THE 10TH INTERNATIONAL CONFERENCE ON ASIA GIS

ASIA GIS

THAILAND 2014

16-17 June 2014

At Lotus Hotel Pang Suan Kaew, Chiang Mai, THAILAND

Final Program

AsiaGIS Association

GISTDA

TECHNICAL PROGRAM

Monday, June 16

13:30-14:50, San pa Tong Room

A1: Spatio-temporal statistics and analysis for moving objects

086
Geospatial Analysis of Poverty Incidence in Pasay City, Philippines using Ordinary Least Squares and Geographically Weighted Regression
Ariel C. Blanco

101
Spatial and Temporal Variations of PM2.5 in China
Yulian Yang

052
Spatial Fishing Migration Patterns of Squid Fishermen at Salura Island Indonesia
Dewi Susiloningtyas

058
3D Reconstruction of Canal Profiles Using Data Acquired from Teleoperated Boat
Supannee Tanathong

13.30-14.50, San Pa Tueng Room

A2: Geo-big data management and mining

003
Data Management for Large-Scale Trajectory Data Analysis using Hadoop/Hive with Spatial Enablement
Apichon Witayangkurn

032
A Pattern Matching Method for Extracting Road Traffic Information from Web Texts
Peiyuan Qiu

039
Domain vocabulary generated by academic paper database in geographic information science
Masafumi Ono

094
Integrating 3D Space-Time Visualisation with Online Analytical Processing and Data Warehouse
Garavig Tanaksaranond

13:30-14:50, San Pa Liang Room

A3: Laser scanning and UAV/Location based services (LBS)

011
Utilizing GIS Data In A Modeling And Simulation Tool For UAV Mission Planning
Nirut Chalainanont

060
LiDAR height transformation with Geoid surface modeling using interpolation method in Bangkok metropolitan area
Worapod Masiri

076
Complex Building Model Generation through Integrating LiDAR and Aerial Photos
Ruifang ZHAI

020
DEVELOPMENT OF KARACHI GIS USING LOCATION BASED SERVICES (LBS)
Aamir Ali

036
An improved index mechanism for efficient POI search in Location Based Service
Zhan-Ya Xu

15:10-16:50, San pa Tong Room

B1: GIS for Environmental Resources & Management

022
Analysis of Spatio-Temporal for Flood Inundation Area Using MODIS Images For Chao Phraya River Basin of Thailand
Hyung-Jin Shin

031
Public Participation Spatial Decision Support System For Integrated Watershed Management
Rong-Kang Shang

041
Mapping Groundwater Potential Zones using Analytic Hierarchy Process (AHP) in Banteay Meanchey Province, Cambodia
Sainglong Kaing

068
IMPROVING IRRIGATION MONITORING SOFTWARE WITH GEOGRAPHIC INFORMATION
Phagasinee Boottho

077
BASIN WATER ENVIRONMENTAL EFFECTS OF URBAN LANDSCAPE
Wang Guilin

Tuesday, June 17

11.00-12.20, Pa Sak Luang Room

D1: GIS for transportation applications

006
GPS Enabled Taxi Probe's Big Data Processing For Traffic Evaluation Of Bangkok Using Apache Hadoop Distributed System
Saurav Ranjit

054
Potential For Fire Emergency Response System In Urban Area Base On GIS Technology
Thoa Nguyen

048
The Analysis and Inspiration from Monalisa Maritime Project of EU
Peng Guojun

100
Estimate Highway Traffic Demand using Large Scale Mobile GPS: A Case Study of Japan Highway Networks
Teerayut Horanont

044
Ground Deposition Mapping of 137Cs Discharged from Fukushima Daiichi Nuclear Power Plant
Nobuhiro Sawano

11.00-12.20, San Pa Tong Room

D2: GIS for Environmental Resources & Management

037
Analysis on Rainfall and Dry spell Probability and Change in Decade for the Upper North of Thailand
Wilasluk Wongwai

093
URBAN GROWTH USING REMOTE SENSING AND SPATIAL METRICS
Suwannee Wutthiwong

123
From Social media information to VGI: mining data from Weibo when in an emergency
Chao Yang

133
Hierarchial Polygonization Method in Automatic GIS-T Information Generation and Updating from Road Marking Database
Anthony G.O. Yeh

136
Groundwater Exploration Using Fuzzy Logic Approach in GIS, Area around an Anticline, Fars Province, Iran
Rafati, S

054

Potential For Fire Emergency Response System In Urban Area Base On GIS Technology

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Linh Thuy Nguyen[c]
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Urban fire is one of the most disturbing problems not only for developing countries but also for developed countries and, in Vietnam very large amount of property and lives are unfortunately destroyed by fire annually. It was against this background that the Department of Fire Prevention and Fighting (DFPF) was established to control fire outbreaks and, since its inception, it has embarked on programs and activities to educate the public on fire safety and prevention measures while fire stations were established in the major cities. In spite of the modern techniques of fire prevention and suppression, urban fires continue to damage properties. Thus, effective handling of these fires requires an effective planning response system on a regional scale. The objective of this paper is therefore to establish a GIS (Geographic Information System) based fire emergency response services where DFPF can identify the optimal route from its location to any fire incident. Since access to a fire incident and timely intervention play a crucial role in managing urban fire, the optimal route was modeled based on the distance of travel, time of travel, the slope of the roads and the delays in travel times. Besides using this analysis to timely respond to urban fire emergency services, DFPF could perform analysis on the number and spatial distribution of fire water hydrants. It is now possible to query the location of a fire water hydrant and its conditions, whether functioning, in high or low pressure or disconnected from water source. The developed fire information system could also be spatially joined to the building and cadastral parcel database for more comprehensive decision support system.

Keyword: GIS Technology, Fire Emergency Response, Urban

POTENTIAL FOR FIRE EMERGENCY RESPONSE SYSTEM IN URBAN AREA BASE ON GIS TECHNOLOGY

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ABSTRACT

Urban fire is one of the most disturbing problems not only for developing countries but also for developed countries and, in Vietnam very large amount of property and lives are unfortunately destroyed by fire annually. It was against this background that the Department of Fire Prevention and Fighting (DFPF) was established to control fire outbreaks and, since its inception, it has embarked on programs and activities to educate the public on fire safety and prevention measures while fire stations were established in the major cities. In spite of the modern techniques of fire prevention and suppression, urban fires continue to damage properties. Thus, effective handling of these fires requires an effective planning response system on a regional scale. The objective of this paper is therefore to establish a GIS (Geographic Information System) based fire emergency response services where DFPF can identify the optimal route from its location to any fire incident. Since access to a fire incident and timely intervention play a crucial role in managing urban fire, the optimal route was modeled based on the distance of travel, time of travel, the slope of the roads and the delays in travel times. Besides using this analysis to timely respond to urban fire emergency services, DFPF could perform analysis on the number and spatial distribution of fire water hydrants. It is now possible to query the location of a fire water hydrant and its conditions, whether functioning, in high or low pressure or disconnected from water source. The developed fire information system could also be spatially joined to the building and cadastral parcel database for more comprehensive decision support system.

Keywords: gis technology, fire emergency response, urban

INTRODUCTION

Hanoi is the capital of VietNam, is central economic, political, cultural, scientific and is an important traffic hub of the country. In recent years, the city has appeared many new town, sector of economy, shopping areas, the amusement parks, commercial centers ... With the rapid increase of social and economic activities in the urban areas, the urban fire accidents occur more and more frequently, did a lot of damage to human and property . In Vietnam, the losses of human and property destroyed by fire each year is estimated to nearly 800 billion Vietnam (2013). Thus, the role of the fire service becomes more necessary.

The mission of the fire service is to protect life, property, and natural resources from fire and ther emergencies. Fire prevention and suppression not only is the task of the police force but also the responsibility of the whole population. Previously, the traditional fire service mode was manual processing, but nowaday, with the development of science and technology, requiring the modernization in urban fire response systems. The fire service must use the best tools, techniques, and training methods to meet public expectations. One emerging tool that is helping the fire service optimize emergency services delivery is geographic information system (GIS) technology.

Currently, in the world, the developed countries applied modern technology for the fire service. In particular, GIS data model to serve the Fire Service Fire / HAZMAT ESRI is recognized that have a full range of nescessary factors. The model includes the basic functions: first response, Locate Security Incident, route to location, Provide Resource/Responder information, Access Tactical Information, preplain, floor plan, collect images/pictures, aerial Imagery, Facility Sensor and video feeds, incident management, support incident command systems, Expand to thực across Boundaries, Understand resources, Access information related to the facility, display other data, GPS track resources through data, fire prevention, fire educators...In VietNam, the fire deparments are not yet widespread application of the information technology for fire preventtion and suppression. December 2012, in HoChiMinh city, the Department of Fire Prevention and Fighting performed the subject: building the fire water network based on GIS technology in collaboration with centre for reaearch and application GIS in HoChiMinh city.

Therefore, the objective of this paper is to investigate the possibility of application of GIS to build databases and propose the quick solutions to support mitigation, response, tracking, incident management and fighting fire. When a fire occurs, from the moment an emergency call is received, GIS helps reduce critical time and increases efficiency. This white paper will examine how GIS technology is helping the fire service meet the needs of the community more efficiently than ever.

MATERIALS AND METHODS / EXPERIMENTAL

1. The Study Area

As stated earlier, in this study, the areas centre of HaNoi city in VietNam was selected as the pilot area for the establishment of a spatial fire database based on GIS and as the basis of sample spatial queries in support of emergency fire response. These are 3 districts in HaNoi: Cau Giay, Dong Da, Thanh Xuan.

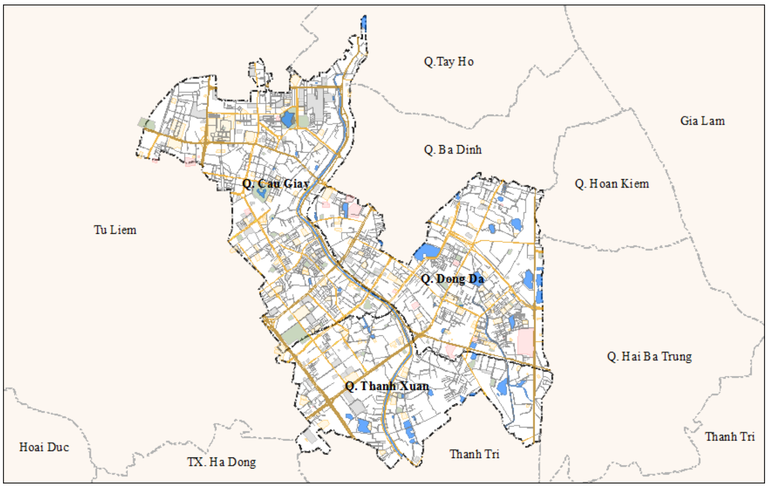


Figure 1: Geographic Location of the study areas

2. Data input

Data in the study mainly consists of the following thematic layers: Digital topographic maps of the study areas with layers: transportation (Streets/roads), hydrological data/ drainage (river networks, water resourse), administrative boundaries, population centres… , DGN format (Microstation), shp format (shapefile), download from http://downloads.cloudmade.com. Beside, the special subject incluses: fire station, fire hydrants locations, police station locations, hospital locations, fire incident/ fire spot.

The spatial information of topographic maps was collected, digitized, supplemented by integrating Google map in ArcGIS. The data which had not been updated for some time had to be updated.

With the fire spot data, determining and updating the information about: location, time, the cause, incendiary substance, the extent of damage. Fast, accurately locating fire spot is the basic for fire – fighting. Besides, the special subject is the fire prevention and suppression system. The fire hydrants locations were determined by GPS (Global Position System) technology. To collect this data, the research team had some days in the field, survey over the streets in CauGiay district, Thanh Xuan district, Dong Da district.

Attribute (inon-spatial data) information such as the shape, the description of the location, status and the condition of each fire water hydrant was integrated into the Geodatabase. Attribute information such as volume of traffic, type of road, width of road and speed limit, average time delay at road junctions and turns were also obtained from a field survey and from available data. The distances of the various roads in the study area was derived from the digitized roads map.

3. Research methods

When the fire accident occurs, what is the fastest route from fire facility to accident site, and from there to nearest hospital? To answer questions like those listed above, requiring the network dataset such as: traffic network, fire engine, fire station, the hospital and so on. This network is used, among other things, to build an efficient fire response system for the study area. After, the user can perform network analyses by Network Analyst tool in ArcGIS. It helps managers, researcher, the fire department and other organizations run their operations more efficiently and make better strategic decisions.

Network analyst is one of the main functions of GIS. It is used to analyze problems such as route, closet facility, service area. The optimal route was determined from one origin to many destination. ArcGIS Network Analyst can find the best way to get from one location to another or to visit several locations. Finding the closest hospital to an accident, the fire department to fire incident are all examples of closest facility problems. When finding closest facilities, we can specify how many to find and whether the direction of travel is toward or away from them. Once we've found the closest facilities, we can display the best route to or from them, return the travel cost for each route, and display directions to each facility. With Network Analyst, we can find service areas around any location on a network. A network service area is a region that encompasses all accessible streets, that is, streets that lie within a specified impedance. For instance, the 10-minute service area for a facility includes all the streets that can be reached within 10 minutes from that facility.

4. Processing

To perform a network analysis, the research team worked with a network analysis layer, which contains network analysis classes and objects. This section of the paper describes what these analysis components are and how to work with them. It also presents an overview of the various Network Analyst options that are available when working in ArcMap. With background geographic information (transportation, hydrological data, boundaries, population layers) can be selected and displayed (overlaid). These layers are linked to data tables that contain detailed information about the geographic features being displayed.

As previously stated , network analysis often involves the minimization of a cost (also known as impedance) during the calculation of a path (also known as finding the best route). Common examples include finding the fastest route (minimizing travel time) or the shortest route (minimizing distance). Time and distance (meters) are also cost attributes of the network dataset. Thus, the optimal route (also called the least cost path) is the path of lowest impedance or the lowest cost.

In GIS, a street layer is often represented as a series of lines that intersect on the map, creating a GIS street network. Each street line segment between intersections contains attribute information such as road type, distance, and travel speeds (miles or kilometers per hour). In addition, one attribute about restrictions were also considered in this study. A field called “oneway” was added to the attribute table of the road feature class and was indicated according to the pattern of digitizing. Besides, to model overpasses or tunnels, using true elevation values from geometry or using logical elevation values from elevation fields. The Streets feature class has logical elevation values stored as integers in the F_ELEV and T_ELEV fields. If two coincident endpoints have field elevation values of 1, for example, the edges will connect. However, if one endpoint has a value of 1, and the other coincident endpoint has a value of 0 (zero), the edges won't connect. In summary, the research team set up some attributes for road layer: Meters, Minutes, Oneway, RoadClass, TravelTime. F_ELEV and T_ELEV. And after preparing all nescessary data, we performed some steps: creat a network dataset, find the closest fire stations, calculate service areas by Network Analyst tool.

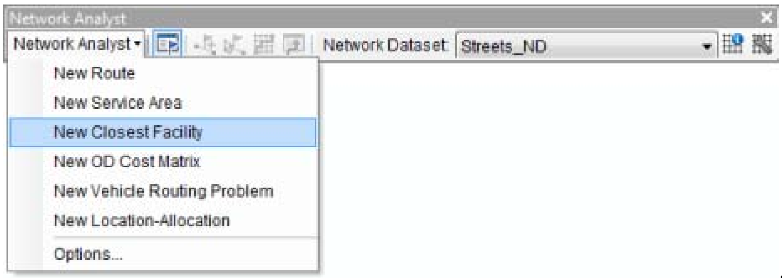


Figure 2: The analysis layers in Network analyst toolbar

RESULTS AND DISCUSSION

In the study, we established fire Geodatabase based on GIS (figure 3) and carried out the network analyse.

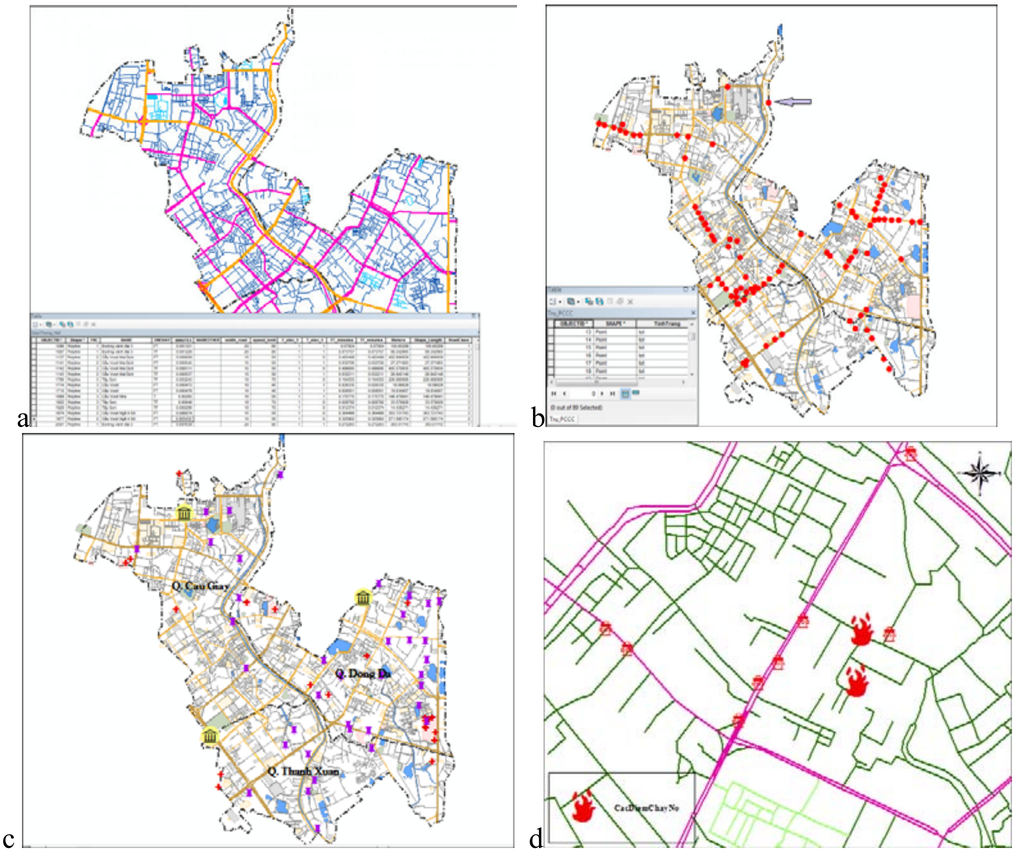


Figure 3: a)Screenshot of roads and b) Screenshot of fire hydrant and c) Screenshot of fire station and d) Screenshot of fire incident

With data was created, queries could be made to locate fire incident on the GIS interface within a particular service area (Figure 3d). Also, the fire service personnel can further make analysis to locate the closest fire hydrant (Figure 3b) without having to memorize the location of these hydrants in the study area and in the fire incident scene.

As mentioned earlier, Network analyst was used to execute some problems: find the fire stations that can provide the quickest response to a fire at a given address, generate routes and driving directions for the firefighters to follow (the shortest and fastest route from a fire station to a fire incident); find nearest hydrant locations (include fire hydrant, the lake, the canal…) ; create a series of service area polygons that represent the distance that can be reached from a facility within a specified amount of time (in this study, we calculated 2-, 4-, and 6- minute service areas from a fire station to a fire incident and calculated 1000-, 2000-, and 5000- meter service areas). The results presented in figure 4,5 and 6:

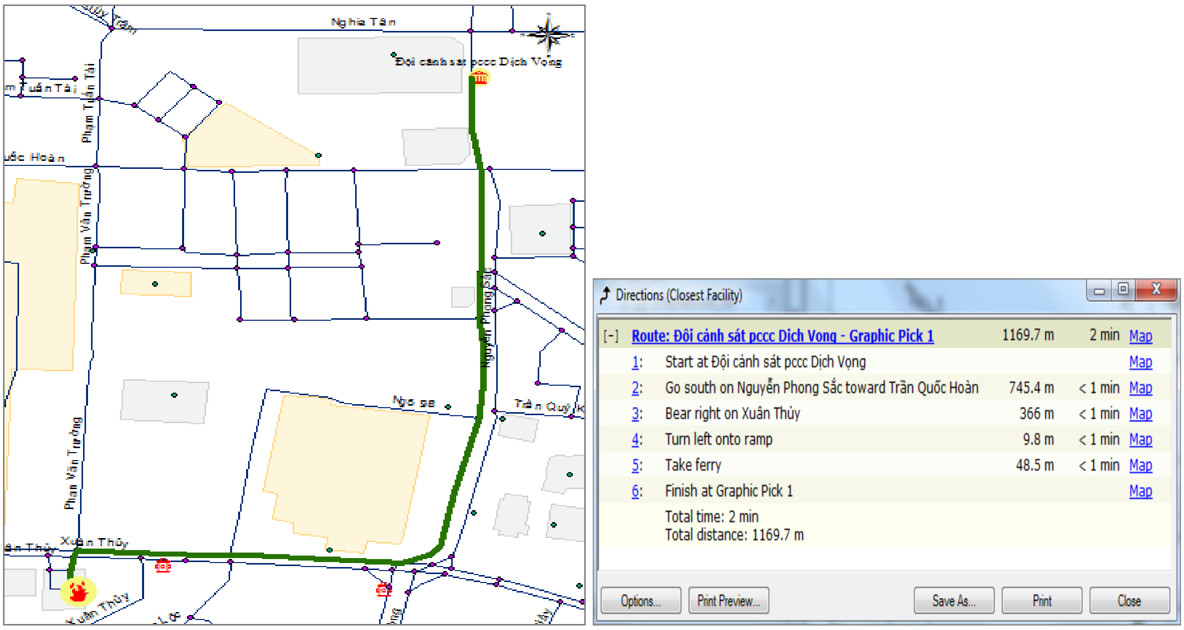


Figure 4: Displaying the optimal route from the fire station to a sample address on fire

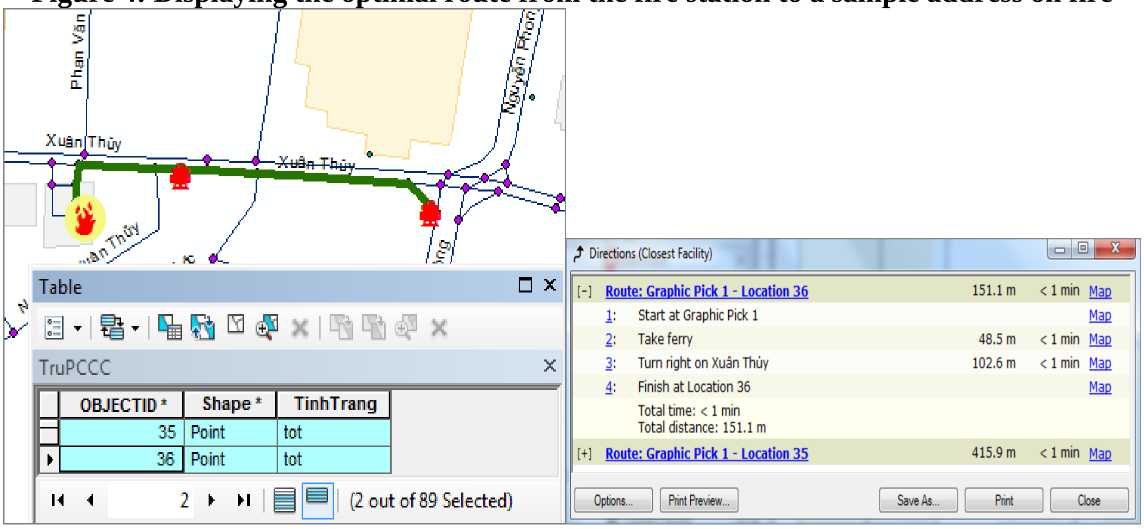
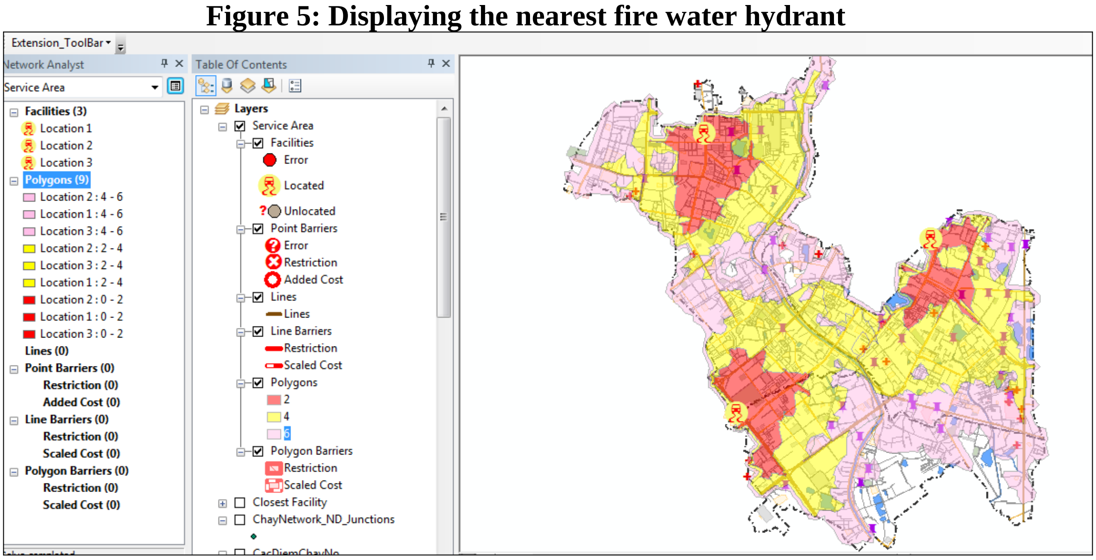


Figure 5: Displaying the nearest fire water hydrant



6a.

6b.

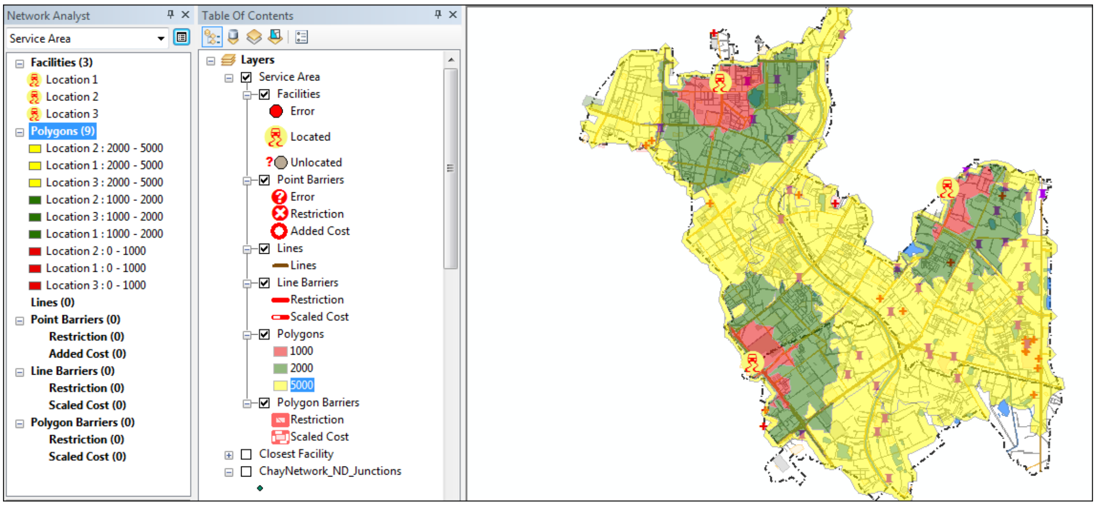


Figure 6: a) Displaying the service area polygon based on driving time
b) Displaying the service area polygon based on the length of the route

CONCLUSION

The fire service mission is to assist the public in the protection of life and property by minimizing the impact of fire, medical emergencies, and potential disasters or events that affect communities and the environment. GIS technology is being deployed in a number of other emergency response areas to increase efficiency and reduce time and provide higher-quality decision support information and data. It brings additional power to the fire personnel whereby hazards are evaluated, service demands are analyzed, and resources deployed.

In this study, the urban fire response system has been in the main fulfilled. The research team provides a useful decision support system to determine the optimal route for emergency response and geospatial analysis on fire water hydrants. Furthermore, data for fire service system will provide the nescessary information for Department of Fire Prevention and Fighting, allow commanders and fire fighters to respond to fire emergency quickly and take action correctly.

ACKNOWLEDGEMENT

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