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Assessment of the Affecting Elements on the Quality of Life and Human Well-Being in Congested Urban Centers; Case Study: Sulaymaniah City

Othman Kareem Mohammed*
Hoshyar Qadir Rasul

City Planning Eng. Dept.
College of Eng.
Sulaymaniah Poly technique University (SPU)
Sulaymaniah
Iraq

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ABSTRACT

This Study is an empiric- analytical research in city planning discipline was conducted in Sulaymaniyah city from Dec. 2015 until July 2017. Geographically Sulaymaniah situates north-east of Republic of Iraq. Like many other urban centers, Sulaymaniyah city as one of the congested urban areas in Kurdistan Region, is almost over populated and congested, resulting in accumulated problems in health-, economical-, services, technical-, social- and planning affairs, which leads to permanent degrading of the natural, and social environment and thus impact on the quality of life, Thus the main concern of this study is firstly finding out the reasons facts indeed responsible for the above described unsatisfied situations and then try to answer the questions whether planning methods (if any) manage to prepare answers to these urgent problems overwhelming the city? The study believes that the cardinal reasons for this situation are the effects of combinations of triple facts, namely: the exponential growth of human population in general- and accompanied problems-, the destroyed balance between rural and urban areas and the political vision of administrative machinery that focus on urban centers by neglecting countryside. The cumulative effect of these facts could be observed in form of many distinctive and at the same time interlocking elements leads to the problems that mentioned above. Among many elements involving, the study handles, analyzes and discusses only the elements indeed responsible for destroying the visual, physical and health conditions of the city inhabitants in Sulaymaniyah. Used criterion in determining these elements are the terms: active element, Passive Element, Critical element, and buffer element, which give the adequate answer to the arise questions .

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تقييم العناصر المؤثرة على نوعية الحياة و رفاهية الانسان في المراكز الحضرية المزدحمة مدينة السليمانية – كحالة دراسية

عثمان كريم محمد و هوشيار قادر رسول قسم هندسة تخطيط المدن، كلية الهندسة، جامعة بوليتكنك في السليمانية

الخلاصة

هذه الدراسة هي بحث تحليلي تجريبي في مجال تخطيط المدن اجريت في مدينة السليمانية من ديسمبر 2015 حتى يوليو 2017. وكحال العديد من المراكز الحضرية الأخرى. جغرافيا السليمانية تقع شمال شرق جمهورية العراق و تعتبر مدينة السليمانية كواحدة من المناطق الحضرية المزدحمة في إقليم كردستان وتكاد تكون مكتظة بالسكان ومزدحمة، مما نتج عنه مشاكل متراكمة في مجالات الصحة، والاقتصاد، والخدمات، والتقنية، والاجتماعية، والتخطيطية، مما يؤدي إلى تدهور البيئة الطبيعية والاجتماعية بشكل دائم وبالتالي التأثير على جودة الحياة ، أن من أوليات البحث هي معرفة الأسباب الحقيقية المسؤولة عن هذا الوضع غير المرضي، ثم محاولة الإجابة عن السؤال ،فيما إذا كانت أساليب التخطيط (إن وجدت) تمكنت من إعداد إجابات لهذه المشاكل الملحة التي تغلب على المدينة؟ وتعتقد الدراسة أن الأسباب الرئيسية لهذه الحالة من اللاتوازن هي آثار مجموعات من الحقائق الثلاثية ، وهي: النمو المتسارع للسكان والمشاكل المصاحبة - والتوازن المدمر بين المناطق الريفية والحضرية والرؤية السياسية للاليات الإدارية التي تركز على المراكز الحضرية من خلال إهمال الريف يمكن ملاحظة التأثير التراكمي لهذه الحقائق في شكل العديد من العناصر المتميزة وفي نفس الوقت تؤدي العناصر المتشابكة إلى المشاكل المذكورة أعلاه. من بين العديد من العناصر المشاركة، تقوم الدراسة بمعالجة وتحليل ومناقشة العناصر المسؤولة بالفعل عن تدمير الظروف البصرية والفيزيائية والصحية لسكان مدينة السليمانية. يتمثل المعيار المستخدم لتحديد هذه العناصر في المصطلحات التالية: العنصر النشط، والعنصر السلبي، والعنصر الحاسم، والعنصر العازل، والتي تعطي الإجابة المناسبة على الأسئلة المطروحة.

الكلمات الدالة: الانسان ،الفضاء والبيئة ، المشاكل المتشابكة في المراكز الحضرية، السكان مقابل المشاكل البيئية

* Corresponding Author: E-mail: wesmanresul@yahoo.com

1.Introduction

Geographically, Sulaymaniah is one the Northern Province cities of Republic of Iraq (north-east of Iraq), and administratively represents mainly one of the three congested and largest urban centers of Kurdistan Region Iraq . It occupies currently a total built-up area of 472 000 square meter and has currently, according to a directorate statistics of Sulaymaniah 723 968 (The figures given in table 1 are unrealistic, it was underestimated. The researchers believe that the figures must be higher than this given. This is because of for many years prevailing disturbed relations between rural and urban areas, which results in a quasi "exodus" of village dwellers, under the influence of so called Push-Pull effect, into Sulaymaniah city, seeking for a better living conditions and future for their families than that exist in their home villages) inhabitants see Table 1. Parallel to the expansion of the built-up area, the population of the city has increased rapidly. (The exponential growth of human population is almost a worldwide phenomenon. So the population of the world of about 1 billion in 1804 reached 7 billion in 2013 and may reach 9 billion in 2050. Concerning the KRI, where the study area a part of it, the population reached from (3.5 mil. in 1999 to 5.5 million in 2016), with an annual increase of 3.5%. And over 95% of their populations live in the cities among them Sualimaniyah with a population of 723 968 in 2017 Table 1). This is because of inadequate practicing socioeconomic policy of both local and regional government in Sulaymaniyah and Erbil, since the 90th of the last century which forced the rural population to a continuous migration to the main cities, such as Sulaymaniah, for seeking better living conditions for their families. Today it was observed that a congested city with the overloaded infrastructure. The most observable and well known phenomenon prevailing is the health threatened environmental pollution, especially air pollution, that has an impacts, essentially on the life quality of the inhabitants. It is also obvious, that the conditions prevailing in Sulaimaniyah is also true for fast all congested urbanized centers, not in Iraq only but in all the large cities in the world- with different grade of intensity[1,2]. But, according to the slogan "thinking global and acting local" this study focus on Sulaymaniyah where the researcher have lived and worked for many years.

The cardinal reason for the prevailing condition in Sulaimaniah – as indicted above-from 1991 up to date 2018 is the sudden increase in population and the bulk and density of unplanned artificial systems that the city have made within this time period, such as factories, human settlements, roads, large number of imported vehicles the culprit of air pollution, see Appendixes 2 and 3, institutions, energy producing plants, service establishments, etc. These, from local government created artificial systems are interconnected in somehow with one another making an artificial environment, like the exiting natural environment, with the resulting feedback effects that impacts the quality of life negatively. Therefore any attempt with the aim problem(s), especially those related to the quality of life in Sulaimaniyah, must take the interlocking principle of sharing facts and elements and their outputs are created into consideration.Then, we don't have to think in a pure cause and effect and linear relationships but also in the interlocking mechanisms of involving elements and facts [3] .

Table 1

Annual rates of population growth for Sulaymaniah city for the period (2007 – 2017). (Data from Directorate of statistics of Sulaymaniah).

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No of inhabitants	538700	554861	571507	588652	606312	624501	643226	662533	682409	723968	723968

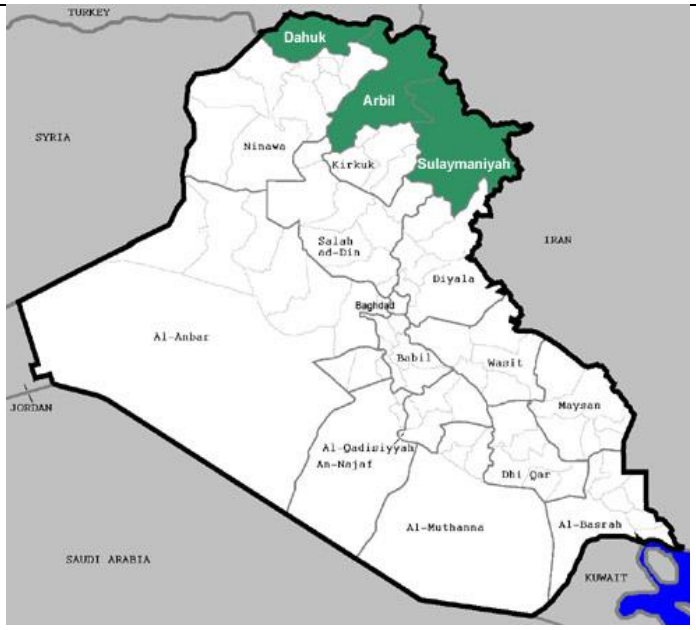


Fig. 1. Map of the Republic of Iraq indicates the geographical location of Sulaymaniah's territory (north-east) of Iraq. Regards the population size, Sulaimanyah is the largest city, among the three large cities of Kurdistan Region Iraq, indicated on the map. (Source: Directorate of statistics of Sulaymaniah).

2.About the Choice of Research City

As mentioned above, the situation of congested urban centers all over the world (especially the cities of Middle East) are generally almost the same. But nevertheless every urban center (also Sulaymaniyah) has its own unique peculiarities, such as sociological-, traditional-, customs-, economic-, and climatology factors, etc. All these facts give the city unique properties, which distinguish it from the other cities. This reality was the starting point which was strengthened by sufficient knowledge about the city, not only physically but also with regard to wider contacts to general public and related authorities and institutions present in the city. The observed, of rush overpopulated city of Sulaymaniyah with all byproducts since the last 15 years was other motivated factor which make Sulaymaniyah city an excellent place for the research. Thus the choice of the research study area has both globally and locally motivation factors. The study follows the principle or the motto "thinking global and acting local".

3.Research Problem

Such paper requires a prior research which could serves as a solid foundation about urban problems in the city coming in question, which is unfortunately non-existent for Sulymaniyah. It is difficult, indeed almost impossible to find a reliable data about the actual conditions, especially regarding this issue, here in this city. Then, our towns all are composed of "imported accumulated and unsuited objects laid side by side", like our other dailies consume articles, from China, Iran, Turkey, etc. This study emerges in the presence of this condition. Therefore the challenge of the study is firstly the identification of the elements that directly or indirectly effecting the social, health and visual environment which in consequence effect the quality of life, in the city of Sulymaniyah table 2. After that the arrangement of the identified elements logically with one another within a system to visualize the interlocking principles between them fig.2 and subsequently make them quasi "quantitative and qualitative" measurable by using the" terms: Active Element Passive Element, Critical Element and buffer element [3]. The two last named elements play a decisive role in fixing the magnitude and mutual effect of each element within the overall system and indicate the path of the required recommendations tables 3 and 4. Thus this study finally could be an initial scientific paper for later researches in this field in Iraq or KRI.

3.1Research Targets

The aim of every plan, in the multidisciplinary disciplines, like city planning, for example, is to improve the quality of the people life. Thus the main target of this study runs into this direction, namely; improvement the quality of life of inhabitants in Sulymaniyah city. Beside this main target the nature of study inherits some sub-targets as follows:

- Since the research begun by "motivating" the citizen to participate in their own planning affair, as a quasi Citizen's participating approach, so the general public were given quite enough information about the effects of their daily activities and behaviors on their immediate surroundings, namely their city environment. This cooperation between the researcher and citizens was done and practiced through filling out the "influence matrix" by citizens given in Table 3 and Appendix 3 respectively.
- In the same way the politicians and decision-maker were given important decision aids and methods for defining and solving similar problems and other multi disciplinary issues occurring in the environmental sphere, engineering, and social science affair.
- Layout of a solid native basis for researches on the problems field related to urban problems in general and specially congested urban centers .

3.2Materials and Methods

This study is a pure analytic-empirical scientific work that conducted in Sulymaniyah city during the period (2015- July 2017). The prolonged time is due to bulk of the issue, its complex nature" [4] (Meise.Volwahsen defines such matter as a bad or complex structured problem "According to the nature of the problems, we differ between Simple, complex, more complex and meta problems. The problems of city planning as multidisciplinary one belong to a complex problem type" [4] P. 13) the desire to obtain accurate and reliable necessary data, as well as possible – and finally the will-power to achieve a more realistic result and accurate necessary recommendations. The nature of research make possible for almost every one to take apart in the city of Sulymaniyah (from teenager to elderly persons up to 80 years old) directly. So the general public was spoken by means of the list of 12 composing influence elements related to the purpose of the study to register their responses, opinions and positions about each of these elements see table 2. Among 12 listed influencing elements the focus by majority of questioned inhabitants was on 8 elements- which also was considered for pertinent by researchers too. To show visually the nature of mutual influences between these chosen elements a graphical model was constructed for this reason. fig. 2. To transfer these subjective response and visual effect into a quasi objective state and numerically measurable form, every participant person got one matrix, so called paper computer/ influence matrix, (table 3). The arrangement of the chosen eight participating elements in the thematic from top to bottom clearly shows that the handling of the issue follows a systematic approach, the process of understanding, how things (elements, variables) regarded as systems influence one another within a whole [5].
Taking "paper computer / influence matrix" Appendix3 as a practicable scientific tool, demonstrates how the participating elements influence each other. According to the targets of the study each of the sharing elements must be given its own deceive role by determining each one its actual weight within the overall evaluating system and then formulate a pertinent terms and related questions. Briefly the following four terms bellow must arithmetically be calculated and identified. (See especially section evaluating procedure):

a- Active element,
b- Passive element,
c- Critical element, and
d- Buffer element.

Table 2
The assessment results of the 12 elements that listed by the researchers.

	Elements/ variables	Assessments
1	Zoning mechanisms	Less than 60%
2	Citizen's opinion	65 %
3	City planning	76 %
4	Public health	97 %
5	Green area	75 %
6	legislation	Less than 60%
7	Traffic congestion and heat radiation	91 %
8	Architectural appearances	Less than 60%
9	Air pollution	98 %
10	Street layout and parking spaces	71 %
11	Building regulation	Less than 60%
12	Infrastructure services	78 %

Note: as inquiry form, which are in a close relationship with the study purpose and its targets which were filled out by the citizens in Sulaimaniyah. The 12 elements were listed arbitrary

The aim of the mentioned inquiry was to know the personal opinion and fillings of the people about the essence of each of these elements with regard to their physical-, and social environment, also about the level of their satisfactions, which in turn reflected on the quality of their life in their hometown. The formulated question was as follows:
Regarding your own wellbeing and that of your community, respectively in your home town Sulaymaniyah, how do you evaluate each of the 12 listed elements? Express your opinion and filling by valuating each one of the elements. State your opinion by giving marks, rating between (0 - 100%). The acceptable pass-mark fixed for research purpose is 60%. Therefore, elements which got less than 60% marks are omitted. After simple calculation, it was clear that, only 8 elements got the required fixed marks, and the remaining four elements, which obtain between 32– 58 % are eliminated from the scheme and neglected. These 8 (chosen/passed) elements with the assessments (between 65% -98%) are the mean value of total of 350 lists distributed as inquiry or questionnaires. Fig. 2 bellow shows the graphical interactions between these elements. This was the first step of analyzing and evaluation. For the second evaluating and decisive step the results of Table 2 were arranged in somehow other form, so called influence matrix, to know the magnitudes of the interactions between the sharing elements the citizens in the city, believe. Thus, they were asked to enter the strength of interactions between these elements arranged on the"computer influence matrix" by giving figures between (0- 3). See Table. 3 (influence matrix).

The differences by circles size of the passed elements in Fig. 2 (public health, city planning, Air pollution, green area, Traffic density and parking space, Citizens opinion, Street layout and heat radiation, and infrastructure services) are representing the difference weights or importance given by peoples to individual elements. The last named element is out of graph because of reasons of overlooking and lack of space**.** The difference by size of circles is almost in accordance with perceptual number within each circle.

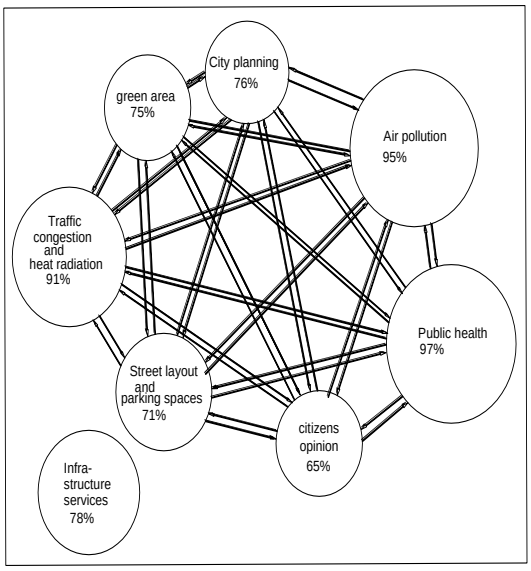


Fig. 2. The graphical representation of the mutual influence and interlocking principle between 8 passed elements that listed in table 2 above.

4.Evaluation procedure and discussion

Since the returned figures, entered by the citizens on the total of 350 influence matrix, which reflected the opinion's of the interview's, were differing widely from one another so we had to calculate the mean value of all filled matrixes. These results were first reflected in the graphical model Fig. 2 to show the relationships and interconnections between the listed elements on one hand and to reveal these differences visually on the other hand - thus the different sizes of the circles on the graphic model are approximately in accordance with the ranking list of the elements that established by the questioners on the influence matrix. The arrangement of elements from top to bottom designates (effect from), and from left to right designates (effect on).The defined elements (A- H) were evaluated with regard to their mutual influence. The strength of influences were arranged on a scale from 0 (no influence) to 3 (strong influence). Now one can begin to assess all occurring interactions by filling out all boxes through entering (0 – 3). The fields which are marked with a **(*)** tell that the participated elements can not influence themselves, thus all fields in which each element comes up against itself are marked with a star. To establish, how strong each element influences among the other elements on the list and at the same time under the influence of the other elements, the following symbol arithmetic calculations will explain this:
1. The additions of all figures in each row, also moving from left to right (effect on ⟶) yields the active sum (AS) of that element. Thus the given figures in the column under the letter Q. represents the active sum of all elements.
2. The addition of all the figures in each column (all figures under Letters), also from the top downwards

(effect from ↓) produce the passive sum (PS) of that element (Thus the given figures in the row are designated by PS which represents the passive sum of all elements.)
3. To find out which element effect the others most strongly, see the element with the highest active sum (AS). (Compare the figures that listed under the column AS)
4. The element which is most effected by the other elements, is the element with the highest passive sum (PS). (Compare the figures in the row that designated by PS).The identification or assessments the above four mentioned terms which also are explained by methodology section followed by these steps:
5. Divide the active sum (AS) of each element by its passive sum (PS) to obtain quotient Q, [AS: PS = Q]. The quotient Q is then the indicator for the determining, both the active element and passive element (according to the calculated value). The element which receives the highest Q-value is the active element; and that with the lowest Q-value is the passive element. (Compare the figures listed in the column designated by Q, also under the letter Q)
6. The multiplication of the active sum (AS) of an element by its passive sum (PS) gives the product P, [PS * AS = product P]. (Compare the figures listed by the row PS.). P-value is the indicator to determine both the critical and the buffer element (according to the calculated value). The element with the highest P-value is a critical element, whereas that with the lowest P-value is the a buffer element. It remains to discuss and determine the effect values for the eight elements those showed in, fig. 2, and listed in tables 2 (also public health, green area, city planning, traffic density and heat radiation, street layout parking space, Infrastructure services, education, city planning, citizen's opinion).

Table 3
Influence matrix. Influence matrix was used to analyze and evaluate the mutual influences of the 8 participating elements (A- H), that acting in Sulaymaniyah city listed in Table 2, and presented graphically in Fig.2. The strength of influences are arranged on a scale (from **0 – 3).**

↓ Effect from / Effect on →		A	B	C	D	E	F	G	H	Active sum (AS)	Qut. (Q)
A	Street layout and parking spaces	*	1	2	2	0	1	0	2	A 08	0.8
B	Green areas	3	*	2	1	2	1	1	2	B 12	1.33
C	Public health	2	1	*	2	2	1	3	2	C 13	1.08
D	Infrastructure services	1	2	0	*	1	2	1	0	D 07	0.58
E	City planning	1	1	2	2	*	2	2	2	E 12	1.2
F	Air pollution	1	2	3	2	2	*	1	1	F 12	1.2
G	Traffic congestion and heat radiation	0	2	1	2	3	1	*	1	G 10	1.1
H	Citizens opinion	2	0	2	1	0	2	1	*	H 08	0.8
		A	B	C	D	E	F	G	H	(AS)	(Q)
(PS)	Passive sum	10	09	12	12	10	10	09	10	PS	
	Product (P)	88	108	156	84	120	120	90	80	P	

All the initial figures entered in Table 3, (all the figures under letters A-H columns and next to letters A-H rows). These figures represent the mean value of all influence matrixes – **350** matrixes in total, returned from the participant persons. And all figures found in (columns AS and Q) and next to (rows PS and P) are arithmetically calculated and obtained from the initial figures, as explained above.

Scale of influences:
0 = no influence
1 = slight influence
2 = medium influence
3 = strong influence

Results, discussion and conclusion:

(B Green area) → = Active element As / (highest Q. value = 1.33)

(D infrastructure services → = Passive element PS / (lowest Q. value = 0.58)

(C Public health → = Critical element P / (highest P. value = 156)

(H citizens opinion → = Buffer element P / (lowest P. value = 8

Table 4
The results and summery of table 3 which identifies 04 decisive elements among 08 participating elements with regard to their importance in answering the questions about: Active element, Passive element, Critical element and buffer element in network urban-system Sulaymaniyah.

Evaluation results	participating Elements							
	A	B	C	D	E	F	G	H
Active element Highest Q-value		**1.33**			1.2	**1.2**		
Passive element Lowest Q-value				0.58				
Critical element Highest P-value			156		120	120		
Buffer element lowest P-value								80

From the outset and according to the obtaining results from Table 2 and Table 3 respectively the element (B green area) with the highest Q.-value =1.33 take the position of active element. The two elements (E city planning) and element (F air pollution) with
Q.-value =1.2 each, whose values come after green area, tell the effectiveness of both elements, negatively and positively. Then, the effect of green area is in some how counter acted by the presence (activity) of air pollution. Both the green area and air pollution have a direct relationship with the element (C public health, Q.-value =156)) and also with the element of (E city planning). Taking all together, the elements B, E, and F can be viewed as the sub-systems within the whole system (E city planning) as the main system to neutralize the negative impacts on the element (C public health). .

Further, the element (D infrastructure service) with the lowest Q.-value = 0.58 becomes Passive element. In the other hand the element (C public health) with the highest P.-value = 156 becomes critical element, as mentioned above, and the element (H citizens opinion) with the lowest P.- value = 80 becomes a buffer element.

As the summery from these results, we come to an interesting and important conclusion, namely the 3 elements mentioned above (green area, air pollution, and city planning) and arranged under the discipline city planning have a close relationship with the critical element (C public health, with the highest Q, -Value 156), This fact proves the assumption of the research that stated early in this paper, from one hand and gives a proper answer to its objective character, in the other hand. This, specific conclusion clearly reflected further some other conclusions on general level, as follows:

1. The city as a whole is a "man-made or artificial environment" comprising and combining many other man-made systems and sub-systems, (or elements) - like the composition and connections that observed by the system(s) of natural environment[6]. This is also valid and proven for Sulaymaniyah city.

2. In connection with "human and his habitat" not only the quantity (number of population) has changed/ increased but also the quality of their life has also changed marked ably. This means that, to achieve research goals in Sulaymaniayah, it is not enough to apply only more efforts (quantitative) but we need, at the time, to change our views and way of thinking and acting completely, also something qualitatively.

3. It is evident, as shown and explained by influence matrix that, this method can be applied as effective tool in dealing with quite many other multidisciplinary affairs, like Forecasting, development issues, system analysis, Crises management, Education, environmental problematic, [3] etc. under the condition that in each case pertinent elements be formulated and logically connected with one another.

4. Finally, it is also clear that the consolidation of participating elements is subject to change due the changes in socio-economical and political changes that might take place in future; and when this is a case, we could come also to other resultant, which differs from the current result. It is also appropriate to ask: what can happen when, for example, "green area becomes a buffer element instead of active element"? And this logical question can be addressed to each element with regard to change its present (actual) position.

5.Recommendations:

The above results and conclusions reveals the dominant of city planning in the issue. Consequently, the necessary recommendations have directly and indirectly relations to this discipline and projects related, presented as follow.

- Since the research city is not a town to be designed, but also an old existing one, with an expanding and enlarging character, so the most effective and important measure on the land use level is to promote the mixed use and multi-functionality. This concept help to provide new facilities, to foster a society and to lend it identify [7].
- Departure from all single-minded undertakings and projects and attention to more the multidisciplinary processes.
- Intensive work to establish an acceptable balance between Sulaymaniah city and its surrounding to combat the so called "push- pull effect" that plays an active negative role between urban and rural areas.
- Media-work to inform the people and promote them eventually to change their way of life with regard to their

consume behaviors and environmental responsibilities [7,8] Furthermore recommendations can be made which cover the following five main components or topics, namely:

Finances (or economy), Environmental aspect, climate, energy consumption and the behavior and tradition, the last can be formulated as sociologic - traditional component.

a- finances: on this level, the following are recommended:

Phase a tax on all types of imported vehicles and gasoline, over at lest 15 years. This measure is justified owing to air pollution created by vehicles. The tax revenue should be used to develop infrastructure, environmental protection, and to initiate the necessary capital for planning projects mentioned bellow, this is especially important in view of present financial situation of the regional government in Erbil .

b- Environmental aspect: This topic is linked to points a, c, and d. It include promoting less polluting fuels, less polluting engines, improve fuel efficiency and get older polluting cars off the road. The tables 5 and 6 bellow shows that an increase of purchased and registered motor vehicles from 2007 – 2017 by ca. 6 times. The more motor and vehicles, the more congested problems, environmental burdens, and air pollution will be.

c- Climate: It is a well known fact that the climate has a great impact on human comfort. The situation here is also not favorable, especially with respect to macro climate (regional climate). But on the level of micro climate (local climate), the motto " If the climate can not be beaten, everything should be done to improve it" [7] is the favorable receipt to be recommended with the aim to improve local climate are undertakings which include increase green area's ratio from currently 11% to 20% . Furthermore, the favorable topographic situation of the city considered to be as helpful tool in this respect.

d- Energy consumption: This aspect includes all measurements in the three known energy sectors, namely: Domestic sector (construction, and development, promoting low energy buildings), Industry sector (promoting energy efficiency production processes, applying renewable energy sources), and transportation sector (using lead free gasoline, importing efficient internal combusting motors only and limitation of vehicle imports at the same time" With their large concentrations of cars and factories, cities normally have higher air pollution levels than rural areas. And according to the World Health Organization (WHO), 1.1 billion people live in urban areas where the air is unhealthy to breathe [9]. Most live in densely populated cities in developing countries where air pollution control laws do not exist or are poorly enforced [3].

e- Sociologic-traditional component: With this respect mean adapting to the new complicated world, without ignoring the traditions of the native inhabitants identity.

Appendixes

Appendix 1 (Table 5)

Total number of motor vehicles (mostly) new imported and registered by Sulaymaniah's general directorate of traffic, for the period (2007 - 07/ 2017). (Data from Sulaymaniah's general directorate of traffic 2017)

Years	No. of Motor vehicles registered from 2007 -2017
2007	80683
2008	90258
2009	123516
2010	173463
2011	206142
2012	252953
2013	300950
2014	344301
2015	371598
2016	383744
2017	396226
Sum total	2723834

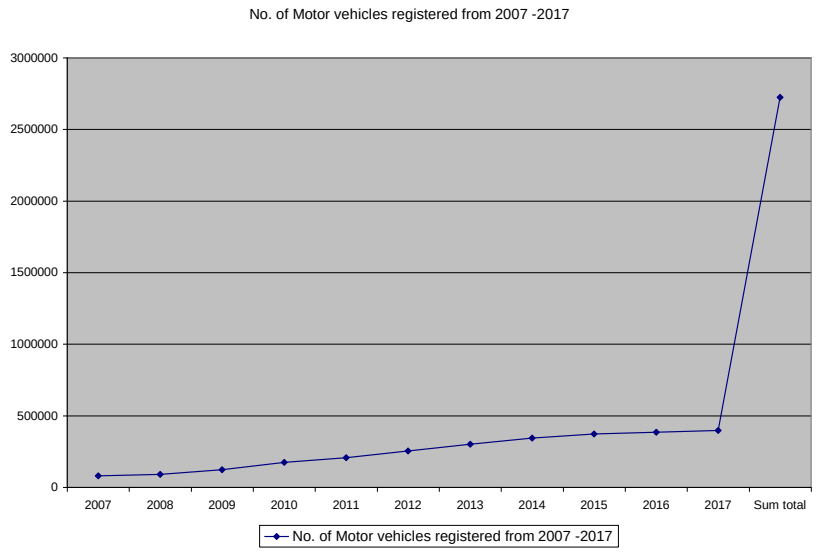


Fig. 3. Graphical representation of table 5 clearly reveal the increase of registered cars in different years (2007 -2017), A comparison between the years 2007 and 2017, for example, indicates an increase in number of registered cars by five times (culprit of air pollution).

Appendix 2 (Table 6)

Total number of private motor vehicles imported and registered by Sulaymaniah's general directorate of traffic from 2007 -07/ 2017. (Data from Sulaymaniah's general directorate of traffic 2017)

Years	No. of Private Motor vehicles registered between 2007-2017
2007	37174
2008	40307
2009	57611
2010	85301
2011	109254
2012	145634
2013	158298
2014	180038
2015	195151
2016	201216
2017	209742
Sum total	141972

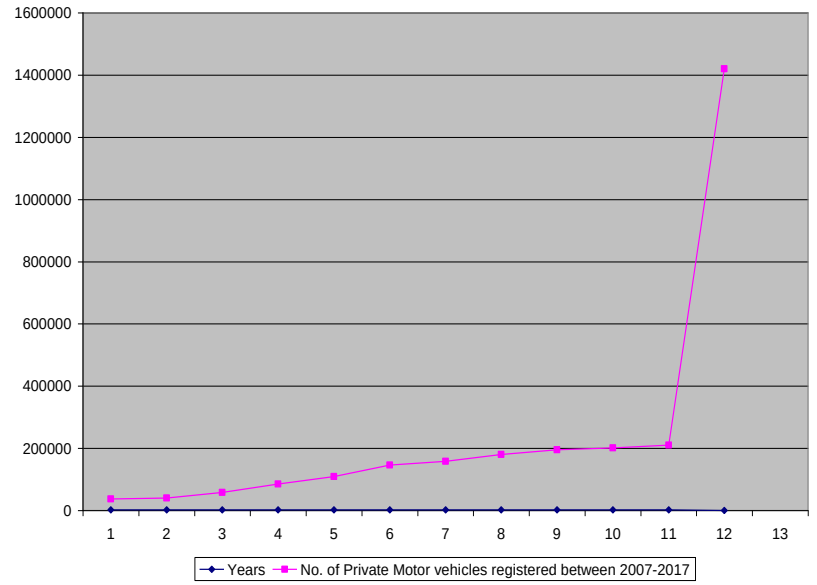
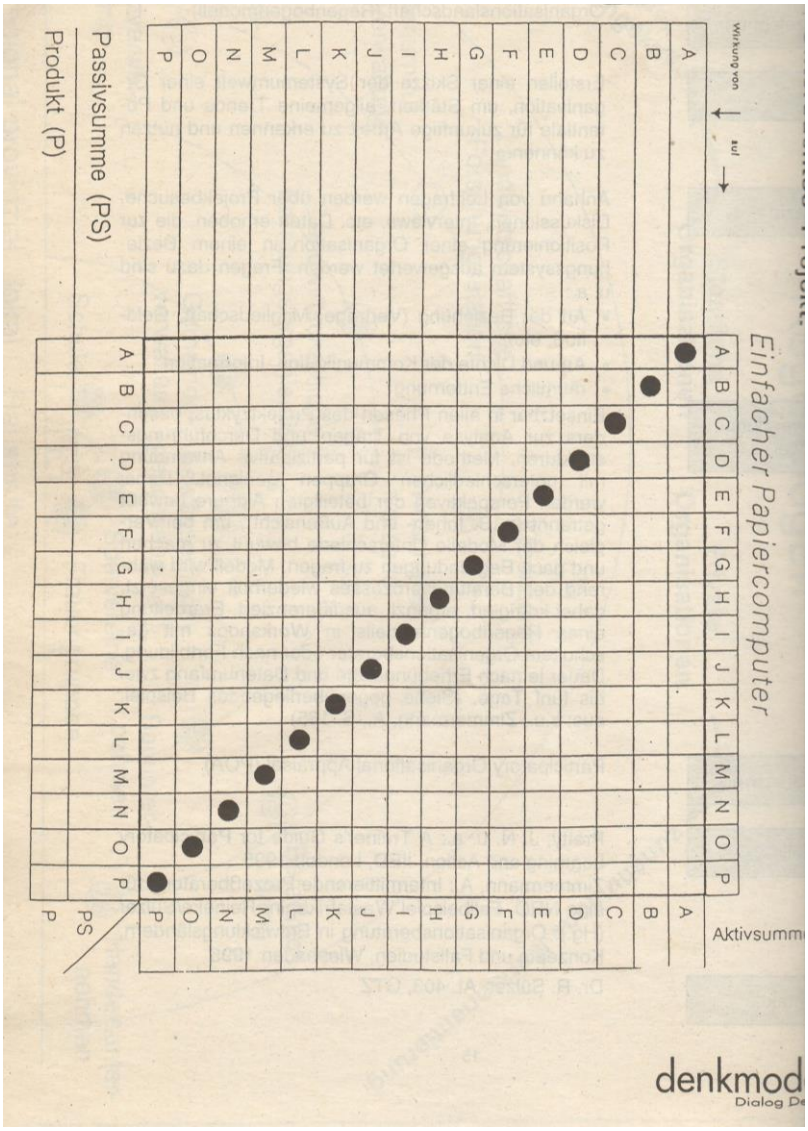


Fig. 4. Graphical representation of table 6 clearly reveals the increase of registered private cars in different years (2007 -2017), A comparison between the years 2007 and 2017, for example, indicates an increase in number of registered cars by six times.

Appendix 3

Paper computer influence matrix in empty state. (Source: Gtz Deutche Gesellschafts fuer Technische Zusammenarbeit GmbH/ ermany 1993/in German language)



0= keine Einwirkung
1= schwache Einwirkung
2= mittlere Einwirkung
3= starke Einwirkung

Appendix 4

(Source: Researcher)

	Elements/ variables	Assessments
1	Zoning mechanisms	
2	Citizen's opinion	
3	City planning	
4	Public health	
5	Green area	
6	legislation	
7	Traffic congestion and heat radiation	
8	Architectural appearances	
9	Air pollution	
10	Street layout and parking spaces	
11	Building regulation	
12	Infrastructure services	

Appendix 4 lists 12 Variables / elements in blank state used as inquiry form to fill out by the citizens of Sulaymaniyah. The purpose of inquiry was to know the personal opinion and fillings of people about the essence of each of these elements with regard to their own physical-, and social environment which in turn reflected on the quality of their life in their hometown. The formulated question was as follows:

Regarding with your own wellbeing and that of your community, respectively in your home town Sulaymaniyah, how do you evaluate each of the 12 listed elements? Express your opinion and filling by valuating each one of the elements. State your opinion by giving marks, rating between (0 - 100%). The results of these form was used to construct the 2nd appendix (influence matrix) shown bellow. The 12 elements listed in these form are arranged arbitrary.

Appendix 5
(Source: Researcher)

Effect from ↓ / Effect on →		A	B	C	D	E	F	G	H	Active sum AS	Quo. Q
A	Street layout and parking spaces	*								A	
B	Green areas		*							B	
C	Public health			*						C	
D	Infrastructure services				*					D	
E	City planning					*				E	
F	Air pollution						*			F	
G	Traffic conge- stion and heat radiation							*		G	
H	Citizens opinion								*	H	
		A	B	C	D	E	F	G	H	AS	Q
	Passive sum (PS)									PS	
	Product (P)									P	

Appendix 5, Shows sample copy **of (influence matrix)** in empty state to fill by citizens in Sulaymaniah city. 350 copies of this sample were distributed and filled and later analyzed and evaluated for research purpose, as explained through Tables 2, 3 and 4.

Scale of influences:
0 = no influence
1 = slight influence
2 = medium influence
3 = strong influence

Appendix 6
Map of Sulaymaniah's city with the existing green areas, relevant with regard to clean air and thus its effects on the quality of life of inhabitants. (Source directorate of Sulaymaniah's municipality 2017)

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