depressed corners. Although every single one of these has its own advantages and disadvantages, only the acceptable designs are presented.

**Perpendicular**

**Advantages:**

1) Ramp aligned with the crosswalk.

2) Straight path of travel on tight radius.

3) Two ramps per corner.

**Disadvantages:**

1) May not provide a straight path of travel on larger radius corners.
Parallel

Advantages:

1) Requires minimal right-of-way.

2) Provides an area to align with the crossing. The bottom landing is contained in the sidewalk and not the street.

3) Allows ramps to be extended to reduce ramp grade.

4) Provides edges on the side of the ramp that are clearly defined for pedestrians with vision impairments.

Disadvantages:

1) Pedestrians need to negotiate two or more ramp grades (makes it more difficult for wheelchair users).

2) Improper design can result in the accumulation of water or debris on the landing at the bottom of the ramp.
Combined Parallel and Perpendicular

Advantages:
1) Does not require turning or manoeuvring on the ramp.
2) Ramp aligned perpendicular to the crosswalk.
3) Level manoeuvring area at the top and bottom of ramps.

Disadvantages:
1) Visually impaired pedestrians need to negotiate sidewalk ramps.

Curb Ramp Specifications
Ramp Grade: maximum curb ramp slope of 8.3%.
Cross slope: may not exceed 2%.
Ramp Width: minimum 1.2 m in new construction. In restricted spaces only, the minimum width should not be less than 915 mm.
Changes of Grade: maximum 13%; counterslope should not exceed 5%.
Curb Ramp Alignment: should be perpendicular to the curb face. The ramp needs to be aligned within the crosswalk with a straight path of travel from the top of the ramp to the roadway to the curb ramp on the other side.

Detectable Warnings: required across the lower part of the ramp; should have a visual contrast with the adjacent walking surfaces.

Transition Points: should be flush in order to accommodate wheelchair users.

Sidewalk approach width shall be minimum of 1.2 m.

Level Landing: at the top and bottom of the curb ramp should be 1.2 m x 1.2m and the cross slope should not exceed 2% in any direction.

Curb Ramp Length is determined by the vertical height of the curb between the roadway and the sidewalk (1).

\[
Ramp \ Length = \frac{Curb \ Height}{Ramp \ Slope - Sidewalk \ Corridor \ Cross \ Slope}
\] (1)

Additional good practice curb ramp design:

- Align the curb ramp within the marked crosswalk, so there is a straight path of travel to the curb ramp on the other side.
• Provide adequate drainage to prevent the accumulation of water and debris on or at the bottom of the ramp.
• Minimize ramp length by lowering the sidewalk to reduce the curb height.

2.5.8. PEDESTRIAN CROSSINGS
Designing an effective pedestrian crossing involves the correct layout of pedestrian elements including: information (signs, accessible pedestrian/traffic signals, markings), turning radius, visible crosswalks (including raised crosswalks), adequate crossing times, medians, refuge islands, corner island, curb ramps with detectable warnings, and curb <8some of these will be described more specifically).

It also involves careful consideration of adequate sight lines, traffic patterns, and traffic signal phasing. Other techniques such as restrictions on right turns, pedestrian lead times, and traffic calming measures will benefit all pedestrians. Regulations that prohibit parking at the corner can also improve blocked sight lines.

Well-marked or designated crosswalks should be provided at all signalized intersections with first priority at higher volume pedestrian crossings. A phased approach for crosswalk improvements should occur with initial emphasis on striping (painting) crosswalks and later upgrading crosswalks and installing brick pavers or another type of aesthetic surface material.

Medians
Medians generally reduce crossing exposure and allow pedestrians to negotiate vehicle traffic one direction at a time. Medians should be curbed or barrier medians to physically separate pedestrians and motorists rather than painted flush.

Furthermore, all medians should be accessible to pedestrians. The nose of the median should be extended beyond the crosswalk (Figure 20).

If a cut through is provided, it should be at least 1.8 m long and 1.5 m wide. This allows 2 wheelchair users to pass each other. In addition the edges of the cut through must be perpendicular to the street being crossed.
Ramped medians
There should be a curb ramp at both end and a level landing of at least 1.5 m x 1.5 m. For all medians, cut through or ramped, a 0.6 m strip of detectable warnings should be located at the entrance and exit.

Corner Island
The design guidance for the island itself is similar to those of the median. The island should be raised and designed with curb ramps or a pedestrian cut-through. If a cut-through design is selected, it should provide at least 1.5 m of clear space in all directions. In addition, a 0.6 m strip of detectable warning should be included at every exit point on the island (Figure 21 and 19).

Ramped Corner Island
The design should include curb ramps that are at least 1.5 m wide, 1.5 m x 1.5 m level landing and detectable warnings (Boodlal, 2001).

It shall be noticed that the rules presented ask for large widths which may not always be reasonable, especially in cities like the ones in Europe, which have been built centuries ago and, therefore, have not been design for the uses we have today.

Still, there is no valid reason for these to be ignored; they should act as guidelines for planners to provide the most efficient and user-friendly pedestrian spaces possible. The most important fact in this situation is that when both pedestrian and motorized traffic coexist it is very important to ensure pedestrian safety and following these rules may help planners organize urban space in a better way.
2.6. **THE CAR AND THE CITY**

Cars have become such an integral part of the cityscape that it is quite hard to picture a city whose streets are free of them, and instead filled with other human activities. So established is the car in the city streets, and in our minds, that such image, to some of us, is highly utopian or even unthinkable.

In addition, buying a car is affordable for most people nowadays and so people have accommodate with the (bad) habit of taking their cars even when there’s no need to - most people even feel like they have the right to drive wherever they want.

Moreover, it’s common knowledge that cities have become so overloaded with motorized traffic that some of them have even pushed people away from the centre because of car-usage side effects.

Because of that, some cities have decided to react towards these circumstances.

Some cities in the European Union have not only restricted access of cars to cities but have even made concerted efforts towards reducing car ownership, while others are attempting to produce “green cars”.

Such efforts have come about as a result of environmental literacy which has led to the realization behind all the shine and chrome, the car is actually uglier than it has been made out to be. This has led to some city planners, to tackle “traffic planning” even beyond the conventional approach of the provisions of mass transportation in the city centre.

These newly realized disillusionments with the car have led to various forms of car-free activities. Generally they are aimed at creating a new mentality of less dependency on cars.

Why should cars no longer be desired in our cities? Some factors have been summoned by J.H. Crawford and are gathered and commented next.

2.6.1. **DEATH OF STREET LIFE**

Studies have shown very clearly that as car traffic on a street increases, social life on the street dies. The noise, danger, and pollution slowly drive people from the street.

On streets with really heavy traffic, people do not even inhabit the rooms that front on the street. They make every effort to shut the street out of their lives (J.H Crawford, 2002).

People walk in the city centre because they have to, not because they want to. In most of the cities plagued by cars, the quality of city spaces has become so problematic that people avoid the city centre altogether (Gehl, 2001).

The level of traffic inversely correlates with the level of social contact. As traffic on a street increases, people retreat from the street and attempt to shut it out of their lives. Traffic noise makes conversation at normal levels difficult or impossible and steals the usual opportunities for casual interaction on the street.

Residents rarely encounter their neighbours and often do not even know who their neighbours are. This leads to a gradual breakdown in the sense of community in the affected block (Appleyard, 1981).
In impoverished city spaces, most of the social and recreational activities disappear completely, leaving only the remaining of the most utilitarian and vital pedestrian activities. (Gehl, 2001).

In Venice, people do not look over their shoulders because they know nothing is about to run them down. People relax and let down their guard. They are more willing to meet strangers and chat. This leads to a very pleasant feeling in the streets, which are full of people and therefore quite safe.

The removal of the car from the urban environment will do much to help restore a sense of community (J.H Crawford, 2002).

2.6.2. DANGER

As mentioned before, the coexistence of pedestrians and road traffic, when not well organized may lead to accident and fatalities than injure, especially, pedestrians.

Lately, in Portugal, there have been something like 16 people run over per day. Last year, the statistics for road accidents point out that more than 13% of the fatal victims were pedestrians.

Among the 850 deaths registered in Portuguese roads in 2006, 137 were walking. Many of the victims are children; the car is the leading cause of death among the young. Most of these accidents happen in the most developed cities, particularly, the capital-city, Lisbon. (aeiou.pt)

In some developing nations, death-by-auto is the leading cause of death after intestinal infections. About 15,000,000 people have now been killed in traffic accidents worldwide. (J.H Crawford, 2002)

2.6.3. NOISE

Roadway noise is the collective sound energy emanating from motor vehicles.

Excessive traffic noise is one of the most common complaints, when it comes to talk about road traffic. Millions of people are affected by constant traffic noise in their own home (trafficnoise.org, 05/04/2008). Actually, it provides more than subjective discomfort (Granados, 1998). In fact, it impacts more people than any other environmental noise source – it can affect the ability to work, learn, rest, relax, sleep, etc.

Excessive noise can lead to mental and physical health problems (trafficnoise.org) like can cause annoyance and aggression, hypertension, high stress levels, tinnitus, hearing loss, and other harmful effects. Furthermore, stress and hypertension are the leading causes to health problems, whereas tinnitus can lead to forgetfulness, severe depression and at times panic attacks.

In most cities, traffic is the largest source of noise. In the pedestrian precincts of Amsterdam and Copenhagen, the loudest sounds are often people’s footsteps. Venice is entirely free of automotive noise, and the noise from passenger and freight boats is a minor problem. The use of slow battery-powered delivery vehicles in carfree cities should add very little to the noise burden. Once the cars are gone, people tend to speak more softly and other noise also tends to diminish (J.H Crawford, 2002).
2.6.4. Pollution

Motor vehicles are the principal source of toxic emissions with both local and continental effects, and are responsible for three-fourths of the atmospheric pollution (Granados, 1998).

Air pollution is usually concentrated in densely populated metropolitan areas, especially in developing countries where environmental regulations are generally relatively lax. However, even populated areas in developed countries attain unhealthy levels of pollution shows the most polluted cities in the world, which is useful to compare to the values in Portugal, which are, for Lisbon, 23 µg/m³ (comparing to the values presented it may seem as a good result, but pollution is never welcome).

<table>
<thead>
<tr>
<th>Particulate matter, µg/m³ (2004)</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>Cairo, Egypt</td>
</tr>
<tr>
<td>150</td>
<td>Delhi, India</td>
</tr>
<tr>
<td>128</td>
<td>Kolkata, India (Calcutta)</td>
</tr>
<tr>
<td>125</td>
<td>Tianjin, China</td>
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<tr>
<td>123</td>
<td>Chongqing, China</td>
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<tr>
<td>109</td>
<td>Kanpur, India</td>
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<tr>
<td>109</td>
<td>Lucknow, India</td>
</tr>
<tr>
<td>104</td>
<td>Jakarta, Indonesia</td>
</tr>
<tr>
<td>101</td>
<td>Shenyang, China</td>
</tr>
</tbody>
</table>

Table 1 – Most polluted world cities

Having now made considerable progress in the fight against industrial pollution, the European Union has decided to shift its emphasis to transport-related pollution and the car in particular. Europe will soon have the world's toughest environmental standards for cars, and a strong demand-reduction policy is going to be developed to reduce congestion and pollution. (J.H. Crawford, 2002)

The solutions to urban air pollution are not difficult to discern. Individuals can reduce car usage in favour of cycling, walking, and mass transit and can use more fuel-efficient cars. Once again, this is only possible if adequate policies are implemented. Urban planning commissions and regional governments can redirect transportation funding towards mass transit options: light rail, heavy rail, or rapid bus transit.

Zoning laws and other regulatory tools can be used to encourage the higher density development that is conducive to mass transit. And countries can shift electricity generation from coal and natural gas towards wind and solar power, using the lever of government subsidies and tax incentives for clean energy, rather than continuing to subsidize fossil fuels (Fischlowitz-Roberts, 2002).
2.6.5. LANDTAKE
As more and more people try to live in the same city (for the sake of argument, within a one-hour drive of each other), something odd happens – if the city depends on road-based transport, the area covered by the road system increases without limit (J.H Crawford, 2002).

The result in city after city is that only the most crucial foot traffic battles its way between moving and parked cars, and only a severely amputated selection of other activities is even offered (Gehl, 2001).

Furthermore, the streets are so overloaded with traffic that most of the times there isn’t any space left for proper pedestrian corridors or public furniture – pedestrian circulation is very difficult and sometimes even dangerous. Consequently, if pedestrians don’t feel comfortable they will run away from the city.

Also, facilities like parks and playgrounds are left behind in order to give right-of-way to road traffic, forgetting about any sense of community or quality of life.

2.6.6. ECONOMIC BURDEN
Some businesses benefit from car dependency, including those involved in vehicle and fuel production, motor vehicle services, and car-dependent destinations (such as suburban housing and malls) (TDM Encyclopedia).

However, reliance on cars requires an extensive infrastructure of roads and parking that are usually financed through a country’s general budgets. In most of the world only a minority of people have cars but the whole population pays taxes that are used for the infrastructure (Granados, 1998).

Also, there are very high costs to society which intimately relate to traffic congestion, crash risk, and environmental damages (Litman, 2007).

The per-mile cost of transportation by car in America has increased only moderately during the past 30 years (largely due to rising insurance premiums). But more people are driving more miles each year, and the national income consumed by the car is increasing (J.H. Crawford, 2002).

Nondrivers do not pollute – to protect the public right to a healthy and tranquil urban space, high taxes should be levied on drivers and budgetary preferences given to those who use other modes of transport (Granados, 1998).

All-in-all, it must be clear that the impact of the car in a city brings much more disadvantages than benefits. Combining all these factors together the result is so massive that many cities are now evolving to a stage where the main concern is to make the city more pleasant and clean – more liveable.

One of the first concerns is to get rid of car-invasion, giving society a chance to learn how to function without cars like it did before.
2.7. **IMPLEMENTING PEDESTRIAN-ONLY SPACES**

Walkability improvements are usually implemented by local governments, sometimes with funding and technical support of regional or state/provincial transportation agencies. It usually begins with nonmotorized planning to identify problems and prioritize projects (Litman, 2000). Implementation may require special funds, either shifting funds within existing transportation, a new budget allocation, or grants.

Some walkability improvements involve land use, street design and community liveability features that create communities that are more attractive for walking, but are not necessarily considered pedestrian improvements. For example, improved roadway connectivity benefits motorists and cyclists as well as pedestrians (TDM Encyclopedia, 2007).

For a successful execution of pedestrian-only spaces, first of all, it is fundamental to define the target-area for the project.

By identifying main pedestrian traffic generators and destinations, an area can be established as a main hypothesis for pedestrianisation policy.

Aspects like commercial activity, leisure facilities, educational facilities and main public transport nodes may be sources of great pedestrian traffic. If pedestrian traffic is too heavy towards motorized traffic and priorities are the other way round, some action may be needed.

There are essentially two ways of implementing pedestrian-only spaces: directly or indirectly.

The direct way is by obligation. The local authorities have the ability of forbidding motorized traffic to circulate on the target-area. If absolute forbiddance is too radical some less drastic measures may be applied, like controlling heavy traffic, or not enabling the usage of private cars during a certain time of day or forbidding access to non habitants of that area.

These direct ways are often quite effective but they raise public attention and may generate too much objection among car-users and car-user associations.

Indirect ways of implementing pedestrian spaces are those which give right-of-way to pedestrians instead of any other mode of transport. Using light signage to allow pedestrians to have more time to cross the streets, applying car-unfriendly surfaces, removing parking spaces and strengthening patrol toward car-user infractions may be some of the potential actions.

These indirect ways are often not noticed and, therefore, well accepted by most of the community – car users simply end up realizing that it’s not efficient to drive in that area and will try finding an easier way.

This is when a good public transport network is needed the most! If car-usage is made difficult and good transport service is available, people will in most cases change their behaviour towards a more pedestrian-friendly environment.

One of the measures which enable most the implementation of pedestrian spaces is the development of cycling which has been strongly followed in Barcelona (Bicing), Lyon (Vélo V) and Cambridge.

However, while taking such measures much care shall be taken in order for them to be properly applied. If pedestrianisation is not allied to public transportation network policy and road usage
efficiency, and proper infrastructures are not provided it can even enlarge the existent problems of our cities instead of solving them.

2.8. **BENEFITS FROM PEDESTRIANIZATION**

Pedestrianisation is after all a recent issue in public policy. Besides it is still hard for most people to understand its purposes and outcomes, for which is very common for them not to send a good feedback towards it, at first.

As a result, it is very important to draw attention to what society may benefit from pedestrian-only spaces, in order for people to leave their misconceptions aside.

2.8.1. **IMPROVEMENT IN THE QUALITY OF ENVIRONMENT**

By not using the private car so much, energy consumption will decrease such as emissions will which may lead to dropping in water pollution and greenhouse effect.

The air feels cleaner and people are called back to the streets, living a healthier lifestyle.

Today transportation policy is as important as agricultural and education policy for our health and that of future generations (Granados, 1998).

Walking is a relatively high crash fatality rate per mile of travel, but this is offset by reduced risk to other road users and by the fact that pedestrians tend to travel less overall than motorists (Litman, 2007).

International research suggests that shifts to nonmotorized transport result in overall increases in Road Safety. For example, the Netherlands has a high level of nonmotorized transport. Pedestrian fatalities per billion km walked are less than a tenth as high as in the United States (TDM Encyclopedia).

When pedestrians feel safe to walk around without the need to watch out for motorized traffic, they feel more comfortable about coming out.

With the decrease of traffic noise, streets become more pleasant and people are more willing to enjoy what surrounds them.

2.8.2. **SOCIAL IMPROVEMENT**

Reducing car-permitted areas will improve accessibility for people who are transport disadvantaged – social justice and cohesion may be improved by this action as well.

For the last twenty years it has been almost impossible for children to meet and play in safety on the streets, which may become reasonable if cars leave making the street a lot less dangerous not only for children but for physically impaired and older people too.

Accordingly, instead of being isolated inside their houses or other indoor facilities, people feel the thrive for coming outside, for socializing and creating bonds with each other – that’s what living in community is all about.
2.8.3. DEVELOP TRANSPORT POLICIES
Improved nonmotorized transport conditions increase travel choice and mobility, which particularly benefits non-drivers.

Walking tends to be one of the most affordable transportation modes.

People who are transportation disadvantaged often rely heavily on nonmotorized transportation, for trips made entirely by walking, and to access transit – in order to attend to this detail, modal transfer must be a main concern so that mobility suffers a deep development (TDM Encyclopedia).

If a good public transportation network is established, people will feel that they can rely on it and, thus, feel more secure about leaving their private cars at home and going to work, for instance, by bus or metro.

Also if cycling and pedestrian facilities are supplied many people may choose these ways of moving, leaving their cars aside.

2.8.4. MAKING CITIES MORE LIVABLE
The city centre may become richer in open spaces which will be more preserved, with less exposition to carbon dioxide and other forms of pollution induced by intensive car usage.

Moreover, this may be a crucial aspect in rehabilitation and preservation of cultural resources, distinctively, historic buildings (which are very common in downtown Porto).

Streets that are attractive, safe and suitable for walking are a key factor in community liveability. Pedestrian-friendly streets create opportunities for people to meet and interact, helping to create community networks (TDM Encyclopedia).

There must also be considered the fact that bringing people back to the cities may enhance new or weakened activities that may have been frozen before.

2.8.5. REDUCING ECONOMIC BURDEN
Shifting travel from motorized to non-motorized modes can be particularly effective at reducing external costs – it most often substitutes for short car trips in higher density urban areas where the per-mile costs of driving tend to be highest. (TDM Encyclopedia) A short walking trip often substitutes for a longer motor vehicle trip. As a result, each percentage shift of vehicle trips to walking can reduce transport external costs by several percentage points, particularly under urban-peak conditions when emission and parking costs are high (Litman, 2007).

Furthermore, car-freeing the city centre may enhance local business/commerce activity and employment (TDM Encyclopedia). Retail and employment centre are affected by the quality of their pedestrian environment particularly in urban areas and resort communities. The popularity of retail malls, suburban office campuses and pedestrian-oriented resort communities are indication of high-values that consumers place on pedestrian environmental quality (Litman, 2007).

Health-related costs may as well decrease by implementing this picture as it stimulates daily exercise and pollution reduction.

All-in-all, many are the advantages that come from development of pedestrian-only spaces.
Along the enhancement of these spaces, people are carried out back to the streets. Thus, activities reborn in the city centre because people are again eager to enjoy them and, therefore, activities are stimulated gather proper conditions to grow.

People feel more comfortable and healthy and so feel more willing to socialize which will improve city life quality.

It’s not only each benefit by itself but all these benefits combined that makes a great impact that produces remarkable changes in the urban environment.

2.9. **EUROPEAN EXAMPLES**

Even though the concept of pedestrianisation is still not very well established, some European cities have already made some efforts towards more liveable cities, where cars are not prioritized and pedestrians are the main concern. Gladly, there are already some success stories for others to observe and follow.

![Figure 22 – European Examples](image)

2.9.1. **COPENHAGEN, DENMARK**

Copenhagen is the capital and largest city of Denmark. It is situated on the Zealand and Amager Islands and is separated from Malmö, Sweden by the strait of Øresund.
Copenhagen was no different from other Western cities during the 1960’s where ‘Americanised zoning values’ where being transported globally (i.e., it was being ‘invaded’). However, once the negative externalities of this practise began to be recognised, the city acknowledged that something had to be done. “We decided to make the public realm so attractive it would drag people back into the streets, whilst making it simultaneously difficult to go there by car” – Jan Gehl, in 1992, (Pugalis, 2006).

In response, the city has made huge investments in alternative infrastructure over the past few decades; improving accessibility, enhancing environmental quality and amenities and creating vibrant public spaces through pedestrianisation and sensitive planning as a means to ‘re-conquer’ the traditional city. (Pugalis, 2006)

The pedestrianisation of Strøget has been a central part of a four decade plan to reduce the impact of cars on the city centre. At first though, the decision to remove car traffic from three of the city’s streets (which collectively help comprise Strøget) raised a public outcry. Shopkeepers in particular were incensed at this decision which they saw as an attack on their livelihood. (Pugalis, 2006)

Traffic calming policies led to immediate increases of pedestrian activity of between 20 and 40 per cent and statistics suggest that noise at street level was reduced by 10 to 15 decibels. The amount of car traffic in the city has remained at an almost constant level for the past 30 years in comparison to the vast majority of European cities where traffic has increased exponentially. This has in part been facilitated by integrated transport planning and densification measures that have seen bicycle use increase by around 70 per cent since 1975. This pedestrian-friendly aesthetic and cultural environment has also led to a dramatic increase in the number of people who spend time in the streets and squares of the city centre by 350 per cent (Pugalis, 2006).

The streetscape is continuously improved largely through the introduction of attractive hard and soft landscaping, sculptures and seating. This has helped produce an environment ‘fit for people’ and has established a positive causal relationship, where the appeal of people using this space and appropriating this place attracts more people. (Pugalis, 2006)

What is striking about Strøget is the general ‘buzz’ about the place, largely responsive to the everyday social activity that pedestrianisation and a good quality urban realm facilitate. (Pugalis, 2006)

Some of the measures taken to overcome car dependence in Copenhagen are summoned in Table 2.
Importance of Pedestrian Spaces – The City of Porto

<table>
<thead>
<tr>
<th>Traffic Calming</th>
<th>Bus Lanes</th>
<th>Favouring Alternate Modes</th>
<th>Facility And Service Improvements</th>
<th>Economic Penalties</th>
<th>Non Auto Dependent Land Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional traffic calming but extensively pedestrian in city centre. No extra road capacity and an incremental reduction of parking by around 2-3 per cent/year over a number of decades.</td>
<td>These provide preferential treatment for public transport and the system has significantly increased bus access to the city centre.</td>
<td>Rent-a-Cycle System that since 1997 has been administered as a free self service system, paid for by advertising and maintained with assistance from the prison system which collects and repairs damaged bikes overnight.</td>
<td>These include better terminal facilities and closer proximity of bus and train loading areas.</td>
<td>Extremely high vehicle registration costs.</td>
<td>Corridors of growth. Urban villages around rail lines. Densification around transport hubs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26,000 bicycle parking spaces have been provided at 72 metro stations. Emphasis on bicycle lanes and pedestrianisation.</td>
<td>Faster services the construction of more tunnels under the green belt and the building of additional bridges.</td>
<td>Beginning in the early 1990s, parking fees were introduced to the majority of public parking areas in the inner city. A decade later, the area subject to parking surcharges was expanded beyond the inner city to the adjacent districts.</td>
<td>Mixed use development.</td>
</tr>
</tbody>
</table>

Table 2 – Measures taken in Copenhagen.

2.9.2. Perugia, Italy

Perugia is the capital city of the region of Umbria in central Italy, near the Tiber River, and the capital of the province of Perugia.

The growth of car traffic experienced in Perugia led to environmental problems and posed a risk to the city's historical heritage. A travel plan for Perugia was conceived in 1971 by Fabio Ciuffini, then Deputy Mayor. This was largely based on the introduction of measures to promote walking and it included the construction of escalators and elevators as part of a pedestrian network, which was built with municipal funds. Perugia was the first city in Italy to pedestrianise its historic centre and could be viewed as the prototype of the 'car-free city' in Italy (http://www3.iclei.org/egpis/egpc-038.html, 29/04/2008).

The main objective of Perugia's travel policy is the enhancement of the city's historic heritage by reducing the space occupied by vehicles and eliminating vibrations caused by vehicles. This has
been accomplished by developing a pedestrian network, and encouraging use of public transit and other alternative transport modes. The pedestrian network has been developed through the establishment of a pedestrian zone in the historic centre; the establishment of controlled traffic zones authorizing access to residents only; and the creation of mechanized pedestrian ways, including elevators, escalators, and pedestrian walks of special design. Perugia was the first city in Italy to pedestrianise its historic centre and could be viewed as the prototype of the ‘car-free city’ in Italy. The pedestrian network has been successfully implemented, and there is already demand for its extension (TDM Encyclopedia).

Overall, there is a high degree of acceptance and use of the pedestrian network, emphasized by the demand for extensions of the system. Most trips to the city centre are made on foot. The escalators, which provide comfortable and continuous route ways, are the most popular. The elevators, which serve discontinuous route ways, are also generally accepted. Studies have shown that 50 % of the local population in Perugia considers 600 m or more to be an acceptable walking distance. A considerable proportion of the local population prefers to combine public transport with other modes of transport. Peripheral car parks, which in the past were little used and which were originally designed to serve modal split points through a shuttle service, are increasingly being used in combination with the pedestrian network. (http://www3.iclei.org/egpis/egpc-038.html, 29/04/2008)

2.9.3. BARCELONA, SPAIN

Barcelona is the capital and most populous city of Catalonia and the second largest city in Spain, located on the Mediterranean coast. It has a population of 1,605,602 in 2006, while the population of the Metropolitan Area is 3,161,081.

Barcelona is a major economic centre, with one of Europe's principal Mediterranean ports, and Barcelona International Airport is the second largest in Spain. Barcelona is today an important cultural centre and a major tourist destination and has a rich cultural heritage.

According to Gehl, cities like Barcelona gather the aspects of a certain type of city – the reconquered city.

Although many cities in Germany and Scandinavia pioneered efforts to push back cars from the middle of the city and create more peaceful condition for pedestrians, it was in Barcelona, starting in 1980, that a broader concept of city spaces was formulated in a co-ordinated public policy. In the course of 50 years, city space had been conquered by cars. Now the city was fighting back, both physically and culturally. It was also in Barcelona that the concept of 'the reconquered city' was born.

In terms of both idea and specific architectural formulation, public space policy in Barcelona came to play a very big role in further developments.

What happened in Barcelona was the starting point for a new, intense period in the last 20 years of the century, in which increasingly more cities and city spaces were created and renewed, in order to ensure good public space for new types of public life. (Gehl, 2001)

One of the most impressive actions taken in Barcelona was Bicing.
Bicing is a public cycle hire network that is integrated into and complements the existing public transport of network of buses, metro, tram and train. Barcelona is a city with a dense urban population and high level of pedestrians. Bicing has a triple effect – it encourages users not to drive; it promotes intermodal travel; and, at key times, it relieves congestion on the existing public transport infrastructure.

Bicing offers a network of 1500 cycles, stationed at 100 points around the city, that are available for hire 24 hours a day on Fridays and Saturdays and from 5am to midnight on other days. Users can move around the city, leaving the cycle at other stations and changing between cycles to maximize low-cost travel (each “hire” has a 30-minute period low-cost use, after which charges rise). Bicing stations are located close to stations for metro, train or light rail, close to public parks or green spaces, and within 300 metres of another Bicing station, meaning the system is accessible and well-connected to other transport modes.

The city has reinforced the potential of the scheme by undertaking a range of initiatives to make cycling easier. 7000 new cycle stations are being constructed, adding to existing infrastructure and creating close to 15,000 stations around the city. 30 km/hour speed limits for cars have been established in different parts of the city and 22 km of new cycle lanes will be added to the city’s existing 128 km network.

Of all users, 33.87% combine Bicing with metro; 21.85% with train; 13.45% with light rail; 9.47% with bus; 8.25% with walking; 4.32% with tram; 4.03% with intercity buses; 3.24% with car (driving); 0.98% with car (passenger); 0.29% with motorcycle; 0.25% with personal cycle. Combining with private car either as passenger or driver represents only 4.22% of this total, but it should be pointed out that this only accounts for users combining Bicing with other modes of transport – and that 71.63% of users exclusively use Bicing!
The implementation of Bicing was financed by incomes from the regulation of parking in the city – i.e. penalties, parking fees, etc.

(http://www.c40cities.org/bestpractices/transport/barcelona_bicing.jsp)

This is kind of bicycle sharing service has already been implemented in other cities like Lyon (France) - Vélo V – and Cambridge (UK).

![Figure 24 – Vélo V in Lyon.](image)

2.9.4. BREMEN, GERMANY

Bremen is a hanseatic city in north-western Germany. It is a port city, situated along the river Weser, about 60 km (37 mi) south from its mouth on the North Sea. Bremen is one of two towns belonging to the state of Bremen.

At the beginning of the 1990s, the idea of “Living without cars” was born in a seminar at Bremen University. In 1992, six families from different types of residential areas in Bremen participated in a research project and agreed to refrain from car use for a period of four weeks. In addition, they agreed to keep a record of their travel and of their modes of transport. All families have little children, and they considered themselves as low-level car users.

(http://www.eaue.de/winuwd/56.htm, 15/04/2008)

Results:

- change of transport mode affects other behavioural patterns (e.g. shopping);
- non-availability of a car leads to replacement activities (e.g. bicycle tours instead of car trips to the countryside);
- people didn’t view extra time spent travelling as waste of time;
- increased social interaction;
- more sensory experiences;
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- absence of feeling restricted mobility;
- five of the six got rid of their car after the experience.

(http://www.ocf.berkeley.edu/~britt/bremen.htm, 25/10/2007)

The experience of such effects makes up the core elements of a new lifestyle, in a car-free residential area. If people deliberately opt for such a lifestyle they have to accept that this includes other qualities and quantities in mobility. In particular, this applies to the travelling times, travelling as a social space, and the sensory perception of self and the environment.

(http://www.eaue.de/winuwd/56.htm, 15/04/2008)

As the results from the experiment had been quite encouraging, the planners from the City Department for Environmental Protection and Urban Development started to promote the idea within the institutional framework.

The project site had to meet three conditions: adequate connections with public transport and two-wheeled vehicle networks, diversity of adjacent urban functions, and proximity to substantial natural open spaces.

The planning philosophy had to break new ground as the planning of an area without cars was not aiming to adopt a strategy for the exclusion of cars. On the contrary, the focus is on an enabling strategy for non-car users. In the first place, this means that the area should offer no car parking facilities, with the exception of car parks for visitors and car sharing organisations.

Four essential steps underpinning the success of a sustainable, non-car-oriented urban development have been identified:

- parking space should be evaluated as an economic asset;
- the obligation to provide parking spaces should be removed from the planning regulations;
- land-use planning should encourage higher urban densities (incorporating the new urban lifestyle) instead of encouraging low-density development on the periphery;
- model projects which reduce the need to own and use a private car should be subsidized.

(http://www.eaue.de/winuwd/56.htm, 15/04/2008)

2.9.5. LYON, FRANCE

Lyon is a city in east central France. It is the third largest French city, the first being Paris and the second Marseille. It is a major centre of business, situated between Paris and Marseille.

Together with its suburbs and satellite towns, Lyon forms the second largest metropolitan area in France after Paris, with 1,783,400 inhabitants at the 2007 estimate, and approximately the 20th to 25th largest metropolitan area of Western Europe. Its urban area (Région Urbaine de Lyon), represents half of the Rhône-Alpes region population with 2.9 million inhabitants.
Lyon is a city which is served by route nationale, air, high speed rail and canal. This way, it’s clear that transportation is a great matter for this town, and has enabled it to face Paris primacy through time.

The concept plan above was presented during the public day of the 1997 "Towards Car-Free Cities" conference in Lyon, France.

This plan gives an idea of what a conversion of an existing city might look like. It is worth noting that the 35-minutes-to-anywhere standard is not reached with this plan, but quite fast transport is still possible. Some trips do require two transfers. Incidentally, the newest of the four metro lines in Lyon operates fully automatically - there are no crew members on the train.

This conference produced the "Lyon Protocol" for converting large districts to carfree areas. It defines a strategy for reaching consensus on how to design and implement such a radical change. (http://www.carfree.com/existing.html, 30/10/2007)

The “Lyon Protocol” defines a car-freeing strategy according to a coherent set of measures that work together.

These measures employ a distinctive approach in order to encourage good practice with attractive offers and discourage bad habits with restrictive measures. Some of the measures can include:

- Reduce speed limits for motorized vehicles (enforced by speed restriction bumps);
- Improve public transport, pedestrian, and bicycle infrastructures;
- Implement parking restrictions;
- Impose right-of-way restrictions on cars;
- Implement traffic cells to discourage cross-city travel;
- Require car owners to buy public transport passes.

Restrictions on vehicle use are probably best implemented in the following phases:

- Private cars of non-residents;
- Private cars of residents;
- Buses (once the passenger rail system is operational);
- Most trucks (using freight consolidation to increase efficiency and reduce environmental impacts);
- All vehicles except emergency services and slow-speed local delivery vehicles (once the rail freight system is operational).

In the early phases, street parking may still be permitted, particularly along the edges. As the implementation progresses, cars are forced to park farther away. On-street parking is removed and the streets are given over to non-vehicular uses. Residents will probably still be allowed to park in their own neighbourhoods during early phases, but visitors will encounter increasingly strong incentives to take public transport when their final destination is the emerging car-free district. This will include restrictions on time of day, length of parking, and greatly increased costs of parking. A
well-balanced combination of these and other measures will lead to a reduction of car traffic at a rate that need not threaten to those accustomed to using their cars for urban transport.

(http://www.carfree.com/lyon_protocol.htm, 30/10/2007)

These examples have shown that there are many different ways of implementing car-free cities and, thus, healthier lifestyles.

Different cities require different solutions and so the target in hands must be carefully studied before taking any kind of measures.

However, some lessons ought to be taken from those cases:

- Reducing parking space discourages people to drive everywhere;
- Fees towards car-usage infractions are effective;
- Providing a good public transportation network gives people freedom of choice and the possibility of leaving their cars at home;
- Providing cycling is a measure that has been very successful abroad; however, it must be taken into account the topography of the city – in Porto, it may be an issue;
- Traffic calming measures are effective when it comes to reducing motorized traffic and getting a lighter, more pleasant environment;
- Nonmotorized travelling increases social interaction and cohesion.
3

PRACTICAL APPROACH

3.1. INTRODUCTION

The way that pedestrian spaces are seen and analysed by planners, architects and engineers must not be assumed as an absolute point of view. The same way, the way planners, as observers, perceive and appreciate pedestrian spaces is not the same as users do.

However, as planners, we must always be aware that planning shall be done for those who will make use of it and to whom every kind of improvement or change will make a significant difference – if possible a positive one.

So, it is important to distinguish the planner’s point of view from the user’s point of view and to acknowledge the way pedestrians observe and feel urban space in order to make planning an instrument of development towards pedestrian comfort and ease.

3.2. URBAN DESIGN QUALITIES – THE PLANNER’S VIEWPOINT

While planning urban space, some aspects must be considered. First of all, one must realize who one’s planning for – the way the issue is worked out may be completely different depending on what the aim is.

Morphology, which could be perceived as the matter about shapes and forms, is a concept related to the image individuals absorb of the urban space. According to Lamas (1994) “it is the subject that studies the object – the urban shape – in all its exterior characteristics and its evolution in time”.

Pedestrians are a very specific kind of user: they circulate randomly, at very low speed and interact continuously with the surrounding environment. So it becomes very important to sought out which factors influence in pedestrians comfort and, consequently, in their behaviour while circulating on the streets.

The upcoming factors describe the way planners perceive urban pedestrians spaces and their main concerns awhile analyzing them.
3.2.1. IMAGEABILITY
Imageability is the quality of a place that makes it distinct, recognizable and memorable – when specific physical elements and their arrangement capture attention, evoke feelings, and create a lasting impression.

A highly imageable city is well formed, contains distinct parts, and is instantly recognizable to anyone who has visited or lived there.

What is essential is its singularity and location, in relationship to its context, background and the city at large.

Landmarks are a key component to imageability – they are a principle of urban design because they act as visual termination points, orientation points and point of contrast in the urban setting.

Jan Gehl explains these phenomena using the example of famous Italian squares (like the one on Figure 25), where “life in the space, the climate, and the architectural quality support and complement each other to create an unforgettable total impression.”

![Figure 25 – Piazza del Popolo in Rome.](image)

When all factors manage to work together to such pleasing ends, a feeling of physical and psychological well-being results: the feeling that a space is a thoroughly pleasant place in which to be.

Imageability is influenced by many other urban design qualities – legibility, enclosure, human scale, transparency, linkage, complexity and coherence – and is, in some way, the net effect of these qualities.

3.2.2. LEGIBILITY
Legibility refers to the ease with which the spatial structure of a place can be understood and navigated as a whole.
The legibility of a place is improved by a street or pedestrian network that provides travellers with a sense of orientation and relative location and by physical elements that serve as reference points. Lynch (1960) suggests that when faced with a new place, people automatically create a mental map that divides the city into paths, edges, districts, nodes and landmarks.

Places with strong edges, distinct landmarks, and busy nodes allow people to form detailed and relatively accurate mental maps.

Legibility facilitates way finding, the process by which people move successfully through the physical environment to reach a desired destination, determining a route between two points, choosing an alternate route when the primary route is blocked, navigating along a route, and learning a new spatial environment.

A regular grid of streets makes it easy for people to navigate although it does not provide a way of distinguishing one block from another. An irregular pattern of streets may increase the difficulty of navigating and learning the network, although it distinguishes each block with different lengths and orientations.

The street network thus works together with other elements of the physical environment to determine the legibility of a place.

Signage, landmarks, visual termination and deflection points also contribute to legibility. For instance, Praça D. João I, which one can see in Figure 26, can function as a visual termination factor for those coming either from Rua Sá da Bandeira, or Rua Passos Manuel, or any of the other streets that lead to these plaza.

Visual termination creates a “focal point, the vertical symbol of congregation” (Cullen, 1961). On a large scale, visual termination point can include large civic buildings, prominent landmarks, or elements of nature.
3.2.3. ENCLOSURE

Enclosure refers to the degree to which street and other public places are visually defined by buildings, walls, trees and other vertical elements, which interrupt viewer’s lines of sight. A sense of enclosure results when lines of sight are so decisively blocked as to make outdoor spaces seem room-like.

In an urban setting, enclosure is formed by lining the street or plaza with unbroken building fronts of roughly equal height. The buildings become the “walls” of the outdoor room, the street and sidewalks become the “floor”, and if the buildings are roughly equal height, the sky projects as an invisible ceiling.

This gives a comfortable feeling that involves the user, leading to a sympathetic reaction towards the space. People feel comfortable and secure.

At low suburban densities, building masses become less important in defining space, and street trees assume the dominant role.

Unlike the solid enclosure of buildings, tree lines depend on visual suggestion and illusion. Street space will feel enclosed only if trees are closely spaced. Properly scaled, walls and fences can also provide spatial definition in urban and suburban settings.

Visual termination points may also contribute for enclosure. When a street is not strongly defined by buildings, focal points at its ends can maintain the visual linearity of the arrangement.

Similarly, the layout of the street network can influence the sense of enclosure. Irregular grids may create visual termination points that help to enclose the space.

However, enclosure is eroded by breaks in the continuity of the street wall.

Breaks in continuity that are occupied by non-active uses – like large building setbacks – create dead spaces that further make the sense of enclosure weaker.

“Building setbacks from the street, originally invented to protect the public welfare by giving every building light and air, have actually helped greatly to destroy the street as social space.”

3.2.4. HUMAN SCALE

Human scale refers to size, texture, and articulation of the physical elements that match the size and proportions of humans and correspond to the speed at which humans walk. Building details, pavement texture, street trees, and street furniture are all physical elements contributing to human scale.

Modest sized buildings, narrow streets and small places create an intimate environment, and the opposite for large buildings, streets and spaces.
Stamps (1998) used a visual assessment survey to explore perceptions of architectural mass. The most important determinant was the cross sectional area of buildings, second was the amount of fenestration, and third was the amount of facade articulation and partitioning.

For pedestrians, small signs with small lettering are much more comfortable than those advertisements designed for being seen by people travelling at 50 Km/h.

Street trees can moderate the scale of tall buildings and wide streets. Where tall buildings or wide streets would intimidate pedestrians, a canopy of leaves and branches allows for a simultaneous experience of the smaller space within the larger volume.

3.2.5. TRANSPARENCY

Transparency refers to the degree to which people can see or perceive what lies beyond the edge of a street or other public space. It is related, as well, to the degree to which people can see or perceive human activity beyond the edge of a street or other public space.

Transparency is influenced, among other elements, by walls, windows, doors, fences, landscaping, and openings into midblock spaces.

What lies behind a street edge need only be imagined, not actually seen. When people are not allowed to see what’s happening their imagination will start speculating about what’s beyond their eyesight. The lack of transparency will lead to feelings of insecurity, pushing pedestrians away.

Jacobs (1993) says that street with many entryways contribute to the perception of human activity beyond the street, while those with blank walls and garages suggest that people are far away.

Transparency is the most critical factor at street level, because this is where the greatest interaction occurs between indoors and outdoors.
3.2.6. LINKAGE
Linkage refers to the physical and visual connections, from building to street, building to building, space to space, or one side of the street to the other, which tends to unify disparate elements. Tree lines, building projections, marked crossings all create linkage. It can occur longitudinally along a street or laterally across a street.

This kind of features promote the interconnectivity of different places, providing convenient access between them and are often associated to the concept of connectivity, as both are concerned with the ease of movement in an area and depend on the relationships between paths and nodes.

Linkages between the street and the surrounding buildings are important and may be psychological as well as physical. Maintenance of sight lines and sidewalk connections are obvious ways to provide this kind of linkage, but it can also be provided in more subtle ways.

For instance, continuous tree rows can psychologically connect places at either end, and tree patterns that reflect or amplify building geometry can psychologically link buildings to the street.

3.2.7. COMPLEXITY
Complexity refers to the visual interest of a place. It depends on the variety of the physical environment, specifically the numbers and kinds of buildings, architectural diversity and ornamentation, landscape elements, street furniture, signage and human activity.

Complexity is related to the number of noticeable differences to which a viewer is exposed per unit of time. Human beings are most comfortable receiving information at perceivable rates. So, too little information produces sensory deprivation and too much of it creates sensory overload.

Pedestrians continuously interact with the surroundings so in order to hold their interest they require a high level of complexity – this level will seem chaotic to people travelling in a motorized vehicle.

The environment can provide low levels of usable information in three ways: elements may be too few or too similar; elements, though numerous and varied, may be too predictable for surprise or novelty; elements, though numerous and varied, may be too unordered for comprehension.

Pedestrians tend to choose streets high in complexity, since they provide interesting things to look at: building details, signs, people, surfaces, changing light patterns and movement, signs of habitation.

An interesting walking network will have the “psychological effect of making the walking distance seem shorter” (Gehl, 1987).

Complexity results from varying building shapes, sizes, materials, colours, architecture and ornamentation.

Variation can be incorporated into the building orientation plan or building set-back line, allowing for varied building frontage instead of monotonous, straight building frontage. Numerous doors and windows produce complexity as well as transparency.

The presence and activity of people add greatly to the complexity of a scene. This is true not only because people appear as discrete “objects” but because they are in constant motion.
Jacobs (1961) describes diversity as a mixture of commercial, residential and civic uses in close proximity to each other, creating human traffic throughout day and night, and subsequently benefiting the safety, economic functioning, and appeal of a place.

3.2.8. Coherence
Coherence is related to a sense of visual order. The degree of coherence is influenced by consistency and complementary in the scale, character and arrangement of buildings, landscaping, street furniture, paving materials and other physical elements.

Coherence takes form of orderly density patterns and hierarchies of communal spaces.

Someone once said “Geometrical coherence is an identifiable quality that ties the city together through form, and is an essential prerequisite for the vitality of the urban fabric.”

There is an impressive list of features of buildings that, when repeated, can create visual unity: building silhouettes, spacing between buildings, setbacks from street, proportions of windows/bays/doorways, massing of building form, location of entryways, surface material and finish, shadow patterns, building scale, style of architecture, and landscaping.

While often presented as opposites, coherence and complexity represent distinct perceptual dimensions.

People like complexity, but not the unstructured complexity of the commercial strip. Scenes with high complexity and low coherence tend to be least liked.

Urban areas which are high on complexity must also be high on coherence (Harzog, 1982).

It is important to notice that coherence does not imply mindless repetition or blandness, rather continuity of design and thematic ordering.

So as to result in success these features must function all together harmoniously – too much of each of them may cause either confusion or discomfort on users. In cities created centuries ago, like Porto, some of these features may already be implemented, while others may be lacking enormously. It is up to the planner to conciliate these aspects, based on the pre-existent situation, in order to guide operations of urban rehabilitation or expansion.

Still, these qualities are main guidelines when planning for pedestrians and may not be applicable for other purposes. Therefore, above all, it calls for sensibility in policy making and planning.

3.3. Understanding Pedestrian Comfort – The User’s Viewpoint

Comfort for pedestrians is a positive emotional reaction to external surroundings (the walking environment) in different situations, including physiological, physical, social and psychological reactions.

Absence of discomfort means that nothing is unpleasant for the pedestrian. Comfort is also a cognitive comparison between actual objects and some point of reference, meaning that expectation
and earlier experience affects the evaluation of comfort. The feeling and degree of comfort is dependent on the surroundings, the situation and the individual.

The factors that may influence pedestrian comfort are numerous and will vary from individual to individual. These are called comfort factors. These factors and the relations between them have been studied and gathered by Ovstedal and Ryeng. These studies have been chosen to act like a basis for the user’s point of view in the project in hands.

These result from Urban Design Qualities but as they are all about human perception of reality they will include questions concerning thermal comfort, visual comfort, acoustic comfort, tactile comfort, smells, air pollution and allergens, the ease to move and the feeling of security as well as a few questions about the individual and the situation.

Studies have been made by some authors in several European countries: Belgium, Finland, France, Italy, Norway and Switzerland. Through these studies (that involved interviews and close observance of pedestrian behaviour) it has been possible to realize some facts about pedestrian movement and pedestrian comfort.

3.3.1. PEDESTRIAN COMFORT AND RELATED ENVIRONMENT

Pedestrian comfort depends on how much pedestrian needs are fulfilled – some factors have been recognized as main-concerns:

- Safety and security – it is crucial for pedestrians to feeling safe when walking at the site, confident in walking alone during daytime and when it is dark, not afraid of whom to meet. This aspect gets the highest score totally and in each country. European pedestrians are rather confident in walking alone during daylight and not afraid of whom they might meet but they are not quite as confident in walking alone during dark hours or in getting help if they should need it: this is what they stress the most.

- Attractiveness – the area shall be aesthetically attractive, either by architectural elements or by air quality (which is second in pedestrians’ priority: they are only partly satisfied with the air quality when walking and they tend to find the odours unpleasant).

- Traffic conditions – there shall be a pleasant (or at least tolerable) sound level, no bothersome car traffic and good definition between pedestrians and road traffic along with proper signage.

- Social meeting places and pleasantness – it shall be easy to meet requirements for rest, food and toilet and there shall be enough places to sit down, be protected from the weather by buildings, vegetation or topography, smooth and nice pavement surface.

- Continuity – for pedestrians it is important to move efficiently: minimal differences in altitude, not too many obstacles and grades or slopes. Moving shall be a continuous way without having to leave the sidewalk corridor or the pedestrian-only area.

Comfort is third on the list of pedestrian priorities – the study by Ovstedal and Ryeng has shown that the comfort feeling is strongly related to the weather conditions.
3.3.2. INTERCORRELATION AMONG FACTORS

It is not an easy task to evaluate pedestrian comfort so the level according which people grade it will be categorized, according to the following hypotheses.

1) Depends On The Individual

The resulting comfort level based on values and ranking of comfort factors may be different for different user groups depending on age, gender, ability and personality factors. While the perception of some factors depends to a great extent on the actual walking environment, others depend also on individual preferences.

According to the information collected through the studies previously mentioned the most dominant factors are:

- Feeling safe and secure;
- Pavement conditions;
- Lighting conditions (during dark hours);
- Appealing surroundings;
- Weather (how comfortable the person assess the weather);
- Traffic conditions.

However, the way these are prioritized depends on each person and the way he/she moves and understands the surroundings. For instance, how safe and secure pedestrians feel and how they like the surroundings depend both on the environment and on each person’s own needs and personality.

For the pedestrian seeking fresh air, space and light, it is important whether the surroundings are open or narrow, as for the pedestrian seeking security away from traffic the important factors are safety, noise level, comfort and traffic conditions.

The pedestrian seeking social pleasure is bothered by the presence of others, the presence of places to sit and to be able to meet requirements, as well as the condition of the street surface.

They can be divided in two groups:

- Pedestrians who emphasise the presence of other people as well as surface conditions and light conditions;
- Pedestrians who find the presence of seating and the possibility to meet needs for food, toilets and so on important.

These pedestrians may value the possibility to sit down because they need to rest rather than for social pleasure: for them presence of other people is important as well as places to sit, requirements met, weather and light conditions, surface conditions, the open/narrowness and layout of the surroundings. Pedestrian seeking security away from traffic: the important factors are safety, noise level, comfort, air conditions and traffic conditions.

The importance of comfort factors increase with age, just as are a main concern to people with mobility problems. People with mobility problems assess all aspects of security lower than people without problems, especially feeling less confident alone when dark and less confident in getting help.
2) Depends On The Situation

The resulting comfort level based on values and ranking of comfort factors may be different depending on travel purpose, time available and whether the person walks alone or accompanied. There are some different situations a pedestrian can be find him/herself in and in each one of them different aspects will be more valued than others. It is a completely different situation if a pedestrian is carrying heavy bags, is on roller-skates or skateboards and city bikes. Also wheelchair users and people using mobility aids like crutches and canes will have different standards.

Also if the purpose for the journey endeavoured will affect the way the space is evaluated: if an individual is going to job, school, shopping, leisure activities and accompanying others. The fact of the trip being made only on foot or by combining different means of transport will affect the impression on users, as well.

3) Depends On The Surroundings

In the way that the resulting comfort level based on values and ranking of comfort factors may be different for central areas and suburban areas, as well as streets with different functions, due to differences in orientation and expectations. When people are very much used to the situation, they seem to be rather blind for some negative aspects, which only become evident when they are extreme (for example very steep streets and total lack of public toilets).

However, it is possible to point out some facts:

→ Pedestrians in residential areas find the surroundings more appealing with sufficient presence of nature, but are less satisfied with the sounds, the sound level and traffic conditions;

→ People in suburban areas are quite more pleased with the odours and the air quality, and pedestrians in city centres least pleased;

→ Pedestrians in suburbs seem to be most pleased about lighting for seeing the pavement, but less so for reading signs;

→ Pedestrians in suburbs find the trip even easier without difficult steps or level differences and feel free to choose speed, but they are not satisfied with any aspects of signing in the area. They seem to feel less protected from weather;

→ People in residential areas are especially dissatisfied with freedom to choose speed, steps and climbs, getting an overview and finding the way;

→ Pedestrians in residential areas are most pleased and the pedestrians in suburbs are least pleased with seating and meeting requirements for food and toilets, while these aspects are looked upon as most important in the city centres.

The feeling of comfort gets higher scores in the suburbs, then residential areas and lowest in city centres. It is looked upon as slightly more important in suburbs and slightly less important in residential areas. Looking at the importance given different aspects, air quality and traffic conditions come up with urgent need for improvements in residential areas, with pavement
conditions, sound level, seating and meeting requirements also in need of improvements but with a less urgent need for action.

Several more aspects need urgent action in city centres: air quality, traffic conditions, seating and meeting requirements. Surface conditions and sound levels also need improvements but less urgent.

4) Is Hierarchical

Needs on a higher level do not affect the feeling of comfort until the needs on lower levels are fulfilled. For instance, feeling safe and secure only the surface condition and assessment of weather affect the feeling on comfort, while with lower assessment of safety and security more factors influence the feeling of comfort (these hierarchic relations can be sought out on Table 3).

<table>
<thead>
<tr>
<th>Ease to rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather Conditions</td>
</tr>
<tr>
<td>Ease to move</td>
</tr>
<tr>
<td>Surroundings:</td>
</tr>
<tr>
<td>Traffic, odours, presence of nature</td>
</tr>
<tr>
<td>Sounds, air conditions, lighting</td>
</tr>
<tr>
<td>Appeal of surroundings</td>
</tr>
<tr>
<td>Surface Quality</td>
</tr>
<tr>
<td>Feeling safe and secure and presence of others</td>
</tr>
</tbody>
</table>

Table 3 - A hierarchical model of comfort factors.

This way, one can easily understand that assessing pedestrian comfort may not be as clear and direct as it seems. Different kinds of pedestrians will evaluate urban space differently and so should be treated distinctively. For this to be feasible an extensive analysis on daily users of a certain urban space shall be done and related to its main uses and purposes.

So, the methodology which will be applied to the case study in hands will be based on both ways of perceiving the issue: planner’s way and user’s way. Not only physical comfort is important in urban pedestrian spaces – to know how the urban tissue behaves and the impact it has on users is just as important and so neither of the viewpoints may be neglected. A balance must be pursued in order to obtain balanced, rational and sensitive results. An attempt will be made towards this balance while gathering criteria and defining its application to the case study.
4 METHODOLOGY

4.1. INTRODUCTION

In order for an analysis of the urban space to be successful, it is very important to gather criteria that actually represent the urban space and its qualities. As it is not easy to bond both pedestrians’ and planners’ viewpoints in a single criteria some decisions had to be made towards the organization of the methodology for this study. Thus, it has been decided that the primary evaluation of the target area would be made according to the pedestrian sense of comfort, with the purpose of narrowing the possibilities to a smaller list. Afterwards, that list was commented on from a planner’s position, after which some assumptions were made.

So as to some aspects have been summoned for further application to the target area selected for this study.

First of all, it must be clear that these factors can be used not only for pedestrian-only spaces but for streets where both road and pedestrian traffic exist, however, when the purpose is related to pedestrian-only spaces the factor related to road traffic must not be considered.

4.2. SELECTED CRITERIA

For this project, 6 factors have been summoned based on Kansas City Walkability plan – these are the factors on which the case study will be based on. For each factor a brief description is given together with a scale of evaluation from A to D.

4.2.1. DIRECTNESS

Directness is the ability given to the pedestrians of following the shortest route to a main place in an efficient way. It represents the actual distance from the origin to the destination and the connectivity of a place towards main pedestrian traffic generators.

Pedestrian trips are highly dependent on trip length - pedestrian infrastructures’ ability to provide the shortest and most direct route is very important.

Measuring directness is all about evaluating how direct the pedestrian connections within a defined area, are provided or not. It should be measured between large pedestrian traffic generators.
4.2.2. ATTRACTIVENESS

Attractiveness is heavily related to the impact of the surroundings on pedestrians.

Upon the space, it shall not be too easy to get an overview and the surroundings shall be appealing without any unpleasant odours - air quality is crucial.

Actually, everything can be related and absorbed by this quality: landscaping, buildings, architecture, pollution, infrastructures, public art. Also there are some facilities that may help enhancing the comfort of the user and, consequently, the space’s attractiveness: shade trees, street lightning, benches and pedestrian infrastructures (ramps, curbs and crossings). Scale, design and maintenance are very important details that automatically influence this factor.

All-in-all, the truth is that if people feel pleased by what surrounds them, they will probably walk more in order to have a chance of enjoying it. Attractiveness is very difficult to quantify or measure. Still, despite the dubious character it may acquire, a scale of evaluation has been made.

| A Very Good | Appealing diverse surroundings, commercial facilities and architectural comfort. |
| B Good | Appealing surround but some pollution or heavy traffic. |
| C Average | Not very appealing but clean |
| D Bad | Ugly, polluted – avoided by pedestrians. |

Table 5 – Criteria for Attractiveness.

4.2.3. SOCIAL MEETING PLACES & PLEASANTNESS

This factor is quite similar to attractiveness but more intimately related to leisure.

The main concern on this field is not those pedestrians that pass by on their way to a certain destination, but instead those who have no defined destination. So, the most important is that there are pleasant encounters, that it is easy to meet requirements for resting, eating/drinking and going to toilet (enough places for sitting). Also protection from weather by buildings, vegetation or topography, smooth and nice pavement surfaces may be essential for this feature to be accomplished.

Basically, the main concern of this aspect is that pedestrians feel that they’ll be able to walk without worrying if they get tired, thirsty or hungry, as all those needs may be easily fulfilled.
4.2.4. TRAFFIC CONDITIONS

When it comes to streets where both road and pedestrian traffic exist, this is one of the main concerns of pedestrians and is also one of the aspects that bother them the most.

Thus, for a pedestrian to feel comfortable towards traffic there are some qualities that shall be provided. For instance, the amount of motorized traffic shall not be such that sound level turns out to be unpleasant and annoying – also it is vital that the air keeps a certain amount of freshness and ability to be renewed. In addition, pedestrian space (for instance, sidewalk corridor or pedestrian crossings) shall be carefully planned and designed in order for pedestrians’ safety always to be the main priority – there must be a clear definition between road and pedestrian space. Infrastructures concerning the elderly or the physically impaired people shall be provided as well.

<table>
<thead>
<tr>
<th></th>
<th>Very Good</th>
<th>Good</th>
<th>Average</th>
<th>Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Well organized and defined traffic – not very heavy.</td>
<td>Well organized, sometimes noisier than it should.</td>
<td>Definition isn’t always so clear, or pedestrians’ corridor is too narrow.</td>
<td>Terrible: there is no defined pedestrian corridor or it is in very bad condition.</td>
</tr>
<tr>
<td></td>
<td>Not too noisy – pedestrians don’t feel threatened by it.</td>
<td>There is light-signage controlling pedestrian vs. motorized traffic conflict.</td>
<td>Pedestrians use it though there is some risk specially related to children, old people or physically impaired people.</td>
<td>It’s a dangerous way for pedestrians to use.</td>
</tr>
<tr>
<td></td>
<td>Pedestrians have right-of-way.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7 – Criteria for Traffic Conditions.

4.2.5. CONTINUITY

Continuity is the ability of making an uninterrupted - without moving out of sidewalk corridors – and effortless trip.

In this case, what counts the most is whether there are minimal elevation differences, minimum amount of obstacles and the existence of infrastructures concerning physically disabled pedestrians (street corridor length and conditions).

It’s a purely physical factor: is it possible for a pedestrian to make his way in an efficient and safe way?
Table 8 – Criteria for Continuity.

A Very Good Homogeneous route (small grades and minimal variation); Absence of street furniture or very well placed one; Good design related to physically impaired people; Good maintenance of sidewalk corridor.

B Good Homogeneous route; Minimal street furniture (or obstacles) or when existing are not too much trouble; Some measure are taken towards physically impaired people; Good surface.

C Average The route is not all the way homogeneous; Those who are physically impaired need to take some risks to follow this path; Surface is not so steady or not very well maintained.

D Bad Bad condition sidewalk or no sidewalk. Obstacles like street furniture, grades and gaps are everywhere and appear randomly. There are no conditions for those who are physically impaired.

Table 9 – Criteria for Security.

A Very Good Area is well-known for being safe and secure; It’s easy for pedestrians to acknowledge the presence of other pedestrians; There’s enough light at night and not too many dark hide-outs. The street is patrolled. The pedestrian traffic is still significant at night.

B Good Area is quite safe but some trouble has occurred. There’s enough light and almost every spot can be seen clearly; Easy to see other pedestrians; There are still some pedestrians at night. No patrol.

C Average Zone is quite safe though there is no patrol or much pedestrian traffic at night. There are some potential hide-out that may enable crime; Some violent crimes have occurred.

D Bad There is a significant history of violent crime; The pedestrian traffic at night is practically non-existent; Lightning is weak, damaged or non-existent.

Table 8 – Criteria for Continuity.

4.2.6. SECURITY
This condition is as well one of the main concerns of pedestrians, particularly at night. Therefore, it is very significant for pedestrians to feel safe and secure.

To enhance this feeling, there shall be a clear visibility of traffic and other pedestrians. Patrolling may increase the feeling of safety towards violent crime, especially at night.

Also lightning plays a key role within this issue at night such as pedestrian traffic does during daytime. A pedestrian may feel endangered or, at least, insecure about wandering in a certain area at night if it is not properly served with appropriate lightning. In the same way, an area which is used by other people also provides a stronger feeling of safety then a deserted or isolated area.

Along the process of analysis some difficulties in evaluating were found and so intermediate grades were also taken into account (AB, BC, and CD). Each of those grades had a correspondent numeric value, described in Table 10.
The process of evaluation consists in giving each factor a grade, which is converted in a numeric value. According to the theoretical basis from which these aspects were taken, there shall be many ways of combining these factors. Although, as a matter of simplification and considering that this project’s purpose is to come out with an overall idea of the outcomes of these factors, it will be assumed that they all influence the same.

So, after all factors have been evaluated, the numeric values for each street shall be added resulting the final grade. Obtaining these values leads to an overall idea of the pedestrianisation skills of a certain space. Applying these criteria to an extended area allows the planner to compare different results of each street in order to define which ones would give best outcomes after implementing pedestrianisation.

It shall be taken in consideration that these aspects are only mere guidelines for analysis – it’s very difficult to evaluate the pedestrianisation skills of an area based on 5 or 6 factors only. However, when it comes to the purpose of this project, the characteristics gathered seem to be enough for getting a general idea of what path to take in order to improve pedestrian spaces in the city centre.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numeric Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14</td>
</tr>
<tr>
<td>AB</td>
<td>12</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
</tr>
<tr>
<td>BC</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>CD</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 10 – Grades and correspondent numeric values.
5

CASE STUDY

5.1. INTRODUCTION

Porto is a city in Northern Portugal, and is the second largest city in Portugal, with an estimated population of 240000. Its strong legacy as one of the main trading landmarks within the country’s commerce history is noticeable until nowadays.

Products, like Porto Wine, produced in the Douro valley, was already in the 13th century transported to Porto in *barcos rabelos*, add such identity to the city that is still known for them, even though Porto Wine is actually produced in Vila Nova de Gaia.

However, what is really important it to understand the dynamics of the city and its evolution until our times.

The downtown of Porto can be defined by certain main landmarks – it is centred in Avenida dos Aliados and includes the whole area that goes from Praça Carlos Alberto and Leões to Rua de Santa Catarina and Batalha.

It’s probably correct to consider that its northern limit to be Lapa and its southern limit to be Douro River (this way also Ribeira and Alfândega will be considered as part of the downtown).

It was very common in this area, around the midst of the XX century for each street to have its own market.

For instance, Rua 31 de Janeiro was specialized in gloves and hats while Rua dos Clérigos was all about fabrics.

By that time, economic trading and services had already settled in the downtown area, in order to reach the greatest amount of consumers – median class consumers. Powerful trading centres had arisen:

- Rua do Bonjardim, where global commerce and coffee shops were the most popular;
- Rua do Almada, where all kind of tools and hardware could be found;
- Rua das Flores, also know as “Gold Street”, because of the great gathering of jewellers;
- Rua de Santa Catarina, where specialized commerce had just started to settle.
Also we would find that suddenly all kind of financial activities like banks and insurance companies would start gathering around Rua Sá da Bandeira, Praça João I and Praça da Liberdade, which is notorious even nowadays.

Later in the XX century, the great dissemination of the economic activities induced some changes in these settlements, filling Rua 31 de Janeiro with shoe-shops and Rua de Santa Catarina with prêt-a-porter – this stronger specialization of trading in each street or area enabled a greater choice range for the client as well as greater mobility among same type of commerce.

At that time, the car was almost non-existent and people would have to travel along the city using the electric car or on foot. Downtown centre of Porto was always full of people and life, the coffee-shops and the theatres were full of intellectuals and the vibrant rhythm of development kept rising.

Sadly, nowadays, that’s not what happens. The noise and pollution coming from the exuberant amount of motor-vehicles takes people away from downtown – the ones who still dare to walk find absurd difficulties and confusion all around. The traffic is intense which doesn’t allow public transports, like buses, to flow properly, causing traffic jams and loss of time. It’s very rare to find people wondering around those streets just for leisure – the stressful environment pushes people away from the historical centre and so does the lack of mobility.

In fact, for multiple reasons, is astounding the amount of building that show evidence of abandon and neglect for not being inhabited for years. Also, it is clearly noticeable a decrease in population inhabiting the historical centre, due to policies of replacing the former inhabitants, while it was overloaded. Well, it has totally come out the other way around: the historical centre is, mostly, inhabited by the elderly, or low class families, (Ramos, 1994) inducing an environment of misery and criminality.

From this point forward, it’s not hard to realize that the more people avoid walking or using public transports, the more popular will great commercial areas, like shopping malls, be. Along with the demand of actual life, people will try to follow the most efficient and convenient ways – going to a mall where you can find a great range of different product at the same time, without have concerns about parking makes a huge difference. So people are, once again, pulled out of the historical centre, away from traditional economy - this weakens the city centre once again and so the cycles goes on.

So it becomes a main issue, to bring people back to Porto historical centre: to revive the theatres and the coffee-shops, to fill the streets with people going back and forward on their way to their jobs, home places or leisure activities.

However, people will not circulate efficiently and pleasantly if walkability conditions are not proper.

**5.2. TARGET AREA**

So, the case study for this project will be the application the criteria previously defined to a range of streets belonging to downtown of Porto, specifically to the following area: from Carmo to Rua de Passos Manuel, and from Rua de Mouzinho da Silveira to Rua de Gonçalo Cristóvão (the target area is approximately represented on .
Several conditions led to choosing this area and not any other in downtown centre of Porto (which is bigger than the target area for this project).

To begin with, this area is where the strongest pedestrian traffic is located due to strong traffic generators like main metro stations, commercially strong streets like Rua de Santa Catarina, S. Bento train station and the City Hall and all services related to it.

Moreover, it is where we can find the greatest amount of streets that have a human scale and, thus, probably more appropriate for pedestrian circulation. In addition, it is an area that belongs to the main centre of Porto and therefore it must be stimulated in order for it to acquire a status of centre for all main uses and for quality of living.

Another reason is the fact that the city centre has experienced some kind of abandonment especially when it comes to residential buildings for it is urgent to create a policy that calls people back to the centre. As a result, nearly 50 streets were observed and analysed according to the factors previously described. Thus, Table 1 comes out gathering the score for every street analysed.
### Street Directness Attractiveness Social Meeting Places & Pleasantness Continuity Security

<table>
<thead>
<tr>
<th>Street</th>
<th>Directness</th>
<th>Attractiveness</th>
<th>Social Meeting Places &amp; Pleasantness</th>
<th>Continuity</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rua de Gonçalo Cristóvão</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>Rua de Sá da Bandeira</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Rua das Carvalheiras</td>
<td>C</td>
<td>D</td>
<td>D</td>
<td>C</td>
<td>CD</td>
</tr>
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<td>Rua de Guedes de Azevedo</td>
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<td>C</td>
<td>C</td>
<td>C</td>
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</tr>
<tr>
<td>Rua do Bolhão</td>
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<td>C</td>
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<td>C</td>
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<tr>
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<tr>
<td>Rua Formosa</td>
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<td>BC</td>
<td>BC</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Rua de Passos Manuel</td>
<td>BC</td>
<td>BC</td>
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Table 11 – Outcomes from application of selected criteria.

After converting the scores into numeric values (as explained earlier), it results in a hierarchy of values which represent the potential of pedestrianisation for each street from a pedestrian point of view, which are summoned in Table 12.

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In order to draw some conclusions, the ten best scored streets will be analysed more carefully.

5.3. **OUTCOME ANALYSIS**

A detailed analysis has been made to the 10 streets that got best criteria grades.

5.3.1. **AVENIDA DOS ALIADOS**

This central avenue (which is represented on Figure 29) is considered as the main central avenue in Porto – the heart of the city. Its great score is a result of great factors combined all together.

![Figure 29 – Avenida dos Aliados.](image)

It has received A in both Directness and Attractiveness. Its Directness skills are top as it is the main transports convergence spot, connecting to dozens of STCP lines and to metro’s yellow line. The City Hall along with all the finance related companies makes this avenue a great pedestrian traffic generator spot. The magnificent buildings that surround the avenue are generally filled with
amazing antique artwork and the main square has been recently renewed, which makes it even more attractive.

Its score for Security is AB as lightning is clear and constant at all its length and there’s a lot of pedestrian traffic due to the commercial activity and the easy access to modes of transport. Security is not excellent though, and some incidents have occurred.

The remaining two factors have scored B. There are plenty of places to socialize, rest and enjoy the view of the beautiful buildings surrounding the centre. The walking surfaces are nice and homogeneous and there are facilities concerning the physically impaired people.

Moreover, the sidewalks are wide and clear, the street furniture is quite well arranged and the pedestrians crossings are well signed – all pedestrian facilities are well built and organized (which is clear on Figure 30). When this happens probably there is no need to change what’s already implemented.

![Figure 30 – Pedestrian spaces in Avenida dos Aliados.](image)

However, from a planner’s point of view, the scenario is very different. Though it’s very strong when it comes to Imageability, Avenida dos Aliados is too wide – the feeling of enclosure is minimal. If it was turned into a pedestrian-only space it would probably become an empty space as people would feel lost in such great area (actually, they already do).

Unless measures were taken in order to fulfil the void, it would be impossible of pedestrianising. Even considering all the services and commercial activities it would not be enough. Also it affects Human Scale as buildings and free spaces are so huge comparing to human size. Additionally, aspects like Legibility, Transparency and Complexity are well managed along the entire avenue and Linkage (which intimately relates to Directness) is great.

Still, the disparity caused by the lack of Enclosure and Human Scale makes it impossible for absolute pedestrianisation.
It could be possible, though, to consider the implementation of private motorized traffic reduction policies or even the forbiddance of circulation for private motorized vehicles. Nevertheless, it should be carefully preceded by traffic analysis studies since Avenida dos Aliados is a main circulation area in downtown and its alteration would be a limitation to all surrounding traffic.

5.3.2. RUA DE RODRIGUES DE SAMPAIO
Although it may not apparently be the most appealing street downtown, there are some peculiar factors worth giving it credit for.

Its best score goes for Directness due to its location (represented on Figure 32): it connects directly to two important spots: Avenida dos Aliados and Praça D. João I. As we’ve already seen, Aliados is considered as the heart of the city, with all the symbolic and the practical meaning that comes with it – all main transports are available along with commercial and services activities. Praça D. João I
has one very distinctive feature: Rivoli Theatre, which is a theatre opened since 1913 and in which one can still see various performances.

This street may act like a bridge between these two spots.

It scored AB for Continuity for the path is continuous and homogeneous and the surfaces are adequate for walking, and B was the score for Attractiveness for it ends at Praça D. João I and the environment overall is simply pleasant.

Its lowest scores are BC for Social Meeting Places & Pleasantness and Security, for there are some resting places (along with shadow) but there would be the need to stimulate commercial activity – the fact of being so close to Rivoli Theatre should be well worked-out in this situation.

On the other way round, its Imageability and Linkage aspects are good but Transparency is lacking (most frontage areas are opaque).

Its width is adequate for human contact and interaction and its surface is appropriate for walking – also measures were taken towards the physically impaired.

The main weakness for this street is the fact of having a parking lot exit which could spoil the environment that an only-pedestrian street should have. In addition, there’s also a fire-fighters’ headquarters which one can assume that can’t be moved.

5.3.3. RUA 31 DE JANEIRO

This street, represented on Figure 34, is one of the oldest commercial streets in Porto.
It shows best skills on Directness – due to its connectivity with a few relevant pedestrian traffic generators like S. Bento train and metro stations, Garagem Atlântico (inter-regional bus station) and Rua de Santa Catarina – and on Attractiveness as it’s surrounded by wonderful buildings which are part of Porto’s distinctive character. Moreover, also the fact it leads to Praça da Batalha enhances this skill.

When it comes to Continuity it scores B, as there’s a considerable slope that goes along the entire street, making circulation hard for the elderly and for physically impaired people. Even though, the surface is good for walking, the street is aesthetically interesting and there are plenty of stores, though they are not so strong. Besides the severe slope, another negative factor is the fact that the electric line goes through this street in all its length. Still, this fact could be skirt if a solution was sort out to separate pedestrian traffic from the electric line in order to ensure pedestrian safety.

This street also scores B for Security as pedestrian traffic is intense (even at night) but there usually is no patrol.

If its extremities are considered (S. Bento Station frontage area and Praça da Batalha), it may be considered that there are some Social Meeting Places, otherwise, this street doesn’t follow the proper requirements (it scores C).
This street may be a good example of Coherence and Complexity coexisting in a harmonious way: there is a similar basis relating every building with the other ones, even though they don’t actually look the same.

Just as it was considered with Continuity, the landmarks at its extremities may also improve Legibility of the area.

It doesn’t provide that much feeling of Enclosure but the existence of plenty commercial activity (though looking impoverished), improves Transparency which gives security and pleasantness to the user.

At first, it seems too wide and huge for Human Scale but some elements mitigate this tendency: commercial activities door-to-door bring buildings down to human size and also the tram is a stimulation for pedestrian traffic not only because of its utility but also for its low speed.
5.3.4. RUA DE MOUZINHO DA SILVEIRA
The keyword for the street must be abandonment.

Though, also this street has best scores for Directness and Attractiveness. Its Directness skills are related to the fact that it connects the main transports destination (Avenida dos Aliados and S. Bento station area) to one of the main leisure zones in Porto: Ribeira (by the river).

![Figure 36 – Location of Rua de Mouzinho da Silveira.](image)

When it comes to Attractiveness, for which it scores AB, it’s noticeable that most of the buildings’ upper floors are abandoned. It’s very important to notice that the degree of degradation of these buildings is a very important matter when it comes to attract or, in this case, repel people away from that area. No one likes walking in a street where ruin is imminent. However, the potential for rehabilitation is huge and if renewed these buildings would provide an astonishing environment.

When it comes to Continuity the surface is good for walking and there’s a defined path, so it scores B.

The least accomplished aspects, with BC are Social Meeting Places & Pleasantness – which are lacking on the street itself but are easy to find all around it, in perpendicular streets, or in Ribeira – and Security – though there’s a police station at its end there usually is no patrol along the street but lightning is enough for circulation and pedestrian traffic is seasonally intense for security is not the same through the entire year.
So, even though degradation and abandonment are noticeable Imageability is imminent, for the structure that can still be seen shows a great potential. Linkage, just as Directness, is also good.

In opposition to Rua 31 de Janeiro its width combined with the tall buildings create a good sense of Enclosure and Human Scale is also present due to the narrow streets that go from Rua de Mouzinho da Silveira and public furniture.

However, Transparency is nearly absent as commercial activity is a lot lower nowadays, but Coherence is high.

All-in-all, special care should be taken in preservation of small traditional snack-bars and restaurants, which in Porto are usually known as “tascos”, that are very common all over town but especially in this zone. Their maintenance shall be vital for the preservation of this area’s character and, consequently, for the enhancement of Ribeira. Even though, its width (which can be seen in Figure 37) and role in motorized traffic are impediments to its pedestrianisation.

5.3.5. RUA DE CEUTA
This street shows best skills for Attractiveness and Continuity. For evaluating Attractiveness, the existence of Praça Filipa de Lencastre at one of the ends of this street was taken into account. So, though the buildings are degraded, there is still some aesthetic interest.

Also Praça Filipa de Lencastre has been recently renewed and is now much more attractive. This also had an impact on surfaces which also were rehabilitated making them homogeneous and continuous and furthermore adequate for walking – also all the facilities required for the physically impaired have been arranged. There’s a pronounced slope at all this street’s length but it doesn’t seem to act as such a significant obstacle for good pedestrian flow.

The second best score goes for Security. Though there’s usually no police patrol, this area is very well lightened at night and there’s some pedestrian traffic due to its proximity to some important night spots (bars and restaurants near Praça Gomes Teixeira).

This street itself doesn’t have that many Social Meeting Places as it’s not that leisure oriented but there can be found plenty of resting places for walkers to use.

The lowest score goes for Directness (C). Though the street is near Avenida dos Aliados and Praça Gomes Teixeira, it may not be such a direct route and as commercial activity has become impoverished it probably won’t be chosen as a primary path for most users. Therefore, its Linkage is not the best as well.

This street’s best skill must be its Legibility as aspects like the great slope or the Ceuta Tunnel add a lot to instant recognition of the space. Also Transparency is good due to the existence of vegetation and the amount of windows at human level in most buildings.

Enclosure is lacking a lot as spaces are wide and open but Human Scale is stronger in Praça Filipa de Lencastre than it is along Rua de Ceuta.
Its Imageability is not that impressive but still it is a distinctive area for its singularity when comparing to most other places in downtown.

In terms of Coherence and Complexity it is quite balanced as along the street one can sense a certain similarity without finding it tedious: the ending in Praça Filipa de Lencastre contributes a lot to this fact.

Ceuta Tunnel, which is a recent infrastructure in Porto, is allocated in Praça Filipa de Lencastre (just down below Rua de Ceuta) which could be an issue. However it could be considered the hypothesis of pedestrianising only from the Tunnel up.

5.3.6. RUA DE CÂNDIDO DOS REIS
This street has a peculiar character. It’s located in an area where streets parallel to it seem very similar to each other. However, looking closely some differences are perceptible.

This streets Attractiveness is strong while comparing to other streets surrounding it – its buildings, seen on Figure 41, seem better conserved.
Also, the sidewalks are wide and clear, the surface is well maintained and there is a somehow comfortable sense of enclosure due to its pedestrian-scale width (which is clearly seen on Figure 42).

Unlike most of the streets analysed in this report, this street doesn’t have very good Directness and Social Meeting Places skills – at least not at first sight.

Actually, this street doesn’t connect to any primary important spots or nodes, for its Directness is worth a C – therefore, its Linkage skills are not that good either. Still, some facts must be sought
out. Some years ago, this street was much more popular due to the existence of what was, back then, one of the most important stores in Porto – Marques Soares. Since the appearance of great shopping malls this kind of stores got left behind. One of the most interesting aspects of this street is that it had, recently, lodged some other activities (related to night clubbing and F&B) that are bringing it back to life. This aspect raises its Security skills, making it worth a B.

It’s curious that this street is just below one of the strongest night spots in Porto – Praça Gomes Teixeira (Figure 43).

Figure 43 – Praça Gomes Teixeira

Lately, some other night activities have settled in the area between Praça Gomes Teixeira and Praça da Liberdade, creating a new environment that didn’t formerly exist in such place. Stimulating the enhancement of this kind of activities in Rua de Cândido dos Reis could reinforce the commercial role of this area, enabling the pedestrianisation of this street. If we considered the kind of activities that have been growing in this area probably the score for Directness and Linkage would be better as, all-in-all, it connects spaces where similar activities are gathered and which are used by the same type of consumers.

So, though it’s attractive, it isn’t that extraordinary and it can even be unnoticed by some people so its Imageability is not that high. Also Legibility may not be taken into account as it is such a small street. It has high skills on Coherence and Transparency though, and even the lack of Complexity can be disregarded.

It is very good on Enclosure and Human Scale as its width and length is absolutely appropriate for daily activities and a certain feeling of confinement is present – the truth is that some leisure activities have actually been held in this street which was temporarily closed for road traffic.
5.3.7. RUA DAS CARMELITAS
Rua das Carmelitas’ situation is a lot similar to Rua de Cândido dos Reis when it comes to activities and background (they share a corner, so the area is right about the same). Conclusions are quite the contrary though.

![Location of Rua das Carmelitas.](image)

This is one of the most impressive streets in the centre of Porto. Its buildings’ great façade give it a very distinctive character raising its Attractiveness up to an AB (which is not an A due to the existence of Clérigos Shopping Centre on the other side of the street which blank concrete walls are a complete urban nonsense). Still its Imageability is the best!

![Rua das Carmelitas.](image)

Continuity also scores AB for the sidewalks are wide and in good shape and measures towards the physically impaired were carefully taken. Directness (and therefore, Linkage) is good – scoring B –
as it connects easily to Avenida dos Aliados and S. Bento station (we may consider the link to Praça Gomes Teixeira as well).

It would be easy to think that Security would be the same as in Rua de Cândido dos Reis as they are so close to each other. However, Clérigos Shopping Centre acts as a hide-out for some illicit activities making it less safe to wonder nearby. The Transparency perceived on one side of the street is totally absent on the other one.

Social Meeting Places & Pleasantness got the lowest score as this street has a very strong commercial activity and yet both resting and leisure places are lacking.

Still, this street is another great example of balance between Coherence and Complexity: the great length of the unique façade appears as a single element but there’s a considerable amount of activities that catch the user’s attention giving it the proper diversity. Its Legibility is very good as well, as it’s easy to perceive the possible routes and paths that link this street to its surroundings.

Anyway, its width is quite inappropriate for pedestrian-only traffic, especially because one can only perceive activities on one side of the street. The amount of free space resulting from total pedestrianisation would be unbalanced by the lack of entertainment for pedestrians to enjoy – there would be no Enclosure. In addition, Human Scale isn’t the best, though it’s improved by the small streets perpendicular to Rua das Carmelitas.

Another issue is that this street acts as an important motorized traffic arteria for it would require careful studies for it to be closed.

5.3.8. RUA DE FERNANDES TOMÁS

This street is one of the most crowded ones when it comes to pedestrian traffic. All its old buildings and stores make it one of the most typical streets downtown.

It connects to several pedestrian hot-spots: Trindade metro station, Bolhão metro station, Bolhão market and Rua de Santa Catarina – its score for Directness is B. It could be a great solution to link all these traffic generators, creating a wide pedestrian infrastructure.
Importance of Pedestrian Spaces – The City of Porto

Its Attractiveness also scores B. Though there aren’t any magnificent buildings or landmarks it has a certain character very specific from downtown Porto that makes it pleasant and attractive in a very particular way.

When it comes to Continuity the picture gets worse: from the interception with Rua Sá da Bandeira to the interception with Rua de Santa Catarina, one of the sidewalks is wide and clear, perfect for walking, and measures towards the physically impaired have been taken. On every other situation, things are not so good: the sidewalks are too narrow for comfortable circulation and the surface in not all well kept.

Also Social Meeting places & Pleasantness scores BC, as resting and meeting places don’t abound – still in the surrounding area one can find some of these facilities.

The same score goes for Security: though during the day it is very safe to walk around this street, at night (due to the closing of traditional commerce stores), it gets empty and, therefore, less safe.

Its Imageability is low as there aren’t that many remarkable landmarks, and so its Legibility is, as for those who don’t know the area the streets perpendicular to Rua de Fernandes Tomás look all the same making it difficult to create a spatial mental map. Its Linkage skills are good though (just as Directness).

It has good skills on Coherence as the architecture of its buildings and the character of its commercial activities are quite typical in downtown of Porto. Also Complexity is very good as it’s probably one of the streets where commercial activity has decreased the least – actually, it’s assumable that it may even be increasing as a new shopping centre, Porto Plaza (Figure 47), has just opened on this street. This amount of activities also raises Transparency.

![Figure 47 – Porto Plaza shopping centre.](image)

The feeling of Enclosure is very good, especially because of the street’s width. Also its Human Scale is quite appropriate for pedestrian traffic as stores bring down buildings to human size.

Once again this street’s role in motorized traffic is very significant which would be very difficult to disregard (though Rua de Passos Manuel goes in the same direction as Rua de Fernandes Tomás, it could mean a lot more time spent in traffic for common users).
5.3.9. RUA DOS HERÓIS E MÁRTIRES DE ANGOLA
If pedestrianisation was implemented in this street it would probably be a big failure.

![Map of Rua dos Heróis e Mártires de Angola](image1)

Figure 48 – Location of Rua dos Heróis e Mártires de Angola.

It gets BC for Attractiveness as aesthetically, it’s not a very interesting street, not even after a new building was built – Trindade Domus Gallery (a new shopping mall on Figure 49).

![Image of Trindade Domus Gallery](image2)

Figure 49 – Trindade Domus Gallery

At some point there’s a small but apparently pleasant plaza with vegetation and resting places but it usually functions as a gathering place for drug use and poverty which produces some insecurity in pedestrians especially at night, which makes it worth a BC for Security.

Also Directness is BC because though it connects Trindade metro station to Avenida dos Aliados it’s not the shortest and most direct way and it’s a lot less used than its nearly parallel Rua da Trindade.
Both Social Meeting Places & Pleasantness and Continuity scored B (the highest for this street) as the sidewalks are wide and have been recently reformed and with the opening of the new shopping mall some resting places are now available adding up to those on the small plaza.

Its Imageability isn’t that good – though the new mall may make an impression it isn’t that significant. Also its skills for Coherence and Complexity are very low and not even transparency provided by the new infrastructure can get enough interest to this street.

Also Enclosure is practically absent and only vegetation and public furniture can supply some Human Scale sense.

Its Linkage is average (just as Directness) and its Legibility is poor – it’s usual for newcomers to feel some surprise when walking from this street to Avenida dos Aliados, which may show that the urban space and its evolution are not well perceived.

Moreover, if this street was shut down to motorized traffic there would probably be no other efficient way of draining all traffic coming down from Rua de Camões (which is massive), ruining all circulation in the surrounding area.

5.3.10. RUA DO DR. MAGALHÃES LEMOS
This is a street which may not seem very interesting but which connects to very interesting places. It acts like a link between Avenida dos Aliados and Praça D. João I (just as Rua de Rodrigues Sampaio does), so B is its score for Directness.

![Figure 50 – Location of Rua do Dr. Magalhães Lemos.](image)

It scores AB for Continuity as its sidewalks are wide and in good shape and well designed, so its Linkage is acceptable.

This street has no Social Meeting Places unless one considers Praça D. João I and Avenida dos Aliados. It scores B for Security as it links Rivoli Theatre to Avenida dos Aliados, which creates some pedestrian traffic – also lightning is properly provided.

Its Imageability is not good and only the fact that it ends in Praça D. João I makes an impression.
It could be seen as good on Coherence but the problem is that there’s too much of it – it’s basically dull. It also shows almost no Complexity or Transparency.

Figure 51 – Rua do Dr. Magalhães Lemos.

Some Enclosure must be taken into account but it’s not enough to balance the lack of all other qualities. Even Human Scale is lacking and is only mitigated by the existence of Praça D. João I.

In addition, there isn’t any room for implementing new activities though and closing this street for motorized traffic would probably create more problems than it would solve.

5.3.11. Final Considerations

It shall be taken in account that the application of the selected criteria is not totally objective – it depends on the planner who is using it and, therefore, results may vary from planner to planner. On the other hand, some assumptions were made from the beginning which conditions the conclusions drawn afterwards – it is believed that pedestrian spaces enhance territorial and social cohesion and integration. Well, some planners, experts and architects would totally disagree from this premise which would lead to completely different results on this study.

In addition, when it comes to changing traffic, some careful studies must be made. In our country, a very recent example has appeared – the study of Parque das Nações in Lisbon, by Serdoura (2006). This is very important as one must never forget how important it is to actually analyze the urban environment before implementing any kind of concept.

When it comes to the present report, going through each case separately, some aspects stand out.

Most of the downtown area has a lot of pedestrian traffic and commercial activity which could be a sign of good opportunities for pedestrian-only spaces implementation. Also, Imageability is present and almost every building, even those in advanced state of degradation, has a high Imageability potential. Moreover, there is a good public transports network that links this area to every part of the city for which the use of the car is not all-time necessary.
Still, some issues arise. Topography is a great concern in some specific areas, which are hard to follow on foot; sidewalks are not always in good shape and some of them don’t have proper width for car and pedestrian coexistence, nor even facilities concerning physically disabled people – however, it must be pointed out that some care has been taken in sidewalks rehabilitation. Commercial activity which is generally good is weakened in some specific areas and thus people are pushed away from them. Although, it is noticeable that in some cases, same type of activities gather, enhancing competition and, consequently, calling same kind of consumers. Still, one of the main concerns of pedestrians is security – which is lacking mostly at night. That is probably the main reason for people not to live in downtown as they don’t feel safe or secure.

All-in-all, it shall be noticed that some efforts have been made towards urban rehabilitation leading to cohesion of the area considered as downtown. Though, there is still a long road to walk and pedestrianisation may be a key to this process if proper conditions are gathered.
CONCLUSIONS & RECOMMENDATIONS

After having studied the theoretical basis, after defining a practical approach and having applied it to the case of Porto, some conclusions must come out.

While looking to the city centre of Porto, specifically the selected target area, some misconceptions may arise. The human scale proportions, the historical buildings and the amount of traffic may lead one to think that the best solution would be to take all road traffic away. Well, after the analysis described in this project shall one realize that the issue goes further than that.

Most of the streets are filled with abandoned buildings, and commercial activity is poor (some exceptions arise though). Furthermore, the state of degrading of many facilities lowers the city’s imageability, pushing people away from the centre. In order to avoid the exodus of the city centre some accurate measures must be taken without delay! The city centre of Porto has a very strong potential, within its great historical legacy, calling for immediate intervention! Authorities shall be interested in developing the city centre starting from its strongest feature and, thus, must be involved in creating policies for urban rehabilitation. Still, this kind of policies must be well sought out and carefully planned before their implementation.

However, for people to let go of their habit of excessive car usage, a good transportation network must be available, as it is crucial that people feel they can keep moving efficiently – reliability is the key for people to change from private cars to public transports. Besides, indirect measures towards usage of the car are often efficient and raise less public attention and rebellion.

Also, some policies should be implemented in order to promote the usage of non-motorized vehicles (like bicycles) or walking for short distances. Motivating the centralization of activities in the city centre may not only raise competition and dynamics in the local economy but may also enhance the walkability of the city – if one can walk from one activity to the other, private cars will be less needed and therefore less useful. If these measures result as attractive bringing people to live in the city centre again, even better.

However, people won’t walk if there aren’t proper conditions to do it – pedestrian spaces rehabilitation becomes essential. So, pedestrian spaces (whether sidewalks or pedestrian-only streets) which are correctly integrated within the urban tissue shall be renewed (if needed) or maintained. Besides, those which have got impoverished or neglected over the years shall be object of attention from authorities so as to renew them and use them as cohesion elements inside the city.

When it comes to pedestrianisation, one may infer that the streets with best pedestrianisation character must be the ones that not only provide human Scale and enclosure but also grant a certain
level of activities (either commercial or social), such that diversity may catch the attention of people (whether general public or a significant specific group).

After all things considered one can assume that the street with highest pedestrianisation potential within the target area would be Rua de Cândido dos Reis. Itsprivileged human scale conditions along with the surrounding night activity indicate that it could acquire a significant role in linking different spots that share the same kind of activities, enhancing the potential of the entire area. This could also improve this area’s security level by calling people to enjoy the new facility. Still, for this implementation to succeed, some speculation should be done in order to encourage other similar activities to settle on this street or nearby.

Still, in order to carry on with an initiative of this kind, careful studies shall be made in order to understand the dynamics of the target area – the services and activities that function within it, the main pedestrian traffic generators, the main routes taken by pedestrians and the reasons for which they’re taken and the impact it would have on the urban space and on life quality.

Still, there was an attempt to understand the issue from the inside out – what is walkability? Why is it undervalued? Is it worth it? How to evaluate it?

All-in-all, outcomes have been summoned and guidelines have been drawn, based on literature and inferred by observance of pedestrian behaviour and dynamics.

Most important of all, it must never be forgotten that the city must be designed for the citizens and the urban space must be planned for people to enjoy it the best way possible.
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