



Global Advanced Research Journal of Engineering, Technology and Innovation (ISSN: 2315-5124) Vol. 1(8) pp. 205-219, November, 2012
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Full Length Research Paper

Developing Multi-Criteria System for Prioritization of Urban Developmental Projects _ Gaza City as a Case Strip

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Accepted 03 November 2012

International Non-Governmental and governmental Organization are adapting traditional approaches in identifying the needs of urban planning. As a result, development projects sometimes targeting unneeded geographical zones without having a clear framework that are based on studying all Multi-Criteria of urban zones in term of poverty rates, available resources, current developmental projects, unemployment rates, youth distribution in the urban zones, gender share, ages and all related Multi-Criteria that should be taken into consideration while doing the needs assessment for Human Developmental Projects. Therefore, projects funded by donors or local institutions do not always properly integrate into a comprehensive planning system that correspond consistently with local community needs. So, it is crucial to develop a method for prioritizing the required projects based on the urban planning strategies available in the Ministry of planning and local municipalities. The Paper will discuss how to identify priorities for improvement and to create an optimized program to facilitate access to the measurement of these indicators. The methodology of the research will be based on identifying relevant indicators and the weight of each one, in addition to the interrelated nature of the relationship between them. The main expected results will be having a sample of computerized program that could be used to measure these indicators and their weights. Sub-indicators will be also proposed based on a questionnaire that will target professionals and stakeholders, as needed to help identifying these priorities and how to determine the extent of its power based on economic, social, and environmental aspects, additionally, regional plans and structural elements of local communities will be taken into account. The proposed paper developed a new multi-criteria system using a sample of Gaza City urban structure as a case study to help the decision makers in NGO's and government in ranking developmental projects. The case study will constitute a framework for available database for urban planning based on geographical distribution of developmental projects. The Paper ended up with a framework that can be implemented by most of INGOs and Governmental Organizations in which they were able to have a systemic approach in doing any needs assessment for urban planning for developmental Projects.

Keywords: Multi Criteria Analysis, decision-making, PritORIZATION, Arc-GIS

INTRODUCTION

The urban strategic planning is a scientific method used to develop priorities and development goals for

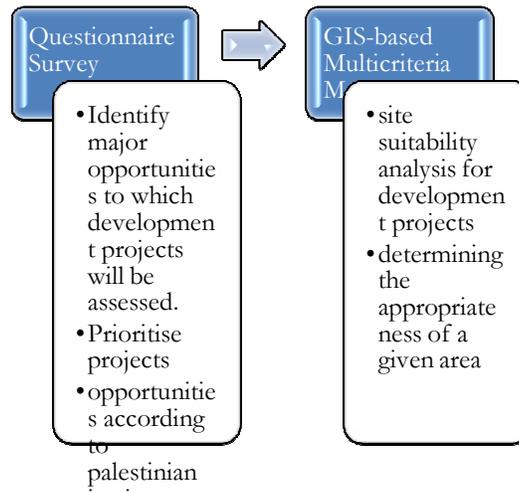


Fig1: The multi-criteria framework for development projects analysis .(Researcher)

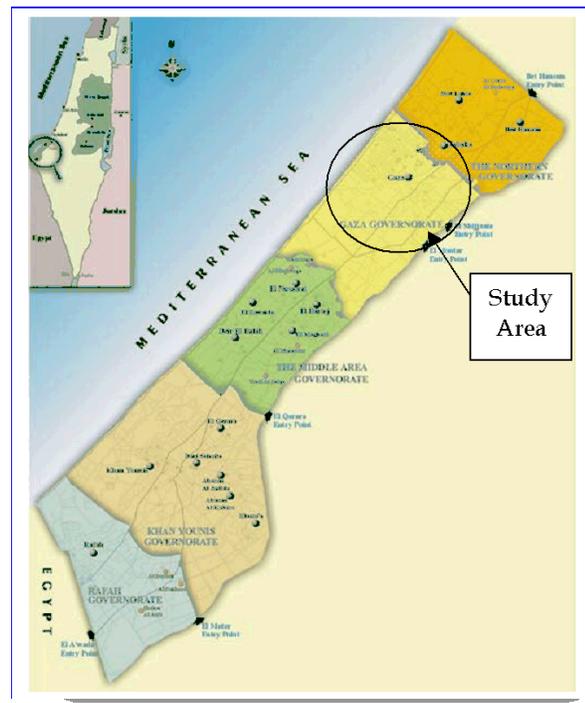


Fig 2: location map for case study in Gaza Strip (Adapted from Ministry of Local Governance, 2005)

residential pools and identifying programs and projects capable of achieving these goals during a certain period of time in line with the aspirations of the population, taking into account available resources and possible constraints The Gaza strip is one of the most density

populated areas in the world estimated at 3,800 persons/ Km2 This has put a lot of pressure on the economy to sustain a certain level of living for Gaza residents. The unemployment rate is about 38%, while the people below the poverty line are approximately 80% (MONE, 2005).

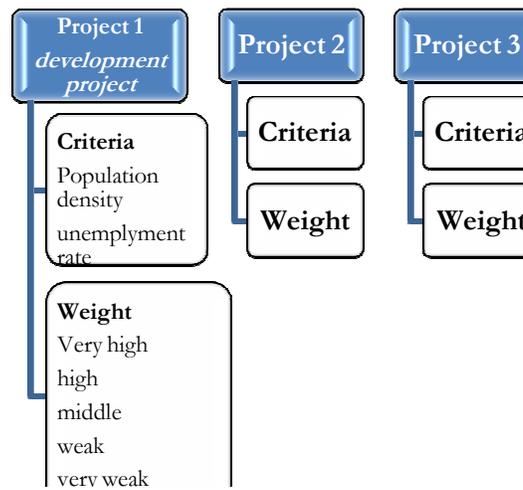


Fig3: Sample of project criteria and weight

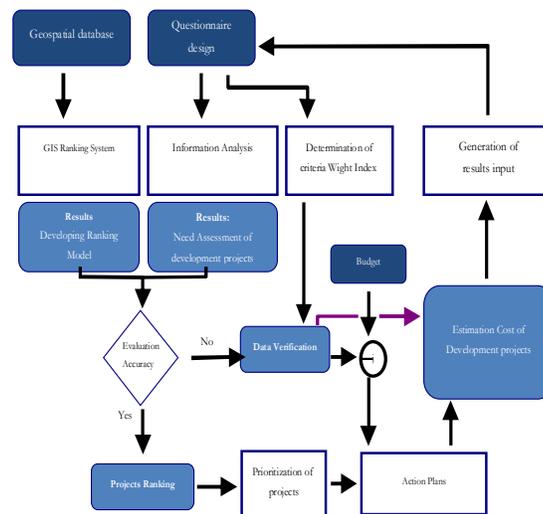


Fig4: Methodology Flow Chart

Economic resources of Palestinian national are limited and depend in many cases on external supports, donors and grants. Also Palestinian national economy has low national strategic control and self-monitoring system according to World Bank (2006). The Palestinian society has an integrated fabric community consisting from Refugees' camps', villages and cities. Due to Lack of financial resources the Palestinian society depends on developed an important model for Multi-criteria analysis which can be used in several projects as a tool for prioritization of projects. This model will be used as decision support system for planning departments in Palestinian institutes and NGOs. Allocation of development projects is critical task since each area in Gaza Strip (Figure 1) has different needs like educational

the grants and external financial support. Allocation of the financial support among Palestinian cities faced in many cases conflicts in projects importance. World Bank (2006). Poor information network between cities or municipalities causes in many cases wrong decisions. International Non-Governmental and governmental Organization are adapting traditional approaches in identifying the needs of urban planning. This research needs, recreational needs, social needs and etc. The Palestinian society has an integrated fabric community consisting from Refugees' camps', villages and cities. Due to Lack of financial resources the Palestinian society depends on the grants and external financial support. Allocation of the financial support among Palestinian cities faced in many cases conflicts in projects

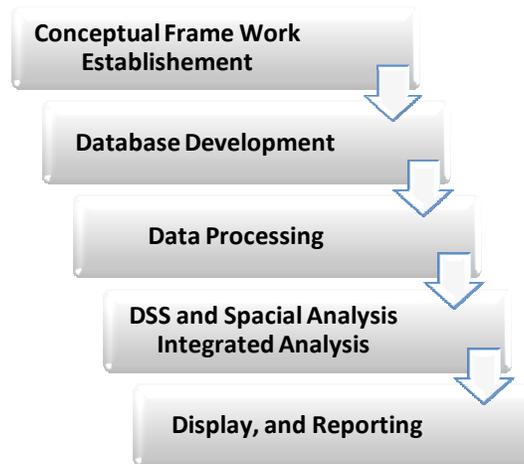


Fig5: Conceptual Frame Establishment Process

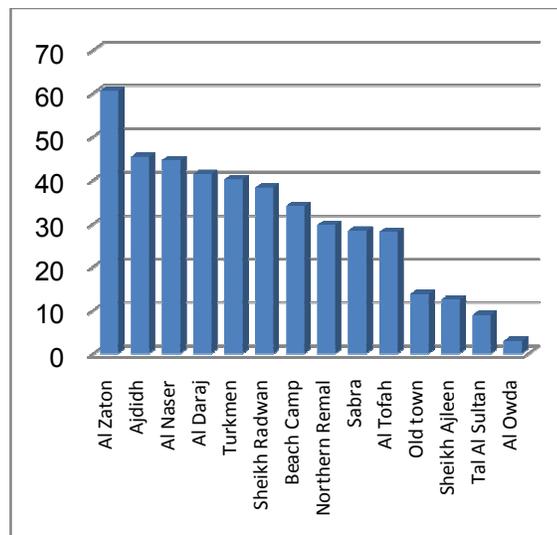


Fig 6: Percentage of Gaza population per neighborhood

importance. World Bank (2006). Poor information network between cities or municipalities causes in many cases wrong decisions. International Non-Governmental and governmental Organization are adapting traditional approaches in identifying the needs of urban planning. As a result, development projects sometimes targeting unneeded geographical zones without having a clear framework that are based on studying all Multi-Criteria of urban zones in term of poverty rates, available resources, current developmental projects, unemployment rates, youth distribution in the urban zones, gender share, ages the allocation strategy of financial support and to apply projects prioritization framework model based on

and all related Multi-Criteria that should be taken into consideration while doing the needs assessment for Human Developmental Projects, according to World Bank Report (2006).

The main aim of this study is to develop a framework model for assisting the decision makers to prioritize the development projects based on real criteria.

This aim can be achieved through the following objectives: To assist the government and stakeholders to provide development strategy, to build on the existing to Establishing a decision support system unit to implement weighted criteria. It is the first study to highlight the significance of decision making mechanism in Urban

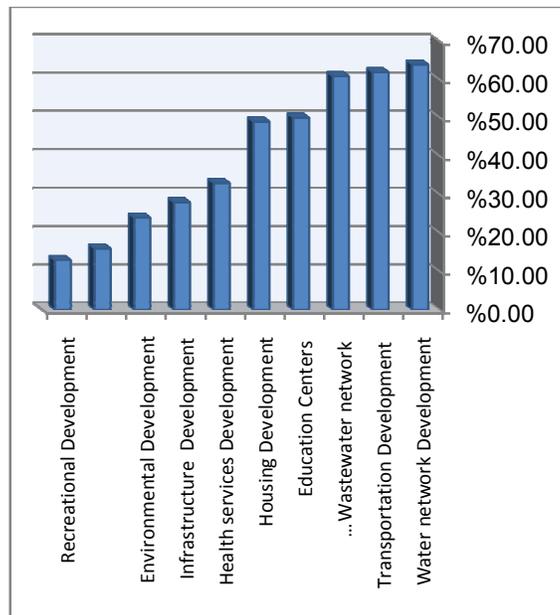


Fig7:Final Ranking of the urban Developmental Projects according to Survey Results projects

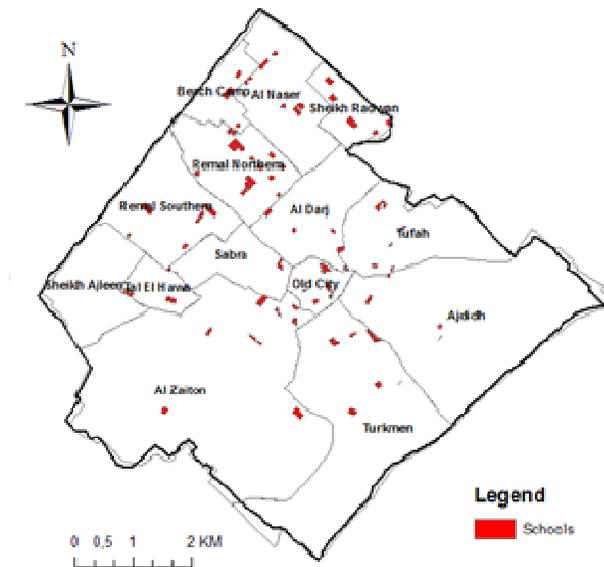


Fig8: Location Map for schools in Gaza City

planning in Gaza Strip.

Background

The strategic urban planning is a scientific approach which is used to formalize the priorities and the developmental objectives for the urban communities; it

also aims at determining the program. Since it is difficult to consider a Strategic development of the current and coming generations with-out deep considerations of a planned and controlled growth of urban areas, thus strategic urban development aims to focus on determining the potential needs and challenges and diagnosis the current situation. In addition, it will lead to develop comprehensive vision expressing the current

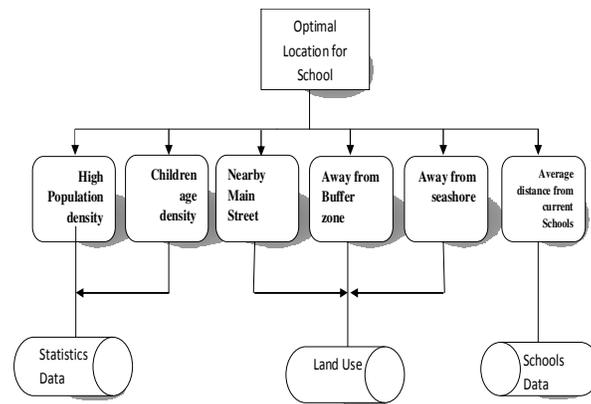


Fig9:Exploring input datasets .

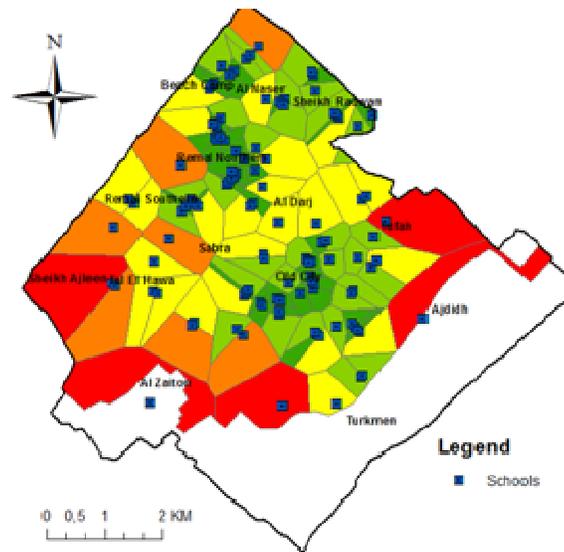


Fig10; Creating Thiessen Polygons for schools in Gaza city to show the represented area for each school

needs within an effective timeframe. Land-use management for the urban developmental projects is the main tool used to guide urban planning to the right approach for infrastructures development and transportation system, both at planning and decision-making stages.

Especially in the cities that lands are very expensive and hardly can be invested as developmental projects such as in Gaza City Region in Palestine, the suitability for various land uses should be carefully studied with the aim of directing growth to the most appropriate sites. Establishing appropriate suitability site selection Multi-Criteria is the construction of suitability analysis is essential to develop comprehensive model in land management.

Initially, suitability analysis was developed as a method

for planners to connect spatially independent Multi-Criteria within the environment and, consequently to provide a more unitary view of their interactions. Suitability analysis techniques integrate three Multi-Criteria of an area: location, development activities, and environmental processes.

Site selection requires consideration of a comprehensive set of Multi-Criteria and balancing of multiple objectives in determining the suitability of a particular area for a defined land use. In the past, site selection was based purely on economical and technical criteria. Today, a higher degree of complexity is expected. Selection criteria must also satisfy a number of physical, social and environmental requirements.

Combining GIS and MCDA is also a powerful approach to land suitability assessments. Subsequently, a similar

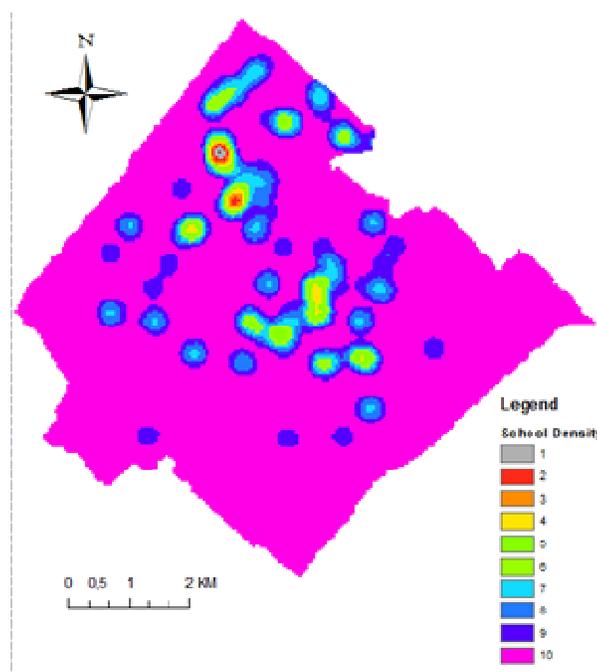


Fig11 School Density in Gaza strip

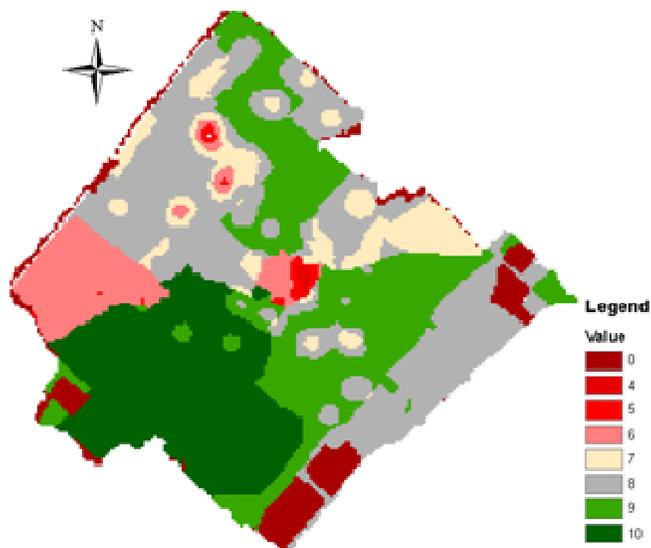


Fig12: Final criteria map for best location of educational schools based on ranking from 0 (no need at all) to 10 (highly needs

approach, (Alemu, 2009) produced a land suitability map for an Paper that tackled the effective usage of GIS based MCDA tool to design a framework to model decision making process considering results taken from process related to network design substitutes in which the main results can be summarized as modeled pair-

specified methods about relevant criteria to encourage the sustainable development of Stockholm. While (M.A. Sharifi et al ,2006) empathized on using the approach of MCDA which help in performing effective decision maki wise comparison method as applied in the paper that had proven its ease of use within limited time constrains in the

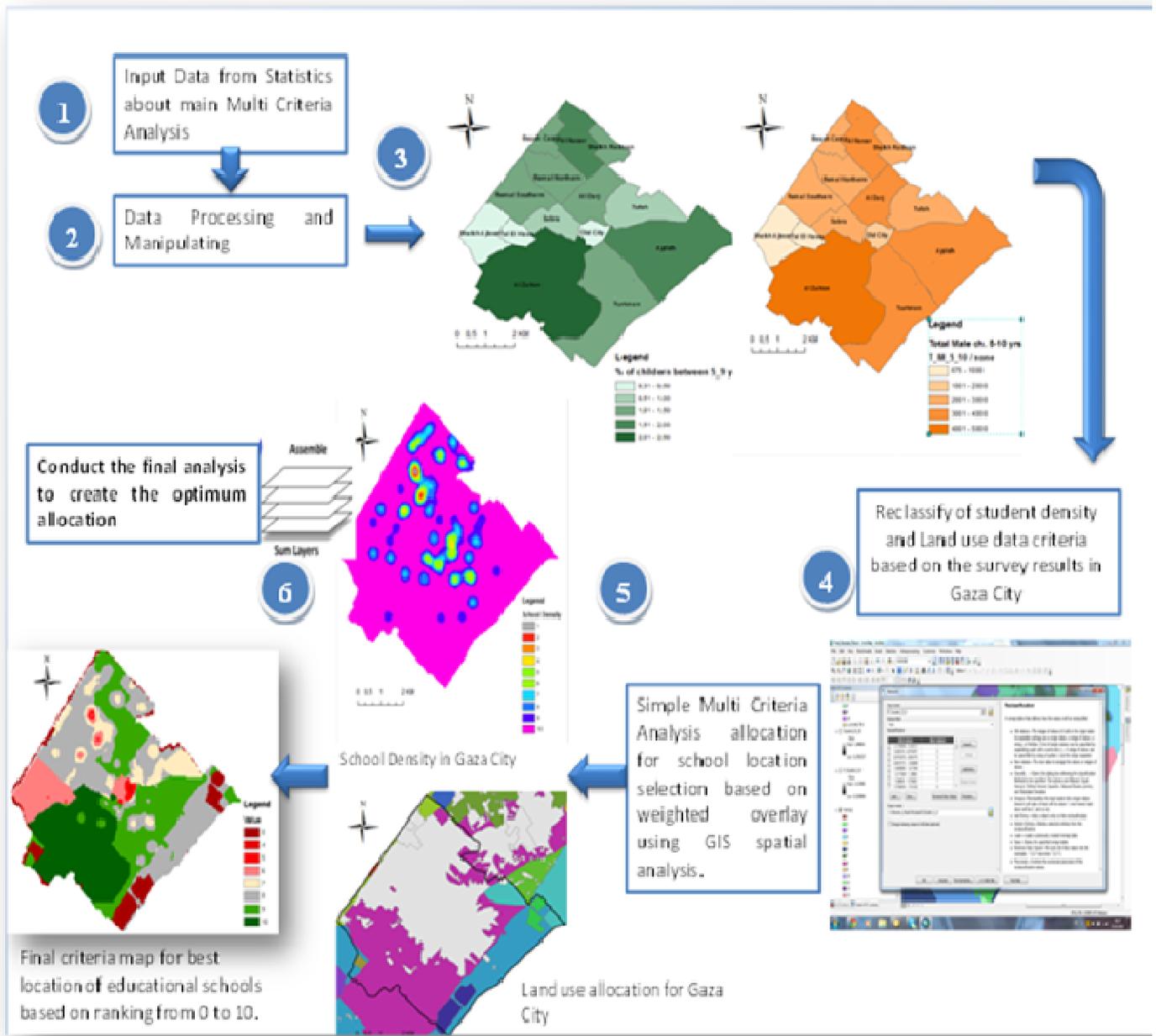


Fig14: The conceptual Frame work Chart for allocating the educational Schools. Source(Researcher)

conceptual framework, while the usage of MCDA methodology in prioritization the public transport needs process.(Salem Chakhar, 2010).

Criteria should be selected to evaluate potential Urban Developmental Projects sites and to support decisions concerning the location of additional Urban Developmental Projects areas. The criteria must be identified and include Multi-Criteria and constraints. Constraints are criteria that exclude areas from the

analysis. Whereas Multi-Criteria : are criteria that influence (enhance or detract) the viability of the objective under consideration. SDSS is used to assist the decision makers in taking effective evaluation in site identifications, Decision-making and decision systems Decision-making is a process of defining a problem and its environment, identifying alternatives, evaluating alternatives, selecting an alternative, and implementing the decision (Malczewski,1999). To this

	Water Development	Transportation Development	Waste Water development	Education Centers	Housing Development	Health services Development	Infrastructure Development	Environmental Development	Resource management and land use development	Recreational Development
Availability of sustainable Multi-Criteria	7.9	9.5	8.2	7.4	7.4	7.4	7.3	7.3	8.3	8.3
Available fund resource	7.8	8	7.5	7.5	7.2	7	7.5	7.2	7.1	7.1
Community need for the project	8.7	8.7	8.9	8.3	8.6	8.1	7.6	8	9.1	9.1
Environmental consideration	7.9	6.4	8.4	7.1	7.4	7	7.2	8.2	8.4	8.4
Institution administration team repetition	7.2	6.3	7.2	7.1	7.4	6.5	6.5	6.9	6.2	6.2
Institution contribution	3.7	6.5	3.6	4.8	4.5	4	4.2	4.2	3.8	3.8
Institution enhancement	6.8	6.4	7.2	7.3	6.4	6.8	7.4	6.4	6.6	6.6
Institution similar experience	6.9	7.4	7.3	7	7.5	6.8	6.8	6.5	5.8	5.8
Number of jobs created	6.6	6.4	7.3	7	7.7	7.3	6.2	6.4	6.2	6.2
Number of target group	8.2	6.4	8.2	8.1	7.6	8.2	6.8	7.9	8.3	8.3
Other institution involvement in project (selection and/or implementation)	6.4	7	6.6	5.9	6	6.2	5.7	6.7	6.3	6.3
Project contributes in capacity building of local human resources	6.3	6.2	7	7.2	6.2	7	6.7	6.5	7.1	7.1
Project implementation duration	6.5	6.8	6.7	5.9	7.1	6.9	5.5	6.9	5.9	5.9
Project strengthen the relations between local stakeholders	6.5	6.2	6.7	7.2	5.9	6.3	6.2	5.7	7.4	7.4
Project will use exported materials	7	7.3	7	7	7	6.6	5.3	5.9	6.9	6.9
Project will use local materials	5.4	7.3	5.4	5	5.6	5.8	5.8	5.5	6.1	6.1
Projects life span	6.7	5.5	7.5	7	7.4	6.9	5.8	7	7.5	7.5
Region consensus on project	8	7.4	8	7.7	7.4	7.8	7.5	7.4	7.9	7.9
Repetition of similar projects in the area	6.6	7.2	6.4	6.1	6.6	6	5.4	5.9	4.8	4.8
Required budget	8.1	9	8.4	7.8	8.2	7.6	7	45.5	7.8	7.8
Type of target group	7.4	4	7.5	7.1	7.5	7.5	7	7.4	6.4	6.4

Table (1)Collected Data from the Ten Proposed Urban Developmental Project Disaggregated by the Proposed Criteria.

end, higher effectiveness of planning and decision making processes can be achieved from a system that can supply timely and accurate information and an interactive computer based system with capabilities of environment (Baloye et al, 2010).

METHODOLOGY

This is analytical study which is designed by triangulation of mixed method approaches. The research methodology implemented a strategy of inquiry that consisted of sequential mixed methods procedures which the researchers seeks to elaborate on the findings of one method to the another.

The research design was mainly relying on the

analytical modeling, database management, tabular reporting, and graphical display. Nowadays, multi-criteria-SDSS, which is an extension on GIS, becomes more relevant to generate an encouraging decision-making deductive approach were the theory is extracted from the results using different approaches of quantitative and qualitative including the multi-criteria analysis and ARC – GIS programs to visualize the output into maps. The research design was based on the mixed used method including Quantitative Data which is one of the main parts of this study was aimed to rank priorities for the main urban developmental projects and set-up main criteria for selection and site allocation. The researcher used the closed ended 1questionnaire approach focusing on prioritization.

The correctness of the research population refers to its suitability for the realization of the intentions of the study

	Water Works	Transportation	Waste Water	Education Centers	Housing Development	Health Services	Infrastructure	Environmental	Resource management and land use	Recreational
Wind Direction	9	9								
Land Slope	8.3	8.3								
Environmental Impact	7.5	7.5								
Aquifer level	8	5								
Away from crowded zones	5.5	5.8	8	5.2	6.53	5.1	6.76	8.3	5.43	6.76
Children density	6.7	6.6	6.83	6.5	6.61	7.15	8	5.2	5.75	8
City area	7	7.2	7.46	6.4	6.8	6.6	6.15	6.7	3.43	6.53
Close to seashore	6.3	5.7	5.33	4.5	5.54	4.6	6.53	7.0	3.0	6.15
Having high location	5.0	5.8	4.23	4	4.83	4.30	8.23	5.3	7.75	6.53
High Population density	7.3	7.2	8.11	7.2	7.22	7.60	5.76	4.6	4.6	8.23
Location type	5.9	6.3	5.9	6.7	7.02	6.5	7.30	7.82	5.1	5.76
Mixed land-use	5.5	6.0	5.10	5.9	6.61	5.6	6.4	6.56	5.0	7.37
Nearby Main Streets	6.5	6.5	6.26	6.2	7.06	6.7	6.46	7.04		6.46

Table (2)The allocation strategy for planned projects in Gaza city

The selection of study population was stand on the basis of appropriateness usually influences the strength of consequent generalizations from the results. This implies the need for having accurate sampling of the research and close attention at the early stage of the given study to reach out the specific targeted results.

The sample size was calculated based on probability sampling method , in which stratified sample of 100 stakeholders was calculated as follows = $PQ(Z)^2/E^2$, (Brown, 2012) Since the sample size N, P proportion of society to be studied in the case of lack of knowledge that is used greater percentage rate possible (50%), Q the ratio of complementary, Z-class standard (0.05 = 1.96 & 0.01 = 2.58), E at both sampling error (0.05 or 0.01) Upon assuming the proportion of available community (7%)(Based on OCHA data that includes the majority of stakeholders in different developmental projects , such as governmental cluster , UN agencies, UNDP, World Bank, International NGO, local institutes , municipalities and utilities in Gaza City, the percentage of stakeholders in Gaza Population), the complementary percentage (93%), and the degree of standard (1.96) and

0.05 sampling error.

A pilot study of this research was Gaza Governorate including refugee camps. Semi-structured interviews were conducted in parallel with Questionnaire's design and collection period, thus the interviews were targeting the stakeholders , active representatives of Palestinian ministries , donors in the field of decision support system and experts in planning and strategic development , in addition to many other organizations that exceeded the 100 interviews while filling the survey.

The establishment of the conceptual framework was the bench mark of the paper , it was intended to initiate an effectual and systematic approach while designing a project and allocating its optimum location , the combination of different tools including the ARC-GIS , Multi Criteria analysis and DSS were essential tools to launch comprehensive data processing to lead the decision making process and facilitate the strategic urban planning ARC-GIS was used because of its systematic usage of multi software's that includes DSS, special analysis , data processing and layering for the reason that of its flexibility, numerical efficiency in calculations

involving combinations and statistical exploration spatial variables, In the methodology of the conceptual framework , it was disaggregated into multiple stages in which GIS has been used in many applied fields that involve spatial data analysis among which the recognition, viewing, assessment and optimization of Prioritization Model of the Developmental projects sitting processes.

Consequently, the survey results were disaggregated by the type of the projects and was set as the database of the multi criteria analysis to be done through special programs. based on set criteria to attempts at integration of the GIS spatial analysis capabilities with other codes or software which would deal with optimization and or ranking of options and alternatives.

As a result , frequent transitional analytical map layers were created using GIS map analysis approaches. The procedure included buffer zoning, neighboring multiplication, and digitizing tools in term of

These procedure were: database development, data processing, integrated analysis, display, and reporting. The usage of ARC-GIS played an integration role between MCDA and the DSS technique, it was utilized for collecting, storing ,renovating, analyzing, and displaying of spatial data. In order to develop such process , it was indispensable to collect the current data bases about Gaza City which is the case study region developing the database , for this purpose available spatial `data of Gaza City region were acquired from relevant sources. The collected data were transferred into companionable Arc-GIS version format before they were projected and re-sampled into the same coordinate system, and fitted into targeted zone to organized them for data processing. GIS data processing embarked on by creating evaluation criteria index based on their relevancies and data availability that were obtained from the survey results . Criteria were established for high density population, geology, land-use, roads, green areas, being away from land fill and crowded zones, being nearby the main streets, protected water area , etc based on disaggregation of projects' type as what will be illustrated in the finding section. Criteria data were categorized into a common scale after transforming vectors into raster formats. To identify the criteria of interest, distance operations were per- formed on roads, rails, and protected areas..

Multi-Criteria Decision-Making and Display: This is the most important stage of Conceptual framework GIS-based MCDA modeling, which was used to create suitability maps from summarized several contributing and relevant criteria . A criteria directory was built for each project model and a Multi-Criteria model were developed for this purpose. There were eight different criteria limitations map based on the outcomes of the allocation strategy .All the map layer has been divided into dominant features which the highest influential factor

was given to the highest site selection score followed by the lowest criteria .Multi-Criteria maps were organized and extracted by overlaying relevant criteria from the land-use map and other data sources.

The scale rate was from 10 the highest score till the lowest one , the combination of the newly proposed score affected the final scoring but enabled having specific and compromising locations. factor was ranked based on its significance to make preferences from them . This ranking provided a standardized common scale for each factor. In this fashion, factor maps were prepared for each site allocation criteria Finally, all multi- criteria maps were weighted by means of weighted average to merge them .After weighting each factor and applying multi-criteria contrast, which is the method in the context of decision-making, a particular Multi-criteria maps were arranged by multiplying each standardized factor map by its factor weight and then summing the results. Consequently, this map was the result of map overlaying using linear combination of all factor maps . The decision making process was facilitated in a systematic situation; in ARC-GIS MCDA analysis , the problems of site allocations were treated into decision situations. A suitability (composite) map was derived by covering the restrictions from the Multi-Criteria map to house qualitative criteria for the final planning and decision making process. Then a sensitivity analysis was also conducted to the final map to examine how sensitive the choices were, using attribute values and overlying weightsAfter thus checking the applicability of the analysis, the

final suitability maps were prepared to the highest prioritized urban developmental project (water development project) overlaid with different site selection scenarios to envision their scope and to evaluate the outlines of future Gaza region expansion in the specific project. Figure (3) shows the Flow chart of research Methodology.

Findings

Gaza City region targeting the effectual stakeholders in urban development process. The principle objective of this of this research analysis is to establish a comprehensive mechanism of prioritization modeling system including the development of a computerized model to help in the project prioritization process. Gaza City is the largest Palestinian cities and the provisional headquarters of the Palestinian National Authority.

The Gaza strip is one of the most density populated areas in the world estimated at 3,800 persons/Sq.Km. This has put a lot of pressure on the economy to sustain a certain level of living for Gaza residents. In addition, during the last intifada Gaza economy has been the target of many Israeli actions such as the bulldozing of

land, commercial and industrial establishments. The Gaza Strip is located between Israel and Egypt on the Mediterranean coast, and it is bounded by the Green Line which is the border with Israel from the north and east. Egypt bounds the Strip from the south, and the Mediterranean Sea is the western border. The area of Gaza City 55,806,796 square meters. Gaza City is characterized by youth category since male female ratio equivalent in number and a number of young people accounted for about 55% of the population for the elderly over the age of 65 years they constitute about 3% of the population.

Analysis of the Collected Database using the Questionnaire Distributed to Palestinian Governmental, Local Institutes and INGOs Located in

Gaza.

The results of the survey represented the reality of current local economy of the Palestinian regions, 78% of total organizations were having donations and grants to implement their projects, despite the fact that 12% were having governmental support, others were having different sources of fund to implement the urban projects in the Gaza city. The questionnaires analysis results showed that only 5% of total interviewed believed that the current planning situation reflects adequate planning of developmental projects, conversely 50% considered the current planning as prominent approach in the meantime within the proposed siege and lack of resources. The initiative of developing prioritization modeling was greatly appreciated by the targeted stakeholders, since 40% of total interviewed were highly agreed with having a systematic model of planning and strategic thinking of the priorities and needs of Gaza city. The survey intended to measure the acceptance of having computerized model to be adapted in the Palestinian organizations which is taking the leads in prioritizing the urban developmental projects, the responses varied among stakeholders, where the majority highly agreed with having such a model, since it will facilitate comprehensive use of resources and will manage decision making process, 38% were agreed with this model, in addition to 17% and 4% were neutral and disagreed respectively.

Consequently, when targeted stakeholders were asked about the effectiveness of having computerized program to prioritize the needs and site selection of the urban development projects, 85% agreed on the usage of such conceptual program, despite the fact that only 9.3% disagreed with the concepts and others were uncertain. This results had showed the awareness and realization of the high experienced stakeholders about the consequence of the research and the establishment of

the conceptual framework. The respondents were asked to rank the different urban developmental projects to agree upon mostly important four projects, after deep data analysis using multi criteria process, the projects were ranked based on the multi criteria analysis for the proposed weight per projects.

It was concluded that water developmental projects visualize the highest priority, the transportation development projects was considered as the second ranked one, the waste water network development was ranked as the third proposed projects, education projects were the fourth degree. According to the fact that decision making process should be based on analyzing the priorities and compromising between the validity of each of them to facilitate the smoothly taking decision making process. The first five projects will be taken as the pilot case studies to be analyzed in depth in term of allocation and criteria selection, but the four ranked proposed ones will be analyzed in the computerized program.

Weighting of Mostly Active Selection Criteria for Urban Planning Developmental Projects Based on Survey's Results

Land suitability assessment is similar to choosing an appropriate location, except that the goal is not to isolate the best alternatives, but to map a suitability index for urban planning of developmental projects. Criteria's weights facilitated all scores to be transferred to familiar scales, it will emulate both the comparative importance of criteria as well as difference in unit of inclination on different scales. Moreover, weighting was accomplished by judging the relative judgment in preference from the bottom to the top of one score scale as compared to another. Selecting criteria from a list of Multi-Criteria was an important step for the compromising between actors. Some criterion were retained by all of them for some projects, but others are only considerable for certain actors. Consequently, having effectual approach of identifying the selection criteria for the major urban developmental projects visualizes a criteria needs, in the data analysis, it was shown that the respondent were able to rank the selection criteria for different projects that were proposed. In order to have valuable mechanism to be prepared for the computerized proposed program, respondents and stakeholders were engaged in weighing the suggested twenty five criteria to be applied by the computerized program as fundamental approach for creation such urban projects selection. The figure below shows the weighted index of each criterion as a result of survey analysis, in general the stakeholders were asked to rank the four proposed projects using the maximum weight of 10 till the minimum weight of 0. These criteria may be considered as a pilot case study and thus they

can be adjusted upon the specific nature of the project itself. It shows the logic ranking of the criteria that may be used for a transparent and fair prioritization process. The weighted results will be disaggregated by the proposed projects that were ranked previously; this was crucial process to provide unique perception about the selection criteria and allocation strategy per each to them to facilitate inclusive approach of selection and allocation. The Evaluation method used was to rank the mean weight sequenced from the analysis of t-test and Lanova test using SPSS analytical methods , in addition it was ranked using Excel program The below table is the collected data from the ten proposed urban developmental project disaggregated by the proposed criteria. The table explained the mean average score of the criteria per projects, they are not ascending but the values are presented per criteria per project.

The allocation strategy for planned projects in Gaza city

The allocation strategy was determined using specific criteria weight based on the scores resulted from the survey data analysis .The analysis of the survey illustrated the differentiation among scores based on the importance of spatial allocation. It is also important to remember that the purpose of the site allocation criteria is to assist Decision Making Process by providing them with suitability maps based on the site allocation criteria. Each of these suitability maps _that will be discussed in the next chapter as the outcomes of the computerized program_ would be based on its own list of criteria. So, these criteria lists were coordinated.

For example, soil productiveness should not be included in the appropriateness criteria for housing. Instead, this factor should be put aside and used only for agriculture land . This methodology of urban planning circumvented imbalance difficulties related to the overestimation of some criteria .The main criteria were disaggregated based on eh type of the projects , it was noticed that the mean average weight was decreased or increased based on the rationale of the criteria itself , the major weights were classified upon anticipated projects , The below table indicated the different scores for the ten proposed projects , it illustrated that the common high score was given throughout the ten projects was the high density , in addition being away from crowded zones, having location type eg. Camps , having children density and high Population density were several common criteria that had been weighted in the allocation study of the survey.

The weight of the main allocation criteria increased based on the nature of the projects, for example the children density and being nearby Main Streets were main criteria that increased the possibility of having a

location comparing to others, on the other hand having high population density was the main allocation criteria for both infrastructure projects and recreational projects .Being close to sea shore was the second main allocation criteria in the recreational activities. There were some of allocation criteria that had much less weight when comparing to other indicators , such as being away from crowed zones , having high locations, being city or a camp, and mix land use. The common sites' suitability scoring was given in detailed comparing the five highest ranked projects similar to what was done formerly for the project selection criteria The criteria proposed in the survey per each projects were taken into consideration, another survey was conducted with stakeholders to get in-depth realization of the proposed criteria and its relevance to the nature of the projects

Establishment of GIS-Based Multi Criteria Conceptual Framework for School Development Projects in Gaza city.

Several assessment procedures were conducted to the current situation of the urban development and plans for the education sector in Gaza City ,as it has been chosen from the Survey analysis's results one of the focal priorities of urban planning to be taken in place .

There are 688 schools in the Gaza Strip, of which 397 of them are governmental schools, 243 UNRWA schools, 48 private schools, and three vocational schools. Based on Interviews and report form MOE2012

Gaza's schools are not enough to meet the increasing demand for education, which reached 481,000 students in 2011. Almost 90% of the government schools and 80% of the UNRWA schools are working two shifts a day to cope with the shortage in schools. Based on Interviews with URWA Educational

At least 200 more schools are needed to redeem the shortage in classrooms in the Gaza Strip. UNRWA Annual Report

According to PCBS in 2012, all information were extracted about the targeted population age group and were unified in several data sets per after conducting the proportional equations to extract the percentages and precise population sizes per neighborhoods in the Gaza city , it can noticed that more than 90% of Gaza's population over the age of 10 know how to read and write. Of the city's population, were 140.848 enrolled in schools (39.8% in primary schools, 33.8% in secondary schools, and 26.4% in public secondary schools). Some 11.134 people bachelor's or master's and doctoral degrees

The main potential model was mainly to configure the optimal zones that meet the criteria of the urban development projects and reflect the needs of the targeted zones by extracting the data of the relevant population. The seeking results were different layers maps showing potential sites (categorized by best to worst sites) that could be suitable for building new water

networks or new educational centers and schools, which was entitled as "ranked suitability map" because it shows a relative range of values demonstrating how suitable each location is on the map, taking into account the inserted weights of criteria that were included into the model. Breaking the Main Scope of the Suitability Analysis. The second step was taken to compromise between the criteria extracted from the survey results and compared them with the GIS –Based Multi criteria analysis to set the appropriate criteria to be adapted in the layering maps. When the main objectives of the analysis was defined and measured, it was preferable to locate new schools areas after doing an assessment for the current located ones , by striding the zoning effects for its surroundings , locating in an area with the highest density of children of an appropriate age based on analysis from available statistics or the available data about the ground water quality .

Input dataset were uploaded for the model for: land use , children population and age per neighborhoods, data for existing schools or wells ,input dataset needed: location of existing schools

Exploring input datasets: After separating down the potential needs into a series of objectives and process models and decided what datasets will be needed, investigate the input datasets to understand their content, thus features within and between datasets are that were important for solving the main objective and data trends .

Establishment of GIS based Multi-Criteria System GIS School System

The conceptual framework was established to three of the prioritized projects , such as the water development , water networks and schools allocation , in this paper the Multi criteria analysis was conducted to the school development projects allocation criteria that was gained through the survey results that were confirmed by experts in the Ministry of Education to have precise weight based on the demands , the criteria was developed and the data were entered into the GIS-Based Multi-criteria analysis based on the previous steps illustrated earlier .

□ Data Input and processing

The data processing of major data of the targeted zones were entered into the system , such as the population density , children density per age disaggregated by neighborhoods, and other data that were relevant to allocate the schools in Gaza city .

The processes as been illustrated above were implemented to form multi-criteria analysis aligned with GIS software to form the multi layers , each of them had its own criteria weights , in addition the layer itself has individuals weights comparing to other data, the overlay weighting was done. Reclassify Process : Thiessen polygons map for schools allocation in Gaza city. Re-

mapping tables was done to define how the values will be reclassified. Reclassify raster files based on criteria values.

Weighted overlay table

The weighted overlay table allows the calculation of a multiple-criteria analysis between several rasters The weighted overlay table allows the calculation of a multiple-criteria analysis between several rasters. The main ranking allocation criteria were as follows: 20% for Student density between 5-9 years, 20% for Student density between 10-18 years, 35% for school density in Gaza city, 25% for Land use criteria in Gaza city.

The figures below indicated the stages that had been conducted to facilitate the final results .The final map shown below indicated the current situation and the proposed allocations of schools based on the multi-weighted criteria and overlay them with multi-weighted layers to form the final stage of the analysis and perform the analysis which took several stages of trial and errors to precisely allocate the zones that needs establishment of new schools for the specific ages based on the targeted population represented data. The map below indicated that Zaiton zone was one of the mostly needy regions of new schools' establishment. This fact was validated by the urban planners and experts in the Ministry of Educations who agreed and validated this results.

CONCLUSION

The study determined a frame work for all INGOS and which used sophisticated tools to analyze and measure multi criteria in indicators levels in master plans of Palestinian strategic plan The Paper formalized a framework that can be implemented by most of INGOs and Governmental Organizations in which they will be able to have a systemic approach in doing any Needs Assessment for urban planning for developmental Projects. The conceptual frame work represented a distinguished reference for many other Palestinian INGOs in targeting the Palestinian society. This study was limited to Gaza governorate including the refugee camps. The projects used in this research will be limited to urban development projects under planning phase to support decision makers in determining the prioritization criteria

The paper visualized a conceptual framework based on a systemic approach in urban planning for developmental Projects. This paper has presented a GIS-based multi-criteria analysis approach to assess site allocation for urban developmental projects.

The results had showed pragmatic shift from the classic

urban planning design to the modern approach. Subsequently, the study determined a frame work for all Governmental and INGOS which used sophisticated tools to analyze and measure multi- criteria in indicators levels in master plans of Palestinian strategic plan .The conceptual frame work represented a differentiated reference for many other Palestinian NGO , local governmental organizations and INGOs in targeting the Palestinian society in effective way while reflecting accurate public needs to develop systematic approach in urban planning and strategic development plans to enable having constant fundraising to the urban developmental projects .

prioritizations procedures that were accomplished in the study had proven track records in developing projects' selection criteria and elaborated the results to improve systematic site allocation strategy aligned with the conceptual framework of the study, which is based on the GIS based Multi-Criteria analysis.

Site Selection Allocation Criteria is a fundamental and comprehensive process that could considerably impact of available resources, factors and constraints .the ten proposed urban developmental projects were ranked based on the survey results , according the highest five prioritized urban projects were ranked in the presence of the sites allocation differentiation , thus the case study was obtained for two sample projects which were highly ranked from targeted population of stakeholders to substantiate the public participation to identify the urgent demands of their respective communities.

This GIS Based Multi-Criteria analysis approach contributed to have easy access to feedback to evaluators, it easy usage for non-experts to recognize, and provides a mechanism of decision making exploration that depended on the variation of criteria weights for different urban project that affected the outcomes and the final results spatially and quantitatively.

The case study had proven the effectiveness of this approach. It helped to recognize the major zones that are suitable locations for schools development.The results will be presented to respective governmental organization and other donors for their consideration in the future

It applies the MCA framework to incorporate stakeholders' assessment and public participation into sites allocation assessment with GIS to determine the overall appropriateness of zones for the establishment of schools .The synthesis of MCA within Arc-GIS environment enhanced the predictable module, advanced the reliability of MCDM outcomes, and broadened GIS functionalities towards the implementation of tool enables decision makers to follow a comprehensive yet comprehensible processes to inspect weight sensitivity in both criteria and geographic allocation.

ACKNOWLEDGMENT

The researcher is grateful for the financial support of the Creative project in Islamic University of Gaza Palestine, funded by Welfare Association and Arabic Monetary Fund.

REFERENCES

- Alemu G (2009). GIS BASED AND ANALYTICAL NETWORK PROCESS BASED MULTI CRITERIA DECISION AID FOR SUSTAINABLE URBAN FORM SELECTION OF THE STOCKHOLM REGION.
- Baptista MNN, Castro LMA, Fernandes W (2007). Multicriteria evaluation for urban storm drainage First SWITCH Scientific Meeting (University of Birmingham, UK).
- Brown C (2012). Sampling methods and sample size calculation.
- Carver SJ (2010). Integrating multi-criteria evaluation with geographical information systems. *International Journal of Geographical Information Systems*, 5:3, 321-339.
- Killpack D, Waltenberger B, Fowler C (2009). Using GIS-Based Tools To Support Decision Making For Marine Reserves. from <http://proceedings.esri.com/library/userconf/proc01/professional/papers/pap981/p981.htm>
- Florent J, F. G. a. A. M. (1998). GIS and Multicriteria Analysis for Land Management. Paper presented at the COST C4 Final Conference
- Florent J, F. G. a. A. M. (2001). Using GIS and outranking multicriteria analysis for land-use suitability assessment. *int. j. geographical information science*, 15, 153-174.
- Lorent J, F. G. a. A. M. (1998). GIS and Multicriteria Analysis for Land Management. Paper presented at the COST C4 Final Conference.
- Mohamed A. AL-SHALABI, S. B. M., & Nordin Bin Ahmed, R. S. (2006). GIS Based Multicriteria Approaches to Housing Site Suitability Assessment GIS Applications(TS 72).
- Olufemi A, Omitaomu, Brandon R, Blevinsa, Warren C. Jochem, Gary T. Maysd, Randy Bellesd, Stanton W. Hadleye, et al. (2012). Adapting a GIS-based multicriteria decision analysis approach for evaluating new power generating sites. [Journal]. EISEVIER, Volume 96, 292-301.
- P. Zander a, & , H. K. (1999). Modelling multiple objectives of land use for sustainable development. EISEVIER, 59, 311±325.
- Randal Greenea, Joan E. Lutherb, Rodolphe Devillersa, & Brian Eddyb. (2010). An approach to GIS-based multiple criteria decision analysis that integrates exploration and evaluation phases: Case study in a forest-dominated landscape. [Journal]. EISEVIER, 260(12), 2102-2114.
- Saaty TL (2007). Decision Making with Dependence and Feedback. RWS Publications.
- Salem Chakhar, VM (2010). SPATIAL MULTICRITERIA DECISION MAKING. EISEVIER, 29, 210-221.
- Sharma S (2010). Prioritization of technologies/Infrastructure -Multi Criteria Decision Analysis Retrieved 20-07-2012, 2012
- Siciliano G (2012). Urbanization strategies, rural development and land use changes in China:A multiple-level integrated assessment. EISEVIER, 29, 165– 178.
- Marrero T, A. G.-T., & T. Scalley a. LB (2012). Multi-Criteria Evaluation and Geographic Information Systems for Land-Use Planning and Decision Making

