Bram Vannieuwenhuyze[*]

The "Digital Thematic Deconstruction" of early modern urban maps and bird's-eye views

Introduction

Studying urban origins, medieval and early modern urban morphology and urban development is hardly possible without using historic maps. Although many scholars (historians, art historians, archaeologists, geographers, urban morphologists, etc.) agree with this statement, they rather seldom proceed to an in depth analysis of cartographic documents. (Urban) historians, for instance, are trained to read, analyse, decode, interpret and write texts. They work with texts ('historical records') and produce texts ('historical studies'), so we can truly state that they principally rely on written words. The text is the primary medium. Of course, historians admit that other kinds of records make it possible to gain insight into history. Nevertheless, they often face problems when they try to integrate the study and analysis of these non-textual records, or when they want to use non-historical methods and results from such disciplines as archaeology, geography, material studies, sociology, natural sciences, psychology, statistics, and so forth. All of these have their own research questions, methods, paradigms, approaches and traditions and outsiders often fail to adopt them properly. Happily, many historians are open-minded and generally willing to work in an inter- and multi-disciplinary way.

Historical urban maps and views of course belong to this heterogenic series of non-textual records (although they generally include pieces of text, see below), since they represent the historic town in a cartographic and/or iconographic way. It is of course important to specify what these urban maps and views have to offer. First, and foremost, they provide data not always to be found in historical texts. They therefore allow historians to reconstruct the historic landscape and urban topography, not only because they offer an immediate and full-range image of the urban space (which is hardly possible by reading a text), but also because they may be defined as topographical inventories, which include lots of information on specific topographic features (buildings, rivers and brooks, fortification works, streets, fountains, etc.) and offer the opportunity to discover topographic and spatial patterns (street network, hydrographical system, building densities, etc.). Secondly, if we move the focus from topography to the reproduction of that topography, these documents allow us to study the way(s) the urban landscape was perceived by mapmakers and artists and how they processed a particular vision on the (urban) space in their work. Finally, using historical maps and views makes it possible to frame different kinds of historical research, by visualising and locating study areas, historical facts and research results.

Although (urban) historians are aware of the possibilities and opportunities old maps and views have to offer, they seldom proceed to an in-depth analysis of cartographic and iconographic

[*] KU Leuven, Department of Medieval History, Blijde Inkomststraat 21 bus 3307, 3000 Leuven, Belgium [Bram.Vannieuwenhuyze@arts.kuleuven.be]

documents. Indeed, in many historical studies old maps and views are only used as 'nice pictures' and serve to illustrate or even to embellish the texts.[1] This is due to the main focus on texts and words, but also because many historians lack (or have little access to) appropriate analytical tools and techniques to make the most effective use of these documents.[2] Of course, it is a question of attitude and of skills, but the argument can easily finish up as a vicious circle. Because historical images and maps are often thought to be less accurate than words or texts ('you cannot prove anything with an image'), historians seldom make an effort to find the appropriate analytical methods, technical skills and digital software for studying them. As a result, they lack a critical iconographic/cartographic approach and, consequently, continue to express historical prejudices.

Of course, we do not only have to blame historians. Just like texts, historical maps and images are very complex and multi-layered records. They can be qualified as compilations of iconographic/cartographic content. While some of these documents are palimpsests themselves (meaning documents that were drawn and redrawn, or even cut, pasted and reassembled), the features, facts and events they show are multi-layered and multi-interpretable too. This is also the case for historical town views and maps, which show hundreds or even thousands of topographic elements juxtaposed in different forms and types in one single image, but also merged with cartographic meta-data (north arrow, scale), decoration (cartouches, framework, emblems), imaginative or inventive features (people, animals, ships, religious figures, monsters, meteorological phenomena) and textual information (names, legends, titles, chronograms), what the art historian Wagner called 'iconotexts'.[3] It is almost impossible to grasp all these juxtaposed details at a glance, not least because they appear all together, but also because the documents often contain much distortion ('useless' data, errors, damage, etc.) and, secondly, because our eyes are usually guided through the image. We can easily compare it with reading a book: it is impossible to catch all the ideas, statements, thoughts, conclusions, and so forth, only by browsing the pages for a few seconds. Anybody who really wants to plumb the depths of the argument, has to read the chapters, paragraphs, sentences and words attentively. The same is true for historical (town) views and maps. Of course, a quick look already gives a good impression of the image, its content and composition, but a meticulous analysis, element by element, can lead to the discovery of numerous other details. Moreover, it allows to break through the iconographic composition and its underlying messages.

In this paper, I will introduce a recently developed research method, called 'Digital Thematic Deconstruction', which allows to exploit historical views and maps more profoundly, by taking into account different issues and problems presented above. First, I shall explain the method briefly; secondly I will illustrate two research opportunities more concretely.

Methodology

Digital Thematic Deconstruction was designed, applied and tested in the context of a doctoral project on the urban and environmental development of medieval Brussels, for which two sixteenth-century city maps were crucial sources of data: the topographic map of the city and its

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[1] Peter Burke, *Eyewitnessing. The Uses of Images as Historical Evidence* (Ithaca/New York: Cornell University Press, 2001), p. 9-10.
[2] Anne Kelly Knowles, 'GIS and History', in *Placing history. How maps, spatial data, and GIS are changing historical scholarship*, ed. by Anne Kelly Knowles (Redlands/California: ESRI Press, 2008), p. 2.
[3] Peter Wagner, *Reading Iconotexts: From Swift to the French Revolution* (London: Reaktion Books, 1995). For a synthetic overview of the cartographic language of old maps, see F. de Dainville, *Le langage des géographes. Termes, signes, couleurs des cartes anciennes, 1500-1800*, Paris, 1964.

hinterland drawn by Jacob van Deventer and the bird's-eye view of the city which was included in Braun and Hogenbergs famous *Civitates Orbis Terrarum*.[4] Briefly put, Digital Thematic Deconstruction requires the systematic analysis of a high-quality scan of the historic map or image, followed by its transformation into a thematically multi-layered file. This can be done by using the Adobe® Photoshop® software. In this case a rasterized file of the map or image (in jpeg or tiff format) is completely cut into pieces, which correspond with the various topographic and cartographic features that can be discerned in the image (streets, buildings, brooks, rivers). Technically speaking, these pieces are nothing more than collections of pixels, i.e. identically shaped little squares with a particular colour. Subsequently, the pieces are thematically categorized in layers and sublayers, which together form a multi-layered psd-file. Every part of the digital image is attributed to one of these thematic layers or sublayers (figure 1 and table below). It is however very important to stress that only the inherent content of the map/image is taken into account. It is a golden rule not to add extra content, for instance by duplicating parts of the image or correcting mistakes of the creator.

Figure 1: Topographic map of Brussels drawn by Jacob van Deventer (c. 1560).

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[4] Bram Vannieuwenhuyze, 'Brussel, de ontwikkeling van een middeleeuwse stedelijke ruimte' (unpublished doctoral thesis, Ghent University, 2008), pp. 16-41 (also available online:
https://biblio.ugent.be/publication/505541). Digital Thematic Deconstruction has since also been applied and refined in the master dissertations of a number of students in the History programmes at Ghent University and the KU Leuven.

Results of the Digital Thematic Deconstruction of the Brussels' map drawn by Jacob van Deventer: repartition of layers (themes) and sublayers (subthemes).

Street network	Hydrography	Buildings	Unbuilt/open space	Town walls	Green elements	Various
streets	rivers	distinct buildings	green (=marshy) areas	walls	bushes	Characters
squares	brooks	churches	uncolored (=dry) areas	gates	parks	
bridges	ponds	towers		towers	hedges	
	pools	beguinage		slopes	woods	
	canals	windmills		water gates		
		monasteries				
		other				
		stereotypical buildings				

More recently, GIS technology has been used for Digital Thematic Deconstruction, since its goals and functions of geographical largely match with those of Geographic Information Systems (GIS) in Humanities research: the visualisation of research results, the exploration of research data, spatial analysis, the reconstruction of (geographical) data and objects, and giving access to research data.[5] Using GIS means that the digital file is no longer cut into pieces (or pixels). Instead, the initial rasterized file is left untouched, but it is completely redrawn, element per element, and saved as vector data. The shape and surface of this particular type of digital data do not depend on the amount of pixels, but on mathematical objects defined by coordinates. Basically, three types of vector data exist: points (one coordinate), lines (two coordinates) and polygons (more than two coordinates). Digital Thematic Deconstruction using GIS implies redrawing/recreating the entire map or image as a collection of polygons. GIS makes it possible to link them to a database, in which different kinds of textual and/or numerical attributes of the polygons (e.g. a unique ID, a typology, names, texts) could be stored. As such, the thematic categorisation of the dismantled image is realized by registering a typology of the several polygons in the database. In short, the GIS-analysis leads to the creation of an entity of vectorized polygons, connected to a thematic database.

It is crucial to emphasize that both methods imply the conversion of a static image (an illustration, a nice picture) into a dynamic file, which subsequently can be used for different research purposes and digital applications. Digital Thematic Deconstruction not only allows the isolation of every single cartographic or iconographic detail from the initial image or map, but also provides insight into its complex composition and accuracy. Especially for this case, it allows us to study the topographic features and patterns of the urban landscape with greater clarity. At a final stage the results of the Digital Thematic Deconstruction must, it goes without saying, be compared to other data, such as other maps, texts, images, archaeological findings, etc. In this respect, GIS analysis makes it possible to expand the database with different kinds of other data and to geo-reference the initial image and its polygons, which is not possible with Photoshop. Nevertheless, Photoshop offers many more layout opportunities than GIS.

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[5] Onno Boonstra and Anton Schuurman, 'Vormen van GIS. Hoe GIS de alfawetenschappen kan veranderen', in *Tijd en ruimte. Nieuwe toepassingen van GIS in de alfawetenschappen*, ed. by Onno Boonstra and Anton Schuurman (Utrecht: Stichting Matrijs, 2009), p. 20. For more information on the use of GIS by historians, see amongst others: Ian N. Gregory & Paul S. Ell, *Historical GIS. Technologies, Methodologies and Scholarship* (Cambridge: Cambridge University Press, 2007); *Placing history. How maps, spatial data, and GIS are changing historical scholarship*, ed. by Anne Kelly Knowles (Redlands/California: ESRI Press, 2008); *The Spatial Humanities. GIS and the future of humanities scholarship*, ed. by David J. Bodenhamer, John Corrigan and & Trevor M. Harris (Bloomington and Indianapolis: Indiana University Press, 2010).

An inaccurate bird's-eye view of Brussels dating from 1572?

In the sixteenth and seventeenth centuries numerous urban bird's-eye views were drawn, engraved and/or published by artists such as Guicciardini, vanden Wyngaerde, Braun & Hogenberg, Hoefnagel and many others.[6] However, unlike the geometrically very accurate town maps drawn by Jacob van Deventer (see below), these figurative three dimensional views are generally considered as nice and decorative pieces of art and thus provide rather inaccurate, unreliable or even imaginative representation of the urban landscape.[7] Of course, nobody would argue that this kind of sixteenth-century bird's-eye view represents a town in a highly realistic way. However, this does not mean that the documents are not useful and can simply be dismissed as inaccurate records. Thanks to Digital Thematic Deconstruction we can show the potential of these urban bird's-eye views for the study of urban topography and topographic patterns. Moreover, it allows to discover 'hidden' details which can help to date and interpret the documents more precisely.

Let us take the case of the bird's-eye view of Brussels published by Braun and Hogenberg in 1572 as an example (figure 2). In all honesty, the general impression does not bode well. Our eyes are immediately drawn to the cellular shape of the town, divided into two disproportionate parts by a central broad and straight artery. Comparison with other maps and with the actual topographic situation shows that this artery was not straight at all. In reality, it seems that it even was not an artery at all.[8] The cellular shape of the town is not accurate either, since it is commonly known that the second town walls of Brussels rather were heart-shaped.[9] Two factors seem to have led to both misrepresentations: the composition scheme chosen by the engraver, who divided the town into two pieces and represented a number of successive market spaces as the central artery, and the virtual bird's-eye perspective, leading to deformation in the pictorial representation. In addition, we can also point out the exaggerated enlarging of some buildings (such as the town hall on the Grand'Place, in the middle of the image) or the emphasis on commercial activities (market stalls in the city-centre, ships on the river Zenne and the canal to Willebroek), which possibly reveal some inherent messages of the creator or his client(s).

[6] See for instance: Richard L. Kagan, *Spanish Cities of the Golden Age. The Views of Anton van den Wyngaerde* (Berkeley, Los Angeles and London: University of California Press, 1989); Henk Deys, Mathieu Franssen, Vincent Van Hezik, Fineke te Raa and Erik Walsmit, *Guicciardini Illustratus. De kaarten en plannen in Lodovico Guicciardini's Beschrijving van de Nederlanden* ('t Goy-Houten: Hes & De Graaf Publishers, 2001); *Civitates Orbis Terrarum. Cities of the World. 363 Engravings Revolutionize the View of the World. Complete Edition of the Colour Plates of 1572-1617*, ed. by Stephan Füssel (Köln: Taschen, 2008).

[7] See for instance Lisette Danckaert, *L'évolution territoriale de Bruxelles. La carthographie de +/- 1550 à 1840* (Brussels: Arcade, 1968) p. 19; P. J. Margry, 'De ontwikkeling van de stadsplattegrond', in P. J. Margry, P. Ratsma & B. M. J. Speet, *Stadsplattegronden. Werken met kaartmateriaal bij stadshistorisch onderzoek* (Hilversum: Uitgeverij Verloren – Historische Vereniging Holland, 1987) pp. 11 & 13. Skelton, editor of a facsimile of the *Civitates Orbis Terrarum* published by Braun and Hogenberg, turned it positively: 'The general multiplication of detail slightly offends certain commentators who fail to appreciate the purpose of the editors. Their primary aim was not to produce well-balanced landscapes, but to give as much information as possible in a pleasing visual form, in reality a kind of super guide book. This was done so magnificently that the result was an art as decorative as it was informative.' (*Braun & Hogenberg Civitates Orbis Terrarum 1572-1618*, ed. by R. A. Skelton (Amsterdam, *Theatrum Orbis Terrarum Ltd.*, 1965), p. VI).

[8] Bram Vannieuwenhuyze, 'Wegen in beweging. De in- en uitvalswegen van middeleeuws Brussel vóór de 13de eeuw', *Cahiers bruxellois*, 41 (2009-2010), pp. 15-18.

[9] The building campaign of the second town walls of Brussels is discussed in Claire Dickstein-Bernard, 'La construction de l'enceinte bruxelloise de 1357. Essai de chronologie des travaux', *Cahiers bruxellois*, 35 (1995-1996), pp. 91-128; Bram Vannieuwenhuyze, 'Brussel', pp. 329-340.

Figure 2: Bird's-eye view of Brussels published by Braun and Hogenberg in 1572 (© Royal Library of Belgium).

The preceding observations may lead to the conclusion that the bird's-eye view shows the choices, visions and messages of the anonymous engraver (possibly Hogenberg himself), rather than it provides an accurate view of sixteenth-century Brussels. As a result, the document seems not to be very reliable for the study of sixteenth-century urban topography. However, the application of Digital Thematic Deconstruction has forced us to expound on this point of view. The systematic dismantling of the image, followed by the thematic categorisation of all its components, has led to the discovery of some thousands of topographic features and patterns. It is impossible to see all of them at first sight, but their presence makes it possible to refine the conclusions on the accuracy and reliability of the urban view, to date the realisation of the document more precisely, to provide information on unknown aspects of urban topography and city life and, finally, to offer lines of direction for further research.

With regard to topographic accuracy, the case of the small alley *van der Elst* is for instance very striking. This former blind alley is a rather unimportant side street of the *Laken straat* (the road to the nearby village of Laken), one of the main thirteenth-century arteries of the town. Nevertheless, it seems that the alley *van der Elst* was older (as was the case for all the other small side streets of the main artery). The etymology of the street name seems to be 'small street leading to a bush of alder trees', referring to its topographic situation in and even before the thirteenth century.[10] Surprisingly, the bushes seem to be represented on the sixteenth-century bird's-eye view of Braun & Hogenberg, since the street comes to a dead end at a row of bushes, situated on the left bank of the river Zenne (figure 2). At this place the alley takes the form of a right-angled square, which is not only represented

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[10]   Bram Vannieuwenhuyze, 'De buurt van de Lakensestraat in laatmiddeleeuws Brussel. Een stedenbouwkundige verkenning', *Arduin*, 6 (2009), pp. 53-56.

on the nineteenth-century cadastral maps of Brussels, but even still exists today. It seems that the engraver took the trouble to represent the topography of this small, blind and unimportant alley with great precision. Probably, the accuracy of the cartographic representation is much higher than initially thought.
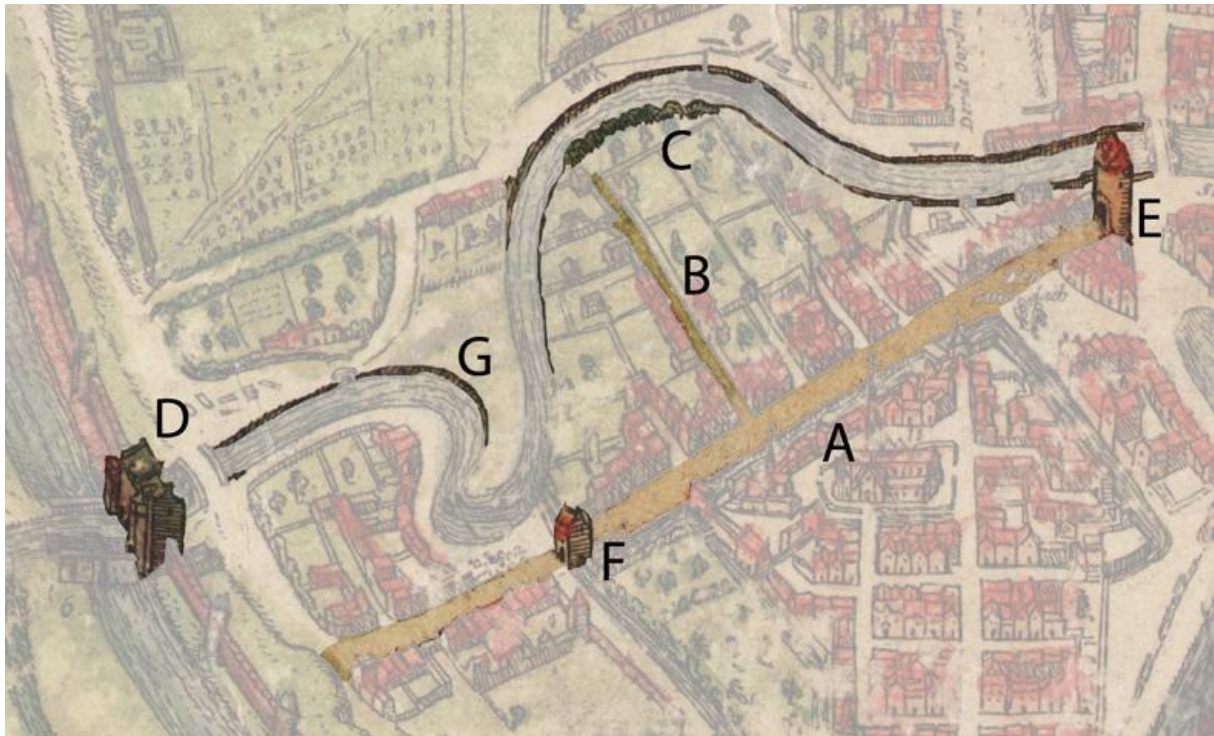

Figure 3: The Digital Thematic Deconstruction applied to a fragment of the bird's-eye view of Brussels published by Braun and Hogenberg, with the *Laken straat* (A), the alley *van der Elst* (B), the row of bushes at the end of the alley (C), the Exterior Laken gate of the second town walls (D), the Interior Laken gate (E), the Small Laken gate (F), and the consolidated banks of the river Zenne (G) (© Royal Library of Belgium – Bram Vannieuwenhuyze).

Does this mean that other features on the map are that accurate as well? For distinct buildings, such as, for instance, the town hall, the imperial court or the gates of the second town walls, we can compare their shape and architecture to data derived from other maps, views, images, texts and archaeological results. In general, the representation seems to be quite realistic, although it is of course necessary to take into account the scale and the orientation of the bird's-eye view. Unfortunately, it is not possible to test the accuracy for those buildings for which the bird's-eye view provides the only representation. This is for instance the case for the Interior Laken gate and the Small Laken gate, both situated on the *Laken straat* mentioned above. The former was demolished in 1573, just after the publishing of the *Civitates Orbis Terrarum*, in order to provide better access to the city-centre, while the latter was sold to a private person in 1526.[11] The destiny of the building is unknown, but the bird's-eye view seems to prove that it was still present at the beginning of the 1570s.

Regarding the stereotypical buildings and other topographic features (green elements, street network, parcel limits, etc.), the bird's-eye view is less realistic. Nevertheless, the accuracy can be found on another level: the application of the Digital Thematic Deconstruction allows to discover spatial patterns and urban transformations. To take just a few examples, it allows us to state that the banks of the river Zenne were consolidated where it left the old town, implying that the river bedding was fixed and that the river was totally under control on this site. As a result, the banks could safely be

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[11] Archives de la Ville de Bruxelles, Archives anciennes, liasse 111.

urbanized. In the city-centre the famous statue of *Manneke Pis*, which was already present in the fourteenth century, is represented as a freestanding statue on the crossing of four streets. Despite the very rudimentary representation, the bird's-eye view shows that in late medieval and early modern times, *Manneke Pis* was a public fountain, in contrast to its more recent (and current) function as a marketed but inaccessible touristic site. Thanks to Digital Thematic Deconstruction, it was also possible to discover some striking spatial patterns, e.g. the distribution of some fifty private towers in the city centre. Not surprisingly, most private towers were present in the virtual triangle between the three major poles of power, the town hall, the royal palace and the collegiate church (figure 4). At this time, it is impossible to identify or to locate these towers more precisely, but the spatial distribution pattern however makes it possible to make some conclusions about the builders and their social status.[12]
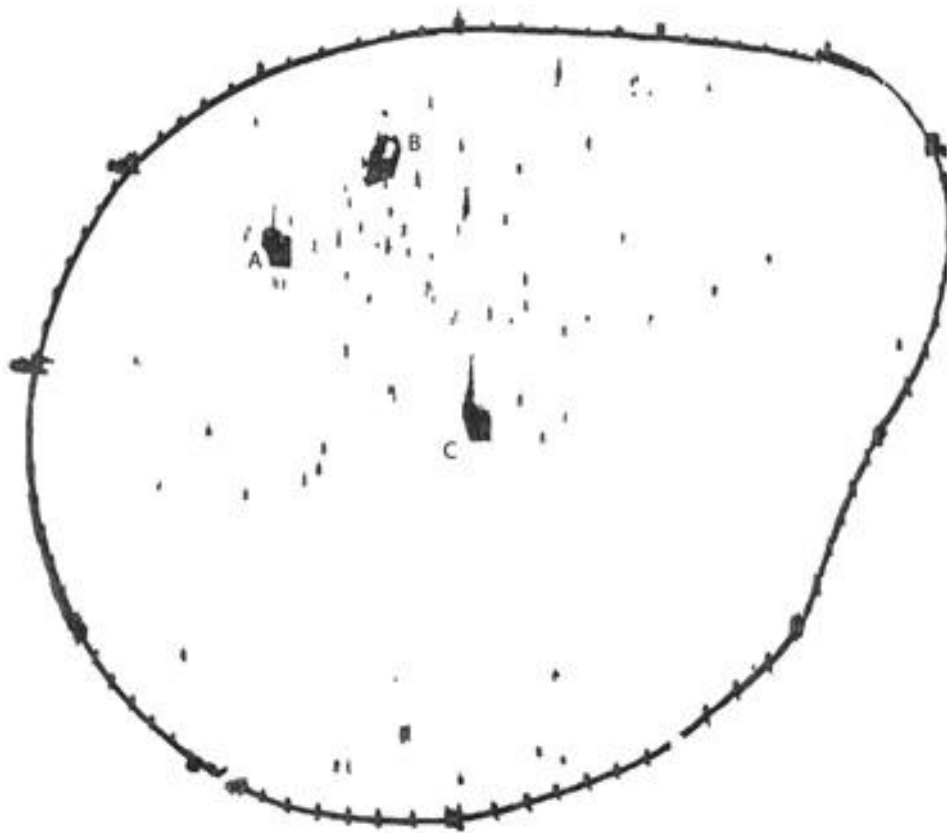

Figure 4: Private towers discovered in the bird's-eye view of Brussels published by Braun and Hogenberg. Most of them were present in the virtual triangle between the collegiate church (A), the royal palace (B) and the town hall (C) (© Royal Library of Belgium – Bram Vannieuwenhuyze).

At a rough estimate, the map includes several thousands of such 'hidden' cartographic details, features and patterns. It is almost impossible to observe them with the naked eye and to discuss all of them here. The application of the Digital Thematic Deconstruction allows to discover these hidden or invisible details and patterns and to isolate them from the image. Moreover, the discovery of some of these elements allows to date the creation of the bird's-eye view more precisely. Of course, the bird's-

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[12] Bram Vannieuwenhuyze, 'Les tours urbaines : particularité du Moyen Âge, tabou de la Renaissance? Quelques réflexions basées sur le cas bruxellois', in *Monde(s) en mouvement : Mutations et innovations en Europe à la fin du Moyen Age et au début de la Renaissance*, ed. by Muriel Cunin & Martine Yvernault (Limoges: Presses Universitaires de Limoges, 2012), pp. 287-299.

eye view was engraved before it was published in the first part of the *Civitates Orbis Terrarum* in 1572.[13] The absence of a windmill, demolished after 1566, and the presence of the commemorative pillar, erected in 1568 on the site of the former court of Culemborg (which was demolished by order of the duke of Alva on 28 May 1568) in the upper town provide a clear *terminus post quem*.[14] In the lower town, particular attention should be paid to the digging of the canal connecting Brussels with the river Rupel and the river Scheldt further on. Saint Catherine's dock, represented on the view, was opened in 1567, while the wooden bridge next to it, was constructed in January 1569.[15] The representation of the old town walls, some few steps away from the docks, provides a *terminus ante quem* since they were dismantled in December 1570. These small elements discovered thanks to Digital Thematic Deconstuction, allow us to date the engraving to the years 1569-1570 (figure 5). It is of course possible that other details will allow us to narrow this chronological fork, since the analysis is not completely finished yet.

Figure 5: The commemorative pillar erected in 1568 on the site of the former court of Culemborg (left) and the canal connecting the city-centre with the river Rupel and the old town walls before their dismantling in December 1570 (right, © Royal Library of Belgium – Bram Vannieuwenhuyze).

Comparing sixteenth-century urban topographic patterns

Digital Thematic Deconstruction is also extremely useful for comparing historic maps and iconography, especially when it is applied to homogenous collections. Here, I will focus on the series of maps drawn by Jacob van Deventer in the middle of the sixteenth century. This famous cartographer drew about 250 maps of the towns in the Low Countries, which are widely

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[13] This is not as logical as it might seem, because Danckaert stated that some of the engravings were added later (Danckaert, *L'évolution territorial*, p. 19). Unfortunately, she omitted to confirm or to refute if this was the case for the Brussels engraving. However, the representation of the Interior Laken Gate, demolished in 1573, seems to prove that the engraving originally was included in the first edition of 1572.

[14] Alexandre Henne and Alphonse Wauters, *Histoire de la ville de Bruxelles (nouvelle édition du texte original, augmentée de nombreuses reproductions de documents choisis par Mina Martens, archiviste de la ville)* (Brussels: Ed. Culture et Civilisation, 1975), vol. IV, pp. 8 and 12.

[15] Henne and Wauters, *Histoire de la ville de Bruxelles*, vol. IV, p. 122 and 142.

recognized as geometrically and topographically highly accurate.[16] All of them were produced in more or less the same time period, roughly between the 1540s and the 1560s, in a very recognizable and uniform style. Here, I confine myselve to ten cities situated in the Dutch-speaking parts of the Southern Low Countries (figure 6). The selection of these towns was in a way accidental, so the ten towns are quite diverse in terms of historical evolution, genesis, surface, population density, importance, topographic situation, socio-economic structures, and so forth.[17] They represent a mix of – what has traditionally been seen as – large (Brussels, Leuven), medium-sized (Oudenaarde, Dendermonde, Kortrijk, Vilvoorde) and small (Gistel, Oudenburg, Zoutleeuw, Halle) cities.
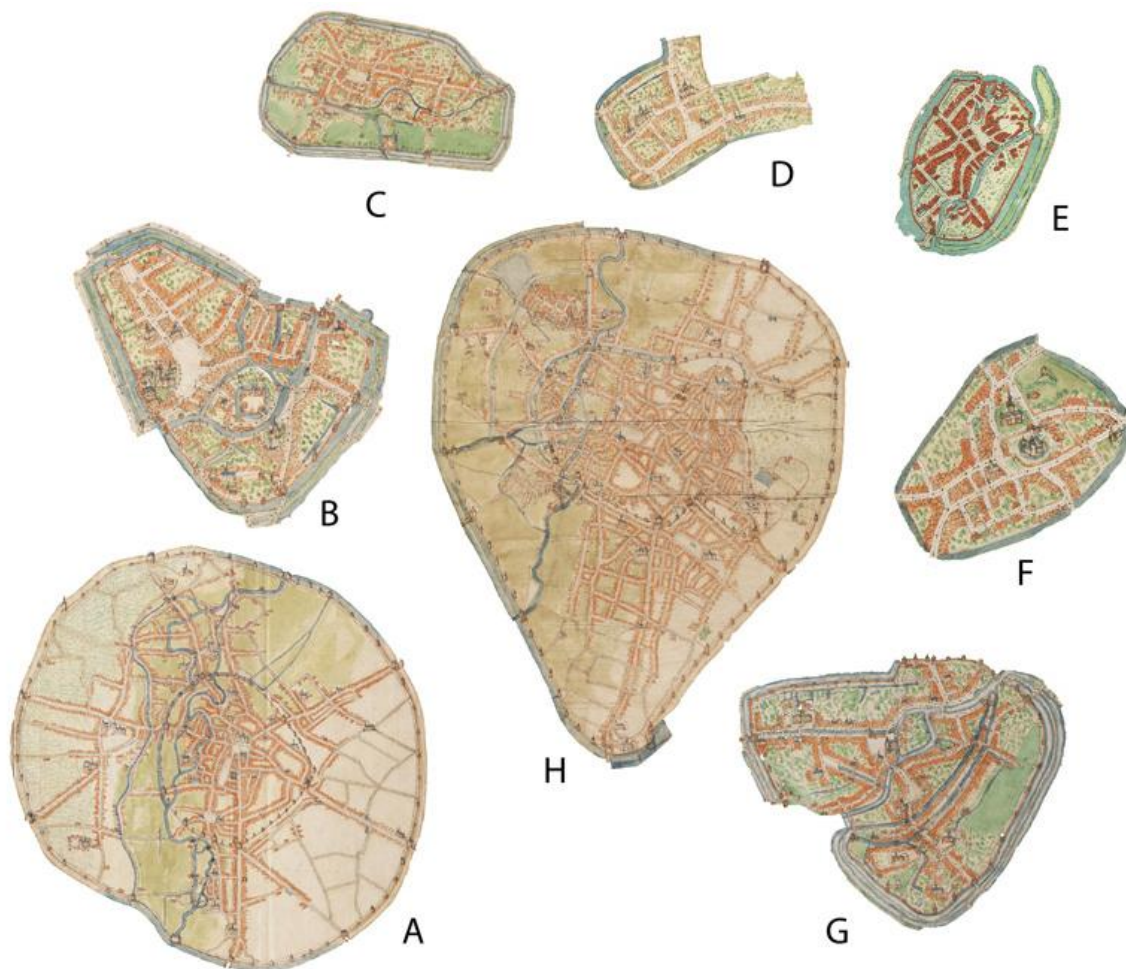

Figure 6: Eight of the towns extracted from the sixteenth-century maps drawn by Jacob van Deventer: Leuven (A), Oudenaarde (B), Vilvoorde (C), Oudenburg (D), Halle (E), Gistel (F), Dendermonde (G), and Brussels (H) (© Royal Library of Belgium – Bram Vannieuwenhuyze).

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[16] For a very recent state of the art, including a complete bibliography, see Bram Vannieuwenhuyze, 'Les plans de villes de Jacques de Deventer (XVIe siècle). État de la question et pistes de recherche', *Revue du Nord*, 94 (2012), pp. 613-633.

[17] Bram Vannieuwenhuyze studied the maps of the neighbouring cities of Brussels, Halle and Vilvoorde (Bram Vannieuwenhuyze, 'Brussel, Halle en Vilvoorde. Een topografische vergelijking van drie 16de-eeuwse steden op basis van de stadsplannen van Jacob van Deventer', in *Caert-Thresoor*, 31 (2012), pp. 67-74), while the other urban maps were studied by master students at the History Departments of Ghent University and the KU Leuven. In most cases, the students 'chose' their 'own' towns (meaning: the town where they came from) as the subject for their carto-historical research.

Of course, we must be aware that the town maps of Jacob van Deventer represent – just like all other maps – a human vision of the landscape. The cartographer made choices when he was surveying, sketching and drawing. He interpreted the landscape he saw and surveyed, decided which topographic elements he would represent and which not, and how he would represent them. His town maps cannot be used, for instance, for the study of sixteenth-century urban housing or for the reconstruction of parcel limits, because these are not things the cartographer paid attention to. But on the other hand, Jacob van Deventer adopted a systematic 'cartographic jargon' through all his town maps, consisting of a solid system of cartographic symbols and colours.[18]

Thanks to his systematic working method, the series of town maps is very homogeneous and offers the opportunity to compare a number of important topographic features of the mapped towns in a systematic way, which are all clearly represented by Jacob van Deventer: the urban buildings, the urban hydrography, the urban road network, the open space inside the towns and the town walls. The Digital Thematic Deconstruction of the maps makes it possible to gain insight into the spatial distribution patterns of these topographic features. Indeed, Photoshop and GIS software make it possible to calculate the percentage of urban space occupied by buildings, roads, hydrography, town walls and open spaces. Evidently, only urban space *strictu sensu* – meanings the urban area up to and including the town walls – is taken into account, the mapped rural hinterland being left aside. The results of this analysis are juxtaposed and ranked in the table below.

Percentages of urban space occupied by buildings, roads, hydrography, town walls, open spaces and various elements (characters), calculated on the basis of the Digital Thematic Deconstruction of ten towns drawn by Jacob van Deventer.				
Brussel open space (41%) buildings (23%) roads (17%) hydrography (11%) town walls (8%) various (0%)	**Halle** open space (27%) hydrography (24%) roads (22%) buildings (21%) town wall (6%)	**Vilvoorde** open space (37%) roads (27%) buildings (21%) town wall (12%) hydrography (3%)	**Zoutleeuw** open space (26%) roads (24%) buildings (23%) hydrography (19%) town wall (8%)	**Leuven** open space (52%) buildings (19%) roads (16%) town walls (9%) hydrography (4%)
Kortrijk buildings (33%) open space (27%) roads (24%) town walls (10%) hydrography (4%) various (2%)	**Gistel** buildings (35%) open space (31%) roads (21%) town wall (13%) hydrography (0%)	**Oudenburg** buildings (38%) open space (31%) roads (21%) town wall (10%) hydrography (0%)	**Dendermonde** open space (29%) buildings (23%) roads (21%) town wall (20%) hydrography (7%)	**Oudenaarde** roads (26%) buildings (25%) open space (25%) town wall (18%) hydrography (6%) various (0%)

Some general trends stand out. In most cities, open space and buildings occupy the largest parts of urban space, while the hydrography and the town walls generally took the least. Based on these calculations, 'the average town' of these ten examples would consist for one third of open or unbuilt space, about one quarter of buildings, and one fifth of roads, while the town walls and hydrography respectively would occupy 10,4 and 7,8 per cent of the urban area. The application of Digital Thematic Deconstruction to the other maps of Jacob van Deventer could reveal if the

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[18] Peter van der Krogt, 'Algemene beschrijving van de kaarten', in *De stadsplattegronden van Jacob van Deventer*, 8 vols, ed. by Peter van der Krogt (Alphen aan den Rijn: Robas – Canaletto – Stichting tot Bevordering van de Uitgave van de Plattegronden van Jacob van Deventer, 1992-2001).

figures based on this small sample are representative for the whole (Southern) Low Countries or not.

If we classify the towns following the topographic categories, we gain more insight into the relative importance of these features and their spatial distribution patterns. Obviously, all towns included a series of urban infrastructures, meaning man-made and collective installations created for human activities.[19] This definition is of course very relevant for roads and urban walls – which were all man-made – but also for the waterways because, strictly speaking, natural rivers and brooks no longer existed in an urban context.[20] In terms of surface, roads were the most extensive urban infrastructure in the towns and took between 16 and 27 per cent of urban space (figure 7). They occupied about one quarter to one fifth of the urban territory in the small and medium cities, while this ratio only reached one sixth to one seventh in the large cities Brussels and Leuven. Compared to these large cities, it seems that roads were much more present (and important) in the smaller ones.

Percentages of urban space occupied by roads, town walls and hydrography		
Roads	**Town walls**	**Hydrography**
Vilvoorde 27%	Dendermonde 20%	Halle 24%
Oudenaarde 26%	Oudenaarde 18%	Zoutleeuw 19%
Zoutleeuw 24%	Gistel 13%	Brussels 11%
Kortrijk 24%	Vilvoorde 12%	Dendermonde 7%
Halle 22%	Kortrijk 10%	Oudenaarde 6%
Gistel 21%	Oudenburg 10%	Leuven 4%
Oudenburg 21%	Leuven 9%	Kortrijk 4%
Dendermonde 21%	Brussels 8%	Vilvoorde 3%
Brussels 17%	Zoutleeuw 8%	Gistel 0%
Leuven 16%	Halle 6 %	Oudenburg 0%

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[19] Following the definition of Bernard Gauthiez, see Bernard Gauthiez, *Espace urbain: vocabulaire et morphologie. Principes d'analyse scientifique* (Paris: Monum, 2003), p. 128.
[20] André Guillerme, *Les temps de l'eau. La cité, l'eau et les techniques (nord de la Belgique, fin IIIe-début XIXe siècle)* (Seyssel: Champ Vallon, 1990).

Figure 7: The road network *intra muros* extracted from the maps of Gistel, Leuven and Vilvoorde drawn by Jacob van Deventer (© Royal Library of Belgium – Bram Vannieuwenhuyze).

Urban defense was a very important issue in the late medieval and early modern towns, so it is not surprising that all of them had one or two town walls, including moats, ramparts, walls, gates and towers (figure 8).[21] Large cities such as Brussels and Leuven even built two town walls, but this did not mean that these defensive infrastructures relatively took more space. On the contrary, as was the case in the smaller cities, the town walls of Brussels and Leuven occupied less than 1/8th of the total urban space, Dendermonde and Oudenaarde being the exceptions.[22]

Figure 8: The town walls extracted from the maps of Brussels (left) and Oudenaarde (right) drawn by Jacob van Deventer (© Royal Library of Belgium – Bram Vannieuwenhuyze).

The presence of waterways was of course due to local soil conditions (figure 9). In some regions, water was much more abundant than in others. Except for Oudenburg and Gistel – which had no water at all, at least if we may believe Jacob van Deventer – all towns emerged or grew on the bank(s) of one or more streams or rivers.[23] However, ditches filled with water were the most important part of the urban hydrography. Of course, their presence was connected to the spatial layout of the town walls, especially in the lower parts of the towns. Halle and Zoutleeuw stand out thanks to their extensive ditches filled with water.

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[21] For recent overviews, see Gilles Blieck, Philippe Contamine, Nicholas Faucherre and Jean Mesqui, *Les enceintes urbaines (XIIIe-XVIe siècle). 121e Congrès des Sociétés historiques et scientifiques – Nice – 26-31 octobre 1996* (Paris : Editions du CTHS, 1999); H. Janse and T. Van Straalen, *Middeleeuwse stadswallen en stadspoorten in de Lage Landen* (Zaltbommel: Europese Bibliotheek, 2000³)

[22] Here the high ratio seems to be due to the building of enormous and irregular complexes of walls around relatively small towns, but it remains difficult to explain this situation.

[23] Brussels, Halle and Vilvoorde on the river Zenne, Oudenaarde and Dendermonde on the river Scheldt, Kortrijk on the river Leie and Zoutleeuw on the river Kleine Gete. As was the case in the neighbouring Northern Low Countries, nearly all medieval towns emerged on the banks of one or more rivers (see Reinout Rutte and Jaap Evert Abrahamse, 'Verstedelijking in Nederland. Duizend jaar ruimtelijke ontwikkeling bekeken en vergeleken', in *Historisch-Geografisch Tijdschrift*, 29 (2011), pp. 109-110.
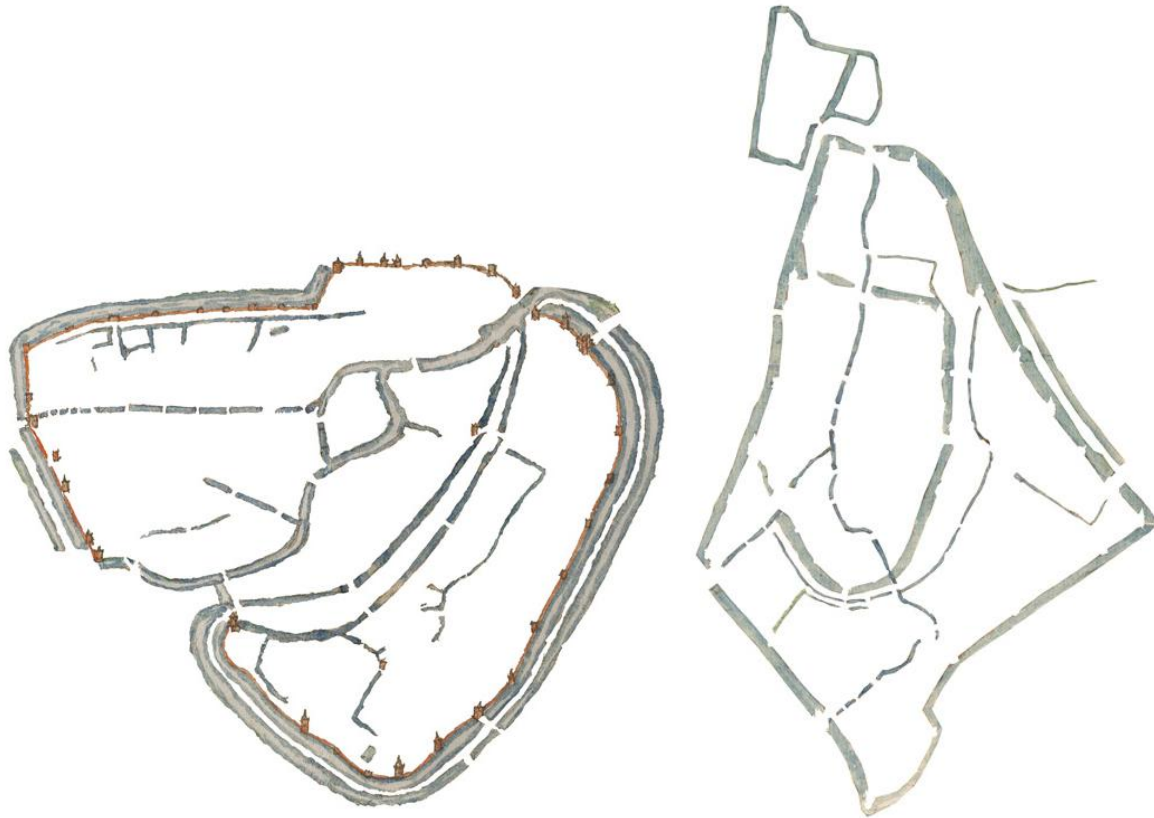
Figure 9: The hydrographic system extracted from the maps of Dendermonde (left) and Zoutleeuw (right) drawn by Jacob van Deventer (© Royal Library of Belgium – Bram Vannieuwenhuyze).

Most definitions of 'a town' include the notion of an abundance or high density of buildings and population.[24] The analysis of the town maps of Jacob van Deventer shows that building densities varied from 19 to 38 per cent. Although buildings are commonly considered as a typical urban feature, the figures surprisingly prove that the building densities of the sixteenth-century towns of the Southern Low Countries appeared not to be that high at all (figure10). Most cities have a building density about 20 and 25 per cent and only three cities stand out with respectively 33, 35 and 38 per cent (Kortrijk, Gistel and Oudenburg). If we may draw conclusions, we can state that building density was not the sole distinctive topographic urban feature and that smaller cities generally had higher building densities. On the contrary, the building density of Leuven, generally considered as a main city, only reached 19 per cent.

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[24] See for instance: 'A town is a permanent and concentrated human settlement in which a significant proportion of the population is engaged in non-agricultural occupations – characteristically in a variety of trades and industries and probably in some administrative, political and professional work too.' (Susan Reynolds, 'The writing of medieval urban history in England', *Theoretische Geschiedenis*, 19 (1992), pp. 49-50); The same is true for the Dutch definitions of a town in, amongst others, Raymond Van Uytven, 'Stadsgeschiedenis in het Noorden en Zuiden', in *Algemene Geschiedenis der Nederlanden. Het sociaal-economische leven circa 1000-1500. Het stedelijk leven circa 1000-1400. Politieke ontwikkelingen circa 1100-1400* (Haarlem: Fibula-Van Dishoeck, 1982), p. 188; Hans Renes, 'De stad in het landschap', in Reinout Rutte and Hildo Van Engen, *Stadswording in de Nederlanden. Op zoek naar overzicht* (Hilversum: Verloren, 2005), p. 15.

Percentages of urban space occupied by buildings and open space	
Buildings	**Open space**
Oudenburg 38%	Leuven 52%
Gistel 35%	Brussels 41%
Kortrijk 33%	Vilvoorde 37%
Oudenaarde 25%	Gistel 31%
Brussels 23%	Oudenburg 31%
Zoutleeuw 23%	Dendermonde 29%
Dendermonde 23%	Halle 27%
Halle 21%	Kortrijk 27%
Vilvoorde 21%	Oudenaarde 25%
Leuven 19%	Zoutleeuw 26%

Figure 10: The building pattern *intra muros* extracted from the maps of Leuven (left) and Vilvoorde (right) drawn by Jacob van Deventer (© Royal Library of Belgium – Bram Vannieuwenhuyze).

Open space seems to have been a much more important topographic feature for the sixteenth-century towns of the Southern Low Countries (figure 11). The figures show that it was the most important topographic characteristic for the large cities: in Leuven and Brussels, respectively 52 and 41 per cent of urban space was open and/or un-built-up (which of course did not mean that these spaces were not used at all). They were just followed by the medium-sized city of Vilvoorde, which in fact was situated between Brussels and Leuven. In the other towns, open and/or unbuilt space 'occupied' between one quarter and one third of the whole urban area.
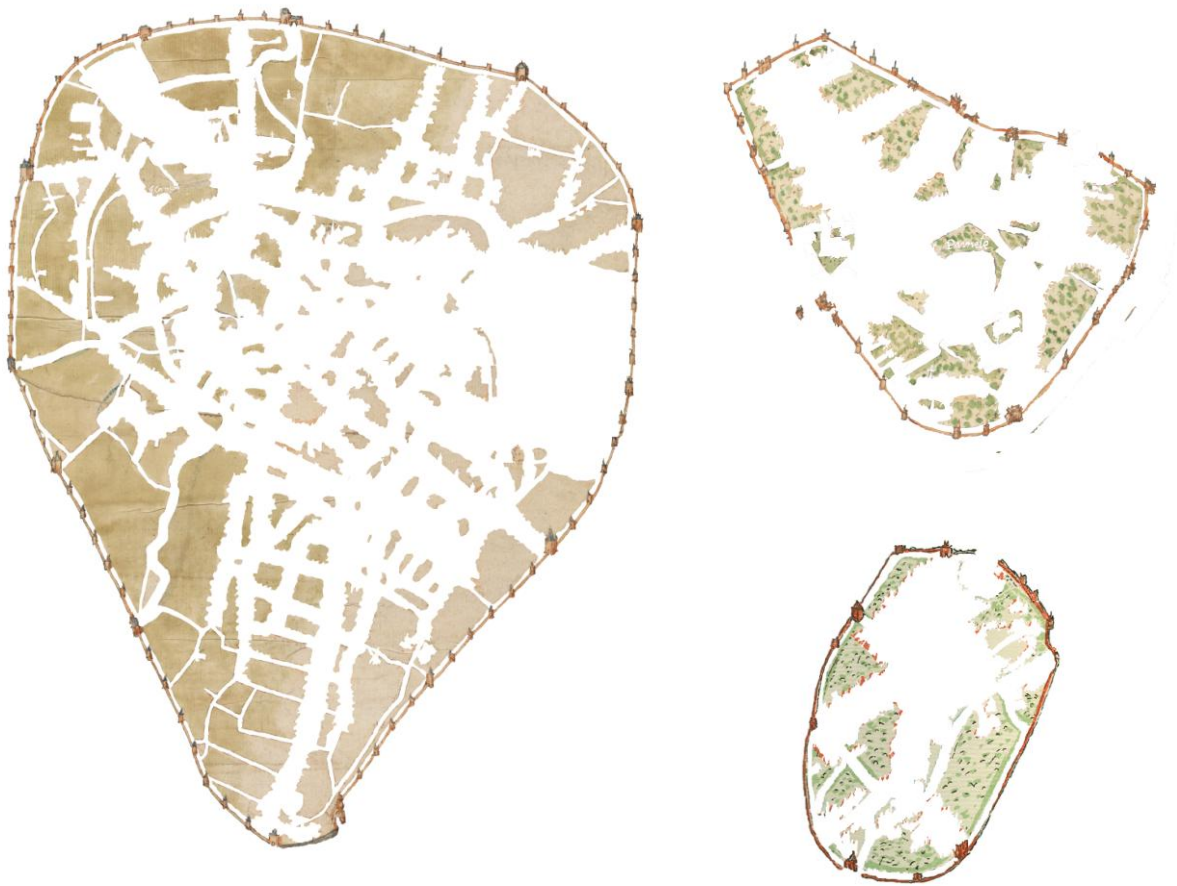
Figure 11: The open/unbuilt space *intra muros* extracted from the maps of Brussels (left), Oudenaarde and Halle (right) drawn by Jacob van Deventer (© Royal Library of Belgium – Bram Vannieuwenhuyze).

Above all, this very short cartographic and statistical analysis based on Digital Thematic Deconstruction shows that the topographic and morphological patterns that characterized the sixteenth-century towns of the Southern Low Countries were not that different at all. All towns disposed over buildings, open space, town walls, waterways and roads. Moreover, the relative importance of these topographic features appears to be quite similar in most towns, except for the hydrography, which was the most variable parameter. Of course, we must keep in mind that our analysis, figures and conclusions strongly rely on the cartographic representation by Jacob van Deventer and the choices he made. For instance, did these towns really include so many open and/or unbuilt spaces or did the cartographer just ignore these areas for some reason (e.g. time pressure, inaccessibility, little importance).

Nevertheless, all the similarities seem to be due to a common history and spatial development of the studied towns. It is of course necessary to continue the analysis by explaining the figures, statements, similarities and differences or by comparing the results to other cases. This was of course not the purpose of this short paragraph, which only wanted to show the potential of Digital Thematic Deconstruction for comparative cartographic analysis.

Conclusion

Hopefully, this contribution has shown that Digital Thematic Deconstruction allows an in-depth and nuanced evaluation of historical town maps and views. The results of the analysis can in turn be used in further research on the topography and spatial lay-out of the mapped landscapes (in this case the early modern towns of the Southern Low Countries). Thanks to the systematic dismantling or redrawing and thematic categorisation of all cartographic or iconographic elements in the maps and views, it becomes possible to isolate topographic features and patterns from the documents and to study them in greater depth. Digital Thematic Deconstruction allows us to discover 'hidden' features and patterns, and to discuss their accuracy and meaning(s). Hence, entire documents can be re-evaluated, by tackling their accuracy as a whole, their symbolic meanings and manifest messages. In this respect, the method gives prominence to the content of these cartographic and iconographic documents by considering them as real records in their own right and valuable sources of information about the past. Of course, this does not mean that their illustrative or decorative power should be denied.

The main goal of this contribution was to present the basic principles that lay behind Digital Thematic Deconstruction and to present some concrete research possibilities. Once again, I want to stress that it has not been the ambition to explain the results and statements or to publish new research results. But of course, Digital Thematic Deconstruction is not a goal in itself and it becomes clear that the results of the analysis need to be questioned, contextualized and/or compared to other (kinds of) data. Hopefully this contribution will stimulate (urban) historians to follow the same path and to make effective use of this and other digital research methods in order to explore the rich layers of information that historical maps and views have to offer.