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## Accessibility of urban spaces: analysis and solutions to make sustainable historical towns

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In 2013 a group of researchers from the Department of Civil Engineering and Architecture of the University of Pavia developed a study and some technical solutions about accessibility and usability of the historic urban center, according to the Department for Equal Opportunities of the Municipality of Pavia. The bases of the research are the UN Convention on the Rights of Persons with Disabilities and the consciousness that an accessible town is sustainable in a social and cultural dimension.

The research delineates a system for evaluating the accessibility based on objective parameters; the results of this evaluation can be used to define pedestrian path without barriers and are also functional for programming the maintenance of the urban spaces. The solutions to make accessible the historical center are sustainable because can be useful for all (because inspired by the Universal Design) and can support different activities, both people living in town that tourists.

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### Introduction

The question of accessibility of urban historical spaces is extremely complex and articulated in a country such as Italy, that is characterized by a large number of towns (it is estimated that there are more than 8.000 municipalities in Italy) scattered over a territory varied, ranging from coastal plains to high mountains of the Alps.

The urban structure of these towns is often a real Cultural Heritage (for example Venice or Vicenza) transmitting the historical, social and cultural reasons that produced it. It is in these public spaces of Italian towns that thousands of people find their daily environment; persons with different abilities and age work, study and have fun and also a lot of tourists, coming from different countries, arrive to visit them. So the accessibility and usability of the urban system are prerequisites for both residents and visitors.

In order to achieve a sustainable development, the needs to access and use the urban spaces should be met in conjunction with the purposes of conservation and valorisation of historical and architectural heritage.

The *UN Convention on the Rights of Persons with Disabilities* (written in December 2006 and adopted in Italy in 2009) has a specific article (n. 30) about the importance of the Cultural Heritage:

“Participation in cultural life, recreation, leisure and sport” and the subparagraph “c” invites to implement the necessary measures so that people with disabilities “enjoy access to places for cultural performances or services such as theatres, museums, cinemas, libraries and tourism services, and, as far as possible, enjoy access to monuments and sites important for national cultural importance”.

On these considerations, the conservation's requirements of the historical urban spaces keep pace with the re-appropriation of the public use of urban spaces. And removing (or the possibility of overcoming) architectural and sensorial barriers represents a technical and design action that must be solved taking into account the needs of all users, regardless of age, gender or ability.

Thus, it is necessary a multidisciplinary and inclusive design, able to satisfy the different needs and based on a detailed knowledge of the urban structure, its historical development and growth. It is important also to act with the awareness of time, this moment and the future, considering also the changing in the society (such as the elderly population in-creasing).

Moving from these considerations and from the significance of Human Being in the re-search and design process towards a sustainable future, the University of Pavia has been conducting studies and applied research on the accessibility from 2006; the aim is to define a method for analysing and evaluating the level of accessibility and usability of the urban system and of the historical buildings as prerequisite for the design and the imple-mentation of measures to remove and overrun architectural and sensorial barriers.

This paper illustrates the methodology for analysing and evaluating the level of accessibil-ity and usability and some solutions to make the urban spaces "for all"; this study was de-velop on the "system of three squares" (Piazza Vittoria – Piazza Duomo - Piazza Cavag-neria) between February and July 2013.

### **Pavia: urban system and research approaching**



Figure 1. Pavia aerial view; it is possible to recognize the Cardo and Decumano of the Roman town; the "system of the three squares" is around the Cathedral, not far from the crossing between Cardo and Decumano.

Pavia is a town in the North of Italy (30km south of Milan), characterized by an urban structure in which the Roman origin and the Medieval consistency can be easily recog-nized; it was the capital of the Longobard Reign and the base of one of the first universities in Italy (it has now more than 650 years). The morphology of the ground, the proximity of the River Ticino, the pavements of a lot of streets (often cobbled) represent some problems that people with disabilities can find moving in the downtown.

For several years now the University of Pavia has been cooperating with the Municipality to carry out studies and research to overcome the problem of architectural and sensorial barriers in order to realize a more accessible town. The aim is to provide a practicable pe-destrian system in the historical center so that everybody can use it (not only mobility impaired people, but also the visual impaired, mentally disabled, elderly, etc.). In the period between February and July 2013 the research focuses on the "system of the three Squares": Piazza Vittoria – Piazza Duomo – Piazza Cavagneria, in the Medieval downtown; that means to investigate the accessibility of these three squares and of all the streets connecting them.



Figure 2. Piazza della Vittoria – Piazza Duomo – Piazza Cavagneria: the system of the three squares investigated in 2013.

## Methods

The research was developed following the same method used in the research Pavia for all (2008) but with a new approach in order to consider three different "spaces" in which persons with disabilities have to move: the streets, the crossing and the squares.

The research can be synthesized in these steps:

- developing the assessment tools able to investigate the accessibility of urban spaces;
- numerical, material and photographic surveys;
- digitization of the survey and database organization;
- identification of the most critical points;
- development of synthesis' boards to understand the level of the accessibility;
- proposal for architectural and technical solutions to improve the accessibility.

## Assessment tools

Starting from the researches developed between 2006 and 2012, it was defined an as-sessment tool with parameters to measure accessibility to the historical centre which suited everybody's needs. The aim was to overcome the difference between pedestrians and people with disabilities due to architectural and sensorial barriers.

It was referred to the World Health Organization's 2001 International Classification of Functioning, Disability and Health (ICF), which holds that a person at any stage in his life may enjoy a health status that becomes a disability in negative surroundings. We sought for parameters to evaluate accessibility for all, which were then used to create an evaluation card. Specific software programs allowed for the easy compilation and processing of these cards.

There are three different assessment tools (defined by the same viewpoint) in order to de-fine the accessibility level of sidewalks, crossings and pedestrian areas. The tools work through the identification of macro-indicators, structured on objective parameters.

The analysis of the sidewalks is divided into four macro-indicators (in brackets the pa-rameters used for each macro-indicator):

- general characteristics (length, type of footpath, pavement, covered path, lighting, path slope);
- paving of footpaths (type, characteristics);
- car parks and public transport (reserved parking, type of public transport, bus stop);
- urban furniture (areas for stopping and relax specifying furniture and their heights, furniture correctly positioned, furniture not allowing safe and independent movements).

The analysis of pedestrian crossings is structured with the same methodology, but with only two macro-indicators; they are:

- general characteristics (type, position, slope);
- paving of crossing (materials, characteristics).

Finally, an accessibility assessment tool was applied to all the pedestrian areas: the three squares (Piazza Vittoria, Piazza Duomo and Piazza Cavagneria) and the streets where cars are not allowed. In this case the macro-indicators are:

- general characteristics (dimensions, covered path, slope);
- paving of footpaths (type, characteristic);
- urban furniture(areas for stopping and relax specifying furniture and their heights, furniture correctly positioned, furniture not allowing safe and independent movements).



PAVIA ACCESSIBILE



Scheda di rilevamento: Progetto PAVIA ACCESSIBILE (febbraio e marzo 2013)			
Comune	Pavia		
Via o Piazza	Via XX Settembre	Codice	0
Attraversamento (incrocio)	Via XX Settembre - Via Mascheroni	11	
Cognome e nome compilatore	Franco Annamaria		
Caratteristiche generali	Tipo	X Non segnalato	-1
		Strisce pedonali	
		Semaforo muto	
		Semaforo con segnale sonoro	
		Presenza di segnaletica luminosa per veicoli	
		Presenza di dissuasori al libero attraversamento	
	Posizione	X In piano	1
		In piano per rampe di raccordo nella sede carrabile	
		Inferiori rispetto al marciapiede e raccordati con scivolo a norma	
		Inferiori rispetto al marciapiede e raccordati con scivolo non a norma	
		Inferiori rispetto al marciapiede e raccordati con gradino	
	Profilo	X Completamente piano	0
		Pendenza media ≤ 8%	
Pendenza media > 8%			
Caratteristiche generali			0
Pavimentazione dell'attraversamento	Tipo	Asfalto	
		Battuto di cemento	
		Cubetti di porfido	
		X Lastre di materiale lapideo	0
		Acciottolato	
		Cotto	
		Ghiaia	
		Legno	
		Gomma o simili	
		Prato	
		Terra battuta	
		Autobloccanti o piastrelle per esterni	
		Caratteristiche	X Perfettamente complanare
	Sconnessioni o avvallamenti		
	Elementi instabili		
Pavimentazione dell'attraversamento			0
PUNTEGGIO TOTALE			0

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Figure 3. Example of the card for evaluating the accessibility of the system of the three square in Pavia.

Each area of investigation includes several elements to be carefully considered and the tools are structured to give automatically a value in relation to a “tick” or “not tick” of the-se elements in the evaluation card. The sum of each value gives a number (positive or negative) which is the reference to assess the accessibility level of the path detached: for values less than or equal to zero the path’s section is considered “not accessible” (identified with red color in a map that was realized at the end of the analysis), for values between one and four it’s considered “accessible with assistance” (in yellow in the map) and for values equal or greater than five it is considered “accessible” (in green).

**Survey and synthesis**

The cards were compiled between February and May 2013 and at the end there are a total of 135 (77 sidewalks, 10 pedestrian areas and 48 crossings); each card has also some pho-tos that show critical (pavement narrowing to less than 90cm, minimum awning and brise-soleil height less than 210cm, slope inclination, etc.) or significant elements for promote the independence of people with disabilities.

After the survey’s phase and after that the cards were transformed in Excel files to obtain the values of the level of accessibility (as described above), the results are summarized on a drafting that shows the three different levels:

- Green lines: accessible;
- Yellow lines: accessible with a guide;
- Red lines: not accessible.

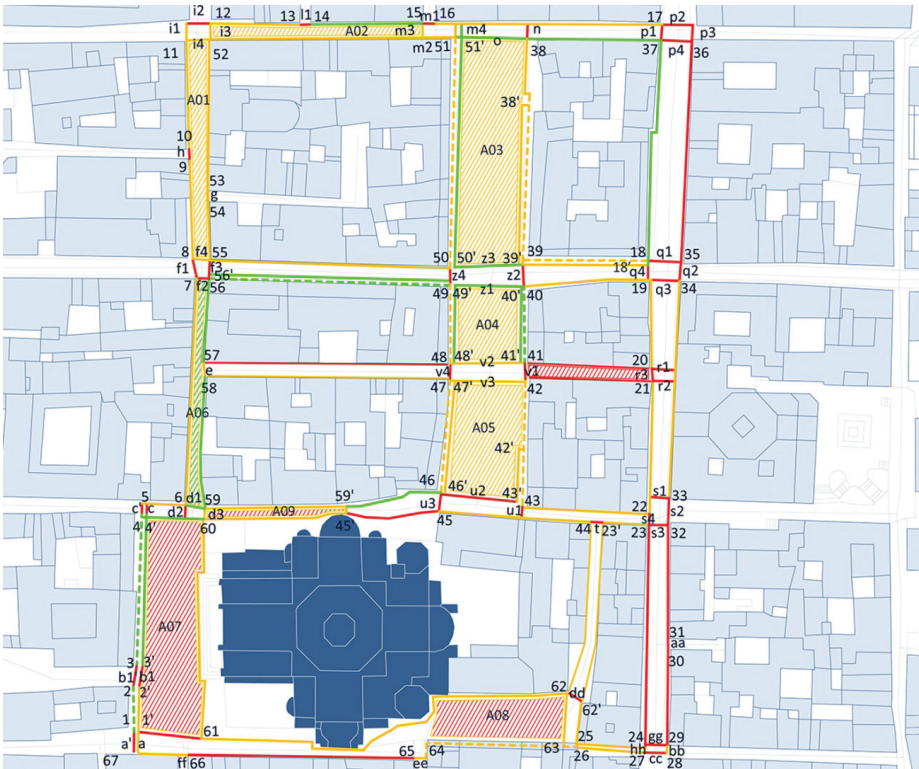


Figure 4. The final drafting with the information about the level of accessibility (green is accessible, yellow is accessible with a guide, red is not accessible) and the code of the cards for sidewalks, squares and crossings.

Observing the drafting with attention, some conclusions can be obtained:

- many crossings are not accessible, and this is often due to the lack of ramps connecting the paths and the road in addition to a poor signaling for blind and deaf persons;
- some streets are not accessible for the morphological characteristics (slope of the roadway and sidewalks) that can not be resolved in terms of design without changing the original Medieval image;
- Piazza Duomo and Piazza Cavagneria are less accessible than Piazza Vittoria, mainly due to problems related to the pavement;
- some pedestrian areas are often critical issues related to street furniture (which is sometimes hindrance to the movement of pedestrians), or to their own morphology.

### **Solutions to improve accessibility**

At the end of the research, we developed some projects to overcome the architectural and sensorial barriers into the three squares. We made some technical drawings, referred to critical points, that show the current situation and a possible solution for overcoming it.

The aim of this phase was to provide to the Municipality a few ideas for improvements of urban public space. The solutions were designed following these principles:

- attention to the context, to avoid altering the image of the medieval environment;
- economic sustainability, to enable the Municipality to realize them;
- reversible, in order to allow their removal in the future, restoring the original image (if necessary).

The projects for Piazza Vittoria are:

- insertion of double-height handrails to overcome the difference between the paving of the square and that one of the porticos that characterize the two 'long' sides of the square;
- connection between the square and the portico "Annabella-Demetrio" with a ramp in order to solve the height difference between the square and the portico itself. It is motivated by the desire to connect without architectural barriers the bus stop in Strada Nuova (the Cardo of the Roman period) with the bus stop in Piazza Vittoria: this "interchange" is very important for person using public transports to cross the town;
- solutions to allow access to the vertical connections between the Underground Market and the square; at the moment, lift and stairs (covered by the green "shelter") are not accessible because of the non-regular pavement of the area covered by the shelter and the surrounding pavement.

We propose the following solutions for Piazza Duomo:

- doubling the stone slab adjacent to the staircase of the main entrance of the Cathedral; at the moment there is only a 60 centimeters slab and the rest of the square is cobbled. This situation does not allow easy movement for people with disability; doubling the laminate, reaching 120cm of plane pavement would allow the passage of wheelchair users or people with shopping carts, that move during the weekly market;
- new signaling information relating to the Cathedral, moving the existing one from the current position (difficulty reached even by people without disabilities as positioned on a portion of pavement heavily bumpy) and supporting with multi-sensory communication systems (Braille, three-dimensional map, QR code);

In Piazza Cavagneria these adjustments have been assumed:

- protection of the path on the side of Broletto; the sidewalk is 90 centimeters wide, so it is appropriate to the passage of persons with physical disabilities, but parked cars often invade the space dedicated to pedestrians, reducing the dimension of the way less than 60cm;
- creation of a paving stone slab to replace a portion of cobblestones at the secondary entrance to Palazzo Broletto and Underground Market, this would allow an easier entrance-exit from the building on a regular and adequate pavement.

Piazza Cavagneria

05



**Criticità:**  
 Restringimento del passaggio a meno di 90 cm dovuto all'errato posizionamento delle autovetture nel parcheggio per residenti.

**Utenti interessati:**



**Normativa:**

- DM 236/1989 e DPR 503/96
- Legge 18 del 3 Maggio 2009
- Linee guida DM 28 marzo 2008

**Soluzioni adottate:**



Marsiglia, 2013



Marsiglia, 2013



Biblioteca Nazionale, Parigi, 2011

**Soluzione proposta:**

- 1) Posizionamento di cordoli dissuasori di altezza 40 cm.
- 2) Rifacimento della pavimentazione in corrispondenza dell'ingresso del Palazzo del Broletto.
- 3) Posizionamento Loges in corrispondenza dell'attraversamento

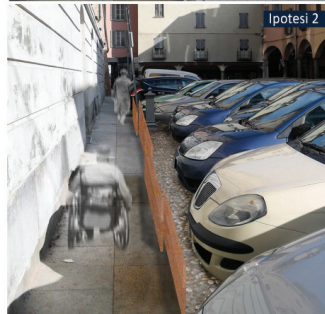
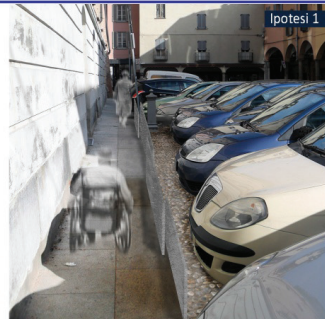


Figure 5. The technical drafting showing the solution to save the path from the cars parking in Piazza Cavagneria; the idea is to maintain no less than 90 centimeters between the wall and the cars in order to allow persons with wheelchair moving without any problem.



Figure 6. Piazza Cavagneria: how it was before and how it is now; the Municipality realized the idea we designed even if the elements to preserve the path are made by iron (in our project they were thought in corten) and their geometry is different (they are 1.10 m height while the corten panels in the project were 0.45 m).

## Conclusion

The research confirms that the medieval urban structure has some morphological and material situations that are not so easy to solve without changing the original image. However it is possible, with simple, economic and reversible solutions, improve the level of accessibility and facilitate the use of space not only for persons with disabilities but for all. In particular, the inclusion of some aids and more care in the selection and positioning of street furniture are not expensive solutions that can help all persons to move safe and independent in our historical town.

The results of the research also represent a useful tool for the planning of maintenance work on public spaces and they can be the starting point for the development of wider and more detailed projects, to improve the accessibility of the city of Pavia.

The structure of the accessibility assessment tools and the syntheses developed into the project "Pavia Accessibile" ("Accessible Pavia"), are very easy to be understood and to be applied not only for engineers or researchers, but for all.

The objective methodological approach and the systematic application of the assessment system on different study cases can represent an important aid for the planning of architectural interventions at the urban scale. The exportability of the methodology can also create an inclusive view about accessibility problems to allow the identification of possible design solutions according to a conscious process.

In addition, involving designers and researches (who are aware of the complexity of the theme of accessibility within historical contexts and public buildings) also with students, associations (e.g. UICI, the Italian association for blind and visually impaired people) and people with disabilities, can help to create a new sense of participation and inclusion. The participation of all these figures can help designers and researches during the analysis, the synthesis and finally the developing of the architectural and design solutions, improving the cultural and social dimension of architecture and engineering, and creating accessible systems for future oriented communities.

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