

# Selecting Indicators For The Sustainable Development of Residential Neighborhoods in Tripoli, Libya

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**Abstract:** The government of Libya aims to position Libya as one of the most sustainable countries in the region, with the hope that this success will create an inspiring example for surrounding countries. To achieve this, an indicator based assessment framework needs to be developed to assess neighborhood sustainability in Libya as it is important in achieving sustainable urban development. The aim of this paper is to identify a significant set of indicators to assess the sustainable development in Tripoli, Libya. Firstly, a number of indicators for sustainable development from various studies were collected into a preliminary list. The list of indicators was then assessed and filtered by experts in the industry, thus resulting in 50 assessment indicators that are relevant to the sustainable development in Tripoli, Libya. Based on measurement issues, 50 indicators were then grouped into 30 main indices or themes that reflect either sustainable economic, environmental, social, or institutional indicators. Therefore, the final sustainable neighborhood assessment framework will hopefully be used as assessment framework or guidelines in strategic planning for the development of sustainable neighborhood in Tripoli, Libya.

**Keywords:** Sustainable Urban Development, Libya Sustainable Neighborhood Indicators, and Indicator Assessment Framework

## 1. Introduction

The concept of sustainable development reflects the important relationships between several pairs of processes, such as human and economic developments, global and local environments, increase in population and poverty, and changes in the political structure and the corresponding problems [1]. This concept also highlights the widespread state of environmental effects of human activities on the ecosystem; high-quality data sets must be collected in the long term to detect and understand the changes in the environment [2]. The Organization for Economic Cooperation and Development foresees the need of indicators for sustainable development and urges countries at the national level, as well as governments and non-governmental organizations at the international level, to identify these indicators [3]. Spangenberg and his partners [4] echoed that the sustainable development indicators aim to create a tool for guiding policies on sustainability, monitoring measures and their results, and transferring the outcomes to a large audience. Smith [5] believed that in identifying indicators, quantitative data must be used to create a sound basis for both social and economic policy



environments in the future. These indicators also serve as a continuous call to arms for protecting environmental psychology. Schultink [6] further emphasized that the selection of indicators must be based on the planning of sustainable development of natural and vital environmental indicators that determine the effectiveness of potential comparison development and environmental constraints. John [7] then highlighted the lack of such indicators causing public institutions unable to develop a strategy for sustainable development as the present state of the system remain unknown. Therefore, by having environment and sustainable development indicators, a better decision for multi-objective environmental can be made [8]. These factors also reflect the main scope of different sustainability standards that have been implemented in recent years. Therefore, sustainable development can be regarded as a mean to develop urban areas at the expense of the needs of current and future generations. Sustainability ideas that emerge from high levels of stimulated activities come in the form of indicators [9].

Many studies have been conducted to develop sustainability indicators as it provides the opportunity to build on the integration of economic, environmental and social programs to develop long-term effectiveness of government policy-related programs. However, a review of the countries' sustainable indicators showed that many lacked the implementation of selected sustainable indicators recommended by the Organization for Economic Cooperation and Development [10]. The absence of comprehensive frameworks or approaches and the lack of sustainable development indicators in Libya [12] had motivated current study to address the topic of selecting sustainable neighborhoods indicators in Libya as a sample case.

## **2. Literature Review**

### *2.1. Sustainability in Libya*

Libya is a country facing the same issues that many other developing countries are facing, for example the conflict of interest between economic growth and environmental preservation. However, it has acknowledged the concept of sustainable development as an integral part of this concept, as its policies and its vision and mission plans [11]. Libya is also very active in international sustainability activities which are reflected through its participation in the 13th session of the Commission on Sustainable Development at the United Nations in 2007. Libya also needs to incorporate the principle of Agenda 21 and sustainable development as one of the important documents in the planning process. The following sections will explore some of the sustainable development indicators in Libya [12].

### *2.2. Weakness of Libya in Sustainable Development Assessment*

Although Libya, has taken several initiatives and processes in sustainable development of the country's policies and plans, yet there still is weakness found in the field of sustainable development, which has been mentioned frequently. This is whereby the weakness referred to are the absence of comprehensive frameworks or approaches and the lack of sustainable development indicators. This shortcoming points to obvious deficits of sustainable development, which makes interpretation of sustainable development indicators a challenging process [12].

### *2.3. Sustainable Neighborhood Communities*

Sustainability is mainly defined as "people continuing to want to live in the same community in the future [13], and it is achievable in situations where people continue to choose to live, work and carry on activities in the same common locality with fully occupied housing. The term "Community" is commonly cited as "the place where people maintain their homes, earn their livings, rear their children and carry on most of their life activities" [14]. It is further supported by Poplin [15], saying that community is "a grouping of up to several thousand households, whose occupants share common experiences and bonds derived from living in the same locality. By understanding the concept of sustainability, community and sustainable communities, these three dimensions of sustainable communities need to be integrated in any community's sustainability related programmed in order to ensure a balanced mix to sustain an existing community.

#### *2.4. Sustainable Neighborhood Indicators*

Indicators in this study were developed to measure progress of neighborhoods and organizations. Sustainability indicators are considered relevant variables of a clear policy that can be measured through time and space [16]. Othman et al. [17] considered “sustainability” as a management tool that is expected to be among the best criteria for determining the wellbeing of communities for development. Therefore, indicators are highly useful in planning sustainability when they are linked to sustainability goals or thresholds, which are scientifically specific points wherein the state of things will change dramatically. Sustainability goals are frequently set by policy makers or through consultation with the public as a reference to a level of sustainability that must be satisfied in the future [16]. Therefore, sustainability indicators are used to monitor and reflect the sustainability of development biology and are closely associated with the main objective of sustainable development [11]. On the basis of their definition, these indicators reflect current trends and provide quantitative and qualitative information. They also act as measurement tools that can be used effectively to enable concerned parties to assess the sustainability of communities or neighborhoods. Othman and colleagues [17] stated that the lacing of the indicator formed from the weaknesses proses of development indicators. Urban sustainability indicators and key elements are selected to continue the practice mode; they are then used to determine the extent to which successful strategies and policies have achieved sustainability goals [18].

### **3. Method**

After reviewing the urban planning and development indicators in Libya, collaboration between researches and Libyan Urban Planning Agency (UPA) of the Ministry of Environment and Residents were established to introduce a plan of action for creating a decentralized environment, monitoring the sustainable development of communities through local authorities, while implementing environment and development indicators. Appropriate steps were followed in proposing a set of local indicators as shown in Fig 1. First, a potential list of indicators was identified through few experts and previous studies. Next a workshop was conducted with experts to select relevant indicators, following, the list of relevant indicators ranked by experts based on their relevancy in sustainable development. Eventually a final indicator based assessment framework for sustainable development was obtained through the steps. The UPA identified 95 indicators related to sustainable neighborhood and presented a final list of 50 common indicators that were divided into four main categories, namely, social indicators, economic indicators, activities of the institution, and sustainable development of the environment.

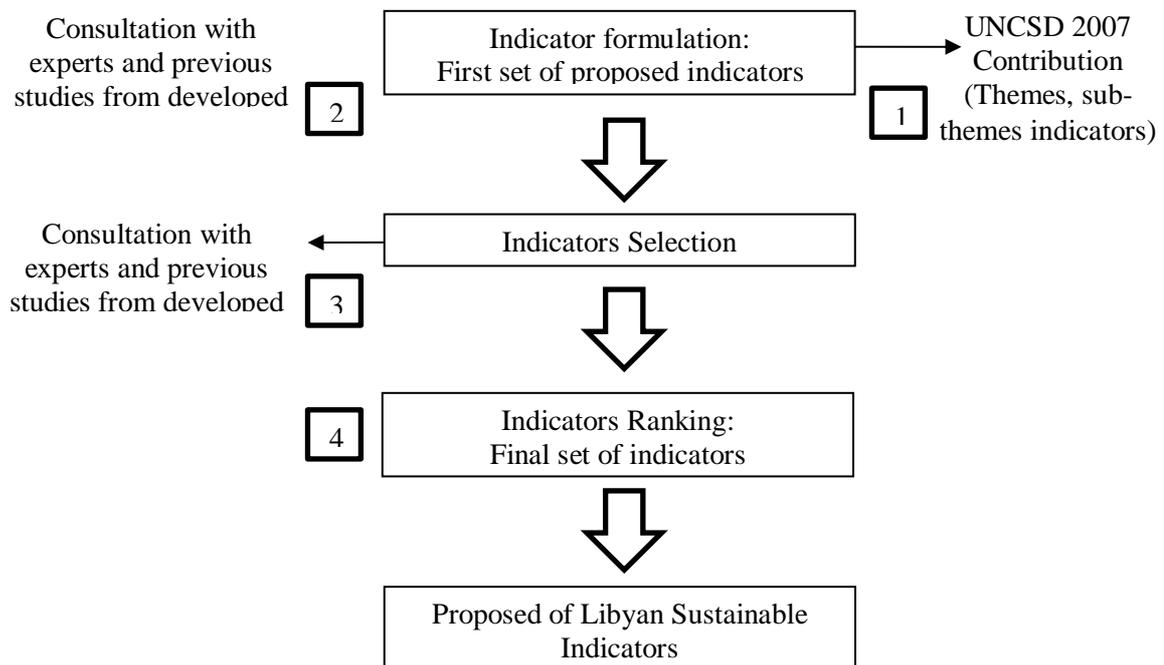


Figure 1: Detailed scheme of the collect indicators process

### 3.1. Libyan Urban Agency For Neighborhood Sustainability Indicator Workshop

A two-day (February 8 and 9, 2016) multi stakeholder discussion was held to gather information about the sustainable indicators. The participants consisted of representatives from local organizations, academics, consultants, and citizens. Approximately forty stakeholders attended a public forum the evening before the discussion, where Libyan local organizations (i.e., UPA) and experts in neighborhood sustainability indicators gave presentations and answered various questions. The indicators followed the call for sustainability indicators in Agenda 21, which published a list of indicators by the United Nations Commission on Sustainable Development (CSD), which covers the social and environmental, economic, institutional dimensions of sustainability within the theme framework of indicator (CSD, 2007) and previous studies on the development of several countries. The workshop participants represented a broad cross section of the local community, and other interested citizen groups also attended the workshop. The workshop began 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 identify potential indicators that could be used in local neighborhoods [19].

### 3.2. Criteria For Selecting Indicators

In close cooperation with UPA, this study implemented several criteria for selecting neighborhood sustainability indicators based on United Nations Commission on Sustainable Development (CSD, 2007) and previous studies on the development of several countries. The most important criteria are listed as follows.

1. Ease in understanding – Can simple indicators be interpreted by a member of the public and the public user?
2. Scientific health – Are the indicators accurate, reliable, and derived from generally accepted data?

3. Availability of data – Are the indicators collected consistently and can the data trend (going back to at least 5 or 10 years) for the issues at hand be measured statistically? What tool is used to combine data?
4. Fitness – Are the local conditions linked with the opportunities for policy development indicator?
5. Forward-looking – Does the indicator of future changes focus on the short and long terms instead of simply evaluating historic trends?
6. Equity – Must the information be monitored to promote the equitable distribution of resources, opportunities, and wealth measures for both current and future generations?

### *3.3. Data Compilation*

The indicators require the development of various tools that can facilitate the collection, analysis, and dissemination of data as well as promote access in information. A rational and transparent sheet of numbers cannot sufficiently support policies on public debate outside of the art scene. An interface that reflects and prefers a simple and transparent calculation of basic tables must be devised [20, 21]. After the data collection process, a collaboration between researchers and various municipalities was established to come out with an action plan. Then, data sheet of indicators and a questionnaire to survey previously used indicators in organization archive or database were presented to UPA. The data sheet aims to compile the household data indicators, whereas the questionnaire aims to gather data on available indicators within the organization archives or database. The UPA indicator data sheet is used to create a unified database across the country, which will allow UPA to contribute indicator data collected from the UPA rule. A model is then constructed based on indicator application programs to use the data from the door-to-door survey and the organization archive questionnaire in generating a data sheet that can automatically evaluate indicators. The model also serves as a basis for developing professional software that allows the deployment of all indicator data from UPA.

### *3.4. Sampling Method*

Data on the number of housing units were obtained from UPA to calculate the indicators and identify the suitable sampling methodology. After conducting an initial questionnaire survey, this study adopted a multi-stage cluster sampling combined with systematic sampling, in which a randomly sampled population was divided across geographical boundaries, and the population cluster were selected according to a random starting point and a fixed periodic interval [22, 23]. That is, the study area was divided into two or four sections of equal sizes according to UPA, while the required sample size of housing units was distributed evenly over the partitions. Sampling was conducted within each section, and then at the street level in order to avoid overlapping. The initial housing unit was then randomly selected from number one to five at the beginning of the allocated area. A progressive scan was conducted at every sixth housing unit in the case of non-response, and the next sixth housing unit will be considered as a sampling unit. This process continued until the sample size achieved approximately 30% of the total number of houses in the assigned part/ area. UPA was then divided into four groups according to the number of houses, in which each group will have teams of few person. Each team member was requested to submit at least 15 questionnaires per day. To facilitate the survey, all contact persons in the municipalities were contacted 1 week before the arrival of the survey teams so that necessary preparations can be arranged and most importantly to ensure successful data collection. The test questionnaires and the survey process were continuously improved and refined, whereas the methodology and questionnaires were upgraded accordingly. The UPA members, a statistical expert, and leaders from the data quality assurance team attended daily meetings after data collection to discuss the challenges faced by the questionnaires. The purpose of the meeting is to propose solutions, to introduce questionnaire amendments, and lastly to key in the data into SPSS.

## 5. Results

The study has addressed directly to the Local Authorities that play as a key player in the implementation of Libya - urban planning agency. Table 1 below describes the selected Libyan urban indicators by each local authority that represented by the different administrative level. There are four major factors to be consider in developing a sustainable urban area, namely social indicators, environmental indicators, economic indicators and institution indicators. Further, results showed that to measure social sustainability, the aspects of income poverty, gender equality, crime, sanitation, health status and risks, mortality, education level, literacy, material consumption, and population change will need to be assess. As for the environmental sustainability, the assessment of climate change, air quality, marine environment, coastal zone, green spaces, water quality, ecosystem, and fisheries will be need. On the economic standpoint, results showed that this factor consisted of economic performance, employment, sustainable financial status, transportation, trade, external financing, and resources and energy use. Lastly, institution indicators measured nature disaster preparedness and response, science and technology, information access, institutional cooperation, corruption, and role of civic society.

Table 1. List of Libyan urban indicators

Component	Theme	No	Indicator	
<b>Social Indicators</b>	Income poverty	1	Proportion of population living below national poverty Line	
		2	Social benefits per capita	
	Gender Equality	3	The amount of public funding provided to address gender inequality <sup>[1]</sup>	
		Crime	4	Number of intentional homicides per 100,000 population
	5		Number of preventive processes against Terrorism <sup>[1]</sup>	
	6		Proportion of city covered by monitoring cameras in the streets and using explosives detection devices <sup>[1]</sup>	
	Sanitation	7	Proportion of population using an improved sanitation facility	
		8	The number of managed landfill sites <sup>[1]</sup>	
	Health status and risks	9	Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis	
		Mortality	10	Healthy life expectancy at birth
	Educational level		11	Life expectancy at birth
		12	Gross intake ratio to last grade of primary education	
		13	Net enrolment rate in primary education	
	Literacy	14	Adult secondary (tertiary) schooling attainment level	
		15	Percentage of sales of newspapers and other print media	
	Material consumption	16	Intensity of Material Use	
		Population change	17	Population growth rate
			18	Net migration rate
<b>Environmental Indicators</b>	Climate change	19	Carbon dioxide emissions	
		20	Per capita emissions of greenhouse gases	
	Air quality	21	Ambient concentration of air pollutants in urban areas	
		22	Air pollutants in urban areas	
	Marine environment	23	Proportion of marine area protected	
		24	Marine trophic index	
	Coastal zone	25	Percentage of total population living in coastal areas	
		Green spaces	26	Percentage of preserved areas/ reservoirs/waterways /

			parks in relation to total land area
	Water quality	27	Wastewater treatment
	Ecosystem	28	Management e effectiveness of protected areas
		29	Fragmentation of habitats
<b>Economic Indicators</b>	Economic performance	30	Number of foreign companies with investments in city
	Employment	31	Employment- population ratio
		32	Share of women in wage employment in the non-agricultural sector
	Sustainable Financial status	33	Aid to developing countries
		Transportation	34
		35	Number footbridges and pedestrian crossing lines on all roads in city <sup>[1]</sup> <sub>SEP</sub>
	Trade	36	Number of hours of traffic congestion during the day <sup>[1]</sup> <sub>SEP</sub>
		37	Current account deficit as percentage of Gross domestic product
		38	Share of imports from developing countries and from LDCs
	External financing	39	Number of modern shopping centers and shops built to international standards
		40	Number of banks that use modern and robust systems
	Recourses and Energy use	41	Number of stations that produce renewable energy
		42	Share of renewable energy sources in total energy use
<b>Institution Indicators</b>	Nature disaster preparedness and response	43	Economic and Human Loss Due to Natural Disasters
		44	Response times from emergency services police, fire/rescue and ambulance
	Science and technology Information access	45	Proportion of staff in government departments who have access to and make effective use of ICT <sup>[1]</sup> <sub>SEP</sub>
		46	Proportion of people who use the postal mail service
	Institutional Cooperation	47	Proportion of powers, resources and decisions devolved to the city authority
		48	The number of civil society organizations participating in city affairs <sup>[1]</sup> <sub>SEP</sub>
	Corruption	49	Number of financial and administrative corruption cases prosecuted in institutions and government departments
Role of civic society	50	Percentage of civic participation of citizens in government institutions <sup>[1]</sup> <sub>SEP</sub>	

## 6. Discussion

The final Libyan neighborhood Indicators shown in the result were not merely number indications. In Libya, particularly UPA, this presents a good example of sophisticated institutional arrangements that are directed toward collecting highly credible scientific information to track urban sustainability and democracy. These sustainable indicators for residential neighborhoods in Libya are expected to indicate whether or not these neighborhoods demonstrate any progress toward achieving the objectives of sustainable urban development. These neighborhoods were provided with the much-needed knowledge at the levels of policy formulation and the affectivity of urban programs in achieving the

desired goals. Therefore, to create more resonant policies for urban indicators, further discussions must be conducted to improve these indicators from time to time through system analysis and research. To enhance the links between the sustainability indicators and the political process, several combinations of strategies must be used to encourage the use of effective and conceptual indicators. Moreover, concerned local authorities must collect data and critically examine issues at hand instead of merely determining how to achieve a specific level of sustainability. Given that numerous issues must be considered and examined, local authorities must be given due credit for implementing UPA. However, the implementation of sustainable and practical Libyan neighborhood indicators must be improved further.

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