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The Role Of Documentation And Measurement Tools In Governing Urban Impact On Environment (A Study on Erbil City Rapid Development)

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ABSTRACT

Erbil city the capital of Kurdistan Region in Iraq faced a rapid non properly controlled urban growth and development during the last decades, the diameter of the city was about one kilometre in 1944 while the target size for 2030 as per the city comprehensive development plan (Master plan) is to be of 50 kilometre what means duplicating the size about 2000 times in 84 years, the city was developing gradually until 2005 when plans for grater Erbil started to be prepared.

This development had a lot of positive aspect like1-Solveing a sever housing problem in the region by having over capacity in housing now a days, 2- Creating new jobs and opening markets for local and foreign labor, 3- Attracting Local and International Investors, 4- Highlighting the City and the region Internationally, 5- Raising the living standards in the Region and many other positive points.

But this non properly controlled Rapid Urban Growth has impacts on Built and non-Built Environments Such impacts can be detected by indexes such as but not limited to, the **Yale University** EPI (Environmental performance Index) that provide a powerful tool for steering individual countries and the world toward environmental sustainability,

In 2006 Iraq was highlighted as no data available in EPI publications this indicates problem No1 in this paper (DOCUMENTATION) while in 2010 Iraq was highlighted having one of the worst impacts on environment here comes problem No2 being (BAD IMPACT), this can be due to 2-1-Wrong data due to misusing of measurement tools if any or wrong assumptions leading to wrong Assessment 2-2-Mal functioning

So the paper case or problem will be the lack of proper documentation and measuring procedures locally, To deal with such a case it is needed to go through foreign up to date legislations and procedures regarding building regulations and their impacts on Environment and the needed indicators measuring procedures such as US LEED, London Sustainable home regulations, German passive house program and UAE LEED regulations

The research ends with a major conclusion, that indicators from documented data and measurement tools are the second major governing factors of assessment of performance after the performance itself, and they are the major governing factor in directing the future performance and impact on environment if the assessments and indexing systems results were used for planning.

FORWARD:

The forward is an entrance to the subject of the paper which is the role of documentation process and the availability of measurement tool in supporting the procedure of assessment of inpact on Environment and how it may affect the planning and Urban Design process and what happened in Erbil City Horizontal expansion and how all these efforts did not manage to change the rank of the region as per International Indexes.

The here under illustrations and drawings gives a clear idea about the development and expansion in size that took and is taking place in the city of Erbil exhausting large areas of fertile soil

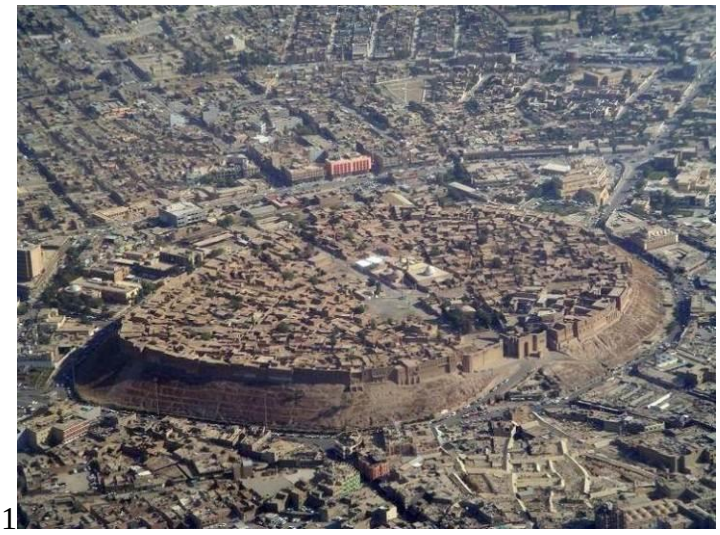
1-The first one shows Erbil Citadel one of the oldest continuously inhabited civilized settlement with a history goes back at least 5000 years

2-The second Drawing is one of the oldest documents about Erbil city a map that was drown in 1944 shows a very limited size city with a diameter of less than one Kilometre

3-The third illustration shows HIC survey and the city size in 2003 what can be regarded as a gradual growth from 1934 to

4- Illustration 4 shows the city size 2012 with huge rapid growth from 2003 -2012 and also shows the fifth ring road under construction with 10 Kilometre diameter approximately 100 times the size of 1934.

5- Illustration 5 shows expected grater Erbil city size as planned to be 50 Kilometre diameter in 2030 as per the proposed Master plan.



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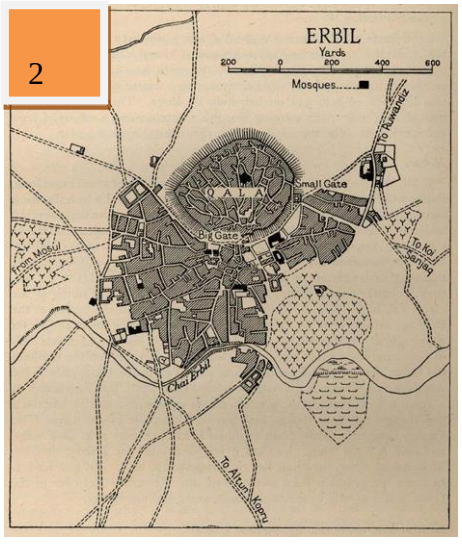
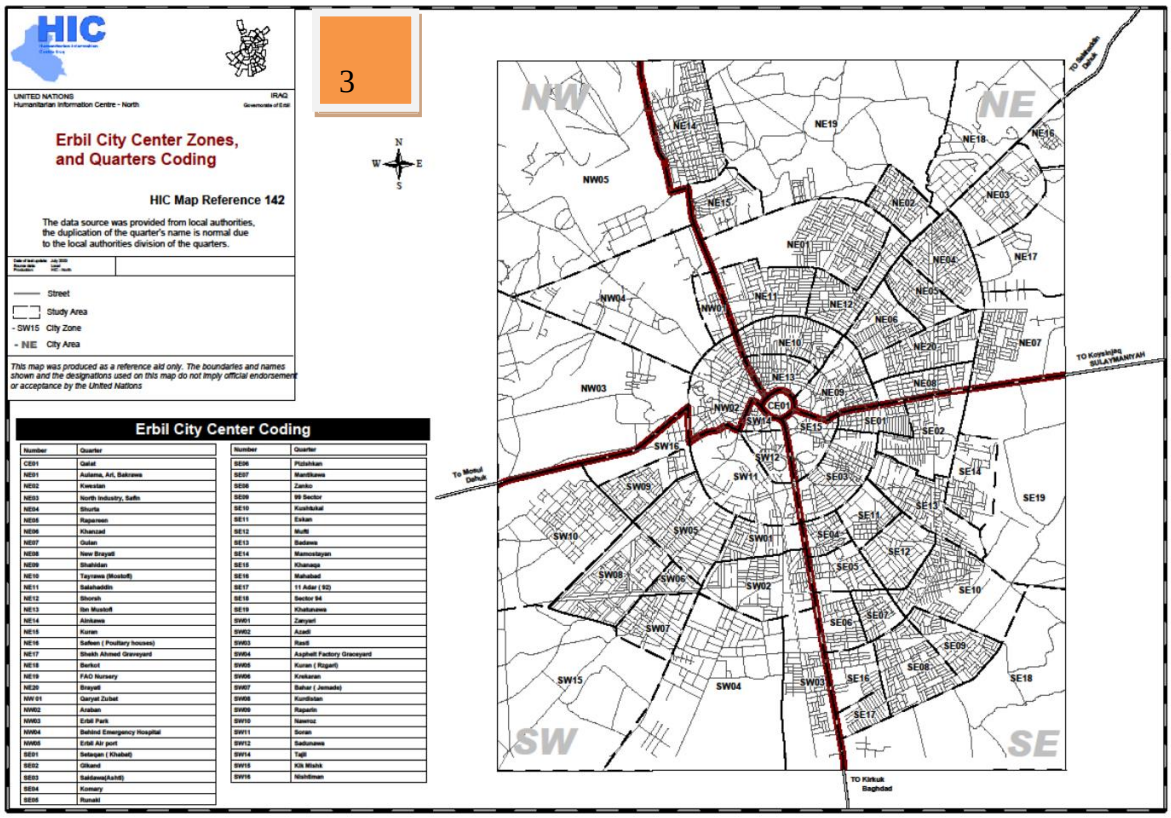
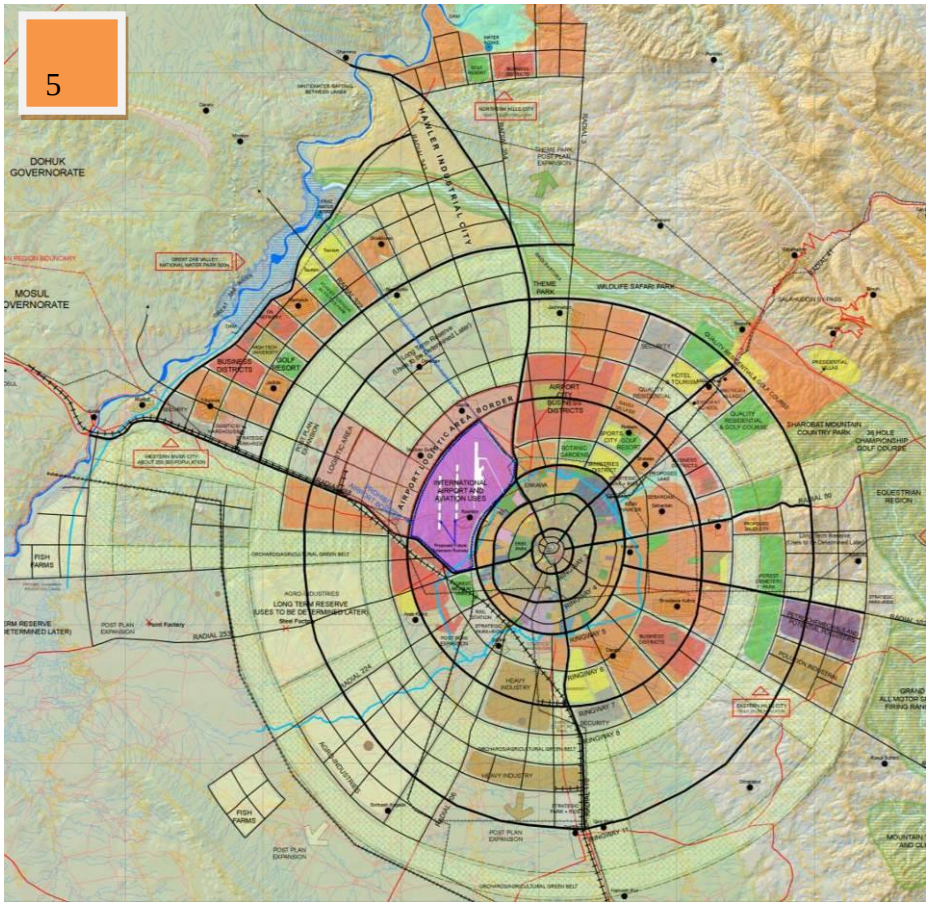



HIC
3
UNITED NATIONS
Humanitarian Information Centre - North
IRAQ
Erbil City Center Zones, and Quarters Coding
HIC Map Reference 142
The data source was provided from local authorities, the duplication of the quarter's name is normal due to the local authorities division of the quarters.
Street
Study Area
SW15 City Zone
NE City Area
This map was produced as a reference aid only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
Erbil City Center Coding
NW
NE
SW
SE
TO Kirkuk Baghdad
TO Mosul Dahuk

(Ref.10)


4
Legend

(Ref.12)



(Ref.11)

This development had a lot of positive aspect like1-Solveing a sever housing problem in the region by having over capacity in housing now a days, 2- Creating new jobs and opening markets for local and foreign labor, 3- Attracting Local and International Investors, 4- Highlighting the City and the region Internationally, 5- Raising the living standards in the Region and many other positive points.

But this non-properly controlled Rapid Urban Growth has impacts on Built and non-Built Environments. Such impacts can be detected by indexes on local and international levels, the following literature review will go through available literature dealing with Urban Growth Impact on Environment Scales and Indexes, Such an Impact that if the suitable documentation and impact measurement tools and indicators where available would have been prevented.

1-THE CASE

The paper as per the abstract and the forward will concentrate on highlighting a general case of Iraq "having one of the worst impacts on Environment" and Kurdistan region being part of Iraq is still having the same rank in spite of the vast development taking place. Since this paper is locally oriented it will start with the Environment issue as a responsibility and commitment on the level of entire planet, For example the here under UNESCO/UIA stand point towards Environment as a responsibility of Architecture education systems by taking the sustainability approach as a guide line.

1-1-UNESCO/UIA CHARTER FOR ARCHITECTURAL EDUCATION

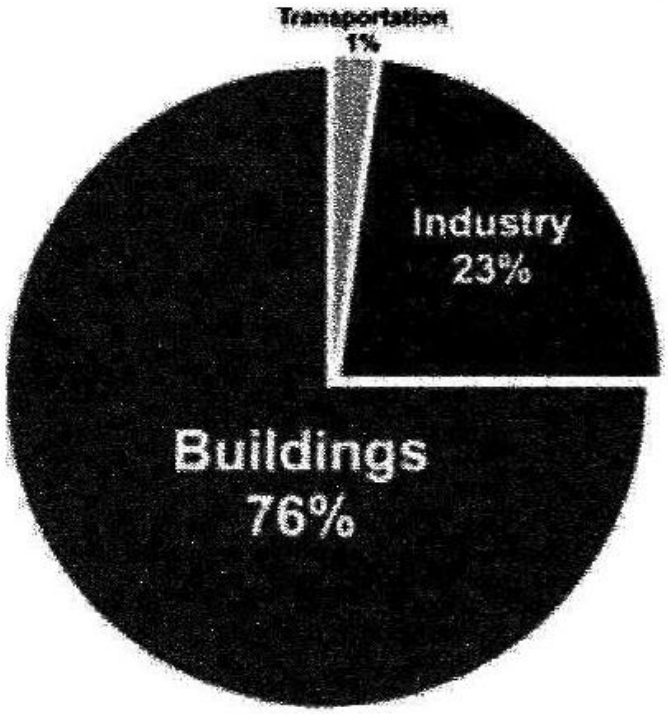
Revised Version 2005

Preamble

"We, the architects, concerned for the future qualitative development of the built environment in a fast changing world, believe that architecture involves everything that influences the way in which the built environment is planned, designed, made, used, furnished, landscaped and maintained. We feel responsible for the improvement of the education and training of future architects to enable them to meet the expectations of XXIst Century societies worldwide for sustainable human settlements in every cultural heritage". (REF. 7)

AIA have a similar stand point on the local level of USA as per the following

AIA *Architects and Climate Change*



GRAPHIC 4: 76% of all power plant generated electricity is used just to operate buildings.

76% of all power plant Generated electricity is used to operate buildings in USA.

It is assumed that these figures are highly reliable since they are derived from a high reputation institution report (AIA), the research did not manage to get such figures locally from such professional institution.

So it is assumed that such data are needed as a start in the matter of dealing with impact on Environment and where to direct efforts of Sustainability.

(Ref. Researcher)

A Perspective On How To Curb Emissions

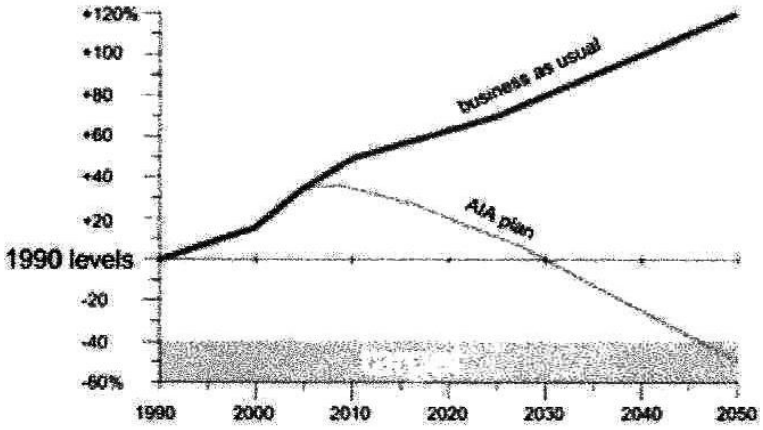
Scientists tell us that in order to avoid dangerous climate change we must keep global warming under 2°C above pre-industrial levels (we are currently at 0.7°C above pre-industrial levels). To avoid exceeding this threshold a way forward would involve:

- Promoting sustainable design including resource conservation to achieve a minimum 50 percent reduction from the current level of consumption of fossil fuels used to construct and operate new and renovated buildings by the year 2010.

- Promoting further reductions of fossil fuel consumption by 10 percent or more in each of the following five year intervals so that the cumulative reduction from today's baseline is:

  60% in 2015
  70% in 2020
  80% in 2025
  90% in 2030
  carbon-neutral by 2035 (Meaning that the construction and operation of buildings will no longer require the consumption of fossil fuel energy or the emission of greenhouse gases.)

(Ref.1)



GRAPHIC 5: By enacting a Building Sector initiative like this we can meet a greenhouse gas reduction target of 40% to 60% below 1990 levels by 2050.

With about 5 billion square feet (sf) of new construction, 5 billion sf of renovation and 1.75 billion sf of demolition taking place in the U.S. each year, by the year 2035, three quarters of the built environment in the U.S. will be either new or renovated. This transformation over the next 30 years represents a historic opportunity for the U.S. architecture and building community, with the support of the federal government, to lead in addressing greenhouse gas emission reductions.

The above quotation from AIA Edward Mazria Report of Architecture 2030 in USA takes one specific issue (Greenhouse gas reduction) with a detailed plan based on reliable data with an approach of treatment based on precise indicators .

The above UIA and UNESCO declaration and AIA Environment Committee report show a commitment for architects all over the world to work towards sustainable development, So the question is whether we in the middle east in general and in Kurdistan Region\Iraq in specific need to go through this procedure, of course it is a decision makers and governments responsibilities but as observers passing through the publications of the Ministries of Environment in the region and Central Government, a rising awareness in this direction can be noticed.

Conclusion:

While in USA the matter of dealing with Environment is a matter of detailed plans by reliable institutions, based on precise data measured by specific measuring tools, it is locally just an awareness that has been just rising.

So how can we tell if what we are doing is in the direction of sustainability and whether the rapid development in Kurdistan Region in General and Erbil city in specific is compiling with the international Environmental recommendations and what are the means of measuring the impact of such a development on Environment.

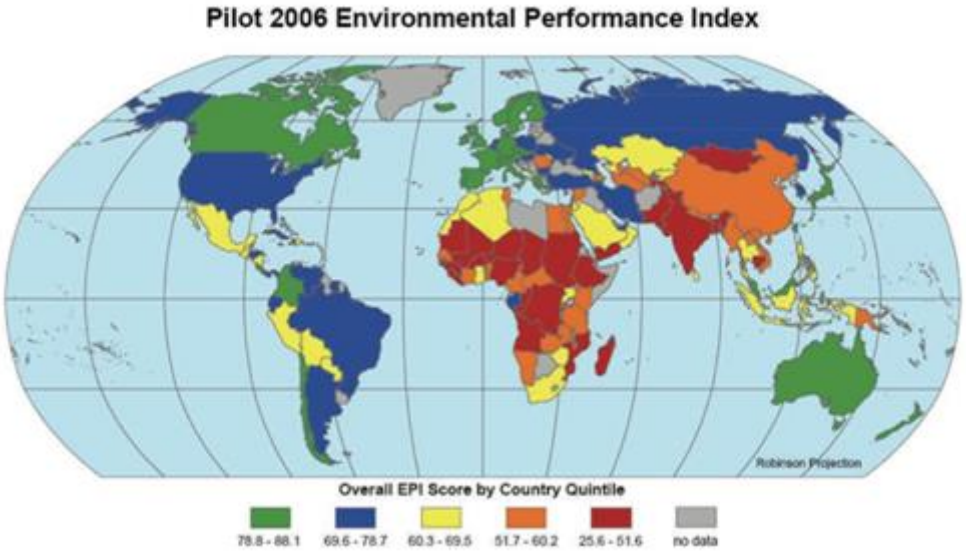
Rapid Urban Growth has impacts on Built and non-Built Environments. Such impacts can be detected by indexes on local and international levels, these indexes vary from country to another and from organization to another such as but not limited to:

•Ecological footprint
•Environmental Performance Index
•Environmental Sustainability Index
•Environmental Vulnerability Index

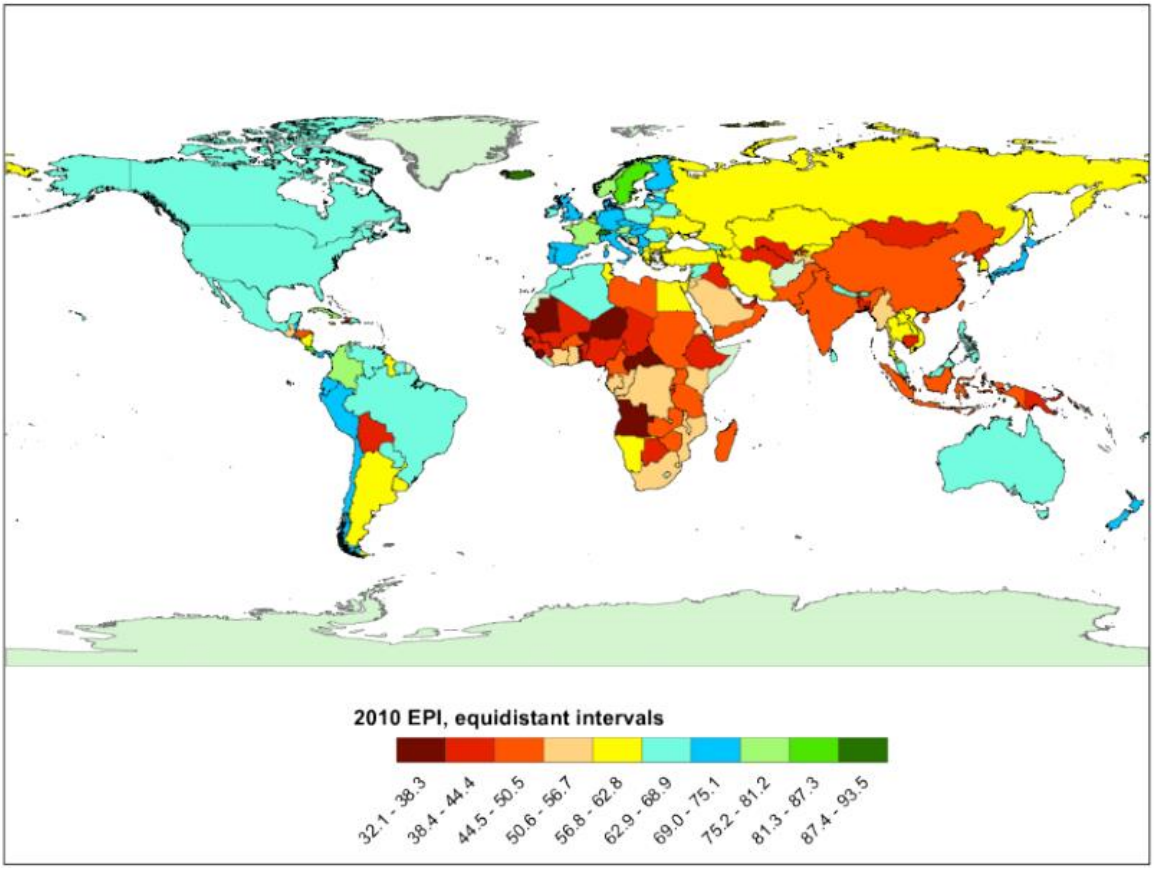
1-2-Environmental Performance Index (EPI)

For example "Yale-Columbia research team shifted in 2006 to an Environmental Performance Index (EPI) that focuses on a narrower set of environmental issues for which governments can be held accountable. The EPI tracks outcome-oriented indicators based on best available data in core policy categories. In addition, the EPI seeks to promote action through transparent and easily visualized metrics that allow political leaders to see the strengths and weaknesses of their nation's performance compared to peer countries. The analysis centers on two overarching environmental objectives: 1) reducing environmental stresses on human health and 2) promoting ecosystem vitality and sound natural resource management.

The 2012 EPI reflects a methodological refinement intended to make the EPI more useful for policymakers by focusing on a slightly smaller set of core indicators that meet higher standards, including direct measurement (rather than modeled data), consistent time series, and institutional commitments to maintain these data streams into the foreseeable future. The application of these more stringent criteria enabled us to track performance over time and should enable us to continue tracking performance using a more consistent set of indicators into the future.(Ref.9)



Iraq in 2006 was indicated as no data which represent the problem Number 1- that is Data and the documentation systems which means the data ordering systems in a manner that can be easily approached and dealt with statistically in the future



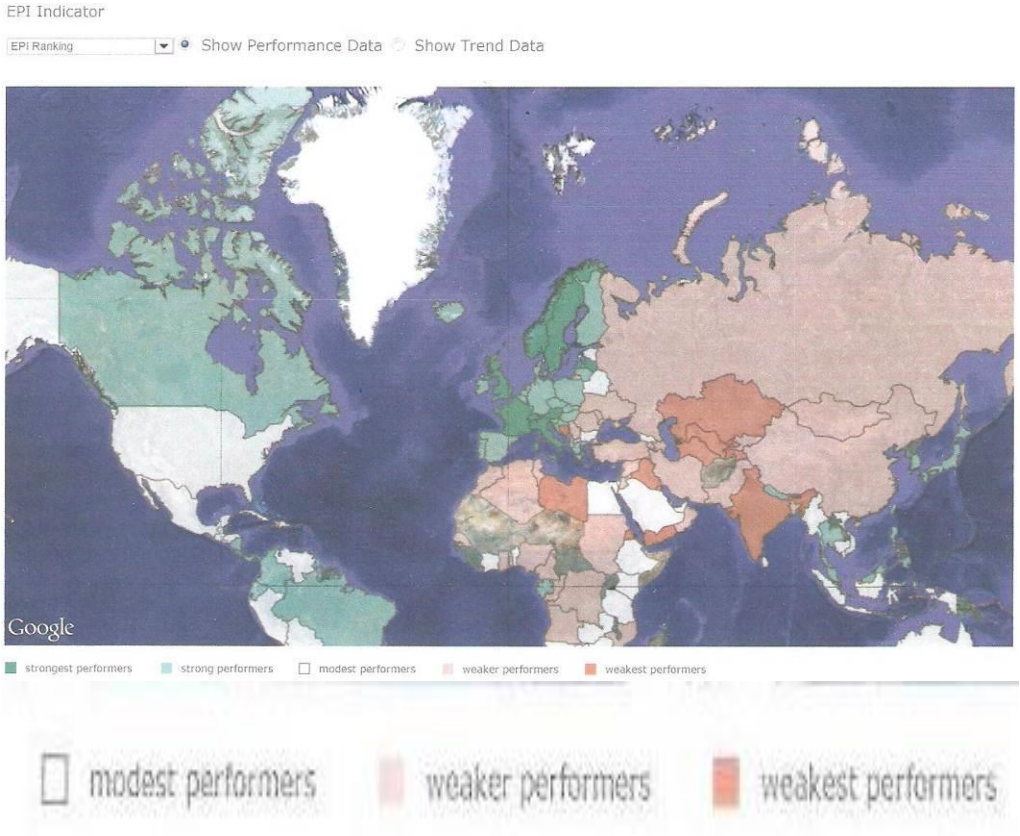
In 2010 Iraq is highlighted as one of the worst performance, what means that in 4 years the sufficient highly sofisticated data that needs professional people and mesurement instruments and methods was available to put the country on the index with assesment of its performance while checking the Iraqi Ministry of Environment website there papers calling for elementary institutional systems like ISO and it is wellknown that there is no relible official sensous in Iraq since 1979 so the data are derived from assumbtions and collected from various institutions,this leed to problem Number 2 being:

2- (BAD IMPACT), this can be due to

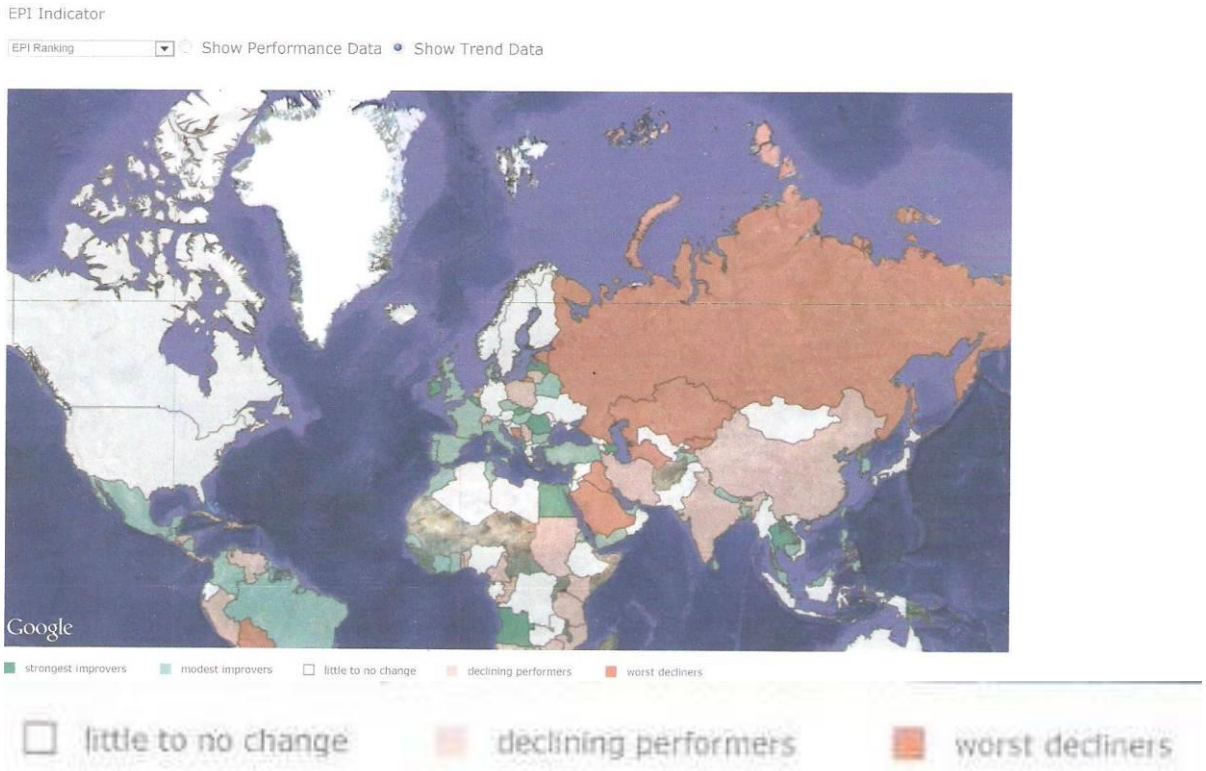
2-1-Wrong data due to misusing of measurement tools if any or wrong assumptions leading to wrong Assessment

2-2-Mal functioning local systems in terms of Environment

The map below displays country performance on both the overall EPI 2012and Trend EPI.
Show Performance Data



Show Trend Data
The map below displays country performance on both the overall EPI and Trend EPI.



The 2012 Environmental Performance Index (EPI) and Pilot Trend EPI (Trend EPI) rank 132 countries on 22 performance indicators in ten policy categories and two overarching objectives that reflect facets of Environmental Health and Ecosystem Vitality. These indicators provide a gauge of how close countries are to environmental policy goals. The EPI's proximity-to-target methodology facilitates cross-country comparisons as well as analysis of how the global community is doing collectively on each particular policy issue. The pilot trend EPI reflects changes in environmental performance over the period 2000-2010

The research will chose 3 countries (Iraq, Jordan and UAE) readings to be but in comparison schedule in quick cross check of readings in the data shown in the results of years 2006-2010-2012

	COUNTRY			**SCALE**
YEAR	**IRAQ**	**JORDAN**	**UAE**	
EPI 2006	No Data	50-60	70-78	25-88
EPI 2010	38-44	50-56	44-50	32-93
EPI 2012 PERFORMANCE	Weakest Performers	Weaker Performer	Modest Performer	Weakest to Strongest Performers (5) ranks
EPI 2012 IMPROVMENTS	Worst Decline	Little to no Change	Modest Improver	Rate of Improvement from strongest to worst decline in(5) Ranks

Case 1(Iraq):

It can be noticed that the change from no data to worst impact with having indications about the fields of decline and direction of reforms in the detail reports it can clearly be noticed that these data are not available locally and it is based on assumptions or external observers' inspections and

calculations and some of them may be misleading. So the documentation systems and calculation tools highly **govern** the Impact on Environment as a rank on the index or as direction towards future reforms.

Case 2 (Jordan):

The first general look at the results shows uniform results but also can be checked if all the indexes are locally driven by external inspectors in order to prevent misleading instructions

Case 3 (UAE):

It clearly show a contradiction between results for the 3 years results, a simple cross check and comparison between results of Jordan and UAE in 2006 UAE was so belter performer than Jordan but in 2010 there is a dramatic decline in UAE performance and it is less than Jordan ranks, then in 2012 UAE is shawn as modest performer and modest improver while Jordan is shawn as weaker performer and little to no change this comparison indicates illogical ups and dawn in UAE performance in intervals of 2-4 years, this may cause conflict in direction of reforms if these results were adopted as strategy for reforms

Conclusion:

Locally driven indexing systems depending on detailed accurate documentation systems and measurement tools is a governing factor of the impact on Environment in terms of performance assessment, and they are the major governing factor of future performance and impact on Environment if these assessments were adopted as indicators for future plans.

2- The Research problem:

The available local literature miss-regards proper documentation systems of data and proper measurement and investigation tools needed for the assessment of Environmental performance

3-Research objectives:

To shed light on how international indexes work in order to develop local data collection and documentation approach that may serve feeding proper data and developing Environmentally mal functioning local systems.

4-Research Methodology:

To review available literature regarding indexing systems and the adopted environmentally oriented legislations, in order to highlight the required indicators for Measuring Environmental Performance.

4-1-legislations:

4-1-1- LEED USA

LEED® standards, in full Leadership in Energy and Environmental Design standards, a certification program devised in 1994 by the U.S. Green Building Council (USGBC; founded 1993) to encourage sustainable practices design and development by means of **tools and criteria for performance measurement**

The Code measures the sustainability of a home against design categories, rating the 'whole home' as a complete package. The design categories included within the Code are:

- **energy/CO2**
- **water**
- **materials**
- **surface water run-off**
- **waste**
- **pollution**
- **health and well-being**
- **management**
- **ecology**

The above criterias represent the major concerns of the LEED legislations in USA and they will surely the fields of concern in any legislation in any country but the diference will be the intencity of each criteria and the how it can be mesured

4-1-2- LEED Dubai:

Department of Planning & Development
Ports, Customs & Free Zone Corporation
Government of Dubai

تراخيص
Trakhees

دائرة التخطيط والتطوير
مؤسسة الموانئ والجمارك والمنطقة الحرة
حكومة دبي

Green Building Regulations for
Dubai World Developments
(For projects Registered with USGBC under LEED Version 2.2)
REGULATION NO.GB-001
1st EDITION January 2008

This represent the available most developed building regulations in middle east it do represent a greater awareness regarding environmental performance of urban development and expansion but compared with the original LEED and the European Environment Agency (EEA), it looks limited in terms of indicators but for Kurdistan Region it can be recommended as model to be studied and by analogy to be adopted for the local requirements, what means to choose the appropriate indicators as per the World Resources Institute to be:

"1-User-driven
2-Policy-relevant
3-Highly-aggregated"(Ref.13)

4-2- Indictors:

The here under quotation from the World Resources Institute report of 1996 gives a simplified definition of what Indicators mean and that they have three levels of conveying meaning

2-1-local level

2-2-national level

2-3-international level

The major role of an indicator is to be useful to their intended audience, meaningful to decision makers and understandable by the public, they have to be easily interpreted in terms of environmental trends or progress towards national policy goals, so indicators specifications and design depend on who is to use it and for what.

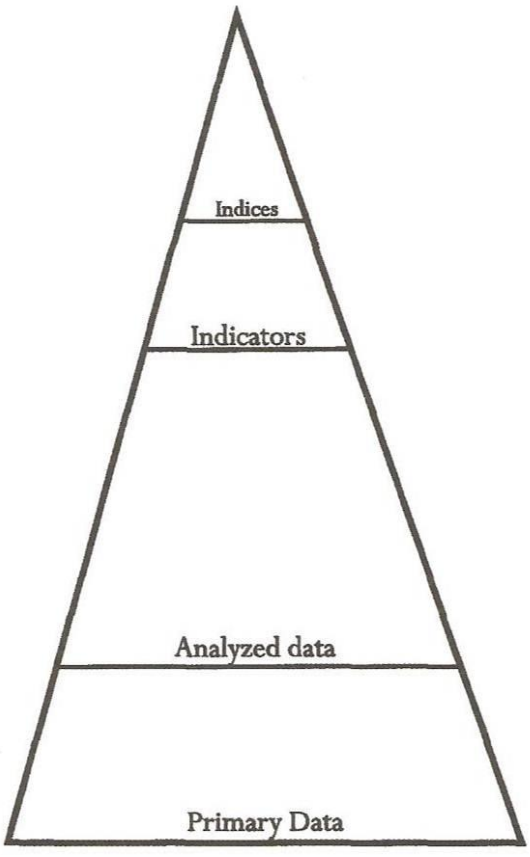
Since the concern in this report is public policy issues and specifically the process of communicating information to decisionmakers and to the public, indicators are defined more precisely. Indicators provide information in more quantitative form than words or pictures alone; they imply a metric against which some aspects of public policy issues, such as policy performance, can be measured. Indicators also provide information in a simpler, more readily understood form than complex statistics or other kinds of economic or scientific data; they imply a model or set of assumptions that relates the indicator to more complex phenomena.

Those who construct indicators for public policy purposes have an obligation to make explicit both the metric and the underlying model inherent in them. As used in this report, indicators have two defining characteristics:[1]

- indicators **quantify** information so its significance is more readily apparent;
- indicators **simplify** information about complex phenomena to improve communication.

Even though indicators are often presented in statistical or graphical form, they are distinct from

Figure 1. The Information Pyramid



(Ref.1)

One of the most sophisticated indicator systems is the one developed and adopted by the European Environment Agency (EEA) that have over all 230 indicators divided into 23 category as follows

- All(230)

No.	Field	Number of indicators	Notes
1	Chemicals	(4)	Each of these indicators has a specific assessment procedure and measurement tools and all the related data are properly documented and saved in a data bank so it is there when it is needed.
2	Climate change	(46)	
3	Coasts and seas	(9)	
4	Energy	(41)	
5	Environment and health	(6)	
6	Environmental scenarios	(44)	
7	Fisheries	(4)	
8	Green economy	(2)	
9	Household consumption	(2)	
10	Industry	(8)	
11	Land use	(3)	
12	Natural resources	(2)	
13	Noise	(1)	
14	Policy instruments	(1)	
15	Soil	(2)	
16	Tourism	(4)	
17	Transport	(45)	
19	Urban environment	(1)	
20	Waste and material resources	(6)	
21	Water	(22)	
SUMMATION		230	

The above discussions lead to conclusion:
There is no specific Model to be copied
(Indicators ought to be tailored as per specific needs and goals)

4-3-Measuring systems:

Measuring Methods, tools and instruments needed for measuring Environmental performance varies from country to another but the major issue is the carbon dioxide footprint and material recycling, the LCA is one of the systems but not limited to as follows:

"Environmental performance is measured using an evolving, multidisciplinary tool known as life-cycle assessment (LCA). LCA is a "cradle-to-grave" systems approach for understanding the

environmental consequences of technology choices. The concept is based on the belief that all stages in the life of a material generate environmental impacts and must therefore be analyzed, including raw materials extraction and processing, intermediate materials manufacture, material manufacture, installation, operation and maintenance, and ultimately recycling and waste management. An analysis that excludes any of these stages is limited because it ignores the full range of upstream and downstream impacts of stage-specific processes.

The general LCA methodology is as follows. LCA begins with goal identification and scoping (defining boundaries). What is the purpose of the LCA? What decision is the LCA meant to support? Where are environmental impact boundaries to be drawn secondary environmental impacts, tertiary impacts? Do we include all environmental impacts, or only a pre-defined subset of impacts?" (Ref.6)

The first step of this method is to specify goals this step is very specific and related directly to the region or state where the measurement action will be taking place while the coming step of implementing the method is Identical for all cases

" After goal identification and scoping, the four-step LCA analytic procedure begins. The inventory analysis step identifies and quantifies the environmental inputs and outputs associated with a material over its entire life cycle. Environmental inputs include water, energy, land, and other resources; outputs include releases to air, land, and water.

The impact assessment step characterizes these inputs and outputs in relation to a comprehensive set of environmental impacts. For example, the impact assessment step might relate carbon dioxide (CO2) emissions to global warming.

The third step, impact valuation, synthesizes the environmental impacts by combining them with stakeholder values. For example, assume there are only two environmental impacts, stratospheric ozone depletion and global warming. The impact valuation step might combine quantitative measures of ozone depletion and global warming into a single measure of overall environmental impact by normalizing the quantitative measures and weighting each impact by its relative importance. (Note that while LCA practitioners generally agree on the nature of impact valuation, not all treat it as a separate LCA step. Some include it as part of impact assessment, while others include it as part of improvement assessment.)

The improvement assessment step identifies and evaluates opportunities for making changes in the product life cycle which improve its cradle-to-grave environmental performance.(Ref.6)

The four step method approach is identical for all cases what means adaptation of a method does not mean changing steps, on the contrary the steps should as it is not touched, only the goals of the first step are to be specified as per the local status

"Depending on the goal of the LCA, the improvement step may be omitted. For example, if the goal of the LCA is to select the most environmentally preferable from among three building materials, the improvement step is unnecessary". (ref.6)

The Result or the output of the method is not a deterministic one, it has to be adjusted as per the local existing status and requirements.

Here accuracy and relevancy of input (Data) and the specified goal of the measurement tool directs the results of any index.

5-Findings and conclusions:

The research ends with a major conclusion, that indicators from documented data and measurement tools are the second major governing factors of assessment of performance after the performance itself, and they are the major governing factor in directing the future performance and impact on environment if the assessments and indexing systems results were used for planning.

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In addition to the major conclusion the paper reached to the following detailed findings and coonclusions:

1-Sustainability and responsibility towards Environment is a commitment of Architects all over the world as per declarations of UIA, UNESCO, and AIA

2-Urban Development especially for booming economies and expanding urban settlements should be carefully monitored in terms of its impact on Environment

3-Monitoring can be achieved by using indexes, these indexes can show the direction of development if it is according to specified goals.

4-Solving local sever urban problems should be according to pre specified criteria and goals having less impact on resources

5-Kurdistan Region in general and Erbil City specifically needs to develop legislations that are based on locally oriented criteria towards development with positive impact on Environment and more responsibility against resources

6- Documentation and recording of Data should comply with the international standards in order to prevent in-proper assessments by international indexes

7-Bad rankings in international indexes do represent in-proper performance but not sometimes it is due to in proper or inaccurate data

8- International indexes by definition are to direct the Governments and institutions to wards development, in-proper data will lead to in-proper assessment and guide lines

9-Huose holds and civil buildings consume more than 75%of the generated power so they bear the responsibility of reducing the impact on Environment, such education needed to be penetrated to the local cultures.

10-Environmentaly oriented legislations and building regulations are to be developed locally as per local needs according to local policies

11-Indicators ought to be locally developed to be 1-User-driven 2-Policy-relevant 3-Highly-aggregated

12-Mesuring Methods can be adopted as per the local goals taking into consideration that the Result or the output of the method is not a deterministic one, it has to be adjusted as per the local existing status and requirements

13- Accuracy and relevancy of input (Data) and the specified goal of the measurement tool directs the results of any index

6-Recommendations:

1-Develop local data collection and documentation centres on the national level that can provide international institutions with the proper input in order to get assessments that represent the actual status

2-Develop local indexing systems depending on locally oriented indicators that represent the local needs and can be easily understood by decision makers

3-Develop legislations and building regulation with higher awareness regarding Environment and sustainability issues

7- Future research plans:

To start a survey covering local working institutions in Kurdistan Region detecting available assessment tools and methods that can be regarded as measurement tools, and fragmented documentation centres in the Region to check the reliability of the followed documentation procedures.

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4-2- تقرير نظم الادارة البيئية-الارشادلت وطرائق الدعم

4-3-تقرير نظم الادارة البيئية –متطلبات الاسخدام

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