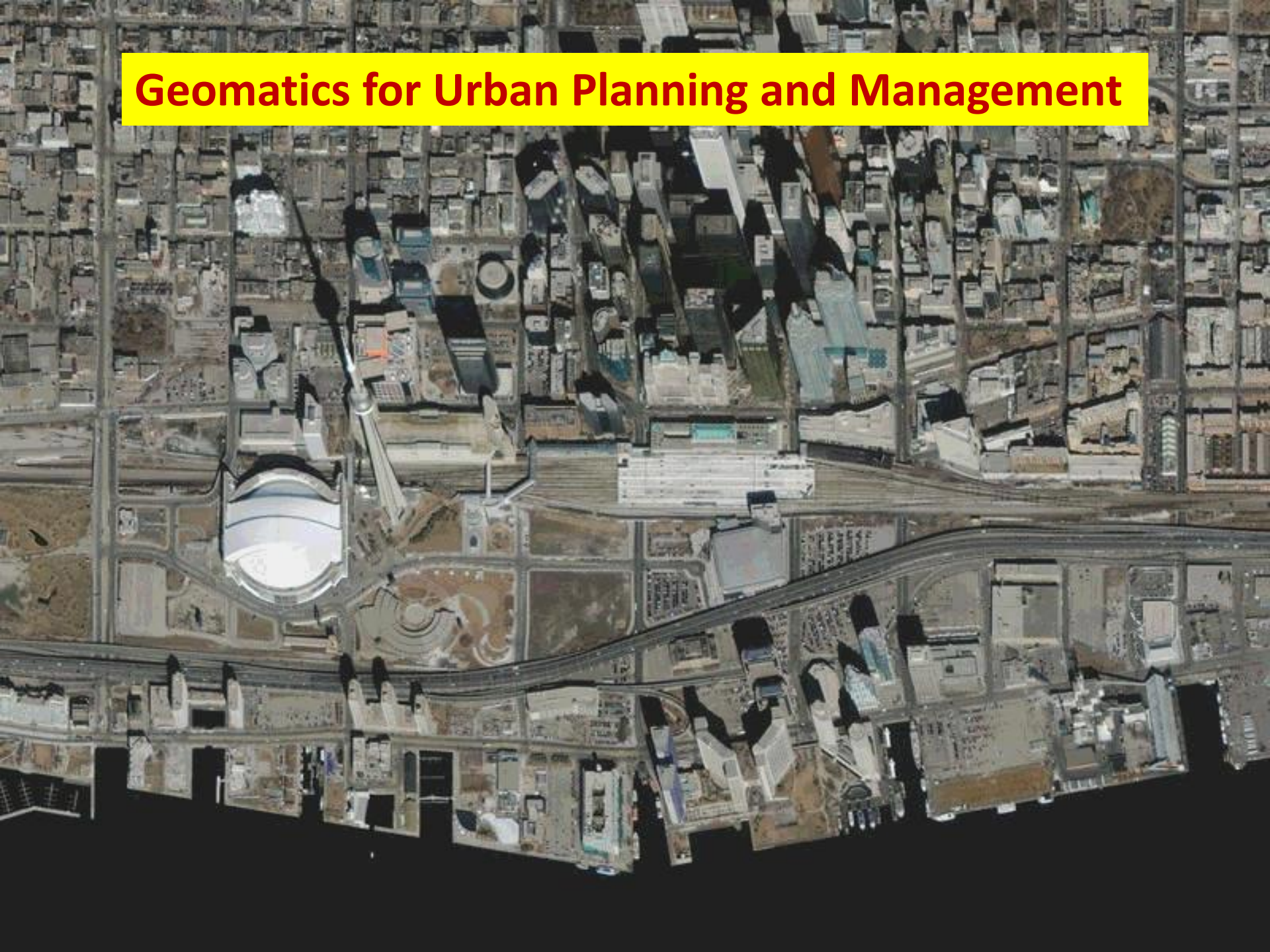
Geomatics for Urban Planning and Management



Geoinformatics is the science and technology dealing with the structure and character of spatial information, its capture, its classification and qualification, its storage, processing, portrayal and dissemination, including the infrastructure necessary to secure optimal use of this information *(wikipedia.org)*

Capture .. Surveying, GPS, Remote Sensing
Classification and qualification .. Image Processing
Storage, Processing .. Geographical Information System
Protrayal and dissemination .. Communication Technology

Most nonagricultural production in developed countries occurs in metropolitan areas.

- The reasons why economic activity agglomerates into cities—localized information and knowledge spillover—also make cities the engines of economic growth in an economy (Lucas 1988).

An **urban** area is the region surrounding a city. Most inhabitants of **urban** areas have nonagricultural jobs.

Urban areas **are** very developed, meaning there is a density of human structures such as houses, commercial buildings, roads, bridges, and railways.

"**Urban** area" **can** refer to towns, cities, and suburbs.

Urban Tribe. (redirected from **Urban Family**)

A closely knit extended-**family**-type group of 6 to 100+ persons, usually unrelated, who regularly converge for meals, parties and various, generally social interactions, and act as each others' support group

Difference Between Urban and Rural.

Human settlements are classified as **rural** or **urban** depending on the density of human-created structures and resident people **in a** particular **area**.

Urban areas can include town and **cities** while **rural areas** include villages and hamlets

An **urban area** is a location characterized by high human population density and many built environment features in comparison to the **areas** surrounding it.

Urban areas may be cities, towns or conurbations, but the term is not commonly extended to rural **areas** such as villages and hamlets

Urban design is the process of shaping the physical setting for life in cities, towns and villages.

It is the art of making places. It involves the design of buildings, groups of buildings, spaces and landscapes, and establishing the processes that make successful development possible.

Urban growth is defined as the rate at which the population of an **urban** area increases.

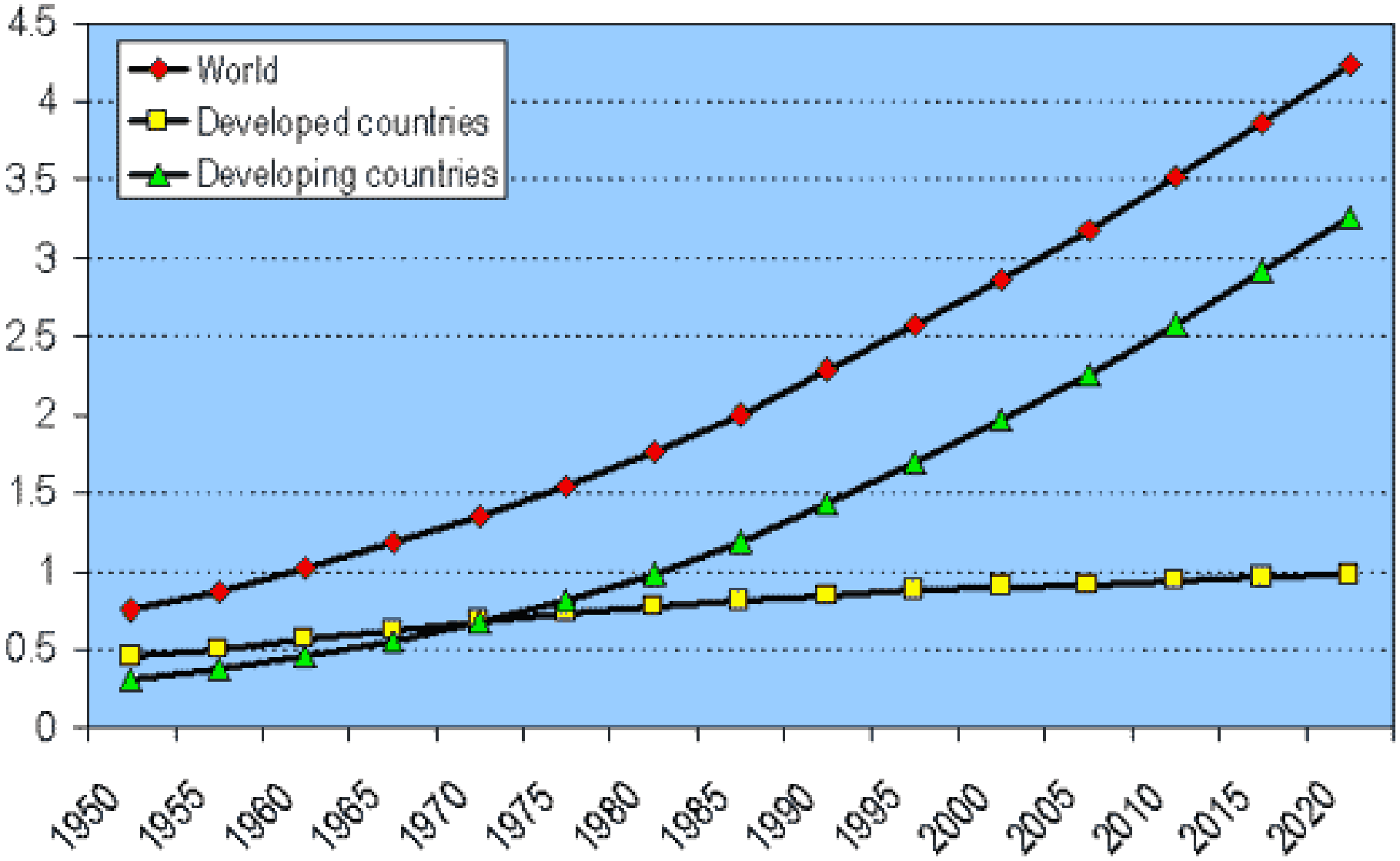
This result from urbanization which **is** the movement of people from rural areas to **urban** areas. ...

Urban growth is also referred to as the **expansion** of a metropolitan or suburban area into the surrounding environment.

Concepts in Urbanization

- **Urbanization**- process which leads to a higher proportion of the total population of an area to live in cities and towns
- **Urban growth-** absolute or simple growth in the number of urban dwellers
- **Urbanism**-characteristic way of life of urban dwellers
- Exceptional is not so much the increased proportion of urban growth, but the absolute growth of urban population
- Rapid growth of cities in the developing world has produced several distinctive forms and processes

World Urban Population



Urbanization

- Urbanization began earlier in the DCs and by 1900 a reduction in mortality occurred as well as a reduction in birth rates
- In the LDCs urbanization began later
- Urban mortality lower than in rural areas; then declining urban mortality but high birth rates
- Stronger surge of in-migration compared to DCs; industrialization lags behind urban growth

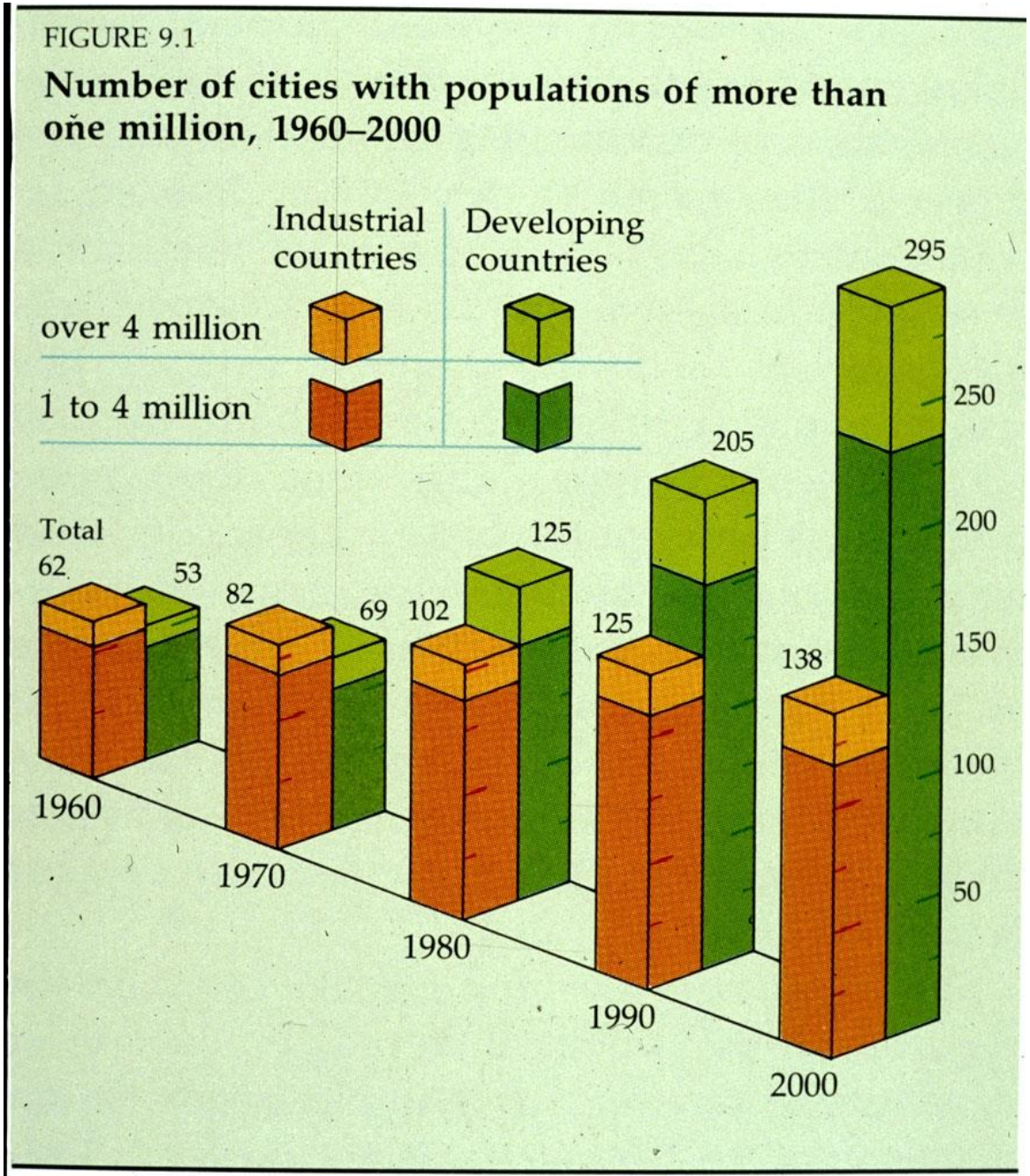
Patterns of Urbanization

- Distinction between DC and LDC is 75 percent versus 40 percent urban
- However striking variations exist across the LDCs in proportion of urban population
- Sub-Saharan Africa 30%; Latin America & Caribbean 75%; Asia (excl China) 30%
- Yet South Africa 50%, North Africa 45% and East Africa 20%
- Central America 68% and South America 79%
- West Asia 62% and Southeast Asia 37%
- Why these variations in levels of urbanization?

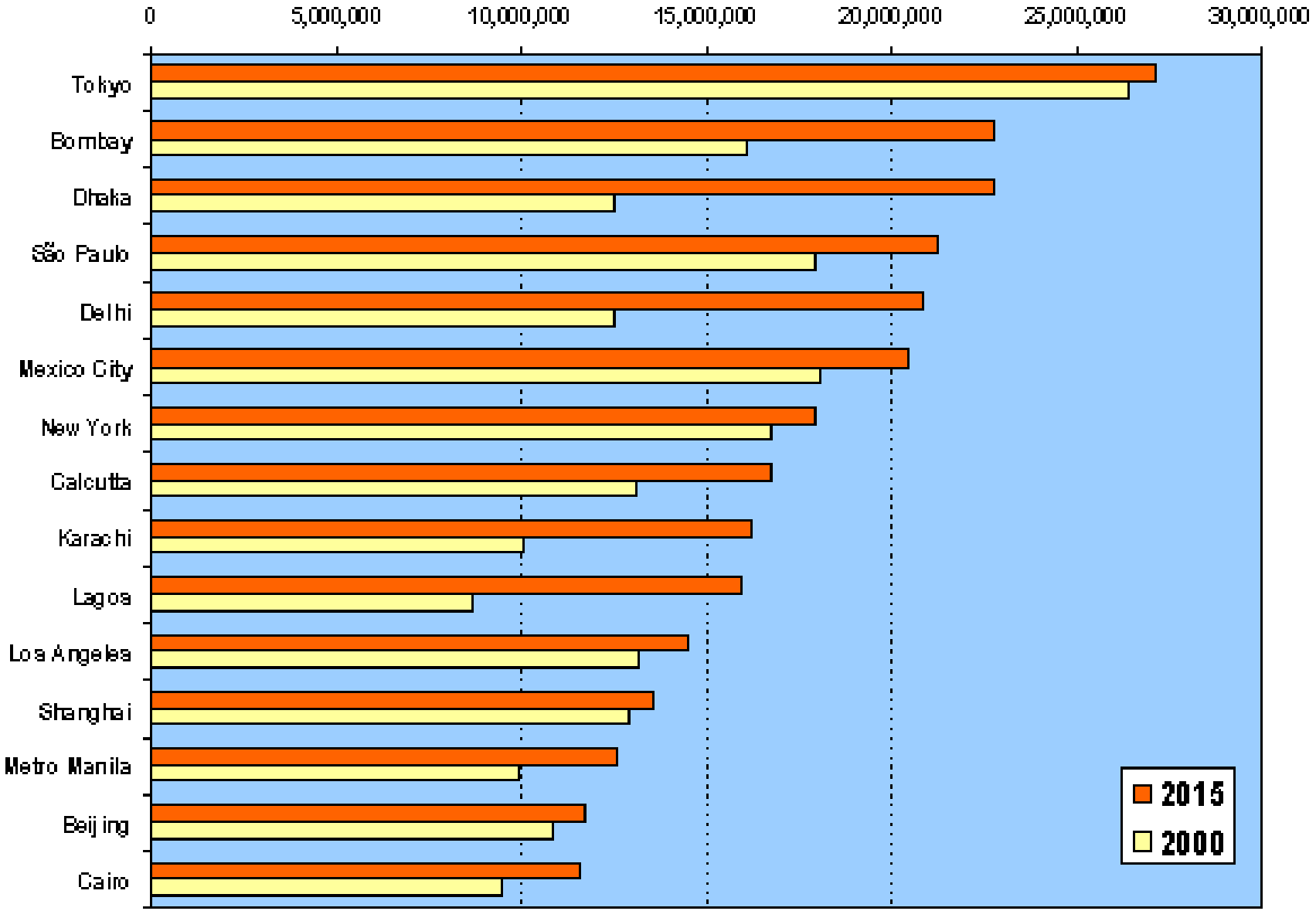
Features of Urbanization in Developing World

- Rapid urbanization has been accompanied by explosive growth of very large cities
- Primate city is used to identify cities that dominate the urban pattern of their respective countries
- Such cities are much larger than next largest city and account for much of the political and economic activity as well as services
  Examples: Bangkok, Mexico City
- The growth of such large cities has produced mega-cities which exceed 10 million Examples: Bombay, Calcutta, Jakarta (Jabotabek), Mexico City, Sao Paulo

Growth of Million Cities



Largest Cities in The World



Cities Over 5 Million

Growth of Cities: Real or False Urbanization

- The rapid growth of cities has been fueled by rapid in-migration in addition to natural increase
- Natural increase and internal migration each account for 50 percent of urban growth in the LDCs
- Must distinguish however between 'true' urbanization where there is a concurrent expansion of non-agricultural activities and 'false' urbanization where people live in cities but do not really have fulfilling jobs
- The latter produces an urban involution whereby city feeds on itself

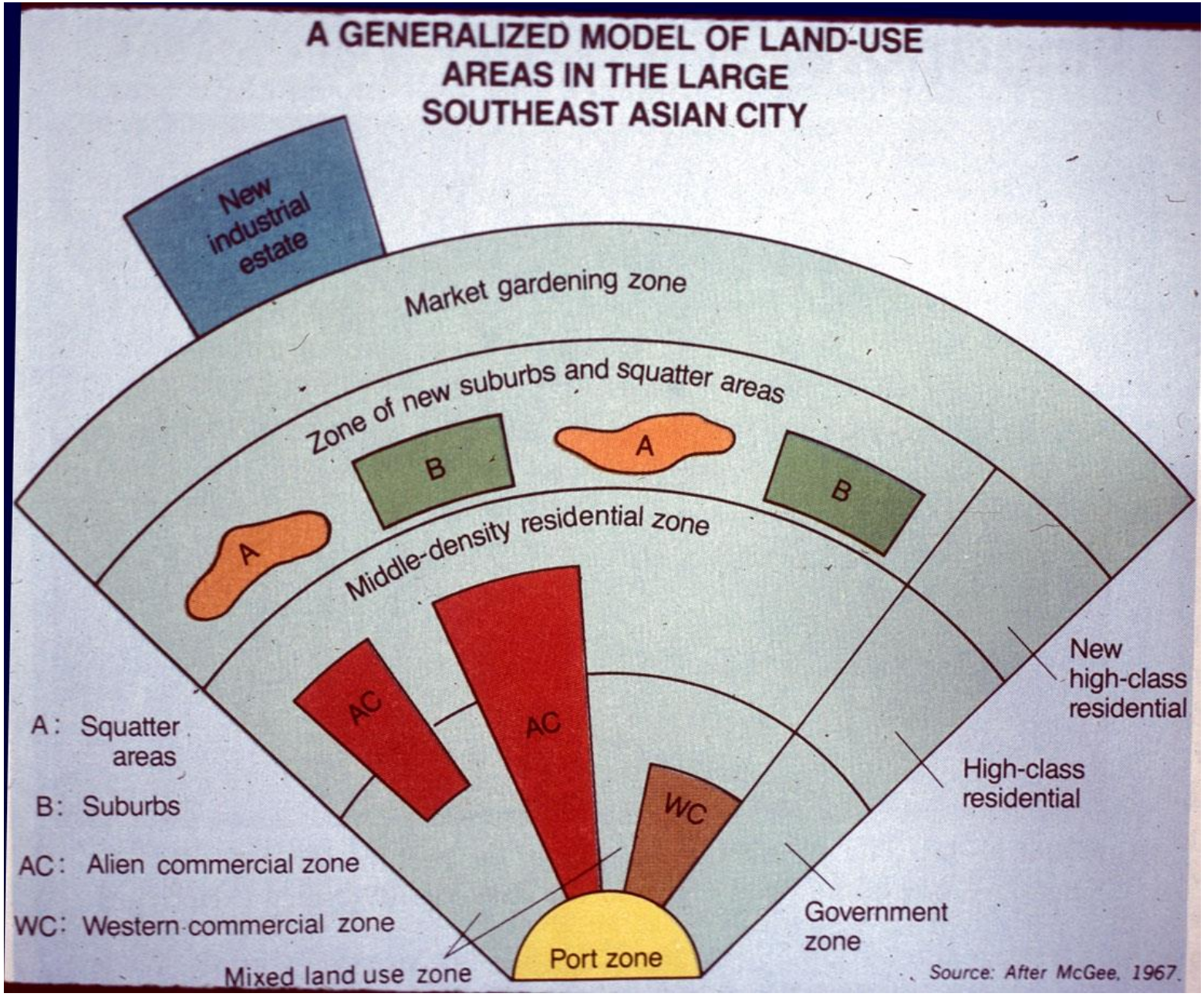
Urban Involution

- **Rapid urbanization brings chronic un- and underemployment, over crowding and inadequate housing?**
- **Contention is that the persistence of intensive traditional and often rural originated activities provide a sense of employment**
- **These labor intensive activities such as food vendors and self employed repair occupations provide minimum income**
- **Thus the service or tertiary sector of city swells to accommodate more and more jobless people by involution**

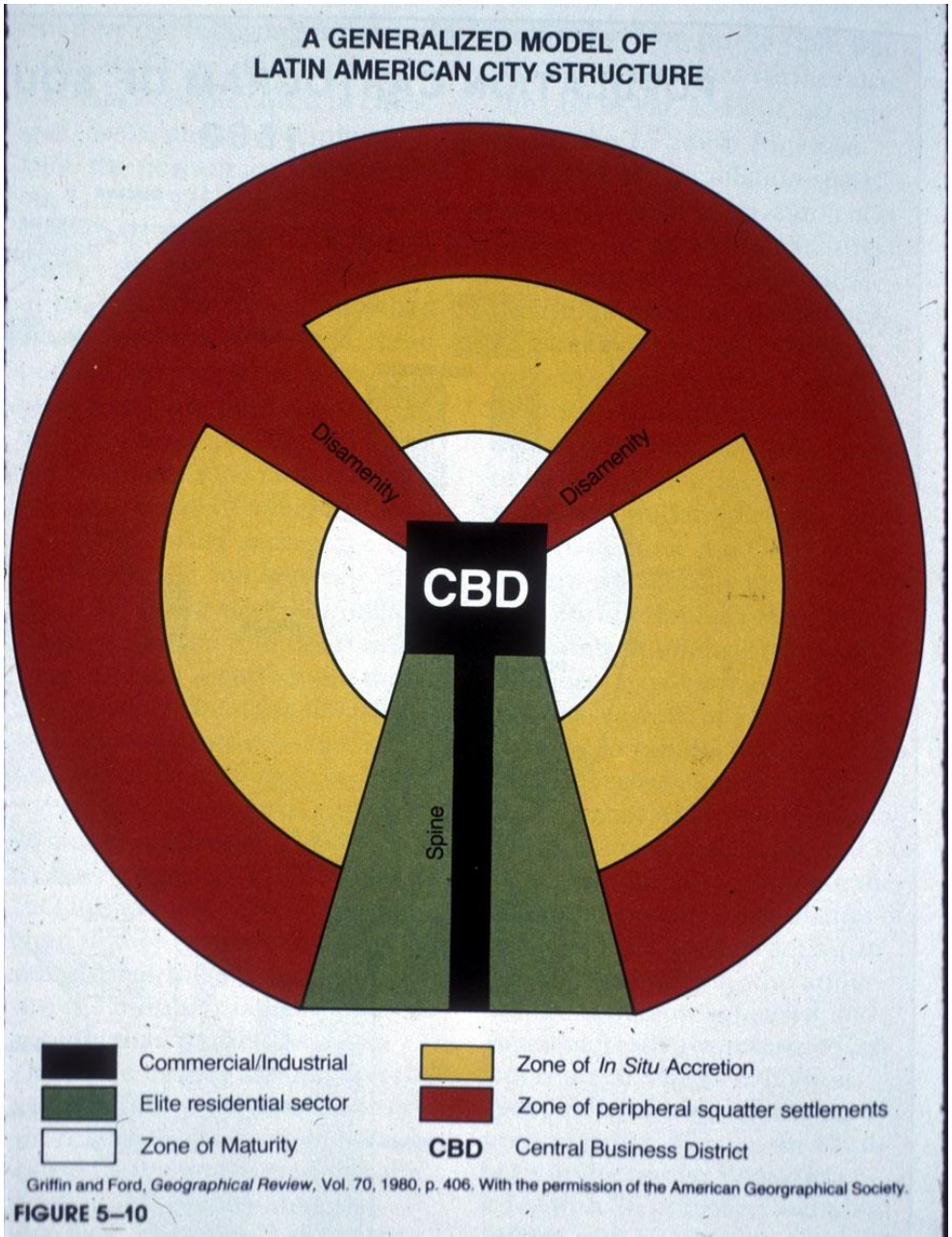
Urban Structures

- **Core areas of cities, known as Central Business Districts, were usually of colonial origin**
- **Once heart of city activity now often peripheral**
- **Subsidiary cores have cropped up and are associated with new residential areas**
- **Port areas-often the initial site-have now declined in importance**
- **Squatter settlements often on the fringe**
- **Industrial areas have high access arteries**

Typical Southeast Asian City Structure



Latin American City Typical Structure



Griffin and Ford, *Geographical Review*, Vol. 70, 1980, p. 406. With the permission of the American Georgraphical Society.

FIGURE 5–10

Urban planning

Direct orderly development in urban, suburban and rural areas.

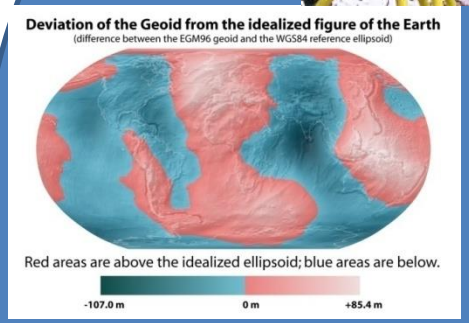
The regulation is the broader category that includes different sub-fields such as

- **Land-use planning,**
- **Zoning of industries etc,**
- **economic development -special corridor,**
- **environmental planning, and transportation planning.**

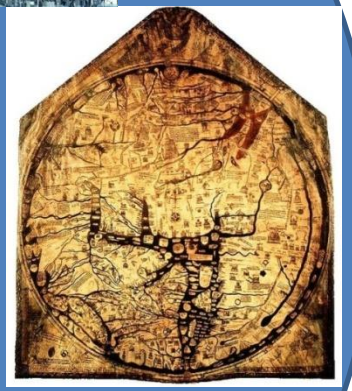
The history of urban planning runs parallel to the history of the city, as planning is in evidence at some of the earliest known urban sites.

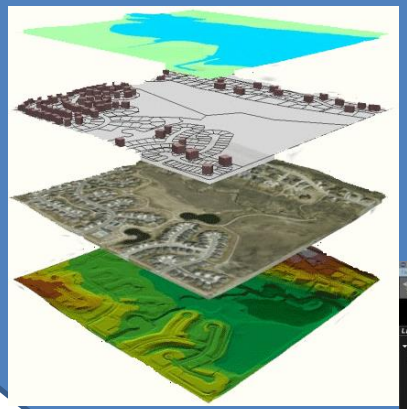
The pre-Classical and Classical periods saw a number of cities laid out according to fixed plans, though many tended to develop organically. Designed cities were characteristic of the Minoan, Mesopotamian, Harrapan, and Egyptian civilisations of the third millennium BC (see Urban planning in ancient Egypt).

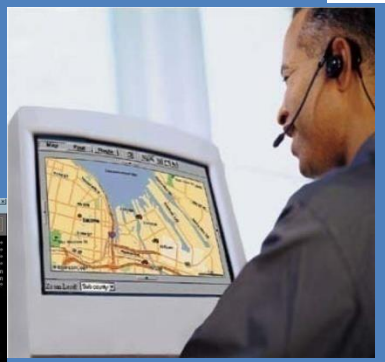
The history of urban design can broadly be categorized into **pre-industrial** and **post industrial** …with the *Renaissance* period forming the interphase


Deviation of the Geoid from the idealized figure of the Earth
(difference between the EGM96 geoid and the WG584 reference ellipsoid)
Red areas are above the idealized ellipsoid; blue areas are below.
-107.0 m
0 m
+85.4 m

GEOMATICS



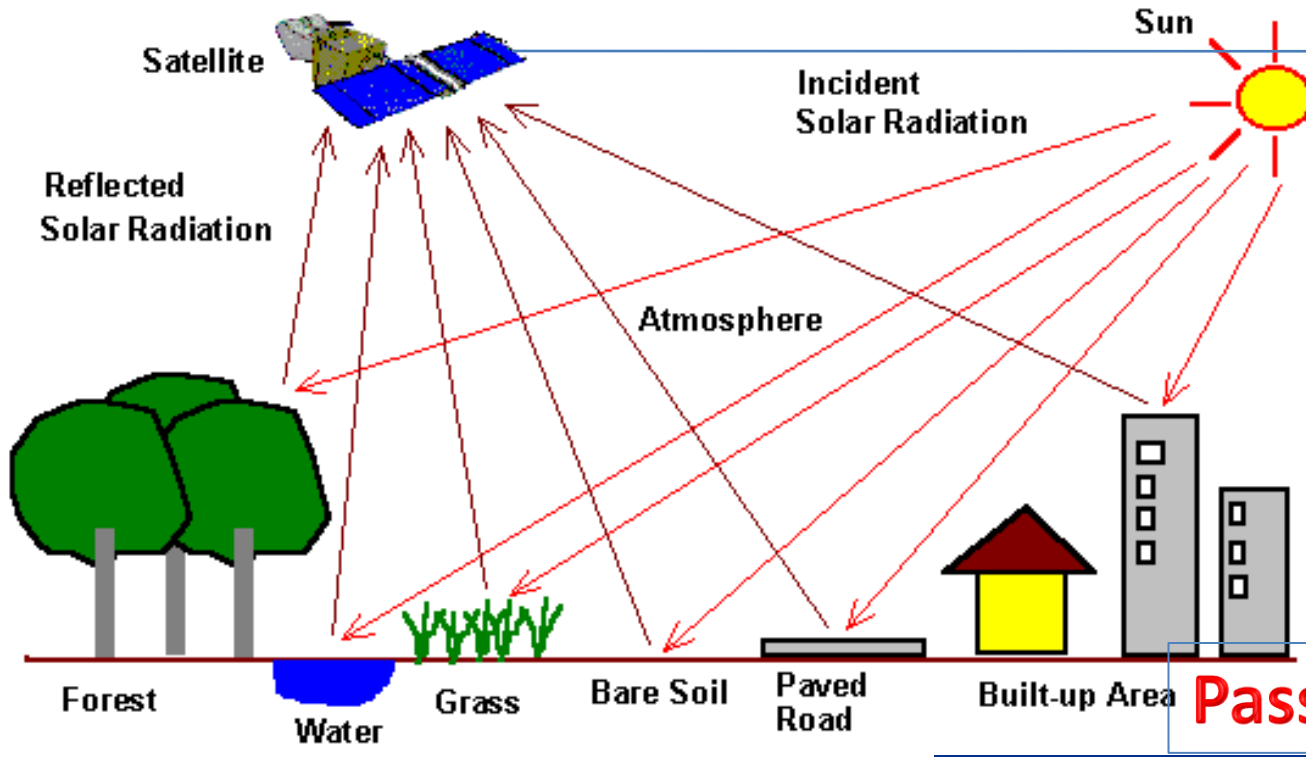




Surveying and GPS

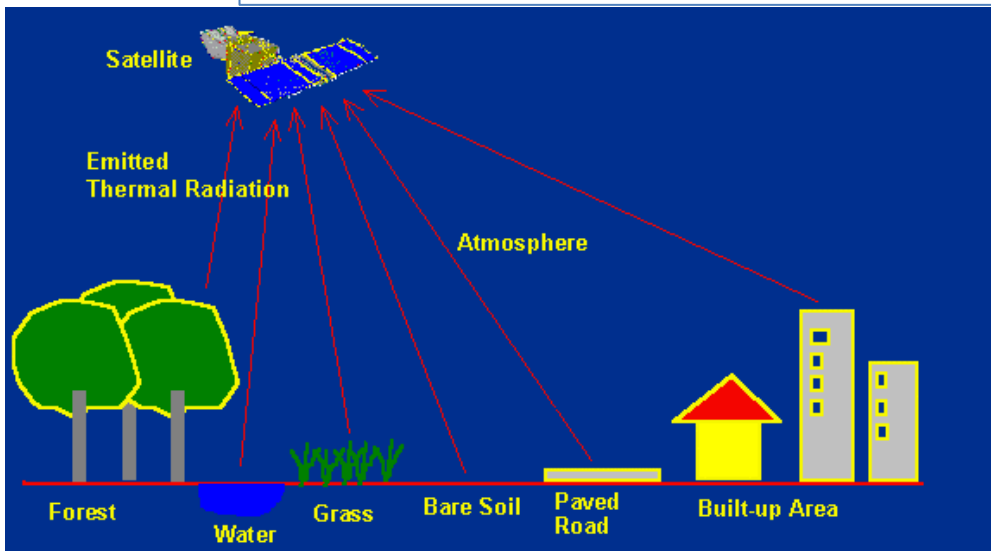
- Spatial Data Capture through Ground Surveys

The Process of Remote Sensing

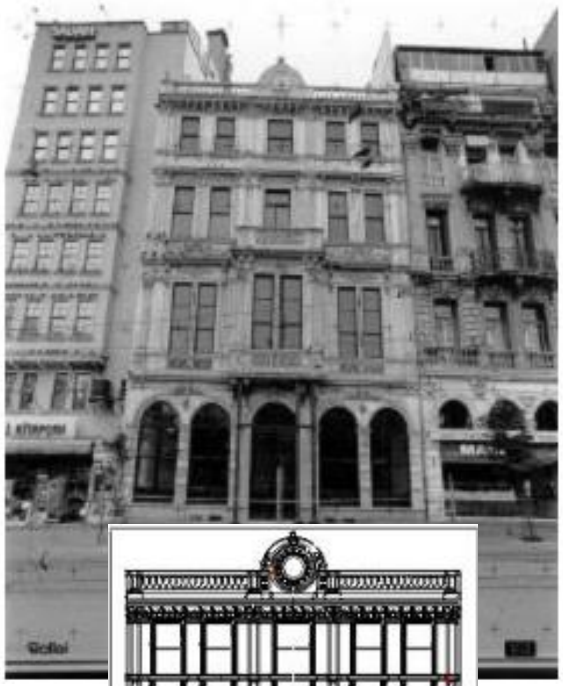


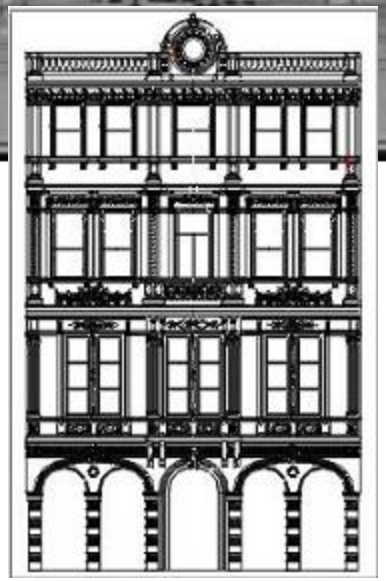
Passive Remote Sensing

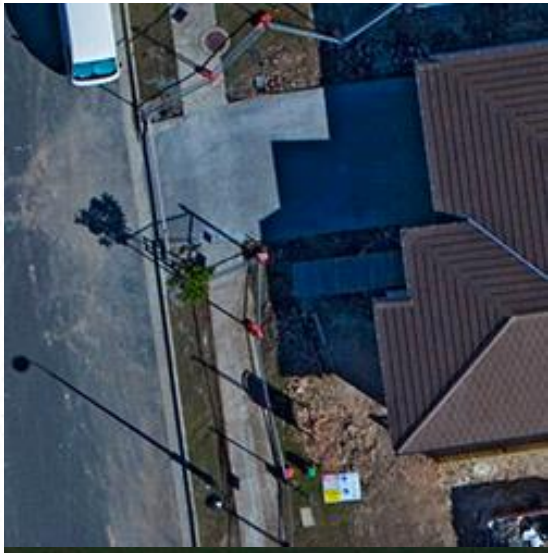
Active Remote Sensing

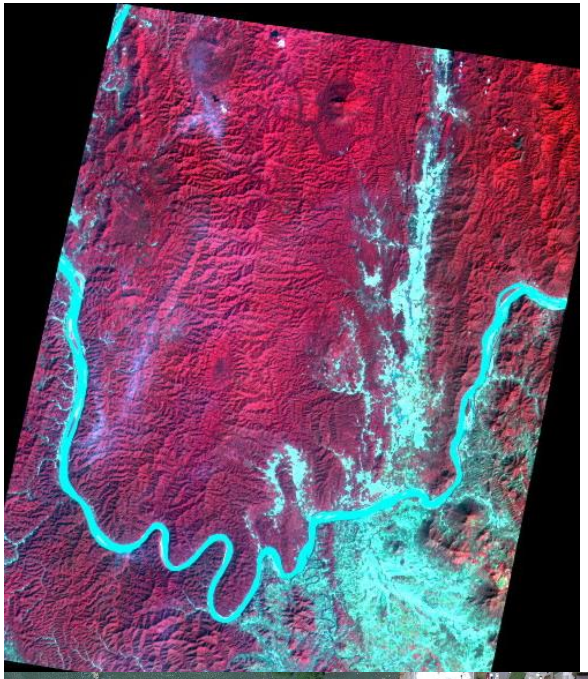


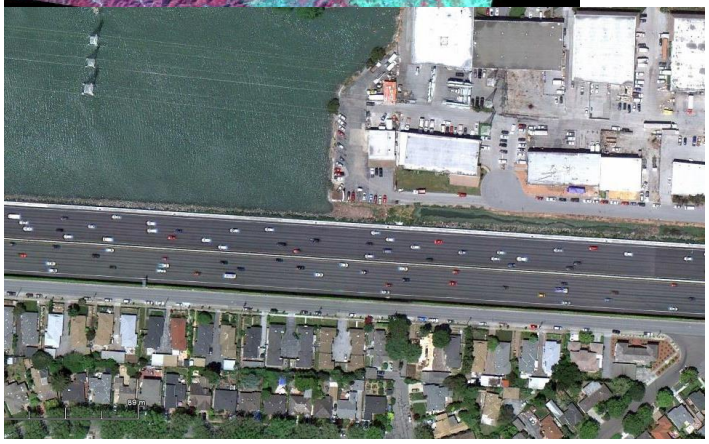
REMOTE SENSING

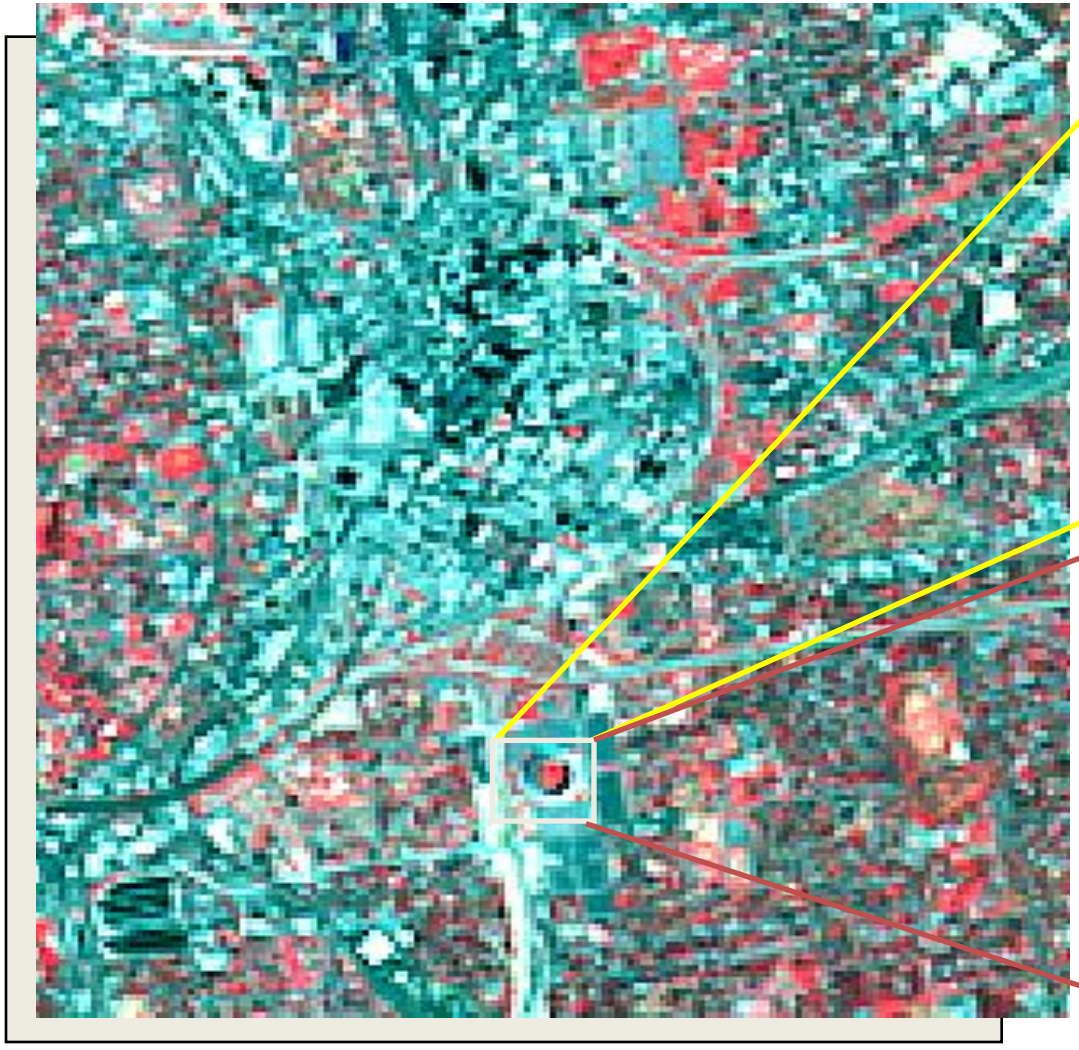


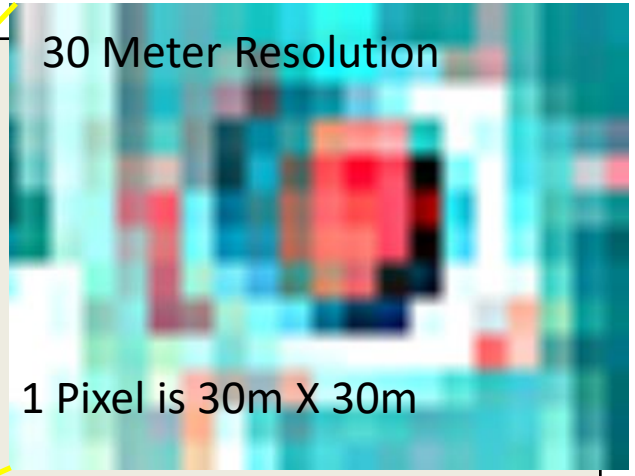








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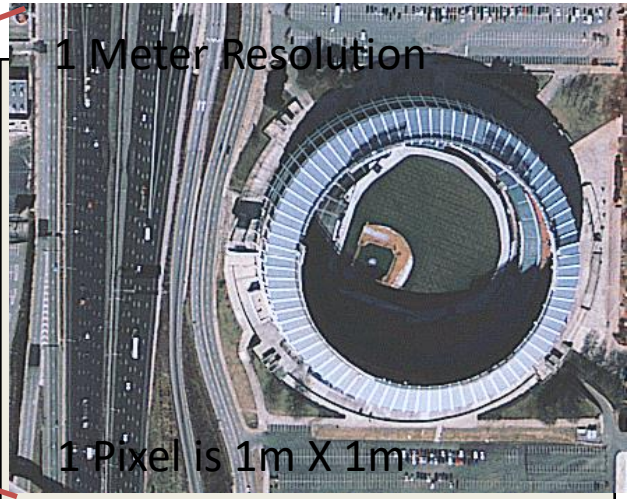
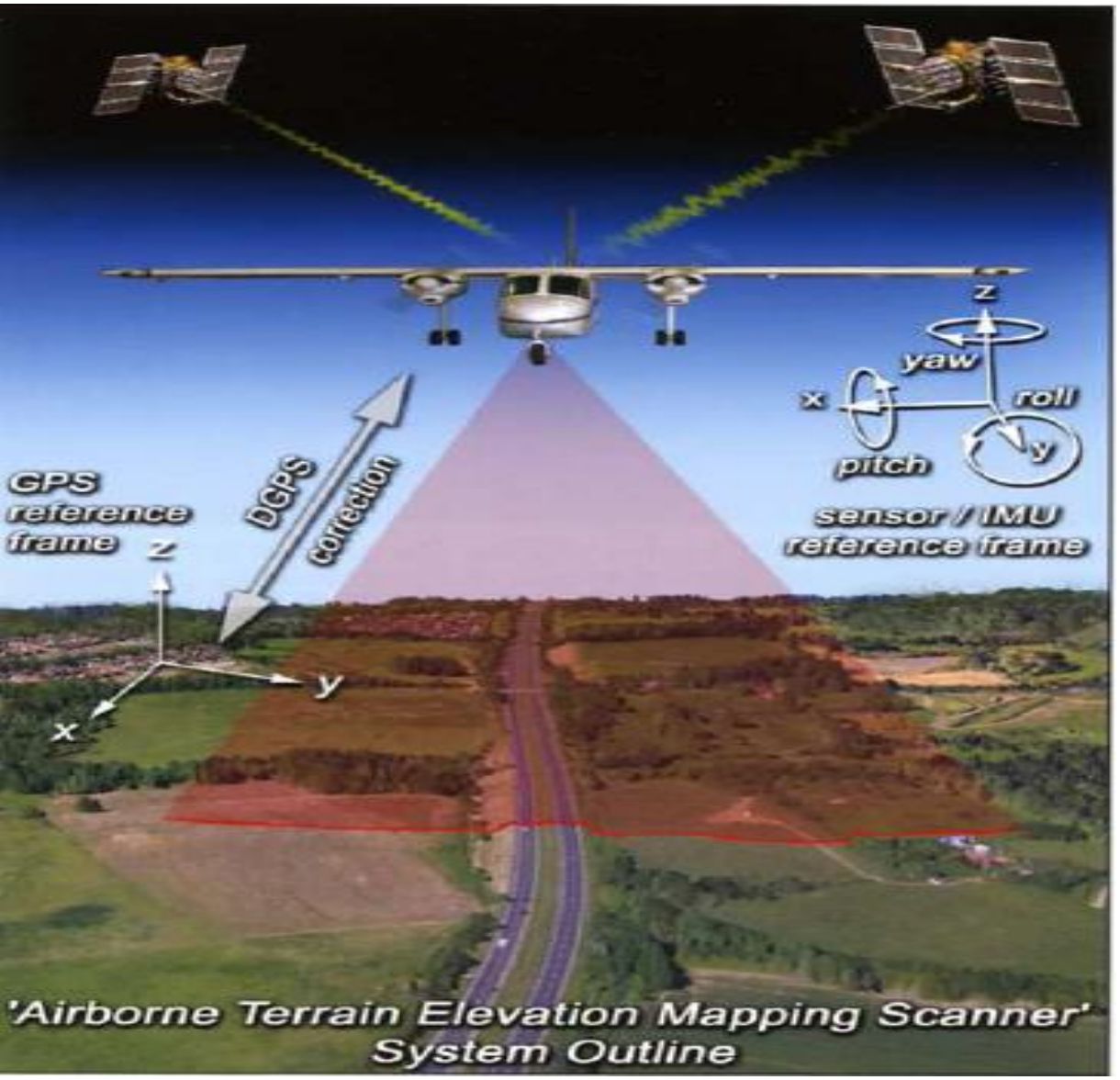
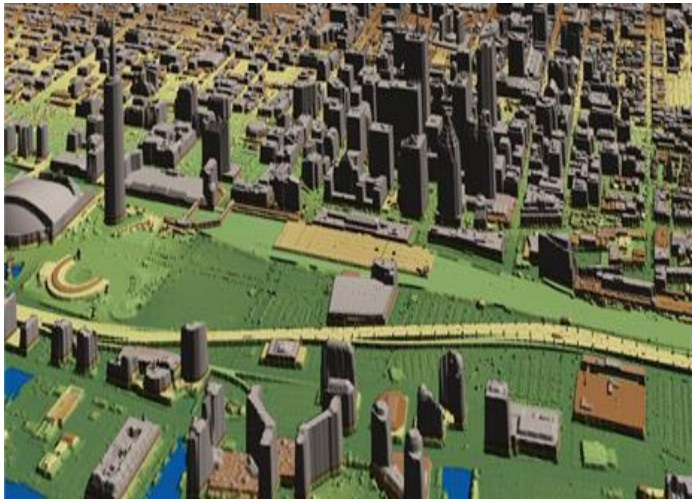
1 Pixel is 30m X 30m

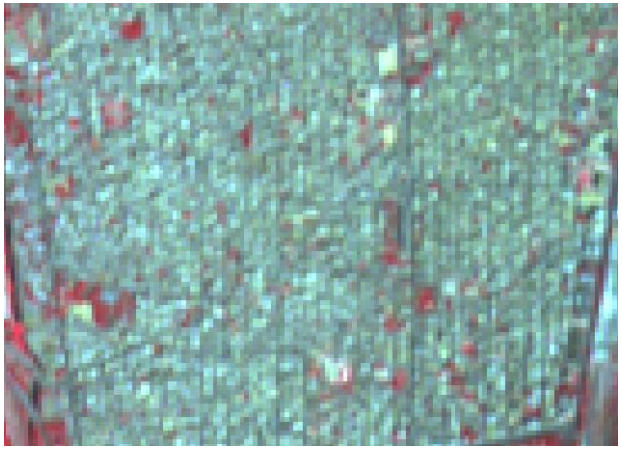

1 Meter Resolution
1 Pixel is 1m X 1m

Airborne Lidar Terrain Mapping (ALTM)



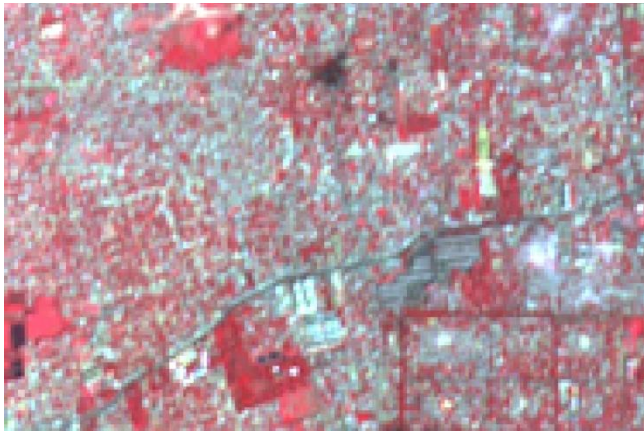


Urban Landuse Mapping

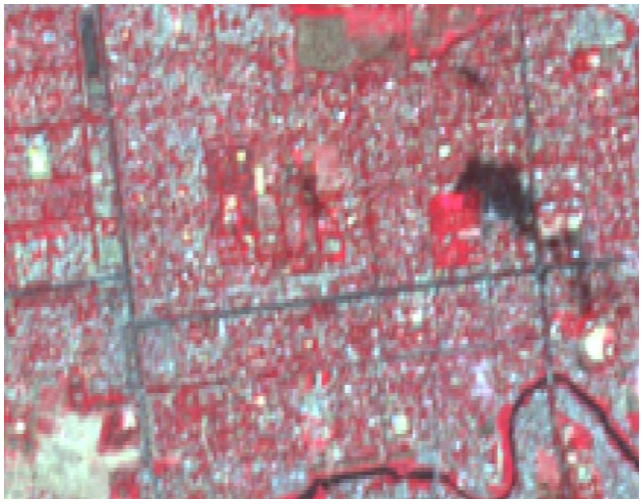


Commercial Area

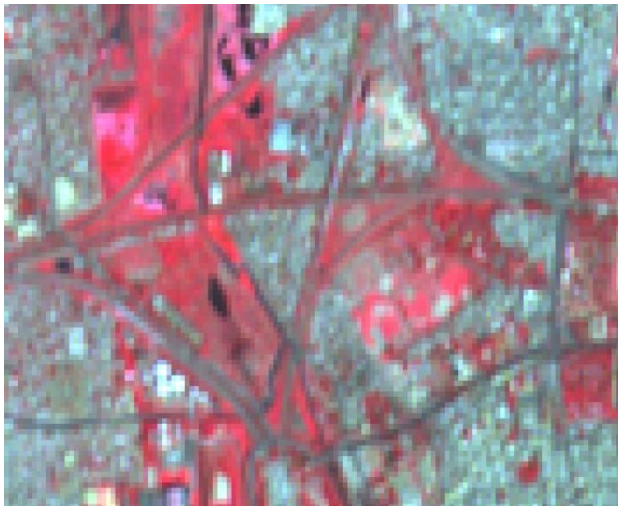
Industrial Area



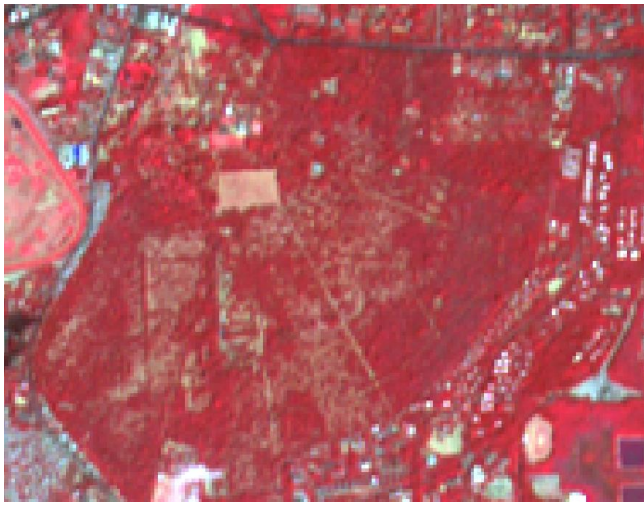
Residential Area



Planned Residential



Railway Network



Forest

Urban Landuse Mapping

Commercial Area

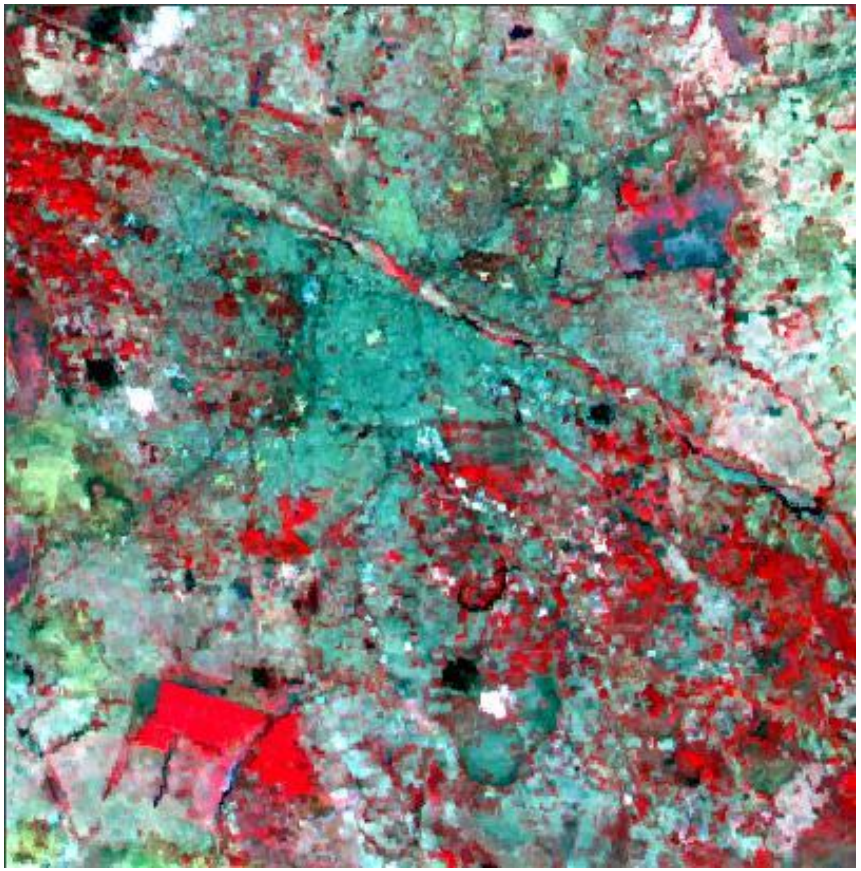
Industrial Area

Residential Area

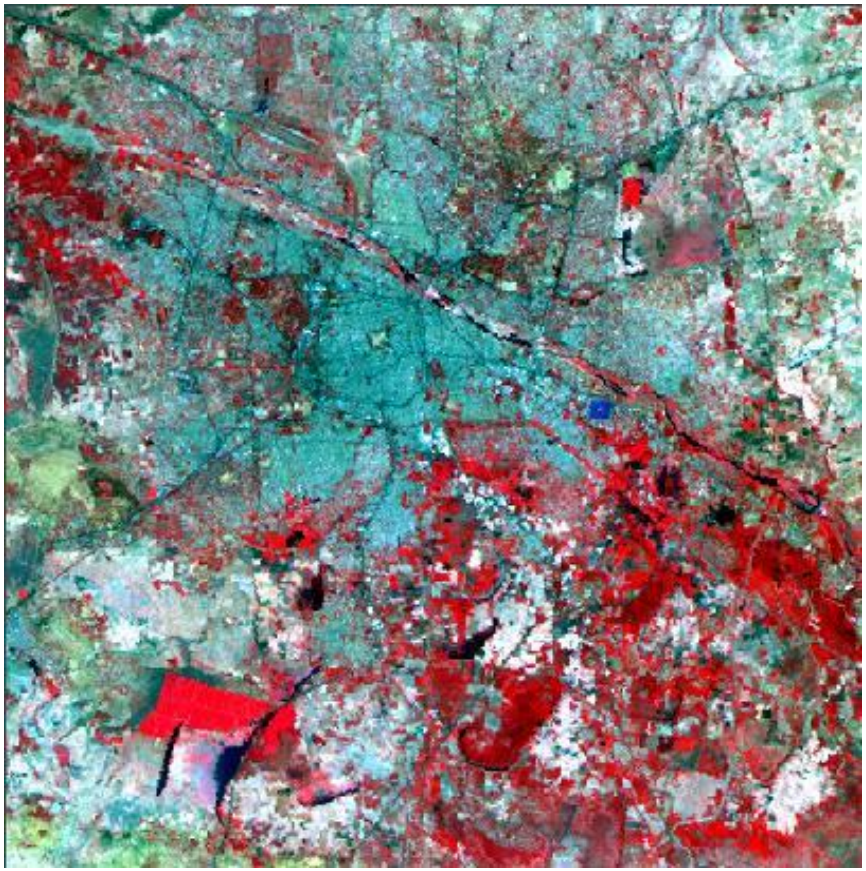
Transportation Terminals

Institutional Areas

Change Detection of Madurai City



IRS 1B / LISS II
March 1996



IRS P6 / LISS II
March 2004

Tirupathi satellite image in 1980 and 2000

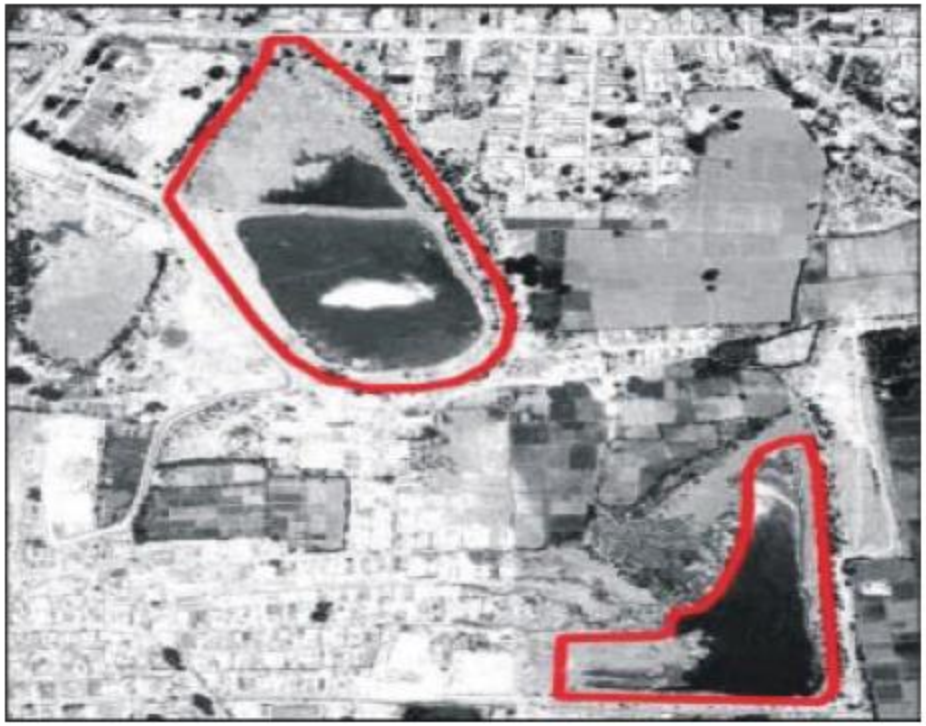
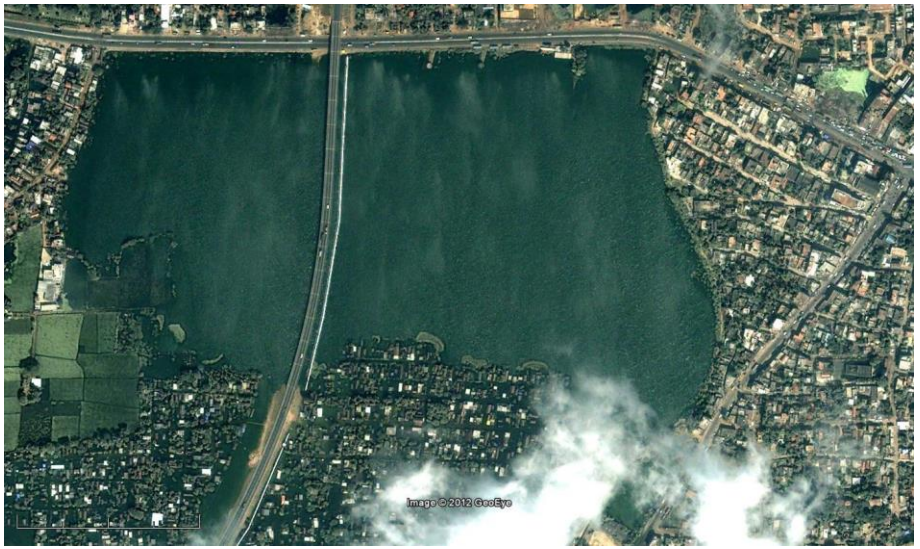


Figure 3a: Inventory of Tanks & Ponds in the year 1980

Figure 3b: Inventory of Encroached Tanks & Ponds in the year 2000


Image © 2012 GeoEye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PROJECT MONITORING

Landuse Conversion


Image © 2012 DigitalGlobe


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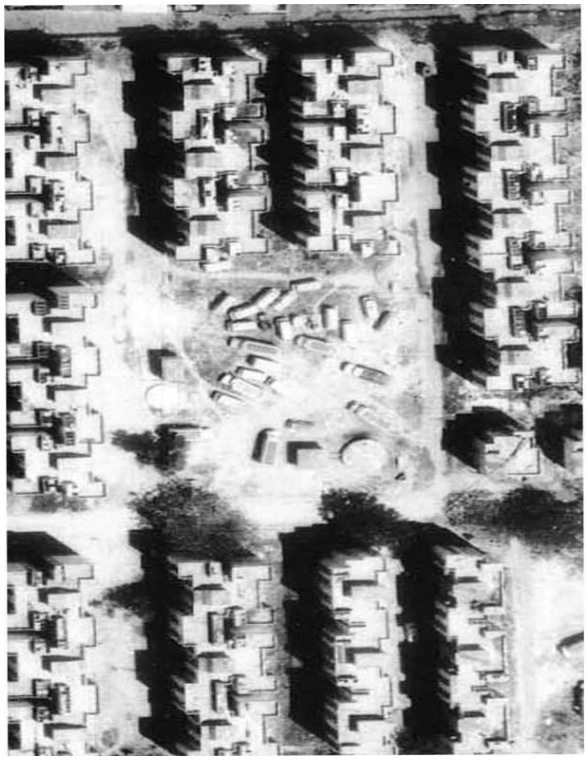
Monitoring of Slums

Urban Housing Typology

Independent Houses

Row Houses

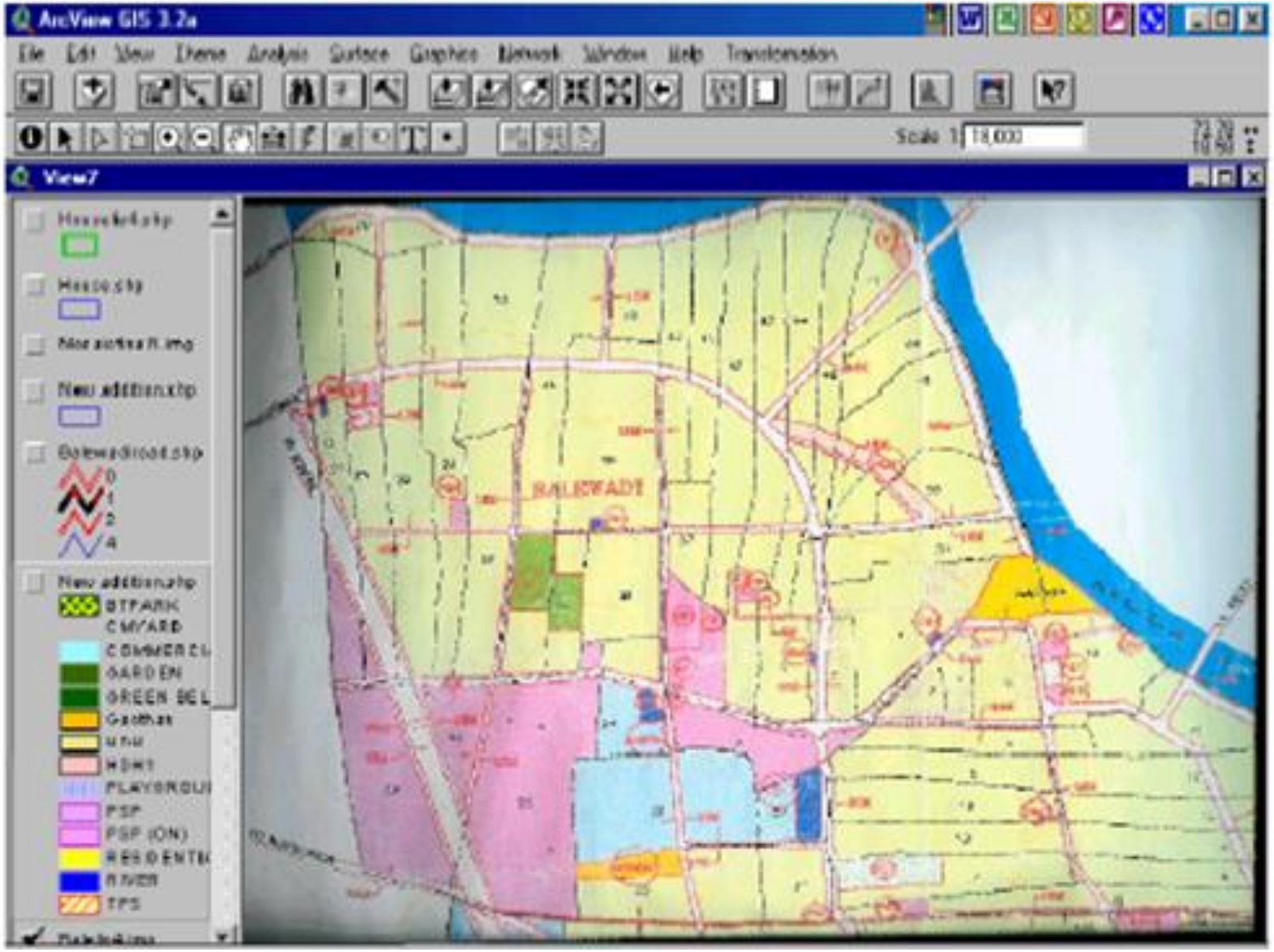


Multi-storeyed

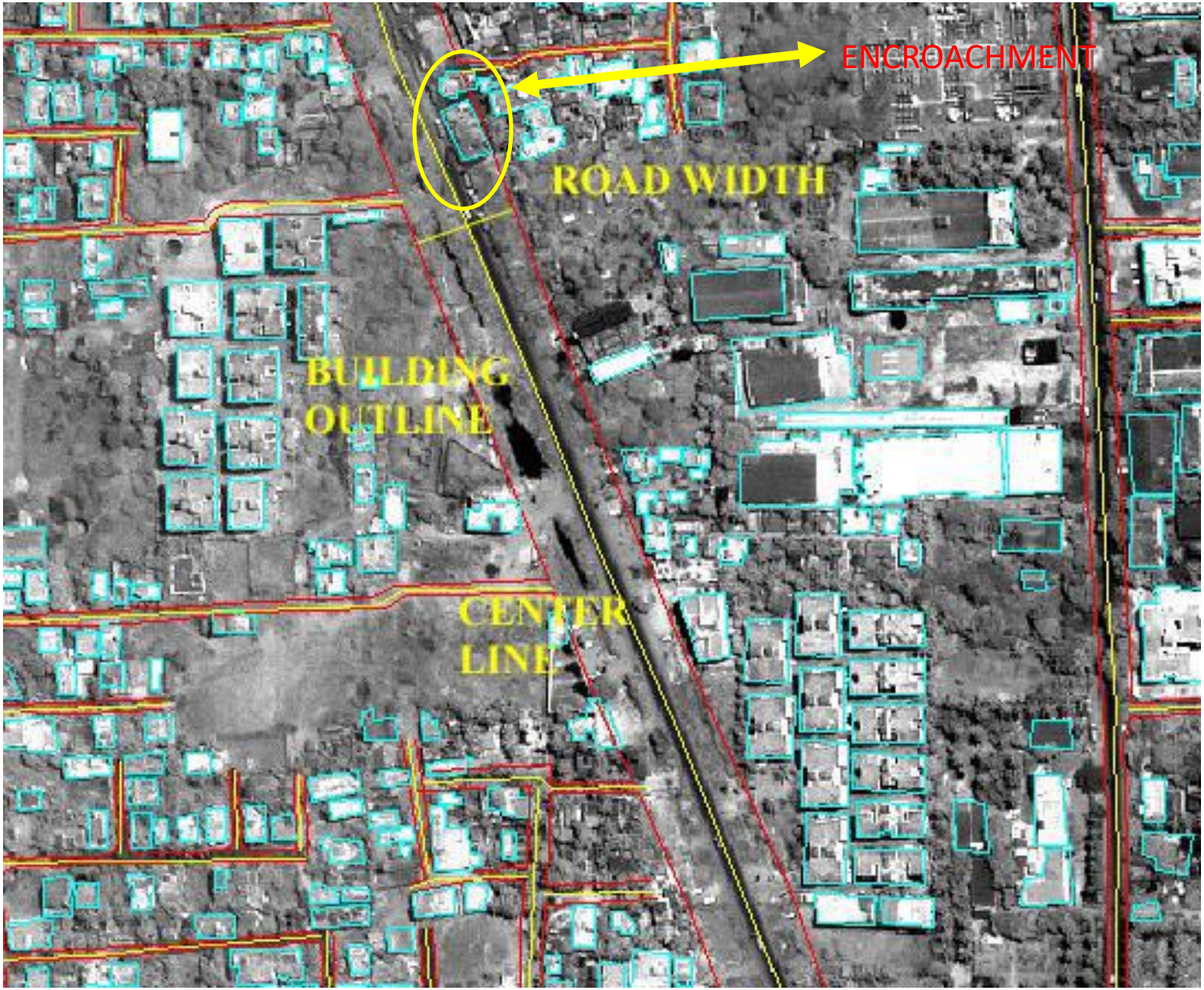
- Census Estimation
- Urban Renewal


OBSTRUCTION
BY TREES
INNER RESIDENTIAL
ROADS
HUTS

Monitoring of Development Plans



Mapping of Encroachments



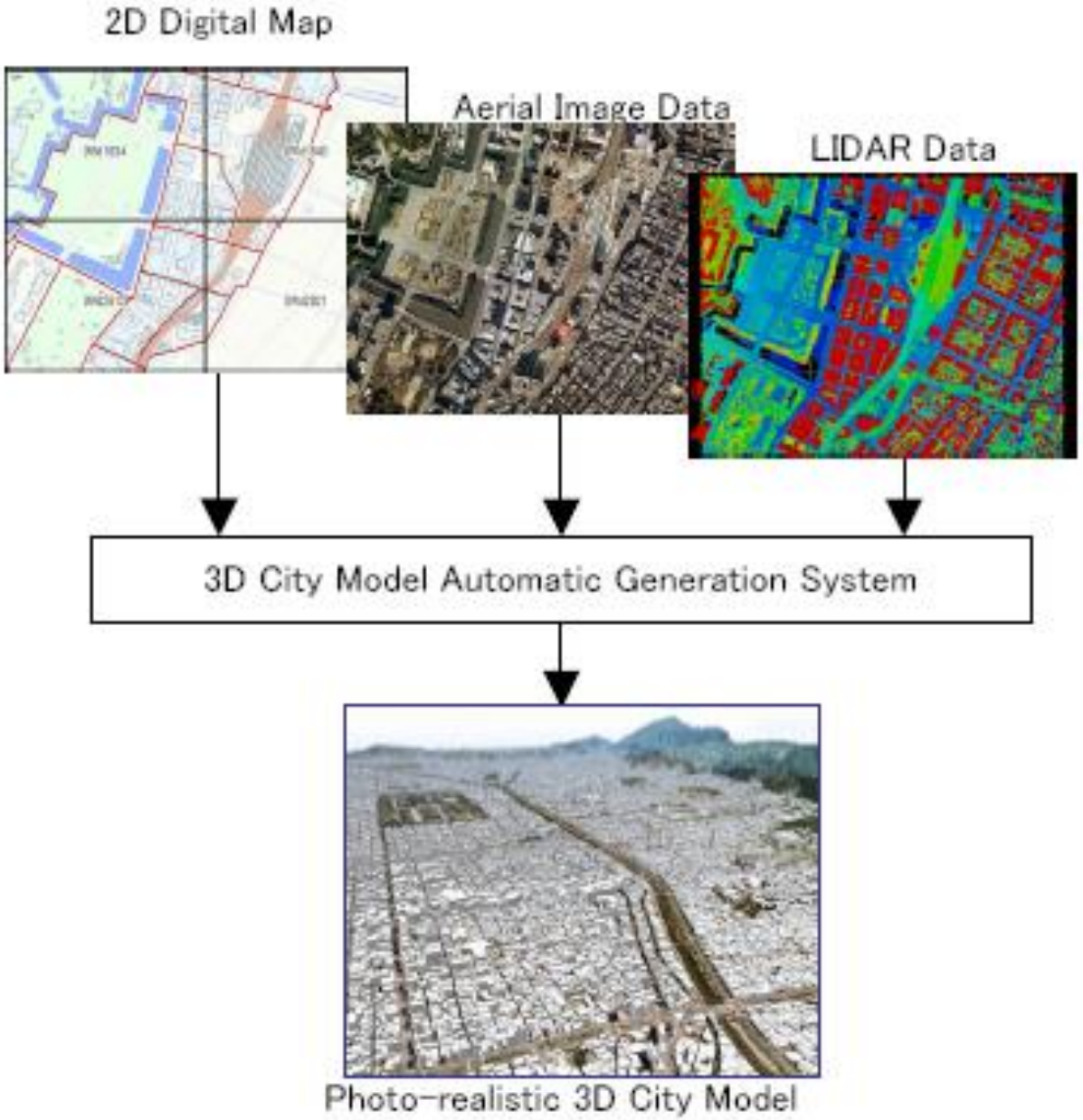


Figure 1. Automatic generation of 3D city model

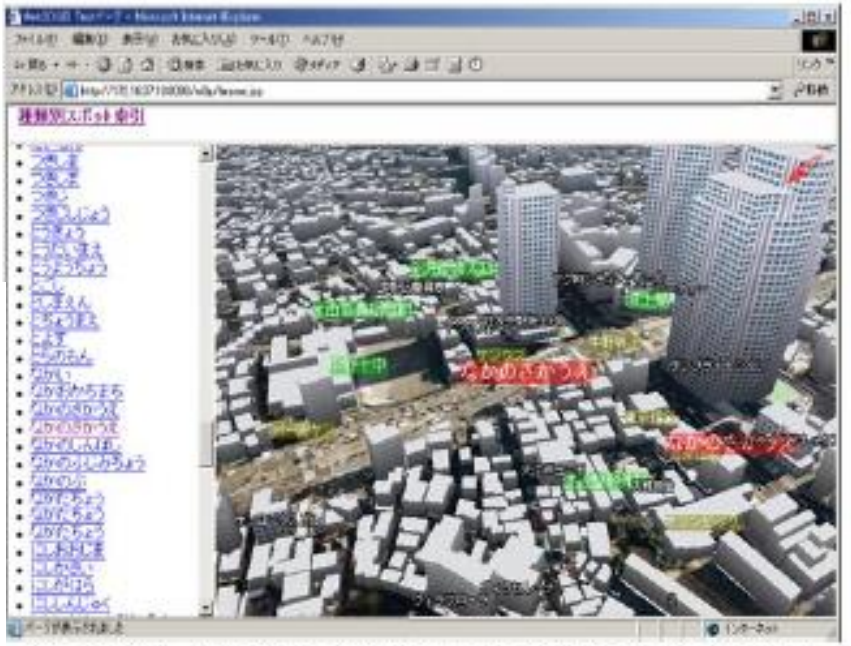


Figure 7. Display of 3D image and the list of areas

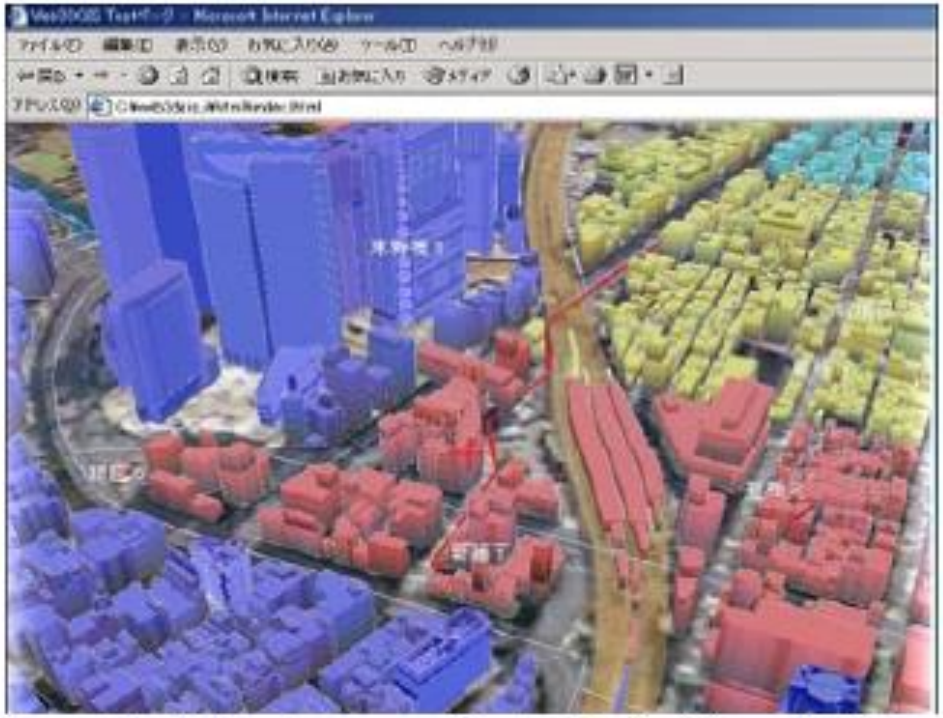


Figure 9. Colouring according to the buildings' attribute

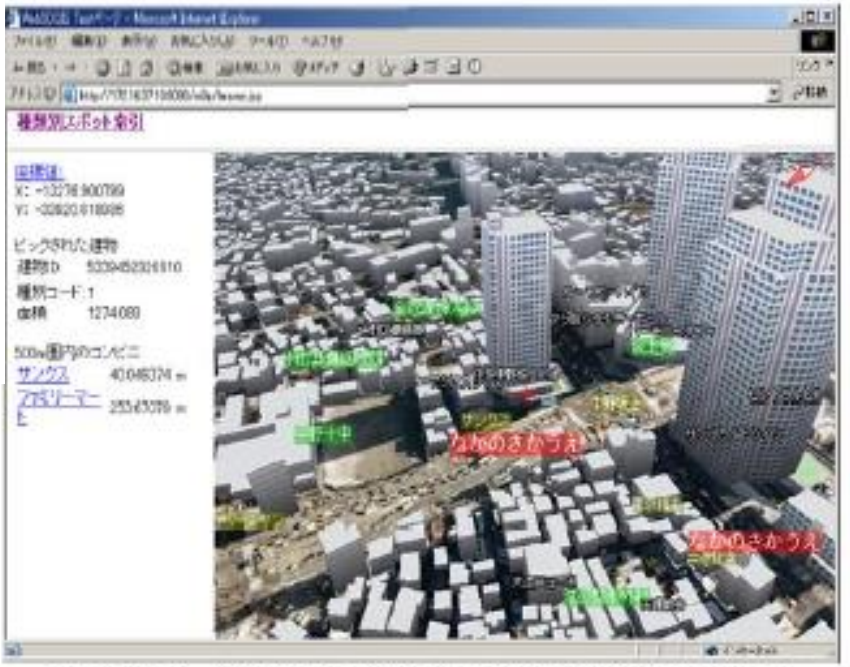
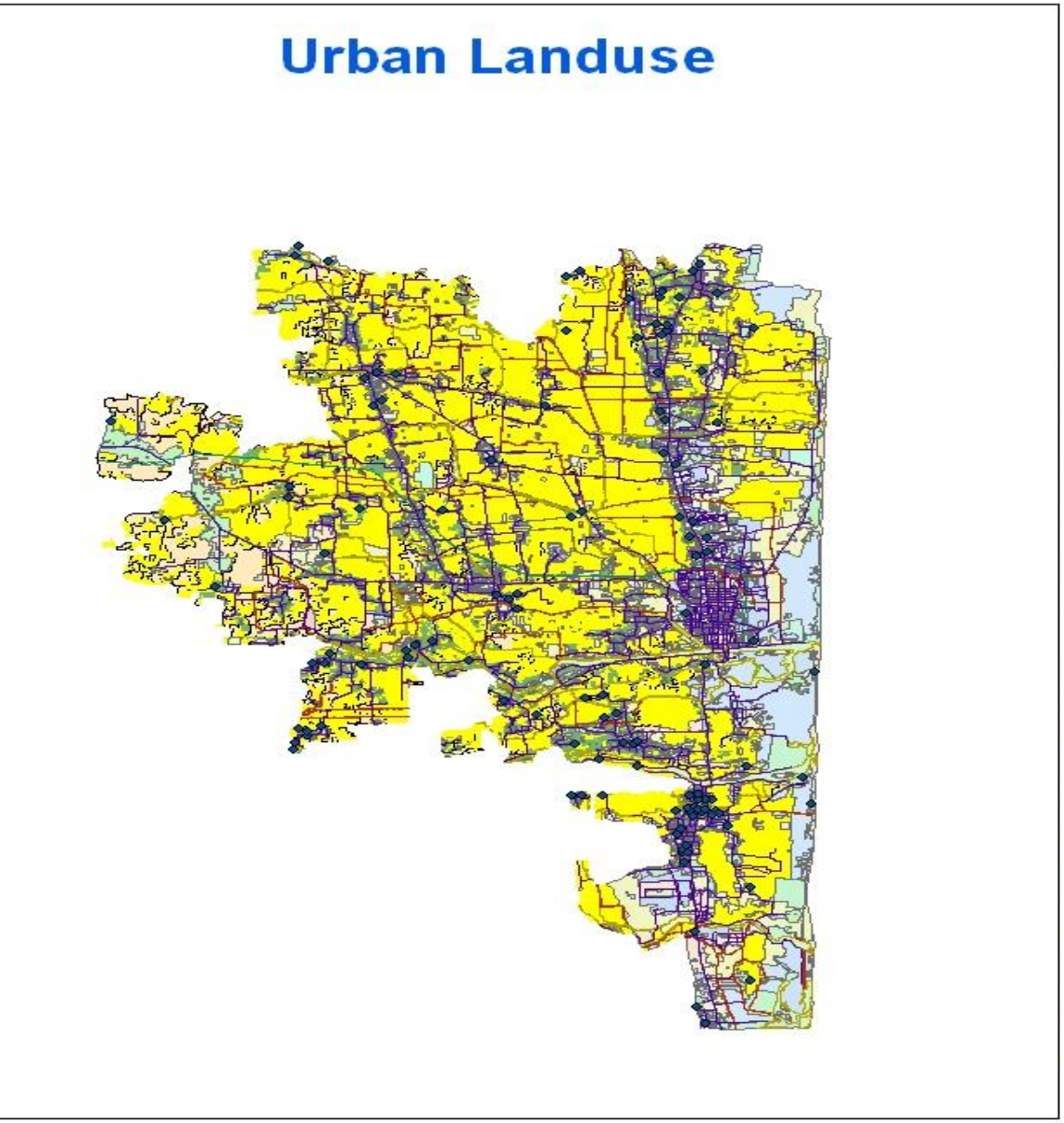


Figure 8. Display of the buildings' information

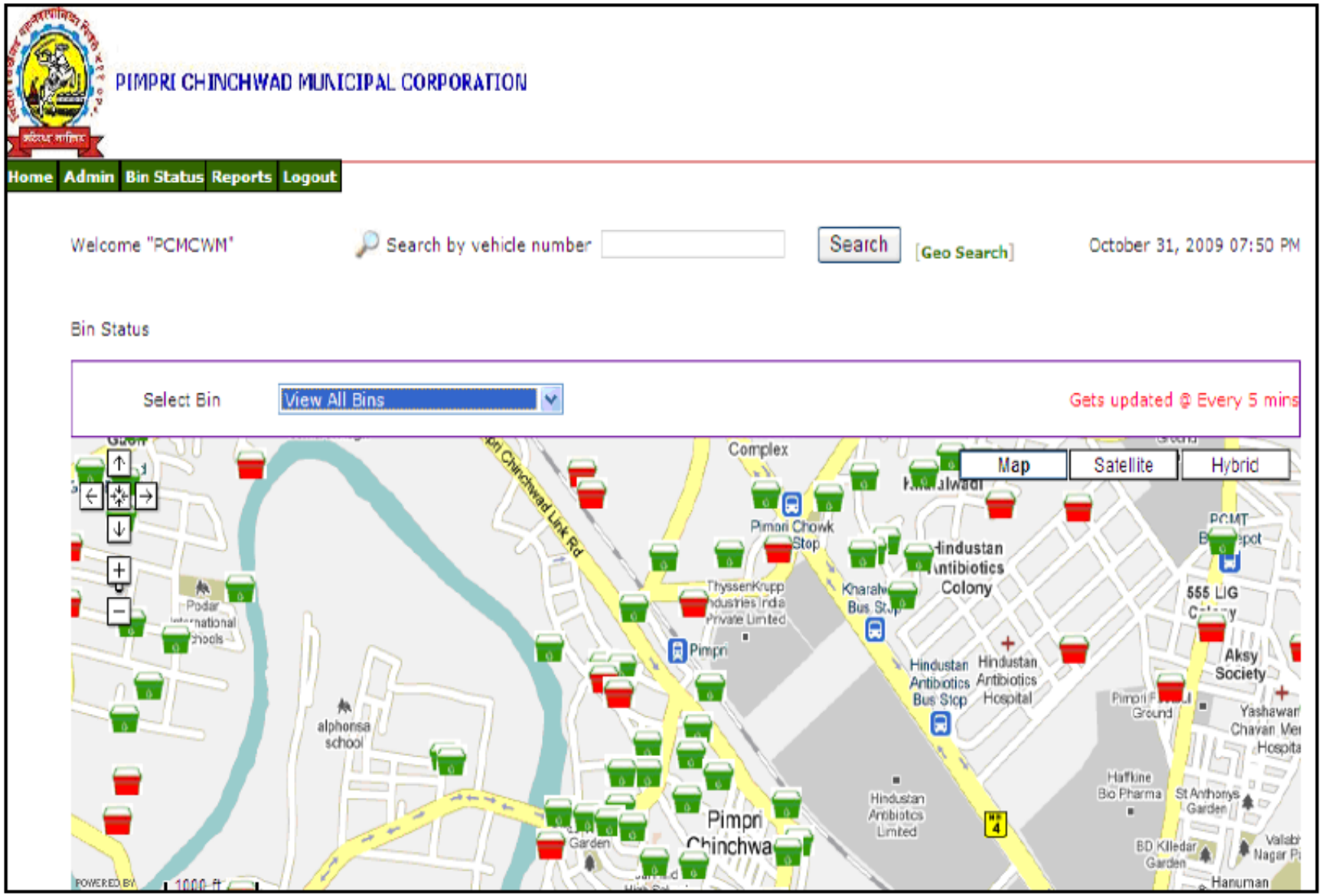
National Urban Information System - Karaikkal



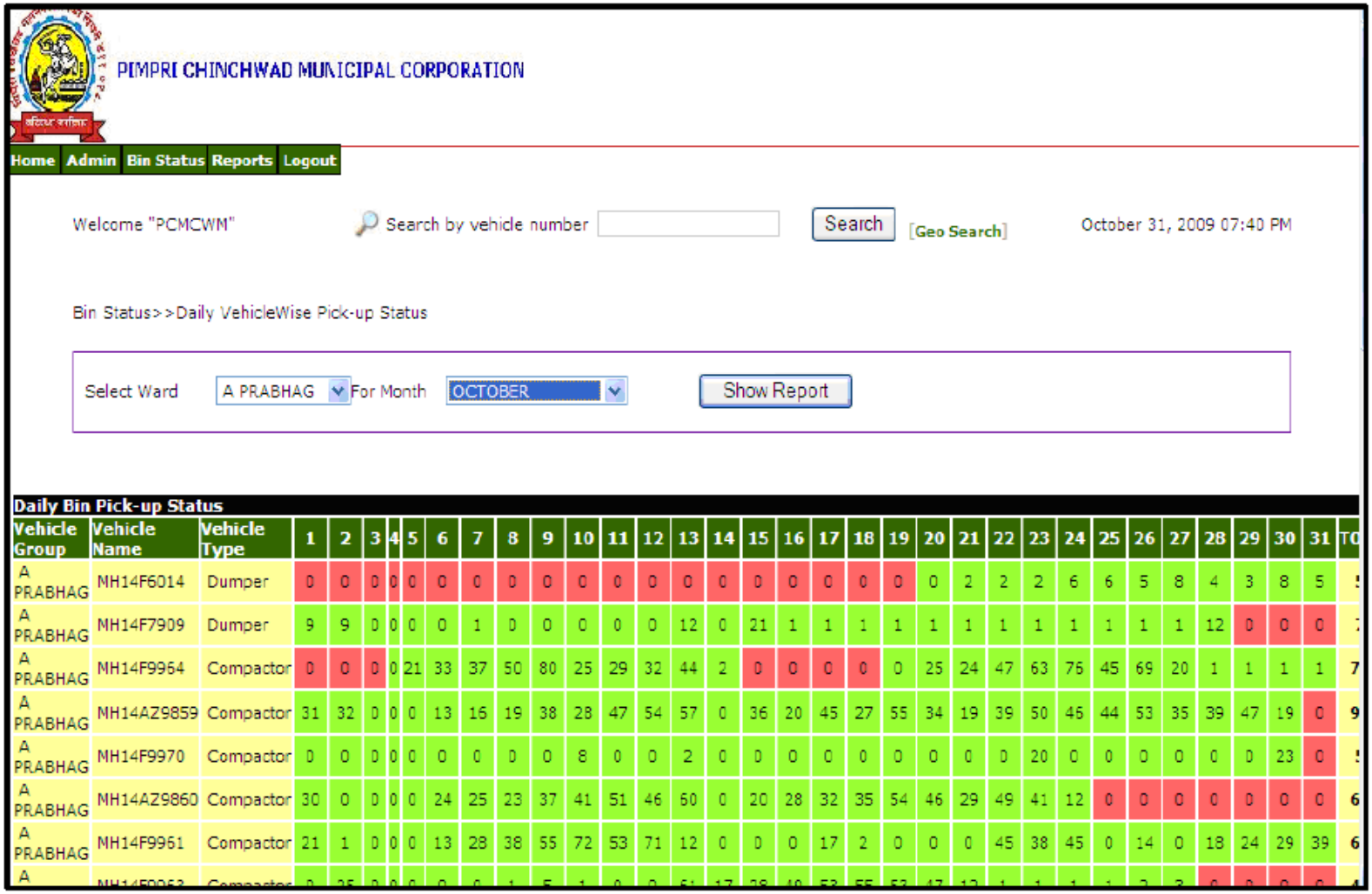
MUNCIPAL SOLID WASTE MANAGEMENT

- City located north-west of Pune
- Area – 171 Sq.Km.
- Estimated Population – 12.5 Lakhs
- Aim
  - Monitor the movement of the vehicle and improve per vehicl productivity
  - Monitor the bin pick up adherence and improve city cleaning service levels and PCM governance image

Offline Bin Status



Offline Bin Pickup Status



PIMPRI CHINCHWAD MUNICIPAL CORPORATION

Home | Admin | Bin Status | Reports | Logout

Welcome "PCMCWN" | Search by vehicle number | Search | [Geo Search] | October 31, 2009 07:40 PM

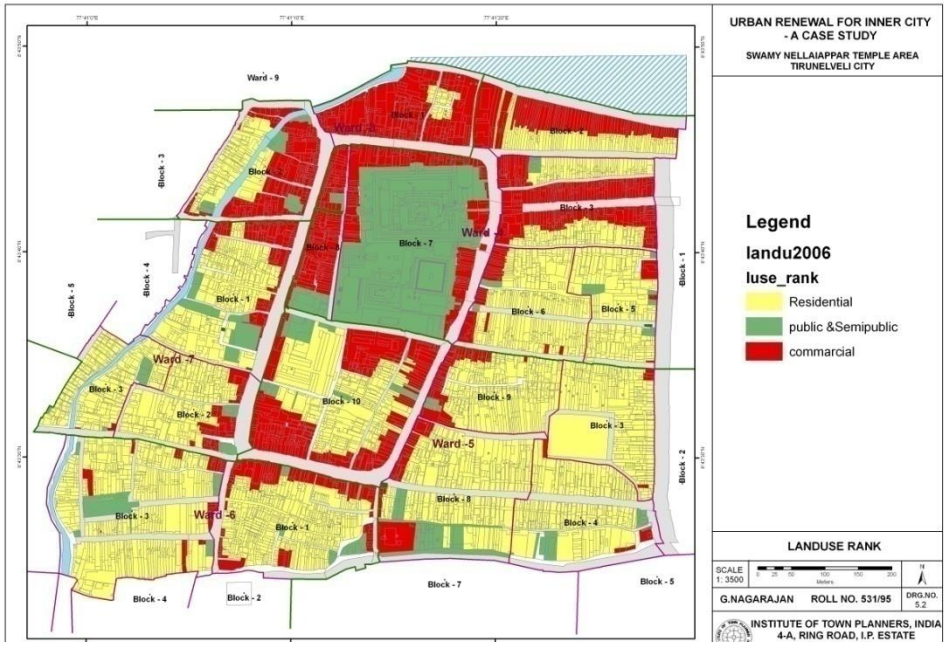
Bin Status>>Daily VehicleWise Pick-up Status

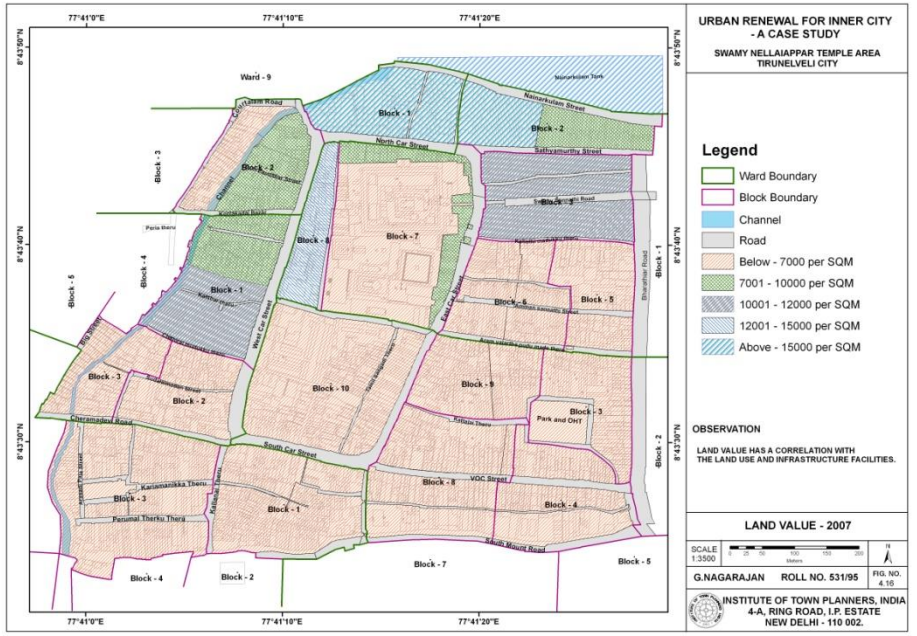
Select Ward: A PRABHAG | For Month: OCTOBER | Show Report

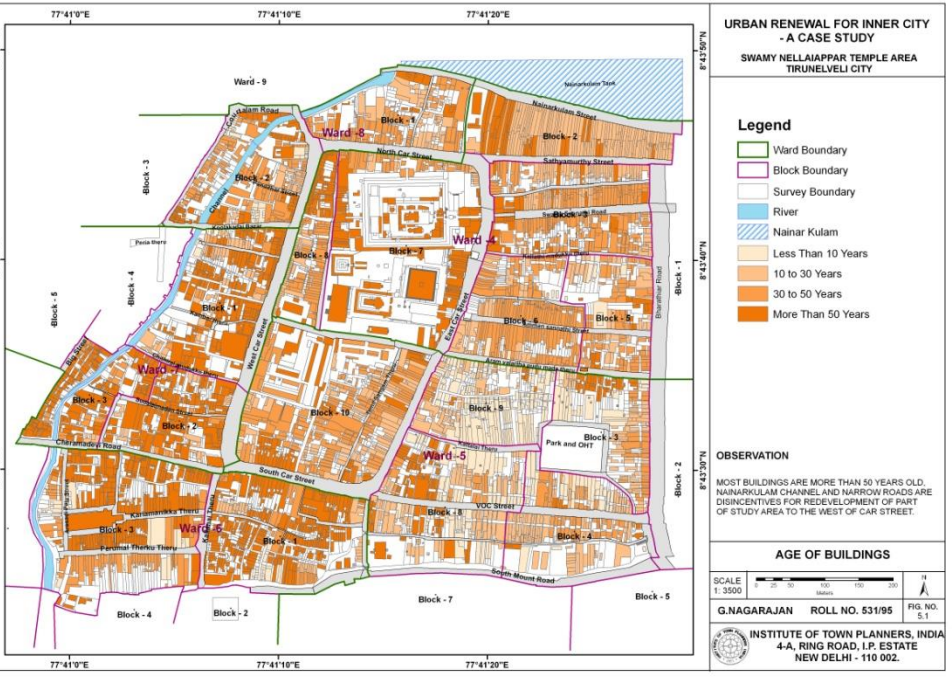
Daily Bin Pick-up Status

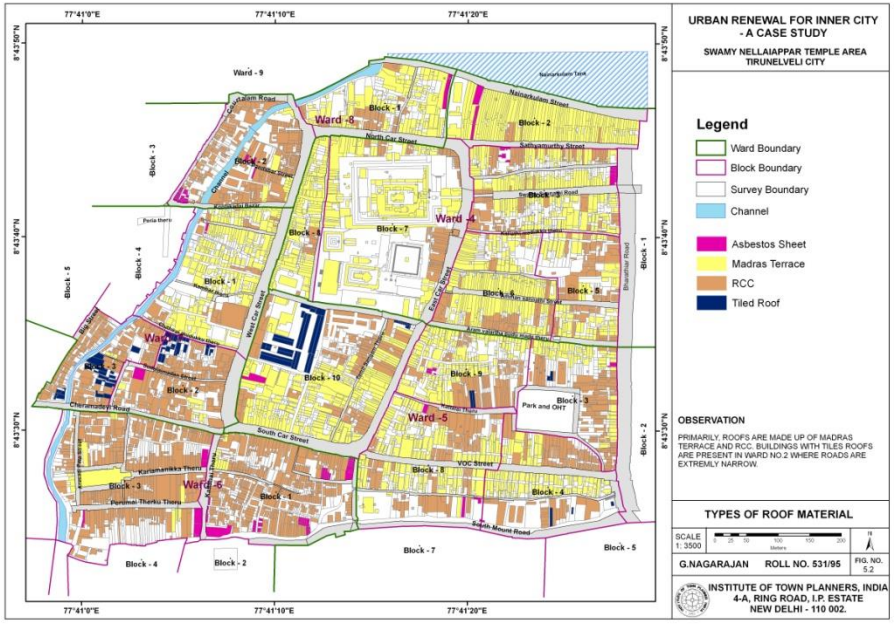
Vehicle Group	Vehicle Name	Vehicle Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TO
A PRABHAG	MH14F6014	Dumper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	6	6	5	8	4	3	8	5	
A PRABHAG	MH14F7909	Dumper	9	9	0	0	0	0	1	0	0	0	0	0	12	0	21	1	1	1	1	1	1	1	1	1	1	1	1	12	0	0	0	
A PRABHAG	MH14F9964	Compactor	0	0	0	0	21	33	37	50	80	25	29	32	44	2	0	0	0	0	0	25	24	47	63	76	45	69	20	1	1	1	1	7
A PRABHAG	MH14AZ9859	Compactor	31	32	0	0	0	13	16	19	38	28	47	54	57	0	36	20	45	27	55	34	19	39	50	46	44	53	35	39	47	19	0	9
A PRABHAG	MH14F9970	Compactor	0	0	0	0	0	0	0	0	0	8	0	0	2	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	23	0	
A PRABHAG	MH14AZ9860	Compactor	30	0	0	0	0	24	25	23	37	41	51	46	60	0	20	28	32	35	54	46	29	49	41	12	0	0	0	0	0	0	0	6
A PRABHAG	MH14F9961	Compactor	21	1	0	0	0	13	28	38	55	72	53	71	12	0	0	0	17	2	0	0	0	45	38	45	0	14	0	18	24	29	39	6
A																																		

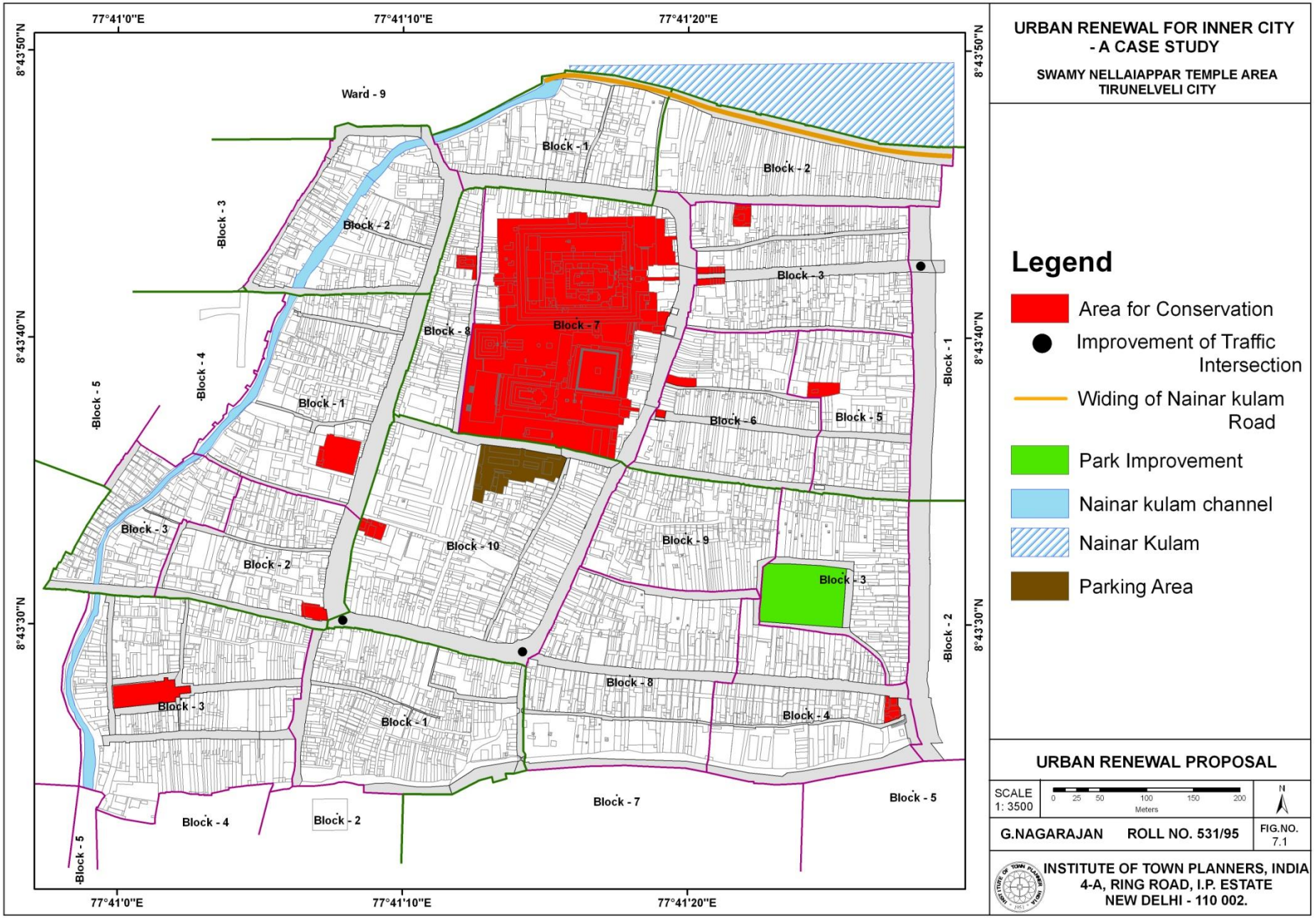
URBAN RENEWAL PLANNING





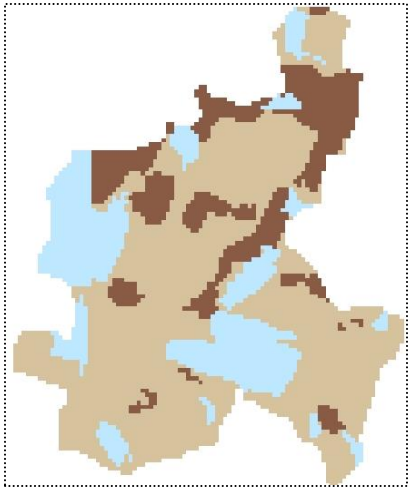




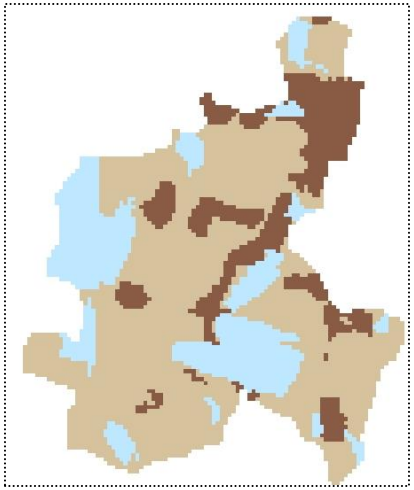

77°41'0"E
77°41'10"E
77°41'20"E
8°43'50"N
8°43'40"N
8°43'30"N
Ward - 9
Block - 1
Block - 2
Block - 3
Block - 4
Block - 5
Block - 6
Block - 7
Block - 8
Block - 9
Block - 10
Legend
Area for Conservation
Improvement of Traffic Intersection
Widing of Nainar kulam Road
Park Improvement
Nainar kulam channel
Nainar Kulam
Parking Area
URBAN RENEWAL FOR INNER CITY - A CASE STUDY
SWAMY NELLAIAPPAR TEMPLE AREA
TIRUNELVELI CITY
URBAN RENEWAL PROPOSAL
SCALE 1: 3500
0 25 50 100 150 200
Meters
N
G.NAGARAJAN
ROLL NO. 531/95
FIG.NO. 7.1
INSTITUTE OF TOWN PLANNERS, INDIA
4-A, RING ROAD, I.P. ESTATE
NEW DELHI - 110 002.

MODEL IMPLEMENTION AND CALIBRATION

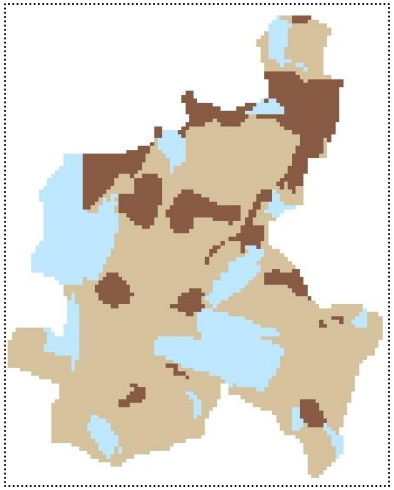
Urban growth -Year 2003 :



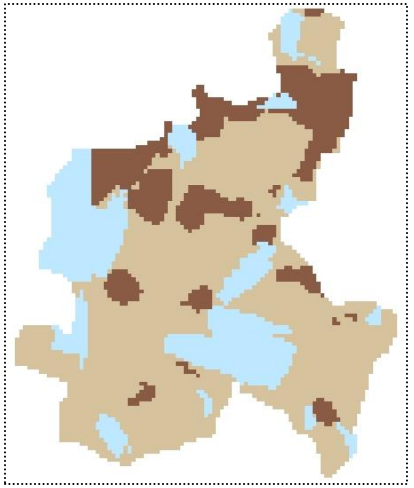
Case 1



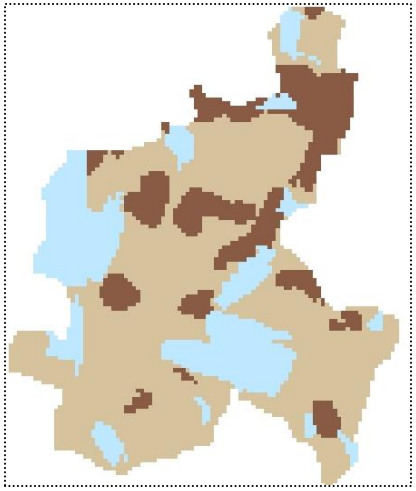
Case 2



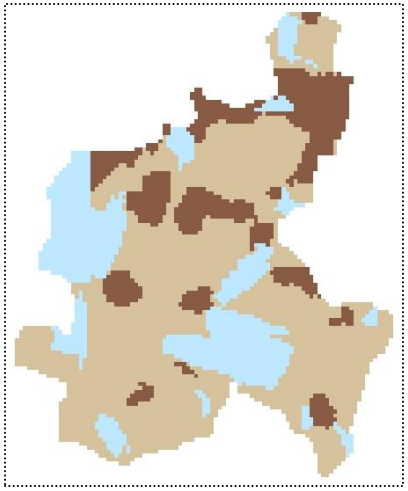
Case 3



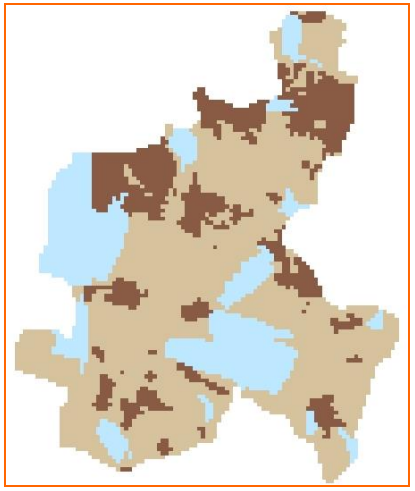
Case 4



Case 5



Case 6



Actual Built up-year 2003

Built -Up

Non Built - Up

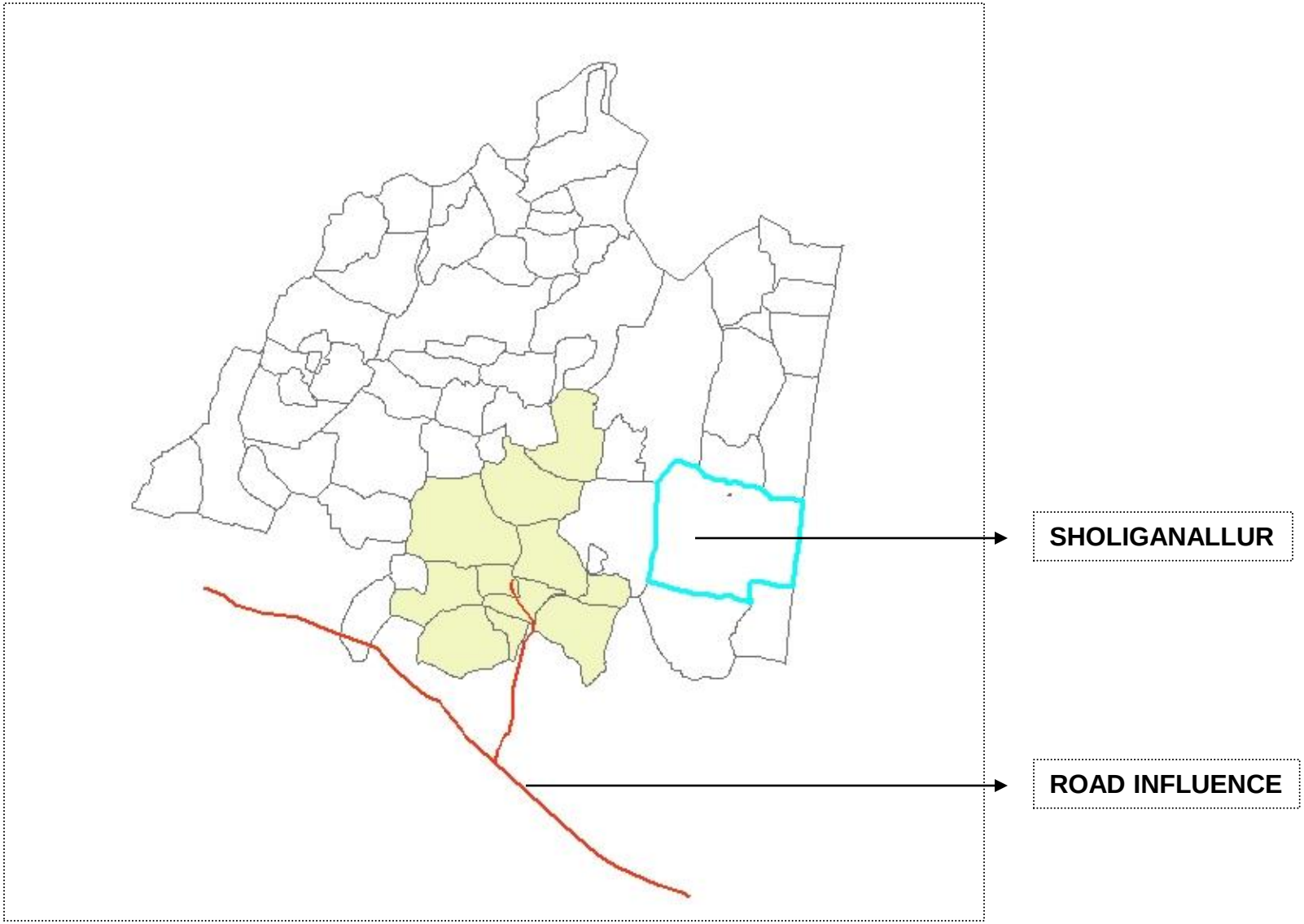
Protected Area
(Water bodies & reserved forest)

MODEL IMPLEMENTION AND CALIBRATION

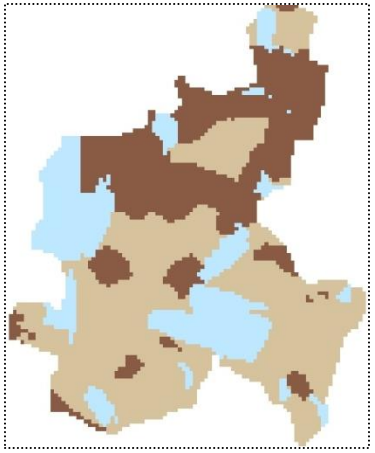
Accuracy Evaluation :

Case	Road Network		Neighbourhood	Urban Center	Land use	Overall Accuracy	Kappa Coefficient
	SH	DR					
1	0.150	0.150	0.2	0.4	0.10	79.6	45.49
2	0.200	0.200	0.3	0.2	0.10	84.3	58.20
3	0.125	0.125	0.3	0.4	0.05	86.2	63.02
4	0.150	0.100	0.3	0.4	0.05	87.3	66.25
5	0.125	0.125	0.4	0.3	0.05	82.6	53.92
6	0.150	0.100	0.4	0.3	0.05	85.1	60.46

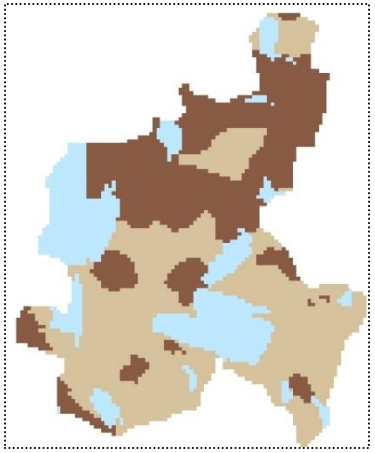
AGENTS - EXTERNAL DRIVING FACTORS



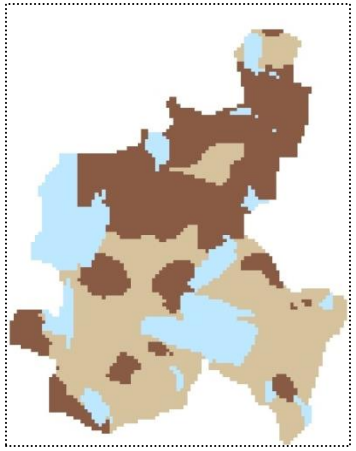
RESULTS - ROAD AGENT INFLUENCE



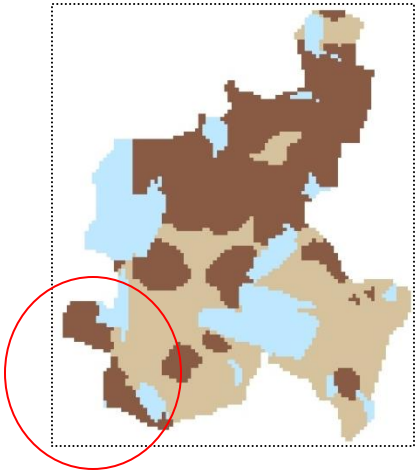
2011



2013



2015



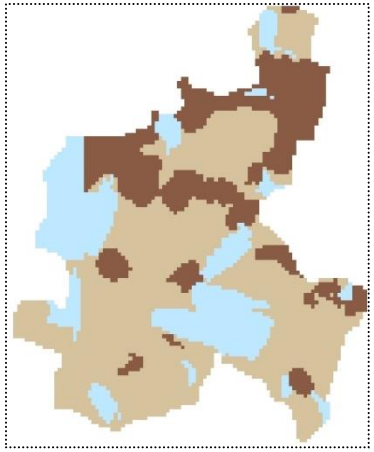
2017

Built -Up

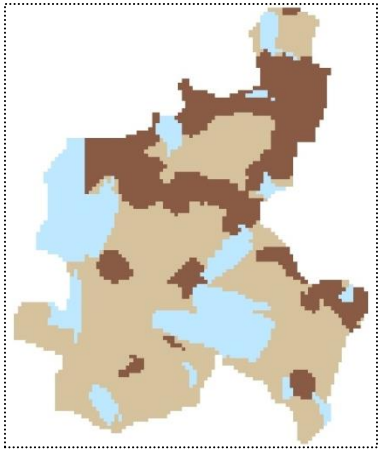
Non Built - Up

Protected Area
(Water bodies & reserved forest)

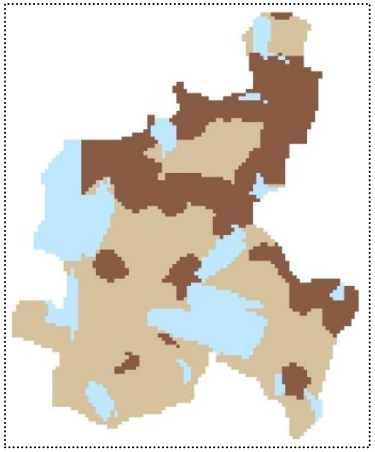
RESULTS – URBAN CENTER AGENT



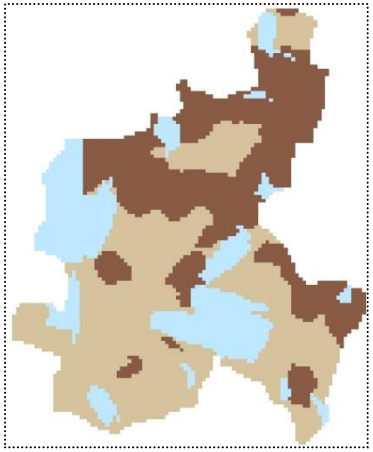
2007



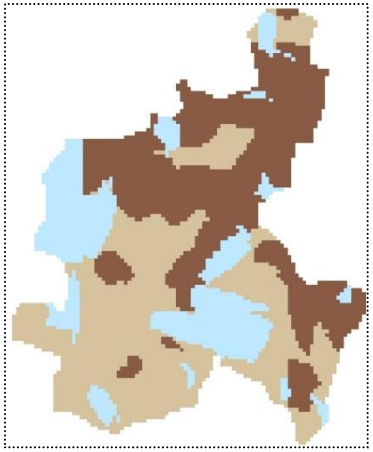
2009



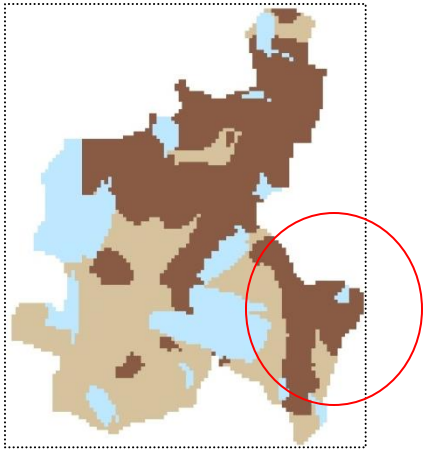
2011



2013



2015



2017

Built -Up

Non Built - Up

Protected Area
(Water bodies & reserved forest)

RESULTS-WITHOUT AGENTS

Year 2015

Built -Up

Non Built - Up

Protected Area
(Water bodies & reserved forest)

RESULTS - WITH URBAN AGENTS

Year 2017

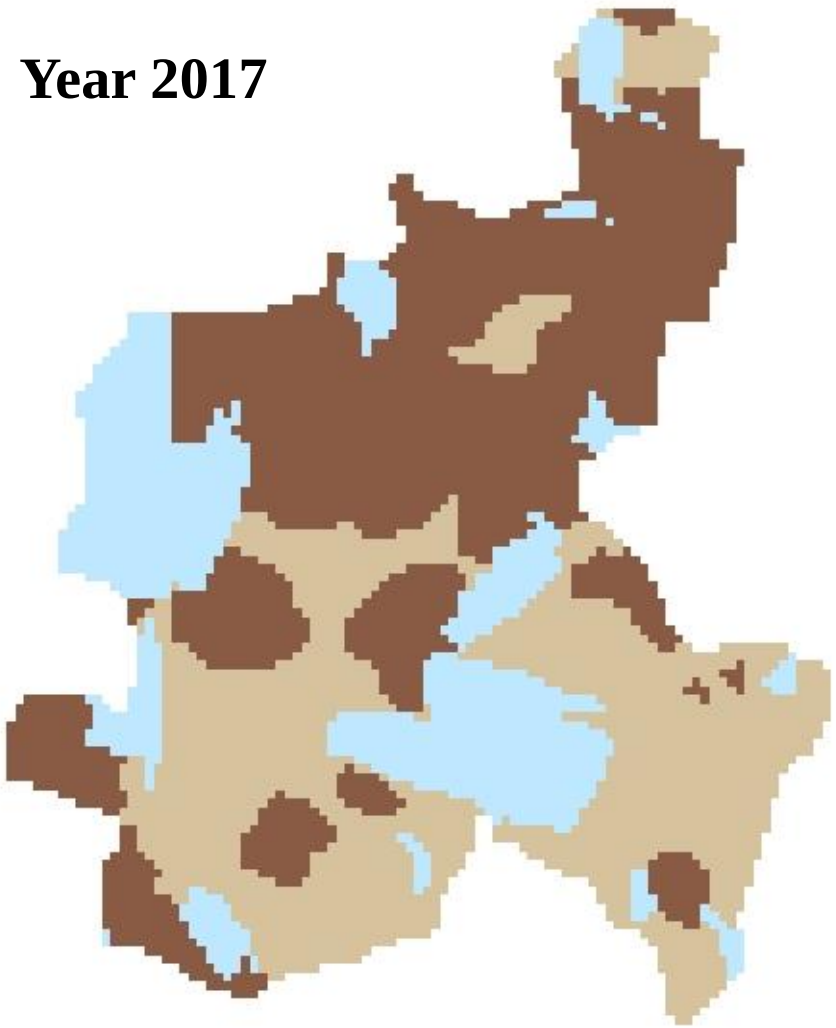
Built -Up

Non Built - Up

Protected Area
(Water bodies & reserved forest)

RESULTS-WITH ROAD AGENTS

Year 2017



Built -Up

Non Built - Up

Protected Area
(Water bodies & reserved forest)

Road Distress Analysis


Severity block/alligator cracking
0
0.1 - 8
8 - 15
15 - 22
22 - 30
250 0 250 Meters

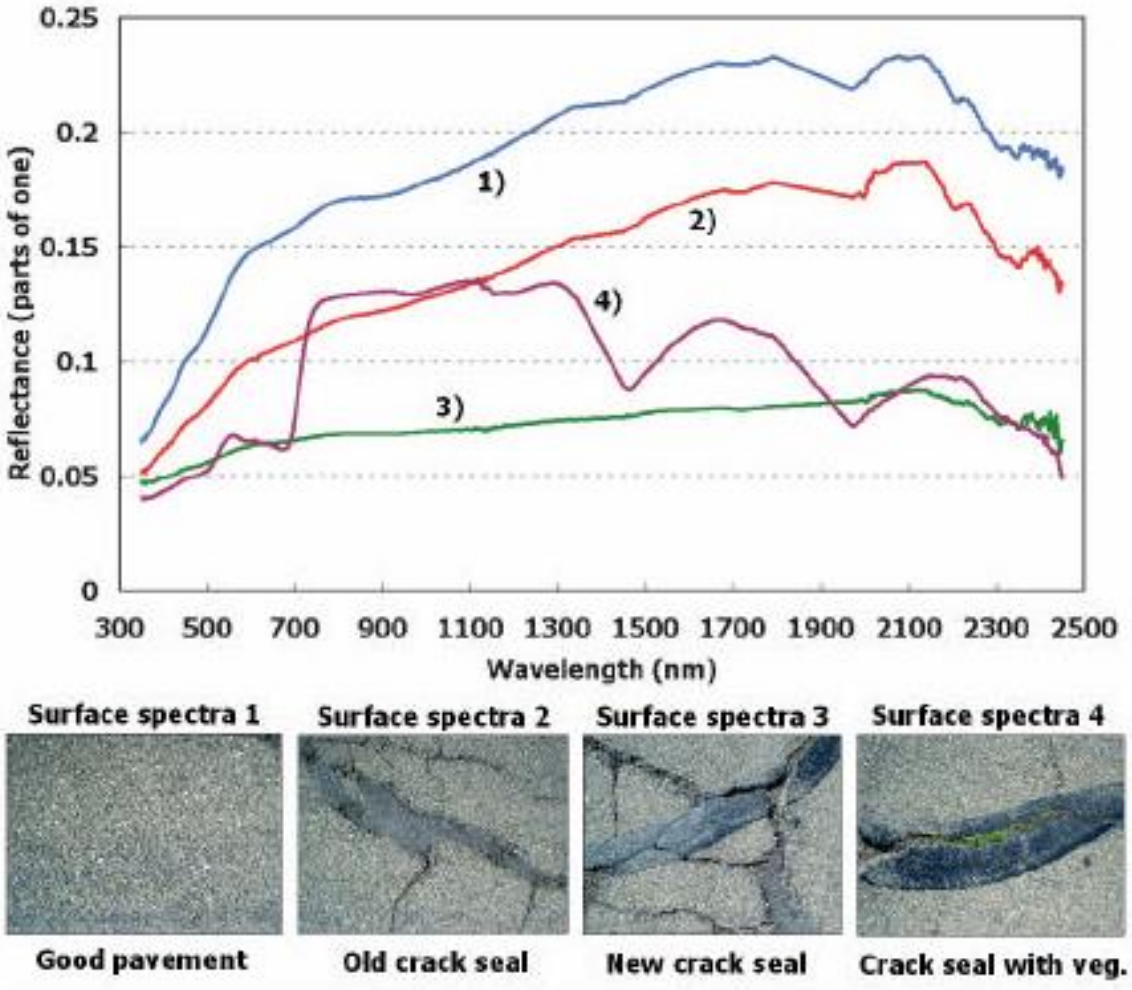
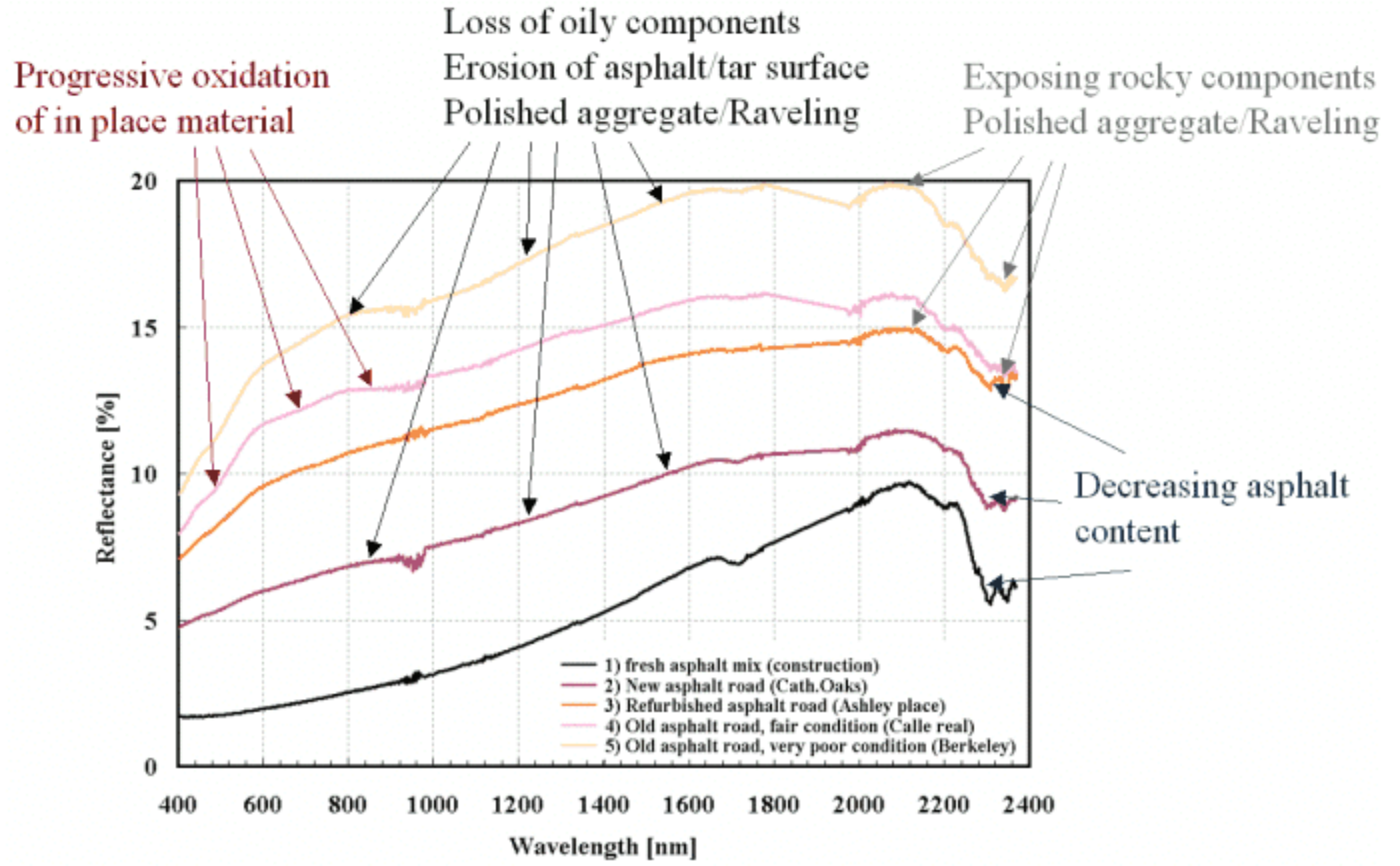


Figure 6: Acquisition of spectr
samples of road surface distresses.


Progressive oxidation
of in place material
Loss of oily components
Erosion of asphalt/tar surface
Polished aggregate/Raveling
Exposing rocky components
Polished aggregate/Raveling
Decreasing asphalt
content
Reflectance [%]
Wavelength [nm]
0
5
10
15
20
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
1) fresh asphalt mix (construction)
2) New asphalt road (Cath.Oaks)
3) Refurbished asphalt road (Ashley place)
4) Old asphalt road, fair condition (Calle real)
5) Old asphalt road, very poor condition (Berkeley)

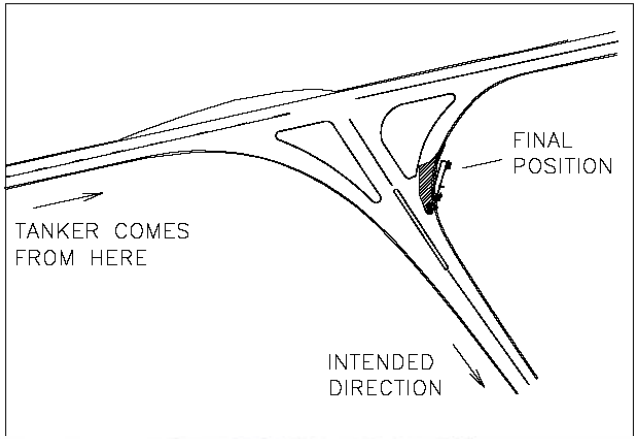
A: Red tile roof
B: Wood shingle roof
C: Grey composite shingle roof

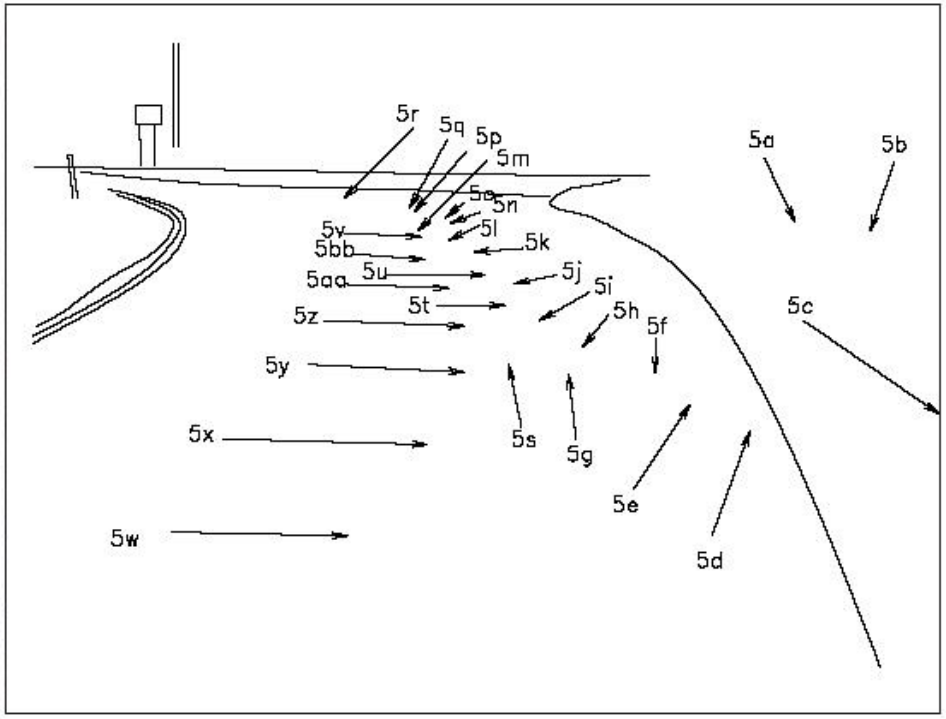
D: Concrete road
E: Asphalt road
F: Parking lot

G: Green vegetation
H: Non-photosynthetic vegetation
I: Bare soil

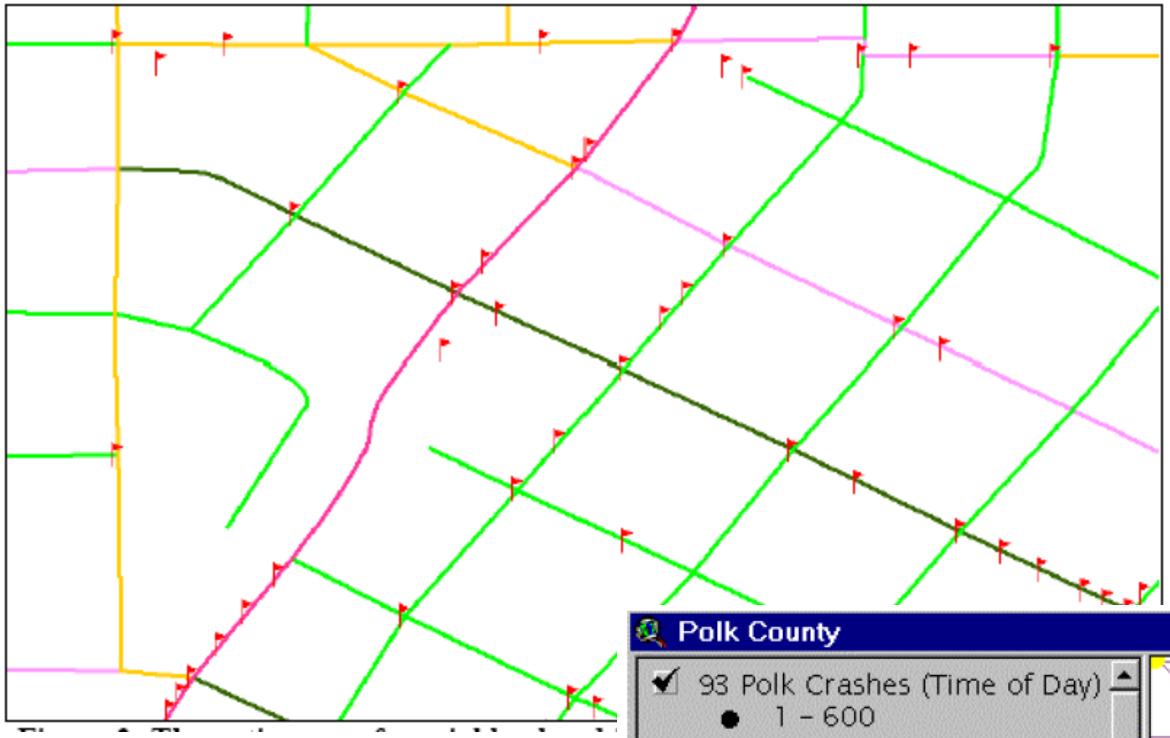
High resolution AVIRIS image
RGB: 2338nm/846nm/438nm
Goleta, CA, June 2000

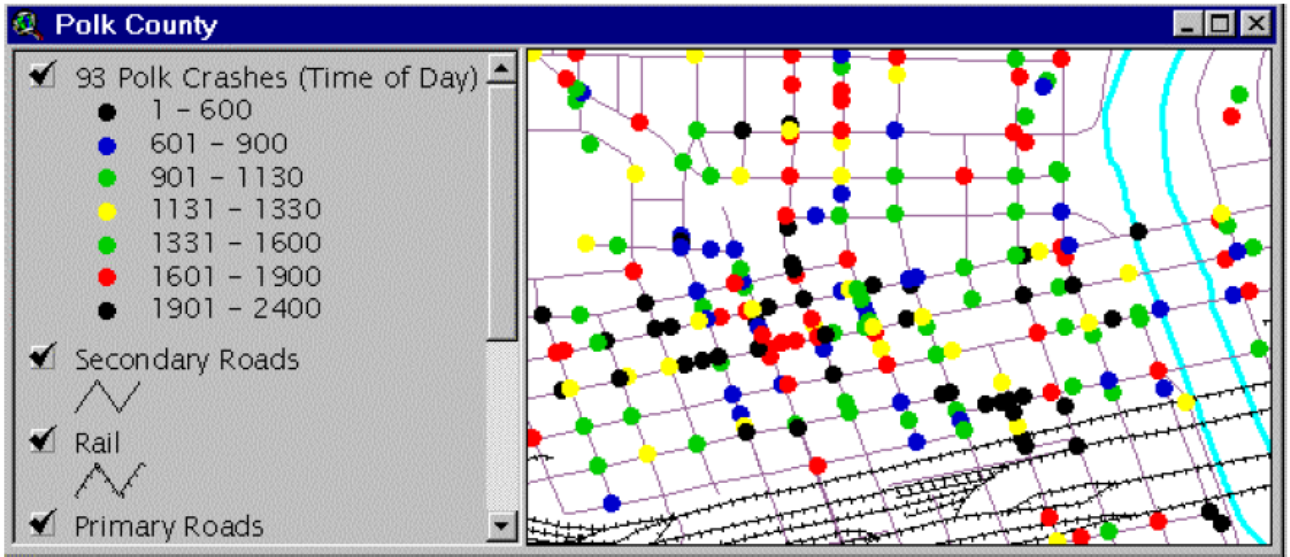
Accident Analysis

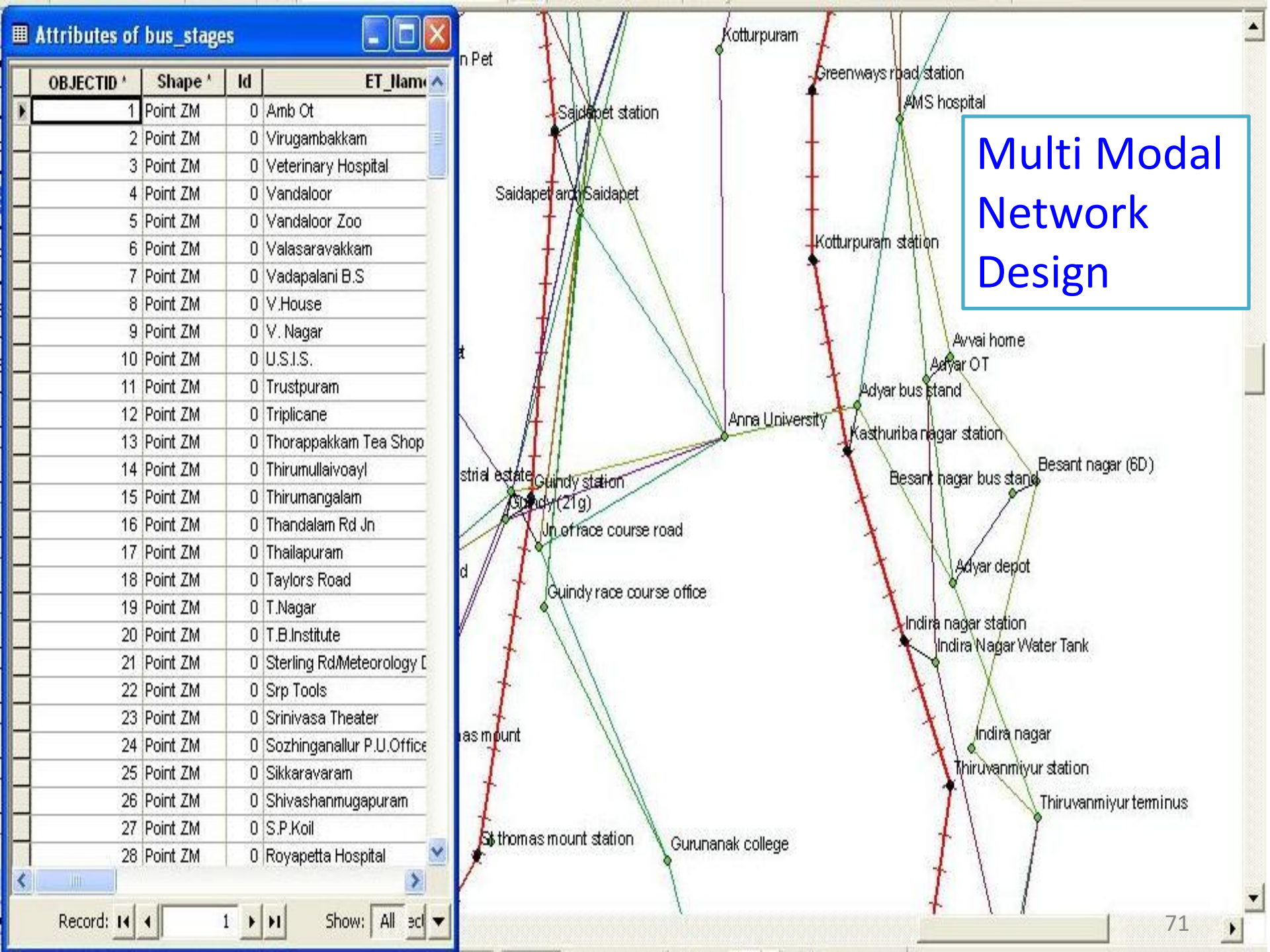




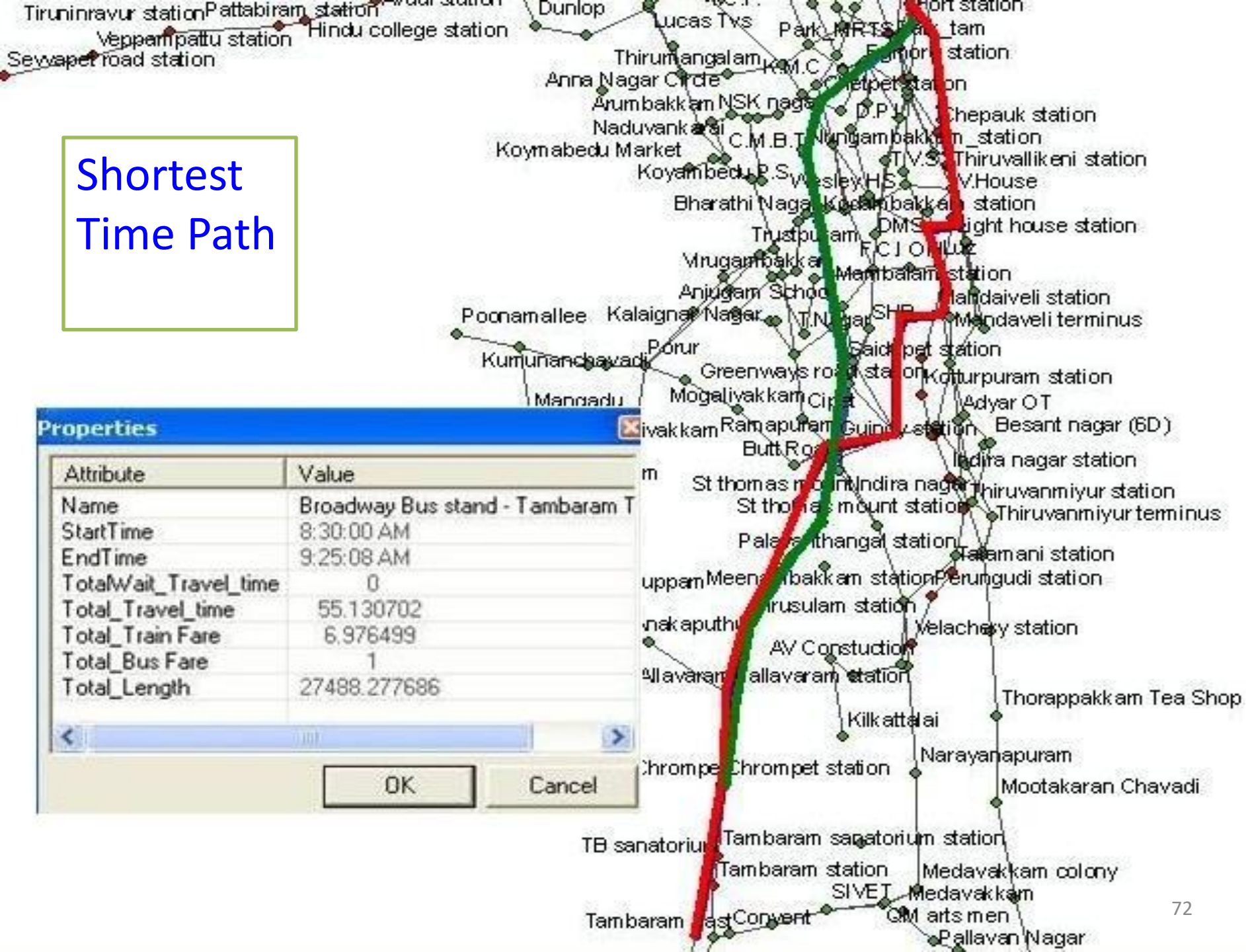
Accident Analysis in GIS






Attributes of bus_stages
OBJECTID * | Shape * | Id | ET_Name
1 Point ZM 0 Amb Ot
2 Point ZM 0 Virugambakkam
3 Point ZM 0 Veterinary Hospital
4 Point ZM 0 Vandaloor
5 Point ZM 0 Vandaloor Zoo
6 Point ZM 0 Valasaravakkam
7 Point ZM 0 Vadapalani B.S
8 Point ZM 0 V.House
9 Point ZM 0 V. Nagar
10 Point ZM 0 U.S.I.S.
11 Point ZM 0 Trustpuram
12 Point ZM 0 Triplicane
13 Point ZM 0 Thorappakkam Tea Shop
14 Point ZM 0 Thirumullaivoayl
15 Point ZM 0 Thirumangalam
16 Point ZM 0 Thandalam Rd Jn
17 Point ZM 0 Thailapuram
18 Point ZM 0 Taylors Road
19 Point ZM 0 T.Nagar
20 Point ZM 0 T.B.Institute
21 Point ZM 0 Sterling Rd/Meteorology D
22 Point ZM 0 Srp Tools
23 Point ZM 0 Srinivasa Theater
24 Point ZM 0 Sozhinganallur P.U.Office
25 Point ZM 0 Sikkaravaram
26 Point ZM 0 Shivashanmugapuram
27 Point ZM 0 S.P.Koil
28 Point ZM 0 Royapetta Hospital
Record: 1
Show: All
Kotturpuram
Greenways road station
AMS hospital
Saidapet station
Saidapet arch Saidapet
Kotturpuram station
Avvai home
Adyar OT
Adyar bus stand
Anna University
Kasthuriba nagar station
Besant nagar (6D)
Besant nagar bus stand
Guindy station
Jn.of race course road
Adyar depot
Guindy race course office
Indira nagar station
Indira Nagar Water Tank
Indira nagar
Thiruvanmiyur station
Thiruvanmiyur terminus
St thomas mount station
Gurunanak college
Multi Modal Network Design

Shortest Time Path



Directions (Route 2)

[−]	**Route: Broadway - Tambaram**	27488.3 m	1 hr 2 min	
1:	Start at Broadway			Map
2:	Go south on Transfer Link toward Beach-Tambaram/Beach-Velachery	389.8 m	4 min	Map
3:	Bear right on Beach-Tambaram	1.8 m	< 1 min	Map
4:	Arrive early at Fort station, on the left Time Window: 10:15 AM - 10:15 AM Wait Time: < 1 min		< 1 min	Map
5:	Depart Fort station			
6:	Go south on Beach-Tambaram	23069.1 m	40 min	Map
7:	Arrive at Chrompet station, on the left			Map
8:	Depart Chrompet station			
9:	Continue south on Beach-Tambaram	8.2 m	< 1 min	Map
10:	Make sharp right on Transfer Link	47.9 m	3 min	Map
11:	Arrive early at Chrompet, on the left Time Window: 11:03 AM - 11:03 AM Wait Time: 5 min		5 min	Map
12:	Depart Chrompet			
13:	Go south on PP21	3971.5 m	8 min	Hide

14: Finish at Tambaram

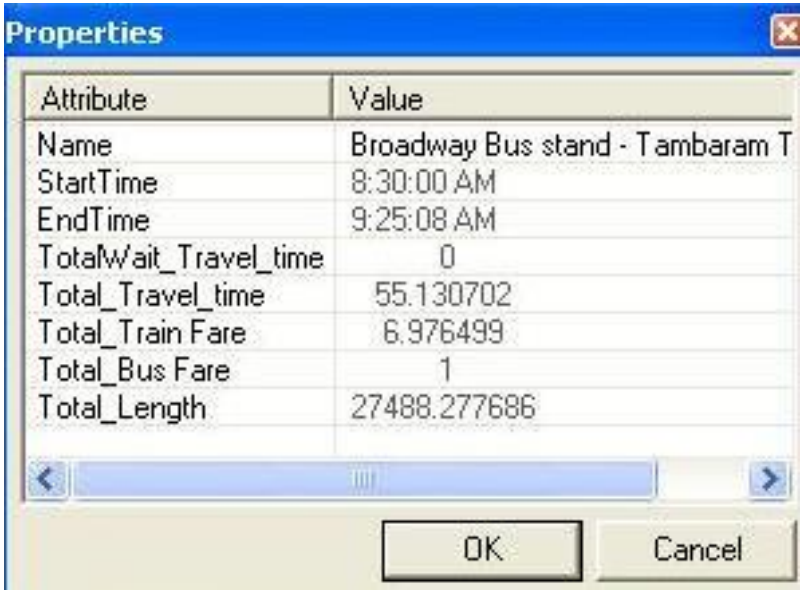
Total time: 1 hr 2 min
Total distance: 27488.3 m
Total wait time: 6 min
Start time: 10:10 AM
Finish time: 11:12 AM

Results and Discussions - Directions

Options... Print Preview...

Single Ticketing

- Single Base Fare
- For train – Based on distance
- For bus – Based on number of stages crossed



Analysis for Broadway – Tambaram

Direct Service: **21G**

Time Taken: **75 Mins**

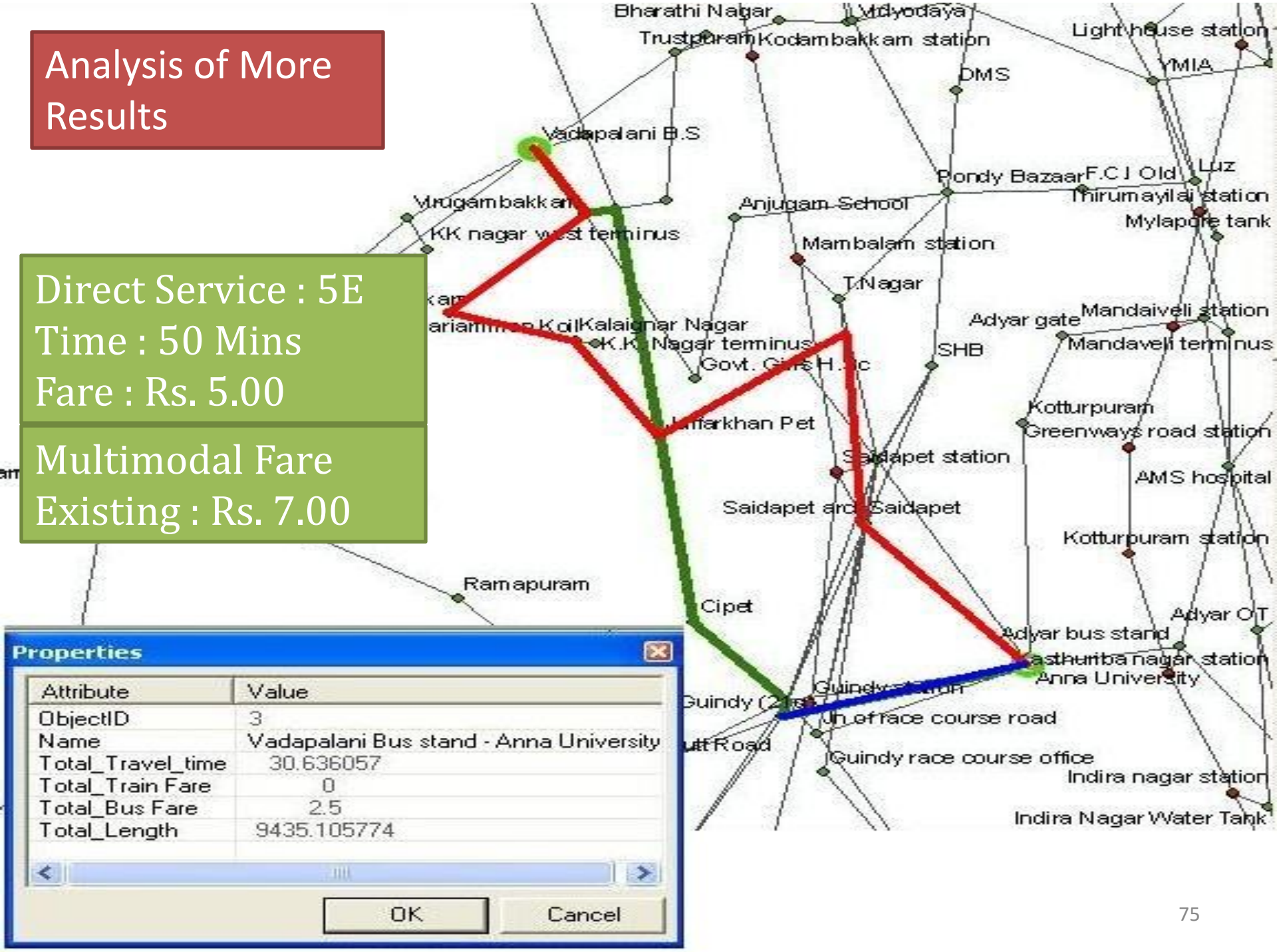
Fare : **Rs. 10.00**

Existing Multimodal Fare : **Rs. 10.00**

Analysis of More Results

Direct Service : 5E
Time : 50 Mins
Fare : Rs. 5.00

Multimodal Fare
Existing : Rs. 7.00



Properties

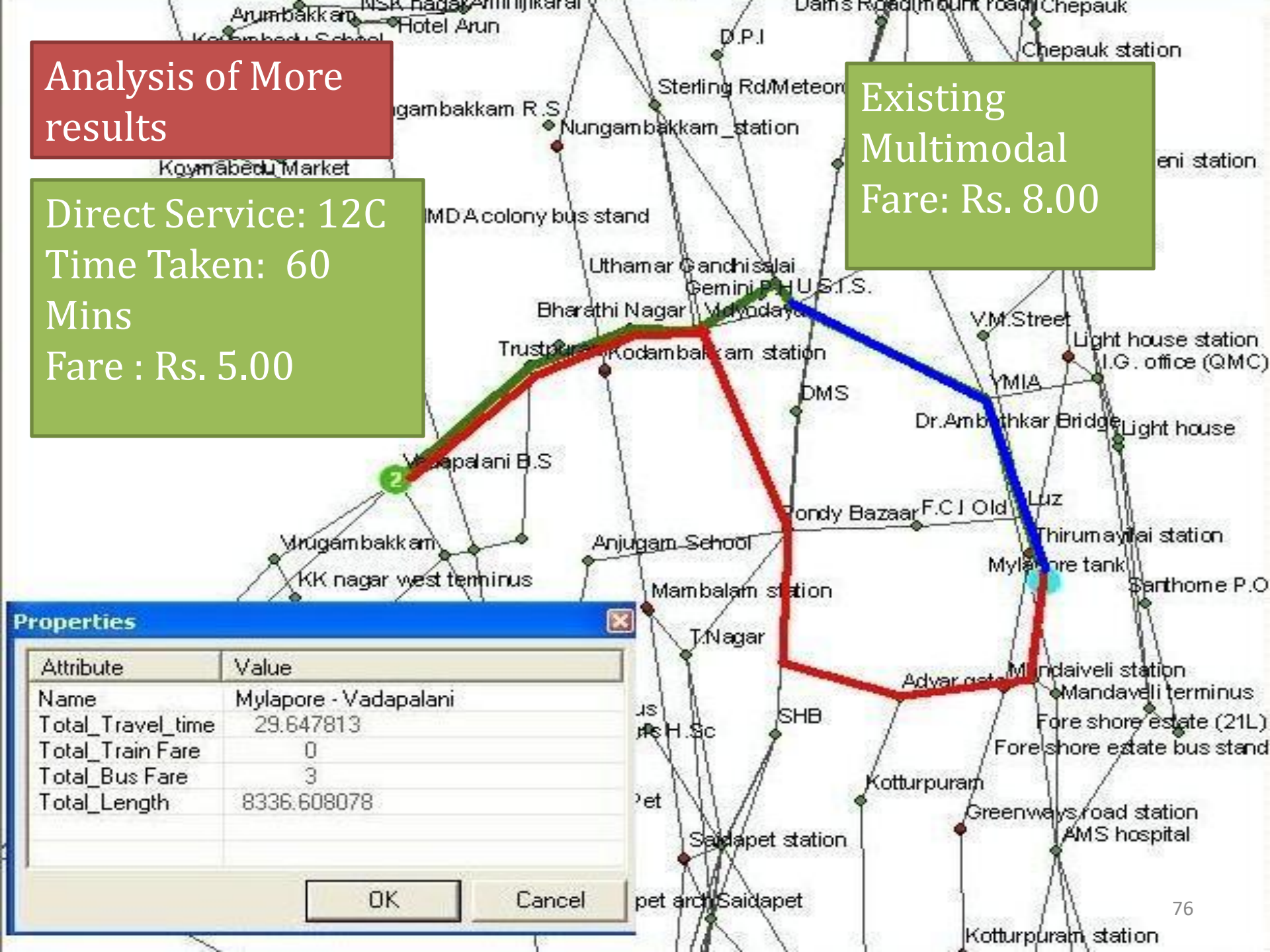
Attribute	Value
ObjectID	3
Name	Vadapalani Bus stand - Anna University
Total_Travel_time	30.636057
Total_Train Fare	0
Total_Bus Fare	2.5
Total_Length	9435.105774

OK Cancel

Analysis of More results

Direct Service: 12C
Time Taken: 60 Mins
Fare : Rs. 5.00

Existing Multimodal
Fare: Rs. 8.00

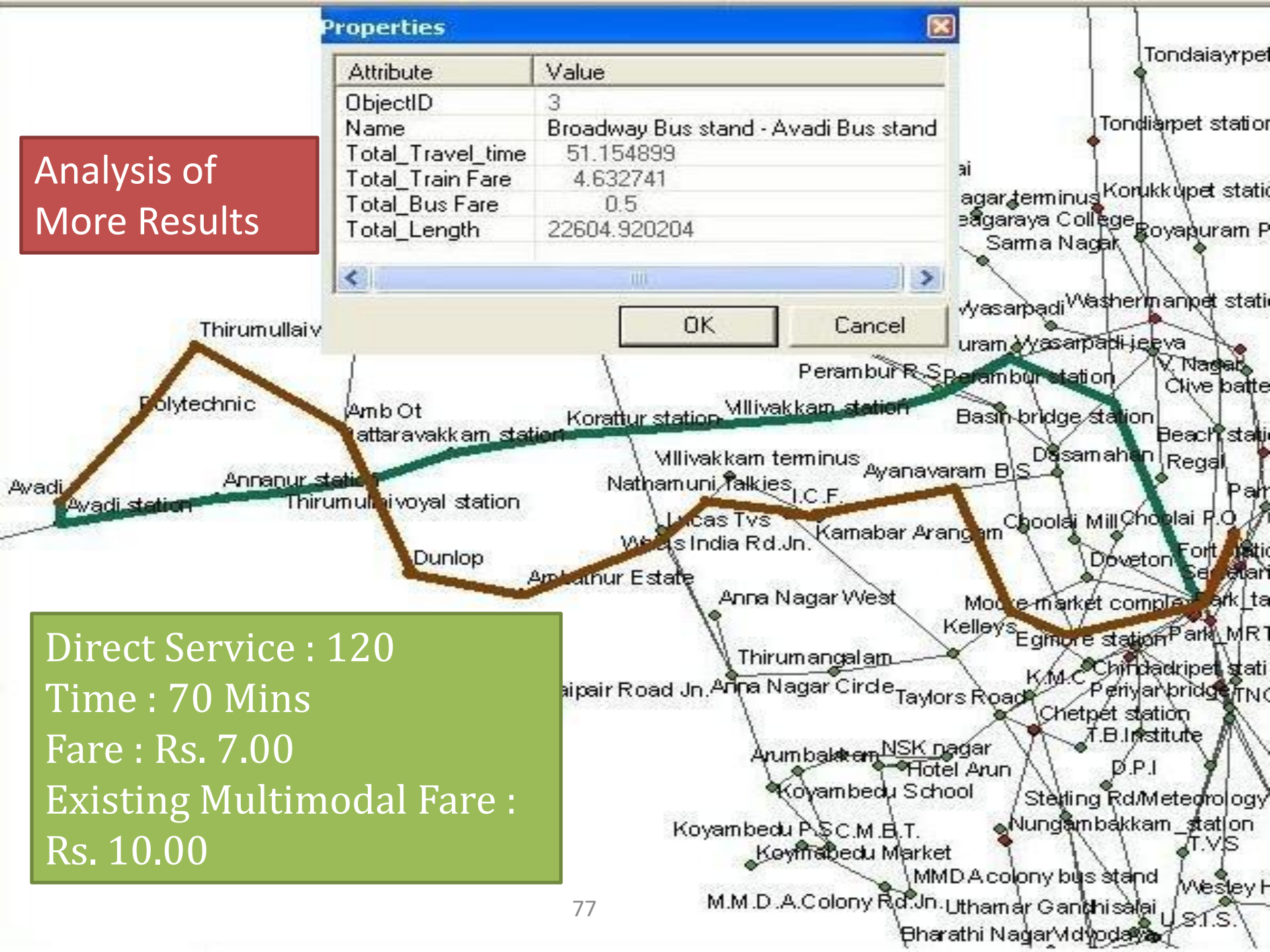


Properties

Attribute	Value
Name	Mylapore - Vadapalani
Total_Travel_time	29.647813
Total_Train Fare	0
Total_Bus Fare	3
Total_Length	8336.608078

OK Cancel

Analysis of More Results



Direct Service : 120
Time : 70 Mins
Fare : Rs. 7.00
Existing Multimodal Fare : Rs. 10.00

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http://www.arcgisonline.com/home/item.html?id=daf596844232416781a11e00339db8c1

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Results and Discussions
Publishing – ArcGIS online

ArcGIS Online BETA

Home My Content My Groups

Unified public transportation network- Chennai City

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The item is shared with:
Everyone

Item Type: Map Document **Owner:** vignesh0711

Modified: March 22, 2010 **Size:** 2 MB

Tags: Chennai,MTC,MRTS,EMU trains,Network analysis

Credits: Eswar group

Use this item

Open in ArcGIS

Summary:
This mxd file will guide the metro transport users to efficiently make use of the available networks to reach their destination in a shorter time.

Description:
In cities like Chennai, though adequate transportation facilities are present to connect almost all the parts of the city, most of the people know very little about the most efficient mode of public transport to reach their destination. This situation is even worse in case of a new comer to the city. A passenger waiting for an MTC bus hours together is a common sight. Rather he or she can select some other break routes and catch a train or another bus from there to reach the destination without any hassle. All these are possible if and only if a meticulous planning is done and all the information, regarding the travel including the time of travel, cost of travel, routes available and other constraints. But the non-availability of information about public transport leads to a pathetic situation that the travel time is not even half the time spent for catching the bus or a train! This makes the need for an Information system sine-qua-non.

Extent:

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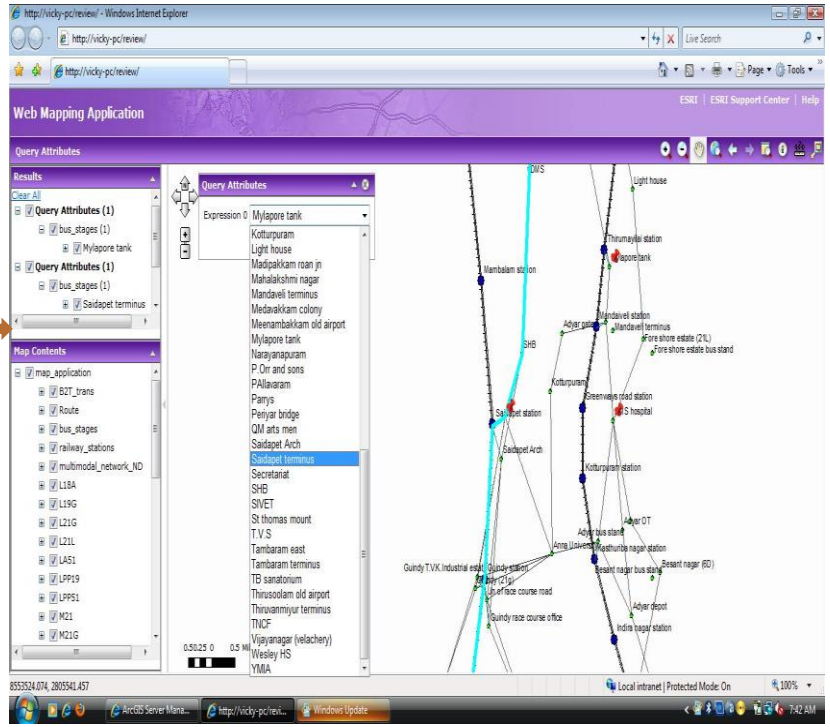
Done

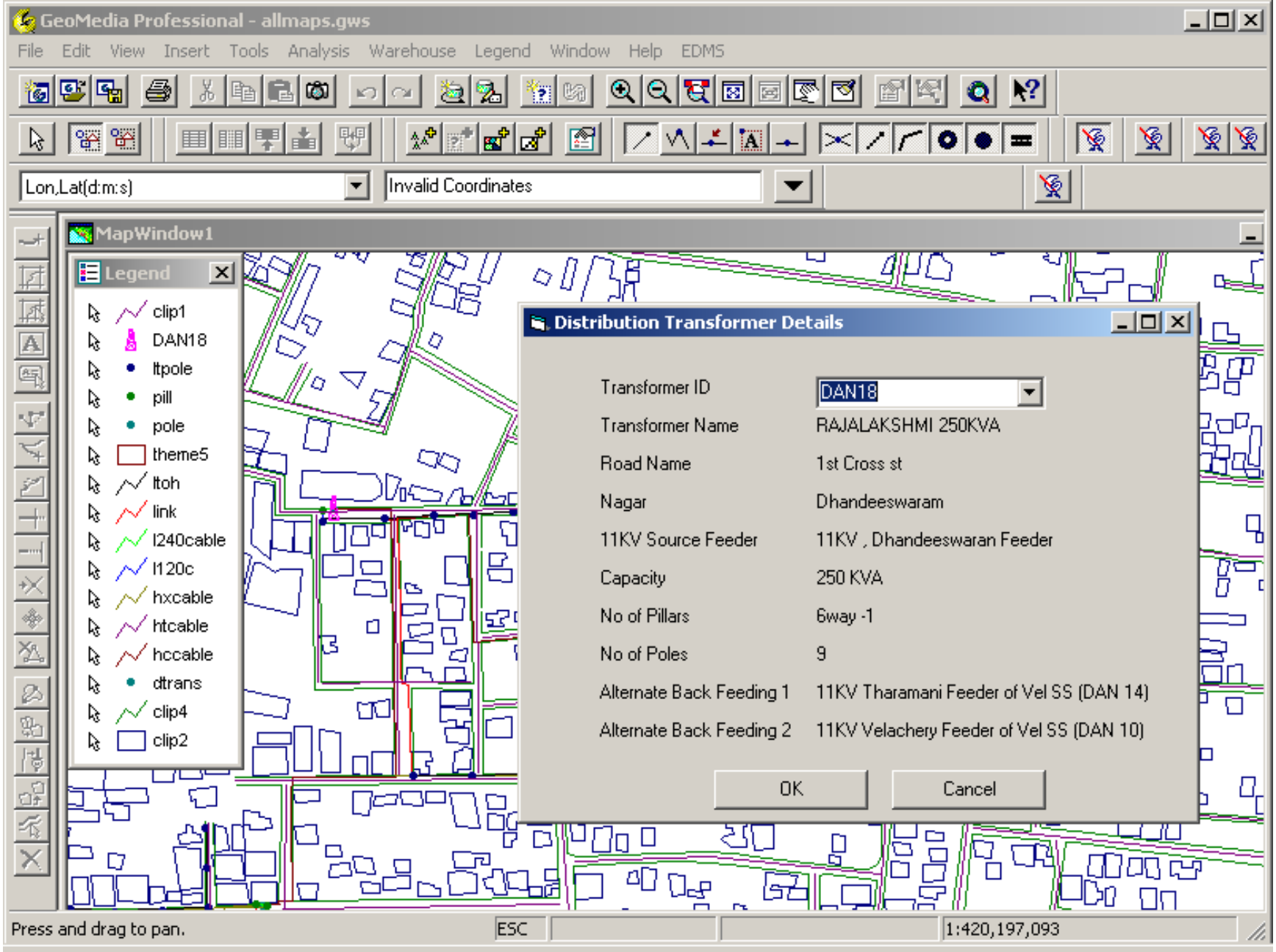
ArcGIS Online - Ite... Downloads project Third review_report ... 9:50 AM

WEB GIS for Information sharing

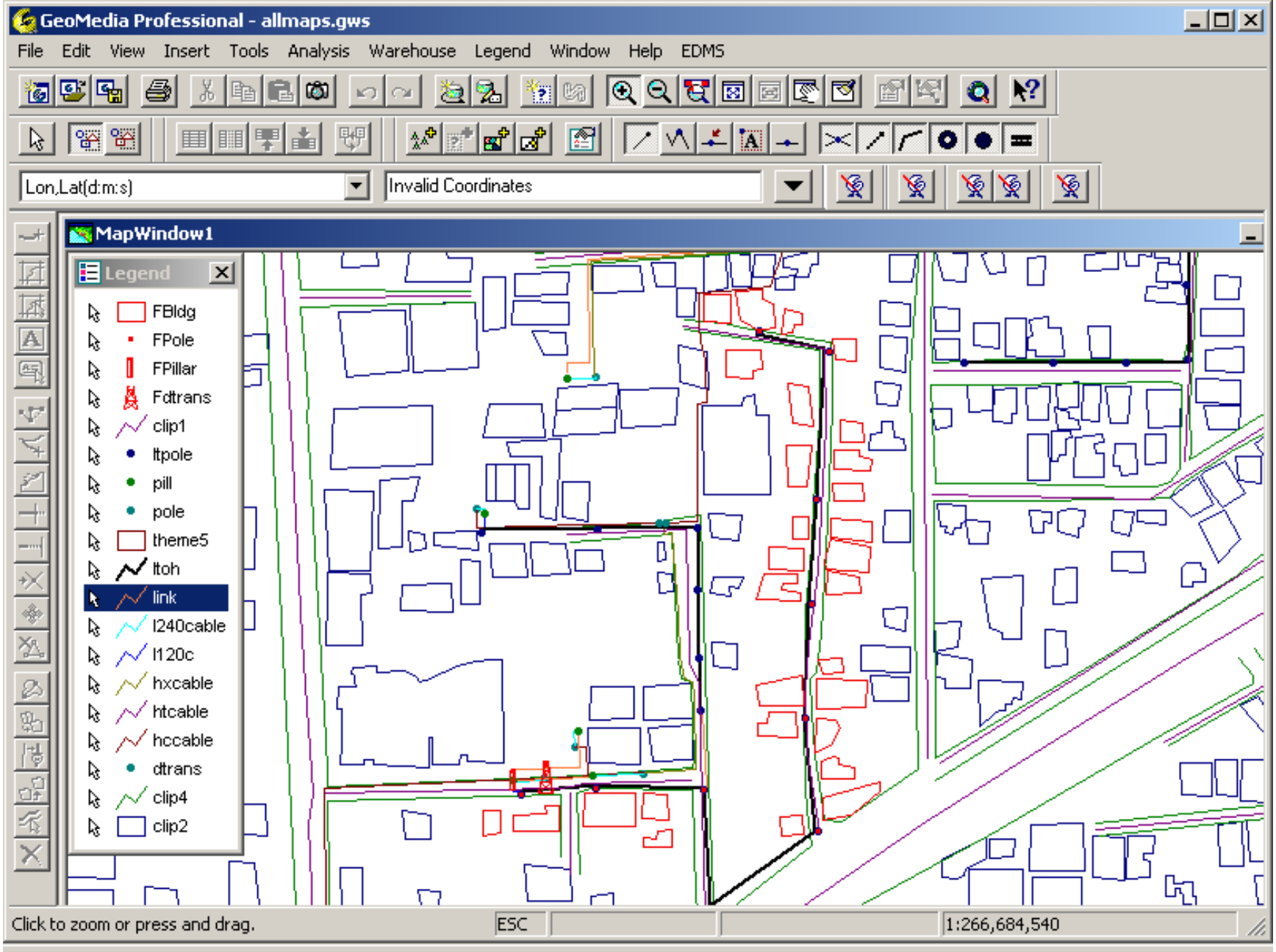
SMS – control room – ArcGIS server



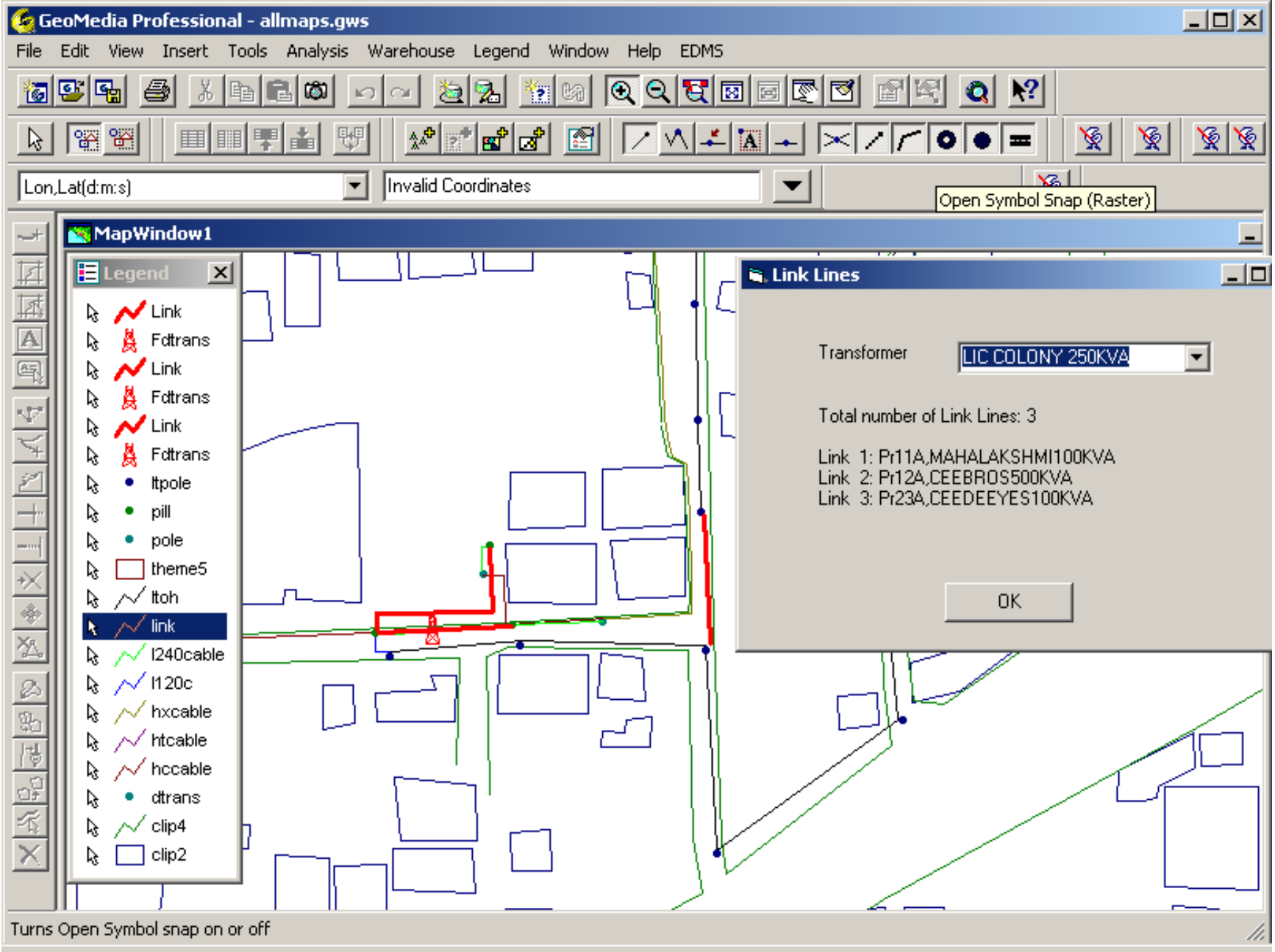
CRIME MAPPING



Information of Selected Distribution Transformer

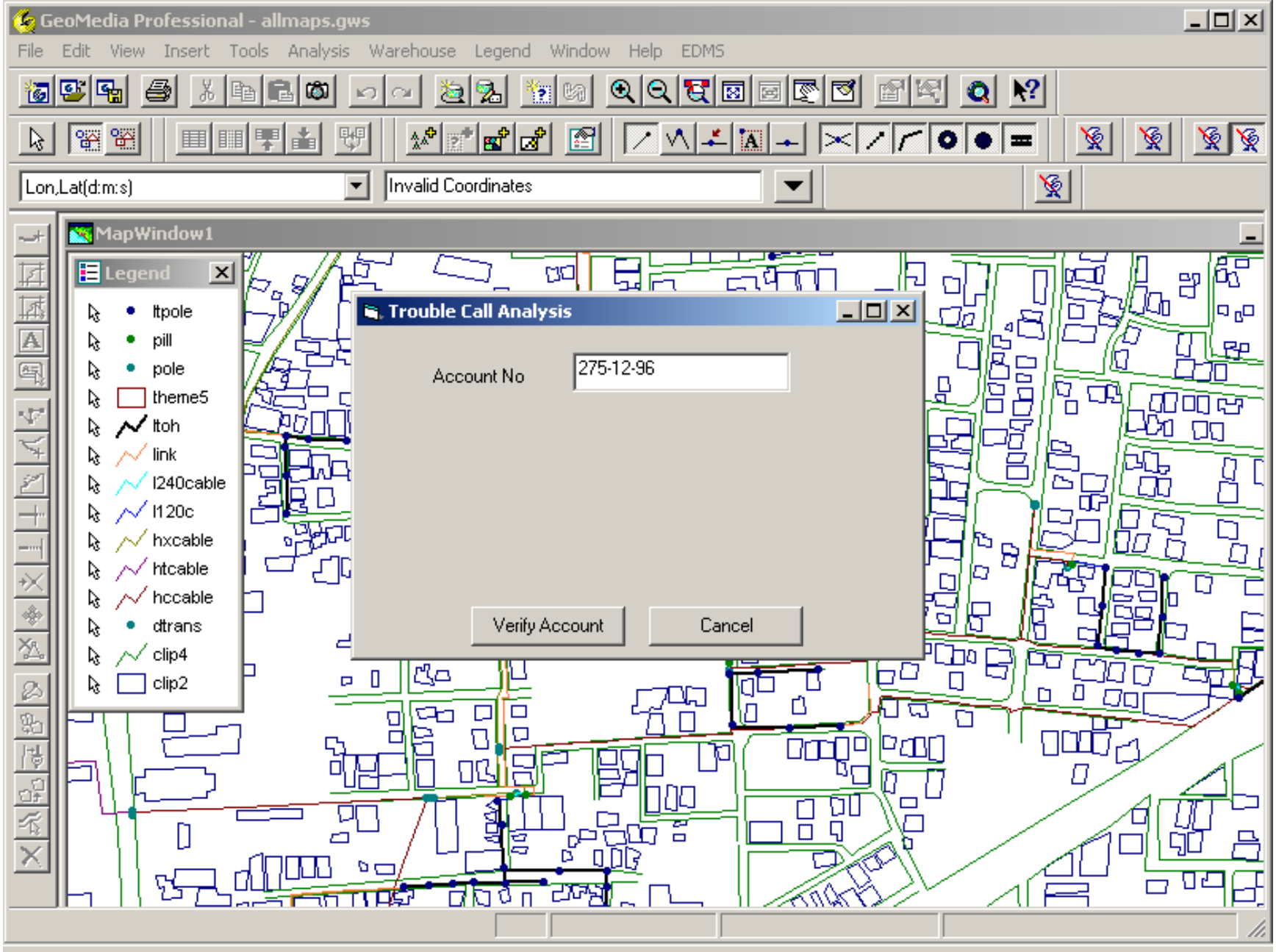


Area Affected Due To Fault



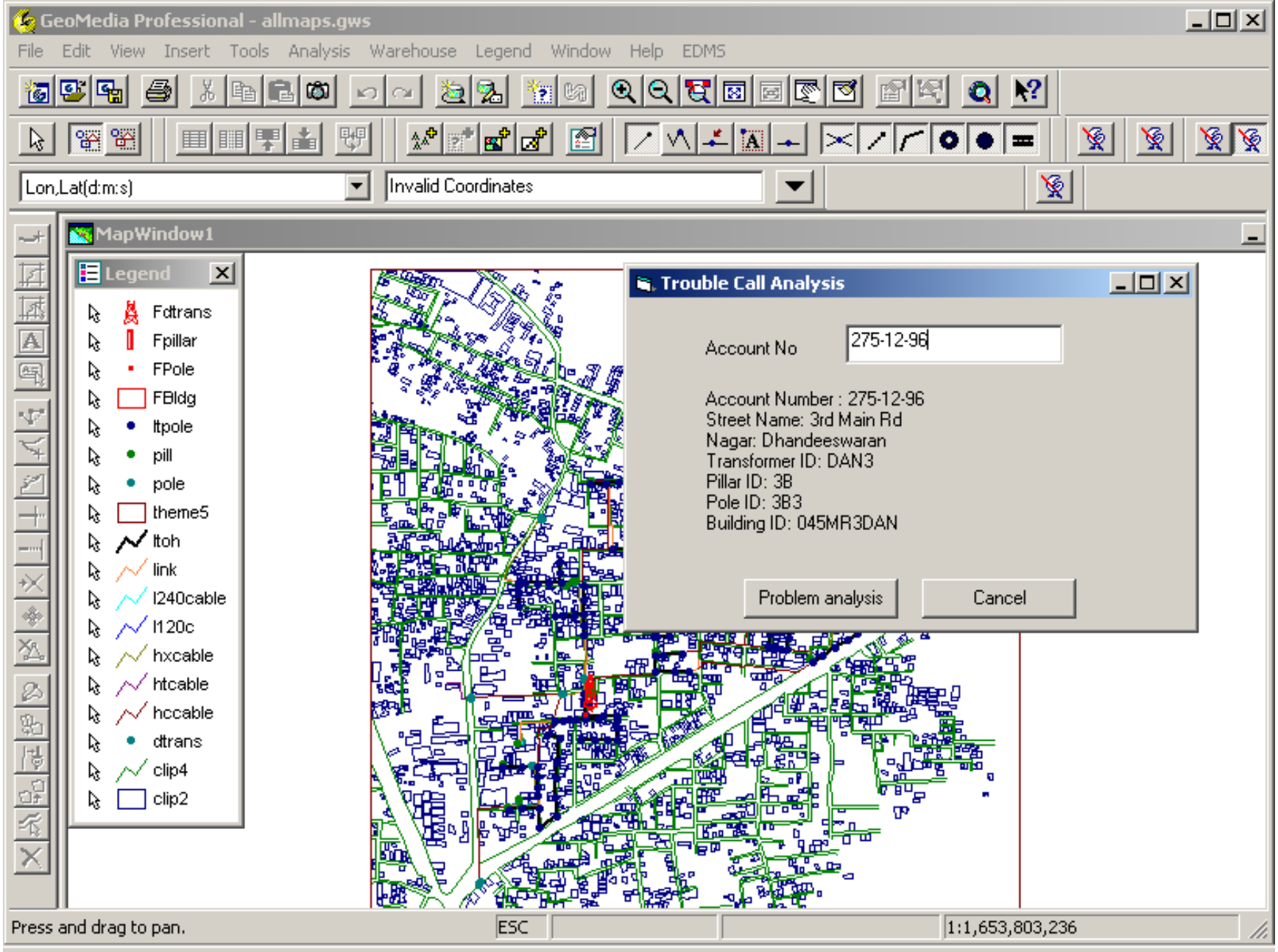
Display Of Alternate Backfeeding Arrangement

Code

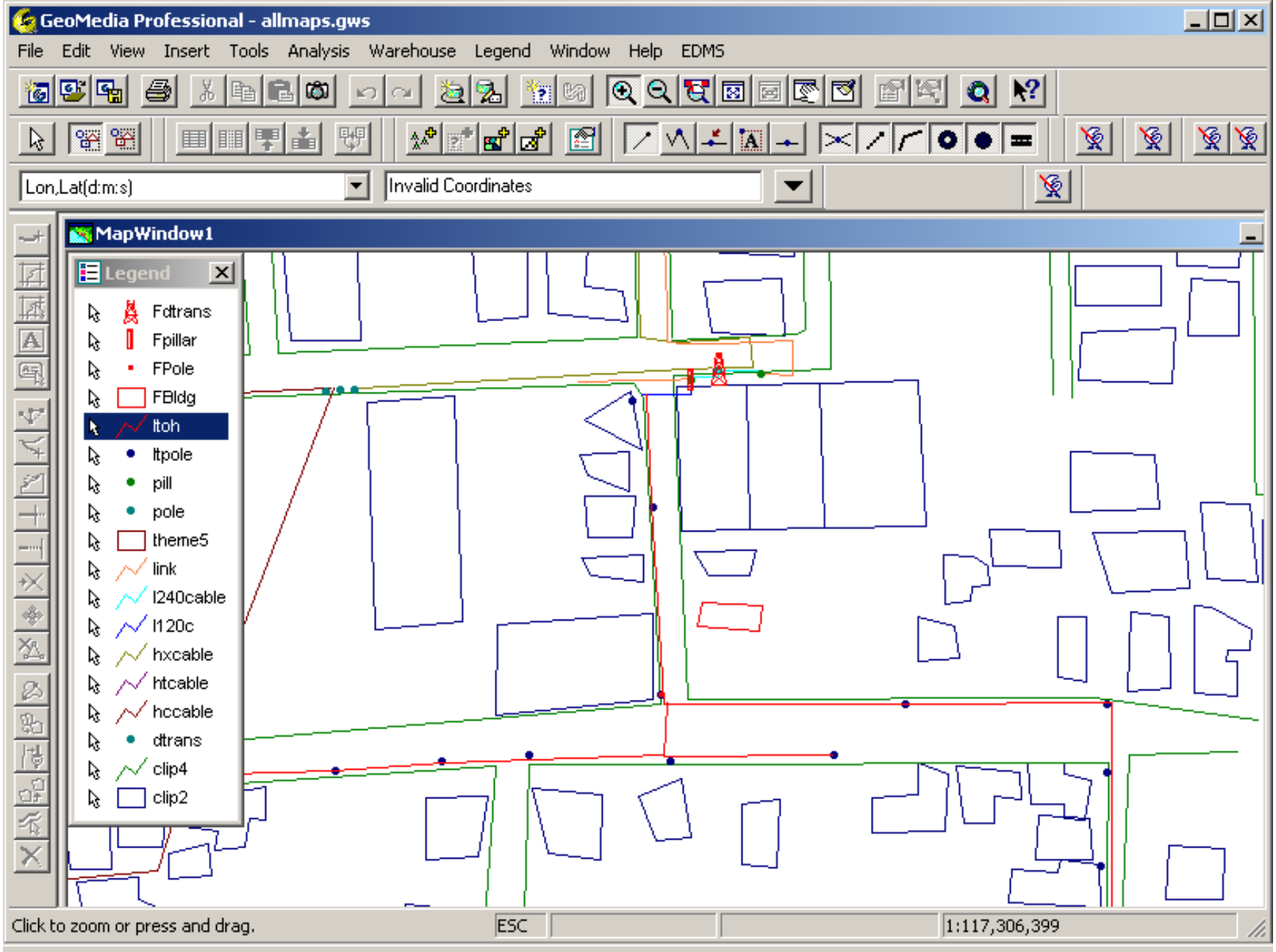


Receipt of Trouble Call

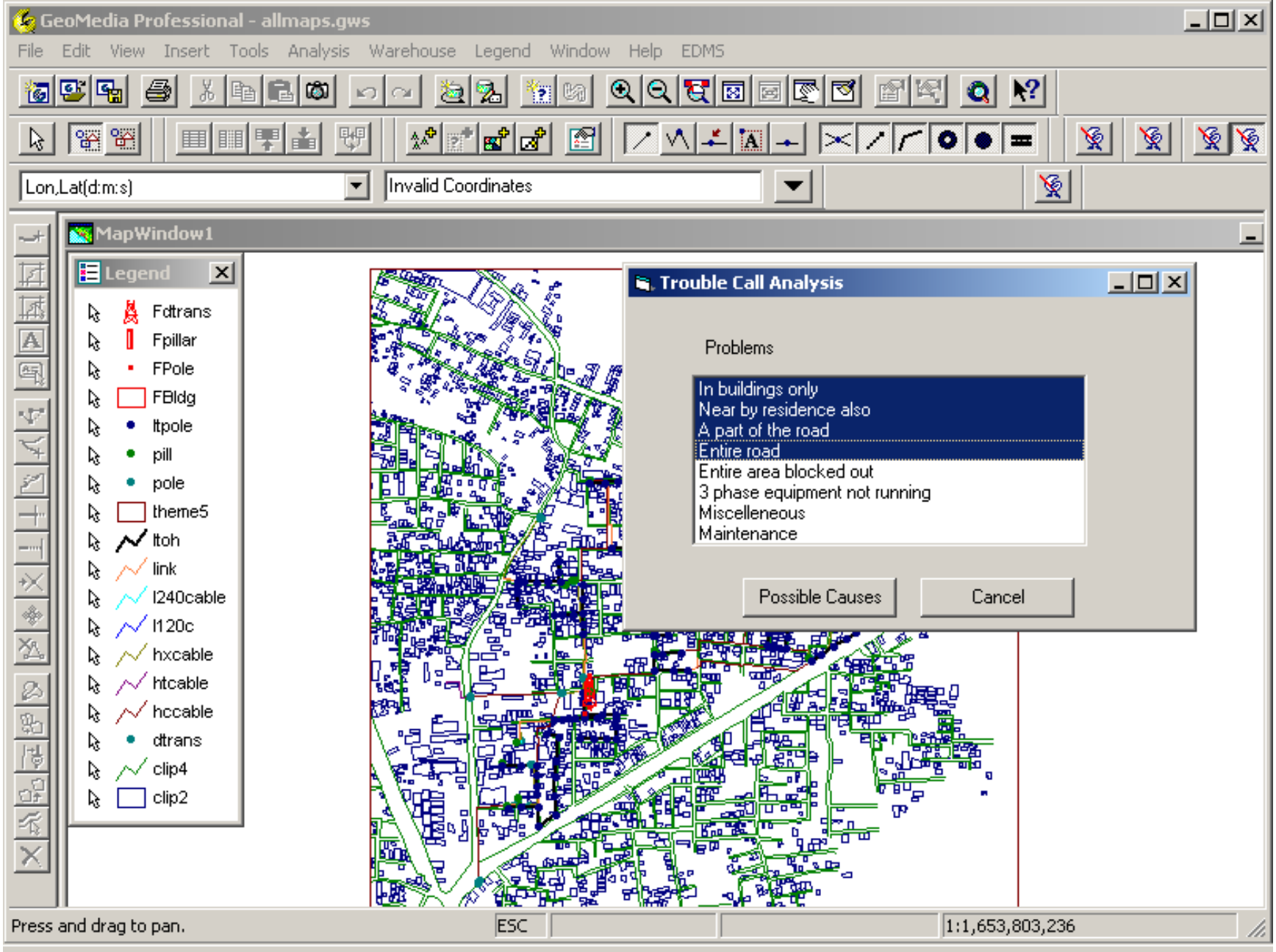
Code



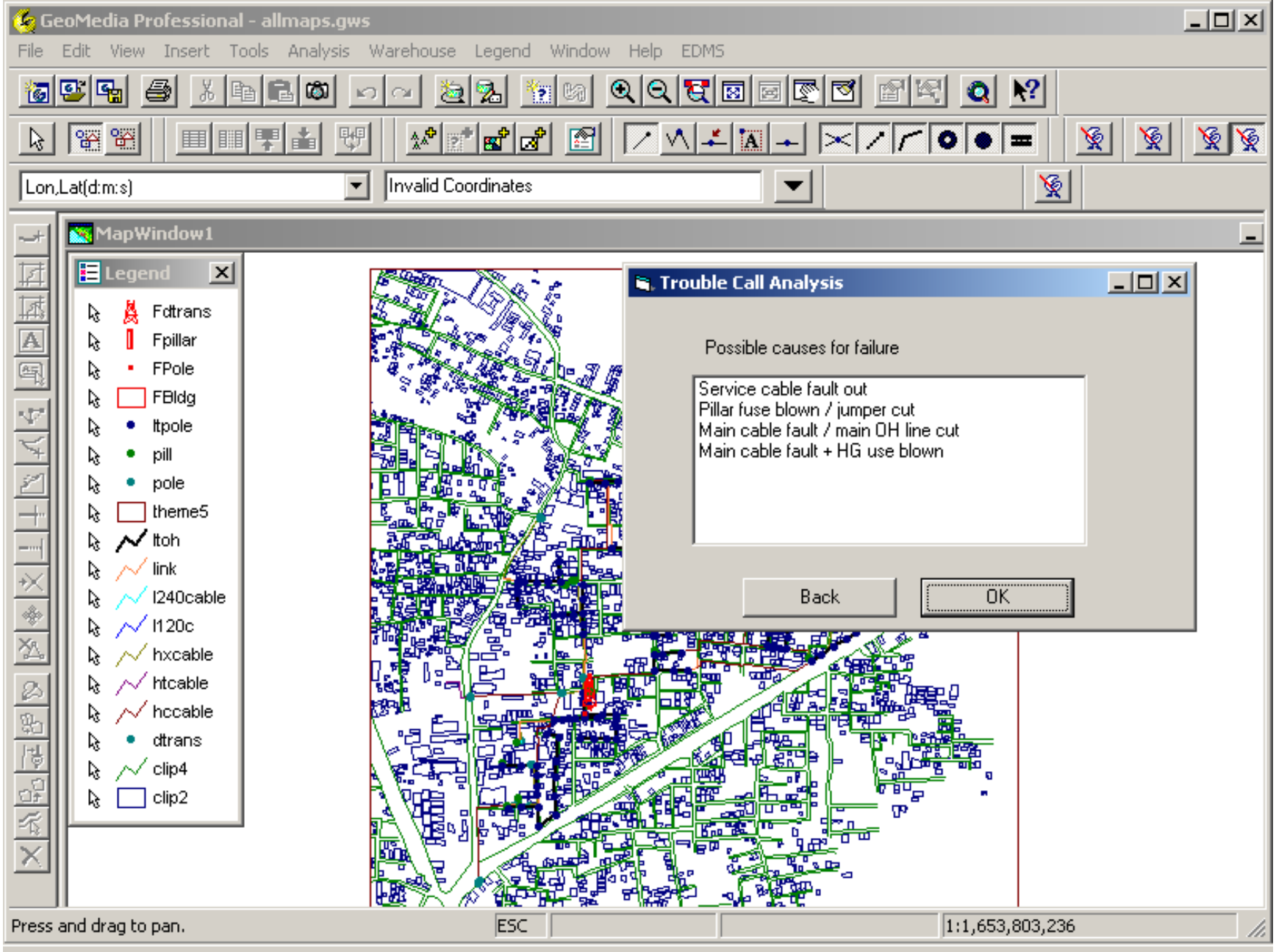
The Location Identity With Electrical Network Details Displayed



Supply Interrupted Building With Network Displayed



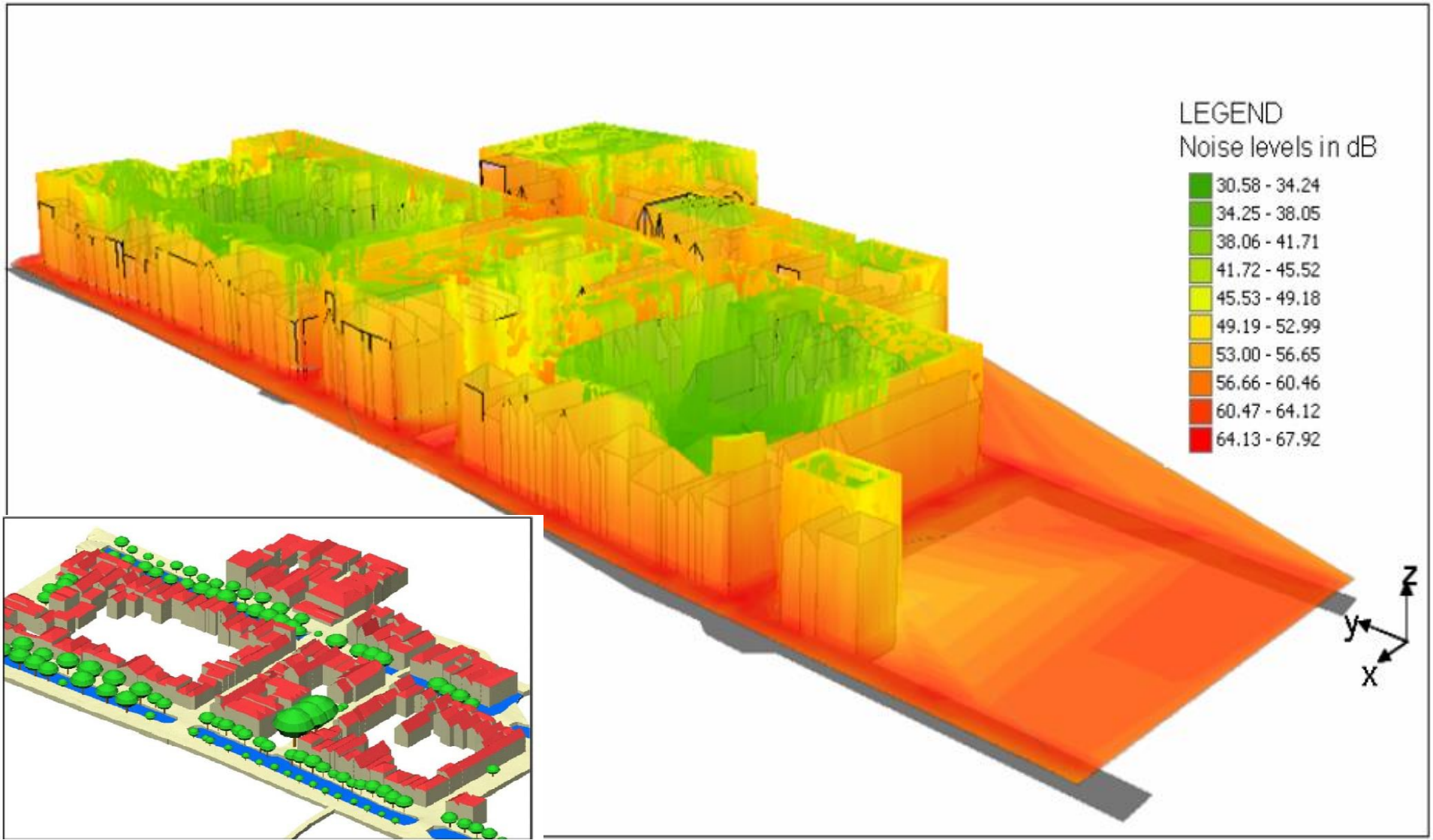
Additional Information Of Fault Gathered



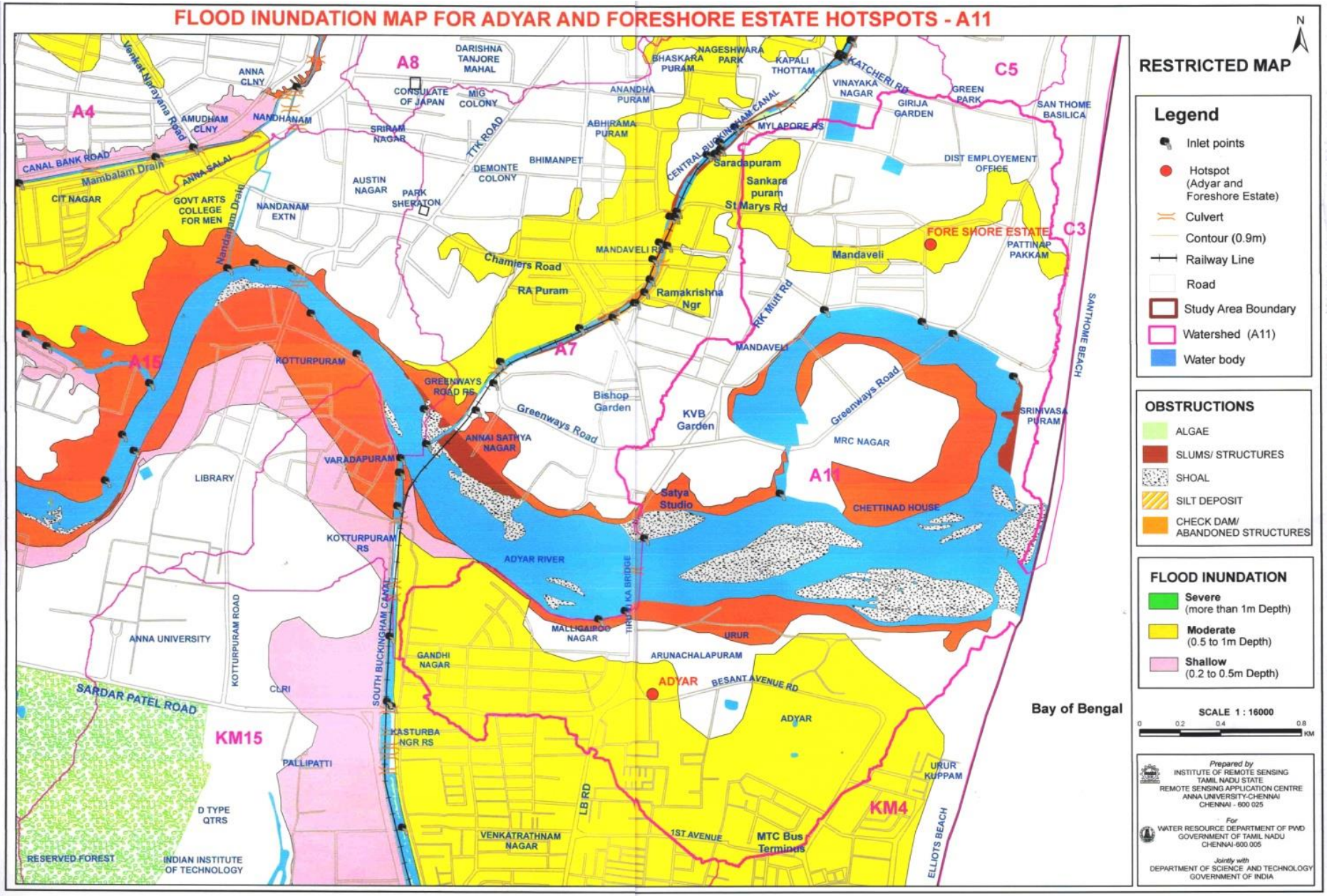
Probable Cause For Fault

Noise Mapping

3D Noise Modelling



FLOOD INUNDATION MAP



FLOOD CONTROL ROOM ARCHITECTURE