

2 Research Design and Approach

2.1 Research questions, general thesis approach and thesis structure

The following research questions are going to be answered to reveal the characteristics of TiB and their present state of sustainability and the potential for future sustainability to inform regional planning and design:

- What spatial structures characterise dispersed urban areas in Europe?
- Which morphological and functional structures of dispersed urban areas offer the potential for more sustainable development? If so, how can this potential be mapped and measured to inform regional planning and design?
- Are there similarities and dissimilarities concerning potentials of dispersed urban areas in different locations, planning cultures, topographies and histories?

The core of the thesis at hand are four separate journal papers, see Figure 2.1. Therefore, this section presents the general approach of this research to bind the papers and their results together to provide the reader with a coherent story. Chapters three to six are predominantly composed of already published or accepted double-blind peer-reviewed journal papers. In all those papers, the specific research questions and methods and data used are explained. An atlas, complementing each chapter, presents additional maps, drawings and photos as well as statistical and analytical material and their interpretations. They were not used in the papers as such, but complete the comparative aspect of the research.

Chapter 3 defines and characterises territories-in-between and thereby, what constitutes a case for the cross-case comparison. Chapters 4, 5 and 6 present methods to assess the potential and possibilities for sustainable development in territories-in-between. Chapter 7 present a meta-analysis of the earlier chapter to identify similarities among cases and outliers to be able to generalise findings. Chapter 8 summarises the key findings of the research and provide, recommendations for planning practice and research.

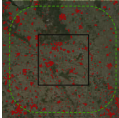



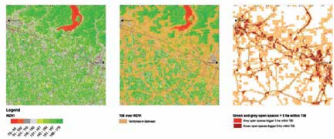

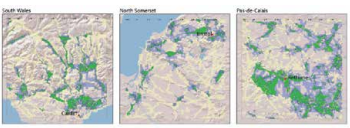

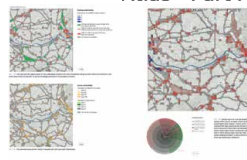

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FIG. 2.1 The structure of the dissertation.

A cross-case comparison as overarching approach was chosen in order to avoid what Geneletti et al. (2017) described as a setback of most studies dealing with sustainable development in peripheries, namely that they are often context-specific and solution-oriented and that it stays unclear whether the general ideas can be transferred to other geographical contexts. Therefore, after briefly introducing all chapters of the dissertation, section 2.6.1 provides a more detailed explanation of the advantages and disadvantages of a cross-case comparison. It also presents several cross-cutting methodological considerations, like the selection of the cases, data availability, reliability and limitations as well as general considerations on transferability.

Section 2.7 introduces the atlas of territories-in-between. The aim of the atlas, which is spread out between the article based chapters of the dissertation, is to provide additional information and material, which was not included in the original papers but which either provides maps for those cases the papers did not focus on, or photographic material in order to support the quantitative data with qualitative information.

2.2 Characteristics of territories-in-between

The first step to answer the main research question is to define territories-in-between by the following sub research questions:

- What are the characteristics which distinguish territories-in-between?
- How can those characteristics be used to distinguish TiB from the existing urban-rural classifications?
- Can these characteristics be applied in cases across Europe to map TiB?

Chapter 3 is based on the paper 'Beyond urban-rural classifications: Characterising and mapping territories-in-between across Europe' by Wandl, Nadin, Zonneveld and Rooij, published in the journal *Landscape and Urban Planning* in 2015.

The paper proposed an alternative classification of territory, which is precise enough to represent the complex (socio-) spatial configuration of TiB and distinguish them from urban and rural areas. This preciseness that is achieved by a combination of freely available geo-data sets allows a detailed classification and mapping of TiB, which goes beyond existing typologies. Therefore, it is helpful for the comparison of form and performance and the evaluation of spatial policies applied to TiB. The resulting classification was used to define TiB within the cases for the following papers of the cross-case study.

2.3 A multidimensional typology of open spaces

Chapter 4 investigates the potentials of open spaces, green and grey ones, to contribute to sustainable development. It does so by analysing the potential of interaction between different network operators with ecosystem services provided by open spaces. The potentials of sustainable development which are investigated are the following:

- Which potentials of social aspects of sustainability can be associated to open spaces in TiB, like human health, well-being and the possibility to interact, socialise and recreate?
- Which potentials of environmental aspects of sustainability can be associated to open spaces in TiB, like protecting biodiversity by improving ecological functions?
- Which potentials of economic aspects of sustainability can be associated to open spaces in TiB, like increase in property values and contributions to the local economy through increased recreation and/or tourism?

Chapter 4 is based on the paper ‘Towards sustainable territories-in-between: a multidimensional typology of open spaces in Europe’ by Wandl, Rooij, and Rocco published in the journal *Planning Practice and Research* in 2016.

The paper presents a typology of green and grey spaces for each case as well as a cross-case comparison. Function and ownership as defining criteria are omitted in contrast to other typologies of open spaces, in order to acknowledge the volatile nature of both of them in TiB: function and ownership are often unclear and/or change relatively often in TiB. The typology shows that most common green spaces in TiB, but also a significant part of grey spaces, have the potential for multi-functionality as well as the potential for multiple ecosystem services. These results build on the idea of Gallant et al. (2004) that multi-functionality is the key to the sustainable development of TiB. It also supports Viganò's (2011) claim to start with open spaces when designing within dispersed urban territories. The presented typology is an answer to the call of the European Landscape Convention (ELC) (Council of Europe 2000) to identify landscapes and to explicitly include urban and peri-urban landscapes in addition to the ‘natural’ and ‘rural’ ones (ELC Article 2).

2.4 Landscape fragmentation and accessibility of green spaces

Chapter 5 adds a systemic perspective on the potential of green spaces to contribute to the sustainable development of TiB. This chapter focuses on the system of green spaces in contrast to chapter four, which focused on individual open spaces. The chapter adds to the existing knowledge and understanding of the relationship between biodiversity and human well-being in two aspects. First, it adapts the fragmentation index (Jaeger, 2002) in a way that can be applied to the specific spatial characteristics of TiB. Second, it combines the fragmentation index with an indicator for accessibility of green spaces, to integrate aspects of ecology, human well-being and the spatial heterogeneity of the relation between them. With these adapted methods the following questions are answered:

- • Do less fragmented green space systems provide better accessibility to green spaces?
- • Is it possible to identify both settlement patterns and spatial planning and design approaches, which combine biodiversity and accessibility to green spaces?

Chapter 5 is based on the paper ‘Comparing the Landscape Fragmentation and Accessibility of Green Spaces in territories-in-between across Europe’ by Wandl published in the journal *Urban Planning* in 2018.

2.5 Investigating forms of mixed-use in Europe’s dispersed urban areas

Chapter 6 investigates to what extent TiB across Europe are predominantly mono-functional or not. It positions TiB in the discussion about sprawl, which is usually seen and discussed as monofunctional and segregated. The paper compares how eight European TiB cases perform according to the mix of functions at different scales and spatial resolutions, answering the following research questions:

- 1. Do mono-functional areas dominate dispersed urban areas in Europe?
- 2. How is functional mix manifested in TiB?
- 3. Are there differences in settlement structures between mixed and mono use areas, which can be used to inform planning and design?

Chapter 6 is based on the paper *Territories-in-between: Investigating forms of mixed-use in Europe’s dispersed urban areas* by A. Wandl and B. Hausleitner which is currently under review.

Chapter 6 demonstrates, by developing a multi-scalar typology of settlement characteristics which includes measures of grain, density, permeability and centrality, that local and regional settlement characteristics can explain the location and intensity of mixed-use areas within TiB. Although the building types and local urban tissue vary significantly in mixed-use areas, it can be concluded that across all four countries, the cross-scale settlement characteristics are similar.

2.6 Crosscutting methodological considerations

This section looks at the following four aspects, which were crucial for the overall approach of the research:

- 1 Which type of case study was chosen for this research project and how was dealt with the most frequent case study research criticism on the transferability of results?
- 2 How were the type, location and size of the cases selected?
- 3 What are the right scale and resolution to understand TiB?
- 4 How was data, theory and methodology triangulation done?

Questions one to three are answered in section 2.6.1. Section 2.6.2 is dedicated to question four.

2.6.1 A cross-case comparison as overarching methodology and selection of cases.

Yin (2003) described a case study as an empirical inquiry with a focus on a contemporary phenomenon in a real-life context, and where the boundaries between the phenomenon and context are not clearly evident. This is the case for the territories-in-between and their related spatial policies, which aim for more sustainable development. A case study may have at least three different aims (Seale et al., 2004; Gerring, 2007; Yin, 2003), which determine the specific methodology selected. It may be understood as the intensive study of a single case, with or without the purpose to shed light on a larger class of cases. Second, case study research may include multiple case studies. From a certain amount on it is no longer possible to investigate those cases intensively: 'where the emphasis of a study shifts from the individual case to a sample of cases' (Gerring, 2007) and generalisation and comparisons become more important, 'we shall say that a study is cross-case' (ibid). The third aim, specifically relevant for a PhD candidate, is that cases are important for the researcher's learning process in developing the skills needed to do good research. 'If researchers wish to develop their own skills to a high level, then concrete context-dependent experience is just as central for them as to professionals learning any other specific skills' (Mils, Harrison, Franklin & Birks, 2017). As Flyvberg et al. (2006) stated 'common to all experts is that they operate on the basis of intimate knowledge of several thousand concrete cases in their areas of expertise. Context-dependent knowledge and experience are at the very heart of expert activity'. As one goal of the dissertation is to better understand TiB across Europe and to test whether the developed methods provide consistent results, the choice was made to make a cross-case comparison.

Many disciplines have further strengthened the case study research approach since Flyvberg (2006) addressed the most common misunderstandings, which were related to its usefulness to the generation of theory, lack of being able to generalise and being biased towards verification. The method as such is not questioned anymore but the problem is rather caused if 'the author does not feel compelled to spell out how he or she intends to do the research, why a specific case or set of cases has been selected, which data are used and which are omitted, how data are processed and analysed, and how inferences were derived' (Maoz, 2002 in Gerring, 2007).

The following paragraphs are dedicated to answering these questions raised by Maoz. In the terminology, we follow Gerring (2007) who defined that a 'case connotes a spatially delimited phenomenon (a unit) observed at a single point in time or over some period of time. It comprises the type of phenomenon that an inference attempts to explain'. In this sense, territories-in-between and the related potentials for sustainable development in one European region is a single case.

The next decision was to select what Mills et al. (2017) call an information-based selection of cases. This means that cases are selected to maximise the information gained from one, a so-called critical case, or a rather small sample of cases, which vary sufficiently to understand processes and outcomes better. Two aspects were chosen as a variation between the cases: the dominant planning culture and a difference of topographies.

To summarise the selection of the case study approach and the (types of) cases: The dissertation is a cross-case study to explore the spatial structure of several instances of TiB across Europe. The population, so to speak, for the cross-case studies are all territories-in-between in Europe, which vary in ideal types of spatial planning and vary in topographies. This specifications characterises the scope of the research and determines that three aspects which were crucial for the selection of the cases:

- 1 the cases should be located in countries that are characterised by different planning traditions, and therefore represent different approach towards sustainable development of TiB;
- 2 the cases should cover a variety of topographies, from Alpine to coastal cases;
- 3 the key regional planning documents had to be available in a language spoken by the involved researchers. This is the reason why only cases in Western and Central Europe are included.

For the first aspect, the traditions (or ideal types) of spatial planning were used, which were introduced by the European Compendium of Spatial Planning and further developed by Nadin & Stead (2013). These ideal types can be assigned to individual countries within the EU, although it is essential to state that these may vary within countries and are changing over time.

Furthermore, an ideal territorial sample size had to be chosen that would allow to carry out the analysis soundly. Due to the sheer extent of TiB, as described above, it would have been impossible to investigate them for the whole of Europe, definitely as it can be assumed, that they are not the same everywhere. Therefore, squares with a 50 km side length were chosen as samples. Following the tradition of several researchers, we used squares as samples to develop a better understanding of dispersed urban development, which exceeded typically defined metropolitan areas. This way, we captured what Boeri (1997) described as 'strange, amorphous figures, without any clear division from the countryside, lacking any obvious centre or any sharp distinction among their different parts'. Neutelings (1990), for example, used a square of 20 km by 20 km when investigating the carpet metropole in the Dutch province of South Holland. Also, Secchi and Viganò (2009) in their studies for le Grand Pari(s), used squares and transects when studying the agglomeration of Paris. Basílico and Boeri (1998) used 18km wide and 50km long transects to describe the contemporary urbanisation patterns in Italy. Plant sociologist and landscape ecologist also use squares as sampling method, often based on Braun-Blanquet (1979), who used a combination of the transect, in his case 50m x 1 m, and quadrants of 50 cm x 50 cm to study the density of species. Although the squares are from a completely different size as the urban applications of sampling, the reason to use the approach is the same, namely to understand a population and its composition via individual samples as the number of different species is too large to count and comprehend in a short amount of time.

When located at the edges of large metropolitan areas, such as Île-de-France or the Randstad, squares with a side length of 50 km proved to be large enough to cover areas classified as urban, rural and TiB. Wherever in the spatial analyses methods were used, that would suffer from an edge effect, then an area with an additional 25 km wider buffer was used. See FIG. 2.2. The exact location of the ten squares was the result of an intuitive process of choice-making by the researcher who used the finger, respectively the mouse, over a map of discontinuous urban areas in Europe and Google Earth. In the last step, the location of the square was adjusted to an exact overlay with the 1 km² equal-area grid according to the INSPIRE Data Specification for the spatial data theme Geographical Grid Systems also used by the European Environmental Agency to avoid unnecessary data handling. See FIG. 2.3 for the location and name of the ten cases across Europe.

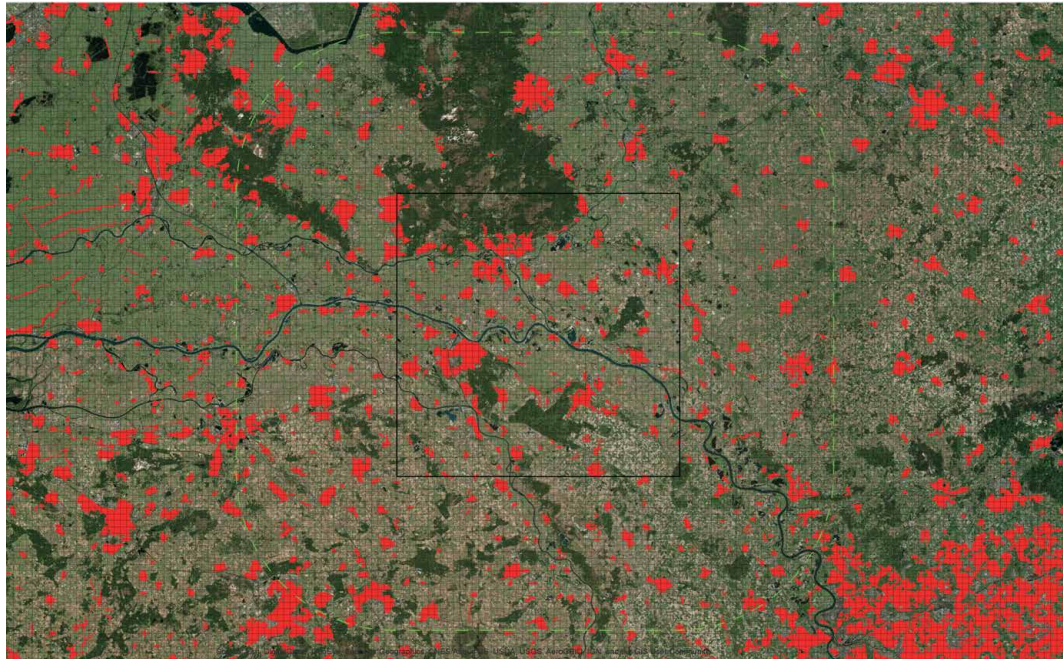


FIG. 2.2 The outline (black) and the 25km buffer area (dotted green) of the case in Gelderland (NL) overlaid on top of a satellite image. The CORINE land cover class discontinuous urban fabric is visualisein red and the EEA reference grid of 1 km in light grey.

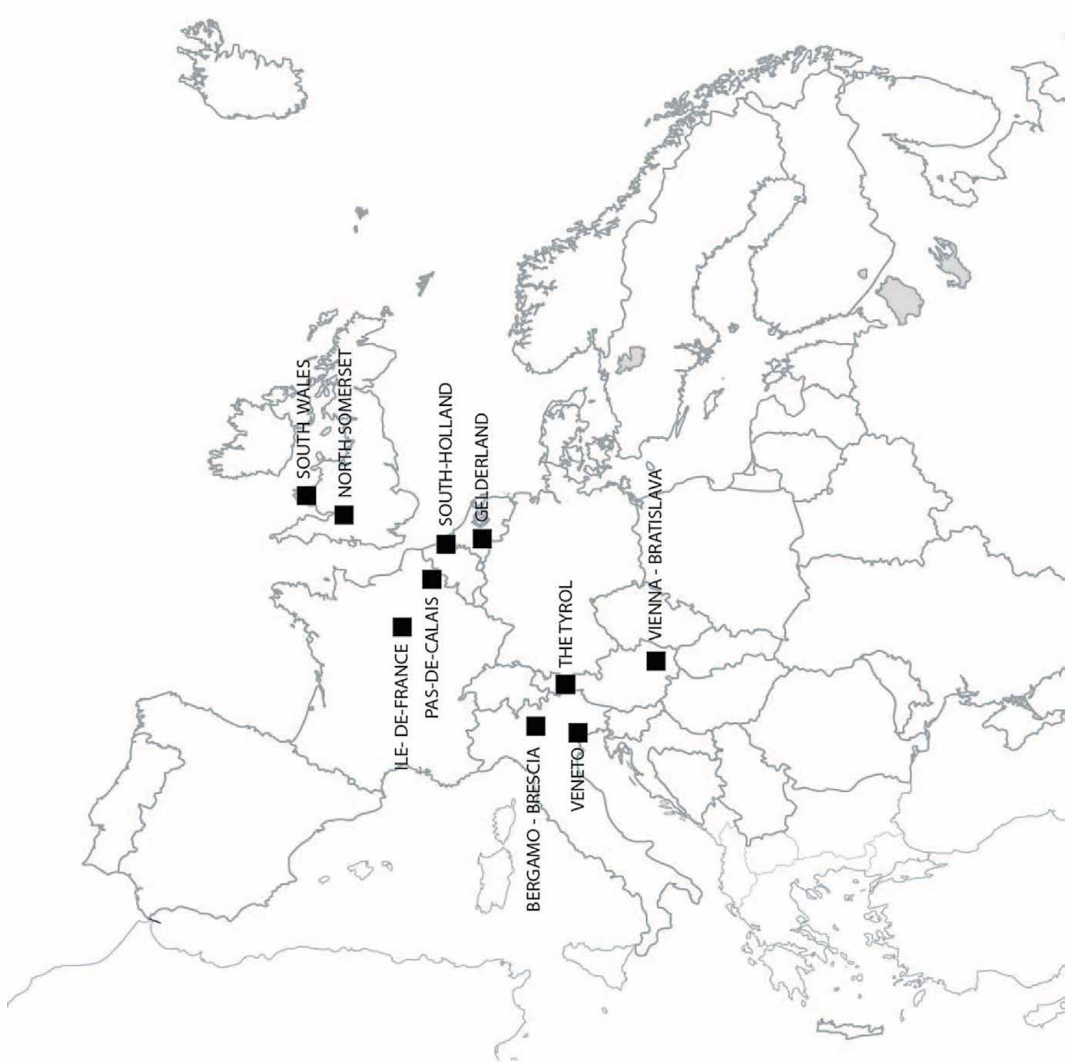


FIG. 2.3 The location of the ten selected cases across Europe.

Table 2.1 presents the cases with their ideal type of planning, the area that is classified as TiB and the number and percentage of population living within TiB.

TABLE 2.1 Key features of the ten selected case study squares across Europe

Case study name	Ideal type of spatial planning	Population			Area classified as TiB	
		Total	TiB		km ²	%
		Absolute	Absolute	%		
Île-de-France	Regional economic	3.893.228	1.006.492	25.85	1.096	54.16
South-Holland	Integrated comprehensive	2.849.336	1.267.325	44.48	1.089	53.82
The Tyrol	Integrated comprehensive federal ^a	281.199	203.066	72.21	379	18.73
North Somerset	Land use management	736.265	562.595	76.41	790	39.03
Vienna-Bratislava	Integrated comprehensive federal	338.470	266.489	78.73	735	36.34
Gelderland	Integrated comprehensive	1.031.570	832.782	80.73	1.083	53.51
Bergamo-Brescia	Urbanism	1.094.195	913.480	83.48	1.051	51.91
Veneto	Urbanism	1.052.495	888.305	84.40	1.299	64.16
South Wales	land use management	987.624	888.662	89.98	966.	47.72
Pas-de-Calais	Regional economic	970.905	913.379	94.08	1.205	59.53

^a Note that for the Integrated Comprehensive Model 4 case studies were selected in order to be also able to compare the cases with strong national planning (NL) and the ones with strong subnational planning (AT)

2.6.2 Mixed-method research: Data-, theory- and methods- triangulation

A combination of data from different sources has been investigated to gain an understanding of the complex, social, economic, environmental and spatial relationship within TiB and to untangle the potential for sustainable development. Several sources have been used: survey data, fieldwork, remote sensing data, or literature and planning documents. To understand, combine and interpret the potentials for sustainable development, an inter-disciplinary approach was needed, including the integration of various theoretical frameworks and related methods. Key disciplines are urban-regional planning and design, landscape ecology and geomatics.

Triangulation is commonly used for three reasons: to increase the validity of data and findings of a study, to uncover the deeper meaning in the data and to question dogmas. The validity of a study is supported by evidence from different sources, but as already Patton (2002) warned, it is a common misconception that the only goal of triangulation is to arrive at consistency across data sources or approaches because also inconsistencies have their value when applying triangulation. This aspect is specifically crucial when dealing with a topic that is not covered or even contradicting the dominant theories and related methods. For example, the model of describing cities along an urban-rural gradient is not only dominant in urban planning and design, but as Farinha-Marques et al. (2011) stated, also in ecosystem services research. There the urban-rural gradient is often seen as necessary because it allows comparison across cities and species. At the same time, it is criticised for being an oversimplification of intricate urban patterns and the diverse ecological matrix of cities. Therefore, triangulation was used in this research for both validation of data and results and the critical review of whether or not contradicting results are a sign for the need to adopt theories and related methods.

Guion, Diehl, and McDonald (2002) defined five types of triangulation in qualitative research (i) data triangulation, (ii) investigator triangulation, (iii) theory triangulation, (iv) methodological triangulation and (v) environmental triangulation. Three of them are used in this dissertations. Data triangulation involves using different sources of information. Methodological triangulation includes the use of multiple qualitative and/or quantitative methods to study a phenomenon. And theory triangulation - to a certain extent - also includes the use of multiple perspectives to interpret a single set of data.

It is crucial to integrate knowledge and theories to understand the complexity of TiB from different disciplines. Strictly speaking, theory triangulation is done by including scholars from various disciplines. In this case, theory triangulation also stands for the integrated use of methods and concepts from different theories. Figure 2.4 presents the references and their associated research areas, according to the Institute for Scientific Information's web of science, for all four papers from this dissertation. In the case that more than one research area was assigned to an article, the main research area was chosen. The figure shows that the most important areas of research are planning and development, urban studies, ecology, environmental sciences, architecture and environmental studies. All of them have more than ten references. Overall, twenty-two research areas have been included in the body of knowledge of this thesis.

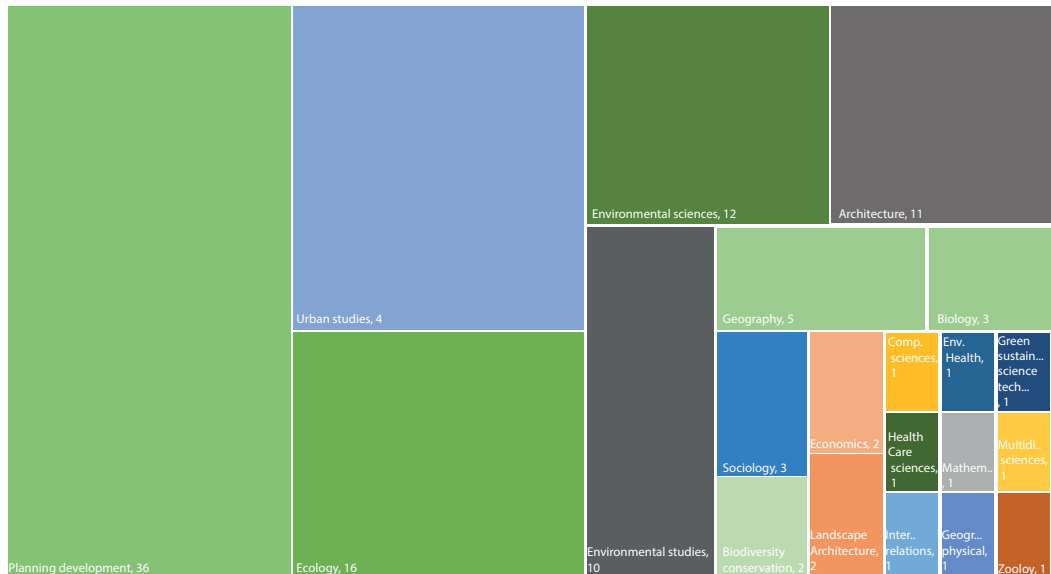


FIG. 2.4 The number of references per research areas of the four articles in this dissertation. Note that only references from the web of science core collection are considered.

Furthermore, it is interesting to see if the dissertation is not only informed by a variety of disciplines but if it is also informing a variety of disciplines. The papers of the dissertation have been cited by authors from fourteen different research areas, see FIG. 2.5. The comparison of the two figures shows that there is large overlap of informing and informed research areas.



FIG. 2.5 The number of citing papers and related research areas of the four articles in this dissertation. Note that only references from the web of science core collection are considered (until 10-2018).

Data triangulation also played a central role in this dissertation. The following table 2.2 illustrates the different types of data sources. The table is organised from qualitative to quantitative data and it specifies the general type of method in row two. The rows beneath specify in each column the type of data further.

TABLE 2.2 Overview of data sources used in the dissertation.

Qualitative					Quantitative			
Scientific literature	Policy documents	Planning documents	Observations by site visits	Maps	Aerial images	Satellite images	Counts and measurements	Models
Research reports	EU	EU	Photos	Official	Google Earth	Landsat 5/8	Geographic/non-geographic	Geographic/non-geographic
Journal papers	National	Regional	Personal encounters	Topographic			National	National
Books		Local	Drawings	collaborative			European	European
			Record of feelings perceptions				Collaborative	Collaborative

The exact methods used during this dissertations are described in the different methodology sections of the papers in chapters three to six. The matrix below provides a brief overview of methods, and it relates them to the research questions of the different articles, and thereby, shows the methodological triangulation of the research.

TABLE 2.3 Overview of methods and their relation to research questions (see next page).

Research question/ Method	a	b	c	d	e	f	g	h	i	j	k
Cross case study			x	x	x	x	x	x	x	x	x
Literature review	x	x	x	x	x	x	x	x	x	x	x
Policy reviews	x	x		x	x	x				x	
GIS supported mapping and analyse of: density, proximity, accesibility, pattern recognition	x			x	x	x	x	x	x	x	x
Geoprocessing	x	x		x	x	x	x	x	x	x	x
Network analyses: different centrality values							x	x			x
Remote sensing: based NDVI calculation				x	x	x	x	x			
Parametric and non-parametric descriptive and clustering statistical methods				x	x	x				x	x
Field visits	x		x				x	x		x	x

- A What are the characteristics which distinguish territories-in-between?
- B How can those characteristics be used to distinguish TiB from the existing urban-rural classifications?
- C Can these characteristics be applied in cases across Europe to map TiB?
- D Which potentials of social aspects of sustainability can be associated to open spaces in TiB, like human health, well-being and the possibility to interact, socialize and recreate?
- E Which potentials of environmental aspects of sustainability can be associated to open spaces in TiB, like protecting biodiversity by improving ecological functions?
- F Which potentials of economic aspects of sustainability can be associated to open spaces in TiB, like increase in property values and contributions to the local economy through increased recreation and/or tourism?
- G Do less fragmented green space systems provide better accessibility to green spaces ?
- H Is it possible to identify both settlement patterns and spatial planning and design approaches, which combine biodiversity and accessibility to green spaces?
- I Do mono-functional areas dominate dispersed urban areas in Europe?
- J How is functional mix manifested in TiB?
- K Are there differences in settlement structures between mixed and mono use areas, which can be used to inform planning and design?

The last method in the matrix, field visits, is rather underrepresented in the papers, but was crucial to develop an understanding of the different TiB, their qualities and their differences. This step was crucial to interpret the results of the different analytical methods developed. Therefore, we will dedicate the next section to an excursus describing the field visit method in an adequate manner.

2.7 Excursus on field visits

As Boeri pointed out in 1997 'zenithal morphology – the view from above' was crucial for grasping the dimensions on new forms of urbanisation and metropolitan areas across Europe. But used as single method the risk is high that 'by piling aggregate representations of the territory one on top of the other, as though they were flat specialised layers, we will never attain any grasp of the essence of contemporary inhabited space: the vertical, mobile energies, and the physical and psychological landscapes winding through them. We will have thematic "maps" crammed with useless and highly ordered information, but they will be incapable of conveying the multidimensional, dynamic nature of urban phenomena.' (Boeri, 1997). So, in order to grasp the complexity and dynamics of TiB each case study area was visited for one week and was investigated in a way that was inspired by one of Boeri's lateral thinking inspired gazes, namely the 'sampling gaze'.

The sampling gaze aims at identifying and describing the elements and the relation between elements which are characteristic for TiB. It is an attempt to decipher the complexity of self-organisational powers at the place. To do so the 50km by 50km squares were horizontally and vertically divided into 5km wide strips, because test runs showed, that one strip could be crossed within two days by a car allowing to stop and further investigate around 20 specific locations along the transect. The car as major means of transport for the field visits was chosen as it is the main means of transport used in TiB. It, therefore, is also the main speed people travel in TiB, which is crucial when considering their daily lives.

For each case, the vertical and horizontal strip with the highest amount of as TiB classified as defined in the first paper (chapter 3) was selected. Only strips, which included all three categories (urban-rural-TiB) were considered.

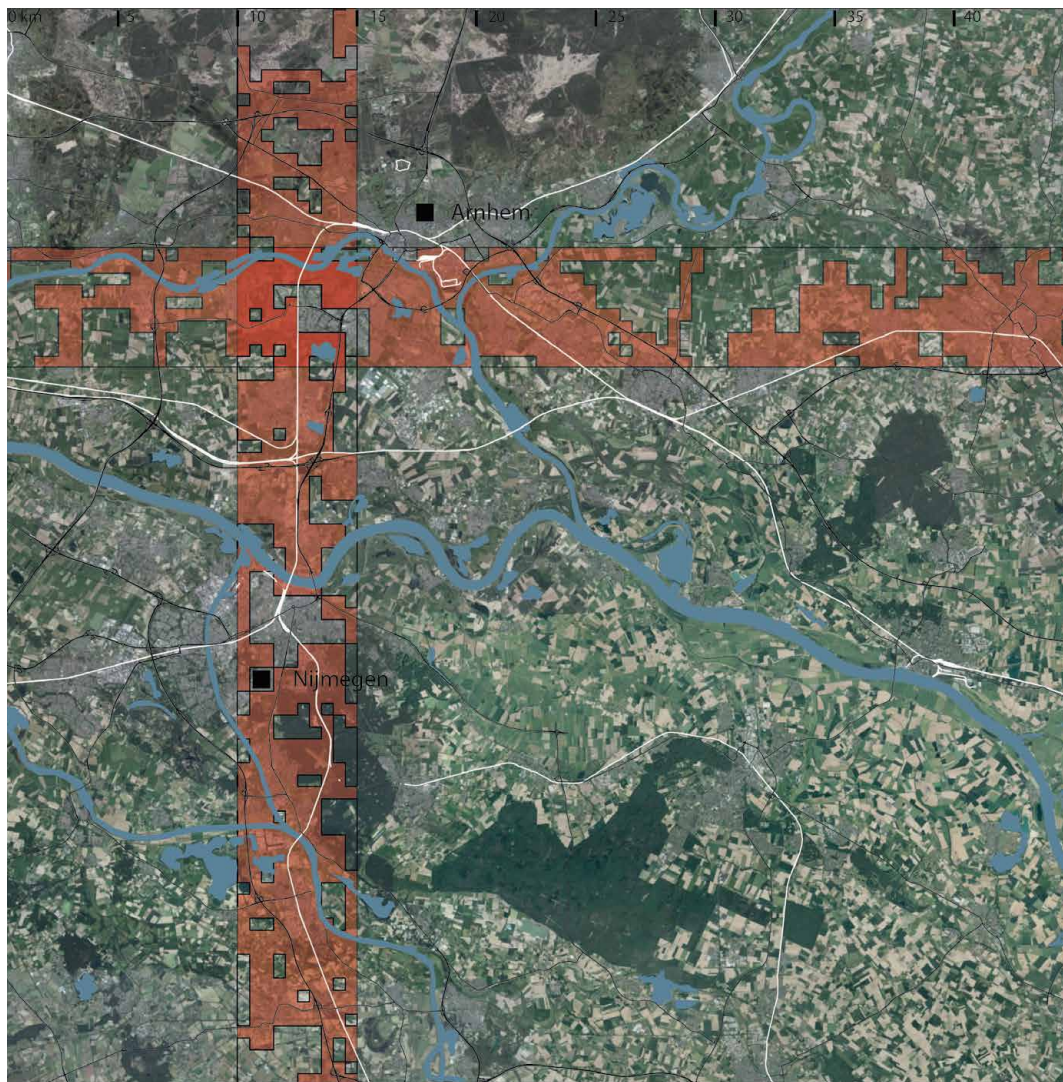


FIG. 2.6 The two field visit strips in the case study area of Gelderland. The red highlighted areas classified as TIB.

In one week time, both strips per case were crossed. The exact path of crossing and the stops along the transects were guided by five types of maps: (i) maps showing different (pedestrian and car-oriented) betweenness centralities of the street network, (ii) maps showing green spaces larger than 10 ha identified by remote sensing analysis, and (iii) density probability maps of consumption and production centralities, such as companies. Additionally, a topographic map and a series of aerial images completed the set of maps.

All these maps were results underpinning the first versions of the papers, which were presented at different conferences. They had basic assumptions concerning the potential for sustainable development. The centrality maps were thought to be important for location choices of economic activities and for indicating the potential for multi-functionality. The green space maps were made following the assumption that many ecosystem services are relying on those green spaces and on the assumption that their permeability and accessibility are therefore crucial. The density probability maps were used as indicators for the suburban centralities, like shopping malls or business parks.

The maps were printed in A3 booklets on a scale of 1:20.000 and as overview maps on a scale of 1:500.000. Every evening before a field trip day, all 5 maps were inspected. Places were marked as stops when they were interesting, because of the features depicted in the five maps. The following day the points of interest were visited. At each point a short walk was done to see, understand and document the physical manifestation of the depicted feature and properties in the maps. The site visits took place in the years 2014 and 2015.

The observations of the fieldwork can be found in three different ways in this dissertation. They were used to check the plausibility of the results of the gis-based spatial analyses. The knowledge and understanding gained on-site also helped to interpret the results of the spatial analyses. And finally, the photos taken at field trips complete the atlas as they add an additional viewpoint.

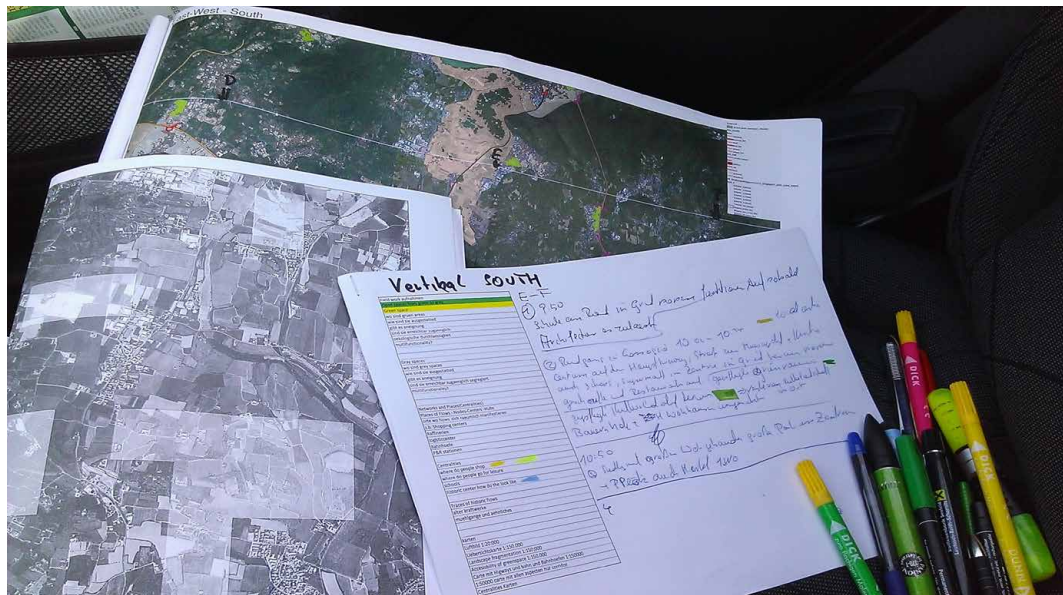


FIG. 2.7 An impression of the maps used during the field visit.

2.8 Atlas of territories-in-between

The atlas is built out of seven parts (A to G). Four different types of double-page spread are used:

- 1 A double-page spread displayed on the left page shows one thematic map with a 50 km x 50 km square scaled approximately at 1: 310.000. Underneath the map has a legend. On the right page, up to three selected photographs are chosen.
- 2 A double-page spread with one thematic map in the format of a 50 km x 50 km square scaled approximately at 1: 310.000. Underneath the map is a legend with an option of an additional diagram on both pages.
- 3 A double-page spread with ten thumbnail maps of the case studies 50 km x 50 km squares at the scale of 1: 1.000.000. The legend and caption can be found on the left page and an optional additional diagram on the right page.
- 4 A double-page spread with two thematic maps at a scale of 1: 500.00 with separate legends and captions on the right page. On the left page, one map with the dimensions of 50 km x 50 km at a scale of approximately 1: 310.000. Underneath it, is a legend and one additional diagram. In addition, a legend and caption for the whole page is found.

Atlas parts C, D and E only use double thumbnail pages to allow for a greater flow of reading, that is not interrupted by a section with too many maps. The maps from these three parts which display original material are repeated at a larger scale in atlas section G. The following list presents the content of the different parts of the atlas:

Part A: Introduction to the ten cases

This section of the atlas of territories-in-between contains:

- An aerial view to provide the reader with a general overview and impression of the case study area. The aerial view includes an overlay of the field visit strips as defined in section 2.7.
- Three photographs illustrate a specific feature of the case study area.
- A thumbnail page with hill shade maps, which is a grayscale 3D representation of the surface with the sun's relative position is taken into account for shading the image to get a first impression of the key features of the topography for the ten cases. The hill shade map also includes the administrative borders of the area as an indication of the governmental complexity of each case.

Part B: Characteristics of TiB

This section of the atlas of territories-in-between contains five thumbnail double-pages:

- A land cover map to understand the landscape and urbanisation pattern in the case study areas.
- The population density to provide a basic understanding of the distribution of the residential population.
- The location and size of companies to provide an understanding of the type of economy and the spatial distribution of the working population.
- Mobility infrastructure to present the different types, mesh sizes and spatial distribution of different kinds of transportation infrastructure.
- The areas classified as territories-in-between, with an overlay of buildings and transport infrastructure.

Part C: A typology of open spaces

This section of the atlas of territories-in-between contains one thumbnail double-page:

- Typology of open spaces overlaid on territories-in-between and overlaid by major transport infrastructure.

Part D: Landscape fragmentation and accessibility of green spaces

This section of the Atlas of territories-in-between contains three thumbnail double-pages spreads with:

- Ten maps which present the size of the different green spaces overlaid on to the territories-in-between. The maps were used to calculate the effective mesh size of the ten cases.
- Ten maps illustrating the number of residents in TiB with access to green spaces.
- Ten maps showing the intensity of access to green spaces which demonstrate how much of the territory is within the service area of green spaces.

Part E: Mixed-use and Settlement Structure

This section of the Atlas of territories-in-between contains three thumbnail double-pages spreads with:

- Eight maps presenting the number of different functions per 500 m x 500 m grid cell as one indicator for the presence of mixed-use. These maps cover the whole case study area, which includes urban and rural areas.
- Eight maps presenting the number of different functions per 500 m x 500 m grid cell as one indicator for the presence of mixed-use. These maps cover only the territories-in-between.
- Eight maps illustrating the typology of settlement structure as described in chapter 6.

Part F: Present and potential for future sustainability

This section of the atlas of territories-in-between contains a total of ten double-pages spreads:

- The above map on the left page shows the indicators that were used to assess the present situation.
- The bottom map on the left page shows potential for future sustainability.
- The map and diagram on the right page provide an overlay and summary of both.

Part G: Atlas of territories-in-between

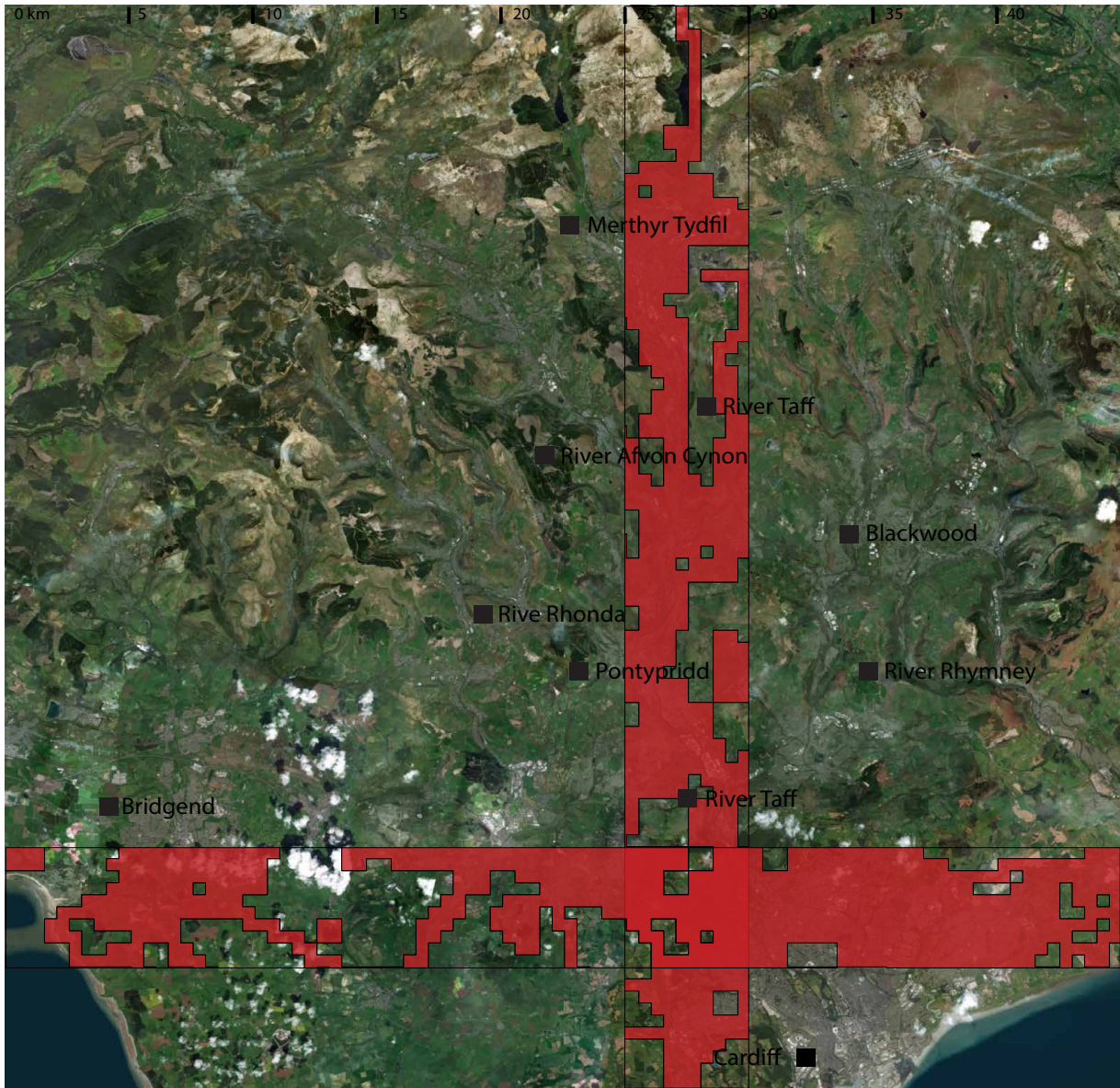
This sub-chapter presents primarily maps from parts B to E, which were generated originally from this research. An additional aerial view, as well as photos of example green and grey spaces are provided.

2.9 Atlas of territories-in-between – Part A: Introduction to the ten cases

This section of the Atlas of territories-in-between contains:

- 1 An aerial view to provide the reader with a general overview and impression of the case study area. The aerial view includes an overlay of the field visit strips as defined in section 2.7.
- 2 Three photographs illustrate a specific feature of the case study area.
- 3 A thumbnail page with hill shade maps, which is a grayscale 3D representation of the surface with the sun's relative position is taken into account for shading the image to get a first impression of the key features of the topography for the ten cases. The hill shade map also includes the administrative borders of the area as an indication of the governmental complexity of each case.

SOUTH WALES



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

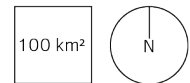


FIG. 2.8 The case study area of South Wales, with the capital city Cardiff in the south-east, Bridgend in the south-west and the rest is covered by the 'South Wales Valleys'.



1

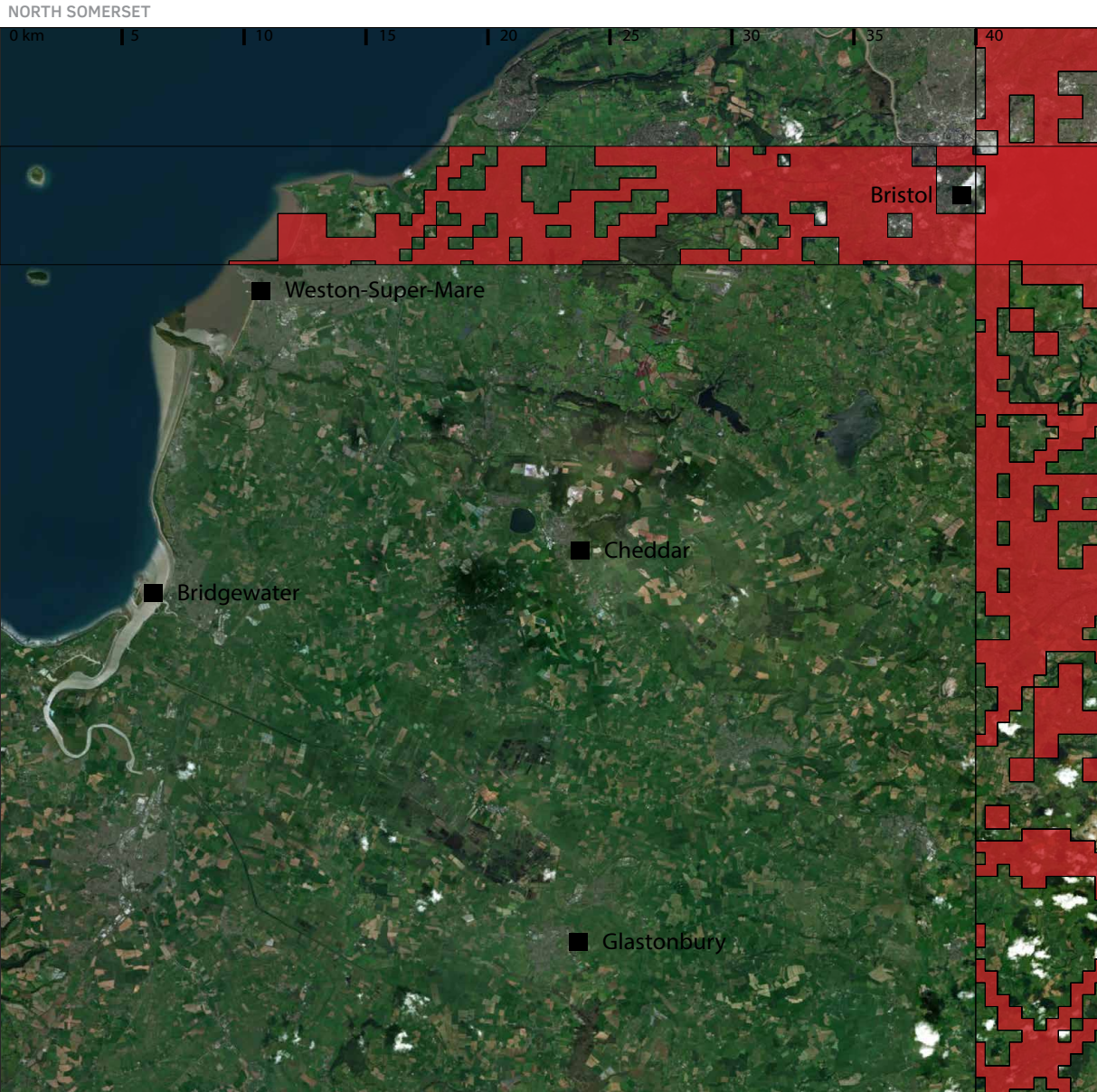


2



3

FIG. 2.9 (1) View over the Welsh countryside. (2) A cul de sac street as a typical suburban element. (3) Images of the historic - mining and iron industry - and present manufacturing industries.



Legend
 Fieldwork strip with the areas
 classified as TiB according to the method
 described in chapter 3

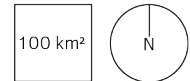


FIG. 2.10 The case study area of North Somerset, which stretches from Bridgewater and the mouth of the River Parrett in the south-east of the square via the Somerset Levels to Bristol in the north-east of the square. The largest town along the coast is Weston-Super-Mare. At the edge of the Somerset Levels and the surrounding hills are cities, with a rich history like Glastonbury and Cheddar.



1



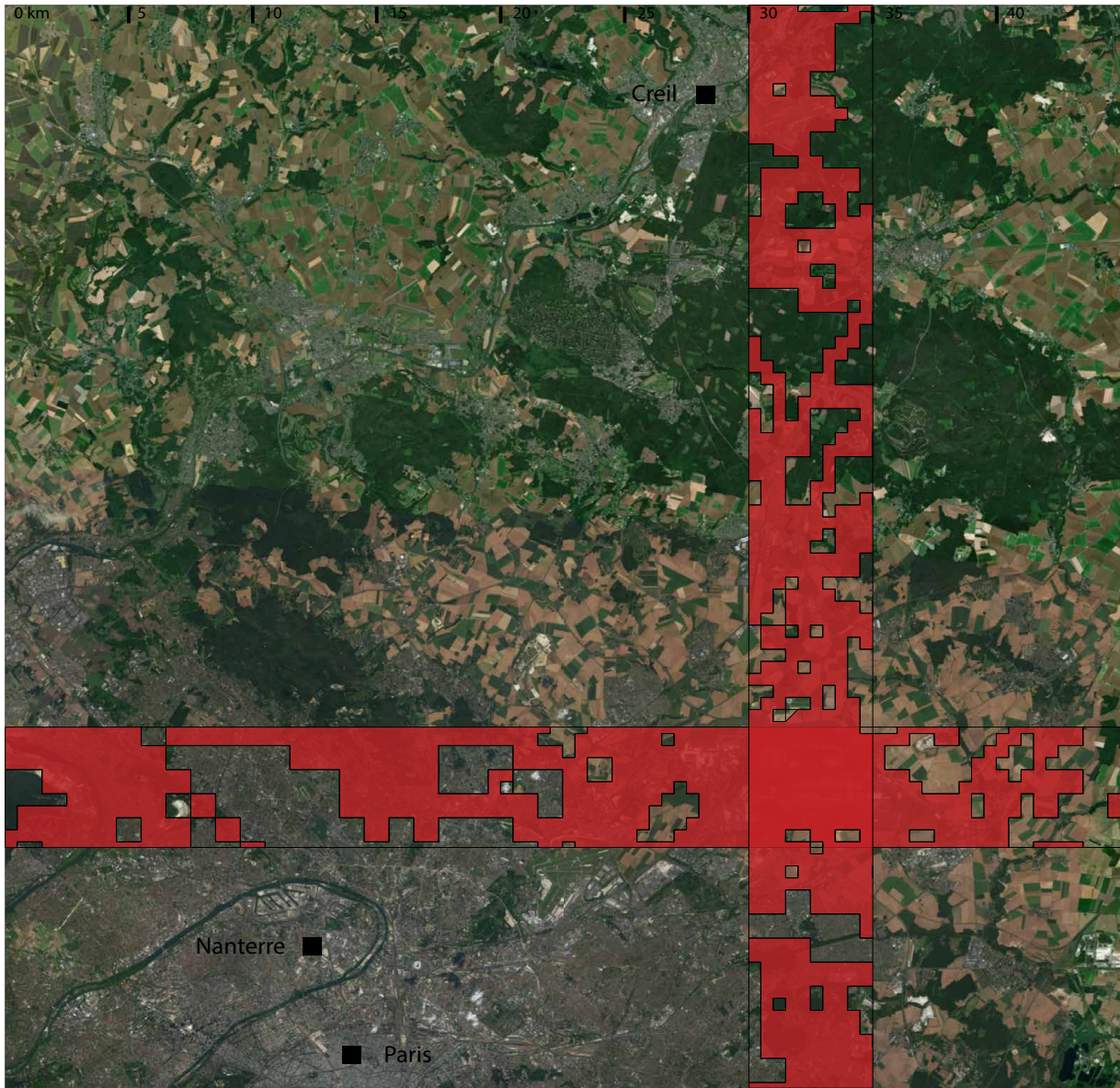
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FIG. 2.11 (1) The view from Dundry in the direction of Bristol across the urbanised landscape. (2) A high-street is one of the key features of many small towns. (3) Three ubiquitous features: the Pub, the mono-functional residential neighbourhood and the forest hills (greenbelt) in the back.

ÎLE-DE-FRANCE



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

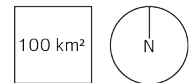


FIG. 2.12 The case study area Ile-de-France, stretching from the North of Paris to Creil in the North. With the Oise Valles crossing from south-west to northeast. The airport, Paris-Charles de Gaulle is a clearly visible in the South-eastern quadrant.



1

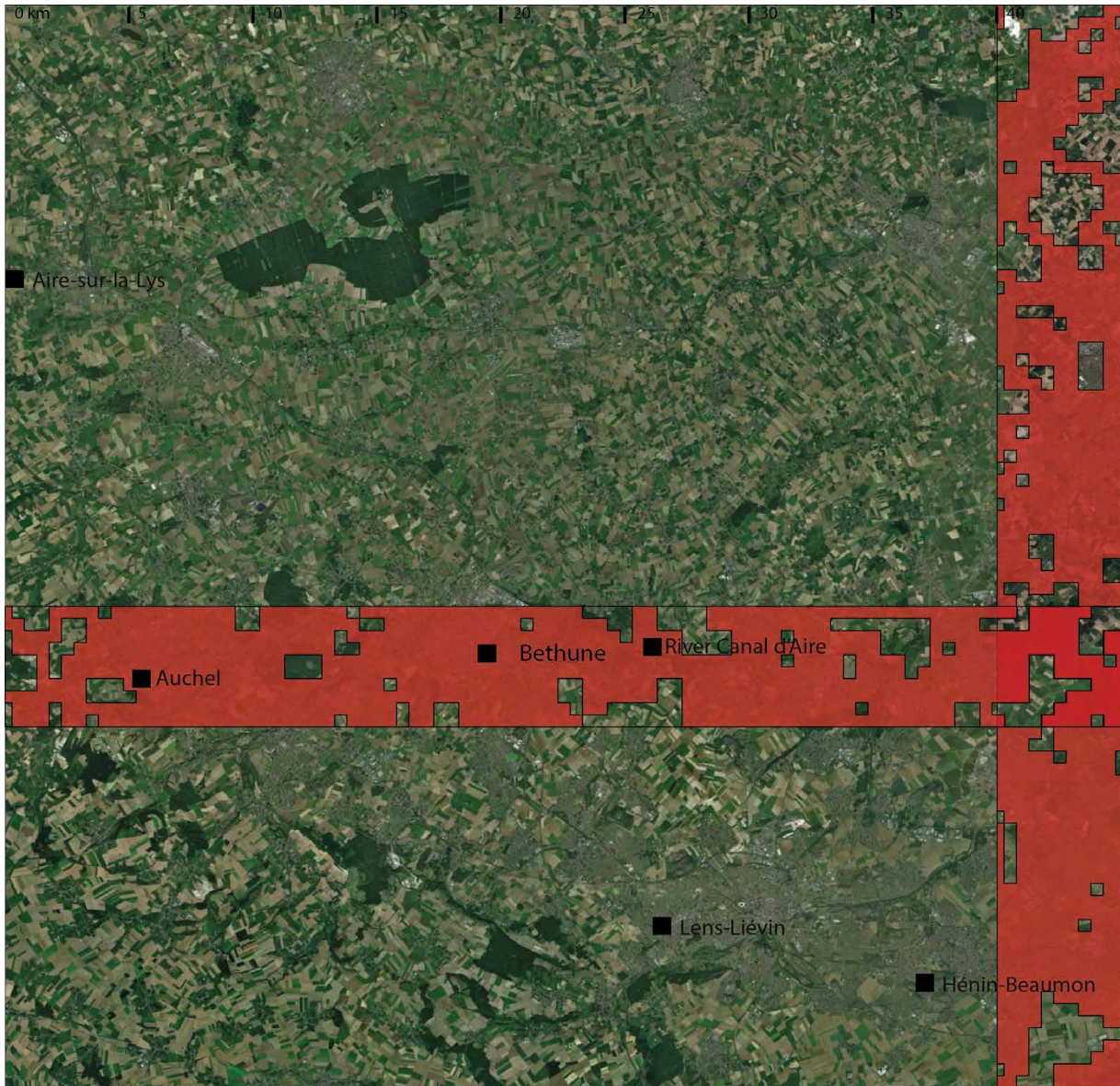


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FIG. 2.13 (1) A typical sharp edge between pavilionaire and agricultural areas in the outskirts of Paris. (2) An intricate pattern in the urbanised valleys. (3) The Great Stables of the Château de Chantilly as the epicentre of an extended equestrian leisure landscape.



Legend

Fieldwork strip with the areas
 classified as TiB according to the method
 described in chapter 3

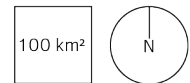


FIG. 2.14 The case study area of Pas-de Calais is situated just east of Lille, with the city of Bethune in the middle of the case study area. The Canal d'Aire crosses the case study area from Northeast to Southwest. West of Bethune, around Auchel is a former mining area. The former military Airport of Merville-Calonne is located in the center of the case study area.



1

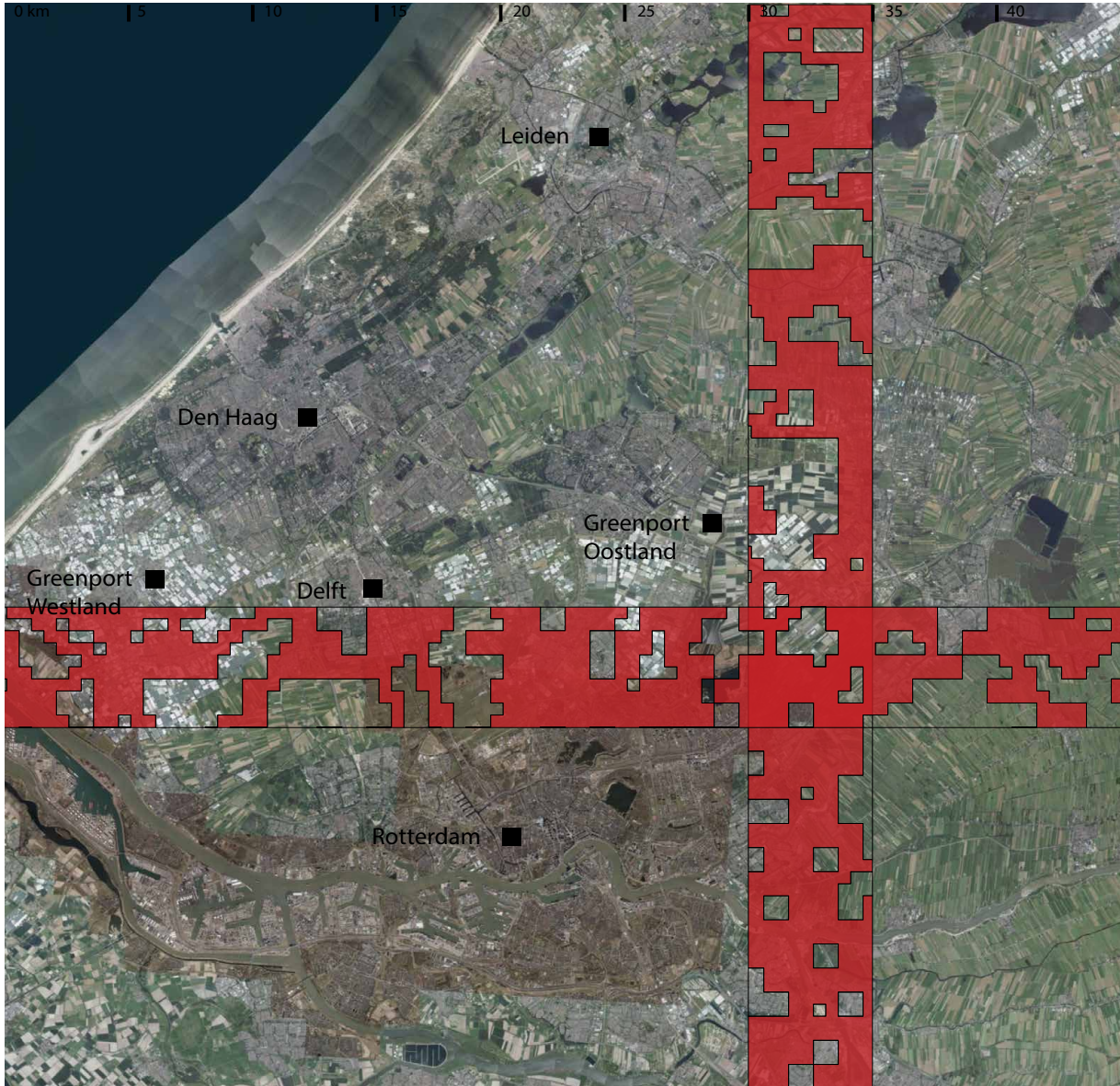


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FIG. 2.15 (1) A former mining site transformed into a leisure and sports facility. (2) A 'polish' mining village. (3) View along the Canal d'Aire



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

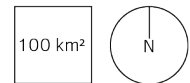


FIG. 2.16 The case study area in South-Holland, with the Maas delta in the south. The Den-Haag- Rotterdam metropolitan area as the south-wing of the Randstad and the edges of the green heart are the main features of the area. Extended greenhouse areas of the so-called Greenport Westland and Oostland are also clearly visible. Another prominent feature is the dunes along the coastline.



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FIG. 2.17 (1) View from the Greenheart towards Rotterdam. (2) Greenhouse meets a terraced house in the Westland. (3) The intermingling of the city and countryside at the edges of Delft. Note the ubiquitous bicycle infrastructure.



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

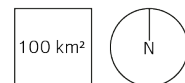


FIG. 2.18 The case study area in Gelderland includes two cities, Arnhem and Nijmegen as well as the river planes of the river Waal, Rhine and IJssel and a ribbon of towns and villages in the otherwise agriculturally used plain. The north of the area is dominated by the De Hoge Veluwe National park, a landscape consisting of heathlands, dunes, and woodlands. In the south, between Nijmegen and Groesbeek, are forests.



1



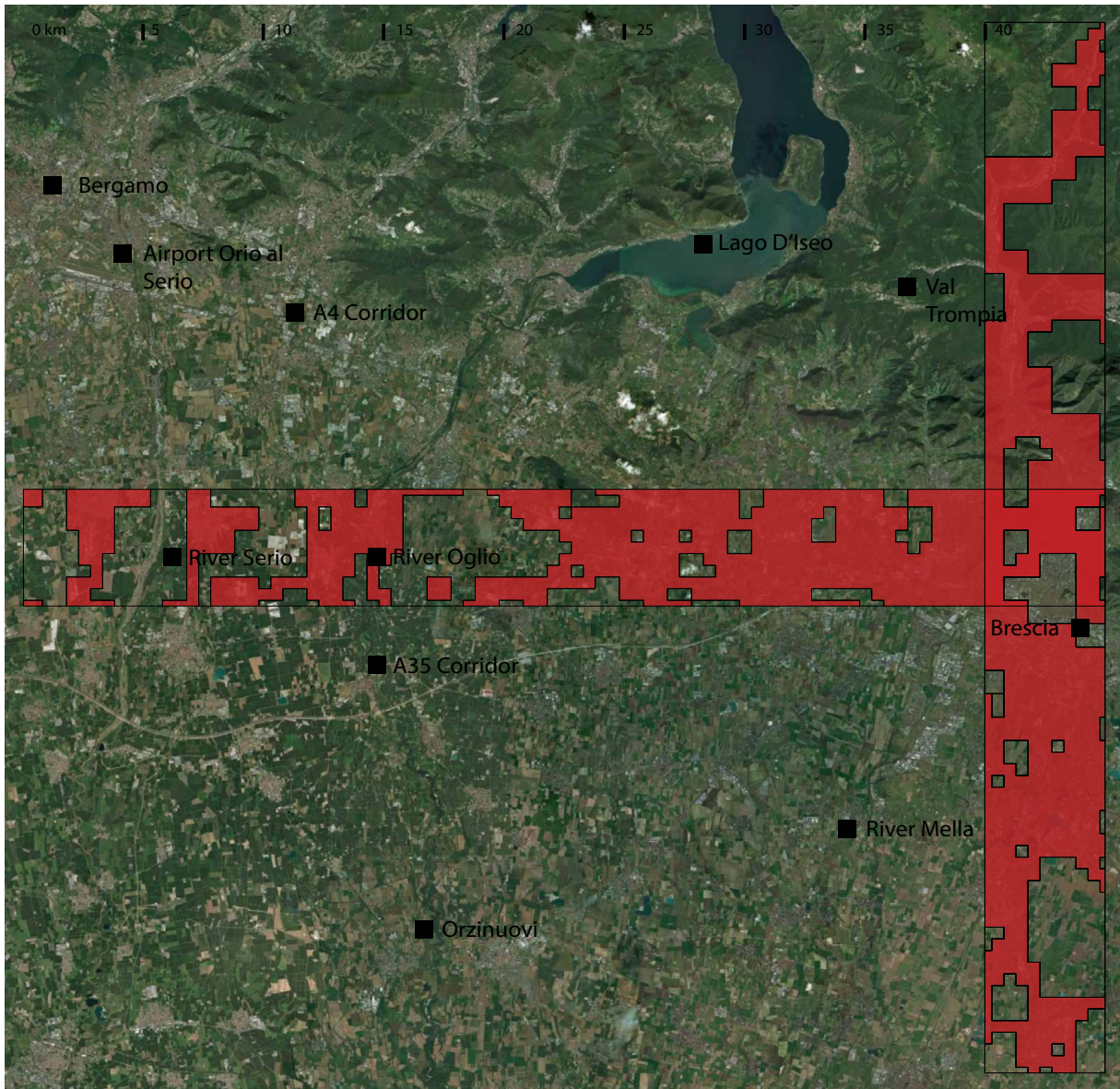
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FIG. 2.19 (1) The Next to each other, 'sub-urban' development and stables and meadows. (2) A typical shopping street in one of the towns. (3) A bundle of transport infrastructure that crosses the area which connects the west of the Netherlands with Germany.

BERGAMO-BRESCIA



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

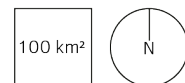


FIG. 2.20 The case study area in Bergamo-Brescia can be divided into three parts These are: the alps in the north and the riverplain in the south and an intensive zone full of infrastructures, like motorways, rail lines and an airport with accompanied urbanisation at the foets of the Alps between Bergamo and Brescia.



1

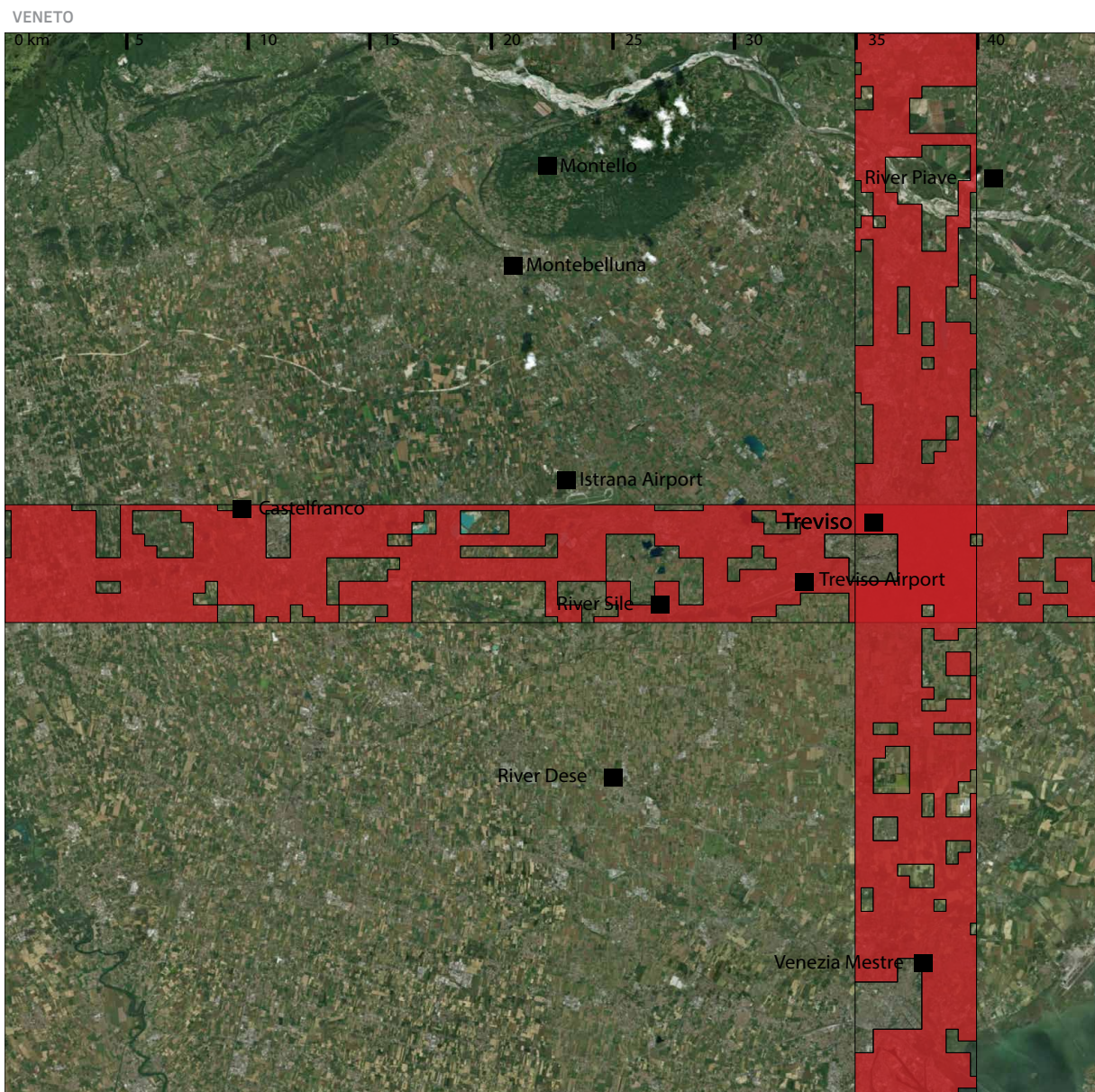


2



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FIG. 2.21 (1) View over the intermingling of the built and unbuilt environment from the alps towards the river plain. (2) The Porte Franche shopping and entertainment centre. (3) View from the riverplain towards the Alps.



Legend
 Fieldwork strip with the areas
 classified as TiB according to the method
 described in chapter 3

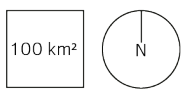


FIG. 2.22 The case study area in Veneto spans from the pre-Alpine hills via the lower plain towards the coastal zone. The city of Mestre is situated in the most south-eastern corner. The river Piave is a visible landscape feature in the north-east in the case study area. The biggest cities in the central area of the cases study area is Treviso. A large part of the case study is occupied by a settlement pattern identified as città diffusa by Indovina.



1



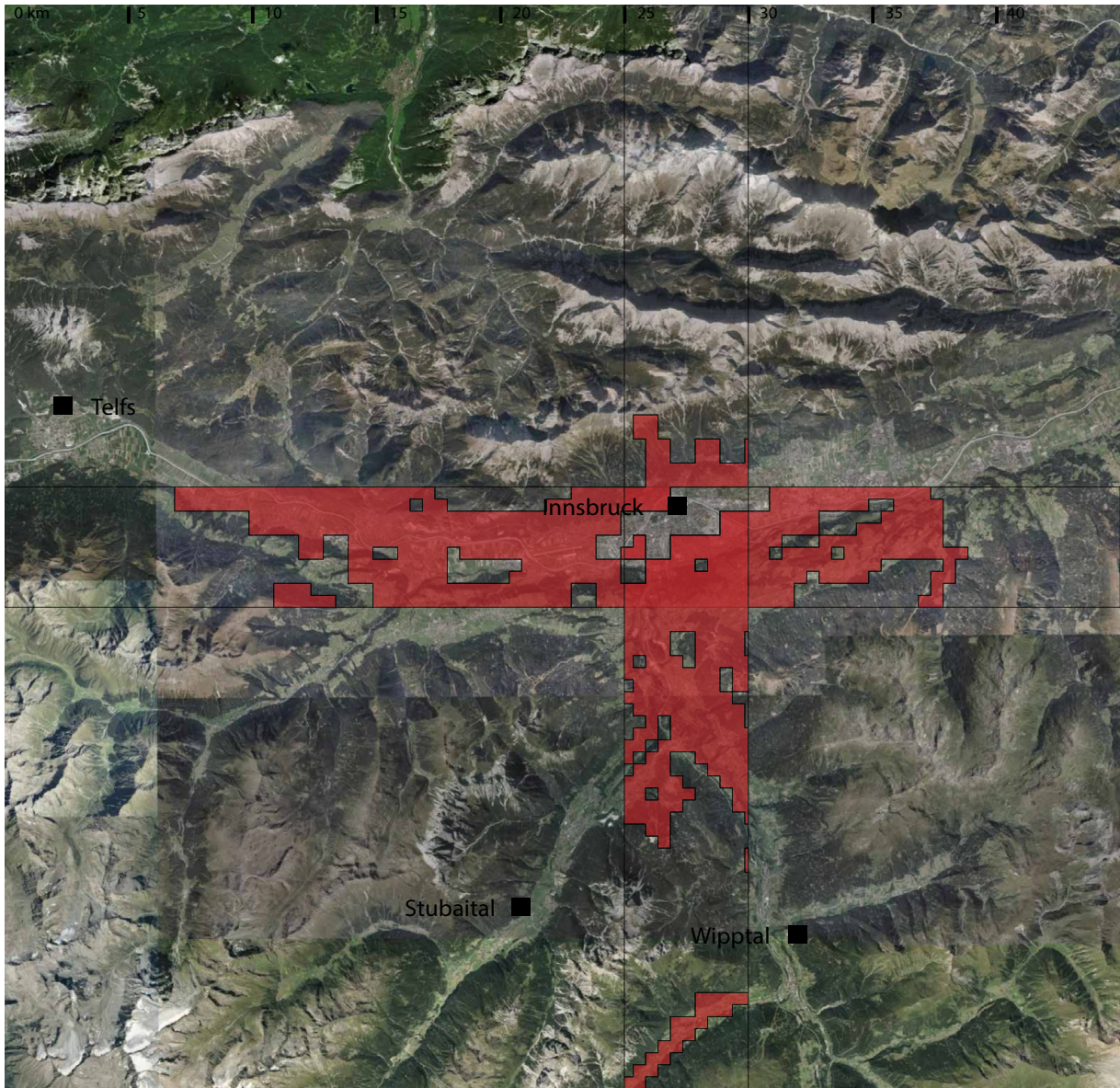
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FIG. 2.23 (1) View across the intermingling of the built and unbuilt infrastructure from the hill-zone towards the lower plain. (2) A typical centre of one of the many historic towns. (3) Long straight roads alongside a diversity of uses.

THE TYROL



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

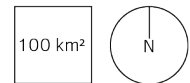


FIG. 2.24 The case study area in The Tyrol with the Inn valley in the centre and the Alps as the most dominant feature. The two valleys leading to the south are the Stubaital wich is one of the the most prominent winter tourism areas in the area.The Wipptal to the east, which leads to the Brenner pass, is one of most important passes of the Eastern Alpine range with the lowest altitude among all passes in the eastern Alps.



1



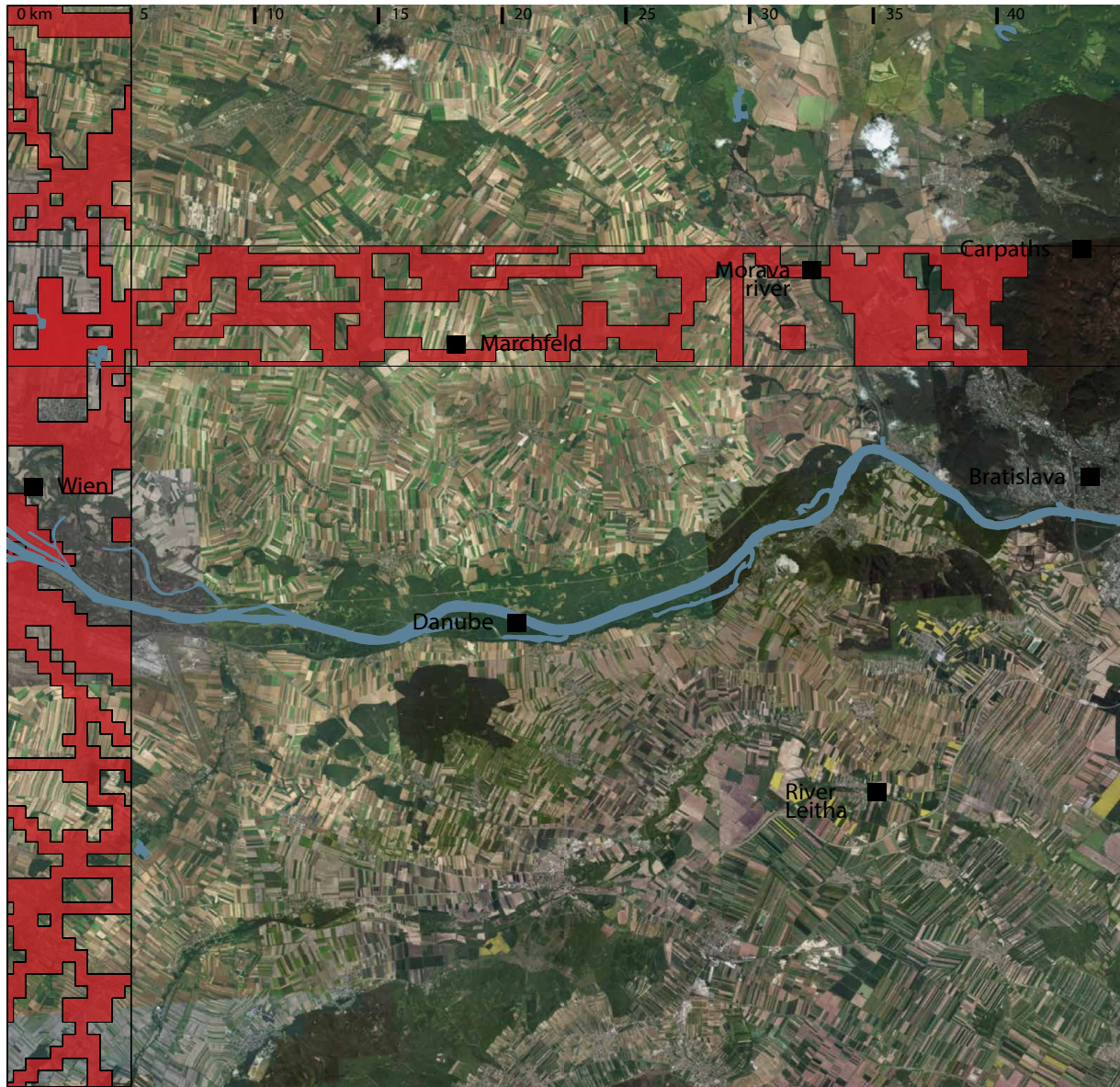
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FIG. 2.25 (1) View along the Inn valley showing the intermingling of agriculture and urbanised areas. (2) Global meets local in the town centre of Telfs. (Photo by B. Hausleitner) (3) The typical transition from an agricultural area into a village in the Inn valley.

VIENNA-BRATISLAVA



Legend

- Fieldwork strip with the areas
- classified as TiB according to the method described in chapter 3

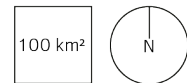


FIG. 2.26 The case study area in Vienna-Bratislava, with the outskirts of Vienna to the west and Bratislava to the east and the river Danube wetlands, a national park – in between. The majority of the case study area is part of the Vienna Basin. North of the Danube is the Marchfeld, one of the most fertile regions of central Europe. The mountain ridges that cross the area from south-west to northeast are the Leitha Gebirge and the Carpaths, which separates the Vienna Basin from the Pannonia Basin. There is a notable difference in the plot size of the agricultural areas in the Austrian part of the case study compared to the Slovak areas. This is the result of different agricultural systems during the cold war, as the Morava river has been part of the iron curtain.



1



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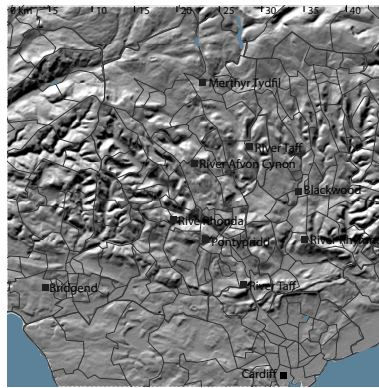
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FIG. 2.27 (1) The intermingling of infrastructure agriculture and 'sub-urban' development. (2) A typical shopping mall, which can be found nearly at the edge of every town or city. (3) An example of the many historic town and city centers.

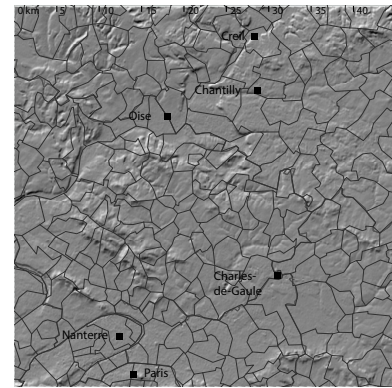
TOPOGRAPHY AND ADMINISTRATIVE BOUNDARIES

Hillshade with Administrative Boundaries

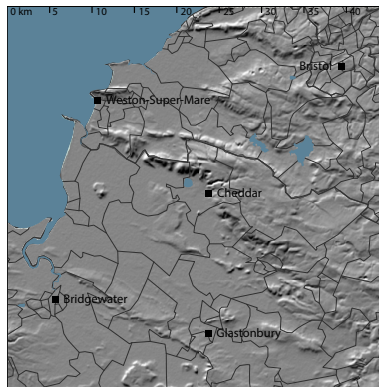
- Municipal Boundaries
- Boundaries NUTS 3
- Boundaries NUTS 2
- Boundaries NUTS 1
- Boundaries NUTS 0



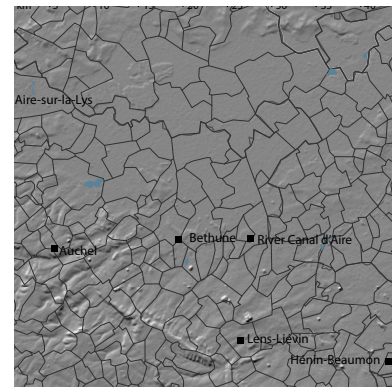
1 South Wales



2 Île-de-France



6 North Somerset

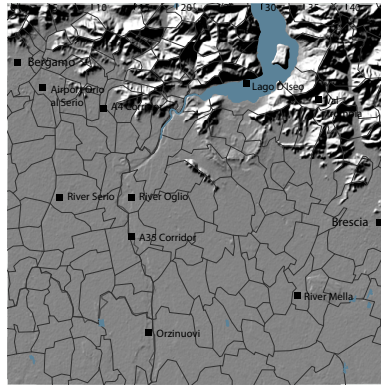


7 Pas-de-Calais

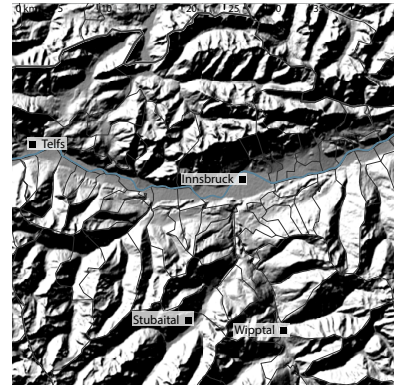
FIG. 2.28 Thumbnails of the ten cases hillshade maps. This is shown through a grayscale 3D representation of the surface, with the sun's relative position taken into account for shading the image to get a first impression of the critical features of the topography of the ten cases. The hill shade map also includes the administrative borders of the area as an indication of the governmental complexity of each case.



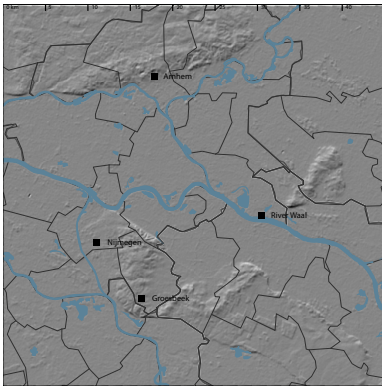
3 South-Holland



4 Bergamo-Brescia



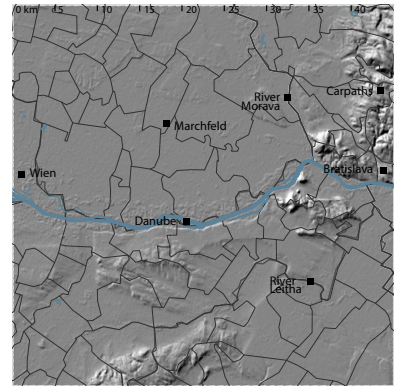
5 The Tyrol



8 Gelderland



9 Veneto



10 Vienna-Bratislava

