8 From Dispersed Urban Areas to Territories-in-between

The dissertation began with the observation that there is an increasing body of literature suggesting that the conventional idea of a gradual transition in spatial structure from urban to rural does not properly reflect contemporary patterns of urban development and their potential for sustainable development. Furthermore, it was argued that large parts of the urbanised areas of Europe are dispersed and that these are neglected in urban and spatial planning policies. Such areas tend to be labelled simply as sprawl, though there is little evidence about whether such dispersed development is more or less sustainable than other forms of urban development. Moreover, evidence points in the direction that large amounts of dispersed urban development ask for different planning instruments which reflect the complexity and network structure of theses specific settlement patterns.

At the turn of the millennium and across Europe, concepts describing dispersed urban areas, like Zwischenstadt, città diffusa or tussenland gained some attention. They share an understanding of design and planning for the territory based on seeing the 'urban landscape as a large interlocking system rather than as a set of discrete cities surrounded by countryside' (Bruegmann, 2005). Nevertheless, none of the concepts influenced mainstream planning policy beyond a few individual plans and projects.

To summarise, there is a limited understanding of the nature of dispersed urban development, uncertainty about how the sustainability of such areas can be assessed, and few policy instruments that would achieve any sustainability potential they offer.

The dissertation sets out to contribute to an improved understanding of these issues by answering the following three research questions.

1. What spatial structures characterise dispersed urban areas in Europe?
2. 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?
3. Are there similarities and dissimilarities concerning potentials of dispersed urban areas in different locations, planning cultures, topographies and histories?

TOC

8.1 Review of research design and process

Figure 8.1 shows how the three different questions were answered and how they informed each other. First, a literature study on dispersed urban development and urban-rural classifications was Figure 8.1 shows how the three different questions were answered and how they informed each other. First, a literature study on dispersed urban development and urban-rural classifications were conducted to identify characteristics that distinguish certain dispersed areas from others which were primarily 'urban' or 'rural' areas. Four aspects have been identified:

1. a distinctive residential and job density;
2. an intermingling of built and unbuilt land;
3. the presence of a large number of infrastructures and other facilities;
4. a distinctive functional mix.

Spatial analysis was conducted at the European scale, regional and local level in two extremely different dispersed urban areas. Tyrol in Austria and South-Holland in the Netherlands were used to define spatial proxies for the four characteristics. This enabled the mapping of 'territories-in-between' (TiB). TiB is an umbrella term that avoids the simple distinction of spatial structure into 'urban' and 'rural', which avoids the urban-rural continuum, and which is not limited by cultural connotations that come with some other terms like Zwischenstadt, because those terms belong to a specific place and are not generic.

Answering research questions two and three was an iterative process. The literature on planning cultures provided a framework for the selection of ten case study areas in five countries across western Europe. See figure x for the names and location of the case studies. The literature on sustainability assessment and dispersed urban development provided a framework to develop a better understanding of the potential for sustainable development, specifically for TiB. The following four aspects came forward as specifically crucial and were further investigated:

a. multi-functionality
b. mixed-use
c. landscape permeability
d. accessibility to green spaces and their ecosystem services.

A series of spatial analyses and mapping exercises were conducted to identify and estimate the potential for sustainable development in each case. A cross-case comparison was used to distinguish which potentials are case-specific and which can be generalised, to a certain degree, across the cases. Field trips completed the investigations of the ten TiB and confirmed the reasonableness of the spatial analyses from data.

The iterative process described above allows for conclusions to be reached on four aspects:

1. a theory of European dispersed urban development;
2. methods of sustainability assessment;
3. estimation of the potential for sustainable development in dispersed urban areas;
4. understanding of (dis)similarities between dispersed urban areas in western Europe

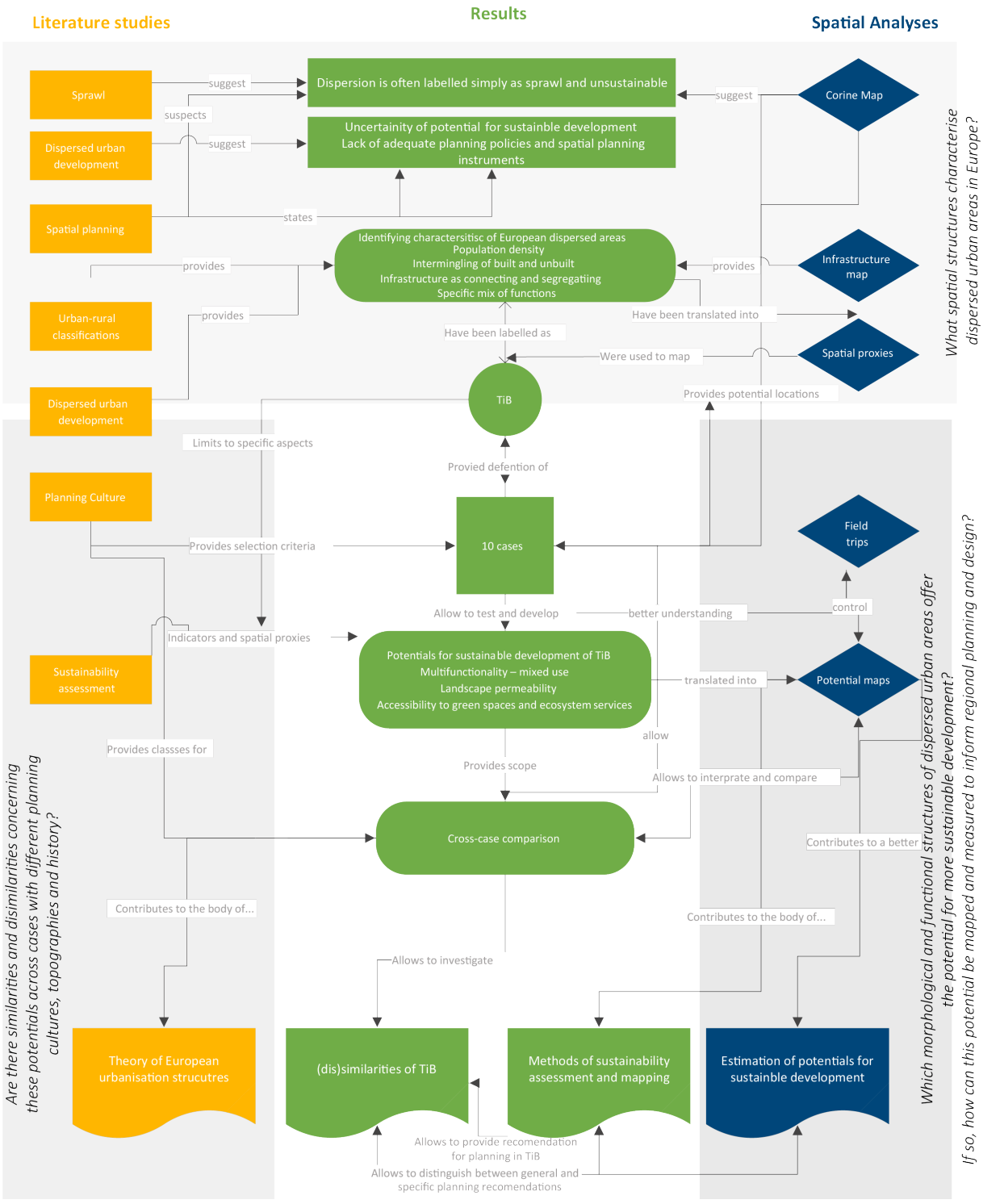


FIG. 8.1 Diagram illustrating the research process.

The following sections report first on the results concerning the distinctive characteristics that identify TiB, and second, the spatial attributes that have the potential to support sustainable development. Finally, the key conclusion and recommendations for planning practice and research from the dissertation are presented.

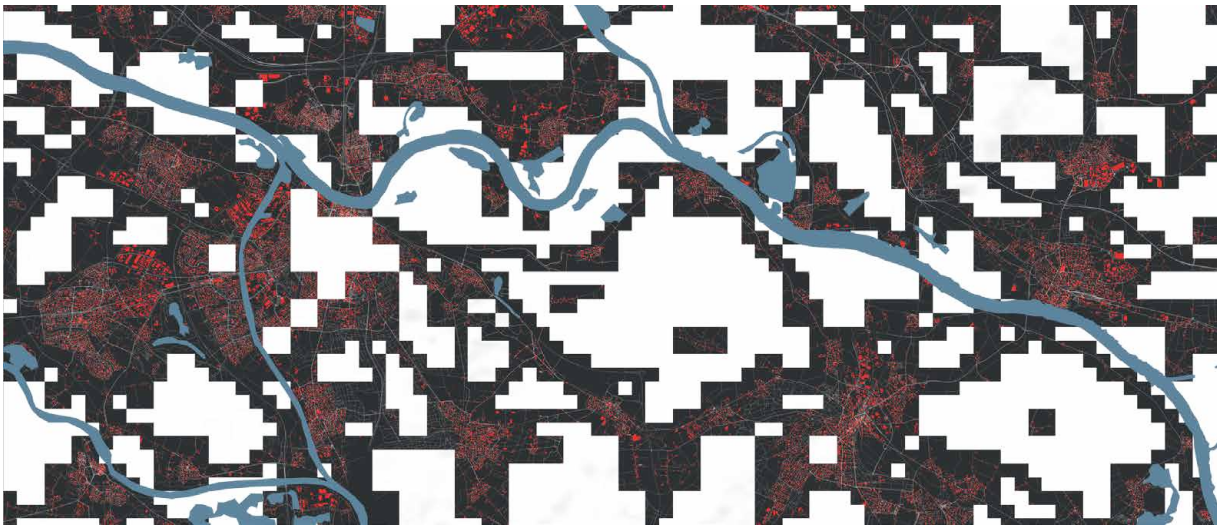
8.2 The distinctive characteristics of TiB

Do dispersed urban areas have characteristics that are distinct from urban and rural? The evidence points strongly to the finding that TiB have a large spatial extent and that a significant share of the EU population lives and works in them. Therefore, it was crucial to be able to bring them on the table by distinguishing and mapping them. To be able to map TiB a definition and characterisation were necessary. The dissertation investigated the spatial characteristics of TiB with three aims, to first understand whether and to what extent dispersed urban development has similarities across Europe; second, to be able to map and thereby identify the cases for the cross-case study, and third to be able to relate these characteristics with the potential for sustainable development.

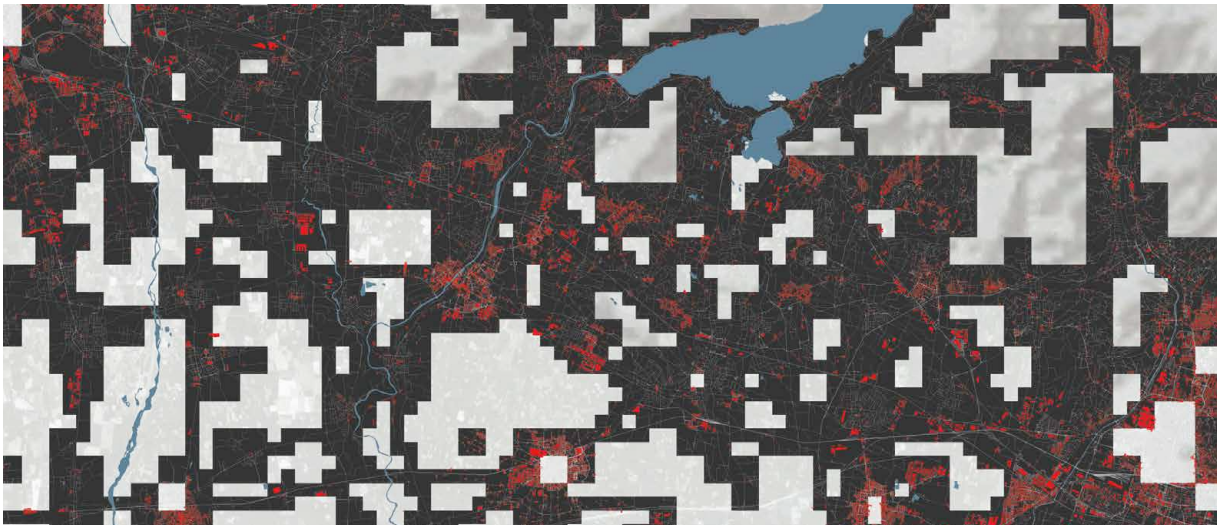
Four aspects proved to be critical for the distinction of TiB: (i) a specific range of density of living and working population, (ii) a complex interlocking system of built and open spaces, (iii) that their existence is highly influenced by the connecting and separating role of infrastructure at different spatial scales; and (iv) they often exhibit a complex mix of functions.

The territories-in-between mapping approach begins with the living and working population. The analysis needs to address three limitations of standard approaches, (i) it goes beyond relying only on the use of residential population density as the prime indicator as this indicator goes hand in hand with often entirely arbitrary cut-off points; (ii) population density approaches predominantly depart from administrative or statistical boundaries (the European NUTS system) because these delimit the areas about which international comparative data are available; (iii) the working population, traditionally excluded in urban-rural classifications, was one way to consider the high temporality and movement of the population during day times. Other temporary types of population, like tourist or pupils, could not be considered. We concluded that TiB have a characterising total (living and working population) density of between 150 to 5,000 people per square km.

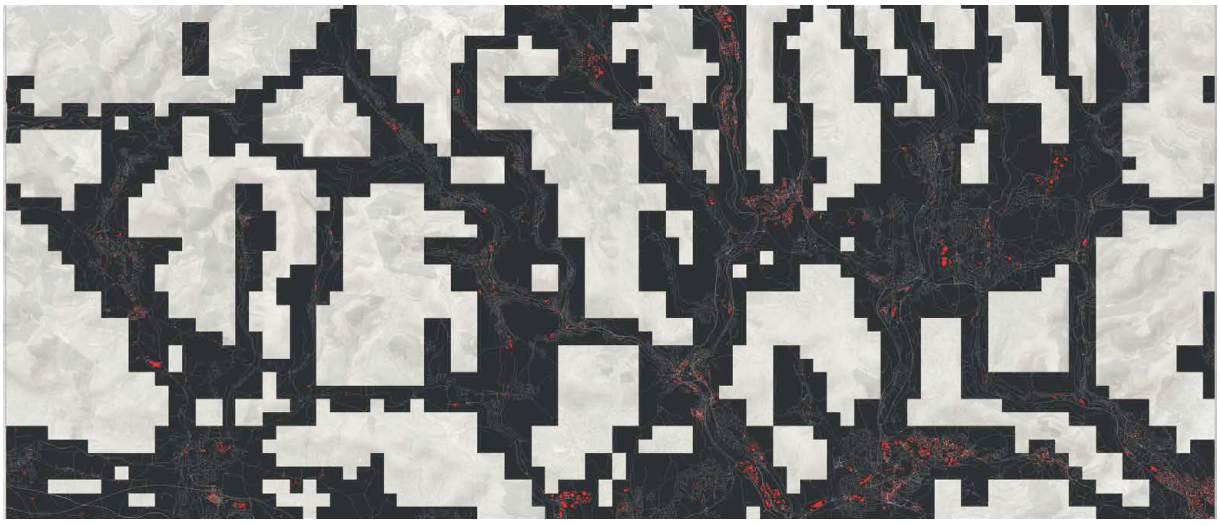
5,000 people per square km may suggest an urban settlement patterns but the territories-in-between approach adds to the quantitative aspects a quintessential spatial approach, based upon the identification of the above listed critical spatial qualities. The intermingling of built and unbuilt is a morphological criterion. A combination of different CORINE land cover classes was used to proxy this variable. The maps of TiB, see chapter 3, show the typical ground figures of dispersed development and allow an interpretation of the relation between built and open spaces, green or grey, on the local scale as well as on the regional scale. Three types of ground figure have been identified in all cases. The first is a field like form of development that often followed the historic street and agricultural parcel patterns. In these fields, very often some of the historic towns or villages show a concentration of densities and functions. See FIG. 8.2.1 for an example. The second are corridors along infrastructure lines, predominantly motorways, with concentrations of densities of built form and functions at the entrance and exit points of motorways. See FIG. 8.32.2 for an example. The third concerns TiB in mountain valleys where, because of the limited space availability, a more equal and intense ground figure with an apparent linear form next to each other off built and unbuilt is visible. See FIG. 8.42.3.



1



2



3

FIG. 8.2 The three different ground figures of TiB: (1) the network of towns and cities, here a zoom into the case of Gelderland; (2) the corridor type, here a zoom into the case study of Bergamo-Brescia, (3) the valley type, a zoom into the case study area of South Wales.

Infrastructure plays different roles at different scales. At the local scale infrastructure divides the territory, physically separating adjacent land uses. At the regional scale infrastructure has a connecting role – linking places and functions. Infrastructure and related connectivity, centralities and accessibilities are crucial for the development potential of different places considering specific economic development possibilities.

The outcome for territories-in-between is that they form a network of distant but functionally connected areas at the regional scale, but a patchwork of proximate but sometimes functionally disconnected areas at the local scale. In other words, adjacent land uses may not have any spatial or functional interconnection, whereas there are closer socio-economic functional relations between areas that are not in the same local area. Infrastructure does not only play a different role in the socio-technical system of TiB but also for the socio-ecological system. While large scale infrastructures like motorways and rail lines disconnect ecological relations locally, some of them, where they are accompanied by buffer zones that allow animal migration, function as eco-corridors at the regional scale. Including infrastructures into the mapping exercise has one specific advantage over other urban-rural classifications. Namely, it amplifies the network nature of TiB, showing their interconnectedness independent of urban centres.

The results of the analysis of the four indicators for the potential for sustainable development are presented in the following section. For each indicator I consider how different aspects of form and function are related to each other and how these relations have been used to derive indicators for the potential of sustainable development.

8.3 Form and function and their relations as indicators for the potential for sustainable development

The second research question asks which morphological and functional structures of dispersed urban areas provide a specific potential for more sustainable development, and how can these potentials be mapped and measured to inform regional planning and design? The question was investigated using a series of spatial analyses on aspects of the morphology of TiB. Morphology was considered in terms of infrastructure networks and the open space system. Different types of function were expressed in economic and residential activities, and land cover. These aspects are used to calculate and map indicators for the potential of sustainable development. Four indicators have been selected: Landscape Fragmentation, availability of ecosystem services, multi-functionality of open spaces and mixed-use;

The results of the analysis of the four indicators for the potential for sustainable development are presented in the following section. For each indicator I consider how different aspects of form and function are related to each other and how these relations have been used to derive indicators for the potential of sustainable development.

8.3.1 Landscape fragmentation

Landscape fragmentation, as an indicator of social and environmental sustainability, is the most straightforward to calculate and map. It is defined as the relation between the segregating function of infrastructure networks and settlement structures on the permeability of the green open space structure. It is mapped and expressed by the effective mesh size. See FIG. 5.1 for a simplified explanation.

The results presented in chapter three show that an effective mesh size between 0,7 square kilometers and 1,8 square kilometers is typical for TiB for eight out of ten cases, only Vienna-Bratislava and Pas-de-Calais have an effective mesh size above 2 square kilometers. Furthermore, there is no apparent relation between population density and landscape fragmentation. The case with the lowest population density, Vienna-Bratislava, still shows the least landscape fragmentation, but the three most densely populated TiB are in the middle of the ranking. Therefore, the sustainable development of TiB is influenced by a combination of factors including topography, technical and green-blue infrastructure, the resulting settlement patterns, and by spatial planning policy and decisions.

TABLE 8.1 Comparison of effective mesh size in the ten cases.

Case study name	Total case study area		TiB within case study area	
	m_{eff}	Rank	m_{eff}	Rank
Bergamo-Brescia	21.912	3	0.405	10
Gelderland	9.191	8	0.956	7
Île-de-France	0.875	10	1.485	4
North Somerset	20.162	4	1.721	3
Pas-de-Calais	9.694	7	2.303	2
South-Holland	10.668	6	0.477	9
South Wales	13.553	5	1.224	6
The Tyrol	199.320	1	1.459	5
Veneto	1.672	9	0.865	8
Vienna-Bratislava	22.917	2	2.782	1

8.3.2 Availability of ecosystem services

The availability of ecosystem services is a more complex aspect to evaluate. It requires consideration of the morphology and diversity of green spaces in an area; the connectivity and accessibility that is provided or hindered by the infrastructural system; and the composition and density of the population that could profit from the ecosystem services. The analysis employed two methods to investigate the potential availability of ecosystem services: i) the accessibility of green spaces, which takes into account their size and the residential population that has access to them; and ii) a typology of green (and grey) land uses so as to address how the availability of ecosystem services is structured by the connectivity of green spaces with economic functions.

People living in TiB have access to more green spaces than those living in urban areas. In urban areas in eight out of ten cases more than 50 per cent of the population has access to at least one type of green space. For TiB, this is true for all ten cases. This confirms one of the significant factors of population migration towards TiB, they offer better access to more green space, but this

quality is only available for a rather low share of the population. The population within TiB that has access to at least one type of green space ranges from around 50% (Bergamo-Brescia and Pas de Calais) to close to 90% in Gelderland. In the majority of cases (six out of ten), more than 40 per cent of the population of TiB has access to more than one type of green space.

TABLE 8.2 Accessibility to green spaces in TiB across Europe.

Case study name	Percentage of population with		
	Access to at least one type	Access to more than one type	Rank
Bergamo-Brescia	53	24	10
Gelderland	89	58	1
Île-de-France	52	28	9
North Somerset	68	40	4
Pas-de-Calais	83	52	3
South-Holland	68	40	4
South Wales	63	43	7
The Tyrol	83	53	2
Veneto	62	29	8
Vienna-Bratislava	66	29	6

A comparison of the two metropolitan cases, the Île-de-France and South-Holland, shows that the latter performs nearly twice as well. This is interesting because large green spaces dominate the green network structure of the Île-de-France, while in South-Holland small and medium-sized green spaces cover a larger area. These different patterns are probably mostly a result of different historic evolution of the settlement patterns.

The Potential for ecosystems services varies according to the spatial relation of a specific open space to its centrality. The centrality is a function of the street network, accessibility to and connectivity of services as well as densities of services, production and consumption. The type of green space that covers the largest area in all cases has a high potential to develop especially provisioning and regulating ecosystem services. Furthermore, they are close to the backbone of the existing regional ecological network. Therefore, these spaces play an important role in completing a regional green network which also integrates urban ecosystem services.

8.3.3 Multi-functionality of open spaces

Multi-functionality is the capacity of an area to provide more than one function, either at the same time or at different times. But the potential for multi-functionality is difficult to assess. The typology of green spaces presented in chapter four assumed that the potential is very distinct based on the spatial relation of a specific open space to its centrality as a resulting characteristic of the street network, accessibility to and connectivity of services as well as densities of services, production and consumption. The results show that grey open spaces, which are defined by Swanwick et al. (2003) as 'land that consists of predominantly sealed, impermeable "hard" surfaces' show high potential for multi-functionality. See FIG. 4.13 for amount and type of grey spaces within the ten cases.

8.3.4 Mixed-use

Mixed-use is defined as the presence of more than two uses within one spatial unit (building, block or neighbourhood) and is an indicator of economic and social sustainability. The dissertation presented two mixed-use indicators, (i) the job to residents ratio and (ii) the number of different economic functions per spatial unit.

The results showed that mixed-use is a property of European urbanised areas, whether dispersed or not. In six cases, investigated at a resolution of 500 m x 500 m cells, more than 65 per cent of grid cell host three or more functions. The exception is the British cases, with 61 per cent for North Somerset and 55 per cent for South Wales. An apparent result is that there are in all instances obvious differences in the frequency distribution for urban, TiB and rural areas. Most cases show that in rural areas, low mix classes (1-4) are dominant. The TiB shows a more equal, distribution across all mix function classes often with a peak around class six. In the urban areas, the highly mixed classes (9-11) dominate in all cases. See figure 8.3. A further aspect to note is that there are mixed-used areas where both, the density of inhabitants and jobs is rather low, as well as, in areas where the density of residents is comparatively high.

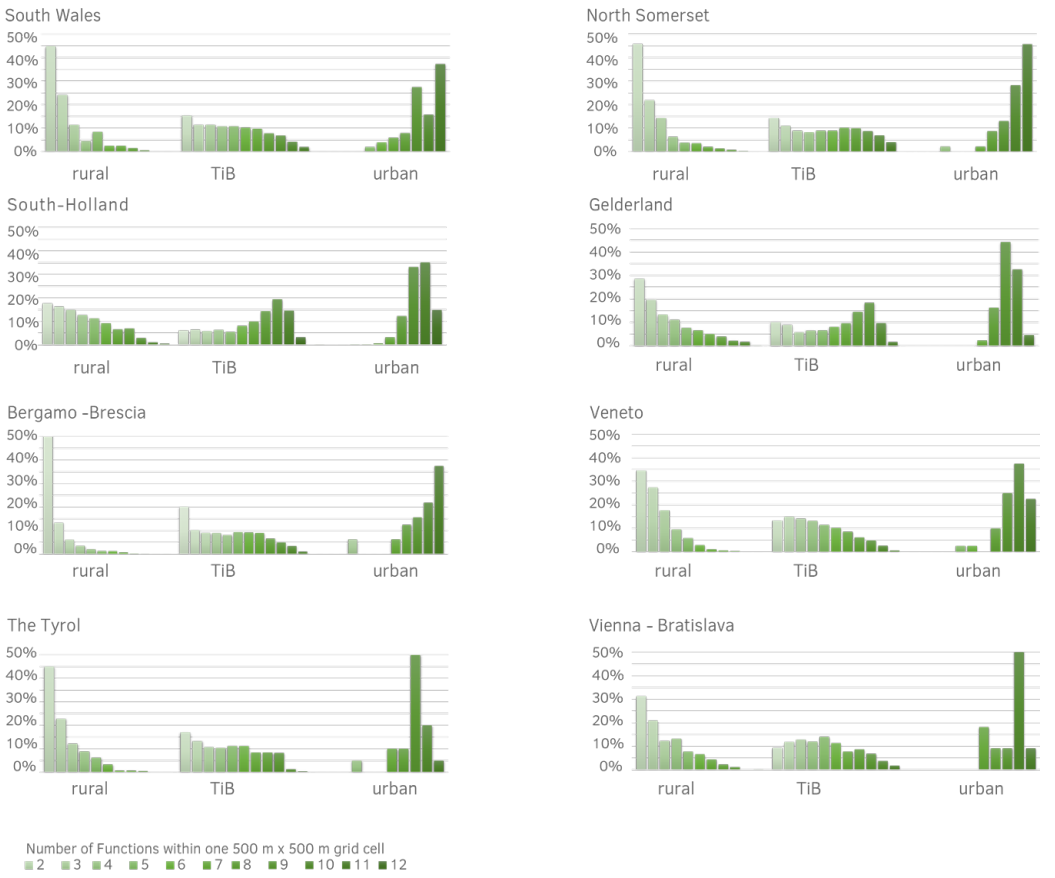


FIG. 8.3 Frequency distribution of mix function classes over urban, TiB and rural for all eight cases. Note that the French cases were not included in the mixed-use study.

Indicators are correlated with five settlement characteristics, grain, density, permeability, centrality and accessibility to understand why certain areas are mixed-use and others not. The typology of settlement characteristics developed shows that mixed-use is significantly diverse between different types of settlement characteristics. The types with the highest mixed-use are characterised by (i) good accessibility to both the motorway system and public transport; (ii) a very high local and regional betweenness; (iii) high population and job density; and (iv) high permeability and small grain pattern of the street network. In the Dutch and Austrian cases, a rather high mixed-use is present in areas with medium local and regional betweenness, medium permeability and medium grain size as well as low population density and medium job density. It leads to the conclusion that in both countries, there may be policies and practices in place that support mixed-use in less densely populated areas. Moreover, the typology shows that in settlement typs with a high population density, this factor compensates for lower accessibility and centrality values.

8.4 Conclusions and Recommendations

Do dispersed urban areas have distinct characteristics? In sum, the findings show that dispersed urban areas in Europe are quite distinct from urban and rural areas and that they share characteristics from one place to another. The findings also show that the well-worn notion of a continuum from urban to rural does not stand up to the evidence, and is a crude simplification of the complexities and socio-ecological systemic relations which characterise TiB. It follows that effective spatial planning for such areas needs to be built on a more careful analysis of characteristics and potential for sustainable development.

Although the ten cases have very different local identities, they share similar landscape morphological structures but even more characteristics of settlement structures as well as economic and residential location patterns.

Sub-areas, such as zones around low-cost carrier-dominated airports (to name an extreme example) are more similar between cases than with other parts of TiB in the same case. Shopping areas, business and industrial parks also share similar characteristics across the cases. Another similarity is development corridors along with technical infrastructures, as well as networks of towns and villages. Therefore it is possible to draw conclusions and recommendations for assessing potentials for sustainable development across all cases.

The following section explains four main conclusions from the research:

- The potential for sustainable development is underestimated.
- To understand and harvest the potential for sustainable development, analytical and planning approaches need to consider both local and regional aspects in an integrated manner, as well as strategic and regulating aspects.
- Planning for TiB should use specific planning and design principles that go beyond the simple application of the compact city.
- TiB deserve an adequate place in planning theory.

8.4.1 Underestimated potential of sustainability

The research investigated three aspects of sustainable spatial development, the potential of multi-functionality, the provision of ecosystem services and the presence and potential for mixed-use.

Gallant et al. (2004) argue that multifunctionality is the key to the sustainable development of TiB, because, their unique characteristics offer potential to lessen the negative impacts of built structures by enabling them to perform additional desirable functions and objectives. The potential for photovoltaic panels on the vast areas of flat roofs of industrial and business parks is a simple but often named example for multi-functionality. Chapter 4 shows that potentials for multi-functionality in TiB go beyond the buildings. Especially grey open spaces provide a significant potential for multifunctionality. Examples like parking lots that become food or flea markets at specific times can be found in all cases and play an essential role in the provision of the goods of daily need. There is also large potential multi-functionality that integrates multiple functions at a location at the same time. Examples that were observed were more informal ones, like using parking lots as a playground or to produce and exhibit art as well as using parts of grey spaces for gardening or food production. This confirms Viganò (2011), who proposes beginning with open spaces when designing within dispersed urban territories. Particularly as the analyses show that the amount of open grey spaces is large and that many of them are located in central and highly accessible places, which provide the possibility to contribute to multifunctionality also at the regional scale.

Greenspaces have an inherent potential through multifunctional use to not only lessen the negative impact of climate changes but also to provide a positive impact on the liveability of citizens. Concepts like green infrastructure or ecosystem services focus on developing these positive effects.

The maps presented in this study show that the most common green spaces, but also significant parts of grey spaces in TiB have the potential for multiple ecosystem services. The form of the potential is very distinct according to the spatial relation of a specific open space to its centrality as a resulting characteristic of the street network, accessibility to and connectivity of services as well as densities of services, production and consumption. The type of green space that covers the largest area in all cases has a high potential to develop multifunctionality since these open spaces are under a rather low level of development pressure because they have lower accessibility to the fast transport network. Then again, they are very close to the backbone of existing green infrastructure and the regional ecological network, which makes them specifically crucial to develop provisioning and regulating ecosystem services. In this way, they provide the strategic potential to contribute to a regional green network which also integrates urban ecosystem services. There is a significant potential to develop green and grey open spaces along with the network of grey infrastructures, to provide ecosystem service but also facilitate multi-functionality. To develop this network, which very often is located crisscrossing the existing blue-green infrastructures, is essential for regenerative development of dispersed areas.

Chapter 5 added a more systemic analysis of the multi-functionality of the regional system of green spaces and answered whether less fragmented greenspace systems in TiB also provide better accessibility for the population of TiB to green spaces? Moreover, which settlement patterns and therefore, spatial planning and design approaches, combine both biodiversity and accessibility more successfully? These questions are relevant as access to green space is essential for the development of educational, aesthetic and cultural values as well as improving recreation and physical and mental health. Experiencing (urban) biodiversity is a key to halting the loss of global biodiversity because people are most likely to take action for biodiversity if they have direct contact with nature. Who has access to which green spaces is, therefore, a question that will challenge

urban planning and design in the coming decades? Moreover, the unevenly distributed benefits of green space raise questions concerning environmental justice.

The answer to these questions is for the ten tested cases, that there is no clear relationship between landscape fragmentation and accessibility of green space. There is the same amount of cases that perform in the same direction for both indicators, as there are cases that perform for both indicators in the opposite direction. Certain conclusions have been drawn for the settlement patterns that perform best. An extensive and un-fragmented regional network of green spaces as the backbone is crucial. Whether this is in the form of green belts, green fingers, buffer zones or landscapeparks, does not make a big difference. It is crucial that these large green spaces are easily accessible, preferably by foot, bike or public transport.

It is essential that traffic and other infrastructures are located and designed in a way that they fragment the big green spaces as little as possible and do not block access to large green spaces. It is also essential to avoid cul-de-sac settlement patterns and gated communities, as well as impermeable industrial or business parks at the edge of the settlements. Although often intended to curb urban development and thereby aim to protect green spaces, they often limit pedestrian access to leisure spaces and may enforce the use of cars.

Cases that have a more compact settlement pattern—where medium-sized greenspaces separate individual cities, towns and villages—tend to perform better on both indicators as these structures allow a greater interweaving of built and unbuilt spaces. An encouraging result, as most of Europe, is formed by a network of towns and small to medium-sized cities. Crucial here is to make sure that the medium-sized green spaces are easily accessible. In contrast to large green spaces, the midsized green spaces are often not part of national planning or environmental protection policies, therefore, regional and cross municipal cooperation is crucial to establish this part of a regional green system.

Moreover, a large amount of well-distributed small green space is crucial for a fair distribution of ecosystem services. Specifically, relevant is that ongoing densification often goes hand-in-hand with a change of housing typology from family housing with private gardens to single-occupancy flats without private gardens. Moreover, the densification efforts often transform green spaces, which are considered as underused but are nevertheless essential for biodiversity and human well-being.

The results and maps presented here have the potential to facilitate and inform discussion across the many fields of expertise and actors involved in protecting and assist in developing a system of green space in TiB. This is specifically important for TiB, where the expected future densification of urban uses and the protection of (urban) biodiversity are causing and will continue to cause conflict among different groups of interest.

Mixed-use, preferably integrated into a pedestrian-oriented environment, is a further aspect of sustainability. Chapter six investigates mixed-use further. The typology presented in this paper showed that mixed-use in TiB could be related to specific settlement characteristics. The characteristics investigated were: grain, density, permeability, centrality and closeness to transit stations and motorway entries.

The areas with the highest mixed-use are characterised by good accessibility to both the motorway system as well as to public transport, and a very high local and regional betweenness centrality. Furthermore, a high population density and high job density as well as high permeability and small grain size of the block structure support mixed-use. The Dutch and Austrian cases show a rather high

mixed-use in areas with medium local and regional betweenness, medium permeability and medium grain size as well as low population density and medium on job density. The last two may lead to the conclusion that in both countries, there are policies and practice in place that support mixed-use in areas with lower population densities. The typology also shows, that in the areas with high population density, this factor compensates for lower accessibility and centrality values. The research clearly shows that mixed-use is related to both local and regional settlement characteristics.

8.4.2 The importance of a cross-scale analytical approach

The chapter on underestimated potentials for sustainability clearly revealed that in order to be able to profit from the potentials for future sustainable development, which are present in TiB, it is crucial to understand that, because of the networked structures of TiB, elements of the regional structure influence the potential for sustainable development of local structures and vice versa.

The indicators and typologies presented in this research were all built on types of spatial analysis that considered these systemic relations. The landscape fragmentation of a region may change significantly by local interventions, like a street or an ecoduct. To determine if a plot has the potential to house mixed-use is highly dependent on its centrality within the regional street network or how accessible it is by public transit. Local small grain sizes of the street network and pedestrian-friendly local streets in multiple places contribute to a more livable region. Further, the provision of ecosystem services shows the same pattern when positive effects are dependent on the characteristics of the open space system at multiple scales.

The analytical methods developed and presented in this research respect this need for developing knowledge and understanding through scales. This is done by always choosing a minimum of at least three scales. First, a 50 km x 50 km square, spanning across local, regional and in some cases even national administrative borders. Second, the sub-areas classified as urban, rural and TiB are within these squares in order to understand and make specificities of TiB apparent. Lastly, all analyses worked with a resolution of 500 m x 500 m and in many cases, even higher. The resulting maps and quantitative findings aim to inform spatial planning and policymaking at different territorial scales. This is essential as it is apparent that (spatial) planning and policymaking needs to work through scales for future sustainable TiB.

8.4.3 TiB require specific planning approaches and adequate place in planning theory

European mainstream planning is concentrated on prolonging and promoting the success of the compact, sustainable European city model. Neglecting that Paris, Milan, Madrid, Vienna, Copenhagen and Amsterdam (only seen within their city boundaries), to only name some icons of the compact city, are only home to less than half of the EU's population. However, a large part of the population lives and works in areas, that somewhat resembles the Ruhrgebiet, the Veneto, the Silesian Metropolitan Area, the Ile de France, the Alpine valleys, the Mediterranean coasts or networks of small and midsized towns and villages. The literature on metropolitan dynamics and metropolitan planning acknowledges the differences of metropolitan areas in Europe but concentrates on the urban centres within the metropolitan areas as engines of economic growth and wealth. They are ignoring or underestimating the potential of dispersed urban territories, which are demonstrated in this dissertation.

However, forgotten or neglected only covers half of the story because of plentiful research and planning policies highlight the growing area of dispersed urban development and the negative impacts of suburbanisation. However, often it is labelled as sprawl, with all its connotations that originate predominantly from Anglo-Saxon dominated research and theory development, ignoring the cultural and spatial specificities of continental European urban development.

Therefore, at the beginning of this millennium, planning theory and practice are largely detached from the spatial reality of Europe's settlement pattern. MCRIT (2010) documented this mismatch and confirmed the need for a distinctive reading and planning of dispersed territories. The financial and related public debt crises of the 2010s have significantly reduced the capacities of planning authorities as well as academia. This has resulted in little progress in developing pathways to address the mismatch as mentioned above. That dispersed urban areas, and planning approaches that are specifically tailored to them, are absent in textbooks on the city of the twentieth century worsen this situation.

There are also indications that mainstream spatial planning research and policymaking is attempting to consider TiB. The peri-urban became more prominent in academic literature and the web of science database shows an increase from ten papers published in 1990 to more than 500 published in 2018. However, many of the papers understand the peri-urban as an area that depends on a city and not the way TiB was described here, which is an independent spatial form.

Another way of shedding light on these forgotten spaces is to include them in the landscapes regulated by the European Landscape Convention (ELC), which defines the whole territory as a landscape, and explicitly includes urbanised areas. The ELC calls upon signatory states to identify their landscapes and to explicitly include urban and peri-urban landscapes in the description, along with the 'natural' and 'rural' ones (ECL Article 2). If this identification is to go 'beyond the traditional focus on individual parks and green spaces and the links between them' (Stiles et al., 2014), then two challenges are crucial: (i) to also include non-green open spaces and (ii) to base the classification of open spaces in more than just ecological and environmental aspects. The typology presented in the second paper did both and went beyond. It not only identifies green and grey open spaces based on social-environmental aspects, but it also provides a tool to identify the potentials for multi-functionality and can thereby inform spatial planning decisions at multiple scales.

Although the study of different planning cultures, approaches and instruments were not part of the research, nevertheless, it is essential to provide some thoughts concerning a possible contribution to regional planning. The inter-scalar, networked nature and of TiB and the lack of a vision for them ask for a strategic spatial planning approach, which as a defined by Albrechts (2004) 'is a public-sector-led (Kunzmann, 2000) sociospatial (see Healey, 1997a for the emphasis on the social) process through which a vision, actions, and means for implementation are produced that shape and frame what a place is and may become'. A crucial first step in the strategic planning process is the development of a vision, which is grounded in the social values of a particular TiB. These are hardly ever developed, and the specific characteristics, needs and potentials for sustainable development of TiB are not very prominently represented in regional strategic plans. There is no simple answer to this question, but the situation asks for a regional planning body as the facilitator of a strategic planning process within TiB to bring them out of their shadow life.

As stated in the introduction, the vision for sustainable development of TiB cannot be found in fundamental principles of urban planning and design that stem from the compact city idea and its application to 'sprawl'. The dissertation clearly showed that TiB have similarities across Europe and that therefore, general planning and design principles can be concluded from the study.

However, the author is aware that the similarities and difference go beyond the morphological and functional aspects investigated in this study. In addition, there are diversities in the institutional and values settings in different places, which play an important role. Moreover, it is also apparent that the dissertation only tackled certain aspects of sustainable development and in the strategic spatial planning process, those have to be brought into alignment with other aspects of sustainability. Table 8.3 presents being aware of the limitations of the study with an attempt to counteract compact city-based planning and design approaches with approaches that are based on the findings presented in this study. In accordance with the plea for strategic planning before those recommendations should not be understood as to be followed dogmatically, but to provide a starting point for strategic planning in TiB from an informed and critical point of view.

TABLE 8.3 Often recommended compact city based planning and design principles and possible alternatives when planning in TiB.

Compact city principle applied to sprawl	**Alternative proposed principles based on the characteristics of TiB**
Increasing population density around transit stops, to provide the potential for mixed-use.	Increase the accessible density of population and jobs around public transit stops (but also highway entries) by modes of soft transport and thereby increase catchment areas and the potential for mixed-use.
The concentration of development on dedicated growth centres with a focus on vertical development;	Use historic linear development axes, like high streets to allow stepwise and gradual (through time) densification. Accept and use the high centralities provided by the regional road network and highway entries to support multifunctional land use, using the full potential of green and grey open spaces.
Curbing sprawling urban extension by concentrating infrastructures and uses with negative environmental impact at the outskirts of settlements.	Integrate unwanted uses with green and blue buffers zones that provide ecological permeability as well as better access and distribution of ecosystem services.
Curb sprawling development by green belts, fingers or similar.	Interweave greenspaces with urban areas, using among other the transformation of brownfields and the further needs to adapt specifically the water infrastructure to be able to handle higher peak charges.
Provide large urban parks as the core of urban green systems.	Improve the accessibility to large green spaces, specifically forest and agricultural areas, by further developing bike and pedestrian paths. Secure a large amount of small and medium-sized green spaces, in an interconnected network, during development processes to provide a diversity of ecosystem services and ecological permeability.

8.4.4 Limitation of the research and recommendations for further research

With ten cases across western, central and southern Europe, this research covers only a selection of dispersed settlement patterns in Europe. Although the variety of case locations offers a broad picture of conditions, further research is needed to test the applicability of the findings elsewhere. There are two pathways to understanding whether the findings of the research can be generalised beyond the cases involved, and therefore support the proposed theory on dispersed urban development. First, as data availability and calculation capacities become better by the day, it should be soon possible to perform most of the spatial analyses for all EU countries at least. However, research at this scale has the disadvantage that the cross-scale analyses become very difficult and also require many people on the ground to check whether the desk results are reasonable.

Second, the study could be extended with further cases, specifically with Scandinavian and eastern European cases. The Scandinavian cases are of interest because of their particular settlement pattern, which is in general low rise and low density with vast extents of almost uninhabited landscape. Moreover, the rather strong welfare state and trust in public planning and decision making are rather unique. Eastern European countries are of interest as spatial development after the fall of the Iron Curtain was predominantly driven by market liberalism. Trust in state-led planning and decision-making is very low because of the communist past of the countries.

The study clearly states that networks and flows are key features of TiB, but the analysis is limited to the use of physical infrastructures that facilitate those flows. The primary reason is that there is minimal data availability that goes beyond flows of energy, water and people. Only recent studies have developed methods that allow spatial analyses and mapping of material and waste flows.

Another limitation of the research is that it is solely a synchronic inventory of the state of dispersed urban development, that is, a picture of conditions at one point in time. A diachronic study would be necessary to understand the morphogenesis of TiB. The research relies heavily on data sets that are provided by the European Environmental Agency and other EU institutions. Those data are usually updated every ten years, which means that further updated data will be available soon. This should allow investigation of other questions about whether TiB are a growing or shrinking phenomenon, and whether they are becoming more sustainable or not.

A diachronic study would also be necessary to deepen the understanding of the relation of sustainability and potentials for the sustainability of TiB with spatial planning approaches and histories of specific places, and with changing periods of different economic development.

Finally, one aim of the study is to inform regional and local spatial planners and designers. Although, I had the possibility to participate and advise regional planning practitioners, this was, because of time limitations and the amount of cases, not done in a structured and replicable way. Therefore it would be of great interest to test how and to what extent the results of the spatial analyses of the research can be integrated into strategic planning processes.

TOC

8.5 Atlas of Territories-in-between Part G

This section 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. The maps are presented case by in the following order:

1. Aerial view of the case study area.
2. The areas classified as territories-in-between, with an overlay of buildings and transport infrastructures.
3. A map presenting the typology of open spaces overlaid on territories-in-between, as well as photos illustrating examples.
4. A Map illustrating the number of residents with access to green spaces;
5. A Map illustrating the intensity of access to green spaces, which demonstrate how much of the territory is within the service areas of green spaces.
6. A Map 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.
7. Maps illustrating the typology of settlement structure as described in chapter 6.

8.5.1 South Wales

SOUTH WALES

FIG. 8.4 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'. Source: Google Earth. Image Source: Google Earth.

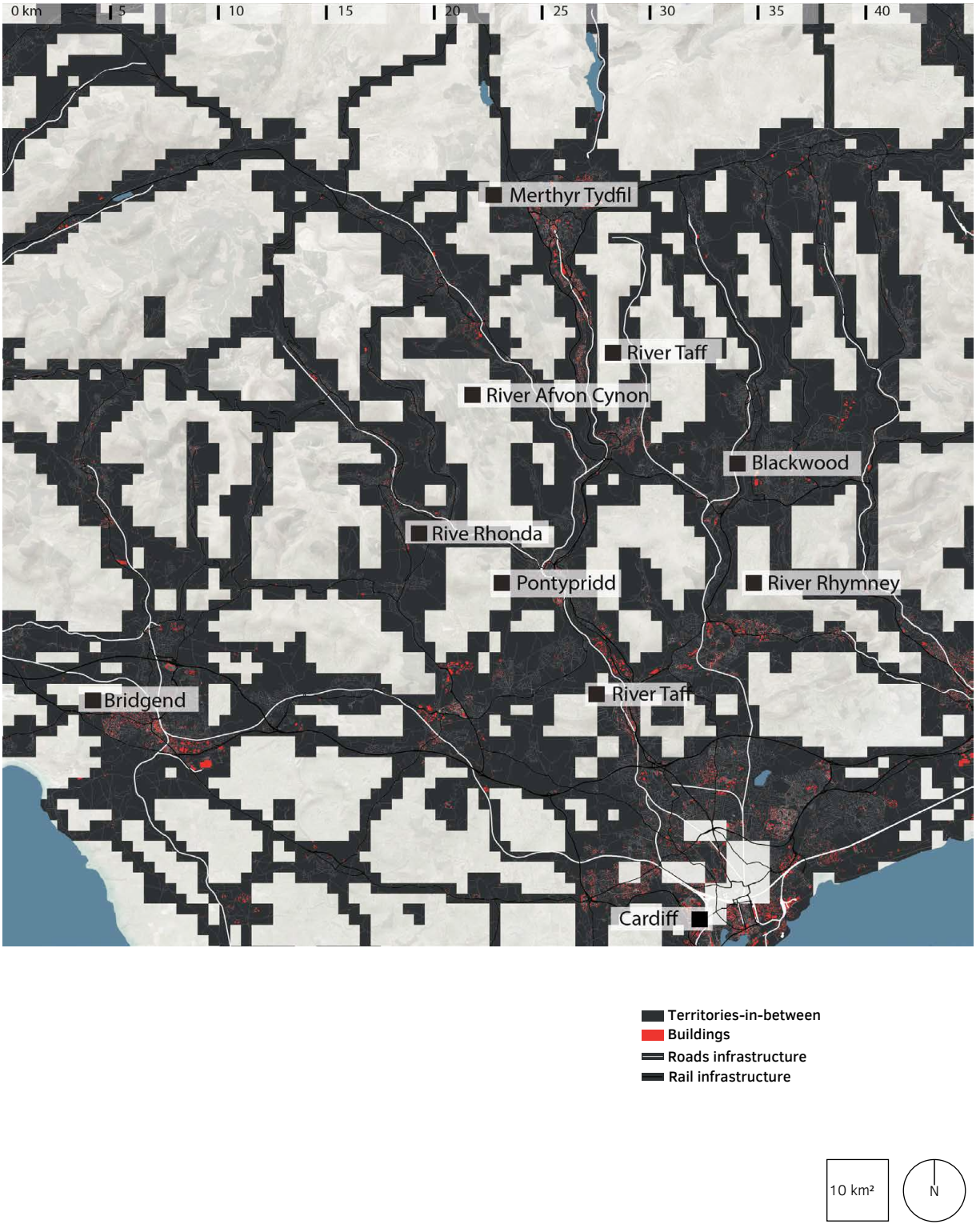


FIG. 8.5 Two different forms of TiB can be observed, one more field like around Cardiff and along the sea, and the typical linear valley type.

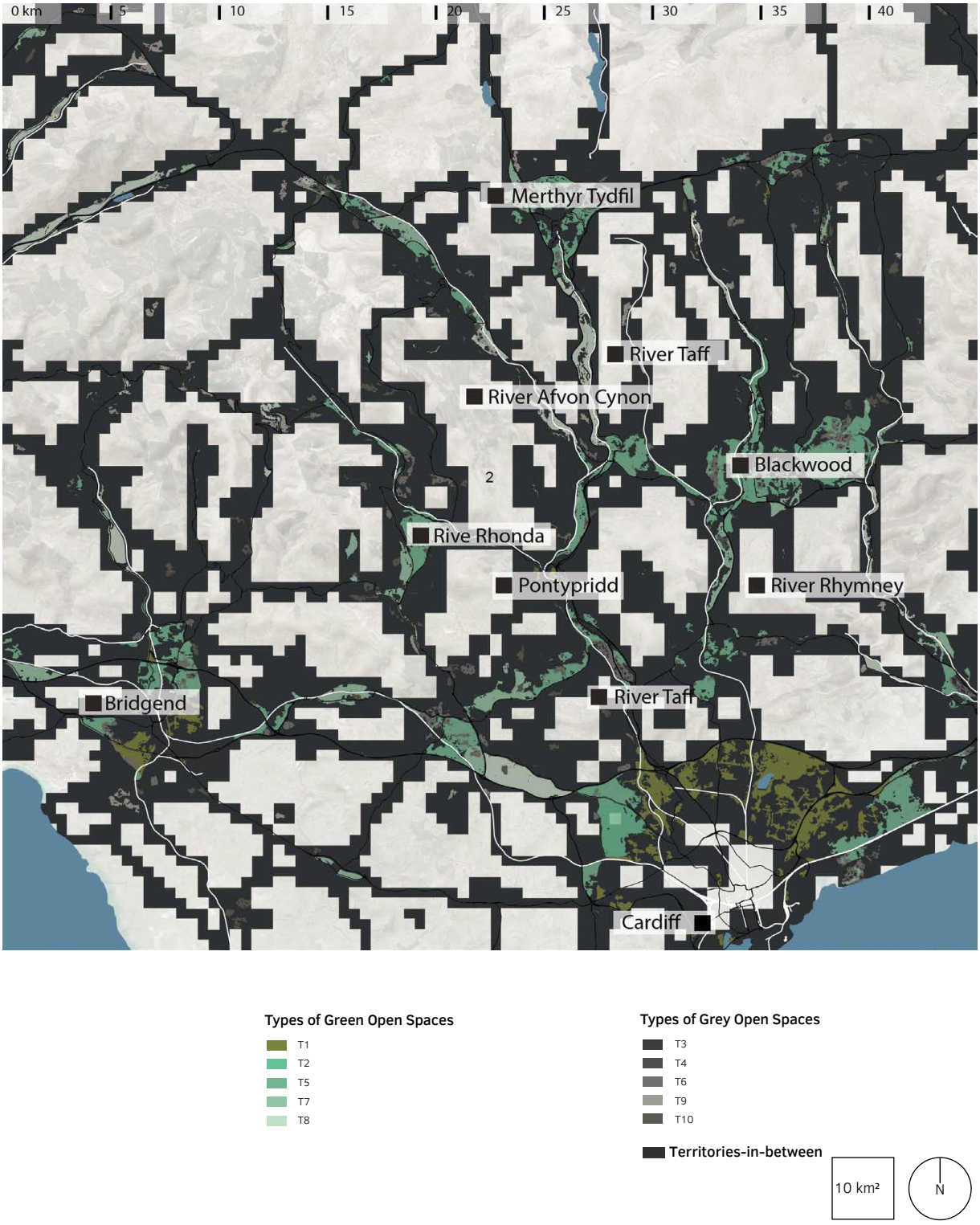


FIG. 8.6 Type 5 is the most common green space in South Wales and type 6 is the most common grey space. Both have a high potential for multifunctionality and are under limited development pressure which is specifically important for ecosystem services in relation to provisioning and regulating. They are crucial areas for the establishment of an ecological network that connects rural and suburban ecosystems.

1

2

3

FIG. 8.7 (1) A buffer zone around a suburban settlement is not accessible but provides regulating ecosystem services. (2) A playground is placed into meadows between two settlements. (3) A typical grey space, a parking lot at a retail center.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

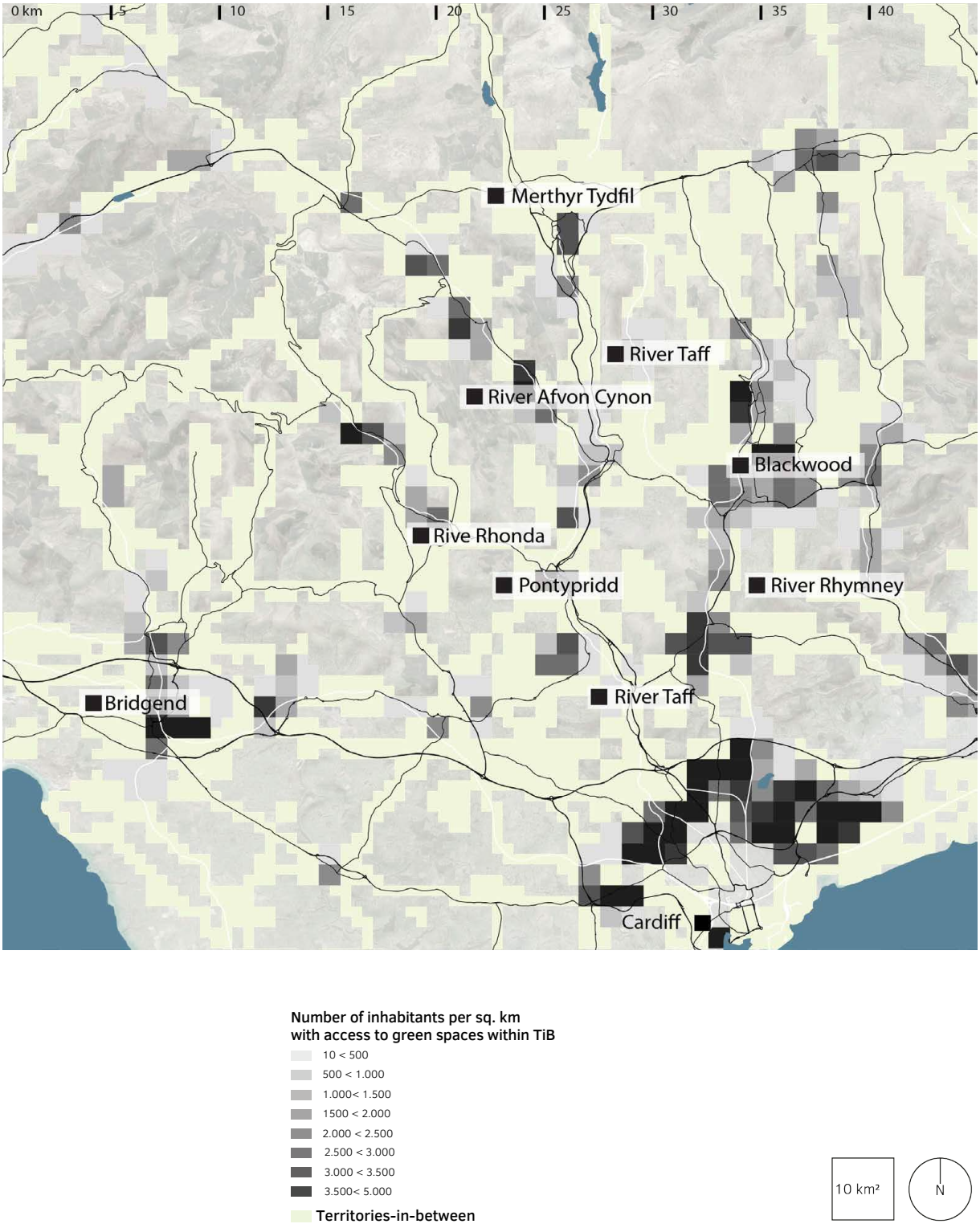


FIG. 8.8 Around 43 % of the inhabitants in the TiB in South Wales have access to more than one size of green spaces.

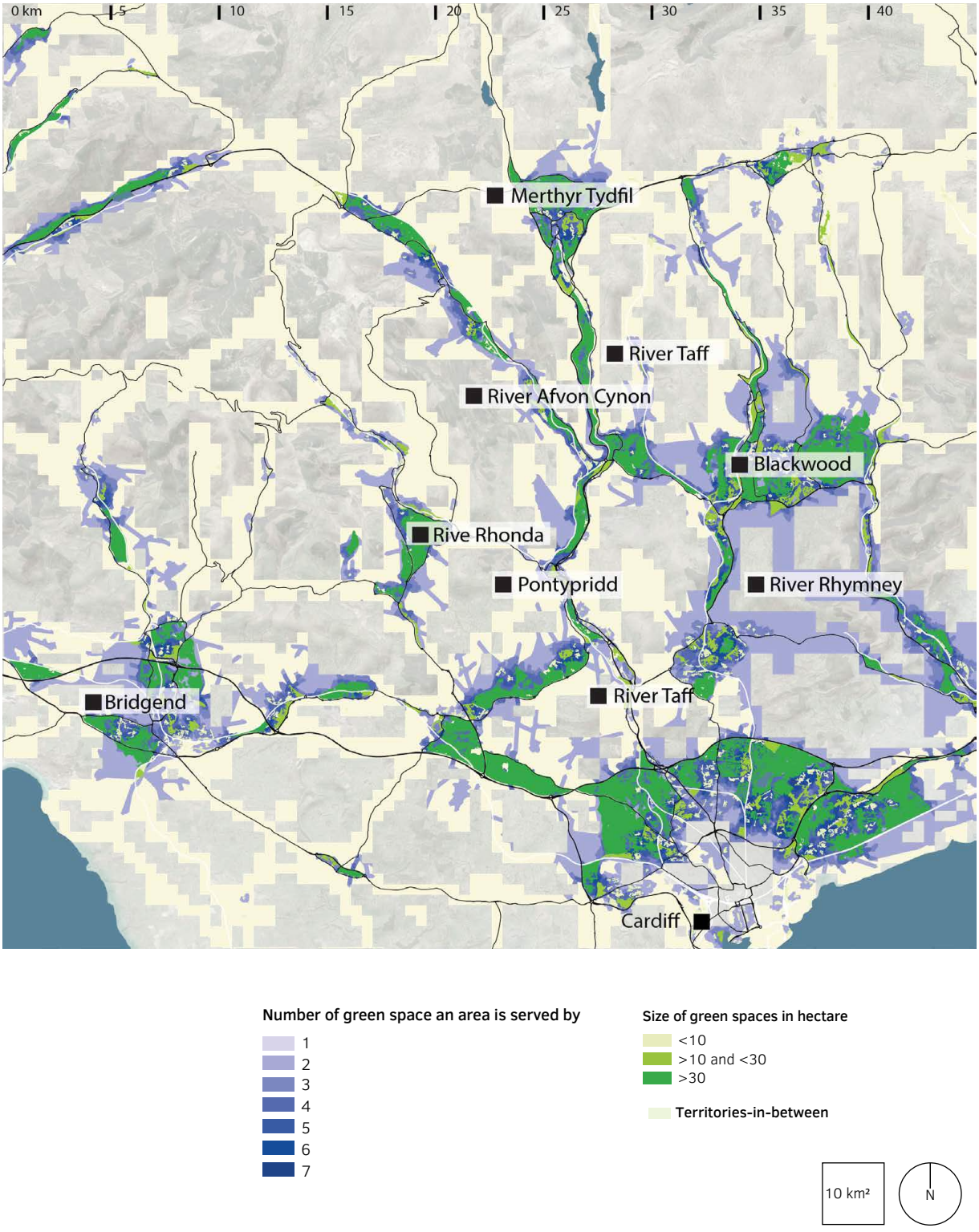


FIG. 8.9 The intensity of access to green space is at the highest in the periphery of Cardiff as well as in the other bigger cities like Bridgend or Blackwood.

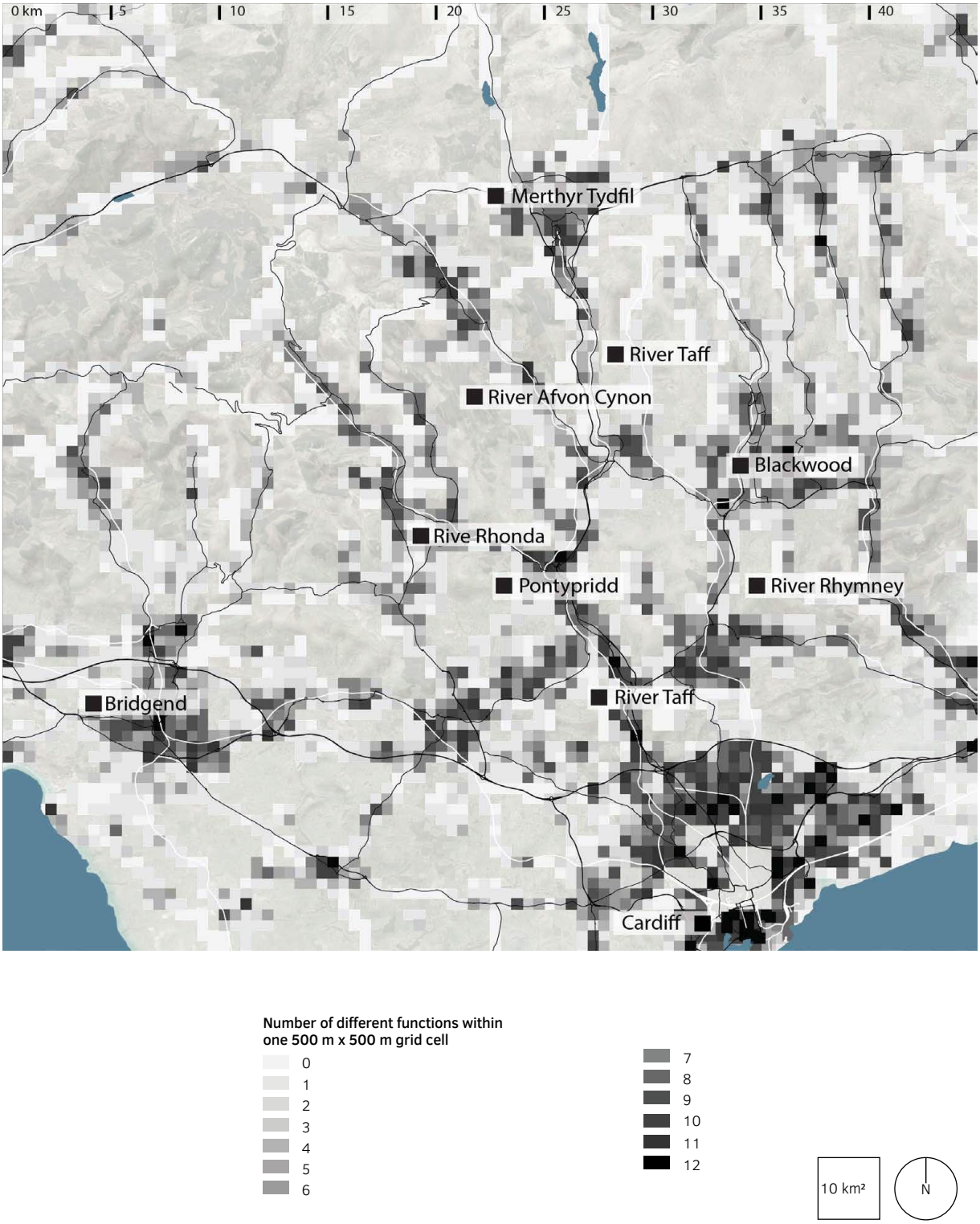


FIG. 8.10 More than 52 per cent of the inhabited grid cells host three or more functions. The highest mix of function is located in the towns in the valleys, the harbour area of Cardiff and parts of the peripheries of Cardiff and Bridgend.

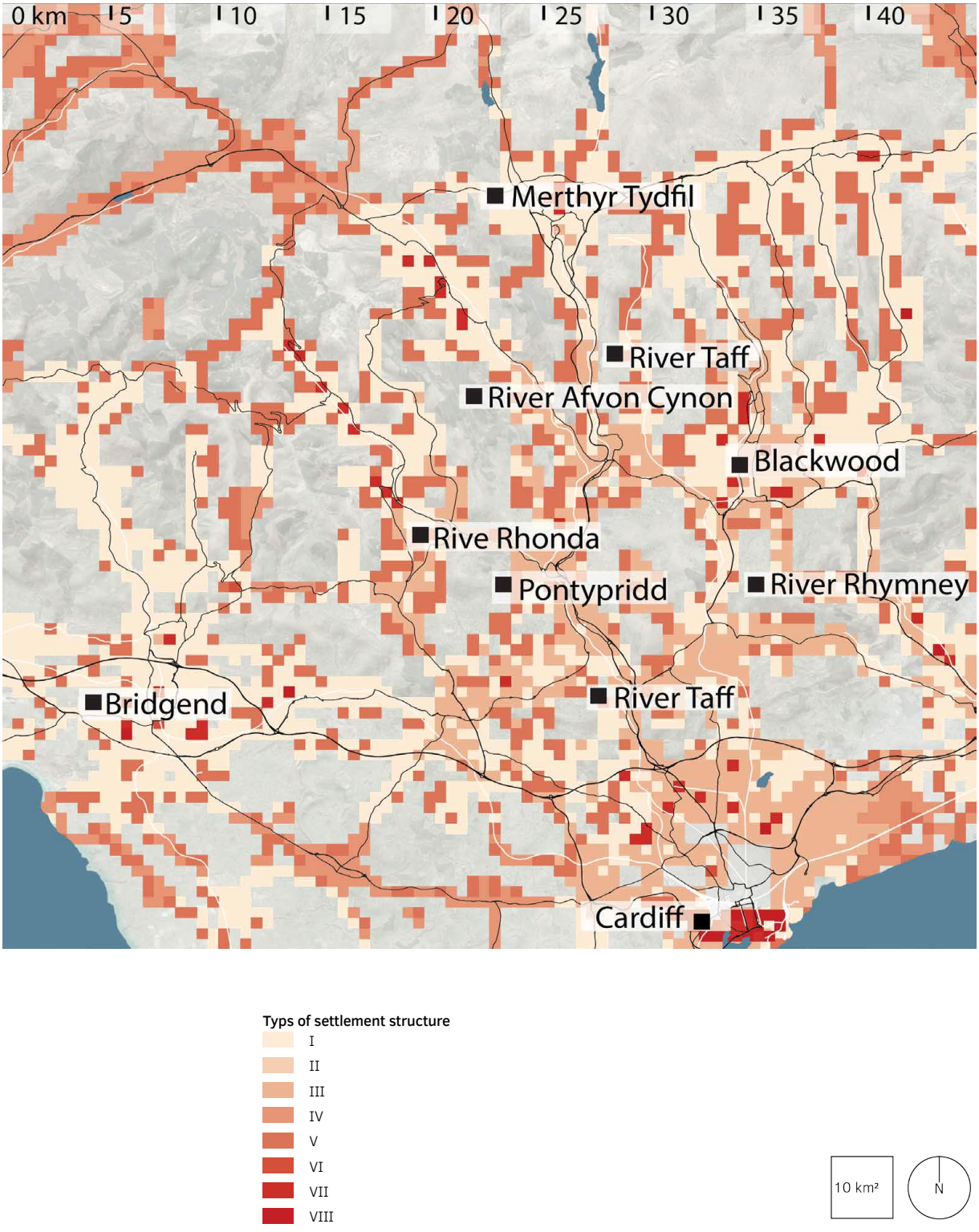


FIG. 8.11 The most frequent (47 per cent) settlement type is I, which has around 50 per cent of mono-functional cells but also 45 per cent of cells with more than three but less than ten different functions, as well as five per cent of cells with ten or more functions. Type III, which accounts for roughly 20 per cent, has more than 80% cells which host 3 or more functions. See table 6.6 for further detail.

TOC

8.5.2 North Somerset

NORTH SOMERSET

FIG. 8.12 The case study area of North Somerset, 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, which have a rich history like Glastonbury and Cheddar. Image Source: Google Earth.

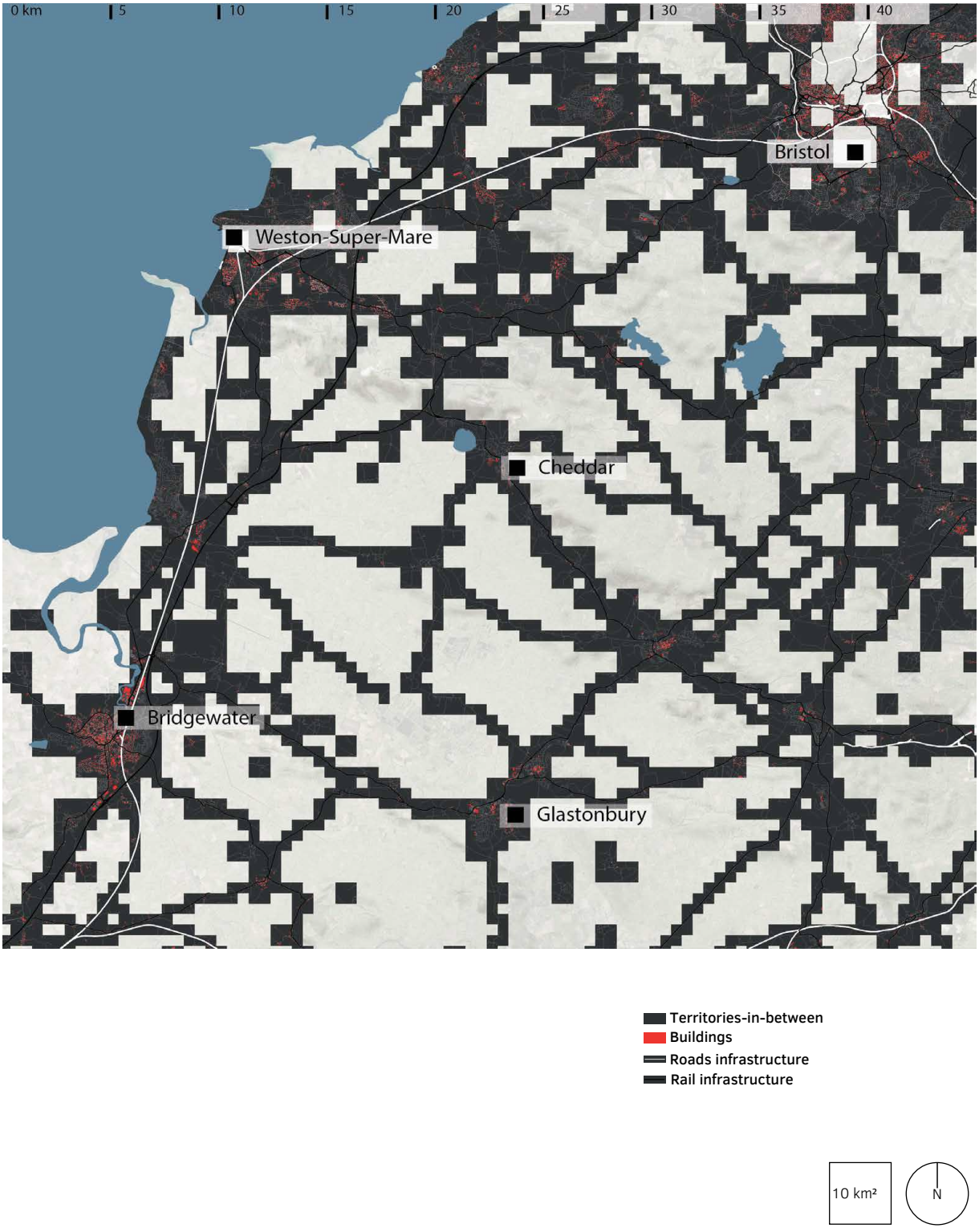


FIG. 8.13 Two different forms of TiB can be observed. One corridor like along the sea, and one network type connecting the towns inland.

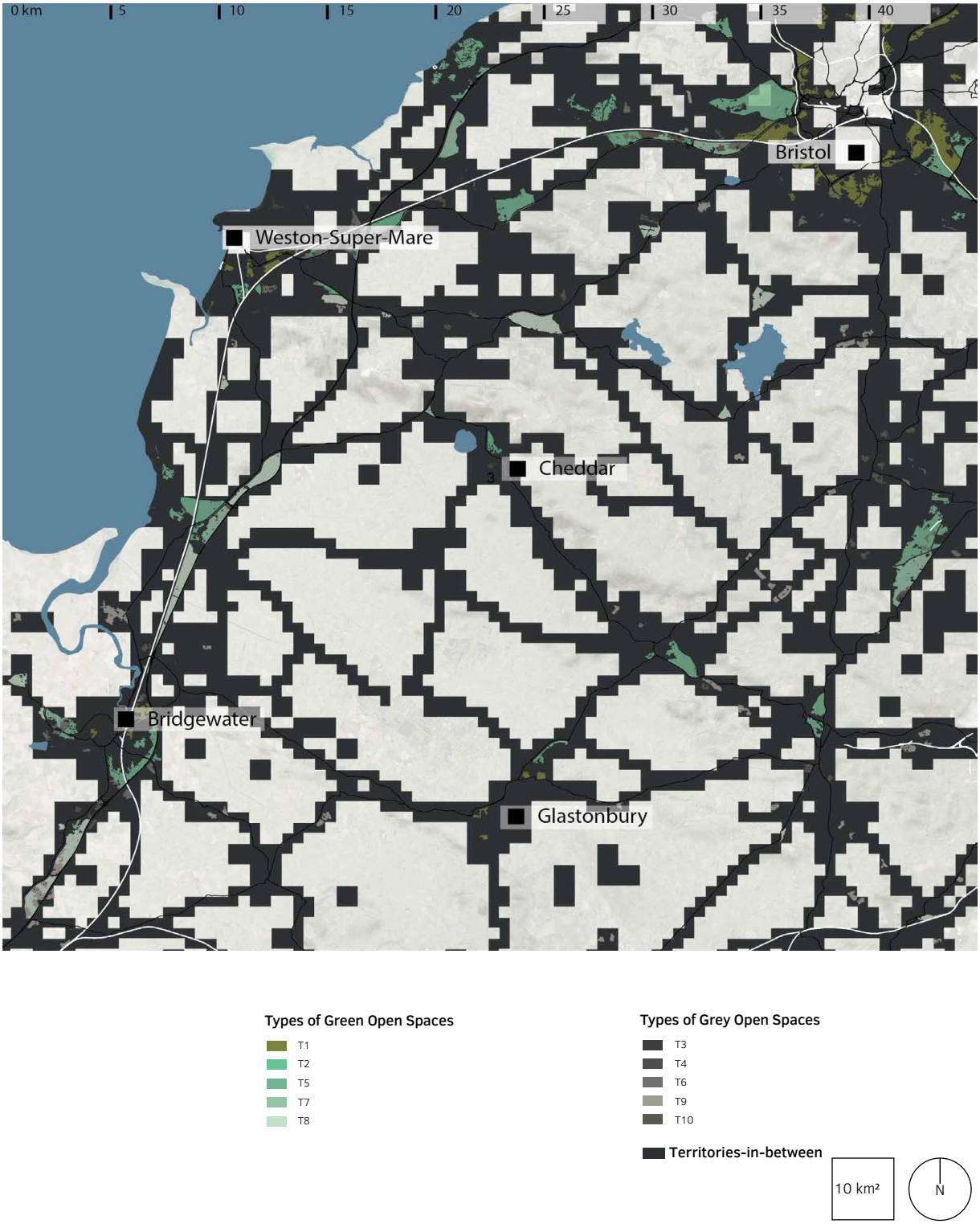


FIG. 8.14 Type 2 is the most common green space in Somerset. Green spacesin type 2, covers the largest area, andare in very central locations of the street network, with high potential aof multifunctionality between operators of production and residential use. Type 6 is the most common grey space, which has a high potential for multifunctionality and is under limited development pressure. They are crucial areas for the establishment of an ecological network that connects rural and suburban ecosystems.

1

2

3

FIG. 8.15 (1) A park along a river, providing regulating and cultural ecosystems that crosses the town. (2) A residual green space between different types of settlements. (3) A typical grey space, a parking lot at the edge of the historical centre of a town.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

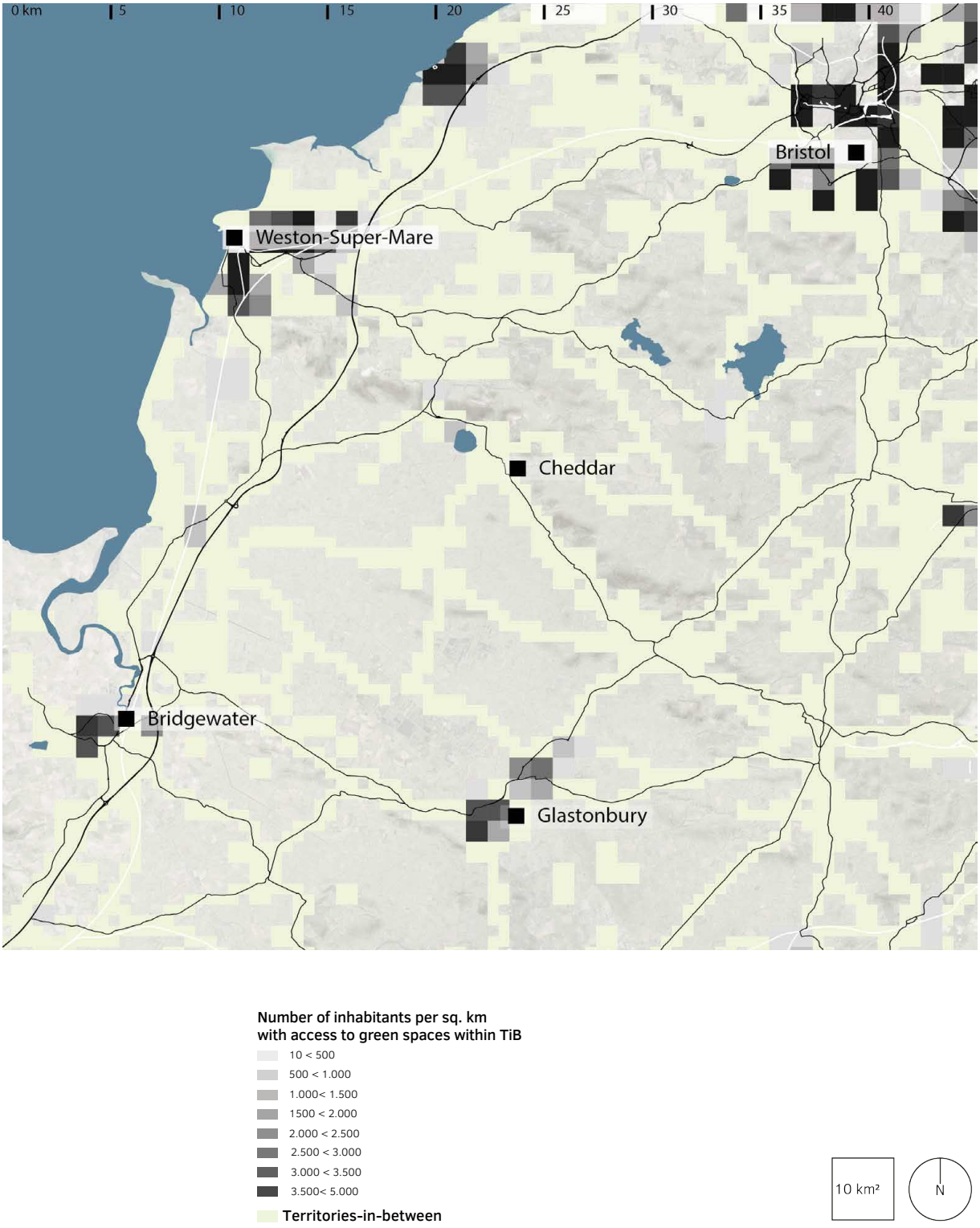


FIG. 8.16 Around 40 per cent of the inhabitants of the TiB in North Somerset have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

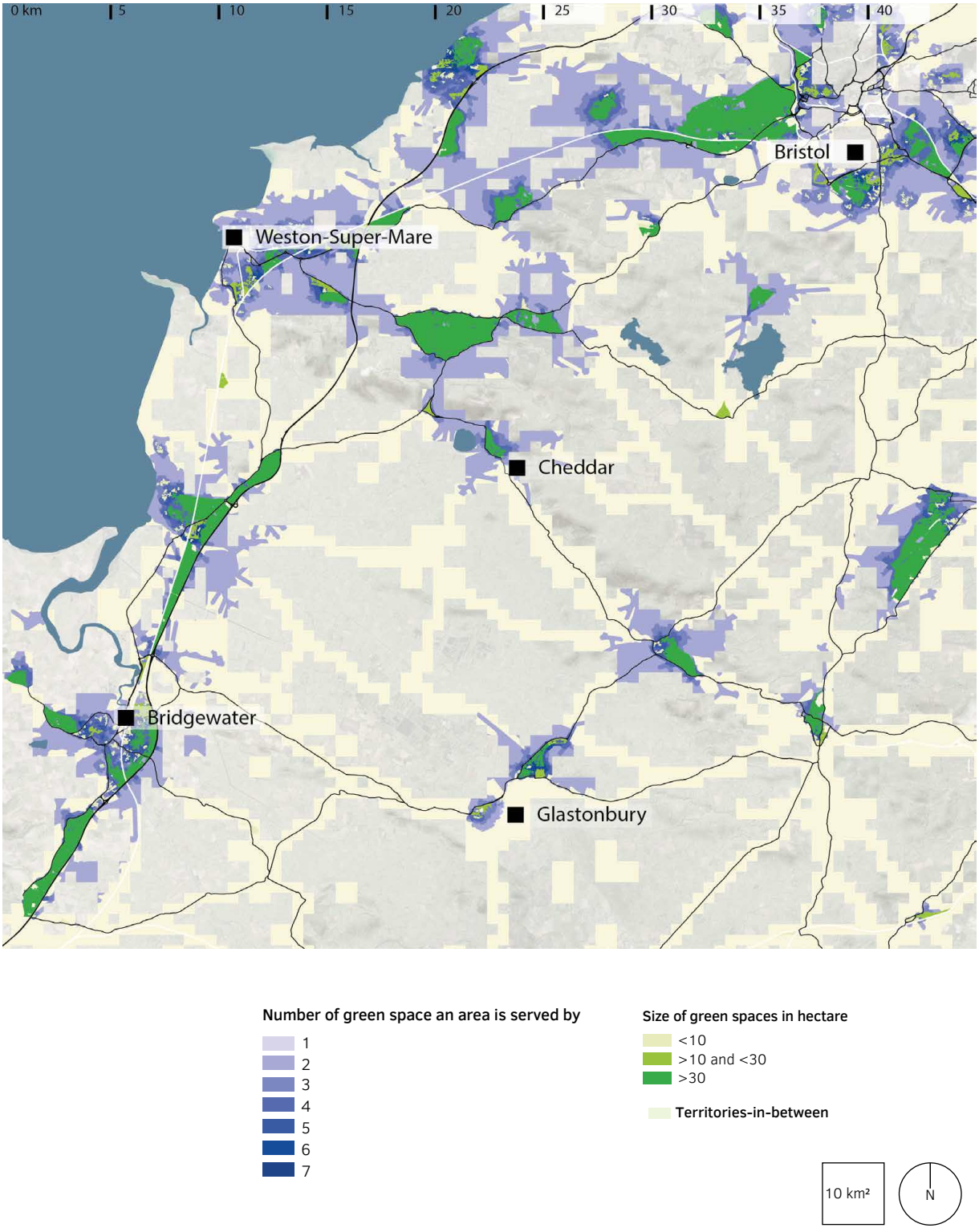


FIG. 8.17 The intensity of access to green space is highest in the periphery of Bristol as well as in and around the cities along the sea.

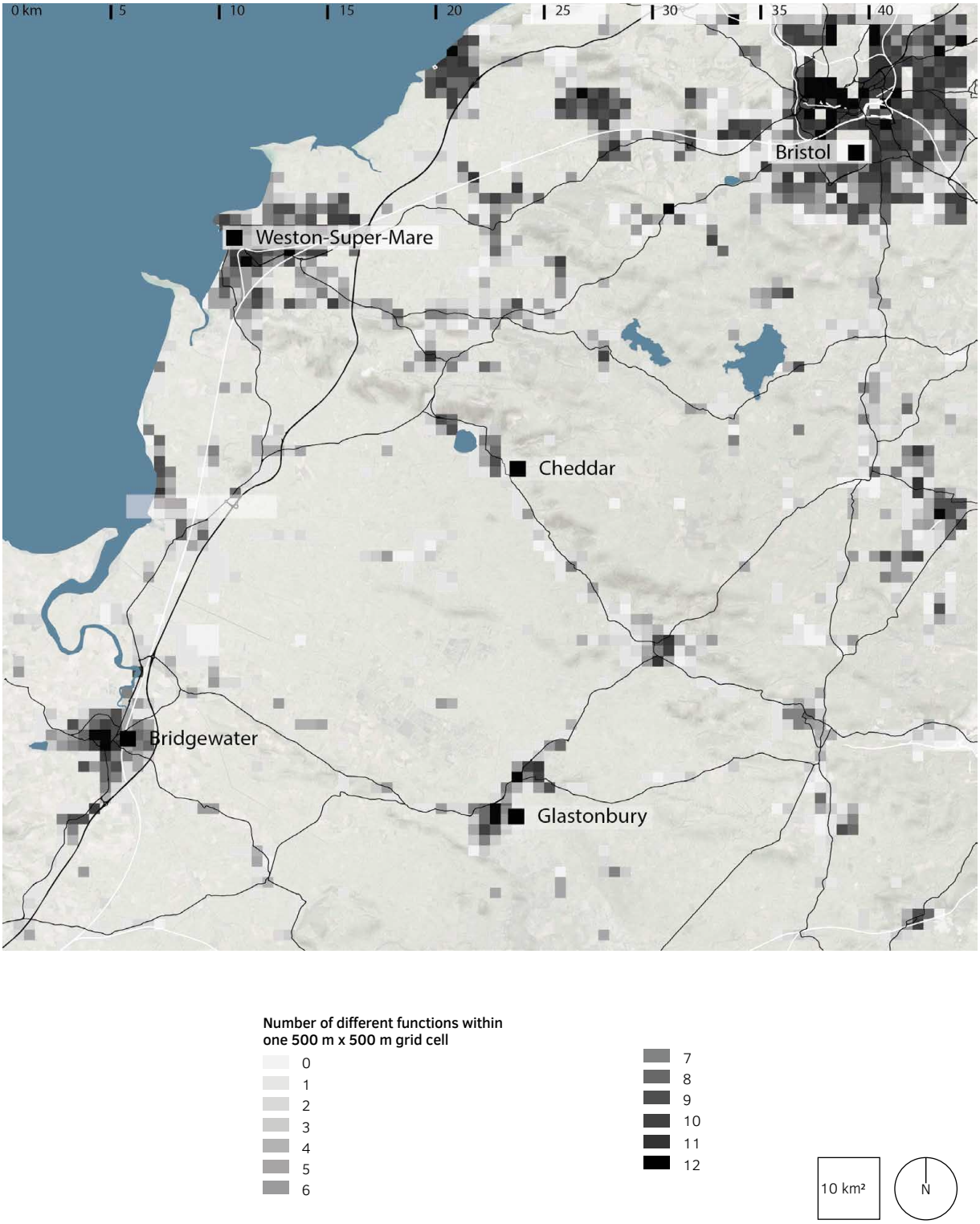


FIG. 8.18 More than 61 per cent of the inhabited grid cells that host three or more functions. The highest mix of function is located in Bristol and the cities along the sea but also the smaller inland located towns.

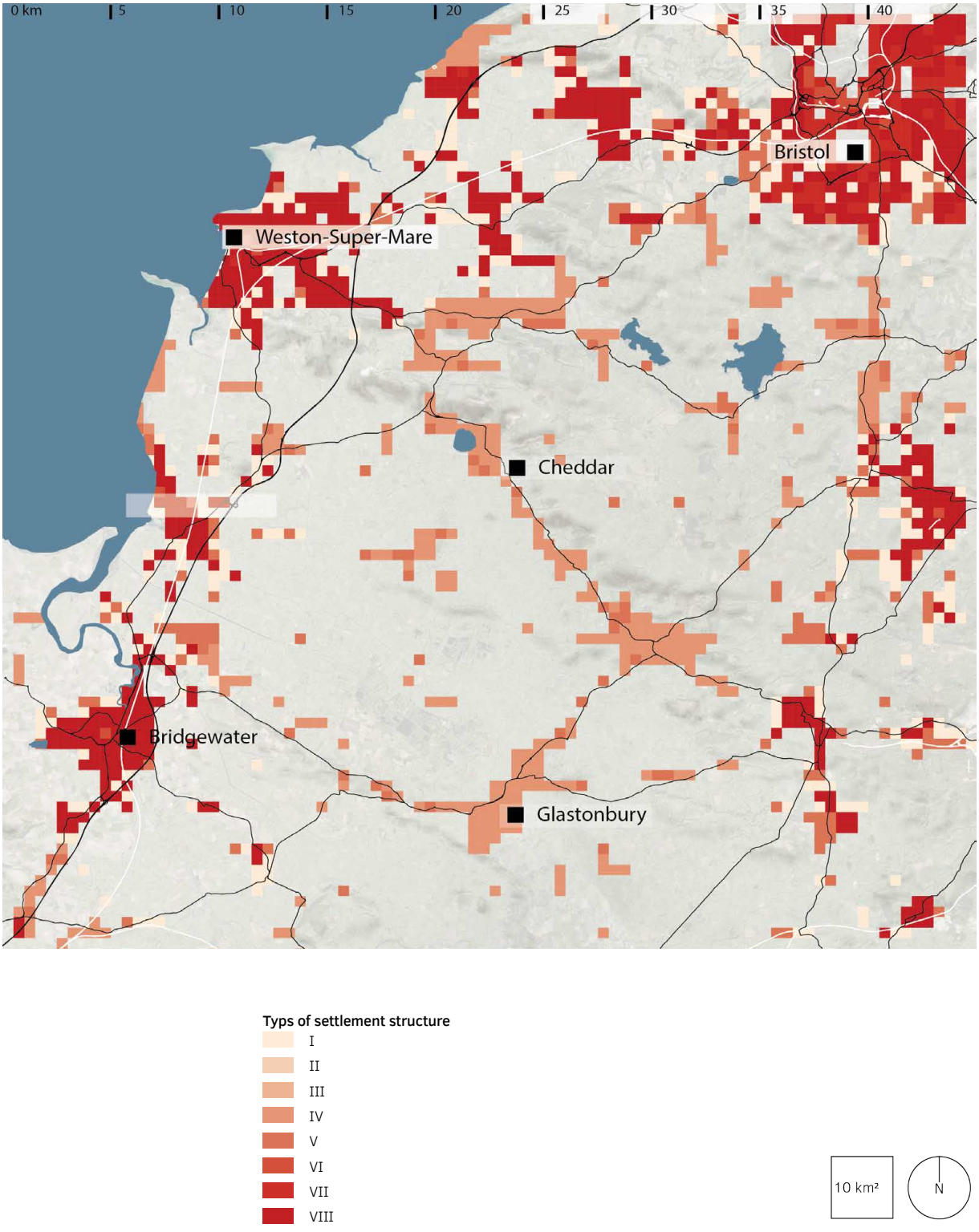


FIG. 8.19 The most frequent (36 per cent) settlement type is type VIII, which has around 20 per cent of mono-functional cells but 65 per cent of cells with more than three but less than ten different functions, as well as fifteen per cent of cells with ten or more functions. Type IV, which accounts for roughly 23 per centof all cells, includes around 50 per cent of mono-functional cells and 45 per cent of cells with more than three but less than ten different functions, as well as five per cent of cells with ten or more functions. See table 6.6 for details.

8.5.3 Île-de-France

ÎLE-DE-FRANCE

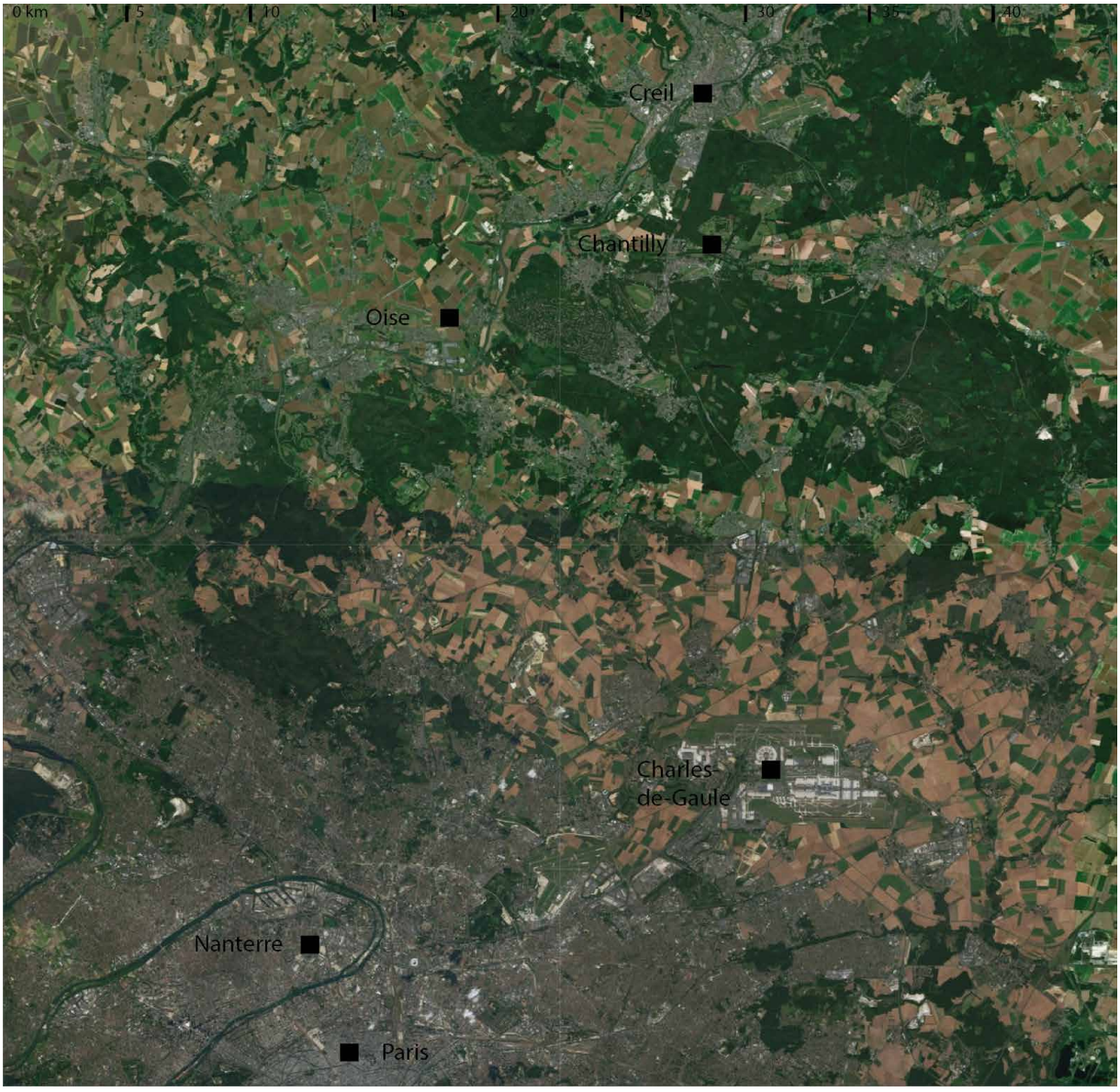


FIG. 8.20 The case study area Ile-de-France, stretching from the North of Paris to Creil in the North. With the Oise Valles crossing from south-west to northeast. The airport, Paris-Charles de Gaulle is a clearly visible in the South-eastern quadrant. Image Source: Google Earth.

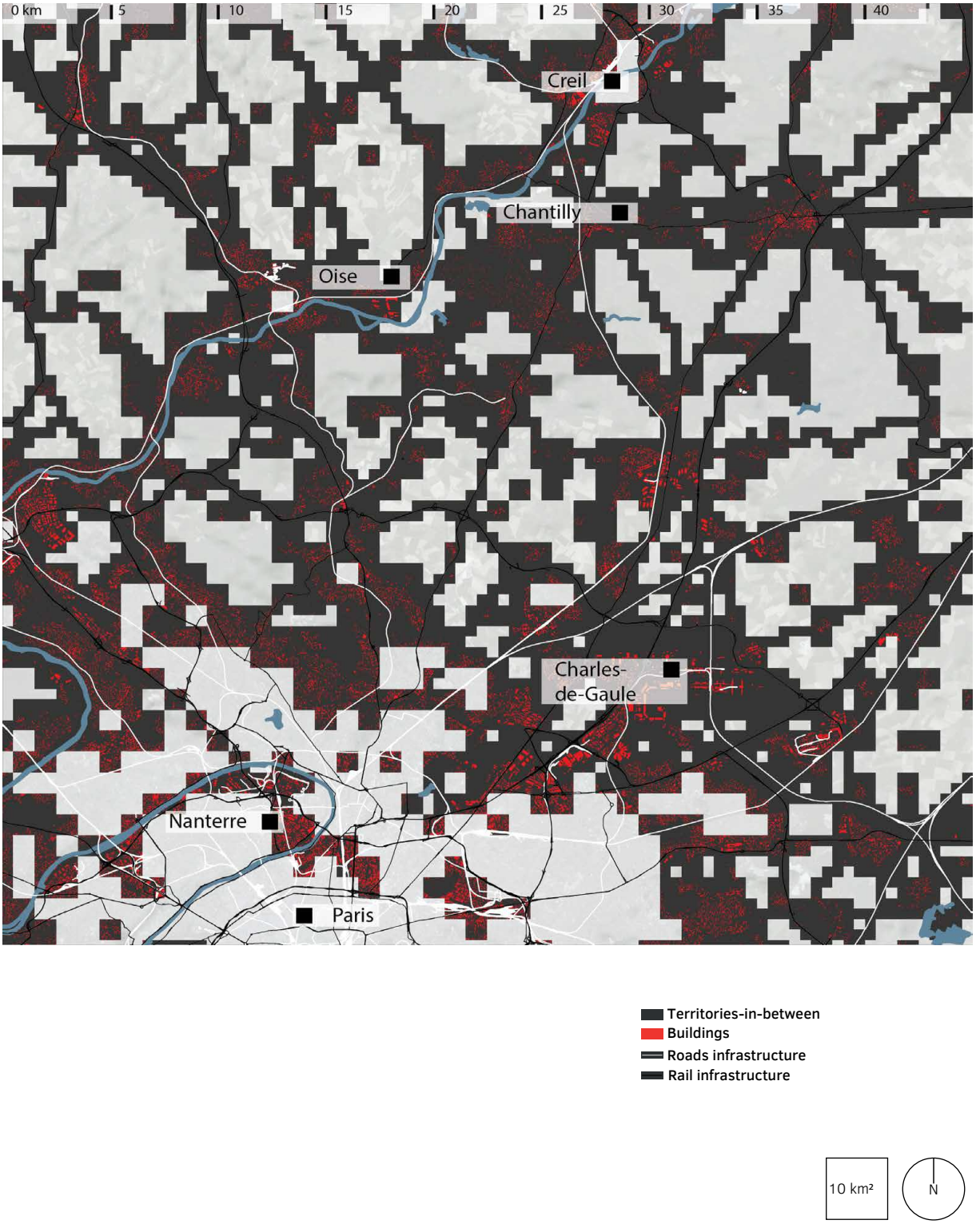


FIG. 8.21 All three types of TiB are observable which are: the field in the periphery of Paris, the network of cities and towns around Chantilly and the valley type along the river Oise.

TOC

TYPOLOGY OF OPEN SPACES

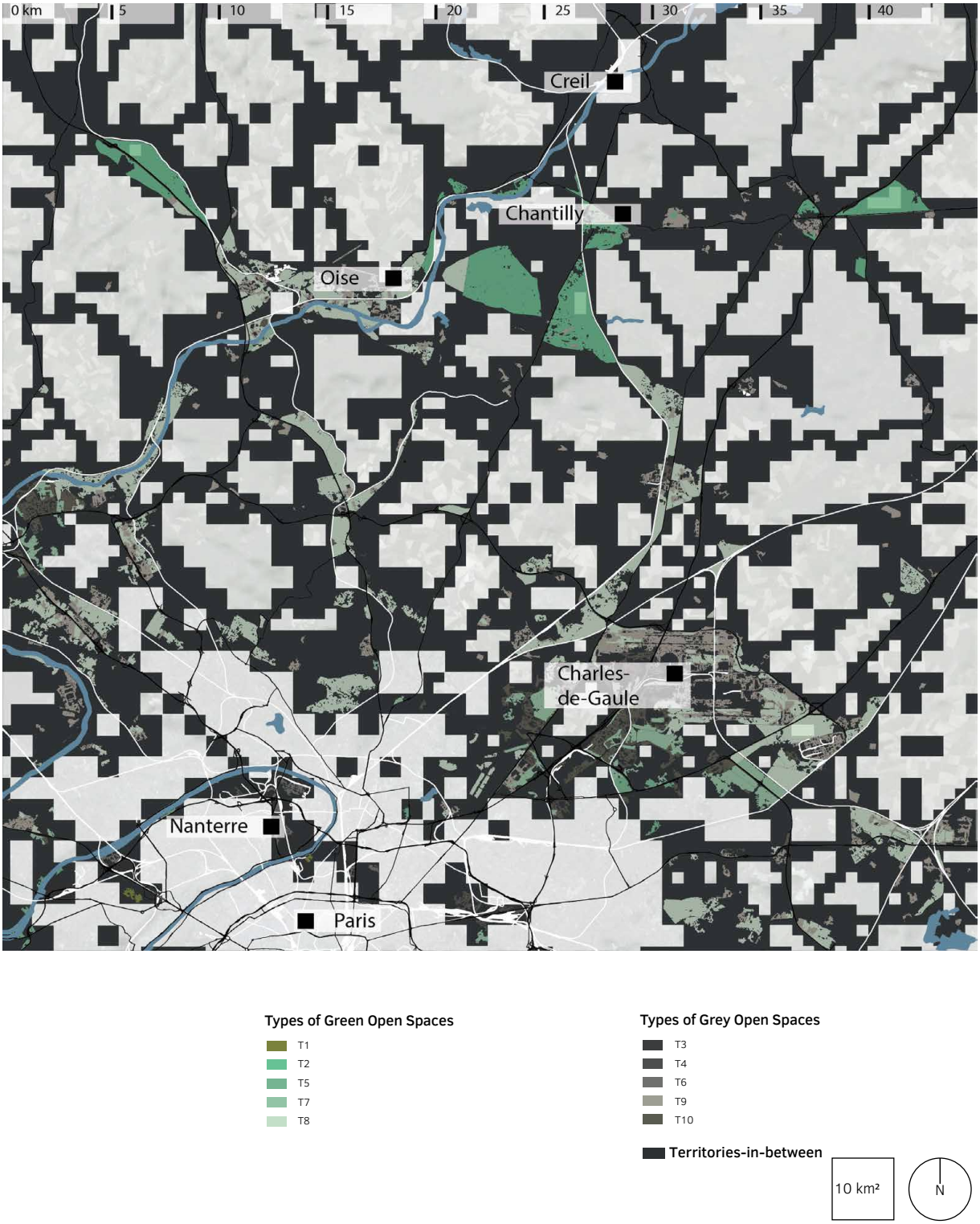


FIG. 8.22 The most frequent green space is type 8, which plays as a key role acting as buffer areas between industrial areas and intensive agricultural areas, but also as ecological corridors that connects the backbone of the existing green infrastructure with the urban green network. They are relevant for regulating and providing provisional ecosystem services. The most frequent grey open space is type 9, which is the grey type with the lowest potential of multi-functionality. They are often located in smaller settlements or industrial areas with automated functions like ports. They are seen as crucial open spaces for the provision of regulating and cultural ecosystem services.

1

2

3

FIG. 8.23 (1) The Hippodrome in Chantilly as an extreme example of a green space with high cultural and economic value. (2) A grey space between industrial and residential areas. (3) Allotment gardens, green spaces provide provisioning ecosystem services, in the flood plain of the Oise river.

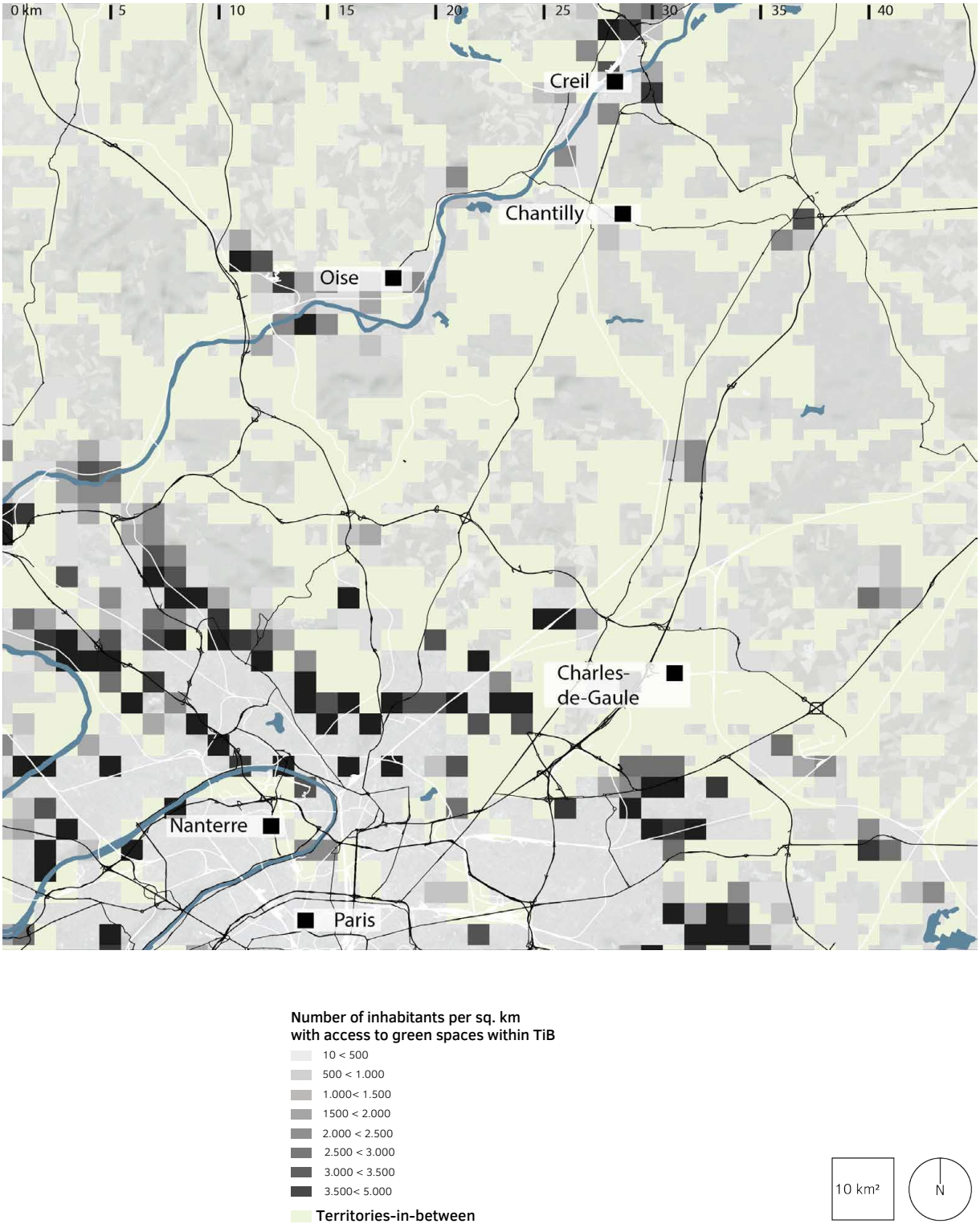


FIG. 8.24 Only around 28 per cent of the inhabitants of the TiB in the Ile-de-France have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

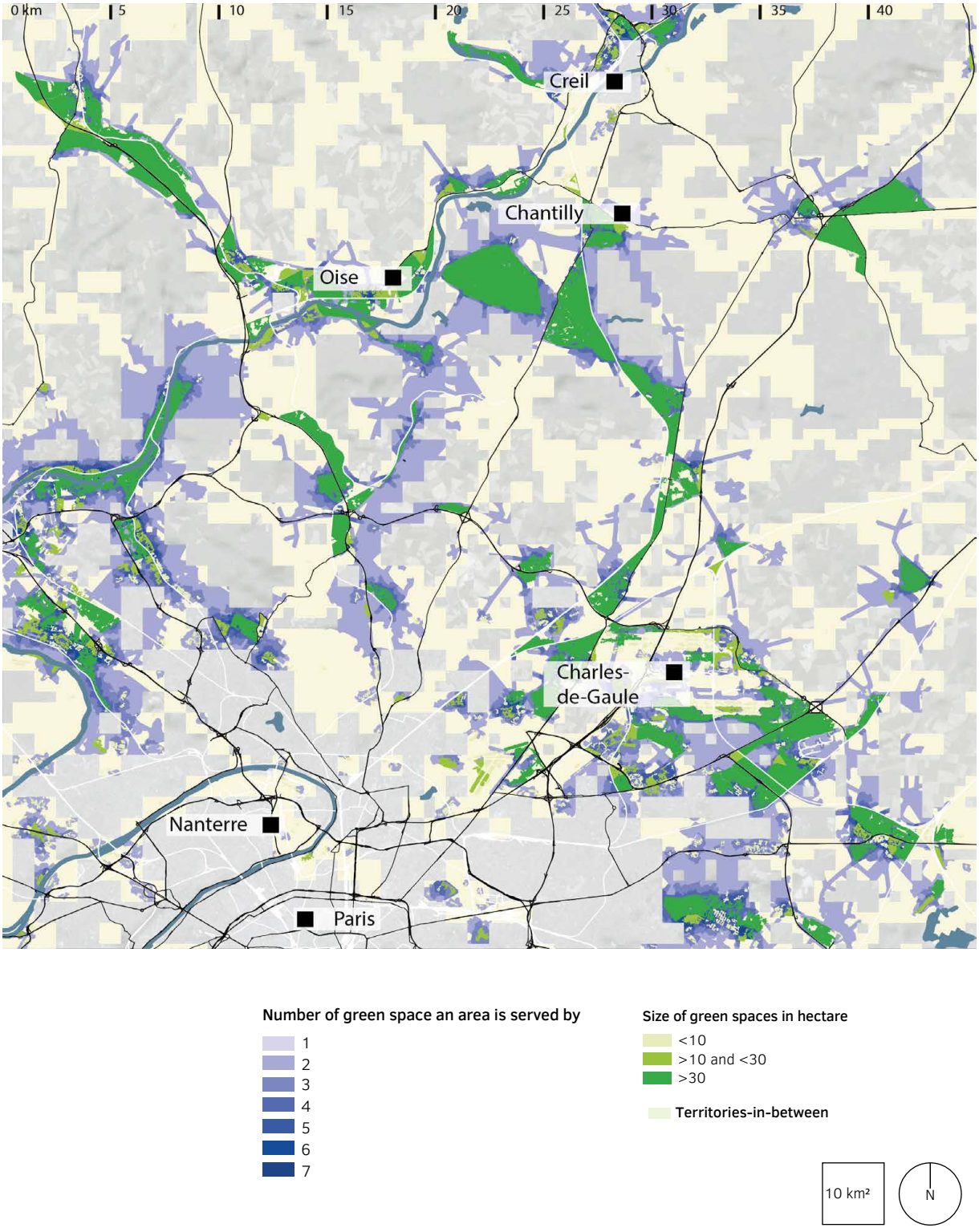


FIG. 8.25 The intensity of access to green spaces is at the highest in the Oise valley and around small and medium-sized towns and cities.

8.5.4 Pas-de-Calais

PAS-DE-CALAIS

FIG. 8.26 The case study area 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. In the west of Bethune around Auchel is a former mining area. The former military Airport of Merville-Calonne is located in the centre of the caste study area. Image Source: Google Earth.

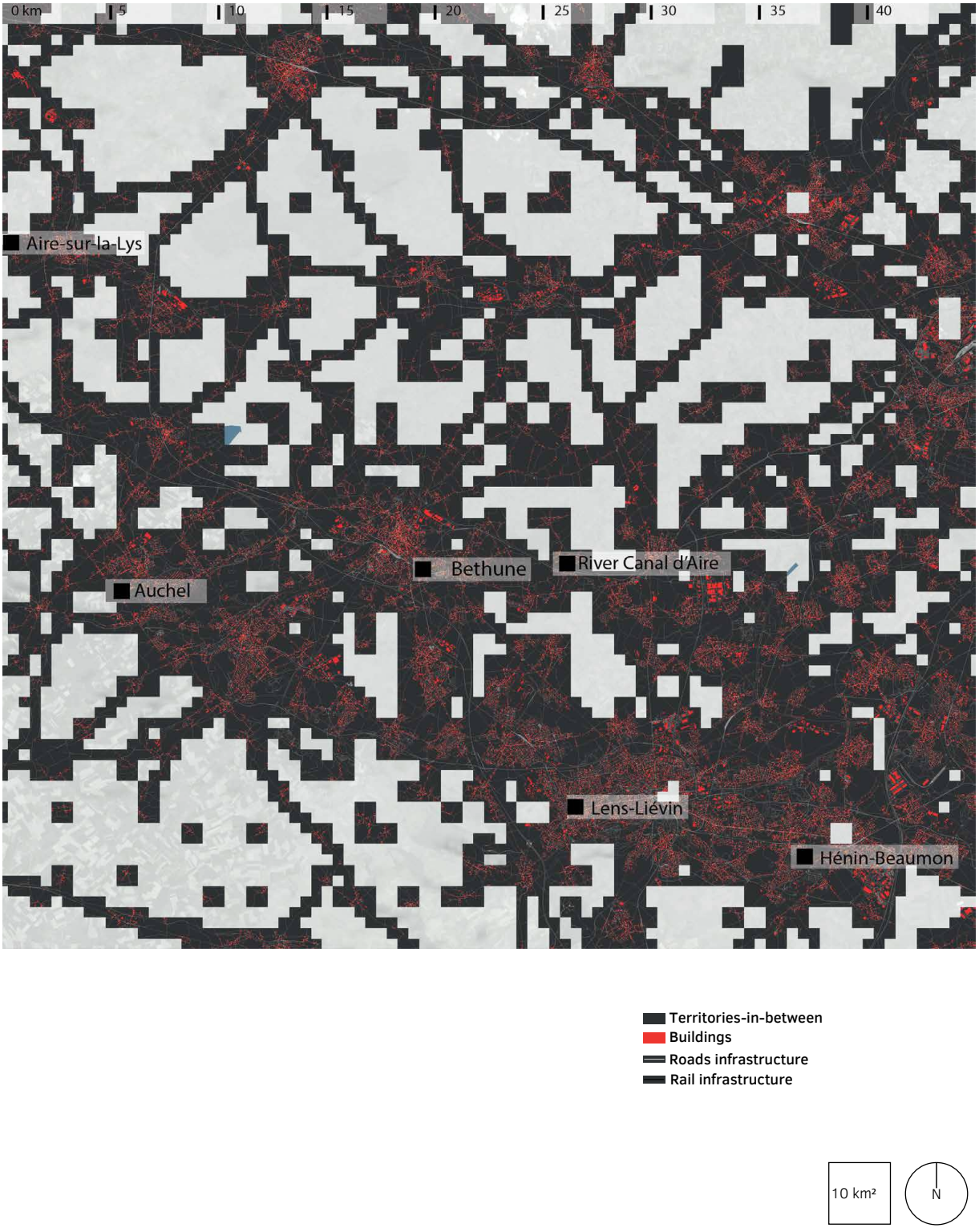


FIG. 8.27 In the case of Pas-de-Calais, the TiB type of networks of towns and cities is more dominant in the north. In the south, the field like TiB are present.

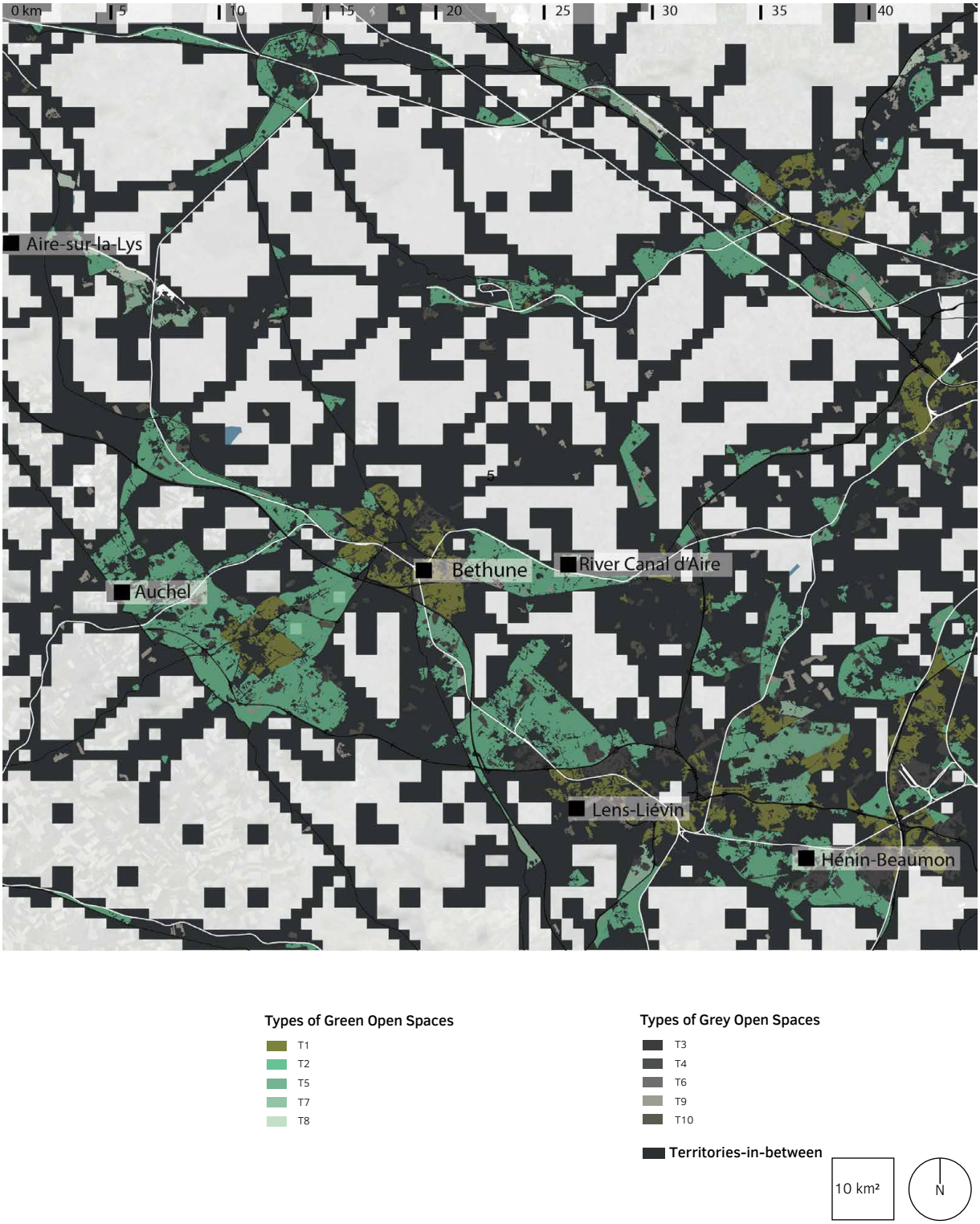


FIG. 8.28 The most common green space is type 2 and the most frequent grey open space is type 4. Both types are often in very central locations of the street network, with the highest potential of multifunctionality between operators of production and residential uses. They provide regulating as well as provisioning and cultural ecosystem services

1

2

3

FIG. 8.29 (1) A park along a creek crosses a town and provides cultural and regulating ecosystem services. (2) A former mining facility transformed into a park providing cultural ecosystem services while strengthening the regional ecological system. (3) A parking lot close to the town centre is an example of a typical grey space.

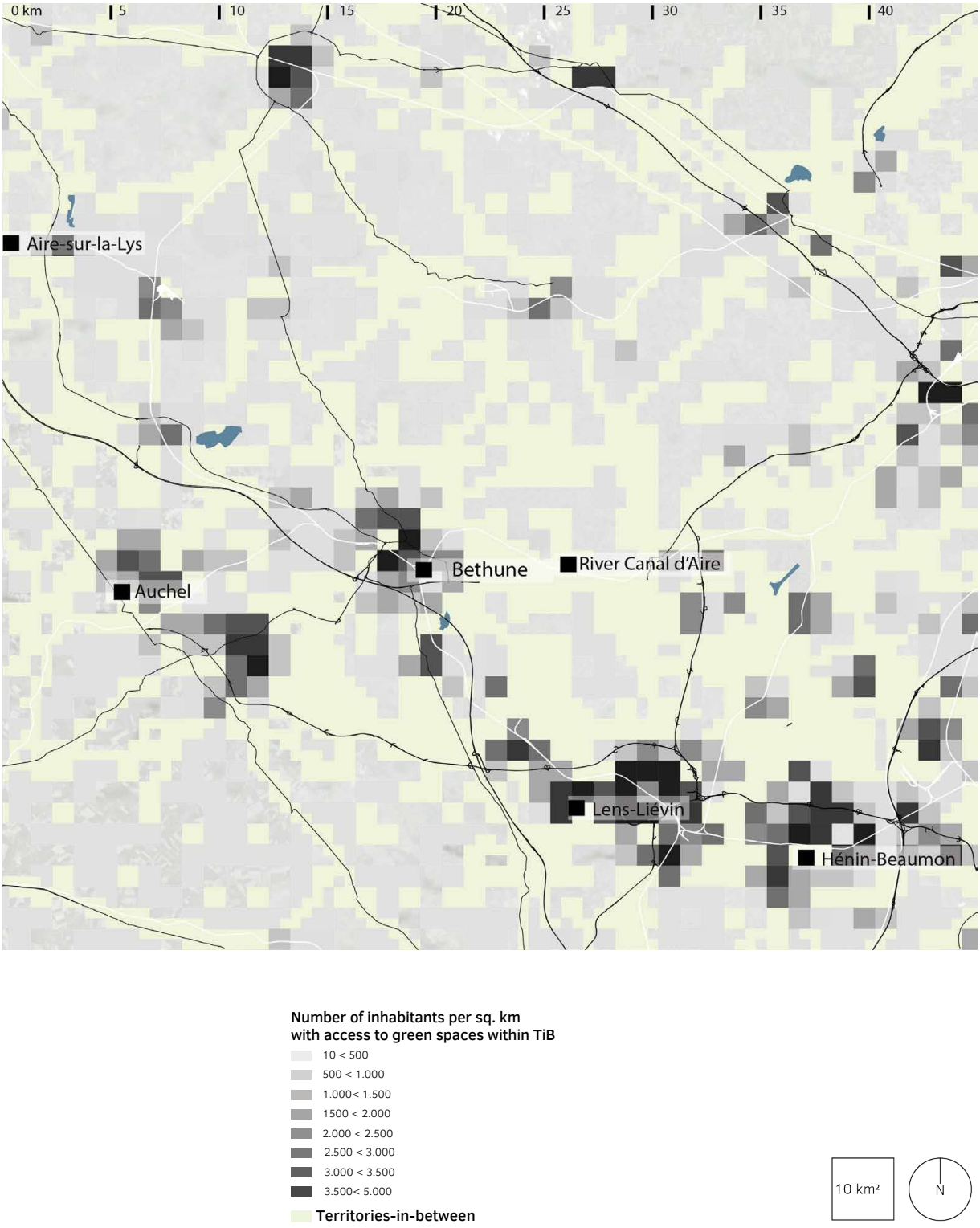


FIG. 8.30 Around 52 per cent of the inhabitants of the TiB in Pas-de-Calais have access to more than one size of green space.

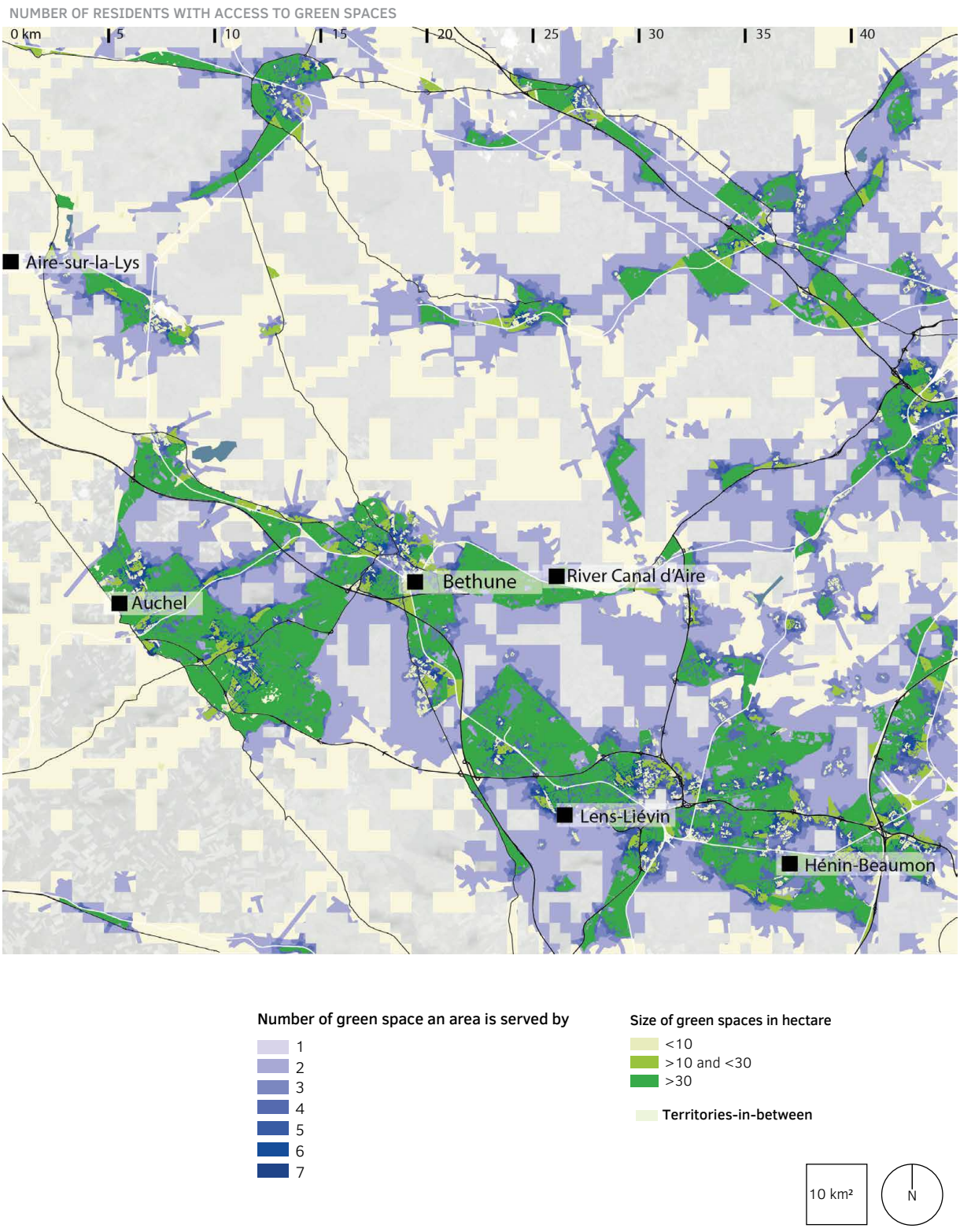


FIG. 8.31 The high intensity of access to green space is widespread.

8.5.5 South-Holland

SOUTH-HOLLAND

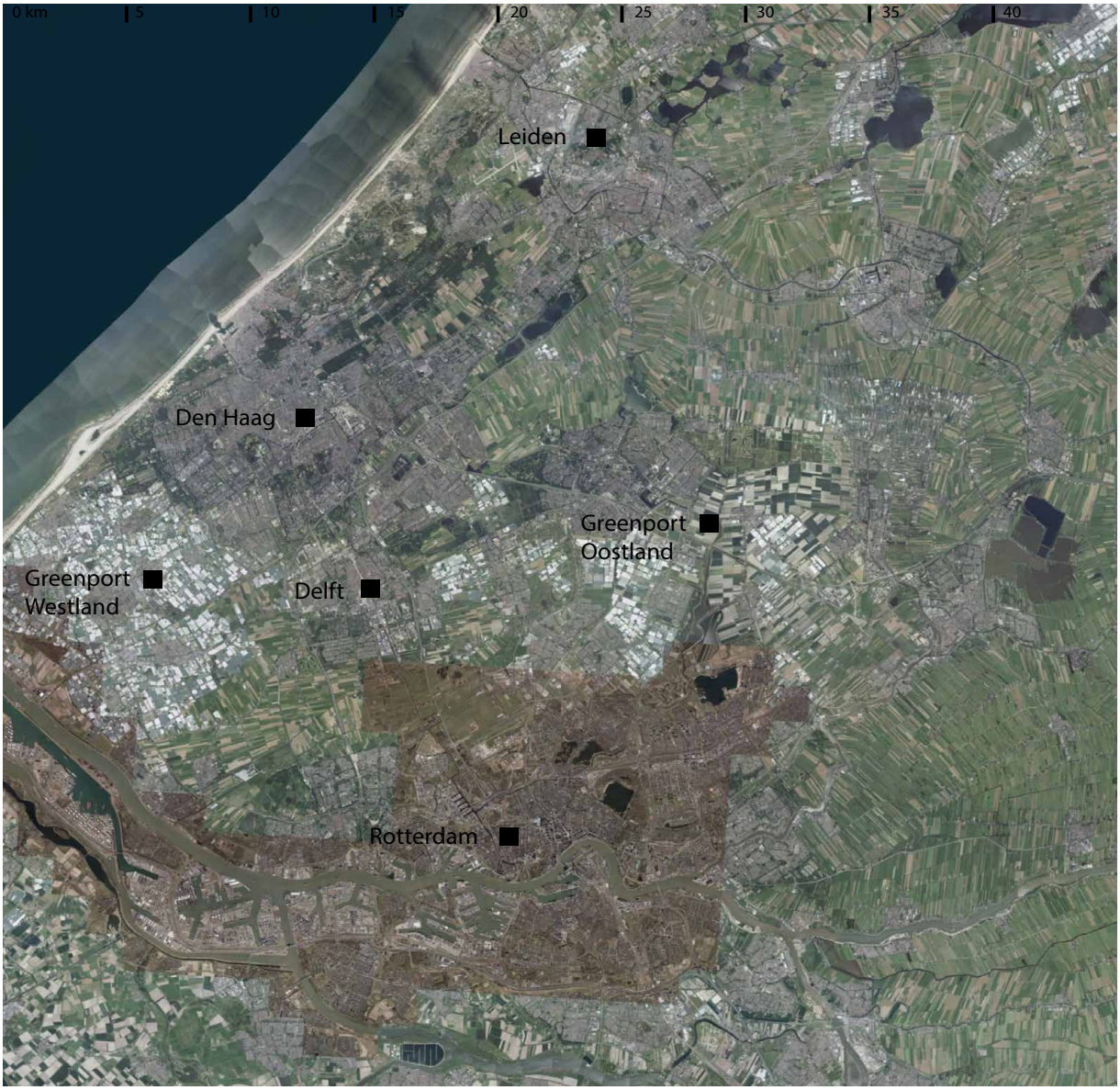


FIG. 8.32 The case study area in South-Holland, with the Maas delta in the south. The Den-Haag- Rotterdam metropolitan area as the south-wing of the Randstad and the edges of the green heart are main features of the area. Extended greenhouse areas of the so-called Greenport Westland and Oostland are also visible. Another prominent feature is the dunes along the coastline. Image Source: Google Earth.

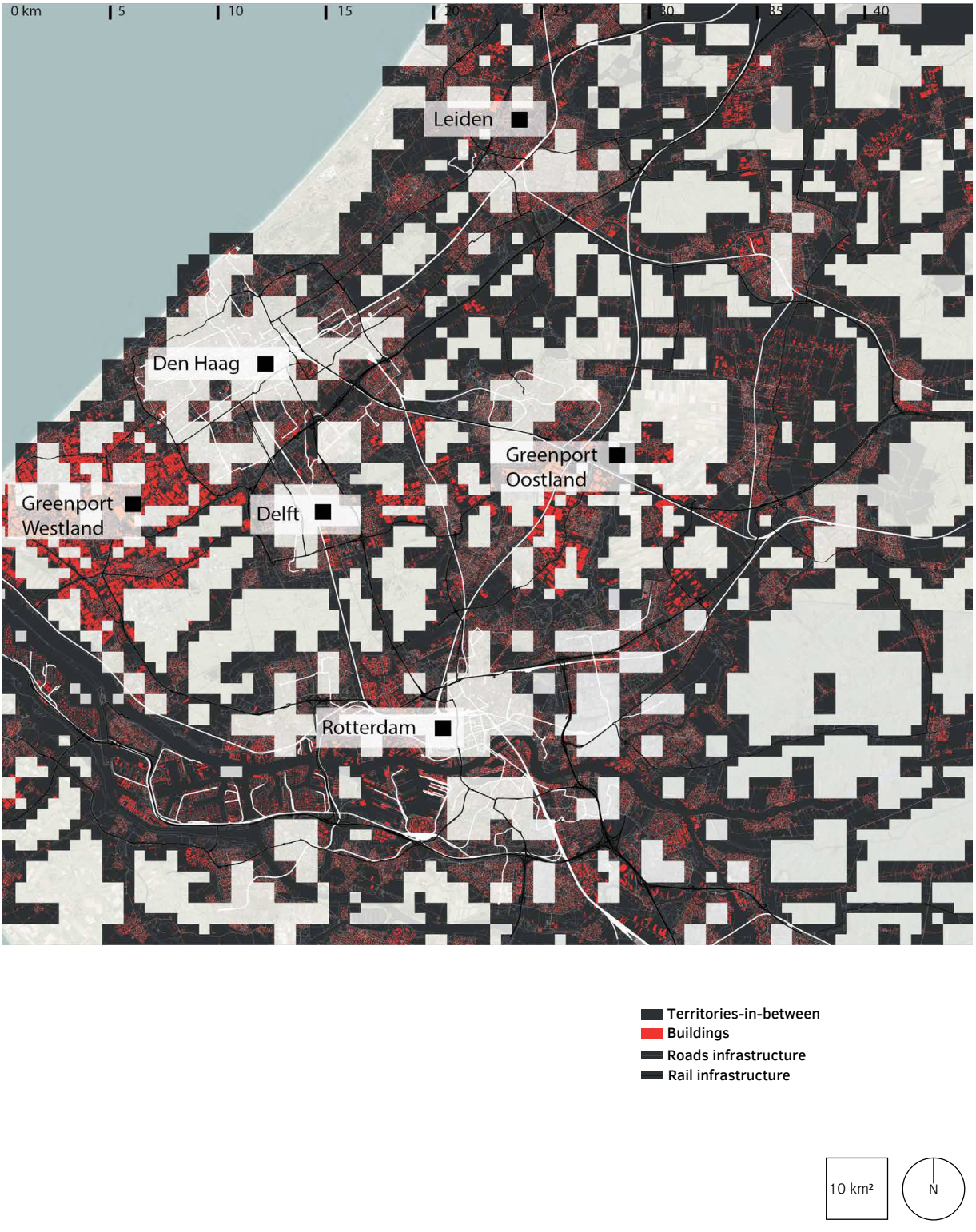


FIG. 8.33 The TiB in South-Holland are predominantly a field like type in the south between and around Rotterdam and The Hague. The network of cities and town type is more prominent in the northern part of the case study area.

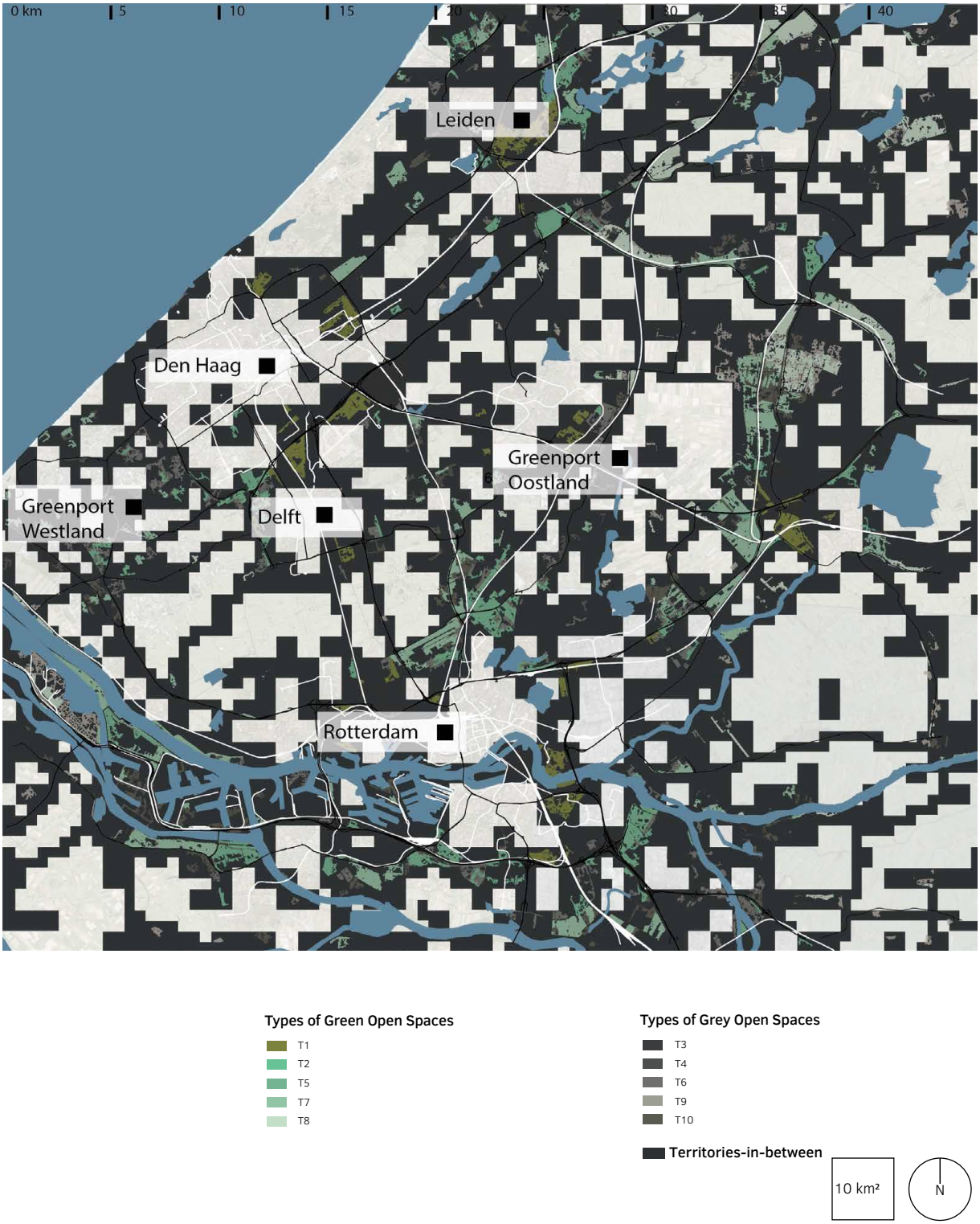


FIG. 8.34 The most frequent type of green space is Typ 7. Type 7 can be best described as the backyards of settlements with a rather high potential of multifunctionality between residential use with green infrastructure. These spaces have a key role as buffer areas between housing areas and intensive agricultural areas, but also as ecological corridors connecting the backbone of the regional green infrastructure with the urban green network. Open space type 6 are crucial areas in establishing an ecological network that connects rural and suburban ecosystems.

1

2

3

FIG. 8.35 (1) A green space in the Westland that provides provisional and cultural ecosystem services. (2) Green and grey open spaces with accompanying public transit infrastructure, providing regulating ecosystem services. (3) A typical grey space is a parking lot at a sports facility in the green heart.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

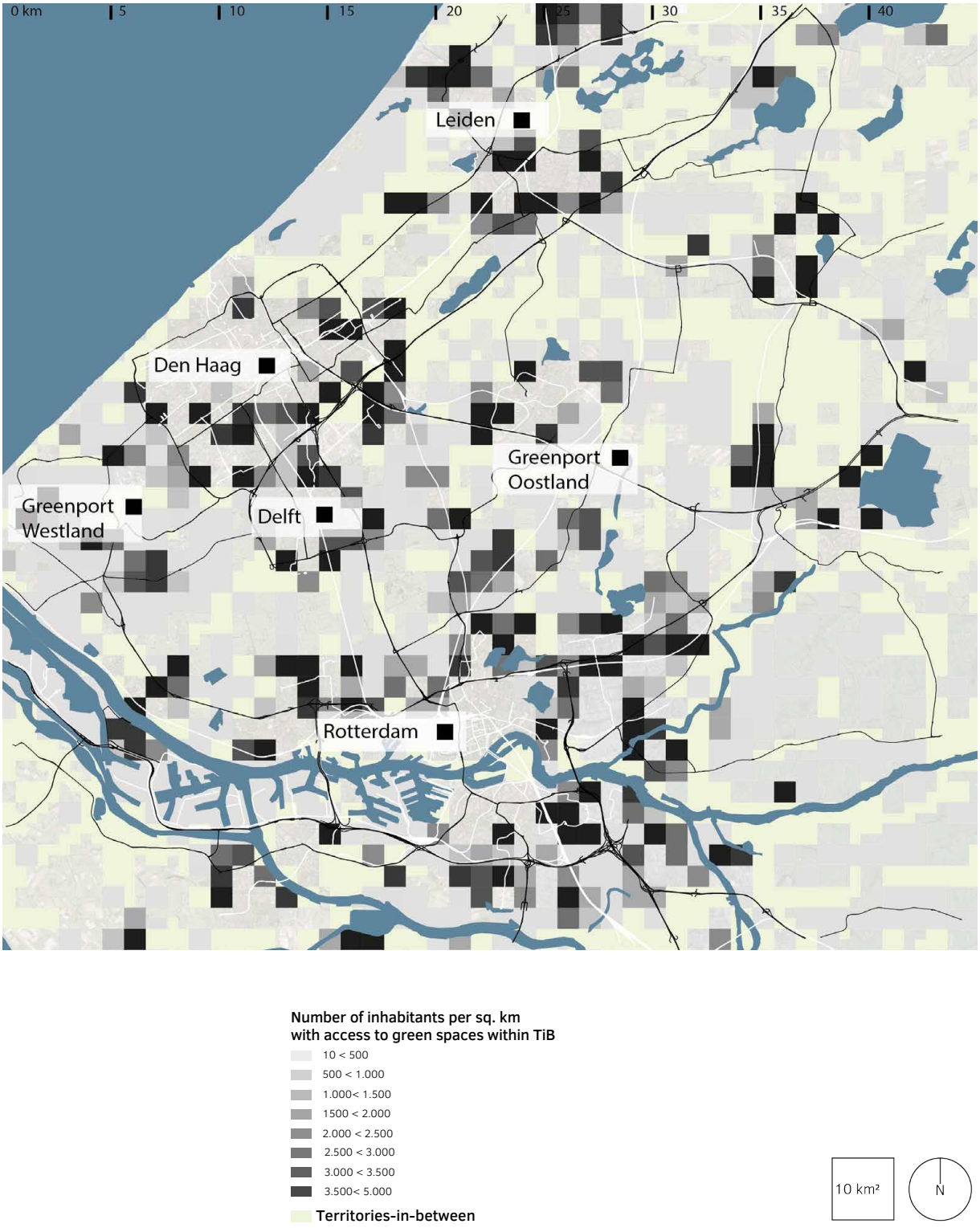


FIG. 8.36 Around 40 per cent of the inhabitants in the TiB in South-Holland have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

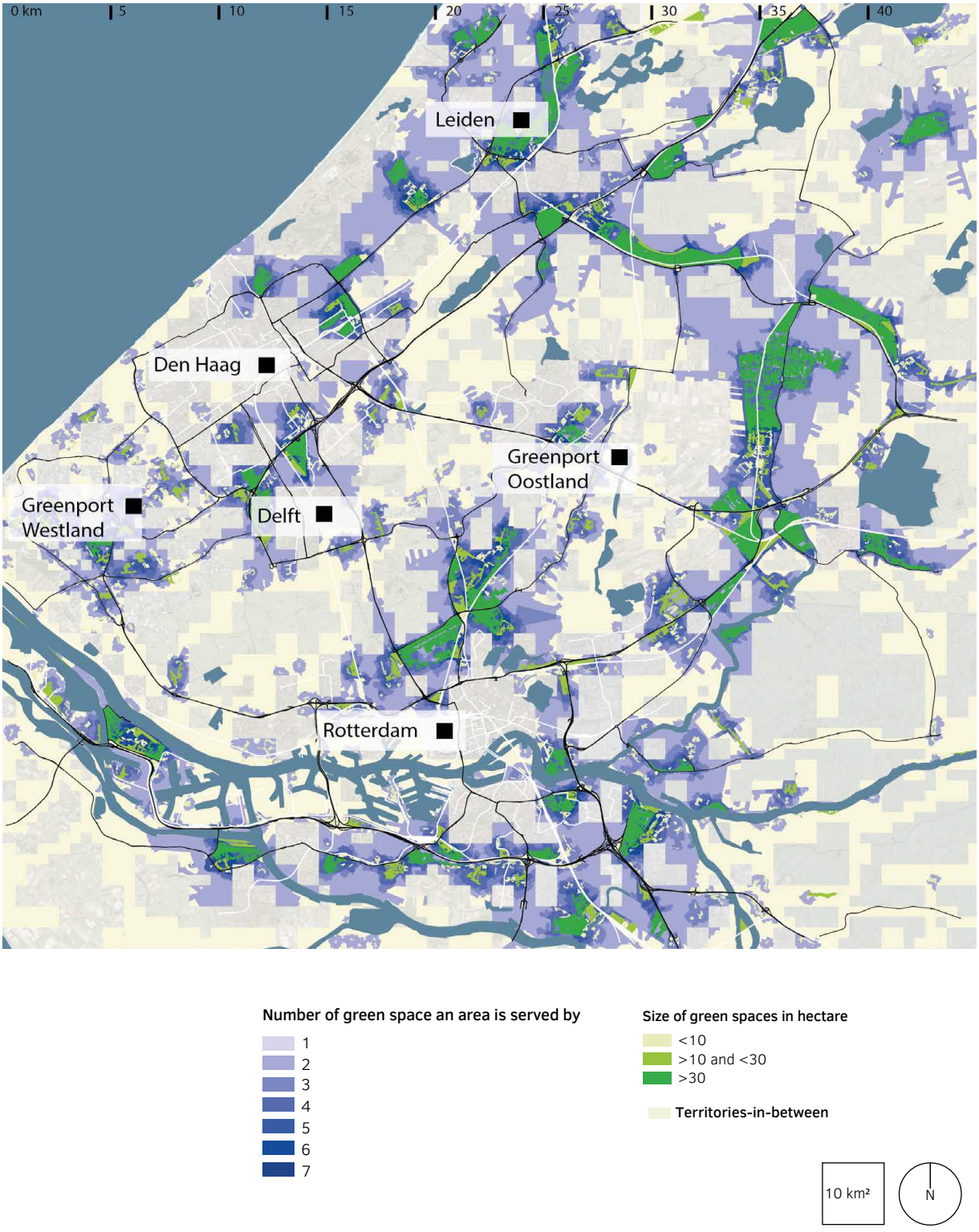


FIG. 8.37 The high intensity of access to green space is widespread.

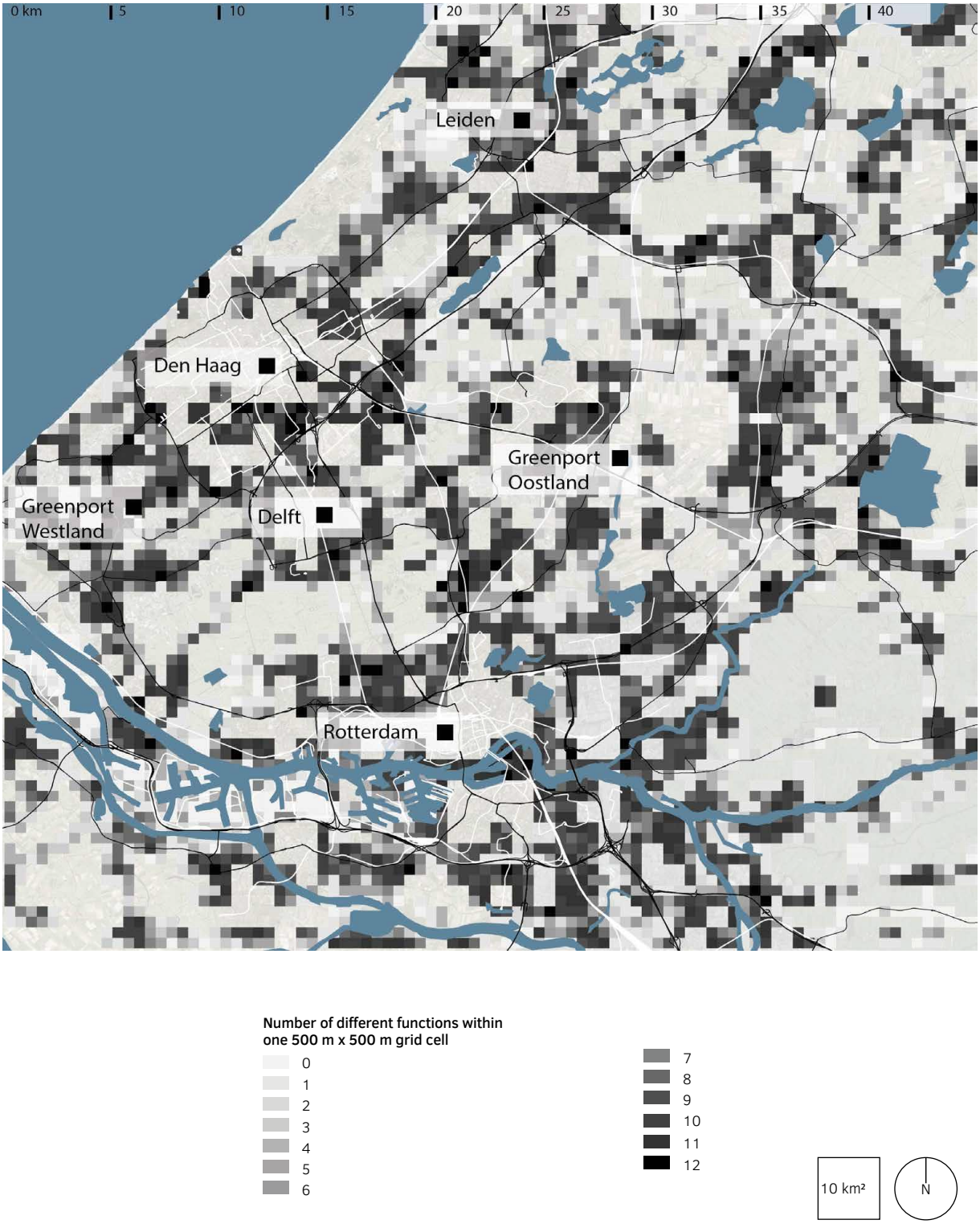


FIG. 8.38 Approximately 75 per cent of the inhabited grid cells hosts more than three functions. The highest mix of function is located in all cities and towns.

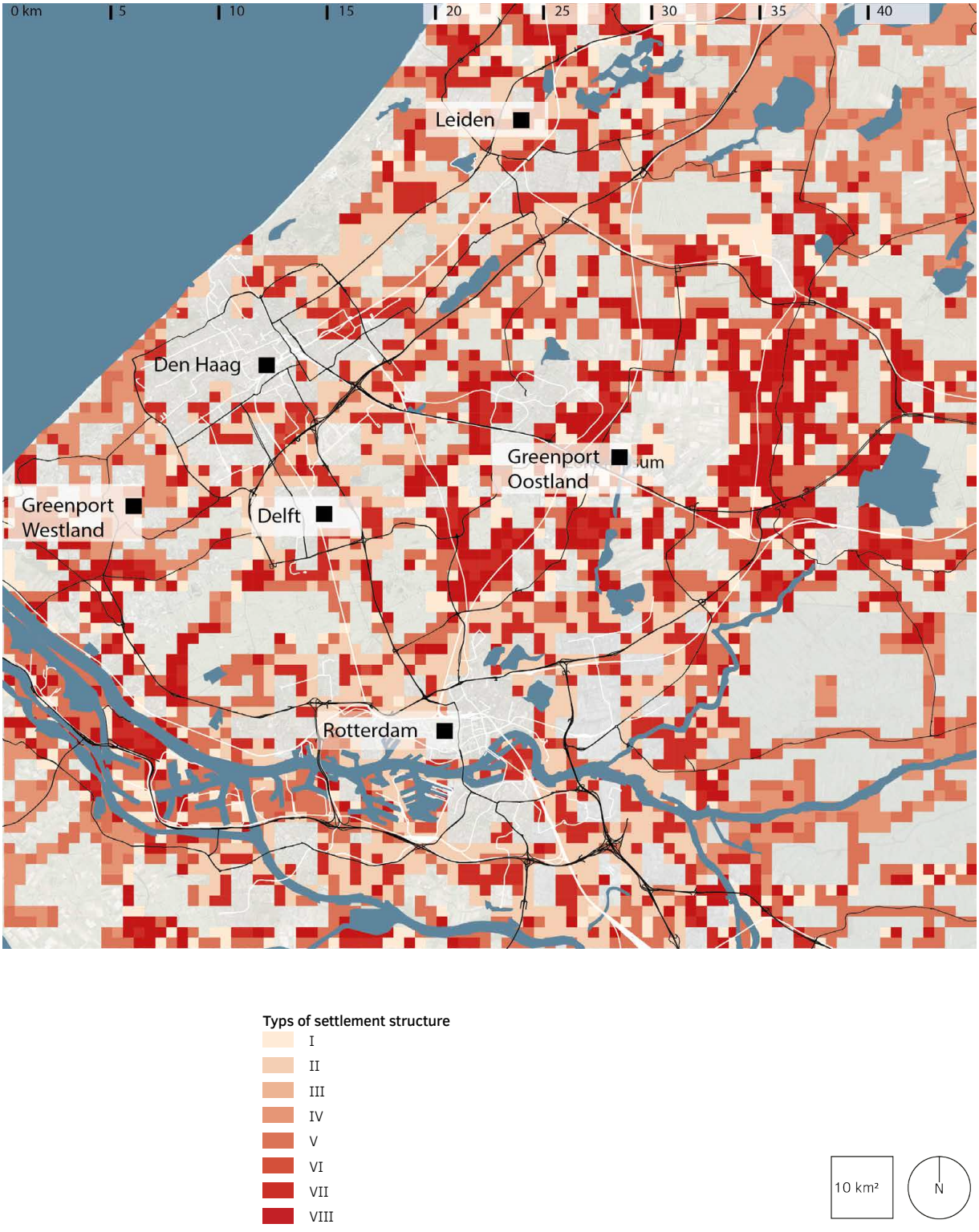


FIG. 8.39 Type V is the most frequent (29 per cent) settlement type, which is predominantly monofunctional. In all other settlement types, more than 90 per cent of the cells hosts more than three different functions. See table 6.6 for details.

8.5.6 Gelderland

GELDERLAND

FIG. 8.40 The case study area includes the two cities of 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 are forests between Nijmegen and Groesbeek.

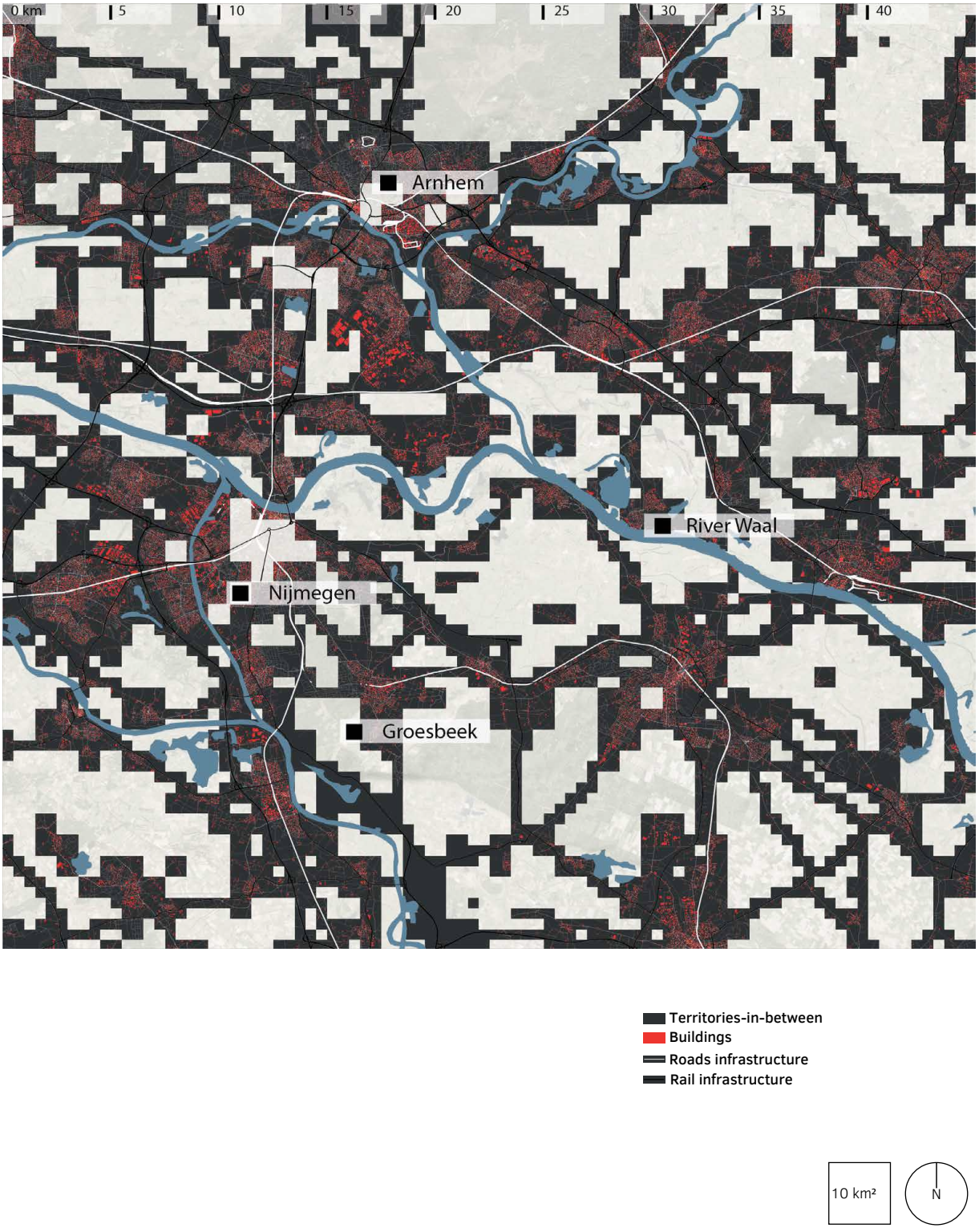


FIG. 8.41 Two different forms of TiB can be observed, one more field like between Arnhem and Nijmegen, and the network of towns and cities in the rest of the case study area.

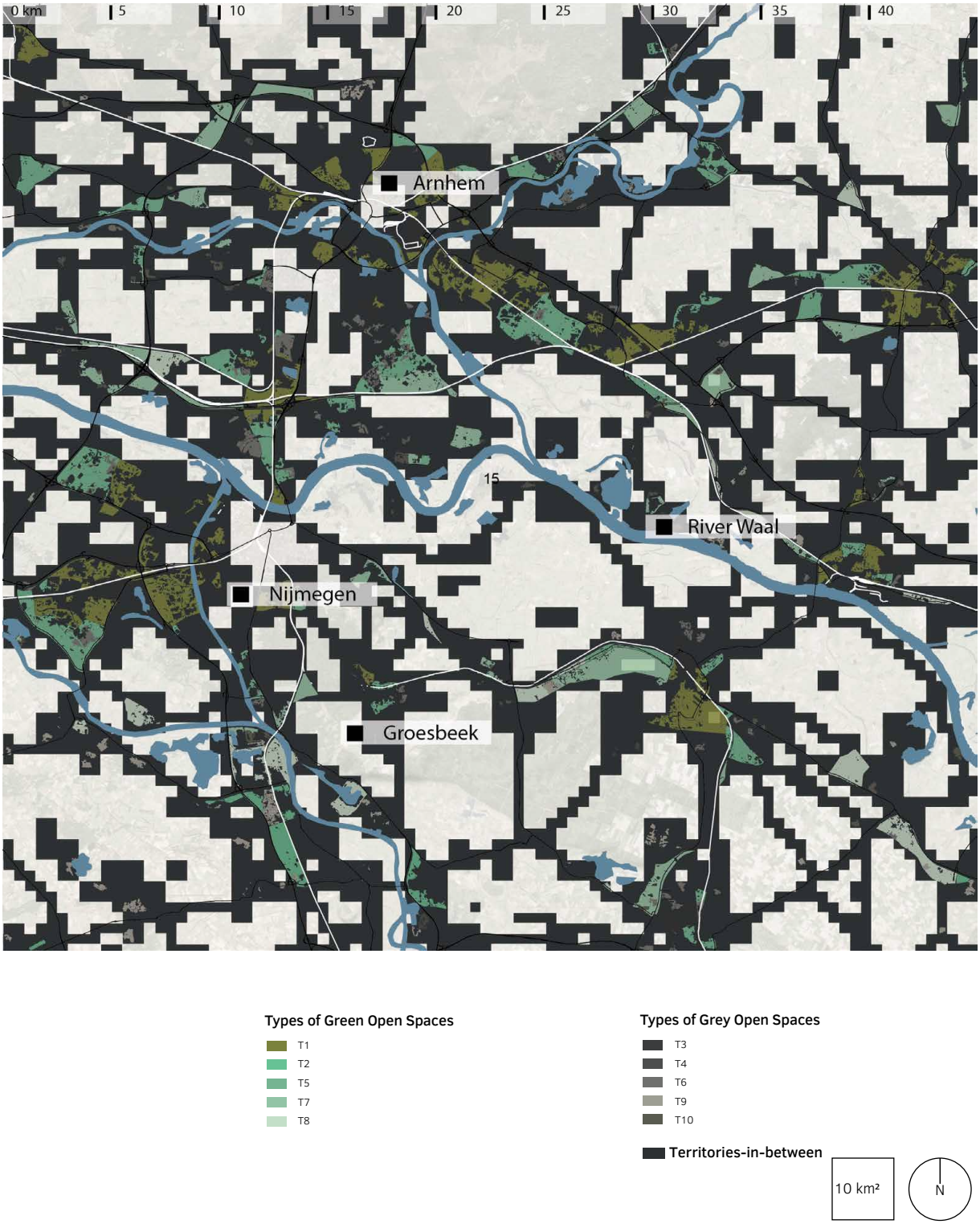


FIG. 8.42 Type 1 is the most common green space and type 3 is the most common grey space. Both are often located within the fringe zone of towns cities, and they have a high potential for multifunctionality, specifically concerning regulating and cultural ecosystem services. These open spaces are under the highest urbanisation pressure and plays a crucial to facilitate social interaction.

1

2

3

FIG. 8.43 (1) A green-blue open space that provides regulating and cultural ecosystem services to its direct surroundings. (2) A residual green space used as a playground. (3) The market street is an example of a multifunctional grey space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

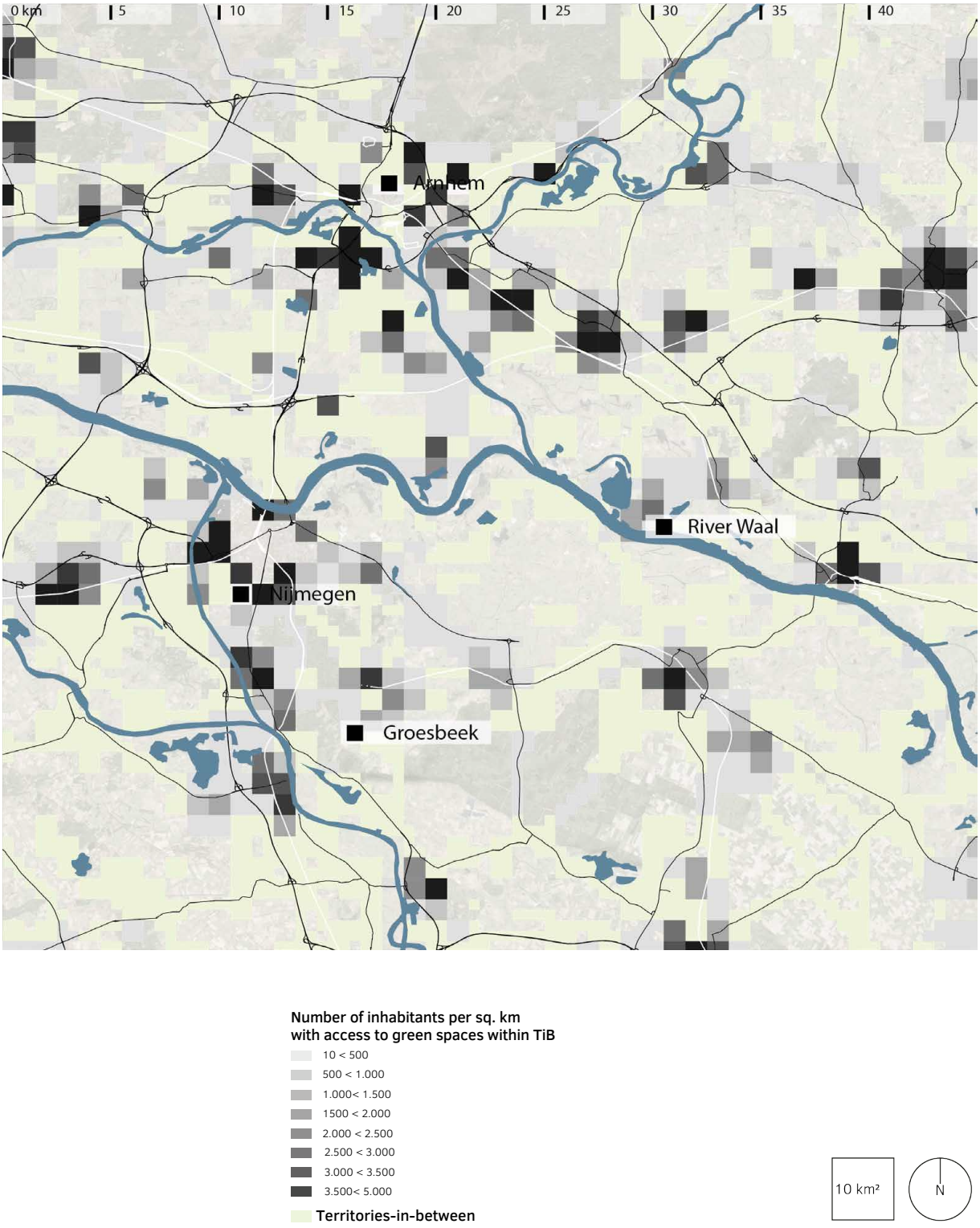


FIG. 8.44 Around 60 per cent of the inhabitants in the TiB in Gelderland have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

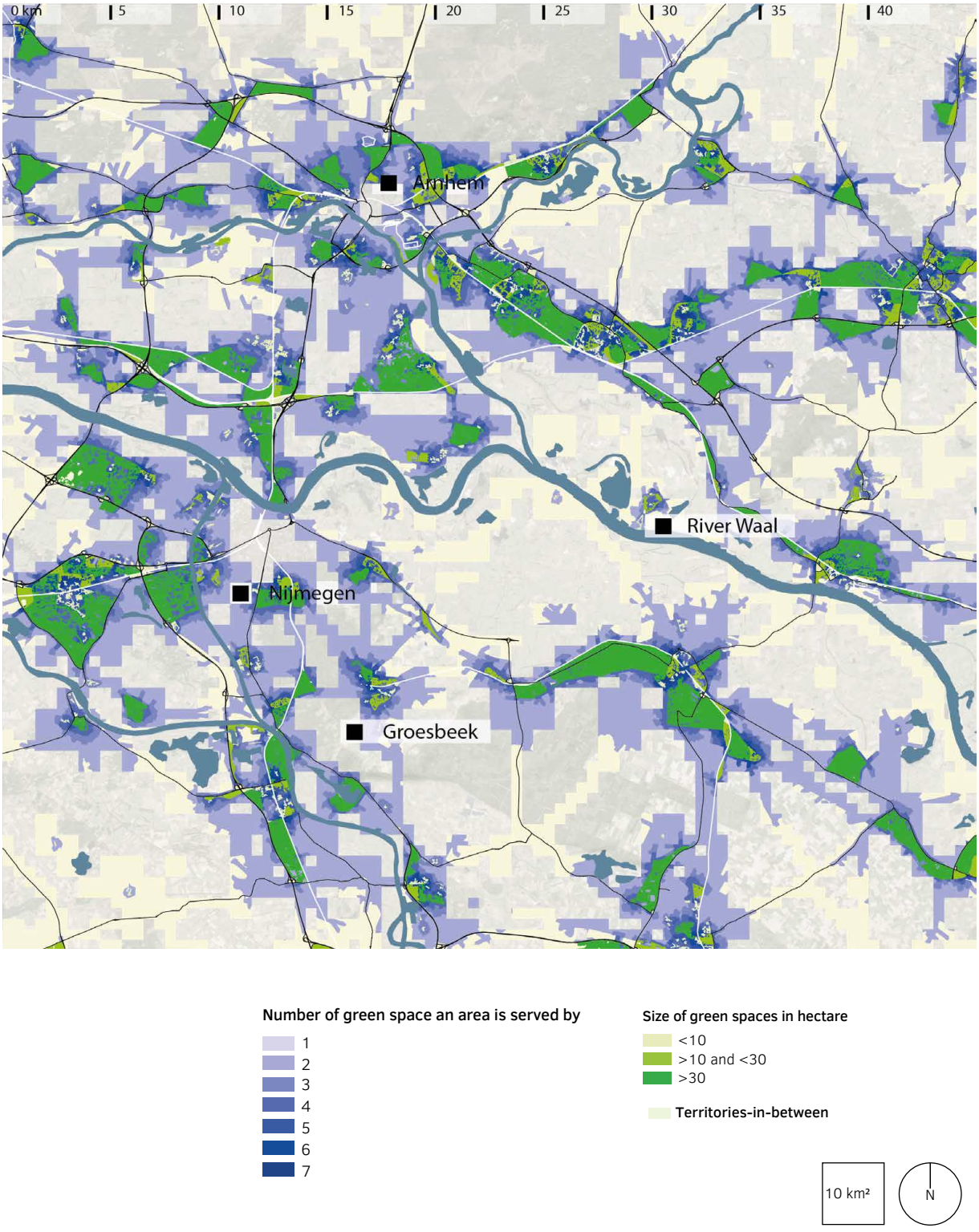


FIG. 8.45 The high intensity of access to green space is widespread.

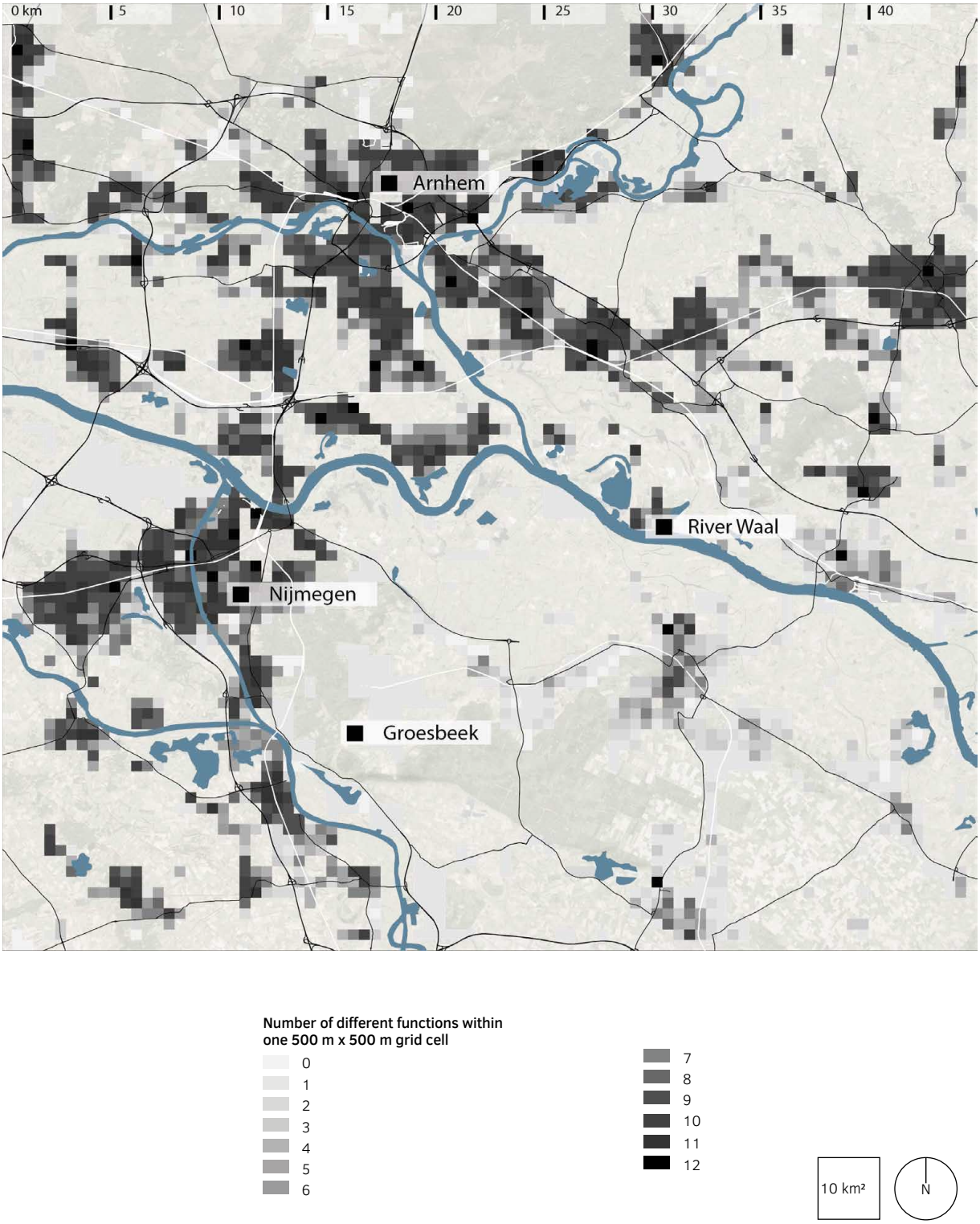


FIG. 8.46 Around 70 per cent of the inhabited grid cells hosts more than three functions. The highest mix of function is located in all cities and towns. A bid less mixed-use can be found in the south-east of the case study area.

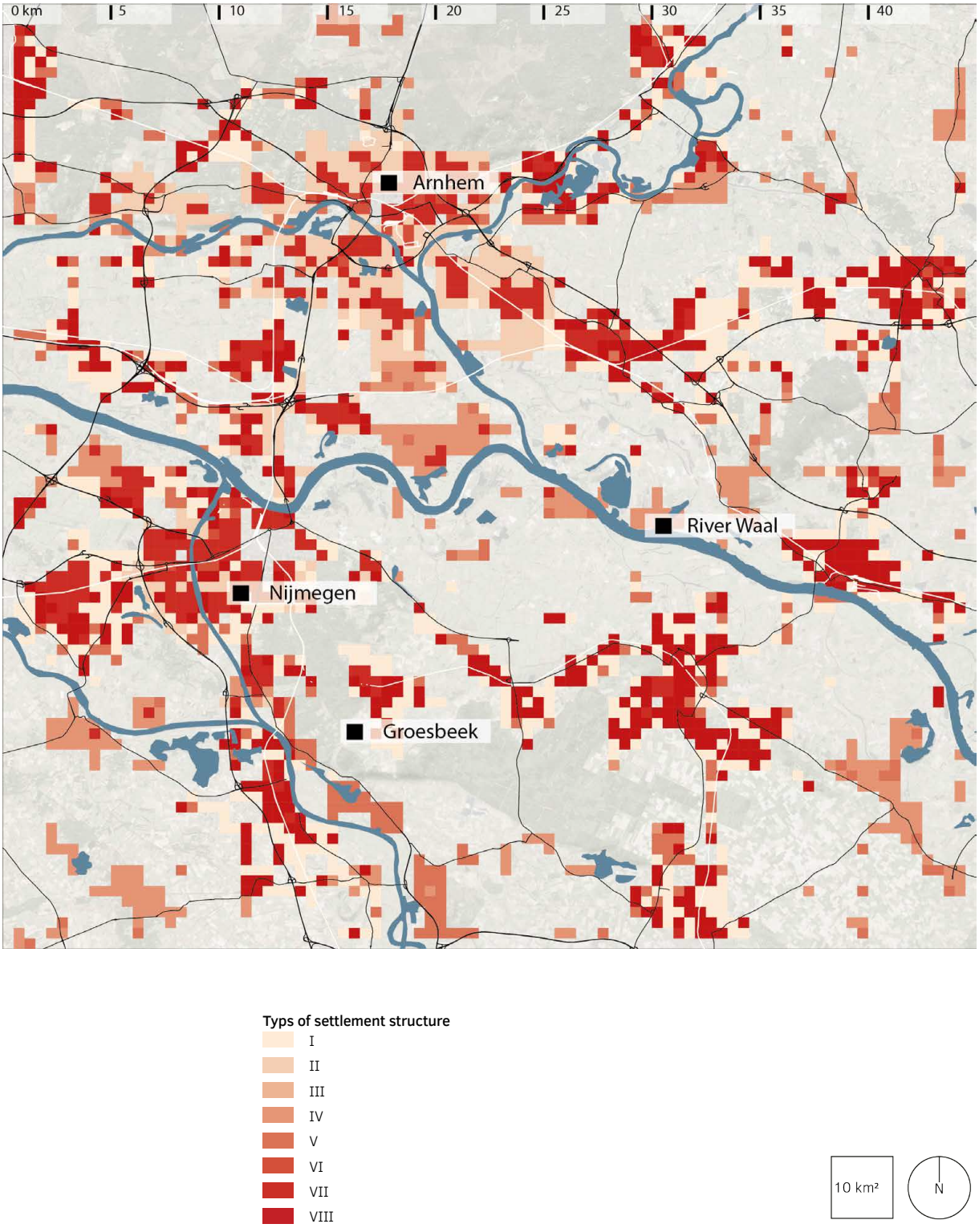


FIG. 8.47 The most frequent (22 per cent) settlement type is type I, which has around 43 per cent of mono-functional cells but also 46 per cent of cells with more than three but less than ten different functions, as well as ten per cent of cells with ten or more functions. Type VIIIaccounts for roughly 22 per cent and has more than 70 per cent of cells which host 3 or more functions. See table 6.6 for details.

8.5.7 Bergamo-Brescia

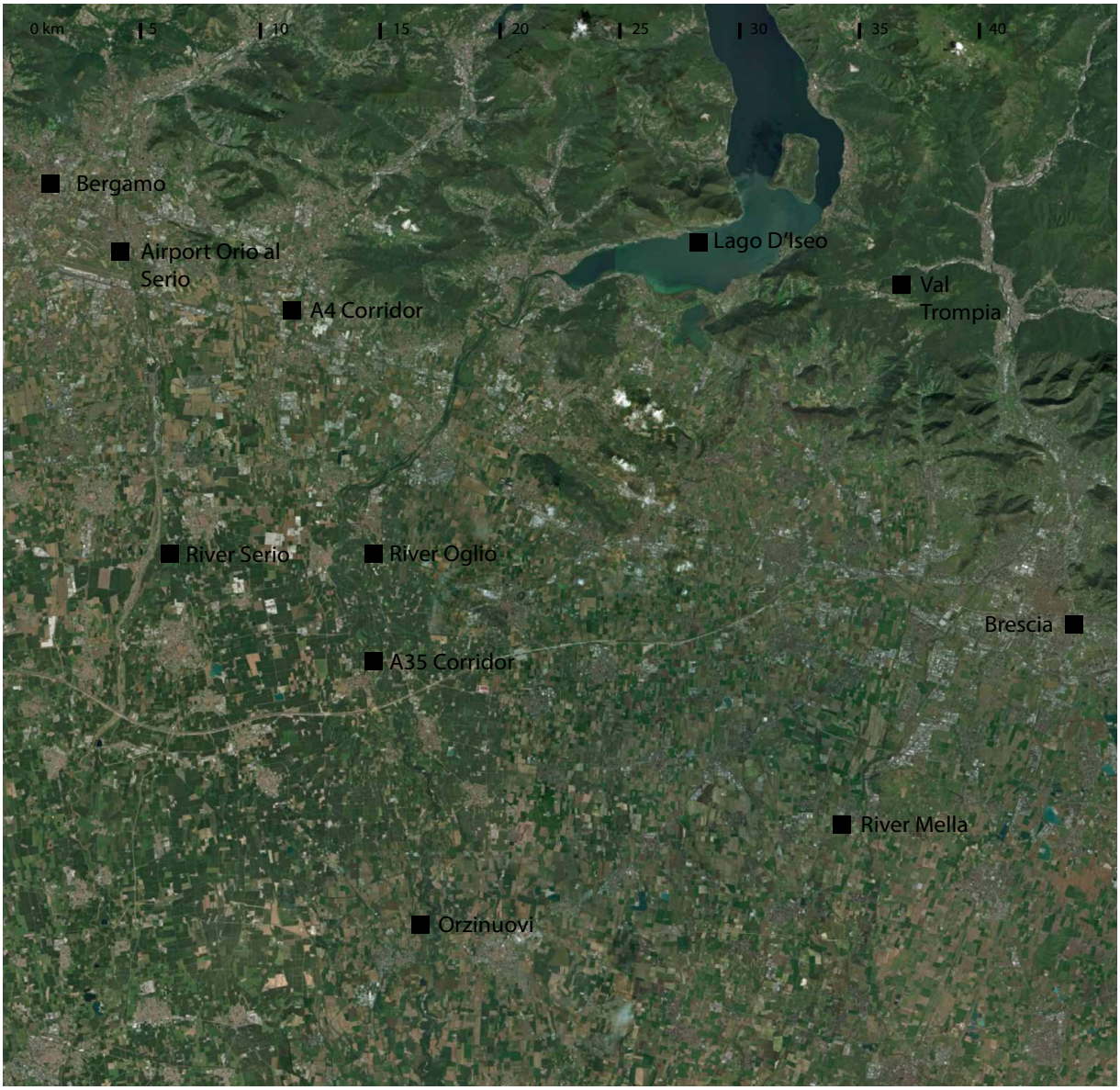


FIG. 8.48 The case study area in Bergamo-Brescia can be divided into three parts: the alps in the north and the riverplain in the south and an intensive zone full of infrastructures, like motorways, rail lines and an airport with accompanying urbanisation at the foods of the Alps between Bergamo and Brescia.

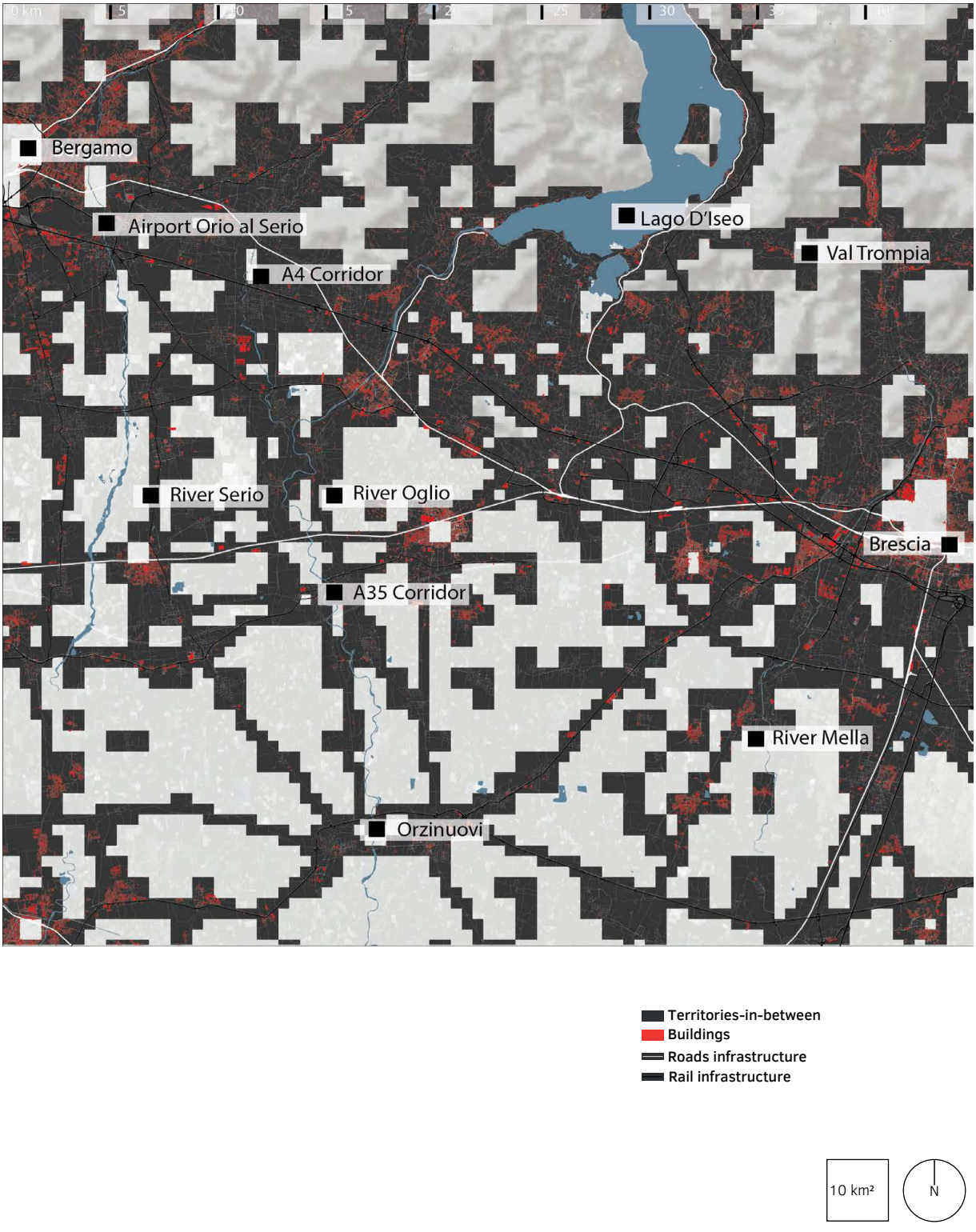


FIG. 8.49 The infrastructure corridor type between Bergamo-Brescia dominates the case study area. The valley type is present in the north and the network of cities and towns type in the south.

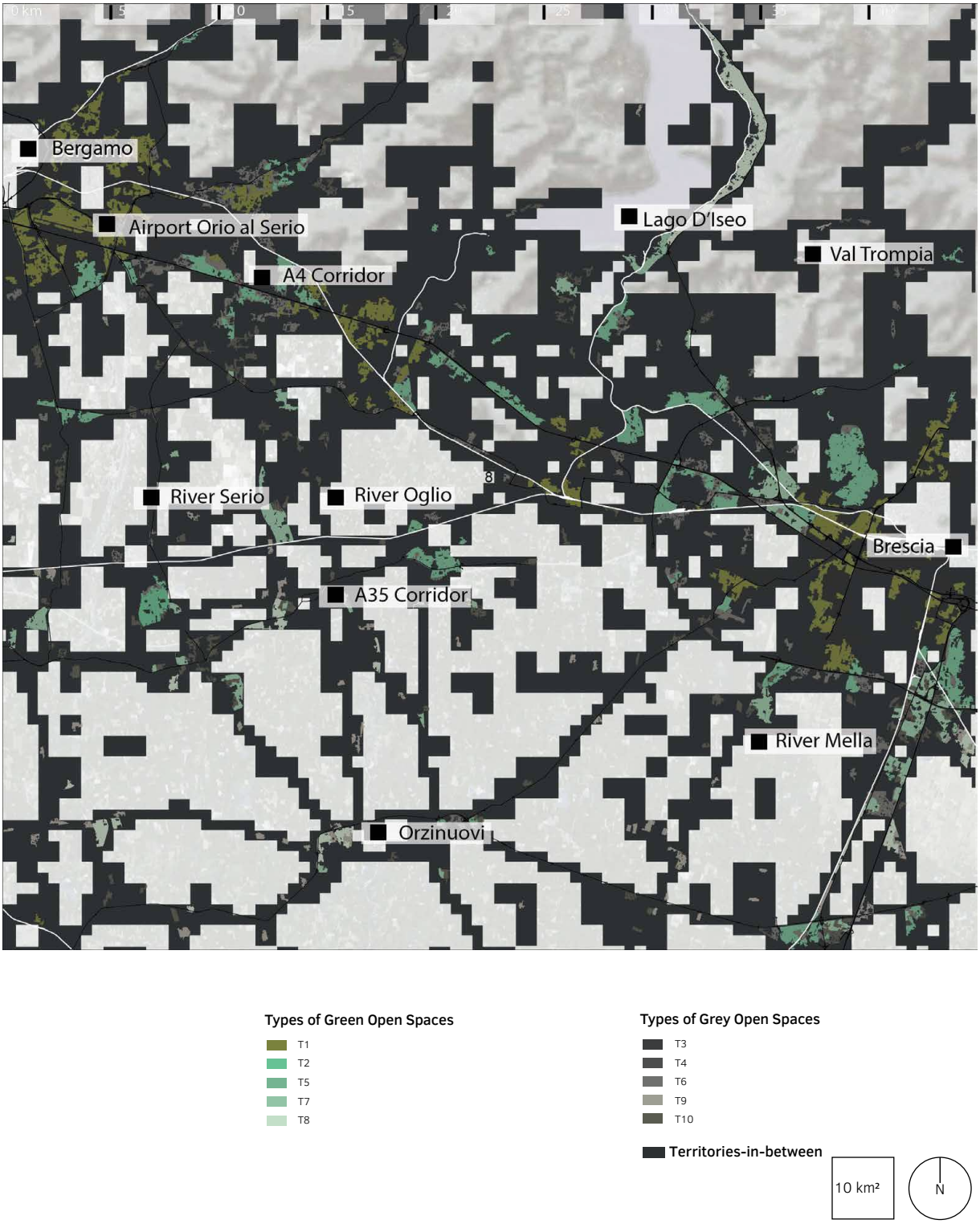
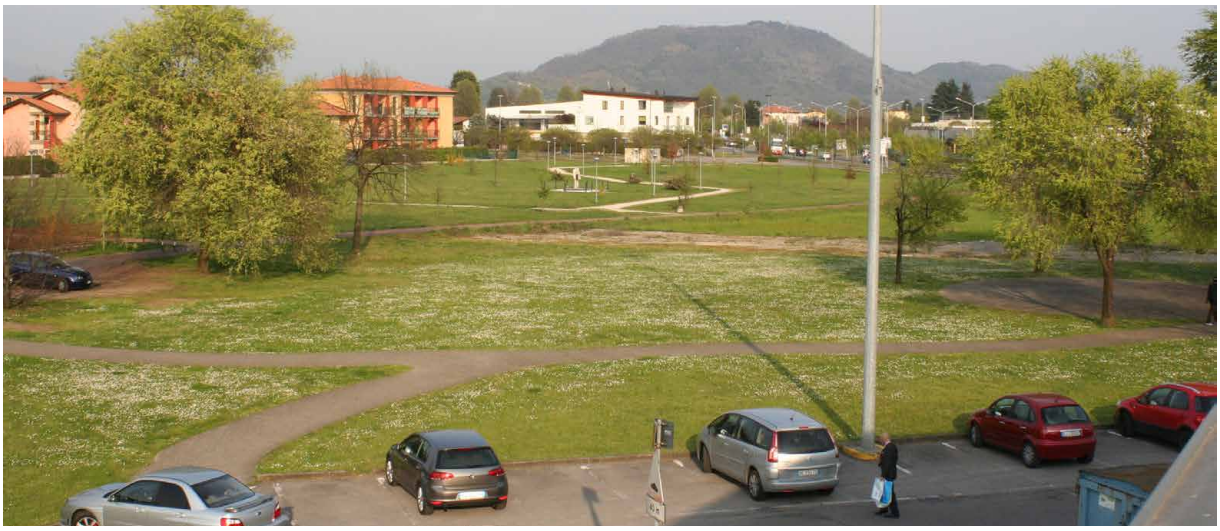


FIG. 8.50 Type 1 is the most common green space and type 6 is the most common grey space. Open spaces of type 1 are often located within the fringe zone of towns cities. They have a high potential for multifunctionality, specifically concerning regulating and cultural ecosystem services. These open spaces are under the highest urbanisation pressure and play a crucial role in facilitating social interaction. Type 10 open spaces are often located at the edges and within smaller settlements or in industrial areas as well as along big technical infrastructures, like highways and airports. They play a key role in the provision of regulating and cultural ecosystem services.



1

2

3

FIG. 8.51 (1) An example of green open space at the edge of a settlement. (2) An extreme example of a grey open space, the parking lot at the roof of a shopping mall. (3) A widespread grey space, in this case, the parking lots in industrial and business parks.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

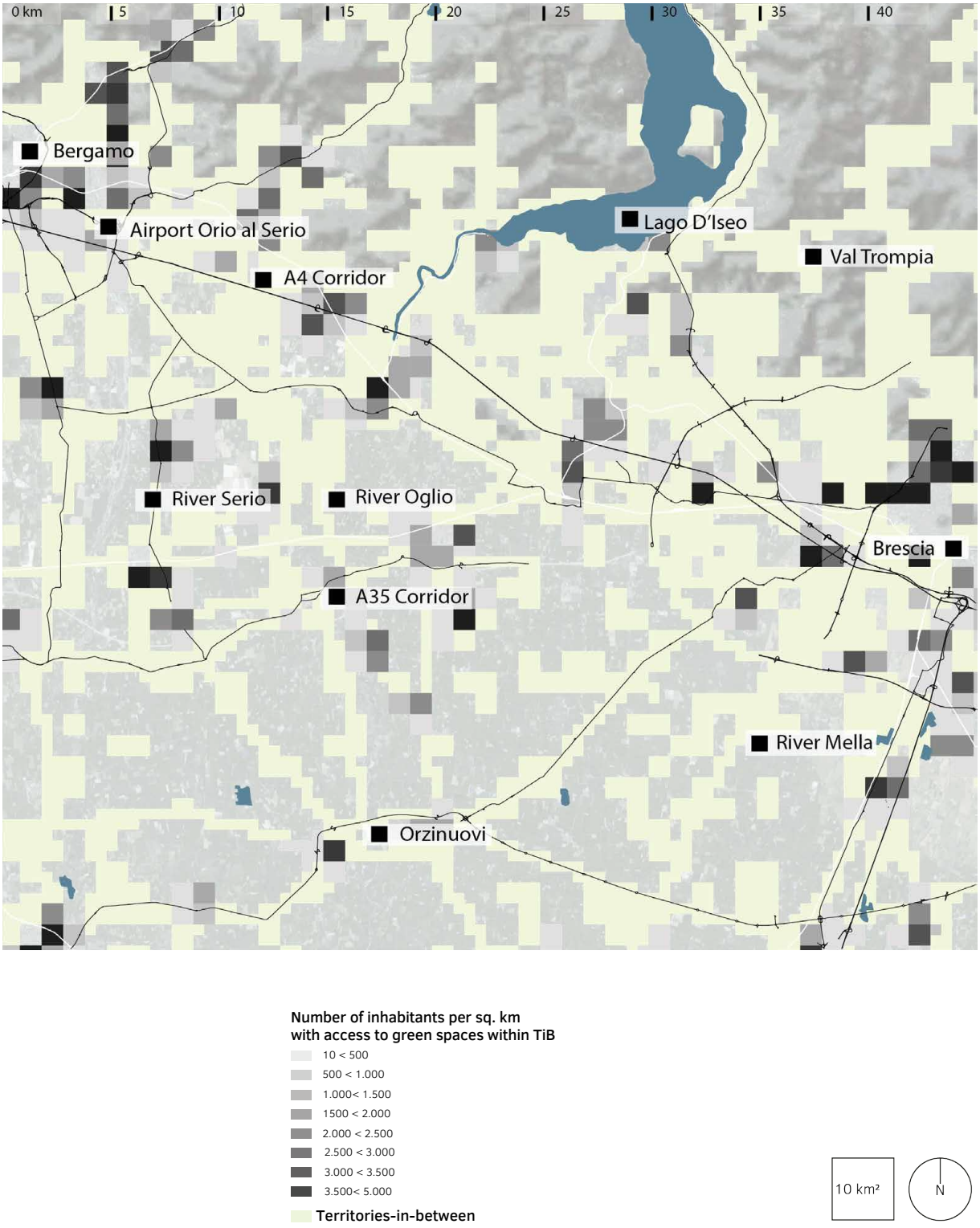


FIG. 8.52 Only around 25 per cent of the inhabitants in TiB in Bergamo-Brescia have access to more than one size of green space.

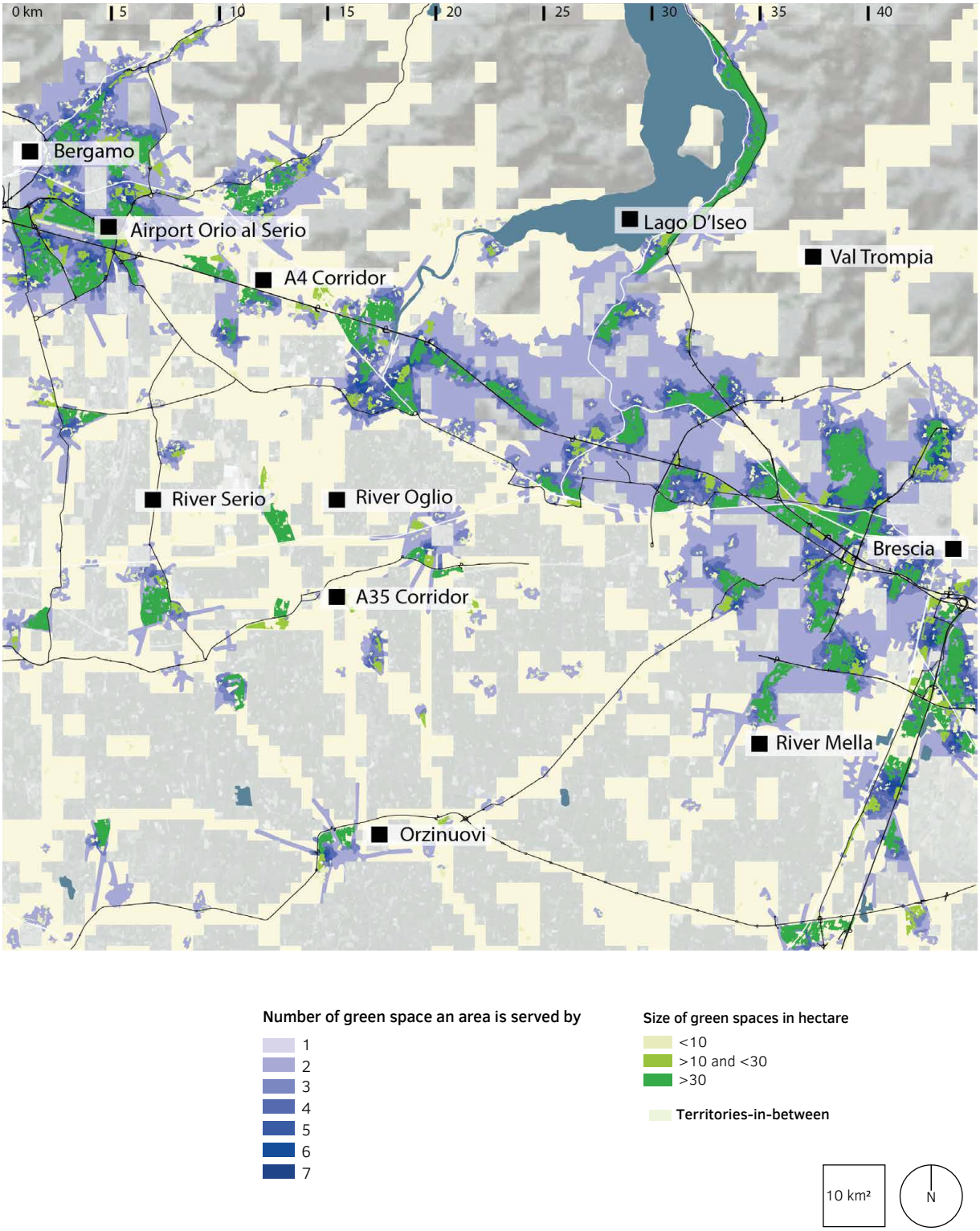


FIG. 8.53 The intensity of access to green space is highest along the A4 corridor.

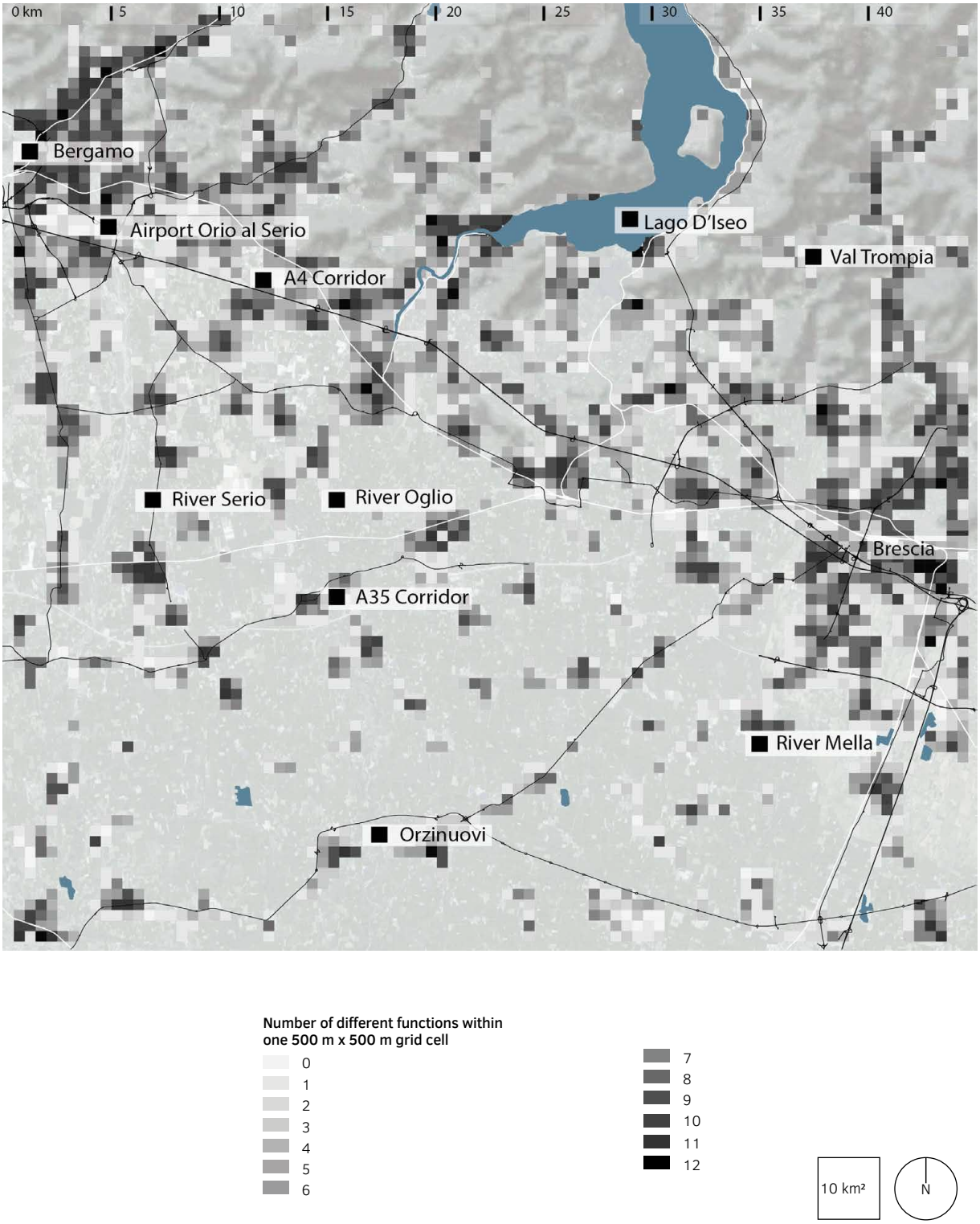


FIG. 8.54 Around 70 per cent of the inhabited grid cells hosts threeor more functions. The highest mix of function is widespread.

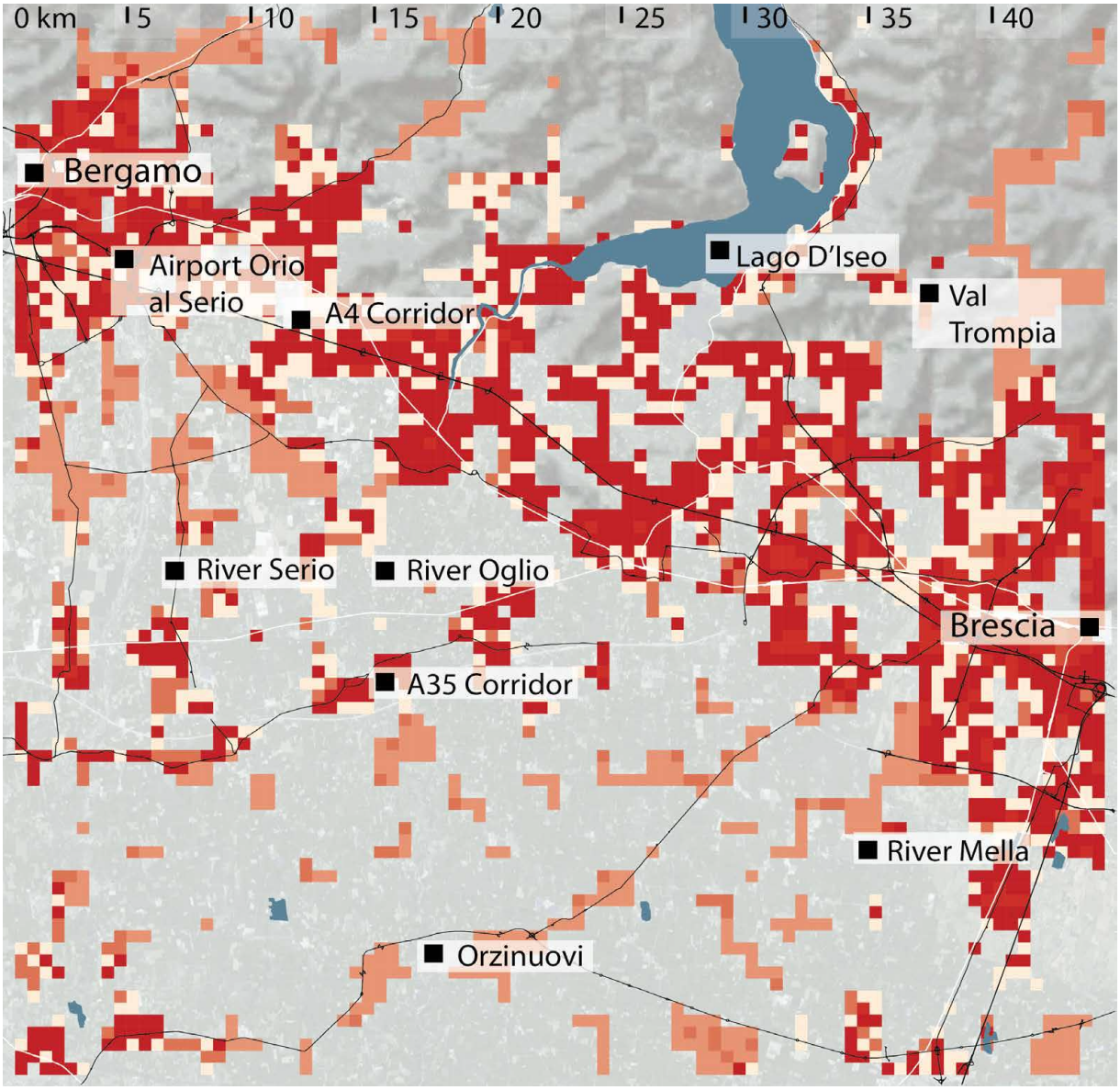


FIG. 8.55 The most frequent (42 per cent) settlement type is type VIII, which has around 20 per cent of mono-functional cells, but also 70 per cent of cells with more than three but less than ten different functions, as well as ten per cent of cells with ten or more functions. Type I, accounts for roughly 24 per cent of all cells, has more than 55 per cent of cells which host 3 or more functions. See table 6.6 for details

8.5.8 Veneto

VENETO

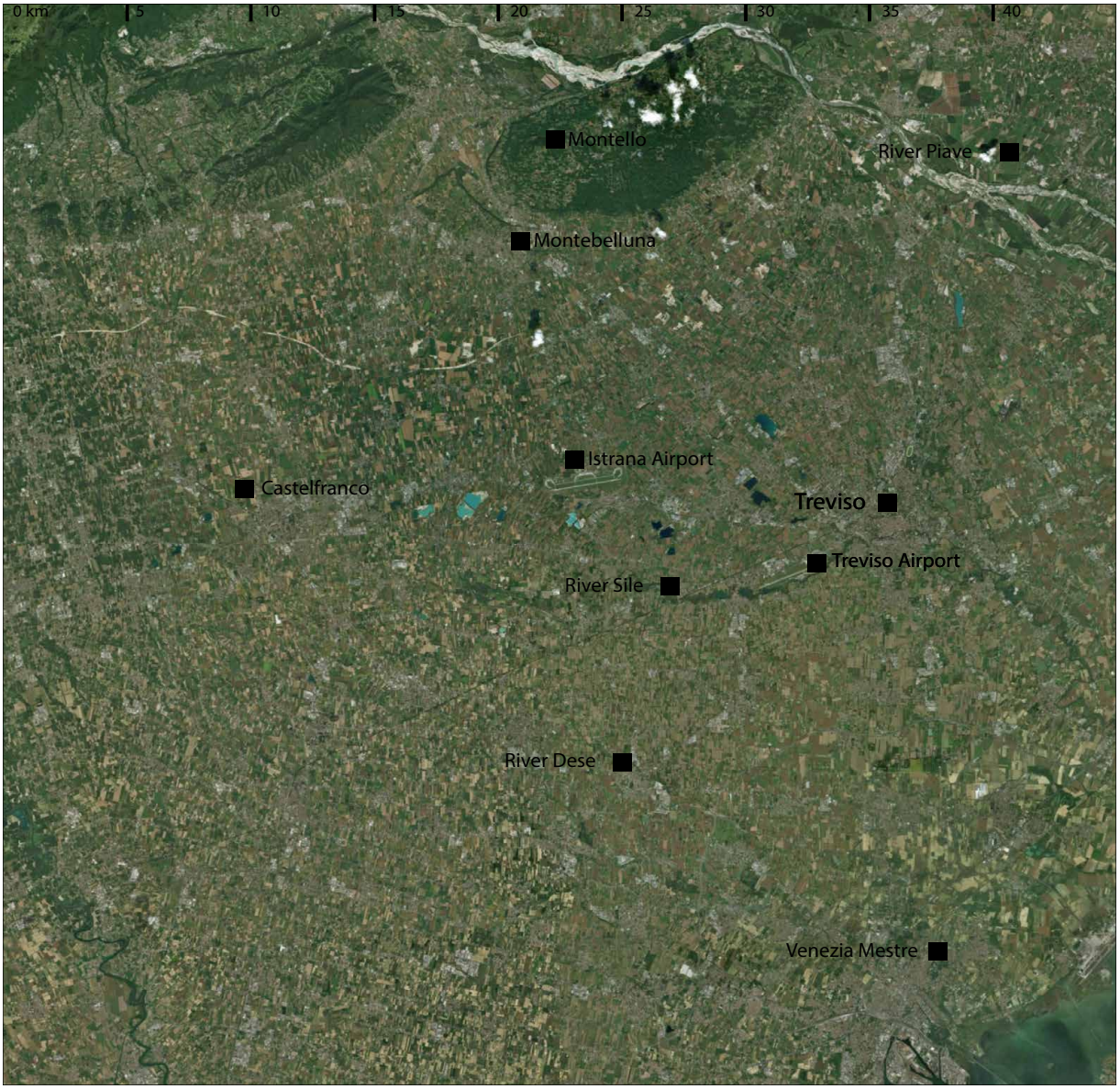


FIG. 8.56 The case study area in Veneto spans from the pre-Alpine hills via the lower plain towards the coastal zone. The city of Mestre is situated in the most south-eastern corner. The river Piave is a visible landscape feature in the north-east in the case study area. The biggest cites in the central 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..

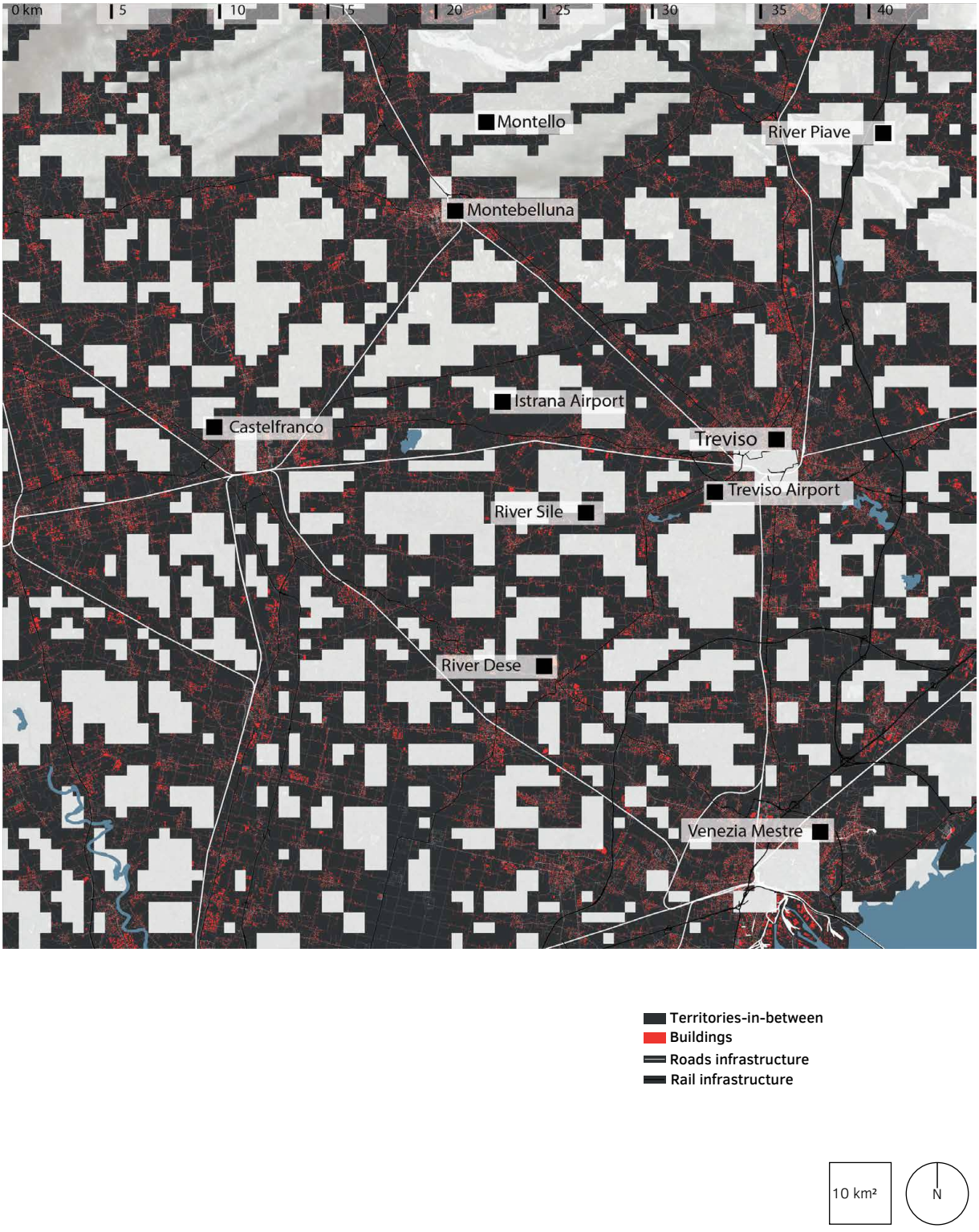


FIG. 8.57 Two differernt forms of TiB can be observes, one more field like around Cardiff and alond the sea, and a the typical valley type.

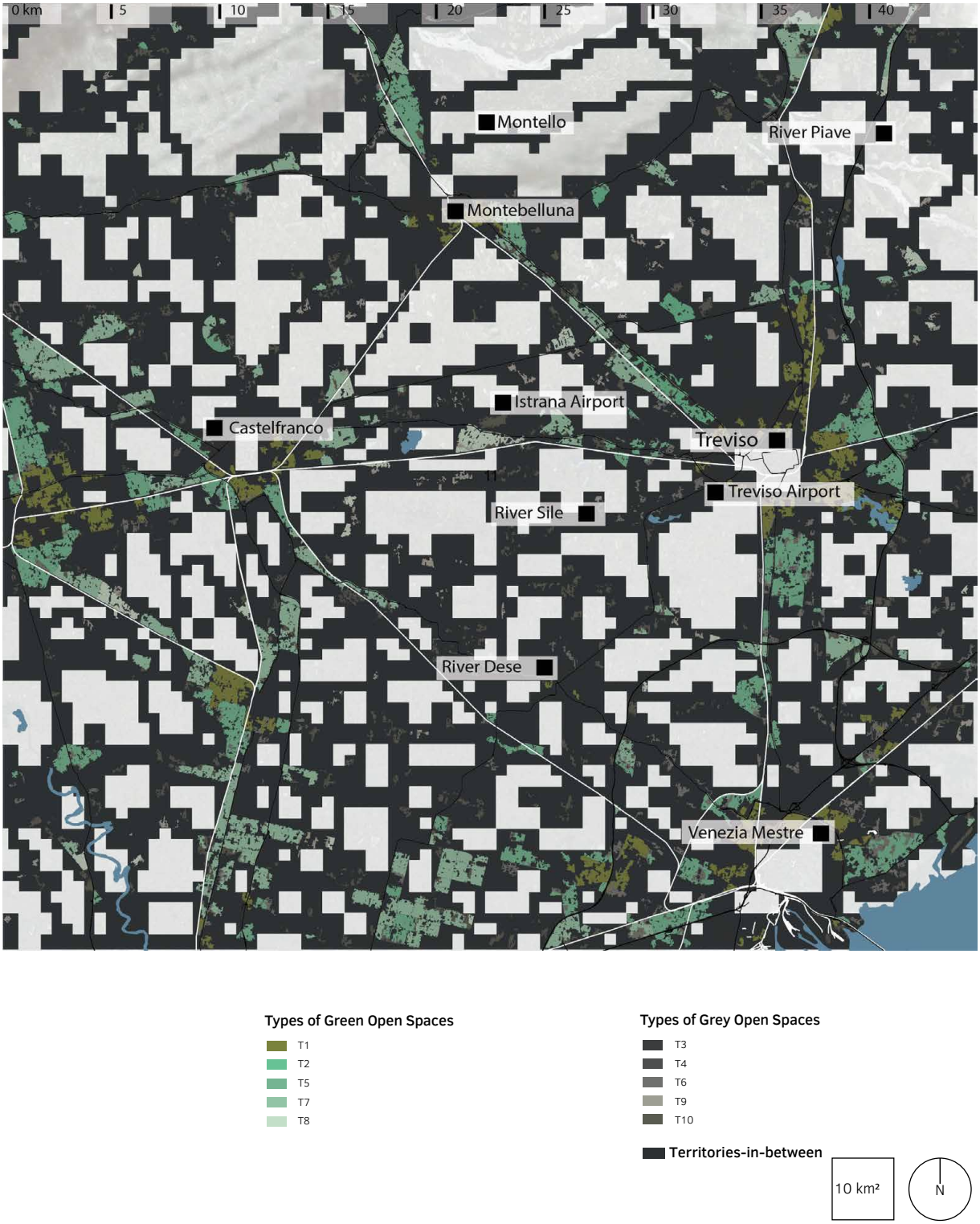


FIG. 8.58 The most frequent type of green space is Typ 7 and type 10 is the most frequent grey space. Type 7 can be best described as the backyards of settlements, with a rather high potential of multifunctionality between residential use with the green infrastructure. These spaces have a key role as buffer areas between housing areas and intensive agricultural areas, but also as ecological corridors connecting the backbone of the regional green infrastructure with the urban green network. Open spaces of type 10 are very often located at the edges and within smaller settlements or in industrial areas as well as along big technical infrastructures, like highways and airports. Those grey spaces play a crucial role in the provision of relation to regulating and cultural ecosystem services.

1

2

3

FIG. 8.59 1) A green-blue open space providing regulating ecosystem services to its direct surroundings. (2) A widespread grey space, in this case, the parking lots in industrial and business parks. (3) A multifunctional grey space on a market day.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

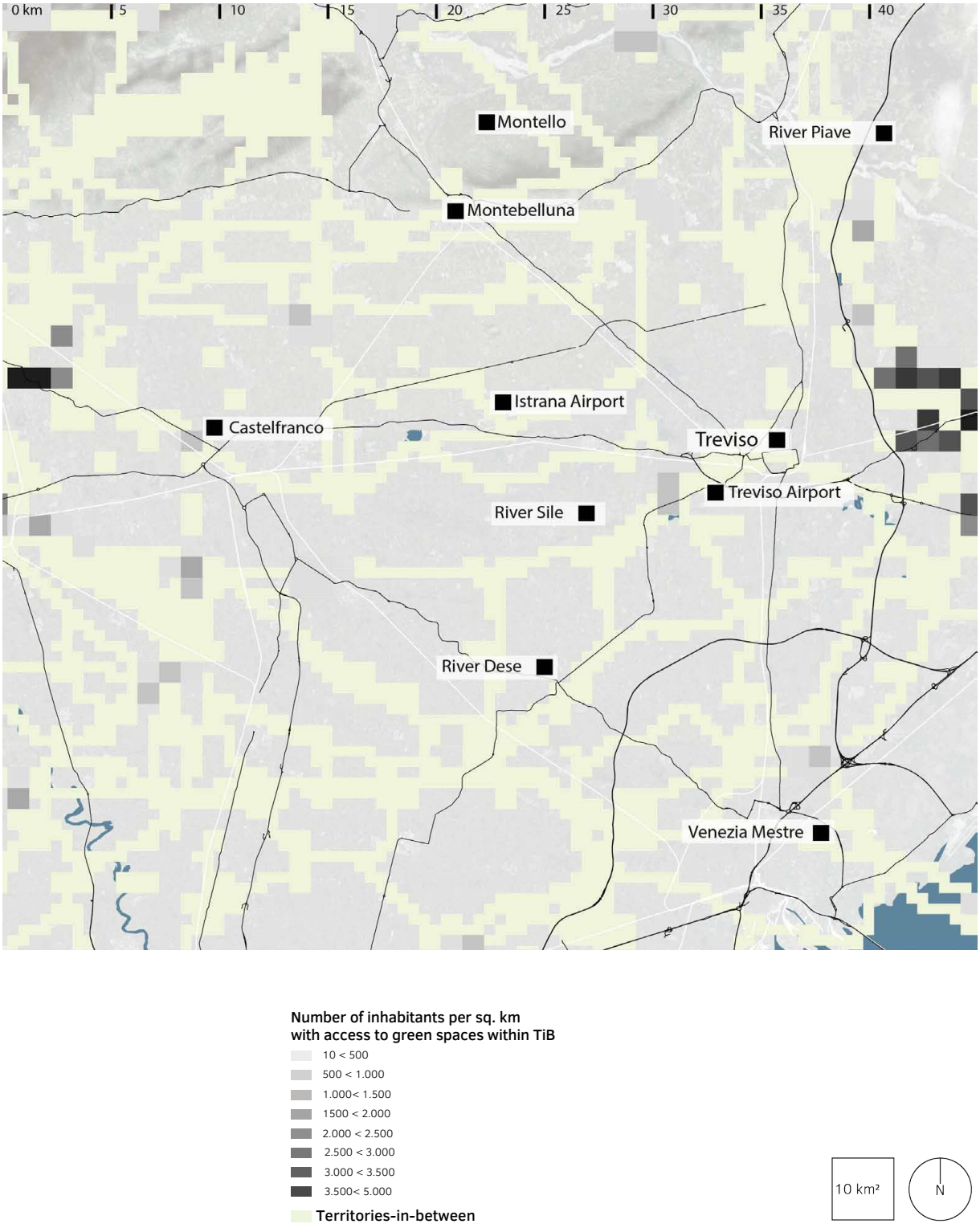


FIG. 8.60 Around 30 per cent of the inhabitants in the TiB in Bergamo-Brescia have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

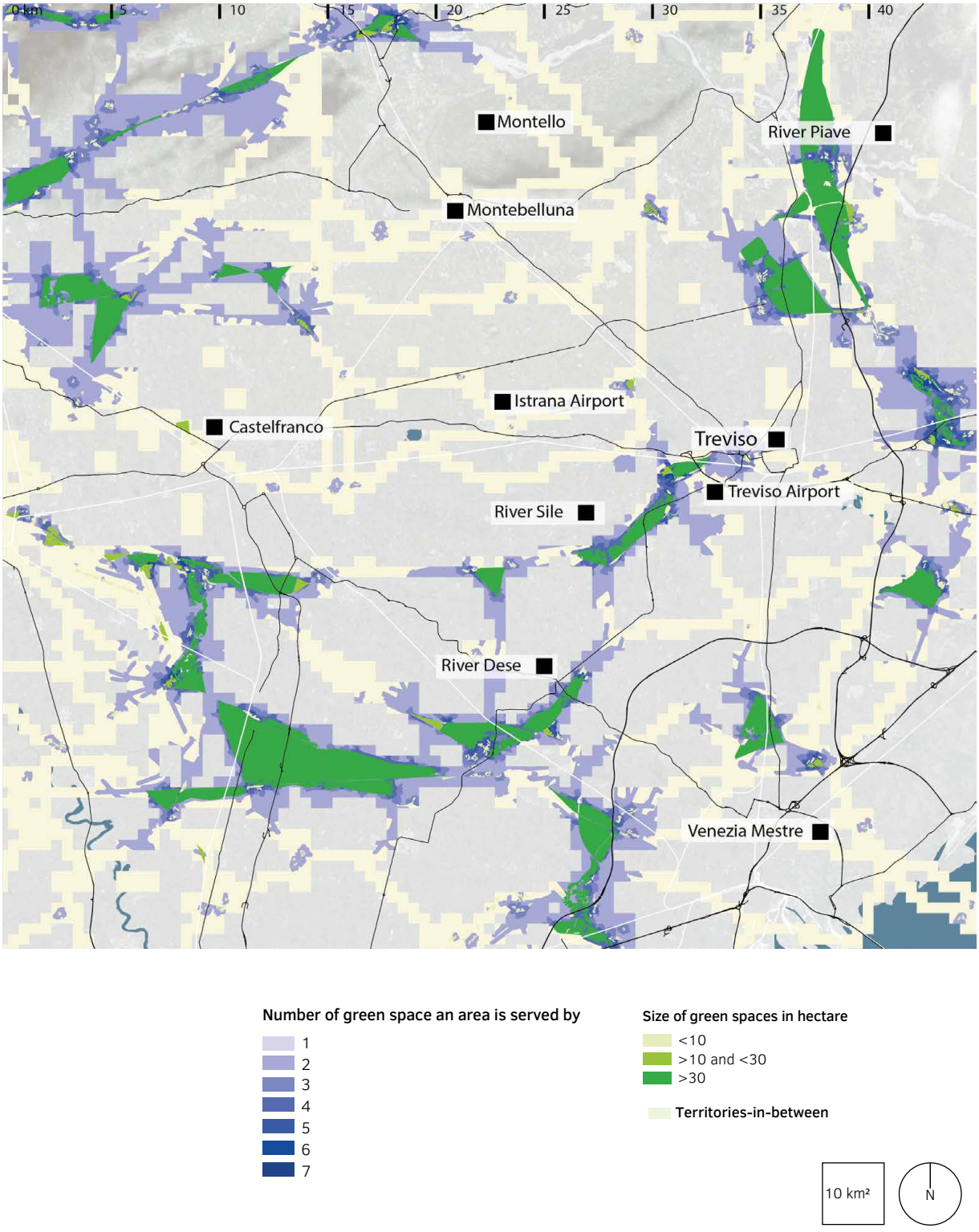


FIG. 8.61 The intensity of access to green space is highest in and around the towns and smaller cities.

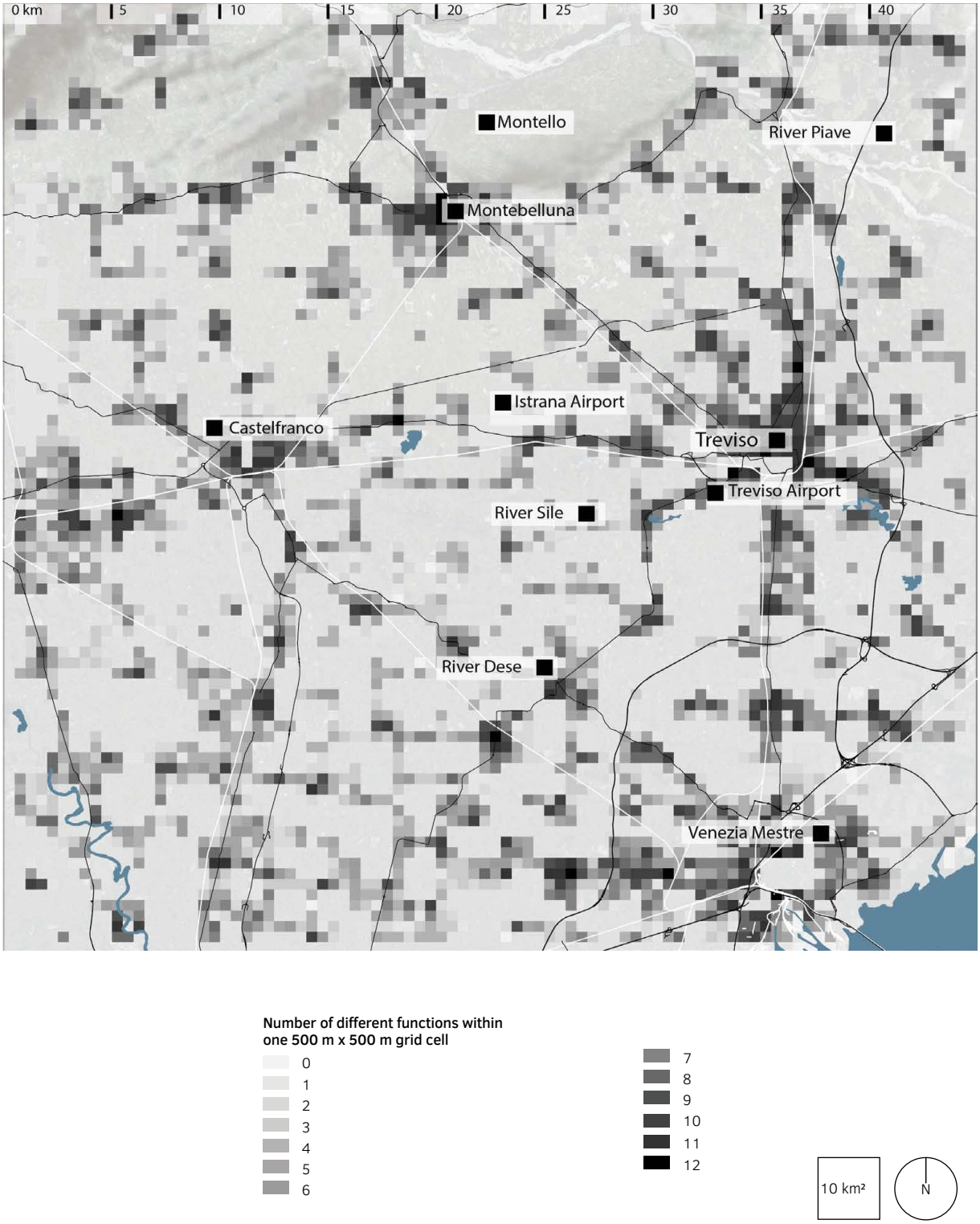


FIG. 8.62 Around 75 per cent of the inhabited grid cells host three or more functions. The highest mix of function is concentrated in cities and towns.

SETTLEMENT STRUCTURE

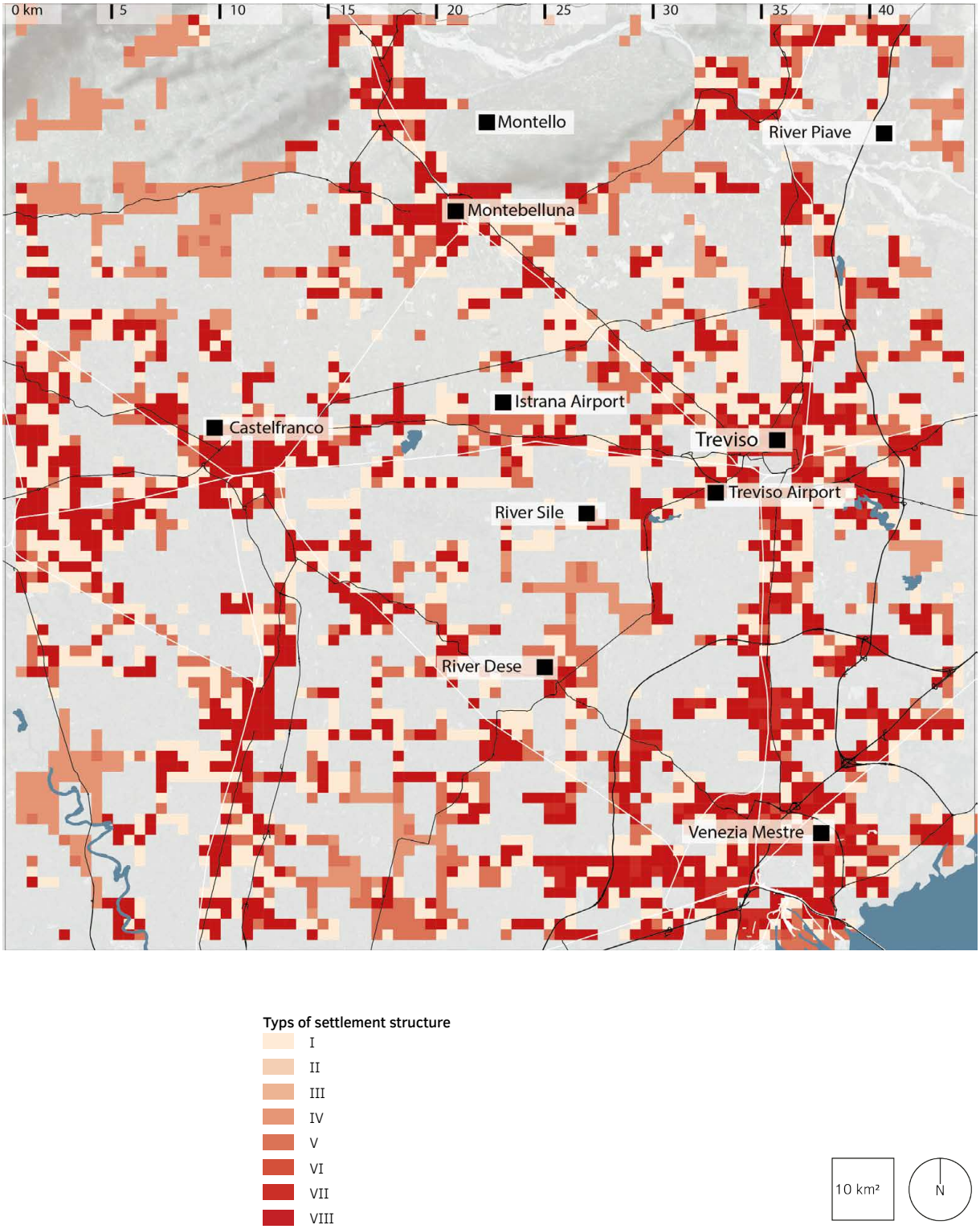


FIG. 8.63 The most frequent (37 per cent) settlement type is type VIII, which has around 17 per cent of mono-functional cells, but also 72 per cent of cells with more than three but less than ten different functions, as well as eleven per cent of cells with ten or more functions. Type I, which accounts for roughly 33 per cent, has more than 70 per cent of cells which host 3 or more functions. See table 6.6 for details.

8.5.9 The Tyrol

FIG. 8.64 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 in the west, one of the most prominent winter tourism areas in the area and the Wipptaal to the east, which leads to the Brenner pass one of most important passes of the Eastern Alpine range which has the lowest altitude among passes in the eastern Alps.

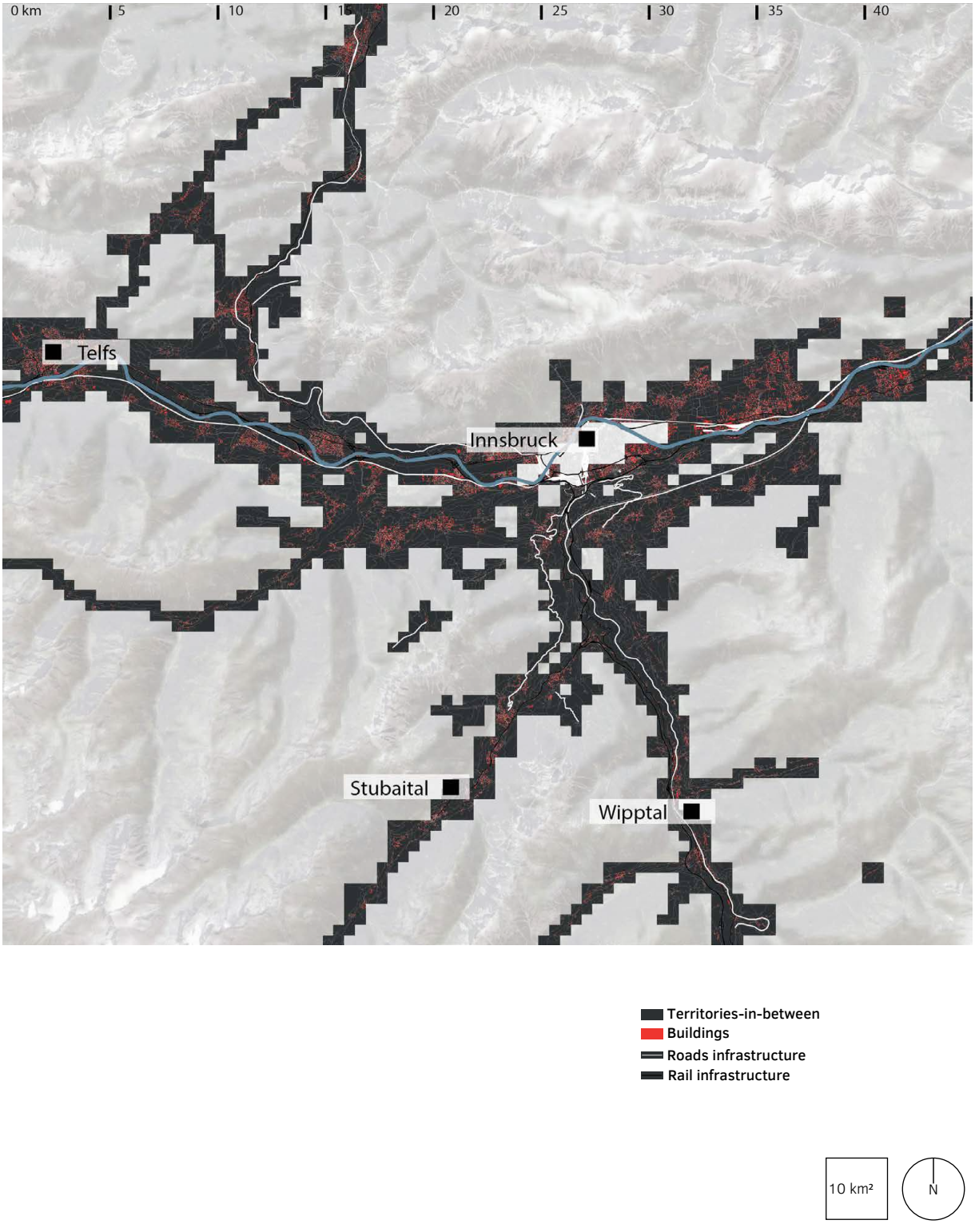


FIG. 8.65 The valley type of TiB is dominant.

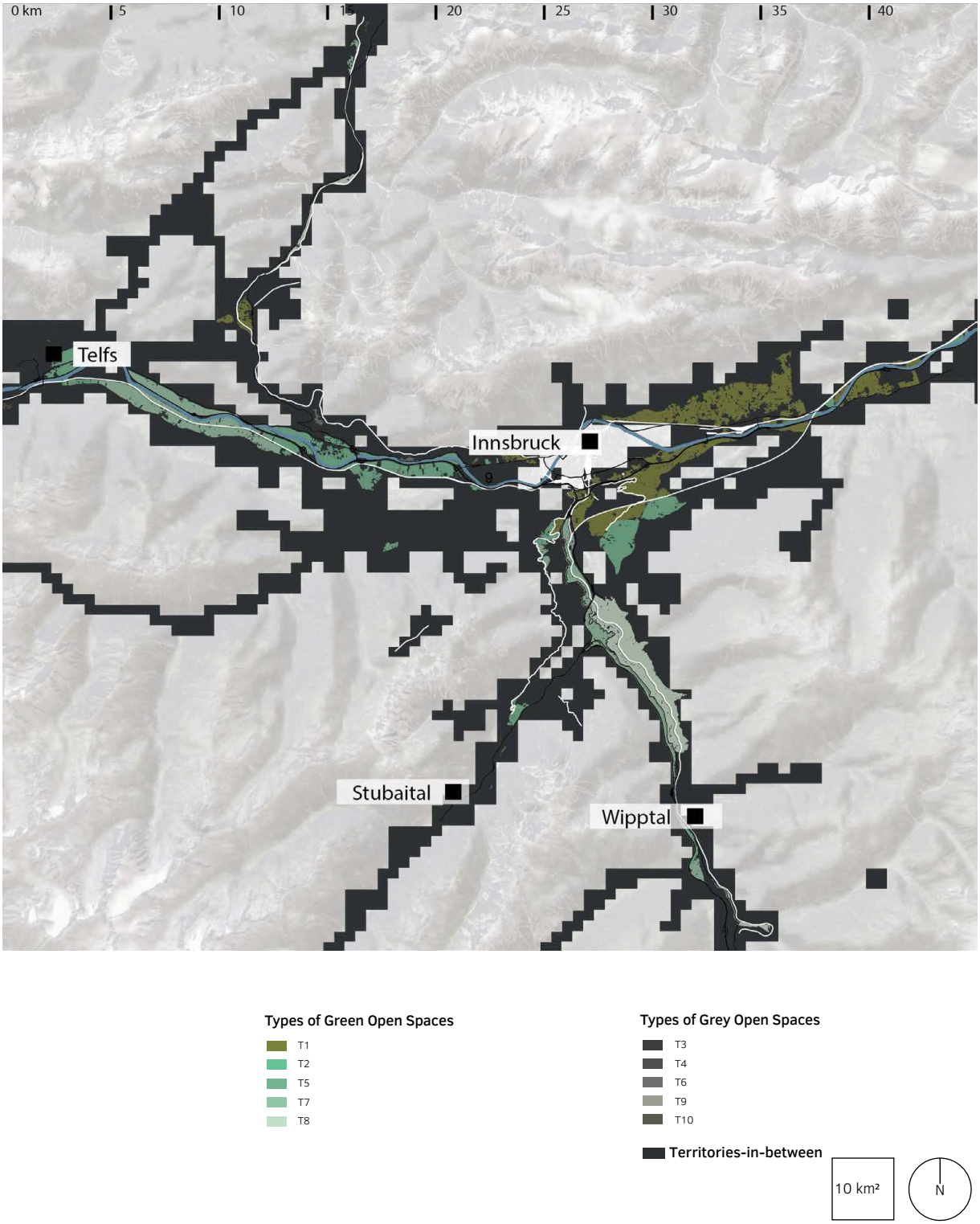


FIG. 8.66 The most frequent type of green space is type 1 and type 3 is the most frequent grey space. Both are often located within the fringe zone of towns cities, they have a high potential for multifunctionality, and regulating and cultural ecosystem services. These open spaces are under the highest urbanisation pressure and play a crucial to facilitate social interaction.

1

2

3

FIG. 8.67 (1) And ecoduct as an example of green infrastructure. (2) The parking lot at a skiing resort is a common grey space. (3) The intermingling of agricultural use areas and the settlement in the Inn valley.

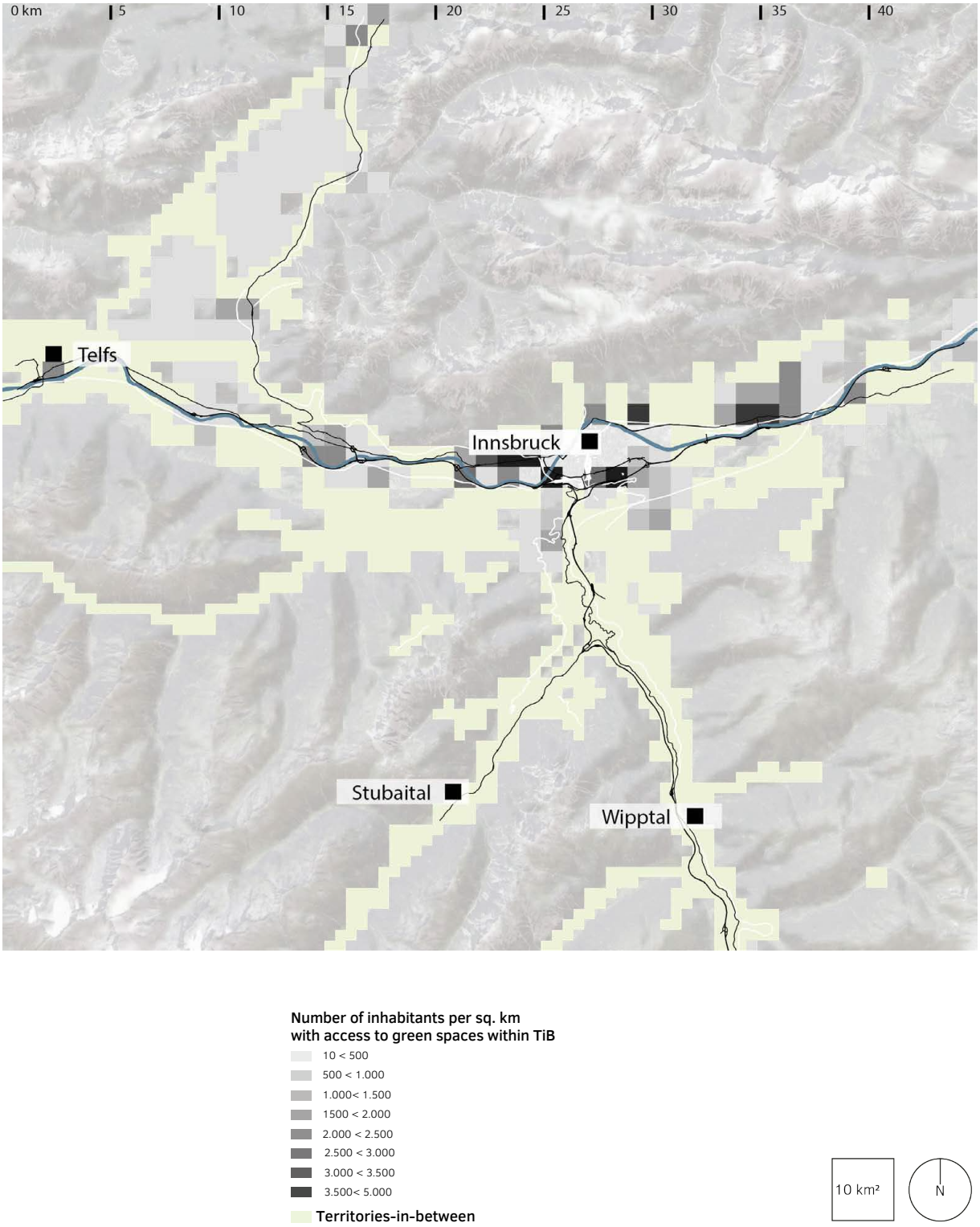


FIG. 8.68 Around 55 per cent of the inhabitants in the TiB in the Tyrol have access to more than one size of green space.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

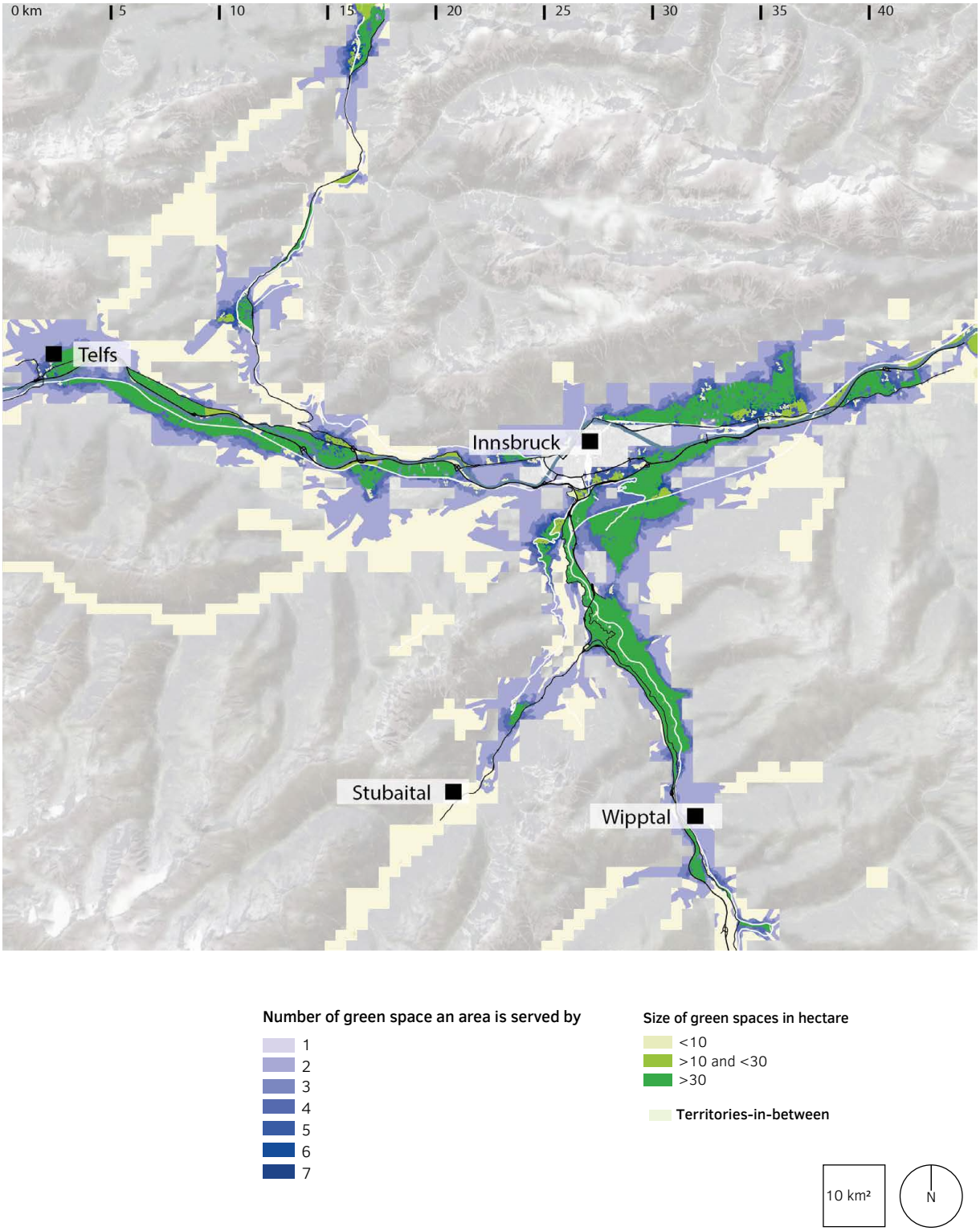


FIG. 8.69 The intensity of access to green space is highest in the Inn valley and the Mittelgebirge.

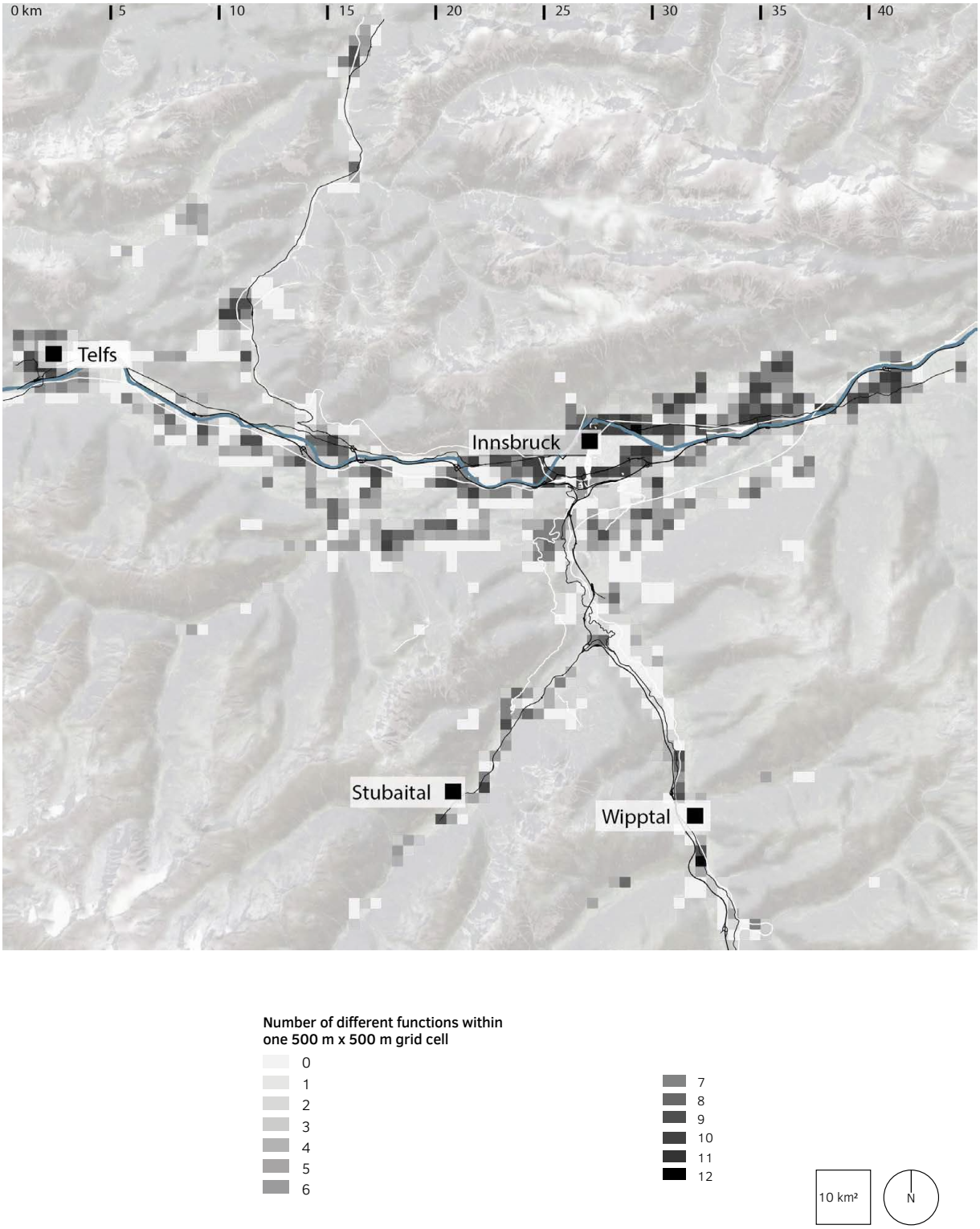


FIG. 8.70 Around 80 per cent of the inhabited grid cells host three or more functions. The highest mix of function is concentrated in the Inn valley and the larger villages.

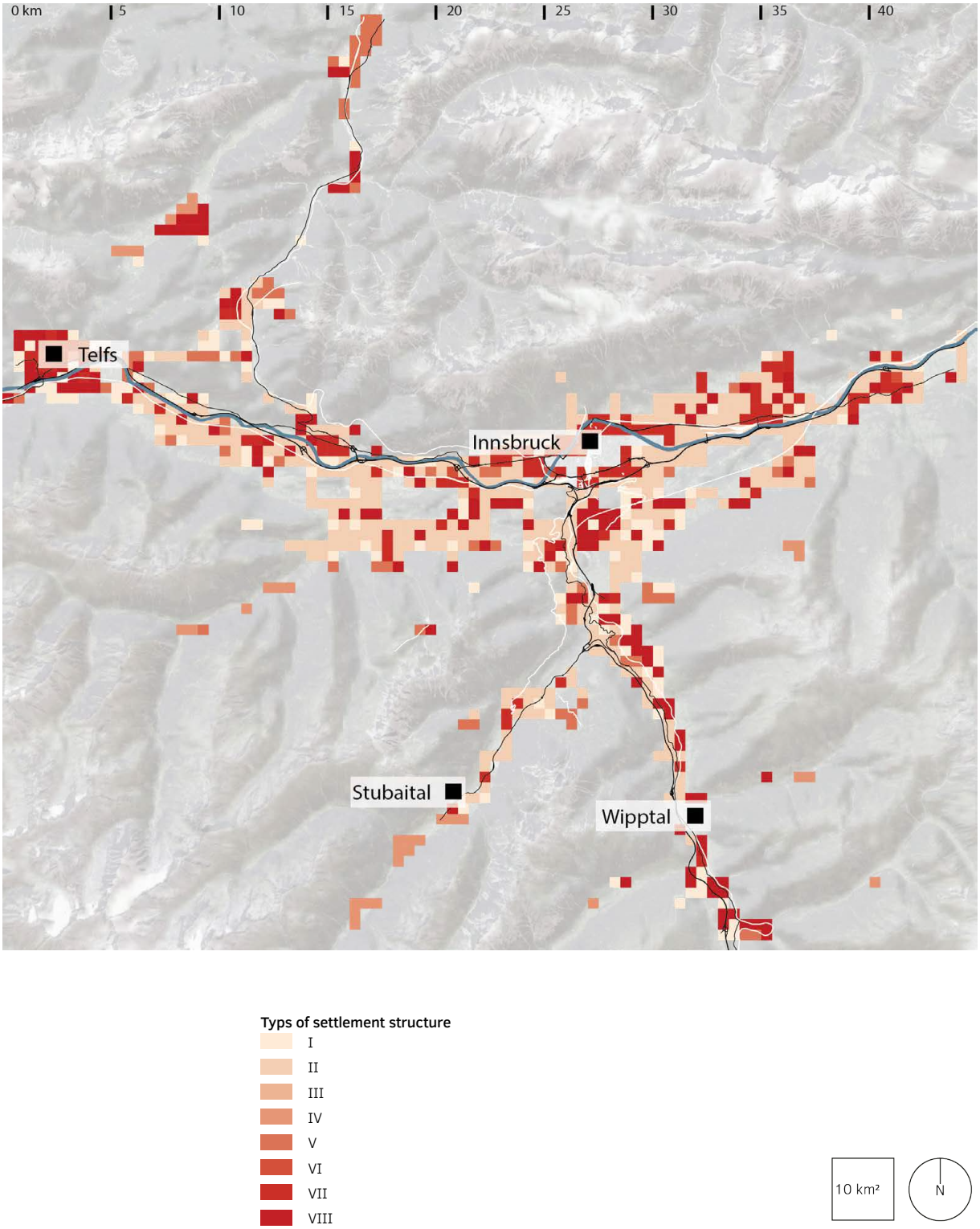


FIG. 8.71 The most frequent (37 per cent) settlement type is type II, which has around 33 per cent of mono-functional cells, but also 64 per cent of cells with more than three but less than ten different functions, as well as three per cent of cells with ten or more functions. Type IV, which accounts for roughly 40 per cent, has around 40 per cent of cells which host 3 or more functions. See table 6.6 for details.

8.5.10 Vienna-Bratislava

VIENNA-BRATISLAVA

FIG. 8.72 The case study area in Vienna-Bratislava, along with the outskirts of Vienna in the west and Bratislava in the east and the river Danube wetlands, a national park between the two cities. 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, a result of different agricultural systems during the cold war, as the Morava river has been part of the iron curtain.

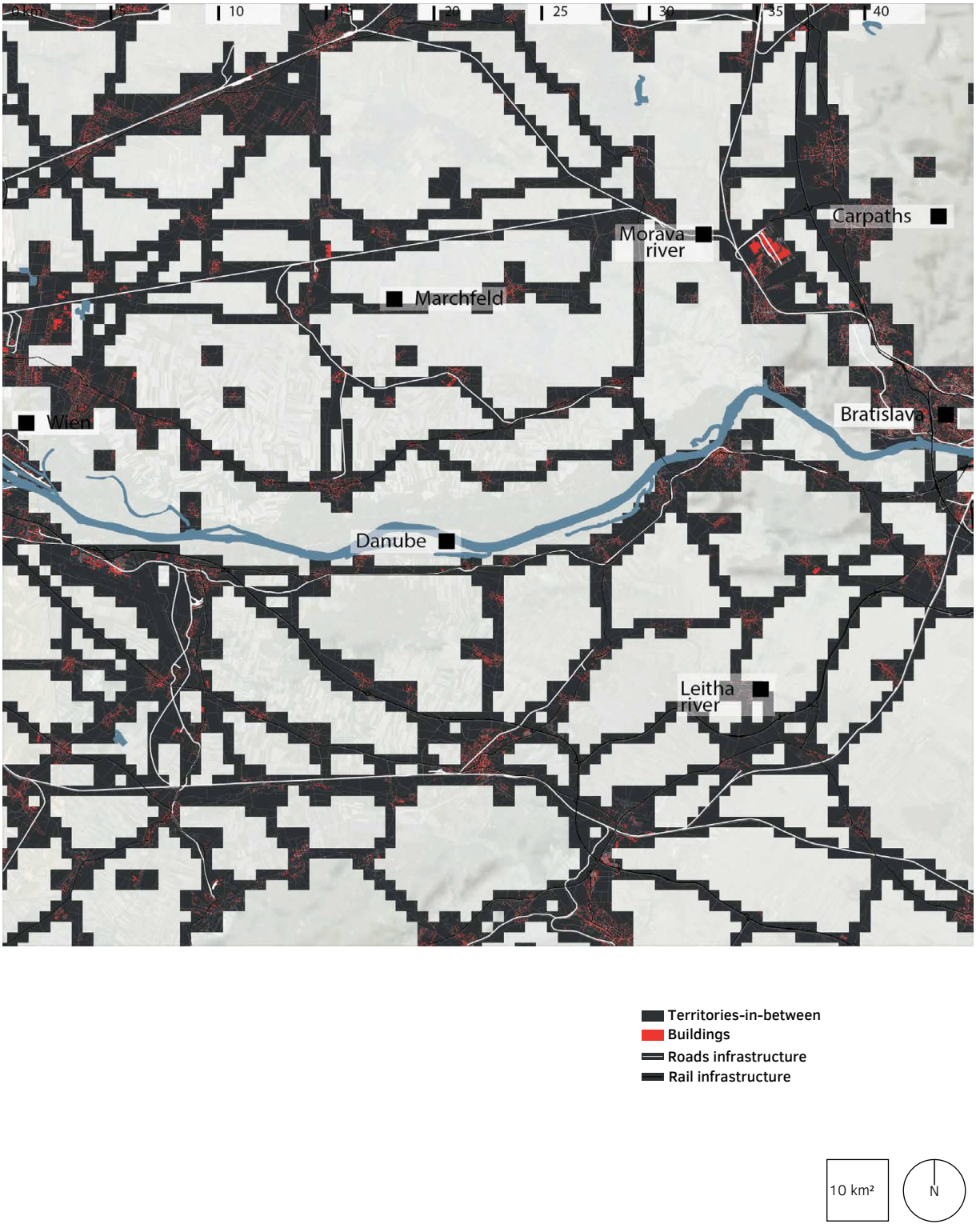


FIG. 8.73 The case study area is dominated by the network of cities and towns type of TiB. Only north of Bratislava and to the east of Vienna, small areas can be considered as being the field like type of TiB.

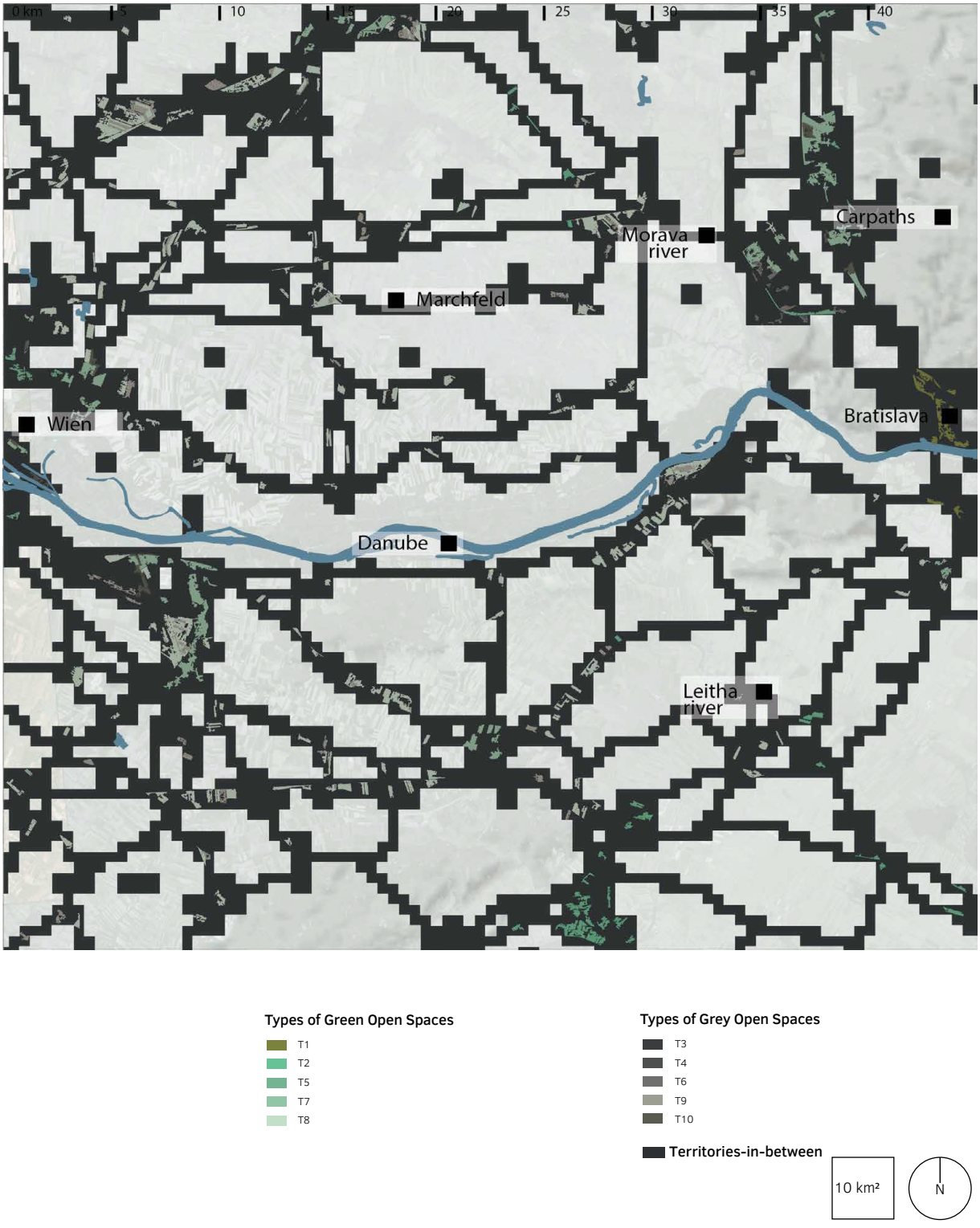


FIG. 8.74 The most frequent type of green space is the type 8, which plays a key role as buffer areas between industrial areas and intensive agricultural areas, but also as ecological corridors connecting the backbone of the existing green infrastructure with the urban green network. They are relevant for regulating and provisional ecosystem services. The most frequent type of grey open space is type 9, which is the grey open space with the lowest potential of multi-functionality. They are very often located in smaller settlements or industrial areas with automated functions like ports. They are crucial open spaces for the provision of regulating and cultural ecosystem services.

1

2

3

FIG. 8.75 (1) A multifunctional green space includes a playground and infrastructure in the buffer zone between settlements and a national park. (2) One of the remaining acres at the fringe of Vienna. (3) A typical grey space is a parking lot in a shopping park at the edge of a smaller town.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

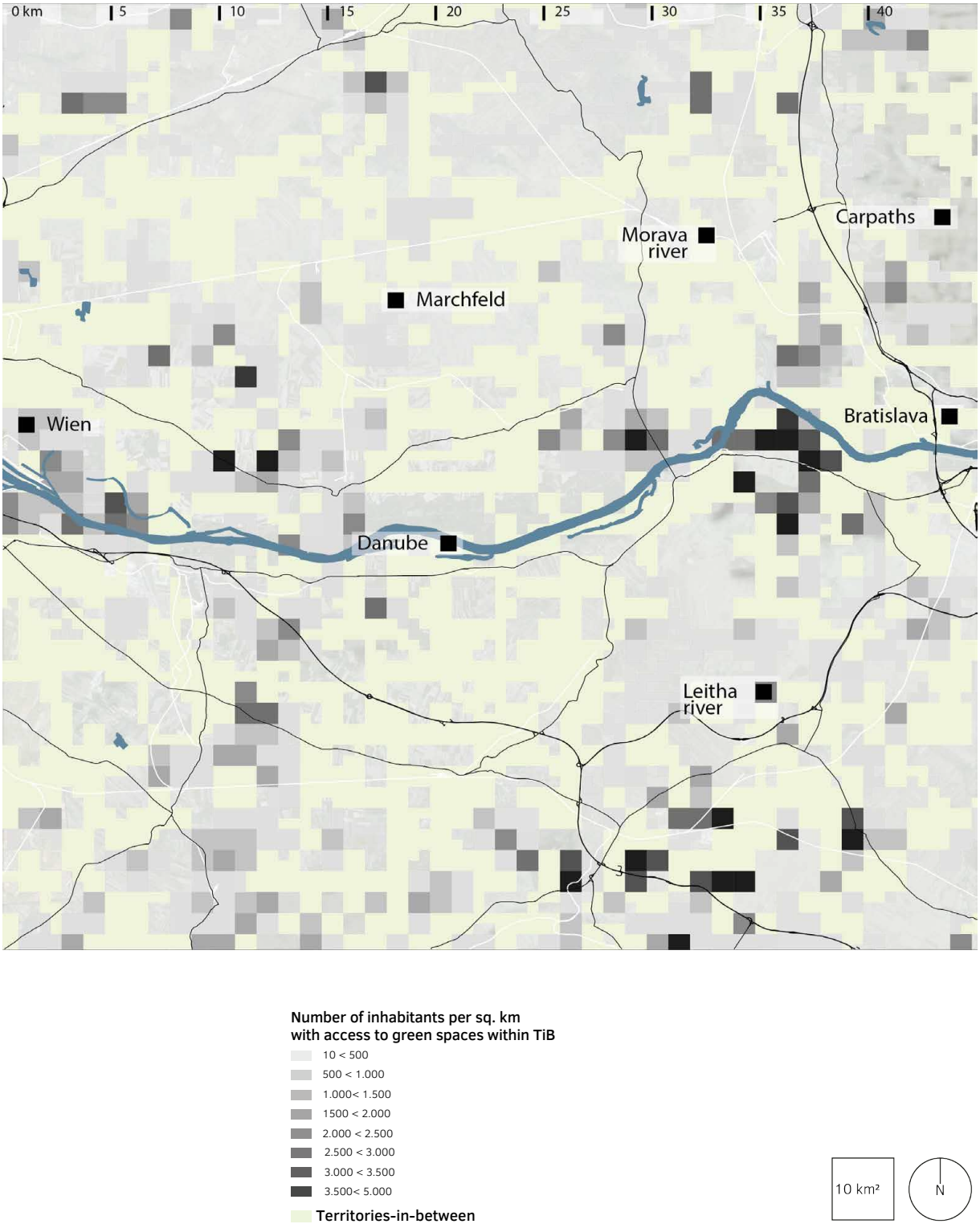


FIG. 8.76 Around 30 per cent of the inhabitants of the TiB in the Tyrol have access to more than one size of green spaces.

NUMBER OF RESIDENTS WITH ACCESS TO GREEN SPACES

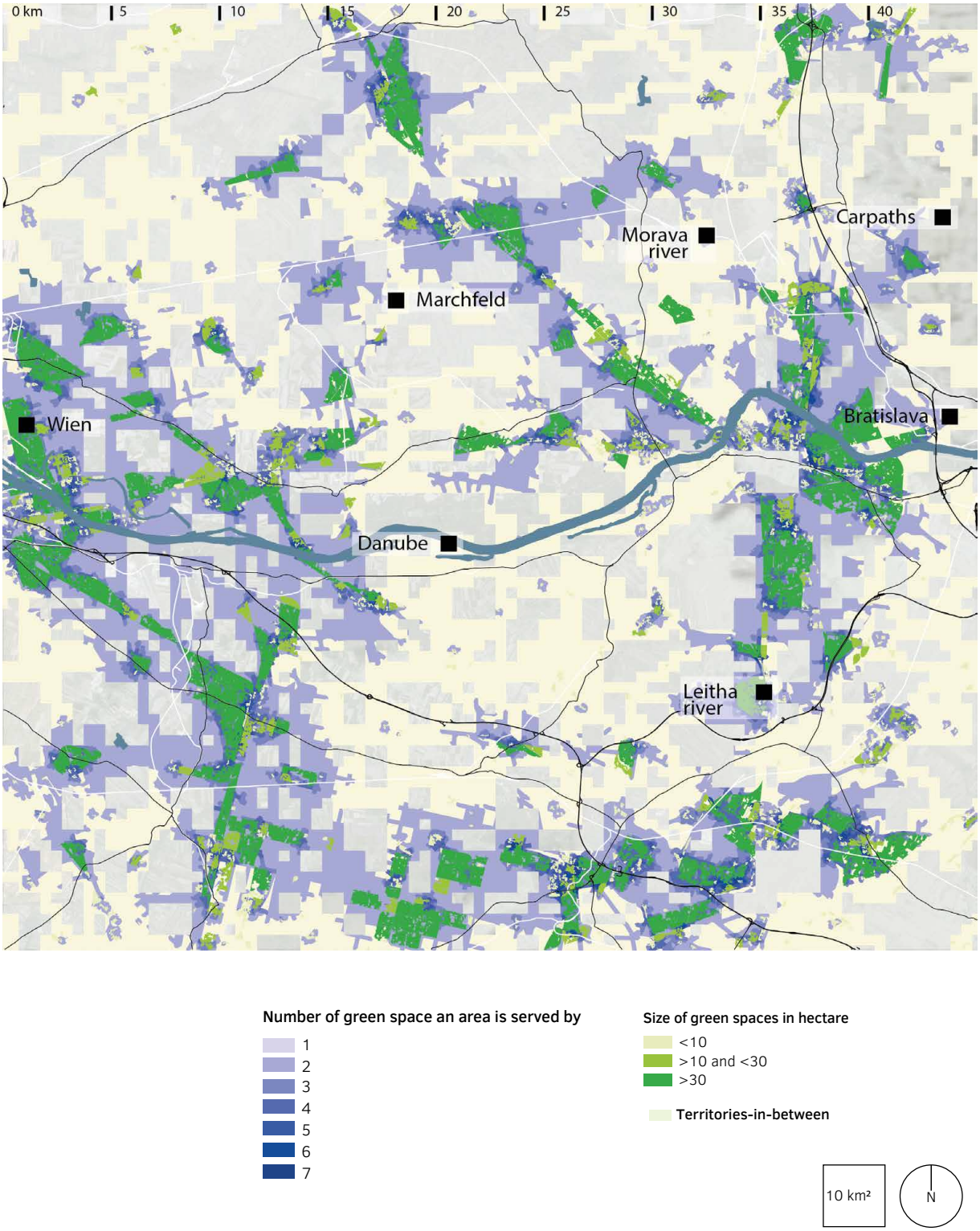


FIG. 8.77 The intensity of access to green space is highest around Bratislava and in the towns in the south as well as the north.

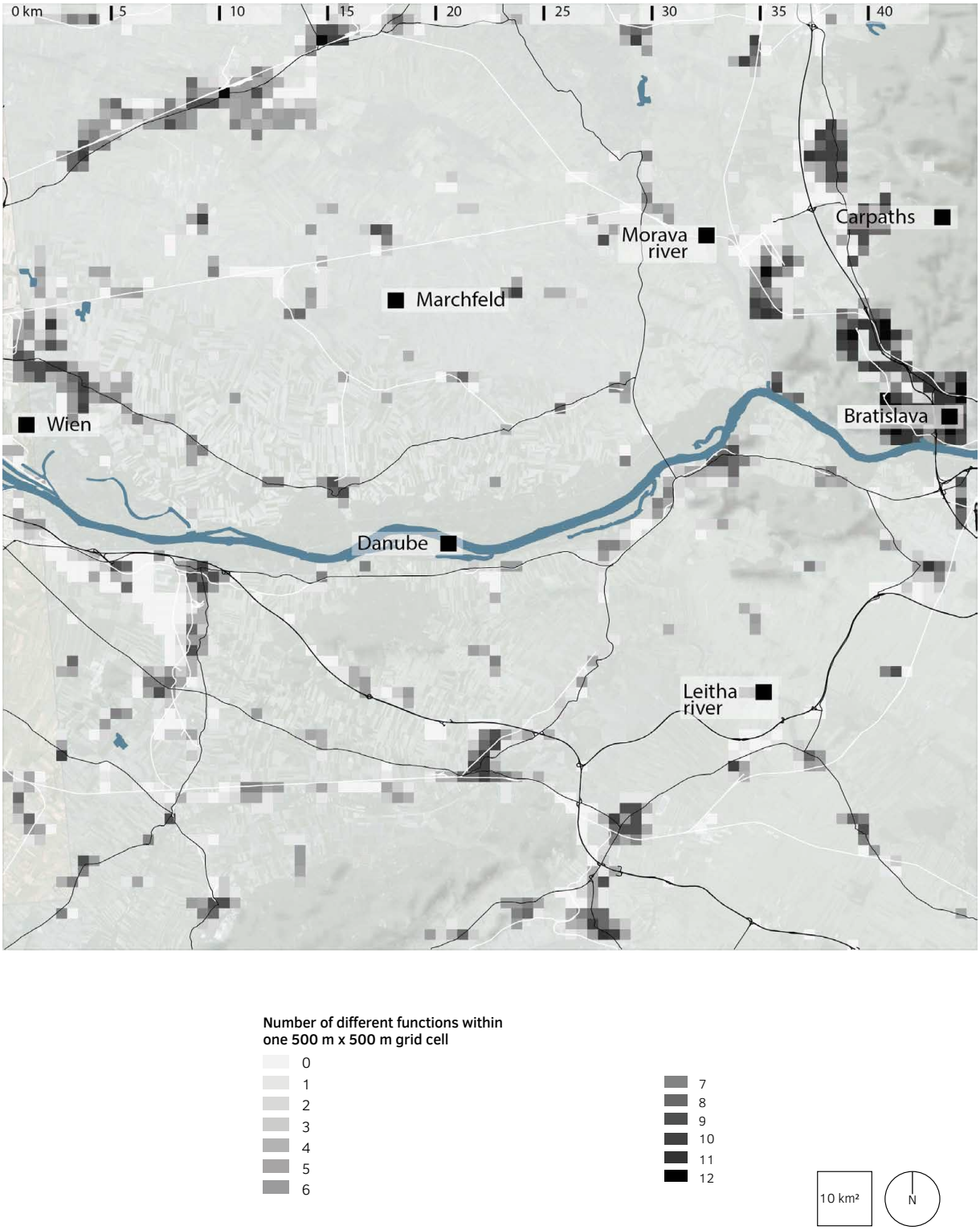


FIG. 8.78 Around 70 per cent of the inhabited grid cells host three or more functions. The highest mix of function is concentrated around Bratislava and the smaller cities and towns.

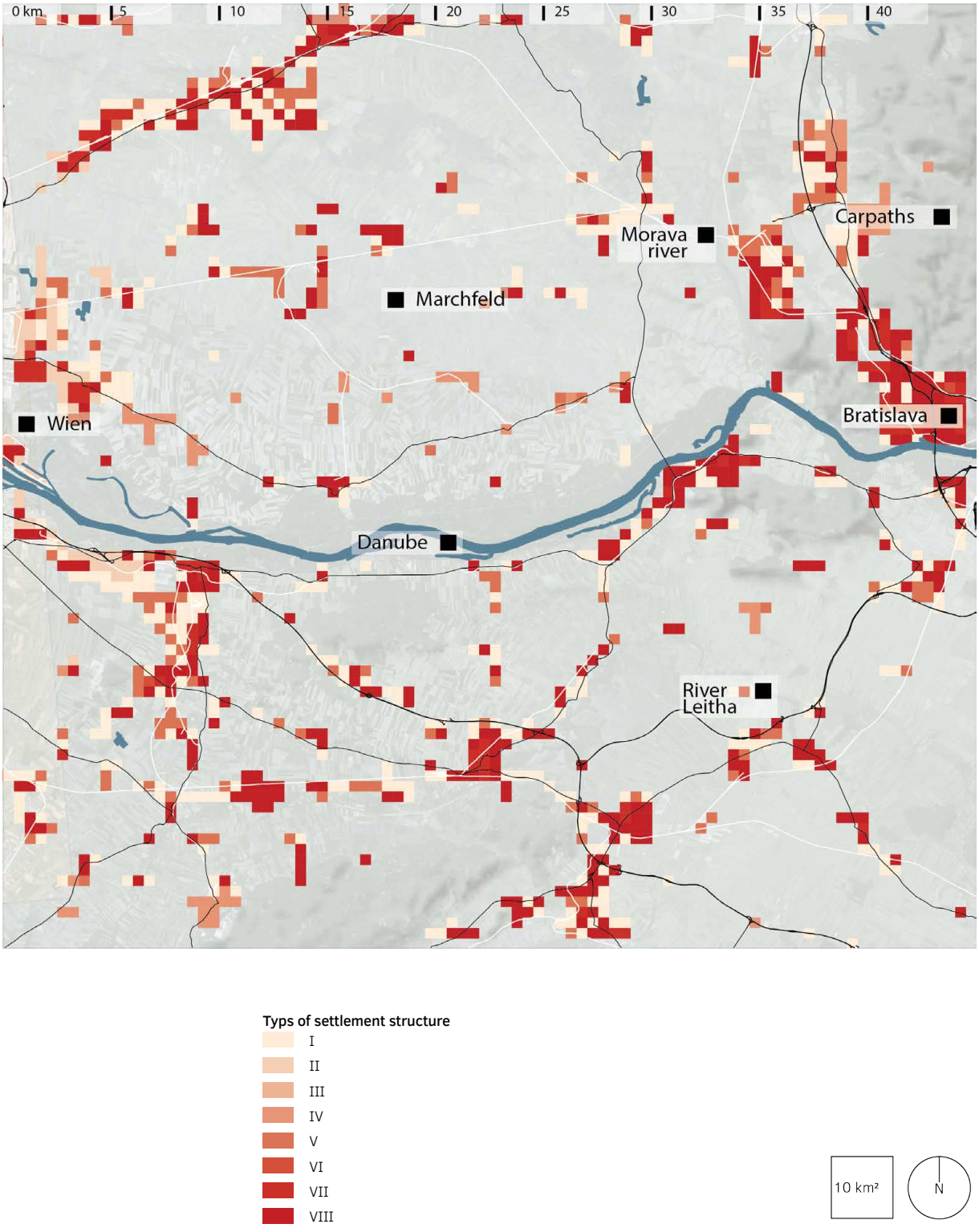


FIG. 8.79 The most frequent (40 per cent) settlement type is type VIII, which has around 19 per cent of mono-functional cells, but also 71 per cent of cells with more than three but less than ten different functions, as well as ten per cent of cells with ten or more functions. Type I, which accounts for roughly 32 per cent, has around 55 per cent of cells which host 3 or more functions. See table 6.6 for details.