

SYNTROPIC SETTLEMENTS VS ENTROPIC LANDSCAPES

Experimenting The Multipolar Paradigm
for the Regeneration of the Fragmented Metropolitan Margin
[The Bogotá Sabana Case Study]



Politecnico di Milano | Dipartimento di Architettura e Studi Urbani | DASTU
Dottorato di Ricerca in Progettazione Architettonica e Urbana XXVII Cycle

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Abstract

The here-present research is based on the hypothesis that the current state of settlement desegregation (especially in the unprecedented positioning of multiple and fragmented margins) is caused by a cycle of formation, deformation and transformation, commonly found in the *life of forms*¹ of a wide collection of disciplines, which the architectural sciences are strongly linked to. If we suppose that deformation is a inclination to transformation, then the fragmentation of built space and landscape, suburbanization processes, slums, unsustainable land consumption, dedifferentiation of places, and erosion of public space are some of the many faces of morphological entropy associated to complex “open” systems. In these, differentiation decreases as entropy increases. Formulating the problem from an interdisciplinary perspective (where the thermodynamical analogy, specifically theories of “open systems”, serves as a paradigm to investigate the dialectic between entropic and syntropic) allows us to attribute the metropolization process of settlements where Latin American cities have become paradigmatic. Clausius’ “*Thermal Death*” of the universe may be analogous to the “*thermal death*” of the city, where urban and rural, natural and artificial, public and private (initially clearly differentiated) will reach a final state of “*constant temperature*” in which the dichotomy between urban and rural is no longer distinguishable.

If we consider the architectural form as the synthesis of physical forms, social-use forms, and productive forms, and we consider form itself, at multiple scales, as a complex open relational system², does this mean that the more ordered the architectural form is, the more disorder is reverted outside the system? If so, what model could be applied in order to control the disorder reverted outside of the system and the production

¹ Focillon, H. *The life of Forms in Art*, Zone Books, New York, 1989

² Delattre, P., *Teoria dei Sistemi ed Epistemologia*, Einaudi, Torino, 1984

of residual and strongly polarized space? Can the modification of a part produce a chain reaction that potentially propagates through various scales?³ And what mechanism could be applied to regulate such a reaction?

The significance of this case study lies in the exceptionally violent social differences that have paradoxically produced a massive centralized and undifferentiated metropolis, where the public dimension of space has deteriorated to a level that seems almost irreversible. Spatial injustice and segregation have led to a degradation of mobility, both physically and socially.

As Castells suggests, Latin American settlements show a higher degree of “metropolization” than other settlements due probably to a greater attraction of labor from impoverished rural areas than the industry can absorb⁴. In addition, especially in Colombia, violence has driven large waves of population to migrate to the capital thus creating uncontrollable slums, which are scarcely habitable, and the un-differentiation of both built and un-built space.

Segregation, within the social tissue, has led to spatial segregation in built space as well, through the concentration of development in “gated islands” of wealth which have generated barriers between the private and public realms inducing the degradation of open public space in favor of a “closed” and ordered privatized semipublic space.

Additional interest lies in the presence of a multipolar settlement before Spanish colonization; the Muisca settlement was a seminomadic one, significant natural resources were dispersed throughout the Andean mountain range and actively exchanged between various groups of native Americans.

In addition, the topographic situation, which encloses and constrains the settlement through relatively concentrated passages that have given place to nodal entities in correspondence with such confluences, allows a clear identification of densely interrelated sites.

Furthermore, traces of a significantly diverse and specific landscape capable of generating artistic movements holds the potential to reconsider the way elements that frequently absorb disorder produced

³ Lorenz, E., “Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?” title of the lecture at 139th meeting of the American Association for the Advancement of Science in 1972

⁴ Castells, M., *Imperialismo e urbanizzazione in America Latina*, Mazzotta, Milano, 1972

by local efforts of organization or global logics of exchange can be used (due to their intrinsically unstable local character and the stable structural role within the global form) as a space holding the capability to activate transformation of relations between the “urban core” and its territory.

The objectives of this research may be summarized in identifying the relation between settled space and exchange (more precisely the chosen term is “*interrelation*” due to the fact that “*exchange*” is used generally in economics and trade), attempting to shed light on the causes for the stability of specific places as structural elements of the settlement’s form where multiple systems interrelate within settled space while paradoxically producing an unstable generic space and accumulating disorder.

Exploration of the relation between entropic and syntropic processes, seemingly a constant of nature (such as thermodynamics, information theory, music and art composition), environmental fragmentation and possibly including contemporary settled space, through places where the dialectic between order and disorder concentrate, using Schrödinger’s paradox as a guideline in order to find the causes. Successively suggesting a strategy that is capable of generating dialectic between multiple scales and to identify guidelines that help identify the spaces where such dialectic is possible.

The final objective is to elaborate a projection of what a nodal strategy, following the identified guidelines, would produce as the form of the metropolitan multipolar settlement in order to evaluate subsequent contradictions at a broader scale. This thesis aims both towards a general principle and its specific application.

This study follows an interdisciplinary approach which adopts abstract concepts reinterpreted in relation to the field of architectural sciences. The procedure is based on three main bodies of conceptualization that correspond to the three previously-identified phases identified as the mutation that is intrinsic to form from the formation, to the deformation and ultimately the transformation itself:

The phase of formation begins by exploring the relation between settled space, stability and the interconnection of relational flows, how human settlements are the physical manifestation of socio-cultural and productive forms of interrelation with an effort to identify and describe the characteristics, potential and limits of such places.

The phase of deformation investigates the causes of the generic features (disorder) found in the spaces of interrelation where various scales and systems intersect (or relate with each other) and trying to compare them with the Schrodinger paradox in order to understand why margins and inter-scale spaces tend to accumulate featureless landscapes, exploring the dialectic between order and disorder, entropy and syntropy, built and void, natural and artificial, local and global in order to find a composition strategy with possible implementations on a variety of scales, from the re-composition of the urban form to architectural design with the same interrelation principles through the tension of entropy and syntropy.

Finally, the phase of transformation in relation to the “net phenomenon” as a key paradigm to both deciphering and operating within the larger urban entity. Focusing on the nodal entity as the “glocal” entity capable of relating both locally and globally and through which various scales, temporalities, and systems may possibly dialogue. Attempting to define a “node strategy” which should identify a series of ways in which the “net phenomenon” may give an answer to the stated hypothesis of this experiment.

And finally, the experimentation of such strategy, within the selected case study, as a theoretical-practice through the elaboration of projects and the exploration of the resulting scenarios that the case study offers in order to illustrate both the limits and potentials of the *net paradigm* through the node strategy and the application of the previously delineated composition principle.

Results

The results of this research may be found on three distinct levels: a theoretical level, a methodological level and an experimental level: From a theoretical point of view, the correlation between the diversified concepts that appertain to a number of distinct disciplines appears to have obtained a verifiable result on the transportation of such concepts to the architectural sciences which explains some of the causes generating the mechanism which produced fragmentation of the metropolitan settlement's edges. Nodal entities, which correspond to the significant places that act as the scaffolding of the metropolitan settlement's structure do not necessarily correspond with an infrastructural entity, even though it may be an infrastructural node, the nodal entity is much more complex and adopts a wide range of configurations within the settlement.

The multipolar metropolitan settlement seems to resemble other natural processes where the net phenomenon is at work. The implosion of the centripetal contemporary settlement may elude the "babel type" of disorder by interrelating multiple systems in specific places and nodes, thus forcing the inevitable disorder into a simpler kind of order which generates a reciprocal system of interrelation based on the continuity of open, natural and residual spaces.

The node strategy, through densification within fragmented margins and supported by places identified as stable elements of the mutating form, may eventually reactivate significant places throughout settlement and contrast some of the entropic processes that have generated the generic "sameness" that characterizes settlement margins worldwide.

The multipolar reconfiguration of sprawling edges is demonstrable and theoretical practice through the methodological process of conceptual exchange between disciplines allows new ways of exploring the causes of the present situation. Despite this, interest is now focused on the possible "recoil effect" that activating such nodal entities throughout the territory will produce, and this opens the door to further research.

Summary

The motivations that have driven the research are found in the assumption that the current state of desegregation of settlements, especially in their unprecedented disposition of multiple and fragmented margins, derive from a cycle of formation, deformation and transformation, common to the life of forms in a wide collection of disciplines, of which the architectural sciences are deeply involved. Assuming that deformation is a predisposition to transformation, the "Terrain vague", "Atopic Places", "Non-places", "Dross-capes", "Third Landscape", "Generic City", "Junk space", "Ladders", are some of the many faces of morphological entropy associated to complex "open" systems where, as the differentiation decreases entropy increases.

Drawing the conceptual formulation of the problem from an interdisciplinary perspective where the thermodynamical analogy, specifically theories of "open systems" serves as a paradigm in order to investigate the dialectic between the entropic and syntropic attributes the metropolization process of settlements where Latin American cities have become paradigmatic. Clausius' "Thermal Death" of the universe may be analogous to the "thermal death" of the city, where urban and rural, natural and artificial, public and private, initially clearly differentiated, will arrive to a final state of "constant temperature" where urban / rural dichotomy is no longer distinguishable.

The results obtained through this research may be found in three distinct levels: on a theoretical level, a methodological level as well as an experimental level: From a theoretical point of view, the correlation between the diversified concepts that appertain to a number of distinct disciplines appears to have obtained a verifiable result on the transportation of such concepts to the architectural sciences in order to explain some of the causes that have generated the mechanism that has produced fragmentation of the metropolitan settlement's edges. Nodal entities, which correspond to the significant places that act as the scaffolding of the metropolitan settlement's structure does not necessarily correspond with an infrastructural entity, even though it may be an

infrastructural node, the nodal entity is much more complex and assumes a wide range of configurations within the settlement.

The form of the multipolar metropolitan settlement seems to resemble other natural processes where the net phenomenon is at work. Where the implosion of the centripetal contemporary settlement may elude the “babel type” of disorder by interrelating multiple systems in specific places, nodes, forcing the inevitable disorder into a simpler kind of order, generating a reciprocal system of interrelation based on the continuity of open, natural and residual spaces.

The node strategy, through the densification within fragmented margins and supported by the places identified as stable elements of the mutating form, may eventually reactivate significant places throughout the settlement and contrast some of the entropic processes that have generated the generic “sameness” that characterizes the margins of settlements worldwide.

It has been proved that the multipolar reconfiguration of the sprawling edges is demonstrable and that the role of the theoretical practice through the methodological process of conceptual exchange between disciplines allows new ways of exploring the causes of the present situation, but the interest is now moved towards the possible “recoil effect” that the activation of such nodal entities throughout the territory will produce, which remains as a possibility for further research.

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Premise

The second law of thermodynamics does not seem to admit any exceptions, and human settlements seem to be afflicted by many different types of entropic processes as well. Suburbanization processes, slums, unsustainable land consumption, dedifferentiation of places, fragmentation and erosion of public spaces are some of the many faces of morphological entropy associated to complex “open” systems where, as the differentiation decreases entropy increases. Clausius’ “Thermal Death” of the universe may be analogous to the “thermal death” of the city, where urban and rural, natural and artificial, initially clearly differentiable, will arrive to a final state of “constant temperature” where urban/rural, nature/artifice, built/void dichotomy is no longer distinguishable. *“L’ordine implica la comparsa di singolarità, quindi di vincoli non uniformi di conservare queste singolarità.”*¹

If architectural form is the synthesis of physical forms, social-use forms, and productive forms, and form, at multiple scales, is a complex open relational system²,

(After Schrödinger’s paradox³)

Does it mean that the more organized the architectural form is, the more disorganization is reverted outside this system?

If so what model could be applied in order to control the disorganization reverted outside of the system and the production of residual and strongly polarized space?

May the modification of a part produce a chain reaction that can potentially propagate through various scales?⁴

“An observer with good eyesight looks at a painting by Poussin (Plates 6, 7) and admires its perfect order. The various shapes and colors of the picture, stabilized by the continuous stimulus input, create corresponding units in the nervous system of the observer. These units interact freely in the physiological field within the limits set by the stimulus constraints and thereby create that system of interrelations among segregated elements which the observer experiences as Poussin’s composition. Now let the image of the painting become somewhat blurred.”

Rudolph Arnheim

Opposite: Poussin paint, photo-elaboration by R. Arnheim 1971
from: R. Arnheim, *Entropy and Art*, Berkeley 1971, p. 25

¹ Delattre, P., *Teoria dei Sistemi ed Epistemologia*, Einaudi, Torino, 1984

² Ibid.

³ Schrödinger, R., *What is life?*, Cambridge University Press, 1943

⁴ Lorenz, E., “Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?” title of the lecture at 139th meeting of the American Association for the Advancement of Science in 1972

If so what mechanism could be applied in order to regulate such a reaction?

The relation of networks and human settlements is pretty clear from the point of view of the stabilization and artificiality of traces, but the potential of a network theory as an instrument of design and especially as an instrument for composition still leaves an open question of which their contribution is not clear yet. This research intends to shed light on the possible ways to recognize, interpret and apply preexisting networks, systems and fields in an inter-scalar methodology where the project acts as a hinge in the space in between. Such a space frequently corresponds to un-built areas, to areas afflicted by suburbanization and fragmentation phenomena, by narrow sighted productive settlements and the waste of natural and cultural resources.

In Sergio Crotti's article "*Strade, frontiere interne della trasformazione urbana*"⁵ the process of formation, deformation, and transformation of the original essence of traces into configurations; or from roads, to streets to routes, "streets" (from *via strata*) and "roads" (*via rupta*) or in other words into increasingly artificialized and stabilized paths, which achieve such stabilization through their underlying relational character, through the increasing exchange of goods and ideas and becoming a mental instrument capable of colonizing and organizing space. This process, according to Crotti⁶, ends with routes, where the significance is lost and the street is reduced to a mere connection.

Formal unity appears not as a global shape or as homogenous design, but as a result of the chain of sections, as a relationship of contiguity between different parts, sensitive in their diversity, and necessarily different.

Interspaces contain the matrix of the modification design of architectonic, urban and regional configurations, infringing the various scales, to draw a conscious form of the settlement.

The objectives of this research may be summarized in the identification of the relation between settled space and exchange (more precisely the

*"L'unità formale... appare... non come forma globale né come disegno omogeneo, ma come risultato del concatenarsi di sezioni, come relazione di contiguità tra parti diverse, sensibili in quanto diverse, e necessariamente diverse."*⁷

Manuel De Solà-Morales

*"Gli 'interspazi' contengono le matrici del disegno modificativo degli assetti architettonici, urbani e territoriali, trapassandone le scale, per attingere una consapevole forma dell'abitato."*⁸

Sergio Crotti

⁵ Crotti, S., "Strade, frontiere interne della trasformazione urbana" in *Urbanistica* 83, 1986

⁶ Ibid.

⁷ De Solà-Morales, M., *Designing Cities*, Lotus Quaderni, Electa, Milano, 1999

term chosen is “*interrelation*” because “*exchange*” is used generally for economic or commodities trading), attempting to shed light on the causes for the stability of specific places within the settlement where multiple systems interrelate while, paradoxically, producing an intrinsically unstable mutating form.

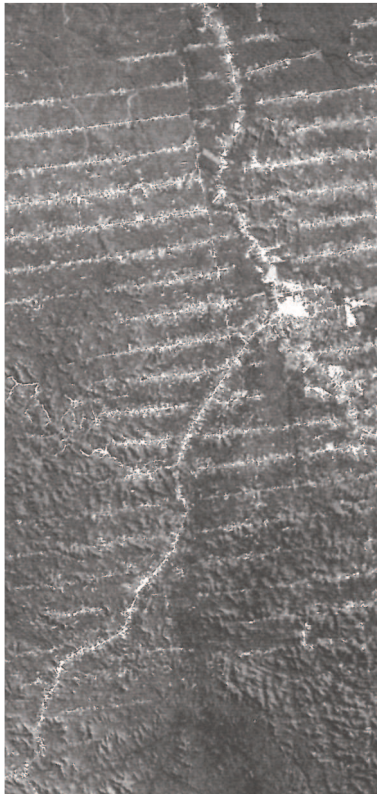
I intend to explore the relation between entropic and syntropic processes, which seem to be a constant both of nature in all its processes as well as in contemporary settled space, through spaces where the dialectic between order and disorder concentrate, using Schrödinger’s paradox as a guideline. Successively proposing a strategy that is capable of generating dialectic between multiple scales and to identify guidelines that helps identify the spaces where such dialectic is possible.

The final objective is to elaborate a projection of what a nodal strategy, after following the identified guidelines, would produce as the form of the metropolitan multipolar settlement in order to evaluate subsequent contradictions at a broader scale.

The thesis aims, from one side, at the generality of a principle but from the other to the specificity of its application, through a global settlement principle and contemporarily a set of local intervention rules.

The methodology undertaken in this study begins by exploring the *formation of places* and the relation between settled space, interrelations and stability, how human settlements are the physical manifestation of socio-cultural and productive forms of exchange with an effort to identify and describe the characteristics potential and limits of such places.

Moving onto investigating the process of *deformation* and the causes of the generic features (disorder) found in the spaces of interrelation where various scales and systems intersect (relate with each other) while trying to compare them with the Schrödinger’s paradox in order to understand why margins and inter-scale spaces tend to accumulate featureless landscapes or “sameness” as well as identifying a series of modalities of operating with the various interpretations of disorder that emerge from a number of modernist and contemporary theorists and architects as well



Deforestation, Brasil

Source: Landsat Aerial photograph by NASA / U.S. Geological Survey

⁸ Crotti, S., “Interspazi: dai siti pubblici ai luoghi comuni”, in Caputo, P. (a cura di), *Le architetture dello spazio pubblico: forme del passato forme del presente*, catalogo della Mostra tenuta a Milano nel 1997-1998, Electa, Milano, 1997

Syntropic Settlements vs Entropic Landscapes





as the mutating concept of entropy throughout the various disciplines. Then it explores the “net phenomenon” as a key paradigm to both interpreting and operating a *transformation* within the larger urban entity. Focusing on the nodal entity as the entity that reveals the intrinsic frontier character, as well as generating the sense of place and consequently space, furthermore, as the one element capable of relating both locally and globally and through which various scales may dialogue. Attempting to define a “node strategy” which should identify a series of modes with which the “net phenomenon” may give an answer to the original question of this thesis.



And finally, the experimentation of such strategy, within the selected case study, as a theoretical-practice through the elaboration of projects and the exploration of the scenarios that the case study offers in order to illustrate both the limits and potentials of the net paradigm through the node strategy that takes into consideration a way to operate with disorder from the conclusions drawn from the previous explorations.



Matrix: Monuments of Passaic
by Robert Smithson
from: R. Smithson, *Artforum*, New York 1967



Introduction

The significance of the chosen case study lays in the exceptionally violent social differences that have paradoxically produced a particularly undifferentiated massive centralized metropolis, where the public dimension of space has deteriorated to a level that seems almost irreversible. Spatial injustice and segregation have led to a degradation of mobility, both physically and socially. A common problem to Latin America, but as some authors suggest⁹, a symptom that is emerging in developed countries as well.

“Brazilianization is symbolized by the increasing withdrawal of the white American overclass into its [...] world of private neighborhoods, private schools, private police, private health care, and even private roads, walled off from the spreading squalor beyond. Like a Latin American oligarchy, the rich and well connected members of the overclass can flourish in a decadent America with Third World levels of inequality and crime.”¹⁰

As Castells suggests, Latin American settlements show a higher degree of “metropolization” than other settlements probably as a consequence of the stronger attraction of labor from impoverished rural areas that the centrality generates than its industry can absorb.¹¹ And in addition, especially in Colombia, violence has driven large waves of population to migrate to the capital uncontrollably generating slums in places that are scarcely habitable.

Segregation has led to the concentration of development in “gated islands” of wealth generating barriers that interpose between the private and public realms inducing the degradation of open public space in favor of “closed” ordered privatized semi public space.

Opposite: Barrio Santa Cecilia, Bogotá
Source: Google Earth 2015

⁹ Lind, M., *The Next American Nation*, pp. 14, 215-16

¹⁰ Ibid.

¹¹ Castells, M., *Imperialismo e urbanizzazione in America Latina*, Mazzotta, Milano, 1972

Syntropic Settlements vs Entropic Landscapes



Left column: Syntropic Settlements vs Entropic Settlements, Bogotá
Right column: Syntropic Landscape vs Entropic Landscape, Sabana de Bogotá
Source: Google Earth 2015

Built space expresses this condition both at an urban scale as well as at the regional (and national scale). At a regional level, the nuclei around the city of Bogotá have experienced an underdevelopment and disconnection. Public facilities, public transport, and cultural have concentrated in the city, leaving the once indissoluble space of the Sabana dissociated from Bogotá, subtracting the identity of its places and reducing the Sabana and its landscape to Bogotá's residual space. The rich fluvial system along with the unique high altitude swamp ecosystem known as "Humedales" has been turned into an open sewer system carrying along the residue of floriculture, leather and other industrial production process. Inhibiting the natural system from becoming dwelled space.

Infrastructure has also played a segregating role within the "*brazilianization*" of contemporary metropolitan settlements. Bypass roads, intra-urban highways and so on become the ultimate contradiction of infrastructure, where space does not only loose its possibility to be inhabited, but it is actually used with the precise intention of dividing, containing, bypassing, and closing.

In the beginning of the 21st century, the renewed attention toward the problem of mobility and infrastructure experienced in Latin America, after the more opulent European experience, led to a series of low budget projects.¹² Nonetheless, interesting solution emerge with the gondola lift infrastructure generates a connected surveilled public open space.¹³

Even though the Sabana currently suffers a condition of residual space in relation to the metropolitan centrality of Bogotá, it still carries the traces of the "*epigenetic substrate*" which contains the significance of the collection of local characters that compose the geographical-mental entity of the Sabana de Bogotá.

¹² Such as TransMilenio in Bogota (2000), Metrobus in Mexico City (2005), Metrovia in Guayaquil (2006), Transmetro Guatemala (2007), Expresso Tiradentes in Sao Paulo (2007), Masivo Integrado de Occidente Cali (2008), Sistema Metropolitano de Transporte in Lima (2010), etc.

¹³ Adopted in Metrocable Medellin 2004, Metrocable Caracas 2010, Mi Teleférico La Paz 2014, Teleférico do Alemão Rio de Janeiro 2011 exposing the potential of a local solution to the general contradictive situation generated between global and local connections. The gondola lift system not only generates a connected surveilled public open space but it contemporarily generates infrastructural nodes in a space with no recognizable singularities or landmarks. It has been used as a tool that opens the barriers of the islands of degradation incentivizing the possibility of physical and social exchange.



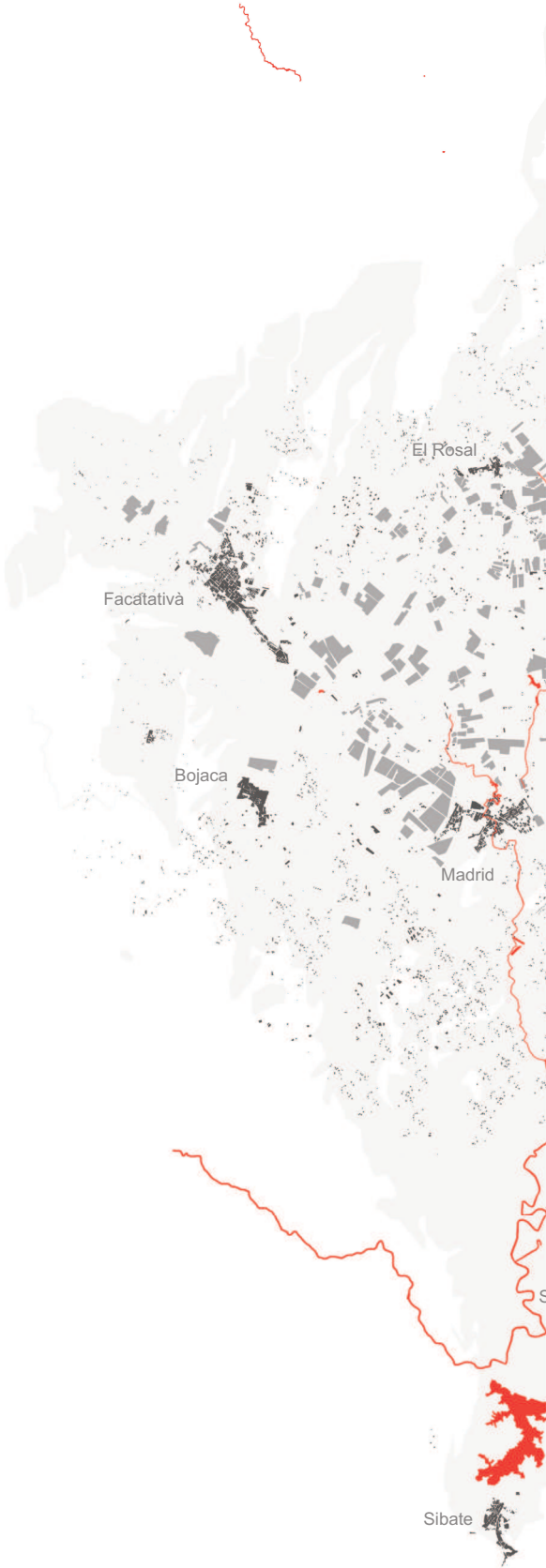
Barrio Caracolí, Bogotá, 2012
Source: Trabajo de campo

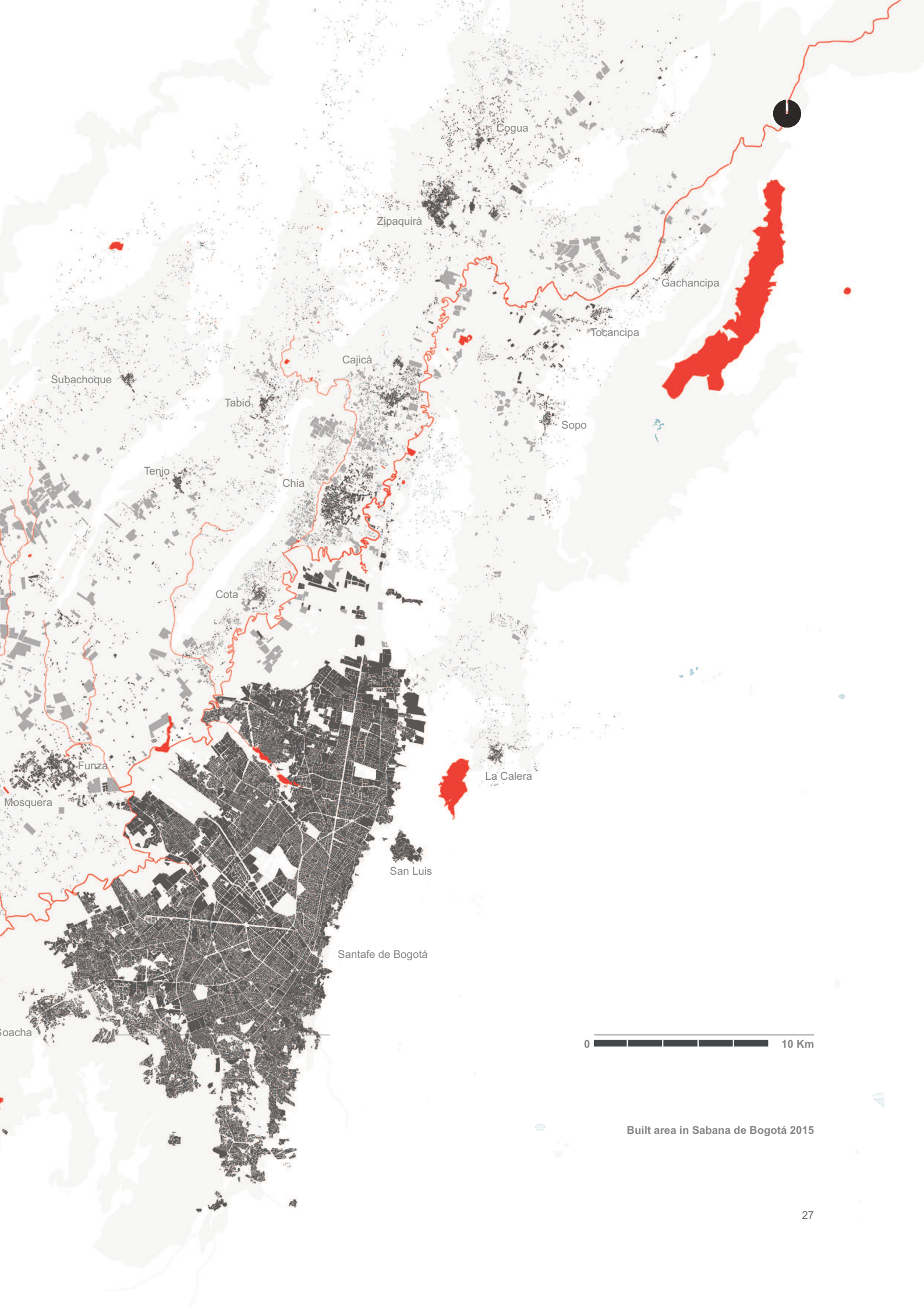
The enormous value within the qualitative character of the Sabana landscape has even produced the “*Escuela de la Sabana*”¹⁴ during the late 1800 and through three generations of landscape artists who were where influenced by the European impressionist movement and who tried to captured the relation of this settlement with its territory and its roots.

The concentration of the increased artificiality effort into islands of wealth and order has produced both islands of complete disorder and margins of generic and contradictive character.

Before such a complex degree of degeneration and assuming that the historicized models have been unable to deliver a theory that could deal with a continuously mutating metropolitan entity where large scale projects tend to be obsolete before they can be put into action and have generally produced contradictive results at local scales or vice versa, it is within the *space of interrelation*, that the potential to rearrange the preexistences of the metropolitan entity into a congruent multipolar region.

¹⁴ Local artistic movement that monumentalized the specific character of the natural landscape of the Sabana, recognizing the unity of such entity.





Built area in Sabana de Bogotá 2015

INTERRELATIONS AND STABILITY [FORMATION]

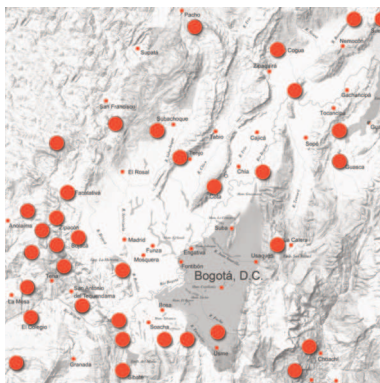
Interrelation: Conceptualization and Relation to the Discipline (31), Interrelation and Human Settlements (35), *Formation of Settlements* (35), *Geomorphology and Settlements* (37), *Stability of Significant Places in Settlements* (43), Limits of Interrelation (47), *Colonization* (49), *Macrocephaly* (55), Conclusions (59).



Interrelation: Conceptualization and Relation to the Discipline

The space where interrelations occur has demonstrated the potential to incentivize the stabilization of settlements (or places within settlements) through the phases of formation deformation and transformation. There is a conspicuous amount of historic examples that sustain this hypothesis; according to some authors, the concept of settlement is, in a sense, a product of exchange itself.

Max Weber's¹ definition of the city, which considers strictly an economical aspect, may be amplified to embrace other types of exchange as well. If physical forms, socio-cultural forms, production forms of exchange are taken into consideration, the settlement becomes the physical expression of the spatial and cultural organization of interrelations in a given territory. Privileged places within settled space itself show a higher concentration of interrelations and tend to stabilize and gain a degree of independence, of significance within both the physical and the mental image of inhabited space. Bernardo Secchi describes them as safe places where sociocultural interaction incentivizes the reciprocal absorption of the best parts of each culture.² Hilberseimer describes forces that determine the growth and decline of settlements, suggesting that if directed consciously, order will generate out of disorder, and he reiterates the profound importance of understanding such forces, which in the past and in the present, influence the origins and development of human settlements.³ Even though exchange seems to play a central role in the formation, deformation and transformation of settled space, it seems somewhat oversimplifying of the origins of the settlement and its most stable and significant elements. On this basis, the term exchange seem to be deviating, generally involving mostly economic trading and commerce, therefore a more congruous term that describes the "exchange of the human substance" as Le Corbusier referred to the exchange of authority,



Opposite: Bedolina map (Iron Age),
Val Camonica, Italy

Source: C. Turconi 1997

Up: Historical plane of Chita Saline

Source: Groot 1999

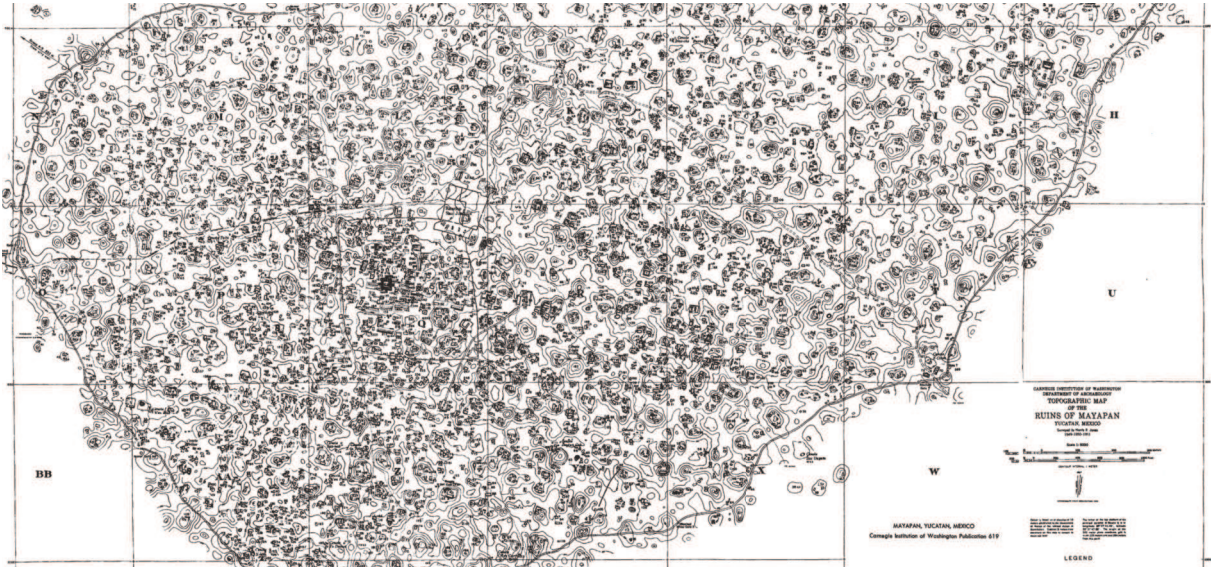
Down: Engravings sites and Cave Paintings

Source: D. M. Celis 2009

¹ Weber, M., *La Città*, Bompiani, Milano, 1950.

² Bernardo, S., *La città dei ricchi e la città dei poveri*, Laterza, Roma-Bari 2013.

³ Hilberseimer, L., *The New City; principles of planning, with an introduction by Mies van der Rohe*, Miami, Hard Press, 2013 p.18

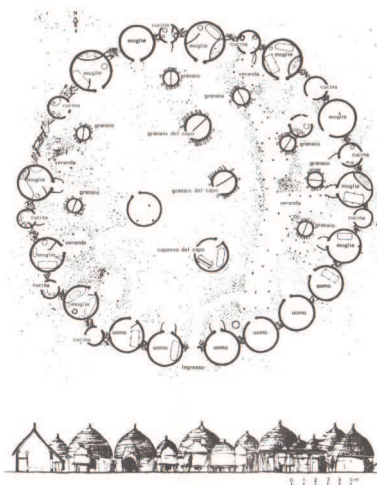


Transformation of Mayapan settlement, Yucatan, Mexico
Source: L. Benevolo 1975

culture and resources, is the term *interrelation*.⁴ More specifically, in architectural terms *interrelation* alludes the exchange of the physical forms, social-use forms, and productive forms, to a mutual influence and mutual modification. Form is itself a type of interrelation between *eidos*, *morphe* and *idea*⁵ as well as its reduction to the reciprocal relation between figure and ground. Moreover *interrelation*, both holds together and separates text and context (inter-text)⁶ and it is a distinctive trait of the concept of *Relational Architecture*.

Spaces where interrelation flows become most intense tend to be reduced to an infrastructural aspect or confused in more contemporary problematic exclusively a transportation challenge. As schematically illustrated before, I will sustain that this is not the case, tracing back to the cycle of modifications in both archaic and antique settlements, in order to attempt to prove the persistence of spaces of interrelation as significant and structuring entities within the urban form and therefore to the characteristics that generate stable reference places within settled space both in the physical aspects as well as in the social codification of the meaning that places hold. It may be considered as an attempt to delineate the characteristics of such places and the role they might play within a multipolar node strategy based on the net phenomenon and between the interrelation of order and disorder.

The objective is the identification of such spaces, their potential and their limits in relation to generating, expanding, eroding and transforming settled space.



Cameroun settlement, Africa
Source: L. Benevolo 1975

⁴ Le Corbusier, *Maniera di pensare l'urbanistica*, Laterza, Milano, 2011, p.110

⁵ The three attributes of form: *Morfé*: material form, empirical form. *Eidos* (*species*): essential form that gives structure, the scheme that forms represent. *Idea*: the abstract essence of form.

⁶ Crotti, S., lecture in *Morfologie e tipologie per lo spazio abitato*, PhD, Politecnico di Milano, A.A. 2011- 2012.



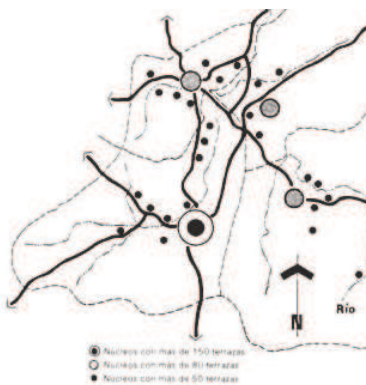
Interrelation and Human Settlements

Some spaces within settlements seem to persist through the different phases of formation, deformation and transformation. They compose the structure as singularities, conferring the sense of *structure* or *form* itself.

As Sergio Crotti notes, in antique settlements that have been transformed through the centuries, structural nodes whose form changes while their content is confirmed are found to endure.⁷ And through the observation of the global system of interrelations, constitutive elements emerge; persistent points, historic thresholds inscribed in built space, and structural nodes of the urbanizing dynamic.⁸ These spaces are referred to as “*significant places*” and according to Crotti, the interest for the architectural project in such spaces lays in their potential of becoming morphogenetic nuclei.

Formation of Settlements

The phase of formation, which may be identified in archaic settlements (but not only) usually as a densification of elements around a space, evidences the establishment of a differentiation; between built and void, natural and artificial, inside and outside, figure and ground, transforming the natural landscape into settled space. Between each of these antonymic couples, there is a physical entity that is the space where each meets, a *threshold*, one of the most recognizable discontinuities within structures of all types, that as mentioned before, is referred to as *interrelational space*.



Opposite: Tairona Ciudad Perdida,
Colombia
Source: National Geographic
Up: Territorial map of
Tairona Ciudad Perdida, Colombia
Source: J. L. Romero 1989

⁷ Crotti, S., “Per un’Architettura delle Connessioni Urbane”, in Crespi, L., *La stazione, il parco e la città*, Alinea, Firenze 1997.

⁸ Crotti, S., *Morfogenesi Urbana e trasformazione Locali*, Quaderni del Dipartimento di progettazione dell’architettura, n. 2, Clup, Milano, 1985



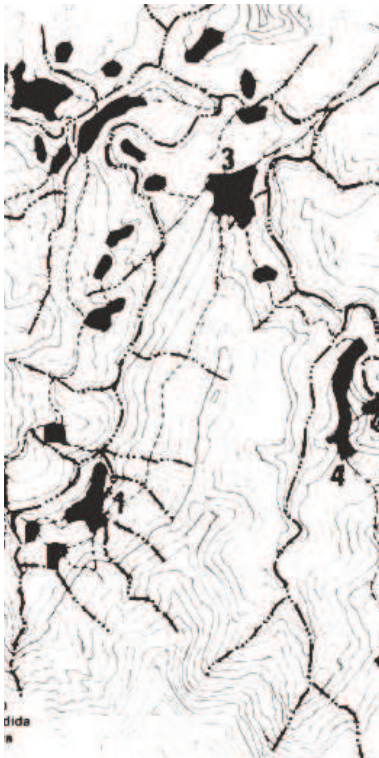
Machu Picchu map, Peru
Source: L. Benevolo 1975



In the stability of settlements and places, the interaction of relational flows tends to assume two main types of configuration: linear dispositions, both parallel and perpendicular between each other. Alignments along large axis, streets or rivers, later railroads, such as the line of Rhineland, Rhône and Loire cities in Europe, settlements along the Tran-Siberian Railway or along the railroad system of Sao Paulo. And convergences of traffic routes, like in the case of the Confluence in Lyon, or Delhi in the Ganges Plains where fluvial systems meet.⁹

Geomorphology and Settlements

The Muisca settlement in the Sabana de Bogotá illustrates how the singularities derived from relational flows, which in the specific case correspond with geomorphological characteristics, have persisted through a series of modifications as the elements that confer a structure to the territory and which give meaning to the settlement itself. "In some parts of the world, Latin America for example, the siting and spread of human settlements respond so fatefully to the sculpture of the land that is impossible to isolate the urban experience from earth induced affects."¹⁰ An obvious example of the influence of topography on the form of settlements in Latin America is Machu Picchu in Peru, while contemporarily Italian hill towns may come to mind.



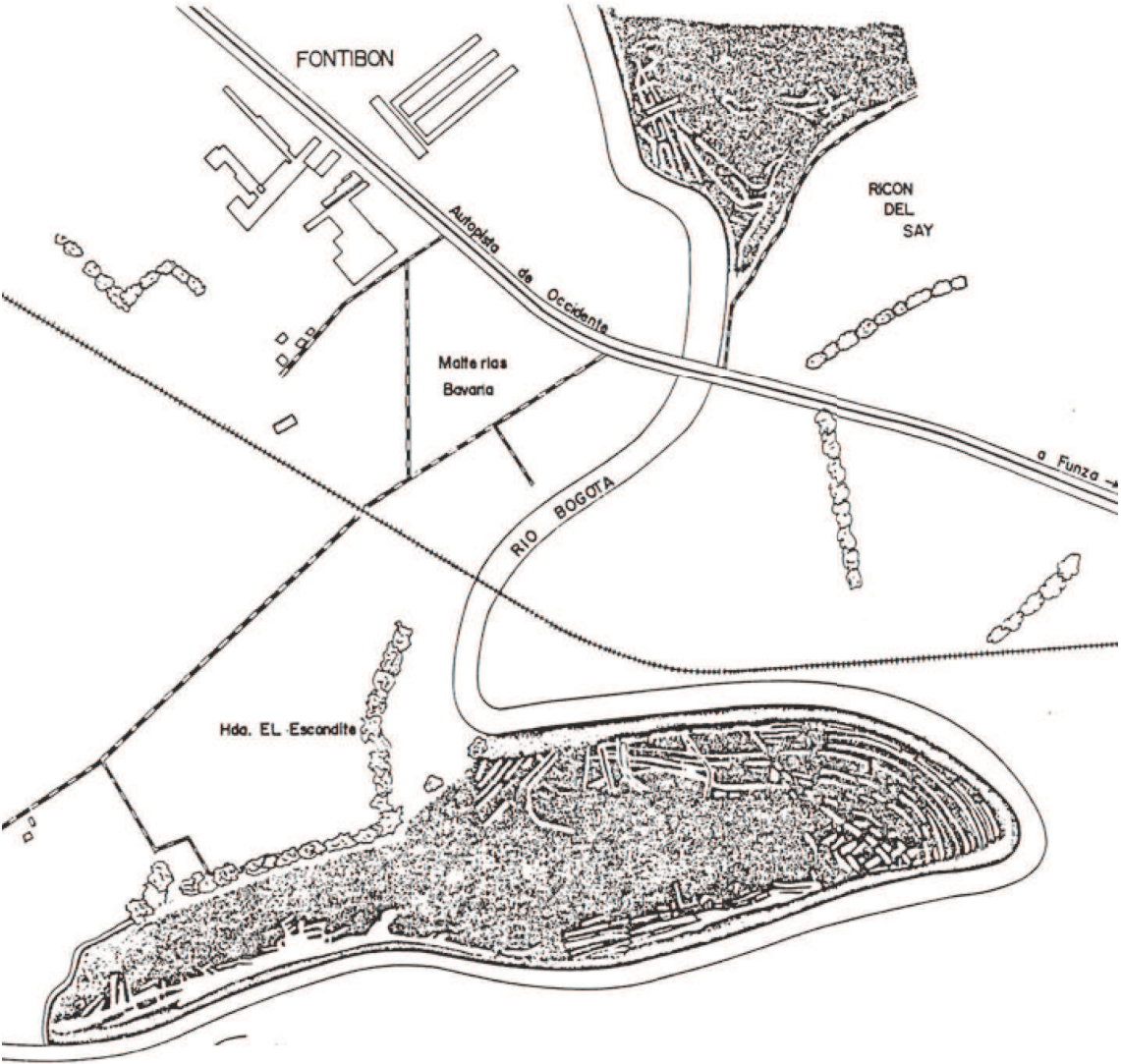
The initial conditions in the Sabana de Bogotá system, which hold the genetic traces that have given shape to the present physical form, before the Spanish conquest presented a constellation of polarities that responded to the interaction with natural resources and the pressure applied by topographical circumstances have concentrated exchange into specific places.

The geomorphological and hydrological systems in the Bogotá plateau have defined a clear geographical enclosure composed of a system of separated smaller scale structures. The Sabana's unique orography has constrained fluxes, being its rich hydrological system, its built/void

Up: Machu Picchu Terraces, Peru
Source: National Geographic
Down: Geographical context of
Tairona Ciudad Perdida, Colombia
Source: J. L. Romero 1989

⁹ Bianchini, M., Enciclopedia Einaudi, *entry: scambio*, Einaudi, Torino 1980, p. 684-709

¹⁰ Kostof, S., *The City Shaped, Urban Patterns and Meanings Through History*, Thames and Hudson, London, 1991



Archaeological research in the old Cacicazgo of Bogotá

Source: F. Bernal 1990

system, or its relational space system, to pass through specific “nodes” where various fluxes converge.

This *connection / separation* contrast has given the possibility to these fluxes to gain, to a certain degree, a specific character, independence and identity while still making part of a constellation of interrelated and interdependent nuclei, becoming a system of systems of which Bogotá, where the various systems converge, is main barycenter, its main Node. This *interrelation*, channeled through the plains in between the ridges has settled, stabilized and artificialized through the plateau’s history into infrastructural traces with a predominantly linear development.

While considering the construction of space conducted by the Muisca culture in the Sabana de Bogotá two primary theories are confronted. All the knowledge we have from the pre-conquest settlement is reduced to written accounts where Spaniards describe what they saw and by scientific speculation based on archaeological research.

The Muisca people identified and exploited places with natural resources, mainly salt extraction, but around which other complementary industries would emerge. This extraction and distribution generated a relational network that integrated different cultures throughout a much broader territory. Cotton and large quantities of gold are an example of this vast network because they are not found in the vicinity but play a central role in the Muisca culture.

Water was used as a main resource in the exploitation of salt in its deluded form, in wells it was extracted and transformed cleaned and processed so it could be traded. These transformation processes included the evaporation of the water using furnaces and the transportation using clay containers.

Salt exploitation was situated mainly in the northern part of the Sabana, in Zipaquirá, Nemocòn, Tausa Gachetà and Sesquilé. Since the extraction technique involved also the use of pots or “gachas” this complementary industry concentrated in Gachancipà and Cogua, and firewood, which was produced in Tasgata and Nema.¹¹ Local interrelations generated two types of territorial transformation composed of both pedestrian paths and navigable paths, conformed a network of

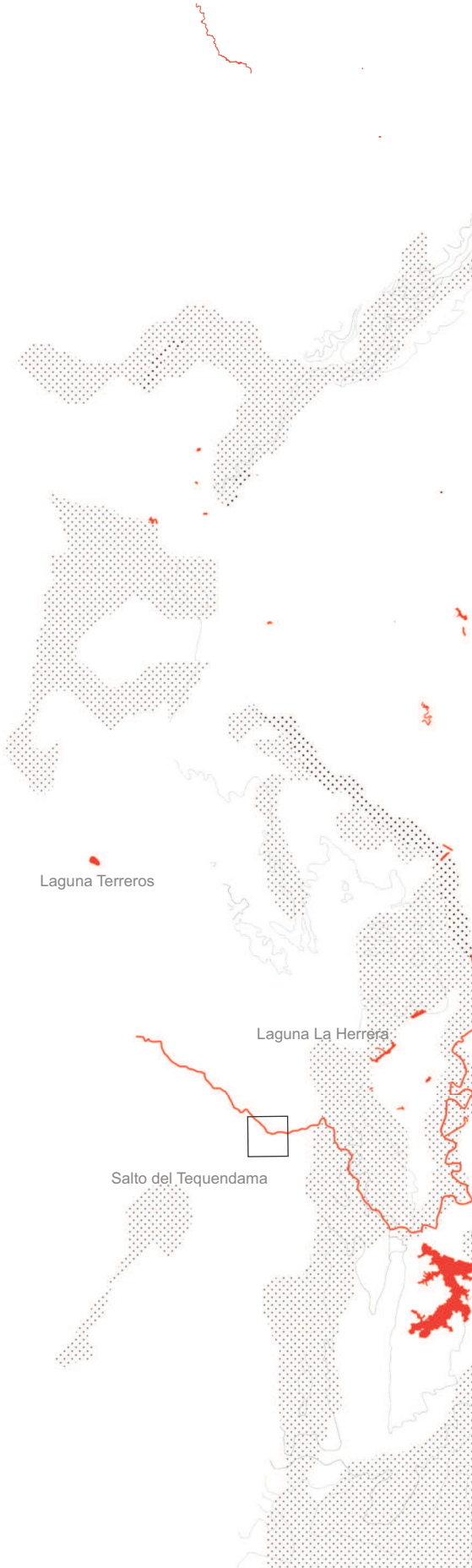


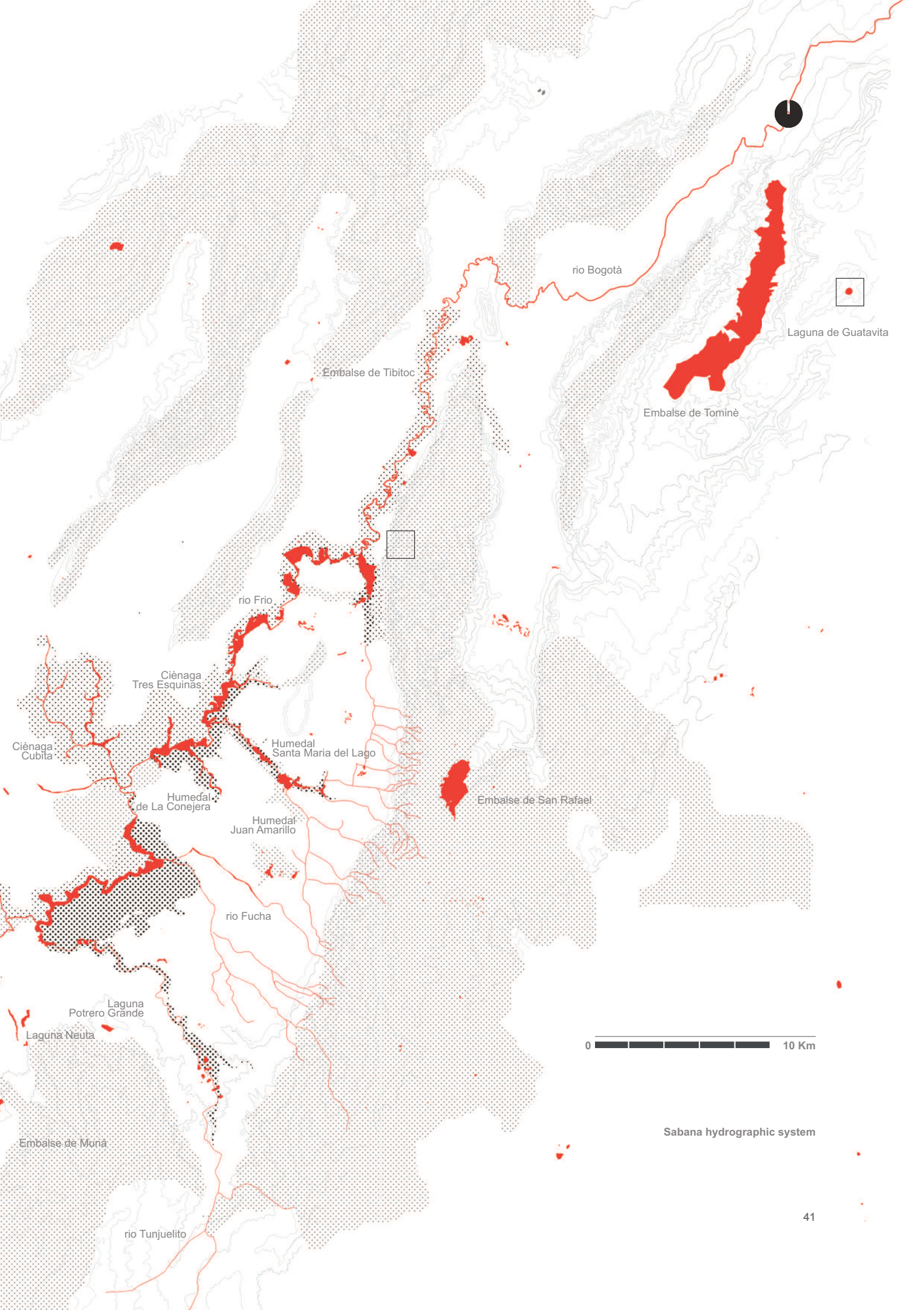
Muisca’s cropmarks Cacicazgo of Bogotá
Source: F. Bernal 1990

¹¹ Cardale, M., “Caminos precolombinos: las vías, los ingenieros y los viajeros”, *Simposio del Congreso Internacional de Americanistas*, Instituto Colombiano de Antropología e Historia, Bogotá, 1997, pp. 49-70



Muisca's patterns
Source: Instituto Geografico Agustin Codazzi 1956





Sabana hydrographic system

canals, lakes and rivers connecting various regions. Water, in the Muisca culture, played both a practical and a metaphysical role of the outmost importance, not only in the exploitation of mineral resources but hydrological bodies were also used for fishing, agriculture ceramics and most significantly as sacred spaces such as Guatavita, Suesca and Sesquilé, where rituals demanded a part of the production as offerings. Interrelations generated cultural exchange with different groups at different scales. Market centers have conserved significance and consequently a global stability, which are here attributed to interrelational flows, and continue to play an important role in the network of interrelations between the Sabana de Bogotá and its surrounding territory. Salt trade concentrated in Gachetá, Pacho and Tunja and was directed to groups in the eastern flatlands from Gachetá, to the Magdalena River from Pacho, and towards the Caribbean from Tunja. Some of these traces are still perceptible as evidenced by the field work conducted by Broadbent in the 1960's where the traces of the different densities of soil derived from the Muisca techniques of agriculture have left a varied density in vegetation, and this way avoiding to be erased by the "Europeization" of land uses with the introduction of cattle and other pasture driven uses of ground.¹²



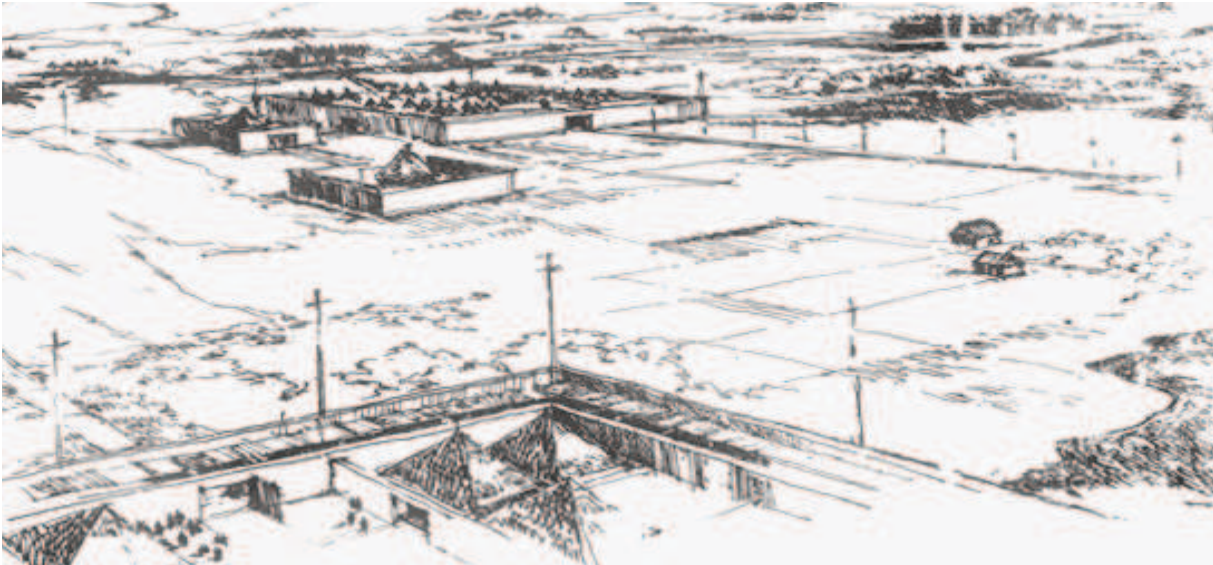
Stability of Significant Places in Settlements

Although experts agree that in the Sabana de Bogotá, the pattern of settlement combines the existence of scattered and nucleated shelters, there is no consensus on whether they generated a definite urbanized space.¹³ Anyway, evidence of a decisive element that sustains the thesis that exchange generates stable settled space from a socio-cultural point of view in the physical conformation and the symbolic mental construction of "urbanized" space is the Muisca toponymy that illustrates how, even after crucial events such as colonization and later globalization the places of interrelation that emerged from the Muisca settlement's configuration still remain: "*Ya hemos visto que quica es pueblo, patria, de donde sale*

Cropmarks east of Hacienda La Conejera
Source: Sylvia M. Broadbent 1968

¹² Broadbent, S., *A Prehistoric Field System in Chibcha Territory, Colombia*, presented at the Society for American Archaeology, 1968

¹³ Langebaek, C., *Mercados y circulación de productos en el altiplano Cundiboyacense, siglo XVI*, Tesis de grado, Universidad de los Andes, Bogotá, 1985, p. 64-68



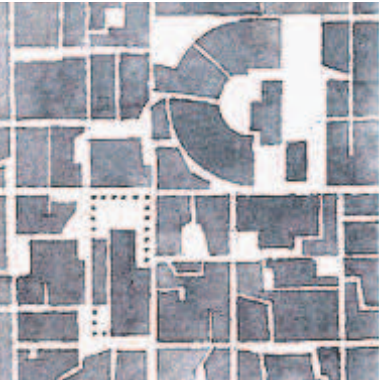
Reconstruction of Muisca's settlements in the Sabana de Bogotá
Source: Sylvia M. Broadbent, *A Prehistoric Field System in Chibcha Territory, Colombia* 1968

la palabra quicasbtasca, desterrar, y que la letra r no figura en el idioma puro; de aquí se desprende que la palabra quira, tan frecuente en los nombres de pueblos y ciudades chibchas, debió de pronunciarse primitivamente quica. Sin embargo, es de notarse que en esta forma sólo aparece como componente de un nombre de una ciudad ideal: “el cielo”, que se decía Guatquica, “ciudad de lo alto”; al paso que en todos los demás nombres geográficos suena quira o quirá, como en Zetaquirá (ciudad de la culebra), Zipaquirá (ciudad del Zipa), Chyquyquirá (ciudad del Chyquy o Jeque, como decían los españoles) y Sotaquirá o Sutaquirá (ciudad de Suta).”¹⁴ In addition to the toponymy, rupestrian art is still found in the areas that have resisted to successive cycles of deformation and transformation, as shown in the map, becoming further confirmation of the structural nature of these places in respect to the settlement’s form. This first phase of formation of the settlement is followed by a phase of deformation, predisposing it for a transformation of its various forms.

¹⁴ Triana, M., *La Civilización Chibcha*, Banco Popular, Bogotá, 1977 p. 181. In Melo Moreno, V., *Espacio Geográfico Y Vivencia Urbana En Santa Fe De Bogotá: La Calle*, Alcaldía Mayor de Santafe de Bogotá, 1998



The solidly framed Roman grid is punctuated by an open-air market and an amphitheater.



The city's new Islamic population appropriates these public monuments for private use, and mid-block pathways begin to violate the orthogonal street pattern.



The transformed city is one with a minimum of open public space. Straight passages along the winding system of narrow lanes offer the merest suggestion of the original layout.

transformation of a gridded Roman colony into an Islamic city
Source: S. Kostof 1991

Limits of Interrelation

When exchange (or the lack of) determines a deterioration of formal, social and technological aspects of a settlement. In order to investigate the relation between the origin and stability of settled space and interrelations, the exploration of the consequences of isolation on settled space may be used as a benchmark for the sustentation of such a statement. Exchange between cultures may also determine a process of cultural homogenization that will reflect in the configuration of urban space.

As observed by M. Cerasi, using the example of Salonico, where ethnically diverse cultures were segregated for centuries but once the possibility of a prolonged communication between the various enclaves verified, the urban structure was progressively uniformed and a research made in the 70's was not even able to identify any substantial difference in the form or character between the various ethnic districts.¹⁵ As for the *arabization* of Roman and Hellenistic colonies in the Middle East, through an intensification of cultural exchange, brought to a gradual loss of the distinction and differentiation of urban and public space, shifting into an endless repetition of the same typology.

Examining the cases where exchange is not constructive or stabilizing but becomes, to some extent destructive, offers an insightful view on the problematic; some of the most tangible examples of when exchange ceases to be reciprocal and becomes univocal are walls, barriers and limits, but also elements that incentivize exchange, as highways or railroads and at one scale, after achieving a notable level of artificiality, sever relations at local scales. In such extreme cases where exchange is suppressed demonstrate the dependency of settlements on exchange as a resource in order to offer the qualities that render space habitable and stable. In antiquity, sieges brought an abrupt interruption of exchange

¹⁵ Cerasi, M., "La Città del Levante", in Donato, F. e Lucchi, L., *L'ordine nascosto dell'organizzazione urbana*, Francoangeli, Milano, 1996

Syntropic Settlements vs Entropic Landscapes



Up: View of Mexico City in 1905

Source: L. Benevolo 1982

Down: The *Laws of the Indies* grid as a farming town in a colonial village in Peru's Colca River Valley

Source: S. Kostof 1991

between a city and its territory and generally brought a settlement to its knees. A contemporary version of sieges such as embargos, where the unilateral interruption of exchange used as a means of constraining a nation to accept certain conditions have demonstrated their devastating consequences, as colonization in Latin America.

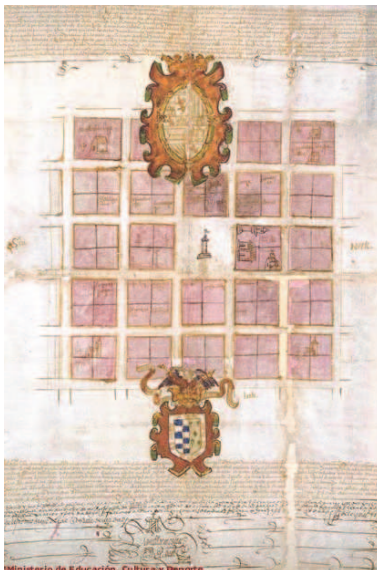
Colonization

The progressive growth of exchange relations may determine the cause of decline of settled space as well. Colonization, in Latin America, has revealed the flattening capability of exchange on preexisting diversity and organization through the overlaying of a new, often simpler type of order, which generated simpler and undifferentiated types of settled space.

The morphological uniformity that Latin American cities display today may be traced to the series of specific aspects that the colonizing powers responded to.

The guidelines of the law of Indies probably derived from the medieval tradition of the French *bastiades*, fortified villages used especially in the southwest of France which referred to the roman *castrum*, as well as from the influence of the renaissance culture, (Vitruvian and Albertian treaties as well as the aspirations to geometric regularity) spawning a new type of city altogether: according to Benevolo¹⁶ the original character of the Latin American cities may be synthesized in three main points, which are useful to understand the present situation:

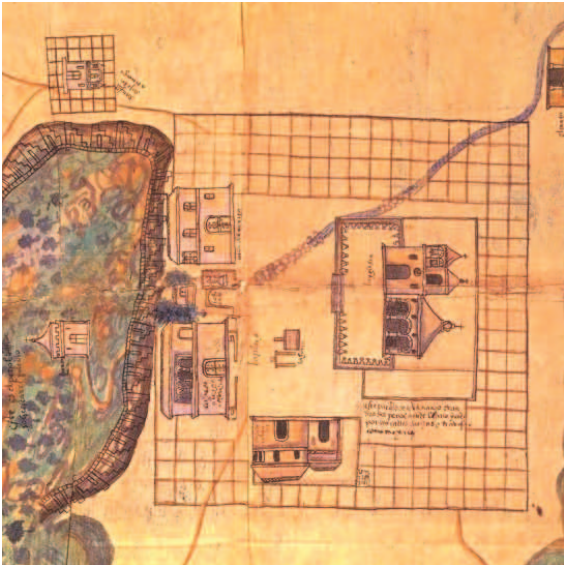
- 1 The foundation of the colonies was based on a two dimensional plotting of the territory, where the construction of the buildings is meant to happen over a long period of time, through the assignation of the single plots to colonizers who may build them when and how they please.
- 2 The city must be able to grow to an undetermined size therefore the grid layout, which is intrinsically limitless in every direction. The outer



Cuadrícula plan of San Juan de la Frontera, Argentina, 1562
Source: Archivo General de Indias, Sevilla

¹⁶ Benevolo, L., *Storia della Città*, Laterza, Roma-Bari, 1981

Syntropic Settlements vs Entropic Landscapes



Spaniard colony plans in Suoth America. From the top, on the left: plan of Pueblo de Teutenango 1582 (Nueva España, Mexico), Nueva Guatemala 1787, San Francisco de Quito1734, Guasca (Bogota)
 Source: Archivo General de Indías, Sevilla; Archivo General de la Nacion (Colombia)

limit of these cities is always provisory, generally lacking the need of moats and walls.(usually only the coastal settlements had to defend from pirates, walls are present in a series of coastal cities, such as Cartagena, Santo Domingo etc.) the clear contrast between urban and rural seen in Europe is attenuated in America, both because of the uncertainty of the city limits as well as the abundance of open spaces around the new settlements.

- 3 The uniformity of the colonic grid, frequently decided for bureaucratic needs, impedes an adaptation to the specific characteristics of places. The uncertainty of the future development defines a precarious and generic urban landscape. Some of these cities that started from a few blocks grew with the same sixteenth century principle into the vast metropolises we find today in the region.

Another factor that Benevolo indicates as determining for the poverty in the colonial layouts derives from the fact that the great masters of architecture and planning were employed in projects for the European cities, which were never realized, while less talented planners who emigrated to America built entire cities. The gridiron model spread to the French and English colonies of the North during the sixteen and seventeen hundreds, not limited to the scale of the city, but also to agricultural and state borders. Even Jefferson on the late seventeen hundreds used the grid model referred to the meridians as a means of colonizing the new western territories.¹⁷

The “Law of Indies”, applied under Phillip the II in 1573 throughout the Andean and Caribbean landscape, homogenized the formal configuration of settled space. The Spanish plan did not adapt, nor to the place, nor to the function: “Port cities like Cartagena (Colombia) were laid out in the same way as agricultural centers.”¹⁸ Spain’s “legalistic, programmatic approach to city planning avoided particular distinctions among cities and identified the functional aspects of planning with its administrative control, an, so, with uniformity.”¹⁹

¹⁷ Ibid.

¹⁸ Kostof, S., *Op.Cit.* p. 114

¹⁹ Ibid.

This does not mean that with the Spanish colonization the previous configuration of the territory was annulled. Instead we could speak of an overlaying of a new order, implicating a new spatial symbology and consequently a different construction of settled space, which in some cases inevitably suppressed the traces of the previous configuration. In most of the region, with the exclusion of the Inca, Maya and Aztec cultures, the level of artificiality reached through their construction methods never went past the phase of perishable materials and therefore the traces of the previous settlements are extremely difficult to recognize. "weather anything was contributed by the example of native pre-Columbian urbanism is an unresolved debate. The plan of Tenochtitlan, the great Aztec predecessor of Mexico City, had a cross-axial structure with a central plaza, but the shape of its residual blocks is uncertain [...] the same 'intra-squared' plan characterizes the Inca capital of Cuzco, but other Inca cities come closer to a regular gridded layout."²⁰

In the Sabana de Bogotá, most of the physical structures were demolished but even though Spaniards did not find situations analogous to Tenochtitlan or Cuzco there is evidence that the Muisca people did not only build with perishable materials, as Zambrano and Bernard sustain²¹, the multipolar form of the interrelational network to some extent was maintained. Being that the Spanish colony's intent in Latin America was not that of settling the space as their new home, unlike in north America, instead this shifts the relation between the Spaniards and the colonized land as purely a resource extraction settlement, as the ones that may be observed even today throughout Latin America's remote spaces.

Still after the colonial mutation, many of the pre-existing settlements' position were conserved, but as the colonic settlement logic evidences with the "plaza Mayor", the central void in the grid that held political and religious powers, an analogous situation in a larger scale was created between Bogotá and the surrounding smaller settlements. In order to better control the territory, Bogotá became the centralized space where the territorial power resided.

²⁰ Ibid. p.115

²¹ Zambrano, F., Bernard O., *Ciudad y territorio. El proceso de poblamiento en Colombia*, Academia de Historia de Bogotá, Bogotá, 1993

The role interrelations operate is both as foundation and decline of the city or as L. Mumford sustains, the city's history is the history of civilization, as a body which is constantly undergoing a processes of anabolism and catabolism, claiming that trade (or its policy) contributes to the activation as well as to the decay of the vitality of the urban cycle.²² Like Alexandria in Egypt, which was a flourishing city in antiquity, saw a population decline in the Middle Ages arriving to about 150 inhabitants during the 18th century, and nowadays it has become a city of about 3.5 million people.

²² Mumford, L., *The City in History*, San Diego, Harcourt Inc., 1961



Macrocephaly

Since the beginning of the 20th century, within the city of Bogotá, but also in other Latin American cities, growth has become extraneous to exchange. A massive centralization process which Castells calls “macrocephaly”²³, and which is common to most Latin American counties, has given place to a stratification on the periphery of often pirate settlements due to an unsupported attraction of population from rural areas to the central settlement but with no possible application of the workforce within the city.

Built space in the Sabana de Bogotá, as in most Latin American cities, was nearly unmodified from the Spanish colonization until the 19th century, when the first industrialization period brought the first migratory wave from rural areas. This coincides with the construction of the most important infrastructures in the region. For Bogotá, this is the period when the short life of the city’s railroad system began.

In Bogotá, from around 1918 to 1927, a new migration wave develops as a consequence of the Thousand Day War, where liberals and conservatives engaged in confrontations around the country, extending to the boundaries of Panama, Venezuela and Ecuador. During this period the urban area of the city reached around 3.26 km² and the population went from 144 thousand in 1918 to nearly 235 thousand in 1927. Lima by the same period had 273 thousand inhabitants, Mexico saw during this period its most dramatic population growth as well reaching about 1 million and in Sao Paulo for example, the population was already growing at a rate of more than 100% reaching by the 1920’s over 4 million people. The linear aspect of Bogotá’s built space, despite some radial deviances in Karl Brunner’s Plan, has been emphasized and accentuated through infrastructure, particularly the northern motorway and the railway. An exponential increase is detected around the 1940’s with the construction of the Techo Airport, and with new fluxes of population arriving in search of labor from the deprived countryside and from overseas, pushing the urbanized area of the city to about 25 km² and the population to 330 thousand.

Migration Waves in Bogotá

1870: first industrialization period of Bogotá. 9 federal states.

1918-1927: large migrations towards the major cities after the 1000 day war. Urban area 3.26 Km².

1938: population growth in search of new labor opportunities in big industries. Urban area 2.51 Km².

1951-1956: forced migration from the country-side towards the cities due to political violence between liberal and conservative parties. Urban area 8.00 Km².

1964-1973: accelerated growth of the urban area especially in high and middle classes. Urban area 14.6 – 18.9 Km².

1993: migration due to guerrilla violence in rural areas (desplazados) loss of small farming economies. Urban area 30 Km².

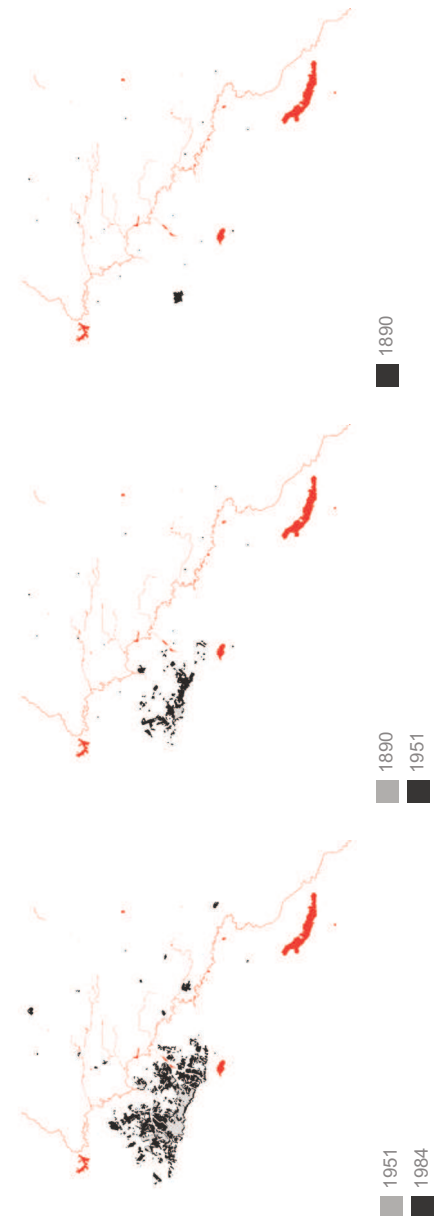
Left: Mega City in South America

²³ Castells, M., *Imperialismo e urbanizzazione in America Latina*, Milano, Mazzotta, 1972

Once again due to the intensification of violence between political parties at the expense of peasants throughout the country in the decade of the 50's the population of Bogotá reached more than 700 thousand and the urban area reached about 80 km². Notice how during this period, while the population doubles in a decade, the area of the city nearly quadruplicates, this is the moment that the automobile.²⁴ In fact, during this unrestrained growth, Le Corbusier, along with Wiener and Sert, was invited to design a plan for Bogotá, of which we can still see the effects, even though it was never officially implemented.²⁵

Between the 60's and 70's the cities growth saw an increase in the consumption of land by the middle and higher classes, occupying an area of 140 km² and 180km² respectively, while the population went from 1.697.311 in the 60's to 2,855,065 in the 70's.

During the end of the 20th century the compact shape of the city and its surrounding nuclei system has seen both an increase in suburbanization and an increase in immigration from the violence in rural areas of the whole country, giving shape to a diffuse periphery with dramatic growth of unplanned spatial occupation in the Sabana and a local disconnection with inadequate transportation systems. By 1993 the urbanized area of the Sabana arrives to nearly 300 km² and a population of 5,5 million. Simultaneously lot of this spatial occupation derives from a productive sector, flower export, which covers the hierologically richest part of the savanna with large-scale greenhouses directly connected to the airport. In fact, the El Dorado Airport shows the highest cargo traffic in South America, with 477 Tons / year in 2004 and 511 Tons / year in 2005 of which 87% is derived from agricultural industry²⁶ while it only ranks fifth in respect to passenger traffic. And while the population is currently reaching 8,4 million people in the city core alone, with an average of 4

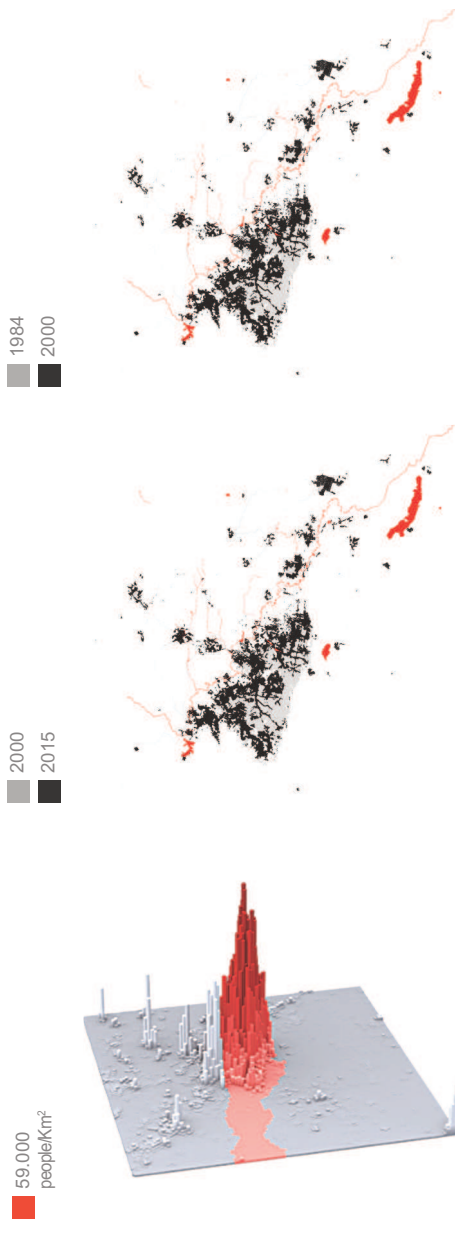


²⁴ Castells, M., *Imperialismo e urbanizzazione in America Latina*, Milano, Mazzotta, 1972

²⁵ While in 1939 Bogotá had about 6 thousand automobiles including buses motorcycles and trucks, in the 1940 the number of automobile arrived to about 7 thousand, two years later the number arrives to nearly 8 thousand. This incrimination, along with the shift in imports, from equally distributed between Europe and U.S.A. to a 70-30 ratio after the second WW, saw an explosion by 1948 when the number of cars in the city arrived to about 15 thousand units and grew to nearly 18 thousand units by 1950. In *Anuario Municipal de Estadística*.

²⁶ The use of the geographical traits of the savanna, especially the hydrological system that descended from the eastern ridge towards the Bogotá River, as the V 7 or the flows related to mind and body wellbeing have become green shafts where the leisure oriented bicycle routes pass through. A more detailed description will be offered in the next chapters.

²⁷ Gomez, J., *Modelo de Ocupación Territorial Regional*, Gobernación de Cundinamarca, Bogotá, 2008



Historic growth in Sabana of Bogotá
Right: Measuring density Bogotá
Source: LSE Cities

m² of public space, well below the 15 m² suggested by world standards, the larger metropolitan area delimited geographically by the Sabana, adds only about 2 million people but reaches 2500 km².

Currently, Latin America shows a percentage of urban population similar to Europe and North America, (from about 59% in Paraguay to Argentina's 92% on average 75% in 2014)²⁷ but according to Castells²⁸, it sees a greater metropolization than European countries. And some aspects of this urban population growth have determined a condition that Castells refers to as "Macrocephaly" or the condition in which the major city's (or one of the major cities)²⁹ urban population tends to grow at a larger rate than its economy may absorb. This means that the growing population will live in an urban area but probably in the worst possible conditions, generating vast areas of slums where the term *urban* is reduced to a mere proximity condition due to the inaccessibility to the most basic public facilities. The attraction that the major city generates is not derived from its economic dynamism but instead it derives from a progressive desertion of rural areas, in the case of Colombia, violence, which has persisted for over 40 years, plays a central role in this desertion as we can see from the waves of migration since the late 19th century. This rural exodus involves, other than violence, poverty and unemployment.

The transformation of Latin American economies in relation to the percentage of urban population does not reflect a transformation of its economy from agricultural to industrial; instead, Latin America has seen a vertiginous growth in its tertiary sector, especially in construction. Housing prices in Bogotá have, in some portions of the city, reached European and North American capital's standards, while the largest portion of its population lives under disastrous conditions.

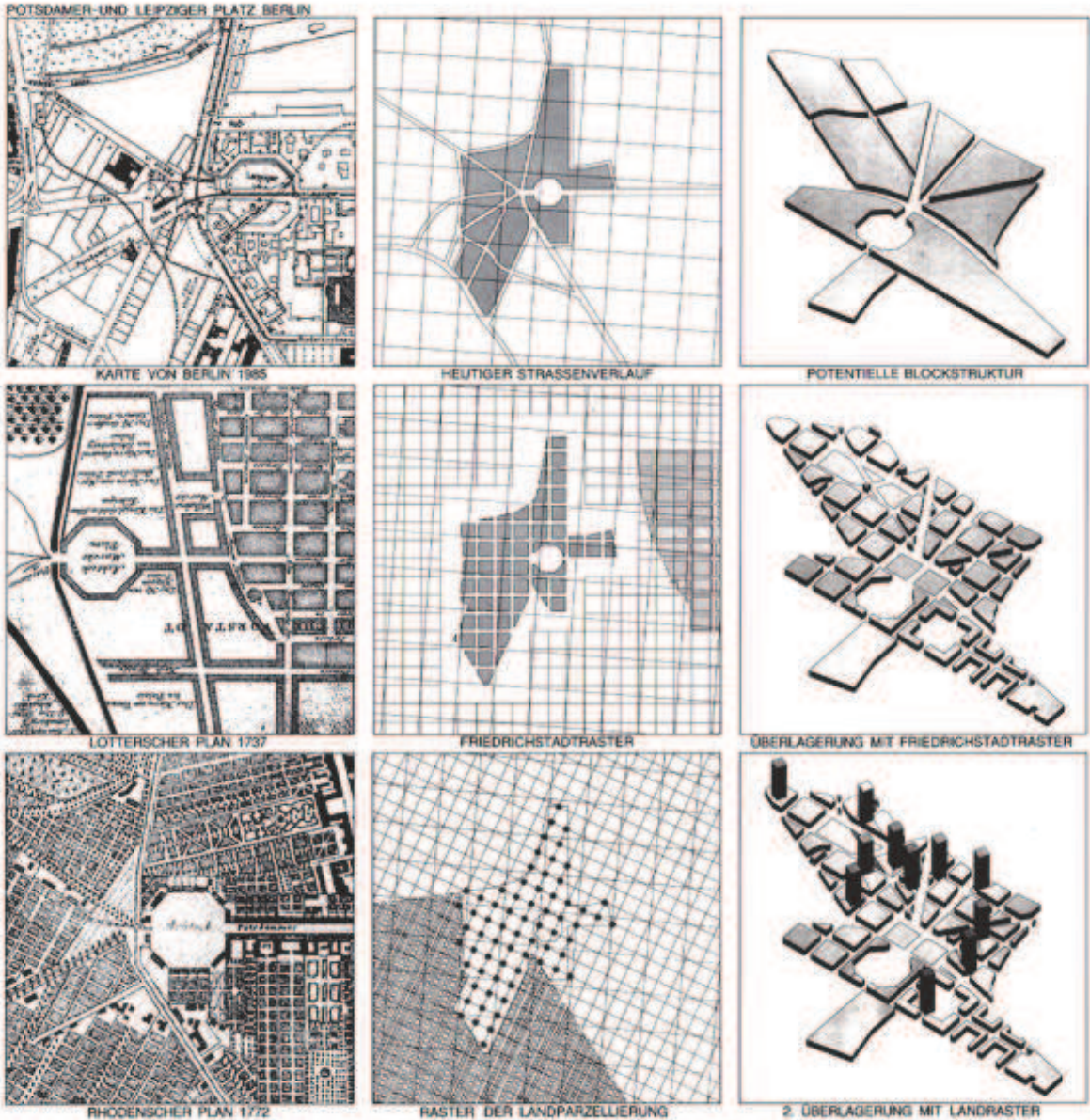
The consequence, according to Castells³⁰, is the formation of a blunt and unarticulated urban tissue, where the disproportion of large agglomerates centralizes the economic and political direction of the country. In addition to the economic, social and cultural distance that separates the rural environment derived from such processes, social stratification, which is typical of the contrast seen in Latin America, is more accentuated.

²⁷ World Bank, World Development Indicators: Urbanization 2015

²⁸ Castells, M., Op. Cit.

²⁹ as in the case of Brasil where the population is slightly less concentrated on only one city, being instead more equally distributed between the three major cities, although the contrast between city and country still presents the same characteristics as other Latin American cities.

³⁰ Castells, M., Op. cit.



Study of Potsdamer Platz and Leipziger Platz by O. M. Ungers
Source: O. M. Ungers, *The City in the City*, 1979

Conclusions

Stability of settlements, paradoxically seems to derive from mutation³¹ although when relations becomes univocal the positive aspects deteriorate and contradictions start to emerge; macrocephaly, imposition, dependency are but some of the effects of a violent relational asymmetry.

But even if frequently, the notion of settlement is identified with a series of functions such as exchange, power, religion, still many agglomerations do not posses any of these qualities as well as many sites that do posses such qualities and are not inhabited.³²

After identifying some of the general features of the relation between settlements and interrelation, both in its positive stabilizing aspects as well as its limits and counterproductive aspects, it is important to identify the specific places within the metropolitan settlement's contemporary configuration where such features are present and have determined stability throughout the metropolitan entity's mutations.

Some of these spaces in can be exemplified in some of the most stable and paradigmatic examples throughout the world, just to name a few: Potsdammer Platz which originated as a confluence of paths since the medieval period and stabilized around the sixteen hundreds as Leipziger Platz. Successively gaining importance as the entrance to the city from Potsdam, one of the most important places for the reign of Frederick II, completely destroyed during the second world war, as well as being sectioned by the Berlin wall during the cold war. And still it re-emerged once more, continuously transforming in order to persist, it even became the stable trace that produces the regeneration of the whole area around it through the projects that generated a complete renovation of the district. Showing that the cycle of formation deformation and transformation is the mechanism behind the stability of places and form.

³¹ Raion, J., Einaudi Enciclopedia, *Entry: Insedimento*, Einaudi, Torino, 1980, pp. 684-709

³² Kostof, S., *The City Shaped, Urban Patterns and Meanings Through History*, Thames and Hudson, London, 1991.

Other stable places that have spawned massive research and citations include the Theatre in Arles, that withstood a complete change in specific typology while remaining a significant place and conserving the traces of its form, Broadway in New York beginning as a pre colonial trail it still convey some of the strongest interrelational flows in the world along with Wall street, of which the name recalls its origin rising on the traces of the walls of New Amsterdam. There probably is an example for every settlement in the world. In Bogota one of the most recognizable places of interrelation is found in the city center, in correspondence with the trails and the first limits of the colonic settlement of Santa Fe, the San Francisco River and successively the limits of the first expansion corresponding to the San Diego river on the north and the San Agustin River on the south. These places have mutated in their use and form while still maintaining their significance. Their relevance has made part of many projects, from the nineteenth century Parque del Centenario to Le Corbusier's Plan Piloto and successive renovations that have generated a propagation of their transformative and structural properties within the urban form, displaying the dialectic between stability and mutation that is attributed to the spaces of interrelation explored in the chapter before.

Spaces of interrelation seem to be characterized by the confluence of various flows and by the concentration of inter-scalar relations. They work as an articulation, both uniting different elements as well as evidencing the diversity of such elements. This usually means that such places are locally unstable, generating modifications elsewhere or being



1 2 3 4

- San Diego River 1
- San Francisco River 2
- Plaza Mayor 3
- San Agustin River 4

Panoramic view of Santafe de Bogota by Joseph Aparicio Morata, 1772
Source: Archivo General de la Nacion, Colombia

³³ Garcia Vazquez, C., *Antipolis. El desvanecimiento de lo urbano en el Cinturón del Sol*, Editorial Gustavo Gili, Barcelona, 2010

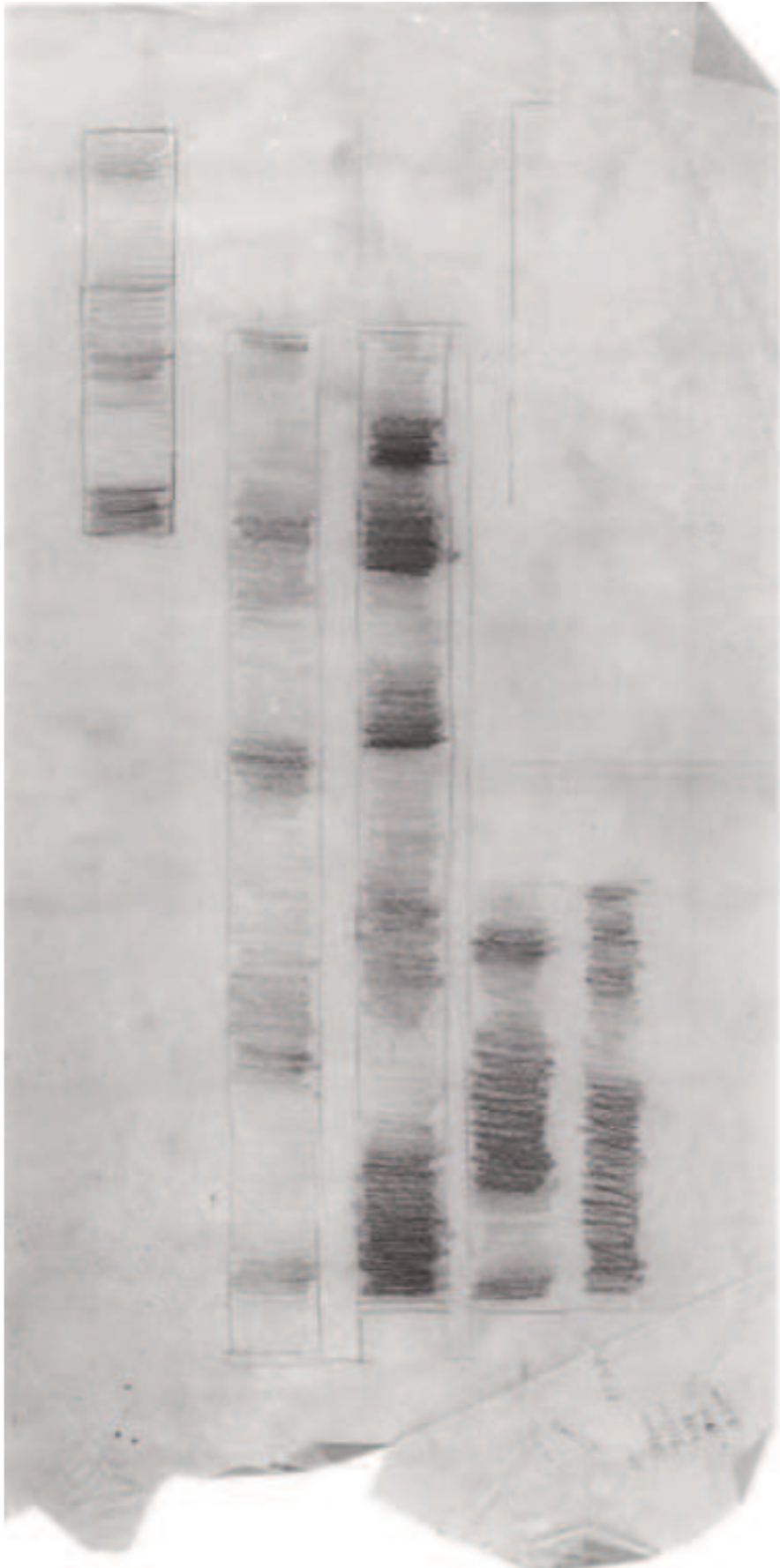
modified by remote alterations, paradoxically these places tend to be stable within the broader interrelational network, acting as catalyzers of the successive modifications of settlement in general.

The place of interrelation from a global point of view, may coincide with the parameters that are traditionally used to describe the urban condition, while from a local point of view they tend to correspond with their opposite. Garcia Vazquez's refers to some of these features in "Antipolis"³³ while studying the sunbelt cities as; Permanence, Diversity, Memory, Consistency, so more specifically in the space of interrelation assumes the following tension between Stable / Unstable, Material / Immaterial, Substantial / Insubstantial, Differentiated / Undifferentiated.³⁴ Spaces of interrelation hold this intrinsic duality between order and disorder, which will be central to the proposed strategy in the Case study. *Spaces of interrelation* also seem to accumulate the contradictions produced by the incongruence of organizational scales and considerable asymmetries of influence between relational entities, while at the same time they seem to persist through succeeding modifications of human settlements and even triggering such modifications by orchestrating the interaction between the various scales. Such condition confers *interrelational* spaces a notable interest for architectural and urban design strategies. This intrinsic contradiction, along with the simultaneous presence of various systems, both dialoguing and not, seems to be what describes *spaces of interrelation* and their modifying role in the transformation of settled space. This is why the architectural project finds in *interrelational* space its most fertile ground and its most important role in a continuously mutating metropolitan entity.

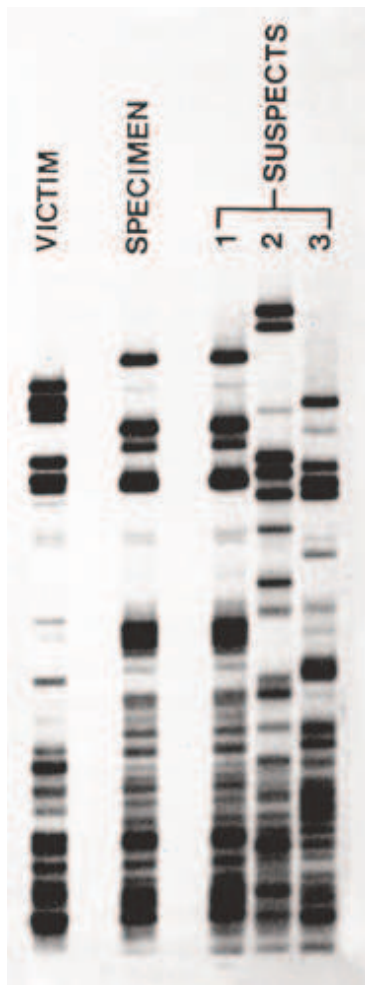
³⁴ this is a personal interpretation of the author's research and spaces of interrelation are not explicitly named in the book

SYNTROPIC VS ENTROPIC [DEFORMATION]

Entropy: Conceptualization and Relation to the Discipline (65), *Entropic processes in Settlements* (73), *Fragmented Edges and Margins* (79), *Entropic processes in Landscapes* (83), **Global Intentions / Local Contradictions** (85), *Modern Strategy: Limits and Potential of the Plan Piloto* (87), *Infrastructure from Relation to Connection* (90), **Local Intentions / Global Contradictions** (99), *Disorganization of Void* (99), *the Rise of Walls: Gated Communities / Gated Slums* (105), **Can Less generate More?** (109), *Open Composition* (119), **Conclusions** (129).



Entropy: Conceptualization and Relation to the Discipline



The origins and transformations of the concept of entropy.

The concept of entropy was introduced in physics in order to describe a large number of phenomena that seem to manifest any sort of directionality (such as the flow of time). Classical mechanics was unable to explain such phenomena due to the fact that equations in mechanics are invariant with respect to the direction of motion. It was then necessary to introduce a new physical principle: the second law of thermodynamics. But as in many other scientific concepts, the definition depends on the theory or branch of studies, as well as for entropy, which varies considerably from thermodynamics to information theory to statistics and biology. The interest in the concept of entropy lays in its vast applicability as a more abstract conception of the principle may be extended to sociology, economics, topology, linguistics, music and art.

The term *entropy* was first used by Rudolf Clausius in 1865, from the Greek word τροπή or “transformation” while intending to quantify in mathematical terms, the transformations of energy that happen within a system subject to thermodynamic changes, deriving from the work made by Carnot on the efficiency of Heat Engines through abstract models.

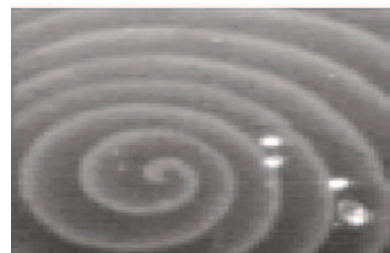
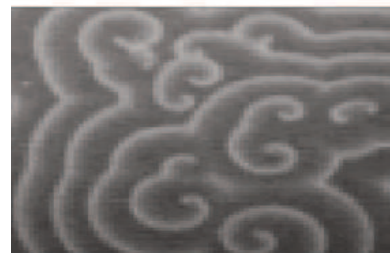
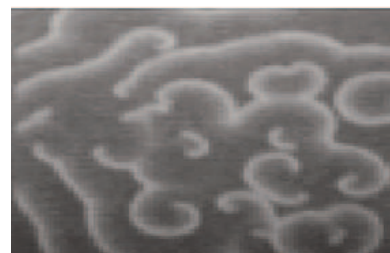
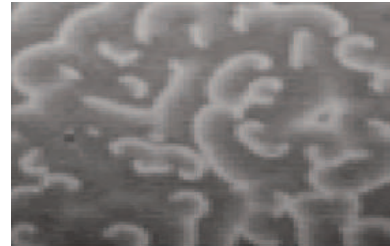
Entropy in mechanical statistics: probability and disorder.

With the success in physical and chemical sciences of the atomistic conception, where in experimental phenomena, at the macro-level may be explained by the physical processes that take place at an atomic level, the concept of entropy in classical thermodynamics became, to some extent, obsolete. This opened the debate to a statistical interpretation of the concept of entropy through the theories of James Clerk Maxwell, Ludwig Boltzmann and Willard Gibbs. According to the statistical

conception of probabilities of the possible configurations of a set of particles, the greater the number of possible dispositions that generate a given state, the greater the chance of finding the system in that particular state. The likelihood of a distribution of particles is inversely proportional to the regularity of its distribution. Order is conceived as an improbable disposition of elements, which is why, according to the second law of thermodynamics, liquids will most probably mix but will, in most cases¹, not un-mix: For example, when a plate breaks it passes from a condition of order (a very small probability of the disposition of its material) to a much more probable disposition of pieces of ceramics. This is the only law in physics that implies that time follows one direction.²

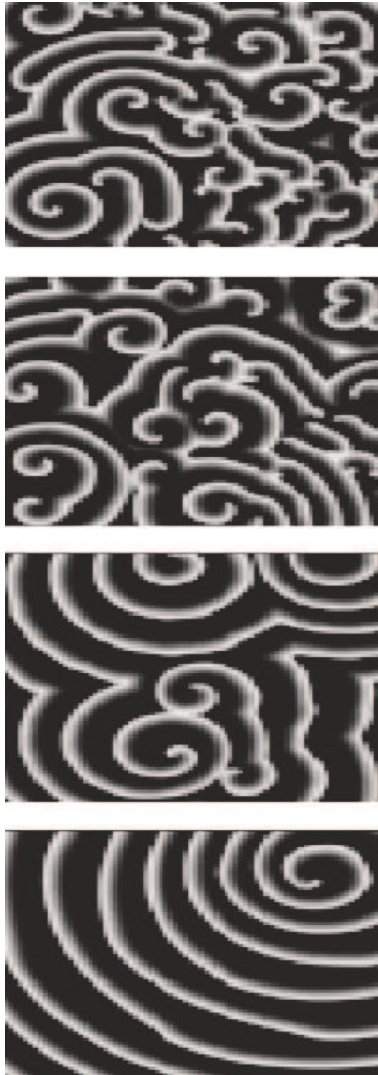
According to Boltzmann, the principle of the increase of entropy means that a system, which is not in equilibrium in time will tend to evolve into a more probable state, will eventually reach equilibrium. According to Boltzmann's model, a system will spend more time in or around its most probable state than in any other. Gibbs, on the other hand, used a different model. In this model the difference consisted on not considering single particles like gases, but instead considering a collection of identical systems, so doing he was able to extend his predictions beyond gases, to solids liquids and any other quantic systems. But even though physicists tend to use Gibbs' model, the difference between the theories is reduced to their justification, and not the theory itself.³

Open systems are characterized by an exchange of matter or energy with its environment. This type of system is directly related to biological systems, as Schrodinger explains in the famous book "what is life" when he introduces the term "negentropy" referring to the way living creatures avoid entropy (or death) by feeding on "free energy". This ultimately takes to the concept of syntropy where order within an open system is created only by discharging disorder into the system's environment.



¹ for a concrete case of self-organization, see Belusov - Zhabotinsky reaction in non-equilibrium thermodynamics

² *"Nella termodinamica classica l'evoluzione fisica di un sistema è descritta dal secondo principio della termodinamica che lega il verificarsi di fenomeni irreversibili all'aumento della funzione di stato entropia. Secondo il principio d'ordine di Boltzmann, l'entropia è una misura del disordine molecolare, della probabilità di esistenza di un certo stato. La legge di aumento dell'entropia è quindi una legge di progressiva scomparsa di ordine e di organizzazione. L'evoluzione organica e lo sviluppo ambientale sembrano andare esattamente nella direzione opposta, verso una maggiore organizzazione, verso l'aumento dell'ordine, verso*



Sincronization of two photochemically coupled Belusov - Zhabotinsky patterns
Source: Tyson and Fife 1980.

Information and Entropy.

Information theory studies the transmission of signals or messages from a mechanism to another. It may be applied to a large range of disciplines, from language and literature to telecommunications, music and genetic mechanisms of living creatures. According to Shannon's mathematical theory of information, the *real* message is selected from a group of *possible* messages, where the higher the number of possible messages means a higher quantity of information produced at the moment of selection of a message. In relation to entropy, within the theory of information, the higher the entropy of a system of events, the more information is associated to a particular choice of a specific event.

The information content in a probability distribution is analogous to the amount of entropy in that distribution. Information is defined in terms of the prior probabilities of certain events occurring; the greater the uncertainty before such event, the greater the information obtained if such an event occurs. The criteria for defining statistical information implies that the measure would be cumulative between independent events and might vary from zero to infinity. Even though Ralph Hartley⁴ was the first to define the entropy of a particular event, it was Claude Shannon⁵, mathematician, cryptographer and father of the *information theory*, who first derived the formula to measure the entropy of any set of probabilities.

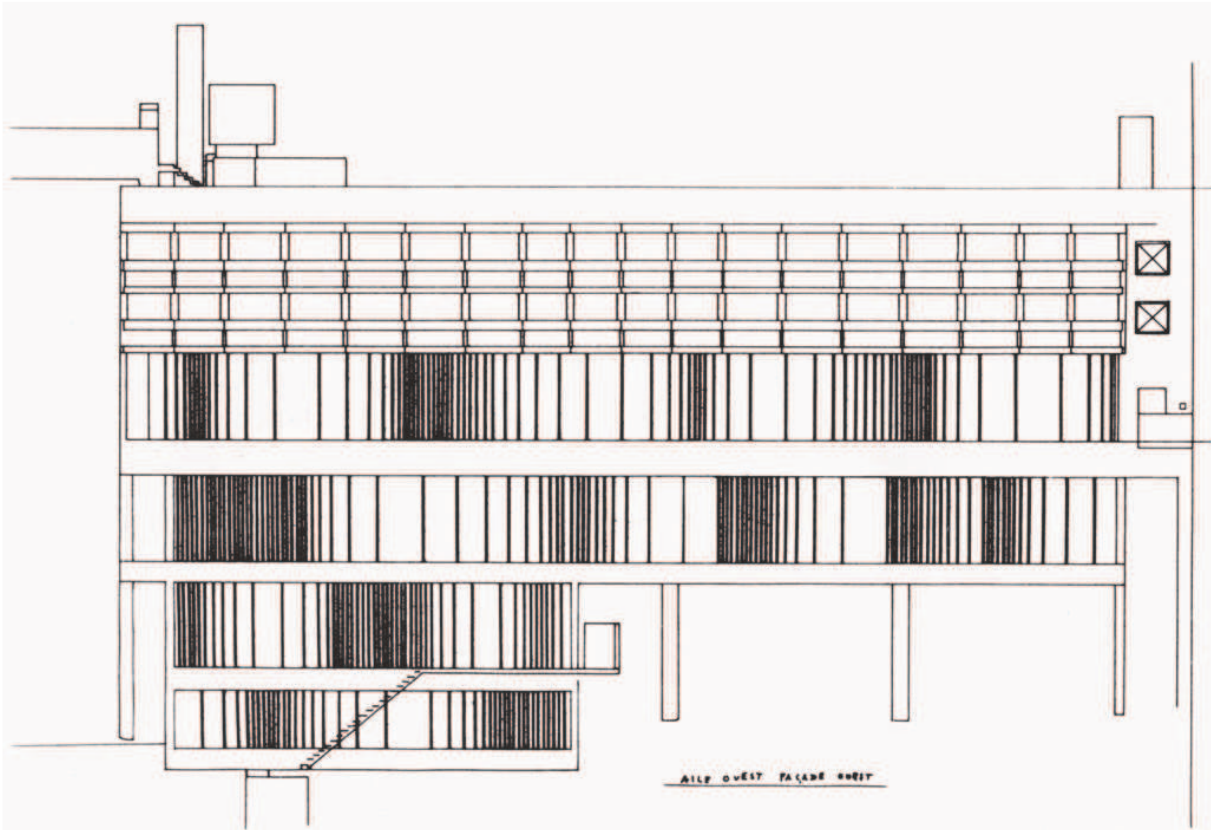
There is still some incoherence between the more generic concept of entropy and the definition of entropy in information theory, to the extent that some authors refer to information as "negative entropy" or "negentropy", to the extent that information should be associated to the suppressed uncertainty.

configurazioni "improbabili". Superando questo paradosso la teoria di Prigogine si pone come una generalizzazione della termodinamica classica, in grado di spiegare sia la distruzione che la formazione di strutture." Geymonat, L., *Storia del Pensiero scientifico*, Garzanti, Milano, Vol. 9, p. 16

³ Elkana, Y., Ben-Menahem, Y., Entry: *Entropia* in Enciclopedia Einaudi, Torino, 1977

⁴ Hartley, R., *Transmission of Information*, Bell System Technical Journal n. 7, 1928, p. 535-63

⁵ Shannon, C., *A Mathematical Theory of Communication*, Bell System Technical Journal n. 27, 1948, p. 379-423 and 623-56



La Tourette Composition facade
Source: Iannis-Xenakis.org

Since the quantity of information is highest when the probability of signals is equal and no constrain is imposed on their relative dependence, any constrain introduced immediately excludes some of the possible arrangements. For example, if a rule that states that every word must contain the letter a, this dramatically reduces the quantity of words that may be composed without the introduction of such rule. Therefore every system that includes constrains or rules, has to have lower entropy than it would if it did not have such rules. It takes then that **structure and entropy express contradicting characteristics**. While referring to a language (as composition in architecture is sometimes referred to) need for a balance between high entropy from one side and structure from the other, emerges.

The explicative importance of the concept of entropy is constantly growing, it has assumed a central role in the discussions on the direction of time, on organization, and evolution of life.

Entropy, redundancy and music (or composition in general) also seem to hold a deep correlation. Messages are transmitted through symbols or signals such as the letters in an alphabet, musical notes or chemicals in DNA. As mentioned before, the information is greater proportionally to the probability of the comparison of any given symbol is equal. And any rule or constrain reduces the quantity of information that may potentially be produced. "Information or entropy, content of a communication system is at a maximum if there are the least number of restrictions upon the process of selecting successive events; specifically, the largest entropy content is obtained whenever the sequence of symbols is completely random."⁶

"It is by avoiding the rapid decay into the inert state of "equilibrium" that an organism appears so enigmatic; so much so, that from the earliest times of human thought some special non-physical or supernatural force (vis viva, entelechy) was claimed to be operative in the organism, and in some quarters is still claimed. How does the living organism avoid decay? The obvious answer is: By eating, drinking, breathing and (in the case of plants) assimilating. The technical term is metabolism. The Greek

⁶ Hiller, L., Isaacson, L., *Experimental Music*, McGraw Hill, New York – Toronto – London, 1959, p. 29



RANDOM MUSIC can be "composed" by spattering ink from a brush onto blank music paper (*top*). When the spots are transcribed (*bottom*), the horizontal distance between them defines their time value. Meters are obtained by drawing cards from a deck.

Source: Hiller in Scientific American 1959

word “μεταβολή” means change or exchange. Exchange of what? [...] . Every process, event, happening -call it what you will; in a word, everything that is going on in Nature means an increase of the entropy of the part of the world where it is going on. Thus a living organism continually increases its entropy -or, as you may say, produces positive entropy -and thus tends to approach the dangerous state of maximum entropy, which is of death. It can only keep aloof from it, i.e. alive, by continually drawing from its environment negative entropy -which is something very positive as we shall immediately see. What an organism feeds upon is negative entropy. Or, to put it less paradoxically, the essential thing in metabolism is that the organism succeeds in freeing itself from all the entropy it cannot help producing while alive.”⁷

Composition and Entropy.

Lejaren Arthur Hiller, who began his studies in music at Princeton and later shifted to studies in chemistry, (in fact he asserted that his choices were not rational but random) wrote a controversial article in 1959⁸ where he sustains that music is a compromise between monotony and chaos or entropy and redundancy. Mind-numbing repetition such as the siren or a drop of water from a leaking faucet is seldom considered music. “There are five basic principles involved in musical composition [...] the first principle is that the formation of a piece of music is an ordering process in which musical elements are selected and arranged from an infinite variety of possibilities i.e. from chaos. The second principle recognizes the contribution to a musical structure not only of order, but also the lack there of [...] the third principle is that the two most important dimensions of music upon which a greater or lesser degree of order may be imposed are pitch and time [...] music exists in time, the fourth principle is that of memory [...] Lastly, as the fifth principle there is *tonality*.”⁹ Theoretically, Hiller sustains that the stylistic component of modulation, in the last two hundred years, display a shift towards the diminution of redundancy (or an increase in entropy). “As a final example, the stylistic device of modulation (key-shift) shows a fairly steady decrease in redundancy over the past 200 years. Mozart employed a

⁷ Schrödinger, R., *What is life?*, Cambridge University Press, 1943, p. 69

⁸ Hiller, L., *A Computer Music*, in *Scientific American*, CCI, n.6, 1959, p.109-121

⁹ Hiller, L., *Op. Cit.*, p. 16

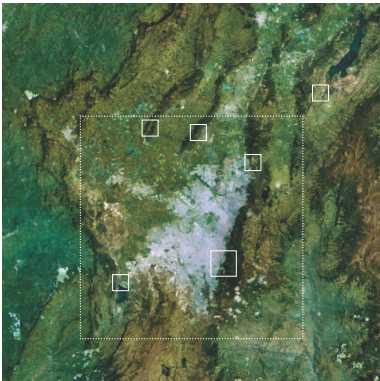
Syntropic Settlements vs Entropic Landscapes



Lima, Perù



Caracas, Venezuela



Sabana de Bogotá, Colombia

Source: Google Earth 2015

limited number of rather standardized modulations. In Chopin and Brahms the modulations are more extreme and occur more frequently and less predictably. Wagner and Debussy modulate so freely that the listener often loses any immediate and unequivocal sense of key. Many modern composers have abandoned the concepts of key and modulation altogether and in this dimension approach complete randomness.”¹⁰

Entropic processes in Settlements

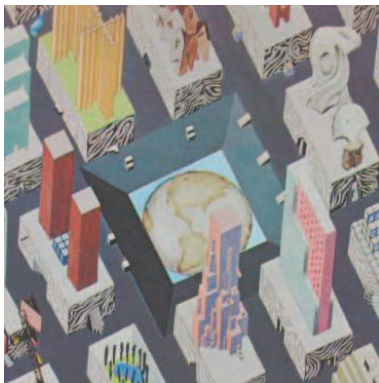
“Among the many entropic processes apparent in the outside world, the post-war transformation of urban space must be amongst the most demonstrable. There is an exurban space a movement from organization and differentiation to chaos and sameness- “drab uniformity”- where the relation between past/present, center/periphery, presence/absence breaks down into a condition which is simultaneously neither and both.”¹¹

Syntropic and Entropic processes in relation to settlements have to necessarily be associated with *form*. But as stated before, the interpretation of architectural *form* is assumed in this thesis as the synthesis of physical forms, productive forms and socio cultural forms, which correspond to Morphology as spatial configuration, Typology as the spatial characters and Technology as the level of artificiality.

The syntropic process, as delineated in the previous chapter, is associated with the phase of *formation* and *transformation* (of which spaces of interrelation act as structural nodes) while the entropic processes to the phase of *deformation*. At this point the identification of the different forms of entropic and syntropic processes must be associated to the physical forms, the forms of use and the forms of production.

Entropic and syntropic processes of physical form coincide with the phases of formation and deformation of *morphology* at multiple scales. Entropic processes are evident in the erosion or construction of built form, of urban layouts, and of the relation between built and void.

The *drab uniformity*, of which Wiener¹² spoke in *The Human Use of Human Beings*, may be seen when a growing number of elements within



The City of the Captive Globe
Source: R. Koolhaas, Z. Zenghelis, 1972

¹⁰ Hiller, L., Op. Cit., p. 111

¹¹ Pope, A., *Ladders*, Rice School of Architecture New York, Princeton Architectural Press, Houston (Texas), 1996, p. 203

¹² Wiener, N., *The Human Use of Human Beings: cybernetics and Society*, Houghton Mifflin, Boston, 1954

settlements aspire to an exhibitionist character and paradoxically trivializes their formal connotations, assuming the inexpressive and fragmentary characteristic of “sameness”¹³. As it does from the point of view of entropy in relation to information and composition, where too much “structure” leads to banality, where there is no space for differentiation or when differentiation is exhibited within a homogenizing configuration. This might be, in architectural sciences, related to a lack of differentiation in more than one scale, to a mechanical repetition. The opposite is true for syntropic processes, when elements, objects or collections of objects tend to arrange in a differentiated manner, by densification and therefore present structure at various scales, recalling the Vitruvian version of *Symmetry*, which “gives due measure to the members of a work considered separately, and symmetrical agreement to the portions of the whole”.¹⁴

Entropy and Syntropy in the Forms of use can be seen in the differentiation of private / public space, in the typological identity of spaces and objects (organ). In the significance associated to spaces in relation to the social form and how built space represents it.

As for the productive forms, syntropic and entropic processes are most evident in the organization or disorganization of agricultural landscape, of industrial and resource extraction complexes. But there is also an aspect of order in the relation between the three architectural forms: if one of the three forms tends to prevail on the other a different type of disorder emerges, generating contradictions between reference scales, or reversing the disorder on the other forms. For example in Latin American countries, the disorder generated by the prevalence of certain social groups seems to be reverted on the weaker part of society both in the physical form associated to the settlements corresponding to the socially inferior group, seeing a diminishing quality and quantity of public space as well as in the erosion of the natural public spaces in favor of islands of order both physical and natural.

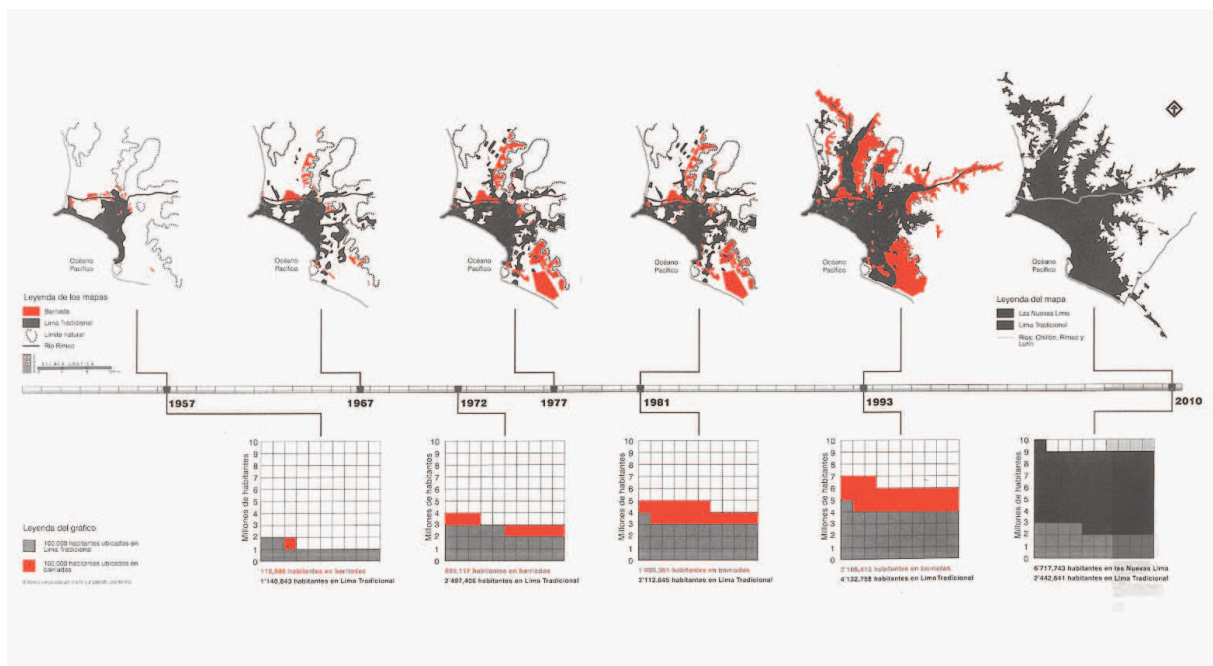
The deterioration of public space which is most evident in informal settlements. These settlements seem to be islands of disorder, the

¹³ *“Mentre tende a farsi oggetto di esibizione, paradossalmente banalizza le proprie connotazioni formali indifferenziandosi nelle varie aree e assumendo l’inerte apparenza del “sempreuguale”, inespessivo e frammentario accidente insediativo, avulso dai precedenti caratteri urbani e insieme privo di connotazioni*

Lima's spatial expansion was structured along two axes, towards the north and the south, which gradually became important parts of the city's structure. Present Metropolitan Lima is usually divided into a central area, which corresponds to the "formal" Lima, and the so called Cones, the peripheral areas which correspond to the informal expansions.

Source: J. Matos Mar, as *Barriadas de Lima* 1957 - 2010

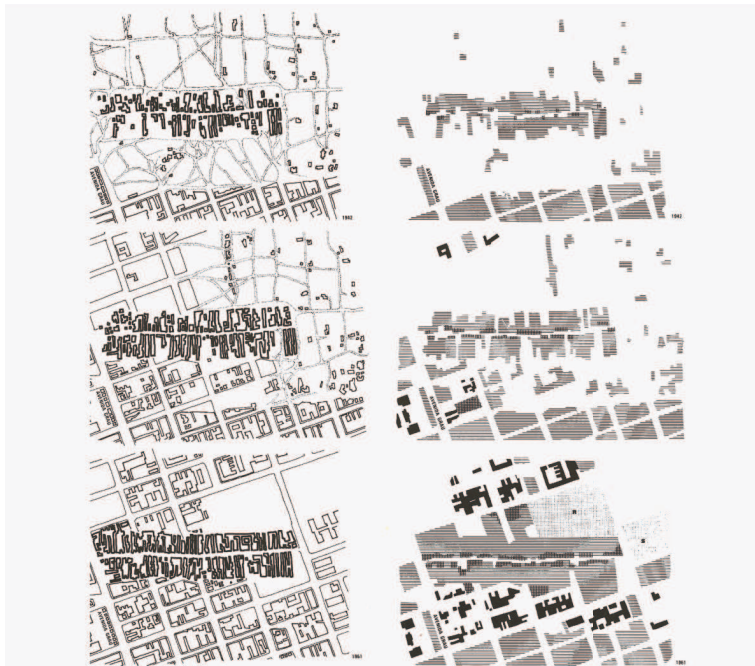
consequence of many factors, amongst which, the islands of order such as *softscapes*, *gated communities* etc., a common plague to Latin America in general, but with many distinct variations within the different countries and cities. In Bogotá the term used to describe these informal settlements is "*invasiones*" derived from the type of illegal appropriation of private or dangerously precarious property. As the plan of Bogotá dated 1950's shows, these informal settlements were placed in fragments around the margins of the city at a relative distance from the consolidated core, following the waves of migrations that, as shown in the chapters before, achieved a particular intensity in the decades of the 40's and 50's. A similar experience in Lima, which in the same decade saw, as mentioned before, an abnormal migration from the poor rural areas of the country, settling in the so called "*Ciudad de Dios*" (God's city) also referred to as "*pueblos jóvenes*" (young towns) or more generally



alternative significanti. Crotti, S., "Per un'architettura delle connessioni urbane", in Crespi, L., *La stazione, il parco e la città*, Aline, Firenze, 1997

¹⁴ Vitruvius, *De Architectura*, R.C.S. Libri, Milano, 2002, Libri I, Cap. II, p. 107

“*barriadas*” (deformation of the term *barrio*: neighborhood) attracted by the development of the capital but non finding a place within the economical dynamics of the city’s growth.¹⁵ In Brazil, the term *favela*, which is also the name of a tree species found in the hills of Rio, comes from the origin of the first informal settlements that date bat to the late 1800’s and were composed of homeless veterans. Today, about 6 percent of the total population of Brazil lives in favelas, that means about 11.4 million people.¹⁶ In Bogotá, the informal city in 1990 arrives to occupy about 20% of the total urbanized area and about 22% of the population lives here. Which means that nearly 1,1 million people are living in 846 informal settlements: the largest of these, where nearly 75% of the population that lives in informal settlements is found in Ciudad Bolivar, Usme, Suba, San Cristobal, Bosa, Ciudad de Kennedy. By the year 2000 the urban area occupied by informal settlements grew by



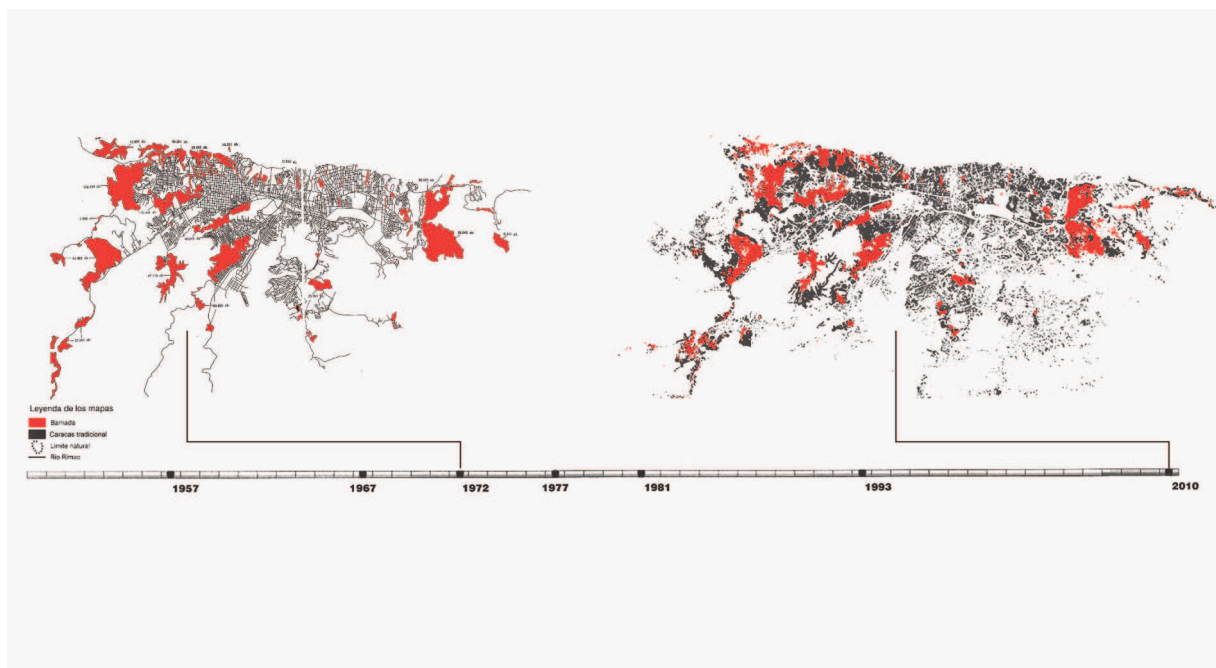
¹⁵ Collins, 1975

¹⁶ Instituto Brasileiro de Geografia e Estatística

about 3% and the population to about 1,4 million and the number of settlements grew to 1365. In 2010 the number of settlements grew again to 1614.¹⁷ These settlements started out in the periphery of the city but gradually with the urbanized area's growth have become integrated within the formalized fabric of the city, process of interference of which the Mendocita settlement in Lima has become paradigmatic.

Even though entropic processes in relation to built space, are not limited to uniformity but also to physical deterioration of the architecture that composes the settlement's fabric. Architecture according to Simmel¹⁸ is inscribed in the eternal battle between creative form and destructive form, represented by nature's gravitational force that pushes down against the vital spirit of man that verges upwards. Even though a vast amount of literature has interpreted ruins with a negative connotation being associated to loss, destruction and dissolution, according to Franco

Caracas's plan and general view. In red the marginal settlements. On the left data from a 1971 survey. On the right data from 2010 survey.
Source: L. Benevolo 1982; Enlace arquitectura 2012



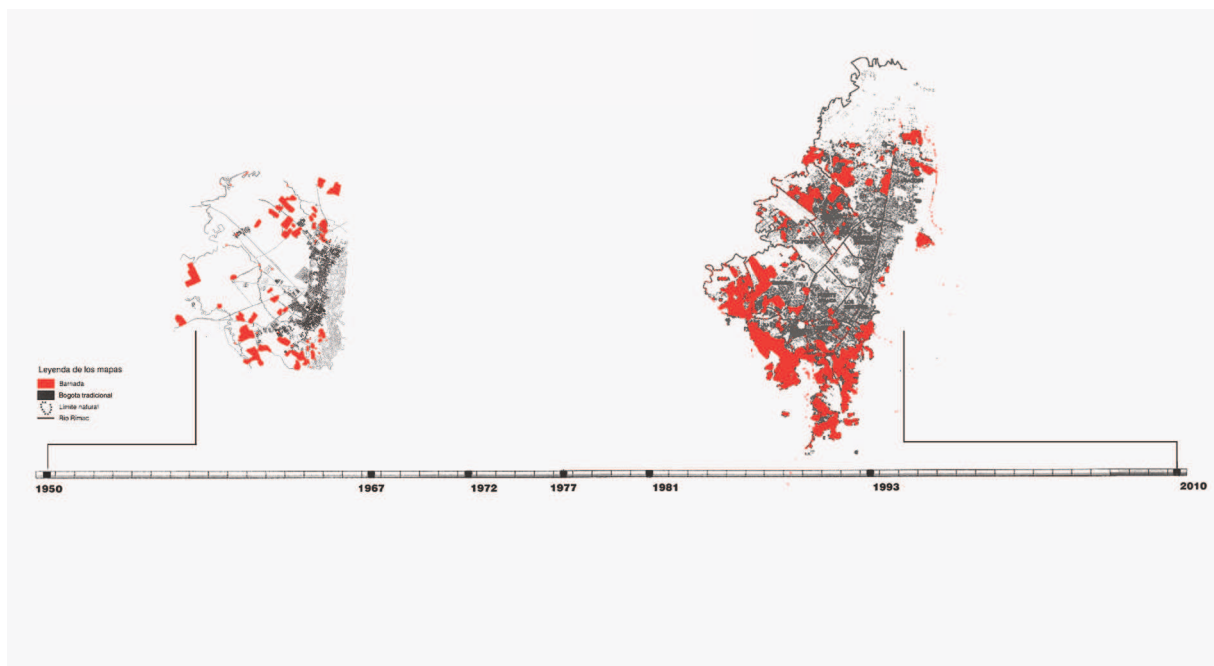
¹⁷ Departamento Administrativo De La Defensoria Del Espacio Publico

¹⁸ Simmel, G., "Cultura Filosofica", 1911, in Bertelli, G., *Frammenti*, Libreria Clup, Milano, 2001, p. 60

Purini¹⁹, the integration of the concept within the transformation process bestows it with the initial place of the physical world's transformation.²⁰ Furthermore, the deterioration of order within settlements may transcend the morphological aspect. Entropic processes are also evident in the deterioration of the sociocultural form when productive form becomes predominant, with consequences on the quality of physical spaces as well.

The deterioration of the urban form appears both in various scales as well as in types of urban fabric. Within Bogotá we can find entropic processes of morphological deformation in the colonial tissue, in the garden city fabric, and so on. The images below should illustrate this phenomenon within Bogotá's urban fabric.

Bogotá's informal settlements. On the left data from a 1950 survey. On the right data from 2006 survey. Source: J. Martínez 1950; Gerencia Operación Nuevo Usme 2006



¹⁹ Purini F., "Costruire la demolizione", in Criconia A., *Figure della demolizione*, Costa e Nolan, Genova-Milano, 1998

²⁰ Bertelli, G., *Frammenti*, Libreria Clup, Milano, 2001, p. 59-63

Fragmented Edges and Margins

The concept of stability being intrinsically related to transformation, which has been examined in the first chapter, is directly related to deformation, or to entropic processes, as they prepare the form for the imminent transformation. The form, as Crotti²¹ sustains, becomes relatively stable within intervals of time, and it is the “edge” that reveals the recognizable configuration becoming the background in the indivisible relation of figure and background. The margin has a double nature of both including and excluding contemporarily; it becomes a temporal threshold between determinant and determinate, between deformation and transformation, between what has happened and what is still to happen.²² But it is design that reveals the edge, only through composition may its bi-univocal character be perceived and only through the design of the margin may the two sides be perceived as different. Still in the contemporary metropolis, built from a new version of the margin, a sort of second generation of marginal space, as a fragmented and diffusive collection of residual spaces or as an entropic dispersion of potential thresholds, a system or structure of margins becomes possible. It is no longer the circular barrier between built and void, or urban and rural, there has been a mutation that is emerging where an interconnected structure. To some extent, if the contemporary settlement was anticipated by the modern models, it was “Hilberseimer who came the closest to approximating the form of the postwar environment with his discreetly formed settlement units.”²³ A series of fragments that in contrast generated an interconnected residual space similar to the one we find in the extended and fractured periphery of the metropolitan settlement.

“In disorderly ways, the apparent homogeneity of this immense urbanized space is interrupted by “clots”, points of denser concentration, consisting of a chaotic collection of incoherent urban elements and types of development. Volumes and areas with different dimensions, forms,



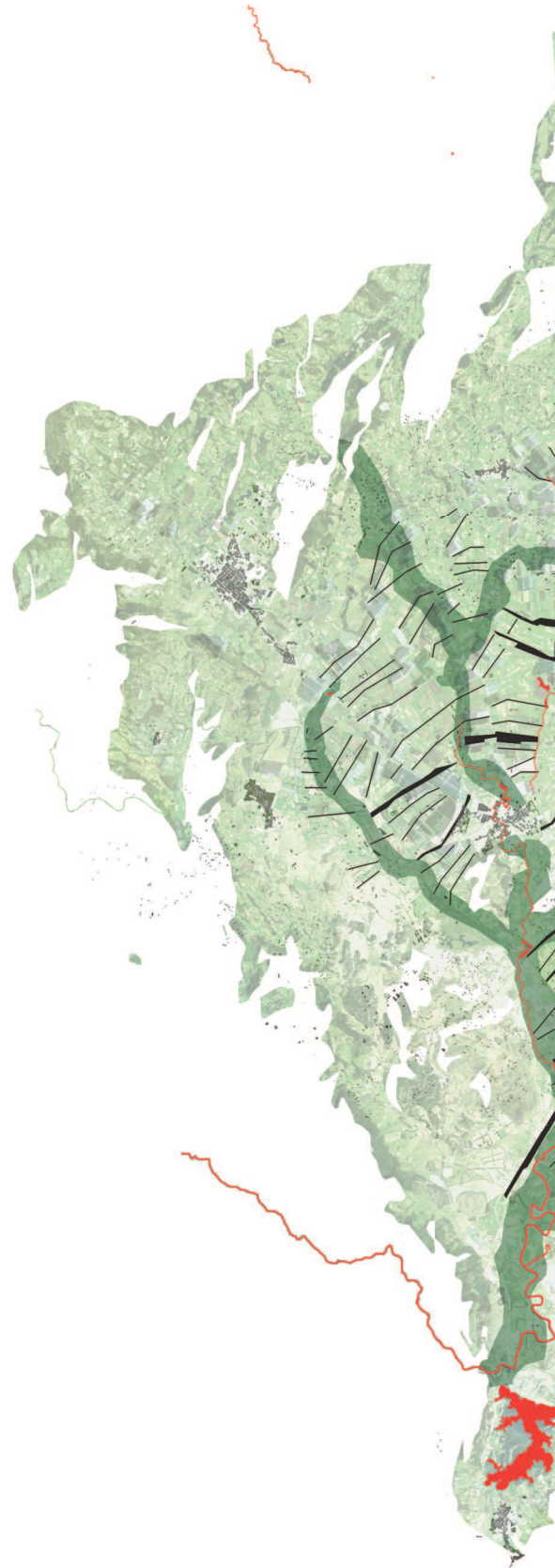
ALO built section of the District
Border near Engativá
Source: MinTransporte 2012

²¹ Crotti, S., Op. Cit.

²² “Perciò si potrebbe dire che la trasformazione è, paradossalmente, la condizione della durata: intervallo relativamente stabile entro cui si definiscono configurazioni riconoscibili che identificano le forme, come figure sullo sfondo, identificate dal margine che contemporaneamente include ed esclude, essendo l’ambigua barriera della soglia che distingue quanto è avvenuto da ciò che dovrà avvenire.” Crotti, S., “Verso un’archeologia del futuro urbano”, in *Urbanistica*, n. August 1987, p. 32

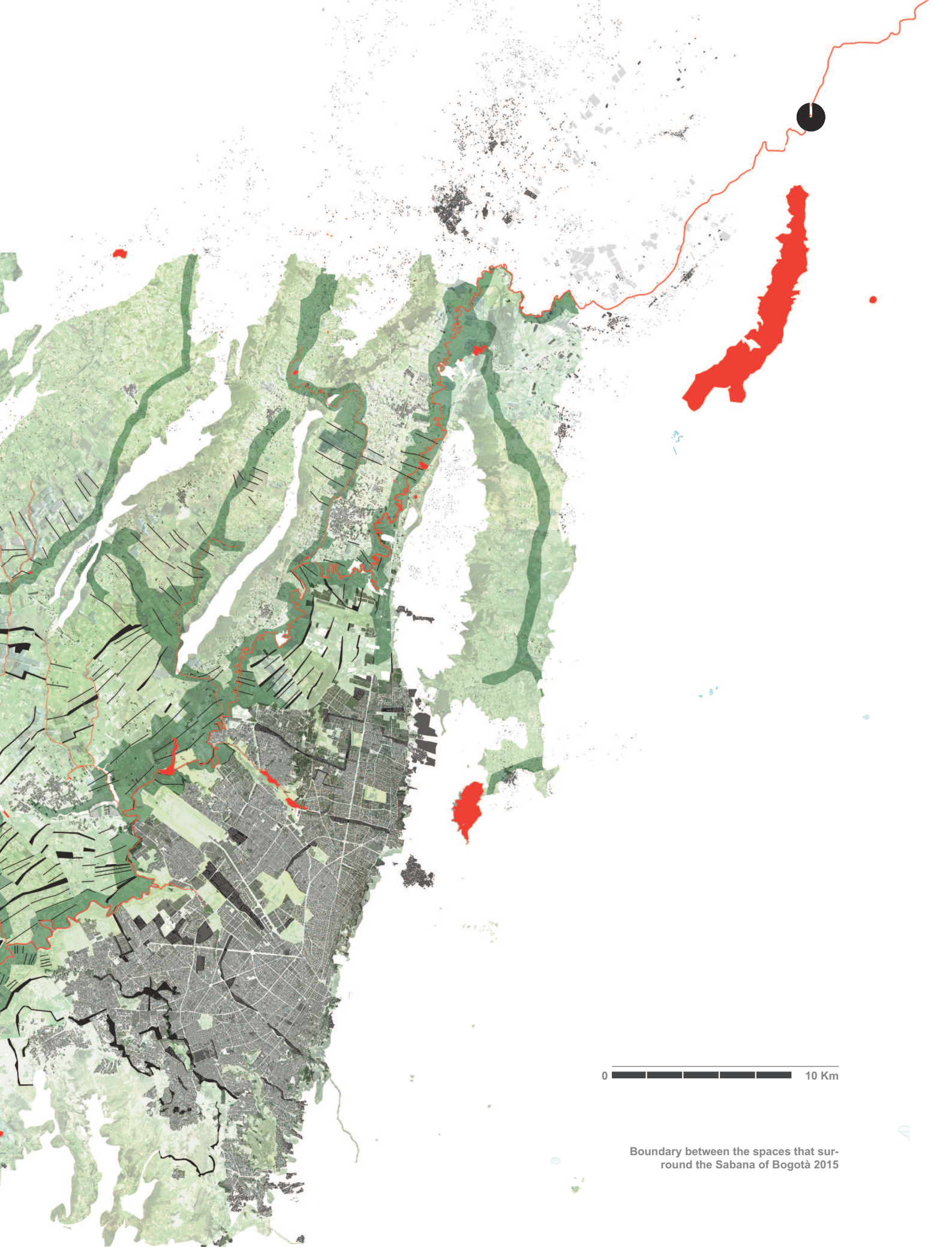
²³ Pope, A., Op. Cit., p. 75

appearance and material consistence witness to practically associated human and design experiences such as the condominium, the factory, tract housing, parking, the school, the petrol station, the church, another factory, the farm house, the supermarket, office building, more parking, a zone of debris, the playing field, the workshop, the large industrial plant, the garage for city buses, the gas-meter, the urban park, the sport facility and the dump. In a wide variety of literary forms, list of this sort have become the canonical form of the description of a “world of objects” which, until short time ago, were identified with the term “periphery”, or “suburb”.²⁴ As Pope notes Suburb is no longer an adequate description of the contours of the extended metropolis “[...] yet as suburban growth continues, it is apparent that the urban / suburban dynamic is failing.” The condition of the metropolitan settlement’s extension is “[...] not a sub-development but rather an alter-development”²⁵ for which, this thesis intends to propose a strategy after the exploration of “alter-composition” strategies.



²⁴ Secchi, B., “The Periphery”, in *Casabella*, n. 583, October 1991

²⁵ Pope, A., *Op. Cit.*, p. 3



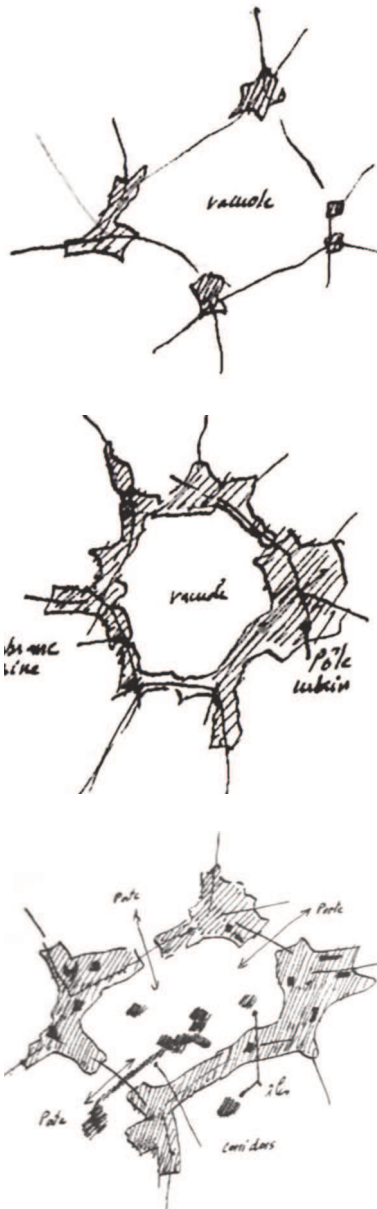
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Boundary between the spaces that surround the Sabana of Bogotá 2015

Syntropic Settlements vs Entropic Landscapes



Source: Google Earth 2015



Entropic processes in Landscapes

As we saw before, the concept of entropy is used in many application fields from information theory to compression technology, medicine, economics, sociology, and mathematics. In ecology entropy the abundance of species in a given landscape is measured by entropy. Landscape fragmentation generates to reduced continuity, increased isolation, and habitat loss, often caused by anthropogenic activities, and has a large impact on biodiversity. Heterogeneity (pattern) and entropy could be considered as equivalent terms, fragmentation can be considered as the deviation from a contiguous space and its assessment is related to patch size diversity measurement.²⁶

Gilles Clement in the Third Landscape²⁷, while referring to *character*, sustains that *Reservoirs*, and *Primary sets* (the spaces that have never been subjected to exploitation and have a unitary aspect), generally strongly differentiated from the point of view of biodiversity, are stable landscapes. While *residual spaces* derive from dismantlement of activities, and even though they are usually populated by pioneer vegetation, they may naturally evolve into *secondary landscape*. Still this means that the number of species, in order to be in equilibrium with human activities, is reduced. The growing quantity of residual spaces is, according to Clement, connected to the organization of the territory. With the expansion of the third landscape the area does not always grow, instead fragmentation tends to increment, and if the relation between fragmentation of landscape and degradation of the interacting ecosystems is true, then a strategy of interconnection of fragments is both necessary and might be useful to find a new dimension for a public space structure.

Source: G. Clement, *The Third Landscape*, 2005

²⁶ Vogt, P., "Quantifying landscape fragmentation", *Anais XVII Simpósio Brasileiro de Sensoriamento Remoto - SBSR*, João Pessoa-PB, Brasil, April from 25th to 29th 2015, INPE, 2015

²⁷ Clement, G., *Manifesto del terzo Paesaggio*, Quodlibet, Macerata, 2005



Barcelona Airport, R. Bofill

Source: R. Bofill.

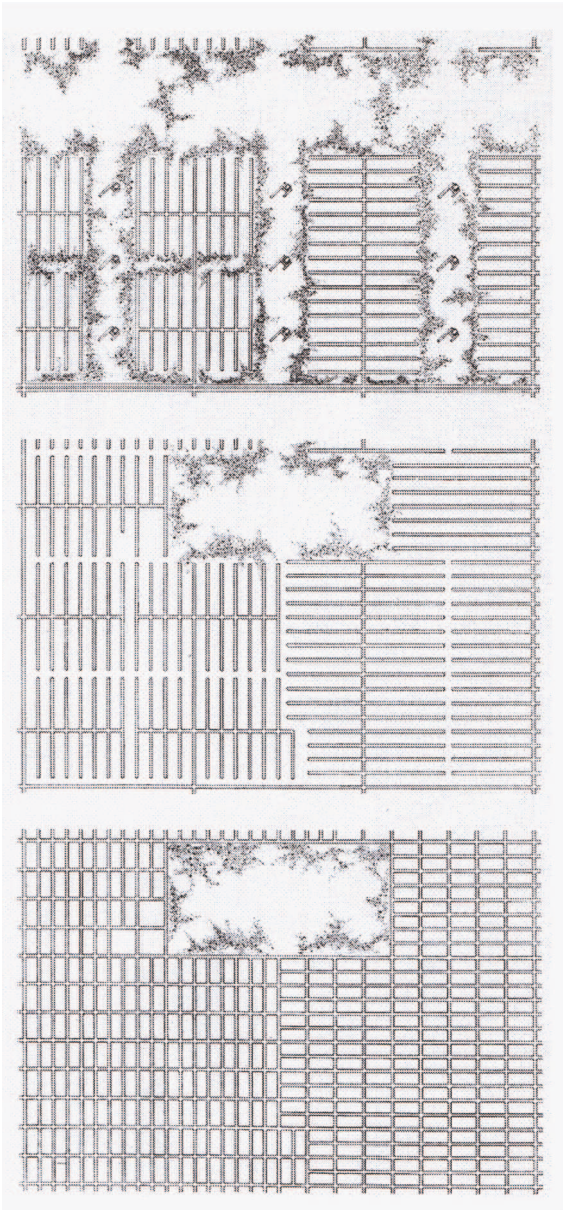
Global Intention / Local Contradictions

The necessity of large-scale connections through infrastructure has led to a paradoxical effect where in order to satisfy the velocity of mobility globally, a fracture or separation emerges locally. This physical consequence reflects a conceptual fracture as well. The loss of relations produces a loss of inhabitable space, a concept that may be described by the parable of the street, slowly losing its relational capabilities locally, privileging distant connections, reducing its significance strata, becoming an abstract connection of two places but not being a place in itself. Or as Manuel Castells, in *The Rise Of the Network Society*, in relation to the consequences on architecture of an increasingly globalized world speaks of the *space of flows*²⁸ where identity seems to be reduced to its minimum, as *architecture of nudity*, “that is architecture whose forms are so neutral, so pure, so diaphanous, that they do not pretend to say anything. And by not saying anything they confront the experience with the solitude of the space of flows. Its message is silence.”²⁹ Demonstrating how order at a global scale reverses at the most local scale in a space where no singularities emerge, where homogenization reveals an intrinsic disorder with infinite possibilities since where there is nothing, everything is possible.

As the following examples attempt to illustrate, when the intention to apply a new order at an urban or regional scale, especially with respect to infrastructure, the intention is to connect, to promote fast circulation and to embrace geographically and generate new relations with distant spaces. The result, at a local scale, is that of discontinuity, separation. The elements that at one scale generate an order seem to pay a price by reverting disorder at another scale.

²⁸ Castells, M., *The Rise of Network Society*, Blackwell, Oxford, 1996, p. 450

²⁹ Ibid.



Marquette Park

Source: L. Hilersheimer, The New City: Principles of Planning. 1945



Modern Strategy: Limits and Potential of the Plan Piloto

The connective strategy proposed during the modernist movement that attempted to respond to the automotive demand, probably due to its partial or incomplete application³⁰, developed further fractures in the development of the city. Fractures that become multiple orders that scarcely correspond with each other, generating a new layer of disorder. The “closed city”³¹ that emerges from modernist proposals, seems to contradict their original agenda of liberating the architectural object from its traditionally complementary relational element, the street, as Rowe’s illustration demonstrates using the built space plan of Parma and Sant’Dié³² and of achieving radical spatial continuity. Such modernist innovations were successful at an architectural scale, as Le Corbusier’s *pilotis*, Gropius’ Bauhaus building or Mies Van der Rohe’s Brick House and Farnsworth house demonstrate, but from an urban point of view, as Albert Pope asserts, “the openness of architecture form does not guarantee an openness of urban form.”³³

The tree-like hierarchical configuration, such as Hilberseimer’s settlement units, as noted by Alexander in 1969 while criticizing the so called “artificial cities”, like Brasilia and Chandigarh, which according to Alexander, lacked a level of complexity that seems essential to achieve *urbanity*, and in essence, the modern urban strategy appears to produce grid fragments.³⁴

The Modern models advanced by Howard, Unwin, Hilberseimer etc., while aiming at a new dialectic between urban form and residual space, “seeking to invert their conventional relation and deliver, in the end, an unprecedented city of space [...] the radical non-centralized urban fields of points, spines, and grids were imagined not as the infrastructure of closed systems, but as the support of a new dialectic between urban form and space. As it turns out, these architects failed, yet they failed only to the extent that the transformations they imagined have yet to be implemented.”³⁵

Above: Brick House,
M. Van der Rohe, 1923-24
Middle and Below: Brasilia and
Chandigarh
Source: C. Alexander 1965

³⁰ Martí Arís, C., *La cèntina e l'arco: pensiero, teoria, progetto in architettura*, a cura di Orsina Pierini, S., Marinotti, Milano, 2007

³¹ as described by Albert Pope in Pope, A., *Ladders*, Rice School of Architecture New York, Princeton Architectural Press, Houston (Texas), 1996

³² Rowe, C., Koetter, F., *Collage City*, MIT press, Cambridge, 1971

³³ Pope, A., Op.Cit., p. 91

³⁴ Alexander, C., *A city is not a tree*, in “The Architectural Forum”, April - May 1965

³⁵ Pope, A., Op.Cit., p. 217



Plan Piloto for Bogota
Source: Fondation Le Corbusier

The different flow type separation may have, to some extent, produced new solutions that would favor a coherence between the traditional relational space and a new type of relational space altogether. As in Le Corbusier's (along with Wiener and Sert) Plan Piloto for Bogotá, and later in Chandigarh, the 7 v, *spaces for the wellness of body and mind*, interprets existing natural traces generating a space that permits a dialogue between local and global relations and between nature and artifice. In the second conference Le Corbusier gave in Bogotá he describes the aim of the relation between nature and artifice as an open dialogue with no submissiveness by either side.³⁶ In fact in his final layout, both at a regional scale, as well as at a local scale, the hydrological traces become a reciprocal network of open natural space. In the final draft of the project, a multi scalar operation of natural open spaces emerges. From the regional scale ecological system of the Bogotá river with its major affluent rivers such as Rio Frio and, the same ones that the Muisca used to construct their *interrelational network* throughout the Sabana, to the local scale where the streams and brooks that descend from the mountain and which have intensely influenced the first colonial settlement of Santa Fe.



While designing the urban core of the Plan Piloto where the civic center would emerge, Le Corbusier's uses a polycentric linear composition that evidences the intersections or nodes between the east-west hydrological system composed by the San Francisco River³⁷ in the historic San Miguel Bridge and the north-south local relational space of both the historic city's layout and the new project's configuration.

Such spaces as mentioned in the chapters before correspond with the *interrelational space* and, as we have demonstrated, hold the intrinsic stability of the epigenetic strata that generated from the colonial city's thresholds and of which Le Corbusier naturally recognized their value.

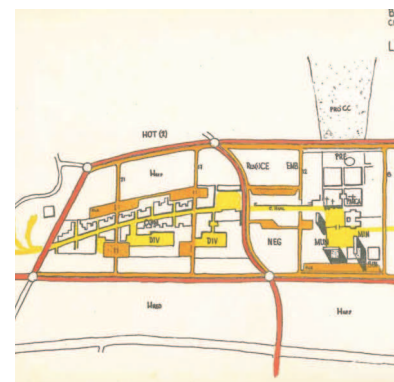
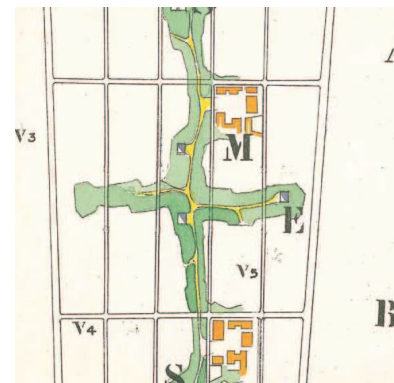
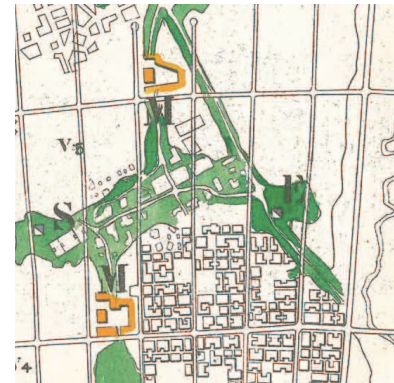
The contrast between nature and artifice, between connection and separation, between built and void is the most interesting aspect that emerges from this model, as well as the attention for a new relation between urban form and residual space, which will be of great utility when elaborating a strategy for the metropolitan settlement in the chapters that follow.

Above: 7 v sketch and Plan for Chandigarh
Source: Fondation Le Corbusier

³⁶ Marti Aris, C., in AAVV, *LC Bog. Le Corbusier en Bogota: 1947-1951*, Uniandes, Bogota, 2010

³⁷ where today we find the Jimenez Av. redesigned by Rogelio Salmons (a disciple of Le Corbusier) and Luis Kopec in 1999, rediscovering the trace of the San Francisco River, which had been buried in an underground canal during the 1930's

The Plan Piloto for Bogota has begins in 1946 while Le Corbusier is in New York, as a French delegate for the construction of the United Nations' Headquarters. The president of the commission, Eduardo Zuleta Angel, a Colombian born in Spain, kept in contact with Le Corbusier and organized a couple of seminars in Colombia on city planning. Eventually the municipality asked Le Corbusier for a new plan for Bogota, which had a population of about more than half a million but was expected to grow, as it effectively did, to more than a million inhabitants. Le Corbusier, along with Jose Luis Sert, the president of CIAM and his associate, Paul Lester Wiener, signed a contract with the Colombian authority in 1949 and soon after the group met in Cap Martin after the Bergamo CIAM. In June 1950 the plan was finished and delivered to the Colombian authorities in 1951. But due to political interests and change in administration, the Plan was never implemented. Still this plan had a series of innovations that were later implemented in Chandigarh, such as the sector system and the 7 v as mentioned before. The plan, on the civic center, would build a 22 *unité d'habitation* with the helio-metric disposition, a completely new configuration of the Plaza Mayor (plaza Bolivar) where the topographic inclination produced an open space on two levels and with a high rising building as landmark, while conserving some of the traditional urban fabric and the preexisting traces, both natural and artificial. The plan also reinforced the linear character that was emerging in the city's form with the expansions to the North, and would later be consolidated with the elimination of the Ferrovia del Norte railway in favor of the Autopista Norte highway.

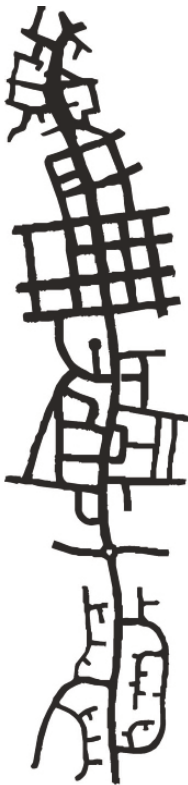


Infrastructure from Relation to Connection³⁸

Infrastructure seems to produce a particularly local type of entropic processes as well as being afflicted by entropic processes itself. From one side the fracture infrastructure creates locally generates an uninhabitable residual space along its banks where pre-existing systems of local relations and diversities are severed. From the other side

³⁸ "E' la vendetta della strada sulla città", in Crotti, S., "Strade, frontiere interne della trasformazione urbana", in *Urbanistica* n. 83, 1986

Plan Piloto for Bogota
Source: Fondation Le Corbusier



Evolution of street patterns
Source: S. Marshal 2005

infrastructure itself has suffered from an entropic process of de-signification, losing its relational capabilities and diminishing its meaning as a place in itself, reduced strictly to its connective use.

The necessity of large-scale connections through infrastructure has led to a paradoxical effect where, in order to satisfy the velocity of mobility globally, a fracture or separation emerges locally. This physical consequence reflects a conceptual fracture as well.

The loss of relations produces a loss of inhabitable space, a concept that may be described by the parable of the street³⁹, slowly losing its relational capabilities locally, privileging distant connections, reducing its significance strata, becoming an abstract connection of two places but not being a place in itself.

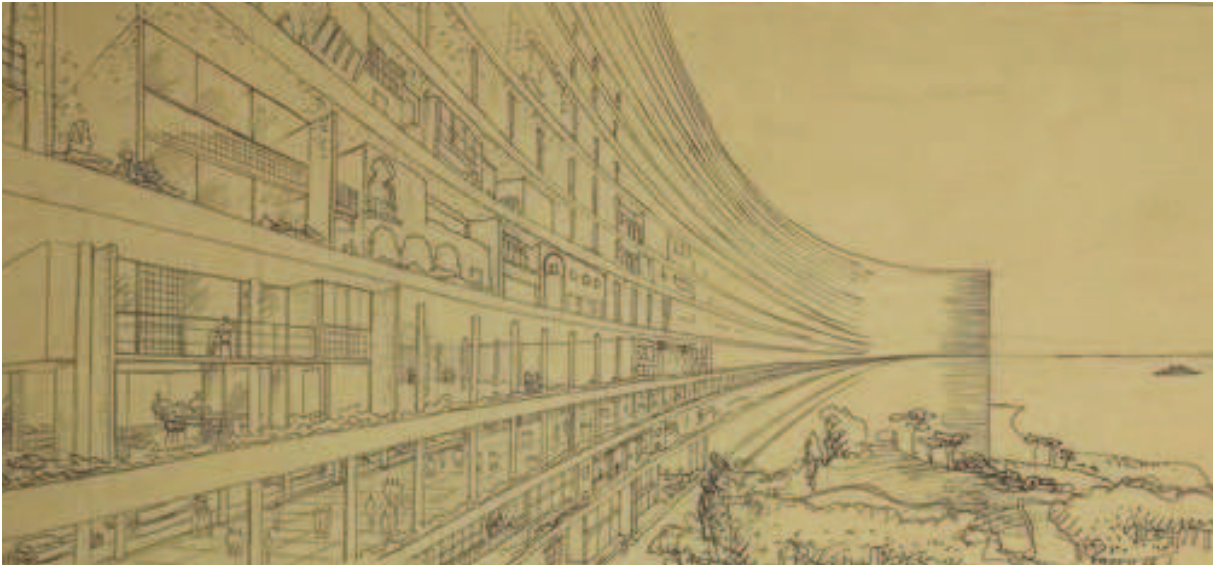
The conflict between the characteristics of distance and proximity with which we see in the figure of exchange are mainly manifested today in infrastructure. With the rise of the ideology of the twentieth century of vehicular traffic and more recent inversion into mass transport, the historical events of the relationship between street-building-city are transformed from relational space to merely an element of connection, a condition that B. Secchi frames within a concept of reduction as is a shared simplistic hydraulic analogy of traffic flow.

An image of the street as technical element that merely conveys, evacuates, assists circulation and avoids traffic jams.⁴⁰ But it is exactly that connective aspect of the street, articulated in networks, that acquires in both urban and social studies such as Gottman's Megalopolis an evermore functional and central role, conceiving the city as a complex interaction of networks, both internal as well as external. While internal networks seem more familiar, the external or global networks become evermore influential.⁴¹

³⁹ Ibid.

⁴⁰ "Ciò che domina la rappresentazione è un'immagine idraulica banale, solitamente utilizzata nelle due flessioni organica ed alluvionale per ridurre ed esaltare il ruolo della strada, ridurlo ad un unico scopo ed esaltarne l'importanza: si tratta di incanalare flussi; smaltire, evacuare, far circolare; evitare la formazione di ingorghi, allargare, dare nuovi sbocchi, impedire che il flusso rompa gli argini, straripi e sommerga la città", Secchi, B., "Lo spessore della strada", in AAVV, "Sulla strada", Casabella, n. 553/54, 1989

⁴¹ "Una città è innanzi tutto un complesso di reti. [...] Ai giorni nostri le reti sono più numerose, più complesse e più necessarie che mai e il loro ruolo acquista un rilievo sempre maggiore. Alla città fanno capo reti interne e reti esterne. Le reti interne sono più note e tangibili, ma le reti esterne aumentano continuamente d'importanza", Gottmann, J., *La città prossima ventura*, Laterza, 1991



Plan for Algerie and Plan for Rio de Janeiro
Source: Fondation Le Corbusier



Autopista Norte Highway in 1949
Source: *Bogota Vuelo al Pasado*,
I.G.A.C. 2010

It is Sergio Crotti who portrays the whole process in astonishing detail from its archaic origins; from the *traccia*, which is the principle that permits the deciphering of places, the Arianna's thread within the urban labyrinth, the founding element, deep inscription capable of restoring the meaning and identity of the distinct parts, to the *tracciato*, as the stabilization of the trace or clue in its origin and now defining itself as *tracciamento*, as the prefiguration of a rule that expresses the principle.⁴² The deformation of the organizing principle of the street completes the reversal of relational spaces arriving to the disarticulation of the built environment. Crotti uses the "*galleries*" and "*passages*" to evidence the domination of the productive form through the commercial logic,⁴³ generating an asymmetry between physical forms, socio cultural forms and productive forms, which in turn is transcribed as contradictions between scales and forms.

Using what Crotti refers to as the *Le Corbusier Paradox*, the cycle of formation deformation and transformation of the street, from relational space reduced to its oversimplified aspect of connection and to its rebirth as a new type of relational object is described with the Modernist master's parable in relation to the street.

Beginning with the complete refusal of the *rue corridor*, to the reemergence of the street at the various scales. It can be read between the lines in the villas through the *promenades architecturales* and in the *rue intriour* of the *unite d'abitation*. Later becoming unequivocal in the projects for Latin America's "grounscrapers" in Sao Paulo, Rio de Janeiro, Montevideo and also in the project for Algeria. In these projects the local contradiction of global infrastructure is, to a certain extent, attenuated by the stratification of uses that pass from a macro-scale connection to a local-scale dwelling in the same structure.

The paradox is concluded with the description of the relation between built-space / relational space using Le Corbusier's project for the Venice Hospital, that is contemporarily building - street - piazza - fabric.

⁴² Bertelli, G., *Frammenti*, Libreria Clup, Milano, 2001, p. 63

⁴³ "il deformarsi del principio ordinatore della strada compie il rovesciamento del sistema degli spazi di relazione: moltiplicati, sospinti ad attraversare il corpo fisico della città, a penetrare e disarticolare il costruito. E' il caso delle galleries, dei passages, degli interieurs, "invenzioni del lusso industriale" -come ricorda Benjamin- della città borghese matura che estende la rete degli spazi commerciali perforando isolati, mettendo in comunicazione parti prima divise per rendere efficienti e diffusi i luoghi dello scambio, della circolazione e quindi del ciclo riproduttivo." Crotti, S., Op.Cit.

As in analogous moments in history throughout the world, dictatorship governments attempt vast indiscriminate renovations of infrastructure, often nearsighted, imposing a new order from above. Many of these intentions tend to be of a macro-scale of the city and as is hypothesized in this chapter, such global actions tend to produce a series of local contradictions. The Milanese experience is pertinent as the country fell into the dictatorship in the mid 1920's and short after, the characteristic canal system that dated back to the Roman conquest of the city began to be concealed to give way to the automobile.

In the case of Bogotá in 1956, the *Paseo de Los Libertadores* highway came to divide the environmental and cultural history of the Bogotá's North border. In that year, under the government of General Gustavo Rojas Pinilla and as an example of development in the country, opened the *Autopista Norte* for the expansion of the city. Eliminating the *Ferrovía del Norte* railroad in favor of private transportation and augmenting a physical social division between north and south. In the fifties, after the Second World War, imports in Colombia shifted mainly to North America and along with this shift the automobile became a symbol of modernization. In fact the number of vehicles in Bogotá went from a stable 8 thousand units during the 40's decade to an exponential growth in the 1950's: from about 15 thousand in 1948 to 18 thousand in 1950 to nearly 30 thousand by the end of the decade.⁴⁴

Autopista Norte in 1960

Source: tallerdefotografiacamiladiaz.wordpress.com

Portal del Norte

Source: AIAC 2014

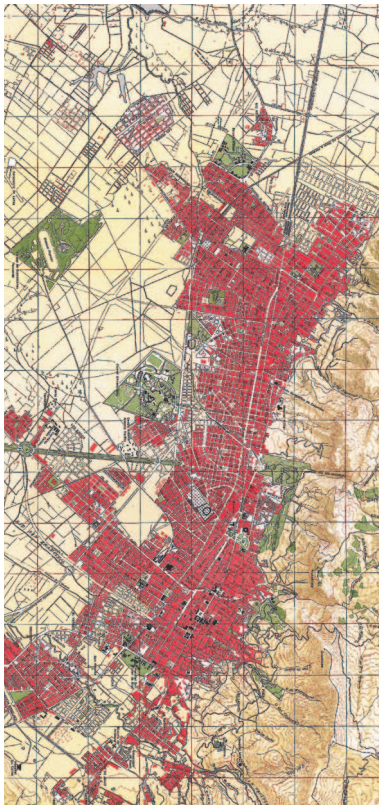


⁴⁴ *Anuario municipal de Estadística, 1940 - 1953*

Until then, the north of the Sabana was a continuous ecological wetland region extending from the eastern hills to the Bogotá River forming the Torca Guaymaral Basin, inhabited a rich biodiversity. For the capital this was a recreational area, where locals went fishing or swimming, natural spaces for family outings and social exchange. Likewise, the wetland was used for the retention of nutrients and sediments, control of floods or rising groundwater, habitat for wildlife and support for local food chains. Euphoria of development and “modernization” was imperative and the need to feel updated with more developed nations led to an indiscriminate construction of infrastructure through mediocre planning with results like the Autopista Norte, where the balance between public and private space paid the toll.

Thus, the Northern Territory was changing gradually the natural dynamics. It was populated at a rapid pace, and what was once a unique body of water, was divided into the wetland Torca (Usaquén), which contains the Aguas Calientes broken Patino and San Juan, and Guaymaral (Suba), which includes the system of fences of the town, which allows water to drain flatter areas. The railroad system never recovered from this renovating dynamism and was reduced to a cheap tourist attraction with all the consequences in both the environmental problematic as well as the transportation catastrophe that the city finds itself today. Not to speak of the consequences on the social segregation and land occupation asymmetries that private transport brought along. Witnessing a greater awareness on the part of many cities of the redefinition of infrastructure and its relation with public space, the possibility for the infrastructural elements to reconcile the contradiction between the large-scale connection and the disconnection on a local scale emerges. Contemporary interest in sophisticated connections to the local level where nodal entities are conceived as an transformation aimed at the regeneration of public space, have seen a series of important interventions such as Barcelona Ronda de Dalt, Trinidad, Placa de les Glories Catalanes, Placa Cerda, Ronda del Mig.

The renewed effort of redefinition of infrastructure saw an eco in Latin America, generating unprecedented solutions and rediscovering



Plan of Bogota in 1954
Source: *Atlas Historico de Bogota*,
Planeta 2007



Metrocable Medellín
Source: P.U.I. 2010

alternate types of infrastructures with the potential to regenerate public space within urban tissue, especially in the most disconnected and marginal areas of the cities. Projects like Metrocable Medellín 2004, Metrocable Caracas 2010, Mi Teleférico La Paz 2014, Teleférico do Alemão Rio de Janeiro 2011 exposing the potential of a local solution to the general contradictory situation generated between global and local connections. The gondola lift system not only produces a connected surveilled public open space but it contemporarily generates infrastructural nodes in a space with no recognizable singularities or landmarks. It has been used as a tool that opens the barriers of the islands of degradation incentivizing the possibility of physical and social exchange.

As opposed to light mass transportation systems like TransMilenio in Bogotá (2000), Metrobus in Mexico City (2005), Metrovia in Guayaquil (2006), Transmetro Guatemala (2007), Expresso Tiradentes in Sao Paulo (2007), Masivo Integrado de Occidente Cali (2008), Sistema Metropolitano de Transporte in Lima (2010), which create barriers at local scales by augmenting the gage of streets. Furthermore, these systems individually are insufficient at resolving the enormous congestion and the obsolescence of the existing transportation systems seen in Latin American cities and should be integrated with other systems in order to offer a serious alternative to private individual transportation. The opportunities of reutilization of dismantled infrastructure, as in the case of Bogotá, the railway system, which has the potential to organize an irrigation of the main settlements in the Sabana through the renovation of the infrastructure, the reuse of the existing historic stations and the addition of new stations in order to achieve a more efficient integration of transport systems based on local characteristic pre-existences that offer the potential of a rediscovered regional unity.



Av Calle 17 Ponte
Source: Google Earth
Riciardo Gómez Campuzano, Sabana de Bogotá, 1959
Source: Museo Ricardo Gomez Campuzano Bogota

Local Intentions / Global Contradictions

As for the incongruence between global organizational intentions, which produce in many cases a series of local contradictions, it is also true that local organizational intentions have produced a reciprocal series of global contradictions, which have generated a disorganized metropolitan entity, not only from a physical point of view but also in social terms.

Disorganization of Void

Entropic landscapes compose what were once agricultural land, natural reservoirs, and characteristic landscape singularities, and through an excessive degree of organization by the syntropic settlement, seem to receive a reciprocal degree of disorganization. In the most extreme cases have become, mines, pits quarries, toxic dumps, landfills, and mass deforestation, the uncontrolled contradiction between the natural and the artificial.⁴⁵ In subtler but equally devastating terms, the metropolization process in Latin America, through the dynamics of globalization and the acceleration of uncontrolled economic growth, along with the constant search for competitiveness, has driven to a massive destruction of the natural space. Both in remote rural areas as well as in the periphery of the metropolitan settlements, an irreversible deterioration of the environment threatens to degenerate in an ecological disaster.⁴⁶ Passaic seems full of holes compared to New York City, which seems tightly packed and solid, and those holes in a sense are monumental vacancies that define, without trying, the memory traces of an abandoned set of features.⁴⁷

⁴⁵ Pope, A., *Ladders*, Rice School of Architecture New York, Princeton Architectural Press, Houston (Texas), 1996

⁴⁶ Castells, M., "Globalización, Identidad Y Estado En América Latina", Conference held in: Palacio de la Moneda, Santiago de Chile, June 1999. Published in *Temas de Desarrollo Sustentable*, PNUD/Ministerio Secretaria General de la Presidencia de Chile

⁴⁷ Smithson, R., *Monuments of Passaic*, p. 55



Chía Cundinamarca
Source: Google Earth
Ricardo Gómez Campuzano, Sabana de Bogotá, 1959
Source: Museo Ricardo Gomez Campuzano Bogota

“The last monument was a sandbox or a model desert. Under the dead light of the Passaic afternoon the desert became a map of infinite disintegration and forgetfulness. This monument of minute particle blaze under a bleakly glowing sun, and suggested the sullen dissolution of entire continents, the drying up of oceans – no longer were there green forests and high mountains – all that existed were millions of grains of sand, a vast deposit of bones and stones pulverized into dust.”⁴⁸

In the Sabana de Bogotá, the development of two mayor entropic processes is visible, from one side, the specialization of large portions of agricultural landscape into vast greenhouses for the production of floriculture destined for exportation to the global market, which employs a small quantity of people but both consumes and destroys large portions of land without generating any local relations. And on the other side, the fragmentation of ecosystems through parceling processes that is aimed at the construction of suburban housing for the mid- high social classes has generated an occupation of the territory with a number of gated communities that ignore the specific character of the natural diversity that once permeated the entire region and was so strong that it was capable of spawning an artistic movement, the “*Escuela de la Sabana*”. In both cases the result has been an un-differentiation of a diversified and articulated landscape that is now threatened but still holds the potential to organize ecological corridors of relational space and a possible strategy for a sustainable regional occupation.

⁴⁸ Smithson, R., *Monuments of Passaic*, p. 56

Atopic typologies

“The hyper-markets, the auto ports, the enormous service stations that line our highways, airports and their parking areas, the nodes of exchange between types of transport, the manufacturing/retail settlements along the roads that lead out of the cities are but a few of these placeless typologies. To these should be added the residual spaces, container deposits, used car lots and junkyards, but also abandoned sport fields or parks. As opposed to the large markets of antiquity, there is nothing in the way these placeless typologies present themselves which gives us the feeling of spontaneous, temporary aggregation which characterized the space “extra muros”: rather, they are regulated by rigid laws of internal distribution and equally rigid laws of investment and profit. These laws are in no way connected to the places, they need no roots, neither in terms of form, nor in terms of resources, because the very resource of the market is based on difference, on its ability to give user a momentary illusion of having left the everyday world and entered another world. [...] The greatest defect of these placeless typologies is their incapacity to regulate open spaces, to use such spaces as a principle form of mediation between surroundings and of attachment to the ground, the land surface which is inevitably their support structure, and of

confrontation with its geographic and technical nature. The placeless typologies express themselves with a great poverty of architectonic detail, often because they pour into their interiors, in a kind of scenographical reconstruction of the world of the market, all of their efforts at layout and spatial division, and offer an exterior, a rapport with urban or territorial space, which is "inside-out", serving only as advertising space. Moreover, the communications functions are often so badly misunderstood, and so poorly connected to the context and to the construction, that there is a constant uncertainty about their structural incorporation in architecture, and their placement in the area of passing, secondary accidental elements. The visual pollution this situation creates is, I believe, measure on the one hand of the distance that has opened in the last half century between architecture and the visual, and on the other hand of the incongruity of the context presented by the placeless typologies, for the moment."

Vittorio Gregotti

Syntropic Settlements vs Entropic Landscapes



Security gates in residential districts, Bogotá

Source: Google Maps 2015

The Rise of Walls: Gated Communities / Gated Slums

Apparently closed systems, settlements or areas within them engaged in *syntropic processes*, are increasing their internal organization at the expense of the disorder transferred in their surrounding context. Such increase in organization may be represented in the form of “softscapes”: “so much of contemporary urban construction is merchandized as a class of natural retreat – the corporate [or university] ‘campus’, ‘park’, ‘meadow’, ‘glen’, ‘forest’, ‘field’ or ‘green’ – where the grass is always green and cut, the parking lots are always swept, the trees are always pruned, the water always clean if not dyed blue, and there are never any dead plants, patches of weed or mud [...] this precisely organized construction of the natural must be matched to the promiscuity of the entropic residuum.”⁴⁹

Infrastructure, through a deformation of its original objective can achieve perverse results by intentionally excluding, bypassing, enclosing or segregating entire settlements or portions population. Bypass roads may not only generate a more continuous flow of transportation but paradoxically it may mark the decline of a town or a neighborhood altogether.

Cities, originally, have been perceived as a place where to find safety and security, but more recently such a perception has been inverted, defining cities as unsafe. Much of this (mostly unfounded) sensation of insecurity may be traced back to the loss of identification between the individual and a series of values related to specific settlements. Vittorio Gregotti defines this new relation between individuals and specific settlement as *city-users*⁵⁰ a deformation of the concept of *citizens* that has generated a series of fractures and divisions within a society that is increasingly composed of what Bauman calls “strangers” (Bauman 2005). These fractures have a reverberation within built space, producing elements that divide peoples and spaces; voluntary and involuntary ghettos.

In Latin America, the situation is most dramatic. As Teresa Caldeira points while speaking about Sao Paolo, a city where social segregation and

⁴⁹ Pope, A., Op.Cit., p. 211-213

⁵⁰ Gregotti, V., *Architettura e postmetropoli*, Einaudi, Torino, 2011



Bogota Residential Segregation 1973-81

Source: United Nations University



Socioeconomical strata in Bogota
Source: A. P. Camargo Sierra, A. Hurtado Tarrazona, Urbanización Informal en Bogota. Revista INVI, 2013, vol 28, n. 78, p. 77-107

violent contrasts are well known, physical barriers have been built everywhere: around houses, condos, parks, squares, schools and offices. It has become the new aesthetic of security and it strongly influences the form of any construction, imposing a logic founded on surveillance and distance. According to Bauman⁵¹, these enclosed spaces are physically inside the city while socially and ideologically they are outside: it is presumed that gated communities are separate worlds and strive to represent an alternative to the degradation of the quality of life and the dissolution of city's public space. One of the main characteristics of gated communities is to keep out the *socially inferior*⁵² segments of society, referred to by Bauman as *strangers*⁵³, in order to achieve a sense of "security". It seems that the key factor to obtain isolation is security means the construction of fences and walls around condos, 24 hour security guards surveillance of the entrances, and a number of private facilities and services that are necessary to keep the *others* out. Latin America, as other settlement around the world, now finds a characteristic typology of residential space composed of walls at the expense of public space, which is deteriorated to a degree that has nearly achieved its complete demise.

This need of segregation, of living and interacting only with those like us, as Flusty illustrates through the concept of *mixophobia* tends to become worse over time. When the population lives segregated both socially or ethnically, the fear of the *others* increases as the social exchange decreases. This activates a vicious circle where the more segregated the population becomes the more fear increases and consequently the aspiration of the population for isolation in search of *security* escalates, therefore the walls continue to multiply.

⁵¹ Bauman, Z., *Fiducia e paura nella città*, Mondadori, Milano, 2005

⁵² in 1867, the great Liberal reformer John Bright had declared the existence of a class he called "the residuum", whose exclusion from the rest of the male working class was essential for the nation's well being

⁵³ Caldeira, T., "Fortified enclaves, the new urban segregation", in *Public Culture*, vol 8, n.2, 1996, Op. cit. in Bauman, Z., *Fiducia e paura nella città*, Mondadori, Milano, 2005



R. Smithson, Spiral Jetty
Picture by G. Gorgoni
Source: RobertSmithson.com

Can Less generate More?

Many authors have theorized the possibility of using disorder, or a different concept of order (different from the renaissance and modernist concept of order) altogether as a means of composition. But before exploring the numerous possibilities of operating with disorder, a synthesis of the interpretation of the concepts of order and disorder undertaken in this thesis is necessary.

In system theory, Pierre Delattre attempts to describe order and chaos, begins by posing two postulates: A, can *less* derive from *more*? And B, can *more* derive from *less*? Postulate B poses some conceptual difficulties: To support postulate B, he begins by citing Hegel's famous statement in which he sustains that human actions act in virtue of passion, power and glory, (chaos) and in spite of this over time it has brought to the development of rationality. This concept may be also traced back to the late 1700's with Adam Smith's "invisible hand" in relation to finance and commerce or later to what Delattre refers to as the "Bachelard-Pauli Principle"⁵⁴ where, according to Delattre, Bachelard applied in general terms "Pauli's exclusion principle" in that differentiation is necessary in order for elements to compose a system. In synthesis, Delattre tries to arrive to a wide consensus on the fact that: *Order implies the existence of singularities and therefore non – uniform constrains able to keep these singularities.*

But there are some cases of working with entropy and disorder becomes explicit, as Robert Smithson illustrates in *Entropy and the New Monuments* where Smithson affirms: "Many architectural concepts found in science-fiction have nothing to do with science or fiction. Instead they suggest a new kind of monumentality which has much in common with the aims of some of today's artists [...] They are not built for the ages,

⁵⁴ Delattre, P., Op.Cit., p. 51



P. Bottoni, QT 8, Montestella
Source: Archivio Piero Bottoni



Map and photo of destruction of Milan
Source: A. Rastelli, *Bombe sulla città*, 2000
Montestella in QT8 neighborhood, Milan
Source: Archivio Piero Bottoni

but rather against the ages”.⁵⁵ Smithson’s statement is an attempt to describe the new pleasures derived from minimal art and chaos.⁵⁶ This emerging aesthetic may also be traced to the interpretation Castells gives of the *architecture of nudity*.⁵⁷

Like much Land Art, *Spiral Jetty* is subject to the cycles of nature and vicissitudes of the environment in which it exists. As water levels rise and fall with the tides or amount of rain, Smithson’s great spiral also changes. In fact, two years after its completion, *Spiral Jetty* completely disappeared under water. After years of only brief, periodic reappearances, a major drought brought *Spiral Jetty* to the surface again in 2002. Sometime in the distant future, the repeated process of submergence and re-emergence will ultimately lead to the erosion of *Spiral Jetty* and the work will cease to exist. Smithson embraced the notion of entropy, resulting in the obsolescence of works like *Spiral Jetty*. He also recognized that the work’s location would make it unavailable to a broad audience. With these things in mind, he documented *Spiral Jetty* in a number of more permanent, more accessible forms including photography, film, and text.

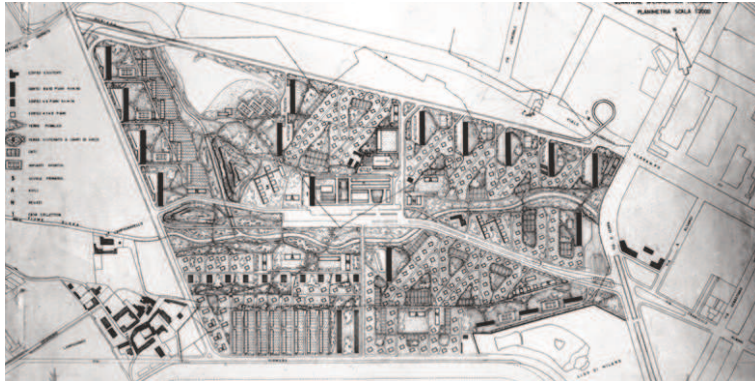
Monte Stella in Milan is a simple but effective example: “... *Sette anni sono molti nella vita di un uomo e pochi nella vita di un quartiere di città che, una volta impostato urbanisticamente, sorge e si ricostruisce per dei secoli nello stesso luogo, Barbarossa o bomba atomica imperante.*”⁵⁸ The presumably extenuating experience of building a new district in the periphery of a city demoralized with the devastation brought by the second world war’s bombardments made the Milanese skeptic of the possibility of an intervention which would transform the urban landscape with experimental design proposals. Especially since in the first years following the war, 1946-47, the only ex novo constructions within the city were built for homeless veterans following eleven house models that were implemented throughout Italy during the reconstruction. “*Nei primi tempi, sette anni fa, vi furono polemiche, asprissime sul programma di una proposta per il quartiere dichiarandosi da qualcuno che esso era cosa utopica e irrealizzabile. [...] Tutti sanno la storia della periferia di Milano, ritratto di tante altre periferie di città moderne, sorte senza*

⁵⁵ Smithson, R., “Entropy and the New Monuments”, in *Artform* June 1966, p. 10-11

⁵⁶ Arnheim, R., *Entropia e Arte*, Einaudi, Torino, 1974, p. 17

⁵⁷ Castells, M., *The Rise of a Network Society*, Blackwell, Oxford-Cambridge, 1996

⁵⁸ Bottoni, P., “Q.T.8 Il quartiere sperimentale della Triennale di Milano”, *Editoriale Domus*, 1954, in <http://archivio.eddyburg.it/article/articleview/6250/1/191>



“Dal primo embrione per scaricare sopra le cave, prima riempite, le macerie di guerra, la collina, specificamente progettata entro il piano del quartiere e come fulcro del parco, cresce per l’affluire del materiale di scarico dei cantieri edili e si conforma attraverso l’opera dei Cantieri-scuola secondo un preciso disegno. Niente di casuale, ma un’architettura secondo uno sviluppo, dalla base al vertice, di rialzi e balze armonicamente adattati alla generale circolarità dell’impianto. [...]La sua dimensione determina il carattere cittadino del parco in cui è inserita e sancisce il ruolo polarizzante che assumerà per tutti gli abitanti, non solo per quelli del QT8, annullando così la ghettizzazione tipica dei quartieri periferici. [...] l’altezza massima [sarà fissata successivamente] a 60 metri. Alla fine del 1968, raggiunta quest’altezza, la massa di materiale scaricato ammonterà a circa 4.660.000 mc. La collina infine rappresenterà nei suoi diversi strati la storia della ricostruzione milanese.”

*“Un elemento superante il limite di interesse di quartiere per divenire di interesse cittadino è costituito [appunto] dal grande parco, col Monte Stella, progettato e in via di realizzazione su un’area superiore a quella occupata dal parco Sempione, che rappresenta, nella città, uno dei due soli spazi verdi fino a oggi esistenti a disposizione dell’intera città”.*²

Piero Bottoni

¹ Bottoni, P., “Stato dei lavori al Monte Stella al QT8 in Milano come premessa al progetto di sistemazione definitiva”, in *APB, Documenti*, 1967, p. 3

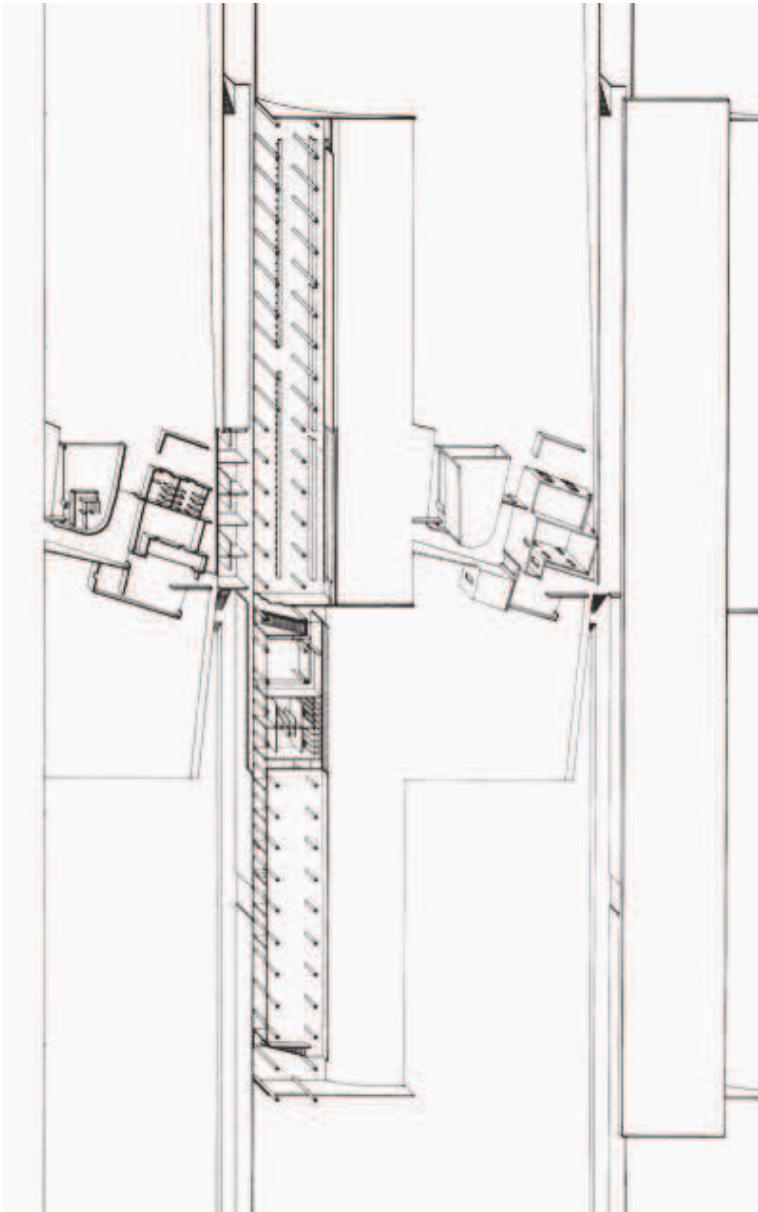
² Bottoni, P., “QT8 e Gallaratese a Milano”, Istituto di Urbanistica della Facoltà di Architettura di Milano, 1966 (lezione del corso di Urbanistica II, 1965-66), p. 12

*programmi e da decenni viventi di una stentata vita nella economia di una società che considera l'abitazione, non un diritto dell'uomo che lavora, ma un affare della iniziativa e della speculazione privata. Il QT8, pur col suo completo programma urbanistico, non ha potuto del tutto sfuggire a questa realtà economica e in questo lascia insoddisfatti i suoi amici e sostenitori.*⁵⁹ The first plan, designed in 1946, pre-existing quarries in the north-west part of the site, (a product of entropic processes) were to be transformed into a city lake within a vast public sports area. The site was divided into four sectors, composed of linear helio-metrically aligned residential buildings around low-rising constructions immersed in a natural landscape where two small hills were to rise.

After the request of the administration to achieve a higher population density, Bottoni along with E. Ceruti composed a new layout with eleven floor buildings closing the northern side of the district. In this plan one the hills assumes a more consistent presence while a smaller lake replaces the second hill. After the initial skepticism, when the plan started to seem feasible, especially after the plan was exhibited in the IX Triennale of 1951, a moment of euphoria followed and the population believed that it would have been built in a very short time, obviously they were disappointed. Nonetheless the second layout entered the official city plan that was approved in 1953.

There was a third layout designed in 1953 in order to respond to a more vast problematic. The inundated quarries disappeared, due to the fact that the accumulation of debris was larger than previously expected and the quarries had been filled. At this moment the mountain passes from becoming an exclusively local character, an inter-scalar element that modified the general aspect of the city itself. Becoming a designative symbol of a new city threshold for the flows arriving from the highways. But it was not only a monument, it was to become an element of urban planning, as A. Rossi defined it "*a great piece of architecture*" streets and houses were placed around the mountain. Originally it was planned to be 100 meters in height, and built through the stratification of the various types of debris that was continuously transported from 1949, throughout

⁵⁹ Ibid.



E. Souto de Moura, Braga Market
Source: Electa Milano 2003

more than twenty years, from the city. The base was built exclusively with residue from the bombardments, while successive layers formed by 33 meter wide and 8-meter tall steps were made of mixed residue. In 1967 the landfill was completed and until 1968 the whole project was finalized. Monte Stella achieved a height of 60 meters and a volume of 4.6 million cubic meters of debris.⁶⁰

Another situation where working with entropic processes, and contemporarily in a space of interrelation, is Braga's public market, by Edoardo Souto de Moura. It may be used to illustrate the idea, even though it may not necessarily be thought of as a successful operation of public space due to the adverse contextual conditions, it may be seen as a stable manifold that has outlived its original purpose and passed from a public space for merchandise trade into a public space for cultural exchange. It seems to obey the process demonstrated by Crotti⁶¹ following the different phases of formation, deformation and transformation, and it has been a place, first for economic and goods exchange and successively, after the phase of deformation, an example of working with disorder or an with an alternate order.

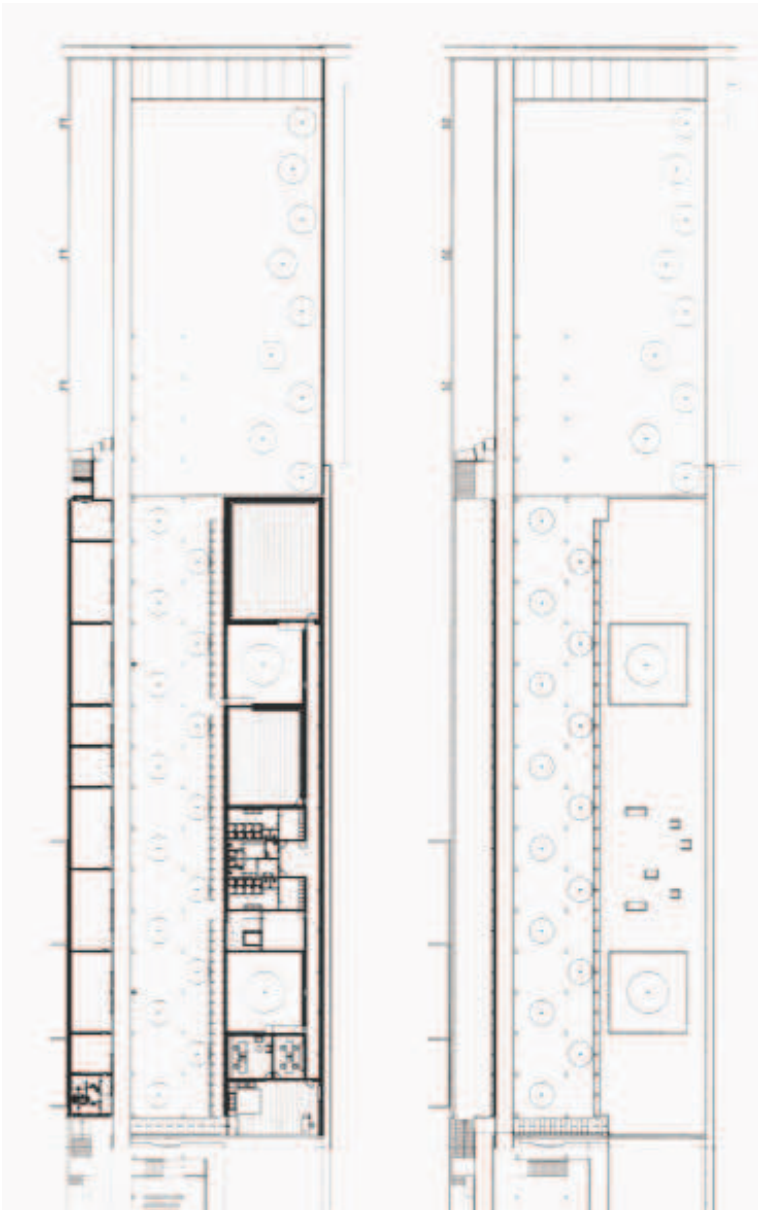
The first tracing of the building in 1980, a sort of modern *stoà*, attempted to organize an essentially arid part of the city of Braga in the Carandà Neighborhood. The proposed configuration begun from the most atavistic foundation act, two main axis, an artificial crossroads where exchange may be jump started and a way to give a new structure where the growing city could find a new arrangement. The building followed the dominating NE-SW axis parallel to a critical inflection in one of Braga's main corridors where Imacolata Conceção Av. and Joao XXI Av. meet. The market was structured by two rows of 16 columns that composed a sort of open sheltered space. A covered street where the main trading activities would be hosted and an elevated public path connected two fragments of urban tissue at a local scale.⁶²

Paths that transform into walls may also be interpreted as a stabilization of the path itself, from an ephemeral and transitory action to a physical irremovable presence and settlement configuration. In fact, these main

⁶⁰ Sabatelli, F., in Consonni, G., Meneghetti, L., Tonon G., (a cura di) *Piero Bottoni. Opera completa*, Fabbri, Milano, 1990, p. 373-375

⁶¹ Crotti, S., "Strade, frontiere interne della trasformazione urbana", in *Urbanistica*, n. 83, 1986

⁶² Esposito, A., Leoni, G., *Eduardo Souto de Moura*, Electa, Milano, 2003



E. Souto de Moura, Braga Market
Source: Electa Milano 2003

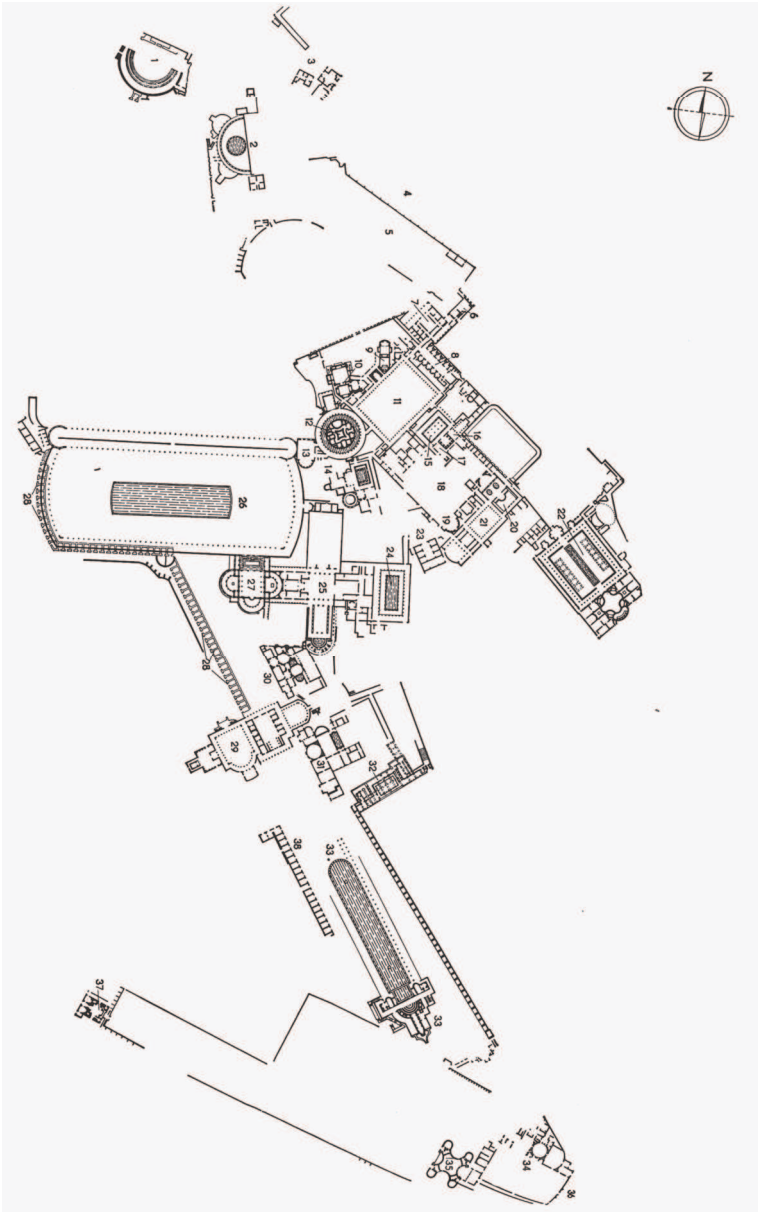
axis reverberate on a series of parallel walls that compose the market's spaces.

Souto de Moura explicitly refers to Rossi's "Architecture of the City" in that the market is a typologically recognizable fragment of the city. Transformation of the surroundings suffocated trading activities and led to the dismantlement of the market's original functions, in 1996 constraining the architect to its reformulation as a cultural center. A transformation that seems even more in tune with the underlying theoretical basis of the project.⁶³

The reciprocal modification between architectural object and context redefined the whole spatial sequence, transforming part of the once sheltered street, like the ruins of a Greek stoa, into an atrium, leaving the un-bearing freestanding columns in an open space where vegetation may grow and inverting the original interior into an artificial exterior. Unexpectedly picturesque, in such a theoretically sophisticated project, the columns' steel armor were left to resemble something like a Corinthian capital, and part of the facilities once used in the market, such as the lavatories and old food stands, were left as a memory of its past function, while the rest of the building would be strongly redesigned transforming it into a dance school. A corridor distributes the internal spaces of the school, composed of two patios, an office and two gyms for the dance school, there are also spaces designed for temporary activities under the shelter that maintains the original pedestrian walkway function.

The strategy adopted by Souto de Moura in the re-elaboration of the project after the phase of deformation is an additional way of utilizing an entropic process in order to generate a transformation that implements an "alternate order" as well, and will become useful within the node strategy while working with residuum in the case study.

⁶³ Zamora Mola, F., *Eduardo Souto de Moura architetto*, Logos, Modena, 2009



Plan of Villa Adriana
Source: L. Benevolo 1975

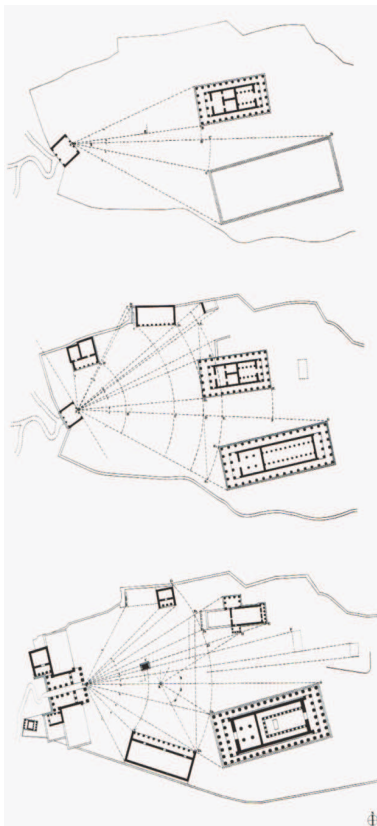
Open composition

An approach that involves alternate concepts of order is not new to architecture; for instance, the acropolis configuration follows an order that eludes regularization (that as mentioned before is a simple kind of order, also considered a type of disorder) or a “concluded” enclosed layout.

In the acropolis as in other Greek “open” ensembles, such as the temple of Poseidon at Sounion, the temple of Athena at Pergamon, the temple of Apollo at Delphi, the temple of Aphaia at Aegina, the agora from Miletus, the temple of Zeus, the Heraion and the Metrom at Olympia, the Heraion at Samos in the classical period, the temple of Athena seen from the Agora at Priene, the temple of Artemis seen from the agora at Magnesia, the temple of Zeus at Magnesia “the ancient Greeks designed not isolated objects, [...] but the parts of a dynamic urban environment [...] Their layouts were not designed on a drawing board each was developed on a site in a existing landscape, which was not subject to the laws of axial coordinates”⁶⁴.

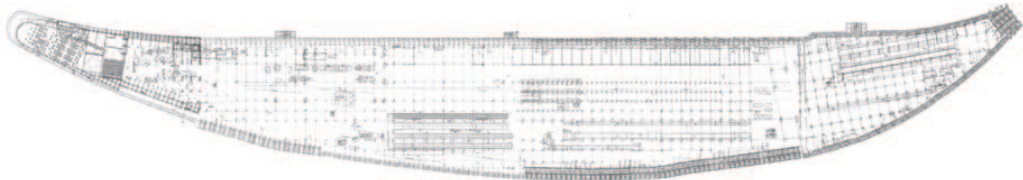
The foremost characteristic of the composition principle is found in the use of two-point perspective as an ordering principle. A reciprocal relation between the “symmetry” (in the contemporary sense of the word) and the open composition of the buildings in an asymmetrical manner reveals an interesting dialectic that reflects the concepts expressed in the relation between information and entropy as well as in entropy and composition in general (music and architectural, Hiller and Xenakis) examined before. Being that the composition of the objects follows an alternate order to the one used for the composition of the objects themselves, the possibilities of the position of the buildings in the acropolis is infinitely higher than the possibilities the composition found on one side of the Parthenon as opposed to the other.

Thus the entropy found in the ensemble is much higher than the entropy of the single building, while still following defined principles on both generating a strategic dialectic that will be explored in other more contemporary examples as well.



Athens, Acropolis, I, II, III
Source: C. A. Doxiadis 1972

⁶⁴ Doxiadis, C. A., *Architectural Space in Ancient Greece*, Mass, MIT Press, Cambridge, 1972, p. 4



M. Desvigne, Ile Seguin
Source: Lotus n.150 2012

The Hadrian Villa follows a compositional strategy that also generates an open configuration where different architectural “episodes” are interconnected through a series of joints or nodes that articulate one order to the next. An open composition of independent elements, built in three different moments in time, the Hadrian villa provides substantial evidence that the open composition is able to receive successive modifications and additions (even if not the case also subtractions). The construction adapts to the terrain adopting.

Peter Eisenman also declares a series of formal strategies that consent a composition with an altered order. Recursivity, self-similarity, discontinuity. Self-similar recursivity, as declared by Eisenman, produces a condition defined as “scaling” in order to achieve an “open” discontinuous composition that strives to go beyond the traditional “enclosed” anthropologically centered composition which, according to Eisenman, has been the central paradigm until the so called end of modernism.⁶⁵ Although to some extent this remains a purely formal application of a strategy within Eisenman’s work that to some extent uses an alternate order, in this thesis, as illustrated in the case study, the openness of the composition and the possibility of recursivity as a compositional strategy are intended to be applied at the framework where the settlement process can absorb continuous modifications and propagate them in a virtuous exchange between nodal entities.

Desvigne Ille Seguin

“The intervention represents a sort of partial anticipation of what is going to be the park at the center of the grand scheme of upgrading of the Ille Seguin. Conceived as a temporary and low cost intervention, the garden plays the role of an observatory of the area under construction and hub for new local activities. Inorganic terraces, of cement or stabilized sand, and green areas of grass or pioneer plants, alternate in a geometric sequence on different levels that follows the grid of the previous industrial layout. The elements of furniture are made from cheap or construction materials, while some rectangles of vegetation are temporarily occupied by wild plants, cereals and other productive crops until such time as they

⁶⁵ Eisenman, P., *La fine del classico e altri scritti*, saggio di Rella, F., a cura di Rizzi, R., CLUVA, Venezia, 1987



R. Moneo Banco de Espana
Source: On n. 291, 2008

are replaced by perennial plants suited to the new environment that has been created.”⁶⁶

Precariousness as an element of design, precariousness ensures great durability, incompleteness allows you to remain open to development. So I consider these spaces subject to successive transformation “intermediate natures”... to compose a landscape of prefiguration. Observation of different archetypes of public space indicates that their permanence is rooted in their pertinence to a piece of territory or an urban form, with a hand of great dignity and respect for the land. The square of Siena comes to mind! Often historical spaces are *undesignable* as there is nothing to design.

Relating to previous orders in architectural composition: Analogy and Contrast

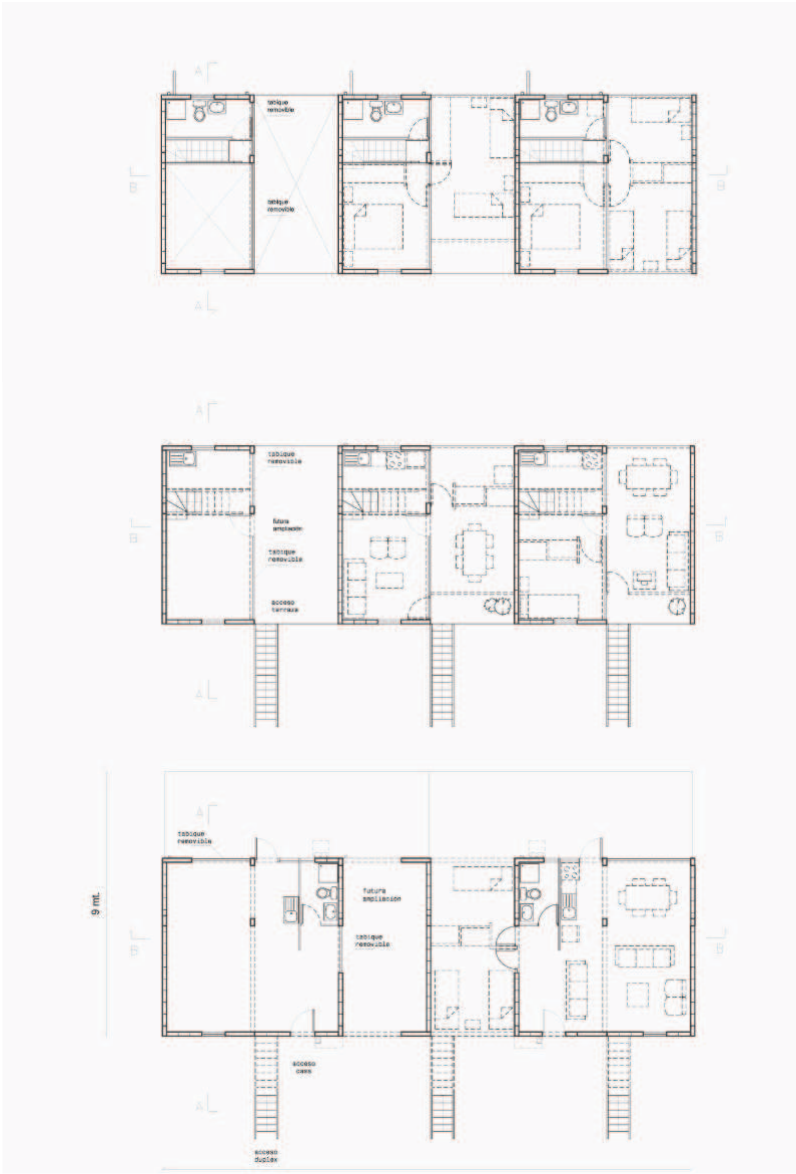
With the scope of identifying methods to compose with preexisting structures, with their fragments, signs or traces, the work of Ignasi de Solà Morales in “From contrast to analogy” printed in *Lotus* on 1985, is revealing. The author refers to Riegl in order to prove the value of the “*intervention*” within a consolidated context and how this action adds a value of contrast between the old and the new; “in one written in 1903, Riegl described a typical category of the new sensitivity with regard to the historical monuments”. Ignasi de Solà builds a background in order to depurate the “*intervention*” into two working possibilities; *contrast* and *analogy*, as equally reasonable intellectual instruments.

Sustaining the interdependence between form and ground beginning from Gestalttheorie referring to Koffka and Koeler psychology of form of 1929, the author additionally refers to the work of artist like Kandinsky and Klee, to Camilo Boito and the charter of restorers of 1931, and to the 1933 CIAM where the *zeitgeist* concept would demand the language of present-day architecture in order to clarify the concept of *contrast*.

He still says “the predominance of the category of *contrast* as a fundamental principle of aesthetics in problems of intervention already belongs to the past.”⁶⁷

⁶⁶ Desvigne, M., “Ile Seguin”, in *Lotus*, n. 150, p. 24-26

⁶⁷ De Solà-Morales Rubió, I., “From contrast to analogy”, in *Lotus international*, n. 46, 1985



Elemental, Quinta Moonrroy Iquique Chile 2003-05
Source: Archdaily.com

The more contemporary *analogical* category is “comparison, as difference and similarity, from within the only possible system, that particular system defined by the existing object, is the foundation of every analogy. On the *analogy* is constructed every possible and unpredictable meaning.”⁶⁸ According to Carl Jung as cited by Aldo Rossi in *Analogical Architecture*; “logical thought is what is expressed in words in the form of discourse. *Analogical* thought is sensed yet unreal, imagined yet silent, it is not a discourse but rather a mediation on the themes of the past, an interior monologue.”⁶⁹

An *analogical* intervention quoted by Sola-Morales is Carlo Scarpa’s Castelvecchio in Verona, where he “introduces historicist figures into the historical authenticity of the existing building”⁷⁰, or the Goteborg Town hall, designed by Gunnar between 1913 and 1937, which is not merely a “simple notion of contrast” instead the architect’s recognition of the most important features of the existing building through “a controlled handling of the relation of similarity and diversity that are proper to any *analogical* operation.”⁷¹

So the *intervention* is “an aesthetic operation, the intervention is the imaginative, arbitrary, and free proposal by which one seeks not only to recognize the significant structures of the existing historical material but also to use them as *analogical* marks of the new construction”.⁷² This approach will become an important part of the design strategy proposed ahead in the case study with the aim of generating a reciprocal infrastructure of pre-existing traces, voids, residual spaces where the significant element of the structure, its intersections, its nodes, may utilize the identified materials that compose the metropolitan settlement in the specific scenario.

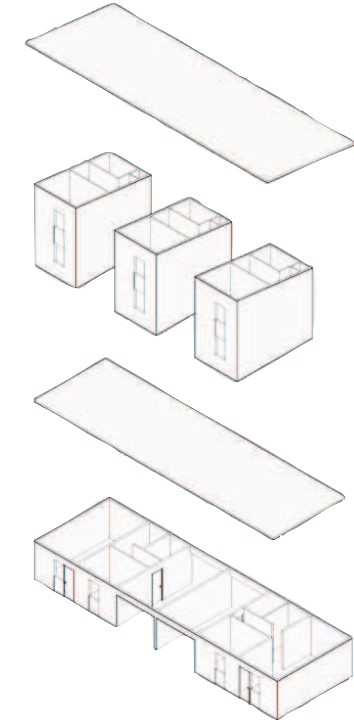
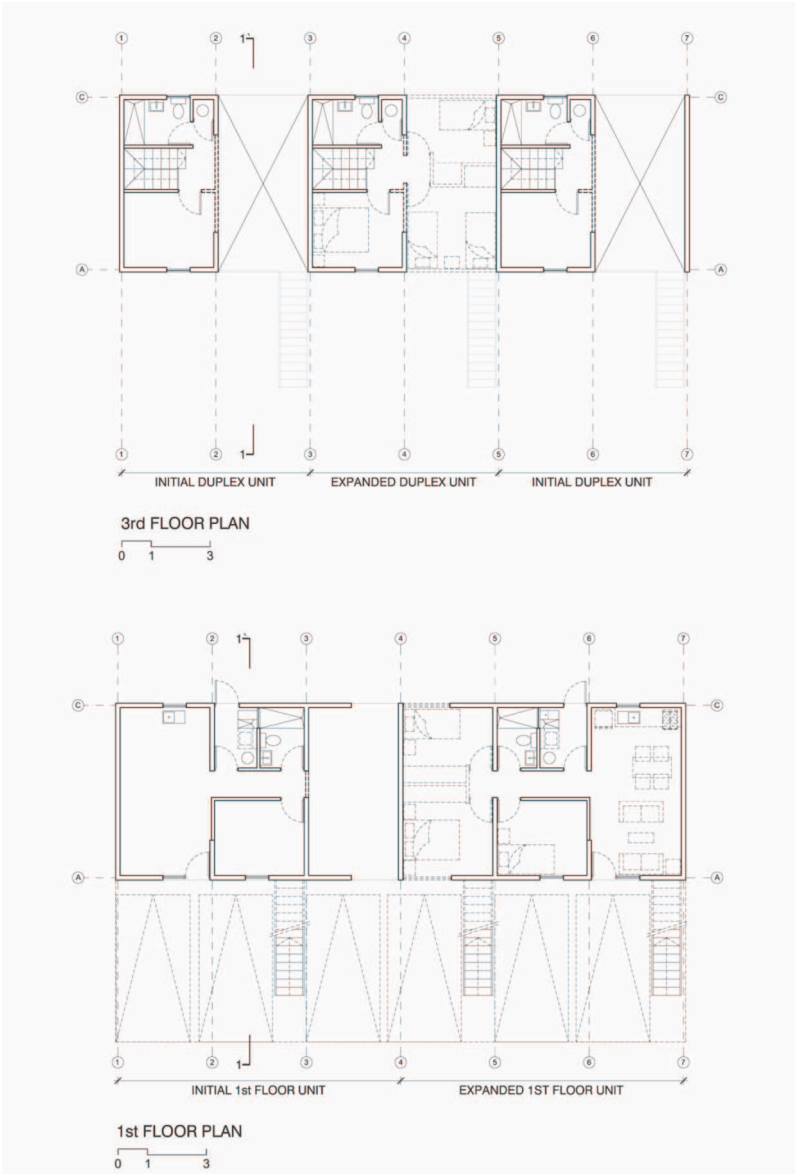
⁶⁸ Ibid.

⁶⁹ Jung, C., in Nesbit, K., *Theorizing A New Agenda For Architecture*, Princeton Press, New York, 1996, p. 341

⁷⁰ De Solà-Morales Rubió, I., *Op.Cit.*

⁷¹ Ibid

⁷² Ibid



Elemental, Monterrey Mexico 2009-14
Source: Archdaily.com

Relation to future orders: Quinta Monroy Iquique Chile e Monterrey, Mexico

“[...] due to the fact that 50% of each unit's volume, will eventually be self-built, the building had to be porous enough to allow each unit to expand within its structure. The initial building must therefore provide a supporting, (rather than a constraining) framework in order to avoid any negative effects of self-construction on the urban environment over time, but also to facilitate the expansion process.”⁷³

This project is particularly inherent to the concept of working with an alternate order, with entropy, structure and probability. The Elemental architecture studio designed in 2004 a low-income target project composed of ninety-three 25 and 36 m² houses, on three levels, predisposed for a future expansion. The houses were provided leaving a void space between one another meant to be successively self-built by the families in order to arrive to what is considered mid-income houses, about 70m², in order to grow in value instead of slowly devaluating. But in relation to entropy and composition, the project provides what Hiller called structure in composition, that as described before, in information theory, structure means redundancy. Even though it seems structure is indispensable for composition to a certain extent. While the spaces in between the houses contain every the possibility, they compose the entropic component, they are the singularity, they contain the part of the message that cannot be predicted. After the Iquique experience, this became a consolidated strategy, exportable and adaptable to social housing (and not only, I add) anywhere. In Monterrey the project consists on seventy houses that could grow to 58 and 76 m², where on the ground level, a single floor house, while a duplex typology on the second floor. The strategy achieves a composition principle that embraces the dialectic between order and disorder, built and void, between planned and spontaneous.

⁷³ Quinta, M., “Elemental”, <http://www.archdaily.com/10775/quinta-monroy-elemental/>

Conclusions

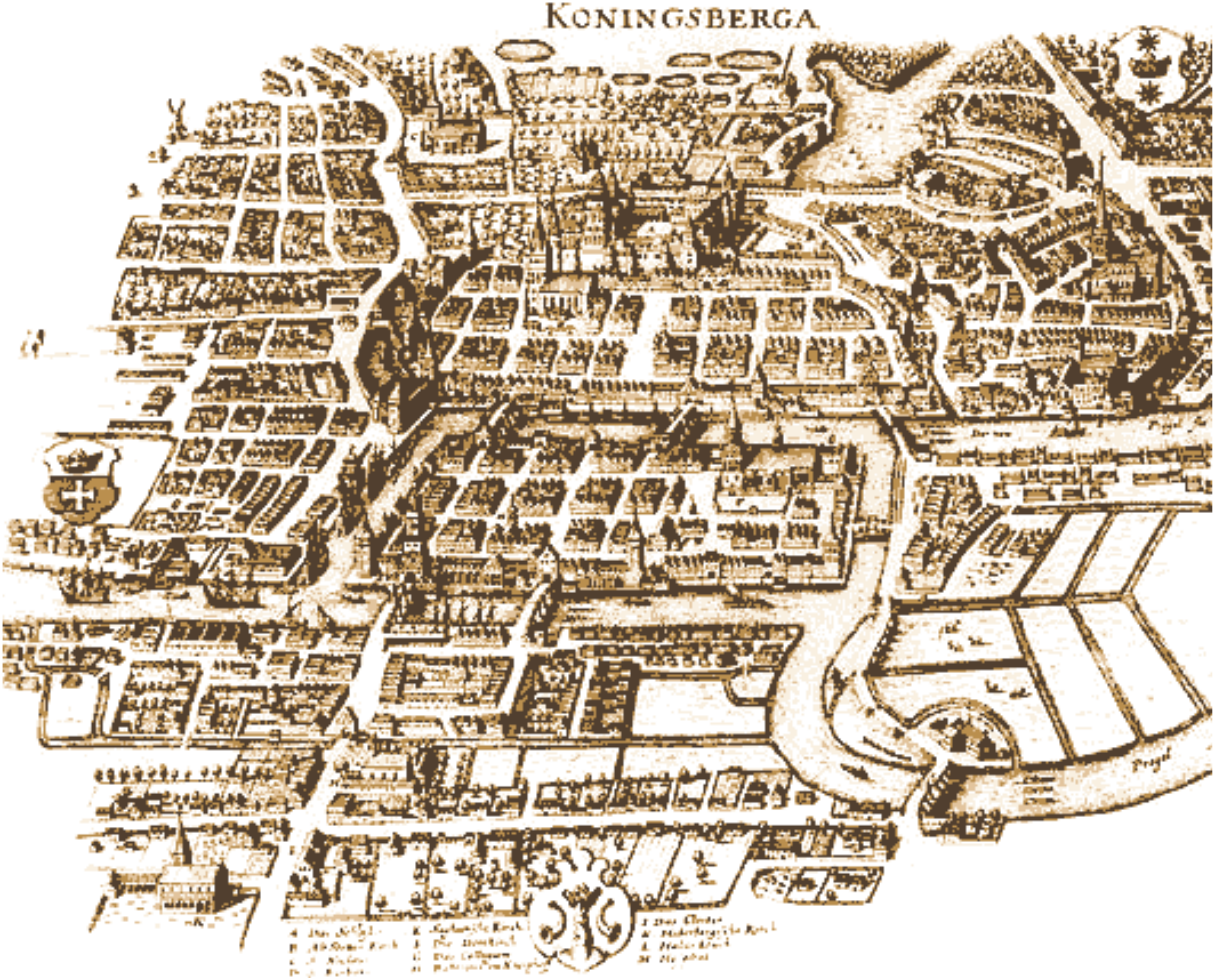
In the 21st century, the margin is not a defined perimeter around the city's core, in the age of the metropolitan settlement, margins have multiplied and fragmented throughout the territory, there is no urban- sub urban relation but a completely new relation altogether.⁷⁴ There is a new system of margins, of residual spaces, full of disorder but at the same time full of potential. As deduced from the various concepts explored in the chapter, the places where disorder accumulates are associated with phases of deformation, which in turn prepare the probabilities for a transformation. The dialectic between entropy and syntropy reflects continuous mutation as the most important constant of form. The relation between disorder and information, as in the development in musical composition as well as in composition in general, through the exploration of strategic possibilities of utilizing entropic processes in architectural design, opens the way for the consolidation of a strategy that may embrace this dual nature of composition.⁷⁵ The explicative importance of the concept of entropy in in contiguous growth, probably even achieving a status of paradigm, there still remains to explore a fundamental concept in order to be able to apply such a strategy that aims at incentivizing the conciliation of the incongruences between the various scales. The exploration of the "*net phenomenon*" in its most abstract form, through the classification of the properties of its elements, especially the nodal role of the *spaces of interrelation* is the next step necessary to build a strategy that, along with the identification of the current conditions, their limits and their potentials, also proposes a mechanism that allows the application and propagation of the proposed transformation.

⁷⁴ Pope, A., *Ladders*, Rice School of Architecture New York, Princeton Architectural Press, Houston (Texas), 1996

⁷⁵ Hiller, L., *A Computer Music*, in *Scientific American*, CCI, n.6, 1959

NET PHENOMENON AND NODE STRATEGY [TRANSFORMATION]

Net Phenomenon: Conceptualization and Relation to the Discipline (133), Nodal entities in Historicized Models of the 20th Century (145), Conclusions and Definition of a Node Strategy (158).



Plan of Königsberg in 1652
Source: preussenchronic.de

Net Phenomenon: Conceptualization and Relation to the Discipline

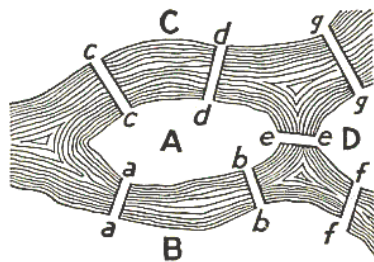
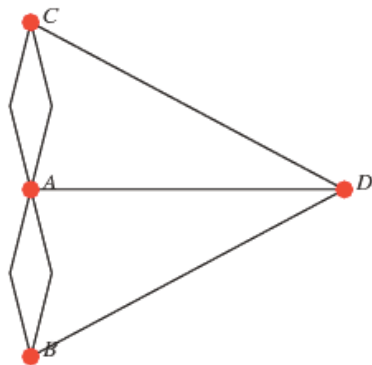


FIGURE 98. *Geographic Map: The Königsberg Bridges.*



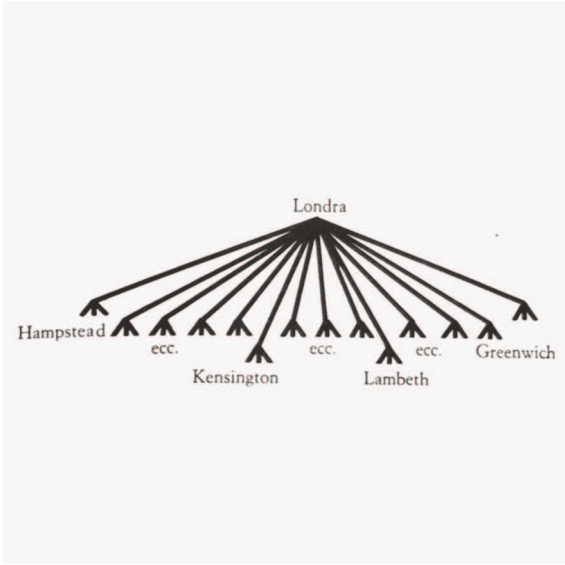
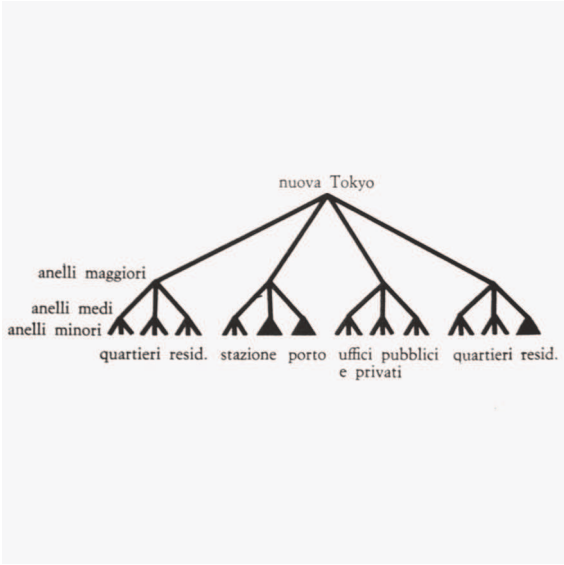
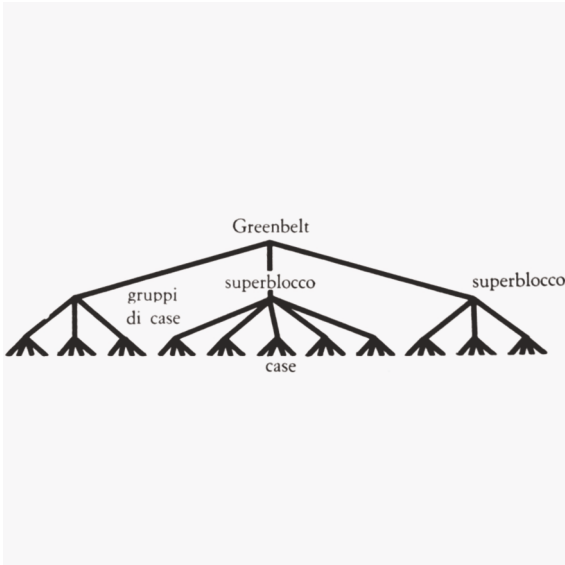
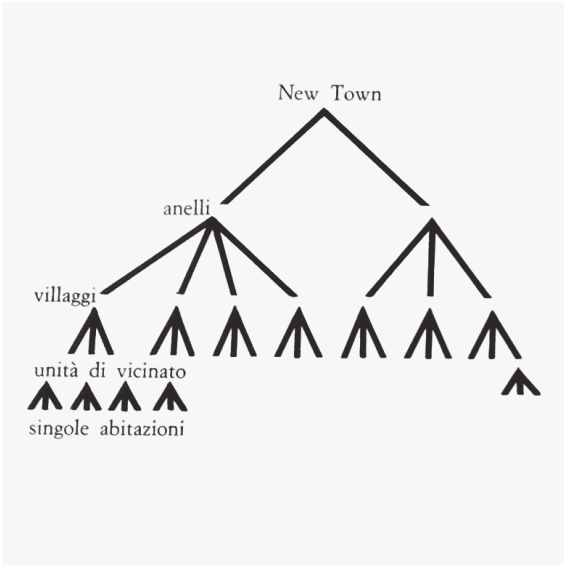
The famous problem dates back to the early 18th century, when the people of Königsberg (today Kaliningrad) lived their lives continuously crossing the intricate arrangement of bridges across the waters of the Pregel (Pregolya) River. The problem considers two central landmasses surrounded by the river and were connected by a bridge (3). The first landmass, an island, was connected by two bridges (5 and 6) to the inferior bank and correspondingly by two more bridges (1 and 2) to the upper bank, while the third landmass, which split the Pregel into two branches, was connected to the lower bank by one bridge (7) and to the upper bank by one bridge (4), in total this adds up to seven bridges. According to tradition, the problem was formulated in the consideration of the possibility of crossing each bridge exactly once and arriving at the starting point. Euler proved that this was impossible due to the fact that in order to arrive at the same starting point, in modern lexicon, depends on the degrees of the nodes of nodes. In other words, on the number of connections or edges of each node, in the Königsberg case each node has an odd number of degrees: 5 and 3 degrees. While to be able to end the walk on the start it is possible if and only if the number of vertices with odd degree is zero or two.¹

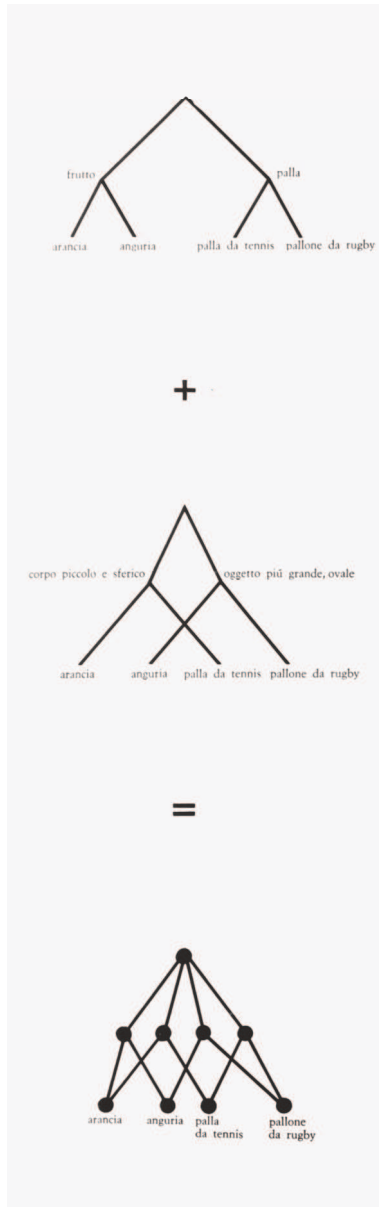
Deriving from the paper written by Euler in 1736 regarding the problem of the Seven Bridges in addition to the paper written by Vandermonde on the Knight problem², through Leibniz's analysis situs, Johann Listing introduced the term "topology" in 1847 generating a new branch of mathematics.

Seven Bridges Diagram
Source: kraitchik 1942
Graph of the problem of the Seven Bridges
Source: mathworld.wolfram.com

¹ Kraitchik, M., *Mathematical Recreations*, cap. 8.8.1, W. W. Norton, New York, 1942, p. 209-211

² the Knight Problem is a mathematical problem that attempts to find different routes within a chessboard (or chessboards of different sizes and proportions) where the scope is to use the rules of displacement of knights in order to land on every single square only once. The sequence of moves designs a unique pattern that describes the solution to each variation





Christopher Alexander's *A City is not a Tree*³, to some extent attempted the application of graph theory to settlement relations in order to evidence the difference between “natural cities” and “artificial cities”. The artificial cities examined by Alexander included: The Greater London Plan of 1943 by Abercrombie and Forshaw, Mesa City by Paolo Soleri, Kenzo Tange's Plan of Tokyo, Le Corbusier's Chandigarh, Brasilia by Lucio Costa, and Communitas. In the article, the author argues that the deep structure behind most “artificial cities” is a “tree like” structure as the tree structures in graph theory, while the “natural cities” such as Siena, Liverpool, Kyoto, Manhattan, which, according to Alexander, follow a “lattice structure” where the complexity of various systems interrelate. “Both the tree and the semi-lattice are ways of thinking about how a large collection of many small systems goes to make up a large and complex system. More generally, they are both names for structures of sets.”⁴

Still, while attempting an interdisciplinary approach, the direct application of the theories of one discipline into a different one, as described in the previous chapter relating to the concept of entropy in the various fields, it is the more abstract conceptualization of the general principle that is useful. It is important to keep in mind that a direct transcription results limited. So the use of network theory in the present case would exclude certain qualities that mathematical quantification simplifies to achieve the field's use of the specific theory. For the present study the *Net phenomenon* becomes useful as a deep morphological phenomenon of universal a character, as a distinctive trait of any system that reveals a sufficiently complex structure, as a symbol of the condition of man, and an image of his culture.⁵

The following attempt to recognize the characteristics that help identify nodal entities in urban tissue and the reason why such entities might be able to generate a transformation that allows local and global logics to interact in a controlled manner is undertaken through the exploration of the “Net or Reitiary Paradigm”, which in this research, is the basis for the elaboration of a territorial strategy that can adequately control the successive modifications of the continuously mutating metropolitan

Alexander's diagrams of New Town, Green Belt, Tokyo, London.
Source: C. Alexander1965

³ Alexander, C., A City is not a Tree, in “The Architectural Forum”, April - May 1965

⁴ Ibid., p. 194

⁵ Rosentihel, P., Entry: Rete, in Enciclopedia Einaudi, Torino, 1977, p. 1046

settlement. The first chapter already identified within the urban form, some of the structural elements that conserve their significance throughout the cycles of formation deformation and transformation, by establishing that interrelations maintain such structural role within form. Still, the interrelation structure must find a mechanism that connects these significant places and makes the structure work.

The term *Reitiary or Net Paradigm* is adopted in this thesis in order to be differentiated from the more widely used concept of “*Network*”, already employed in specific procedures that diverge from the object of the thesis. Nonetheless this paradigm is assumed because it is efficient in seizing the characteristic constitutive modalities of the human settlement and of which both the internal and external inter-connective aspects are exceptionally expressed, leading to an interpretation that may be defined *Relational Architecture*.⁶ Therefore, the aspect of the net in terms of a settlement principle⁷ derives from its open relational system characteristic. It is important to differentiate the net as an open relational system from the grid, from the roman *castrum* for instance in that the grid is a constraining *netting* which determines, as seen in the chapter before, a suffocating rule that increases the constrains of the relational system.

The term *network* derives from a net-like arrangement of threads, wires, etc., 1550's, from **net** (n.) + **work** (n.). Extended sense of “any complex, interlocking system” is from 1839 (originally in reference to transport by rivers, canals, and railways⁸). The term *net* instead, comes from the Latin *nodus* “knot, joint articulation, point of intersection, or a significant point in the development of something” recalling *nectar*, *connectere*, *nexus*⁹: ultimately the double nature of the net is that of including and excluding, of extending and constraining contemporarily, alluding to the previous chapter where the dialectic between order and disorder is examined at a deeper level.

⁶ “Se le argomentazioni premesse valgono ad indicare di quale inattualità soffre la definizione di “spazio pubblico”, è proprio dallo “spazio relazionale” ora indicato che si profila un attendibile rilancio del suo ruolo strutturante: nel seguito si vorrebbe appunto considerare come la “relazionalità” degli insediamenti contemporanei sostenga quei “luoghi comuni”, non necessariamente coincidenti con la pubblicità dei siti, la cui caratterizzazione rientra nella più generale categoria degli “interspazi”. Crotti, S., “Interspazi: dai siti pubblici ai luoghi comuni”, in Caputo, P., (a cura di), *Le architetture dello spazio pubblico: forme del passato forme del presente, catalogo della Mostra tenuta a Milano nel 1997-1998*, Electa, Milano, 1997

⁷ Gregotti, V., *Il territorio dell'Architettura*, Feltrinelli, Milano, 1966

⁸ Etymonline.com

⁹ *Webster's American Dictionary*, Random House, New York, 2000

In the spatial, architectural and urban sciences, the *Reitiary Paradigm* or *Net Paradigm* has suffered a deformation and loss of part of its fundamental meaning concerning human settlements, analogous to the loss of meaning of the street, delineated in the chapter before, which by losing meaning becomes merely a connection.

The classification of the complexity of any determined human settlement needs an adequate apparatus in order to identify and summarize the different components that determine the global configuration. Identification of entities that will be denominated; nodes or vertices, edges or lines - cords or segments and patterns or meshes. The basic elements of any netlike structure may be reduced to tree type of entities: nodal entities, linear entities and mesh entities. Such entities may be identified at various scales and in different forms.

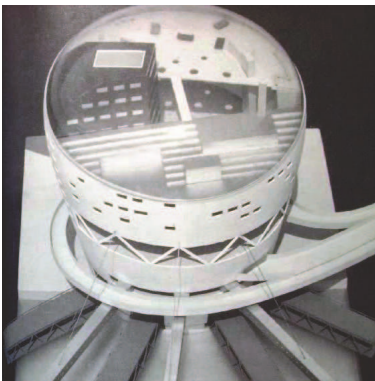
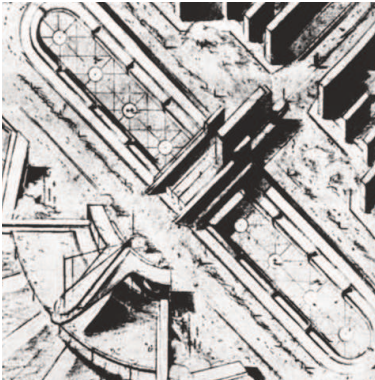
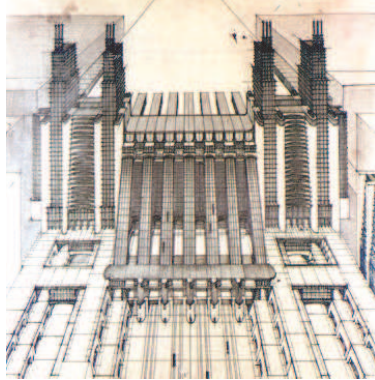
The role of nodal entities in the formation of the architectural urban unit is derived from their qualitative¹⁰ character. Nodes are the local anchoring of a global net, where various lines of force¹¹ intersect. It is defined by the complex coexistence of multiple relations at an inter-scalar level. Nodes may be described as a “*glocal*” space since they consent the exchange between local and global relational systems. *Glocal* entities are even more relevant when compared to the size of the interventions, now expanded to a territorial scale, but also the size of the areas affected by regressive and therefore covered as an opportunity to enhance by design, space for relationships, become exchanger elements and nodes of condensation.¹² It is specifically within the discontinuities of conurbations that it is possible to achieve open, deep and experimental design content. Becoming reference points for the urban population, in meeting places that do not belong to an interior or an exterior but instead they fluctuate in an indeterminate territory which needs now more than ever the reinforcing of nodes as the scaffolding of a rediscovered armor.¹³

¹⁰ Rene Thom in *Structural Stability and Morphogenesis* provided an undeniable example of the fact that quality is not a sketchy version of quantity, or as Ernest Rutherford sustained “qualitative is nothing but poor quantitative” and that *Form* is a valuable tool in order to recognize quality from quantity. It is brief but pregnant with meaning and clarity of a problem that is usually lacking evidence in favor of quality, so I think it is worth quoting here.

¹¹ analogy to Michael Faraday’s lines of force or Maxwell’s lines of induction, which today would be referred to as field lines

¹² Crotti, S., “Per un’architettura delle connessioni urbane”, in Crespi, L., *La stazione, il parco e la città*, Aline, Firenze, 1997

¹³ Ibid.



A. Sant'Elia Stazione d'aeroplani e treni ferroviari con funicolare e ascensore 1914
E. Mendelson Metropolitan Airport 1943
R. Koolhaas Sea Terminal Zeebrugge 1988
Source: M. Biraghi 2012

Nodal entities, in their most abstract sense, are analogous to the figure of Heidegger's Bridge, which reveals the river as a fracture between regions. The nodal entity is a bridge between scales or historic moments. Nodal entities within urban texture are stable traces that outlive the transforming context while at the same time are subjected to relational stresses, producing a mutual modification between object and context while at the same time leaving a genetic trace of the past configurations where different sets of relations have shaped diverse patterns. The nodal role of the such entities, at a specific *reference scale*, may be such only if there is a connection, if it makes part of a larger group of analogous interconnected elements, of which it serves as the urban structure's configuration scaffolding. The nodal role may occasionally coincide with infrastructural nodes such as train stations, naval ports or airports, even though they are not equivalent and may sometimes even be equivocal because many of these infrastructures, as seen in the chapters before, impede the settlement to generate around them once they have reached a certain level of artificiality. Nodes are the strategic places in a city where an observer may come in, and are the intensive foci from which and towards which an observer moves. They may be junctions, places where transport systems interrupt, a place to cross or a convergence of paths, they are moments of exchange from one structure to another, or nodes may simply be concentrations, that gain their importance from the condensation of uses or physical characteristics, as happens in meeting places on street corners or in closed piazzas. Some of these concentration nodes are the focus of a neighborhood or district, on which the node irradiates its influence and of which it is its symbolic representation.¹⁴ And, at different scales, *nodal entities* may be represented by cities within a territorial network.

Even though infrastructures, both locally and worldwide, have seen a moment of dismantlement, underuse, and in some cases, of requalification or reuse, in other words predisposed to the modification of the existing settlement. The nodes of these infrastructures are of considerable interest for architecture¹⁵, as they permit the deciphering of inter-scale intersections, of the dynamic traces of successive

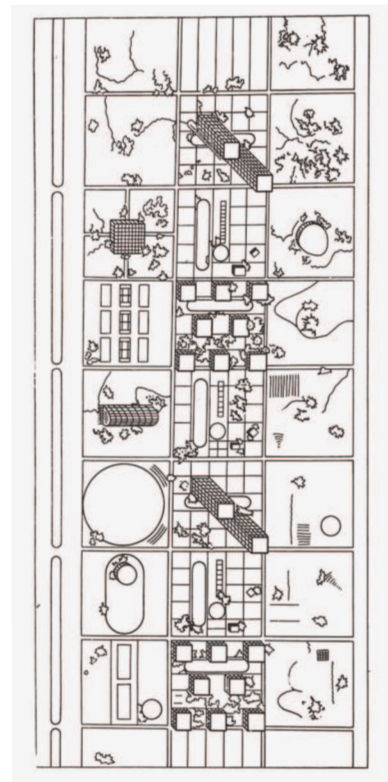
¹⁴ Choay, F., *La città utopie e realtà*, Einaudi, Torino, 1976, p. 400

¹⁵ "Così, quando le vie di ferro si aggiungono alle vie di terra e alle vie d'acqua, le stazioni ferroviarie, interpretano il ruolo di nuove porte, recapiti del collegamento meccanico cadenzato tra località lontane. Poiché a differenza di altre categorie di strade, l'approdo non è indifferenziato o comunicante puntualmente con i bordi, ma soltanto in punti di arrivo discreti." Crotti, S., Per un'architettura delle connessioni urbane, in Crespi, L., *La stazione, il parco e la città*, Aline, Firenze 1997

configurations, of typological *variability / persistence* features, of the degree of artificiality reached by technological alterations. Furthermore, it reveals the imprinting of architectural and urban forms that is inscribed in the deep underlying layer¹⁶, their genetic inscription appertains to the built environment while contemporarily being a place of flows of various natures, these nodes are the starting point for new relations that can confer a return to a decentralization of the city, through their landmark nature, by attributing a critical mass to peripheral nuclei in order to elevate them to the status of polarity, overcoming the obsolete relation of *center / periphery* towards a new balance between *metropolitan area / external polarities* relation.



But considering only infrastructure or even built space as the only possible *nodal entity* is extremely reductive and even equivocal. Intersection or convergences between multiple ecological systems, orographic features or even potential residual space structures compose a type of *analogical* structural node. This symmetry between built and void, form and residue, may offer a new perspective of the interpretation of spaces involved in syntropic and entropic process, and how nodal entities may be more profound than just infrastructural articulations.



Linear entities are complementary to both nodal and mesh entities, consenting nodes to make part of a larger configuration, to generate structure, form, therefore order, while still maintaining a certain degree of freedom and contemporarily inscribing areas that contain space of a different nature. Linear entities hold the possibility of coagulating continuous settled space, therefore when reduced to the role of connection or path, they become stripped of their significance within the human settlement, loose their capability of generating settlement space and constitute an obstacle at a local scale. As nodes, linear entities may be identified at a specific *reference scale*, where, according to such scale, both the *linear city*¹⁷, the *“equipped axis”*¹⁸, the Le Corbusier’s *7 v, streets*¹⁹, and even the distributive space within a building (the Venice hospital is a good example) may generate inhabited space. The capability

¹⁶ Crotti, S., “Reti reticoli reticolati”, in Zanni, F., (a cura di), *Architettura progetto rete*, Clup, Milano, 2002

¹⁷ Leonidov, Soria y Mata, Kenzo Tange, Le Corbusier Industrial City

¹⁸ in the 1960’s a series of proposals such as the plan of Rome of 1954 produced by C.E.T. (*Centro di Elaborazione Tecnica* composed by prominent architects such

I. Leonidov Magnitogorsk 1930
Source: P.A. Alexandrov 1978

of linear entities in the generation of settled space is well substantiated by linear cities, such as Ciudad Lineal first designed by Arturo Soria y Mata at the end of the 19th century, which was to extend around Madrid over the tramway generating a ring around the city where a differentiated typology of housing, hotels and several facilities in a sort of garden city. Or by the industrial city in Le Corbusier's Three Human Establishment where the linear city would grow as a further artificialization of infrastructure, to some extent alluding to Taylor and Ford's assembly line. Further evidence of linear entities' capability of generating relational space is evident in the C.E.T.'s project for the Italian interpretation of the linear settlement that considered a complexity of uses, becoming a



L. Quaroni, S. Muratori, L. Piccinato, B. Zevi, M. Fiorentino, R. Morandi, L. Passarelli, V. Delleani. *Asse Attrezzato* 1967-70
Source: Fondazione Bruno Zevi

as Ludovico Quaroni, Saverio Muratori and Luigi Piccinato) and rejected in 1958 theorized the relational properties of linear equipped axis "*assi attrezzati*"¹⁹ "*Via strata*" described in Crotti, S., "Strade, frontiere interne della trasformazione urbana", in *Urbanistica*, n. 83, 1986

stratified artifact that promotes public space and to a certain extent demotes the infrastructural connection character. Designed by a group composed by Mario Fiorentino, Riccardo Morandi, Lucio e Vincenzo Passarelli, Ludovico Quaroni, Bruno Zevi e Vincio Delleani, the Roman "equipped axis" an area to the east of the city had been indicated as a dominant expansion of the city and was included in the city's Plan of 1962. A series of facilities were foreseen in the area as well as a primary circulation highway.

Furthermore, these entities frequently stabilize over connective traces of previous configurations that make part of the genetic layer of the architectural-urban form. Such traces may be identified in human settlements everywhere: Broadway in the New York or Passyunk Avenue in Philadelphia coincide with native American trails that have left a trace within the cities' grids.

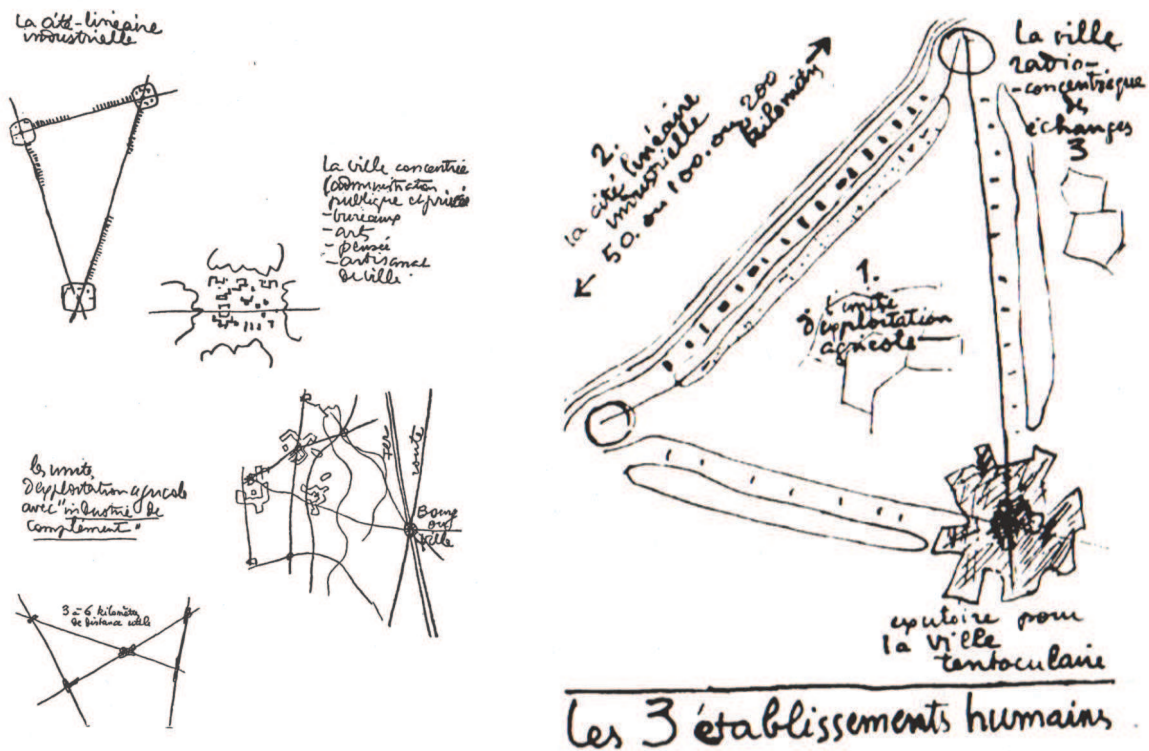
Ultimately nodal and connective entities delineate a grid or mesh, the rhythm and interconnection of these "voids", which produces radically different spaces within the different shapes that the net may acquire in relation to the theoretical model applied.

Various historicized models have produced numerous patterns that are formulated in an ideal space and are successively adapted to a specific context, responding to topography, hydrography and demography. Christaller's "central place theory"²⁰ which produces a series of interconnected hexagons, and aims at proposing a growth model where at the vertices new settlements should develop following a strict hierarchical configuration between centralities.

The hexagons, when adapted to a specific region, deform and become irregular in order to adapt to the determined place. The first centralized polynuclear strategy was Howard's Garden City, probably being the most dominant model of the contemporary metropolitan settlement, with enormous deformations, like the *macrocephalic* processes regarding Latin America described before.

²⁰ Christaller, W., "Le località centrali della Germania meridionale: un'indagine economico-geografica sulla regolarità della distribuzione e dello sviluppo degli insediamenti con funzioni urbane", traduzione di Malutta E., Pagnini P., introduzione di Pagnini P., Milano, F. Angeli, 1980

Le Corbusier's "Trois établissements humains" produces a triangular grid extending throughout a territorial scale. The interrelation of these entities is the scaffolding of human settlements. It gives a form to a relational apparatus of higher scale. Reference scales may change the role of any given entity, for example, in the "Trois établissements humains" model, the cities themselves become the nodes of a territorial net composed of a triangular pattern, connected by linear industrial settlements and containing the agricultural settlement within the triangle. It becomes a sort of topographic triangulation of the territory that may adapt and measure any geomorphologic condition.

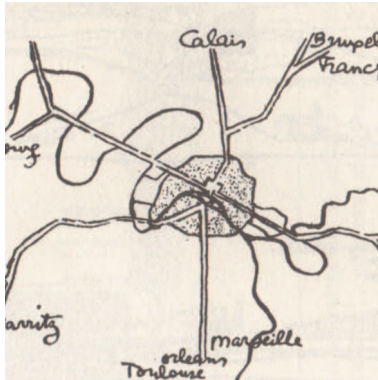




E. Lissitzky *Volkenbugel* 1924-25
Source: Russian State Archive for Literature and Art, Moscow. Cat. 36

Nodal entities in Historicized Models of the 20th Century

Some of the Urban plans elaborated in the 20th century demonstrate the potential of nodal entities as a conciliating element between multiple systems and scales, in order to find a useful strategy for a continuously mutating metropolis, it is useful to re-interpret the following models from a perspective that shifts the attention to the places selected by the various authors, where flows and exchange condense. The selection process of these models was oriented towards an easier recognition of nodal entities even though it is not an explicit intention of the authors. The places where different systems interrelate and how such places could become the scaffolding of future modifications is open to interpretation, the objective is also to discover the characteristics that Modern planners attributed to places with a nodal character, and how they would relate to the larger design. Furthermore, after the chapters where the accumulation of disorder were discussed, the reader should have a new instrument to interpret the consequences at local scales of some of the following models. It might be interesting to note how these authors are able to go beyond the nodal entity as merely an infrastructural element, instead as an instrument of planning and architectural design.



This study was started in 1922 and presented at the Salon d'Automne, and continued in 1925. Le Corbusier's plan for Paris determines what is intended as a city connected with its territory, both regionally and nationally, through the typical elements of the mechanical city. Two main axes referred to as "great crossing arteries", based on the traces of Lutezia's cardinal alignments, connecting to Calais and Bruxell on the north, to Nice on the south, Reims and Strasburg on the east and to the English channel to the west. A complete reconstruction of Paris' center,

Le Corbusier, Plan de Paris 1925
Source: *Des Canons, Des Munitions, merci, des logis s.v.p.* 1937

while still conserving the historic monuments, the plan focused on the city center proposing an unprecedented densification, through the expropriation of a conspicuous amount of land arguing that a higher density would compress the need for mobility.

The great central intermodal station was articulated various layers beginning with an airport platform of 200 thousand squared meters on the surface, a fast automotive traffic turnpike below the platform, on the ground level, the ticket offices and pedestrian entrance. On the first underground level the local metro system, on the second underground level the suburban railway, while on the third underground level the regional railway connections.

Twenty-four skyscrapers of 60 floors each were planned with offices, hotels etc. with a population oscillating from 10 to 50 thousand people. The six double floor low rising linear buildings of would host about 600 thousand inhabitants. And the garden city on the perimeter where the five floor buildings enclosed a green space where facilities were placed would have a capability of at least 2 million.

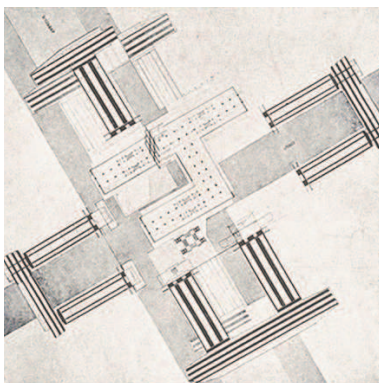
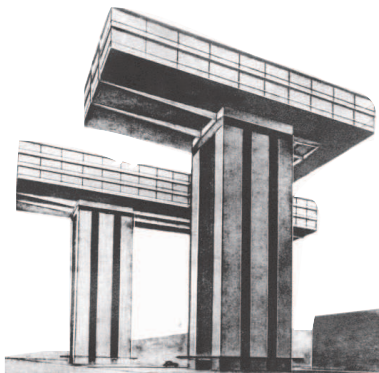
The fundamentals where synthesized by Le Corbusier as:

1. Decongestion of traffic in the city center.
2. Intensification of population density.
3. Multiplication of the means of transportation.
4. Expansion of green areas.

Presented short after the "Ville Radieuse" it anticipates the theory of the three types of human settlement: agricultural settlement as resource management, linear industrial city as the transformation of resources, with a clear analogy to the industrial assembly line. The third was the commerce and administrative settlement and utilized a concentric configuration. It operates a densification in the heart of the city in order to liberate extensive areas to open natural space. It is itself a node of a territorial scale while al a local scale, Le Corbusier identifies a series of "significant places" that would prevail to his violent transformation, and the new district would become an additional nodal entity of the Parisian



Three Human Establishments, Cooperative centers, 1924
Source: Fondation Le Corbusier



constellation.

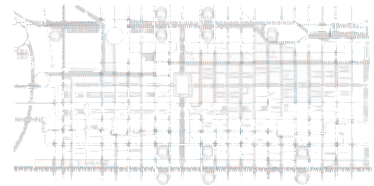
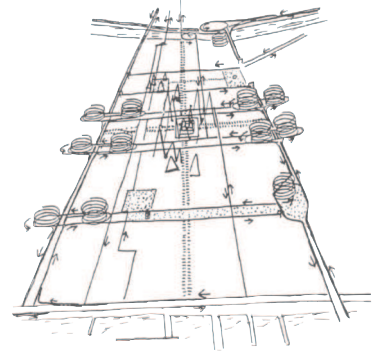
Although the nodal entities in Le Corbusier's plans are most clear at a regional scale through the theory of the three human establishments, where the multi-scale interpretation of the net phenomenon, proving it contains an adequate level of abstraction, shows how the cities themselves become the nodal entities where, according to a functional separation of space, commerce and exchange would take place.

EI Lissitzky in his 1920's project for Moscow, the nodal entity is reflected in a series of horizontal skyscrapers placed in the intersections between the radial streets of Moscow and the first ring. EI Lissitzky sustains that since the cities we dwell were born long before us and that they have become obsolete and do not meet the needs of our day. Since, as he points out, we cannot demolish them overnight and rebuild them "correctly" being impossible to change their structure and type all at once, it is not accidental that the strategy is that of using nodal entities, that as seen above in the chapter permit the interrelation of temporalities, spaces and flows, placed in a historic threshold as expansion rings evidences, the contrast between the historic city and the uncompromising design of the horizontal skyscraper becomes a compositional strategy as well. The nodes as in Kahn's plan become designative of the intrinsic relations that already exist in the city pointing at the Cremlin and containing both the exchange of flow and public spaces for the community.

In a comparable manner, Louis Kahn's Plan for Philadelphia 1951-53, infrastructure becomes architecture, and the nodal entity is reflected on the analogy of the highways being like rivers, and the parking lots becoming like docks at the margin of the famous grid, where the relation between the scales is condensed on a vehicle silos that contains what is usually residual space and transforming it into monuments where public space finds a new dimension as well. The "Docks" have a 270 m diameter and find an underground exchange with other types of transportation as well as evidencing the fracture between the contrasting settlement logics of the grid and the successive expansion of the city.

EI Lissitzky, A series of skyscrapers for
Moscow, WB1 (1923-24)

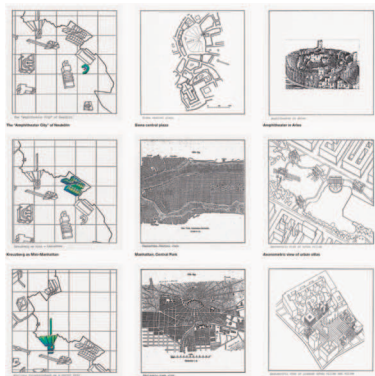
Finally, Ungers' Archipelago city, which emerged from a summer school in the 70's displays an interesting interpretation of both nodal entities and to some extent, to the dialectic between entropy and syntropy. Ungers identifies a series of significant places for the city and since in those years Berlin was experiencing a demographic reduction, he proposes a concentration of the city in these significant places while allowing the rest of the spaces in between to return to their natural state. In some sense the project voluntarily concentrates the syntropic processes in the identified strategic places while conveying the entropic residue in the form of re-naturalization, in the spaces in between, as a complementary alter- order. The City within the City explores the possibility of generating a settlement based on a series of nuclei that correspond to typological differentiation of a culturally specific identity and specific program while still making part of a larger territorial constellation. The plan may be traced back to Ungers and Koolhaas' study of Berlin of 1977 where the shrinking population of post war berlin was generating a fragmented urban fabric where the generic character of the spaces in between the recognizable culturally dense neighborhoods was jeopardizing their persistence. Therefore the operation proposed was that of subtraction, as opposed to the more common addition operation, by returning the generic fabric to a natural state or what may be referred to as neutral field, to a higher level of entropy. Finding a dialectic between order and disorder, a more contrasted relation between nature and artifice. For Ungers and Koolhaas the city could retreat into such strategic "fortifications" even though there is no part of the plan that illustrates the connection between the islands of order it is very useful in clarifying the concepts of spaces of interrelation and nodal entities described in the chapters before. There are two important principles that may be extracted from the Archipelago City, and that will be useful to both the strategy proposed in the design experimentation, as well as sustaining the hypothesis of the existence of significant places that generate the structure and therefore the form of the urban entity which may contain the essence of the specific city itself. First the demonstration of the structural role of these places within the urban form and second that



Louis Kahn,
Il sistema del movimento e la ristrutturazione della città, Philadelphia
in «Perspecta» 4, 1957, Complete Work pag. 35

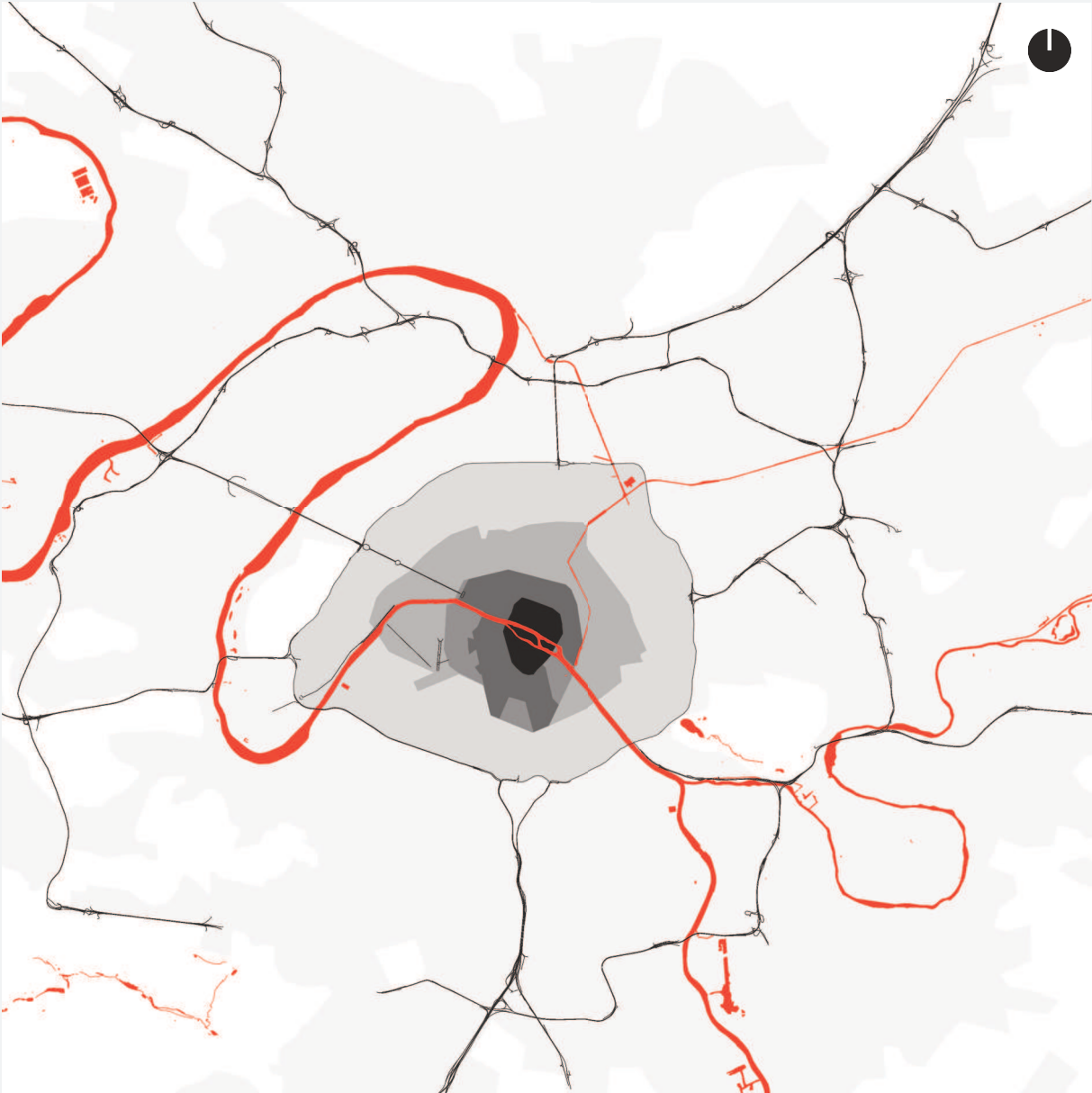


these places need an interrelational network in order to generate a structure, that it is within the relation between the fragments that the configuration emerges.



O.M. Ungers, R. Koolhaas, *The City in the City* 1977

Giurgola, R., Mehta, J., *Louis I. Kahn*, Zanichelli, Bologna, 1981
Kahn, L. I., "Il sistema del movimento e la ristrutturazione della città", in "Perspecta" 4, Philadelphia, 1957, *Complete Movement patterns*, 1953, p. 35
El Lissitzky, "A series of skyscrapers for Moscow", *WB1*, 1923-24
El Lissitzky, "The Film of Life", Part 7, p. 127; "Novy Ermitazh-1", Moscow, 2004
Le Corbusier, *Maniera di pensare l'urbanistica*, Editori Laterza, Bari, 2011
Le Corbusier, *Urbanistica*, Il Saggiatore, Milano, 2011
Canestrari, M., Testa, G., *L'Ilot n.6 di Le Corbusier per Parigi*, Napoli, Fratelli Fiorentino, 1981
Monteys, X., *La gran maquina La ciudad en Le Corbusier*, Barcelona, Ediciones del Serbal, 1996
Ungers, O. M., Koolhaas, R., *The city in the city. Berlin: a green archipelago / a manifesto* (1977), Müller, Cologne, UAA Ungers Archives for Architectural Research, 2013



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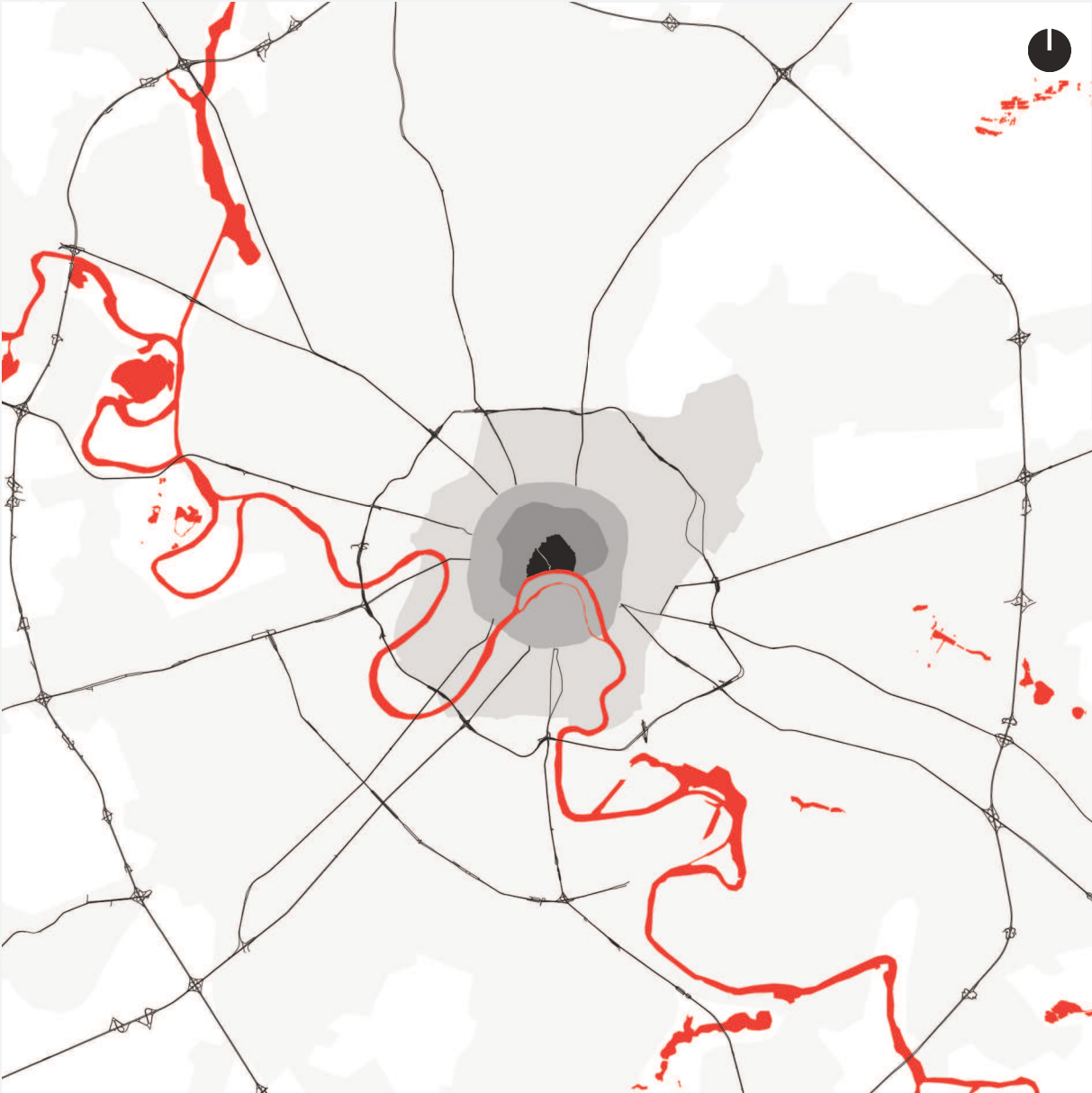
Paris Historic Thresholds.

Paris, Le Corbusier 1937



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Le Corbusier, Plan Voisin for Paris, 1925



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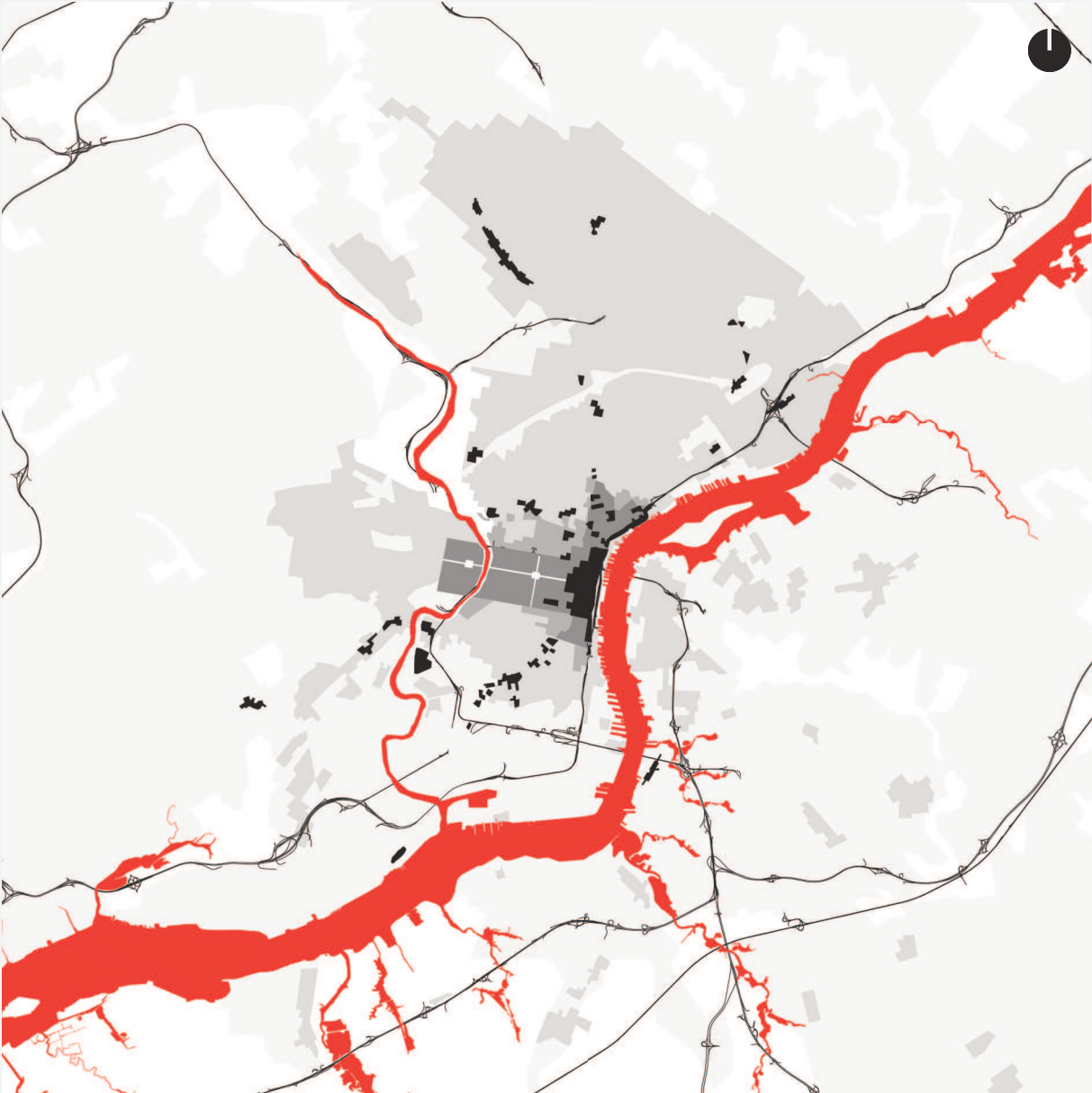
Moscow, Historic Thresholds.

Moscow, El Lissizky 1920



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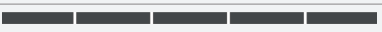
El Lissizky, Plan For Moscow, 1924



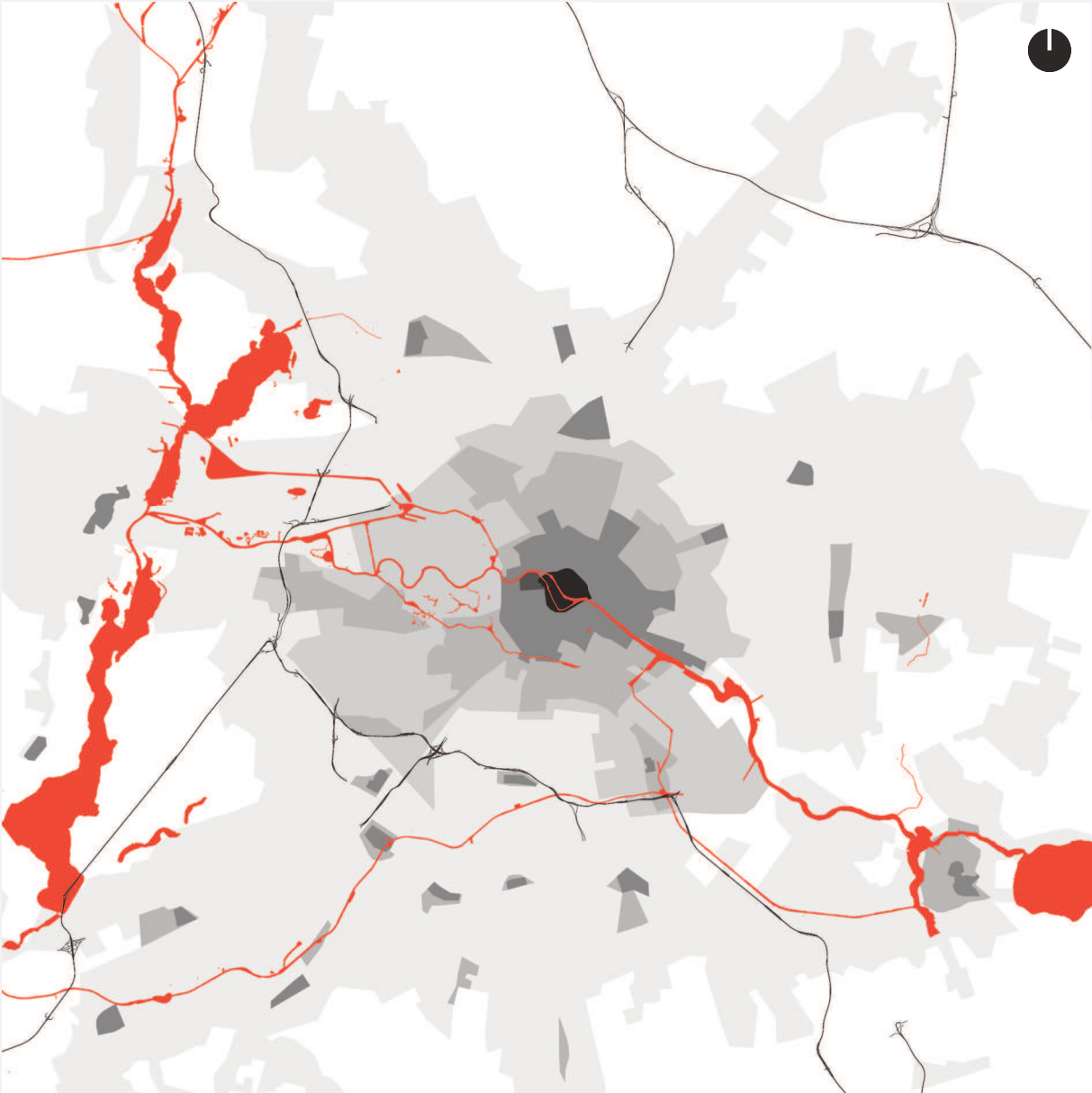
Philadelphia Historic Thresholds.

Philadelphia, Louis Kahn 1951-53



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Louis Kahn, Plan for Philadelphia 1951-53

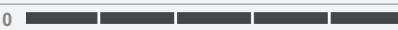


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Berlin Historic Thresholds.

Berlin, O. M. Ungers 1979



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O.M. Ungers, R. Koolhaas, Archipelago City, 1979.

Conclusions and Definition of a Node Strategy

The node strategy applied in the case study is closely referred to the theoretical text written by Sergio Crotti "*Reti, Reticoli, Reticolati*" interpreted through the conceptualization described in the chapters before. It is a compositional strategy that may be applied at various scales, from the regional through to the architectural scale, based on the dialectic between order and disorder, entropic and syntropic, between nature and artifice, public and private, local and global, analogy and contrast. In the apparent disorder, structural elements of form, through their continuous mutation emerge. Spaces of interrelation may become "morphogenetic nuclei" of the new formal configuration. As Heidegger's bridge reveals the river as a fracture in the region, the project of the nodal entity becomes revealing of the threshold between the antonymic dialectic, of the fracture between reference scales and between historic thresholds. The importance of the nodal entity as a structural element of the orchestration in the mutation of form as Alexander suggests, "We must now explore the structure of this field. The most important and most obvious structural characteristic of any complex entity is its articulation - that is, the relative density or grouping and clustering of its component elements."²¹

From the most abstract concept of net, that embraces the apparent contradiction between the figure of enclosure and the eternally expanding colonizing paradigm encompassed in it. The objective is to enhance and protect the differentiation that nodes contain. Utilizing the structural stability of inter-relational space while embracing its continuously mutating form. The strategy is based on the identification of such structural elements within the case study and the reactivation of the deteriorated interrelation flows. After a stable anchoring of the nodal entities, the strategy intends to infiltrate in the margins and interspaces of the undifferentiated conurbation through the same nodal densification

²¹ Alexander, C., *Notes on the Synthesis of Form*, Harvard University OPress, Cambridge, Massachusetts, 1964, p. 80-81

methodology to generate linear entities that re-discover residual spaces as a reciprocal scaffolding of the infrastructural traces that currently shape the settlement. Working in the space inbetween the rarefactions of margins and revealing the fractures that sameness hides is designing the Form-Context boundary as a reciprocal structure where residue is not inert.

A strategic action enables the establishment of an interpretational model of the existing characters in a potential frame of “projections”, with which it is possible to implement more effectively a process of territorial organization. A territorial organization that puts Form as the main qualitative representation and demotes the purely quantitative interpretation of the settlement used generally in planning. The proposed requirements take into account the protection and promotion of natural resources to support the territorial model. They are related with the identifying elements as well as by their historical, traditional and architectural characteristics and thus represent the nodes of a network of cultural development. In relation to the urban organization network, the relationships between the various existing or potential regional settlements that form the main systems of the Sabana are consolidated and strengthened. This orientation implies a reversal of the hierarchies within the relationship Bogotá-Sabana, increasing the supply of regional scale services in the regional centers. The valley of the Bogotá River interprets and directs the interactions, functional relationships and interrelations in the Sabana’s organizational network. In this arrangement the exclusive or unilateral relationship of the single urban center with the city of Bogotá is not privileged, but each of the five systems of Sabana is placed in reciprocal relations with each other in order to avoid social homogeneity and sectorial specialization. Within the framework of strengthening territorial settlements, the reitairy model responds to the region’s need of growth from densification strategies, excluding rarefaction strategies in order to preserve the distinctions between the heterogeneous characters of each system.

Significant places like resilient points, historical thresholds and structural nodes through a design operation are elevated to a scaffolding of “morfo-genetic nuclei”²² that may withstand successive configurations of the mutating metropolitan entity.

22 Crotti, S., Op. Cit.

In the first chapter the exploration of the formation phase proved, to a certain extent, the existence such spaces of interrelation that persist throughout the phases of formation deformation and transformation. It has also emerged that the phase of formation follows a natural syntropic process of densification into nuclei. Such places seem to persist even in cases of violent deformations and transformations such as colonization, and might be able to contrast degenerative processes within the mutation of the settlement's form.

Interrelation spaces apparently correspond with intersections between systems where the various scales interact, and if not predisposed correctly by the architectural project they seem to produce contradictions between scales and between successive orders. Still, the nexus between the stability of places and spaces of interrelation still remains to some extent elusive, although their importance within the structure of the urban form is undeniable. At this point, the characteristics of spaces recognized in the first chapter help to structure the strategy that will be presented in the case study.

The interdisciplinary analogy explored in the second chapter proves the possibility of an abstract conceptual exchange between various fields allowing a specific interpretation of paradigmatic concepts within each field. In the explicit case studied in the second chapter, the thermodynamical analogy, which has propagated in various other fields, seems to hold some elements that permit the deciphering of the dissolutive processes at work in the contemporary metropolitan settlement. Furthermore, the identification of specific procedures and composition strategies investigated, have led to suggest the possibility of a dialectic between entropic and syntropic processes within architectural design. It

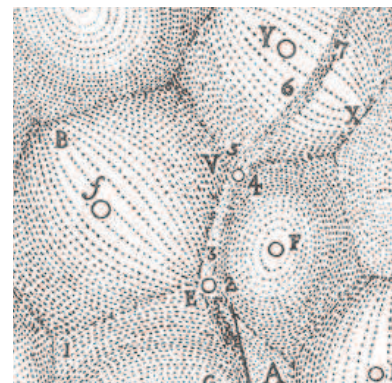
has underlined the need of the project as an articulation in the interaction of global and local relations, of natural and artificial thresholds, ultimately of order and disorder. The contradictions of built space also seem to reflect the asymmetries between the physical forms, sociocultural forms and the production forms, demonstrating that where one of these forms prevails over the rest, the consequences propagate to the other forms in a negative way. Asymmetries in social physical and productive forms generate contradictory, paradoxical and perverse effects.

Less can generate more while still reverting disorder into the environment but this is not the object of the thesis.

The interpretation of the *Net Phenomenon* as a deep morphological phenomenon of universal a character, as a distinctive trait of any system that reveals a sufficiently complex structure, as a symbol of the condition of man, and an image of his culture, allows the transcription into the architectural sciences as a useful tool in the hypothesis of generating modifications that can potentially propagate through the various scales, generating an open structure that may be applied as a process and not as a model. This way avoiding an obsolescence of the model before it may be entirely implemented. The net phenomenon from this point of view, can be combined with the previous sustentations, as it is coherent with an open composition like the projects and interdisciplinary examples exhibited in the chapter that explores the dialectic between order and disorder and utilizing the spaces of interrelation as nodal entities in order to elaborate a node strategy that can arrange a system of the residual spaces, identified in entropic processes, in combination with stable structural places.

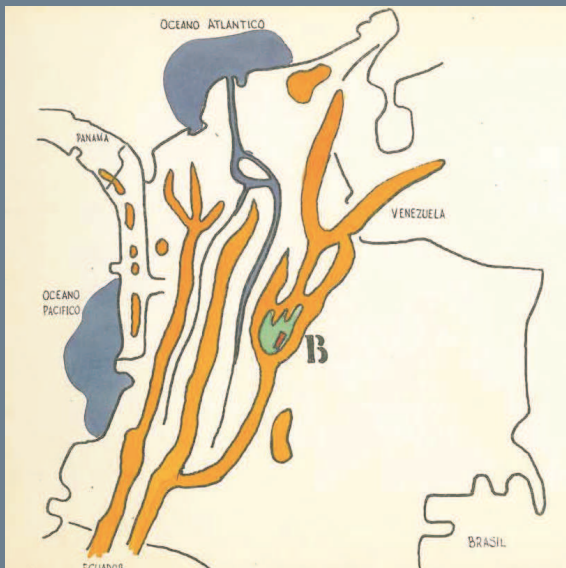
After the classification of the complexity of the aspects of human settlement in relation to the stability / instability of significant places, to the possibilities within the different concepts of order and disorder explored and the potential of the net phenomenon as the potential mechanism capable of controlling flows of interrelations between global and local, the role these concepts play within a settlement strategy must be delineated.

The exploration of the spaces of interrelation along with the identification



Descartes plenum vortices 1633

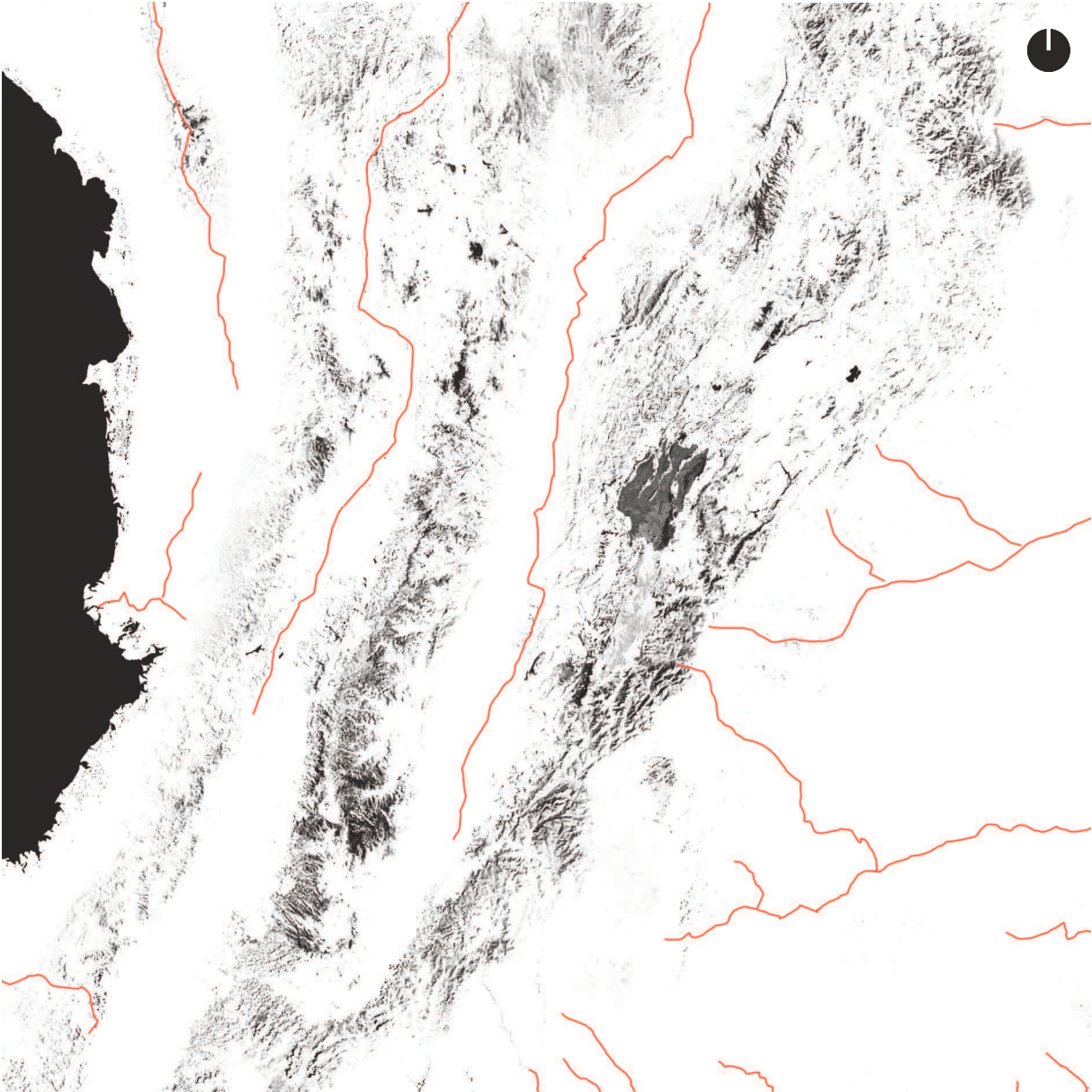
of the elements that compose interrelation networks has evidenced the parameters needed in order to identify, within a determined location, the structural elements where discontinuities accumulate and where a hypothetical node strategy must be anchored. Furthermore, within the complexity of the Latin American settlement, the utility of the identification of a variety of entropic processes that afflict the settlement along with a number of examples of the potential methods of using deformation as a predisposition for transformation, the elaboration of a specific strategy that takes into account the previous conceptualizations may be defined through antinomy: order / disorder, stable / unstable, differentiation / undifferentiation, natural / artificial, global / local, analogy / contrast.



Le Corbusier, P. L. Wiener, J. L. Sert
Plan Piloto for Bogota 1951

APPLICATION OF THE MULTIPOLAR PARADIGM THROUGH THE NODE STRATEGY

Design Experimentation (169), Sabana Systems (183), Intersections between Systems (191), North System: the Salt Route (195), *Territorial Interpretation: the North System* (196), Territorial Context (200), Multiple Ambit Identification (214), *Node_1* (246), *Node_2* (254), *Node_3* (260), *Node_4* (266), *Node_5* (272).



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The Sabana de Bogota is placed in the Eastern Andean mountain ridge Known as the “Cordillera Oriental” and occupies a central position within the national configuration.

Design Experimentation



View of Bogota

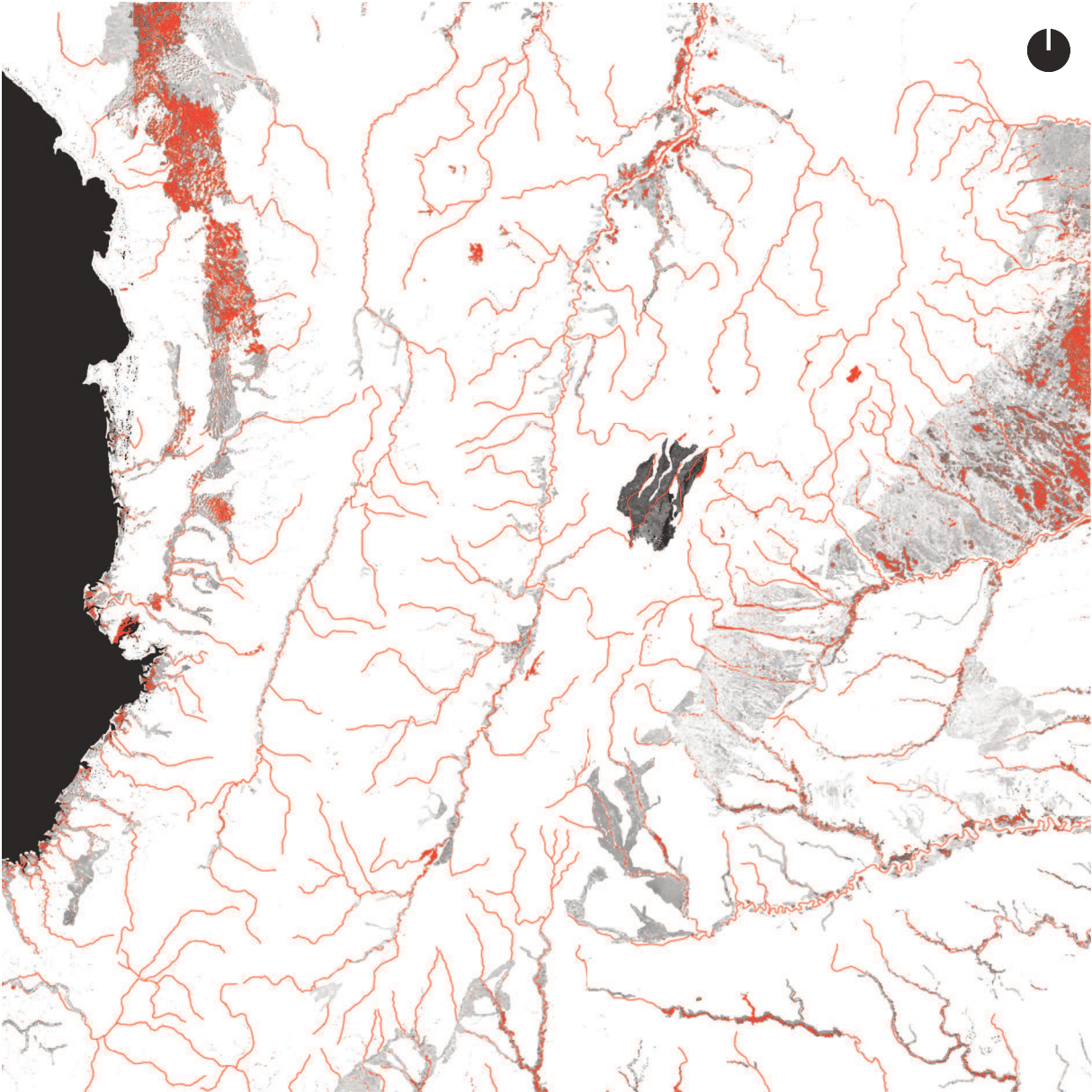
The experimentation on an actual context of the theoretical model, as explored through the previous chapters in its general aspects, is developed in the second part of the thesis by dealing with the logic and contradictions of real systems such as the Sabana de Bogotá. Five specific systems have been identified based on their morphological characteristics and relationships between Bogotá and territory systems Northeast, North, Northwest, West and South. The sequences of recognition and interpretation of the Sabana context focus on procedural aspects that lead to recognize the specific locations of interrelations starting from the characteristics of the nodal entities. Here lays the interest of a theoretically oriented experimentation that implicates the project at two levels, as a projection of a concrete- realistic level and in a possible-realistic level contemporarily.¹ The project operates a local transformation of space founded on the intrinsic discontinuities of contemporary architecture in relation to its context through a process of densification into “discrete places” that innervates the urban field functionally, formally and technically. Generating a transformation of all the elements of the architectural form: physical, cultural and technical and re-elaborates interfering historic layers, in order to achieve a typologically complex environment that follows an inter-scale logic.²

The recognition conducted through a chart process of a specific system -system North from Chia Zipaquirà- consents the detection of steps in which entropic processes occur at different scales, often in opposition to higher degrees of ordering of individual fragments in the previous scales.

Conceptual outlines are measured against the existing materials in the territory, such as shopping centers, schools, universities, gated

¹ “Di qui l’interesse per una sperimentazione teoricamente orientata, che implica il progetto ad un doppio livello: nel proiettare un “concreto reale” in un “reale possibile”...”

² Crotti, S., “Morfogenesi urbana e trasformazione locali”, *Quaderni del Dipartimento di progettazione dell’architettura*, n. 2, Clup, Milano, 1985



The fluvial system at a National scale evidences the exchange, predominantly North South direction, following the rivers of Magdalena and Cauca Rivers favoring an exchange with the Northern coast in Barranquilla, Cartagena and Santamarta.



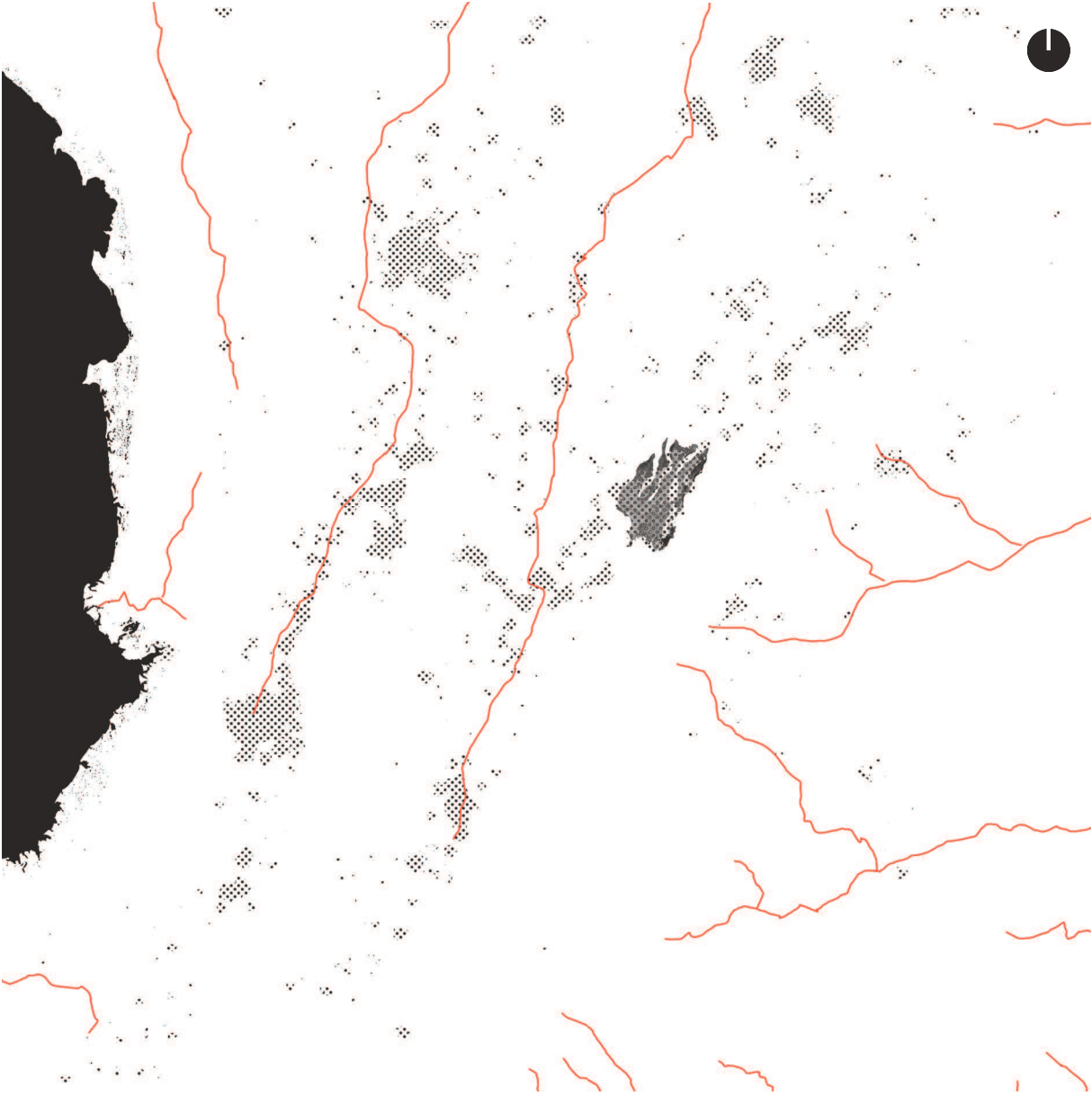
communities, residual or abandoned areas; but also pastures, greenhouses for floriculture and disused railway stations. The proposed strategies act in the conviction that an exchange between social and physical forms, between local logic in relation to the global trade is possible: projects are oriented to detect nodes of interaction through the discontinuity of the urban rhythm.

This is the case of the floricultural greenhouses, involved in the strategies of coagulation or dissipation, with the aim act as an articulation between local and global production logics, finding a new concept of market, not only as a place of trade but of social exchange as well. The problem of public spaces, increasingly privatized, focuses the effort on commercial and cultural islands and their impact on public space: measuring and restricting some of these architectural schemes the goal is aimed at establishing new polarities within the relationship between solid and void, center and margin, with the intention of transforming these significant spaces into interrelation nodes.

In all these cases the set of solutions proposed have been used as tools to ask more questions more than stating certainties. More specifically, ways of relating with context have required different strategies of spatial organization:

- Chia and Portal del Norte relation; two entities of which the first one is recognized as a complex polarity and historically autonomous in contrast to the last layer "*macrocephalic*" development: among them are arranged alternately communities with restricted access in which community gardens, golf clubs, theme parks and colleges linked by major infrastructure (Autopista Norte).

- Redefinition of the relationship between the system of Humedales and the margins of the existing settlement: in this way is the potential existence of a threshold between water and shore from an architectural point of view in the contact between the different spatial scales, in reference to Le Corbusier's Director Plan for Bogotá of 1950.



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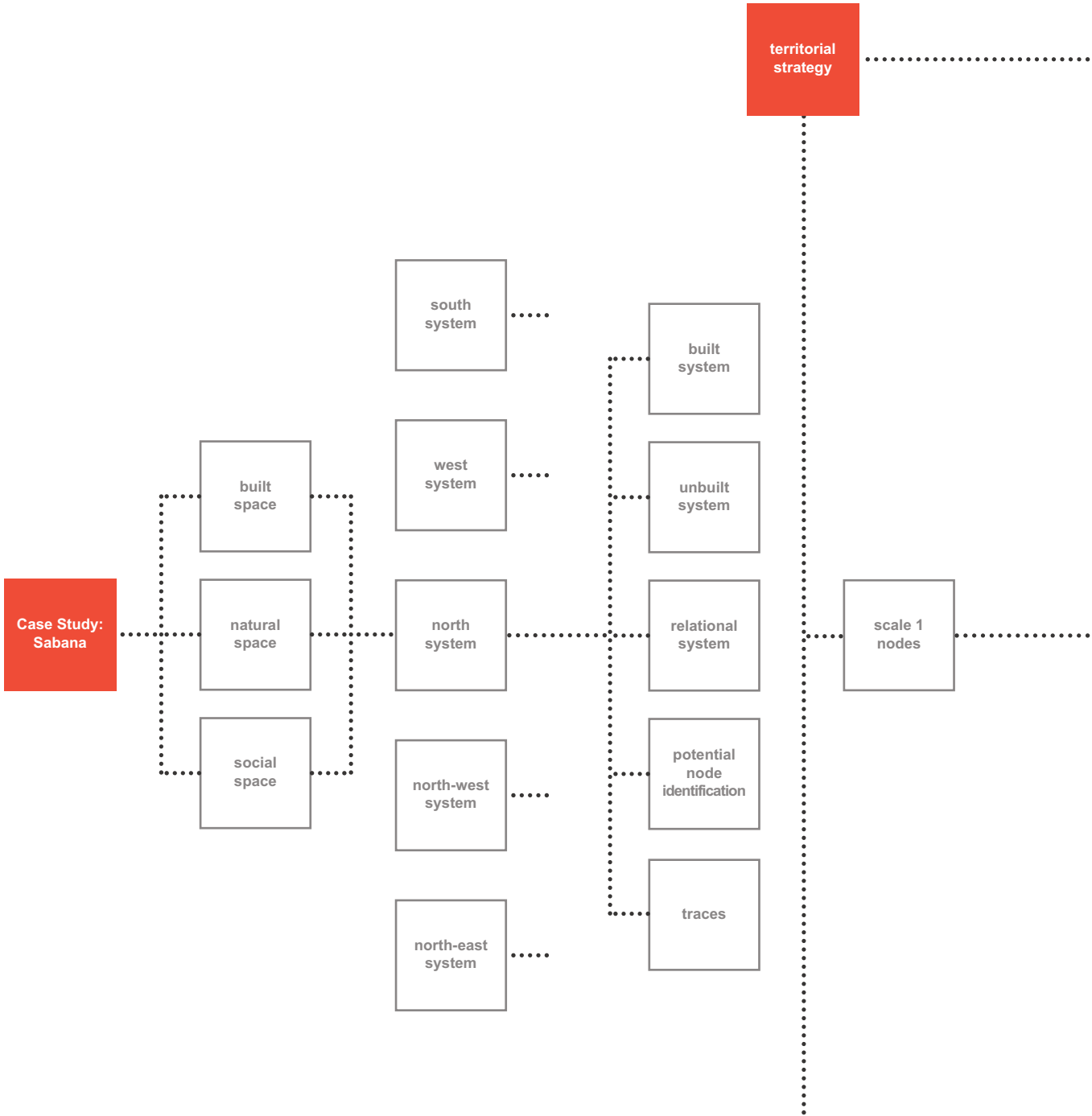
The Settled space of the region follows both the Magdalena and Cauca River Valleys as well as the Cundinamarca and Boyaca Plateau, known as "Altiplano Cundiboyacense."



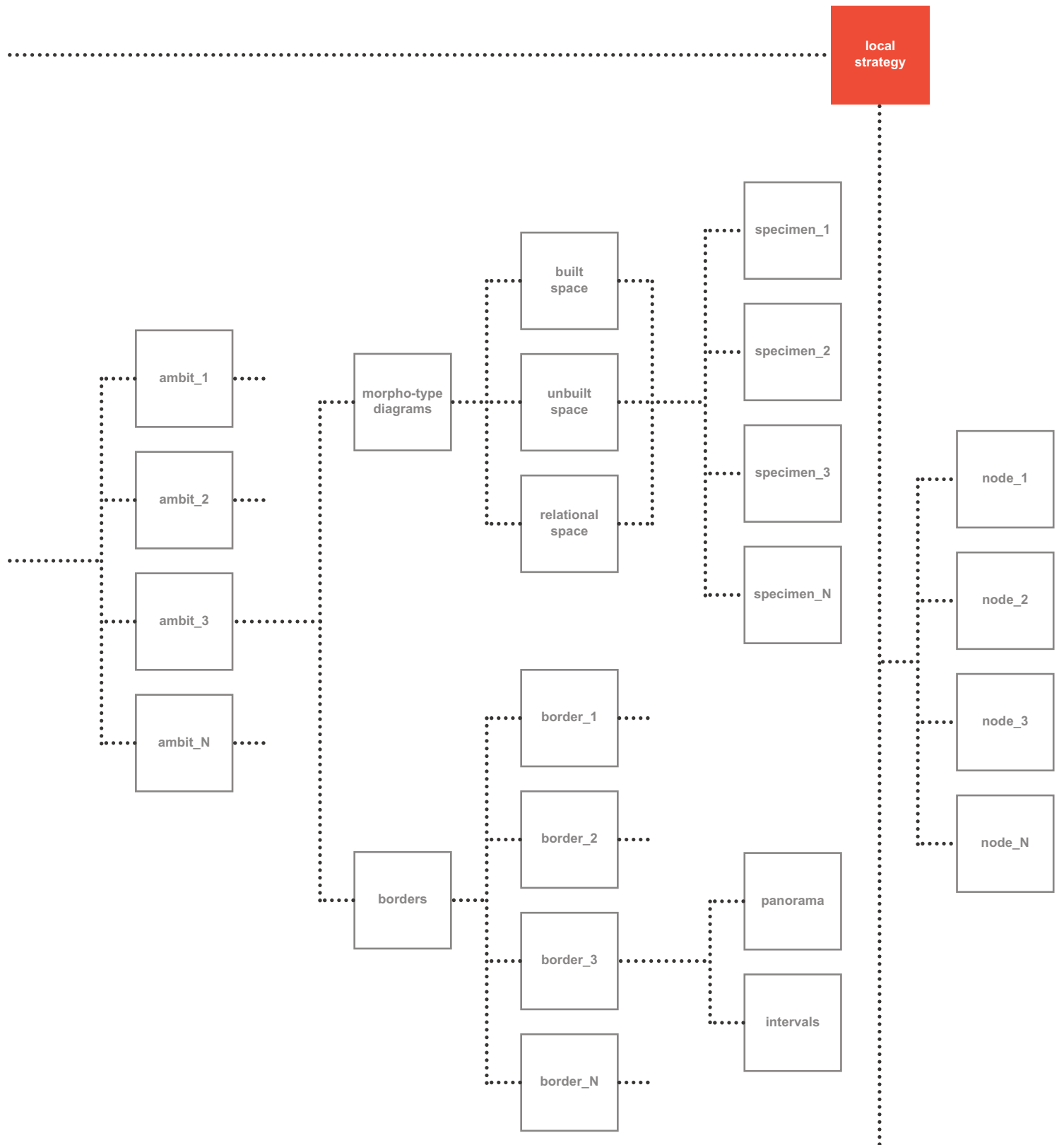
-The experimentation of local elements of inter-scale capacity able to reactivate the latent potential of recognized nodes. Elements (reinterpretations of local orders such as greenhouses and colleges in the public sphere) permeable to the human scale but readable to the territorial scale such that they operate as a link between systems moving properties of interacting elements (order between the rhythms full-empty, including guidelines visual, and between the mobility in the area) which do not depend significantly on the nature of the elements.

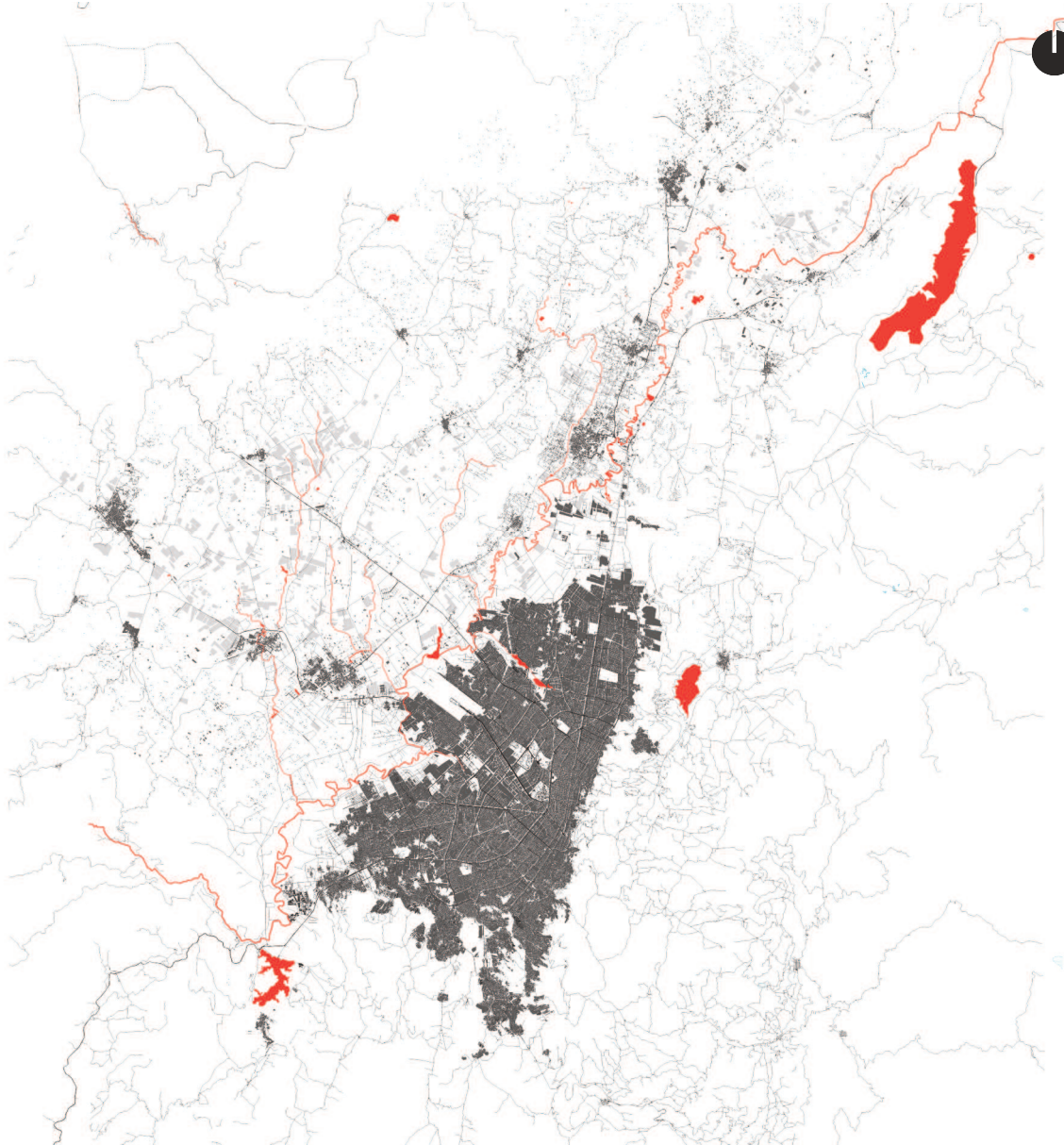
Starting from a reduced number of assumptions, the project achieves testable results. It anticipates the very early stages where the production of disorder may be controlled from nodal places of scalar interrelation; Experimenting the modalities that activate a type of chain reaction reorganization process; explores how small changes in local orders can transform communities, business sectors and urban territories; Indicates the potential of the reticular phenomenon and declares the existence of synergy between urban entropic and syntropic processes; discovers the extent to which the reticular paradigm may be used as a mechanism to reorganize and reconfigure individual elements dominated by randomness.

View of Bogota Center and Av. Jimenez



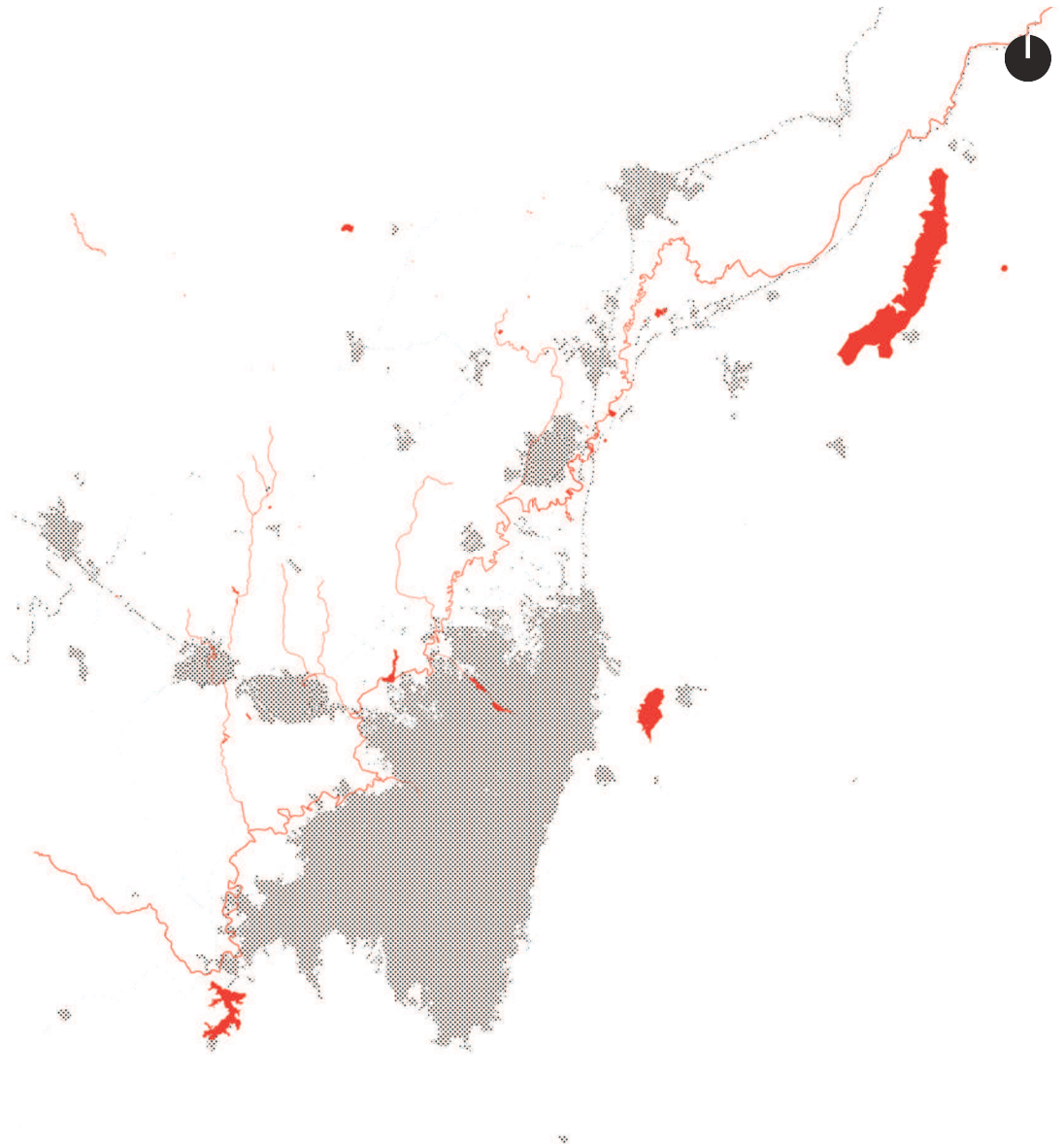
Conceptual map





Urban Form

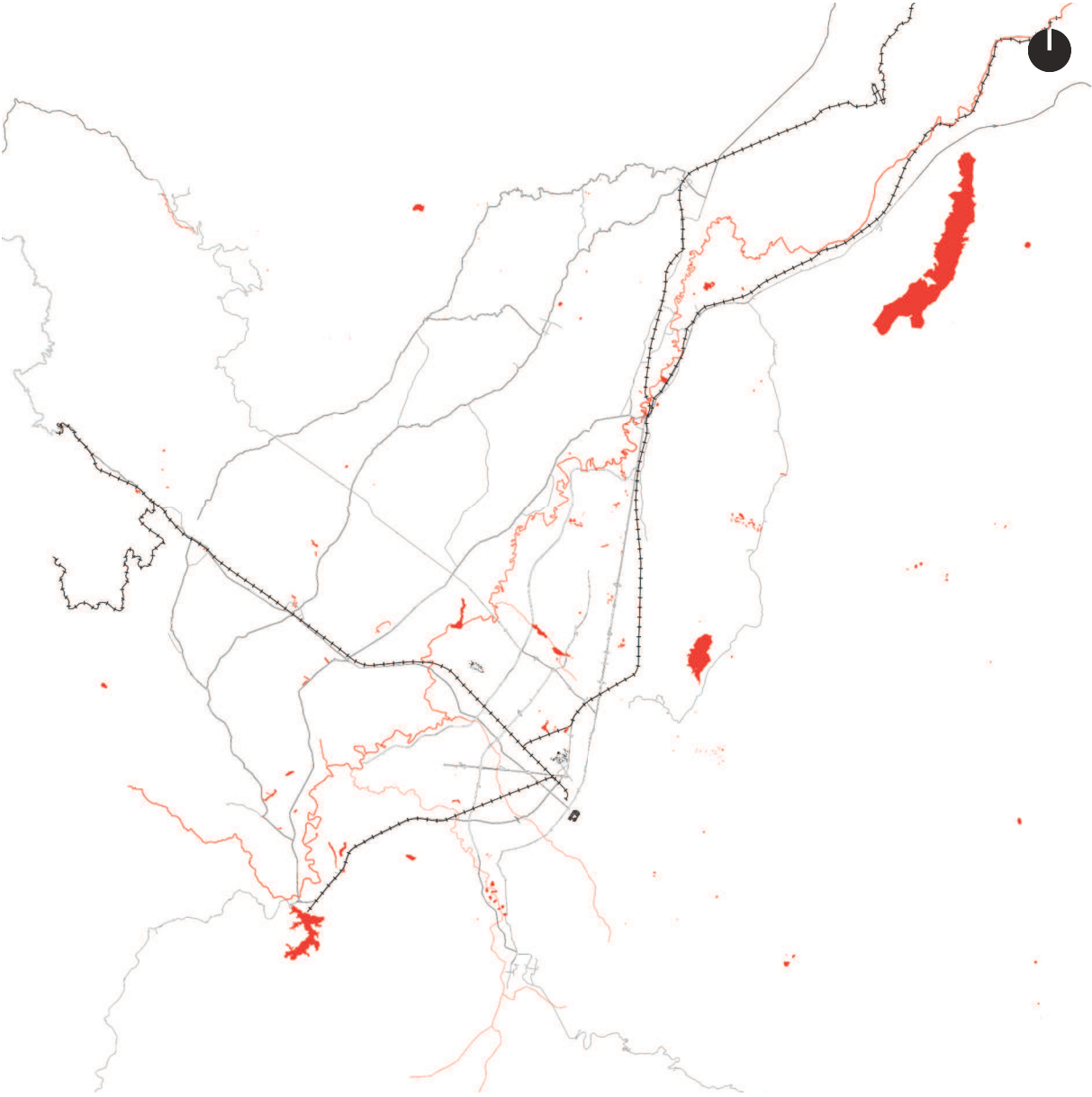
Three forms of urban development: The main centrality that absorbs the regional structure; the conurbation's settlements, which use the city's facilities while finding labor in the territory; sub regional settlements, which have a nucleus with independent facilities; rural centralities.



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Built spaces

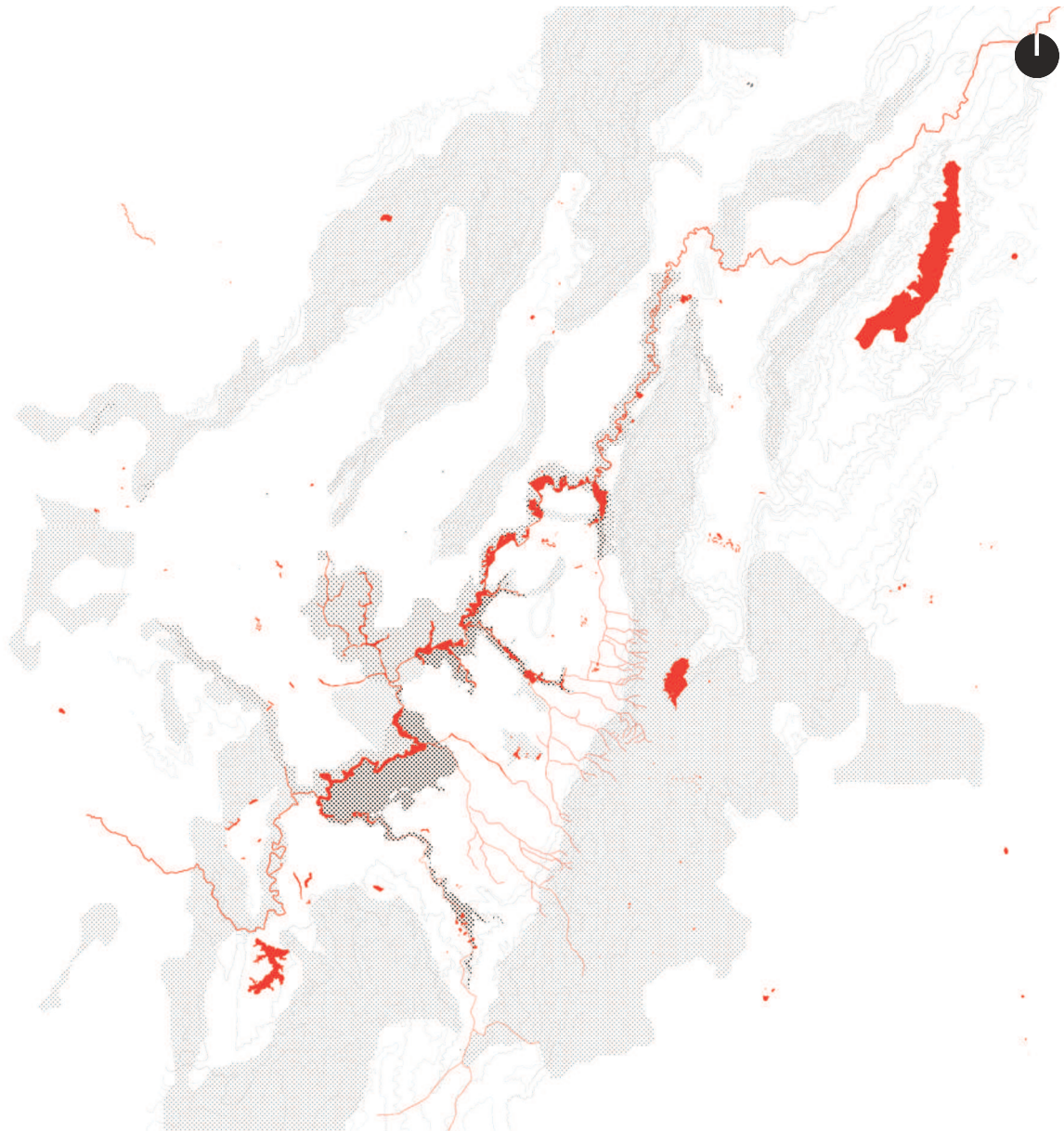
The city and minor regional settlements function as a larger differentiated and mostly unbalanced metropolitan area, while still remaining closely related. Soacha has clearly become an extension of Bogotá, analogous to the processes seen in Usaquen, Fontibon, Suba, Techo etc. the north and west systems present themselves with a high degree of interrelation and have become, to a certain extent, conurbations with their own identity.



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Infrastructure

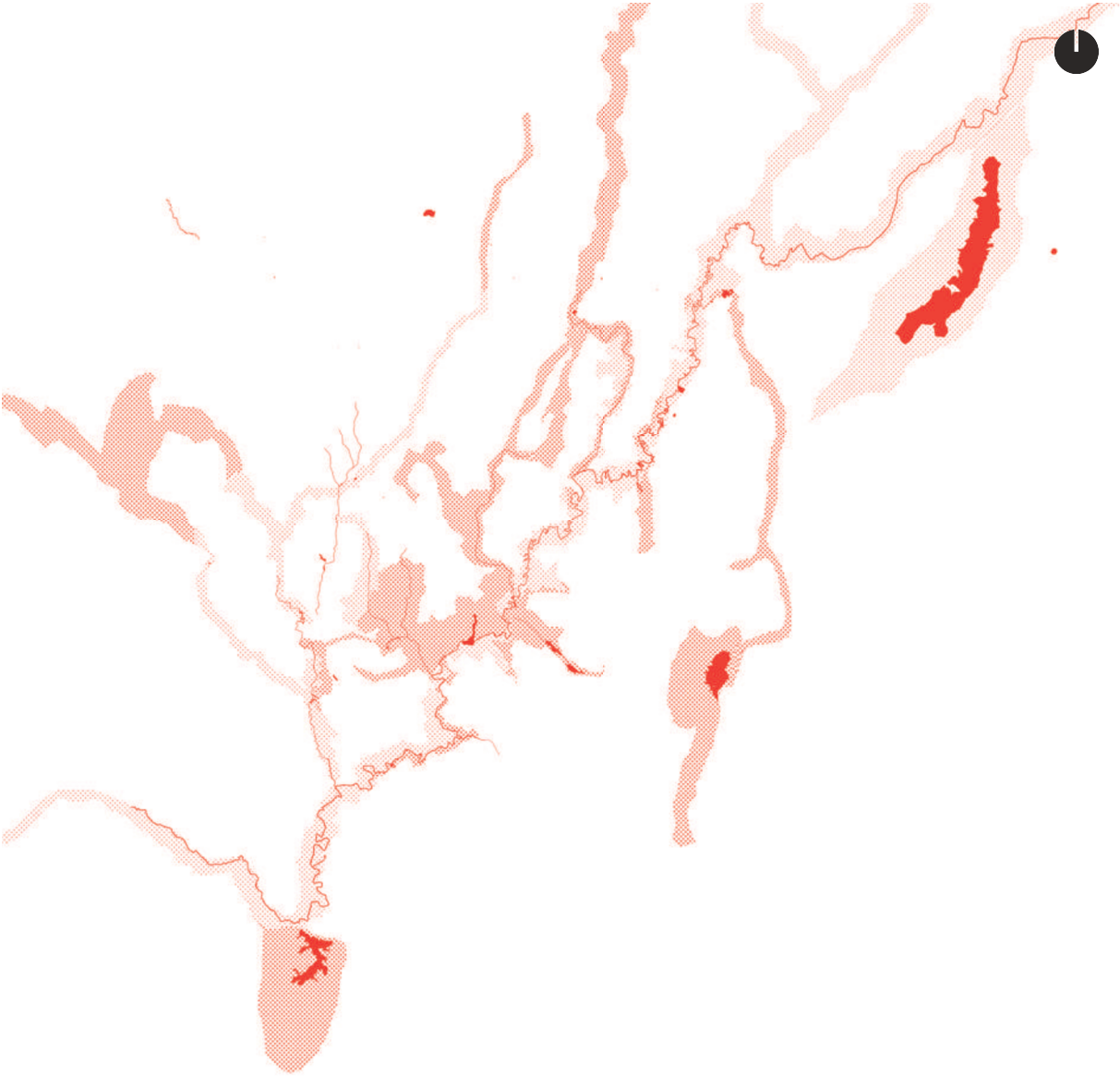
Sabana railway and Highway. The infrastructural network evidences the problematic of interrelation and exchange between the main centrality and the Sabana territory. A densification of connections is found in the proximity of the Bogotá nucleus, as well as a disconnection with adjacent metropolitan areas. While the abandoned railway system (Tren de la Sabana) that had historically connected the Sabana to Bogota must be re-used as a vicinities railway connection by regenerating the old stations which have high architectural value and are potential landmarks that can be usefull to exchange both between natural and artificial systems as well as to generate a more sustainable metropolitan growth.



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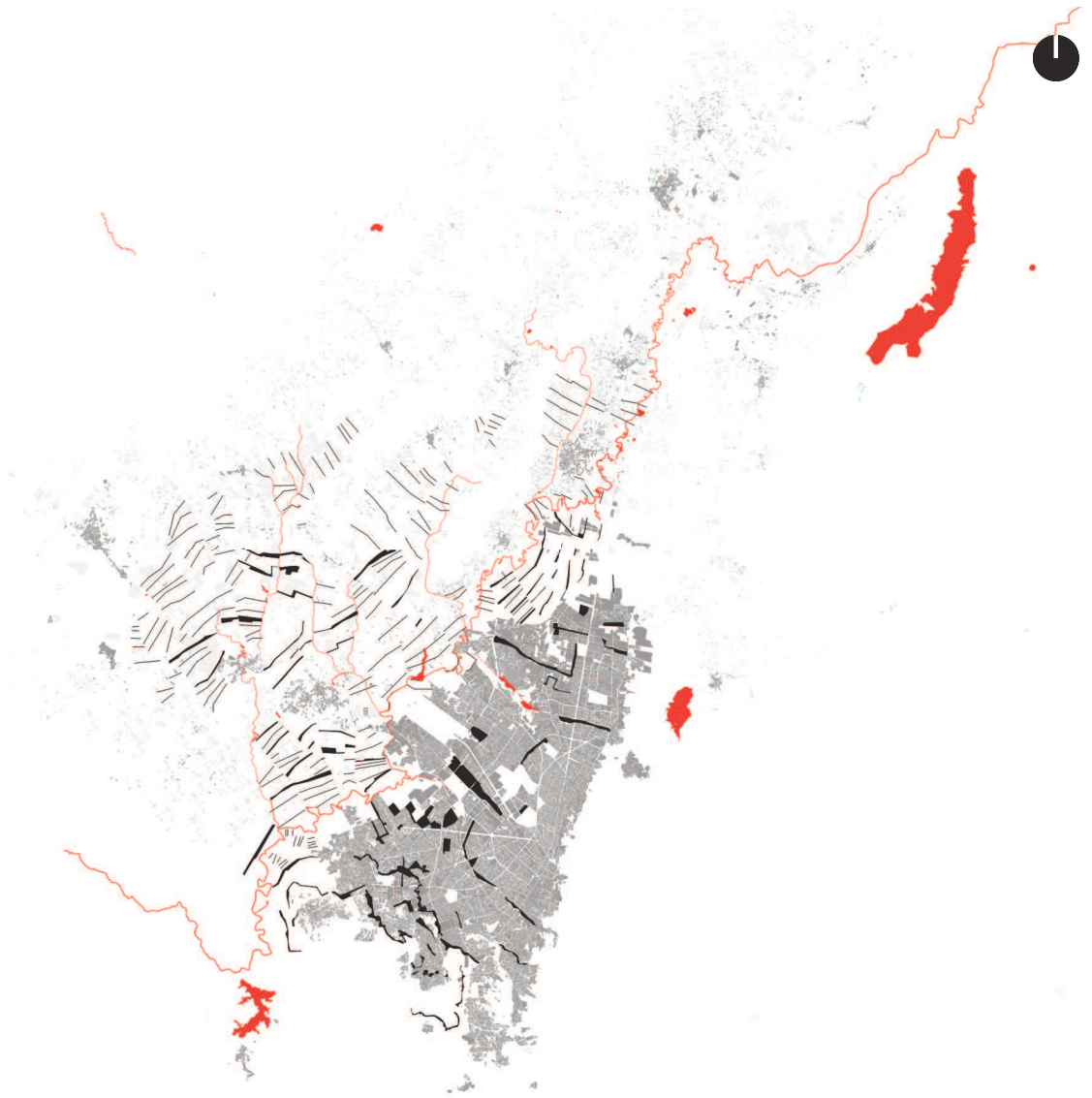
Natural Elements

Natural elements are the basic components that define the territorial settlement model: the regional natural reserve composed by the Sumapaz Chingaza system; the mountains that delimit the Sabana de Bogotá; the Bogotá River and the corresponding fluvial affluent system; the Humedal system; Rural land utilized mainly for cultivation.



0  20 Km

Hydrological system
Thanks to its river, the Sabana of Bogotá has the highest demography, the highest agricultural potential, and the highest vulnerability to natural disaster of the whole country. The river creates a system of natural "humidales" which form a strategic ecosystem around the City.



0  20 Km

Margins

Urban margins of the Bogotá centrality present a increasing population. A high percentage of this population works on the city but mainly in the agro industrial sector, while the poorest classes are mostly found in the spaces where the delimitation between the main centrality and the peripheric conurbations is unrecognizable.

8

7

4



3

6

2

1

9

5

- Santa Fe de Bogotá 1
- Chía 2
- Zipaquirá 3
- Tausa 4
- Funza 5
- Facatativá 6
- Tabio 7
- Subachoque 8
- Tequendama 9



Sabana Systems

The Sabana de Bogotá may be outlined as a triangular shaped valley with Facatativa, Sibate and Zipaquira and is crossed from north to south by the Bogotá River.

In relation to the Sabana territory, the city of Bogotá assumes the consolidation of a highly centralized metropolis. The city is the main reference in governance and administrative matters, and attracts the main commercial activities and public facilities.

Until the beginning of the 20th Century the polarities around Bogotá assumed a nearly reticular disposition. But after the savage growth this structure suffers a centripetal deformation, which is visible under a number of aspects: as a disproportionate growth with respect to the surrounding territorial polarities and in terms of social segregation.

A first element of differentiation between the regional structures is made by the three systems (conurbations) identified through the urban development and growth processes in the Sabana: The North system, which includes the Chia, Cota, Cajica, and Zipaquira polarities, with Zipaquira covering a regional hierarchically higher role; the West system including Funza, Mosquera, Madrid and Facatativa, with the later covering an analogous hierarchical role to Zipaquira, and the South system which includes Soacha and Sibate.

Beyond the three main regional systems, by taking in consideration the historic and sociocultural characteristics of the Sabana two other systems may be identified: The Northwest System, which comprises El Rosal, Tabio and Tenjo; the Northeast System, which includes La Calera, Sopo, Guatavita, Gachancipa, Tocancipa, Sesquile and Suesca.

Within the systems are identified four constituting elements of the agglomerations. A first element of differentiation in the regional structure is the three conurbations in which the process of development in the

Opposite left: section of the Map of Sabana de Bogota by Elisee Reclus, 1875
Source: Nouvelle Geographie Universelle

Opposite right: section of Cordilleras Monuntains

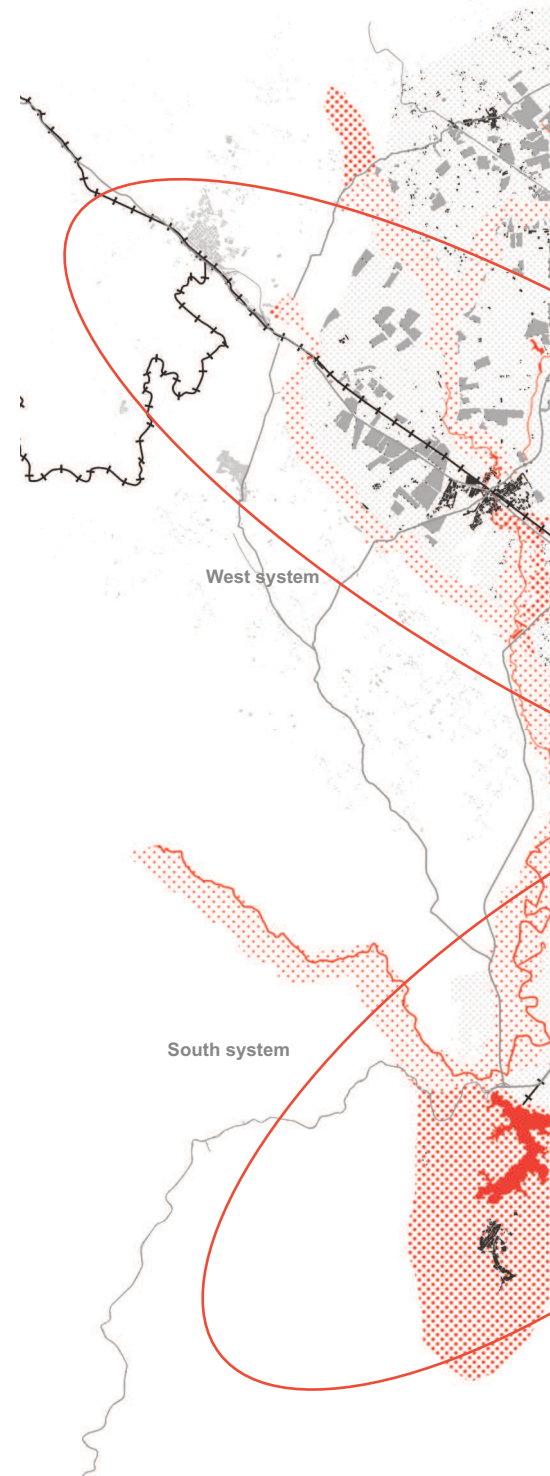
Sabana focuses, growing along the radial axis of communication and that tends to incorporate the various regional centers.

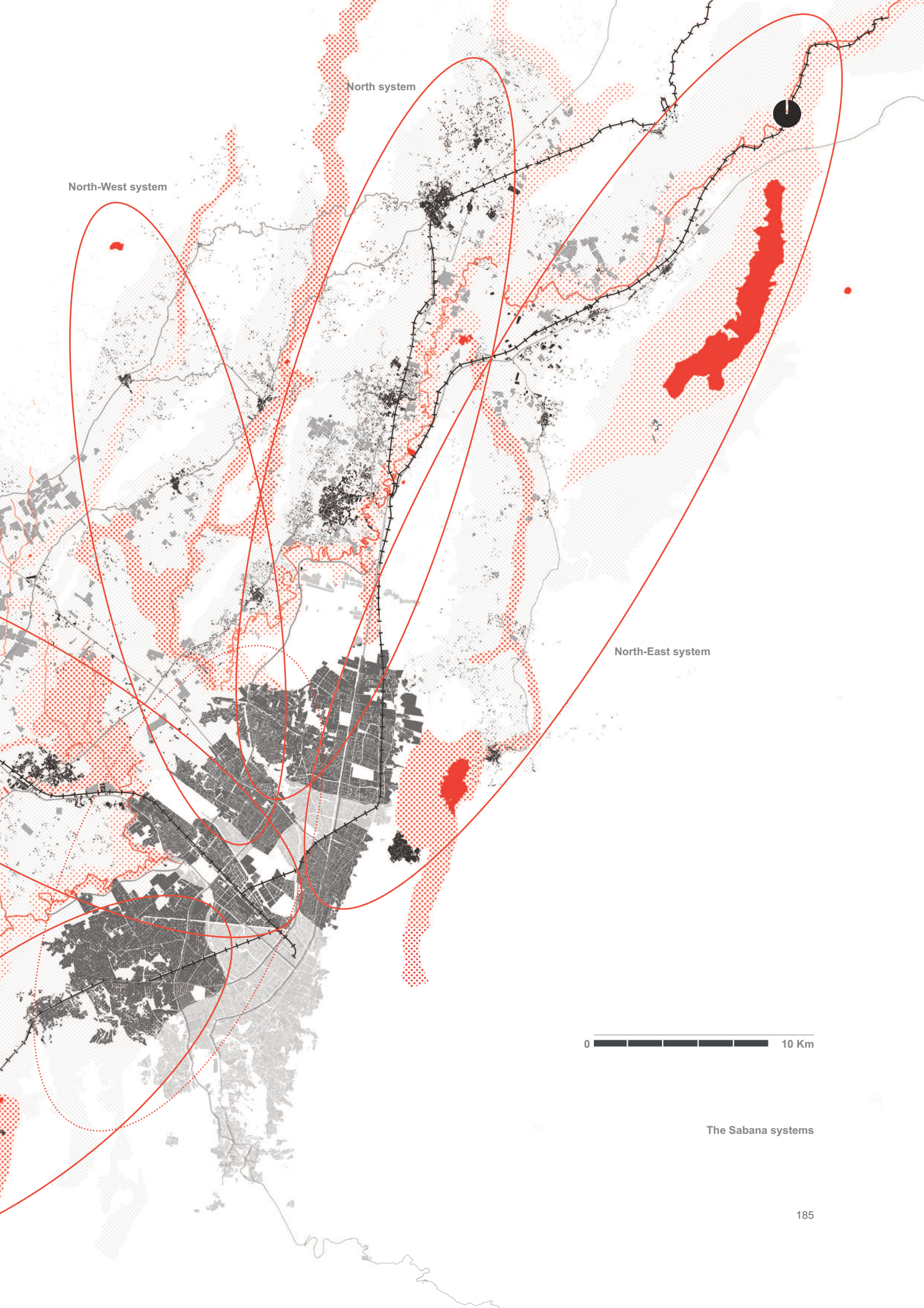
The morphological structure of the Sabana has allowed some regional centers to establish relationships with Bogotá and simultaneously to maintain a functional relationship with the other regions of the department of Cundinamarca (the cases of Zipaquirá and Facatativá). This means that services and activities are not produced exclusively oriented towards the metropolitan centrality's market, but are balanced with other adjacent regions, so as to constitute the external border of the relational systems.

A suburbanization process of the suburbs of the most dynamic urban centers of the Sabana is identified. Such process finds greater vitality in areas where a recreational, educational and commercial use is present.

The suburbanization of the outskirts of Bogotá and the North System is the beginning of an increased dispersion with extensive ground consumption.

Finally cores and rural areas show a survival of traditional agricultural activities alongside of a slow penetration of urban activities. Where processes of parcel fragmentation of rural areas destined at a suburbanization, recreational (private Clubs) use, and to a lesser degree floricultural land use.





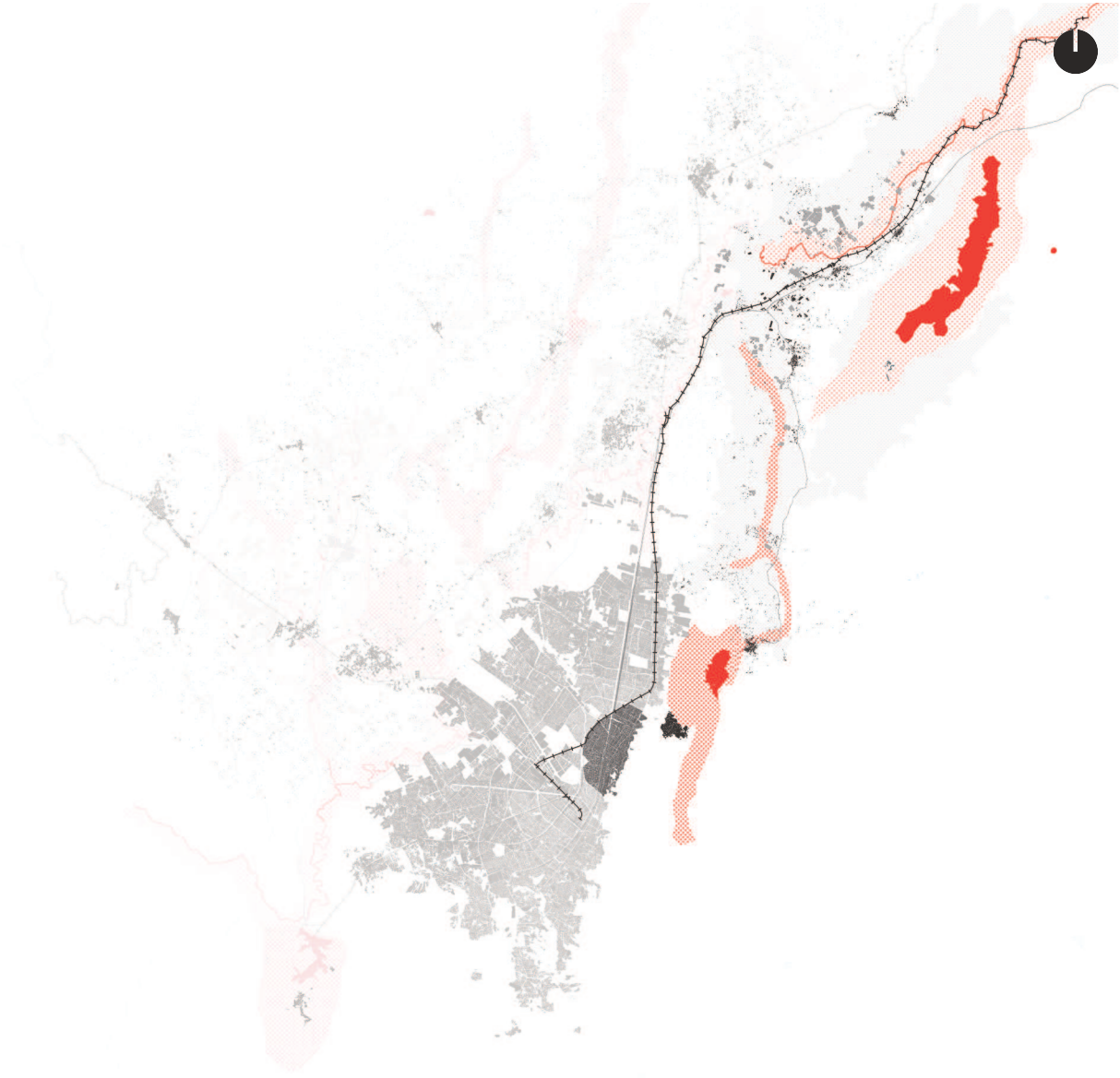
North system

North-West system

North-East system

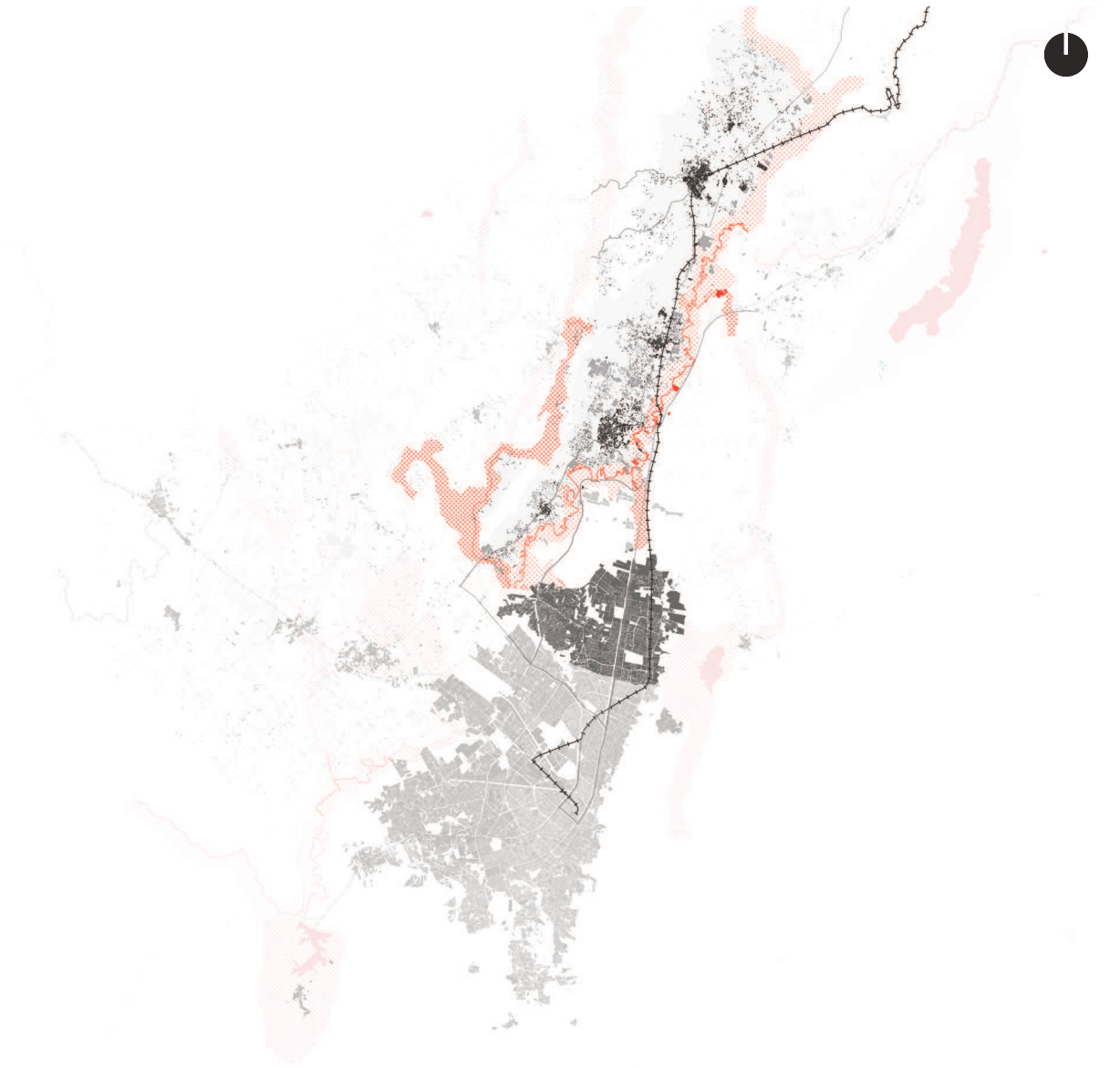
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The Sabana systems



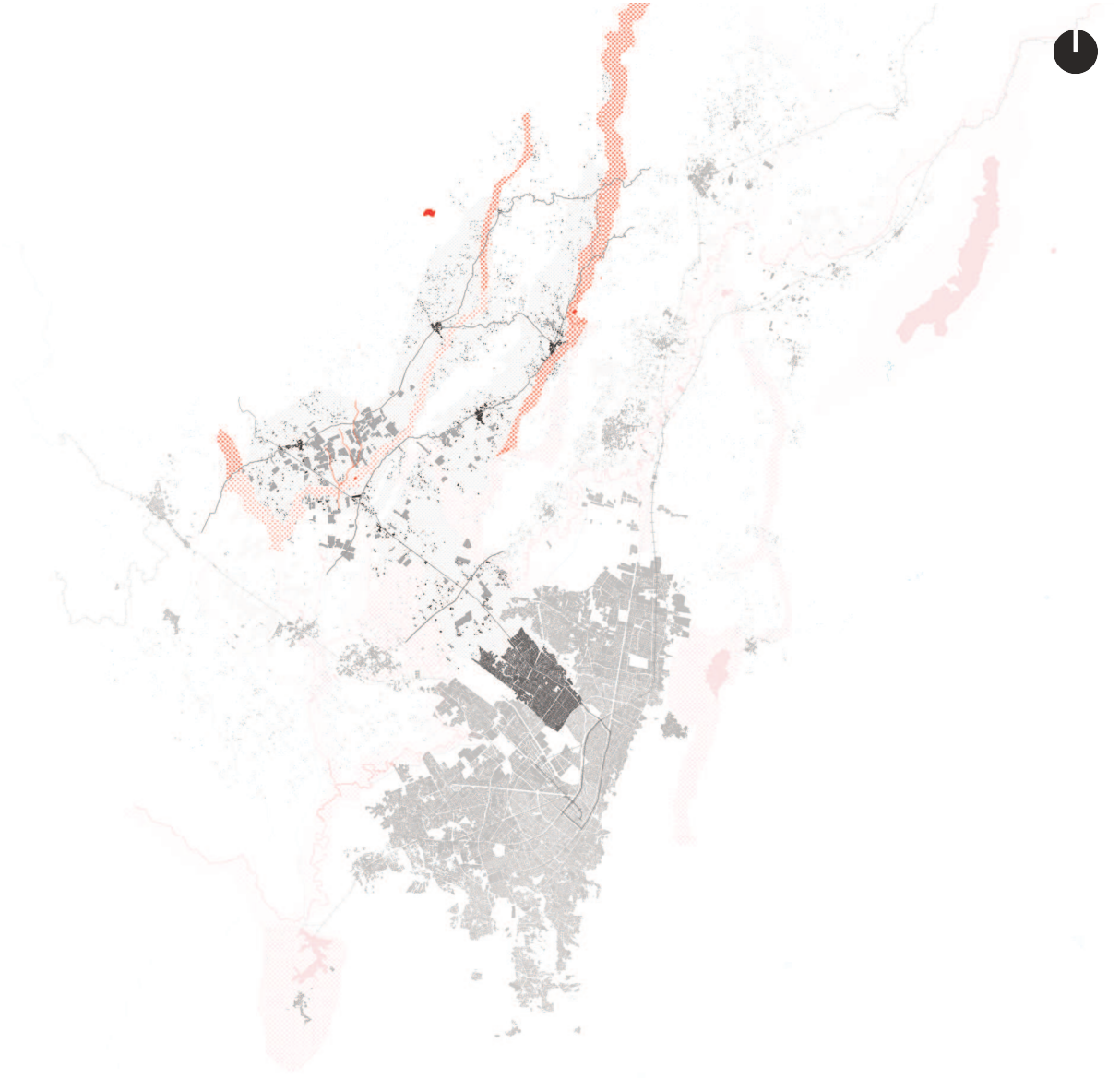
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The north East System, composed by La Calera, Guasca, Sopo, Gachancipa, Suasca and Sesquile.



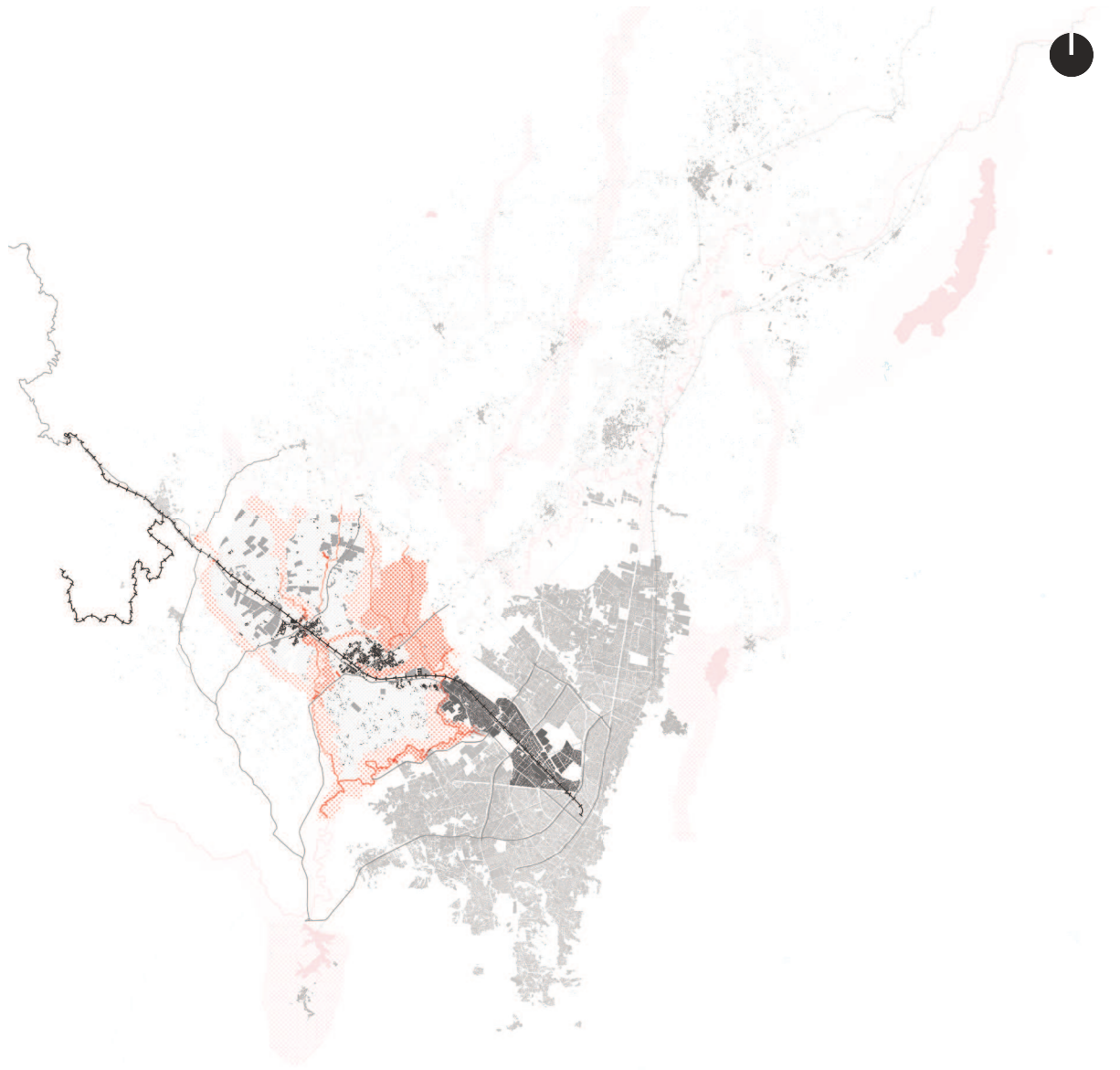
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Ther Noth System: composed by Guaymaral, Chia, Cota, Cajica and Zipaquirá.



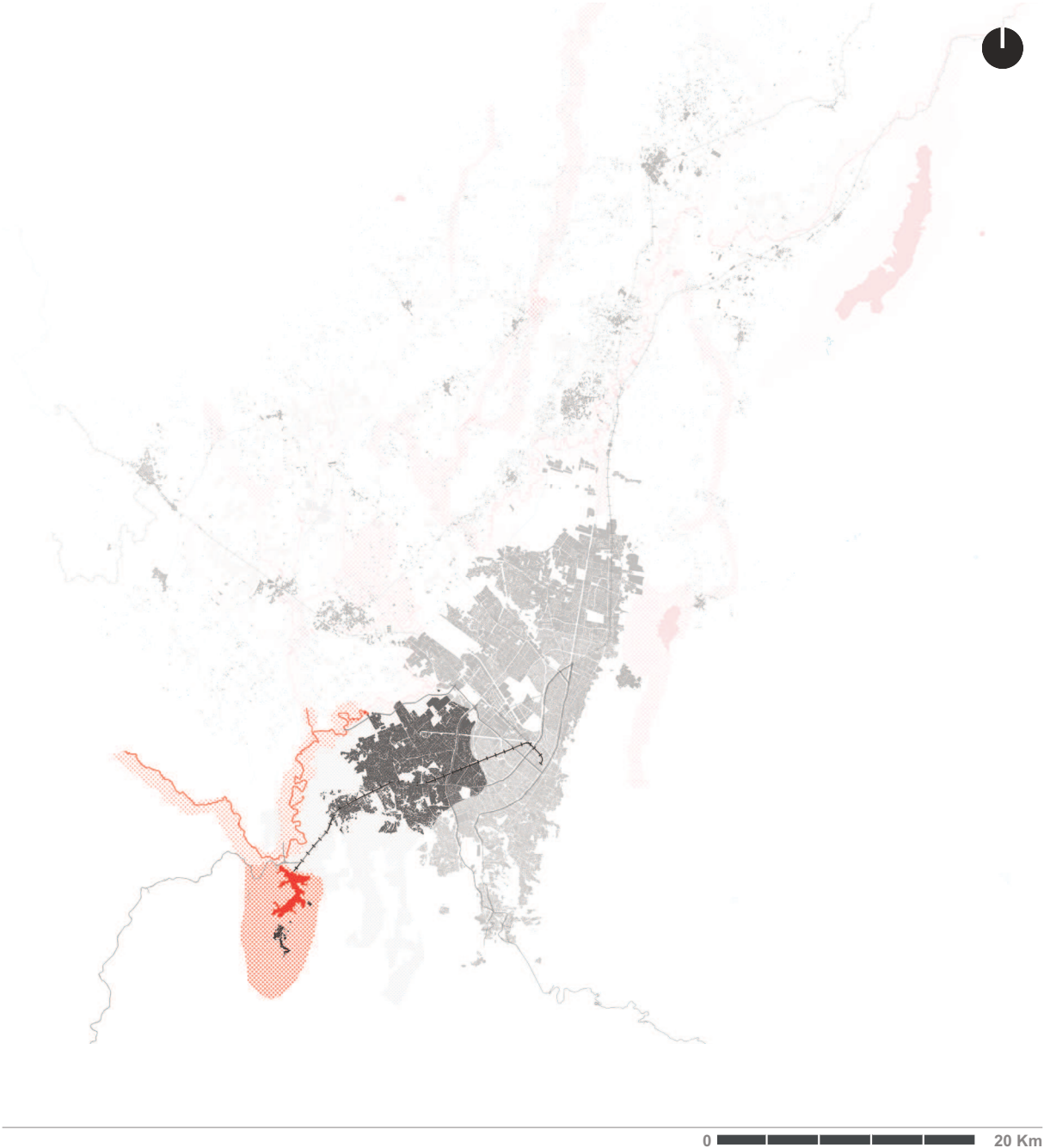
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The North West System, composed by Engativa, El Rosal, Tabio Tenjo, and Subachoque



0 20 Km

The East System, composed by Fontibon, Mosquera, Madrid and Facatativa.



The South West System, composed by Bosa, Soacha and Sibate.

Intersections between Systems

The main elements that make up the metropolitan area of the Bogotá-Sabana do not differ materially from those that characterize land use throughout the metropolitan area. Briefly these elements are represented by: the main city, high hierarchy of services for the population and for the adjacent centers, with which there is a phenomenon of functional regional and metropolitan interdependence; the conurbation of some of these agglomerated urban centers by means of the physical growth of the original nuclei and that today present the appearance of a continuous mesh; the interpenetration of agro-industrial, industrial and urban activities throughout the regional territory.

Therefore, the binomial Bogotá-Sabana has configured, from a structural point of view, a metropolitan agglomeration, which operates with a very high degree of dependence from to the current political and administrative jurisdiction. Its elements are highly interdependent from the main centrality and within each centrality there is a relatively differentiated aspect that is manifested at a regional scale as polarizations or sectorializations of specific localized activities.

Alongside a national scale metropolis with a high grade of centralization of all territorial functions (in governance and administration, in financial matters of national and international trade, business services and telecommunications, facilities and health care), a balanced and organized distribution of these activities in the regional system is not clearly recognizable. The elements of the peripheral centralities tend to specialize in mono-functional characteristics (logistics, commercial, educational, or floricultural greenhouses).

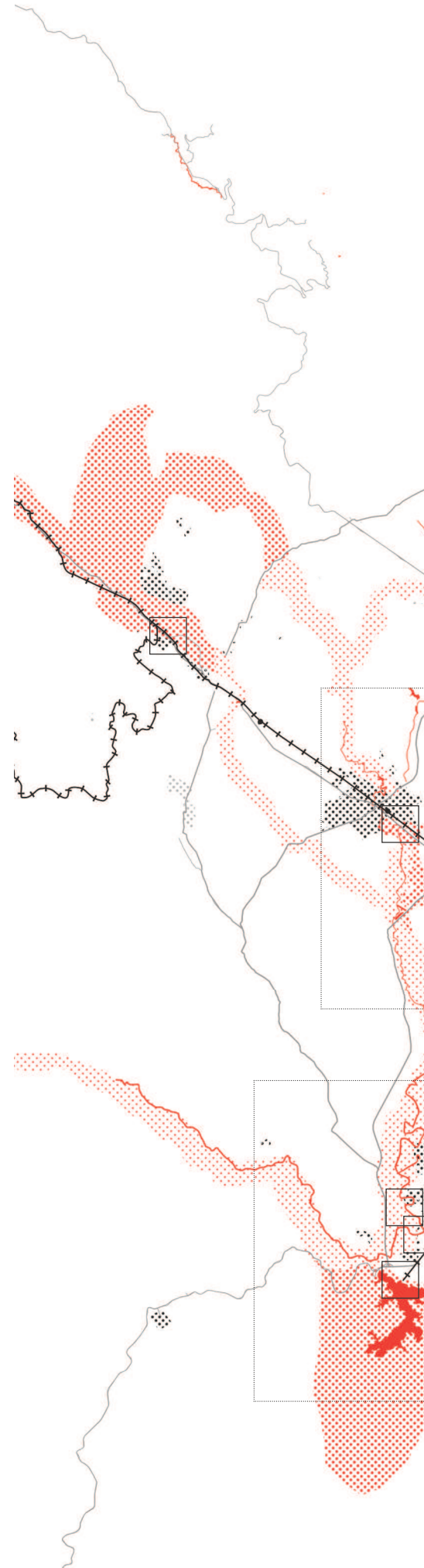
The subordination of the other urban centers to the centralization of services is a process that occurred spontaneously. It is not identified with a clearly ordered and balanced distribution of these services across the region.

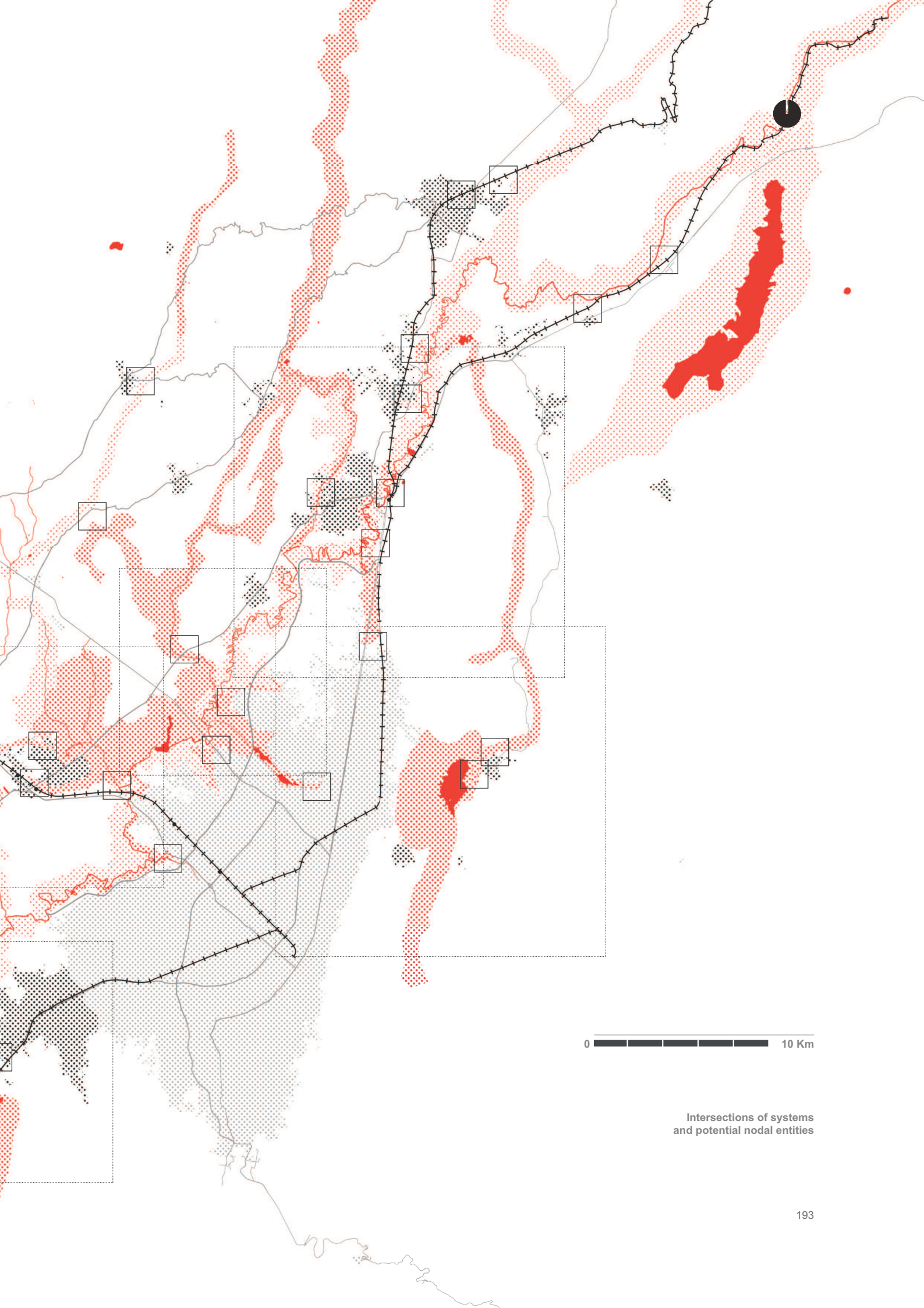
In this way the different elements of the agglomeration of the Sabana tend to be configured as systems of characterizations at the expense of single multifunctional centers.

The areas evidenced in the map show the intersections between systems of different nature. intersections between the ecological corridors and infrastructural networks in order to use such spaces as the interrelation between reciprocal orders.

As the previous maps illustrate, there are regional structures that, after a more local articulation, may be able to guide the transformations at a global scale using such structures to configure a regional form.

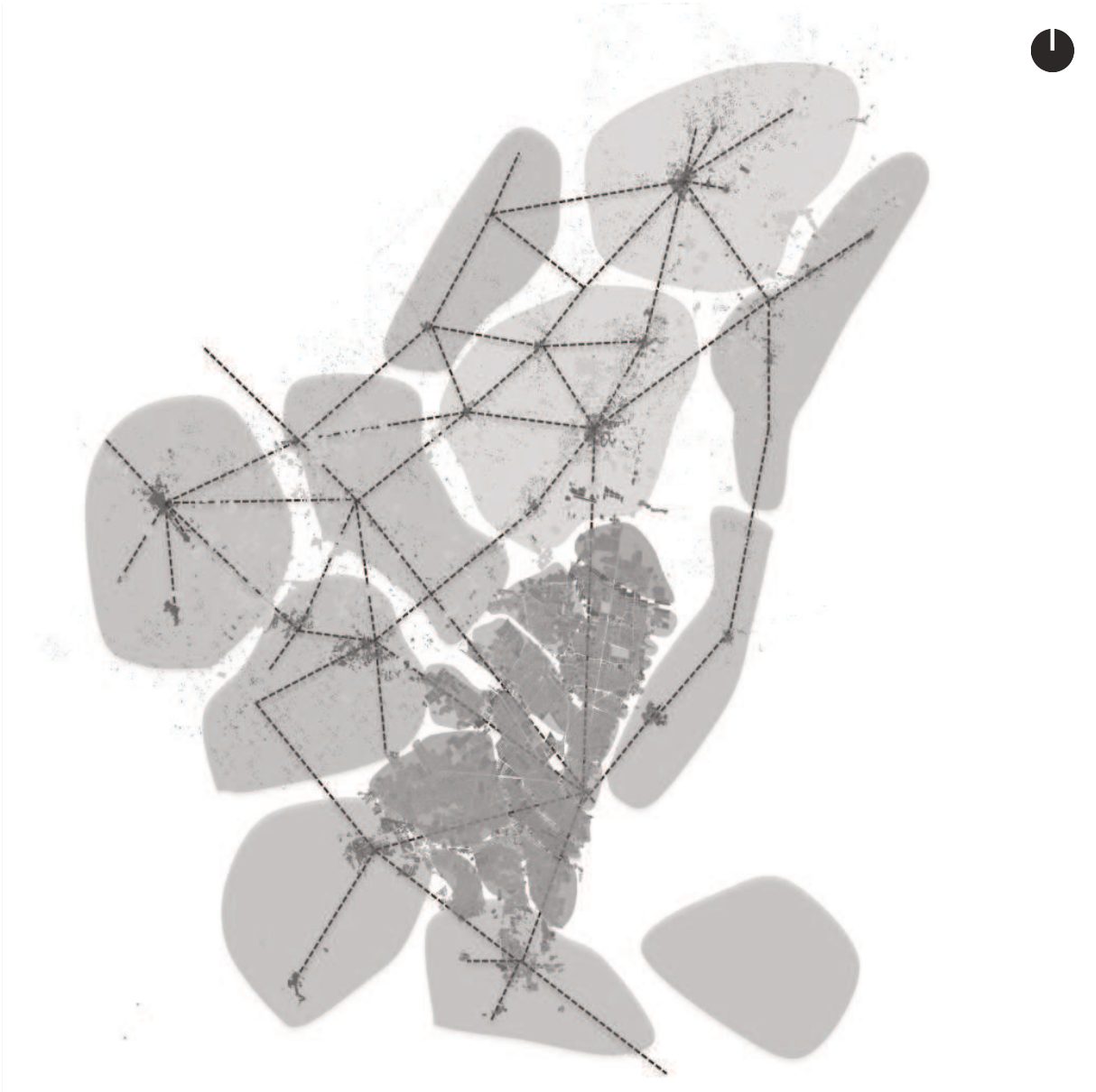
These spaces are or may become the stable nodal entities, such as the type described in the strategy, and serve as the anchoring point for the interception of important interrelational flows in order to, within the single systems, generate enough power to be able to inhabit the margins of sameness. in the following maps the strategy will be better articulated.





0 10 Km

Intersections of systems
and potential nodal entities



0  20 Km

Relational Fields
The relational fields are represented in the gray spots, while the spaces in between these field is seen here as a potential relational structure of mostly residual spaces and becomes a strategy at a regional scale.

North System: the Salt Route

“El camino que sale para Tunja, dirige también a los corregimientos de Chocontà, Soccoro, Pamplona y al Gobierno de Los Llanos.

El camino que sale para Sipaquirà es particularmente para tiempo de verano y se pasa el rio de Bogotá por balsa y en el tiempo de invierno se va por el de Tunja.

El camino que sale para Honda dirige al Gobierno de Mariquita, Provincia de Antioquia y a la costa de Cartagena, Sta. Maria y Rio del Hacha. El mismo por la Mesa dirige al Chocò, Popayan. Por Suacha se va también a la Mesa.

El camino que sale para Caqueza dirige a Los Llanos y también el de Fomeque. Por el que se va a Chiguachi se abre camino para Los Llanos, serà el mas costo pero el mas fragoso”.

*Transcription of part of the legend: Noticia de los caminos
Sketch of the city of Santa Fe de Bogotá and environs,
Carlo Francisco Cabrer, 1797*

The Bogotá Sabana case study was selected through the application of specific criteria that demonstrated a potential to describe certain concepts that are fundamental to this research.

The presence of a multipolar settlement before the Spanish colonization; the Muisca settlement was a seminomadic one, important natural resources were dispersed throughout the Andean mountain range and actively exchanged between various groups of native Americans.

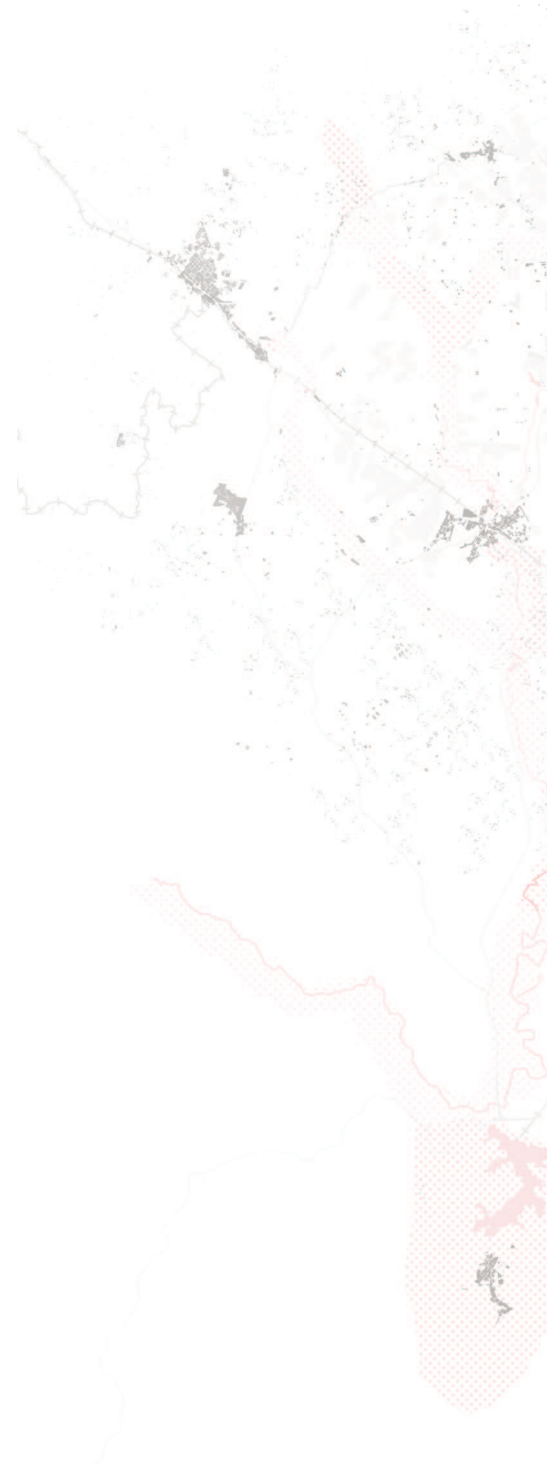
The topographic situation that encloses and constrains the settlement through relatively concentrated passages that have given place to nodal entities in correspondence with such confluences. The presence of

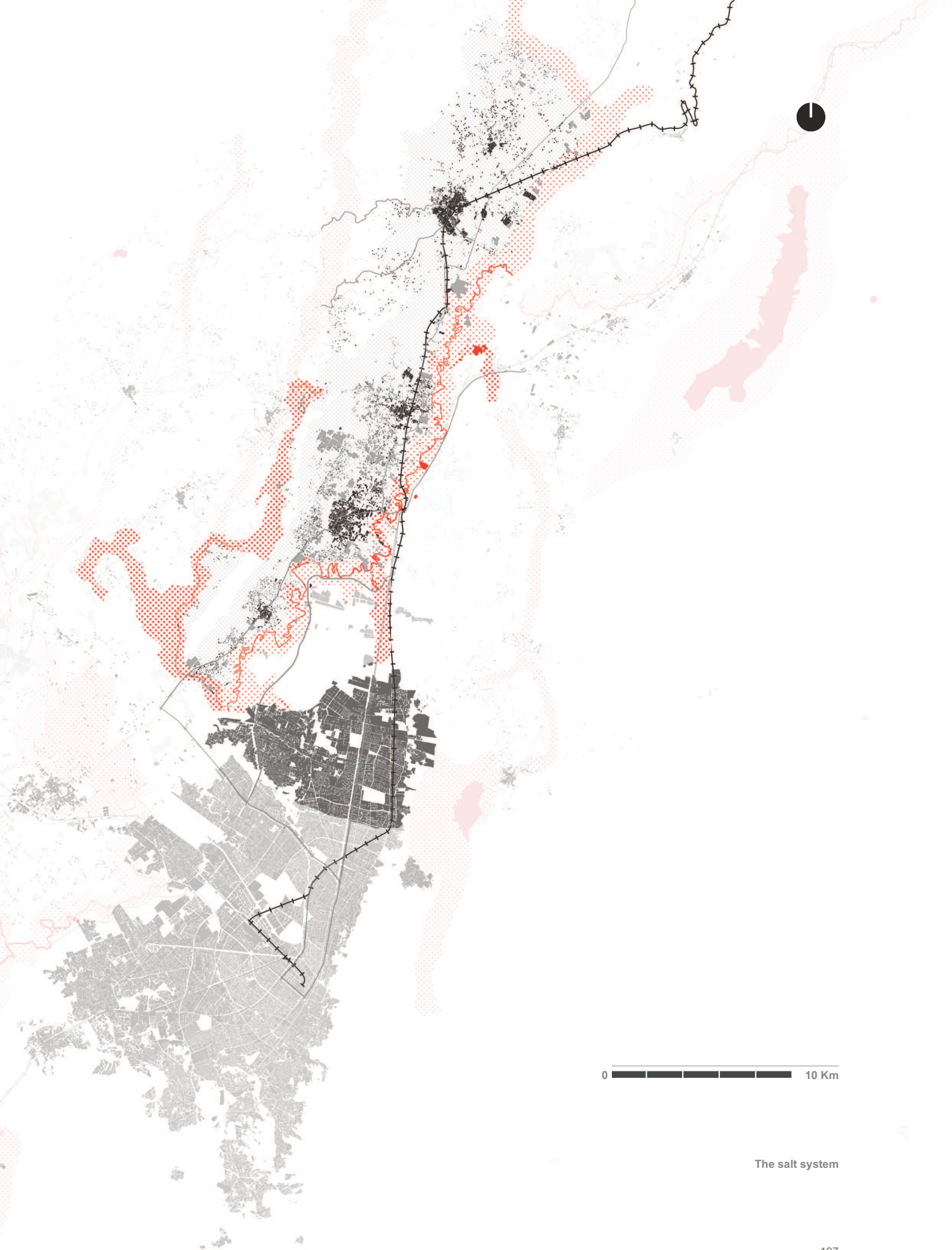
“entropic processes” common to human settlements worldwide, and common to a conspicuous number of ex colonial cities, especially in Latin America.

Colombia is the main entrance to South America from the north. Its topography is characterized by the extreme landscape typical of the Andean mountain range. Infrastructure has encountered huge difficulties in connecting the various settlements, leading to a geographic isolation of the Bogotá plateau and constraining exchange to happen in the few localized passages where the orography allows. This has penalized rail and road connections in favor of air transportation during the 20th century, turning “El Dorado” Airport into the first hub in South America for cargo and the fifth for passenger traffic.

Territorial Interpretation: the North System

Following the first Muisca settlements founded in the valleys and surrounded by water, the tracks that are the basis of the five systems identified emerge. The chronicles of the 16th century of Jimenez de Quesada, describe the Sabana as a complex maze of "alcazares" (enclosures) connected by roads delimited by fences. The description suggests an orderly and uniform occupation of the territory by square hedged settlements connected by a network of canals and paths, therefore entirely opposite to the centrality of the villages founded by the Spaniards later. The Muisca had recognized the morphology of as a resource for their cultural development, distinguishing themselves by their ability to trade. Using salt as a currency, not only traded with the





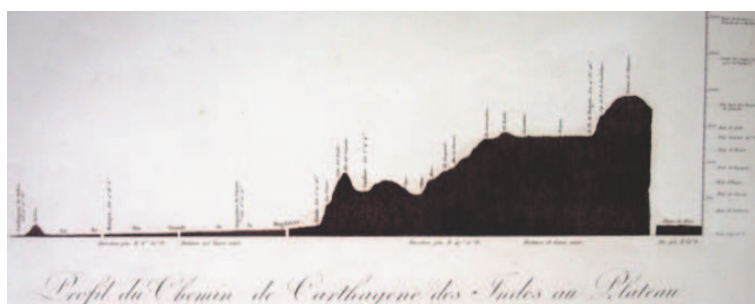
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The salt system

neighboring cultural groups but also with distant territories. Roads and settlements in the Sabana have developed in relation to the dynamics of exchange: the highways were the Salt Road that runs north to Zipaquirá; south-west to Engativa; west from the sabana to Facatativá and connected with the Yuma river, later called Magdalena River; From Choachi crossed the mountains to the east and connected with the plains of Guayupe and other settlements of the Llanos Orientales. Each of the five streets is characterized by specific properties related to the cultural traditions and landscape of the different historical periods.

Despite the profound changes of the settlement structure and land associated with the Spanish occupation and the industrial revolution, the modern roads basically reflect the ancient lines crossing the Sabana. The first to emerge, between 1882 and 1889 was the Sabana Railroad that connected Bogotá with Facatativá, while the second line connecting Bogotá to Zipaquirá was the Northern Railway, built in 1889. The construction of the railroad produced a large number of immediate effects, affecting urban hierarchy of the region. The city of Zipaquirá and Facatativá developed much more rapidly than other nearby villages. The resulting triangle has been the main reference for the subsequent settlement development throughout the 20th century.

Motorways appeared in the same period of the railway tracks, replacing the latter in connection sections with the main centers of Zipaquirá and Facatativá. Automotive roads were far more efficient than railroads to link the inland areas of the Sabana, and spread much faster and the



Section of Bogotá plateau

Alexander von Humboldt, 19th Century

Source: Alexander von Humboldt, *Voyage aux régions Equinoxiales*: atlas, plate 7, view of Cartagena de Indias road from Santa Fe



railway (which was still under construction and development) lost its role as the main connective infrastructure. The smaller settlements inside the Sabana did not see the phase of the intense industrial development induced by the railway.

The Sabana has preserved its agricultural and rural character, in spite of the industrial activities that first arose along the main arteries outside of Bogotá and recent florocultural activities have occupied expansively the plains in the region. In particular, the connection to the north (Bogotá-Zipacquirá-Chiquinquira) became an artery along which residential areas for upper middle classes of the population developed. Many urban centers such as Cota, Chia, Cajicá, Siberia, the rural area of the RioFrio River valley and the plateaus of Manjuy Torca are now part of a single suburban area. The signs of this transformation are recorded in the general urban structure, reuse of architectural original converted into functional centers and segregation in socio-cultural life in the city. Urban centers located in the first peripheral belt around Bogotá have lost their traditional autonomy, acquiring different characters: for example the city Chia has undergone a transformation into a suburb for the middle or higher classes that mainly work in the city of Bogota and therefore commuting daily in private vehicles aggravating the traffic and having nonpossibility of public transport. Moreover, urban growth, initially linear and close to the mountains in the east, in the last decades of the 20th century has expanded westward reaching the banks of the Bogota River. This has created a conflict between the natural and the urban system, with consequent destruction of the local ecosystems, land use and erosion problems, as the floods seen in 2010 demonstrate. Other than a collapse of the hydrological systems or a failure of administrations and planning, it is a failure to see the potential of natural systems as a space for an alternate order. Here we are offered an alternative vision of the Sabana's territory. Much more than a plain to occupy, the Sabana offers the possibility to interpret under a different perspective and a number of "entropic processes" affecting, to various degrees, metropolitan areas of the world, including Bogota, its past and its future.

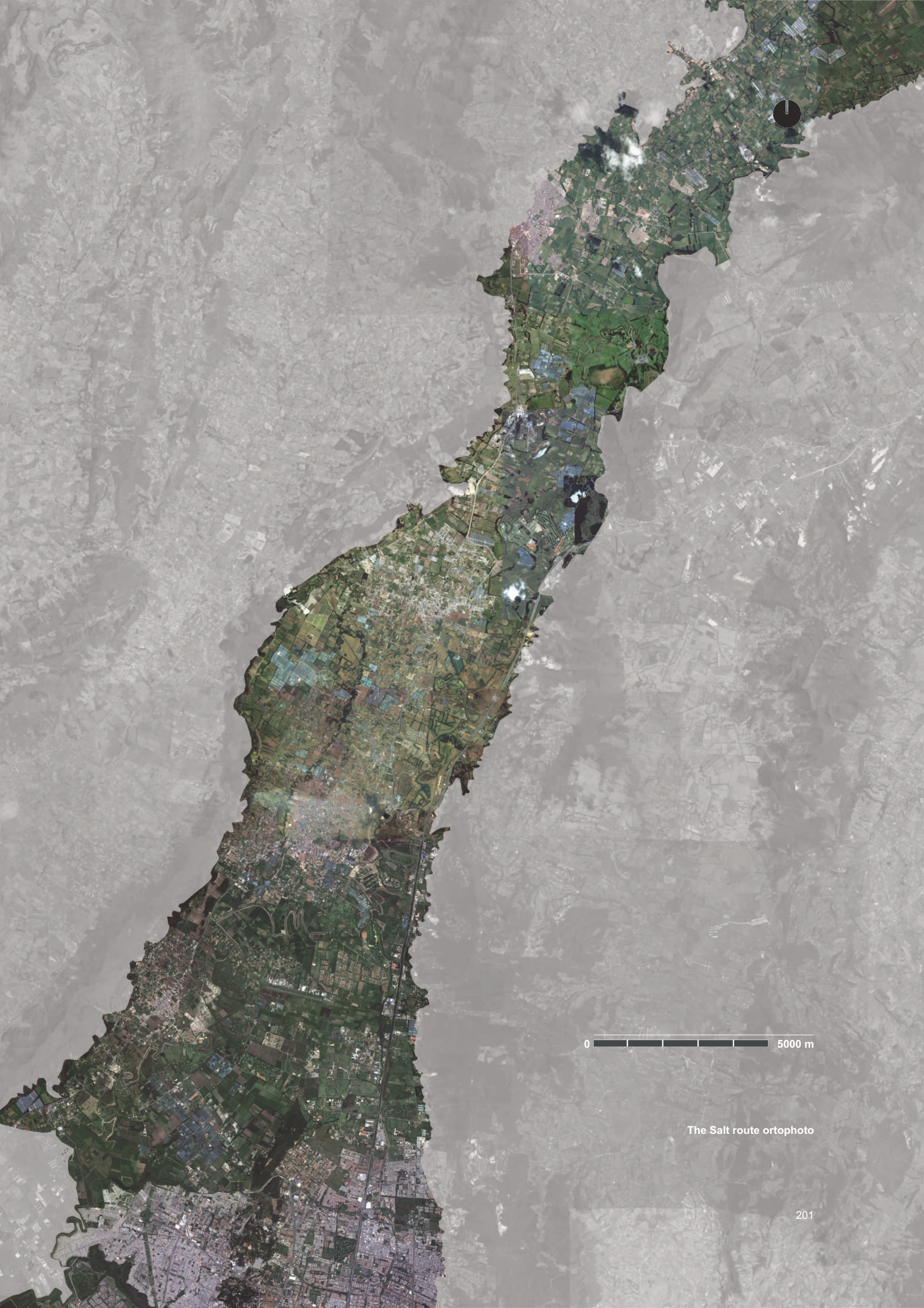
Sections of the North system evidencing the possible ambits for potential project areas.

Territorial Context

Considering the area of the Sabana that contains the Rio Frio river, the Bogota River and the Manjuy–Torca Topographic system here denominated the North Sabana System also identified as the Salt Route due to its historical connotations ever since the precolumbian settlements and to its current significance.

The dynamics that have led to the loss of differentiation of the urban continuum involve not only the urban residential centralities, subject to the process of suburbanization and sprawl, but also agricultural areas, where land use has changed from pasture land to a fragmentation into parcels along with vast areas dedicated to greenhouses for floricultural industry destined for exportation. The area is characterized by an almost complete occupation of the flat expanses of land as suburban housing and privatized urban services that gravitate around Bogota (clubs, colleges, shopping centers and more generally the uses that require large extensions that are no longer available within the city), reaching the limits of mountain ranges with haciendas and condominiums. The uncontrolled growth of private transportation infrastructure emphasizing the north-south direction since the 50's such as the Autopista Norte Highway described in the chapters before, has generated a saturation of the built space within the city that arrives to the banks of the Bogota river incorporating the ecological reservoirs,





0 5000 m

The Salt route orthophoto

Humedales as well as the few historic traces present in the area (Yerbabuena hacienda).

It has already been demonstrated how, what has been referred to as entropic and syntropic processes, develop in urban space in the chapters before using paradigmatic examples, which are especially eloquent. It is necessary to concretely identify them in the case study where these elements of organizational characteristics are less evident and tend to be more hybrid in nature. If as mentioned before, there are two types of order, useful and formal, the first may be, within the architectural sciences related to the forms of use, private public, local global etc. while formal order may be identified with physical forms.

In the Bogota case study, syntropic settlements may correspond to Malls (Santabarbara, Andino, Titan, San Vittorino); University campuses (Los Andes, Nueva Granada); Gated residential complexes (Guaymaral, San Jose de Bavaria, Santa Barbara); and infrastructure systems (Railway, Autopista Norte, TransMilenio).

The same organizing elements may also be found in the landscape such as: the greenhouses for floriculture, which organize globally but disorganize locally due to their lack of local relations; private Clubs which are enclosed within gates and therefore avoid any relations; Gated communities of wealthy social classes; Private educational campuses which are usually enclosed within protective walls as well.

A series of signs traces and fragments, memories of preceding orders that now tend to generate disorder if not properly involved in the design of the landscape, pre-existences such as the characteristic Plaza de Cota, The Puente del Comun Bridge, The muisca traces in the meanders and banks of the Bogota River. These make part of a cultural system of fragments and hold the potential, if involved in the design and planning transformation, to give significance, identity and character to the drab uniformity of the Sabana Landscape.

Beginning from the identification of the of the "ordering configurations" identifying the corresponding simpler type of orders, deriving residual spaces, amongst which, parking lots, fragmentation of landscape,

turnpikes, infrastructural banks, quarries. Such entropic spaces are characterized by their lack of order from one side or by their repetitiveness and uniformity on the other.

Such spaces have been defined in a variety of ways, from *Non-Places* (Augè) to *Terrain Vague* (De Solà Morales), *Third Landscape* (Clement), *Drosscapes* (Berger), *Junkspace* (Koolhaas), *Atopic Typologies* (Gregotti) etc. But it is possible that the authors have described the characteristics of these spaces and that there is more to the relational and formal processes behind the effects.

In order to identify the entropic spaces within the case study and to find a way to involve them in a reciprocal structure or form, it might be useful to begin by the spaces of interrelation where the various systems both entropic and syntropic, global and local, figure and residue, intersect. Still it is possible to recognize the places where order and disorder accumulate utilizing the traditional methods of territorial interpretation, such as the mass-void relation, the levels of artificialization, the use of territorial sections etc.

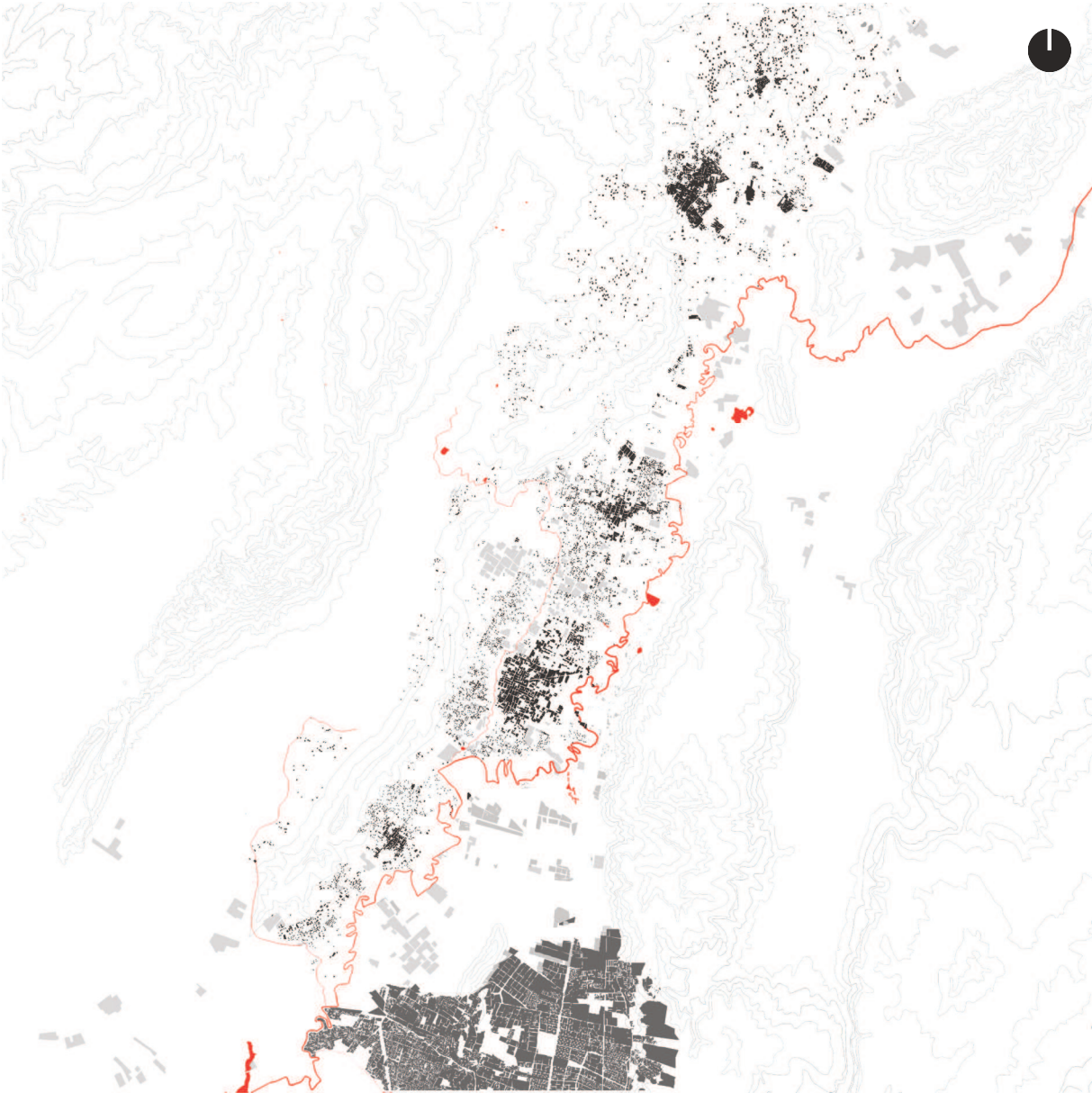
From the next maps, which refer to the north system where the “suburban” character emerges more diffusely, the reciprocal fragmentation of open space becomes more evident. Along with this fragmentation the repetition of gated communities and low income housing has spread through the borders between the Cota, Chia and Cajica settlements, generating a continuous conurbation, a patchwork of uses, shapes and scales that has occupied the ground in an extensive manner.

Naturally, the wide spread settlement, as in other nations, generates a deformation of public space, into the semipublic realm, where walls and gates separate social classes and their corresponding spatial qualities, generating semipublic polarizing places that adhere to large scale connections, hybrid and anonymous spaces (as described in the chapters before referring to the architecture of nudity).

The structural nodes of this part of the Sabana have been overwhelmed by the low-density growth along the north south axis as well as the

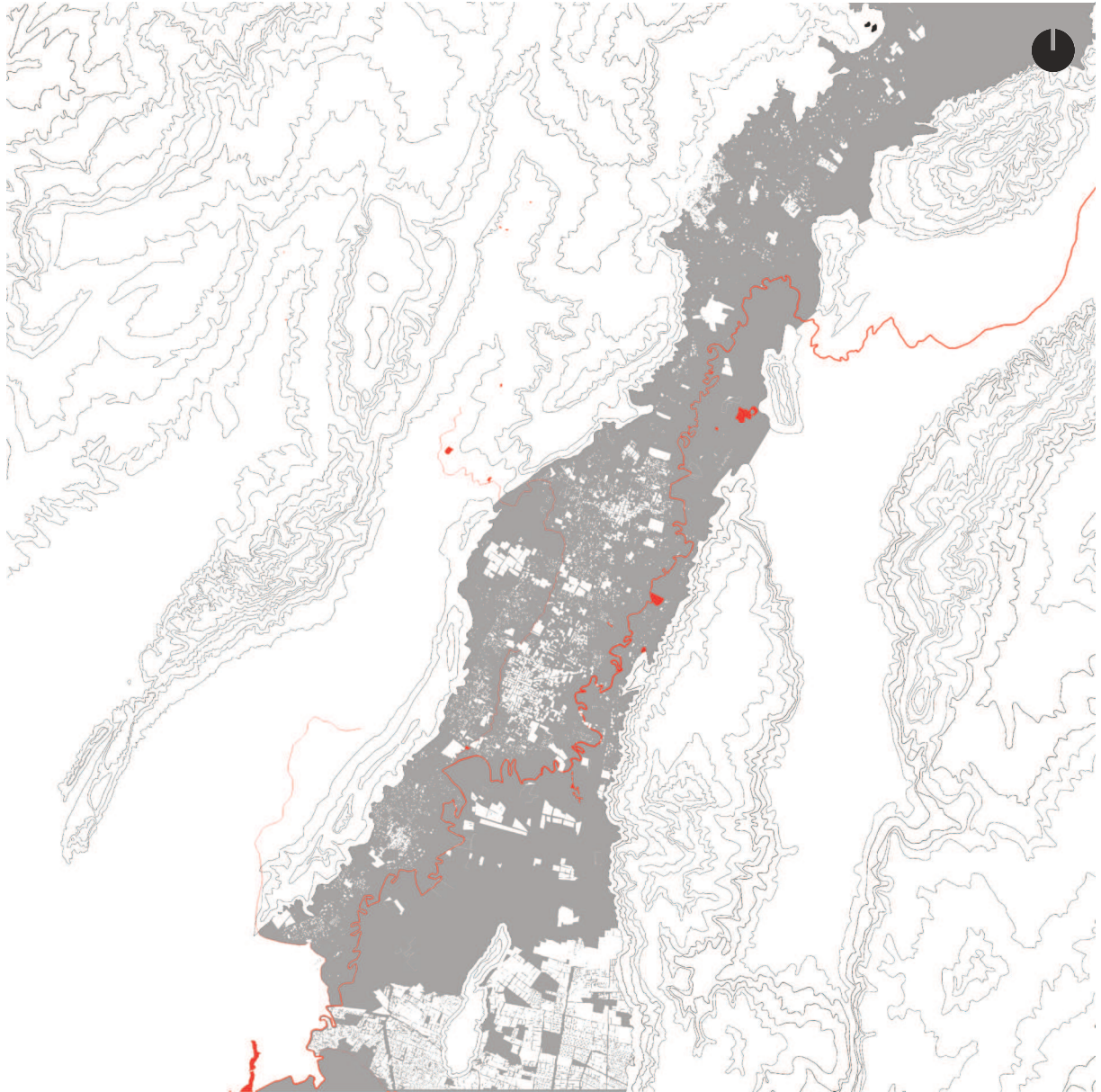


View of Santa Fe Mall in the north of Bogotá.



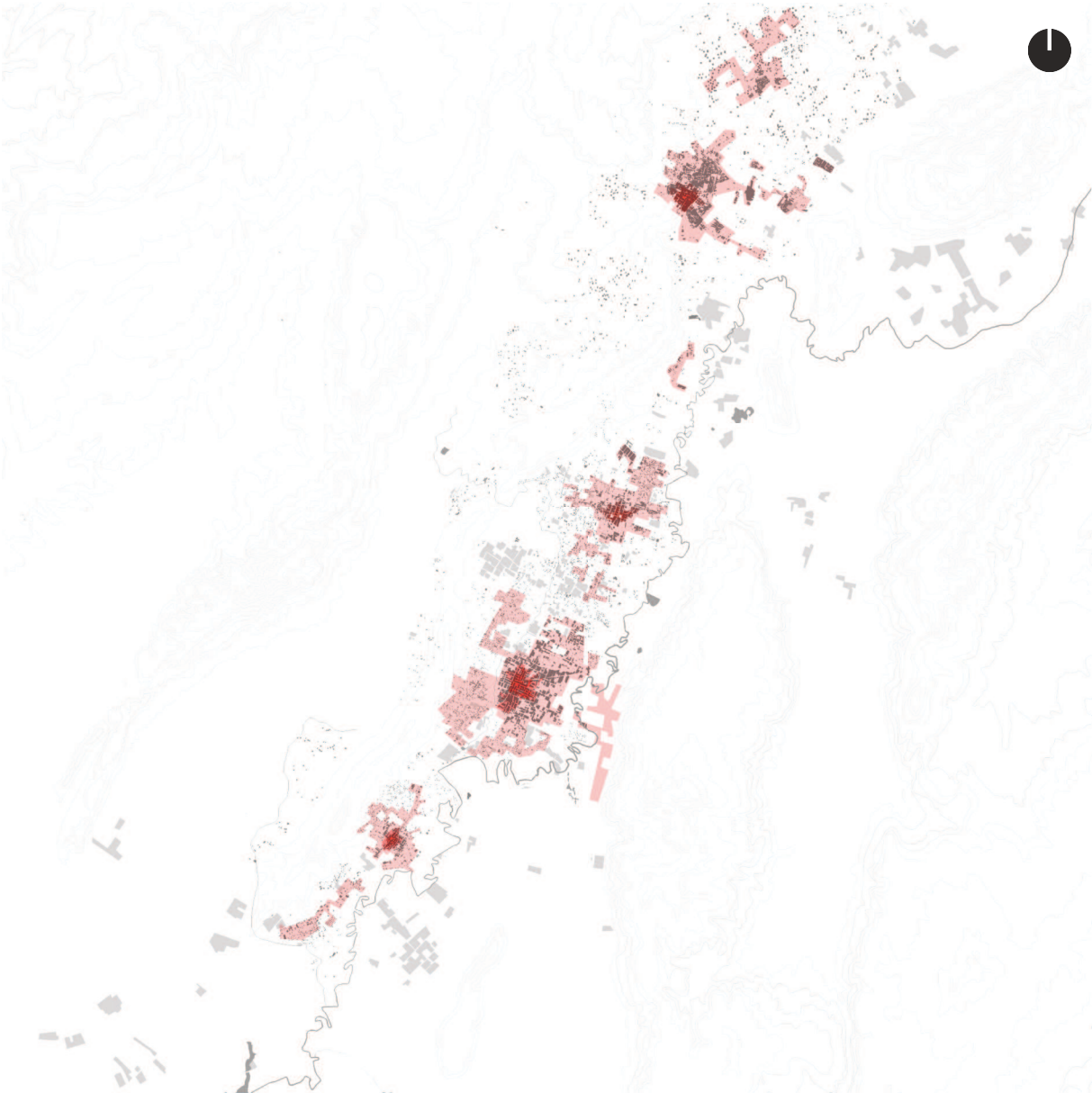
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Built Spaces.



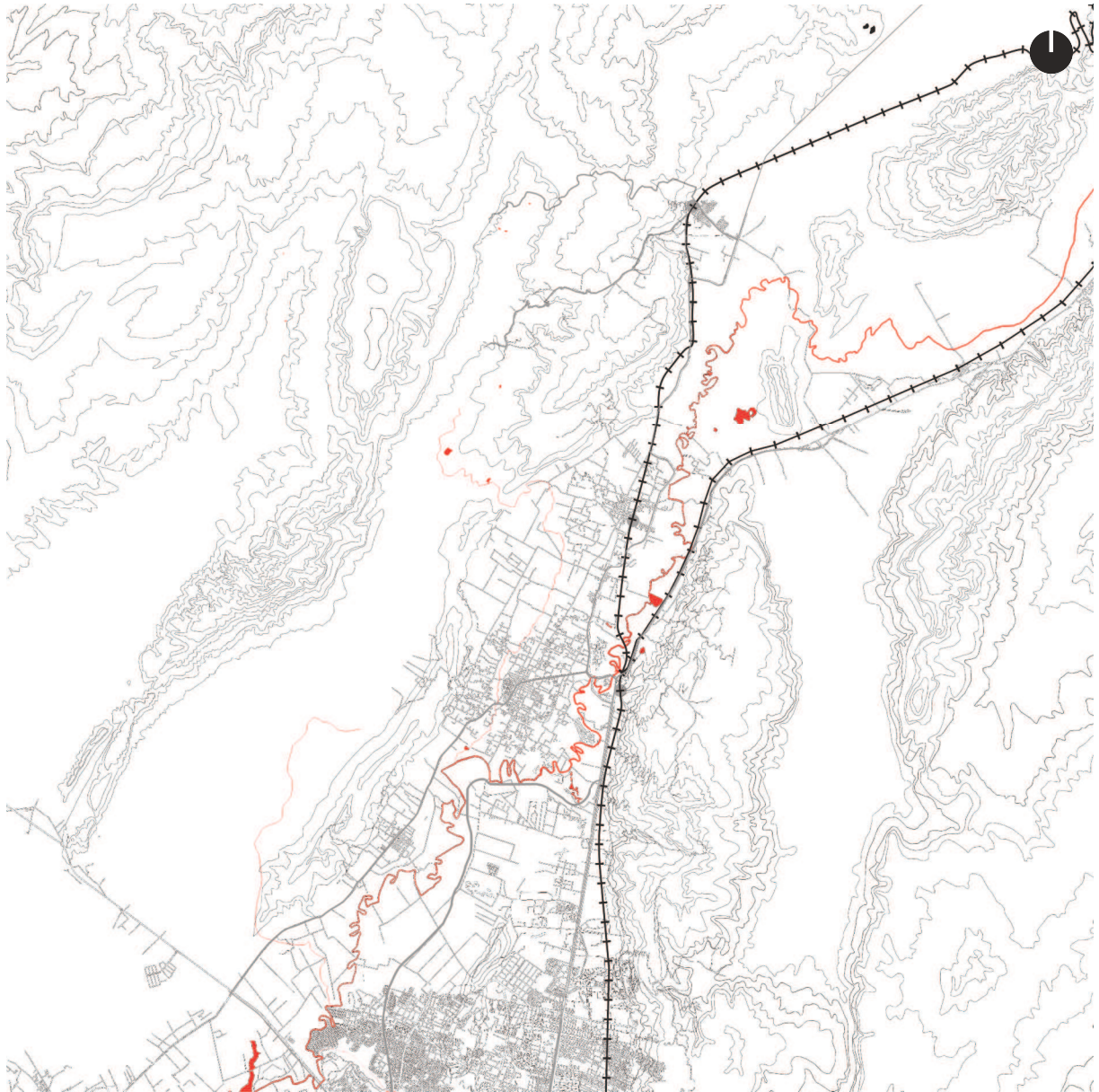
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Un-built Spaces.



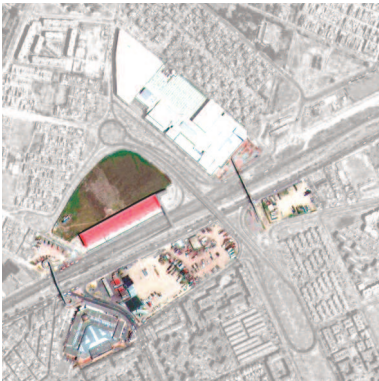
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Historical Thresholds.

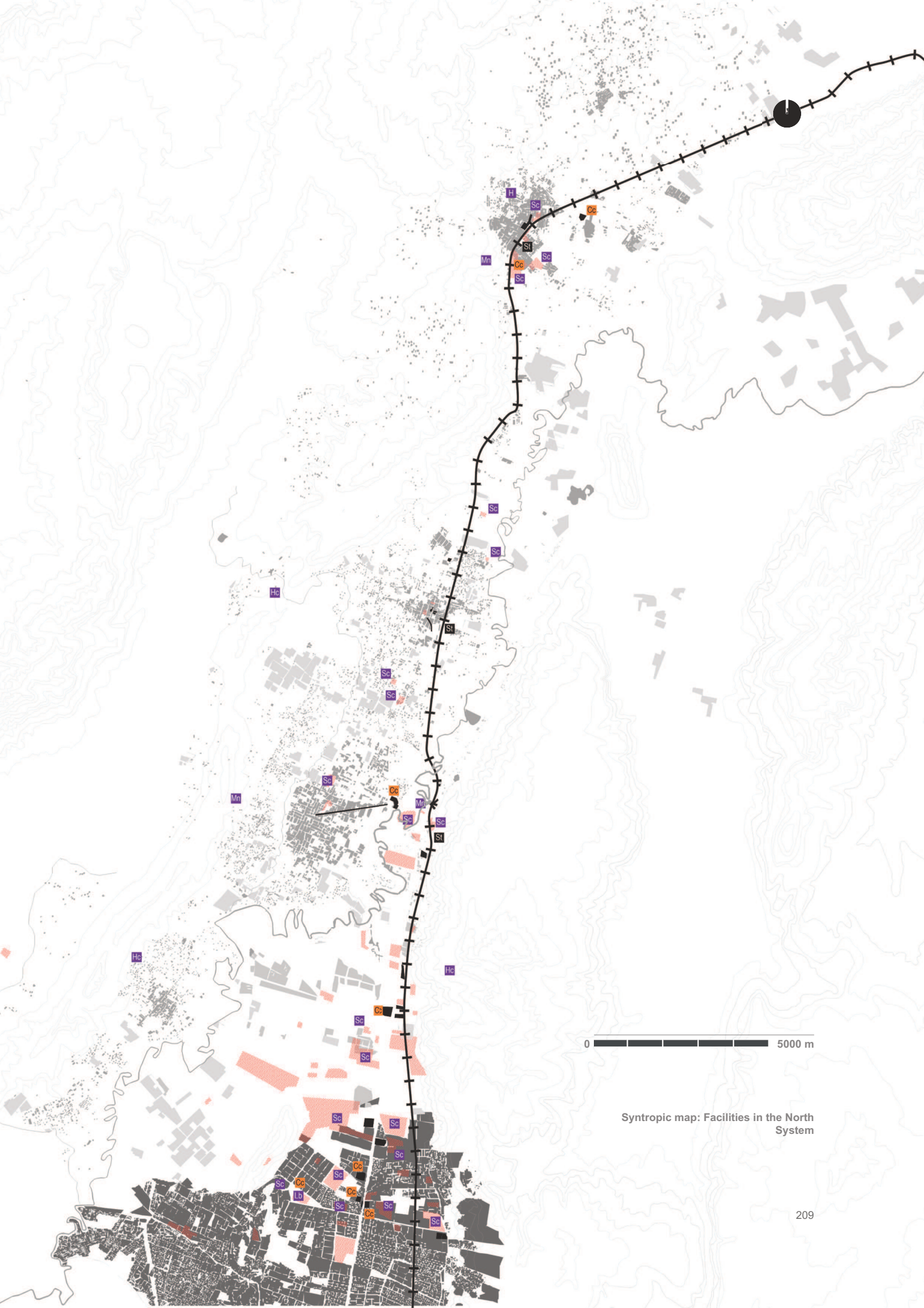


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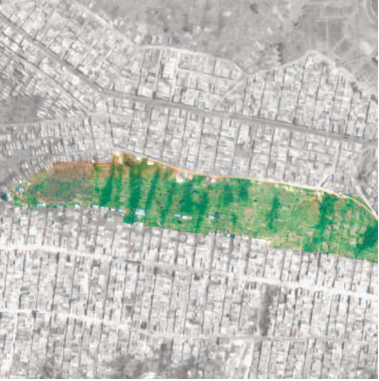
Infrastructural Networks.



Syntropic elements
Source: Google Earth 2015

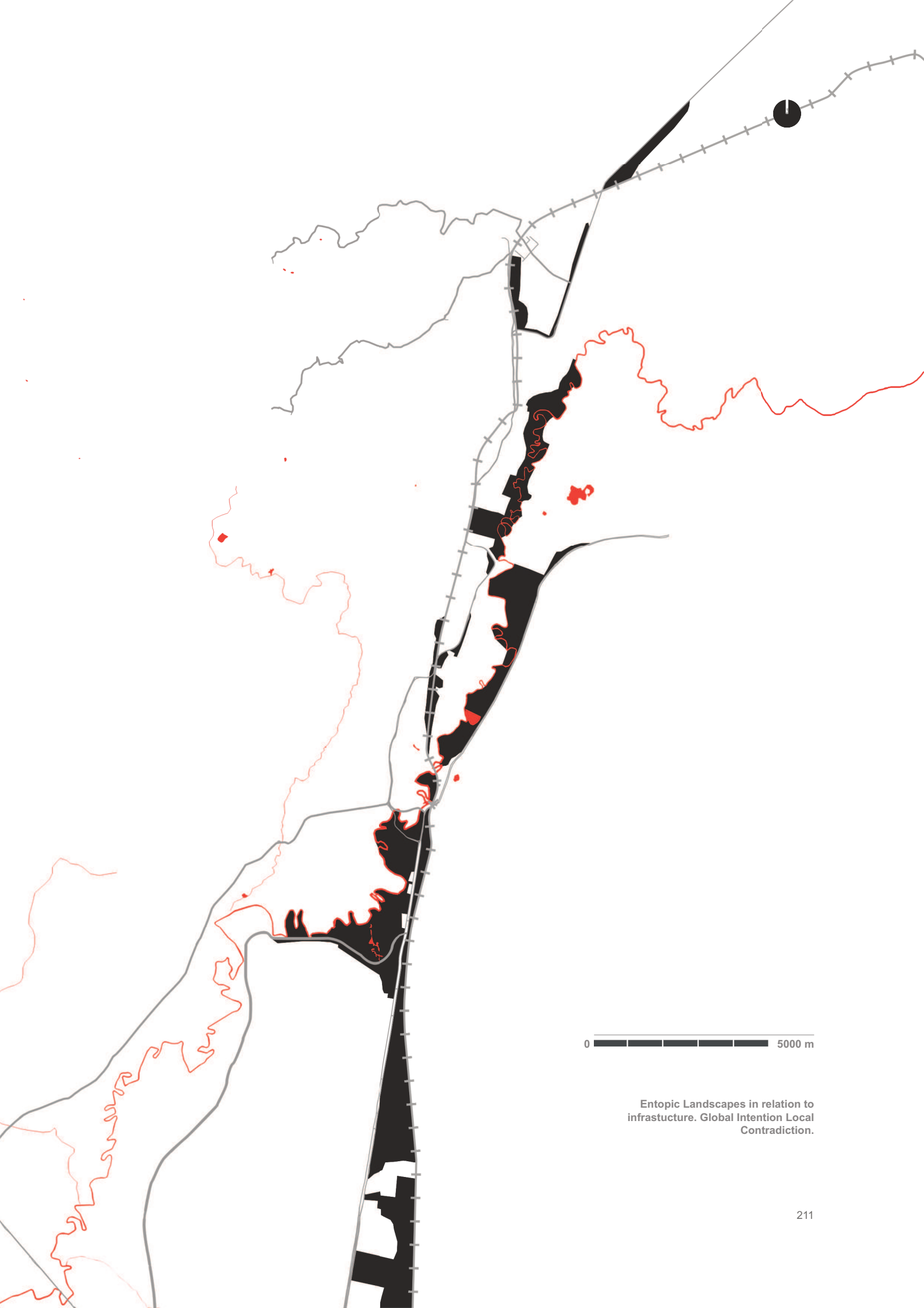


Syntropic map: Facilities in the North System



Entropic spaces

Source: Google Earth 2015



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Entopic Landscapes in relation to
infrastructure. Global Intention Local
Contradiction.

inclination for private uses of space, facilities and transportation, even though they still maintain a potential to generate an inter-scale structure if properly involved in a requalification process.

Along with the clearly identifiable islands of order behind the walls and gates, the spaces in between such islands, (analogous to the re-naturalized generic spaces between the islands of the archipelago city described in the chapters before) are defined as marginal spaces, the “Antipolis” (G. Vazquez) the opposite of what the characteristics of “urbanity” represent.

It is no longer a continuous margin around the recognizable form of the settlement; instead what emerges is a collection of fragments of margins within the diffuse fabric, composed of informal settlements, of a patchwork of ever-more subdivided voids without a specific use, parcels of agricultural land, dumps and more residual space derived from infrastructural connections.

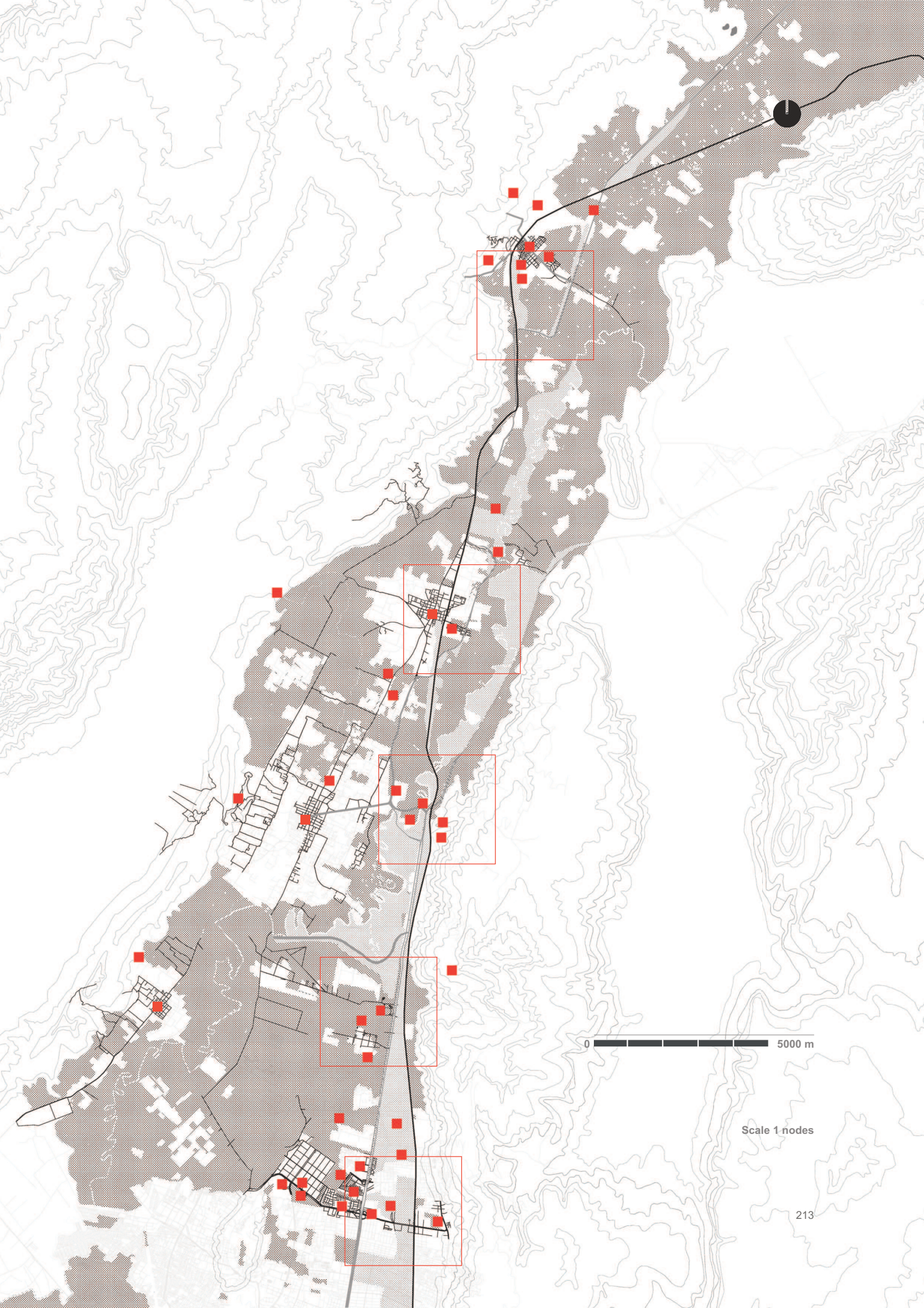
While these margins are delineated by perimetral limits, their condition when considered as a whole is that of an instable and undefined permeating margin of the metropolitan settlement.

The challenge is now to find a reciprocal relation between the islands, of generating an alternate structure of residual spaces and anchoring it to the existing, latent, and potential nodal entities within the system.

Identification of significant spaces within the system.

The evidenced areas hold the potential to intercept the North-South predominant flow in order to irrigate the fragmented margins. the areas in red show facilities and infrastructural nodes of the practically dismantled railway.





0 5000 m

Scale 1 nodes

Multiple Ambit Identification

When you look at a big city and its surroundings from above, the picture that emerges is similar to organic tissue, with a filamentous form that comes together in a more or less accentuated. Towards the center of the material is very dense, compact, while at its ends is more dispersed, it branches into ever-smaller condensations.

An interpretation of the cell-like configuration of the territory, which is not new to the spatial sciences from the theories of Saarinen to some allusions by Le Corbusier, displays a branching at different scales arriving to the smallest gaps between the fragments of the built city. It was probably Peter Geddes the first to identify such a biological analogy between the settlement and cell-like structures, later adopted and reinterpreted by functionalism. This conception of spatial organization is still present in the current debate however if detached from a structural point of view of the form, it becomes superficial and purely an image exercise.

The considerations derived from the architectural debate of the sixties marked a first distancing between the autonomous or natural organization from a more programmatic vision. Gregotti sustains that from a certain distance things lose their recognizability, while still enhancing the potential of knowledge: elements are reduced to points and pieces. Generating the possibility of a combined approach, a sort of





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0 5000 m

Ambit study

“bricolage” of the recognized elements considered as a formal concreteness, operating through a juxtaposition or collage, conferring in various levels of aggregation or dimensional complexity, a structuring role.

After a wide the acceptance of the obsolescence, within the architectural discipline, of the contraposition of settlement and territory, the metropolitan form becomes fair ground along with the single architectural elements, for architectural design in an inter-scale approach. While built space is clearly differentiated by reference scales, voids seem to have a more ambiguous relation to scale. This relation may be associated to a fractal relationship of self-similarity, conferring a characteristic to void space that is intrinsically inter-scalar nature that is indispensable in generating structure with interconnected fragments.

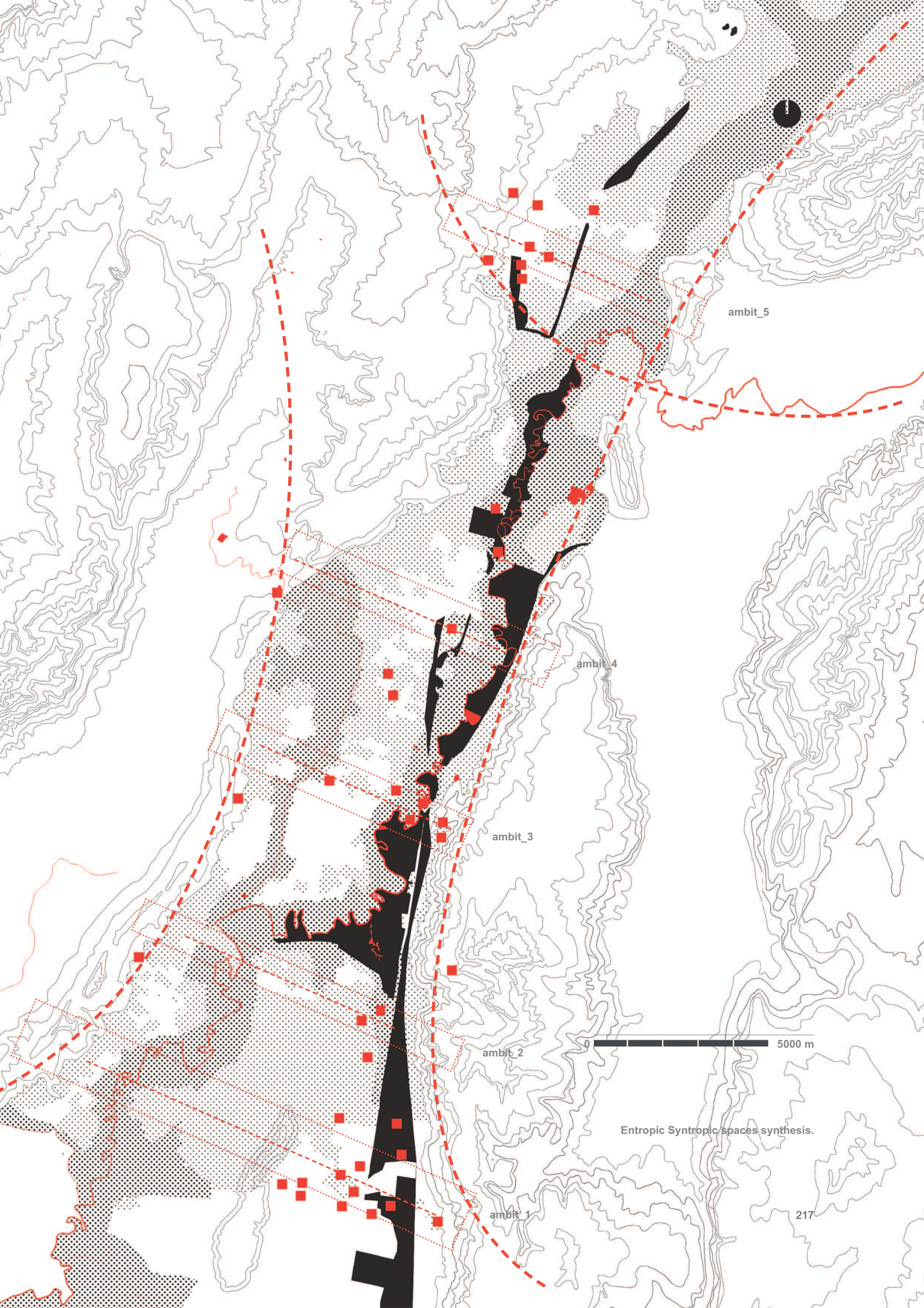
The idea that the margins are constituted of a multiplicity of fragments of void and that it is possible to connect countless voids of different scales and of a different nature, generating a branched and permeable system is slowly emerging.

Obviously, these gaps are not the result of planned actions to maintain a certain image and overall configuration. They are not therefore attributable to the relational categories that from the environmental image of the area.

Every rational organization of space inevitably generates waste, junkspace, and disorder. Such “byproduct” may be associated to what Clements refers to as Third Landscape.

This feature is important for many aspects. Considering in the same category a vastly heterogeneous collection of spaces that are hardly classifiable (fields





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Entropic Synoptic spaces synthesis.

boundaries, along roadsides, vacant lots or pending etc.), Clement concentrates on the investigation of their spatial distribution within urban fabric and delineates the interactions that take place at different scales of reference.

The picture that emerges is that of the void as ordering element, like a background that organizes its highly disordered structure.

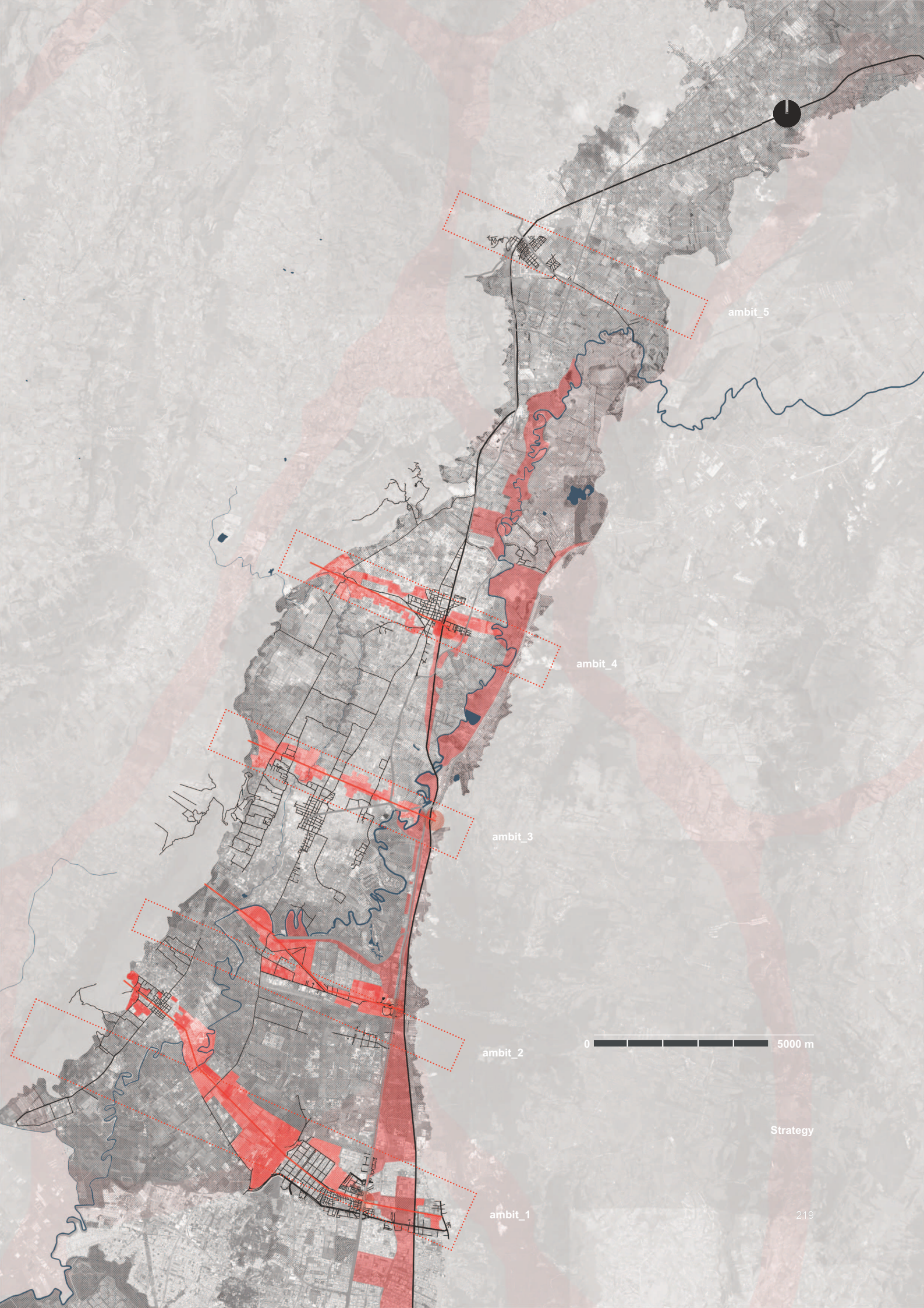
The reformulation of the territorial scale of the concepts theorized by Clement poses methodological and technical problems of new nature and require the development of appropriate tools. The possibilities offered by the network phenomenon relative to the description and design of structures arranged on multiple dimensional open levels offers interesting perspectives of interpretation in this regard.

The strategic maps on page 222 evidences how some guiding principles may be extrapolated from specific elements present in the area.¹

As Secchi sustains, a rule is something weaker than a theory for it has no foundation, but it originates genetically from certain elements and events that are specific, not universal, which belong to a site, not to an era. The development dynamics of Cota, Chía, Cajicá and Zipaquirá and their lines of communication (Autopista Norte and new ring of Bogotá) induce an increase in the number of fragmented areas and residual spaces. Increasing residual space seems to be linked mainly to infrastructural organization of the territory that has generated both a type of settlement that leads to a growing fragmentation, contradicting the possibility of generating a relational structure locally as well as a series of insurmountable limits and

¹ The areas shown in red are the residual spaces that have the potential to work as a linear system and to be anchored to the potential nodal entities along the main axis of interrelation. Residual are spaces re-composed into a system.





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Strategy

219

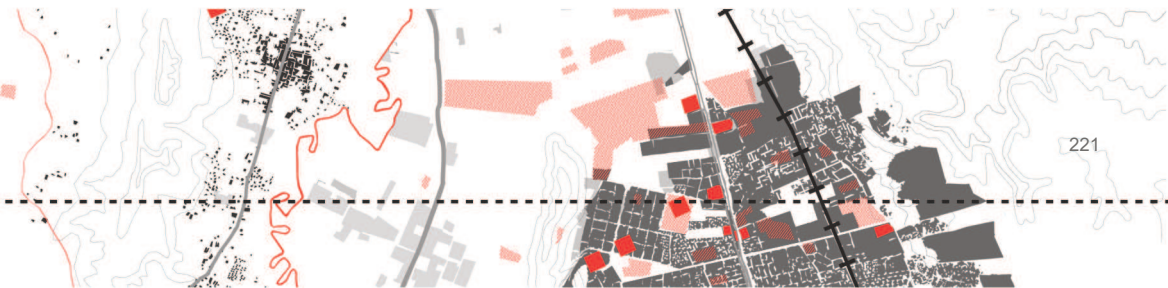
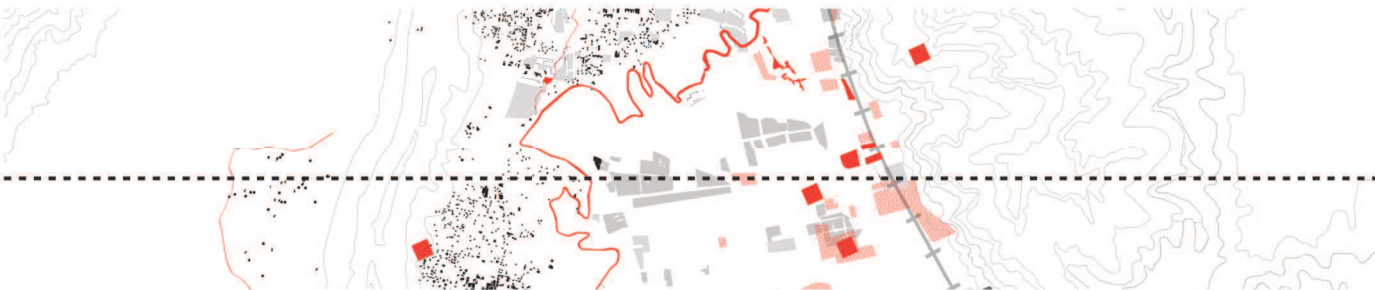
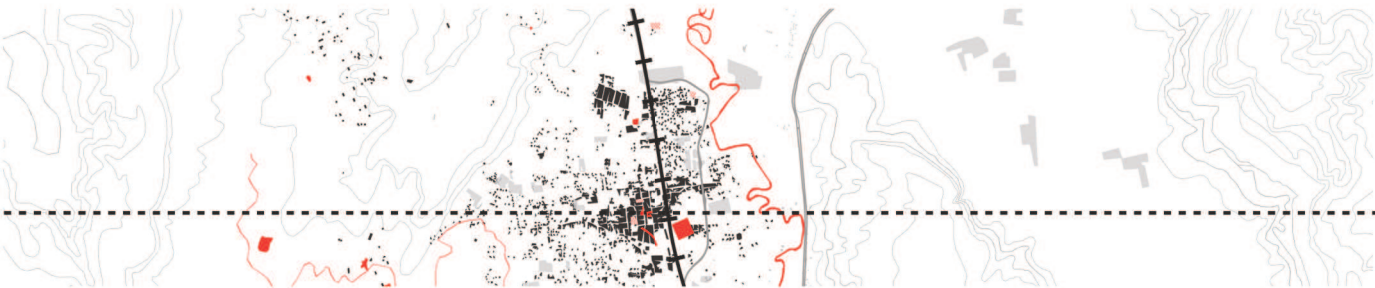
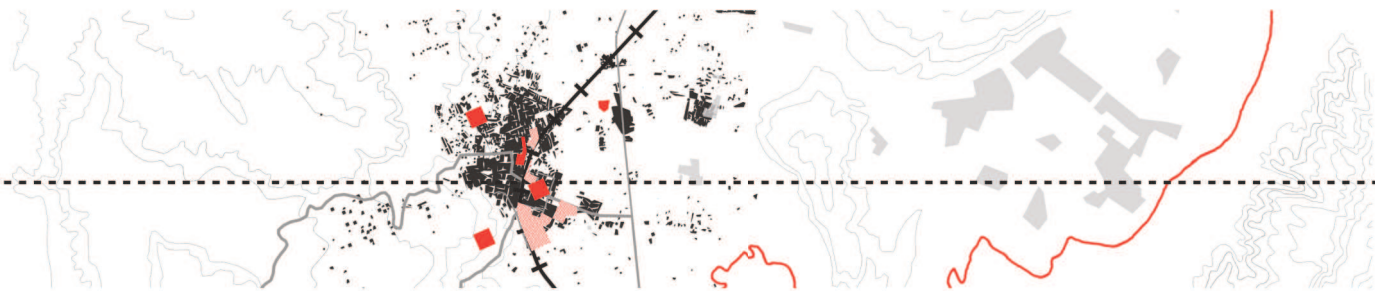
borders. This constitutes the first argumentation for a formulation of a territorial strategy for the Sabana through nodal and linear entities that contain areas occupied by suburbanization, found especially along the edges of the structures with higher degree of order and artificiality, such as the syntropic polarities previously identified.

The proposed strategy is based on a sequence of hierarchical condensations associated to the various activities and infrastructures that reveal a nodal structure that is the first step in generating a structure according to the concepts elaborated in the previous chapters. Nodal entities become the intercommunication doors between entropic spaces and syntropic elements, channeling a relational exchange within the current continuum of fragmentation.

The spatial articulation of the polarities system appears within the strategy in the edges and margins where fragmentation is accumulated, by recomposing and reconnecting the residual interstitial space into linear entities that to some extent resemble Le Corbusier's v 7 containing facilities and public space, while contemporarily responding to a global configuration that achieves structure through ecological corridors. (areas in red).

The composition is assembled through the elements that create the heterogeneous open spaces found in the Sabana, generating a reciprocal scaffolding to the artificial infrastructure that interconnects the territory that takes into account the weak resistance to transformation that these areas pose.

The reticular strategy serves as an open structure that is able to adapt to the transformations while maintaining a stability within the nodal entities both in

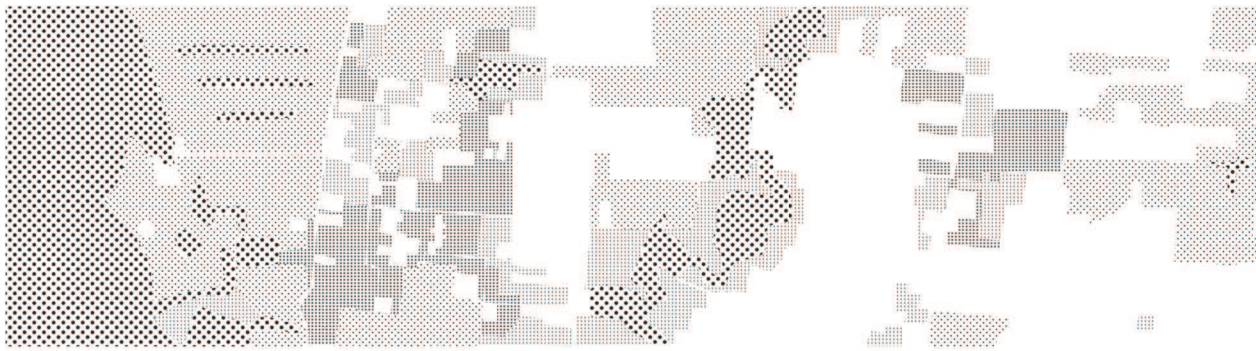


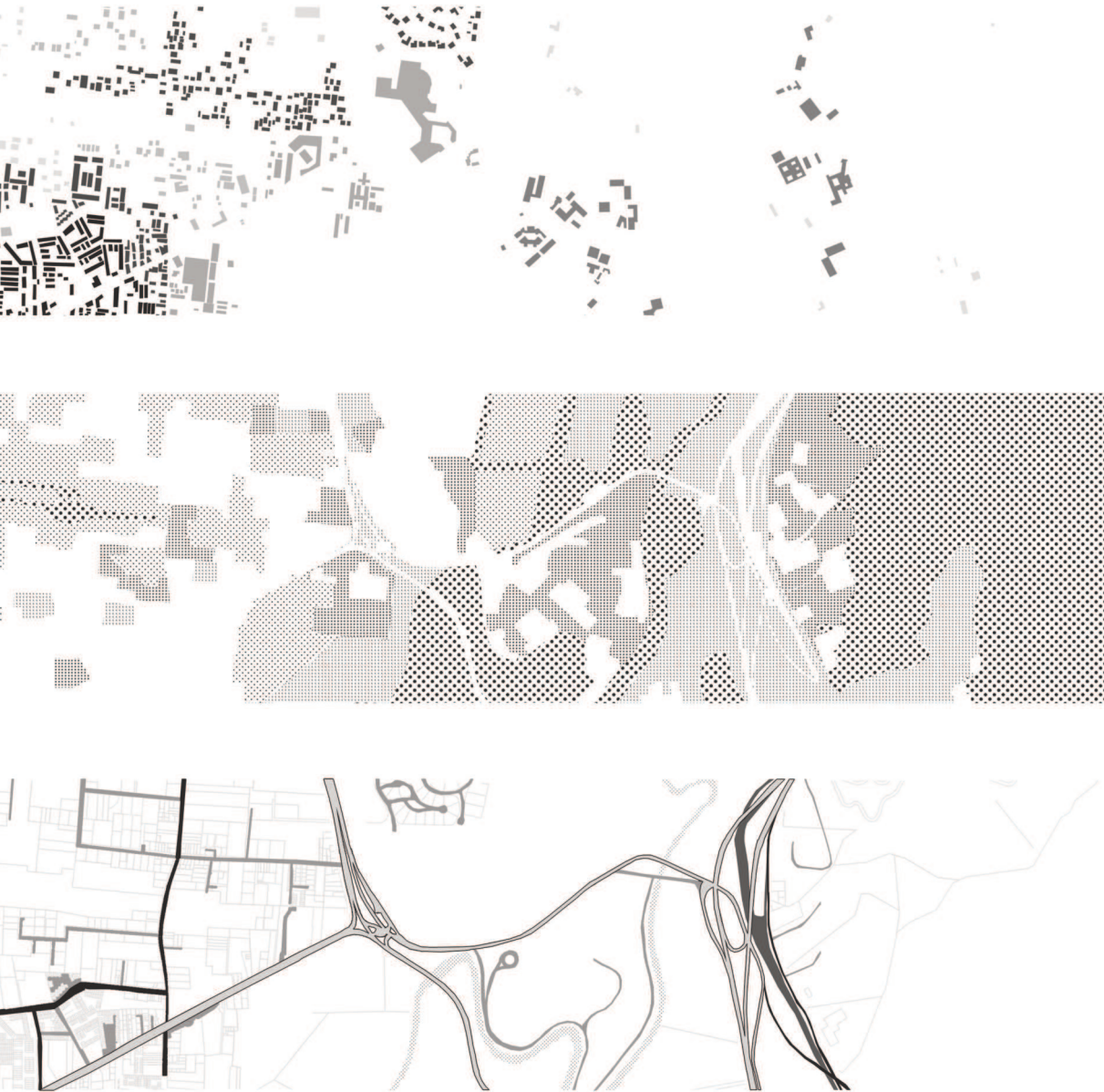
moments of expansion or in possible moments of reduction as well as creating the possibility for both an inter-scale relation between the polarities and the metropolitan settlement and the generation of a chain reaction of transformations at numerous scales. The materials of the Sabana Landscape, composed by the floricultural greenhouses, suburban fabric, residual spaces, if strategically recomposed, have the potential of generating a symmetric structure of alternate order that exploits the dialectic between order and disorder, natural and artificial and especially between analogy and contrast.



ambit_3

Ambit 3: Space Diagrams





0 2000 m

Ambit 3: Chia, Built space, Un-built space, Relational space.



If the architectural project may be used as a form of description, the importance of finding the adequate instruments in order to identify the characteristics of the elements that reveal the structural connotations of settled space becomes essential.

In an area that displays a wide range of deformations, both formal as well as cultural, as in the Sabana de Bogota (such as the Spanish colonization that has profoundly transformed the idea of a Sabana territory), the elements that the transformation project must deal with are mostly composed of fragments.

In recent years there has been an increase in fragmentation of land going from medium-small batches to an almost minute scale, with a growing trend, not only in urban landscape but also in agricultural landscape.

Continuous privatization of land and successive inheritance and subdivision for the various members of the family, along with local administrations using division and separation as a means to manage their land has produced a mosaic of more or less regular fragments. As Harvey notes, the urban or in this case sub-urban territory is the capitalism of order as opposed to an organization of capitalism (Harvey 2012) evidencing how financial models have directed social development instead of the models being tailored by social priorities. The increase in fragmentation implies an increase of heterogeneous characteristics that when multiplied paradoxically compose a homogeneous configuration. But as evidenced in the previous chapters, the interest in these spaces is derived from their deformation, where they become predisposed for a new transformation, for new interrelations with the territory and if configured into a structure become capable to gene-







0 2000 m

Identification of Speciment in Ambit 3: Chia, Cajica Margin



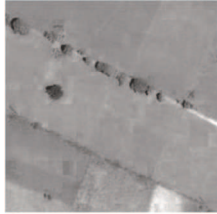
rate a new for the whole metropolitan settlement, through a series of chain reactions.

De Solà Morales suggests the “section cut”² generates a sequential severed recognition of space and becomes a descriptive mechanism and even a design strategy.

In order to find the characteristics and identities of the entropic landscape in the North System, using the section cut as described by De Sola Morales evidences the significant features of the ground and the stratified diversities. The Geographical features emerge showing why the interrelational flows as well as the settlement itself have found its proper ground ever since the first pre-Columbian settlements. The reasons for the form infrastructure has adopted in order to adapt to this contraining terrain, but also the orientation such terrain provides generates an order form a Geomorphological point of view, as well as the areas subject to constant flooding become clear.

vegetable gardens	1
multiple-family housing	2
greenhouses	3
condominiums	4
three floor housing	5
gated communities	6
commerce	7
housing with gardens	8
steep ground	9
spatial permeability	a
built space	b
paved roads	c

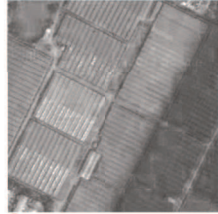
² De Sola Morales, E., “Città Tagliate”, *Lotus Quaderns n. 23*, 2009, p. 12



1



2



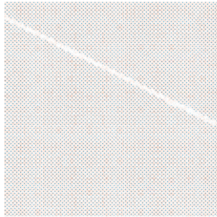
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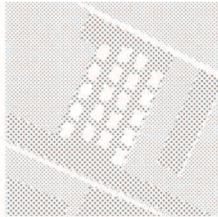
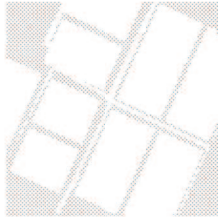
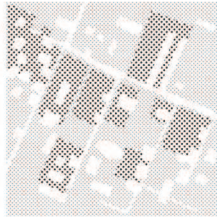
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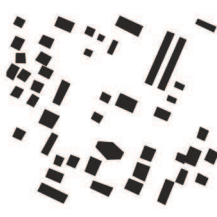
5



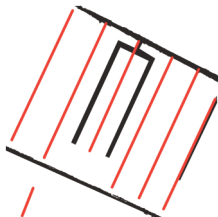
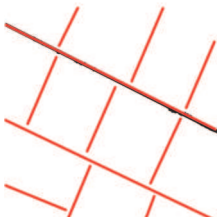
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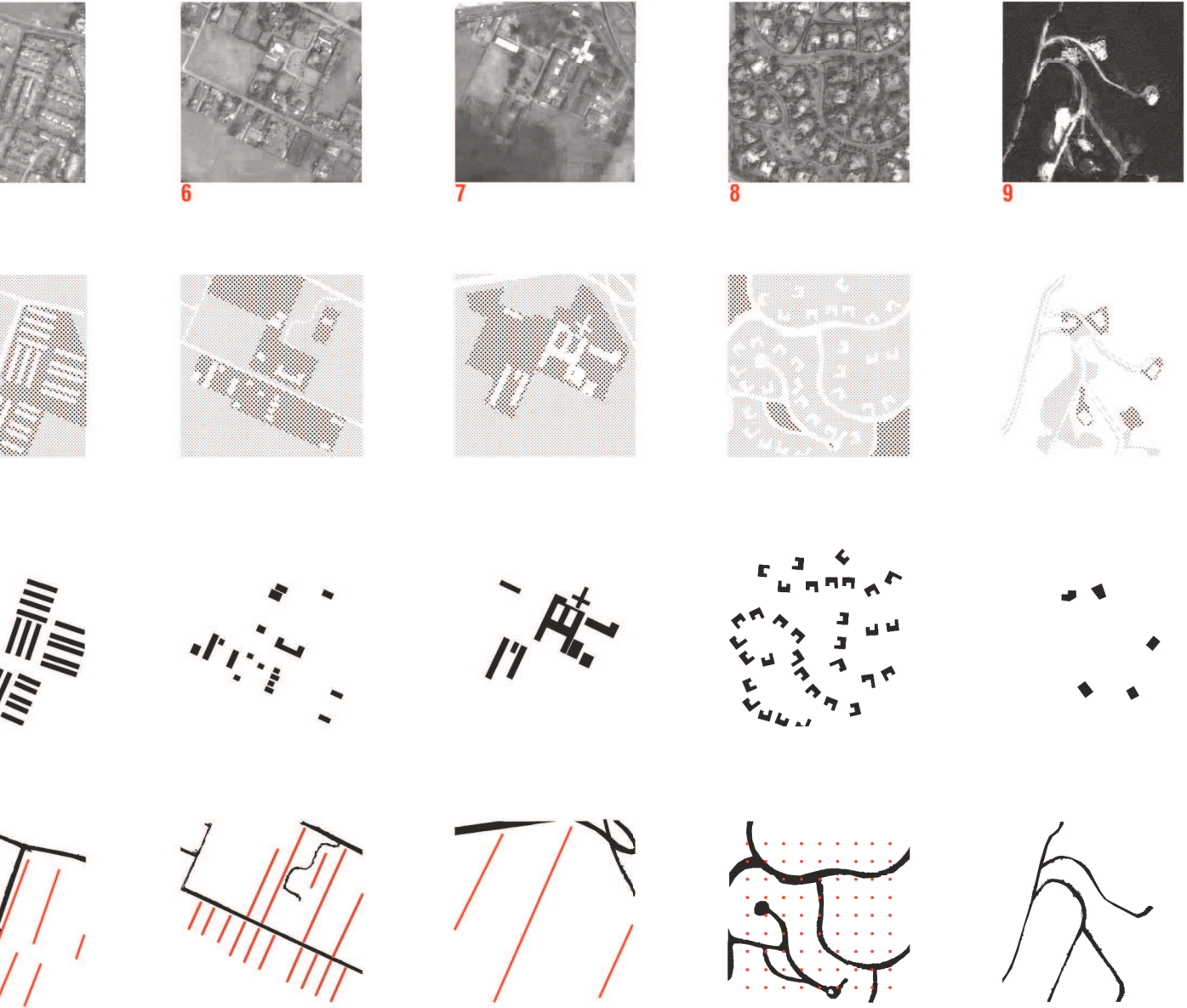


b



c





Taxonomy of the elements in the selected ambit.



Once again De Sola Morales notes how when Ungers suggested the small squares in order to represent fragments of urban textures, he was proposing a generalizing characteristic of the elements represented but evidenced how the texture expanded beyond the square's limits.³

Using a series of specimens of the "materials" that compose the variety and irregularity of the urban and suburban textures that have generated the undifferentiated configuration we see today is necessary in order to find patterns and to regulate the scale of the intervention. The sequences evidence a transition from self-referential residential tissue, such as the gated communities of wealth to the diffusive semi-informal housing. The specimens follow relational paths from the central plaza through to the once "sub-rural" spaces that have become a collection of small and mid-sized plots, in contrast with the low rising "megaforms" that occupy vast areas comparable to the size of the entire settlement in some points. These megaforms are constituted by the massive greenhouses that occupy areas from about one thousand squared meters to about a couple of squared kilometers or more.

In Chia's urban colonial core, for example, a hierarchy of streets, alleys and volumes that support orientation to some extent articulates the approximation towards the historic and cultural landmarks.



³ Ibid.

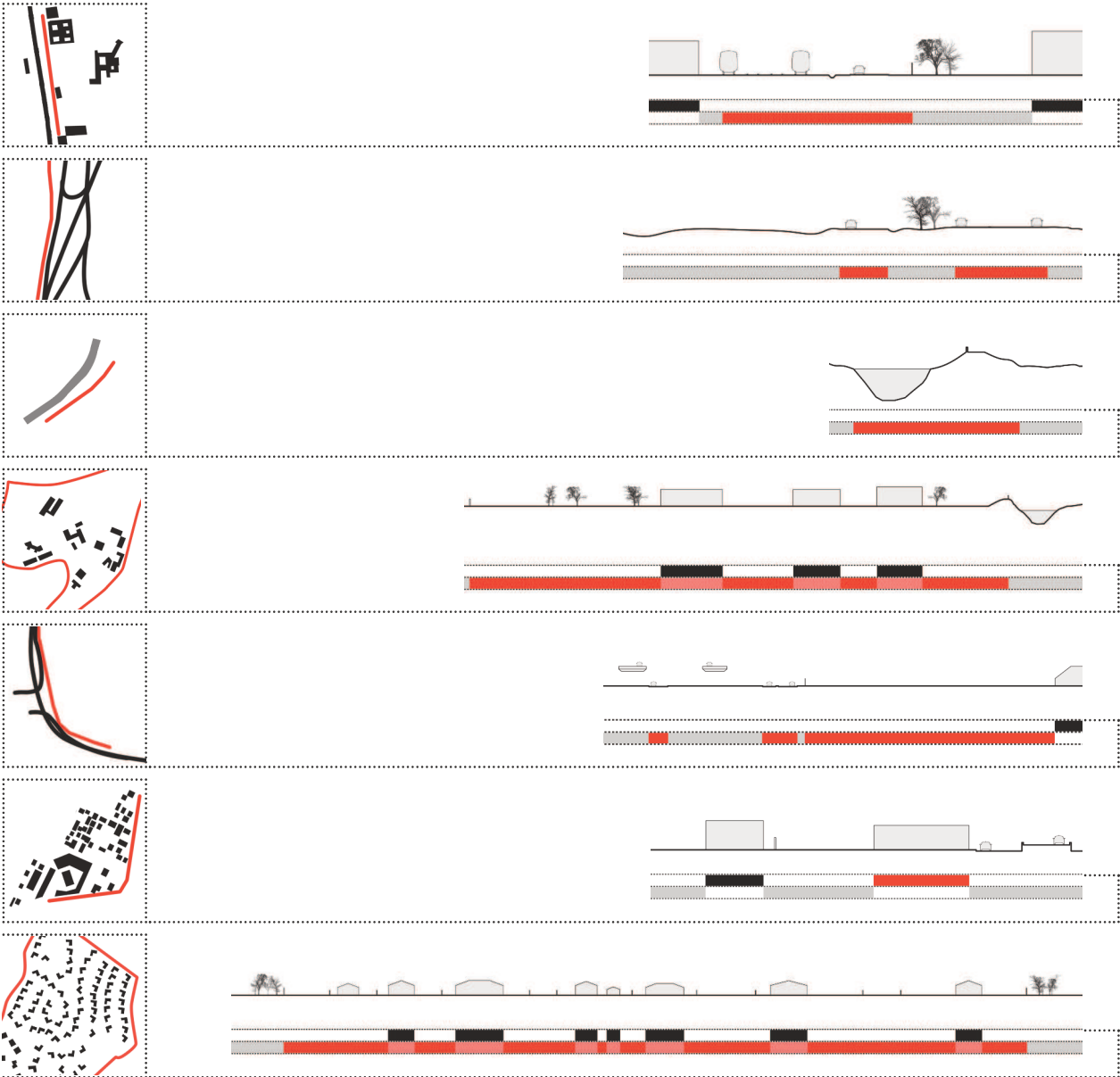




0 2000 m

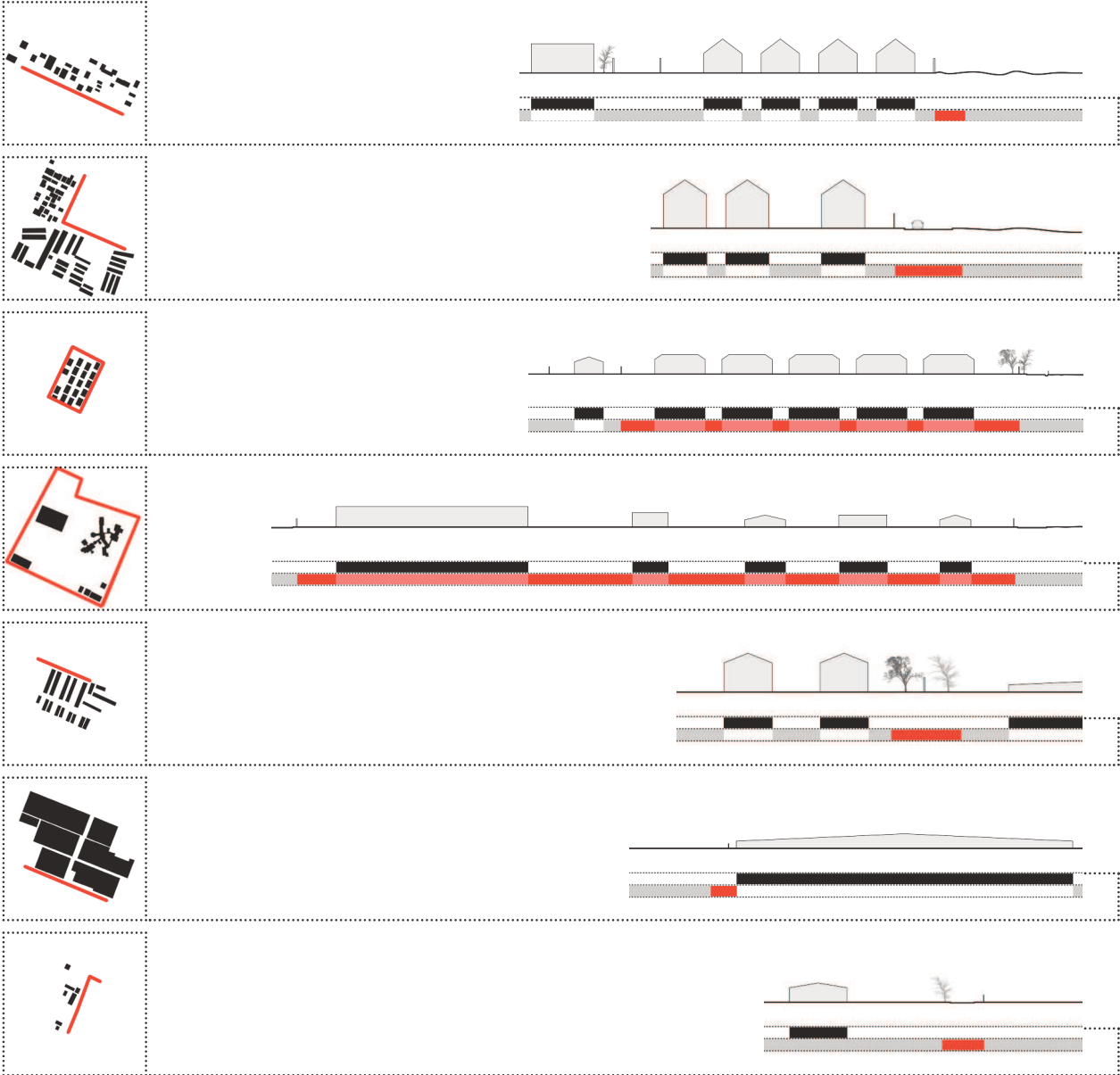
Identification of Margins and borders in the selected Ambit





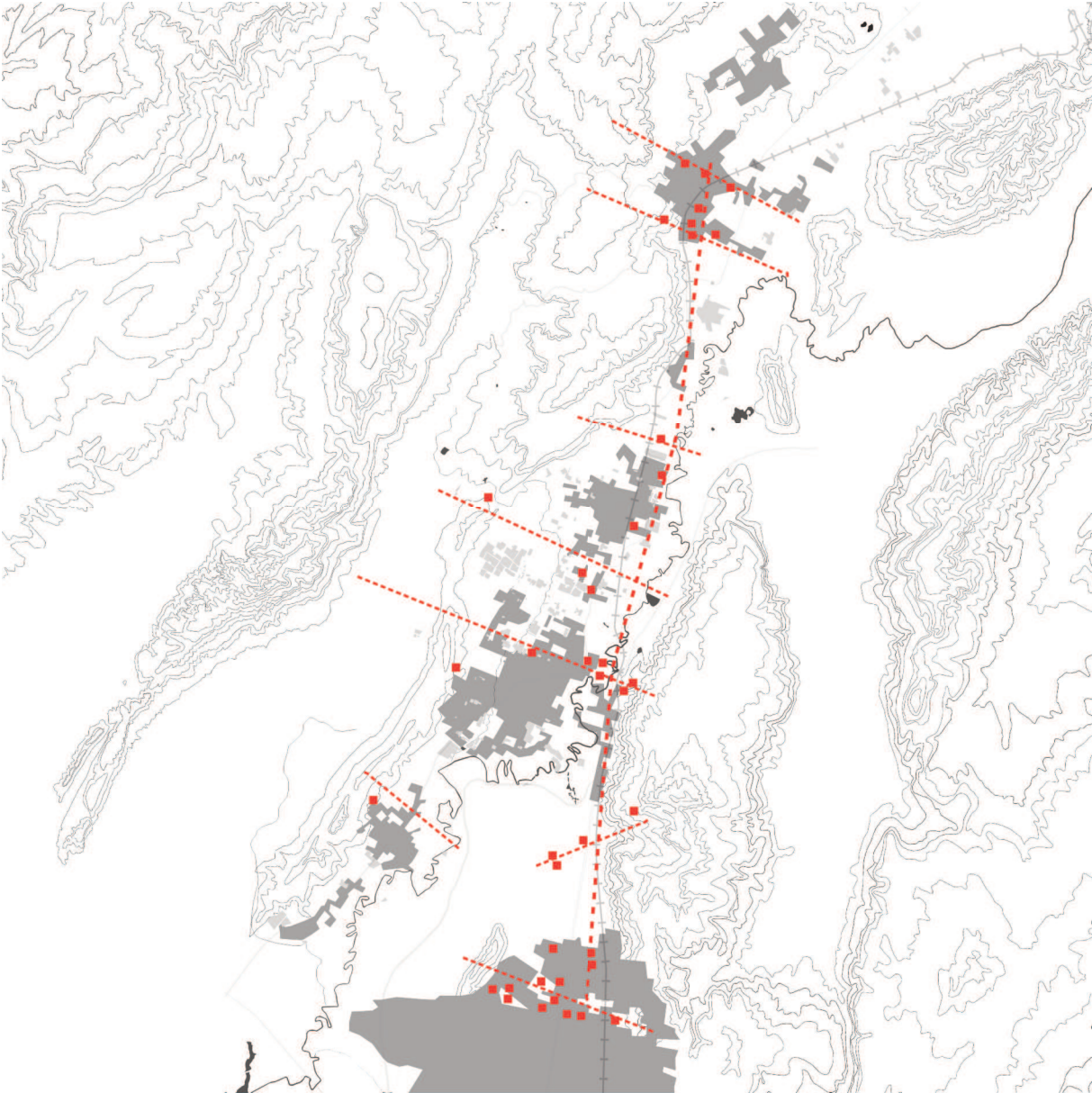


Cross sections of gate and residue elements, Margins and Borders





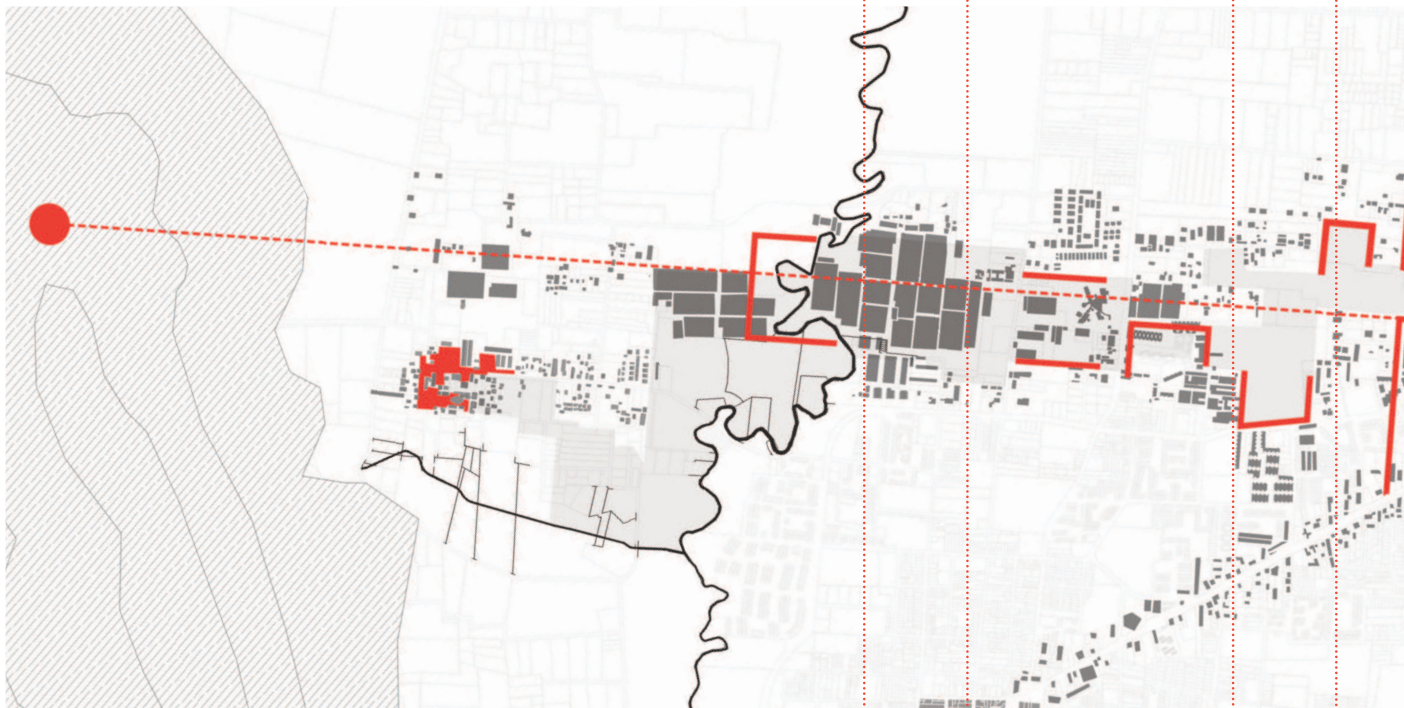
Cross sections of gate and residue elements, Margins and Borders

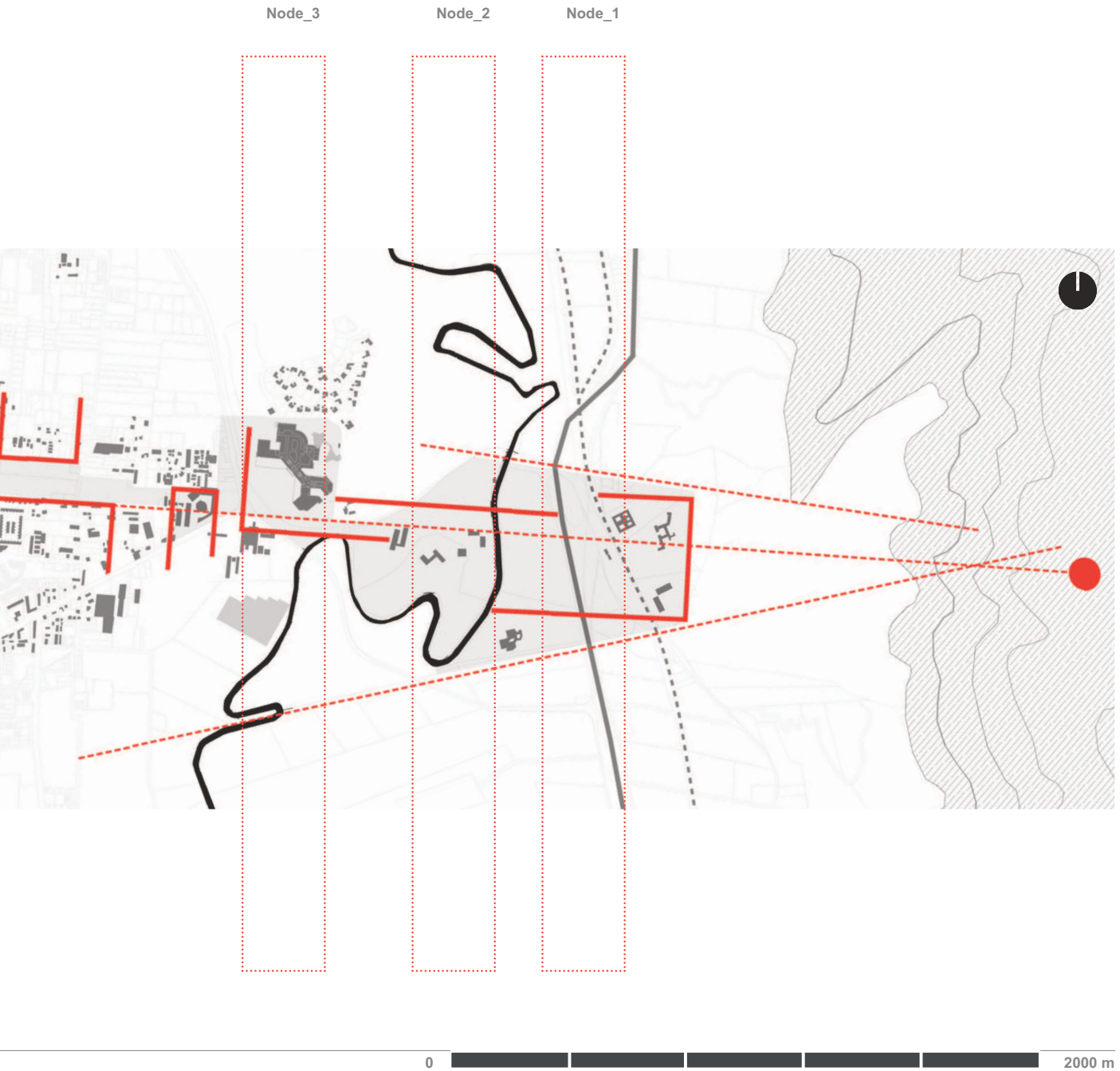


Interrelational Synthesis.

Node_5

Node_4





Strategy and identification of local nodes



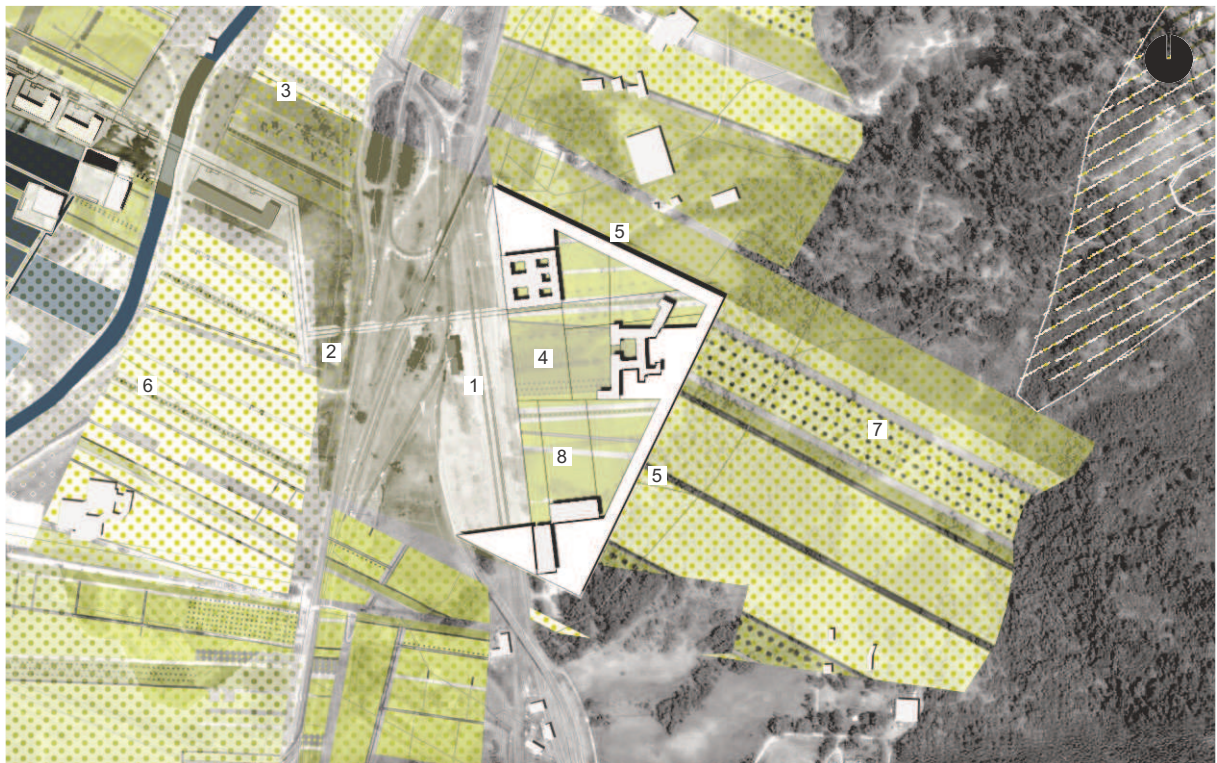
Node_1 Railway system and infrastructural land

address Autopista Norte 55, Chia, Cundinamarca
area 150000 sqm open area
site near the currently abandoned La Caro Railway Station
lot Interspaces around private colleges, infrastructural turnpike and train station.

- Autopista Norte 1
- La Caro Railway Station 2
- Jorbalan School 3
- Marroquin Castle 4
- Catholic university Sports Center 5
- Pedestrian Bridge 6
- Teleton University Clinic 7
- Puente del Comun 8
- Hacienda 9
- Industrial warehouse 10
- INALDE Business School 11



- Tren de Cercanias Station and underpass 1
- New pedestrian and species crossing bridge 2
- Bogota River Linear Park 3
- Public Space Court 4
- Social Housing 5
- Wetland Reservoir 6
- Mountai Primary Forrest Reservoir 7
- Sports Court 8



0 500 m

Node_1

The main node is composed by a series of pre-existences that are found relatively close to one another and especially interesting because they intercept the north-south flow which as seen before is the predominant relational axis between the city and the sabana. The abandoned La Caro train station, which within the general strategy that proposes the re-use of all of the Sabana stations is hypothesized through the regeneration of the infrastructure as a “tren de cercanias” in order to rediscover the traces of an infrastructure that has had a crucial role in the development of the sabana, but for mainly political reasons, the infrastructure has been nearly abandoned and is currently only used as a tourist attraction. Its potential in the reconfiguration of the region is enormous; it does need some investments but the areas where the railroad passes need not to be expropriated as they already belong to the government.

In the same area both the Jorbalan school and the Catholic university's sports facilities are found in relatively monumental buildings that are currently disassociated. The project for the area intends to review such disassociation in order to generate a relational inter-space to hold these

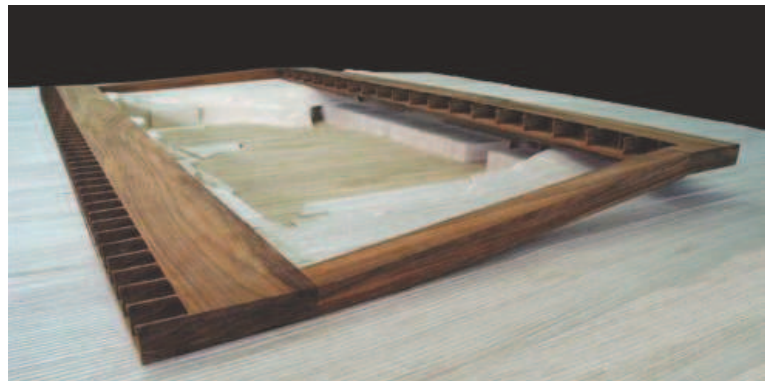




fragments together in a new network of relations which by tapering into the North South flow can potentially involve the more ignored parts of the territory in a new regional relational network. The project identifies an infrastructural underused node and designs the crossing of the global connection to find a local coherence and generate habitable space in such an entropic landscape. In the hypothesis of a re-activation of the railway as a Metropolitan mass transport system, through the re-use of the dismantled stations the area is reconfigured in order to emerge in the landscape as large scale enclosure which recalls both the pre-columbian “alcazeres” as well as redefining a new type of island of order in contrast with the primary forrest of the mountain ridges and through the analogy of the enclosure, finding an inhabitable enclosure. A relation of object and context that intends to apply the parameters set in the chapters befor of analogy and contrast, order and disorder.

The Bridge

The bridge the central figure of the general intervention as it reveals the fracture of the region, it is no coincidence that in the selected area we find the “Puente del Comun” a historic landmark that has identified the area with a relative stability of the places of interrelation mentioned in the first chapter. In this case the design of a new bridge is necessary

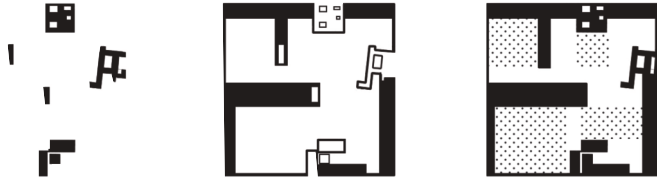


Jorbalan School
La Caro Station
Puente del Comun

Reference Projects: Aires Mateus, Barrocal Farm

because the largest fracture of the region is not the river anymore, instead it is the infrastructure, which needs to be crossed in order to find a new possibility of inhabiting the entropic landscapes that characterize the area. The project proposes both a natural bridge for the continuity of both ecology and local crossing as well as a new infrastructure, that may be built in a second moment using the gondola lift technology elevating the re-used station to an intermodal exchange node.

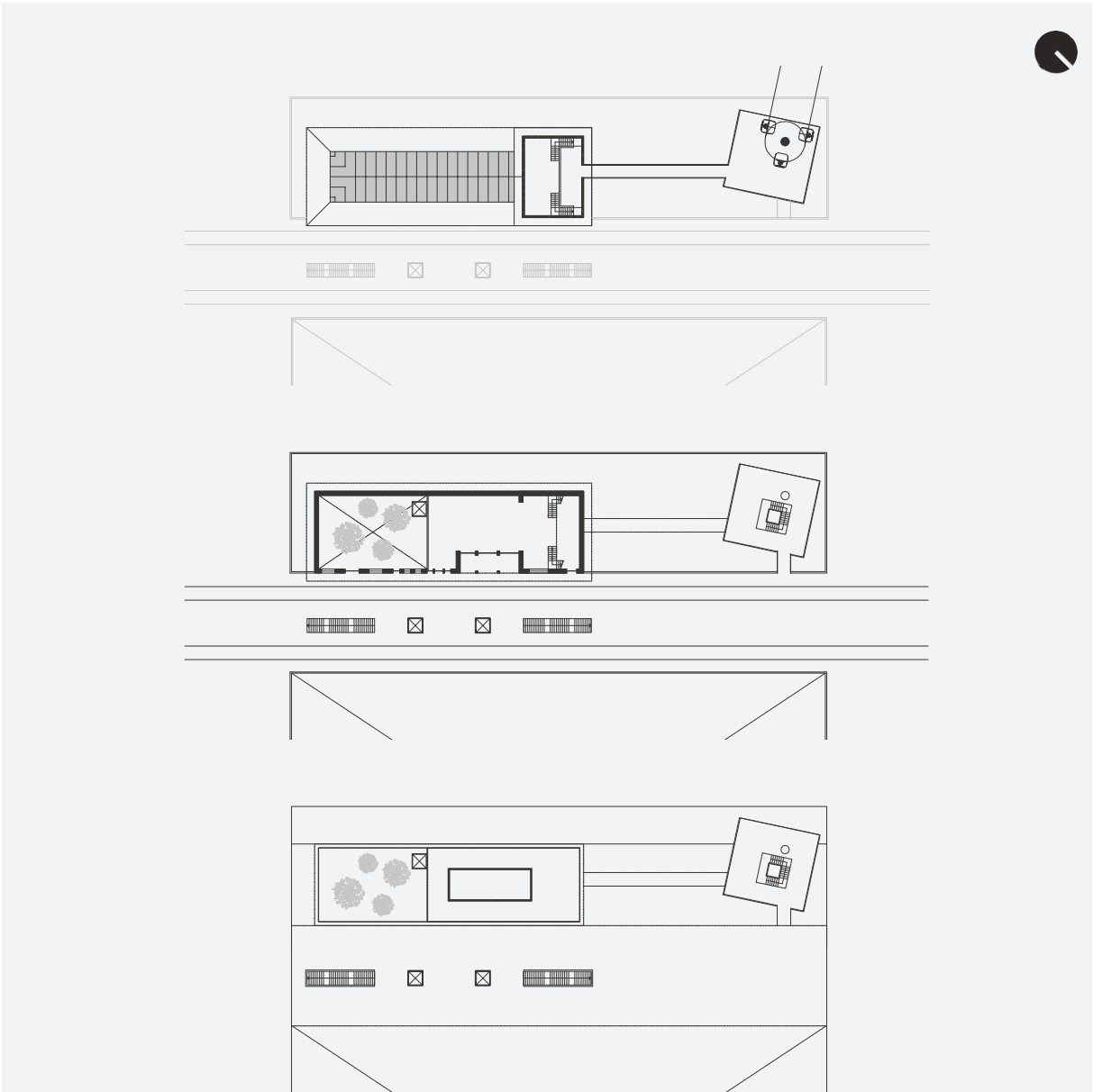
The use of a historically stable place, a connection between systems, the re-definition of the relations between pre-existences and the re-activation of a historic infrastructure through its integration in a broader system defines this first node as a multifunctional space where the north-south flow that dominates the Sabana's current relational system is tapered into in order to generate a series of perpendicular flows in order to promote the re-activation of the polarities through its margins, from a centrifugal logic towards a centripetal settlement principle.



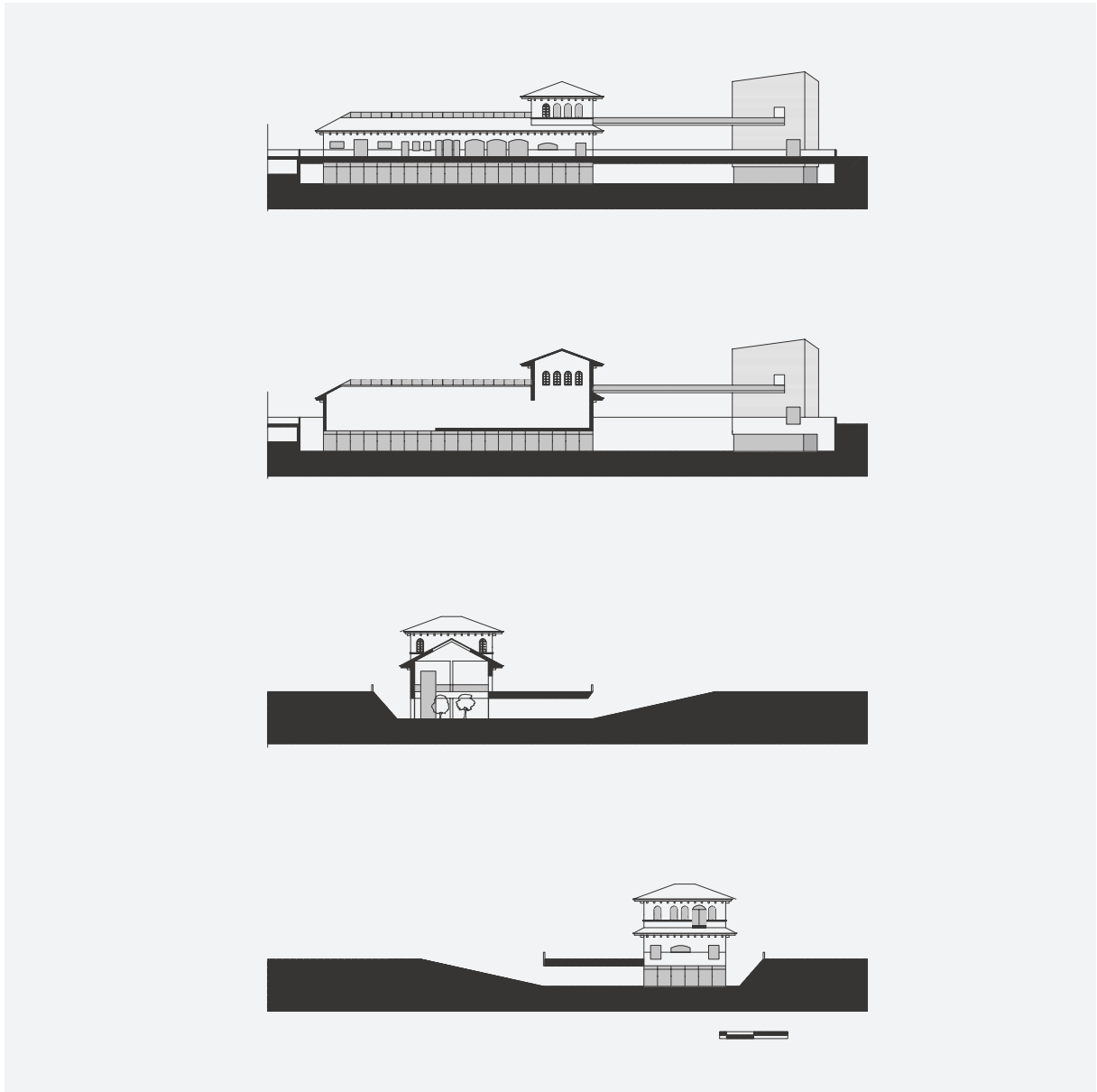


0 100 m

Plan of the enclosure with the pre-existences reconfigured through the "interspace" and project of the re-nued station.



Plan of the station: above_ Gondola lift Station, center: Railway station, below: Internal Garden and Underpass.



0 50 m

Sections of the Station.

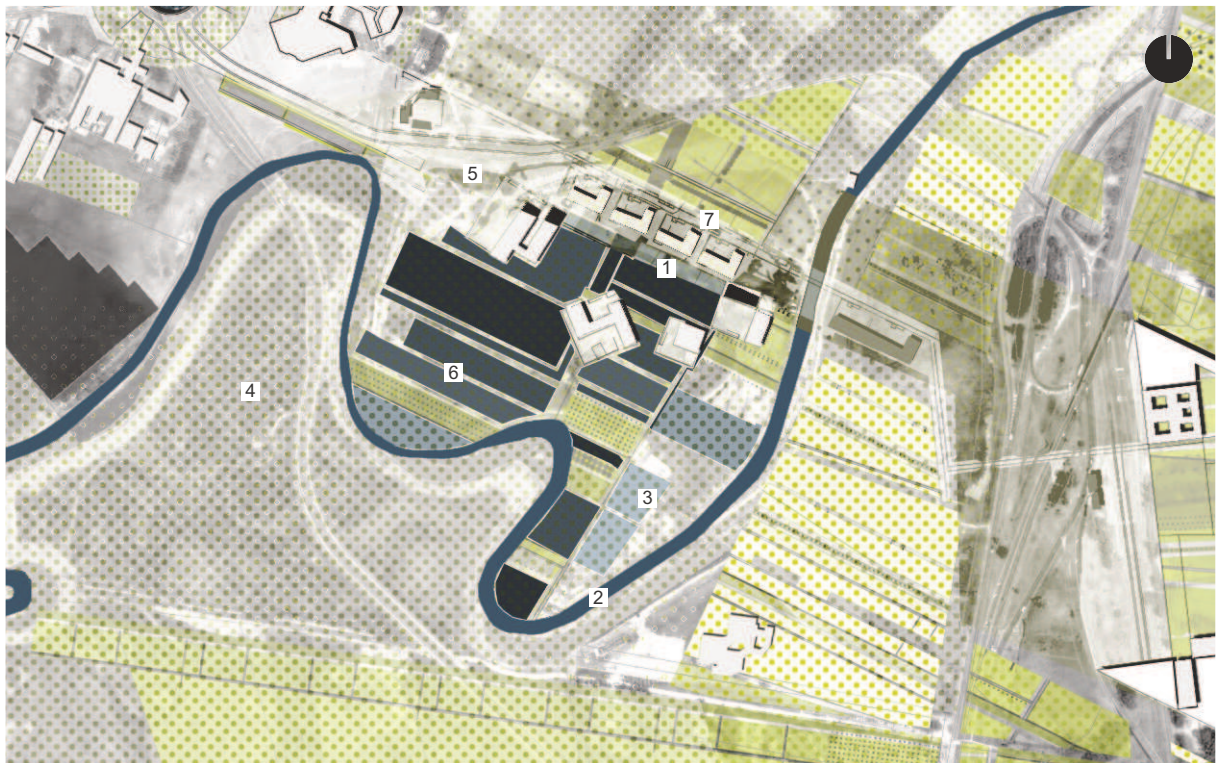
Nodey_2 Railway system and infrastructural land

adress Sabana University Campus
area 250000 sqm open area
site Sabana University Campus
lot University buildings, Detention Basins, Flood Risk Areas

- University Campus 1
- Bogota River 2
- Univerity Sports Facilities 3
- Wetlands 4
- University Campus Main Gate 5



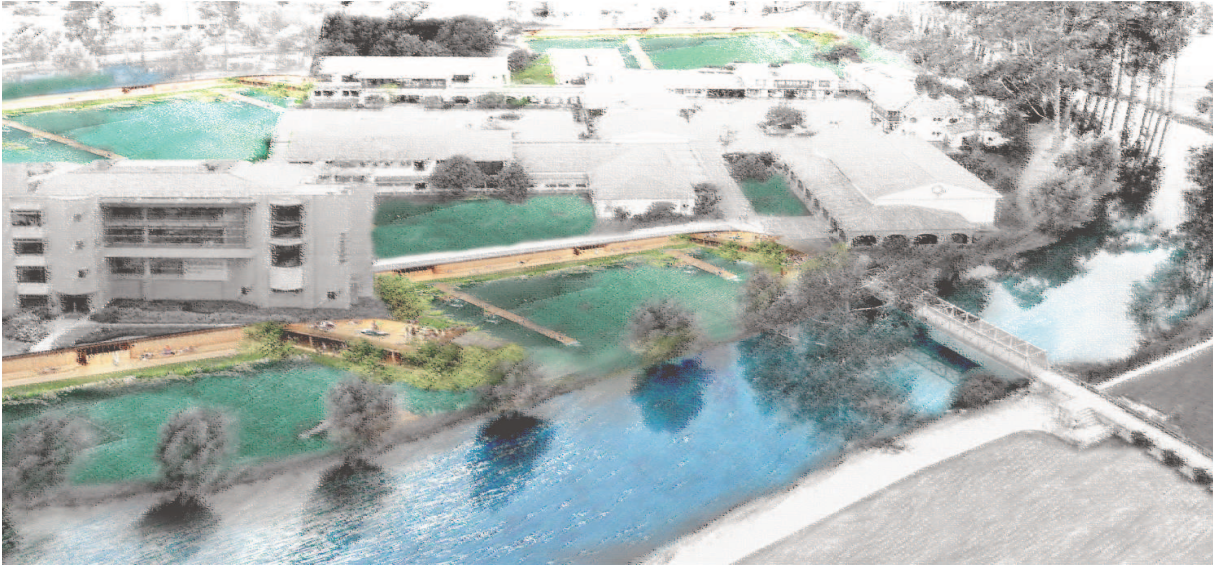
- University Campus 1
- Bogota River 2
- Univerity Sports Facilities 3
- Wetlands 4
- University Campus Main Gate 5
- Detention Basins 6
- Student Dormitories 7



0 500 m

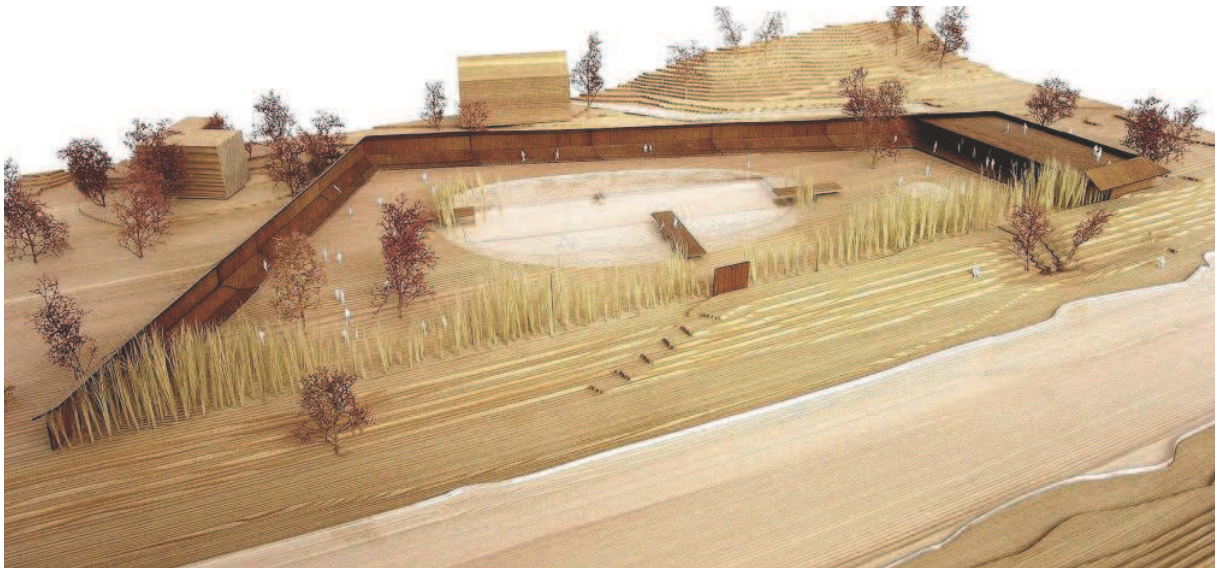
The University Campus

The university campus has been subject to intense flooding in more than one occasion and it is a natural expansion basin for the Bogota River, for its ecosystem and its wildlife. There are currently undergoing studies on the prevention of such events with ever-taller dykes which would further isolate and divide the area as well as stubbornly contrasting a natural cycle. The current proposal intends to collaborate with this natural entropic process, embracing the flooding in order to generate a series of detention basins that will transform the gated island of the university campus' "softscape" into a series of island buildings capable of absorbing the hydrological expansion when flooding occurs. The project mostly consists on a reconfiguration of the open space by excavating in order to create such basins and by designing a series of bridges to interconnect the existing buildings of the university. The excavated soil from the basins can be used to create the necessary dykes and elevated grounds for the university's open space.





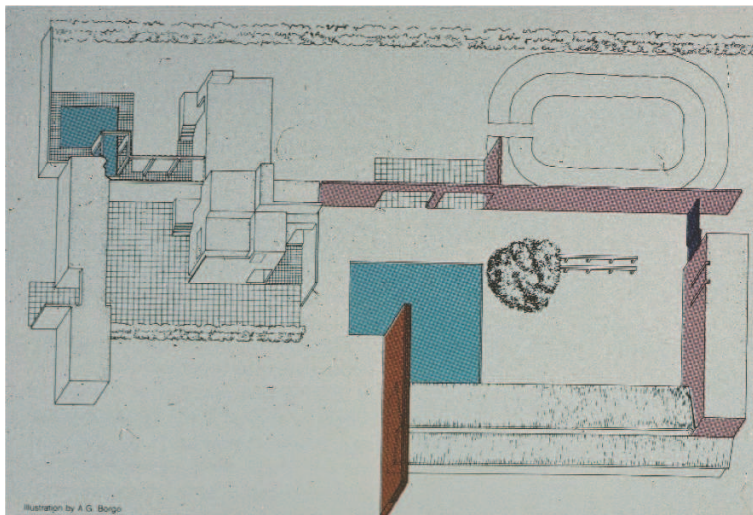
Through the re-definition of the open-space the objective is intensifying its relation to the ecological system of the Bogota River, which is currently undergoing a transformation into a linear park by the regional agency C.A.R which protects local flora and fauna. The Bogota River Linear park would serve as a metropolitan scale relational space, and would be able to provide a structure to which a series of local scale parks and public spaces may attach to in order to generate the continuity of ecological space that natural species need in order to maintain their biodiversity.



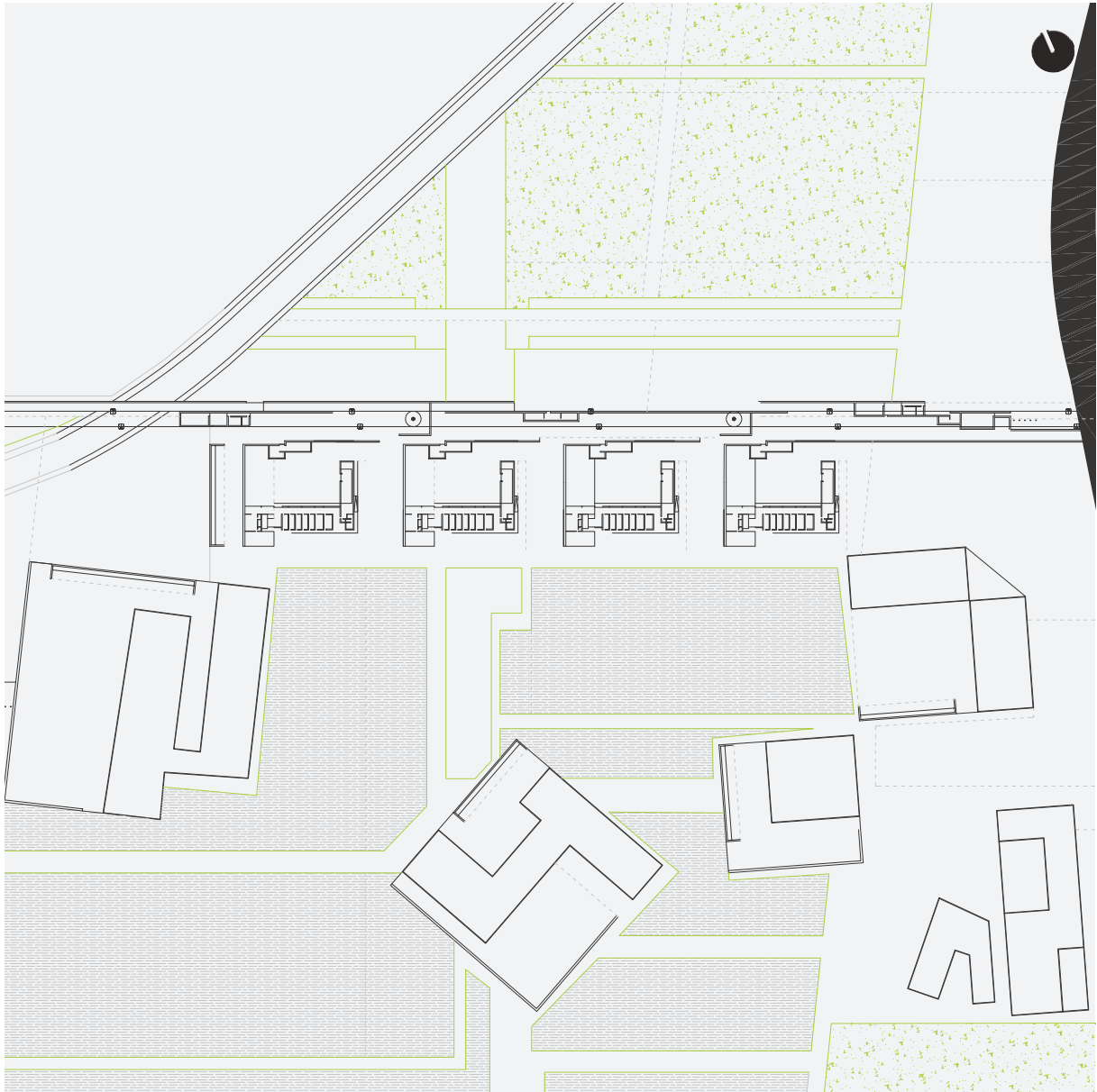
Opposite: University of Sabana before and after the Rio Bogota floods on 2010
Above: Reference Projects: Herzog & De Meuron Naturbad Riehen.

Furthermore, within the here proposed case study, a series of student dormitories are designed as a way to give the gated space of the campus a local relation that may be active in a 24 hour span as well as generating a larger population for the regeneration of the Tren de Cercanias infrastructural node. The project is composed of four buildings that contain a series of common spaces in the ground floor and residences in the floors above.

The idea is to place these buildings in a way that can easily exchange with the infrastructure to promote the relations outside of the campus in order to generate a more surveilled space and avoid an introverse campus.



Reference Students dormitory Projects: Louis Barragan, Casas San Christobal



0 100 m

plan

Node_3 **Infrastructural Turnpike, Centro Chia Mall**
address 45 A-21 Chia, Cundinamarca
area 100000 sqm open area
site Centro Chia Shopping Mall
lot Infrastructural Turnpike, Gated Community, Hospital

- Centro Chia Mall 1
- Infrastructural Turnpike 2
- Mall Parking lot 3
- Santa Ana Gated Community 4
- Santa Ana Chapel 5
- Plaza Mayor Shopping Center 6
- San Juan de Dios Hospital 7



_ Experimenting The Multipolar Paradigm for the Regeneration of the Fragmented Metropolitan Margin

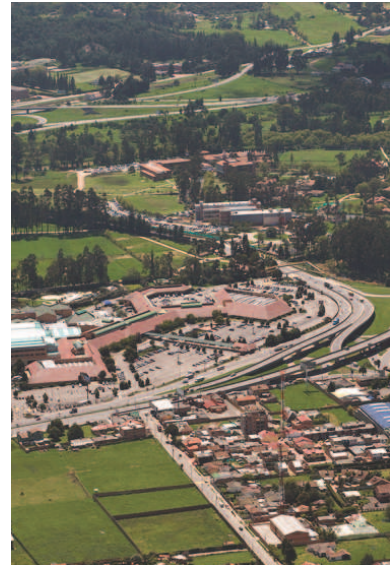
- Centro Chia Mall 1
- Infrastructural Turnpike. Carnot Gardens 2
- Underground Mall Parking, Roof Garden 3
- Santa Ana Gated Community 4
- Santa Ana Chapel 5
- Plaza Mayor Shopping Center 6
- San Juan de Dios Hospital 7
- Restaurants and food market 8
- Entrance to Interstitial Agricultural Park 9

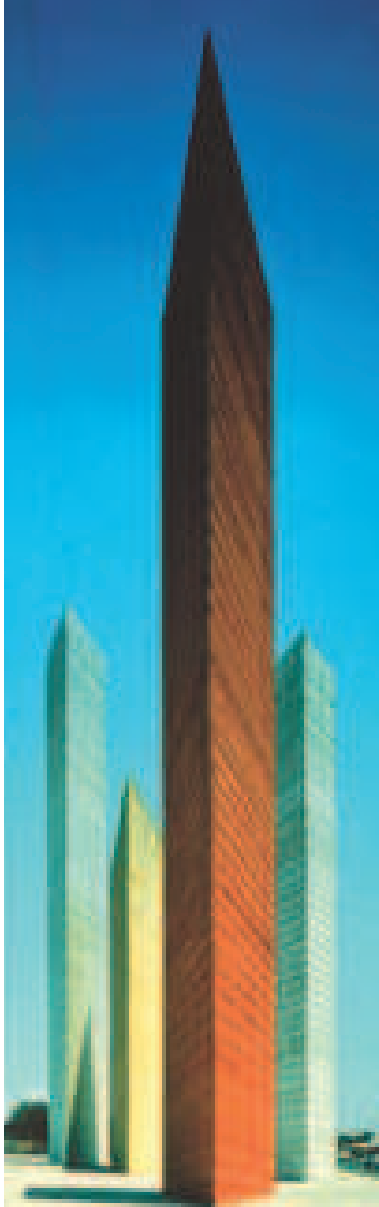


0 500 m

Carnot Vertical Gardens

The current turnpike that connects the main commercial street of Chia with the local mall is a complicated arrangement of intercrossing flows that give the automobile an importance that exceeds the local needs. The project proposal is a large roundabout that searches for a local relation as well as consenting the global interaction. In this case some of the water from the adjacent river is deviated to create a large basin where three vertical gardens should emerge. These gardens are an analogy of the private floricultural exportation greenhouses that pullulate the region, but working contemporarily with compositional contrast, they become a landmark, a local public garden that uses the water of the Bogota river, through the accumulation of heat from the green house, evaporates and rises to the top of the tower where the humidity condenses and is conveyed in order to irrigate the garden. It becomes a public space that as seen before, the Bogota Sabana area is critically lacking.



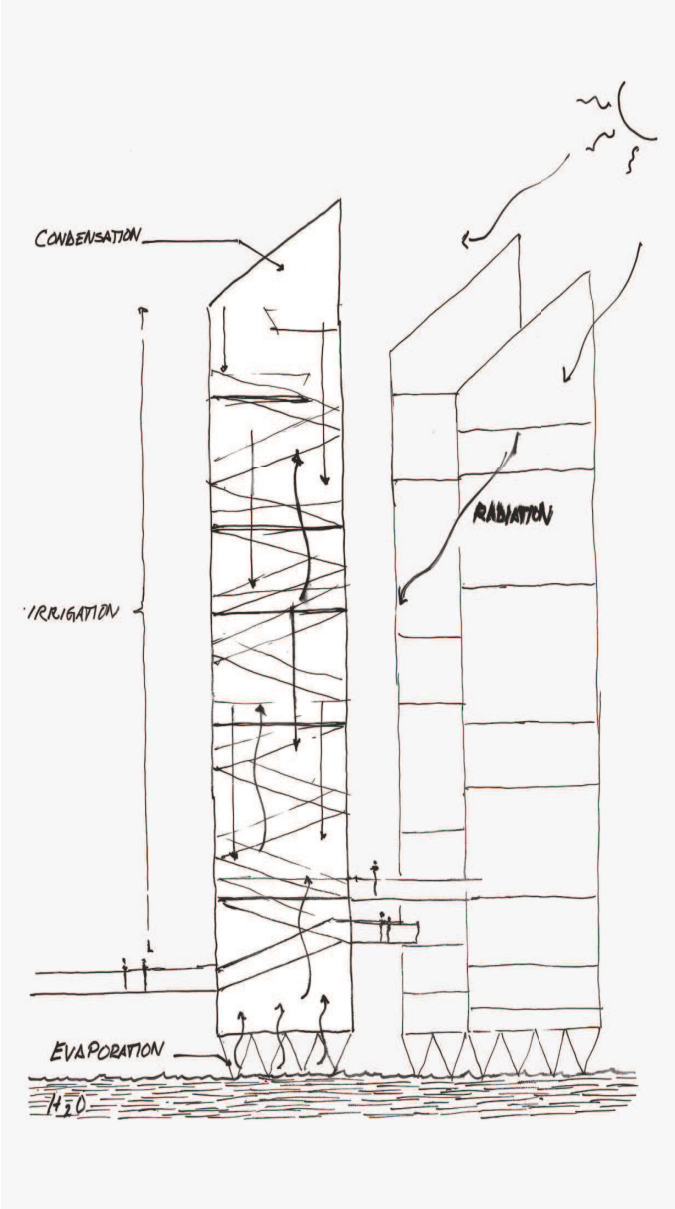


The roundabout is an inhabited infrastructure, closely related to the Equiped Axis, and the inhabited infrastructure of the Plan Obus for Algerie. In this case the stratification of the infrastructure generates a connection and a relational space contemporarily. On the top level, traffic circulation is guaranteed, while on the lower levels a semi-hypogeum space permits pedestrian crossing, vehicle parking and the possibility for commercial spaces, generating a hinge between the existing commercial street that connects the shopping mall to the historic city center of Chia with the project's linear connection and with the university's campus. The isolation of the shopping mall is therefore reconfigured into a more permeable semi-public space by becoming more intimately connected to the forestanding public space and its scenographic presence in favor of a designative role of the vertical greenhouses. More generally the area itself becomes a nodal entity, reconfiguring once again the pre-existences through the integration of a few new elements but more importantly through the re-arrangement of the space in between.

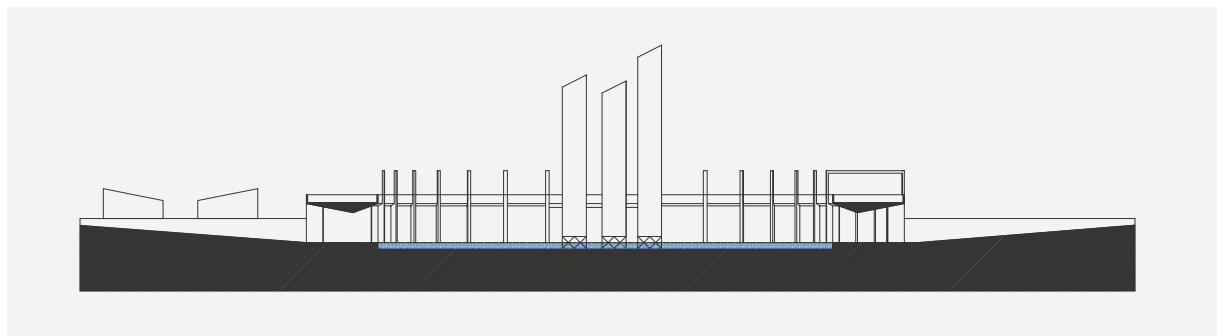
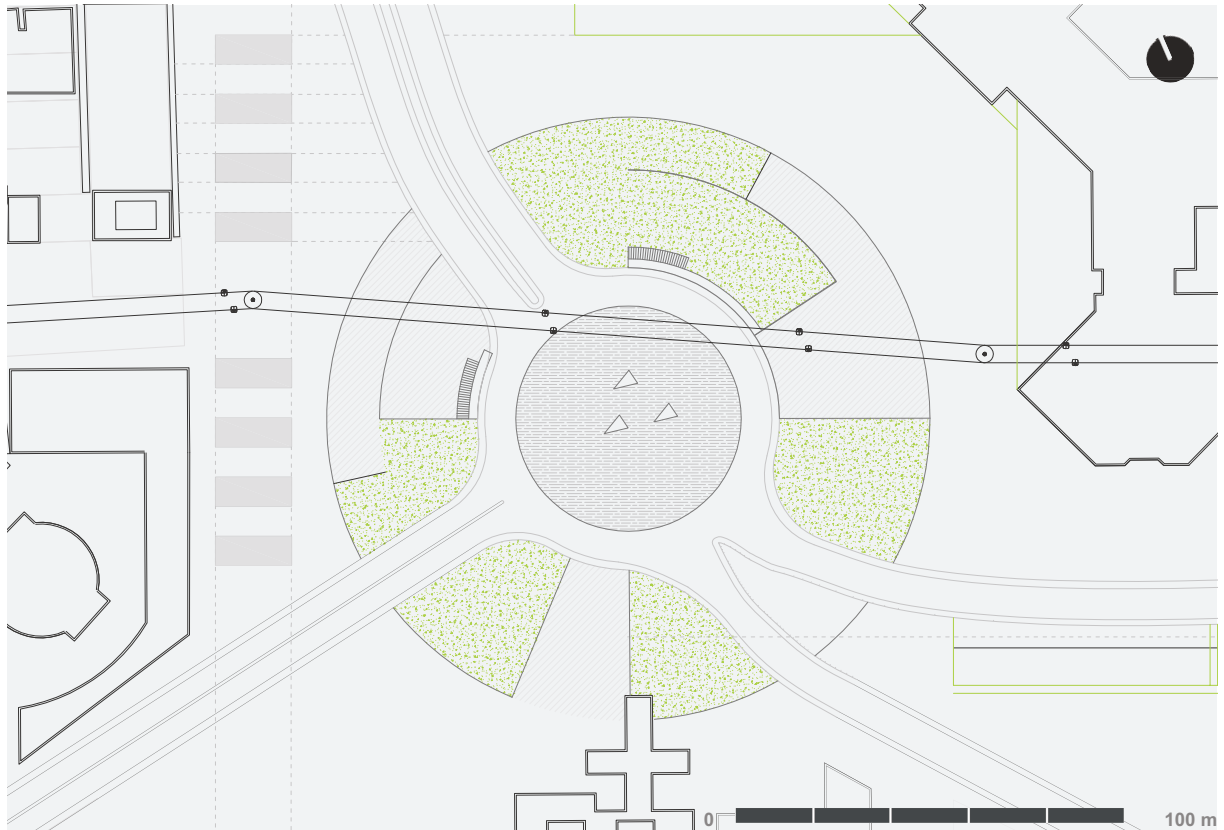


Opposite: Centro Comercial Chia
Above: Torres Ciudad Satelite
Source: *Barragan. Opera completa*,
Logos Art, Modena, 1996

Reference Projects: Torres Ciudad Satelite, L. Barragan, Mexico
Node of la Trinidad, Batlle i Roig, Barcelona



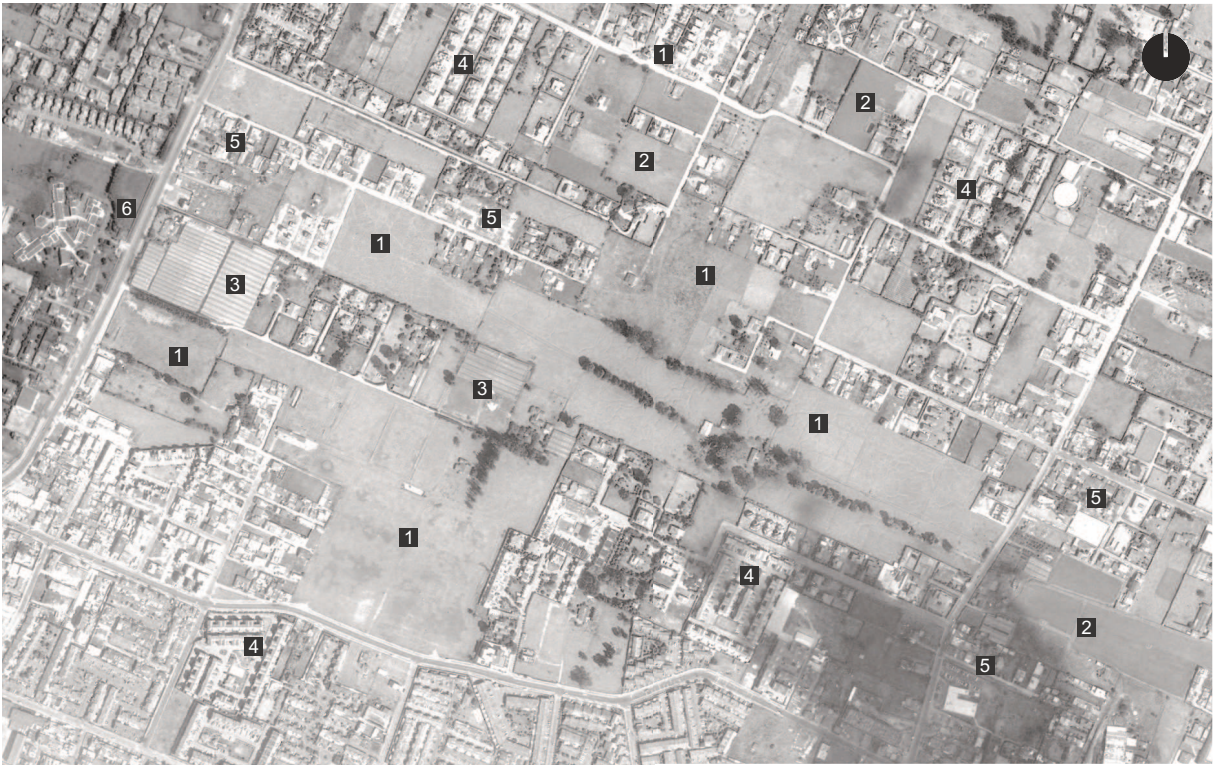
Above: Carnot Vertical Gardens, diagram of function_ radiation-evaporation-condensation-irrigation. Reference Project: Eco-Boulevard, Studio Ecosistema Urbana, Vallecas, Madrid



Plan and cross section

Node_4 **Community Local Market**
address —
area 250000 sqm open area
site Residual spaces in the Urban Margin of Chia and Cajica
lot Mid-Income Gated communities, Low-income housing,
Private schools. Vacant lots, Small- size greenhouses.

- Residual spaces 1
- Agricultural fields 2
- Greenhouses 3
- Mid-Income gated Communities 4
- Low-income Housing 5
- Private Schools 6



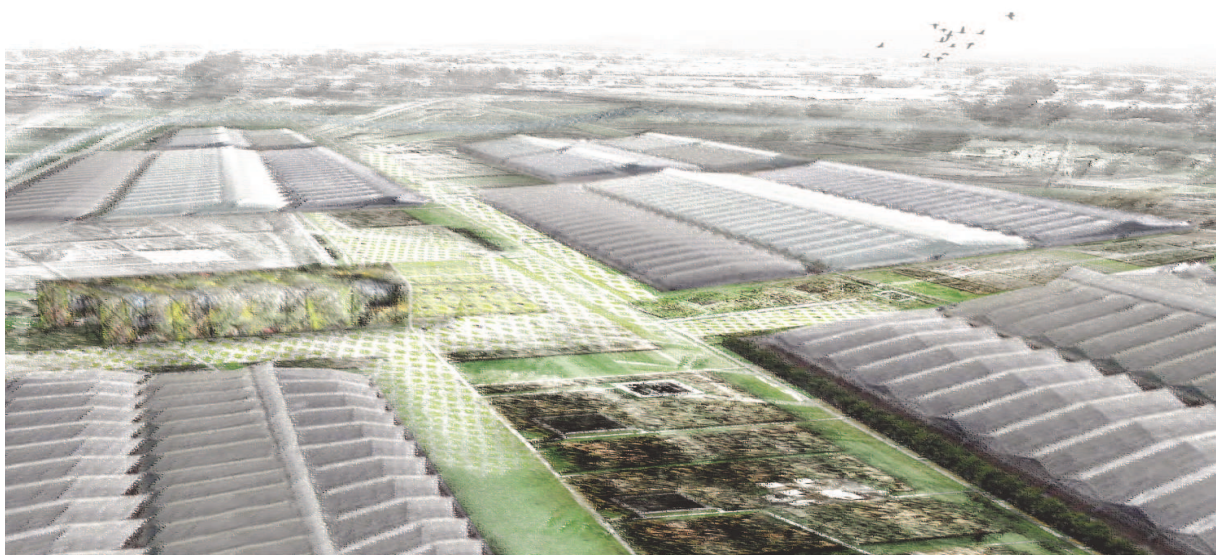
- Market for the consumption of local products 1
- Social Housing 2
- Pedestrian Paths 3
- Public Greenhouses and Vegetable Gardens 4
- Playgrounds 5
- Flower Gardens 6



0 500 m

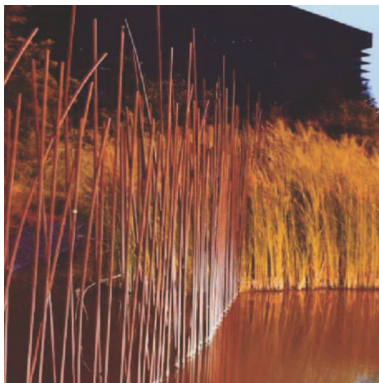
Community Local Market

The community Market is designed to work through a synergic relation with the agricultural citadel, where the cycle of production distribution and consumption finds a local scale complementary to the existing analogous global cycle. The community market may offer local vegetable gardens, public facilities and cultural exchange in order to generate a central gathering place where the local population can rediscover a relation with public life in open spaces found through the interconnection of residual spaces at the margins of the settlement. the project proposes a low cost redefinition of the area by the use of vertical elements that may adapt as shelters for commerce, open spaces for cultural events and may evidence the continuity of public space connecting the Agricultural Citadel to both the city's historic centers as well as to the Chentro Chia Shopping mall and university.

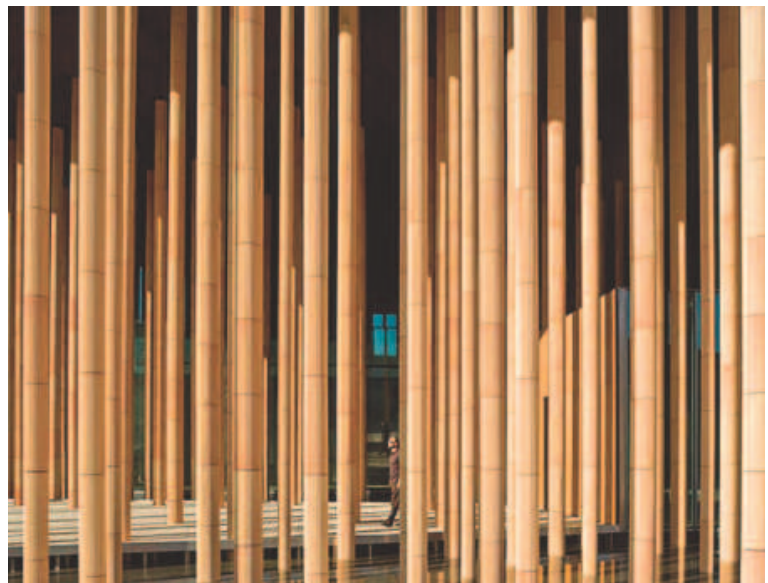


Residential borders

To find an alternative order to the widespread gated communities that have been identified in the area as a critical element in the erosion of public space. These residential social housing is inspired on the projects for social housing proposed in Chile and Mexico, described in the chapters before, uses the techniques elaborated by the Elemental studio, in order to find a useful composition strategy that capitalizes on the dialectic between planned and spontaneous architecture. The buildings are designed to complete the fragmented margins of the connected residual spaces in order to create a unitary composition of the larger project that holds together the new nodal entities described before. The project proposes two typologies of 60 and 70 sqm that are able to grow through a self construction of the predisposed spaces. Conforming a



Opposite: J. Ishigami, Japan Pavillion
Venice Architecture Biennale 2008
Above: J. Nouvell,
Branly Museum Gardens

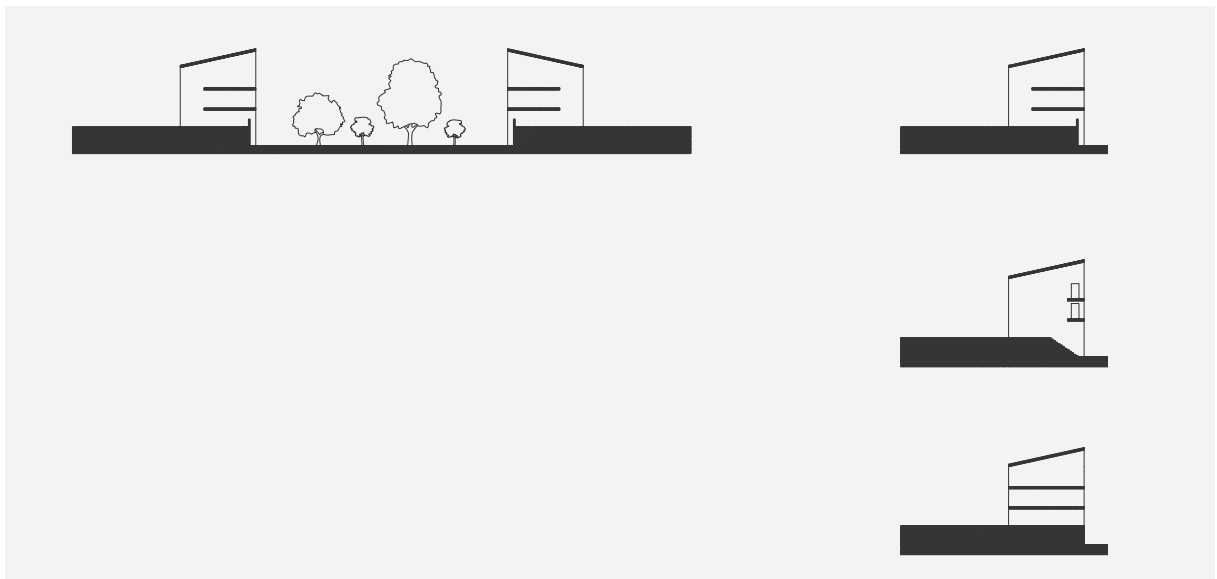


Nouvell Branly Museum Gardens, J. Ishigami, Japan Pavillion Venice Architecture
Biennale 2008

three floor linear building that permits the permeability between the re-naturalized residual spaces and the adjacent areas. The composition strategy for the residential buildings is the same as the one described in the chapters before, that is the tension between structure and probability, configuring a rythm between order and “disorder, planned and spontaneous.



Reference Projects: Elemental Quinta Monroy, F. Mangado Expo Zaragoza 2008, J.



0  50 m

Facade, plan and section of linear residential buildings

Node_5 Agricultural Citadel
 adress Carrera 11, Chia, Cundinamarca
 area 230000 sqm open area
 site Rio Frio River, Greenhouses.
 lot between bounderies, around private colleges

- Rio Frio River 1
- Greenhouses 2
- Colegio Britanico Private School 3
- Colegio Britanico Sports Facilities 4
- Colegio Padre Manjanet School 5
- Hacienda Arapoca 6
- Chia Public Sports Center 7
- Mid-Income Housing 8
- Agricultural Land 9
- Wetlands and basins 10
- Junkyard 11



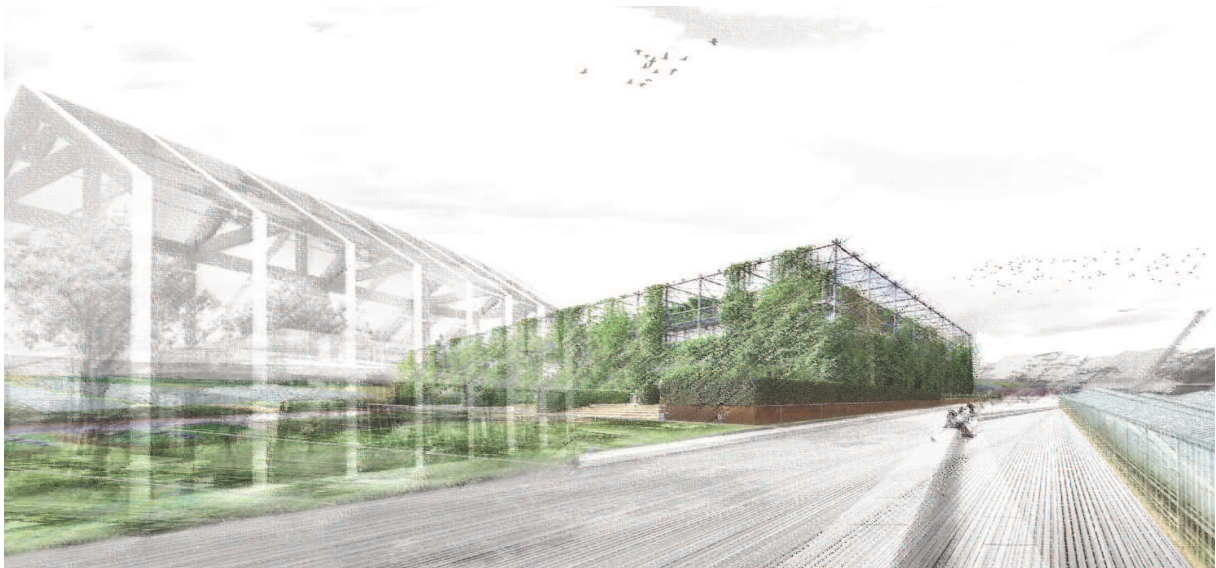
- Agricultural School 1
- Public greenhouses 2
- Rio Frio Linear Park 3
- Play Ground 4
- Social Housing 5
- Wetlands 6

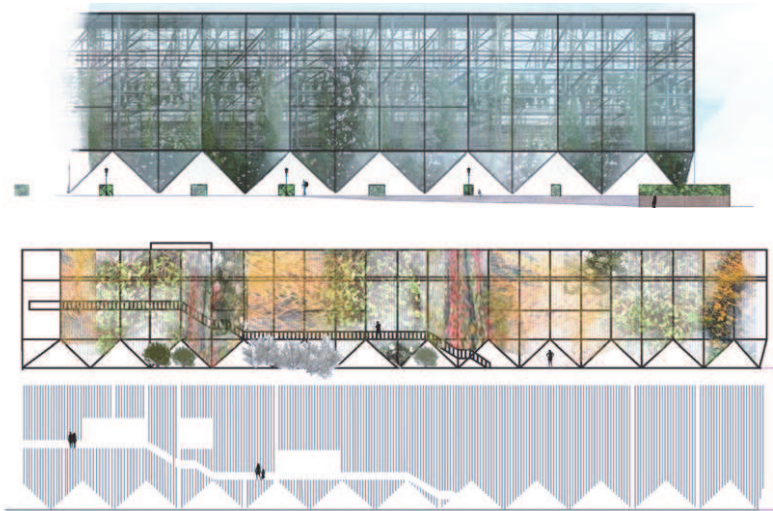
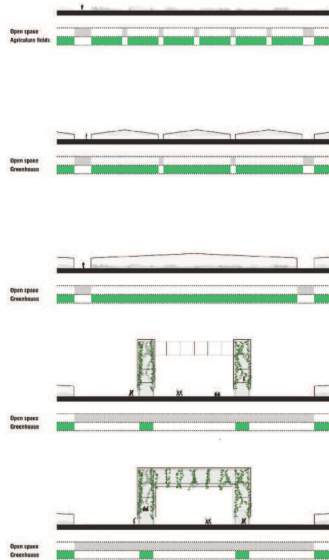


0  500 m

Agronomic Citadel

The agronomic citadel is a project aimed at generating local relation of the productive landscape in order to discover a complementary logic to the strictly global logic that greenhouses follow in the Sabana. An agronomy school, public vegetable gardens, and public space in general, intended to contrast the degradation of public space and to generate a polarity that can attract and intercept the intense North-South flow that dominates the current interrelation system through a complementary perpendicular connection of residual spaces transformed into an “equipped axis” of alternative order, inspired on Le Corbusier’s V7 which found its genesis in the Plan Piloto for Bogota. The citadel should re-discover agricultural techniques as well as offering a place for the rural immigrational waves that need a space to adapt to a new urbanized environment, while being able to receive education and facilities.





Section Elevation aa 1:50 @ A3

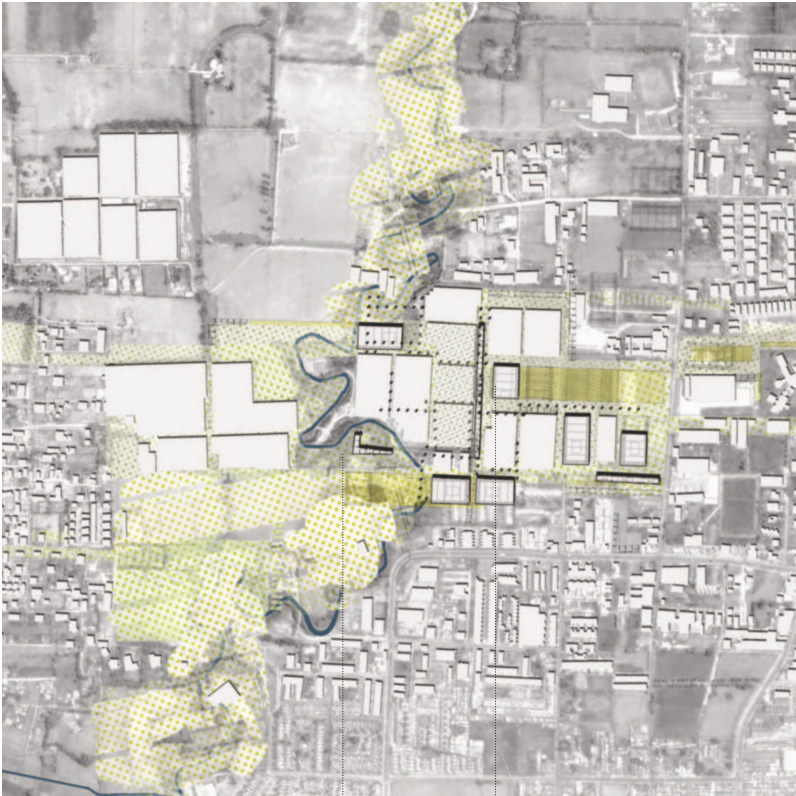
Gondola lift system



A possibility in a second stage of the process is to intensify the exchange between the main north south flow through the use of a gondola lift system which as mentioned in the chapters before, generates a surveilled public space without generating local barriers and intensifying the power of the nodal entities with the stations. It is not a mass transport system but on the other hand it is cheaper to build and it can avoid existing obstacles and limits in its tracks. The traitions of this infrastructure also generate a more secure space for residents while promoting the creation of commerce and social exchange. The infrastructure may grow with time according to the local needs and may expand even in places where the terrain becomes insidious such as the mountain ridges that delimit the valley, giving the possibility to connect the poorest social groups that tend to settle in the steep terrains and therefore become excluded for a social exchange and facilities. This type of infrastructure promotes the integration of marginal populations within area.

Above: MFO Park, Zurich
Gondola Lift System, Medellin

Reference Projects: Burckhardt + Partner, MFO Park, Zurich



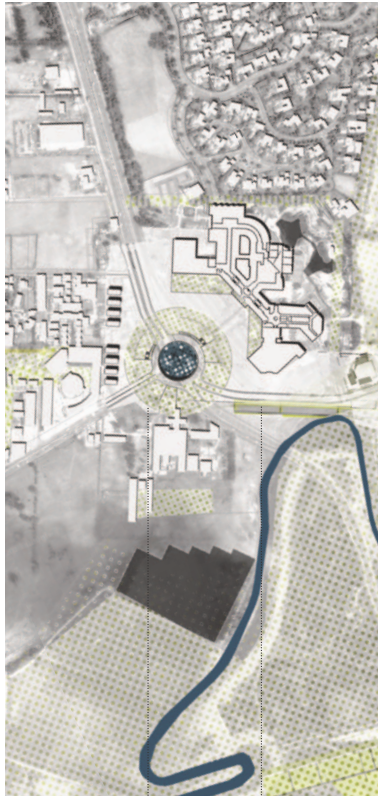
agricultural citadel

linear park



social housing

community market



greenhouse monument vertical garden

detention basins

university sports center, school, railway station (reuse)

mall in park

university and student housing

historic bridge

0 1000 m

Location specificity

Results

The following maps intend to show how the local modification, through the use of the reitiary paradigm, may connect the local modification to an ever-larger structure. from the residual space local structures, to the regional fluvial and infrastructural system generating possibli a chain reaction that propagates throughout the various scales. The use of the open composition strategy described in the chapters before and the reciprocal orders based on the dialectic between order and disorder, built and void, structure and entropy starts to constitute a self similar form at a larger scale. This way a a series of polarities within the north system may work both separately as well as synergically in order to generate a hierarchical relation between the systems that still permits the rearrangement of the relations into new configurations of future modifications. this way the use of the reitiary paradigm does not becom a constriction but instead it becomes a mutable configuration.

The results of this research may be found on three distinct levels: a theoretical level, a methodological level and an experimental level: From a theoretical point of view, the correlation between the diversified concepts that appertain to a number of distinct disciplines appears to have obtained a verifiable result on the transportation of such concepts to the architectural sciences which explains some of the





800 m

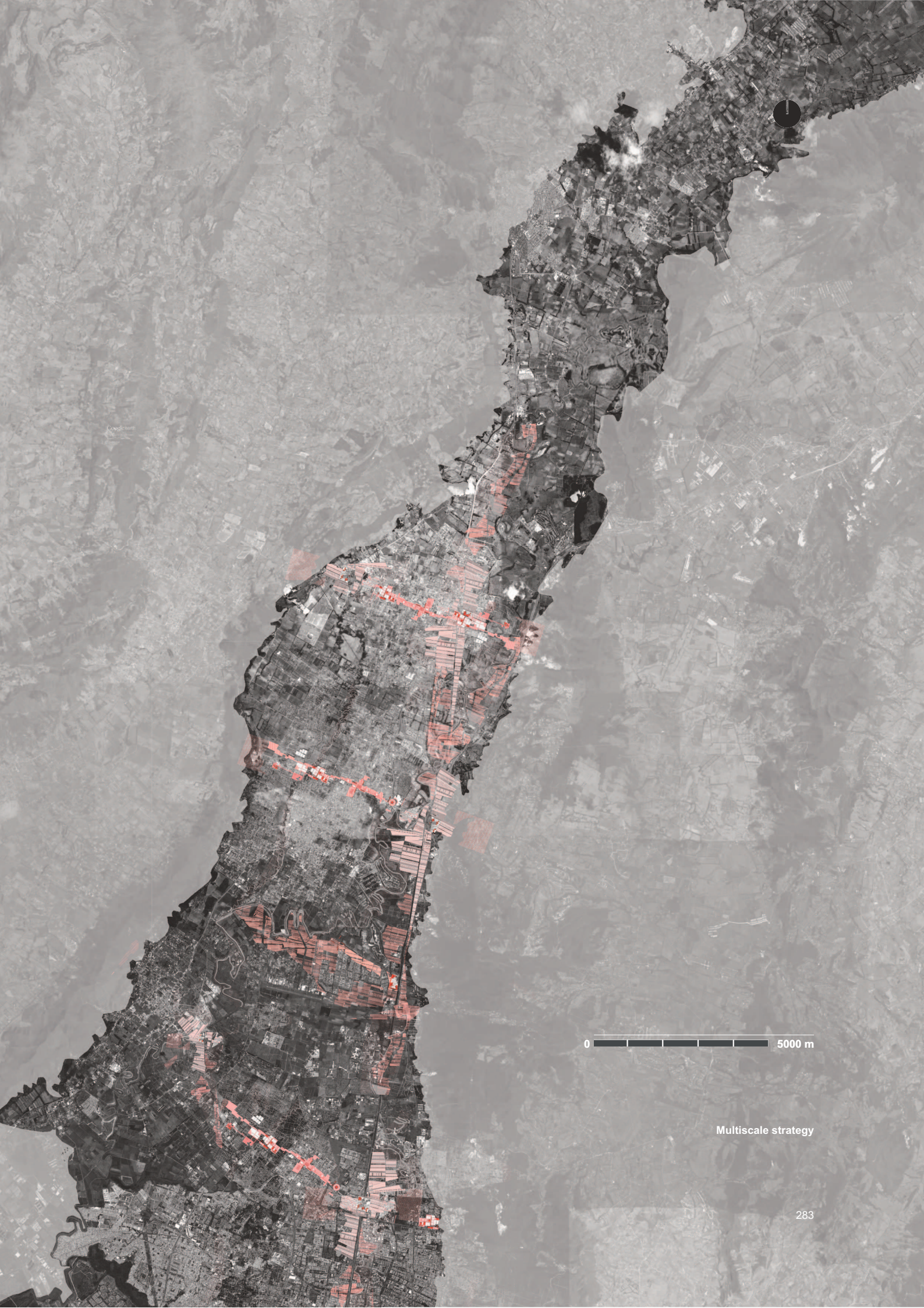
Recoil effect at the north system scale

causes generating the mechanism that produced fragmentation of the metropolitan settlement's edges. Nodal entities, which correspond to the significant places that act as the scaffolding of the metropolitan settlement's structure do not necessarily correspond with an infrastructural entity, even though it may be an infrastructural node, it has been demonstrated the nodal entity is much more complex and adopts a wide range of configurations within the settlement. If considered a space of interrelation, its stability seem to have been verified, even though the reasons for this stability still remain elusive and would need further exploration.

The multipolar metropolitan settlement seems to resemble other natural processes where the net phenomenon is at work. The implosion of the centripetal contemporary settlement may elude the "babel type" of disorder by interrelating multiple systems in specific places and nodes, thus forcing the inevitable disorder into a simpler kind of order which generates a reciprocal system of interrelation based on the continuity of open, natural and residual spaces. Its compositional strategy, which emerged from the dialectic between entropic and syntropic processes and was linked to a wide range of compositional strategies in various fields (information, music, architectural design), has the potential to re-discover spaces that seemed irrecoverable, through the use of nodal entities and the netlike structure, it has been demonstrated that an alternate open structure that uses the entropic "by-products" of the organization efforts is plausible.

The node strategy, through densification within fragmented margins and supported by places





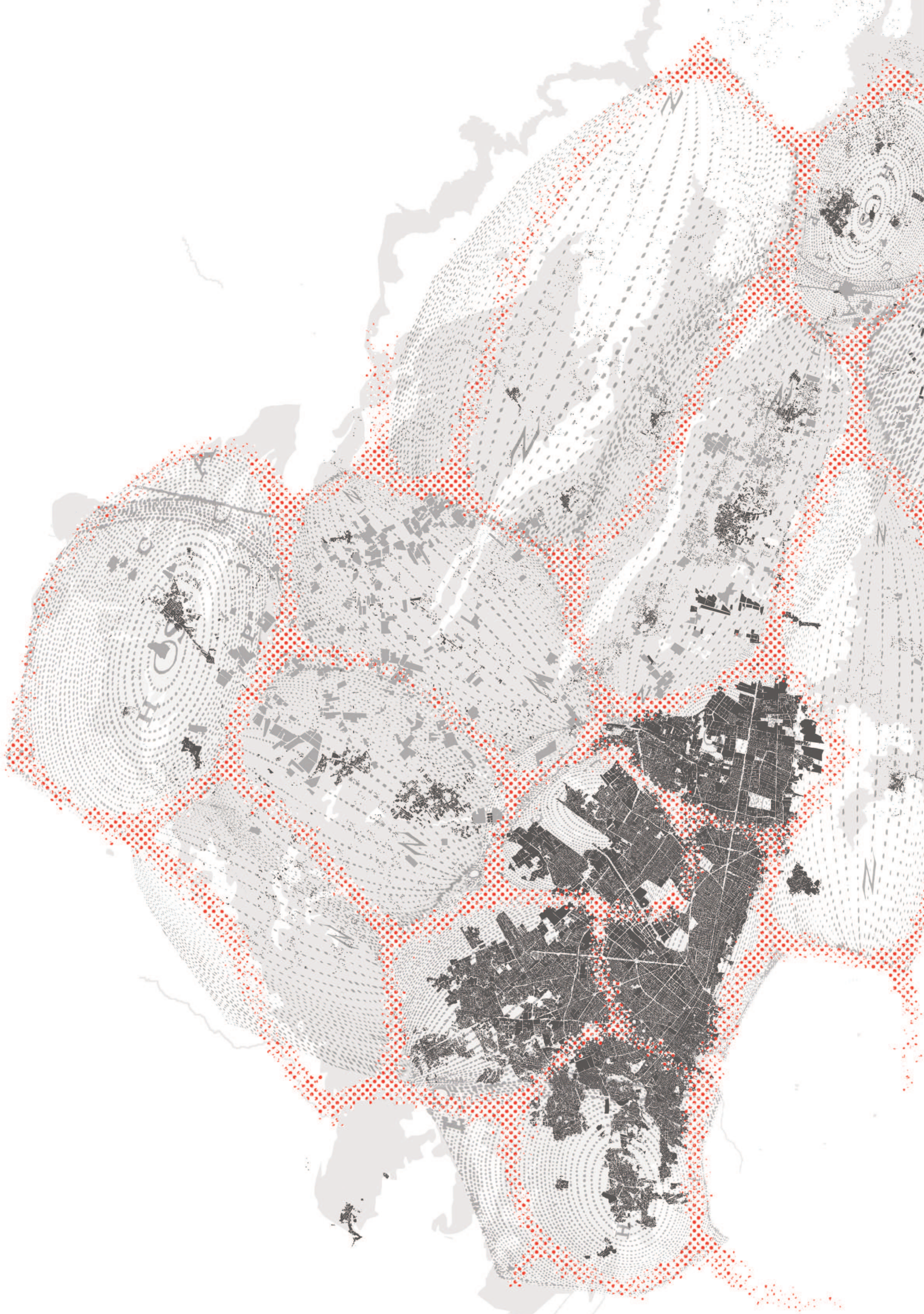
0 5000 m

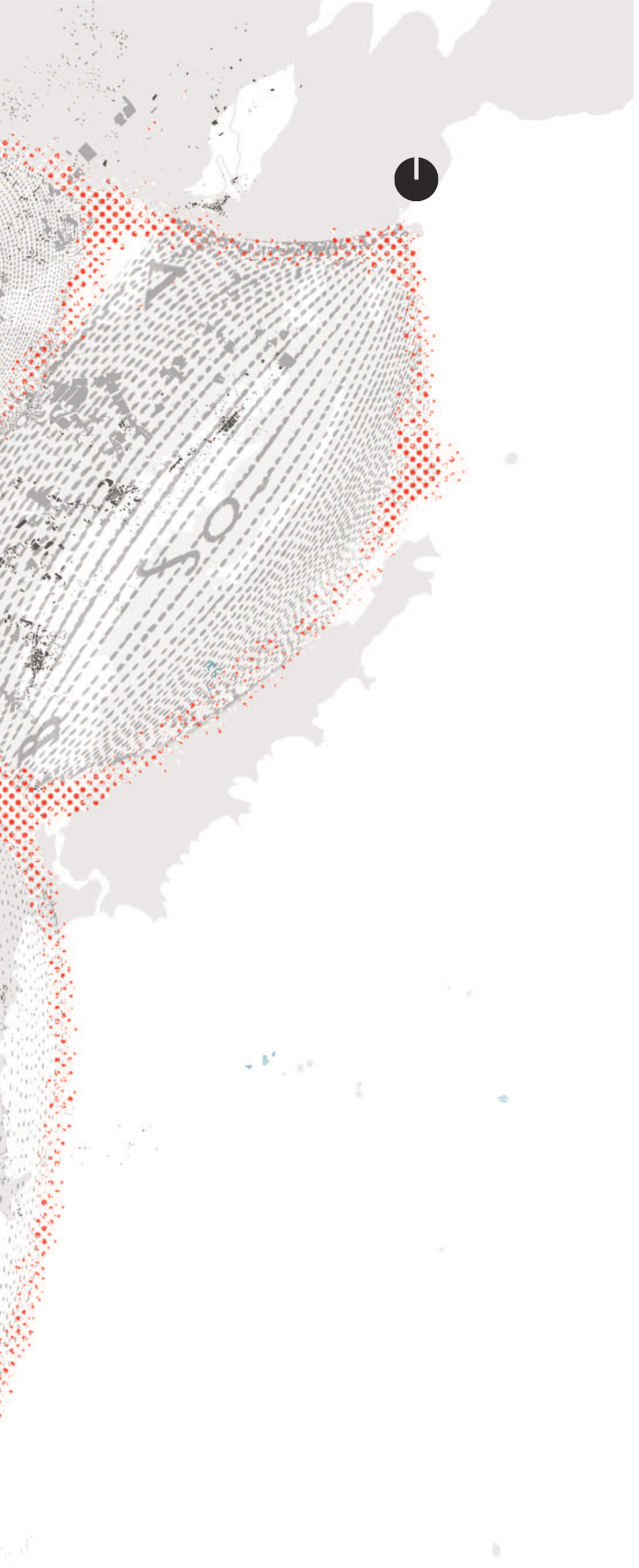
Multiscale strategy

identified as stable elements of the mutating form, may eventually reactivate significant places throughout settlement and contrast some of the entropic processes that have generated the generic “sameness” that characterizes settlement margins worldwide.

The node strategy has generated a projection of the form of the multipolar metropolitan settlement that emerges from the application of the identified principles seems to resemble other natural processes where the net phenomenon and the conservation of energy are at work. Where the implosion of the centripetal contemporary settlement may elude the “babel type” of disorder by interrelating multiple systems in specific places, nodes, forcing the inevitable disorder into a simpler kind of order.

The multipolar reconfiguration of sprawling edges is demonstrable and theoretical practice through the methodological process of conceptual exchange between disciplines allows new ways of exploring the causes of the present situation. Despite this, interest is now focused on the possible “recoil effect” that activating such nodal entities throughout the territory would produce, and this opens the door to further research.





0 10 Km

Multipolar Paradigm

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ANNEXES

Bogota Historical Urban Development, 1772-2011 (301), Plan Piloto for Bogota by Le Corbusier, 1951 (347), Plan de Ordenamiento Territorial, Secretaria de Planeacion (397), Key Words (413), *Interrelational Space* (414), *Form* (415), *Syntropy* (416), *Disorder* (417), *Quality* (418), *Entropy* (419).

