

# Cities, a conceptual framing for a synthetic perspective

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## Abstract

Cities are pervasive and they are some of the most powerful ecosystems of the Anthropocene. They have been around for almost 10000 years, and by the year 2050 most humans will be living in a city. Although it is known that cities have an impact to different scales, from the very local to the whole Earth System, its implications are far from being understood. Studying cities as organismic systems has been a productive strategy and favourable to complex adaptive systems analyses. However, the organismic view is to a great extent metaphorical, focusing exclusively on human activity, instead I argue for an approach that actually considers life processes as constitutive to them. In this extended abstract I suggest a conceptual framing for a synthetic approach to cities in which life processes are paramount for their understanding. Specifically, I will focus on two aspects: 1) the human-teleological component of cities and 2) the role of life processes organisationally closing the city, and bringing forth a self-generated unity and identity and the conditions for its own evolution. I believe that due to the increasing interest of the ALife community in tackling social issues, ALife unique insights and methods can be of great value in understanding cities and dealing with the social-ecological challenges they pose. A definition of cities from a synthetic perspective can help the ALife community to put into action its epistemic arsenal.

## Introduction

Cities are equally fascinating and highly challenging processes to academics and policy makers. Their awe is well justified because cities display complex dynamics, affecting their inhabitants –humans and non-human, with an immense impact on their surroundings and contributing to global change at the level of the biosphere (Mills, 2007). However, given the current environmental conditions, understanding cities should also help to steer them towards more sustainable pathways and to be resilient once they're on track (Romero-Lankao et al., 2016).

At present, it is quite common to approach cities from a systems and integrative perspective (Bretagnolle et al., 2009). For example Sustainability science in general conceptualize cities as social-ecological systems with complex adaptive dynamics. It is important to acknowledge those dynamics as traversing the human-ecological dimensions, be-

cause it re-frames the we understand our relation with the biosphere. It also points directly to the need to scientifically investigate this “epistemic object” under new light with the double objective to understand it, as well as to steer it. However progressive this vision, it still falls short since the system is seen as a composite of the social with the biophysical –with some exceptions such as Alberti (2016)-. Also, although it acknowledges it, it struggles in integrating the human intentional and goal-directed behaviour as constitutive to the city as a social-ecological system. The ALife community is no stranger to either Life and teleology. With its epistemic and methodological emphasis on *synthesis*, it seems a good candidate to suggest an integrative view of cities that can properly address such complications. In this sense, the concept of urban system here advanced is that of an *ecosystems mediated by human-built material –green, blue and grey<sup>1</sup>- life-worlds that are functionally integrated (organisational closure) by multi-scale life processes –e.g. primary production, nutrient cycling, and niche construction among others.*

## Human material life-worlds, niche construction and the city organisational closure by life-processes

No doubt, cities are a collection of purpose and designed material transformations that cannot be neglected in any definition of an urban system. As any other organism, humans build their niches. Humans transform their material world into blue and green, and in the case of cities, into grey infrastructure. Those transformations can be intentional –with added unintentional consequences-, and through processes of reflexivity, design itself is object of transformations and intentions.

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<sup>1</sup>In very simple terms, green infrastructure refers to 'nature-based' transformations to the urban landscape, such as parks, tree rows, and vertical gardens. Blue refers to water-based infrastructure like city lakes and constructed wetlands. Green-blue infrastructure networks –as sometimes are referred- are important because they conserve ecosystem values and functions. Gray infrastructure would include things like buildings, roads, pipes, power networks.

Yet, human-environment interactions are not unidirectional. Such relationships are both ways in which the environment contributes substantially to the organism-environment dynamics. The environment imposes a set of constraints and it offers a space of possibility, both defined by its materiality, from its physics to its geo-bio-ecological processes. This is a relationship known as niche construction: the organism modifies the environment that in turn will modify it back (Laland et al., 2016).

The interaction implied in the process of niche construction grounds the idea that an *environment is not simply the physical properties of things as now conceived by physical science. Instead, they are ecological, in the sense that they are properties of the environment relative to an animal or organisms in general* (Reed and Jones, 1982). When the interaction is meaningful to an organism, then we are speaking of a life-world. In other words, a life-world is the world that is meaningfully experienced by an organism and its community. *Cities are ecosystems that are possible as they revolve around a human-built material life-world.* This life-world, due to its materiality transcends individuals & generations in a way that it becomes part of the process known as niche inheritance, that scaffolds the reproduction of practices, traditions, and culture.

The material life-world becomes the axis without which the urban ecosystem wouldn't be possible. That is because human induced transformations to the environment become an opportunity for other organisms to create their own niche, in this sense, niche inheritance also transcends humans and affects other organisms.

As humans develop their life-world, other organisms do as well. Such life-worlds can be conceptualized as niches. In a word, a niche is more than a habitat it is also the way an organism lives it. A niche then, is formed by the network of opportunities for action –also known as *affordances*– that an environment offers to an organism in relation to the organisms exploratory modes and skills, therefore a niche is always meaningful to an organism (Reed and Jones, 1982; Heras-Escribano and De Pineado-García, 2018).

I suggest that niches also bundle together forming a web. As organism modify their environment they create opportunities for other organisms niche construction processes, e.g., the cables of urban energy supply –a human modification to the environment– affords squirrels to move all over the city. The central idea is that niches, by connecting multiple levels of organization, they channel the flows of energy, matter and information and sustain and integrate the system as a whole.

According to Mossio and Moreno (2010), organisational closure is about how a system assures the conditions for its own production. In the case of ecosystems in general, organisational closure is attained through constant production of a web of niches. The ongoing production of such web can be seen as a constitutive *life process* that generates the conditions for the continuation of its own unity and identity, as

for its components and system level evolution.

## Conclusions

Human-built material life-worlds –green, blue and grey– and closure by life-processes bring cities to life, . . . literally. There is an asymmetry that has to be acknowledged openly: when compared to the actions of other organisms, human material life-worlds impose the dominant constraints on flows of energy, matter & information that sustain the city as an ecosystem; that is why these are among the most important ecosystems in the *Anthropocene*. On the other hand, cities would be sterile and inert if it were not because of its dynamicity brought by the complex web of interdependent life forms, creating and connecting niches.

I believe that the ALife community has too much to offer to tackle pressing societal and environmental problems, such as those present in urban contexts. In Langton's line of thought, I believe that social, cultural, economic or political phenomena are a continuation of Life. The operationalization of this idea is highly relevant if we are interested as a community in ALife becoming part of the solution. This is why I am interested in advancing such a primitive and highly speculative definition of cities with the hope of bringing closer to the ALife community the problem of cities as meaningful complex geo-eco-systems.

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