Articles

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Ekistics and Traffic

EKISTICS—the science of human settlements—is at the beginning of its evolution. It is trying to provide an answer to the important problems involved in maintaining and operating human settlements today. Ekistics avoids the term "city," "metropolis," or "village." The phrase "human settlements" shelters under one roof all species belonging to this family, the family of the habitat created by man for himself. In the past, human settlements comprised only villages, then villages and cities, and later metropolises. Now we speak of megalopolises. To define our field as the field of all human settlements is to be free to conceive their proper dimensions and their proper character. Ekistics looks at the problem of human settlements with no prejudice as to their kind, size or form.

Traffic has always been an indispensable part of human settlements, and it will always be so. It is an element within the single room: the space we leave around furniture near doors is space dictated by the necessity of internal traffic; even the space we leave around a dining table is space which is required if we are to sit and to take our seats. To complete the spectrum, traffic flows within a house, in parks, in gardens and then in the paths connecting houses, in roads, in streets, in highways, in all lines of communications. Traffic, as old as human settlements, is the factor, which leads to their proper formation and to their proper functioning.

We are now at an important turning point in the evolution of human settlements. We are passing from problems and forms of the past to problems and forms of the future at a time when the future seems to have little in common with the past. It is useful therefore, to try to relate the total problem of human settlements to the problem of their traffic. It is useful to try to define the relationship between ekistics and the disciplines related to traffic.

The earliest human settlements and their traffic accommodated pedestrians only. Later, the movement of animals had to be taken into consideration. The movement of animal-driven carts and, finally, the traffic of the machine began to play a progressively more important role.

At present, we must face the problems of pedestrian traffic, which is receding although we are not sure that it should. We must face what is probably the last phase of traffic by animal-driven carts, which is also receding and probably for good. We must also face an ever-increasing traffic by mechanical means, which, for the near future at least, requires more and more control of the space of

Figure 1. Village in pre-urban era, conditions unsafe

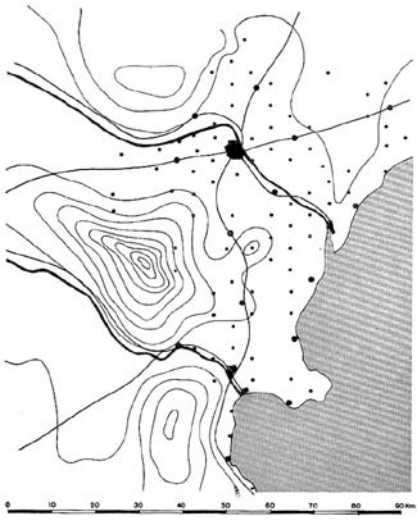

Figure 2. City in the beginning of the urban era, related to a city state

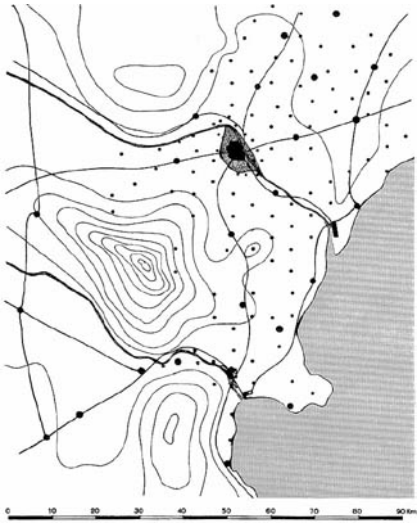

Figure 3. Early dynapolis, related to the existence of larger political units

human settlements.

THE FUTURE OF HUMAN SETTLEMENTS

In order to understand the future problems with which we will have to cope in ekistics and traffic, and the relationship among them, we must consider the future of human settlements.

Not only are we living in a changing world: the rate of change is continuously altering—and in most phenomena accelerating. Thus, it is not enough to state that we have to face difficult problems; it is much more realistic to say that the rate of increase of the problems we are facing is accelerating. It is only, thus, that we can gain the real perspectives of the problems ahead of us and the difficulties we are going to meet.

It is interesting to look for a moment at the wealth, which has been created on the surface of the earth from the beginning of civilization to 1960. This is estimated to be of the order of $13 million millions. That investment will be doubled in the next forty years. It is going to be more than doubled again by the year 2030 and it will be practically ten times higher by the year 2060.

These changes mean that in the next forty years humanity is going to invest as much in settlements as it has invested since the beginning of civilization. This gives humanity the opportunity to create within the next forty years a wealth which surpasses materially the total wealth created since the beginning of civilization. It is only if we use such figures that we can visualize the great problems which lie ahead of us.

TOWARDS ECUMENOPOLIS

Such an investment opens completely new perspectives in the outlook for human settlements. It is not only the investment that is increasing at an unprecedented rate. The total surface required for the settlements is increasing year after year on a per capita basis. This means that a much higher percentage of the surface of the earth is going to be covered by human settlements.

In this way we are heading toward a form of human settlements, which differs completely from the forms of the past.

In the past, human settlements were isolated within an open countryside. The relationship was the relationship of certain nodal points lying in a homogeneous and relatively passive surrounding. In the future, we will be led towards a universal city or ecumenopolis.

From the village we move to the city, to the metropolis, to the megalopolis. We now witness the gradual formation of

Figure 4. Dynapolis, in industrial and railroad era

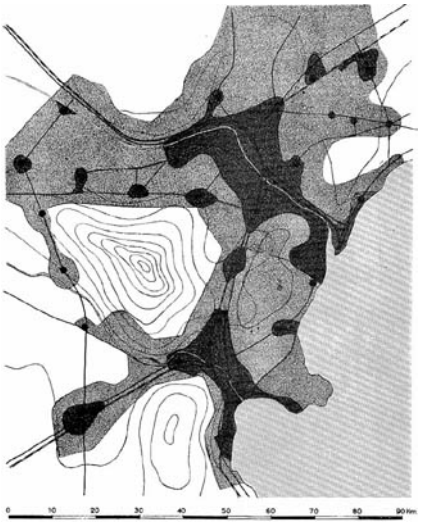

Figure 5. Metropolis, in industrial and motorcar era

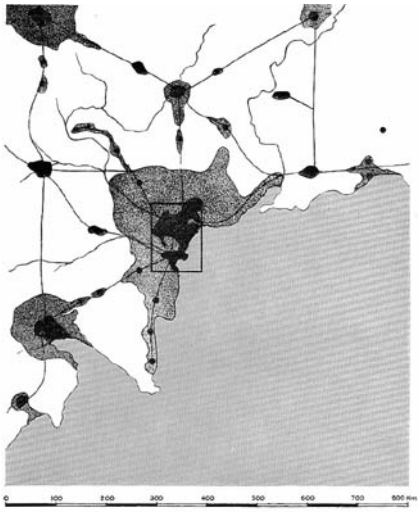

Figure 6. Megalopolis, related to the creation of a very large political unit

several types of megalopolis in many parts of the world. A century or two from now, all these will be interconnected in a continuous network. This is already happening in several parts of the world. The network of ecumenopolis is very different from the networks of human settlements of the past. It does not consist of small isolated settlements within the vast countryside. On the contrary, it is creating continuous networks of major nodal points and many radial branches, which are covering the whole earth like a great octopus; slowly, because of the interconnection of the branches, they are surrounding the countryside within the elongated parts of ecumenopolis. (Figures 1-7.)

Humanity has been found completely unprepared for such an evolution. We have overlooked the fact that, around the beginning of the nineteenth century, the city or polis was transformed into a new type of settlement, the dynamic city or dynapolis, a settlement which has since been covering larger and larger areas of the countryside. This process is still continuing. It has led several settlements to the form of megalopolis. Others are still in the form of growing dynapolis. In both cases, growth continues and we shall witness very soon the creation of the first parts of ecumenopolis.

It is quite probable that in a century's time—in some parts of the world even earlier—this growth will slow down until we face static settlements again, in the same balance with our countryside as during the feudal era or the era of the city states. In the meantime, we should be prepared for the changes to come in every part of the world. It is characteristic to think that the same phenomena are apparent in countries of all political, social and economic systems.

It is quite clear that human ekistic history, up to now, will seem like a century to people, hence, like a short preface to the formation of the permanent ekistic network of ecumenopolis. Surviving cities and villages will seem romantic leftovers of humanity's period of growth into the era of the permanent universal settlement.

We are gradually moving to the point where one basic network of human settlements will cover the whole earth, a network which will incorporate within it small and large parts of the countryside. The network will serve us in peace, which appears more and more indispensable under the conditions of ecumenopolis, and also in war if humanity is going to have the misfortune to witness a war of ecumenical dimensions.

CAUSE: ECONOMIC DEVELOPMENT

Why this happens and why it is going to continue to happen is obvious. With continuing economic development come higher productivity in the countryside and a higher concentration of people in urban areas. It is expected that

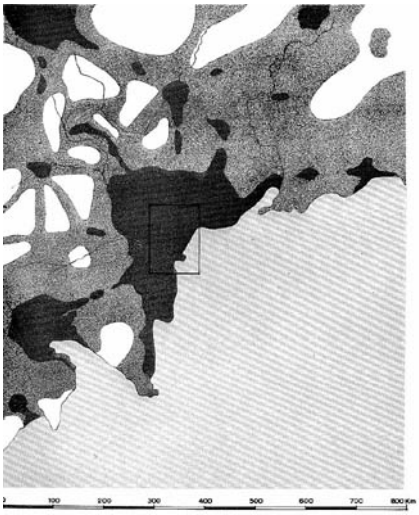

Figure 7. Ecumenopolis, the settlement of the future

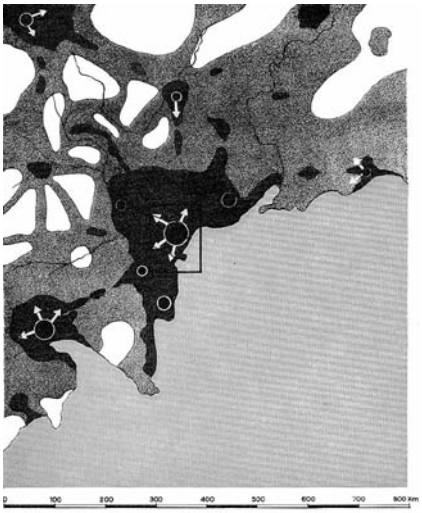

Figure 8. Ecumenopolis as a dead city—necropolis

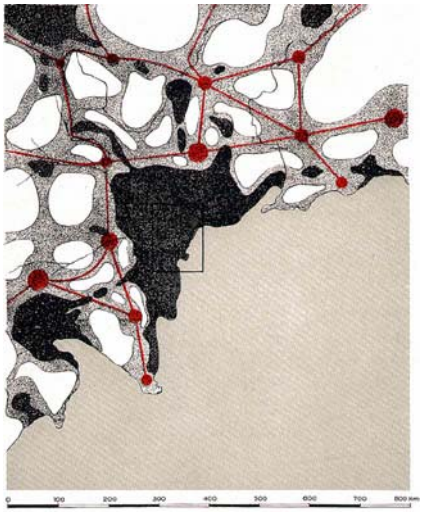

Figure 9. Ecumenopolis as the city of life

a century from now more than 95 percent of the world's population and perhaps 97.5 percent will be living in urban areas. If we also consider consumer-oriented industries, the percentage of which is increasing more and more, we can easily see why previous forms of settlements will be gradually superseded and why our main task will be with the settlement of the future which is going to attract attention because of its dimensions, because it will house the majority of the population and because it will incorporate within its body practically all industries, the whole system of transportation and eventually the greatest part of agricultural production.

It should not be thought that we have plenty of time to face the reality of ecumenopolis because it is only now beginning to take shape and will not take final form for perhaps a century. We have entered into a phase of crisis for human settlements, and we are already witnessing the death of our cities because of pressures exercised on them. Surgery imposed by urban renewal is only a small sign of the gravity of the situation.

Let us for a moment look at the problem of continuous accumulation of new wealth around the centers of old settlements. Because of our present inaction, because of our inability to understand the real issue, we are accumulating new wealth around the existing centers of cities and, thus, we are leading them to their death. If this goes on, ecumenopolis will be a dead city. Its old centers, unable to function, will die, and spread death instead of life. (Figure 8.)

In this way we understand one of our greatest contemporary problems in the formation of space. How this could be solved can be seen by the proposal to create a new network of lines of transportation and communication which do not lead towards the center of existing cities but towards completely new nodal points. (Figure 9.)

Such a network, with new nodal points, will be adjusted to the needs of the growing ecumenopolis and will relieve the centers of existing cities from pressures for which they were never meant and which they cannot survive.

If we overlook this truth, we condemn our settlements to move into the vicious circle of congestion at the center, pressures at the center, renewal at high cost, temporary relief immediately followed by a more acute outbreak of the same symptoms in another circles around the center of the city. It will be a mere matter of time until the pressures once again break the very central core of the city despite the great effort put into its renewal. Once the accumulation of population, wealth and pressures continues to be exercised around the centers of existing cities we are doomed to move in such vicious circles and finally to see the death of our cities and our civilization.

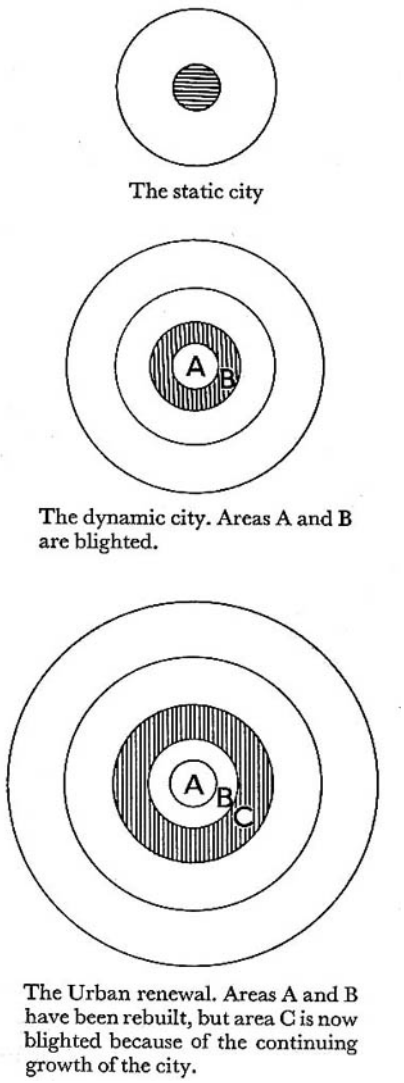

Figure 10. The vicious circle of a growing settlement

We are losing the battle in the field of formation of a proper habitat. (Figure 10.)

The greatest danger and the greatest problems in spatial development in the immediate future are not inappropriate selection of new locations or the form and remodeling of existing settlements, but the cumulative effects of development on existing nodal points which cannot stand the new pressures.

Not only are we not facing the danger: we have lost the ability to understand and analyze it. It has gone beyond the ability of all experts to grasp, as far as dimension, content, and importance are concerned.

CHANGES IN EVOLUTION SPEED, SCALE AND CHARACTER

As a result of the new forces which have entered the scene, we are now witnessing changes which are of great importance for the future of human settlements. The basic changes are changes in speed of evolution, changes of scale, and changes of nature and content.

The rate of evolution in the field of human settlements is changing with every day that passes. If we think particularly of urban settlements, to which more and more people move, we find a higher speed of growth than ever before, and we can foresee an even faster rate for the future. Thus, we cannot even follow the evolution of the phenomena related to settlements. If sometimes we catch up with that evolution, we are incapable of catching up with the technique to face it.

The second basic change is a change in scale. In the past, settlements were confined to very limited space—spots on a map interconnected by lines of transportation over wide-open areas of countryside. Now we see the creation of settlements which spread all around, covering wide areas of what was formerly open land and leaving only very small spots of land within the broader area which may extend for hundreds of miles. The change in scale is apparent and of truly revolutionary importance for the settlements themselves.

In order to understand the magnitude of this change in scale we can look at the logarithmic scale of terrestrial space, as used in ekistics. We will understand then that what we have been dealing with in the past was areas of the size of an average town, while now we have jumped to the megalopolis and are moving quickly towards a large region, creating colossopolis, and towards Ecumenopolis. (Figure 11.)

The changes in the rate of evolution and in scale had an impact on the nature and the content of human settlements. While settlements were once small, compact and uniform urban areas, now they are not only much

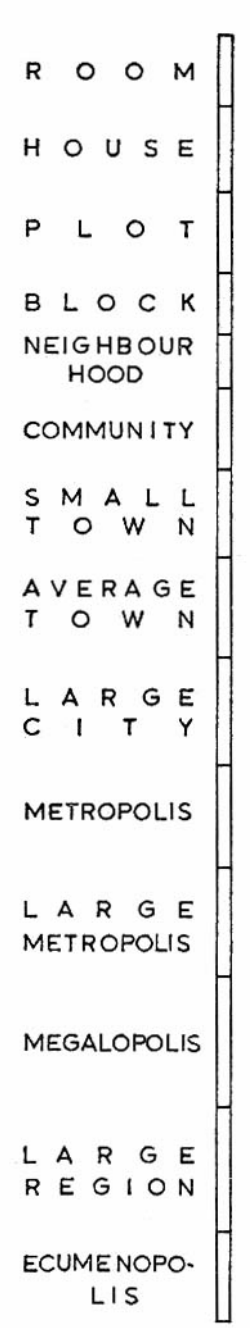

Figure 11. Logarithmic scale of terrestrial space in Ekistics

larger but also loosely built, with uneven densities and sometimes with very different expressions of all kinds of industry, services and physical forms. They have given refuge to man and have offered him the opportunity to work within homelike workshops and small factories. They now incorporate, besides housing, a host of other types of functions related to production, transportation and recreation, and are completely different in scale, in content and expression from the age-old patterns.

All this is confusing. New forces and the tremendous changes which have occurred lead towards the creation of an ecumenopolis, which can very easily become a necropolis or city of death. No country or major urban area has been able to develop policies appropriate to the challenge.

THE TASKS AHEAD

We should create better human settlements. This is the basic task that lies ahead of us and which we are called upon to face. We can do so by analyzing a whole category of problems through the spectrum of scales, dimensions and disciplines concerned with settlements.

In addition to understanding the dynamics of the human settlement, we must make a definite distinction between the nature and the scale of the whole of the settlement and the specific part we are talking about.

Thus, if we look again at the whole terrestrial space on a logarithmic scale, we can understand that man is shaping it in accordance with several patterns. I will make a basic distinction between two of them, one based on a right-angle axis and one a natural pattern derived from considerations related to open space and to the location of settlements within it, considerations which lead to the theoretical hexagonal pattern. The human scale—of importance in spaces of lower order such as room, dwelling and building—imposes a pattern of right-angle axes. In distinction to it, the large scale requires the hexagonal pattern and the geographical patterns imposed by the formation of the surface of the earth. The two patterns, combined, lead toward a natural network of communications and nodal points.

It is the task of ekistics to see that the human patterns (small-scale) and the natural patterns (large-scale) are merged into a total rational pattern. This appears to be possible if the patterns imposed by the room and building are the controlling factors in the micro-scale and if physical formation becomes the controlling factor in macro-scale. Where one scale ends and the other begins depends on the value and size of the settlement and the formation of the landscape. The fact is that the two scales impose two types of physical patterns, two methods of approach to our problems. In the same way we can

discover a variety of differences which are the results of the scale of the terrestrial space we are dealing with. This relationship between scale and methodology changes with the change of the dimension of time. For example, the motorcar is now enlarging the scale of the space which can be formed by two right-angle axes. Pedestrian and animal transportation in the past could put up with the same rectangular pattern of axes only on a very small scale. For greater distances, there was a necessity to cut through the city body by diagonal lines. Now there is no necessity to cut through the city body, as the car can encompass longer routes. Such a solution is beneficial from several points of view.

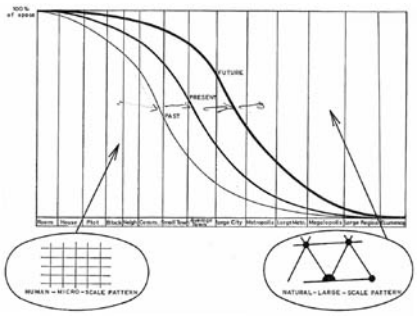

Figure 12. Synthesis of physical patterns

The conclusion is that we can draw a line which separates the parts of settlements controlled by the right-angle patterns and those controlled by a natural large-scale pattern as seen in Figure 12. This line of separation is gradually moving, leaving larger space controlled by the human micro-scale pattern of right angles. Today's mechanical means of transportation and the greater investment per traffic line, as well as new mechanical means of construction, allow right-angle patterns to be constructed over larger areas and over more difficult ground than before.

Increasing incomes and developing technology will also cause another transposition of this dividing line. That is, we should expect much greater areas to be covered by right-angle patterns in the future.

In order to illustrate the tasks ahead, I select two examples, one in small dimensions—human community—and another one in major dimensions—the expanding metropolis—which serve to demonstrate how we can face in a systematic way the problem of better human settlements.

THE HUMAN COMMUNITY

One of the major problems is the great confusion created by a mixing of two elements—of man and machine—within the cities of the present. This confusion, which brings man and machine into conflict in all urban areas, has been resolved satisfactorily in favor of the machine only for major lines of transportation where man as a free agent has been completely separated from machine and has been confined within it.

Even within the machine, man is no longer a free agent. He is following the rules of the machine. If anyone doubts this, he has only to try to stop his car on a highway. Man, within the machine, on such a highway, is simply a part of the great machine operating on the highway. Thus, the problem of conflict of man and machine has been resolved on the highways completely in favor of the car. But what happens in other scales? What happens on minor roads, or

within residential or shopping areas?

The modern city has gradually eliminated the human scale, so indispensable for the happy life of the citizen who should move around as a free agent so far as possible. This is not necessary over large distances. The pedestrian cannot go from one end of the metropolis to the other, much less of the megalopolis. However, it is indispensable up to a certain scale of a mile or two, which the pedestrian can cover easily and should cover easily, in order to have a healthy body and in order to avoid turning into half-man, half-car centaur, which he will surely do if he is not given the chance to use his legs. Let us not forget the warning by the committee of experts appointed two years ago by the White House, who declared, among other things, that young Americans are turning into a legless species. Such considerations lead to the necessity for the formation of the human community as the basic element of the city of the future. We call this community a human one when we give preponderance to the movements of man, give man the chance to enjoy the community on his own scale.

Figure 13. A Representative Human Sector

In order to create such communities, we must separate pedestrian and car traffic. On a small scale, up to a mile or slightly more, this can be achieved through a pattern of streets infiltrating the community without ever crossing it. (Figure 13.) Such ideas have already been employed in several cities and have lately reached the stage of implementation in the new urban renewal area of Eastwick in Philadelphia (Figure 14) where the following are achieved:

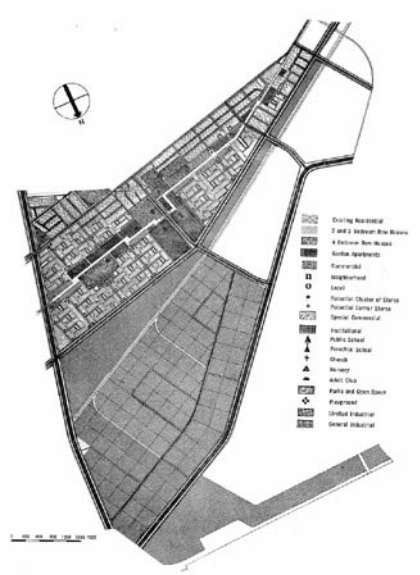

Figure 14. Eastwick, proposed first stage of redevelopment

1. Pedestrians move as free agents in the heart of the community. There they can enjoy space, they can enjoy art, and they can discover again the age-old relationship between man, architecture and art, without concern for any danger near them.

2. Pedestrians can move freely to the heart of the community without having to cross car traffic lines.

3. Car traffic of necessity moves at low speed within the community and at lower speed within the residential streets, but it can develop high speeds within the city *outside the human community*, as crossings are now at great distances.

4. Thus, a city consisting of human communities can be crossed at high speeds while the human community itself, by its own nature, keeps the speed of an entering car to the minimum possible.

As can be seen by the examples given, the human community is conceived as a community in the human scale which can remain static, it does not need to expand and it cannot expand. It does not need to, because it has all services necessary to its own inhabitants, at its own

scale, within the community itself. It cannot expand because it is surrounded by highways which form natural barriers to further expansion.

THE DYNA-METROPOLIS

The fact that the human community can re-establish human values does not guarantee the solution of the problems of our urban settlements, as the human community is by nature human, limited in dimensions, and static. Cities cannot be limited in size. They are already very large. They cannot be static. They are dynamically expanding, and because of size they are by necessity controlled by the machine. We must therefore proceed to think about major urban areas like the metropolitan ones.

If we wish to look into the problem of a metropolis, we must understand that there is no metropolis any more but rather a dynamically growing area which, in order to avoid confusion, we call dyna-metropolis. If the dyna-metropolis is in open land without pre-existing features which impose specific lines of transportation, it is quite natural to accept that the right-angle pattern may be imposed on it.

Figure 15. Islamabad, the metropolitan area

Several research studies which I have carried out prove the advisability of such a solution over larger areas. The last article by Howard T. Fisher and Nicholas A. Boukidis1 on the "Consequences of Obliquity in Arterial Systems" proves the advisability of relying more and more on mathematical patterns.

A metropolitan area, which we planned lately on the basis of such considerations, is that of Islamabad, the new capital of Pakistan, for a population of 2,000,000 people. Both for Islamabad as well as for the existing city of Rawalpindi, which is incorporated within the new metropolitan area, the right-angle pattern has proved to be a most practical one. (Figure 15.)

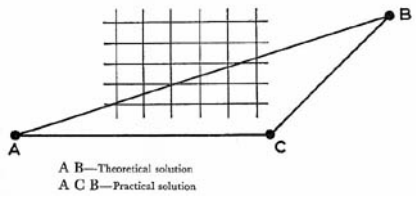

Figure 16. Actual situations influenced by forces of resistance of existing patterns

In developing such patterns, we should keep in mind that in actual situations, where certain settlements already exist, it is more reasonable to think of lines of transportation which completely avoid completely built-up areas, even if this means theoretically a longer line. In practice, however, such longer lines mean higher speed and a shorter time for the connection of the two points. (Figure 16.) Under these circumstances, straight lines would mean:

1. Passing through an existing settlement and disrupting its functions.
2. Higher cost.
3. Lower speed.

If the area already has many pre-existing commitments, we can still hope to develop it on the basis of considerations related to its dynamic growth. Such an

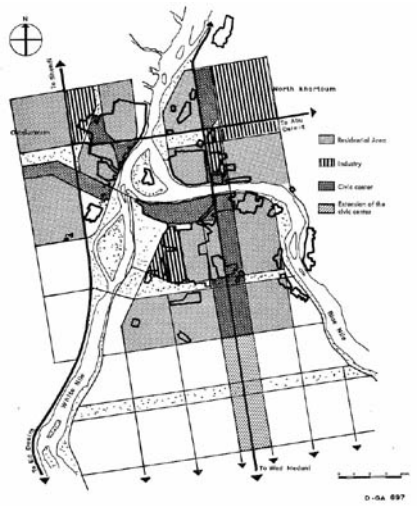

Figure 17. Greater Khartoum, metropolitan area. The dynametropolis consists of two static and one dynamic center.

example is demonstrated in the new metropolitan area of the capital of Sudan, which incorporates the three cities of Khartoum, North Khartoum and Omdurman. (Figure 17.)

Traffic has always been an indispensable part of any settlement, from the smallest to the largest. In natural settlements, traffic and the over-all settlement have grown together. They have therefore been in balance, have consistently shaped each other. Whether settlements meant a room, a house, a village, or a small city, there was always a unity between the whole settlement and its traffic lines.

TRAFFIC AND THE FUTURE OF SETTLEMENTS

When settlements no longer grew naturally but were planned by man, there was still a consistency between the whole settlement's conception and its own traffic. Even if there were weaknesses because of the inability of the planner to do as well as the natural development did, the harm was not felt seriously, as traffic was confined to the movement of man and animals. It was not a traffic of the machine.

Problems began to arise when the machine—mainly the car— entered our cities. In the last thirty years the crisis has become imminent, the tremendous difference between the over-all conception of settlements and the operation of traffic manifesting itself clearly.

At present we face a host of problems created because of unsatisfactory solutions given to traffic. Cities have been planned, designed, and built without proper thought given to traffic problems. The result is congested streets and traffic chaos which experts attempt to remedy by regulative measures or by opening up new highways. The urgency of the situation causes failure again since experts lack:

1. The over-all conception of dynamically expanding settlements and the way to face resultant problems.
2. The proper co-ordination between traffic and the other functions of the city.

Thus, we have human settlements where the problem of traffic has been overlooked and which are therefore unsatisfactory. We have human settlements where an attempt has been made to solve existing traffic problems, but where we are led to a different kind of disaster, since traffic may work against the settlements' own interests or at least against the proper balance between it and the other functions of the city.

The dangers are great.

They will be much greater as there is an increasing accumulation of problems related to dynamically

Figure 18. Ekistics, and other disciplines

expanding settlements and to their traffic problems. What is needed here, is a great deal more research and much more collaboration between the experts on traffic and those concerned with the over-all problems of cities. This is why we need to incorporate traffic into the ekistic conception of human settlements, a conception whose purpose is to co-ordinate all points of view and to bring into balance all functions in an interdisciplinary approach dealing with several functions or several specific aspects of life within human settlements. (Figure 18).

In this respect our main task in the future is to try to re-establish the age-old balance between all functions within the city, a balance that has been lost during recent generations, especially during the last one. It is within this framework that we must define the role of traffic as one of the functions of human settlements which should remain in constant balance with all other functions. Further than that, the role of traffic should be seen at three different scales:

1. At the scale of the human community.
2. At the scale of the dynamically growing settlements.
3. At the scale of ecumenopolis.

PEDESTRIAN BILL OF RIGHTS

In the human community we have to re-establish human values. It is here, therefore, that preponderance should be given to pedestrian traffic, allowing man to move freely as much as possible in all directions and to all functions within his city. This is the right of everyone, from the child to the very old man: to be free to use properly not only the park and the secluded space, but the human community as a whole.

The car is also needed within the human community. Thus it seems that although the controlling element of the human community should be the pedestrian, the car should also be permitted to infiltrate and to serve all parts of it. But this should be based on proper design, i.e. on a system in which pedestrians and cars will not cross. Such a system should be gradually worked out, and does not preclude that one day it may be found economically feasible to use different levels, although this does not seem possible for most communities at present. In working out this system, maximum economy should be achieved since any superfluous space given to the car at the level of the human community increases its cost enormously and forces the city to expand without reason. This is economically, socially, and aesthetically wrong.

EXPANDING SETTLEMENTS

The human community remains static, but the settlements are expanding. They consist of human communities but they should be able to expand as long as their population

and functions require expansion. These dynamic settlements have to be conceived properly, right from the beginning, so that we can understand the speed at which they are developing.

Furthermore, we should understand that we have to deal here with different conceptions about centers of settlements and their periphery. We need different solutions, like the solution of dynapolis, which is a parabolic city in distinction to the concentric one. In these dynamically growing settlements we must understand the necessity of a gradual transfer from the two-axial system, on which it is natural to conceive the human community, to the hexagonal one. Where and how this happens depends on many factors, such as the pre-existence of human settlements, topography and the commitment it is creating, the economics of the situation, etc. The answer to how far the right-angle system can go and where the hexagonal can take over is the key for the proper internal formation of dynamically growing settlements.

Thus, the over-all shape depends on the proper understanding of the speed of development, as this defines the lines of expansion and the areas to be covered, while their internal formation depends on the proper conception of a system of traffic which can keep the balance between traffic requirements and all other requirements of the city.

Finally, all efforts toward the solution of problems at the level of the human community or the dynamically expanding settlement should always be made in the light of the ecumenopolis to come, the major human settlements which will gradually cover very large tracts of the earth in continuous stripes. In this universal settlement we shall have to bring into balance not only the human communities with their own requirements, not only the dynamically growing settlements at small scale, but the dynamically growing settlements at a large scale, covering greater and greater parts of the earth. In this respect, considerations of pedestrian traffic prevailing in the human community and of car traffic prevailing within dyna-metropolis at distances of 100 or perhaps 200 miles should be rounded out by considerations of traffic by air for distances beyond 100 miles, be it a traffic of airplanes or a traffic of rockets, if it is reasonable to expect that transportation over larger distances, even on earth, is going to be served by such means.

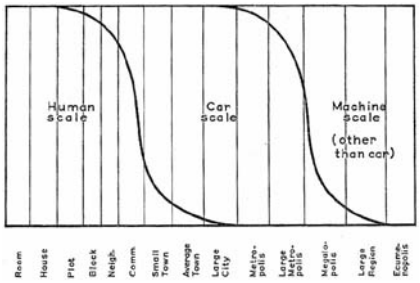

Figure 19. The challenge for traffic

If we now want to look at the challenge which exists for traffic (Figure 19) within the human settlements of the present and of the future (at least of the future which we can foresee) we could describe it as follows:

1. The car must serve, as much as possible, the areas of the human scale without hurting that scale. It must enter the human community with the greatest respect for man,

whose senses should be protected. Cars should not cross the lines of man; they should serve all areas; they should not be seen, if possible, but only serve.

2. The car should be the predominant factor in the areas of the
car scale, but with full respect to other characteristics of the settlement, and with full realization that, although the car is supreme, the ultimate goal is to serve man—for whom, in the first place, the settlements are built. Economics and technology, however, will probably lead to different kinds of solutions. A car-conditioned network will be the system of blood arteries of the body of human settlements. The body must be served, the blood system must be conceived as one part of the whole.

3. Airplanes, rockets, and other machines like cars will form the scale of the machine. The car should here be the auxiliary means of transportation. Its requirements should be seriously considered, but they are not to determine the basic solutions of this scale.