The city of the future

The Ecumenopolis and the vertical city
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Introduction: The Overpopulation

Man is beginning to understand the path he is following into an unknown future. The time has come for man to try to understand the great confusion that surrounds him in his city and to solve the problems that he himself has created during the last few generations. He will not change the cities of the present, it is too late for that. He can achieve it only if he thinks of the cities of the future, for what we conceive today can be a plan tomorrow and a reality in the future.

The global human population on the Earth has grown slowly along the history, but this growth has accelerated in the last two centuries. A thousand years before Christ, the World population was around 50 million, quadrupling it in a thousand years more (1 A.D, 200 millions). In 1000 A.D. the population was around 310 million. In 1750 A.D., that population doubled to 750 million. We can see here a continuous growth, but suddenly the numbers exploit in amount.

In 1800, the population was around 1 billion and in the firsts decades of the nineteenth century, it reached the 2 billion population. From there, in only fifty years, the total population, from the beginning of the human kind, doubled to 4 billion. Thus, in the year 2000 we reached the 6 billion and in 2011 the 7 billion.

Every human has his rights, every human has his needs, every human claim his space. As the population endlessly grows, similarly our cities grow. The movements of aircraft in the sky, those of trains and motor vehicles on the earth, the torrents of news circulating by telephone, television, and internet. Inevitably the mankind, as it grows, expands rapidly on the Earth´s surface.

The humanity never before had to deal with such forces of change as exist at present. As we see, a growing and aging population; rising incomes and an increasing economic; a social and technological gap, especially between rich and poor nations; rapidly changing social and political conditions; changes in science and technology that make the impossible possible. We have not managed to conceive the totality of the problems we are facing and, as a result, we have lost the ability to think about our future in a systematic way so that our projections can be meaningful and satisfactory.
The emerging megalopolises

Following the work of Constantinos Apostolos Doxiadis (1914-1975), Greek architect and town planner, there are fifteen units of population. Beginning with the first one, the space of a human being with the arms and legs extended, and through a room, a house, a neighborhood, a town, a city, a metropolis, etc., we reach the twelfth, the megalopolis.

The megalopolis is a metropolitan area with more than 10 million of inhabitants. They are not just megacities, but in some cases, the convergence of more than one megacity. One of the larger cases is the extended urban area from Beijing via Seoul to Tokyo (Beseto), gathering the metropolitan areas of Beijing (China), Pyongyang (North-Korea), Seoul, Pusan (South-Korea) and Fukuoka, Kyoto, Osaka and Tokyo (Japan). In 2010, its population estimation was over 100 million of inhabitants.
On the other side of the world we can find more. It is a name coined by Herman Kahn in 1967 that refers to the group of metropolitan areas in the northeast coast of the United States. It extends from Boston to Washington DC, gathering some big cities and megacities, like New York City, Philadelphia and Baltimore. It is an enormous corridor (650km) in which more than 55 million of inhabitants live.

Also in the United States we find Chippitts, developed between Chicago and Pittsburg, with more than 25 million of population, the Greater Los Angeles Area with a population of over 17.6 million, the San Francisco Bay Area with 7.5 million and many more examples.

The Greater Mexico City, plus 60 municipalities reach the 25 million. At the same time, Greater Sao Paulo reaches the 29 million and Greater Buenos Aires the 22 million.
In the United Kingdom, the area that include London, Birmingham, Liverpool, Manchester and Bradford, reach the 30 million of inhabitant, and the River Rhine axis in Germany (Stuttgart, Amsterdam, Dusseldorf, Frankfurt and Mannheim) count on 33 million. If we join these two areas and the surroundings, we get the Blue Banana, a discontinuous corridor urbanization crossing Europe, with a population of around 110 million. To the above mentioned cities, we have to add The Hague, Rotterdam, Brussels, Eindhoven, Cologne, Luxembourgh, Strasbourg, Zürich, Turin, Milan, Venice and Genova.

By contrast, we find in another part of the planet the Indo-Gangetic Plain, between India, Pakistan, Nepal and Bangladesh. Those plains support one of the most populous areas on the Earth, around 1 billion on inhabitants (1/7 of the world´s population). Delhi, Chandigarh, Islamabad are some of the most important cities/megacities of that great area.
**The presumable future: the Ecumenopolis**

The inclination of city growth must eventually lead from megalopolis to Ecumenopolis, a single planet-wide city including all Earth's inhabitants. The city of mankind.

In the past century, when someone talked of cities, the only questions raised were questions of the aesthetics of buildings. Later, when the cities began to suffer hardly from the poor state of communications, all one heard was about the crisis in urban communications, and more particularly about too many motor-cars. Later still, social problems arose in some countries, and people began to view the urban crisis from that particular aspect. Actually, the crisis is the entire system of the human settlement.

C.A. Doxiadis saw the city as composition of five elements: nature, man, society, buildings in general and networks. The failure of the system is due to the destruction of the relationship between its elements. Because man cannot find joy in his home, because his habitation cannot offer him a better life, the entire city system suffers. Because the city expands rapidly, thanks to the motor-car and other centrifugal forces, it destroys the surrounding country-side and the entire system goes slowly from bad to worse.

We can also see this system in other ways, from different points of view. From the economic, social, political, technological and cultural aspects of the city, in combination with the above mentioned elements, results a great number of different variables, which show just how many demands will have to be satisfied and how difficult it will be to meet them all. These problems become even more complex if we admit that what we understand by the word “city” is only an extremely simplified term for a phenomenon of infinitely complexity.
In addition, if we talk about the growing of this list of Megalopolises, about the point in the history in which two or more megalopolises join together, we come to the fifteenth unit in the scale of populations: the Ecumenopolis, the urban continent, the universal city. These constitute a world system that we cannot actually see because it remains to be created. If we consider this system in combination with the five previous elements and the different points of view, we would realize that we are talking of billions and trillions of aspects and problems. Since the cause of the crisis in the system is essentially the latter's size, obviously as the size grows, the problems arising out of it will grow in the same proportion. Assuming that we shall have reached a figure of over 20,000 million by the end of the twenty-first century, such a population increase will call for a corresponding increase in the units which compose the main elements of the city. But population is only one aspect of the question.

As a first approximation, as the population increases, the need for surface space increases proportionately. However, since incomes go up, people demand more space for their dwellings and service networks. They also have more cars at their disposal and they insist on more room for them, too. We now see that, where we have a population with an increased economic potential and therefore insisting on more living space, our whole system of human settlements is bound to become much more complex.

From here, Doxiadis talks about different ways of acting, from the birth control (inapplicable, due to the impossibility of convincing the inhabitants of remote villages in India or South America to apply it), through the keeping of the population in the countryside (almost impossible with the actual proportion of urban inhabitants) to the restriction of the growth of our cities by directing the surplus population to new towns. We could build new towns to absorb the population, but in that case, such towns call for a bigger capital investment for fewer services during the first few years, decades generations, until they reach the size of our present cities.

So, his conclusion is that the most probable, logical and practical solution is the progressive expansion of the present type of city as a result of the massive incoming of an ever-increasing population.

“Ecumenopolis, this world-city that will en-globe the whole of humanity, will be a frightening conurbation, but, as we made clear earlier, we have no evidences that enable us to conclude that a better sort of city can be created. Once we are convinced that this city is inevitable, we can only form one conclusion: if it is
built on today's lines, according to present-day trends, it will be a city doomed to destruction.”

What is evident, is that in a universal city of such proportions, the size and the shape are of no concern, what matters is a proper balance between the different elements. The nature side must be coherent with the urban element. A good combination of green tentacles and residential areas with an easy reach to the two sides must be created.

The size of the city should not be a problem when we can control that the atmosphere keep itself unpolluted. The key resides on keeping a good relation between the elements.

The greek architect affirm that the good approximation way to the Ecumenopolis is by keeping a relation between small population cells of 30000-50000 inhabitants, covering an area of about 1.5 square miles per cell, with underground transportation of matter, people and information.

“We can now ask ourselves whether Ecumenopolis will ever be built. We have already given the answer: it is under construction. We can then ask ourselves whether it will be built for man's benefit, his freedom, safety, and happiness, or for his slavery and extinction.”
An alternative: the vertical city

Instead of the “horizontal urbanism” and occupation of huge areas of land with a low density, there are some emerging approaches to a different kind of city, following the idea of slowing down the urban sprawl and taking more advantages of the available land.

Among the examples of this urbanism, it should be pointed out the Bionic Tower, one of the first existing models of “vertical urbanism”, which concentrate 100,000 inhabitants uses in an area of 1km diameter wide, what allows returning to nature the land non occupied. This model was designed by Eloy Celaya, Mª Rosa Cervera and Javier Gómez.

“Nature did it first and did it better”. This model is based in the idea of Bionic Architecture which it could be defined as eco-philosophical synthesis of the common principles of biology, engineering and architecture applied to the future development of human habitat in harmony with progress and nature.

The challenge of conquest the vertical space is not based on beating height records, but that is based on re-defining with dignity the life of large communities. The real social compromise consists on developing an innovative model of vertical construction that unifies in a new philosophy of life the revolutionary technological concepts which are able to surpass the frontier of 500 meters high with the new urbanism and architectural bio-ecological models. It is based on principles of flexibity and fitness of biological structures, it is able to adjust its height, capacity and use to the different economic, environmental and social conditions of the cities where it is built.
Bionic tower is composed of two bio-ecological urban complexes one into the other. One of them is vertically developed being the other one horizontally developed. The first one, Bionic Tower, is composed of twelve vertical neighborhoods 80 meters high each one of them, separated by safety areas in order to make easier the techno-economical rationality of its construction in different phases and the eviction in case of emergency. Each neighborhood, or level, has two groups of buildings, one interior, and another one exterior. Both are situated around huge vertical gardens and pools. The second complex, the “Base Island” form a complex 1,000 meters diameter in which are distributed medium high buildings, expanded gardens, interior pools and communication infrastructures. The foreseen use of both complexes is extensive: Hotels, offices, residential, commerce, cultural buildings, sports and leisure.

There are many examples of this idea of “vertical urbanism” or concentrate the population in some “constructions” to let off most of land and environmental. This is a utopian solution for the explosive growth of global population.

Another example is the Super Tower in London. It is estimated that London will need to provide housing for almost 100,000 new people every year up to 2016. This is the result not only of migration (internal and global) but also the need to replace existing housing stock that is reaching the end of its lifecycle.

The preferred method of dealing with housing need, and the one most likely to be employed in the near future, is to build low density commuter towns outside the metropolis. This method takes up a tremendous amount of valuable greenbelt or agricultural land and seems ever more inappropriate in the context of the need for a sustainable society.
This is in spite of London being actually one of the least dense major cities in the world. London's population density is five times less than Paris, half as much as New York and only marginally greater than that of Los Angeles. In fact just 13.5% of land in London is covered by buildings.

These statistics prompt the idea of a new and perhaps more radical solution to the housing crisis: could 100,000 people be housed within a single structure? A tower of unprecedented scale conceived not as a building so much as a vertical extrusion of the city; a new town in the sky complete with parks, public squares, schools and hospitals.

The tower designed by Populous Architecture Architects seeks to reduce movement across the city by condensing facilities; living, working and entertainment within a single location. Its position near to existing transport infrastructure would allow goods to be delivered more easily and the proximity of public transport links would reduce the need for car travel between work and home.

Water and household waste would be recycled within the tower to reduce the energy required to replace it with fresh water from the ground. Fresh water could be harvested and filtered from the clouds that would envelop the top of the tower on overcast days.

We should point out too the Crystal Island, which is a proposed building project in Moscow (Russia) that is currently planned to have around 2,500,000 square meters (27,000,000 square feet) of floor space and a height of 450 meters (1,476 ft.) designed by Norman Foster. At these dimensions upon completion it would be the largest structure (in floor space) on earth.

Inside can harbor near 30,000 people, with other uses of offices, museums, shops, theaters, schools and 9,000 hotel rooms.
The tent-like superstructure would rise to 450m, and form a breathable "second skin" and thermal buffer for the main building, shielding the interior spaces from Moscow’s weather. This second skin will be sealed in winter to minimize heat loss, and opened in the summer to naturally cool the interior. The building would be integrated into a new park, which would provide a range of activities throughout the year, with cross country skiing and ice skating in the winter.

In addition one of the most utopic building ever design is the **X-Seed 4000**, the tallest construction over the earth. The idea was initially created and developed by Peter Neville. Its proposed 4 km height, 6 km wide sea-base, and 800 floor capacity could accommodate five hundred thousand to one million inhabitants with a population density over 23,000 inhabitants/km². This is not a big density if we compare it with cities like Manila (40,000 inhabitants/km²) and it has the nearly the same density of Paris (22,000 inhabitants/km²) against the two first examples which have 100,000 inhabitants/km². But it is just an utopy created to commercial goals.

**Beyond…**

We can affirm that the concept “Ecumenopolis” is now a relative nearly reality. If the mankind follows the actual line (population, growth, settlements, etc) is obvious that in 100-200 years this situation will be carried out.

Assuming this point, now is the time to act accordingly with that. Although we have presented two different possibilities, that does not mean they are an antithesis. Facing the presumable future, the vertical city can be used to control and slow down that future. In fact, it is an interesting way of using the minimum land surface, reducing the transportation (matter, human, energy, etc.) and hence the energy consumption. However, everything has a cost. Instead of the money and the construction energy, those megabuildings could create side effects in the nearly urbanism (good or bad ones) and the main challenge is to find a balance between the costs and the benefits, between the city and the nature.
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