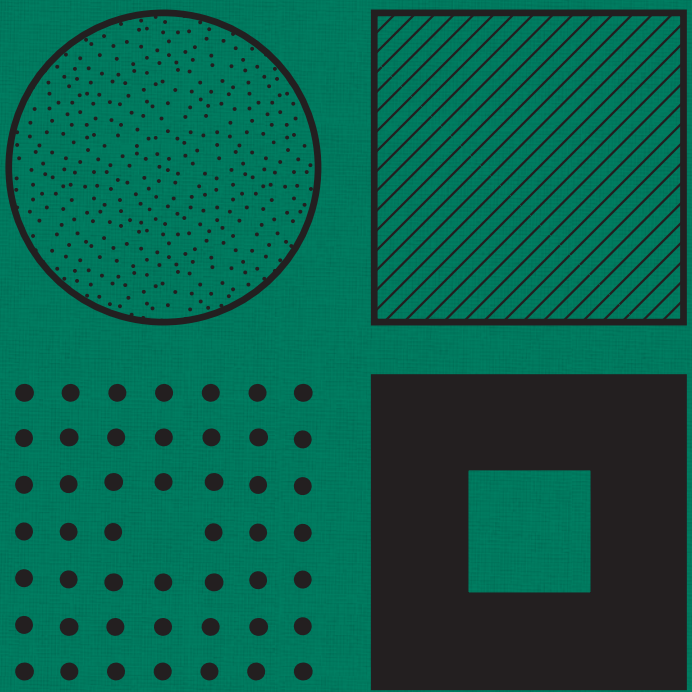
Marcel Smets

Foundations of Urban Design



Actar / Public Space

Foundations of Urban Design

F01 Ribbon Cluster

A settlement comes into being through an accumulation of built-on plots. In its most primitive form, such a settlement is made by a juxtaposition of farmsteads along a common access road. This is the primal form of the *ribbon*. Each plot stands on its own. And each is in principle large enough to be self-sufficient. Its size enables the individual family to build a house and live off agriculture and cattle breeding.

The plot is private. The *road* is collective. The road opens up the plots and provides access to the rest of the world. The road allows for exchanges with travelling artisans and between the plots themselves, among others for barter in the manorial economy. It constitutes the only collective element – the only *urban* component – in this type of urbanization.

The road has neither beginning nor end. The ribbon can always be extended. Hypothetically, the accumulation of plots is infinite. The only condition restricting the length of the ribbon is the walking distance between the scattered plots or the remote position of collective destinations. For even the most autonomous household in terms of lifestyle or production method still requires certain shared facilities: jetties on lakes and rivers, markets or supply points, temples for religious services.

Besides the primal form of the agricultural settlement, the ribbon also involves other types of applications. In the late eighteenth century, *mansions* emerged in British spas and leisure resorts. Located along ring roads on royal plots, these mansions gave onto landscaped parks. They were self-sufficient thanks to their domestic staff. In this sumptuous form of urbanization, the size of the lots was no longer determined by agricultural yield but by social status. Its plot surface was primarily intended to create a garden large enough to highlight the status of its 'bourgeois palace'.

This model of stringing together self-sufficient plots persisted in the nineteenth and especially also in the twentieth century. The size of the plots decreased gradually and the little 'villas' built on them moved closer and closer to each other. The introduction of the tram and metro, at first, and later also of the car extended the serviceable length of the ribbons. The appearance of domestic appliances, telecommunications and later the internet firstly increased the autonomy of the individual house and ultimately connected every household directly with the world. The initial limitation of the ribbon came to disappear. The ensuing decentralization of collective facilities instigated the phenomenon of *urban sprawl*, the contemporary expression of the ribbon.

The *cluster* is the complement of the ribbon. The cluster results, not from the juxtaposition of plots, but from their *densification*. The primal form of the cluster goes back to the first extension of the medieval *suburbium,* around the gates of its earliest city walls. It appeared as an organic entwining of building plots around a main trunk with branches and twigs. For the distance to the city gate could always be reduced by laying a cross-connection rather than prolonging the approach road. The shared concern about minimizing the walking time to the communal destination of gate and city thus served as an organizing principle. The cluster took on an ingrained form of functional hierarchy. From the lane, one first had to go along the residential street to reach the area's distribution road, and from there the city's radial artery.

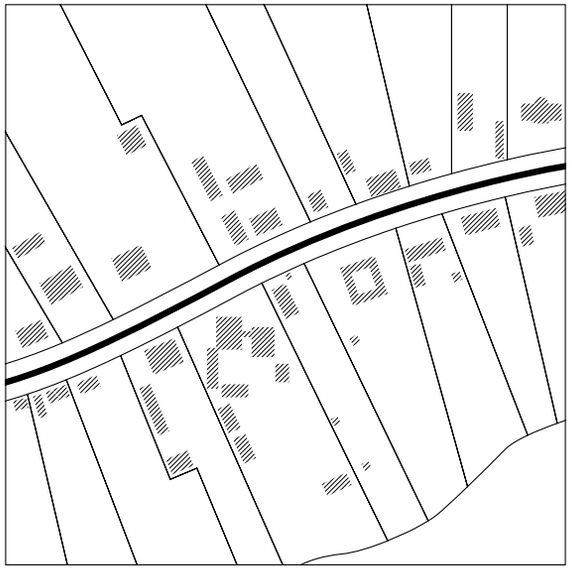
The settlement pattern of the cluster is therefore dictated by the *communality of the first core*. The cluster grows out of the intention to optimize proximity and the willingness to adapt the allotment pattern to a reduction of the distance to the common goal. Contrary to the ribbon, the configuration of the plot is no longer determined by the yield of the ground, but by participation in a collective existence.

The cluster represents a different economic model from the ribbon, one that is no longer centred on agriculture and the manorial economy, but on trade and industry. Its plots are no longer self-supporting, but founded on the exchange inherent to urban life.

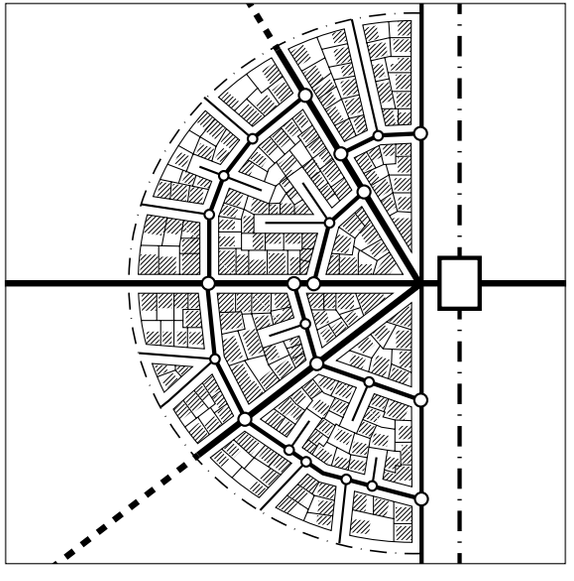
Unlike the ribbon, the cluster is essentially limited. If the cluster grows too big, proximity to the city gate – or, more generally, to the collective destination – is lost. Because the advantages of concentrated settlements disappear if the extent of the area on which that form of concentration takes place brings with it a distance that is not proportionate to the force of attraction of the collective facilities.

Old maps of medieval cities clearly show the cluster-shaped structure and functional hierarchy of the medieval fabric along the radial road. But typical nineteenth-century factory districts are also organized in cluster-shaped patterns. Series of standard housing types are spread around the factory in such a way that its access – on foot – is facilitated for the workers. Narrow rows of houses stand perpendicularly to long 'draining streets' leading to the factory gate. Today's *favelas* are modern examples of the cluster. Often built on hilly terrain, these informal settlements follow a logic of compact land occupation and hierarchical street layout starting from the access road to the official city.

RIBBON



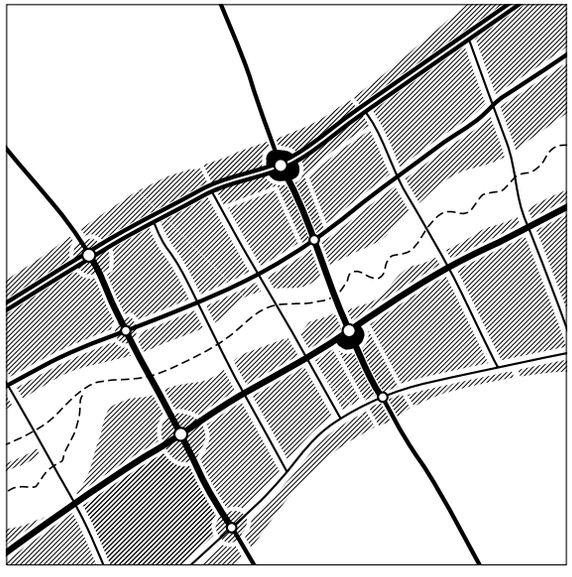
The road has neither beginning nor end. The ribbon can always be extended. Hypothetically, the accumulation of plots is infinite.



CLUSTER

The cluster is the complement of the ribbon. The cluster results, not from the juxtaposition of plots, but from their densification.

LADDER



The ladder originates from the natural densification of the ribbon.

STAR

The star comes into being through the multiplication of clusters along the approach roads of the urban core.

F02
Ladder Star

The *ladder* originates from the natural densification of the ribbon. Indeed, the linear extension of the ribbon is limited by the walking distance it imposes. To reduce this distance, the ribbon can be duplicated by constructing a parallel road nearby. Integrating both roads into a unifying system additionally requires cross-connections at regular intervals. In this sense, the formation of the ladder is related to the creation of communal facilities. It stems from the need to make these amenities accessible to all inhabitants.

Because of the advantages inherent to settling near flowing water, the ladder often encompasses both flanks of a valley. The initial ribbon, with plots that give onto a brook or watercourse, is then duplicated on the other side of the dale. The ladder extends on both banks, at a sufficient distance from the bed to limit the risk of flooding. The intermediate space – the flood area of the brook – generally remains empty. The cross-connections enabling the system to function as a whole make the boggy terrain traversable.

In the ladder structure, the intersections of rungs and stiles form the locations of choice for the establishment of community facilities and the creation of hamlets. The denser the fabric, the greater the yield of the facilities and the stronger the nodes. That difference in weight between the service provision of the nodes is reflected in the movements pattern. The latter creates a hierarchy within the ladder structure, which in turn stimulates a denser clustering and facilitates the reinforcement of existing cores.

Ladder structures have been used frequently throughout history. In the thirteenth century, they appear in the *bastides*, fortified settlements built in south-west France to serve as instruments of colonization and defence. The alleys and narrow lanes serving to prevent the spread of fire ensure that the elongated blocks remain traversable and model the city map into a near-perfect ladder form. In Delft and other Dutch dam cities, the ladder structure

is a product of the drainage system. The streets along the canals form the rungs of the ladder. The alleys that connect the successive bridges make up the stiles. The municipality of Hoeilaart in Brabant developed around the broadening of the Kerkdam, one of the traversable connections between the parallel roads higher up on either side of the IJsse valley. The morphology of the Leie region, finally, reveals a structure of parallel roads with the Leie valley on which a hierarchical system of villages and cores came into being around the intersections with their transversal connections.

While the ladder emerges as the natural densification of the ribbon, the *star* comes into being through the multiplication of *clusters* along the approach roads of the urban core. For that reason, the primal form of the *star* is to be found in the radial medieval city. The land between its different clusters remains open and undeveloped. It generated the 'rear sides', the swamplands, meadows and bleaching fields that were part of our cities until the early nineteenth century.

The individual cluster is characterized by a hierarchical ramification of its street system, split up in trunk, branches and twigs. When the clusters along the successive radial arteries expand, their main distribution streets – the branches in the classification above – run into one another. Joining these successive sections leads to new tangential connections. The cross-connections assemble into a concentric structure. They render the star traversable by making it possible to move from one cluster to another without having to pass through the core via the radial. In the medieval city, these cross-connections still present themselves as a random web of polygonal segments. In the idealized concepts from later periods, they become a substantial constituent of the city model, which generally comprises a succession of concentric streets. The crossings of these tangents with the radials are places where many people pass through. They represent central locations in which sub-cores and facilities thrive.

The star is a key figure in the urban design vocabulary. Many ideal cities from the Renaissance were envisioned in the shape of a star. Often, they were constructed as fortified towns (Palmanova, Philippeville, Mariembourg, Rocroi) where the star shape served to fire on advancing enemies from a central location. But later too, urbanists often returned to the radial or radio-concentric pattern, especially when they were eager to address the idea of a 'centre'. In Paris, this tradition began with the Place des Victoires, a circular square designed in 1685 by Jules Hardouin-Mansart in such a way that the equestrian statue of Louis XIV would be visible from all arriving streets. The model achieved its climax under Napoleon III, with the construction around 1860 of Place de l'Étoile, from where twelve avenues fan out in a star-like shape to emphasize the Arc de Triomphe. A more recent example is Walter Burley Griffin's prize-winning design in the 1912 international competition for the new Australian capital Canberra. The interconnected star-shaped figures of his plan define the city's political, administrative and commercial centres.

Network Polynuclear Field

Ladder and star are centripetal settlement patterns. They are turned inward. They are configured as micro-communities that strive for the optimization of neighbourhood-oriented objectives: adequate plots for common housing types, facilities accessible on foot, the preservation of natural grounds, and so forth. But the ladder and star are difficult to expand. Once they grow beyond a certain size, journeys become excessively long, supply lines get to be saturated, and central facilities are no longer accessible to all.

Ludwig Hilberseimer, a German urban theorist and planner who emigrated to America, realized this in 1944 already. That year he published his ideal model for the *decentralized city*, in which he aims at organizing the explosive urban expansion in the United States by grafting an in-theory endless number of ladder structures on a central highway. His intention was to combine the central and green pedestrian areas including schools and community centres – which, at a local level, had to ensure the formation of a neighbourhood centre, the permanence of ecological continuity but also the demarcation of the successive residential areas – with the smooth, universal accessibility of attraction poles on a regional level.

With the exception of such theoretical models, larger agglomerations and urbanized areas hardly ever assume the form of enlarged ladders or stars. Rather, they morphologically consist of an amalgam of fragments, which themselves may assume the spatial logic of a ladder or star. In order to make these fragments work as part of a larger whole, an overarching figure is required. Roughly speaking, such a figure can take two forms: the network and the polynuclear field.

The *network* is an infrastructural system that serves the entire territory (in the case of energy or telephony) or opens it up (in the case of transport). The type of network depends on the scale of what people experience as a coherent territory. Initially it was meant to make the (agricultural) plots accessible and serve incidental settlements. Later, these primal country roads developed into connecting roads between villages and incidental cities. With industrialization and the ensuing growth in trade, this composite system of local roadways entwining successive villages became inefficient to reach more distant destinations. To accelerate transport between the regional centres, high roads, railway lines and canals were created and established direct connections between the major cities.

To overcome a standstill of the high roads network under the explosive growth of car travel, engineers developed a new system of separate motorways. Because these motorways were positioned outside the cities and designed free of roadside constructions, as an autonomous network with separate lanes and without conventional intersections, their capacity and average driving speed grew exponentially. As such, they not only added a new hierarchy to the national (and later international) accessibility system, but they also realized a fundamentally different objective.

For the first time, one had created an infrastructural network that did not simply follow the urbanization pattern. For the motorway system did not only make poles of attraction accessible, it also opened up the entire country. As a *self-sufficient network,* it was not so much conceived to connect existing cores, but to serve the whole territory. It intended to create an equal, universal accessibility. It was meant to ensure that all destinations within the network were equally accessible from all points of origin within that network.

Achieving that egalitarian, territorial condition appears to be the fundamental objective of a properly functioning network. In other words, the network is there to create *isotropy*. Thanks to the network, the territory acquires the same qualities everywhere. When the mesh size of the motorway network gets to be small enough, every location gets to be situated at a short distance from this supralocal network and is therefore equally well connected to the world as any other location.

The territorial isotropy created by the network enables the city to spread unrestrictedly across the countryside. Contrary to the *ladder* and the *star*, the *network* therefore works centrifugally.

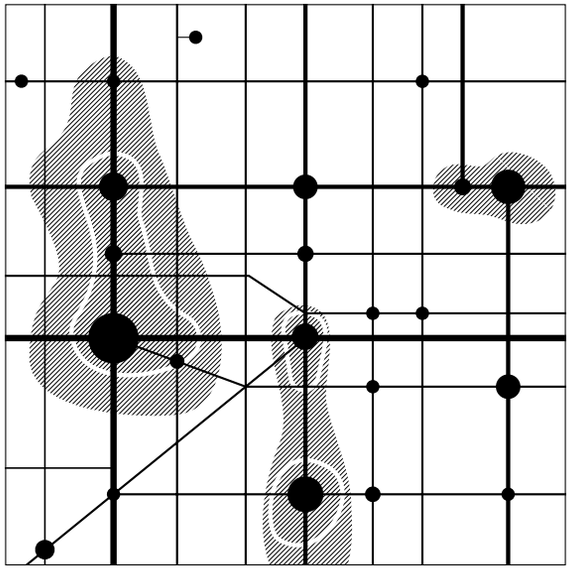
It ensures that cities can expand, without dictating *where* that extension should occur. In itself, the network is non-hierarchical. It opens places up to the production of new spatial programmes but does not define in advance what they should be or look like. The network thus produces flexibility for specifying and designing future developments.

The network contrasts with the *polynuclear field*. The latter is founded on the observation that centripetal cities lose their intrinsic raison d'être when they grow out of proportion. Indeed, the logic of the star only holds if the distance to the communal centre remains reasonable for all its inhabitants. If the star grows too big, the proximity to the centre is lost. Instead of having the prevailing radial structure expand pointlessly, one therefore wins by multiplying it into a field of manageable and interconnected star-like structures. Urbanization thus arises as a system of regionally spread-out nuclei engaging in informal forms of cooperation. For that reason, the apparent dissolution of the city into an amorphous urbanized area should rather be seen as the formation of a polynuclear field which, through the planning of adequate and aptly chosen connections, can begin to operate as a territorial unity.

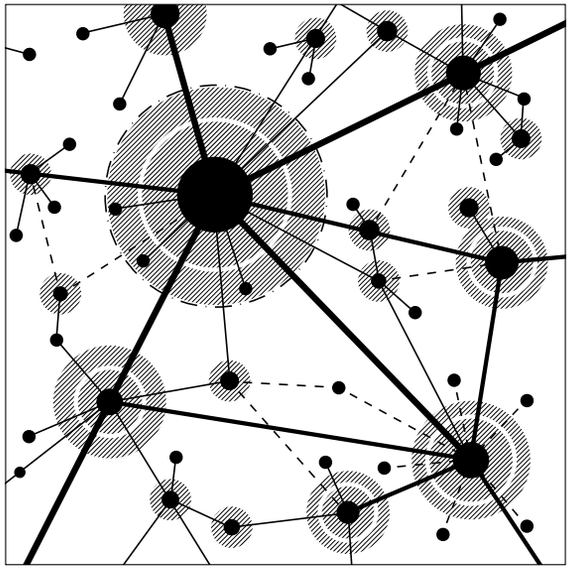
The Flemish *nevelstad* (nebular city) and the *città diffusa* in Veneto function as polynuclear fields. The (mainly unplanned) transition to this form of coagulated settlement appears like the by-product of the universal accessibility that accompanied the recent growth of the transport and communication network. In that sense, the polynuclear field rests as much on the territorial equivalence introduced by the network as on the sense of singularity and belonging that relates to the collective meaning of the core.

Network and polynuclear field are two sides of the same phenomenon. They are the positive and negative versions of the same photo, the cast and mould of the same statue. The main difference between both lies in the way in which they are viewed. The network creates a field in which things can emerge, but it also ensures that the existing cores in the polynuclear field get to be connected naturally.

NETWORK



The network is an infrastructural system that serves the entire territory (in the case of energy or telephony) or opens it up (in the case of transport).



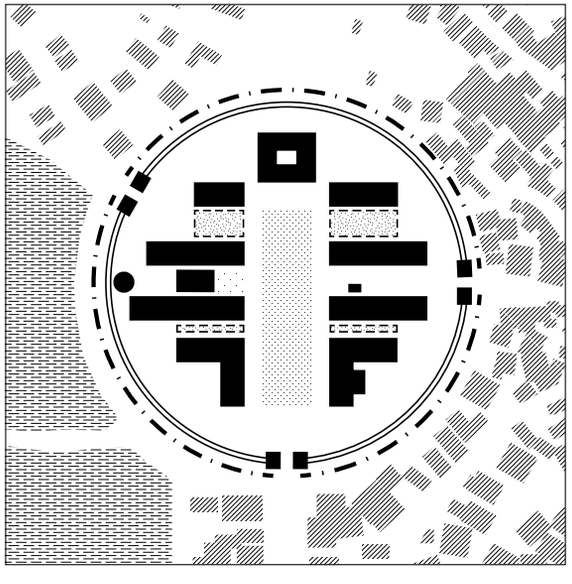
POLYNUCLEAR FIELD

The polynuclear field is founded on the observation that centripetal cities lose their intrinsic raison d'être when they grow out of proportion.

FABRIC

A settlement structure that has developed organically is labelled as fabric. It is neither planned nor created. Its shape is not predetermined.

CITADEL



The citadel is a type of settlement that has been planned from above and is designed on the basis of a specific, intrinsic functionalism.

F04
Fabric Citadel

We label a settlement structure that has developed organically as *fabric*. It is neither planned nor created. Its shape is not predetermined. The fabric comes into being under the influence of local circumstances. Its configuration and spatial organization are determined by climate and composition of the soil. They reflect the economic or social conditions of the inhabitants.

This organic relationship between the built morphology and the characteristics of the place gets particularly articulated when the ground features differ significantly over a short distance. The overall structure of Mediterranean mountain villages, for instance, but also the layout of their streets and alleys and the position of their buildings closely reflect the topography of the hillside or mountain ridge they are constructed on. In the historic city centre of Berne, the texture of the streets and housing blocks ties in perfectly with the ground figure of the ness shaped by the local meander in the Aare river. But even in the absence of extreme preconditions, the shape of the fabric can be traced back to its underlying conditions. In the historic cities of Flanders, for instance, the location and shape of the squares is generally related to the type of market that took place there in the Middle Ages.

Opposite the fabric we find the *citadel*. The citadel is a type of settlement that has been planned from above and is designed on the basis of a specific, intrinsic functionalism. The citadel constitutes an enclave within the fabric. It does not conform to the formative logic and declines the particular character of the latter.

The primal form of the citadel – a fortified and ramparted structure defending the city but also ruling over it and exerting control – came about from a military perspective. Between the sixteenth and eighteenth century, many such autonomously conceived bastions appeared against the walls of major European cities: in Antwerp, Lille, Barcelona, Turin, Plymouth, Le Havre

and Helsingor, among others. During the colonization of North America, fortified encampments served as both base of operations and trading post. They emerged all over the occupied country, first on the East Coast along the main rivers, later as stepping stones for the conquest of the 'Wild West'.

From the late eighteenth century onward, architecture applied itself to designing specific building types for the new institutions of the modern age. Accordingly, prisons and hospitals, but also schools, ministries and universities were systematically envisioned as citadels. They were built as separate fragments, streamlined on the basis of their own rationale. Their design is clearly dictated by internal efficiency. It neither takes into consideration their location, the composition of the soil or their relation to the surrounding constructions. In such a way, the ambition to exert maximum control with a minimum of staff led to the typology of both the star-shaped prison (which materialized in Ghent, Mechelen, Leuven and many other places) and the hospital, with separate pavilions on either sides of an open interior courtyard or a broad walkway (applied in, among others, Lariboisière Paris, Brugmann Laken and Bijloke Ghent). In the late nineteenth and early twentieth century, the prototypical neo-Gothic colleges multiplied as bastions of Catholic education. After the Second World War, the corporate and financial world went looking for image-defining design and representativity. Buildings such as Bank Brussel Lambert (Brussels) and Royale Belge (Watermaal-Bosvoorde) were designed to be iconic but remain fundamentally self-centred objects. When safety became an important issue finally, the office complex alienated itself permanently from the bordering public space. It behaves like a contemporary citadel vis-à-vis the city it is embedded in, as the Berlaymont building in Brussels, the headquarters of the European Commission, nicely illustrates.

FOUNDATIONS OF URBAN DESIGN

Author
Marcel Smets

Illustrations
Heinrich Altenmüller

Translation from Dutch
Patrick Lennon

Graphic design
Atelier Sven Beirnaert

Printing and binding
die Keure, Bruges

Distribution
Actar D, Inc. New York, Barcelona

New York
440 Park Avenue South, 17th Floor
New York, NY 10016, USA
T +1 212 966 22 07
salesnewyork@actar-d.com

Barcelona
Roca i Batlle 2
08023 Barcelona, Spain
T+34 933 282 183
eurosales@actar-d.com

Printed in Belgium
Publication date: September 2022

Published by
Actar Publishers, New York, Barcelona
www.actar.com

Public Space, Belgium
www.publicspace.be

ISBN 978-1-63840-033-2
LCCN 2022942359