School Safety in GIS

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ABSTRACT: *In today's hard and fast life people are becoming more prone to accidents and other similar mishaps. Such reasons prioritize safety for school students. Nowadays, in schools various kind of accidents occur such as injury due to some non-structural and structural disasters like building collapse, electricity, fire accident, road accident or due to increase in criminal activity. These kinds of accidents require some facilities which could be easily solved by police or some disaster management committee.*
For this purpose we have studied around 343 SMC school to know about safety in school. For instant, while electric fire, how students and teachers can use shortest routes and they can contact to the nearest facility centres. So the result of this study may increase school safety.
In this report I am going to show closest facility, shortest route, location-allocation, service area

Key Words:

OBJECTIVE

- To protect learners and education workers from death, injury and harm in school.
- To plan for educational continuity in the face of expected hazards.
- To safeguard education sector investments.
- To strengthen climate smart disaster resilience through education.
- Safe learning facility.
- Focus on education sector

1. INTRODUCTION

Surat is a port city situated on the banks of theTapiriver. Damming of the Tapi caused the original port facilities to close; the nearest port is now in the magdalla and Hazira area of Surat metropolitan region. The city is located at 21°10′N 72°50′E. It has an average elevation of 13 meters. The Surat district is surrounded by the bharuch, Narmada, navsari, to the west is the Camay and the surrounding districts. The climate is tropical and monsoon rainfall is abundant (about 2,500 mm a year). According to the bureau of Indian standard, the town falls under seismic zone-iii, in a scale of I to V in order of increasing vulnerability to earthquakes.

1.1.1Climate

Surat has a tropical savannas climate, moderated strongly by the Sea to the Gulf of Cambay. The summer begins in early March and lasts until June. April and May are the hottest months, the average maximum temperature being 37 °C (99 °F). Monsoon begins in late June and the city receives about 1,200 millimetres (47 in) of rain by the end of September, with the average maximum being 32 °C during those months.
Since the 20th century, Surat has experienced some 20 floods. In 1968, most parts of the city were flooded and in 1994 a flood caused a country-wide plague outbreak, Surat being the epicenter.

2. STUDY AREA

In Surat, almost all disaster possible and there are also 346 SMC Schools. There is also a disaster in there. The epicenter of the plague was Surat, Gujarat. The release of water from Ukai Dam resulted in flooding of up to 1 foot of water in some areas of Surat (2013). So that's why I found Surat area.

Fig.1 study area

3. METHODOLOGY

- ❖ Import excel data in to arc map
- ❖ Data download
- ❖ Add road shape file
- ❖ Clipping the road shape file
- ❖ creating a network dataset
- ❖ finding the best route using network dataset
- ❖ finding the closest fire station
- ❖ choosing school sites using location –allocation

- ❖ **Data download:**
- ● I downloaded my road shape file from http://www.diva-gis.org. Vector data is very useful in this case.
- ❖ **What is vector data usage?**
- ● A representation of the world using points, lines, and polygons. Vector models are useful for storing data that has discrete boundaries, such as country borders, land parcels, and streets.
- ● Vector data involves storing data as geometric objects. For example, a road can be represented as a combination of lines. In this case, the lines are the objects.
- ● A vector data can be thought of as an object described using mathematical notations. Vector data is represented as a collection of simple geometric objects such as points, lines, polygons, arcs, circles, etc.
- ● For example, a city may be represented by a point, a road may be represented by a collection of lines, and a state may be represented as a polygon.

4. CHARACTERISTIC OF DATA SOFTWARE USED

Build Maps

Use maps to visualize, summarize, analyze, compare, and interpret spatial data in both 2D and 3D environments. Maps are the primary user interface for your professional work.

Understanding how to find route

When you want to know how to get somewhere, a map can provide a lot of information. Particularly if you're a business that has more than one stop to visit, it's often impossible to choose the most efficient route just by looking at a map.

The **Find Route** dialog box can help you:

- Find the quickest way to get somewhere or the quickest way to visit several locations.
- Determine the best sequence to visit those stops.
- Make a map showing the quickest travel route.
- Create a list of travel directions to use when driving a route and calculate the approximate driving time.

You can make a list of the stops to be calculated along your route in several ways. Use one of the following methods or a combination of several:

- Pointing and clicking on the map
- Entering the address and ZIP Code of the stop
- Choosing a point layer of stops
- Selecting a point feature or features
- Selecting a point graphic or graphics

To use the **Find Route** dialog box, click the **Find Route** button on the **Tools** toolbar.

The find route dialogue box

The **Find Route** dialog box allows you to find routes between stops using a variety of methods. You can find an optimized route, which is the most efficient travel route between the stops you define, or you can find a route from stop to stop based on an order you specify. You can also place barriers on the street network to define where a route cannot travel through.

The **Find Route** dialog box has four tabs: **Stops**, **Barriers**, **Directions**, and **Options**.

Stops

On the **Stops** tab, you can define the stops by typing the street address (the **Find** dialog box is used for this), clicking the map with your mouse pointer, adding them from a point layer, or adding graphic points. You can also change the order of the stops, save stops, load saved stops, and have the route return to a stop upon completion. Each stop can also be assigned a stop duration and a time window, which will affect the driving time when the trip start time is specified in the **Options** tab.

Barrier

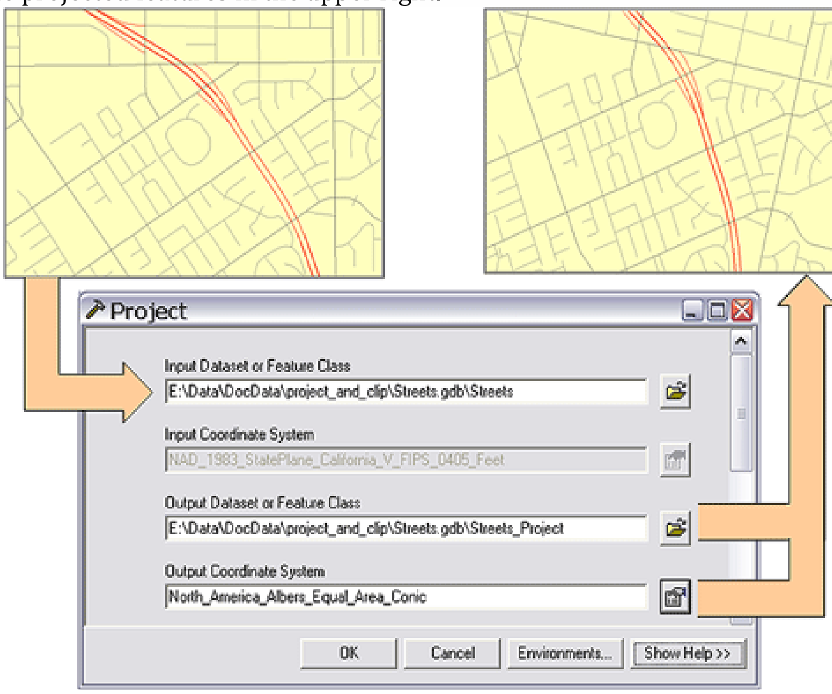
On the **Barriers** tab, you can also define the barriers by typing the street address, clicking the map with your mouse pointer, adding them from a point layer, or adding graphic point.

Automating data management tasks: Project and Clip

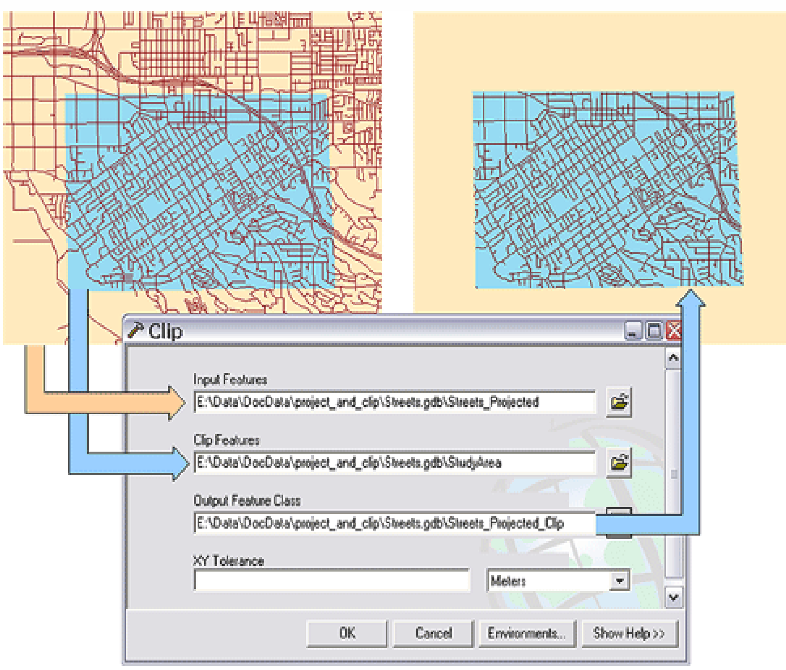
The example workflow below uses two geoprocessing tools, Project and clip. This is but one example of an infinite number of tasks you can automate with geoprocessing.

Suppose you've received 20 shape files from a colleague, and they're in different map projections and contain lots of features that are outside your study area. Your task is to change the map projection of each of the 20 datasets, remove the extraneous features ("clip" the datasets), and put them all into a file geodatabase.

By far the easiest way to accomplish this task is to use geoprocessing. First, you would use the geoprocessing project tool, which applies a new projection to an input feature class to create a new output feature class. The illustration below shows the Project tool dialog box with its input features shown in the upper left and the projected features in the upper right.



The second step is to use the geoprocessing clip tool to clip the data that falls outside your study area. The Clip tool takes two inputs, a feature class of any type (point, polyline, polygon) and a polygon feature class (the clip feature class), and creates a new feature class of just those features that fall inside the clip polygons.

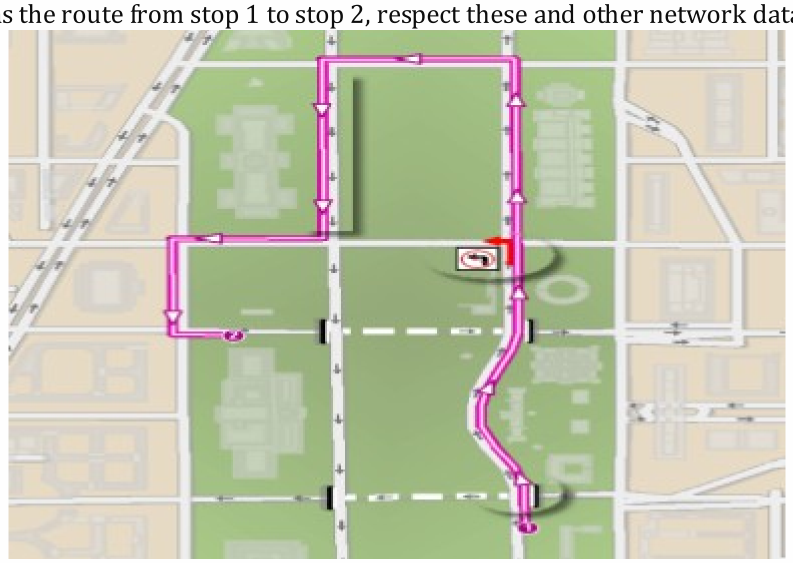


- **Arc GIS network analyst extension**
  - Drive-time analysis
  - Point-to-point routing
  - Route directions
  - Service area definition
  - Shortest path analysis
  - Optimum route analysis
  - Closest facility analysis
  - Location-allocation analysis

Network dataset

Network datasets are well suited to model transportation networks. They are created from source features, which can include simple features (lines and points) and turns, and store the connectivity of the source features. When you perform an analysis using the ArcGIS Network Analyst extension, the analysis always happens on a network dataset.

A network dataset models the street network shown in the graphic below. The graphic highlights that one-way streets turn restrictions and overpasses/tunnels can be modelled. The analyses that are performed on the network, such as the route from stop 1 to stop 2, respect these and other network dataset properties.

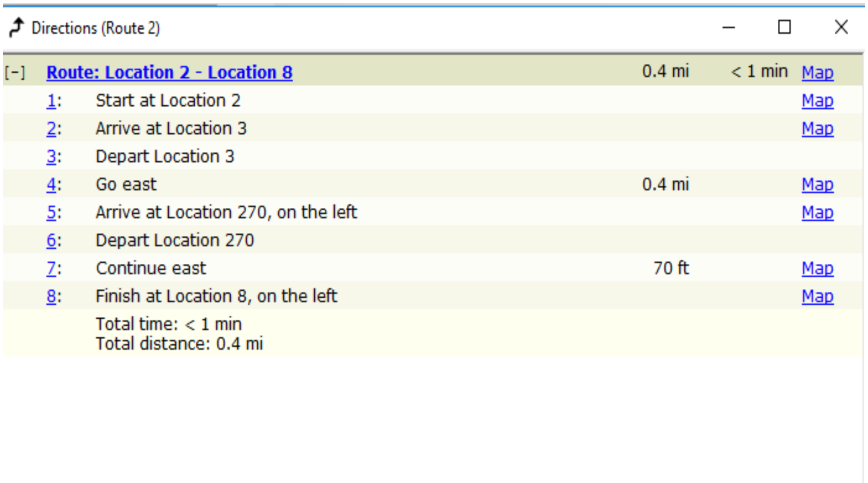


5. RESULT

- **Route**

Fig.2 shortest route output

- **Route direction**



Directions (Route 2)

[-]	Route: Location 2 - Location 8	0.4 mi	< 1 min	Map
1:	Start at Location 2			Map
2:	Arrive at Location 3			Map
3:	Depart Location 3			
4:	Go east	0.4 mi		Map
5:	Arrive at Location 270, on the left			Map
6:	Depart Location 270			
7:	Continue east	70 ft		Map
8:	Finish at Location 8, on the left			Map
	Total time: < 1 min Total distance: 0.4 mi			

- **Shortest path:**
  - One common type of network analysis is finding the shortest path between two points. In a network of streets, the shortest route can either refer to different variables, such as distance and time.
  - Finds the minimum cumulative impedance between nodes on network.
  - Shortest path analysis can hep
    - An emergency service connects a dispatch station.

- **Closest Facility**

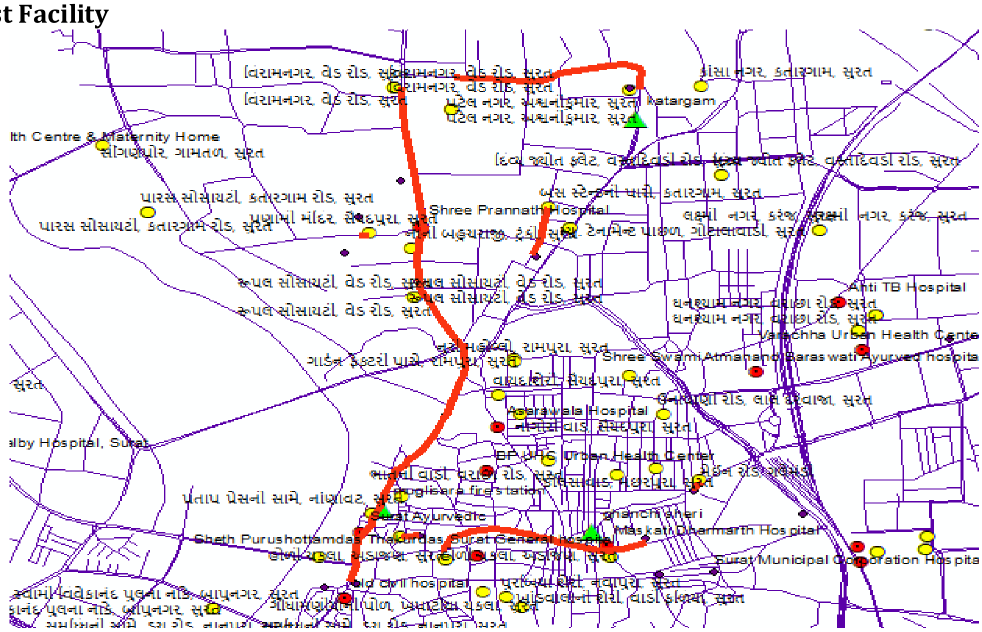


Fig.3 closest facility output

- **Closest Facility**
  - Find nearest hospital, police station6, fire station to any location on a network. Now days this facility is also available as part of location based service on a GPS based enabled cell phone.
  - Types of shortest path analysis which finds the closest facility.
  - The closest facility algorithm computes the closest path from the select location all candidate facilities and chooses the closest facility among the candidate facilities

- **Location allocation**

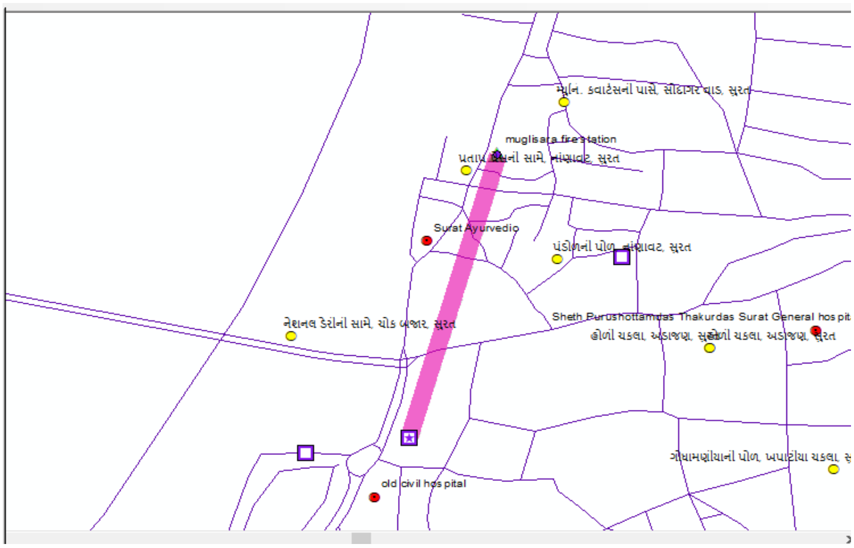


Fig.4 Location allocation output

- **Location allocation**
  - Distance measures between the supply and demand are often included in a distance matrix or a distance list.
  - Distance may be measured along the shortest path between two points on a road network or along the straight line connecting two points.
  - In location-allocation analysis shortest path distance are likely to yield more accurate results than straight-line distance.
  - Location is often considered the most important factor leading to the success of a public sector organisation. Public sector facilities such as school ,hospitals fire station can provide high quality service to the community at a low cost when good location chosen.
- **Service area index**

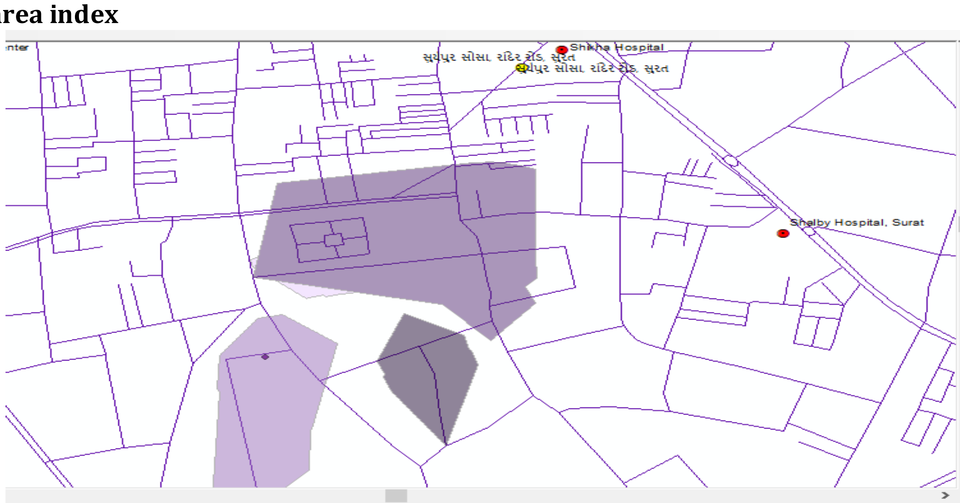


Fig.5 service area output

- **Service area Index**
  - You can find service area around any location on a network.
  - A network service area is a region that encompasses all accessible streets (street that are within specified impedance).
  - For instance, the 10 –minutes service area for a point on a network includes all the streets that can be reached within 10 minutes from that point.

6. CONCLUSION

A Safe learning environment is essential for student of all ages.

School transportation planners and policy makers at all levels should analyze transportation risk comprehensively in their decision making related to school travel.

Using a systematic risk management framework, school should identify the risk factor most salient for the modes of school travel used by children in their community and identify approaches that can be used to manage and reduce those risks, including shifts to safer modes and safety improvements within each mode.

Each school and even school within a district will have different conditions and requirements that will affect school travel risk and the choices of official and parents for reducing those risks.

7. REFERENCES

- Bejleri, Ilir, Ruth L. Steiner, Allison Fischman, and Jeffrey M. Schmucker. 2011. "Using GIS to analyze the role of barriers and facilitators to walking in children's travel to school." Urban Design International 16, no. 1: 51-62. Accessed October 9, 2016.
- Boarnet, Marlon G., Craig L. Anderson, Kristen Day, Tracy McMillan, and Mariela Alfonzo. 2005. "Evaluation of the California Safe Routes to School legislation: urban form changes and children's active transportation to school." American journal of preventive medicine 28, no. 2: 134-140. Accessed October 9, 2016.
- http://en.m.wikipedia.org
- http://www.diva-gis.org.
- https://spatial.usc.edu
- http://shodhganga.inflibnet.ac.in