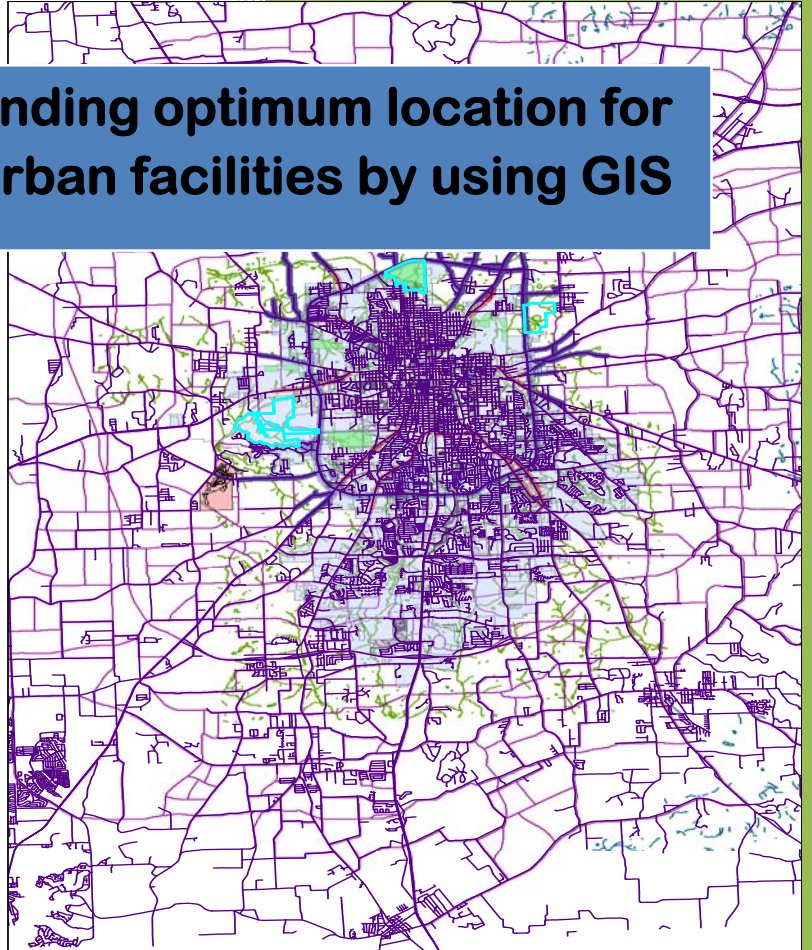


23rd January, 2011

Developing a model for finding optimum location for urban facilities by using GIS



Submitted to:

Dr. Baqer Al-Ramadan, Instructor
Course: Introduction to GIS, CRP-514

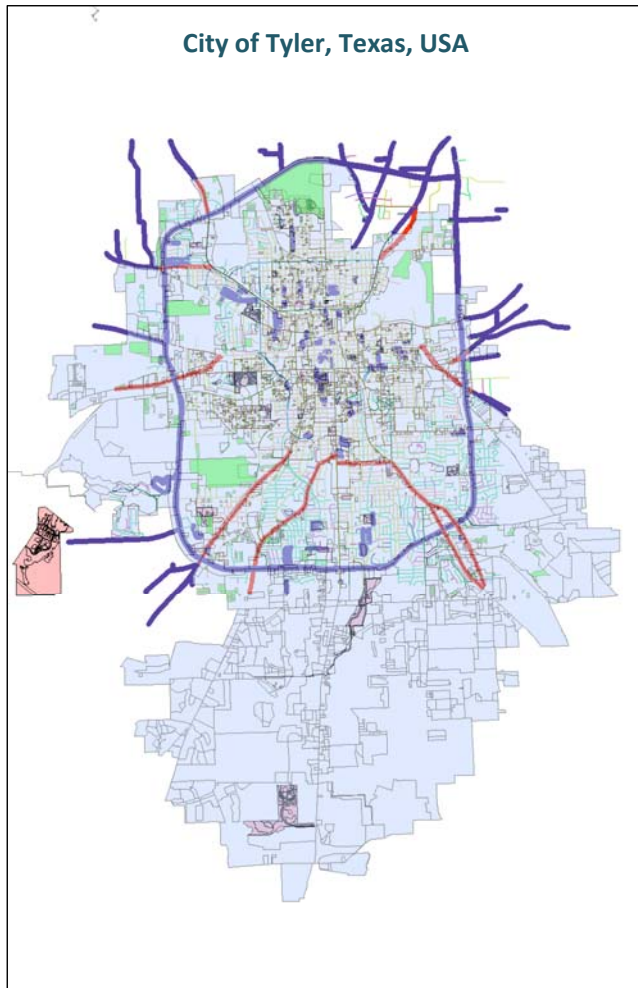
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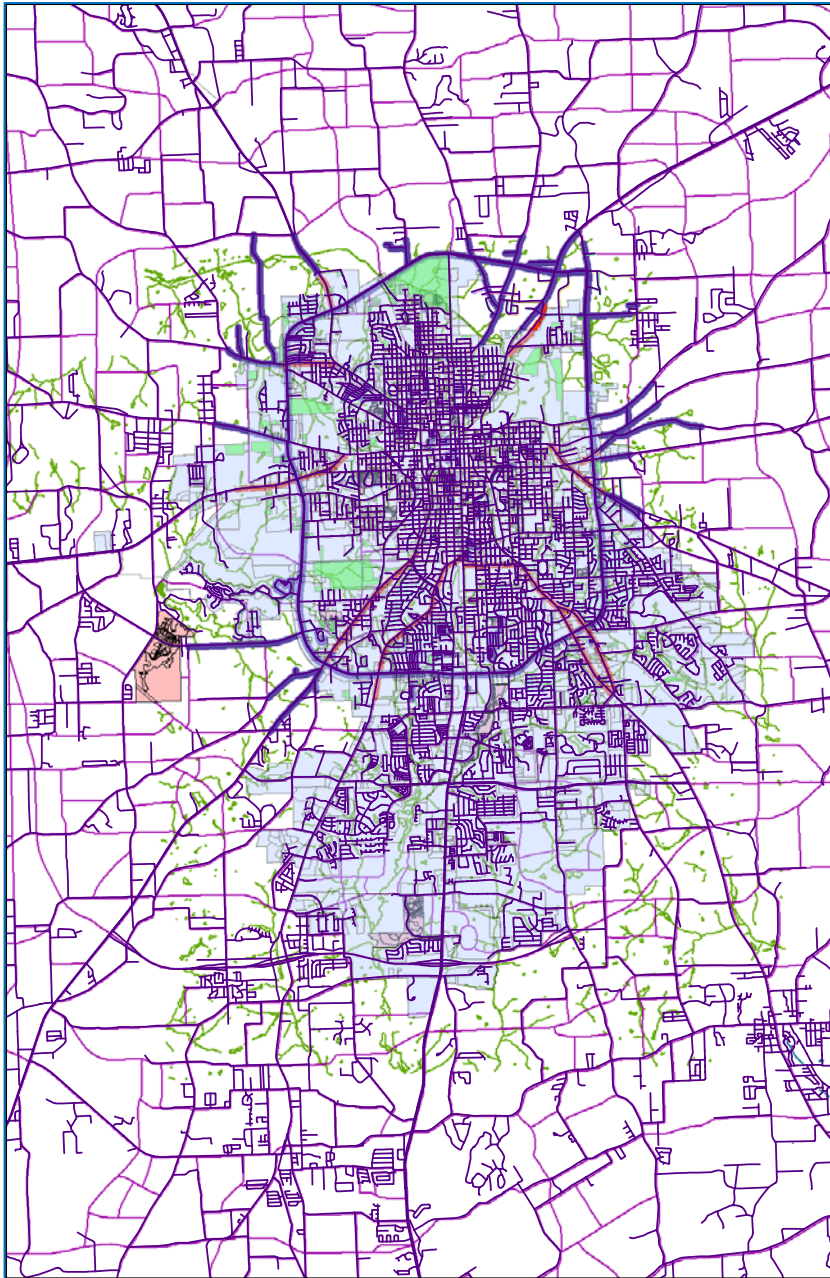
Abstract: Scarcity of land for establishing Airport in most large urban areas is one of the serious and growing potential problems nowadays. Landfill site selection in urban areas is a critical issue due to its huge impact on the economy, ecology, and the environmental health. Therefore, numerous criteria must be considered and the selection process is a complicated since it has to integrate social, environmental and technical parameters. In this study, the most suitable candidate sites for locating a domestic airport, as a case study, area are determined by using an integration of the Geographical Information System (GIS) and Multi Criteria Decision Making (MCDM) method. For this purpose, seven input map layers are prepared by GIS.



Map 1: Study Area

Introduction

Choosing a suitable location for various urban facilities is a gigantic task for city planners and managers because it involves a lot of factors and decision dilemmas like finding and managing land parcels, land prices, connectivity, nature of services, services areas etc. The concept of this model deals with the meeting of possible factors those are involved in choosing optimum location by the technique of GIS as a tool. In this study, the planners of a city have been asked to find out a suitable location for establishing a new domestic airport close proximity to city limit whether the residents of the city can have a easier access to that service. The City of Tyler of Texas is taken as case study to show the model.



Map 2: Represents the major components of the City of Tyler

Objectives

Primary Objective: To build a model for deciding the best possible location on the basis of different criteria.

Secondary Objective: To learn how to use the different GIS tools in respect to real world application.

Scope of the study

Dilemmas arise: The City Tyler municipality wants to provide a new domestic airport proximity to city boundary. Then the Municipality decided to give the responsibility to urban planning division to choose the optimum location in terms of factors involving in decision making process. Now, the Municipal planner wants to find out the optimum location which must meet the following condition or criteria:

- Close proximity to Highway
- Vacant Land
- An area of more than 300 acre

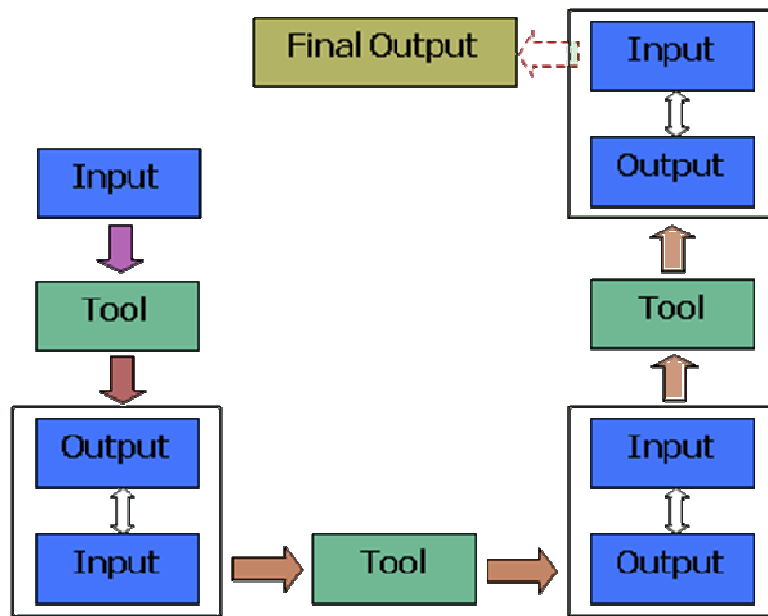


Figure 1: Basic design process

Modeling approach

Basically the model will work on the basis of three factors like input data, tools and output data. To get the final output, there will be several operations until getting desired output. When starting with an input data, an appropriate tool will be used to get the next step output, then this output will further used as input for another process. In this way it will continue until getting the final output that means desired location.

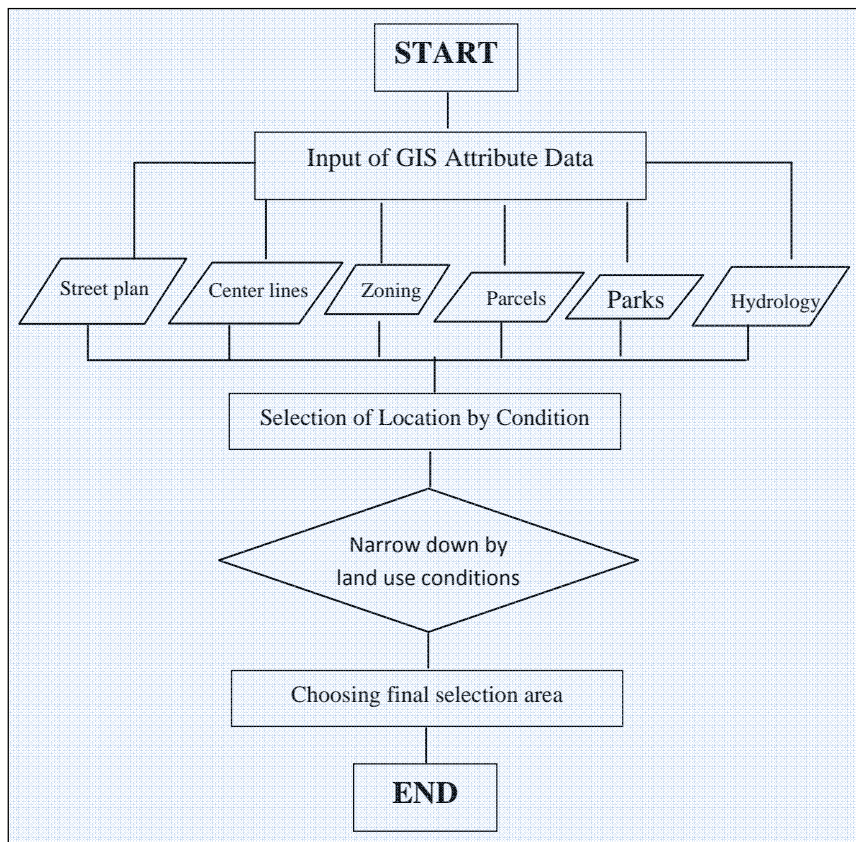


Figure 2: Flow Chart of the study

Input Data

GIS data: City of Tyler, Texas, USA

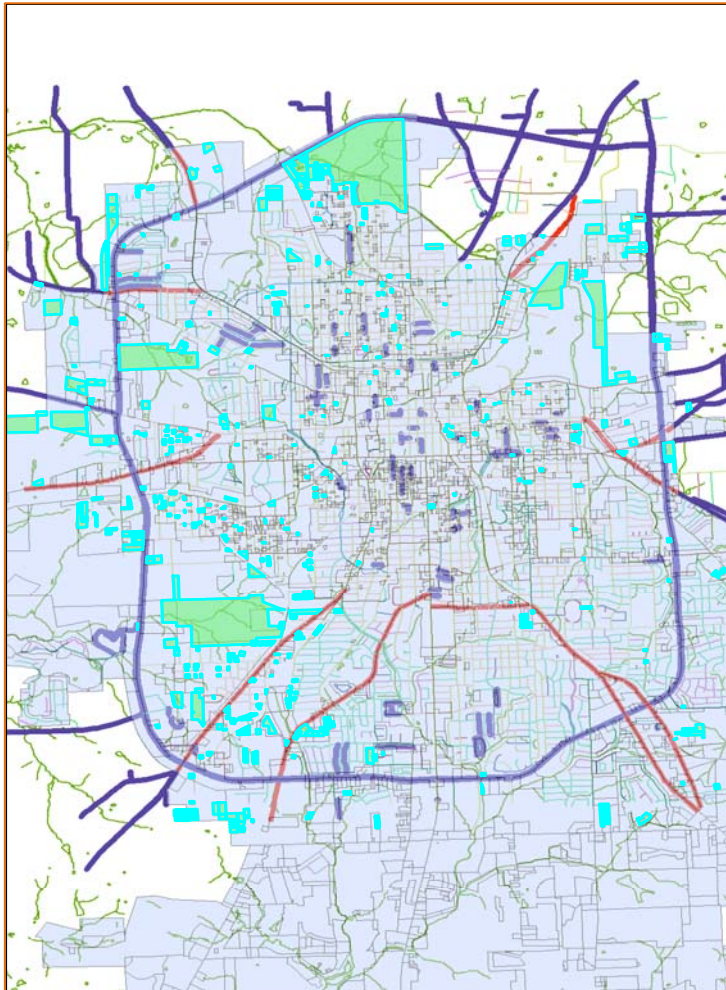
Source: Internet

Data set: shapefiles

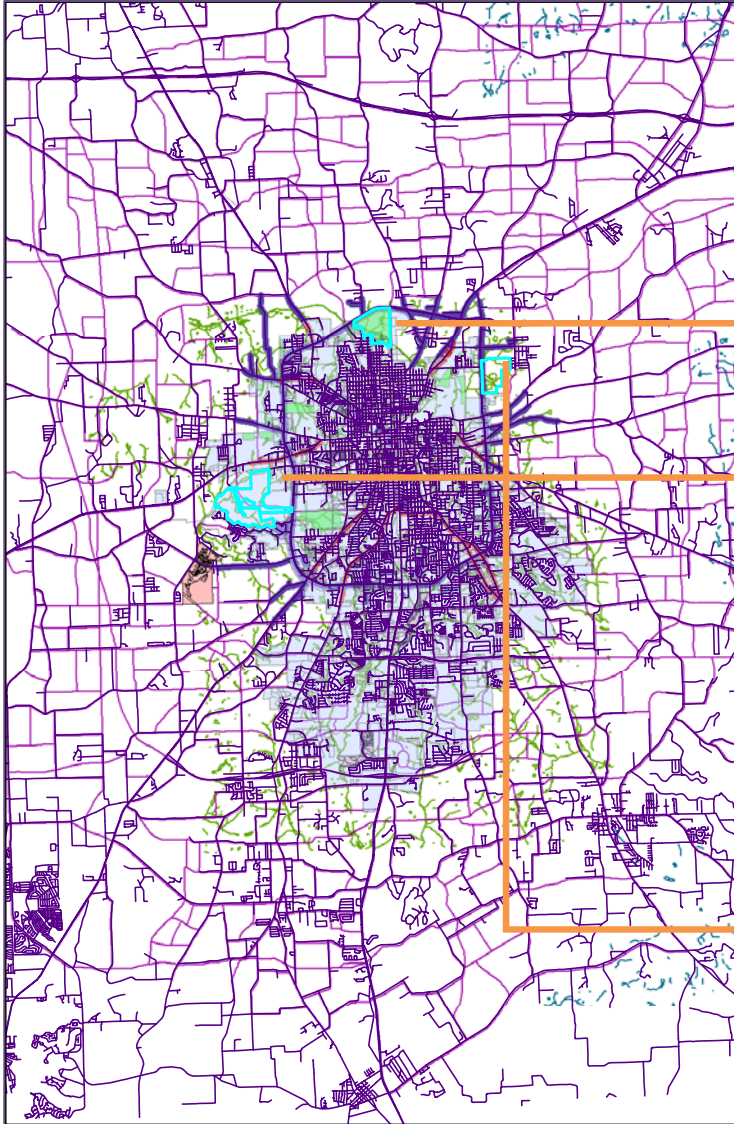
- Street Plan
- Center lines
- Zoning
- Parcels
- Parks
- Hydrology

Use of tools/Exercises

- *Querying Data* including identifying, selecting, finding and hyper-linking features, selecting features by attributes
- *Joining and relating tables*
- *Selecting features by locations* including using location queries, combining attribute and location queries
- *Preparing data for analysis* including dissolving features, clipping layers
- *Analyzing spatial features* including buffering features, overlaying data



Map 3: Represents Buffering of possible locations



Map 4: Represents Potential locations

Final Output

Selecting condition of domestic Airport by using GIS is summarized below:

Firstly, it should be out of the service effective distance area 200 feet proximity to Highway.

Secondly, it should be a vacant land

Thirdly, the size of the plot must be large enough and close proximity to city loop. The finding plots are shown by the map 4. So it is thought that the finding three potential locations could meet the GIS data requirements.

Finally, when it is searched by considering minimum area required by the service, the operation does not support to select any particular location.

Potential Locations

Therefore, the result means that there will be no desired location for Domestic Airport proximity to city boundary. And, the policy maker should search for alternative locations.

Expected Outcome

- This model will help city planners to decide the optimum location of the various services on the basis of evidence
- It reduces the time of decision making process
- Helps alleviating decision dilemmas which are commonly found
- Make sure the proper distribution system among the services
- Helps identifying in the further research, monitoring and evaluation of the infrastructure and services system of existing and future planning process
- Ultimately this model will reduce the municipal budget as it makes sure the balance distribution of the services

References

City Tyler GIS database (<http://www.smithcountymapsite.org/webshare/data.htm>)

Getting to Know ArcGIS desktop, ESRI Press, Redlands, California