

## Adaptation. A metaphor for the age of climate change.

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**Abstract:** The following contribution aims to explore the projective qualities of the metaphor, with a specific focus on the organic metaphor, and its potential applications within the milieu of climate change. Firstly, the paper will concentrate on the understanding of the metaphor as a tool for the construction of referential images and imaginary projects, taking into consideration some of the projects that have been generated through this powerful, cognitive means. Secondly, analyzing the term *adaptation* and the whole of its spatial connotations, an investigation will be proposed, which will identify this very concept as the vector for the modification of cities and areas that are – or soon will be – facing the impact of current and prospective climate transformations.

**Keywords:** climate change, urban theory, anthropology, adaptation.

### 1 | The orienting potentiality of the image.

Over the course of his professional career, Franco Farinelli demonstrated that the construction of the map, far from being an objective gesture of graphic translation, always inherently implies a certain degree of representational bias, be it conscious or unconscious. (Farinelli, 1992). At the dawn of the modern age, the shift from celebrative cartographical models to denotative models, marked by the «the disappearance of the paradise of the map»[2], (Farinelli, 2009 p.22) inevitably corresponded to the epochal shift from an otherworldly legitimation of power to a system based on its worldly distribution (Cfr. Heidegger, 1927). «Grasping the analogy between the cartographic representation and the market, which is its very implementation, the natural form becomes value-form [...] In other words, space and money are all the same, in the sense that cartographic symbols and money function, the former in the map and the latter in the market, exactly in the same way [...] The organization of reality dovetails with its geographical manifestation, namely, cartography»[3]. (Farinelli, 2009, 28-28) This very shift, whether conscious or not, transforms the role of cartography, from celebrating the Earth as a metaphor of the divine power – that is embodied in the worldly power – to employing it as the site (and metaphor) of human power. Thus, the renowned philosophers of natural law postulated the existence of the Social contract – a concept that referred to the transposition of the primary source of power from God's will to the collective being. Michel Foucault, similarly to what Farinelli proposed in his definition of the map, describes how the first change is the economic-political change, which is then followed by the

justification. In other words, we can say that the descriptive metaphor is a product of the context and not vice versa. (Cfr. Foucault, 1961)

With regard to the field of urban planning, we might trace back this process to the very shift from the city of God – such as Plotinus' Platonopolis, More's Utopia, (Mumford, 1922, 45-61), and Campanella's City of the Sun – to the novel understanding of the town planner as a social physician, bearing in mind the notion of the corrective machine, introduced by Bentham's Panopticum and Haussman's *artiste démolisseur* (Cfr. Foucault, 1975). Together with the turn from an otherworldly to a worldly power attribution, the very focus of urban development shifted from the divine field to the earthly one.

Thus, this archetypally orienting value resides in an understanding of the image as an «act of territorialization, whereby it becomes possible to take up the definition of a relational system, connecting physical territory, built environment, and anthropic space»[4] (Guida, 2011); this had been previously described by Giuseppe Guida in his *Immaginare Città*, and, in turn, inspired by the work of Pasqui (2004) and Bruzzese (2001).

«The construction of images is, essentially, a cognitive act that unfolds according to a precise set of mental proceedings, apt to explore new areas of knowledge, by taking up a known context as the starting point of the map. In dealing with these overlapping interpretational layers, imagination can function as a complex and ambitious space, located in between rhetoric, poetry and speculation» [5] that is defining of the metaphor. (Guida, 2011). Thus, Guida understands the metaphorical structure of the image as an operation «in between the layer of scientific knowledge and that of a mere opinion», (*Ivi*, p.45) which aims at the alteration of a specific research as well as at the production of space and institutions. According to Guida, the act of generating the metaphorical image is at once interpretational and orientational. In other words, the image is able to give substance to a description not only via comprehension, but also through a dimensional quality of the productive thought. «According to what has been previously stated, when it comes to territorial sciences and urban planning, a figurative approach can facilitate a horizontal and vertical dialogue among the actors involved in the practices of planning, thereby structuring a *shared vision* that is necessary in order to describe and act upon complex realities»[6]. (*Ibidem*)

If this is the case, that is, if «description is to urban planning not only a sort of reconstruction of reality, but also a generative notion, implicitly introducing a projective stance»[7], (*Ivi*, p.46) we might be able to ask ourselves, with a certain degree of both malice and awareness, which metaphorical images can be orientational towards the desired projects and models. Specifically, we might wonder which class of images has the capacity to take over the very role of the *paradise of the map* – or of the leviathan – in guiding urban planners and citizens towards a pertinent collective response to the challenges posed by the contemporary tendencies in urban planning. Having said that, the critical question regarding the relationship between risk management and its actual concrete implementation, posited by Gilber White, Robert Kates, and Ian Burton in *Knowing better and losing even more*, remains unsolved (White et al., 2001). In their work – which was proved solid by the reiteration of their experiments in the following decade – it was argued that the progressive improvement of risk and emergency management techniques did not result in an increase in the number of cases where these very techniques could have been applied to tackle local issues.

Our essay is intended as an analysis of the relationship between risk-management techniques and the metaphors that are currently adopted in the field of urban planning, with specific interest paid to the management of the risks brought about by climate change. Moreover, it will question the actual efficacy of these metaphors as tools for the production of imaginary scenarios and local problem solving.

The main focus is put on *adaptation*, which here will be analyzed against the backdrop of the long

lasting tradition of organic metaphors it originates in, as well as within the context of its current potentiality to foster a transformative change in the approach towards the city – which is needed in tackling climate change.

## 2| Climate change and the city. A new organic metaphor.

With regard to his own definition of *hyperobjects* – entities that question the very notion of the object due to their ambiguous positioning within the fields of time and space – philosopher Timothy Morton [8] argues that climate change has rendered climate a substance rather than an accident. This is a tendency that permeates every aspect of contemporary life. Opposing it requires urban planners, politicians, and citizens to rethink their approach towards the city and the territory, as a response to extreme natural phenomena such as flooding and rising temperatures – be they temporary or permanent.[9] «This challenge will lead buildings, cities, and wider areas to shape our lives and our environmental footprint. Aside from the transition to clean energy, urban planning will play a critical role in facing the intertwined menaces. As a matter of fact, it will be impossible to provide a successful answer to climate change and to our energy challenge without a more sustainable form of urban planning» (Calthrope, 2009). Accordingly, the future of urban planning will reside in a global understanding of the urban territory, as well as in coming to terms with the consequences of its unprecedented growth and expansion. [fig. 1]



Figure 1 – Judy Natal, Future Perfect 2040, Solar Panel and Steam Portrait Woman With Helmet. Judy Natal is a contemporary artist who explores the future of the anthropocene between science, philosophy and climate change.

This essay will question, firstly, the efficacy of the organic metaphor of *adaptation* as a tool for fostering human agency within the context of «a world of planetary disasters, emerging pandemics, tectonic shifts, strange weather, oil-drenched seascapes, and the furtive, always-looming threat of extinction» (Thacker, 2018). Secondly, in a more pragmatic fashion, it will ask whether the notion of adaptation [10] is able to serve as useful conceptual framework for the study of the urban form, its morphological features, and its potential development.

### 3 | Some key points on organicism.

In the last two centuries of the brief history of urban planning, organic metaphors have provided a fundamental basis for theories and projects concerning the city and the territory. In parallel with the development of science and biology, we can observe that *organicism* [11] has progressively broadened its field of action. It first emerged as a discipline based on the sole quest for formal harmony, and then evolved to one focused on the imitation of the biological processes. Since the beginning of the 20<sup>th</sup> Century, it started to incorporate the models offered by machines, technological networks and social relationships.

It is possible to observe some trace of organicism as early as in the writings of Vitruvio and Alberti, (van Eck; 1997) wherein the notion of harmony was employed to draw comparisons between the human body and the shape of the Corinthian and Doric columns. This ideal was bound to change as a consequence of Galileo's scientific method as well as of the advent of natural sciences. In Piccinato's *La progettazione Urbanistica. La città come organismo*, an organic viewpoint was understood as necessary to both the explanation of the evolutionary patterns that led to the transformation of the medieval city, and to the grasping of their resemblance of an anthropomorphic organism, wherein brain, heart and muscles can be metaphorically discerned [12] (Piccinato; 1941). «In 1628 William Harvey explained how the human heart causes blood to circulate mechanically through arteries and veins. [...] A century later Harvey's discovery about the circulatory system became a model for urban planning; the French urbanist Christian Patte used the imagery of arteries and veins to invent the system of one-way streets we know today. Enlightenment planners imagined that if motion through the city became blocked at any major point, the collective body would be prone to a crisis of circulation like that an individual body suffers during a heart attack». (Sennet, 2018)

According to Benedikte Zitouni, since the beginning of the XIX Century, the School of Edinburgh developed an ecosystemic understanding of the urban dynamics, which was useful for the analysis of the historical evolution of the city, and best epitomized in the writings of Scottish sociologist and urbanist Patrick Geddes. In *Cities in evolution* (Geddes, 1915), observing the origination of the English cities following the industrial revolution, Geddes detected – with regard to their birth, development, expansion, and contraction – a precise correlation between the location of the residential areas and that of potential mining sites. An organic approach becomes further explicit in his infamous concept of the *valley section*, which – in reference to the relationship between plants, animals, and biotopes included in Von Humbolt's *Geographie des plantes equinoxiales* – pins down the strong link between the potential productivity of a specific territory and the process of settling. In *Garden Cities of Tomorrow*, Ebenezer Howard established that the foundational aspects of a city are one central node and the set of smaller satellite nodes connected to it, thereby proposing a model wherein the well-being of the citizens is granted by a close connection to the countryside, to avoid the congestion of the big city.

At the beginning of the 20<sup>th</sup> Century, the School of Chicago made a similar use of the organic metaphor. However, a new set of concepts was introduced, which also included the organic features embedded in machines and new technologies, and characterized the city as an indefinite entity, inherently devoid of



any physical and conceptual threshold. In this context, Frank Lloyd Wright's *Broadacre City* was able to bring this very mutability to the forefront. In support of the ideals of democracy and individual freedom, a *Jeffersonian grid* established a new set of spatial relations directly tailored on the individual, thereby assuming the organic metaphor as a fundamental interpretative framework – based on living in harmony with nature. In keeping with this no longer anthropomorphic perspective, it is worth to mention the *Inflation der Gross-Städte* (Gloeden, 1923), a model according to which an understanding of the city as a multicellular living organism is theorized. Its form is indefinite, and capable to comply with the whole of the urban necessities, by dint of a process of functional specialization of the individual cells, which is governed by the logics of production, habitation, and mobility. [fig. 2]

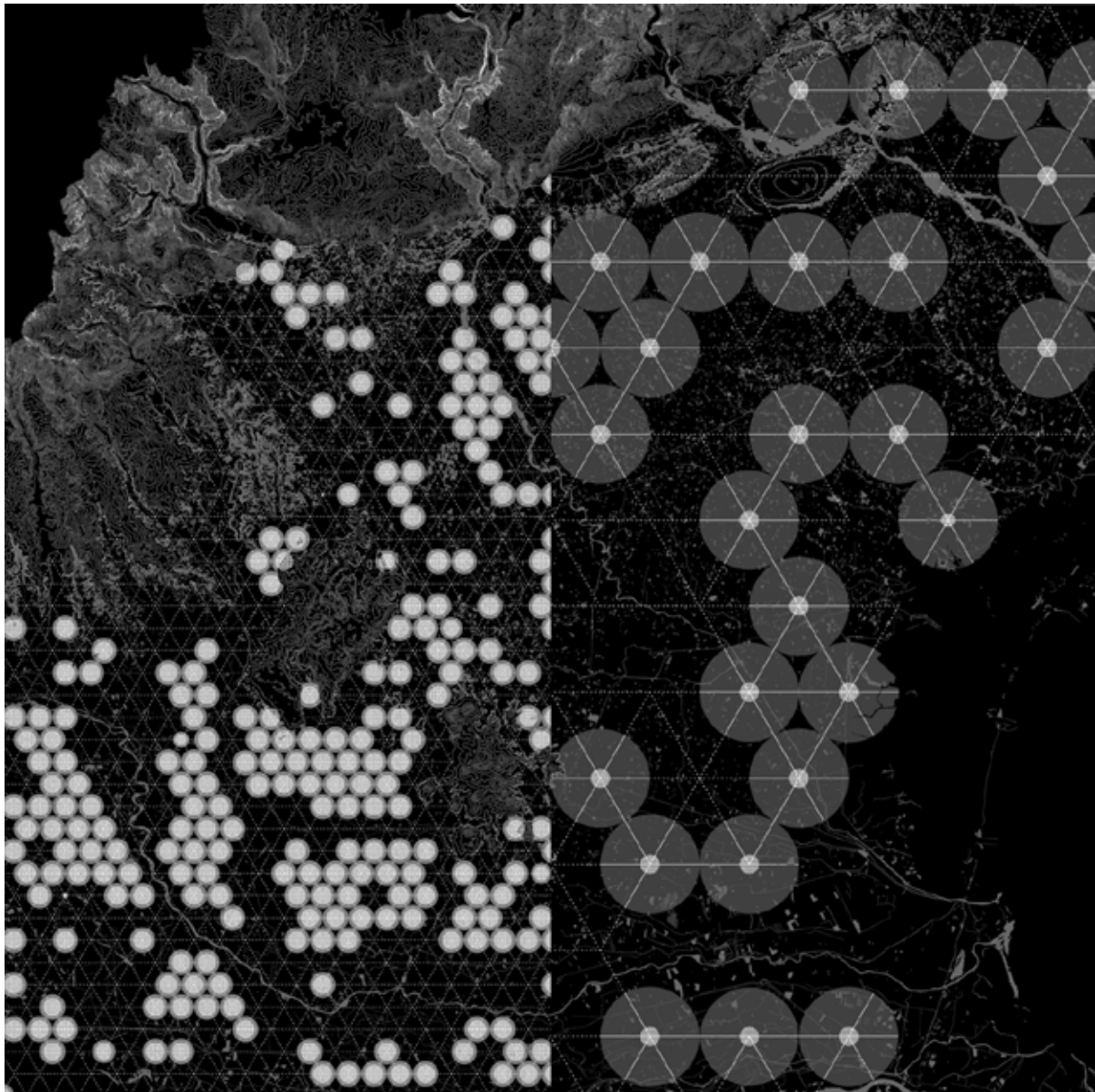


Figure 2 – The model proposed by Gloeden applied to the central Veneto area according to a principle of cellular duplication according to purely settlement parameters (left) and according to metabolic parameters (right). Author's processing.

In the same period, Le Corbusier fostered a shift in the interpretation of what had been generally described with the notion of organicism. In the context of his *machine à habiter*, we can observe that the machine, far from being biological per se, begins to be understood as such, insofar as its inner functioning reproduces the same dynamics as those of an organism [13].

In Japan, over the course of the 1960s, the aforementioned understanding of the machine as an organism morphs into an even more radical acceptance – which results into the project for the Tokyo bay [14], the Osaka Expo, and the *Nakagin Capsule tower* [15]. «Metabolism [16] [...] regards human society as a vital process – a continuous development from atom to nebula. The reason why we use such a biological word, the metabolism, is that we believe design and technology should be a denotation of human vitality». (Kurokawa, 1977) The result is a cyborg architecture, or capsule, wherein man, space and machines are all part of a unique organic entity.

Thus, the capsule becomes a tool for social differentiation, namely a shelter protecting the cell as the minimum unit in the potentially infinite process of growth of the Japanese city.

In the last decades, the theoretical discourse around the organic metaphor has evolved further and sharpened the focus on the social drivers underpinning the construction of space. This tendency is best epitomized in the project for MVRDV's *Almere Osterworld*, where it is implied that «both the passing of time and the new residents are (f)actors influencing the future design of the district» (Schilders, 2010). The metaphor here becomes the ideal support of a *bottom-up* approach, understood as the concrete manifestation of a natural process of self-organization, whereby spontaneous actions fuel the main vectors of the process of planning. Given the relevance the organic metaphor maintained in urban planning over the course of the last centuries, it is timely to reflect upon the potentialities of such powerful cognitive tool – in relation to the transformations brought about by climate change. A useful reading might be found in the words of Zitouni, who argued that «The city needs breadth of vision [...], there has been a need for sidetracking into biology or life sciences in order to describe intricate action patterns. The organic metaphor gives us a sense of what causality may be like in a complex urban system. Causality, then, is the way in which action travels inside a system or set of interactions». (Ivi)

#### **4| Adaptation: a metaphor for urbanism in the age of climate change.**

As previously stated, a set of terms borrowed from biology – such as *evolution*, *metabolism* and *resilience* [17] – has come to be, over course of the last two centuries, a source of inspiration for the development of organic metaphors in the field of urban planning. Specifically, with regard to the last decades, evolutionary biologists' notion of *adaptation* [18] has become a shared frame of reference for ecological thinkers (Morton, 2017), architects, and urban planners alike.

The employment of this very metaphor, which has been transposed from biology and ecology to urban planning, helped architects and urban planners to focus on new features – *anatomical* (shape, orientation, local specificities, fixed capital), *physiological* (flows, metabolism, territorial capital), and *behavioral* (modes of use, lifestyles, cultural capital). It further allowed for an analysis of society, environment, and urban territory, based on a continuously evolving system of interconnected implications. According to this interpretation, which sheds new light on the *modification theory* [19] developed in Italy over the course of the '90s, *adaptation* introduces a soft approach to planning, which is oriented towards progressive, continuous and non-traumatic transformations of the build space – whose effects can be measured in the long term. In radicalizing these concepts – in order to foster a pertinent response to the shifting environmental conditions – it might be useful to turn to the four variants of adaptation recently identified by French biologist and evolutionist Guillaume Lecointre: *préadaptation*, *exaptation*, *transaptation*, *adaptation* [20].

In the context of Lecointre's own distinction between primitive and derivative structures and functions, *préadaptation* and *exaptation* describe the process whereby the fully-evolved character of a specific function is repurposed into a new one (e.g. theropods' plumage, which was critical to their evolving into flying species, was originally meant to carry out a set of thermoregulatory functions). On the other hand, according to *transaptation* and *adaptation*, the evolutionary process resides in the global function of a particular element, which can be identified as *anatomical*, *physiological*, or *behavioral*. [fig. 3]

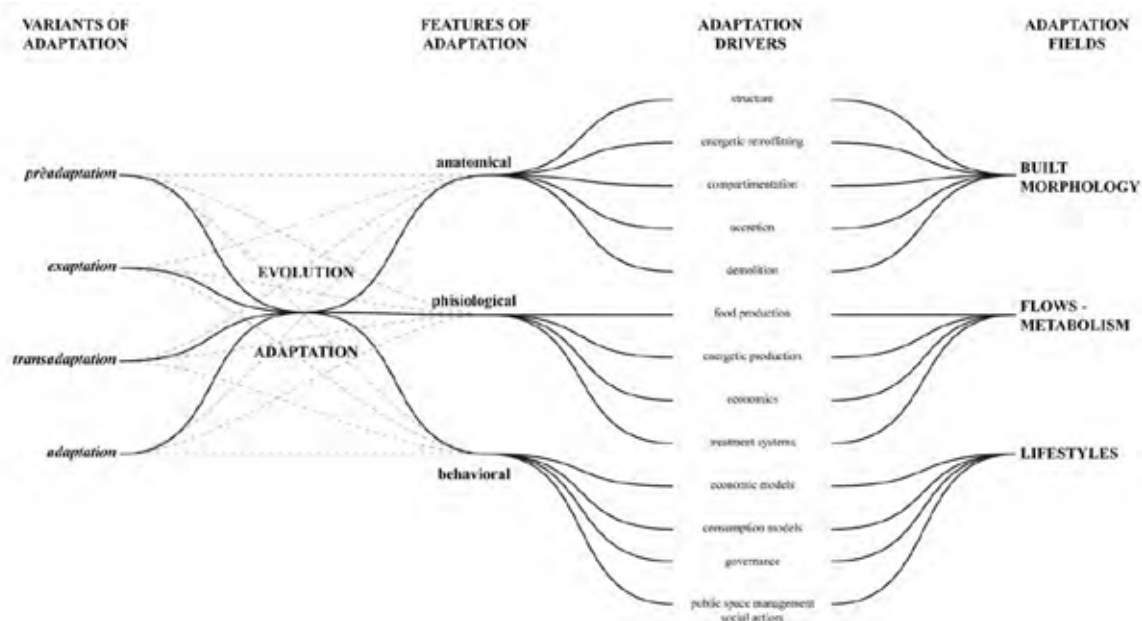


Figure 3 – Adaptation process diagram. Author's processing.

Hence, acting upon the variants of adaptation of the *anatomical* features of the territory – such as the building stock, the road system, the water distribution system, and the energy and technology networks – it is possible to build a set of evolutionary scenarios that simulate the potential progressive transformations of the fixed capital. For instance, adapting the construction stock in conformity with the consumption patterns (by dint of operations such as building compartmentation, infill, accretion, structural adjustment, volumetric extension, and energy *retrofitting*) allows for a sustainable implementation of the urban density, which does away with additional land consumption (*transaptation–adaptation*). Another example might be the process of river adaptation (based on operations such as the transformation of the streambeds and the redesign of the riverbanks), which allows to acquire a new series of specialized sites for the controlled water infiltration in the soil, and, at the same time, to obtain – as a derivative function (*exaptation*) – a series of infrastructures that might couple the solution of hydraulic problems with the safeguarding of the environmental biodiversity as well as with the leisure related requirements of the communities.

Furthermore, the adaptation of the energy networks (via the redistribution of the systems of accumulation, the employment of *off-grid* systems, and so forth) allows for the progressive transition from a centralized system to one based on the distributed and decentralized generation of energy.

On the other hand, acting upon *physiological* features such as density, *mixité*, energy, water, and food, it becomes possible to revise the metabolic flows powering the city, as part of a process of optimization of the pre-existing peculiarities (*transaptation – adaptation*), which is realized via operations of recycling and waste reduction – inspired by *circularity* as well as by a *systemic design*. (Berger 2009).

Finally, the adaptation of the *behavioral* features requires a gradual valorization of the territorial capital – which is understood as the totality of the socio-cultural and environmental skills of the citizens (Camagni 2009) – on the basis of the potential behavioral shifts in the context of an evolutionary scenario, wherein individual action can still be considered useful for global scale transformations.

It is this very process of adaptation, which lays the grounds for «a world where everyone designs», that prompts an understanding of the urban planner as a designer, who facilitates the ongoing process of social innovation by fostering new collaborative economies, everyday politics, and life projects that concretely change the world (Manzini 2015; 2018).

Given the wide range of the observational methods making use of the organic metaphor in the past century, it is not hard to imagine how *adaptation* can become a unifying force in the reconciliation of the different natures of the notion of the project, as well as in the definition of a fruitful combination of urban space and architectural possibilities.

However, despite the manifest potentiality of the concept of *adaptation*, it is equally important to keep in mind that this soft approach does not take into consideration the radical revolutionary processes that are necessarily required by the most pressing and catastrophic issues caused by climate change. If the role of the image as a territorial metaphor is that of acting descriptively not only in the process of understanding, but also in the prospective thinking concerning the production of space, it becomes necessary to investigate the limits and the opportunities of *adaptation*, when applied to the relation between climate change and built environment.

It becomes necessary – in observing the city and its development from an organic standpoint – to hermeneutically anticipate the effects of *adaptation* in all its spatial implications, thereby focusing on the modalities through which the adaptive model can productively affect the metabolic understanding of the city.

Assuming the efficacy of this metaphor in favoring the resilience of a given territory, we must fully understand the potential of its specific features (anatomical, physiological, behavioral) and of its biological variants of adaptation (*préadaptation*, *exaptation*, *transaptation*, *adaptation*). Doing so fosters concrete and useful developments, capable of both tackling short-term emergencies and building a robust set of long-term derivative structures. In other words, we need adaptation – and its variants – to lay the foundations for ambitious projects capable of nurturing an effective and meaningful evolution of the settlements.

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[1] Although this paper is a collaboration between three authors, whose content has been thoroughly discussed by all of them, the writing process has been distributed as follows: paragraph 1, was put into writing by Mattia Bertin, paragraph 2 and 3 were put into writing by Giacomo Magnabosco, paragraph 4 were put into writing by Lorenzo Fabian.

[2] «la scomparsa del paradiso dalle carte» (Farinelli, 2009).

[3] «Cogliendo l'analogia tra la rappresentazione cartografica e il mercato, che è la sua messa in opera: la forma naturale diventa forma di valore [...] In altre parole spazio e denaro sono la stessa cosa, nel senso che il simbolo cartografico e la moneta funzionano, il primo sulla mappa e la seconda nel mercato,



esattamente allo stesso modo [...] La gestione della realtà passa attraverso la sua espressione geografica, cioè cartografica» (Farinelli, 2009).

[4] «atto territorializzante attraverso il quali è possibile parlare esito di un processo e sistema relazionale fra ambiente fisico, ambiente costruito, ambiente antropico» (Guida, 2011).

[5] «La costruzione di immagini è, in sostanza, un atto cognitivo che avviene secondo definiti processi mentali che consentono di esplorare campi nuovi della conoscenza, utilizzando come mappa un campo già noto. Nella sintesi dei diversi livelli interpretativi può agire, quindi, l'immaginazione quale spazio complesso e ambizioso tra dimensione retorica, poetica e speculativa» (Guida, 2011).

[6] «Da quanto si è accennato in precedenza, relativamente alle scienze del territorio e all'urbanistica in particolare, l'approccio figurativo può, in sostanza, facilitare il dialogo orizzontale e verticale tra gli attori in gioco nei processi di pianificazione, strutturando una *visione comune* necessaria per la descrizione e l'azione in realtà complesse»

[7] «per l'urbanistica la descrizione non è solo una sorta di ricostruzione della realtà, ma una descrizione propedeutica all'azione, implicitamente progettuale»,

[8] With the term *hyperobject* Timothy Morton describes an entity that questions the very notion of the object due to its ambiguous positioning within the fields of time and space. The most dramatic example is our understanding of climate change, which forces us to acknowledge our own existence as part of a continuously endless chain of *hyperobjects*.

[9] Large-scale floods, local inundations, sea level rise, saltwater intrusion, heat waves, urban heat islands, anomalous storms, tornados, whirlwinds, and general hydrogeological instability.

[10] In his 1968 *The cultural present*, Yehudi Cohen describes adaptation as a process aimed at the fruitful alteration of a given habitat, which is primarily achieved via cultural means.

[11] Organicism is here understood as "[...] any of various theories that attribute to society or the universe as a whole an existence or characteristics analogous to those of a biological organism." Merriam-Webster online dictionary, "Organicism".

[12] Government and administration offices; Churches; production sites.

[13] The origins of the understanding of the machine as an organism can be traced back to the School of Chicago, as well as in Sullivan and his employment of new technologies in the field of architecture.

[14] In 1960 Kenzo Tange proposed a new physical order for the Tokyo bay, which would have to accommodate the progressive expansion of the city on the basis of an incremental infrastructure.

[15] The *Nakagin Capsule Tower* is a multifunctional building, designed by Japanese architect Kisho Kurokawa.

[16] Metabolism is a movement oriented towards both architecture and urbanism, which was founded in 1960 in Tokyo by architects Kiyonori Kikutake, Fumihiko Maki, Masato Otaka, Takashi Asada, and

by architecture critic Noburu Kawazoe. The group is deeply engaged with urban planning and urban development, in the context of the Japanese metropolis.

[17] *Evolution*, the term originally used by Darwin and Lamarck in the context of biological science, was later transposed to urban planning by Geddes and Mumford. *Metabolism* was introduced in urban planning by Wolman in order to describe «the metabolic needs of a city, in terms of the materials and goods needed to sustain dwellers in their everyday activities» (Wolman, 1965). The term *resilience*, which was born in the context of physics and materials science, is understood in ecology as «the measure of the perseverance of a given system, as well as its ability to absorb changes and disturbances, while still being able to maintain the same relations between population and state variants» (Hollin, 1973).

[18] Adaptation in biology is defined as the transformation of any anatomical, physiological, or behavioral character of a specific population, similar to both the process and the result of the evolution of an organic entity. (Cohen, 1968)

[19] With reference to Casabella's issue 488 and 489, published under the direction of Gregotti, and, specifically, to the contributions by Gregotti (1984) and Secchi (1984).

[20] Evolutionary biologist Guillaume Lecointre, in the light of his own distinction between primitive and derivative structures, and between primitive and derivative functions, recently put forward the definition of four potential variants of adaptation: préadaptation, exaptation, transaptation, and adaptation (Lecointre 2009).

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