



# The Use of the Graphic Medium in the Method of the Urban Planner C.A. Doxiadis

Mercedes Díaz Garrido<sup>(✉)</sup>

Sevilla University, Seville, Spain  
mdiazg@us.es

**Abstract.** The communication deals about C.A. Doxiadis, Greek architect and urban planner, known in our schools especially for his Architectural Space in Ancient Greece (Doxiadis 1972), a late publication of his doctoral thesis, although not so much for his work as city planner and theorist. As such, he developed an extensive activity, in which the graphic medium plays a leading role. Here we analyze his graphic production, reflection of a particular way of understanding the urban, around his concept of “ekistics”, as science and art of human settlements.

After a brief review of his work, we continue through three sections. The first corresponds to the theoretical model of the ekistic object of study, the so-called “Anthropocosmos”. The second and third correspond to two main and complementary project issues, the dynamic city or “Dynapolis”, and the City of the Future or “Ecumenopolis”.

The analyzed images are all part of the numerous publications with which the author spreads his method. They are therefore black and white images, depurated and encoded with respect to a first production and they show, by this same fact, the result of personal reworking of a material initially produced collectively.

**Keywords:** Doxiadis · Ekistics · City · Drawing · Ecology

## 1 Introduction

With this communication we want to approach the work of the Greek architect and urban planner Doxiadis (Asenovgrad, Bulgaria 1913 - Athens, Greece 1975) through his graphic production. We do it with a double intention, to succinctly refer to the content of his work, and to analyze the relationship between drawing and thought referring to the urban, in an example that constitutes a reference in this regard.

His labor extended over 40 years in which he works on different fronts, from research, project and management, to the dissemination of theories and results, and was directed as a whole towards a central objective: the improvement of human habitat. A task that Doxiadis collectively develops, involving in different initiatives a large number of professionals whom he inspires and coordinates.

These initiatives include the constitution in 1963 of the Athens Center of Ekistics, through which Doxiadis incorporated several research projects that covered the spectra

of scale and time<sup>1</sup>, as well as the creation of the Ekistics magazine<sup>2</sup>, active from 1957 to 2006, in which the main results of these investigations were published.

His commitment arises from the noting of a crisis, produced mainly by the accelerated and uncontrolled growth of cities, and whose main cause is in the emergence of new means of transport, since the appearance of the railway, but especially with the generalization of the car. According to Doxiadis, given the situation generated, there would be great confusion, which would mean the failure of the response given so far. He believes that it is necessary to act facing the problem from its roots, through the systematic study of “human settlements”<sup>3</sup>, theory and practical action. For this, the foundation of a new knowledge is proposed, which is called “ekistics” (from the Greek οἰκοῦς-house, home- and οἶκω-seat or settle-), as science and art of human settlements.

*“Now architectural creation is growing physically at such a rate that it has gone beyond the control of the architect; this makes necessary a different, more comprehensive approach, which is gradually moving from the status of a technique and an art towards that of a science. At present, total architectural activity is not growing in a natural way, but is created from the top. As such it has to be conceived and directed by ekistics, the science which illuminates problems of human settlements and defines the way which architecture and its fellow-disciplines must go”* (Doxiadis 1963, p. 99).

Ekistics considers the city as a complex fact, whose study must be approached in a multidisciplinary way, based on the study of reality, of the human settlements that exist and have existed throughout history, in all its forms. The method incorporates three moments that feed back: the study of facts, the generalization and theorization, and the practical action. The habitat of man as a whole is the laboratory, and the inquiry techniques are diverse, with special weight of the graphic medium.

To characterize the graphic medium by some main feature, we would say that this one is to share the scientific character of the method of which it is a part. The latter is shown, for example, in the care of the precise definition of the terms, which leads to the creation, when necessary, of a new terminology, coined from terms in Greek, which appears in all his publications as a glossary. Respect to the graphic production, we see these same characteristics reflected in aspects such as the coded layout, the accuracy of the content or the diagrammatic character of graphic theories and models.

In the preface to the book Ekistics, written as “an outline of my personal experience, and an introduction to the total effort which has to be made” (Doxiadis 1968, p. 2), the author explains that he has redrawn all the plans of all settlements to unify its presentation and allow comparison. In its introduction, he justifies the use of drawing versus photography for several reasons, such as to select or accentuate phenomena of interest and general features, discarding unnecessary details, or to develop theoretical models from different characteristic cases (Doxiadis 1968, pp. 16–18).

But in addition to drawings, whether descriptive plans, theoretical models or project drawings, he uses profusely other type of graphs, such as tables or variables graphics,

<sup>1</sup> The projects are: City of the Future, Capital of Greece, Human Community, y Ancient Greek Cities. Reviewed in <https://www.doxiadis.org>.

<sup>2</sup> Published online in: <https://www.jstor.org/journal/ekistics>.

<sup>3</sup> As the territory modified by the action of man for its best development.

to work with all types of data and for different purposes, from the visualization of a complex reality as a set of related aspects, the data collection, or the extrapolation.

We will see some of these characteristics reflected in the images that follow, which appear in relation to the three themes for which they were elaborated. The first has to do with the definition of the object of study, the so-called Anthropocosmos Model, while the other two refer to two major and complementary subjects of study, the Dynamic City or Dynapolis, and the City of the Future or Ecumenopolis.

## 2 Anthropocosmos Model

The Anthropocosmos Model would be the synthetic image of human settlements as a whole, understood as complex systems, in their different types, elements and aspects. For Doxiadis it is necessary to create a model that can help us understand how to conceive and build the entire Anthropocosmos correctly. The model offers the image of settlements as a total system, connecting disciplines and creating a framework in which to organize all contributions (Doxiadis 1976c, pp. 58-68). The model, shown in Fig. 1 comprises:

- Types of settlement, according to two related scales, the population scale and the territorial extension scale (1 and 2 in the legend).
- Time scale (3 in the legend).
- Elements that constitute human settlements. Nature, Anthropos, Society, Buildings, Networks (4 in the legend).
- Aspects or approaches. Economic, social, political, technological, cultural (5 in the legend).
- Principles of conformation. Maximum contact, minimum effort, protection, quality of the environment as a whole, balance in the synthesis of all principles (6 in the legend).

As an example of operation Doxiadis proposes different examples of two-dimensional relationship:

- Between population and territory for the “basic dimensions model”.
- Between elements and time scale for the “structure and function model”.
- Between principles and aspects by introducing two levels of assessment, desirable or viable, for the “satisfaction model”.

These three models are linked to each other, so that each one develops a minimum part of the previous one.

Although the operation of the models is not obvious to us, the truth is that they make a total system concept visible. In this sense we can also understand them as symbolic representations. This is not strange if we relate it to the image that Doxiadis elaborates for another concept, that of Anthropos. In it, Leonardo’s Vitruvian Man, “excellent as symbol but it do not transmit the message that real Anthropos is the center of a system” appears in the center of a frame of spheres whose diameter symbolizes the reach of man through his senses and beyond “as it goes as far out as modern science allows, and even beyond when Anthropos imagines the whole cosmos” (Doxiadis 1976b, p. 38).

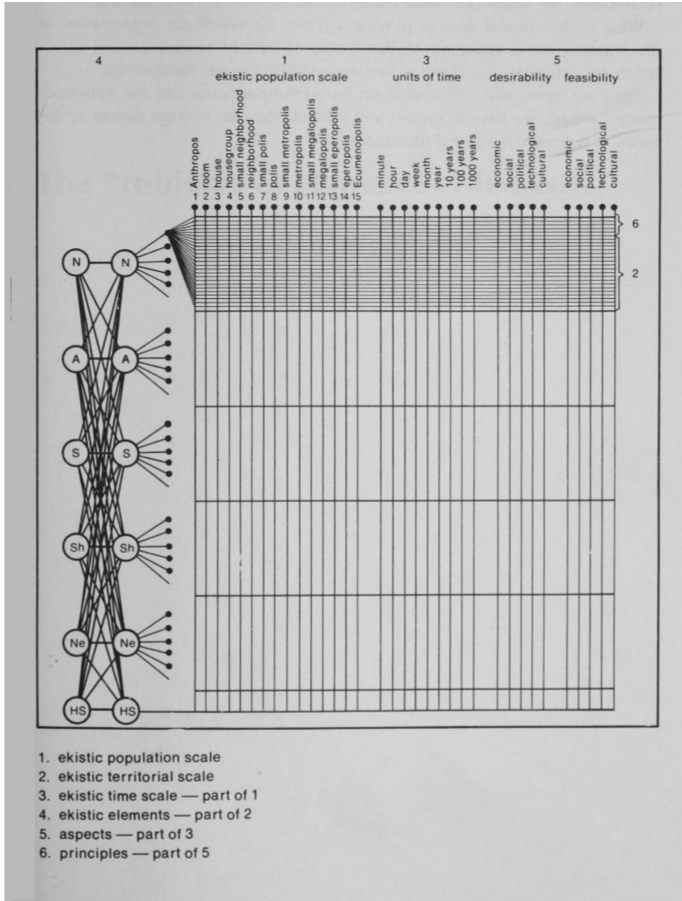


Fig. 1. Anthropocosmos model. Source: Doxiadis 1976c, p. 67.

### 3 Dynapolis

The concept of Dynamic City or Dynapolis occupies an intermediate position in the scale of the types of settlements proposed by Doxiadis, between the city and the metropolis. It is there that the possibilities of displacement of the new means of transport have led to the emergence of a new type of city, the city of continuous growth or Dynapolis.

The problem is addressed, following the general method proposed, from the facts to the action, through the theory. It is in that order that we present this section, through the main concepts and some drawings that develop them.

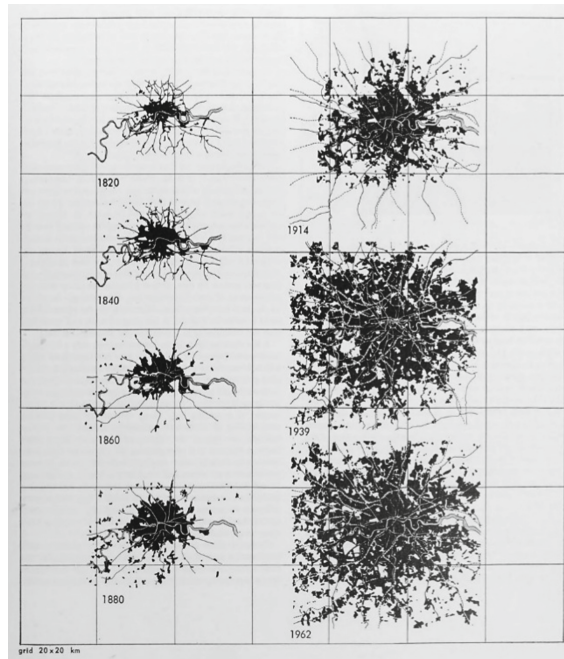
### 3.1 Facts

The difference between the growth of the cities of the past and those of today is that, while the first ones grew to a limit, in exceptional cases up to one million inhabitants, the latter do so continuously, without limits. Cities like London, New York and Tokyo exceed (in 1968) 10 million.

Among the problems this causes are the collapse of the center with the pressure on the immediate tissue, the road congestion, and the loss of the city's human scale. In Doxiadis thinking, to address the problem we must be aware of this change.

*“In recent generations the growth of cities has taken place at such an unprecedented speed that the fourth dimension, the intangible dimension of time, has gradually become more important than the three physical dimensions. In this sense our cities have become fourdimensional, they have become dynamic. It is our lack of understanding of this important transformation that is responsible for many of the problems of city planning and architecture today”* (Doxiadis 1963, p. 99).

For Doxiadis the solution is not in escaping, in the models of garden city or satellite cities, since these continue to exert pressure on the large city which, in its growth, ends up absorbing them (Fig. 2).



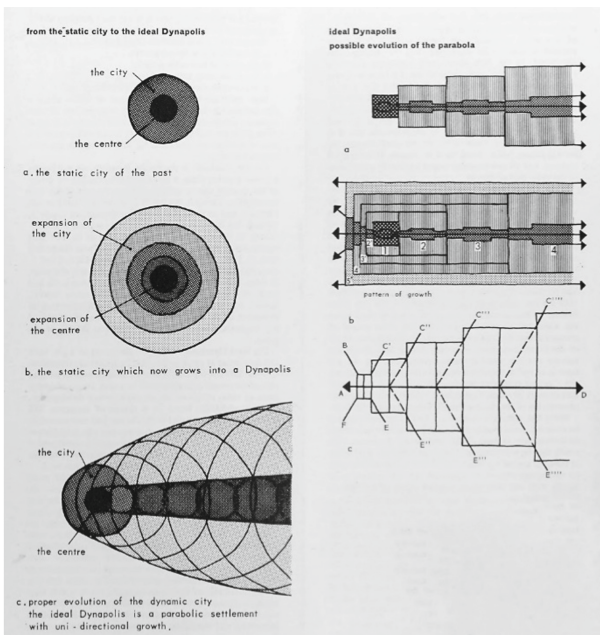
**Fig. 2.** Evolution of a Dynapolis. London. Source: Doxiadis 1968, p. 200.

### 3.2 Theory

The key to addressing the problem is to make this continuous growth compatible with two issues, with the existence of stable sectors or communities, and with the continuous and proportionate expansion of the center. This leads to a progressive growth scheme in one direction, which derives in a parabolic plan. On the axis of the parable are the new centrality spaces, proportionate to the new acquired dimension, while the sector constitutes the unit of growth, with a balanced internal composition and dimensions adjusted to the human scale.

*“One of the major problems dynamically growing settlements face is a continuous change of functions, dimensions, structure, texture and density. Nothing remains static; everything gets broken and very often must be changed. [...] Here we can draw an important conclusion: the search for ideal solutions has to be geared towards static cells and the dynamic growth of the organism” (Doxiadis 1968, p. 355).*

In Fig. 3, three theoretical models are presented: that of concentric growth that occurs as an evolution from the static city of the past to the city of continuous growth or Dynapolis of the present; the ideal Dynapolis model, which leads to the parabola shape; and the corrected model from the previous one, considering its adaptation to the reticular shape of the roads.



**Fig. 3.** From the static city to the ideal Dynapolis. Possible evolution of the parabola. Source: Doxiadis 1968, pp. 365, 366.

The design of the human sector responds to the needs of stability, relationship and human scale of the community. To achieve, it responds to a series of factors such as: maximum walking distance, adequate scale of its spaces, or community size. Fast traffic routes are restricted to its edges and vehicle roads are prevented from crossing it. Figure 4 shows an example of a representative community in its general characteristics of dimension, general layout of the building and community center, and roads network, differentiating vehicle and pedestrian roads.

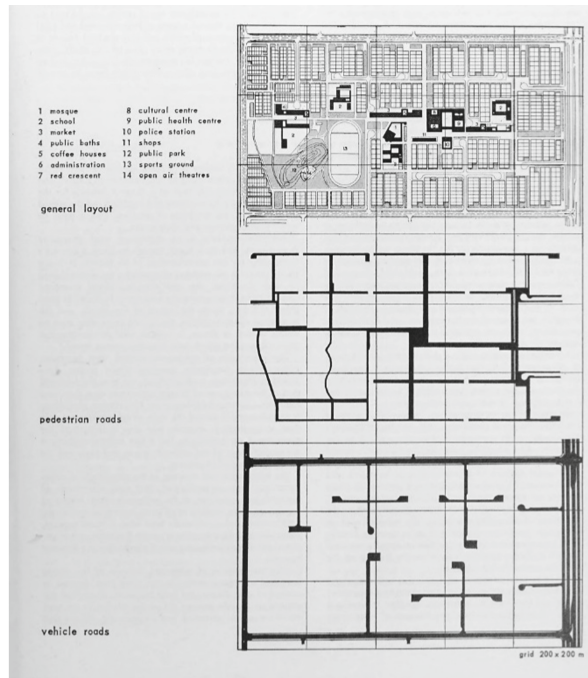
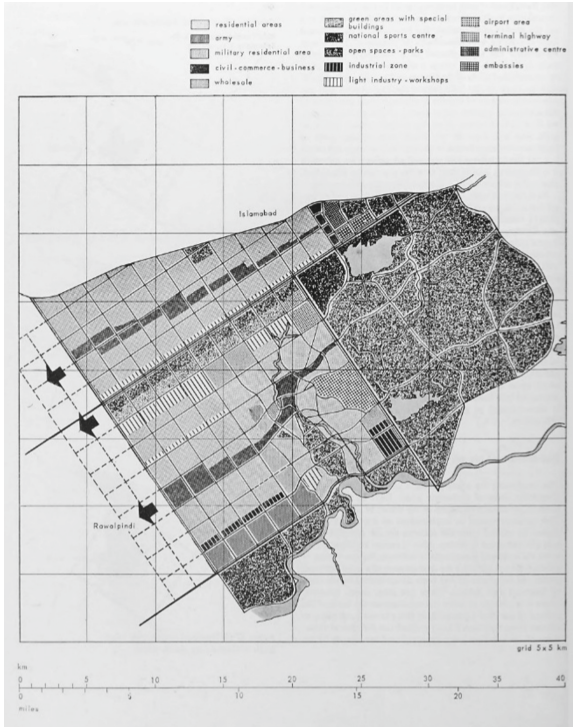


Fig. 4. Human sector in western Baghdad. Source: Doxiadis 1968, p. 123.

### 3.3 Action

The model would be implemented in numerous projects, although the best known example is that of Pakistan's new capital, Islamabad. The new city is projected at a certain distance from the existing city, Rawalpindi, as a double set of parallel growth in the same direction. Figure 5 shows the project for Islamabad in a presentation that is common to the rest of the Dynapolis projected by the Doxiadis office. It can be read as a set of overlapping systems: natural, in continuity with the surrounding nature, is given by the waterways that run through the city and by the network of green spaces; roads network, with roads of greater hierarchy that separate the three major sectors (Islamabad, Rawalpindi, and the large open spaces and parks); built extension, organized by the roads grid in square sectors of approximately 1.800 m of side (correspond

to a population of between 10.000 and 15.000 inhabitants) and developed around two axes corresponding to the civil, commercial and business center.



**Fig. 5.** Master plan of the metropolitan area. Islamabad, Pakistan (1960). Source: Doxiadis 1968, p. 468.

Figure 6 shows with greater definition the administrative center and the first four sectors projected in Islamabad. Each sector is organized around a central area and distributed in turn in four other subsectors delimited by paths of lesser hierarchy. Although it is a more descriptive and less conceptual drawing, we can see the same idea of overlapping systems referred above.

In other projects, the scheme adapts to other specific situations such as the scale and structure of the settlement, or the geography. In all of them however the same structure remains: the adoption of one or more parallel growths in one direction, according to the Dynapolis scheme; the superposition of nature, roads network and the built extension as interlaced systems; and the formal hierarchy of the ensemble.





**Fig. 6.** First four sectors- Islamabad, Pakistán (1960). Source: Doxiadis 1968, p. 470.

## 4 Ecumenopolis

The City of the Future or Ecumenopolis is the first project tackled by Doxiadis through the Athens Center of Ekistics and to which he dedicates a good part of his latest writings. It corresponds to the greater degree in the scale of human settlements, from the megalopolis, a recent phenomenon, to the Ecumenopolis, a term with which he refers to the City of the Future, as the “universal settlement towards which our whole evolution is leading and which will be reached within a few generations” (Doxiadis 1976a, p. 36).

We will see some of the drawings related to this topic, in the same three parts used in the previous section (facts, theory and action), with some variance introduced by the different nature of the object of study.

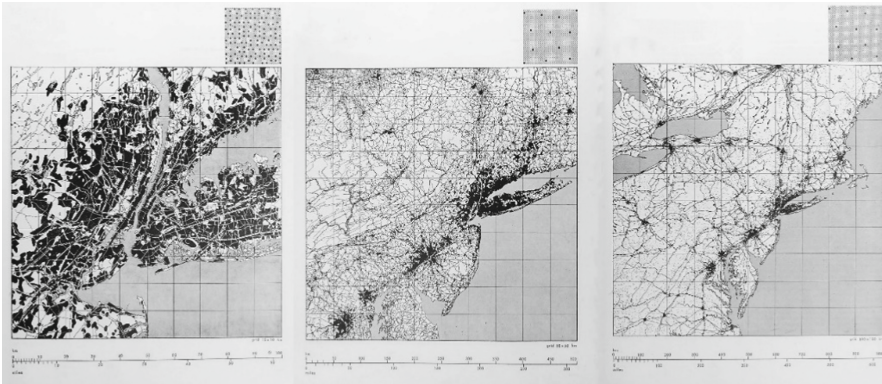
### 4.1 Facts

The increase in mobility and urban growth has led to the change, from the notion of isolated built-up areas, to the notion of interconnected areas within increasingly wider systems. In these systems, urban growth must be considered, not only as the growth of the built-up area, but also as the incorporation to the radius of influence of the city of an extensive territory in which people move every day. It is the so-called Urban Daily

System (UDS) or daily displacement fields, whose radius of action can reach a few hundred kilometers for the cities analyzed by Doxiadis in the United States: “we are now witnessing a further jump in size to much larger daily urban systems, moving up from the city to the metropolis and to the small megalopolis” (Doxiadis 1976a, p. 101).

But in this unstoppable process, the formation of increasingly larger systems does not end with the daily urban systems or “small megalopolis”. The megalopolis, which covers larger areas up to  $1.000 \times 1.000$  km, tends to form linear systems from the interconnection of several daily urban systems. This is a phenomenon already identified in the formation of the megalopolis of the American east coast<sup>4</sup>, and in an emerging state in other parts of the world, including the Great Lakes region. The next inevitable step would be towards the formation of the Ecumenopolis, “the porcential area for the development of the main body of human settlements on the whole earth” (Doxiadis 1976a, p. 37).

Figure 7 shows the constructed area of the large urban agglomeration of the east coast of the United States at different scales, from a closer view of the extension of the main metropolis of New York, through the vision of the agglomeration linearly developed between Boston to the north and Washington to the south, to an even wider frame where some connection lines towards the Great Lakes concentrations begin to draw.



**Fig. 7.** Nueva York and the megalopolis of the eastern seaboard, U.S.A. (1960). Source: Doxiadis 1968, pp. 105–107.

## 4.2 Theory

The previous image, despite being indicative of the size of the megalopolis, would not be enough to approach its real dimension since it no longer corresponds only to its built-up area. In the following image (Fig. 8) we can see a respond to this. Here appear

<sup>4</sup> The term megalopolis was used for the first time by the French geographer Jean Gottmann to refer to the great urban conurbations, with special reference to that arising on the American east coast.

two new ways to gaze the phenomenon, the so called “real city of urbanites” and “real city of farmers”. Both aspects would be analyzed in the study conducted on the urban area of the city of Detroit, The Developing Urban Detroit Area<sup>5</sup>. It would be a case study in which to experience different topics related to the analysis, growth forecast, and threats and opportunities of the City of the Future.

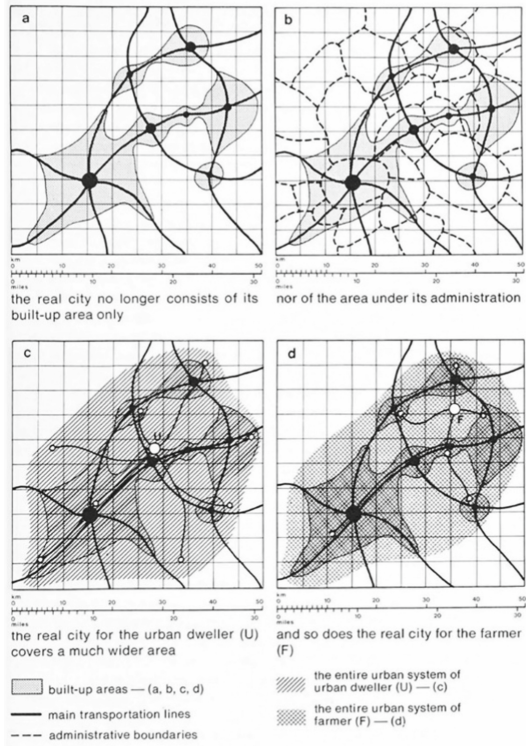
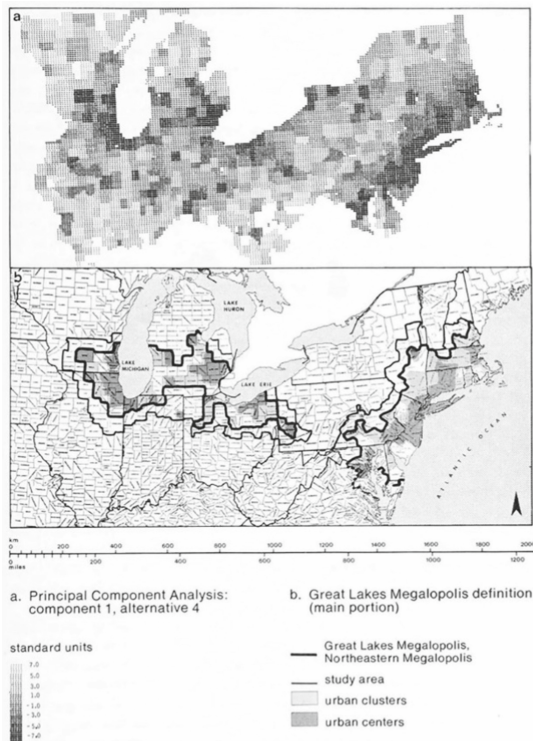


Fig. 8. The change from city to urban system. Source: Doxiadis 1976a, p. 83.

As for the representation of megalopolis as a reality that exceeds the limits of the built, it was considered how its area can be differentiated from the surrounding territory as a functionally coherent whole. For this, series of 40 variables were chosen, which expressed to a greater or lesser extent the degree of urbanization in any place, using data extracted from many fields such as sociology, economics, demography, transport, etc.

<sup>5</sup> In January 1965, The Detroit Edison Company began a comprehensive, five-year study of the area under the direct influence of the city of Detroit, with the purpose of analyzing, understanding and exploring future growth patterns, potentials and requirements.

Applying statistical analysis techniques<sup>6</sup>, different characteristic patterns of the degree of urbanization in each area were brought to light<sup>7</sup>. These different degrees of urbanization were represented as contours on a map in which, “with the peaks of urbanization standing up like mountains, we could see the shape of the megalopolis” (Doxiadis 1976a, p. 106). The images in Fig. 9 show these results. At the top, the degree of urbanization by partial areas according to a grid of squares. At the bottom, the identification of the limits of the megalopolis, as an area of greater degree of urbanization, within the limits of the study area. Within this outline, the zones corresponding to the “centers” and the urban “clusters” are differentiated.



**Fig. 9.** Great Lakes and Eastern megalopolises. Source: 1976a, p. 107.

### 4.3 Action

The City of Future has to do with the scope, in terms of location, dimensions and general structure, of that main body of human settlements throughout the Earth. It is

<sup>6</sup> In particular, Doxiadis refers to the Principal Component Analysis method, a method of statistical analysis especially suitable in situations of multiple variables. (Doxiadis 1976a, p. 106).

<sup>7</sup> The so-called Component One according to the method, a new derived variable, which synthesizes the relevant information contained in each original variable in a significant index (Ibid.).

therefore a difficult to predict and impossible to plan reality. The effort in this case is directed in another sense, different from the development of models, which would be to provide a framework for action and guidelines for proper planning, for any place and for any foreseeable time horizon.

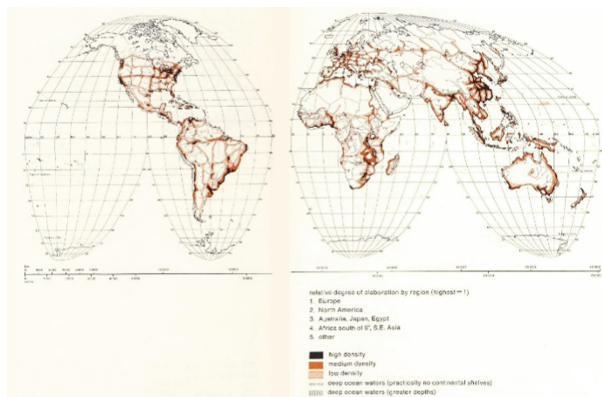
*“The structure of the settlements of the future on the large scale is going to have nothing to do with anyone’s personal and esthetic theories of design; it is going to depend on the laws imposed by Nature, on Anthropos’ real needs, and on his ability to organize the use of his technology to serve those needs”* (Doxiadis 1976a, p. 308).

For this, current trends are analyzed and forecasts are made for the most probable future, taking into account all the variables: population (growth, densities, distribution), resources (water, energy, food, minerals), habitability (climate, topography, water drinking), and income.

Different prediction techniques were used: extrapolation, which links existing trends with the near future, and the forecast, which provides points of arrival for a distant future in three scenarios (high, medium and low). Thus, for population projections, for example, amounts of 50 billion (high), 15–20 billion (low) were estimated, with the intermediate assumption of 35 billion inhabitants around the year 2100.

The criteria used to determine the living space mainly contemplated the climate, topography and water supply. The degree of habitability of the different areas of the Earth was established for each one of these aspects and for all of them combined, and maps of the habitability of the Earth were drawn by independent and combined aspects (Composite Habitability of the Globe) for 1960 and for 2100.

Based on the two variables, population and habitability, and considering an optimal ceiling of population (20 billion), the probable distribution of the population was defined according to the existing urban developments, the main transport axes and the availability of habitable territory. This provided an image of the world City of the Future or Ecumenopolis on the map of the earth towards the year 2100 (Fig. 10).



**Fig. 10.** Probable structure of Ecumenopolis with 20 billions inhabitants, 2100. Source: Doxiadis 1976a, pp. 362, 363.

## 5 Conclusion

The topics seen allow us to get an idea of the dimension of the work developed or coordinated by Doxiadis. Its scope is difficult to establish since, beyond the proposals or specific visions, what is proposed is a mode of action, a method in continuous redefinition as a consequence of the incorporation of changing conditions.

Although the technoscientific and excessively idealistic nature of Doxiadis proposal has been questioned (Katsikis 2014, p. 498), his approach has to do with those of international organizations such as the United Nations, which play an important role in habitat management<sup>8</sup>. Moreover we must add his early attention to some problems that continue today. Those of mobility, the loss of the human scale, or the balance between urbanization and nature. Proposals such as stable communities or continuous networks of natural spaces continue to be current.

From the point of view of the graphic medium, characterized as we said at the beginning by the scientific approach of the method of which it is a part, we highlight its versatility, its capability of adaptation to the nature of the object of study and to the purposes for which it is intended. In this sense, we highlight the work done in relation to the urban area of Detroit, of which only a brief summary has been seen here. In it, new ways of identifying and representing an emerging urban reality were tested.

**Acknowledgments.** To Ricardo Díaz Garrido for his disinterested reading and his observations.

## References

- Athens Center of Ekistics. *Ekistics* 4(25)-73(436/441) (1957–2006). <https://www.jstor.org/journal/ekistics>
- Doxiadis, C.A.: *Architecture in Transition*. London, Hutchinson. Oxford University Press, New York (1963)
- Doxiadis, C.A.: *Ekistics: An Introduction to the Science of Human Settlements*. Hutchinson - New York, Oxford University Press, London (1968)
- Doxiadis, C.A.: *Architectural Space in Ancient Greece* (transl. by Jaqueline Tyrwhitt from the German original *Raumordnungim griechischen Stadtebau*). MIT Press, Cambridge (1972)
- Doxiadis, C.A.: *Ecumenopolis: the Inevitable City of the Future* (with J.C. Papaioannou), p. 1976a. Athens Publishing Center, Athens; W.W. Norton, New York (1974)
- Doxiadis, C.A.: *Building Entopia*. Athens Publishing Center, Athens (1975). W.W. Norton, New York (1976b)
- Doxiadis, C.A.: *Action for Human Settlements*. Lycabettus Press, Athens (1976). W.W. Norton, New York (1976c)
- Katsikis, N.: Two approaches to world management. In: Doxiadis, C.A., Fuller, R.B. (ed.) *Implosions/Explosions: Towards a Study of Planetary Urbanization*. Jovis, Berlin (2014)

<sup>8</sup> According to the architecture historian Panagiota Pyla, the 1976 Habitat Conference was in many ways the culmination of the intense efforts of the World Society for Ekistics to highlight the global dimensions of urbanization and develop common approaches to its management (Katsikis 2014, p. 483).