

The Urban Emergence Of Edge Cities

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Abstract:

When looking at the big cities, some may see, the mass of chaos that characterized overpopulation and urban overcrowding without a system, and others that concentrate on the main components, see these cities as a system consisting of secondary systems, affected by many effects that surround cities across time. the extent of these changes depends on the effect of effects the surrounding cities, thus the kind of system known as a dynamic system, the dynamic behavior for cities is represented by urban growth that occurs by many inputs on cities among the development currently taking place in the cities, which leads to a series of changes for the structure of the city, ending emergence of new urban centers to absorb the overpopulation and urban overcrowding in city, restoring stability and balance to it. The research formulated its problem of how to get urban emergence to edge cities. Assuming that cities are a dynamic system, the objective of who urban emergence of the edge cities takes place The researcher introduced the concept of a dynamic system and identified the most important stages starting from the chaos of the edge to the emergence, and the researcher addressed the concept of urban growth and the most important stages it goes through and the most important methods taken by urban growth in cities, For the researcher to come to the most important indicators that resulted from the interview of the vocabulary of the dynamic system with the vocabulary of urban growth in the second axis, the researcher introduced the city of Baghdad as a major city and identified the most important stages that the city of Baghdad has passed through, after applying the indicators to the city .

Keywords: dynamic system, urban growth, edge cities.

1 -Urban Growth

Urban growth is "a global phenomenon, which is the cause and result of various ecological, social and economic processes occurring in all natural and human structures" (Lefteris, p1), Urban growth is a physical urban expansion and functional changes, as it refers to the changes that occur in the surroundings (transformation from open areas to urban areas) and this leads to a change in the type of land uses, as efficiency and the surroundings are two of the main elements of the urban system (cheng, p3). Therefore, the concept of urban growth includes several concepts related to it, among them :

- "Urban sprawl " as urban growth begins to crawl, expand and move towards empty land to fill it, as the city grows from its outskirts by adding parts to it, then the process of qualitative development of the place begins (complexity and development of events), so expansion and spread is the first step to urban growth, and sudden urban growth occurs as a result of the economic growth of the region accompanied by an increase in the population. And contemporary urban growth occurs as a result of interrelated problems of place dynamics (Batty, 1991, p1).

1-the decline of the central city is an indicator of the historical origins of growth.

2-the emergence of the outskirts and edges of the city and competition and integration with the city center and its functions.

3-semi-urbanization of the edges of the city and its outskirts, as it is considered the most spatial indicator of such growth.

- In terms of economic significance, urban growth refers to the transition from simple to complex economic organizations that is, the transition from an economy dependent on Labor and primary production to an economy dependent on industry, management, trade, and services, and in a simpler sense is the transition from a subsistence economy to a market economy.

1-2 stages of urban growth

1 -Continuity: Growth includes individual movements that can be measured by land uses, density, amount of work, and the type of change in terms of speed, slow, gradual, or sudden, this depends on the level at which the change occurs, so if it is at the level of formal spatial patterns, the change is slow, but if it is at the level of internal events and activities, the change is clear and rapid, as the change in the formal patterns of the city is continuous and occurs at a slow level, as the shape and the formal pattern follows a specific rule in the growth period, which is growing from bottom to top, and this is

called on "fractional patterns," the city continues to grow by creating parts over time Until you reach the next stage of growth and(Bengston, Fletcher, et al.,2004,p272).

2 -Transformation: when the city continues to grow by adding parts to it, Accordingly, the effects of this growth are generated as a result, such as noise and error in the morphological patterns of the city, and the symmetry of growth is broken, The characteristics of growth change accordingly to reach a state of equilibrium and symmetry, so the patterns reach a more complex level, and then the urban cells continue to grow at a new level of morphological patterns, and these changes continue in the growth process until the cells reach the critical limit where they are unable to self-regulate, so they have to shift or jump to a new level and the self-regulation process starts again according to the continuity in growth.

3- Emergence: Emergence is a relative phenomenon, which can be known through the changes that have occurred in the urban system (before and after emergence), which is sudden changes in the size of the city and at periods, and it is considered over time a gradual change to a new level of the urban system itself, When a single urban system has support for growth from an urban neighborhood, it moves towards it by building kinetic links to form a new urban agglomeration. As a reaction to this, the urban systems in the old agglomeration demolish the links with the urban system separated from it, reaching a state of equilibrium through the process of self-organization. the separation of the urban system and its connection with a new urban agglomeration comes from the need for support and for growth in space over time, and this is due to its constant need to search for energy for growth and thus cities grow and separate from big cities(Anthony, 2004, p: 379).

1.3 methods of urban growth

When the city begins to expand and move, it takes several methods to arrange this expansion, among them:

1-expansion within the master plan

There may be places in the basic city plan that are not occupied by a certain use or may be occupied by inappropriate use, so there are several options for growth within the master plan, among them:

1 -Creep some cities have grown in the manner of crawling areas within the basic plan and the gradual occurrence of Creep from the Old area to the new area and function and form are homogeneous.

2- Jumping some cities grow irregularly and homogeneously, so they

consist of irregularly distributed housing blocks due to the presence of natural or human thresholds that hinder the continuation of their expansion, or maybe other reasons that produce a homogeneous appearance of the city. 3- Filling after the process of exploiting all the possibilities available in the city, the resort is made to filling the blanks in the master plan, which may need to change some uses that are contrary to the master plan (Olajoke, 2007, p: 222-224).

2--growth outside the master plan

1-centralized expansion: some cities are crawling toward areas that are prepared to expand and the creep occurs gradually towards the areas adjacent to the master plan, which are connected to the city center by transportation roads, the beginning of which are commercial centers to provide services to the population, and the further away from the city center the lower the population and urban density. There are several options available for expansion beyond the master plan. 2- Expansion in the form of satellite cities: sometimes the expansion of cities on the adjacent territories is difficult or there are obstacles to expansion, so they expand in the form of stand-alone cities that are relatively independent of the central city, and are connected with it by a transport network to provide communication between them and spread on the roads commercial and industrial institutions, Sometimes empty lands are separating the central city and the satellite city, and in others, the satellite cities continue to expand until they join the central city, so they are called the metropolis. 3-sectoral expansion: this type includes concentrated expansion and satellite cities where it has the form of sectors adjacent to the central city and connected with it by transport routes, and those sectors contain the activities and events that the population needs, over time the sectors and the city continue to expand towards each other until they connect forming the overall shape of the city. 4- Longitudinal expansion: in some locations, cities cannot expand in all directions, where the direction of expansion is specific, such as a river, coastal or Mountain sites, so expansion is either in one direction or in opposite directions, this type generates disadvantages, among them the high cost of services due to distance. 5-scattered expansion: sometimes cities expand by adding new urban centers that are separated from each other and isolated and connected by transport routes, separated from each other by empty or low-density spaces, in some cases centers are allocated a specific function (commercial centers, educational centers, industrial centers) (Olajoke, 2007, p: 224).

2 -The Dynamic System

It is one of the systems "that conducts complex behavior through time, deals with feedback loops and time delayed, and these elements give it the character of complexity and non-linearity" (MIT System Dynamics in Education Project (SDEP)), the dynamic system is an application to explain the dynamic behavior of a complex system, as " dynamic systems are a powerful methodology and spatial modeling technique for identifying, studying and discussing complex things and problems "(Robert, 2008, P2).

2.1 dynamic system phases

1-the edge between order and chaos: "the edge of chaos is when information puts its feet in the door of the physical world, as it has the upper hand over energy, and being in this transition stage between order and chaos (information) not only provides control over the inputs and outputs of the system but also provides the possibility of the information processing process to be an important part of the dynamics of the system "(Roumieh, 2005, p.9). 2- Bifurcation: when a complex dynamic system reaches an unstable state in its environment due to turbulence, interference, or pressure, a gravitational State returns, the paths of this pressure and at the phenotypic turning point the system branches and is pushed to the state of the new system through self-arrangement or decay "(Roumieh, 2005, p. 6). 3- attractor: the system begins to bifurcate due to the presence of attractors near the system that attract it towards it. 4- Nonlinearity: Sally Gouer defined "nonlinearity is the Lack of proportionality of inputs to outputs of a system under which phenomena operate in a nonlinear way" (Kasbi, 2005, p.29) that nonlinear systems are those in which the rates of change are not constant.5- Complexity: complexity appears when systems are formed by parts that are related to each other, and the system becomes more complex by the presence of these parts that have qualities, features, and associations with each other (Salingaros, 2000, p256). 6-Phase Transition: when the system enters chaos due to internal and external disturbances and influences, the system enters the stage of Phase Transition, and after the system becomes complicated as a result of branching and taking a certain path according to the attractor of the system, then the Phase Transition of the system occurs, this transformation needs a space to occur in it, and this space is called the appearance space or Phase Space. 7- The Fractal phenomenon in a dynamical system has dimensions through which it operates and which appear at several ordinal levels (Salingaros, 2003, p34). The Fractal body is irregular, and this is at all ordinal levels, whether of large or small scales, and the concept of fatality appears in several phenomena, including living systems, organisms, and the structure of the city

(Batty, 1994, p4-5).8- Self Organization the concept of self-organization is the difference between the information received by the system (input) and the information produced by the system (output) (Gers Henson, 2012, p29) and is also the work of a network of internal relationships, even if it is simple, and it needs the energy to maintain the interconnectedness of its parts and unity, as the parts are connected until they reach a state of order forming an organized structure.9- Emergence: the stage of emergence is followed and associated with the stage of self-arrangement, and this stage leads to the birth of a new system, a measure of the information produced by the system, relative to the information received by the system (Gers Henson, 2012, p29) , There are several modes of emergence according to the degree of change, namely zero emergence mode, weak emergence mode, medium emergence mode, and strong emergence mode.

2 -The second axis: the practical side

2-1 the most important indicators reached by the research for the urban emergence of the edge cities :

1 -the stage of chaos: cities at the beginning of their origins are urban agglomerations and these systems are open non-linear dissipative linked by some relationships with another open system, because both systems intersections, interweaving and converging, and the edge in the system gives importance to inputs to be part of the overall system because it gives a big change even if it has a small energy.

2 -Bifurcation stage: the urban system begins to expand horizontally through branching due to the presence of attractions near the system that attract it towards it, so the system begins to bifurcate.

3 -the stage of complexity: in the stage of the horizontal extension of the urban system, the inputs are not proportional to the outputs of the system under which the phenomena operate in a nonlinear way, as the rate of change in it is not constant and variable, and with the continuation of the extension there is a process of dictating open spaces and linking the parts together, so the system becomes more complicated by the presence of these parts that have qualities, features, and links with each other.

4 -Phase Transition: when the urban system continues to expand horizontally, the system enters the phase of the phase transition, and after all the open spaces have been filled, the urban system is in several levels of arrangement and has an irregular body, which is

the reason for the development of systems and their survival over time .

5 -The Stage of Emergence: after all the open spaces were filled in the previous stage, the city continues to grow and with the constant entry of variables into the city and the presence of feedback and self-organization, the emergence of the city occurs, which means the birth of a new system.

6 -The Attraction of the City: the city is expanding and branching towards the attractions that take its path, so there are multiple forms of the city, including rectangular, circular, square, radial, finger, scattered, reticular, finger and multi-core, this depends on the available attractions.

7- The Emergence Patterns of the Edge Cities: the cities of the edges begin to be scattered urban clusters and then begin to move towards each other until they reach the stage of vertical height and the features of the city change and begin to emerge, but the emergence is on several patterns from the zero emergence pattern to the strong emergence pattern.

2-2 Baghdad City

The city of Baghdad has passed through several stages, namely:

1 -the stage of origins: this stage begins when the Baghdad city wall was abolished in 1869 as shown in Figure (2-1), when the Ottoman governor Medhat Pasha ordered the demolition of large parts of the wall that were still standing, during this period Baghdad expanded, its area increased and its population increased (Al-Ashaab, 1982, p. 26), After 1869, Baghdad witnessed a series of reform projects such as the construction of a railway line, the construction of new buildings with military, cultural, religious and health functions, modern irrigation projects, and the construction of new streets such as Al-Rashid Street in 1916(Al-Wardi , 1972, p .57), and an area of (4 km) (Al-Ashaab, 1982, p. 37). Baghdad at this stage grew in such a way that its integral parts could not be separated, forming a solid urban fabric and an organic system of streets.



Figure (2-1) the city of Baghdad was in 1869

Reference: <https://sabahnassery.wordpress.com>

2 -The stage of influence by inputs: this period begins in 1936, at this stage the importance of Baghdad increased as a result of the development of means of transport and communications, as the functional role was activated and influenced the internal environment of the city, where some streets were improved and a number of them were opened, such as Al-Kifah and al-Jumhuriya streets, and the outskirts of Baghdad developed as a result of the emergence of new uses such as warehouses, industry, camps, and cemeteries (Al-Ashaab, 1982, p .78). The extension areas in the thirties filled twice the area of the rounded city and extended to include (waziriyah , Azamiyah, Alawiya, Karada Maryam and Allawi Hillah) (Khudair ,2010, p. 95) and several planning appeared by international companies to put the basic design of the city of Baghdad, including the doxiades planning of the city of Baghdad as in Figure (2-2)

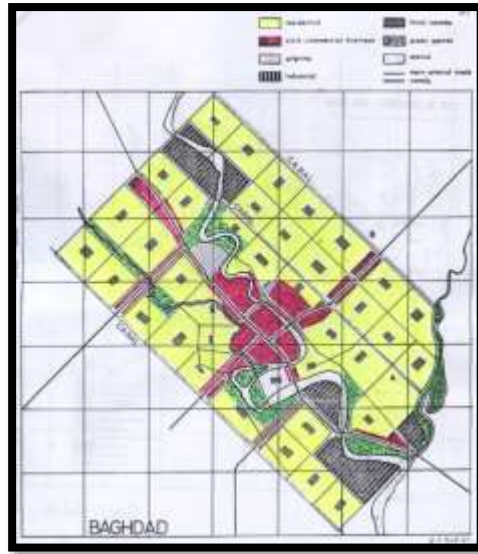


Figure (2-2) the doxiades plan for the city of Baghdad 1987

Reference: Baghdad municipality, comprehensive development plan, 2006, P. 12.

3- the stage of urban sprawl: this period was represented by the operations of allocating new lands and the distribution of land plots by cooperative societies to citizens, in addition to a political decision to distribute residential homes to low-income people, as the number of residential plots distributed in 1959 reached about 265 thousand pieces, the highest number witnessed by the city of Baghdad, and this continued until 1964 after the 14th Ramadan Revolution, as Baghdad witnessed an increase in the distribution of land plots and the private sector continued to grow (Mohsen, 1986, p. 5) This period witnessed a sharp horizontal sprawl and as a result, some small cities within the city of Baghdad , such as aldubbat, almuhamin, alaiqtisadiyn, alqudda and shurta).



Figure (2-3) the polservice diagram of the city of Baghdad

References: POLSERVICE "Comprehensive Development plan for Baghdad 2000, Warsaw, Poland, 1973, p36.

4- The stage of regional spread: in the eighties, the urban growth of the city of Baghdad increased and its population increased, and this led to the spread outside the urban boundaries of the city of Baghdad by the emergence of cities on its edges, so the planning alternatives turned to planning new cities or subsidiaries after they were interested in horizontal expansion in all previous proposals, and the population in 1977 reached about (2.7) million people and rose to (3.8) million people in 1987, Then it increased to (4.4 million) in 1997, which led to the emergence of planning proposals to accommodate the population increase and growth taking place. In 2006, the Baghdad municipality sought to draw the future plan for Baghdad by developing a comprehensive development plan for the year of the Goal 2030 , so it studied alternatives that would absorb the population momentum from Baghdad to outside the borders of Baghdad , by creating new cities and urban settlements outside the borders of Baghdad, These settlements and cities have the economic and urban potential to make them an attractive factor and to absorb the momentum from Baghdad, and this should be by : either the establishment of new cities whose appropriate location is chosen or by the development of towns located within the Baghdad region and located on the main axes of Baghdad, and three alternatives were reached as follows: the first alternative : proposing sites within the city of Baghdad in non-urban areas of Baghdad through two options, the first option : the city of basmaya, which is located (7.5 km southeast of the borders of the municipality of Baghdad), the second option was to search for to establish urban settlements due to expansion restrictions within the borders of Baghdad as shown in Figure (2-4).

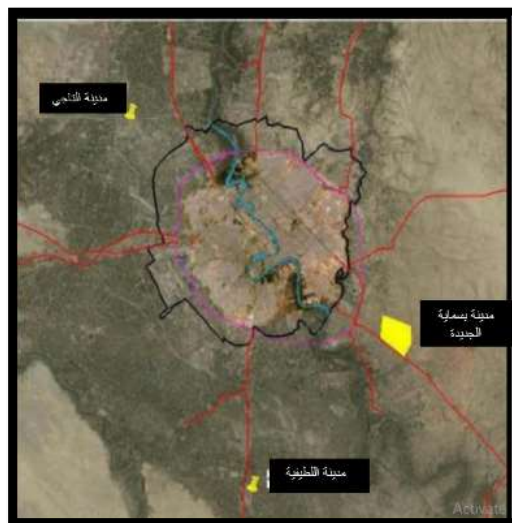


Figure (2-4) the most important new cities

References: Baghdad municipality-comprehensive development plan for the city of Baghdad 2030-phase III, Part II, 2012, p. 347.

The second alternative: is distribution within the existing urban areas of Baghdad within the boundaries of Baghdad governorate, i.e. expansion will be within the vacant lands available in the cities and towns located within Baghdad governorate, including (Abu Ghraib, Taji, Tarmiya, Alexandria, Nahrawan, unity, Madain, yousafiya, latifiya, mahmudiya, Rashidiya, Rashid), this alternative will be political by developing these areas and optimizing their exploitation and making them an attractive factor for the population to absorb the population momentum of Baghdad by 2030 as shown in Figure (2-5)



Figure (5-9) the cities of the edges within the province of Baghdad

References: comprehensive development plan for the city of Baghdad 2030, Part II, 2012, p. 348.

The third alternative: is expansion within a radius of 70 km from the center of Baghdad, and this circle will include five governorates, and not just Baghdad governorate, as in the second alternative, i.e. expansion only within Baghdad governorate, but includes 25 cities within five governorates within a radius of 70 km (Baghdad municipality, 2012, pp. 345-352).

Analysis of indicators of urban emergence of the edge cities from the city of Baghdad:

The index	Indicator weight	Baghdad city	Indicator value

Continuity of edge chaos	20%	When the continued entry of information and energy into the system generates a state of turmoil and imbalance at the edge of the system, this stage begins in the nineteenth century, when the city wall was abolished, Baghdad witnessed a series of reform projects such as the construction of a railway line, the construction of new buildings with military, cultural, religious and health functions, modern irrigation projects and the construction of new streets such as Al-Rashid Street in 1916, all of these are considered inputs to the system, which led to the liberation of Baghdad and its Edge began to expand in search of balance and stability, Baghdad grew at this stage in solidarity so that its integral parts cannot be separated, the problem of urban solidarity and an organic Street system	20% to achieve the city of Baghdad for most of the characteristics of this indicator
Bifurcation continuity	20%	At this stage, the importance of Baghdad increased as a result of the development of means of transport and transportation, as the functional role was activated and influenced the internal environment of the city, where a number of streets were improved and a number of them were opened, such as Al-Kifah and al-Jumhuriya streets, and the outskirts of Baghdad developed as a result of the emergence of new land uses such as Stores, industry, camps and cemeteries in the Fifties of the twentieth century, there were socio-economic developments for the population and Baghdad developed as a functional center, which led to the construction of buildings for new jobs such as banks and shops, this in turn led to the expansion of Baghdad, and this expansion included the vertical growth of buildings along the main streets, at this stage and as a result of the impact of new inputs on the urban fabric of the city There was a revolution in the fabric through the new planning method based on the	20% to achieve the city of Baghdad for most of the characteristics of this indicator

		construction of relatively straight and wide streets, so there was a change in land uses as well as in the style of street planning .	
Complexity in growth	20%	The system reaches a state of complexity, which represents a dividing site for the system, as the system stands, branches or interacts in a renewed manner and the sequence of the growth process as a result of continuing to grow, the components of the system reach the critical limit as they are unable to self-organize, so the system resorts to transformation or jumping to a new level and the self-organization process begins according to continuity. This stage is represented by the Sixties period in Baghdad, after increasing the growth and complexity and reaching the critical limit, the Iraqi government commissioned some companies to prepare a basic plan for the city of Baghdad	20% to achieve the city of Baghdad for most of the characteristics of this indicator
Methods of the system in self-organization	20%	Self-organization is the difference between the information received by the system and the information produced by the system, when the system reaches the critical limit, it resorts to self-arrangement. in urban growth, the system resorts to several methods of self-arrangement, including growth inside the master plan through the dictation of empty spaces, crawling and jumping, or growth outside the master plan through the emergence of new urban centers in the eighties, the urban growth of the city of Baghdad increased and its population increased, which led to the spread outside the urban boundaries of the city of Baghdad by the emergence of cities on its edges, so the planning alternatives new cities or subsidiaries after they were interested in horizontal expansion in all Previous proposals	20% to achieve the city of Baghdad for most of the characteristics of this indicator
Urban emergency	20%	When one urban agglomeration has support from urban neighbors, it is separated from its urban agglomeration and extends dynamic links towards one of	10% Baghdad has not achieved most

		<p>the urban neighbors and separates from the old urban agglomeration .therefore, due to the development that occurred in the cities of the edges of Baghdad governorate, they emerged urban and became existing cities with an interactive relationship with the city of Baghdad.</p>	<p>of the characteristics</p>
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The most important conclusions and recommendations reached by the researcher :

Conclusions

1-the city of Baghdad is a dynamically unstable system, so it is always looking for stability and this gives it the character of continuous movement in search of the ideal through interaction with the surrounding elements.

2-the city of Baghdad has gone through several stages during its growth period, and the stages were in response to the inputs that entered the city and interacted with it, and those inputs affected the economic, urban, social, and environmental structure of the city. This was a series of changes in the structure of the city of Baghdad, starting from the urban fabric of Baghdad to the emergence of new urban centers on the edges of Baghdad to absorb the urban growth taking place.

3-Baghdad has not reached a strong emergence of the cities of the edges due to the lack of serious development of these cities

Recommendations

1-the research recommends researchers and planners look realistically by realizing that the city is more like a dynamic system as it is influenced by inputs and to follow planning approaches based on the principle of few interventions with large impacts.

2-the research recommends researchers and planners study the inputs that affect the city and find out how much they affect the structure of the city to take note of those effects.

3-following the decentralized development policy in planning, taking into account international experiences and benefiting from them.

4-optimal exploitation of the resources available to the cities of the edges creates a strong economic basis for them and makes them an attractive factor for the population of Baghdad to absorb the population momentum.

References:

1. Al-Ash'ab, d. Khalis, (1982) "The City of Baghdad, Its Growth, Structure, and Planning," Dar Al-Jahiz, Baghdad.
2. Al-Kasbi, Hassan Abd Ali Abd Al-Shaheed, (2005) "Non-Euclidean Geometry in the Architecture of Urban Systems", a doctoral thesis submitted to the University of Baghdad, College of Engineering, Department of Architectural Engineering.
3. Al-Wardi, Ali, (1972), "Historical Glimpses of Contemporary History of Iraq," Baghdad.
4. Anthony, J. J. U. A. R.,(2004), "Do state growth management regulations reduce sprawl.?"
5. Baghdad Municipality, (2006), Baghdad Perspective in 2030.
6. Baghdad Municipality, (2013), "The Comprehensive Development Plan for the City of Baghdad 2030," Phase Three, Part Two
7. Batty , Michael , Xie , Yichun , Sun , Zhanli ,(1999), "Dynamics of Urban Sprawl", Centre for Advanced Spatial Analysis, University College London, ISSN: 1467-1298.
8. Bengston, D. N., et al,(2004), "Public policies for managing urban growth and protecting open space: policy instruments and lessons learned in the United States.
9. CHENG, Jianquan , MASSER,Ian , OTTENS,Henk ," UNDERSTANDING URBAN GROWTH SYSTEM: THEORIES AND METHODS", Department of Urban and Regional Planning and Geo-Information Management, International Institute for Geo-Information Science and Earth
10. Fathi, Ihsan, (1987) "Baghdad Between Yesterday and Today," Amanat Baghdad, 1987.
11. Gershenson carlos , Nelson Fernandez ,(2012), " complexity and Information Measuring Emergence, Self – Organization, and Homeostasis at Multiple Scales."
12. Khudair, Amer Shaker, (2010), "The Architecture of Modernity in Baghdad Planning," Plan and Development Journal, Issue 22.
13. Lefteris , A. Mantelas , Poulicos Prastacos, Thomas Hatzichristos, "Modeling Urban Growth using Fuzzy Cellular Automata " , Regional Analysis Division Institute of Applied and Computational Mathematics Foundation for Research and Technology- Hellas, Greece
14. Mohsen, Fouad Radi, Salih Ahmed, (1986) "Urban Urban Growth in the City of Baghdad," research published in the proceedings of the Eighth General Conference of the Arab Cities Organization,
15. Olajoke, A. J. J. o. H. E.(2007), "The pattern, direction and factors responsible for urban growth in a developing African city: a case study of Ogbomoso."
16. Polservice ,(1973), " Comprehensive Development For Baghdad 2000 " ,Warsaw , Poland.
17. Robert ,A. Taylor,(2008), "Origin of System Dynamics: Jay W. Forrester and the History of System Dynamics", In U.S. Department of Energy Introduction to System Dynamics. Retrieved 23.
18. Roumieh, Moein, (2005), "An Introduction to the Theory of Complexity and Chaos," an article on the Maaberna website, at:

http://www.maaber.50megs.com/issue_february05/epistemology1.htm

19. Salingaros , Nikos A.,(2000),"Theory of the Urban Web", Journal of Urban Design,Vol. 3.
20. Salingaros, Nikos A.,(2003), "Connecting The Fractal City", 5th Biennial of towns and town planners in Europe.