Journal of Babylon University/Engineering Sciences/ No.(4)/ Vol.(22): 2014

Selecting Urban Sustainability Indicators For Residential Neighborhoods In Iraqi City

Mohammad Ali Alanbari **Ameera Jaleel Alisawy**
Babylon University/College of Engineering
mw_alanbari@yahoo.com Ameera_jaleel@yahoo.com
Wafaa Abdulqader Mohammad Aladhami
Babylon University/College of Engineering
Profdr_alanbari@yahoo.com

Abstract:

Sustainability indicators reflect key trends in the environment, social systems, economy, human well-being, and quality of life. In short, they measure what counts to people . The attractiveness of indicators is that they can capture key aspects of local conditions and assess the congruence between ongoing development processes and community goals and make this information accessible to decision makers and residents. Indicators can play several important roles in promoting, implementing, and monitoring neighborhood sustainability.

Many studies have addressed the issue of urban sustainability indicators in the various countries of the world and put many of these indicators, in an attempt to find a balance between economic ,social, and environmental factors and commensurate with those countries. But the Iraqi cities lacked of such studies, which led to the existence of a knowledge gap in identifying indicators of urban sustainability for city level or residential neighborhood level, so the objectives of this research was as follows:

- extrapolation of previous studies on urban sustainability indicators for residential neighborhood in different parts of the world.
- select group of sustainability indicators at the level of residential neighborhood (economic ,social, and environmental indicators) due to some criteria, so that can be applied in assessing the sustainable performance of residential neighborhood in the Iraqi city .

So, group of indicators has been selected and through Interviews with a group of local planning multidisciplinary experts by making cycles of in-depth dialogue.

Keywords: Urban sustainability indicators , Neighborhood sustainability indicators, (economic ,social, and environmental indicators)

المستخلص :

إن مؤشرات الاستدامة تعكس الاتجاهات الرئيسية في البيئة والنظم الاجتماعية والاقتصادية ورفاه الإنسان ، ونوعية الحياة. وباختصار، تقيس ما يهم الناس. وان جاذبية المؤشرات كونها تحيط بالجوانب الرئيسية للظروف المحلية وتقييم التطابق بين عمليات التنمية الجارية وغايات المجتمع وجعل هذه المعلومات في متناول صانعي القرار والمقيمين .يمكن أن تلعب المؤشرات عدة أدوارا هامة في تعزيز وتنفيذ ورصد الاستدامة للمحلات السكنية .

وقد تناولت العديد من الدراسات مسألة مؤشرات الاستدامة الحضرية في مختلف بلدان العالم، ووضع العديد من هذه المؤشرات، في محاولة لإيجاد توازن بين التنمية الاقتصادية والاجتماعية، والعوامل البيئية وبما يتناسب مع تلك البلدان .ولكن المدن العراقية تفتقر إلى مثل هذه الدراسات، مما أدى إلى وجود فجوة المعرفة في تحديد مؤشرات الاستدامة الحضرية على مستوى المدينة أو على مستوى المحلة السكنية ، لذلك كانت أهداف البحث على النحو التالي :

- استقراء الدراسات السابقة بشأن مؤشرات الاستدامة الحضرية للمحلة السكنية في مناطق مختلفة من العالم.
- اختيار مجموعة من مؤشرات الاستدامة على مستوى المحلة السكنية (المؤشرات الاقتصادية والاجتماعية والبيئية) وذلك من خلال بعض المعايير، بحيث يمكن تطبيقها في تقييم الأداء المستدام للمحلة السكنية في المدينة العراقية .

لذا، حاولنا اختيار مجموعة من المؤشرات ، ومن خلال مقابلات مع مجموعة من خبراء التخطيط المحلي متعددي التخصصات عن طريق دورات من الحوار المعمق.

الكلمات المفتاحية: مؤشرات الاستدامة الحضرية،مؤشرات الاستدامة(الاقتصادية،الاجتماعية، البيئية) للمجاورة السكنية.

1.0:Interoduction

Sustainability indicators reflect key trends in the environment, social systems, economy, human well-being, and quality of life. In short, they measure what counts to people. For example, environmental indicators might include things such as the concentration of different pollutants in the air, the amount of resources consumed locally (e.g., water and electricity), and the quantity of waste produced. Tracking shifts in the social environment can include factors such as community participation in volunteer activities or the availability of affordable housing, while economic changes can be represented by topics such as unemployment rates or business starts. Indicators are a tool that can help visualize and measure progress in our efforts to move towards urban sustainability. Likewise, indicators can identify areas that are worsening so that appropriate action can be taken (Maclaren. 1996).

The attractiveness of indicators is that they can capture key aspects of local conditions and assess the congruence between ongoing development processes and community goals and make this information accessible to decision makers and residents (Bossel. 1999.). Indicator data is often presented through the use of easy to read graphics like charts and pie diagrams. This makes local conditions and trends understandable to a wide audience, as overly technical or scientific language and analysis are avoided. The process of developing indicators can also promote citizen participation–indicator initiatives often include a variety of participants including community groups and citizens, universities and educational institutions, and municipal departments. Finally, indicators help educate residents about pertinent environmental, social, and economic issues in their community.

2.0 : Sustainability Indicators in a Neighborhood Context :

Indicators can play several important roles in promoting, implementing, and monitoring neighborhood sustainability:

1.A neighborhood can use indicators to help determine what conditions exist and whether the direction the neighborhood is headed is consistent with community goals.

2. Indicators help evaluate whether local actions are having the desired impacts.

3. Indicators can establish a common understanding among different stakeholders such as community groups, borough and City governments concerning critical issues that need to be addressed and help build consensus for effective actions.

4.Indicators can allow a group to hold itself, its public officials, its funders and supporting institutions accountable to neighborhood goals.

5. Neighborhood indicators provide a tangible opportunity for a community to learn about itself; the development of neighborhood indicators depends on extensive public consultation, thereby providing a means for citizens to directly participate in future of their neighborhood. Citizen participation in the indicator development process also promotes community pride and a sense of personal efficacy.

3.0 : Types of Indicators

Indicators can be classified in several different ways. One important distinction is that between input and outcome indicators. Input indicators reflect public or collective resources being put into advancing community sustainability or addressing community sustainability challenges(e.g., dollars invested in public transportation spending compared to road construction).Outcome indicators measure conditions or trends in the community or environment (e.g., number of new cancer cases, number of poor air quality days). Both types of indicators are important: input indicators signal policy priorities while outcome

indicators can track the effectiveness of public or collective action in changing economic, social or environmental conditions.

Indicators can also be classified as subjective or objective. Subjective indicators are measures of perceptions by individuals about conditions, issues and trends. Objective indicators are facts independent of personal perceptions, based on the measurement of actual conditions(Maclaren. 1996).Thus, a measure about people's attitude toward crime in the neighborhood is a subjective indicator, while a count of the number of burglaries or assaults that have occurred in the same area represents an objective indictor.

4.0: Indicator Selection criteria

There are numerous criteria in selecting neighborhood sustainability indicators; the main ones are outlined below.

1. Easy to understand – Is the indicator simple enough to be interpreted by the general user and the public?
2. Scientific validity – Do the indicators provide accurate and reliable measures that are drawn from commonly accepted data?
3. Data availability – Is consistently collected, statistically measurable trend data (data going back for at least five or ten years) for the issues to be examined collected? Who collects the data?
4. Relevance – Is the indicator relevant to both local circumstances and opportunities for policy making?
5. Forward-looking – Does the indicator focus on short and long-term future changes rather than simply evaluate past trends?
6. Equity – Do the measures provide the information required to promote equitable distribution of resources, opportunity and wealth, not only for the current generation but also for future generations.

ENVIRONMENT		
Potential Indicators	**Topic**	**Issue Area**
1-Proximity to metro stops (meters) or # metro stops nearby	**Accessibility**	**Green Space**
2-# hectares green space and /or % change	**Trend in growth**	
3-# new trees planted or surface area subject to tree planting	**Tree planting**	
4-# hectares natural green space	**Ecological health of green space**	
5-Green space per 1,000 population	**Recreational use of green space**	
6-# hectares tree cover	**Tree canopy**	

7-# kilometers cycling paths	Cycling Accessibility	Transportation
8-# bike racks		
9-# meters traffic calmed streets	Pedestrianization and traffic calming	
10-# traffic calming initiatives in the neighborhood		
11-# users of public transit	Access to public transportation	
12-Cost of a monthly bus pass		
13-Population living within 500 meters of a bus or metro stop		
14-# parking spaces	Congestion	
15-# vehicles / per family household	Car Use	
16-Average # Vehicle kilometers traveled per day		
17-Average length of commuter trips		
18-Mode of transportation used to get to work		
19-% residents regularly disturbed by noxious noise (over X decibels)	Incidence	Noise pollution
20-# cases of graffiti removal per year	Incidence	Visual pollution
21-Average annual ozone levels	Ozone	Air pollution
22-Average annual concentration of fine particulate matter	Fine particulate matter	
23-Volume per capita of recycled per year	Management / Diversion	Waste
24-Composted waste – Volume waste composted through City composting programs; e.g., leaves and Christmas trees		
25-Space devoted to community compositors		
26-Average volume of waste collected by sector (residential, commercial, institutional)	Efficiency of waste collection (responsibility resident local government, business)	
27-# drop off points that safely dispose of hazardous waste	Hazardous Waste – Management of toxic substances	
28-% toxics produced and treated locally		
29-Volume collected per year	Trend in	
30-Space left in local land fills	Production	
31-Volume of waste land filled per year		
32-Total # kilowatts of electricity used by the neighborhood	Electricity consumption	Energy Consumption and Efficiency
33-# energy efficiency buildings in the neighborhood	Energy efficient buildings	
34-# participants in energy efficiency programs		

35-Concentration of toxins such as cadmium and chlorine	**Tap water quality**	**Water Quality**
36-Average annual phosphorous levels	**Surface water quality**	
37-Lead levels in blood	**Toxins present in humans and the environment**	**Human and Environmental Health**
38-# species native animals, birds and plants	**Native animals, birds and plants**	**Biodiversity**
39-# native animal, bird and plant species in danger (of extinction)		
40-# natural disasters (ice storms, flooding)	**Occurrence**	**Hazards / Disasters**
41-# human caused disasters (arson, contamination)		

7. Value orientation -Do the indicators reflect community values and the sustainability objectives identified by the citizens of the neighborhood?
8. Congruence -Are the neighborhood indicators linked to higher level indicators and assessment? Are they linked to policy and benchmarks from reliable sources such those drawn from other experiences or provincially set targets?
9. Practicality -Is it possible to implement actions that will improve performance with respect to the indicators? What is the political acceptability of these actions?
10. Visibility -Is the indicator attractive to the local media?(Maclaren. 1996).

5.0: Research problem and objectives:

Many studies have addressed the issue of urban sustainability indicators in the various countries of the world and put many of these indicators, in an attempt to find a balance between economic ,social, and environmental factors and commensurate with those countries. But the Iraqi cities lacked of such studies, which led to the existence of a knowledge gap in identifying indicators of urban sustainability for cities or residential neighborhood level in Iraq, so the objectives of this research was as follows:

- extrapolation of previous studies on urban sustainability indicators for residential neighborhood in different parts of the world .
- select group of sustainability indicators at the level of residential neighborhood (economic ,social, and environmental indicators) so that can be applied in assessing the sustainable performance of residential neighborhood in the Iraqi city .

6.0 : Background and Recent Publications:

6.1. Neighborhood Sustainability Indicator Workshop

Over two days, June 10 and 11, 2005, the Neighborhood Sustainability Indicator Workshop brought together stakeholders including local organizations, academics, consultants, and citizens. A well attended public forum was held on the evening prior to the workshop.This event featured presentations from local organizations such as the Urban Ecology Center/SodecM and the City of Montreal, as well as experts on neighborhood sustainability indicators from Calgary, Alberta and Baltimore, Maryland.

An animated question and answer period followed the presentations. The forum was followed by a day-long workshop that was attended by invited participants representing a broad cross-section of community groups and interested citizens. The workshop started with technical presentations on the development and use of neighborhood sustainability indicators. These presentations were followed by breakout sessions in the areas of environment, society, and economy to determine potential indicators that could be used in Montreal's neighborhoods(Jozsa ,Alex , 2005).
Table (1)

SOCIAL		
1-# coop housing	**Accessibility and affordability**	**Housing**
2-# pedestrians using local streets and alleys per day or during peak periods	**Streets and alleys**	**Health**
3-# Hospitals **4-# Clinics** **5-# Home care services**	**Access to health services**	
6-# Recreation services e.g., community centres **7- # Cultural facilities e.g., libraries**	**Availability**	**Recreation / culture**
8-# elementary and high schools that have healthy eating programs **9-# students participating in healthy eating programs (e.g., health food choices in school cafeterias)**	**Eating habits**	**Promotion of healthy lifestyles**
10-Average # hours physical activity per person	**Exercise**	
11-Crime rate (# criminal code, violent, property crimes) **12-Incidence of crimes committed by youth**	**Police resources**	**Safety**
13-% residents who are experience fear in the neighborhood (alone on the street)	**Perception of safety – fear (a survey would need to be conducted)**	
14-% residents believed others would try to take advantage of them if they got a chance **15-% resident who have one or no person outside of their family to call on in case of an emergency**	**Empowerment / taking charge Individual, collective, social network**	**Community pride (a survey would need to be conducted**
16-Diversity in positions of power and influence (# or % of positions held by visible minorities and/or women)	**Participation in community life of a diverse group of people**	**Social Mix**

ECONOMIC		
1-# of businesses certified by *Eco-Quartier's Appellation Verte*	Green business	Business sustainability
2-Average # years of operation of local established businesses	Continuity of business	
3-# cooperative businesses in neighborhood each year	Cooperatives / cooperation	Economic structure
4-Volunteers (# hours volunteered in the neighborhood or people participating in a volunteer activity 3 or more hours per week) 5-% residents engaging in unpaid work (child care or caring for senior family members)	Informal economy	
6-% residents and business with high speed internet	Access and distribution network	
7-# of residents working in the neighborhood	Local job availability	Employment
8-Unemployment rates, male and female	Jobs and gender	
9-Unemployment rate of young people (15-25 years) willing to work	Jobs available for young people	
10-Average personal income per capita 11-Average household income 12-Average spare disposable income	Poverty	Income
13-Ratio of monthly pass compared to average monthly income	Price of transit	
14-# services and jobs available in the neighborhood	Access to services and jobs	Access and availability
15-% of population owning / renting	Level property ownership	
16-% population spending 30% or more on shelter costs (owners and/or renters)	Housing affordability	
17-# food stores / cost of "food basket"	Food market availability	
18-# pharmacies	Primary needs business availability	
19-Property taxes as a % of average annual household income	Taxes levels	
20-Ratio of	Disparity rich/poor	
21-% population with post secondary education (25 years+) 22-% population without highschool	Education	Capacity to work
23-# day care centres	Day care availability	
24-# locally owner business vs. chain businesses	Community ownership of business	
25-# projects undertaken by public and private sectors 26-Amount (e.g., metres squared or # lots) of vacant land	Public / private investment Vacant land	Community investment

6.2. The Urban Ecology Coalition's Neighborhood Sustainability Indicators Project (UEC-NSIP) in Minneapolis is apparently the first U.S. effort to engage residents directly in defining indicators of neighborhood sustainability for their own communities. By defining linkages among issues that have previously been seen as independent, NSIP has built a more coherent understanding of the links between society, environment and economy in two locales that front the Mississippi River. At the same time, this integrative approach helped bring together more than 100 residents, technical experts and professional researchers to work in a collaborative, synergistic manner.

This Guidebook is a report on this project that offers practical tools to neighborhood organizations or research professionals who may wish to define sustainability indicators in other urban or rural locales. Basic concepts and approaches used in NSIP are defined, and first-hand stories identify important qualities of the project.

Four types of neighborhood sustainability indicators were developed:

(a) ***Data Poetry Indicators*** are highly linked indicators that are most useful for local stakeholders. They have the quality of transforming the discussion of the neighborhood's future toward a more long-term view.

(b) ***Core Indicators*** are linked indicators useful for local residents as well as for external investors, funders and researchers. These more readily allow for comparisons among diverse communities.

(c) ***Background Indicators*** offer interesting background information that helps define the context in which sustainability initiatives take place. These are useful for both internal and external stakeholders.

(d) ***Deep Sustainability Indicators*** assist local stakeholders to define a longer-term vision for life in their community. These are often very highly linked and look far to the future. Years of activity may be required to realize progress in such indicators. (Crossroads,1999)

a1-Data Poetry Indicators (Seward Neighborhood)

developed by **Seward Neighborhood Group** in collaboration with **Crossroads Resource Center** These ten linked indicators were defined by Seward Neighborhood, and identify the key measures of long-term neighborhood sustainability.

1. "Friendly space." *(See Appendix F, page 49)*
2. Consumption by residents at independent local stores.
3. Purchases from local vendors by local businesses.
4. Number of residents who share skills or barter services with each other.
5. Number of residents who volunteer for church or community service work.
6. Number of residents who plan to stay in neighborhood for a specified number of years.
7. Number of bicycles traveling on key routes compared to number of cars.
8. Number of Seward home-based businesses and resident-managed studio/office spaces.
9. Percent of residents earning living wage.
10. Percent of workers working inside and outside of Seward.

a2- DRAFT Data Poetry Indicators (Longfellow Community)

developed by **Longfellow Community Council** in collaboration with **Crossroads Resource Center** *[See next two pages]*

This initial set of linked indicators were defined by Longfellow Community residents to identify the key measures of long-term neighborhood sustainability.

1-Quality of water leaving Longfellow through storm sewers

2-Number of birds (cluster of sensitive species)

3-Number of empty storefronts

4-Number of professional and personal services
5-Ratio of family-owned to franchise restaurants
6-Ratio of locally-owned to non-locally owned restaurants
7-Number of calls to local graffiti removal team and city
8-Number of books checked out at East Lake library
9-Number of hours worked in a week
10-Ethnicity of business owners
11-Per-capita fossil fuel consumption
12-Number of houses not in good repair
13-Number of houses at risk for condemnation
14-Pct. of parents volunteering at their childrens' schools
15-Pct. of adults involved in youth activities affecting more than their own kids
16-Pct. of children involved in organized community activities
17-Number of domestic disturbance calls
18-Pct. of eligible children enrolled in Head Start
19-Number of residents involved in simple living activities
20-Pct. of residents consuming locally produced food
21-Pct. of families living in poverty
22-Number of people working out of their homes
23-Hours of TV/videos/games during evening or weekends
24-Number or percent of families engaged in outof- house recreation
25-Family participation in organized leagues
26-Recreational opportunities that meet diverse income levels and interests
27-Number of hate crimes in community

b- Core indicators of sustainability

Based upon our experience in Seward and Longfellow, these indicators offer ways of assessing neighborhood sustainability both inside neighborhoods and across neighborhood boundaries.

1. Percentage of residents who feel safe in their neighborhood.
2. Percentage of block clubs with a scope of activity broader than crime prevention.
3. Number of residents who share skills or barter services with each other.
4. Profile of diverse and affordable housing opportunities. (Cost and availability of housing of diverse styles and price levels.)
5. Percentage of neighborhood children attending schools in neighborhood.
6. Percentage of students from neighborhood who changed schools at least once during school year.
7. Percentage of babies born at adequate birth weight.
8. Number of modalities of alternative health care available within 20-minute ride on public transport.
9. Percent of residents earning living wage.
10. Percentage of neighborhood children eligible for free school lunch.
11. Number of residents receiving welfare benefits and estimated amount received.
12. Percent of residents working inside and outside of neighborhood.
13. Average time of travel to work by neighborhood residents.
14. Number of neighborhood home-based businesses and resident-managed studio/office spaces.
15. Consumption by residents at independent local stores.
16. Purchases from local vendors by local businesses.
17. Average price at nearby stores for a "market basket" of basic foods.

18. Skills and capacities sought in new hires by local businesses.
19. Capacities and skills built among local residents by local nonprofits.
20. Number of lenders actively making home and/or commercial loans in neighborhood.
21. Amount of money residents and new buyers borrowed for home purchase and repair. *(Number of loans and amounts)*
22. Toxins released by nearby industrial firms.
23. Lead content in neighborhood soils.
24. Annual utility consumption.
25. Number of practicing artists living or working in neighborhood who either:

• Earn at least 15% of income from art;
• Owner or part owner of neighborhood studio/sales outlet/gallery;
• Work actively with neighborhood youth in arts education; or
• Are active in community visioning/planning or art installations.

c- Background Indicators

(These indicators are less linked than the core indicators, but offer useful background information for interpreting sustainability indicators. They are not described in detail since each is fairly self-explanatory.)

1. Number of residents active in community organization.
2. Number of active block clubs.
3. Number of residents participating in National Night Out.
4. Resident mobility rate.
5. Ratio of Renter-occupied to Owner-occupied households.
6. Ratio of homesteaded to non-homestead properties.
7. Percentage of neighborhood residences that are vacant and/or boarded.
8. Profile of household income levels.
9. Hours of work required to meet basic needs at three prevailing wage rates.
10. Employment.
11. Unemployment rate.
12. Estimated total consumption by all households in neighborhood.
13. Children under 5 in poverty.
14. Number of live births.
15. Population by Gender.
16. Population by Race.
17. Population by Age.
18. Number of households.
19. Number of families.
20. Number of households by head of household (married, male, female, non-family).
21. Number of households by marital status with children under 18.
22. Number of households by number of persons.
23. Number of households by head of household and number of related children.
24. Number of households by age of head of household.
25. Aggregate household income.
26. Aggregate household income by race.
27. Aggregate household income by type of income.
28. Number of households earning each type of income.
29. Median income by Census tract.
30. Occupation.
31. Median monthly owner costs.
32. Aggregate contract rent and median gross rent.

33. Monthly owner costs.
34. Year householder moved in.
35. Estimated market value, tax capacity, and taxes payable for residential, apartments, and commercial properties in neighborhood.
36. Blood lead levels among neighborhood children.
37. Population of fragile species (or a cluster of common species).
38. Number of environmentally remediated sites.
39. Pounds (or volume) of waste hauled from community.
40. Water quality in nearest major body of water.
41. Air quality at nearest collection point.
42. Water quality of tap water.
43. Energy consumed.
44. Price of crude oil (per gallon).
45. Price of gasoline at local pumps (regular unleaded - per gallon).

d- "Deep Sustainability" Indicators

As potential indicators, these may be impractical at the present time. Nevertheless, they offer glimpses of what a more sustainable neighborhood might look like in the future, and may inspire fruitful discussion of future visions. These are meant to be useful in evoking discussion, and are not intended to describe an "ideal" community nor "ideal" indicators.

1. Percent of residents who have regular contact with ten or more of their immediate neighbors.
2. Percent of residents who have ever been involved in neighborhood organizing and governance initiatives.
3. Percent of residents involved lifelong in educational programs.
4. Percent of housing built or remodeled following green construction principles (energy efficient,recyclable materials, longevity, flexible uses, minimal repair requirements, aesthetic integrity to place).
5. Percent of neighborhood's physical surface area that is permeable.
6. Ratio of annual income earned: highest-income household to lowest-income household.
7. Percent of residents owning and operating businesses within neighborhood.(Separate count for cooperative memberships).
8. Percent of loans obtained by residents from local credit sources (including individual lenders, credit unions, and local lending institutions).
9. Economic multiplier for locale:How much additional economic activity in the locale does one dollar generate?
10. Percent of energy consumed from renewable sources used renewably.
11. Percent of new wealth produced in local industries using renewable resources and practices.
12. Percent of residents who walk to local stores to purchase most life essentials.
13. Percent of local businesses consistently hiring local youth.
14. Percent of food consumed in neighborhood that is grown within 50 miles of neighborhood (with a separate reporting for food grown inside neighborhood).
15. Percent of children who are aware from first-hand experience where and how their food is produced.
16. Percent of value from locally-harvested natural resources that is reinvested in community.
17. Ecological footprint of neighborhood population.

18. Percent of toxic materials produced locally that are safely handled, effectively preventing contamination.
19. Percent of households involved in international exchanges.
20. Percent of households in which at least member is fluent in one non-English language.
21. Number of local foundation dollars committed to partnership with neighborhood for long-term sustainability initiatives.
22. Percent of neighborhood organization budget spent for R & D.
23. Percent of cultural productions staged locally created by neighborhood artists.
24. Percent of residents who regularly celebrate their cultural heritage.

3- GIS-Based Urban Sustainability Assessment: The Case of Dammam City, Saudi Arabia :This paper applies an integrated approach to assessing urban sustainability in Dammam City, Saudi Arabia.. The study ensured that the core indicators (greenhouse gas emission, crime rate, employment, education level and life expectancy) identified by Hens and De Wit (2003) and CSD (2002) are included in the analysis (ALSHUW,2006),(Hens,2003),(CSD ,2002,).

Environment:

1-Ratio of non-residential to residential land use
2-Percentage of designated land area redeveloped per year
3-Auto vehicle miles traveled per capita per day
4-Number of auto vehicle per 100 people
5-Percentage of total street frontage with improved sidewalks on both sides
6-Percentage of total land area covered by impervious surfaces
7-Percentage of citizens exposed to level of pollutants (NOx and CO) higher than 40 kg/ capita (NOx) and 136 kg/ capita (CO)
8-Percentage of citizens exposed to traffic noise pollution greater than 65 dB (A)
9-Percentage of citizens exposed to levels of particulates higher than 31 kg/capita
10-Residential water use in cubic metres per capita per day
11-Percentage of land area designated for off-street parking
12-Weight of domestic waste in kg per capita
13-Intensity of electric energy consumption per capita in Mwh per capita

Social:

1-Percentage of historic and archaeological sites and buildings designated for reservation
2-Percentage of total land dedicated to open space
3-Persons per hectare in residential built-up area
4-Ratio of average house sale price to an 'affordable price'
5-Years of healthy life expectancy
6-Percentage of population living below poverty line (earn less than US$4 per day)
7-Literacy rate (completion of primary education by primary school-age children)
8-Recorded crime per 1,000 population
9-Access to health services (percentage of population)
10-Access to basic education (percentage of population)
11-Access to open spaces (percentage of population)

Economic:

1-Number of employees per net acre of land designated for employment uses
2-Rate of unemployment
3-Ratio of jobs to dwelling units (total number of jobs divided by number of dwelling units).

7.0: Selection process:

Through access to the previous studies , set of neighborhood sustainability indicators were selected, based on the following criteria;

1. Easy to understand – Is the indicator simple enough to be interpreted by the general user and the public?
2. Scientific validity – Do the indicators provide accurate and reliable measures that are drawn from commonly accepted data?
3. Data availability – Is consistently collected, statistically measurable trend data (data going back for at least five or ten years) for the issues to be examined collected? Who collects the data?
4. Relevance – Is the indicator relevant to both local circumstances and opportunities for policy making?
5. Forward-looking – Does the indicator focus on short and long-term future changes rather than simply evaluate past trends?
6. Equity – Do the measures provide the information required to promote equitable distribution of resources, opportunity and wealth, not only for the current generation but also for future generations
7. Value orientation - Do the indicators reflect community values and the sustainability objectives identified by the citizens of the neighborhood?
8. Congruence - Are the neighborhood indicators linked to higher level indicators and assessment? Are they linked to policy and benchmarks from reliable sources such those drawn from other experiences or provincially set targets?
9. Practicality - Is it possible to implement actions that will improve performance with respect to the indicators? What is the political acceptability of these actions?
10. Visibility - Is the indicator attractive to the local media?(4).

We tried to adopt the above criteria for the selection of indicators and through Interviews with a group of local planning multidisciplinary experts by making cycles of in-depth dialogue. The results had been shown in tables (,2,3,4).

Table (2) shows the selected sustainable environmental indicators at the level of residential neighborhood

ENVIRONMENTAL INDICATORS :
1-# hectares green space and /or % change
2-# new trees planted or surface area subject to tree planting
3-# hectares natural green space
4- Green space per 1,000 population
5-# hectares tree cover
6-# kilometers cycling paths
7-# users of public transport
8--Population living within 500 meters of a bus or metro stop
9-# parking spaces
10- Average # Vehicle kilometers traveled per day
11- Average length of commuter trips
12- Mode of transportation used to get to work
13-% residents regularly disturbed by noxious noise (over X decibels)
14- Volume of Waste per capita of recycled per year
15- Average volume of waste collected by sector (residential, commercial, institutional)
16- Volume of waste collected per year
17- Volume of waste land filled per year
18- Total # kilowatts of electricity used by the neighborhood
19- Average annual phosphorous levels in surface water quality
20- Lead levels in blood
21- Per-capita fossil fuel consumption
22- Percent of energy consumed from renewable sources used renewably.
23- Ecological footprint of neighborhood population
24- Percent of toxic materials produced locally that are safely handled, effectively preventing contamination.
25-Ratio of non-residential to residential land use
26-Percentage of designated land area redeveloped per year
27-Auto vehicle miles traveled per capita per day
28-Number of auto vehicle per 100 people
29-Percentage of total street frontage with improved sidewalks on both sides
30-Percentage of total land area covered by impervious surfaces
31-Percentage of citizens exposed to level of pollutants (NOx and CO) higher than 40 kg/ capita (NOx) and 136 kg/ capita (CO)
32-Percentage of citizens exposed to traffic noise pollution greater than 65 dB (A)
33-Percentage of citizens exposed to levels of particulates higher than 31 kg/capita
34-Residential water use in cubic metres per capita per day
35-Percentage of land area designated for off-street parking
36-Weight of domestic waste in kg per capita
37-Intensity of electric energy consumption per capita in Mwh per capita

Table (3) shows the selected sustainable social indicators at the level of residential neighborhood

SOCIAL INDICATORS :

1- Number of coop housing
2- Number of Hospitals
3- Number of Clinics
4- Number of Recreation services e.g., community centres
5- Number of Cultural facilities e.g., libraries
6- Crime rate (# criminal code, violent, property crimes)
7- Incidence of crimes committed by youth
8-% resident who have one or no person outside of their family to call on in case of an emergency
9- Number of bicycles traveling on key routes compared to number of cars
10- Number of professional and personal services
11- Number of houses not in good repair
12-Number of houses at risk for condemnation
13- Pct. of parents volunteering at their childrens' schools
14- Number of residents active in community organization
15-Pct. of children involved in organized community activities
16- Pct. of families living in poverty
17-Number of people working out of their homes
18-Hours of TV/videos/games during evening or weekends
19-Number or percent of families engaged in outof- house recreation
20-Family participation in organized leagues
21-Recreational opportunities that meet diverse income levels and interests
22-Number of hate crimes in community
23-Percentage of residents who feel safe in their neighborhood.
24- Percentage of block clubs with a scope of activity broader than crime prevention.
25- Number of residents who share skills or barter services with each other
26-Percentage of neighborhood children attending schools in neighborhood.
27- Percentage of students from neighborhood who changed schools at least once during school year.
28- Percentage of babies born at adequate birth weight.
29-Average time of travel to work by neighborhood residents.
30-Percent of residents who walk to local stores to purchase most life essentials
31-Percentage of historic and archaeological sites and buildings designated for preservation
32-Percentage of total land dedicated to open space
33-Persons per hectare in residential built-up area
34-Ratio of average house sale price to an 'affordable price'
35-Years of healthy life expectancy
36-Percentage of population living below poverty line (earn less than US$4 per day)
37-Literacy rate (completion of primary education by primary school-age children)
38-Recorded crime per 1,000 population
39-Access to health services (percentage of population)
40-Access to basic education (percentage of population)
41-Access to open spaces (percentage of population)

Table (4) shows the selected sustainable economic indicators at the level of residential neighborhood

ECONOMIC INDICATORS :

1-# cooperative businesses in neighborhood each year
2-% residents and business with high speed internet
3-# of residents working in the neighborhood
4- Unemployment rate of young people (15-25 years) willing to work
5--Average personal income per capita
6- Average household income
7-# services and jobs available in the neighborhood
8-% of population owning / renting
9-% population spending 30% or more on shelter costs (owners and/or renters)
10-# food stores / cost of "food basket"
11-# pharmacies
12- Property taxes as a % of average annual household income
13- Ratio of Disparity rich/poor
13-% population with post secondary education (25 years+)
14-# projects undertaken by public and private sectors
15- Amount of Vacant land (e.g., metres squared or # lots) of vacant land
16- Purchases from local vendors by local businesses
17-. Percent of residents earning living wage
18- Percent of workers working inside and outside neighborhood
19- Number of hours worked in a week
20- Number of lenders actively making home and/or commercial loans in neighborhood.
21-Number of employees per net acre of land designated for employment uses
22-Rate of unemployment
23-Ratio of jobs to dwelling units (total number of jobs divided by number of dwelling units)

Ninth: Conclusions and Recommendations:

a- Conclusions:

1- Sustainability indicators reflect key trends in the environment, social systems, economy, human well-being, and quality of life.
2- The attractiveness of indicators is that they can capture key aspects of local conditions and assess the congruence between ongoing development processes and community goals and make this information accessible to decision makers and residents.
3- Indicators can play several important roles in promoting, implementing, and monitoring neighborhood sustainability.
4-Many studies have addressed the issue of urban sustainability indicators in the various countries of the world and put many of these indicators, in an attempt to find a balance between economic ,social, and environmental factors and commensurate with those countries.
5- Iraqi cities lacked of such studies, which led to the existence of a knowledge gap in identifying indicators of urban sustainability for cities or residential neighborhood level in Iraq
6- Group of sustainability indicators at the level of residential neighborhood (economic, social, and environmental indicators) can be selected due to some criteria, so that can be applied in assessing the sustainable performance of residential neighborhood in the Iraqi city .
7- Special methodology needed to select sustainability indicators at the level of residential neighborhood ,which contains interviews with a group of local planning multidisciplinary experts by making cycles of in-depth dialogue.
8- The process of selecting sustainability indicators of the residential neighborhood in the Iraqi cities that have been done in this research, is a pilot at the level of Iraq.

b- Recommendations:

1 - Further studies and a review of the indicators that have been reached within the various Iraqi cities are needed.

2 -Measuring of sustainability indicators for residential neighborhood in the Iraqi cities, and building databases .

3 - Development of urban sustainability indicators at the city level with the integration of urban sustainability indicators at the neighborhood level.

References:

ALSHUWAIKHAT,HABIB M., and AINA,YUSUF A.,2006,"GIS-Based Urban Sustainability Assessment: The Case of Dammam City, Saudi Arabia", ARTICLE, Local Environment Vol. 11, No. 2,141–161

Bossel.1999.Indicators for Sustainable Development: Theory, Method, Applications. Winnipeg: IISD.

Crossroads Resource Center, 1999, " Neighborhood Sustainability Indicators Guidebook: How To Create Neighborhood Sustainability Indicators in Your Neighborhood" Produced for the Urban Ecology Coalition (Minneapolis)

CSD ,2002, Indicators of Sustainable Development: Guidelines and Methodologies (New York, United Nations).

Hens, L. and De Wit, J.,2003,The development of indicators and core indicators for sustainable development:a state of the art review, International Journal of Sustainable Development, 6(4), pp. 436–459.

Jozsa ,Alex ,and Brown ,David, 2005," Neighborhood Sustainability Indicators Report on a Best Practice Workshop",Macdonald Harrington Building(815)-Université McGill

Maclaren.1996.Urban Sustainability Reporting, Journal of the American Planning Association,Vol.62,No.2,Spring.

Maclaren.1996.Developing Indicators of Urban Sustainability: A focus on the Canadian Experience.Toronto: ICURR

Maclaren. 1996. Developing Indicators of Urban Sustainability: A focus on the Canadian Experience. Toronto: ICURR.