

**COMPUTERIZED GUIDE SYSTEM TO SUPPORT PILGRIMS IN
PERFORMING RITUALS**

By

Abdulaziz Ali O. Alzubaidi

Supervisor

Dr. Ahmad Abdel-Aziz Sharieh

Co-Supervisor

Dr. Moh'd Belal Al-Zoubi

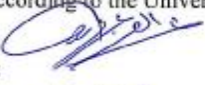
**This Thesis was Submitted in Partial Fulfillment of the Requirements
for the Master's Degree in Computer Science**

**Faculty of Graduate Studies
The University of Jordan**

May, 2009

The University of Jordan**Authorization Form**

I, Abdulaziz Ali O Alzubaidi, authorize the University of Jordan to supply copies of my Thesis to libraries or establishments or individuals on request, according to the University of Jordan regulations.

Signature: 

Date: 15-5-2009

COMMITTEE DECISION

This Thesis (Computerized Guide System to Support Pilgrims in Performing Rituals) was successfully Defended and Approved on

14 / 5 / 2009

Examination Committee

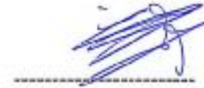
Signature

Dr. Ahmad Abdel-Aziz Sharieh (Supervisor)



Prof. of Parallel Processing

Dr. Moh'd Belal Al-Zoubi (Co-Supervisor)



Assoc. Prof. of Data Mining / GIS and Computer Graphics

Dr. Saleh Hosni Al-Sharaeh (Member)



Assoc. Prof. of Mobile Computing, Wireless Networks

Dr. Ammar Huneiti (Member)



Asst. Prof. of Hypermedia-Based Performance Support Systems for the Web

Dr. Khalid A. Kaabnah (Member)



Assoc. Prof. of Multimedia

(Amman Arab University for Graduate Studies)

تعتمد كلية الدراسات العليا
هذه النسخة من الرسالة
التوقيع.....التاريخ 14/5/2009

DEDICATION

إلى من تلهج لي ليلاً ونهاراً إلى والدتي الغالية حفظها الله , إلى مدرستي التي
 أنهل منها دوماً والذي الذي أتعلم منه كل يوم الكثير ومازلت أتعلم , إلى روح أخي
 رحمة الله عليه الذي وإن غاب جسداً سيظل معنا روحاً أينما كنا وحللنا , إلى إخوتي
 وإخواتي سندي في رحلتي , إلى وطني في غرّيتي النبض الصادق والتي كانت سنداً ومبهماً
 لكل الأمور وشريكة كل اللحظات وسيدة كل الاوقات , إلى صديق المصير والمسير (فيصل
 الشرجي) والذي تقاسمنا كل لحظاتها حلوها ومرّها , , إلى كل مسلم يريد تأدية مناسك
 الحج أهديكم هذا العمل , , ,

AKNOWLEDGEMENT

كلمات الشكر والعرفان اجدھا قليلة جداً لـ موجهي الأول دكتوري الفاضل احمد عبدالعزيز الشرايعة الذي كان له كبير الأثر في إنجاز هذا العمل , شكري وامتناني لمن تعلمت منه الكثير لمن كان يستقبلني بصدق ورحب ويتعامل معي بلطف لا يوصف ويوجهني للأفضل ويدفعني للتميز دوماً الدكتور الراقى جداً محمد بلال الزعبي والذي له الفضل الكبير في إتمام هذا النظام .

الشكر لـ أعضاء لجنة المناقشة الذين تشرفت بانتقاداتهم وتوجيهاتهم وحضورهم وأرائهم التي ستدفعني نحو الأفضل بإذن الله , وشكري الجزيل لكل من وقف بجاني منذ البداية وحتى الآن .

TABLE OF CONTENTS

Subject	Page
Committee decision	ii
Dedication	iii
Acknowledgement	iv
List of Contents	v
List of Tables	vii
List of Figures	viii
List of Abbreviations	xi
Abstract	xii
Chapter 1 INTRODUCTION	
1-1 Introduction	1
1-2 Problem Overview	2
1-3 Research Objectives	9
1-4 Thesis Organization	11
Chapter 2 LITERATURE REVIEW	
2-1 Related Studies to Al-Masha'ir area.....	12
2-2 History of Geographic Position System	23
2-3 Summary of related work	26
Chapter 3 PROPOSED SYSTEM	
3.1 CGSSP Overview.....	28
3.2 System Design and Establishment.....	30
3-2-1 Collect data "Setting CGSSP"	31
3-2-2 Creating Maps.....	49
3-2-3 Transforming maps from (desktop file) to (website pages).....	69

Subject	Page
3-2-4 Implementation & Testing.....	75
Chapter 4 SYSTEM IMPLEMENTATION	
4-1 How the CGSSP works.....	76
4-1-1 Map and area selection toolbar.....	78
4-1-2 Search toolbar	79
4-1-2-1 Search by main services.....	80
4-1-2-2 Search by facilities.....	86
4-1-2-3 Search by roads.....	89
4-1-3 CGSSP Tools.....	92
4-2 How to use Shortest Path.....	96
4-3 Advantages of CGSSP.....	98
Chapter 5 CONCLUSION AND FUTURE WORK	100
References.....	103
Abstract (in Arabic).....	105

LIST OF TABLES

NUMBER	TABLE CAPTION	PAGE
1	Numbers of Pilgrims Hegri years 1417-1428	3
2	Timing of Pilgrims Arrival in the Small Stones Throwing Area...	14
3	Timing of Pilgrims that Starting and concluding the throwing process.....	15
4	Time that the security forces in the area.....	15

LIST OF FIGURES

NUMBER	FIGURE CAPTION	PAGE
1	Numbers of Pilgrims during the Period 1417-1428 H.....	4
2	CGSSP Overview.....	28
3	CGSSP Construction Phases.....	30
4	Opening GMP6.1 and connecting data.....	32
5	Displaying data (Districts- Services- Roads) as layers.....	33
6	Basic map of Makkah and Almasha'ir.....	34
7	District layer categorized into Almasha'ir District only.....	35
8	Basic map after dividing Districts layers into Masha'ir layer...	36
9	Dividing Services layer into Almasha'ir only.....	37
10	Basic map after dividing the Services layer in Almasha'ir	38
11	Dividing Roads layer into Almasha'ir only.....	39
12	Basic map after dividing Roads layer in Almasha'ir.....	40
13	District layer categorized into Makkah District only.....	41
14	Basic map after dividing Districts layers into Masha'ir layer..	42
15	Dividing Services layer into Makkah only	43
16	Basic map after dividing the Services layer in Makkah	44
17	Dividing Roads layer into Makkah area.....	45
18	The map after dividing the Roads layer in the Makkah area...	46
19	Stage 1 of transforming data from (*.shp) to (*.mdb).....	47
20	Second stage of transforming data from (*.shp) to (*.mdb)....	48
21	First stage of creating an English map of Almasha'ir.....	50
22	Second phase of creating a map of the CGSSP1_EN.....	51
23	CGSSP1_EN.....	52

NUMBER	FIGURE CAPTION	PAGE
24	Format of District layer at Almasha'ir.....	53
25	CGSSP1_EN after formatting District layer.....	54
26	Format of services layer at Almasha'ir.....	55
27	CGSSP1_EN after formatting services layer.....	56
28	Format of roads layer at Almasha'ir.....	57
29	CGSSP1_EN after formatting roads layer	58
30	Adding Buffer Zone Around Road layer.....	59
31	Adding data, titles, layer, District in CGSSP1_EN.....	60
32	CGSSP1_EN after adding title of Almasha'ir District.....	61
33	Adding English titles of Services layer at CGSSP1_EN.....	61
34	CGSSP1_EN after adding names of services.....	62
35	Adding English titles of roads layer at CGSSP1_EN.....	63
36	CGSSP1_EN after adding names of roads.....	64
37	Steps of adjusting Roads District layer at CGSSP1_EN.....	65
38	Steps of adjusting roads titles at CGSSP1_EN.....	66
39	CGSSP1_EN after adjusting roads and roads titles layers.....	66
40	Steps for adjusting Services titles at CGSSP1_EN.....	67
41	CGSSP1_EN at its final shape.....	68
42	First stage of transforming maps into website pages.....	69
43	Second stage of transforming maps into website pages.....	71
44	Steps of the publishing CGSSP1_EN.....	72
45	Map Settings at second phase of the Publishing process.....	73
46	Third phase of the Publishing process (Layout Map).....	74
47	Map Content Setup.....	75
48	Components of the system interface (Log in).....	76
49	Components of CGSSP (Arabic interface).....	77

NUMBER	FIGURE CAPTION	PAGE
50	Components of CGSSP (English Interface).....	77
52	Selection of Almasha'ir and its map in the dedicated place...	79
53	Search toolbar in CGSSP1_EN.....	80
54	Main services in CGSSP1_EN.....	81
55	Search by main services(search for mosque).....	82
56	Search results for mosques after using main services	83
57	Locating Islamic Guidance Center number 12 on map.....	84
58	Search for security centers at CGSSP1_EN using search by main services.....	85
59	Locating NMPS on map with browsing information about the station.....	86
60	Search by landmarks in CGSSP1_EN.....	87
61	Search for JAPS.....	88
62	Location of Jabal Alrahma Police Station on map.....	89
63	Components of search by roads window.....	90
64	Search for KFT using search by roads feature.....	91
65	Locating KFT on map.....	92
66	Search by drawing a circle around a certain point.....	93
67	Search by drawing a rectangle around a certain point.....	94
68	Shortest path window.....	97

LIST OF ABBREVIATIONS OR SYMBOLS

Kingdom of Saudi Arabia	KSA
Computerized Guide System to Support Pilgrims	CGSSP
Geographic Position System.....	GPS
Navigation Systems-and control of the time rate.....	NAVSTAR
Pseudo Random Noise.....	PRN
Coarse/Acquisition.....	C/A
Precise (or Protected) code	P-CODE Precise
Communications and Information Technology Commission of KSA.....	CITC
GeoMedia Professional 6.1 program	GMP6.1
Almasha'ir Map with Arabic Interface	CGSSP1_AR
Almasha'ir Map with English Interface	CGSSP1_EN
Makkah Map with Arabic Interface	CGSSP2_AR
Makkah Map with English Interface	CGSSP2_EN
Namira Mosque Police Station.....	NMPS
Jabal Alrahma Police Station	JAPS
King Fahd Tunnel	KFT

COMPUTERIZED GUIDE SYSTEM TO SUPPORT PILGRIMS IN PERFORMING RITUALS

By
Abdulaziz Ali O Alzubaidi

Supervisor
Dr. Ahmad Abdulaziz Alshara'yah

Co-Supervisor
Dr. Mohammad Belal Alzu'by

ABSTRACT

This study presents a computerized system that help in supporting pilgrims and visitors to the holy city (Makkah) as they perform Al-Hajj. Most previous studies found that 69% of pilgrims come from outside Saudi Arabia; while the remain percentage is distributed on all regions of the Kingdom. This assures that the majority of pilgrims have no complete knowledge of the locations where services are available or how to reach their targets correctly.

The previous studies indicated that many of the pilgrims waste time and effort, which imposes a negative impact of Al-Hajj performance. Also, none of the previous studies introduced a complete computerized guide system to provide services and locations guides for the pilgrims.

This study suggests a solution by producing a prototype of computerized system to enable pilgrims their Hajj with serenity and security. The Computerized Guide System to Support Pilgrims (CGSSP) was designed, implemented, and the prototype was tested. GeoMedia Professional 6.1 program was used to display data.

The CGSSP provides major and important services such as: identify the pilgrim's location by displaying a map showing the surrounding areas of his current location, display how to reach a service location, for example police or medical station, display time and how far the pilgrim's location from the nearest service station, display the maps of Makkah, and the holy places such as Mena, Arafat, and Muzdalefah.

CHAPTER ONE: INTRODUCTION

In The Name of Allah the Most Gracious, the Most Merciful; “And proclaim to mankind the Hajj (pilgrimage). They will come to you on foot and on every lean camel, they will come from every deep and distant (wide) mountain highway (to perform Hajj) "(Al-Hajj, 27).

Al-hajj (pilgrimage to Makkah) is one of Islam's five basic elements; it is a religious duty on the capable Muslims in terms of physical and financial conditions. Muslims, while carrying out this duty, feel the greatness of God who is worshipped anywhere, anytime, and in any language.

Al-hajj is considered as one of the biggest and greatest conferences on the world's level; as more than two million pilgrims annually gather in the holy places to carry out al-hajj duty; out of their desire to gain Allah's reward and recompense after death (الكحلوت, 1426).

Due to the great importance and holiness this event enjoys, the government of the Kingdom of Saudi Arabia (KSA) its their utmost to serve the guests of Allah; and thus, they dedicated all the required capabilities and potentials to make the rites of pilgrimage work and improve the quality of services offered for the pilgrims who exert great efforts to get to Makkah since they bear physical tiredness, financial burdens, and psychological difficulties (leaving their families and homelands) to carry out this duty; with the hope that God will accept this from them so that they can come back with forgiven sins.

1-2 Problem Overview

More than two million pilgrims coming from inside and outside the KSA carry out al-hajj duty every year. The researches have shown that in the year (1423 AH), the number of pilgrims reached (2,041,129) pilgrims; while in (1426), it reached (2,258,050) pilgrims (ادريس, 1422). Also the researches and statistics provided by the Custodian of the Two Holy Mosques for Al-hajj Research expect that the number of pilgrims will reach (4,800,000) by the year (1450 AH) (ادريس, 1422). Under this massive increase in the number of pilgrims, the holy places in al-hajj area suffer from being quite small and limited in area; these places include the following: Mena Al-Masha'ir area (whose area is 8.16 Km²), Arafat Al-Masha'ir area (whose area is 12.690 Km²) and Muzdalefah Al-Masha'ir area (whose area is 12 Km²) (الكحلوت, 1426).

Table (1-1): Numbers of Pilgrims during the Period (1417-1428 AH)¹

Year	No. of Pilgrims from inside KSA	No. of Pilgrims from outside KSA	Total
1417	518822	1169678	1688500
1418	585842	1132344	1718186
1419	775268	1056730	1831998
1420	466230	1267555	1733785
1421	549271	1363992	1913263
1422	479984	1354184	1834168
1423	610117	1431512	2041129
1424	592368	1416706	2009074
1425	629710	1534759	2164469
1426	700603	1557447	2258050
1427	724229	1654407	2378636
1428	721441	1707814	2429255

¹ المديرية العامة للجوازات بالمملكة العربية السعودية , 1429 , إحصائيات أعداد الحجاج من داخل وخارج المملكة العربية السعودية من عام 1428-1417 هـ.

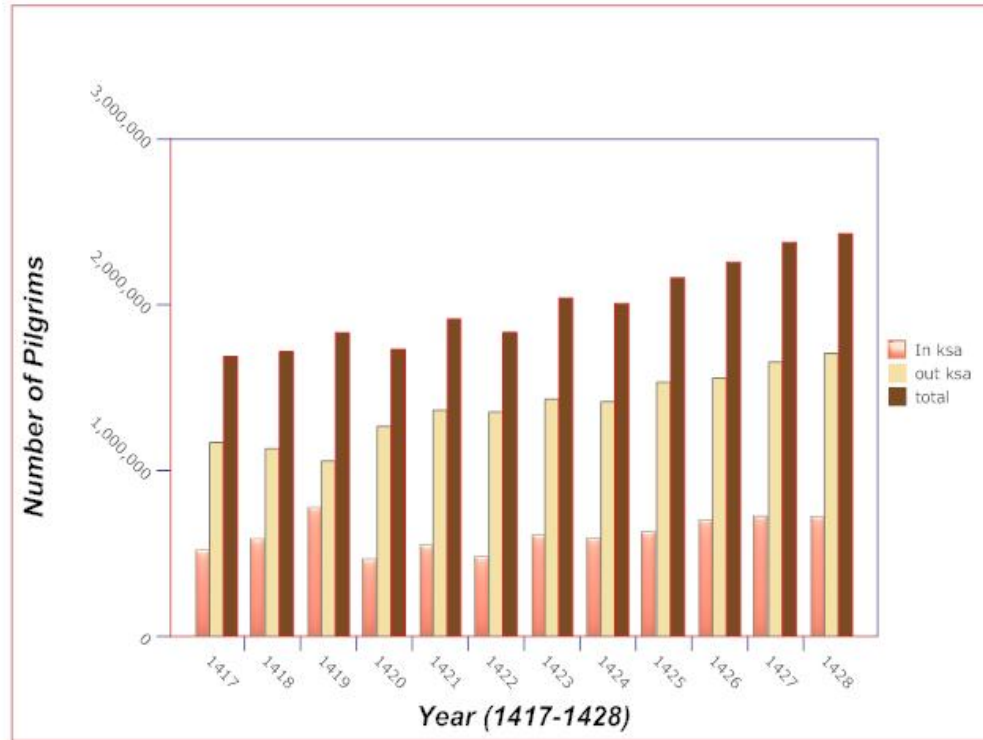


Figure (1-1) Numbers of Pilgrims during the Period (1417-1428 AH)

Figure (1-1) and Table (1-1) illustrate the numbers of pilgrims during the years (1417-1428 AH) distributed as for whether they come from inside or outside KSA (المديرية العامة للجوازات, 1426). The researches have shown that more than (%50) of the pilgrims carry out al-hajj duty for the first time (عبدالمجيد و آخرون, 1415). And thus, they do not have the necessary knowledge regarding the places where (health, security, banking, financial ...etc) services are offered. The existence of great numbers of pilgrims in the afore-mentioned restricted Al-Masha'ir area results in many problems; including the following:

1) The pilgrim faces a great difficulty in identifying their location in the Al-Masha'ir area where he/she performs any of al-hajj steps because he/she is not totally aware of the right method of doing so; which results in many loss cases; in addition to the effort and time wasted.

2) From table (1-1), we can note that (%69) of the pilgrims come from outside; the others come from inside (different places and governorates). And hence, a great percentage does not really know where the service- offering locations in the Al-Masha'ir area are; which causes a great difficulty in getting to these locations.

3) Some places get more crowded than others; which makes crowdedness and suffocation cases increase in these places due to several reasons; the most important of which is that the pilgrim is not aware of the shortcuts which can lead him/her to the target destination without wasting much of his/her time and effort.

4) When this great number of pilgrims (a million pilgrims) get lost, cannot identify the service-offering locations or are not aware of the shortcuts, they constitute a great pressure upon al-hajj coordinators and organizers; which leads to many problems and mistakes.

Based on that account , we found that many pilgrims suffer from multiple various problems while carrying out any of al-hajj steps; such as the difficulty in identifying their location, the unawareness of the service-offering locations and the lack of knowledge regarding the shortcuts which can get them to the desired destination in the least possible time and effort .These problems cause wasting a great deal of time and effort; which the pilgrims badly need to carry out al-hajj duty in a more peaceful atmosphere.

Based on the foregoing, we are in a bad need for a system that helps the pilgrim save his/her much of time and effort during the search process and get to the target destination in the least possible time and easiest possible way, identifies the pilgrim's location within the Al-Masha'ir area, identifies the service-offering locations within the Al-Masha'ir area, measures how far they are from a given pilgrim, identifies which one

is the closest to the pilgrim and provides the pilgrim with a comprehensive road map that should be followed in order to get to the desired destination. There are a number of solutions used nowadays in order to help the pilgrim, guide him/her, facilitate his/her arrival and answer all his/her inquiries; the most important of which are the following:

- The Ministry of Education in cooperation with the Ministry of Pilgrimage enlists every year the members of the scout team to help the pilgrims, guide them, answer their inquiries and decrease the loss cases.
- The Ministry of Pilgrimage in cooperation with the security directorates installs huge screens in the Al-Masha'ir area illustrating the most crowded places, so that the pilgrims can avoid them.
- The Mobile phones service providers offer the service of identifying the location of the pilgrim and inquiring about one single destination; no matter what the other similar services and the shortcuts pilgrims can use are.

In this research, we introduce a Computerized Guide System to Support Pilgrims (CGSSP) that helps the pilgrim performs al-hajj; saving much of his/her time and effort. CGSSP suggests securing a system that can:

1) Identify The Pilgrim's Location: For pilgrim who cannot be connected to the GPS; as their locations can be identified by asking them about the prominent sites that are the closest to them in the Al-Masha'ir area they exist within. After this, a map showing the surrounding areas appears to the pilgrims, so that they can manually identify their locations.

2) After identifying the pilgrim's location, he/she is asked about the requested service; i.e. if the pilgrim wishes to visit a medical center, the map will show all the medical centers within the given Al-Masha'ir area.

3) After showing all the services needed by the pilgrim (like the medical centers), the CGSSP measures how far the pilgrim is away from each one of them. And then, it marks the closest one to the pilgrim's current location. CGSSP also provides the pilgrim with the shortest road map he/she shall use to get to his/her destination; illustrating the needed time to get to their if the pilgrim is on foot or in a vehicle.

As for the Study Problem, the Study Determinants are:

- Time Aspect: It includes the time of al-hajj from the year which is (8th Al-Hejjah-13th Al-Hejjah) and between (1417-1428H).
- Place Aspect: it includes the holy places (Mena, Arafat, and Muzdalefah).

This study looks into the following questions:

- 1- Does the suggested system provide pilgrims with the best options while carrying out al-hajj duty?
- 2- Does the suggested system offer suitable strategies that help with reducing the time wasted in looking for a certain destination?

Based on the study questions, the study has put the following Presuppositions:

- 1- The suggested system provides strategies to identify the pilgrim's location in each Al-Masha'ir area, the service-offering locations (like the security stations, medical centers ...etc.) within every Al-Masha'ir area, the closest one to the pilgrim's current

location, the best way to get to that location and the time needed to get to there. And hence, we presuppose that the CGSSP offers the best options and solutions to the pilgrims' inquiries when they wish to visit any service-offering location within a given Al-Masha'ir area.

- 2- Based on the strategies used to identify the pilgrim's location and the closest service-offering location to him/her, we presuppose that the CGSSP provides major solutions to the issue of saving much of the pilgrim's time and effort during the search process; i.e. (around %25-%50) of the time the pilgrim usually spends without using this system.

1-3 Research Objectives:

The CGSSP helps save much of the pilgrim's time and effort; as it helps him appropriately identify his/her location; providing him/her with the service-offering locations within the Al-Masha'ir area he/she exists in, illustrating the closest one to his/her location and showing the best road map the pilgrim shall follow to get to the given location.

The CGSSP gains great importance in terms of helping the pilgrim with moving fast within the holy places, identifying the required destination, and heading for the authority that is the nearest to his location; and thus, the CGSSP reduces the time wasted in the searching process and enables the pilgrim to make the best use of the rest of his him in doing the pilgrimage rites with much peace of mind.

The CGSSP is also important in that it contributes to reducing the crowdedness in the holy places; and accordingly reducing the number of injuries due to this crowdedness.

The CGSSP also significant as it has much to do with raising the proficiency of the concerned organizations that offer the required services to the pilgrims, which provides support to the interaction of these authorities that are directly connected to serving pilgrims.

The study aims to:

- 1- Guiding the pilgrim and directing him towards the authority which is the nearest to his location.
- 2- Reducing the time and effort wasted in the searching process.

3- Reducing the crowdedness in the holy places; and accordingly reducing the number of injuries due to this crowdedness.

4- Gaining the honor of serving the (guests of Allah) pilgrims and trying to put an end to the difficulties they have been facing.

1-4 Thesis Organization

The remaining of our thesis is organized as follows: Chapter 2, which is the literature review, gives summary of the previous works that are related to our research, gives background information of hajj problem and GPS History. Chapter 3 depicts detail about our proposal system. Chapter 4 describes how to use CGSSP. The Conclusion and Future works are represented in chapter 5.

CHAPTER TWO: LITERATURE REVIEW

2-1 Related Studies to Al-Masha'ir area

There are many domains in which suitable programs for enlightening the pilgrims in their countries since the moment they arrive in the holy lands until they leave them after doing al-hajj should be designated. The government of the KSA exerts great efforts in spreading the awareness among the pilgrims; the number of Saudi governmental authorities and departments in this respect is around (30) department , (الشريف وخضر, 1425).

However, it has been noticed that these efforts have been unable to achieve their goals due to the lack of coordination and integration among them, in addition to the absence of a clear scientific vision that takes into consideration all the variables and determinants connected to the nature of pilgrims to whom the enlightening efforts are directed, like the diversity in the pilgrims' ethics, languages, social classes, cultures, their need to the enlightening programs, and the forms of such programs.

In (الشريف وخضر, 1425) aims at:

- 1- Getting acquainted with the reality of efforts the concerned authorities exert in connection to al-hajj.
- 2- Getting acquainted with the goals the departments seek to achieve through all the efforts they exert in awareness.
- 3- Getting acquainted with the contents and forms of such awareness programs.
- 4- Getting acquainted with the tendency of the awareness professionals in the concerned departments towards the coordination and integration among these departments.

In (الشريف وخضر, 1425) determinants are:

1- Time Aspect: the study is confined to the awareness professionals in the concerned departments during al-hajj season (1424 AH); besides the individuals involved in awareness during Al-Qe'da and Al-Hejjah (1424 AH); Muharram (1425 AH).

2- Place Aspect: study is confined to the concerned departments (governmental or private) connected to pilgrims' services and awareness in Makkah and Medina.

The results of this study reveal that there are many obstacles that stand in the way of achieving the goals of these awareness programs. Among these obstacles are the following:

1. The lack of experience in the awareness professionals (More than (%62) of the study population have (1-5) years of experience; while only (%23) of the study population have (6-15) years of experience.).

2. The absence of coordination and integration technique among the departments concerned with awareness.

3. The need for a clear strategy for comprehensive awareness to be the basis of the awareness programs.

4. The languages used in the awareness programs: Arabic (%30.89) ,English (%12.26) , Indonesian (%8.96)

In (عبدالمجيد وآخرون, 1415), the area, where the pilgrims throw the small stones, witnesses a severe crowdedness, especially on 12 Al-Hejjah; out of many pilgrims' desire to throw the small stones and leave Mena within the shortest possible time. This crowdedness had its impact on changing the fashion in which the small stones bridge is used.

The importance of study stems out of changing the fashion in which the small stones bridge is used and using it, compulsorily, as a one-way bridge, instead of two-way bridge as it used to be (1415) عبدالمجيد وآخرون).

Study(1415) عبدالمجيد وآخرون) aims at:

1. Getting acquainted with the characteristics of the throwing pilgrims and their motion in the area.
2. Building a model and making experiments on it to reveal its impact on the area's operational capacity.
3. Getting the area's best operational capacity via:
 - The best safe load capacity of the area (where pilgrims throw the small stones).
 - The mean time of the activities included within the small stones throwing process.
 - The load of the area (where pilgrims throw the small stones).
 - The collapse incidences.

Study (1415) عبدالمجيد وآخرون has reached to the following results:

- Most pilgrims are (36) years old; more than (%50) of them are carrying out al-hajj duty for the first time.
- The proportional distribution of the pilgrims throwing the small stones according to the timing of their arrival in the small stones throwing area is as follows:

Table (2-1) Timing of Pilgrims Arrival in the Small Stones Throwing Area

Day	Time of Climax	Time of Arrival
10 th	6-10 a.m. (%59.8 coming pilgrims)	7-8 (%17.5) , 6-7 (%15.3)
11 th	1-6 p.m.	1-2 p.m. (%14.8)
12 th	11-12 (%14) , 4-5 (20.2)	

The proportional distribution of the pilgrims throwing the small stones according to the timing of starting and concluding the throwing process is as follows:

Table (2-2) Timing of Pilgrims that Starting and Concluding the throwing process

Day	Time of Climax	Time of Arrival
10 th	6-11 a.m. (%70 throwing pilgrims)	Highest Percentage (of start) at 7-8 a.m. (%18.4); then at 9-10 (%16.6) Highest Percentage (of end) at 7-12 (%68.1)
11 th	Starts at 1-6 p.m. (%70.1); ends at 1-7 p.m. (%77)	
12 th	Starts at 1-6 p.m. (%82.7); ends at 1-7 p.m.	Highest Percentage at 1-2 p.m. (%23.8)

Study (1415, عبدالمجيد وآخرون) recommends the following:

- Expanding the small stones throwing period, so that we can alleviate the crowdedness in the area where the small stones are thrown.
- Intensifying the security forces in the area at the following times:

Table (2- 3) Time that the security forces in the area

Day	Time
10 th	1-11 a.m.
11 th	1 p.m.- Sunset
12 th	10 a.m. – Sunset

- Controlling the pilgrims' passage through the small stones bridge by resorting to trained security forces.

- Coordinating and integrating among the concerned authorities to make the pilgrims' departure from Mena on 12th and 13th Al-Hejjah instead of the crowdedness that used to occur when all pilgrims depart on 12th Al-Hejjah.
- Providing all the necessary services (electricity, water, cleaning-up, health, administration, and security) in Mena in the best possible manner until the end of 13th Al-Hejjah to lay out the good conditions for the biggest possible number of pilgrims staying in Mena till the end of 13th Al-Hejjah.

The availability of the designation standards for any project is considered one of the important basics in helping the designer with developing his designation theme (ادريس , 1422).

Study (ادريس , 1422) relies in developing designation standards for the small stones bridge so that the designers can enable the pilgrims to carry out the small stones throwing duty within the religious time for it in a comfortable and safe way.

Study (ادريس , 1422) aims at:

- 1- Studying and analyzing the geographical area for throwing the small stones.
- 2- Limiting the rates of pilgrims' flow and identifying the passage direction in the small stones throwing area.
- 3- Identifying the perfect rates of pilgrims existing on the bridge.

Study (ادريس , 1422) has reached at many results; the most important of which are the following:

- The number of pilgrims is expected to reach (2.800.000) in (1430 AH) and the number of pilgrims is expected to reach (4.800.000) in (1450 AH).

- It was revealed, via pictures analysis, that the density in some locations, particularly, on the small stones bridge is 6 individuals per m². The motion completely stops at some times. It was also revealed, via pictures analysis and interviews, that the motion in the areas where the density was 3-4 individuals per m² was quite comfortable for the pilgrims. We can make use of this in achieving the required density on the bridge which is 3 individuals per m².

The increase in the number of pilgrims refers directly to the increase in the number of Muslims. When the number of pilgrims increases; the geographical space is fixed, the crowdedness occurs in the holy places; including Arafat, the areas where the different activities and duties are performed on Arafat, in particular (ادريس , 1423).

Study (ادريس , 1423) aims at:

1. Getting acquainted with the current situation of Arafat.
2. Identifying the crowded places in Arafat and figuring out the reasons of this crowdedness.
3. Developing organizational solutions to alleviate the crowdedness in Arafat.

Study (ادريس , 1423) revealed that although Arafat is one of the biggest holy areas in terms of its geographical space (its load capacity is not low), the future estimations for the number of pilgrims would decrease this load capacity. It was also revealed that the place (Arafat) does not have a structural pattern that takes the requirements and environmental conditions into consideration; the current situation represents the work done through the previous contracts.

Study (1423 , ادريس) offers many suggestions and solutions; the most important of which are the following:

- Increasing the load capacity of the roads that link the holy places with their expansions.
- Developing the plans of managing and operating the crowded places in Arafat.
- Increasing the guidance and awareness in Arafat, especially in the crowded places.

The crowdedness on the small stones bridge is considered the biggest, if not the most dangerous, problem pilgrims face while performing al-hajj duty. And thus, the scientific and financial capabilities should be dedicated to find solutions for this problem. This study offers the system of assessing the human density on the small stones bridge, implemented for the first time in (1425 AH) (البيديوي وآخرون , 1426).

The system in (البيديوي وآخرون , 1426), located in the events room, consists of the following:

- A highly- developed server connected to several assisting PC's.
- (16) Fixed cameras and (8) movable cameras.
- (5) Big display screens and more than (50) small display screens.

The system in (البيديوي وآخرون , 1426) aims at presenting the following services:

1- Conveying pictures and information to:

- The big screens around the small stones and the walking passage to guide and enlighten the pilgrims.
- The small screens in the camps of pilgrims' guides.

2- Conveying live pictures for the small stones area and walking passage via the fixed and movable cameras.

3- Identifying the human (crowdedness) density in pictures.

4- Identifying the number of pilgrims per picture (flow of pilgrims/min).

5- Turning on the warning levels when crowdedness among pilgrims occurs:

Green (%25-50) , Orange (%51-75) , Red (>%75)

When the system was used for the first time, many advantages and disadvantages were revealed:

- The big screens system in many locations succeeded in terms of enlightening the pilgrims.
- The small screens system in the camps of pilgrims' guides provided adequate information for pilgrims; which entails increasing its number and adding voice to the picture.

Study (1426 , البيديوي وآخرون) recommends the following:

Increase the number of screens in the events room and the number of fixed and movable cameras, especially between the minor stone and intermediate stone.

Al-hajj season is considered one of the biggest congregations in Makkah on the Islamic World's level. During every hajj season, an exploratory field study for the pilgrims' demographic, cultural, and social characteristics, in addition to their thoughts regarding the facilities offered to them during their accommodation in the vicinity of al-Ka'aba and the holy places is carried out (1426 , الكلوت) .

Study (1426 , الكحلوت) gains its importance as a resource of information about the characteristics of pilgrims for the researchers inside the institute and for whoever needs this information from the various governmental and private sectors in the country. This information is further considered an important resource for the database of the Custodian of the Two Holy Mosques Institute for Al-hajj Research about pilgrims and their social and cultural characteristics; as those pilgrims flow into the kingdom from different communities just to perform al-hajj duty.

Study (1426 , الكحلوت) aims at the following:

1. Securing a basic database for the information about the pilgrims' main characteristics in a constant and renewable way for the researchers inside and outside the institute; in continuation for the previous studies in this field.
2. Identifying the demographic, social and cultural characteristics of pilgrims in Makkah; this contributes to identifying the types of services to be presented to them in the future.
3. Evaluating the provided services and facilities from the pilgrim's point of view.
4. Exploring the pilgrims' thoughts about what they really see or notice in Makkah.

Study (1426 , الكحلوت) emphasizes on identifying the demographic, social and cultural characteristics of the pilgrims coming to Makkah in (1425 AH); since this study covers (52) pieces of information about the pilgrim; including his personal details, like gender, age, academic level, times of previous hajj performances, nationality, the source of his information about the kingdom, his culture regarding using computers, the pilgrim's mother tongue, the other languages the pilgrim speaks, and the pilgrim's own evaluation of the services provided in Makkah and Medina.

Study (1426 , الكحلوت) has reached at many results; the most important of which are the following:

1. The most frequent age range is (36-45) years old (%28.4); and then (46-55) years old (%21.8)
2. The variety in the academic levels of the study population (%32.1 high-school certificates or diploma holders), (%28.9 B.A. holders), and (%14 literate pilgrims).
3. The variety in the academic levels of the study population (%17.5 are employees), (%11.4 are teachers), (%10.5 are businessmen) and (%9.7 are jobless).
4. (%34.9) cannot use computers and internet; while (%40) use them fairly good or perfectly.
5. (%51) of the pilgrims came alone to Makkah; while (%49) of them came with their spouses or families. The most frequent number of companions is (2); then (3) persons.
6. (46) Mother languages for the study population' pilgrims were identified. Arabic is the most frequent one (%27.8); then Urdu (%14.7); then Pengali (%10.4). The other languages represented lower percentages. As for the other languages pilgrims speak, (44) languages were identified. The most frequent one is English (%40.2); then Arabic (%15); then French and Urdu (%10) for each of them.

Study (1426 , الكحلوت) reveals the following:

- 1) An increase in the number of pilgrims who have previously performed al-hajj duty. And thus, we should emphasize, via the mass media, on the importance of leaving some space for those who have not performed al-hajj duty yet.
- 2) Using the internet to get the pilgrims acquainted with the kingdom and the various issues they will need in the kingdom and activating the internet's role in

promoting for the products in the kingdom. A significant increase among the pilgrims using the internet is noticed (%40).

3) Increasing the promotional and informational brochures distributed among the pilgrims when they first arrive in the kingdom; as (%78) of the pilgrims have not performed al-hajj duty before.

4) Using the most frequent languages among pilgrims in awareness means and boards, like English, French, and Urdu.

2-2 History of Geographic Position System (GPS)

GPS systems are systems based on Locating by satellite to unknown sites, whether on land or sea or anywhere else throughout 24 hours a day, the system was created and developed through the Pentagon, where it was devoted to military purposes and became later available to civilians such as sites locating – navigation systems-and control of the time rate (NAVSTAR). The system of NAVSTAR GPS is a system works in all weather conditions and locates sites, speed and time accurately and permanently(Thomas,et al.(2000) , (Parkinson , 1976) , (شودود , 2005)).

NAVSTAR GPS System consists of three key components: -

(1) Space Segment:-

Satellites revolve in circular orbits with a highness of (20200 km) above the level of Earth's surface and with a period of 12 asterisk hours for the session. The first satellite was launched on February 22, 1978, the number of satellites was 11 between 78 – 85 years, whereas all satellites was launched successfully but one failed due to the engine's failure in 1981 (*the first set of satellites*) Thomas,et al.(2000) , (Parkinson , 1976) , (شودود , 2005) ,)..

It was planned to use 24 satellites Thomas,et al.(2000) , (Parkinson , 1976) , (شودود , 2005) ,., spreading into 3 levels inclined to the equator with 63° but for financial reasons the number of satellites was reduced to 18 satellites, but this system did not provide the required coverage throughout 24 hours. During the year of 1986 the number of satellites arrived to 21 satellites, every 3 satellites revolve in 6 orbits and 3 standby satellites were prepared. Standby satellites were designed to be replaced with the operating satellites in the case of defaulting, while the current set consist of 24 operational satellites spreading evenly on 6 orbits numbered (A-F)with 55 degree inclination and with the existing of 4

standby satellites. The accuracy of the system is due to the adjustment of signal's components through atomic hours, that produce wide range frequency alternators of (L) range with 10.23 MHz , the results of this frequency are two signals :-

$$L1 = 1575.42 \text{ MHz } (10.23 * 154)$$

$$L2 = 1227.60 \text{ MHz } (10.23 * 120)$$

They are essential to get rid of any error resulting from the ionosphere. Time is calculated by the period that the signal takes to move from the satellite to the receiver by two blades of spacecraft's blades Pseudo Random Noise (PRN) on the waves L1, L2

a) First blade (Coarse/Acquisition) (C/A)

- Devoted for civilian purposes such as sites locating with a wave's length of 293 M.
- Installed on the wave L1 to be used only by military persons from all the accuracy of the system.

b) Second blade Precise (or Protected) code (P-CODE Precise)

- Devoted to the American army and some licensed users.
- Length of Wave is 29.3 meters.
- Installed on the waves L1, L2.

(2) Control Segment

The control component consists of:

(A) Master control station is devoted to collect all tracking data from control station and calculate the satellite's orbit and hours where pass the results to Earth stations to be transferred to the satellite.

(B) Monitoring stations ,whereas 5 monitoring stations each one supplied with the cesium Measurement and receivers measure continuously illusory frequency for all visual satellites (measured per 1.5 seconds),by using weather information and

ionosphere, that combined information to produce new information every 15 minutes and being sent to the Master control station.

(C) Ground control stations, which considered as a connecting link to satellites, consisting of ground antennas - astronomical calendars - information about the hours for each satellite which being calculated in control and information station By radio transmission systems.

(3) User Segment

It Was planned at the beginning to devote the system for military purposes only, where each aircraft or spacecraft or even pedestrian group must have a receiver compatible with its work, many cities with the development of the system use this system to organize the work of spacecrafts and direct them to the required place in the shortest time it also became available to civilians and walker to appoint their locations.

The basic of GPS is precise time and position information. Using atomic clocks and location data, each satellite continuously broadcast the time and its position. A GPS receiver receives these signals, listening to three or more satellites at once, to determine the user's position on earth. By measuring the time interval between the transmission and the reception of a satellite signal, the GPS receiver calculates the user distance at each satellite. Using the distance measurements of at least three satellites in an algorithm computation, the GPS receiver arrives at an accurate position fix. Information must be received from three satellites in order to obtain two- dimensional fixes, and four satellites are required for three- dimensional positioning (تشدود , 2005)

2-3: Summary of related work

-It is highly important to have a clear strategy for the coordination and integration among the departments concerned with the awareness in al-hajj; so that the efforts exerted in this respect can get united to make these awareness programs work successfully.

- The Number of pilgrims is expected to reach (2.800.000) in (1430 AH) and the number of pilgrims is expected to reach (4.800.000) in (1450 AH) (ادريس, 1422).

-The most frequent age range is (36-45) years old (%28.4); and then (46-55) years old (%21.8), (%34.9) cannot use computers and internet; while (%40) use them fairly good or perfectly (الكحلوت, 1426).

- The big screens system in many locations succeeded in terms of enlightening the pilgrims. The small screens system in the camps of pilgrims' guides provided adequate information for pilgrims; which entails increasing its number and adding voice to the picture.

CHAPTER 3:- PROPOSED SYSTEM

In this chapter, we will demonstrate a brief overview for the functions of the CGSSP system. We will explain the necessary steps that the user has to take in order to benefit from the suggested system as he has to make a private account that allows him to enter the system and benefit from the services of the suggested system. We will also review the phases through which CGSSP was built with an explanation of the steps taken and tools used in order to produce the CGSSP in its final form.

3.1 CGSSP Overview

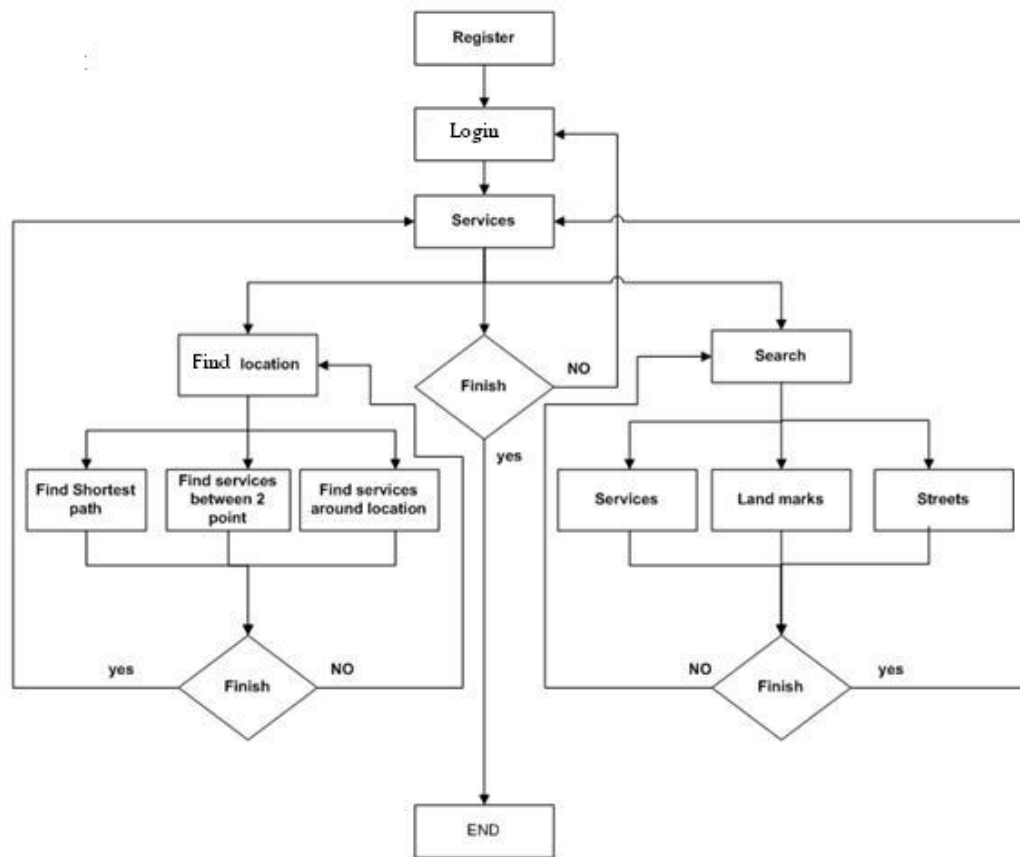


Figure 3-1 CGSSP Overview

Based on figure (1-3), we find that the suggested system is divided into four phases:

Phase (1): It requires that the user of the CGSSP registers in order to get an independent account consisting of the username and password; via which he/she can access the CGSSP.

Phase (2): After the user gets an independent account, he/she can access the CGSSP by typing the username and password; he/she can select the language, as well.

Phase (3): The user selects the area whose services he/she'd like to explore (Makkah & AlMasha'ir).

Phase (4): The user can access the CGSSP and make advantage of it via the following:

1- Location identification:

It requires that the user identifies his/her location; so that he/she can benefit from the following services:

1-1 Identifying the shortest path between two points.

1-2 identifying all services, landmarks and the roads existing between the point where the user exists and another point.

1-3 Identifying all services, landmarks and the roads existing around the point where the user exists.

2-Search:

2-1 Search for services in a particular area or all areas.

2-2 Search for landmarks.

2-3 Search for major ways and roads.

3-2 System Design and Establishment

The design and construction of CGSSP passed the following phases as shown in Figure (3-2):



Figure (3-2) CGSSP Construction Phases

Figure (3-2) shows that the system passes the five phases:-

Phase One (Collect data): This phase aims at collecting data about Makkah and the Almasha'ir, categorizing and transforming them from (*.shp) to (*.mdb).

Phase Two (Analyses & Design): This phase includes creating and formatting maps, setting scales and producing them proportionally.

Phase Three: Transforming maps from (desktop file) to (website pages).

Phase Four (Implementation & Testing): Setting, design and programming of the interface, search tools and CGSSP tools

Phase Five: Publishing.

3-2-1: Collect data "Setting CGSSP"

This is the basic and primary phase in constructing and setting the CGSSP. This phase passed the following stages:

3-2-1-1 Obtaining Data about Makkah and the Almasha'ir:-

Several official bodies were requested to provide documented, accurate information that contribute and help build the CGSSP correctly. Data was obtained upon permission from the Communications and Information Technology Commission of KSA (CITC), dated 28-10-1429 "18-10-2008".

Note: (The obtained data had the extension type (*.shp))

3-2-1-2 Setting, Categorizing Data

After obtaining data they were prepared for setting and categorizing. Data were categorized into:

3-2-1-2-1 Districts: Categorized into:

A- Makkah , including the following suburbs:

(AJYAD, AL "ADL ,AL AWALI ,AL AZIZIYYAH ,AL HIJRAH , AL HARAM , AL KHADRA , 'AL JAMI"AH , AL MURSALAT , AL MA"ABDAH,AR RASHIDIYYAH , AN NASIM ,AR RAWABI , AR RAWDAH , AS SULAYMANIYYAH , SHI"B AMIR AND SHI"B ALI , KUDY)

B- The AlMasha'ir Area

3-2-1-2-2 Services and facilities:

These were categorized into: (Governmental- Educational- Medical- Banks and ATMs- Mosque- Sports Club- Public Parks- Markets- Enterprises- Companies-

Hotels- Residence- Restaurants- Tourism and Travel- Museums- Parking- Stations- Press).

3-2-1-2-3 Roads:

These were ranked by importance from 1-12: Roads were ranked depending on importance. There are main roads and sub-roads. Most important were given number 1 and least important given 12.

3-2-1-2 Displaying primary data with the GeoMedia Professional 6.1 program (GMP6.1)

After obtaining data and categorizing it into three main sections (districts-services- roads), GMP6.1 was used to display these data, which were still with the extension (*.shp) in layers and basic map. The following steps were followed:-

After opening GMP6.1, we do the following in Figure 3-3

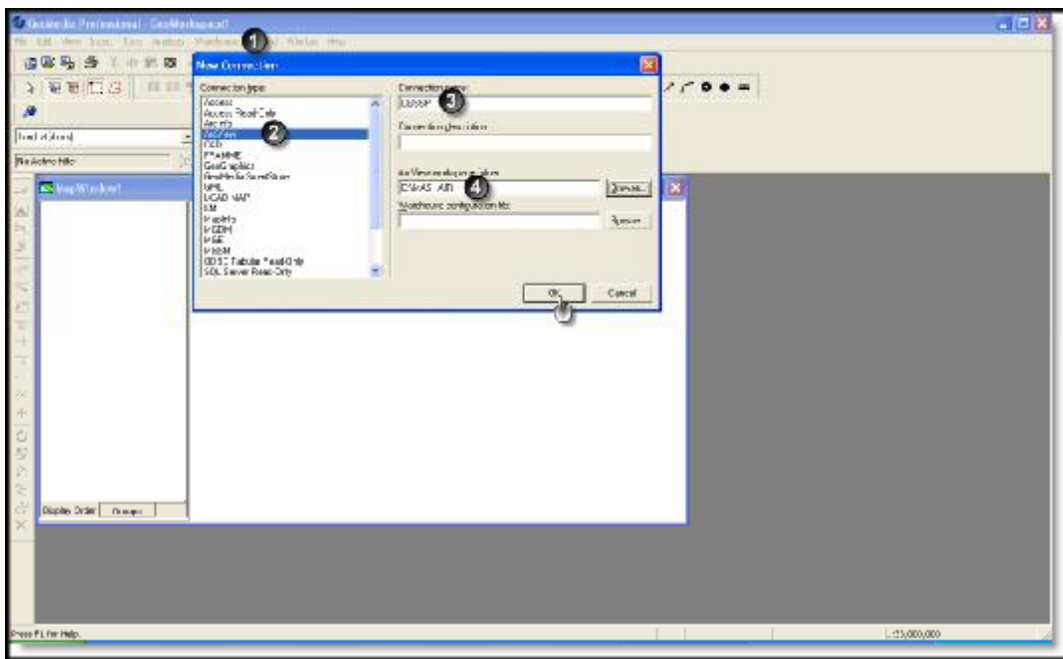


Figure 3-3 Opening GMP6.1 and connecting data

Figure (3-3) shows the necessary steps to connect with (*.shp) data as follows:

1. Select (Warehouse → New Connection).
2. Select connection type (ArcView).
3. Type Connection name (CGSSP).
4. Select location and path of the file you wish to connect with the program.

After completing the previous steps, data about roads, services and districts should be displayed as layers and basic map:-

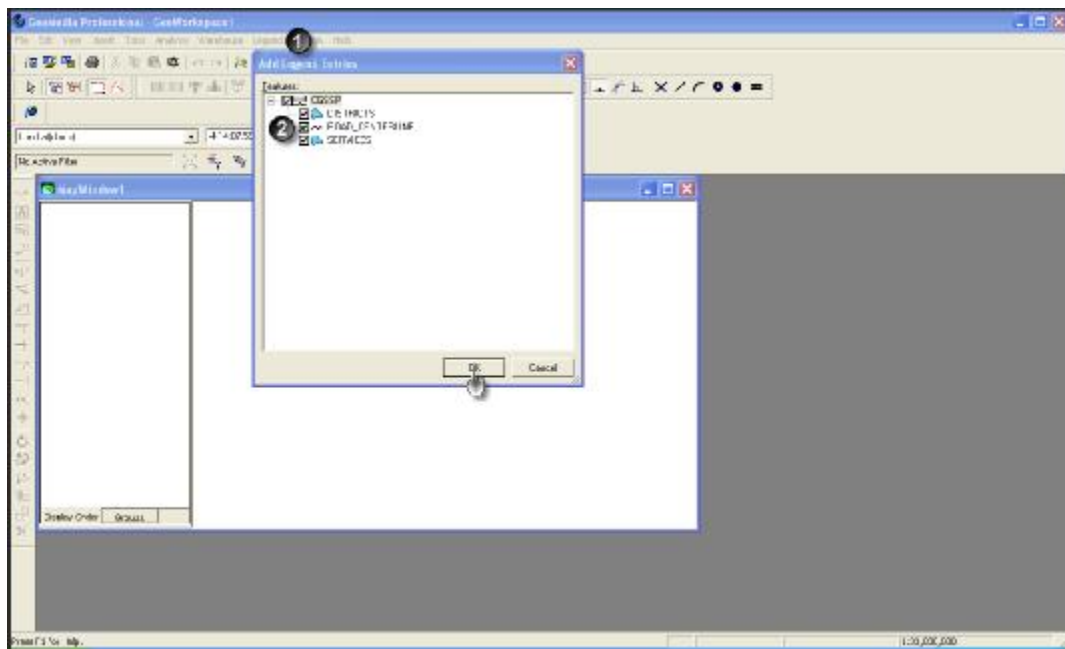


Figure 3-4 Displaying data (Districts- Services- Roads) as layers

Figure (3-4) shows the next step; after connecting with (*.shp) files, where layers for (Districts- Services- Roads) data are displayed in layers and basic maps:

1. Select (Legend → Add Legend Entries).
2. Select the data you wish to display in layers (Districts- Services- Roads)

After selecting layers the basic map is displayed as in Figure 3-5.

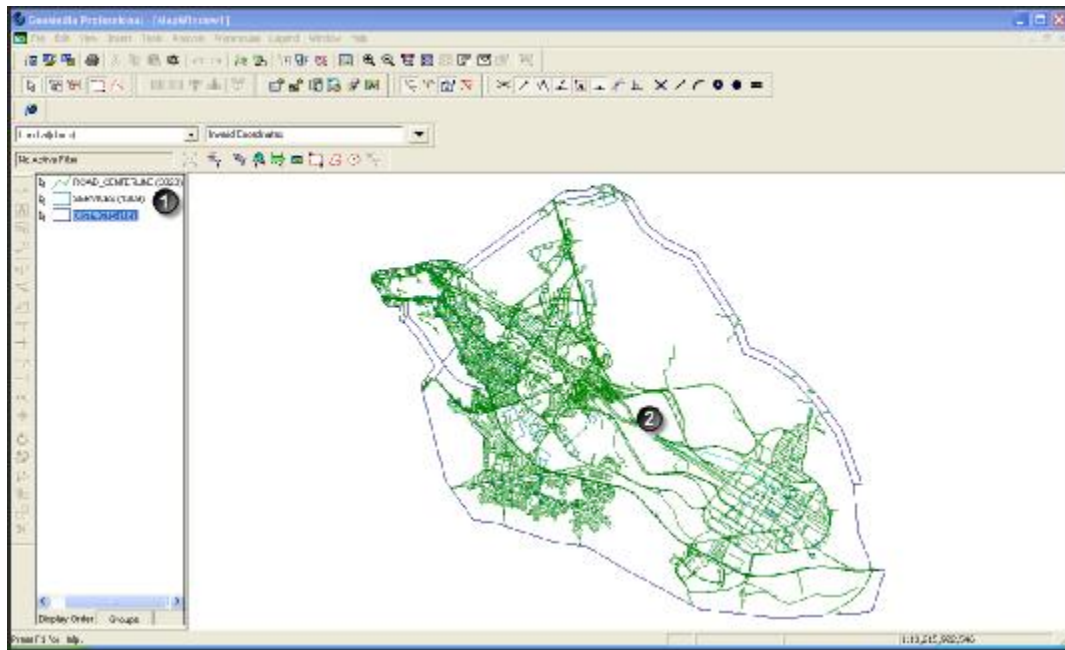


Figure 3-5 Basic map of Makkah and the Almasha'ir

Figure 3-5 shows:

1. Layers represented on the map (Districts- Services- Roads). They are called (Original Layers).
2. Map of Makkah and the Almasha'ir including all (Districts- Services- Roads), their locations and distribution.

3-2-1-4 Data Categorization:

After setting primary data (Districts- Services- Roads) and representing them in layers, data are categorized into two main parts:

3-2-1-4-1: AlMasha'ir Data: For data about the Almasha'ir only, three steps should be followed:

3-2-1-4-1-1: Dividing District Layer:

To categorize the Districts layer into a layer that specializes in Almasha'ir as shown in Figure 3-6

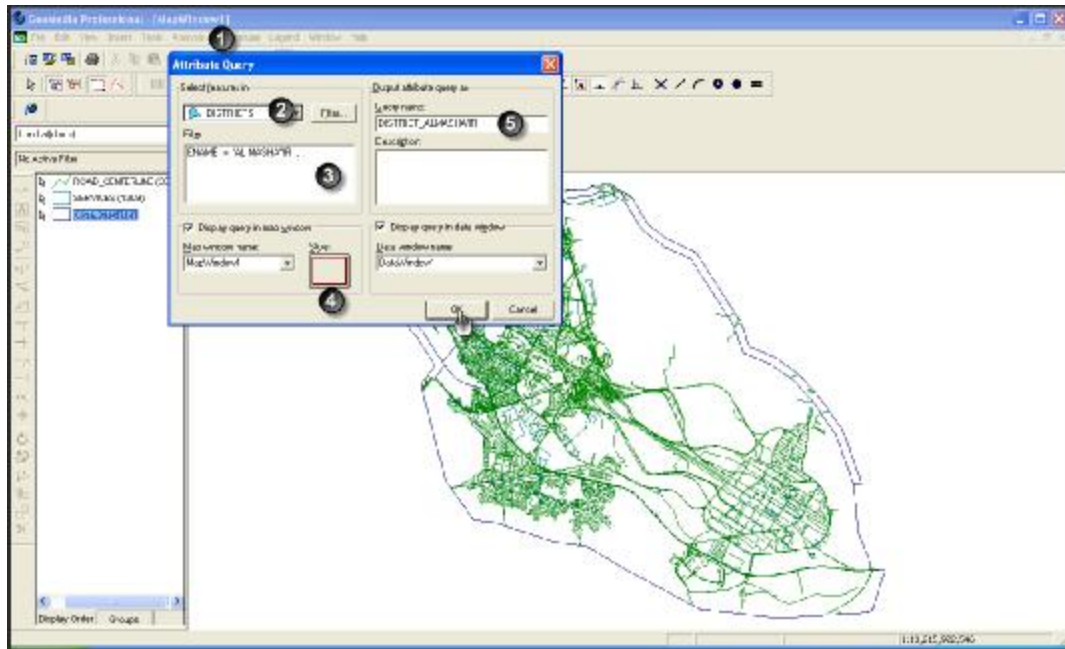


Figure 3-6 District layer categorized into Almasha'ir District only

Figure 3-6 shows the necessary steps to categorize data of the Almasha'ir' District data:

1. Select (Analysis → Attribute Query)
2. Select the layer you wish to divide (DISTRICTS)
3. Conduct the filterzng process thurgh typing
ENAME="ALMASHAIR", where the Districts layer will be categorized under the name "ALMASHAIR"
4. Adjust borders on the Districts area by selecting border color and size for the "DISTRICTS_ALMASHA'IR" layer.
5. Name the newly added layer which is "DISTRICT_ALMASHA'IR", which only specializes in the Almasha'ir area only.

After implementing the mentioned steps, the map will appear as in Figure 3-7.

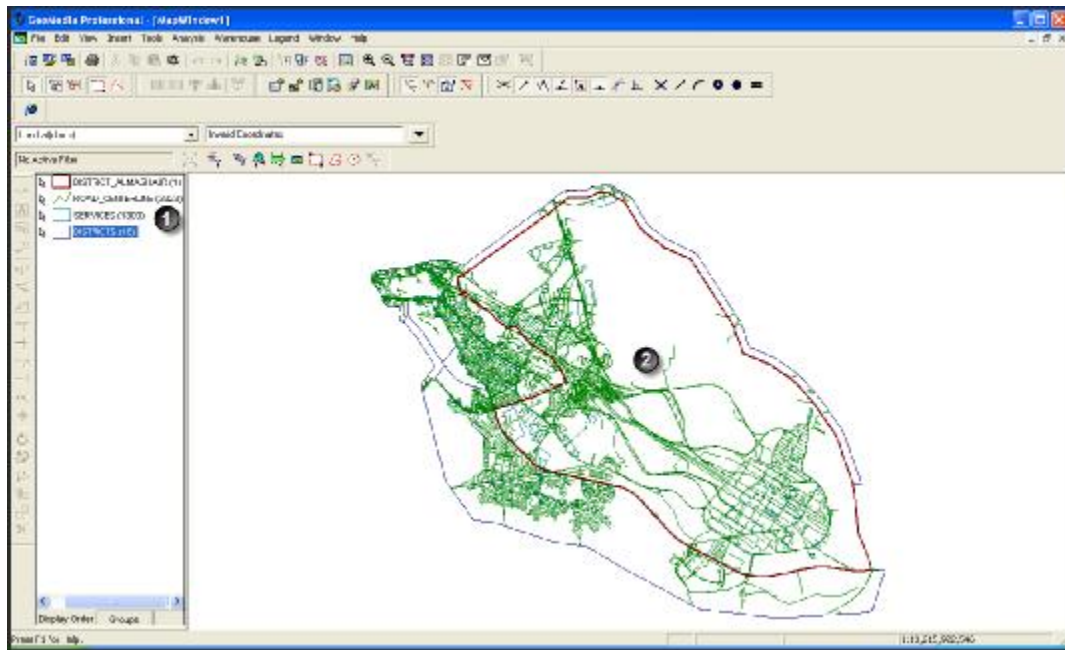


Figure 3-7 Basic map after dividing Districts layers into Masha'ir layer

Figure 3-7 shows:

1. Layers represented on the map.

Note : "DISTRICT_ALMASHA'IR" layer is added.

2. The Almasha'ir area bordered on the basic map by red.

3-2-1-4-1-2: Dividing Services layer:

After dividing Districts into Almasha'ir area, the next step is to divide Services into Services available only at the Almasha'ir. We follow the steps shown in Figure 3-8.

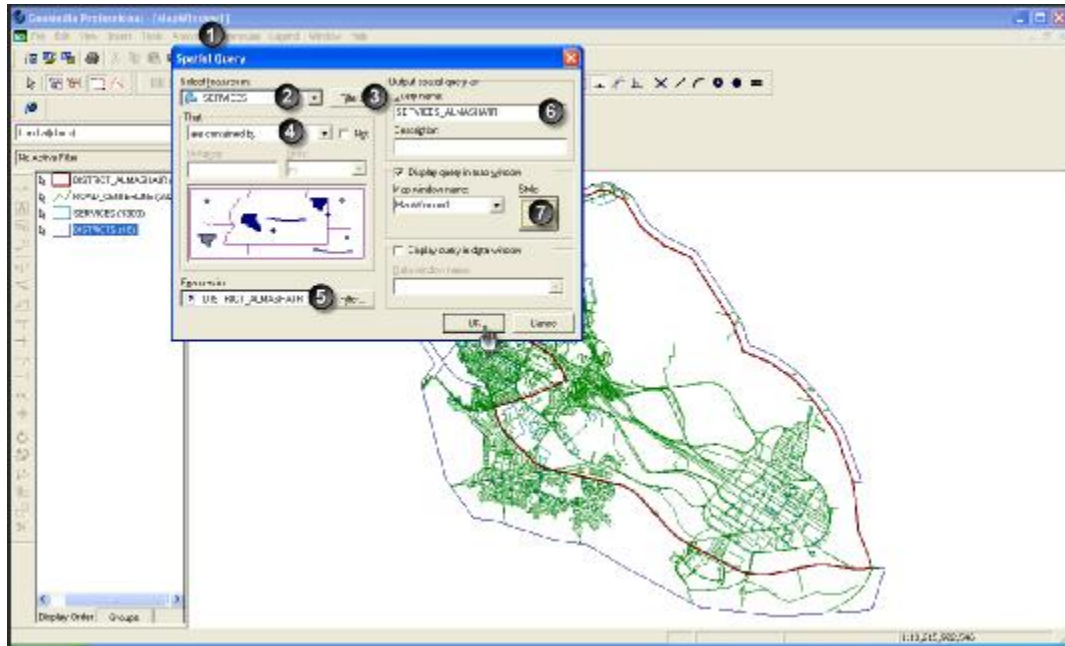


Figure 3-8: Dividing Services layer into Almasha'ir only

Figure 3-8 shows:

1. Select (Analysis → Spatial Query)
2. Select the layer you wish to divide (SERVICES)
3. Conduct the filterizing process with this instruction:

CATEGORY_E in (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19) Services will be categorized as mentioned above.

4. Select (Contained by)
5. Select the area for which you wish to define services (DISTRICT_ALMASHA'IR).
6. Name the new layer (SERVICE_ALMASHA'IR), which includes all services available at the Almasha'ir area.

7. Select color and border size of services at the Almasha'ir.

Upon completing the previous steps, the map should appear as in Figure 3-9.

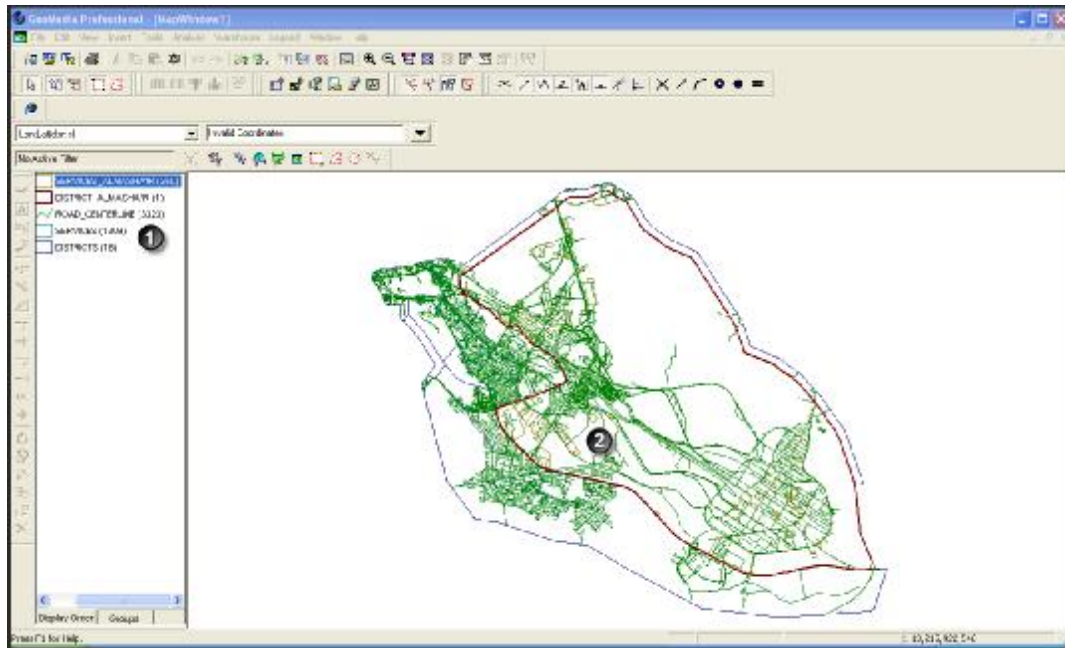


Figure 3-9: Basic map after dividing the Services layer in the Almasha'ir area

Figure 3-9 shows:

1. Maps represented on the map. Note that the layer (SERVICE_ALMASHA'IR) has been added.
2. Services available at the Almasha'ir area in blue.

3-2-1-4-1-3 Dividing Roads layer

After dividing the Districts and Services layers of the Almasha'ir, we divide the Roads layer following the next steps:

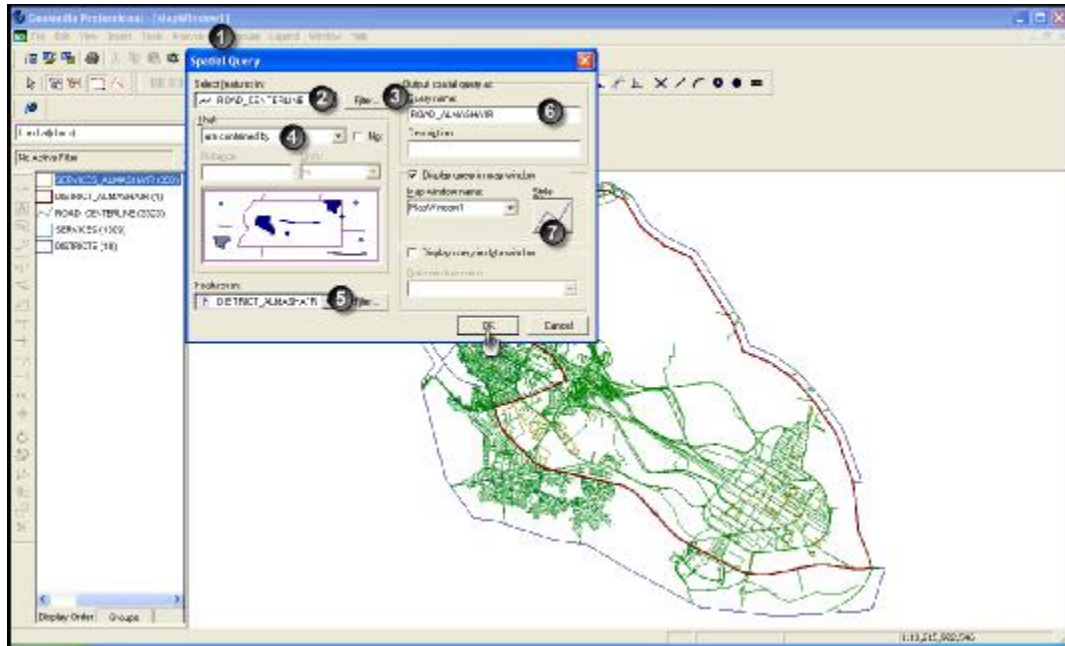


Figure 3-10 Dividing Roads layer into AlMasha'ir only

Figure 3-10 shows:

1. Select (Analysis → Spatial Query)
2. Select the layer you wish to divide (ROADS)
3. Conduct the filterizing process with this instruction:

ROADCLASS1 in (1,2,3,4,5,6,7,8,9,10,11,12)

4. Select (Contained by)
5. Select the area for which you wish to define services (ROADS_ALMASHA'IR).
6. Name the new layer (ROADS_ALMASHA'IR), which includes all services available at the AlMasha'ir area.
7. Select color and border size of services at the AlMasha'ir.

Upon completing the previous steps, the map should appear as in Figure 3-11.

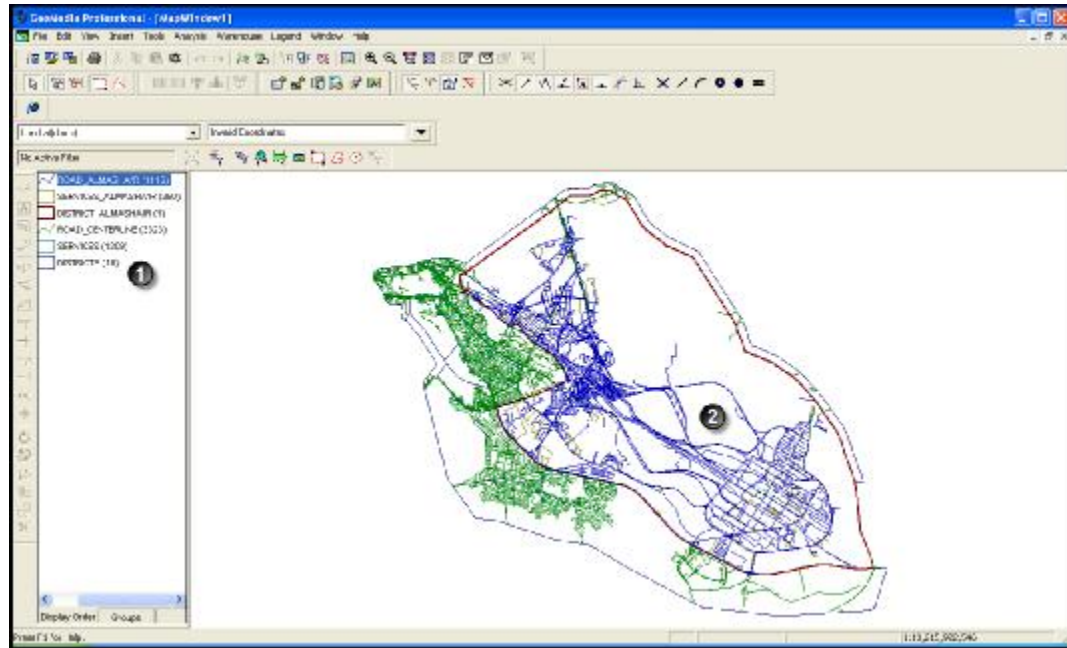


Figure 3-11: Basic map after dividing the Roads layer in the Almasha'ir area

Figure 3-11 shows:

1. Maps represented on the map.

Note: The layer (ROADS_ALMASHA'IR) has been added.

2. Roads available at the Almasha'ir area in blue.

3-2-1-4-2 Makkah Data

As we noticed in 1-4-1 data were divided into data about the Almasha'ir area. Now we will divide data for the Makkah District (using the same steps).

3-2-1-4-2-1 Dividing Districts layer:

To divide the Districts layer of Makkah , we follow the steps shown in the figure, noting that we have 17 suburbs in Makkah as clarified earlier.

Note: Back to 1-3 we find that we had 3 basic layers for the Makkah and Almasha'ir District, which produced:

Three layers specialized in the Almasha'ir including all services and roads in the Almasha'ir District (1-4-1) and Three layers specializing in Makkah including all areas and main suburbs and services and roads.

To categorize the Districts layer into a layer that specializes in Makkah District only, we follow the following steps as shown in Figure 3-12.

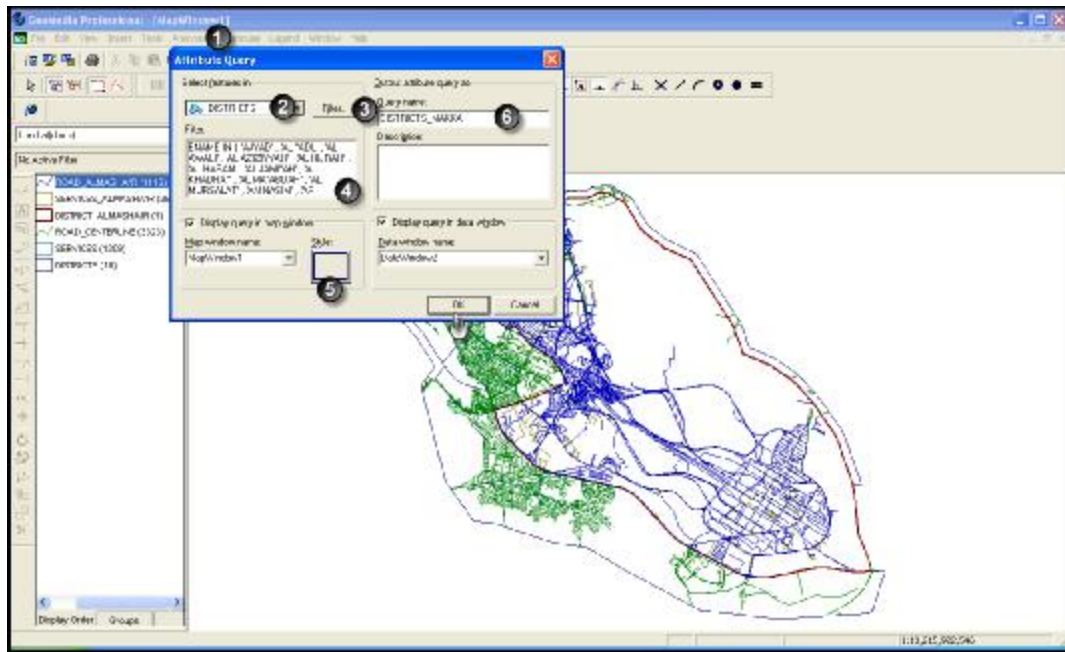


Figure 3-12 District layer categorized into Makkah District only

Figure 3-12 shows the necessary steps to categorize data of the Makkah' District data:

1. Select (Analysis → Attribute Query)
2. Select the layer you wish to divide (DISTRICTS)
3. Conduct the filtering process through typing

4. ENAME="Makkah", where the Districts layer will be categorized under the name "ENAME in ('AJYAD' , 'AL "ADL' , 'AL AWALI' , 'AL AZIZIYYAH' , 'AL HARAM' , 'AL HIJRAH' , 'AL JAMI"AH' , 'AL KHADRA"' , 'AL MA"ABDAH' , 'AL MURSALAT' , 'AN NASIM' , 'AR RASHIDIYYAH' , 'AR RAWABI' , 'AR RAWDAH' , 'AS SULAYMANIYYAH' , 'KUDY' , 'SHI"B AMIR AND SHI"B ALI')"
5. Adjust borders on the Districts area by selecting border color and size for the "DISTRICTS_ Makkah" layer.
6. Name the newly added layer which is "DISTRICT_ Makkah", which only specializes in the Makkah area only.

After implementing the mentioned steps, the map will appear as in Figure 3-13.

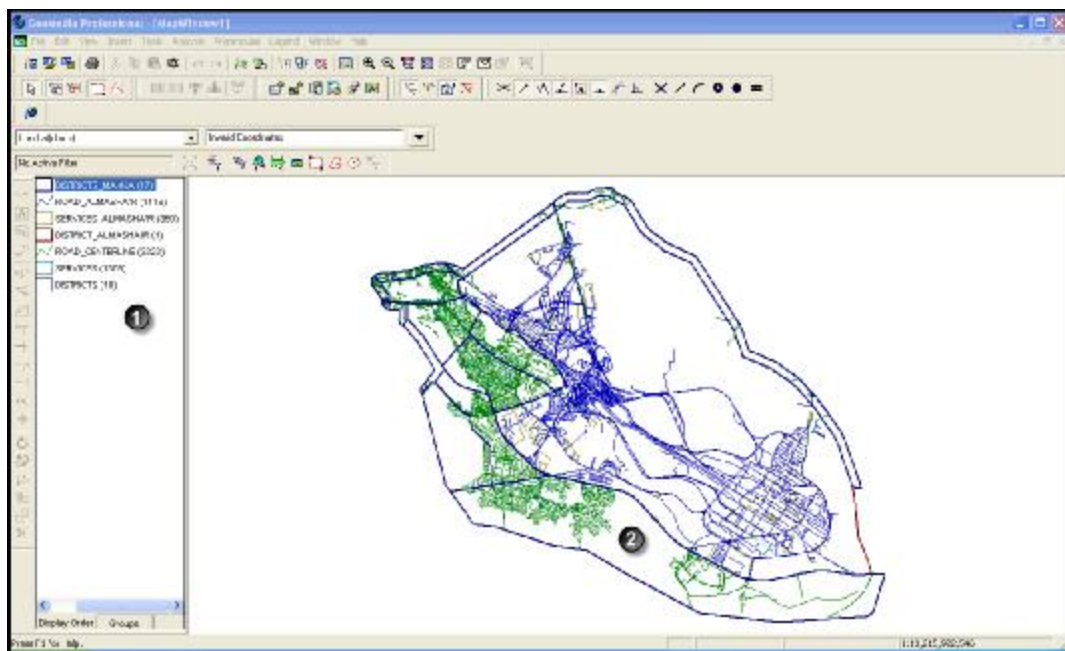


Figure 3-13 Basic map after dividing Districts layers into Masha'ir layer

Figure 3-13 shows:

1. Layers represented on the map.
Note : "DISTRICT_ Makkah" layer is added.
2. The Almasha'ir area bordered on the basic map by red.

3-2-1-4-1-2: Dividing Services layer:

After dividing Districts into Makkah area, the next step is to divide Services into Services available only at the Makkah . We follow the steps shown in Figure 3-14.

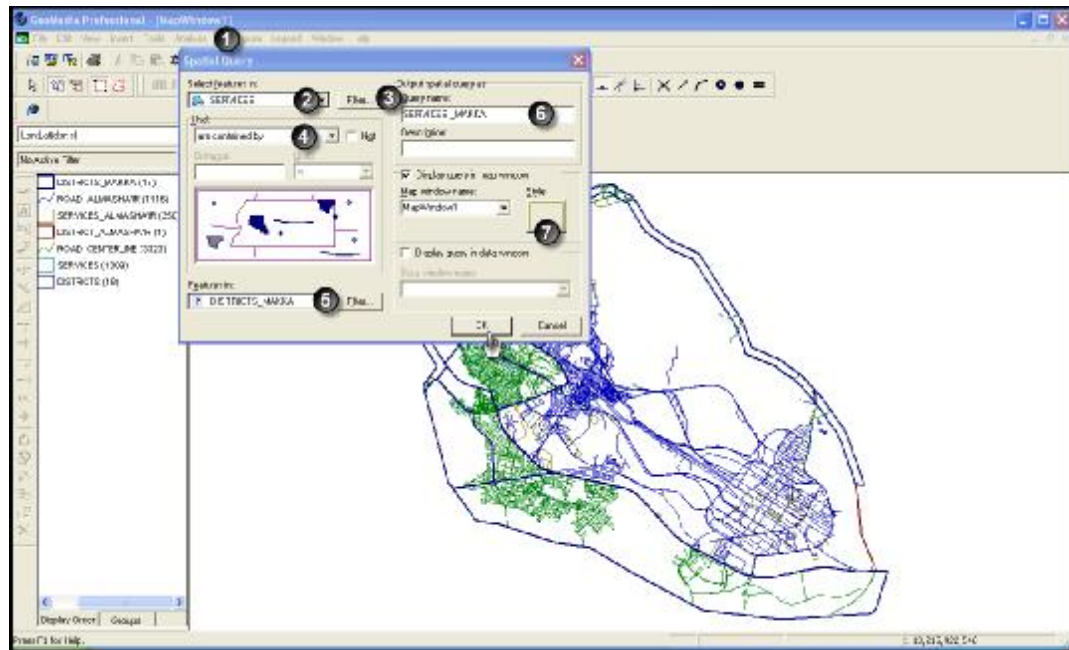


Figure 3-14: Dividing Services layer into Makkah only

Figure 3-14 shows:

1. Select (Analysis → Spatial Query)
2. Select the layer you wish to divide (SERVICES)
3. Conduct the filterizing process with this instruction:

CATEGORY_E in (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19) Services will be categorized as mentioned above.
4. Select (Contained by)
5. Select the area for which you wish to define services (DISTRICT_Makkah).
6. Name the new layer (SERVICE_ Makkah), which includes all services available at the Makkah area.

7. Select color and border size of services at the Makkah.

Upon completing the previous steps, the map should appear as in Figure 3-15.

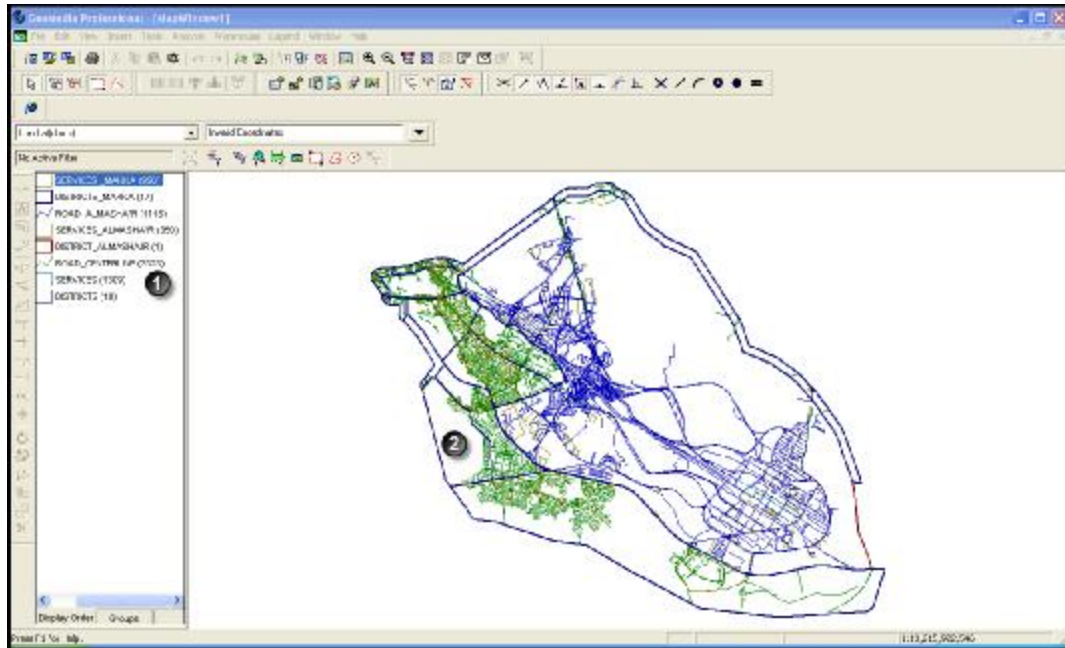


Figure 3-15: Basic map after dividing the Services layer in Makkah

Figure 3-15 shows:

1. Maps represented on the map.

Note: the layer (SERVICE_ Makkah) has been added.

2. Services available at the Makkah area in blue.

3-2-1-4-2-3 Dividing Roads layer

After dividing the Districts and Services layers of the Makkah, we divide the Roads layer following the next steps:

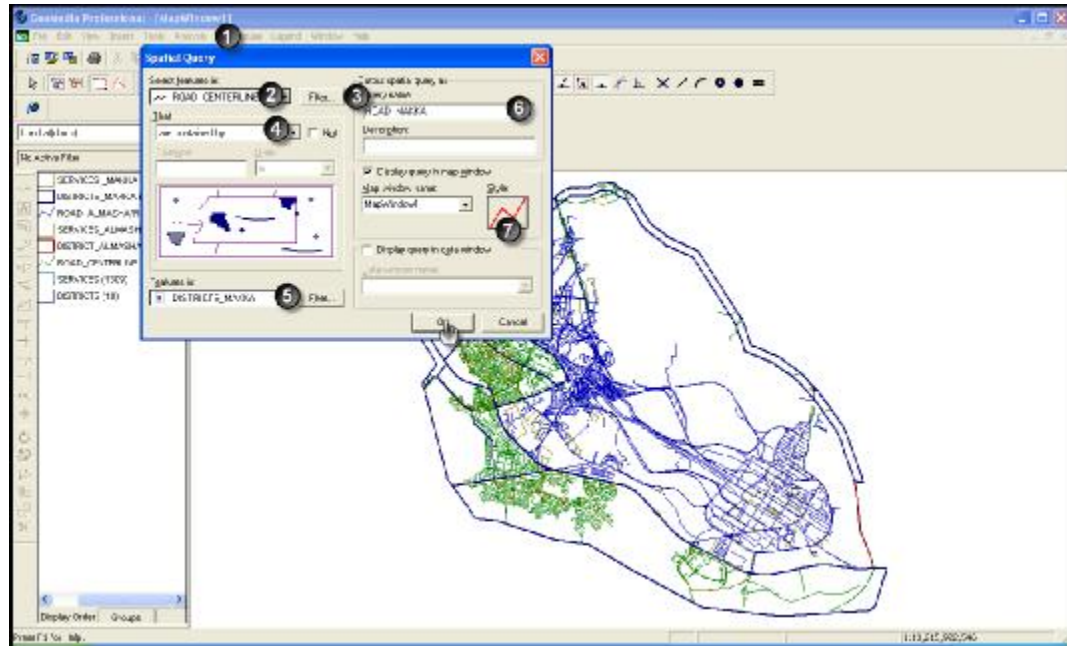


Figure 3-16: Dividing Roads layer into Makkah

Figure 3-16 shows:

1. Select (Analysis → Spatial Query)
2. Select the layer you wish to divide (ROADS)
3. Conduct the filterizing process with this instruction:

ROADCLASS1 in (1,2,3,4,5,6,7,8,9,10,11,12)
4. Select (Contained by)
5. Select the area for which you wish to define roads (ROADS_ Makkah).
6. Name the new layer (ROADS_ Makkah), which includes all roads available at the Makkah area.
7. Select color and border size of sercies at the Makkah.

Upon completing the previous steps, the map should appear as in Figure 3-17.

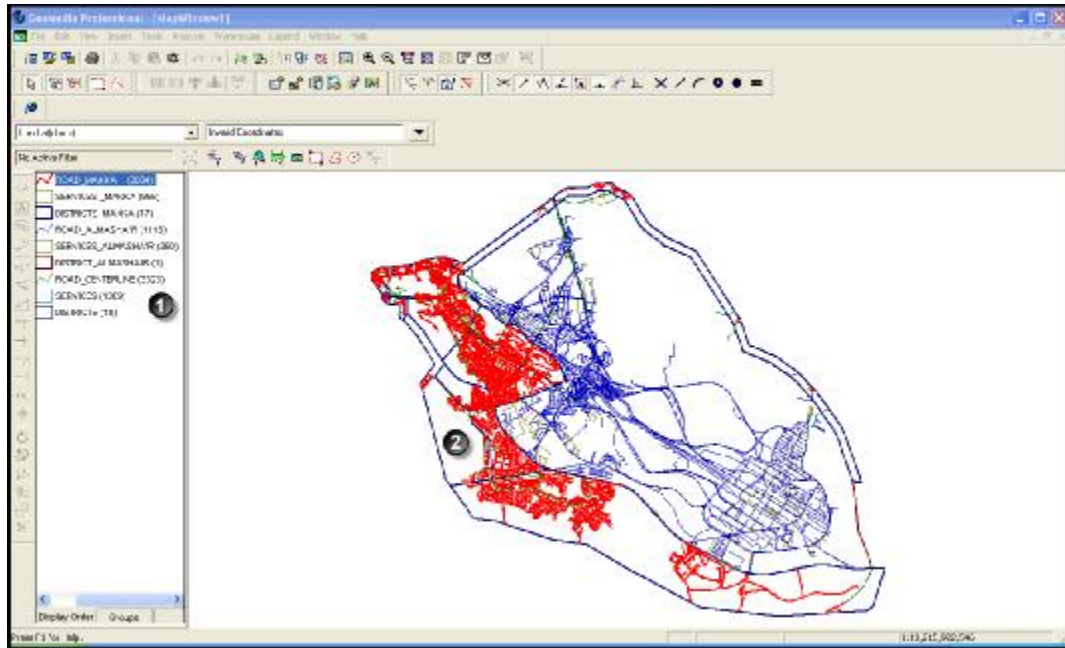


Figure 3-17: The map after dividing the Roads layer in the Makkah area

Figure 3-17 shows:

1. Maps represented on the map.

Note: The layer (ROADS_Makkah) has been added.

2. Roads available at the Makkah area in red.

3-2-1-5 Transforming data from (*.shp) to (*.mdb)

After dividing data into data about Makkah and data about the Almasha'ir, which are still of type (*.shp). The next stage is to transform them into (*.mdb) data that is easier to program in later stages. Data transformation was implemented as in Figure 3-18.

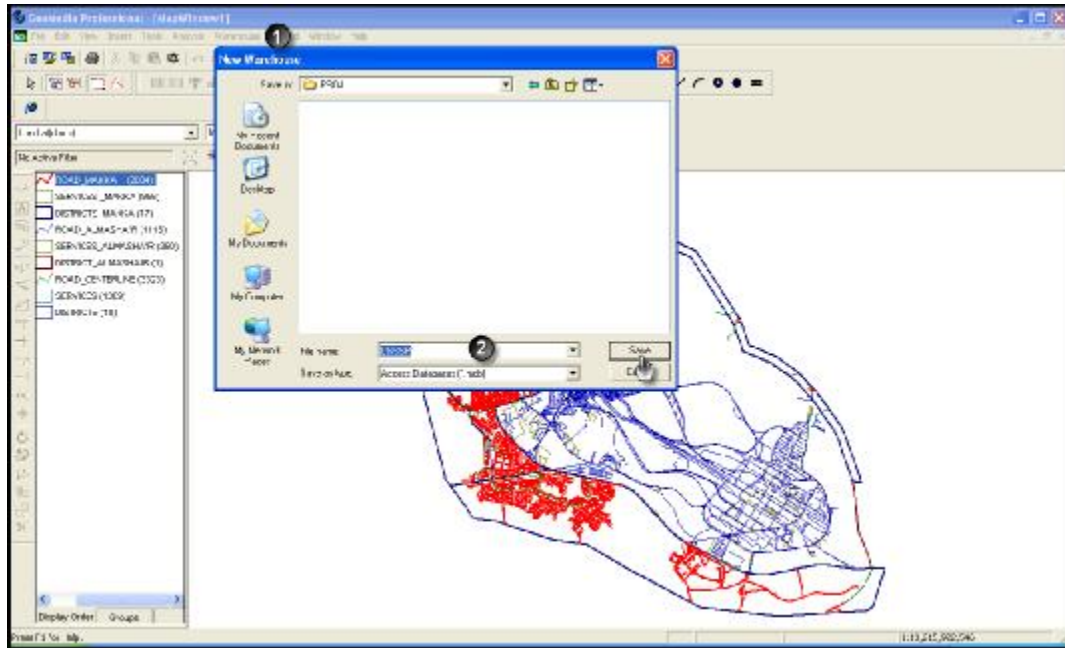


Figure 3-18 Stage 1 of transforming data from (*.shp) to (*.mdb)

Figure 3-18 shows stage 1 of transforming data from (*.shp) to (*.mdb):

1. (Warehouse → New Warehouse → Normal)
2. Type name of the new database (CGSSP1) and save.

After transforming, naming and saving the new database, the next transformation stage is to select the layers you wish to transform where you select the basic layers and those specialized in Makkah and those specialized in the Almasa'ir as shown in Figure 3-19.

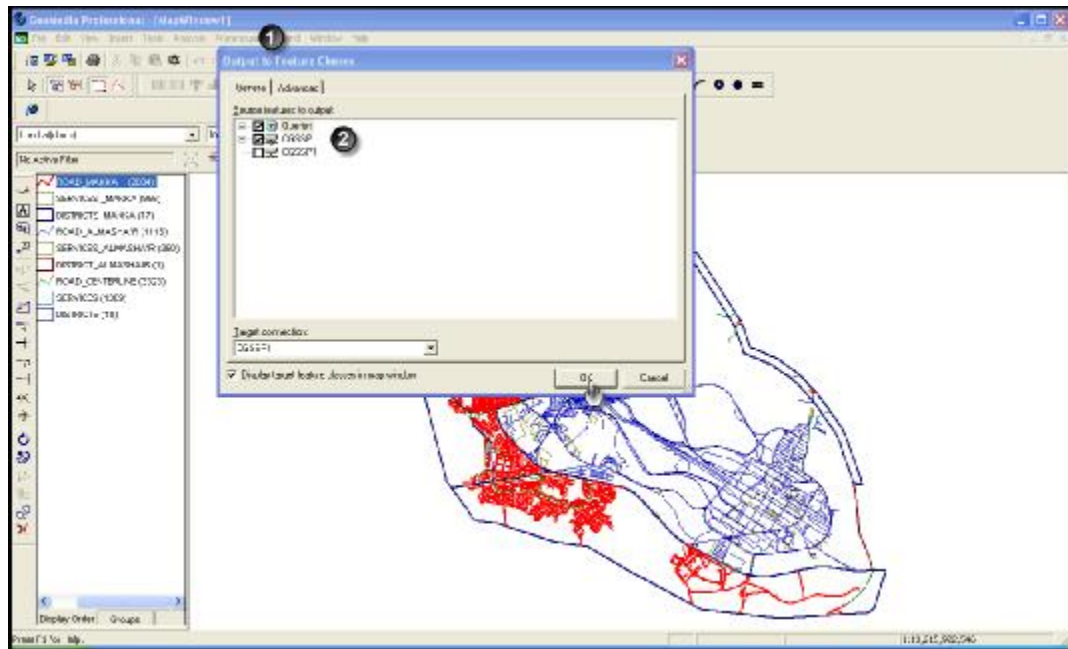


Figure 3-19 Second stage of transforming data from (*.shp) to (*.mdb)

Figure 3-19 shows:

1. (New warehouse → Output to Feature Classes)
2. Select the layers you wish to border (basic layers in addition to Makkah and Almasha'ir' layers)

After selecting the layers you wish to transform, the transformation is implemented from (*.shp) to (*.mdb) .

This concludes the first phase of setting the system and preparing it for creating maps.

3-2-2:- Creating Maps

After setting data and dividing them into layers for Makkah and layers for the Almasha'ir and transforming them from (*.shp) to (*.mdb), comes the phase of creating maps for the Districts of Makkah and Almasha'ir.

Since the system was designed to initially deal with interfaces that support Arabic and English languages, then we will need to create 4 maps as follows:

▼ Two maps for Makkah :-

1. Makkah Map with Arabic Interface (CGSSP2_AR)
2. Makkah Map with English Interface (CGSSP2_EN)

▼ Two maps for Almasha'ir

1. Almasha'ir Map with Arabic Interface (CGSSP1_AR)
2. Almasha'ir Map with English Interface (CGSSP1_EN)

3-2-2-1 Creating a map of the CGSSP1_EN

To create and format and setup a map of the CGSSP1_EN, the following steps will be taken:

3-2-2-1-1 Creating the map

After opening the program (GMP 6.1) and opening a new page and naming it (CGSSP1_EN), the following steps will be taken as shown in Figure 3-20.

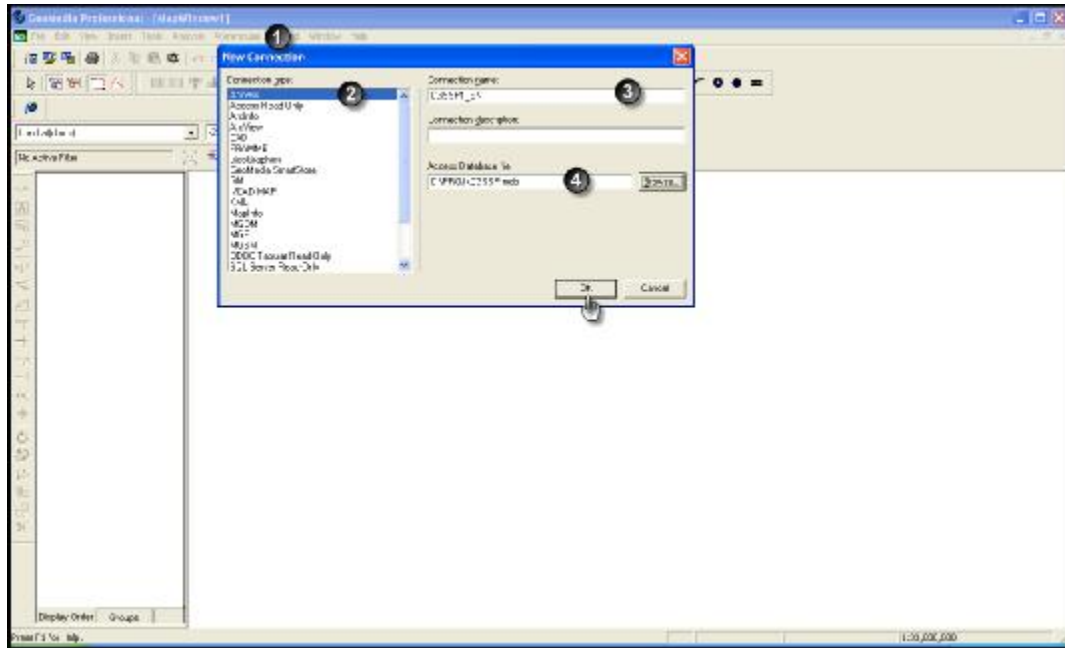


Figure 3-20: First Phase of creating an English map of the Almasha'ir

Figure 3-20 shows:

1. (Warehouse → New Connection)
2. Select connection type (Access)
3. Type connection name (CGSSP1_EN)
4. Select a path for the database we wish to connect with

After completing the mentioned steps, the following steps should be taken to display the CGSSP1_EN.

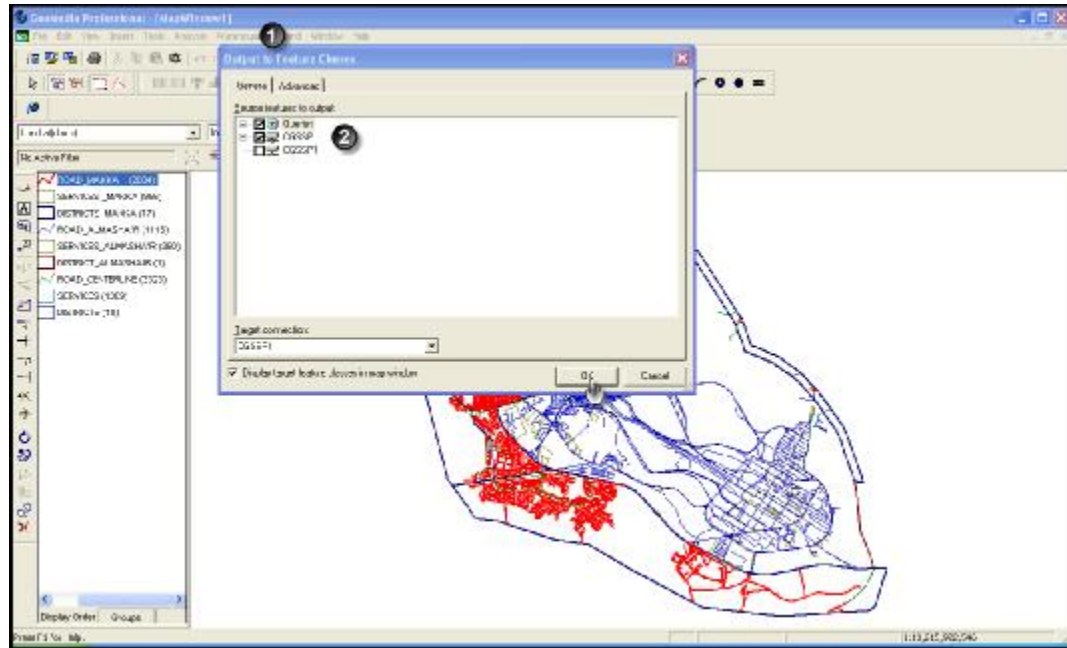


Figure 3-21: Second phase of creating a map of the CGSSP1_EN

Figure 3-21 shows:

1. (Legend → Add Legend Entries)
2. Select these layers only (DISTRICT_ALMASHA'IR, SERVICE_ALMASHA'IR, ROAD_ALMASHA'IR)

After selecting Almasha'ir layers, the map will be shown as in Figure 3-22.

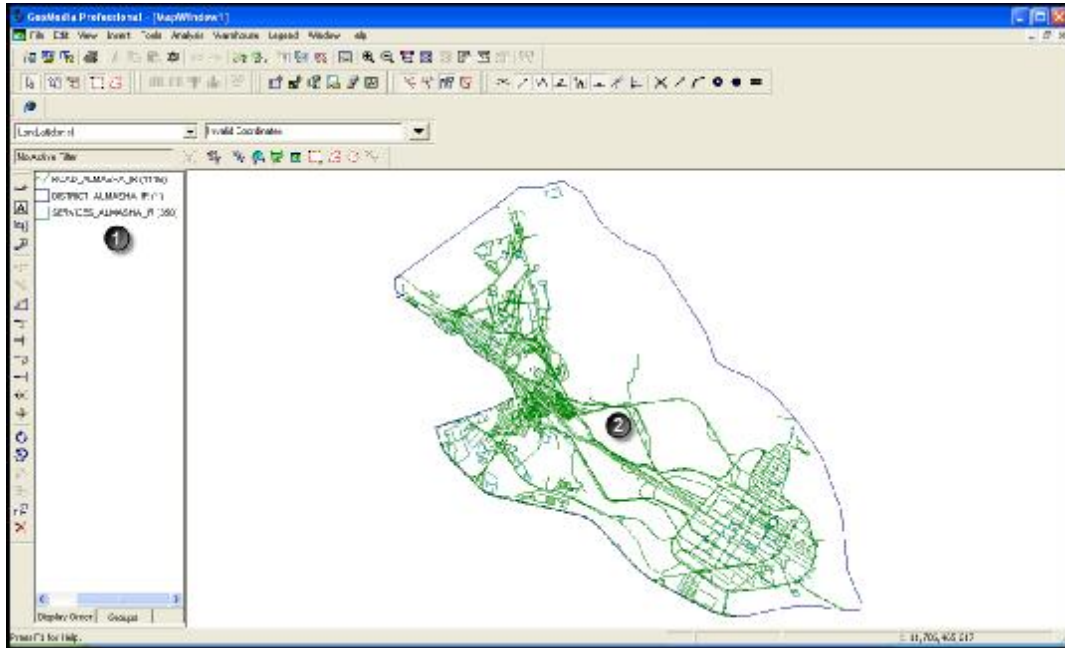


Figure 3-22: CGSSP1_EN

Figure 3-22 shows the Almasha'ir maps

1. Layers of the Almasha'ir

(DISTRICT_ALMASHA'IR, SERVICE_ALMASHA'IR, ROAD_ALMASHA'IR)

2. Map of the Almasha'ir with all roads and services.

3-2-2-2 Map Format:

To format the CGSSP1_EN we will do the following:

3-2-2-2-1: Format District Map

Figure 3-23 shows steps for formatting the Districts layer of the CGSSP1_EN:

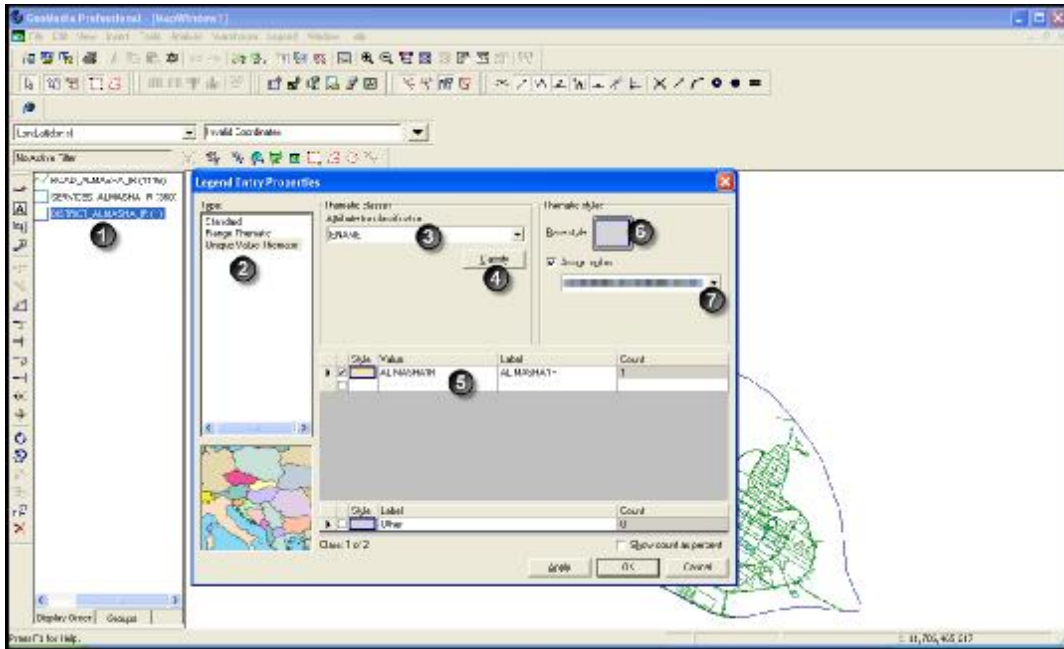


Figure 3-23: Format of District layer at Almasha'ir

Figure 3-23 shows:

1. Select layer (DISTRICT_ALMASHA'IR)
2. Select division (Unique Value Thematic)
3. Select division element (ENAME)
4. Select (Classify) to display all Almasha'ir Districts named in English, i.e. Masha'ir.
5. Upon classification by name, show Almasha'ir District with all pre-set properties
6. Set borders, color, border size and pattern.
7. Select suitable fill for District layer.

After completing format of Almasha'ir District layer, the map will be shown as in Figure 3-24

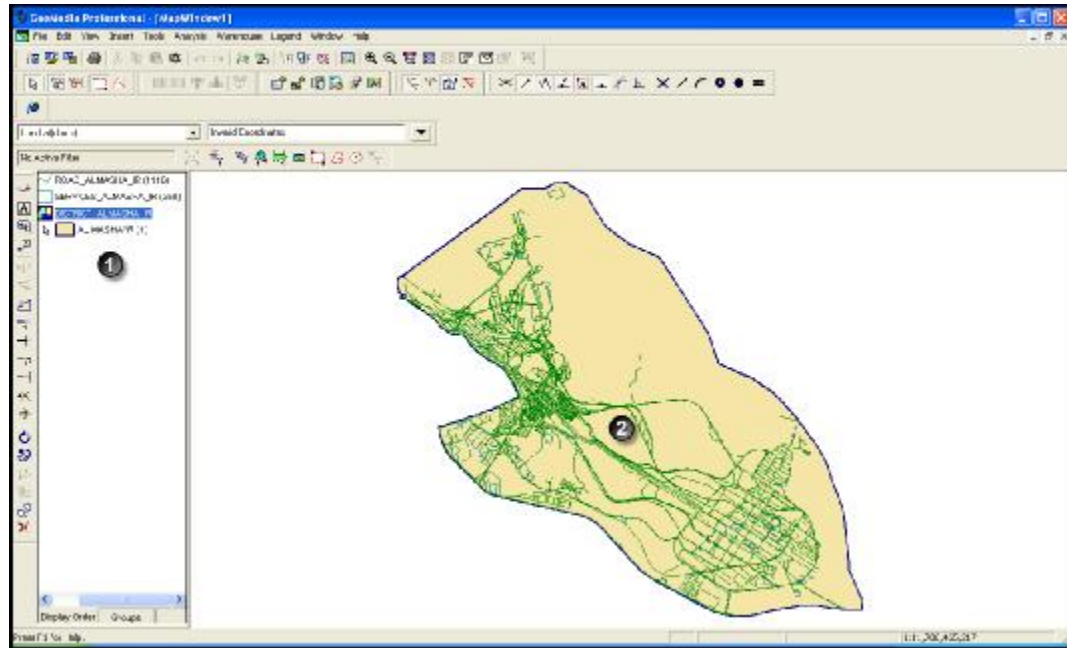


Figure 3-24: CGSSP1_EN after formatting District layer

Figure 3-24 shows:

1. Almasha'ir maps layers (DISTRICT-SERVICES-ROADS)
2. CGSSP1_EN after formatting District layer where we can choose the color of Masha'ir District border and fill the layer with a certain color.

3-2-2-2-2: Format Service Map

Figure 3-25 shows steps for formatting the Service layer of the CGSSP1_EN:

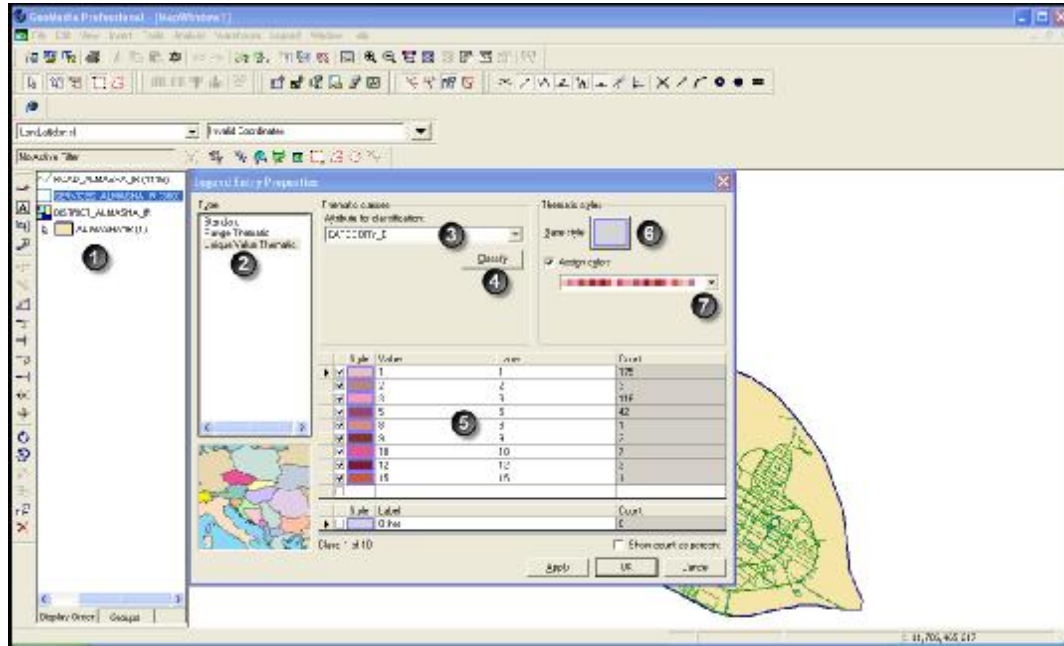


Figure 3-25: Format of services layer at Almasha'ir

Figure 3-25 shows:

1. Select layer (SERVICES_ALMASHA'IR)
2. Select division (Unique Value Thematic)
3. Select division element (CATEGORY_E)
4. Select (Classify) to display all CATEGORY services
5. Upon classification by category, show Almasha'ir services with all pre-set properties
6. Set borders, color, border size and pattern.
7. Select suitable fill for District layer.

After completing format of Almasha'ir Service layer, the map will be shown as in Figure 3-26

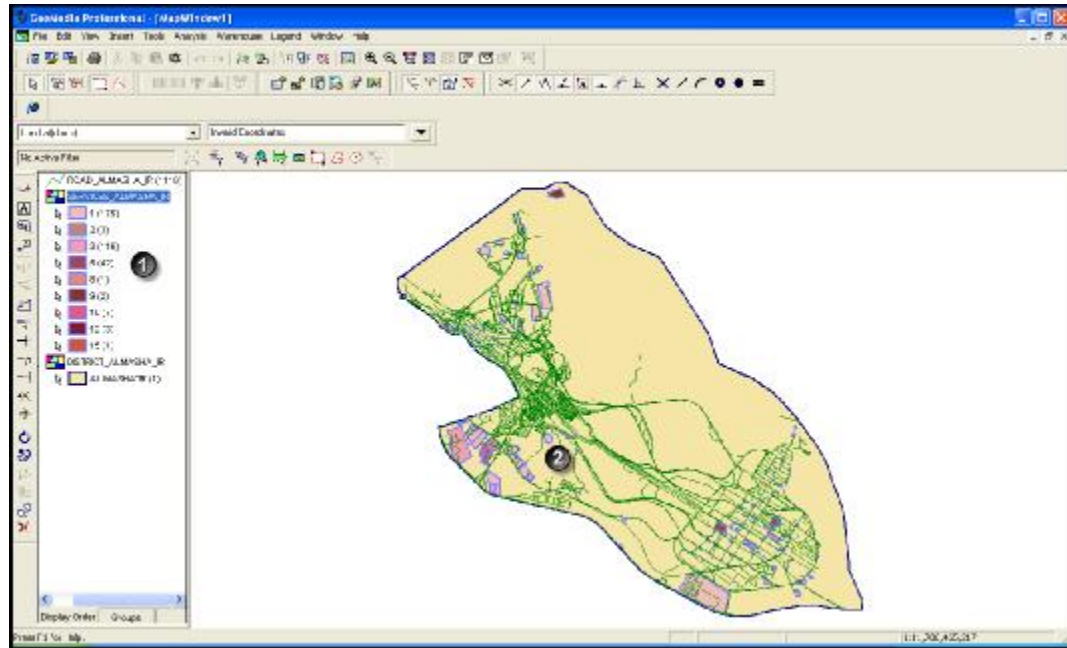


Figure 3-26: CGSSP1_EN after formatting services layer

Figure 3-26 shows:

1. CGSSP1_EN layers (DISTRICT-SERVICES-ROADS)
2. CGSSP1_EN after formatting Service layer where we can choose the color of Masha'ir Service border and fill the layer with a certain color.

3-2-2-2-3: Format ROAD Map

Figure 3-27 shows steps for formatting the ROAD layer of CGSSP1_EN:

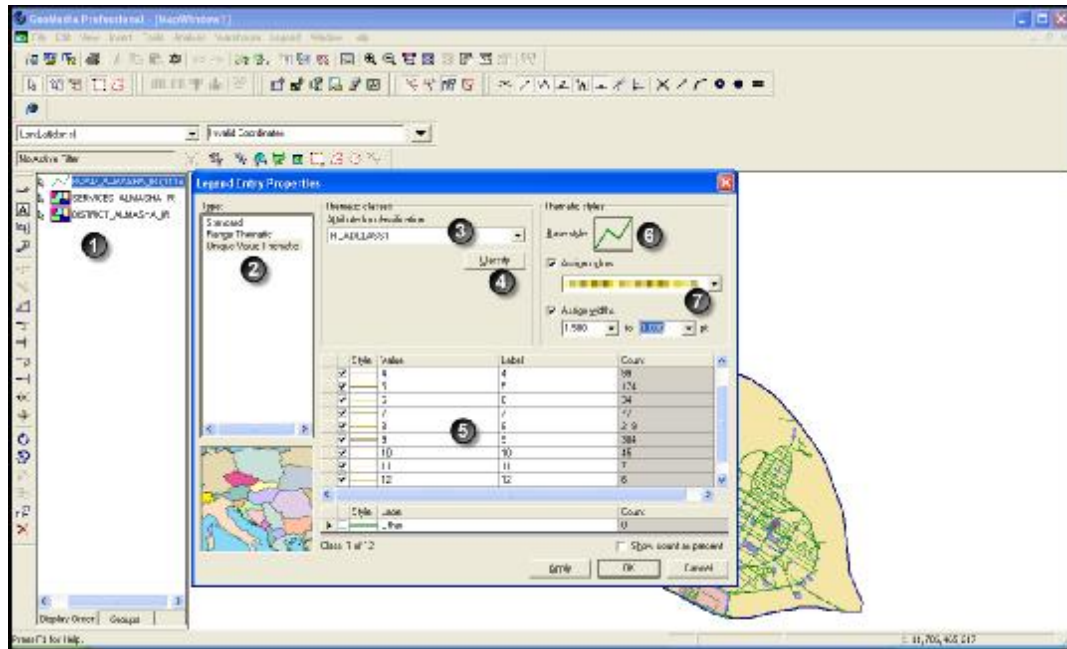


Figure 3-27: Format of roads layer at Almasha'ir

Figure 3-27 shows:

1. Select layer (ROADS_ALMASHA'IR)
2. Select division (Unique Value Thematic)
3. Select division element (ROADCLAS1)
4. Select (Classify) to display all class roads
5. Upon classification by roadclass, show Almasha'ir roads with all pre-set properties
6. Set borders, color, border size and pattern.
7. Select suitable fill for District layer.

After completing format of Almasha'ir Roads layer, the map will be shown as in the Figure 3-28 :

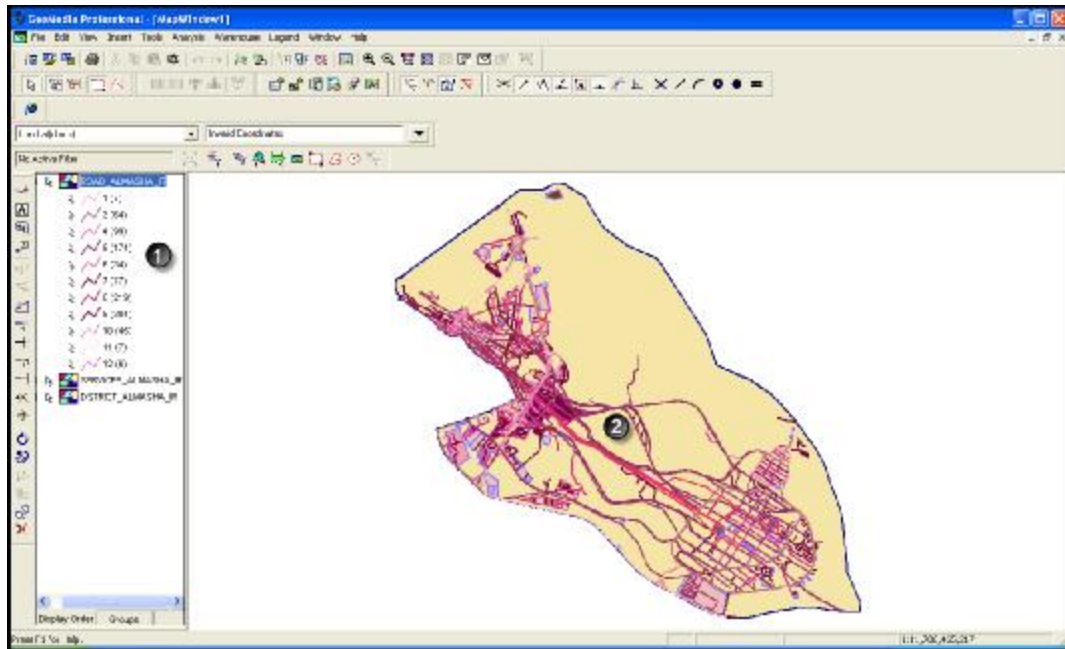


Figure 3-28: CGSSP1_EN after formatting roads layer

Figure 3-28 shows:

1. Almasha'ir maps layers (DISTRICT-SERVICES-ROADS)
2. Almasha'ir map after formatting roads layer where we can choose the color of Masha'ir roads border and fill the layer with a certain color.

3-2-3-3 Adding Buffer Zone:

After formatting Districts, Services and Roads layers a special layer should be added (buffer zone around road_masha'ir)

Target of this layer: To display available services around the roads at certain distance.

This layer shown as in Figure 3-29.

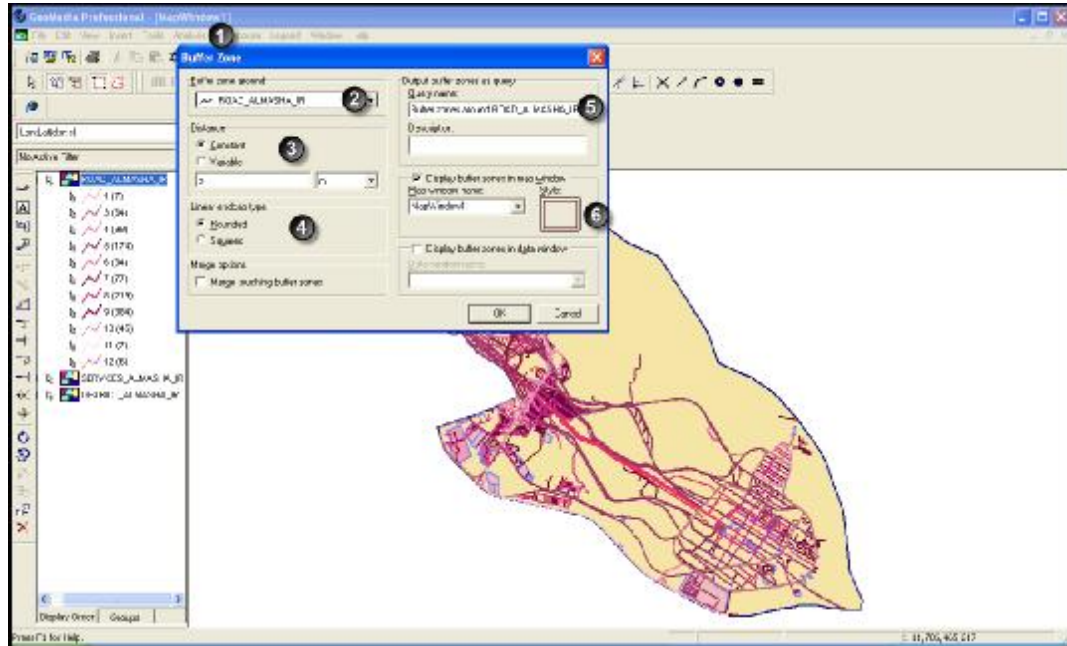


Figure 3-29: Adding Buffer Zone Around Road layer

Figure 3-29 shows:

1. (Analysis → buffer zone)
2. Select the layer to which we wish to add buffer zone
3. Select distance from road by selecting a certain distance (for instance 5 meters)
4. Name the new layer (Buffer zones around ROAD_ALMASHA'IR)
5. Setup borders, colors and type.

3-2-3-4: Adding Titles and information to the CGSSP1_EN:

To add data and titles and information about the District, Roads and Services we will do the following:

3-2-3-4-1: Districts:

To add data about the CGSSP1_EN layer we will show as in Figure 3-30

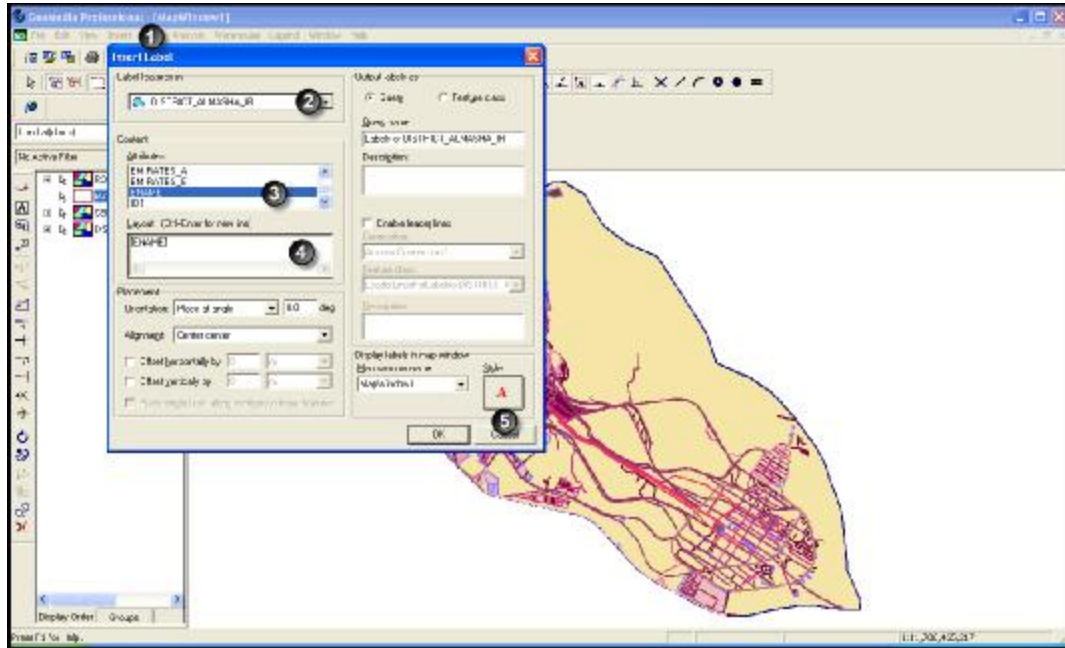


Figure 3-30 Adding data, titles, layer, District in CGSSP1_EN

Figure 3-30 shows:

1. (Insert → Lable)
2. Select the layer of which you wish to display information
(DISTRICT_ALMASHA'IR)
3. Select information elements that you wish to display on the map (District English name)
4. Display elements selected in step 3 above, where only ENAME was selected.
5. Select font type, size and color.

After completing the mentioned steps, the map should appear as in Figure 3-31

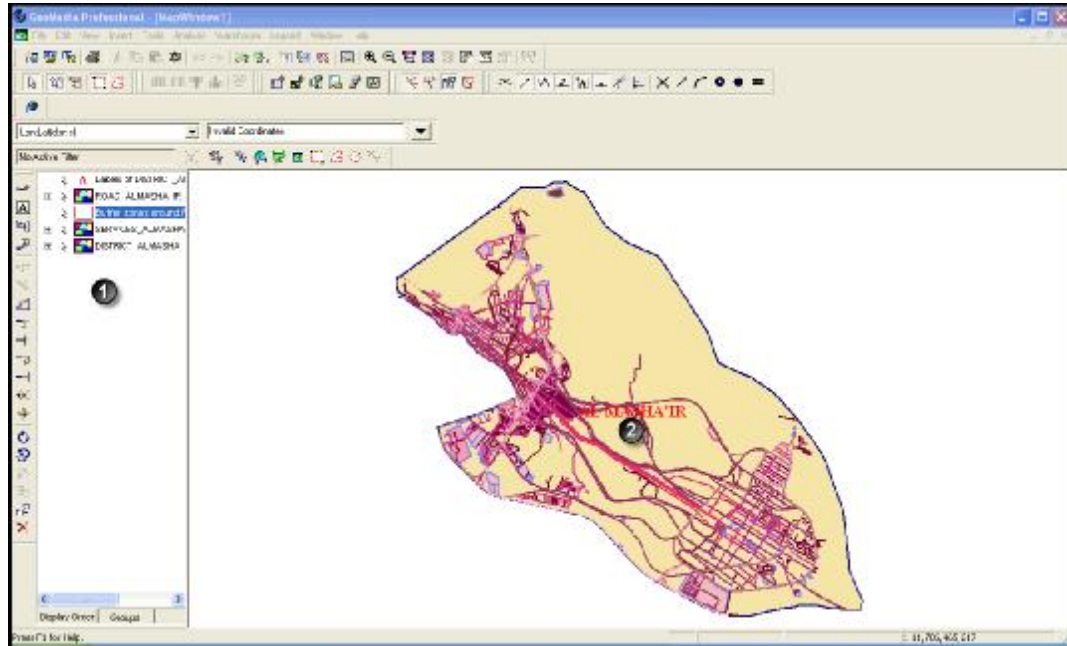


Figure 3-31: CGSSP1_EN after adding title of Almasha'ir District

3-2-3-4-2: Services

To add names of services and facilities available at Almasha'ir ,we do the following

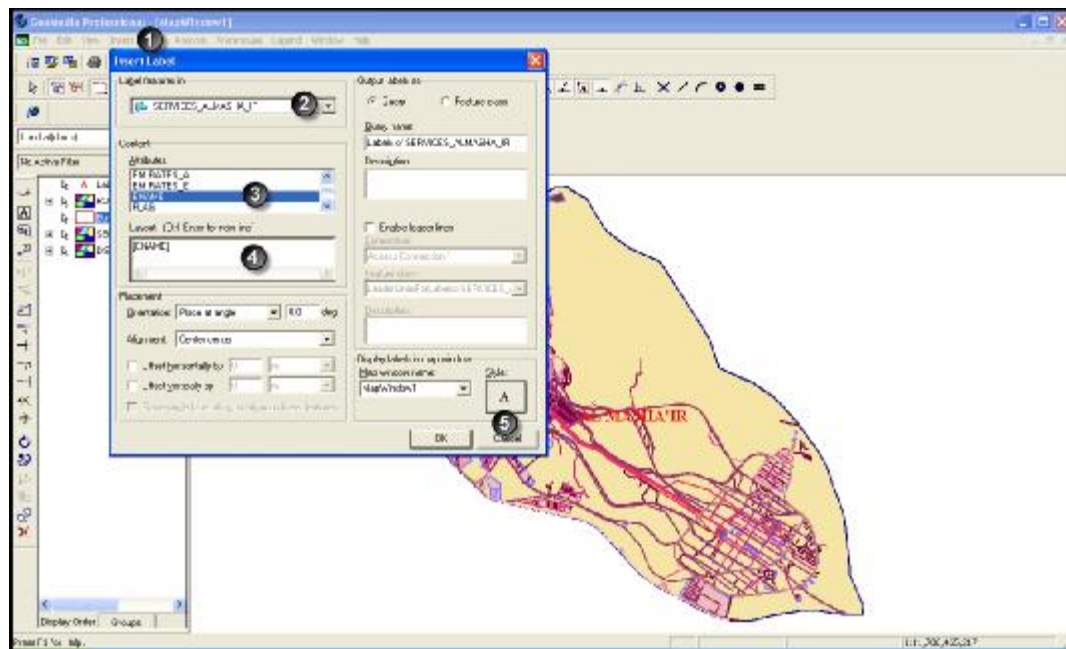


Figure 3-32: Adding English titles of Services layer at CGSSP1_EN

Figure 3-32 shows:

1. (Insert → Lable)

2. Select the layer of which you wish to show data (SERVICES_ALMASHA'IR)
3. Select elements of the information you wish to display on the map soon (name in English)
4. Display the elements selected in Step 3 above, where only ENAME was selected.
5. Select font type, size and color.

After adding Services titles the map should appear as in Figure 3-33

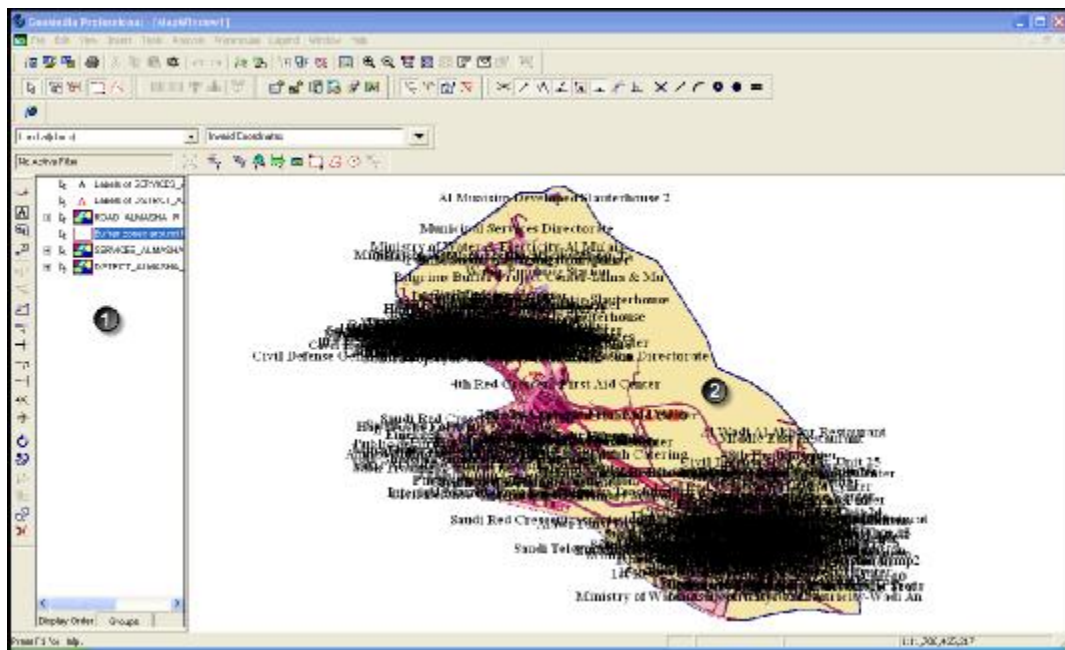


Figure 3-33 CGSSP1_EN after adding names of services

Figure 3-33 shows names of all services and facilities available in Almasha'ir noting that some titles are printed over each other due to their large numbers and that the drawing scale did not adjust titles for services and facilities of the District.

3-2-3-4-2: Roads

To add names of roads and facilities available at CGSSP1_EN, We follow the steps shown in Figure 3-34

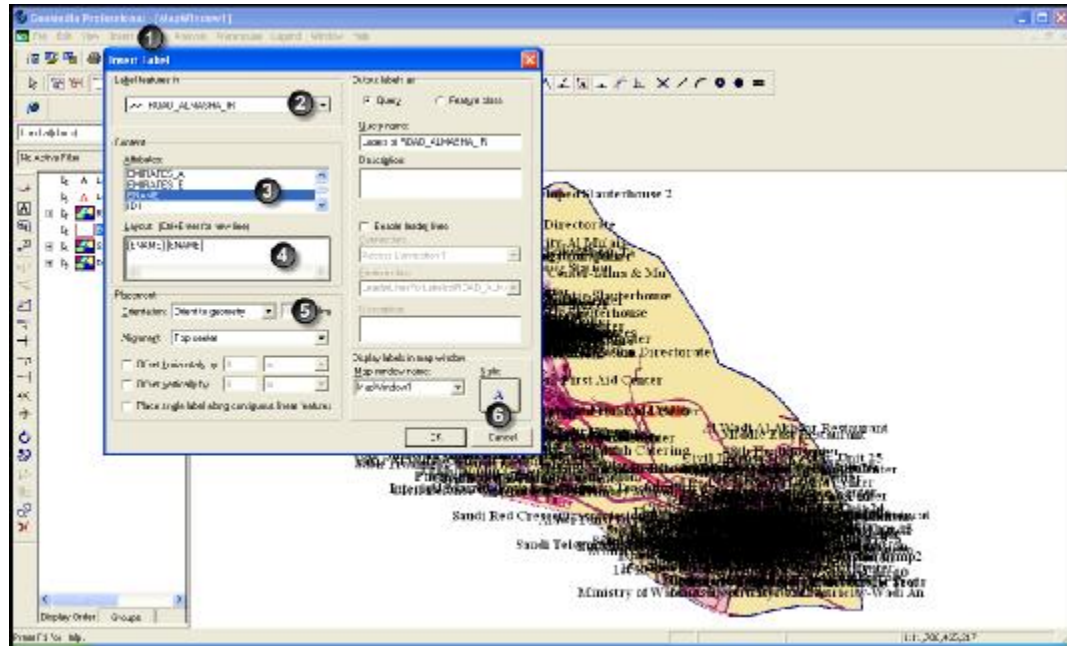


Figure 3-34: Adding English titles of roads layer at CGSSP1_EN

Figure 3-34 shows:

1. (Insert → Label)
2. Select the layer of which you wish to show data (ROADS_ALMASHA'IR)
3. Select elements of the information you wish to display on the map soon (name in English)
4. Display the elements selected in Step 3 above, where only ENAME was selected.
5. Select font type, size and color.

After adding roads titles, the map should appear as in Figure 3-35:

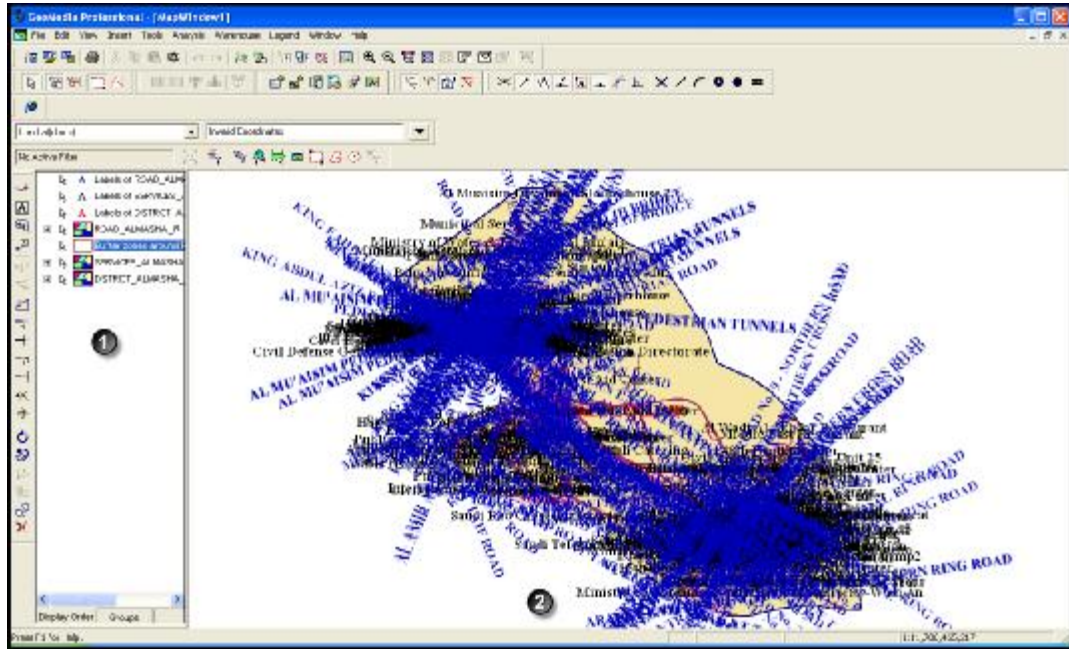


Figure 3-35: CGSSP1_EN after adding names of roads

Figure 3-35 shows names of all services, facilities and roads available at CGSSP1_EN, noting that some titles are printed over each other due to their large numbers and that the drawing scale did not adjust titles for services and roads at Almasha'ir.

3-2-3-5: Setting drawing scale

We notice in figures 3-33 and 3-35 that some services and roads data at CGSSP1_EN appear randomly and in unorganized patterns. So the drawing scale has to be adjusted to display services and roads data at a certain point.

3-2-3-5-1: Adjusting Roads layer

To adjust Roads data we will first adjust the drawing scale for the Roads layer as shown in Figure 3-36

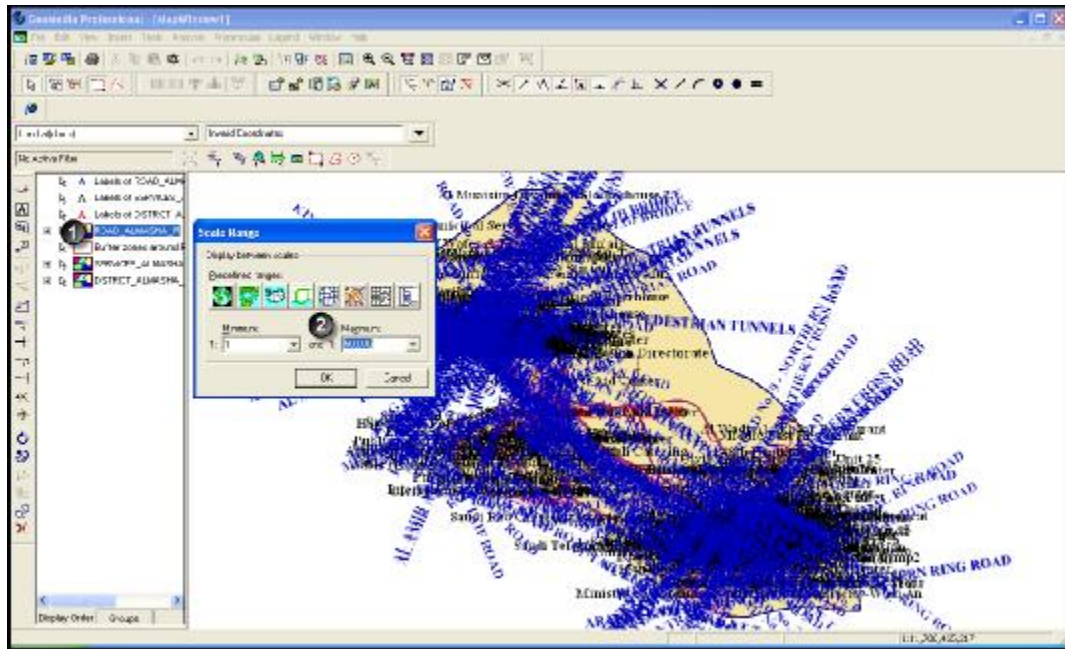


Figure 3-36: Steps of adjusting Roads District layer at CGSSP1_EN

Figure 3-36 shows:

Setting roads width between point 1 as minimum and point 50000 as maximum. Width should be between these two points

3-2-3-5-2: Adjusting Roads Titles layer:

After adjusting the Roads layer we adjust the roads title layer as shown in Figure 3-37

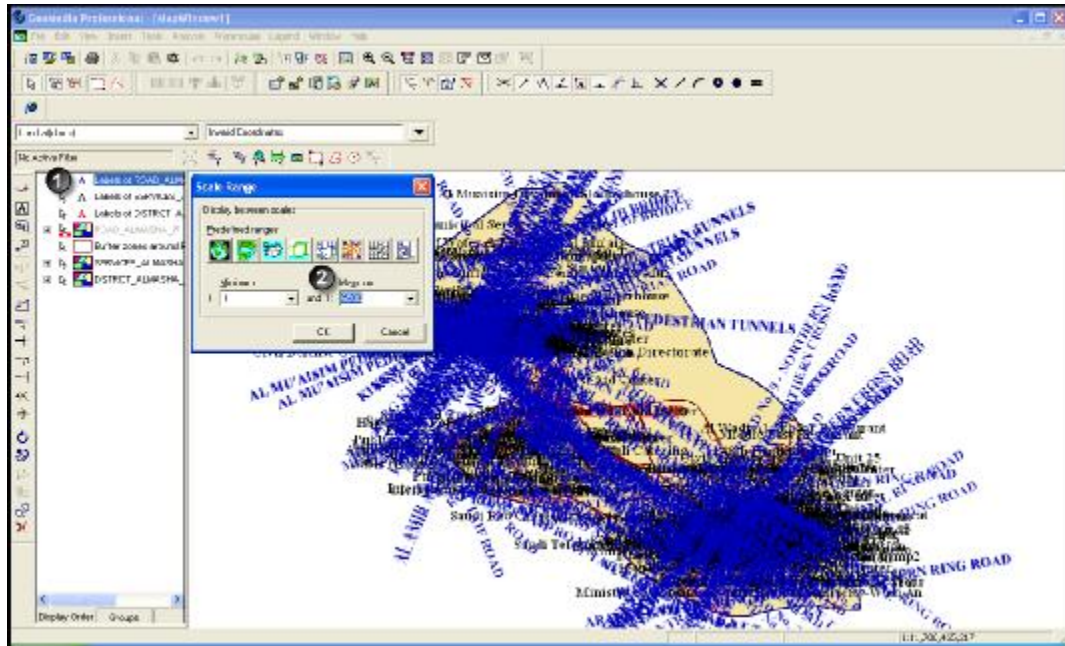


Figure 3-37: Steps of adjusting roads titles at CGSSP1_EN

Figure 3-37 shows:

Setting data width of roads between points (1, 6500). After adjusting the roads titles scale, the map should appear as in Figure 3-38

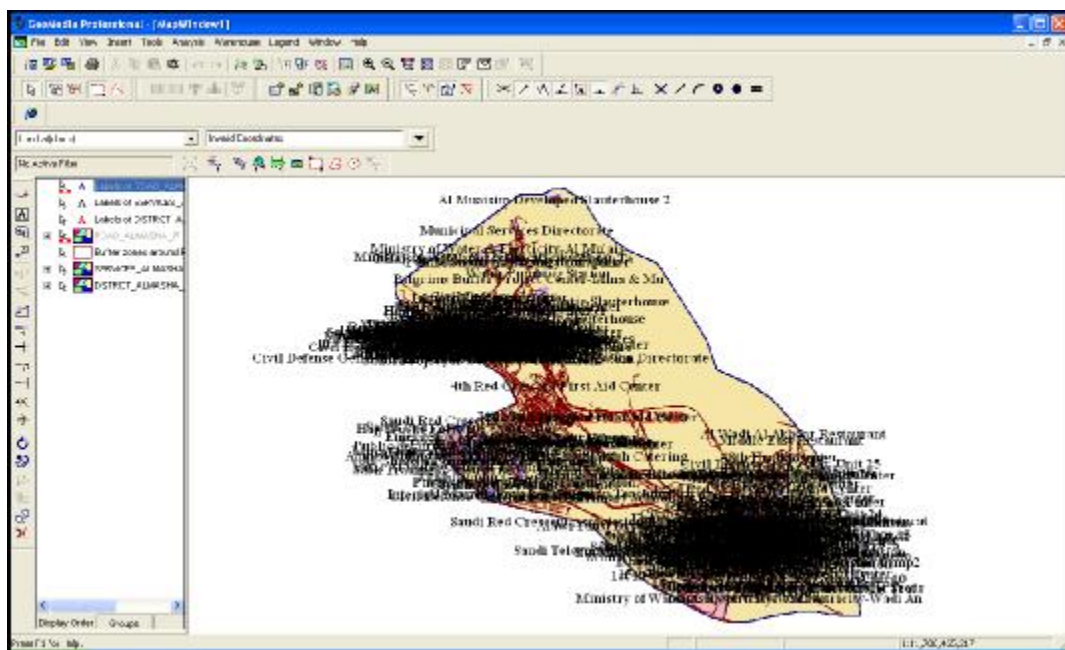


Figure 3-38: CGSSP1_EN after adjusting roads and roads titles layers

3-2-3-5-3: Adjusting Services and Facilities Titles layer:

To adjust the drawing scale for the Services and Facilities Titles layer as shown in

Figure 3- 39

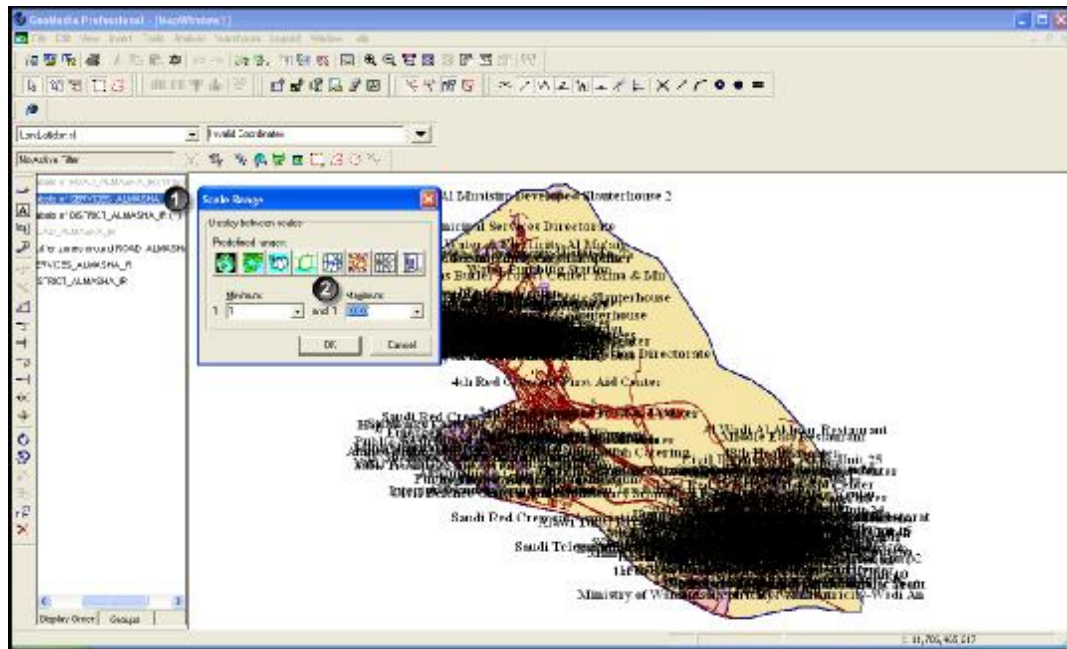


Figure 3-39: Steps for adjusting Services titles at CGSSP1_EN

Figure 39 shows:

Setting width data for Services and Facilities between (1, 8000). After adjusting the scale for roads titles, the map should appear as in Figure 3-40

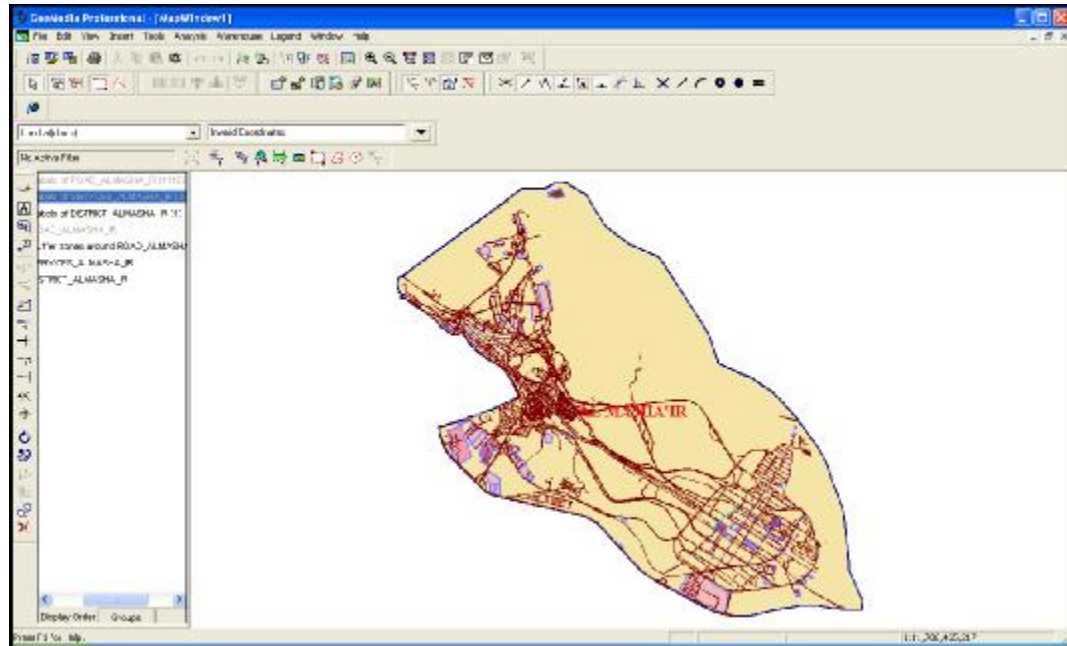


Figure 3-40 CGSSP1_EN at its final shape

Figure 3-40 shows the CGSSP1_EN at its final shape. It includes:

- All available services at Almasha'ir, in addition to showing services titles between (1, 8000)
- All available roads at Almasha'ir, in addition to showing roads between (1, 50000) and displaying names of roads between (1, 6500)
- Services and facilities available around the roads at Almasha'ir.

3-2-3: Transforming maps from (desktop file) to (website pages).

After finalizing setup and design for maps of CGSSP1_AR , GSSP1_EN,CGSSP2_AR and CGSSP2_EN , these maps are transformed from Desktop File to Website Pages.

The transformation process is carried out in two phases:

3-2-3-1: The program (GeoMedia Web Map Professional – Publisher- server configuration Utility) was used to implement the first phase of the map transformation as explained in Figure 3-41.

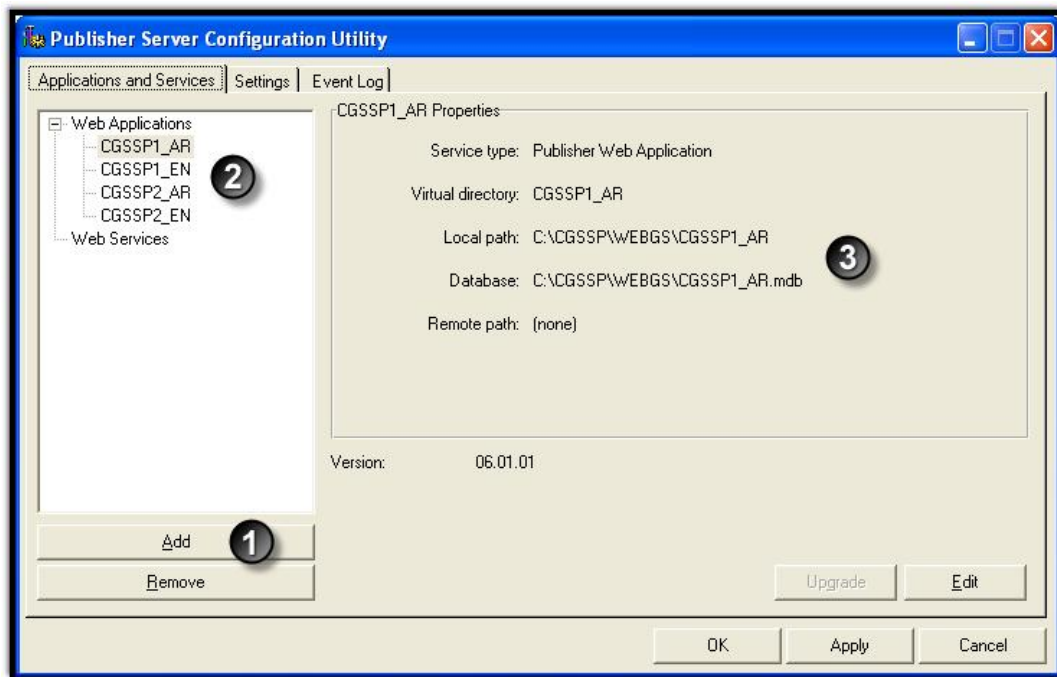


Figure 3-41: First stage of transforming maps

Figure 3-41 shows

1. Add Web Application as we will add the four maps previously formed:

- CGSSP1_AR

- CGSSP1_EN

- CGSSP2_AR
- CGSSP2_EN

This phase aims at adding the four maps with setting their course and locating a storage area for each of the maps' database.

2. After adding the Web Application and adding each map's database, maps will be added and transformed into Web Application
3. The path for each map and the path for each map's database.

3-2-3-2: After setting a path for each map and a path for databases and transforming them into Web Application, comes the second phase which is related to the Publisher process. This phase aims to:

- Setup the Publishing
- Setup the Map and Layout
- Setup the Map Content

For this phase we use the GMP6.1 as explained in Figure 3-42.

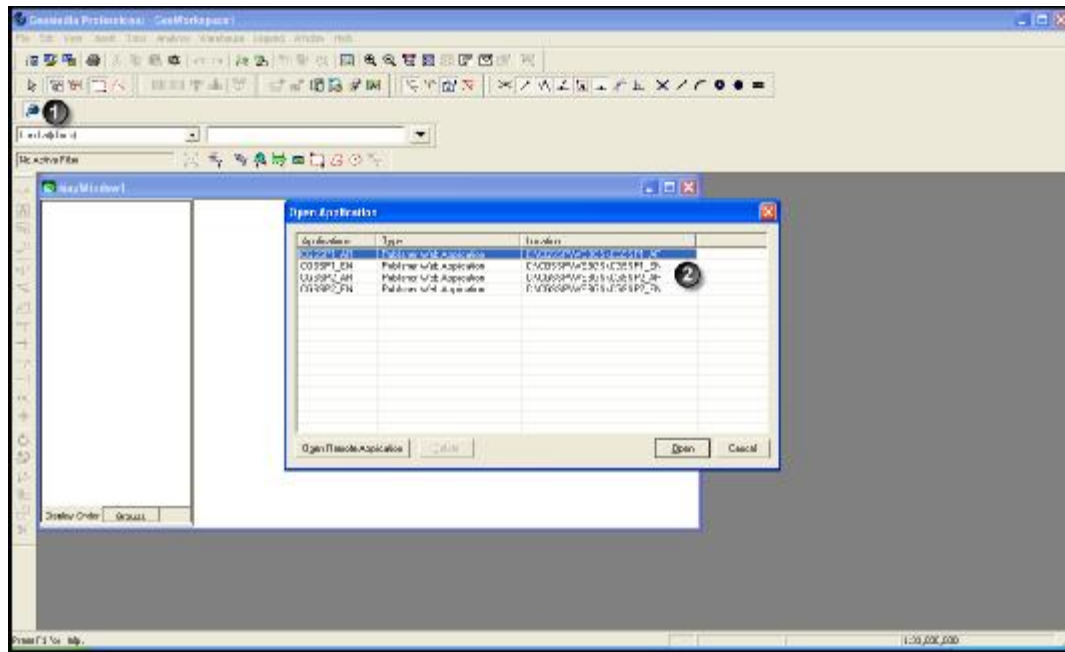


Figure 3-42: Second stage of transforming maps

Figure 3-42 shows

1. Select GeoMedia Web Map Publisher Administrator program in order to start the Publishing process.
2. Select the four maps which had been prepared in the previous phase in order to start the Publishing process. This process is carried out through four steps clarified in Figure 3-43.

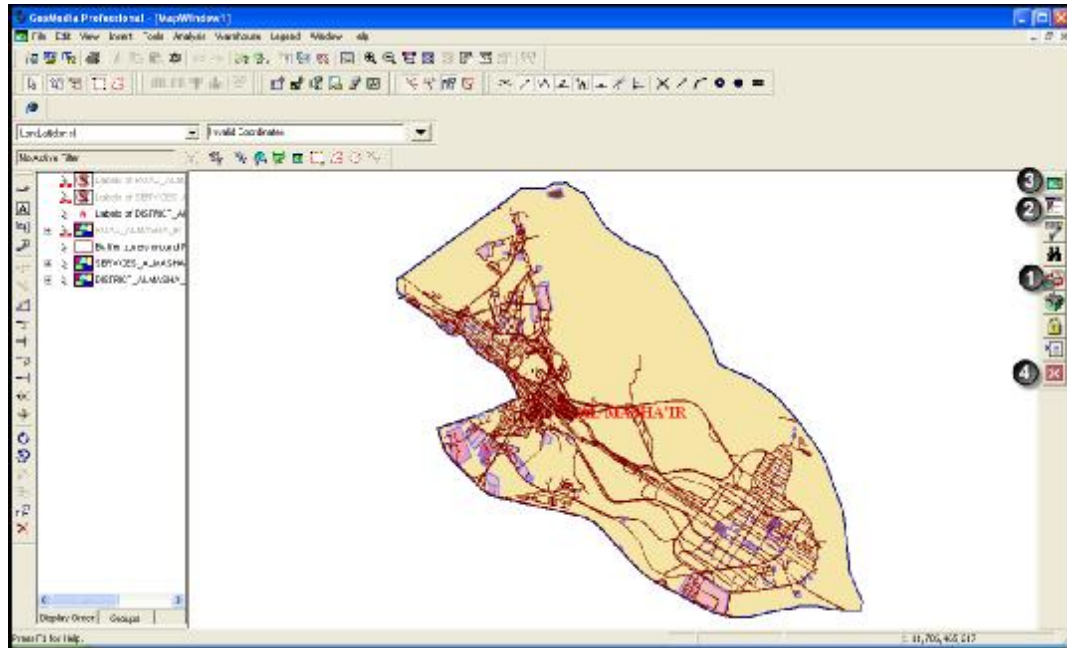


Figure 3-43: Steps of the publishing CGSSP1_EN

Figure 3-43 shows steps of the publishing CGSSP1_EN:

1. Publishing
2. Map Settings
3. Map Content
4. End Publishing

3-2-3-2-1- Publishing :- This step is meant to publish and populate the geoworkspace by using (publish the GeoWorkspace contents to the Metadata) .

3-2-3-2-2-Map Settings: The setup of Map Settings is carried as follows and explained in Figure 3-44.

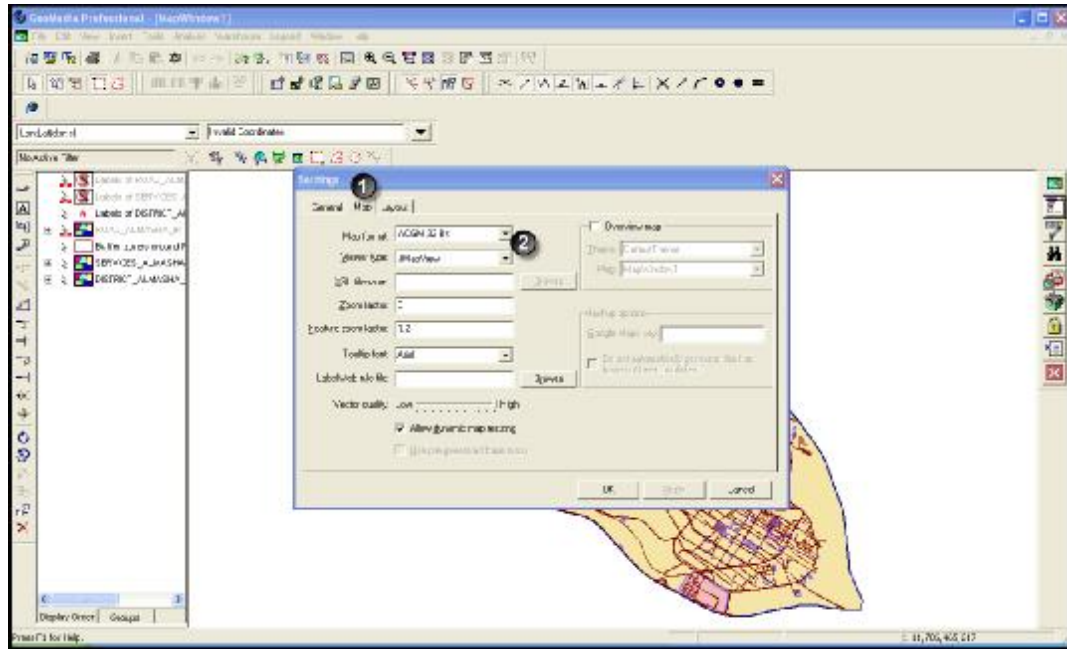


Figure 3-44: Map Settings at the second phase of the Publishing process

Figure 3-44 shows the Map Settings at the second phase of the Publishing process:

1. Select Setup Map to display Setup Options
2. Setup the map that
 - Map Format : ACGM 32Bit
 - Viewer type :- JMapView

3-2-3-2-3-Layout Settings:

Figure 3-45 explains steps to setup Layout Settings

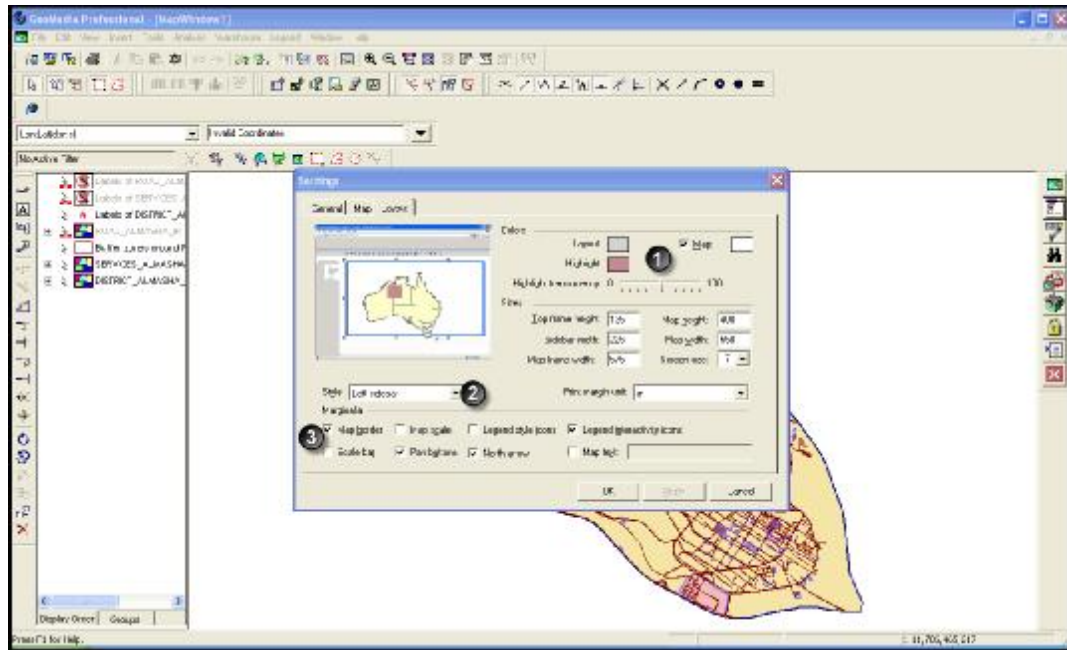


Figure 3-45: Third phase of the Publishing process (Layout Map)

Figure 3-45 shows plenty of available options in Third phase of the Publishing process

1. Possibility of selecting suitable color
2. Setting map alignment on the page either left or right
3. Possibility of adding some options or not displaying them on the map.

3-2-3-2-4-Map Content Setup: In order to enable the user to learn about services and roads around him, the Locatable feature must be activated. The following figure shows how to setup this feature

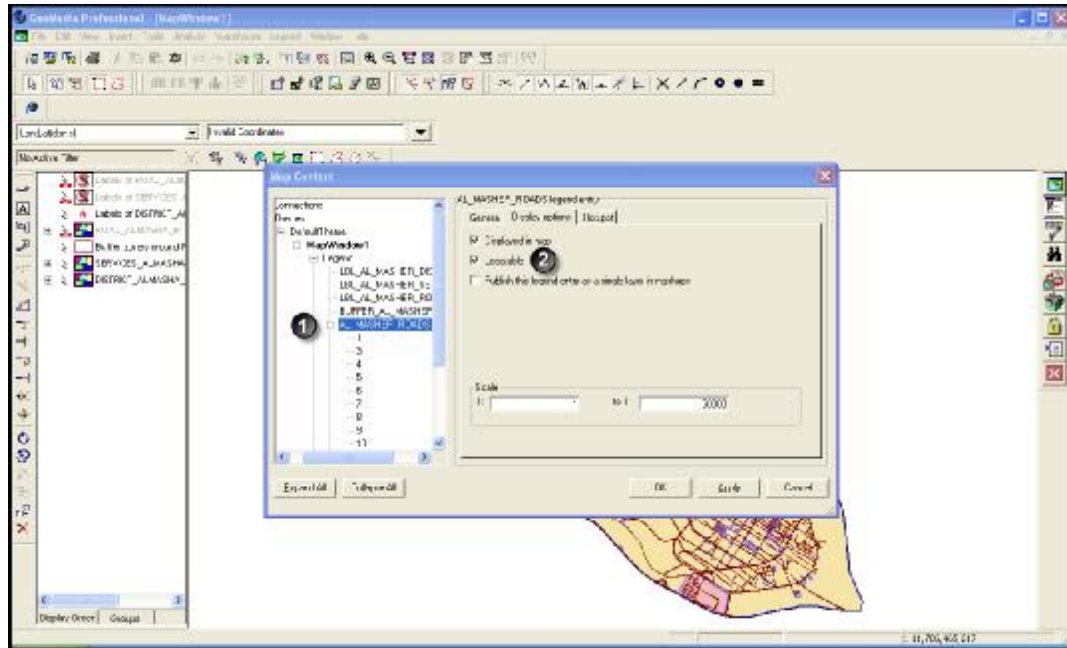


Figure 3-46: Map Content Setup

Figure 3-46 shows Map Content Setup that

1. Select the layout where you wish to activate the feature in all layers.
2. Activate the feature (Locatable)

After Map Content setup is done, the Publishing process should be finalized and settings saved.

Note: The same steps, at the same order, are repeated with each of the four maps.

3-2-4- Implementation & Testing CGSSP (by using Asp.net)

CHAPTER 4:- SYSTEM IMPLEMENTATION

This chapter offers guidance on how to use the CGSSP in detail and how to manage the system layouts. It also presents some possible scenarios and discussion for their results and reviews CGSSP advantages.

4-1 How the CGSSP works:

When opening the CGSSP system the open window will appear as in Figure 4-1.

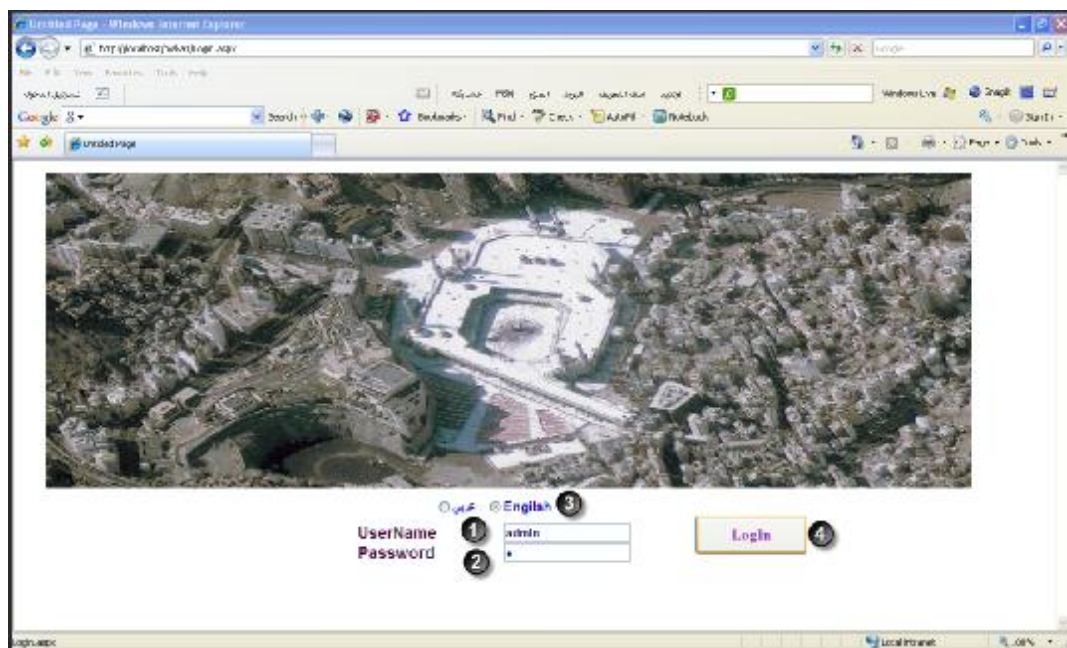


Figure (4-1) Components of the system interface (Log in)

Figure (4-1) shows components of the system interface which includes:

- 1 and 2: User account (username and password) to enable the user to access the CGSSP.
- 3: Select system interface language (Arabic- English)
- 4: Check entered data accuracy and allow user to access CGSSP.

After accessing the system, the CGSSP window will appear as in Figure 4-2.

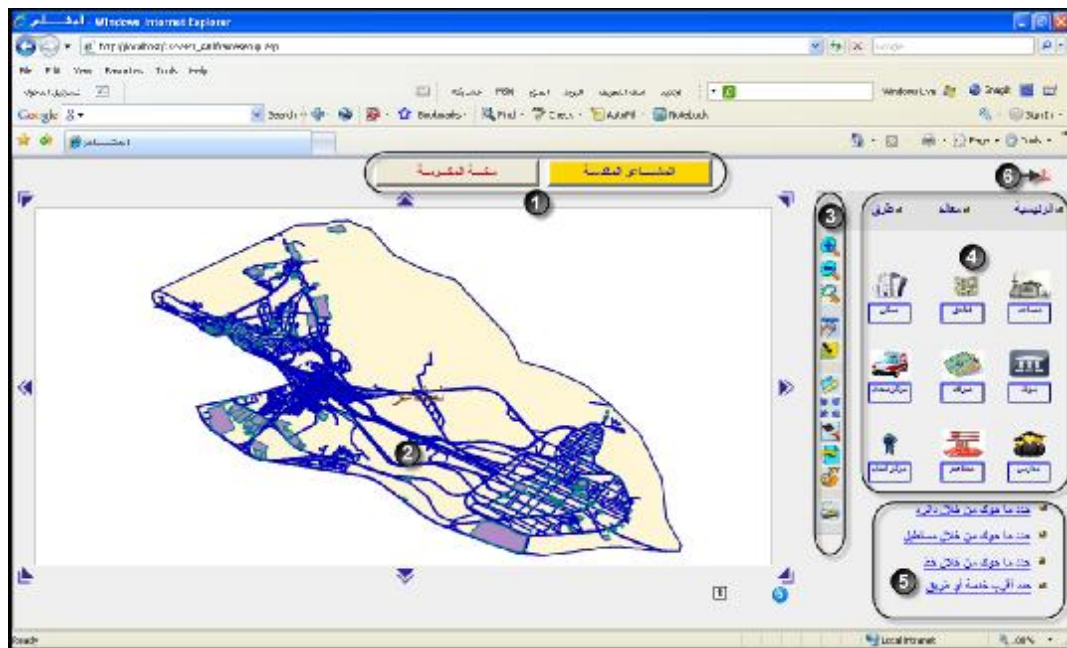


Figure (4-2) Components of CGSSP (Arabic interface)

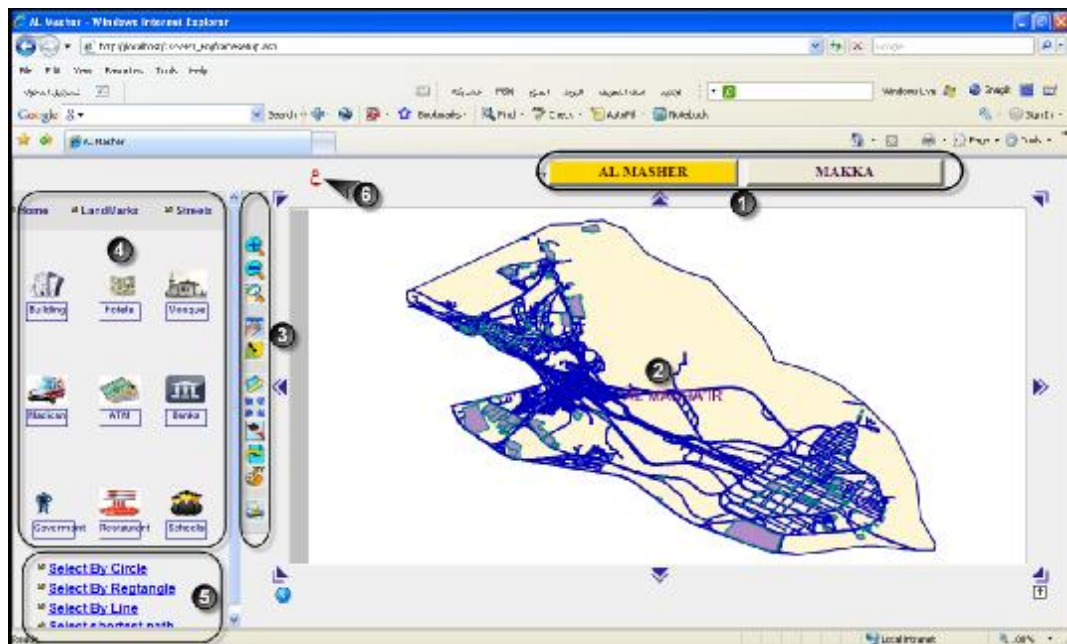


Figure (4-3) Components of CGSSP (English Interface)

Figure (4-2) and figure (4-3) show components of the CGSSP interface, whereas figure 4-2 shows the Arabic interface and 4-3 shows the English interface.

From figure (4-2) and figure (4-3) we find that the CGSSP in general consists of the following elements:

- (1): Select area toolbar (Makkah/ Almasha'ir).
- (2): Map of selected area.
- (3): Map control toolbar
- (4): Search toolbar
- (5): CGSSP toolbar
- (6): Language change toolbar (Arabic → English) (English → Arabic)

4-1-1: Map and area selection toolbar

The area selection toolbar offers the possibility of selecting the area of the user as they could select between Makkah and Almasha'ir. When selecting an area its map will appear in its dedicated place.

Figure 4-4 shows the selection of Almasha'ir area and the Almasha'ir map:-

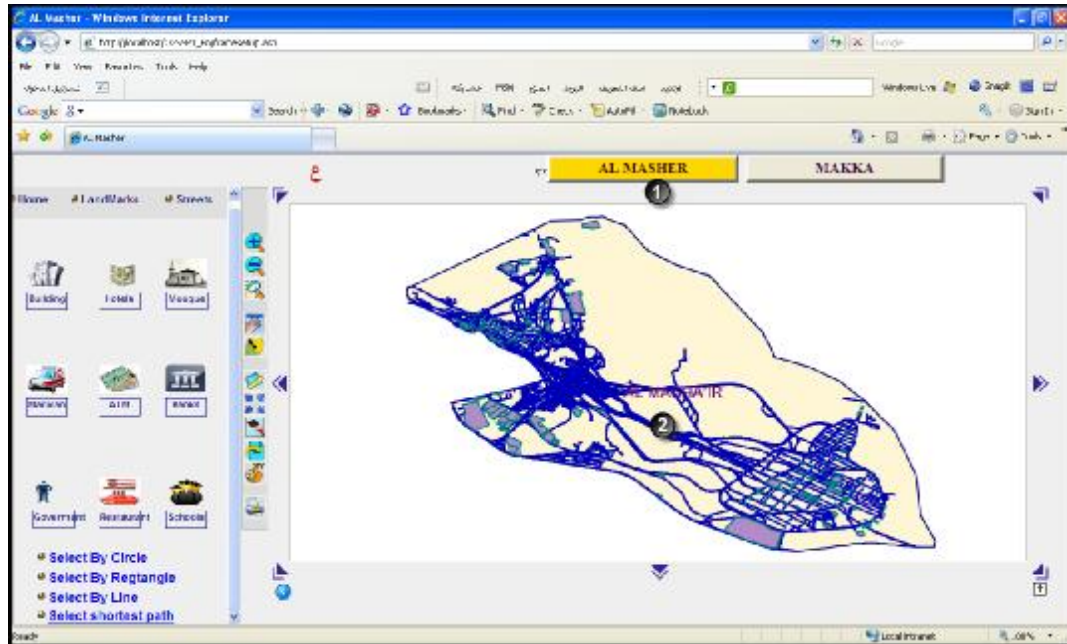


Figure 4-4 Selection of Almasha'ir and its map in the dedicated place

Figure 4-4 shows:

1. Almasha'ir area selection
2. Almasha'ir area map.

4-1-2: Search toolbar:

The search toolbar was set up to provide the ability to search for areas or landmarks or services or roads or tunnels that the user aims to search for or be guided with. This feature provides the ability to search for the facility with the possibility of locating its position on the map.

The search toolbar has been divided into three main types as explained as in Figure 4-5

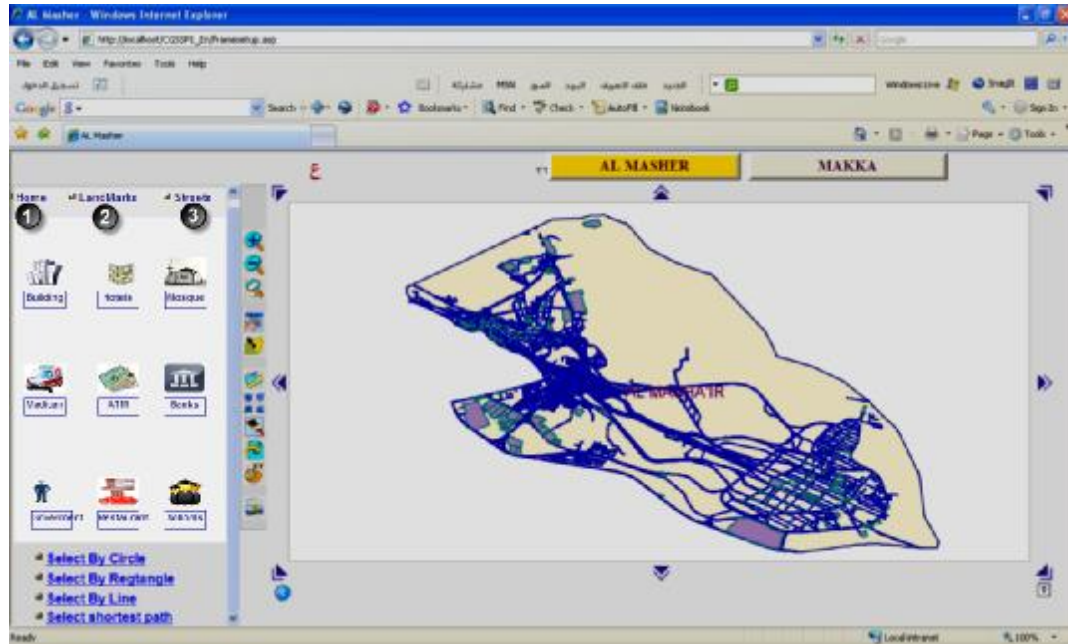


Figure 4-5: Search toolbar in CGSSP1_EN

Figure 4-5 shows the components of the search toolbar which are:

1. Search by main services “to search for all services, roads and facilities within a certain area”.
2. Search by landmarks “to search for a certain services or landmarks within a certain area”.
3. Search by roads “to search for a road or several roads within a certain area”.

4-1-2-1: Search by main services:

Services were divided into 9 main types clarified as in Figure 4-6.

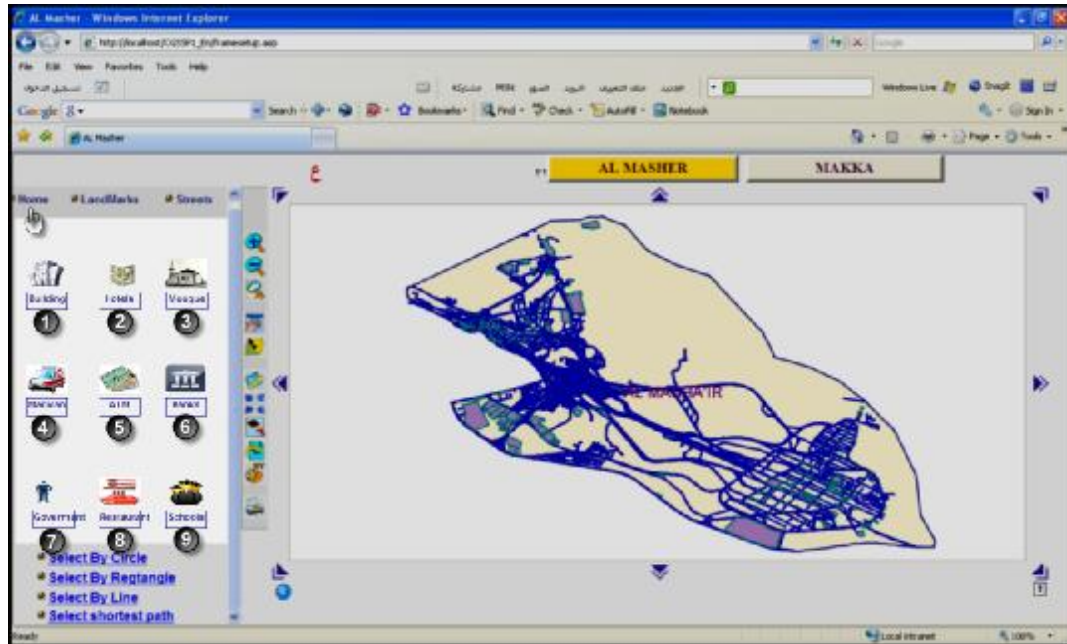


Figure 4-6 main services in CGSSP1_EN

Figure 4-6 shows us the main services sections as they have been classified into:

1. Building.
2. Hotels
3. Mosques: Including all mosques and religious guidance centers.
4. Health centers, including hospitals , health centers and pharmacies
5. ATMs
6. Banks
7. Security centers, including all governmental and security departments of all ranks.
8. Restaurants, including restaurants, kitchens, cafeterias, coffee shops and fast foods and drinks' centers.
9. Schools, including all schools , educational and training centers

How to search with main services?

After knowing about main services sections within the system, the question is how do we search using main services?

When the CGSSP user wants to know all services, landmarks and roads available at a certain area then they will follow the following steps:

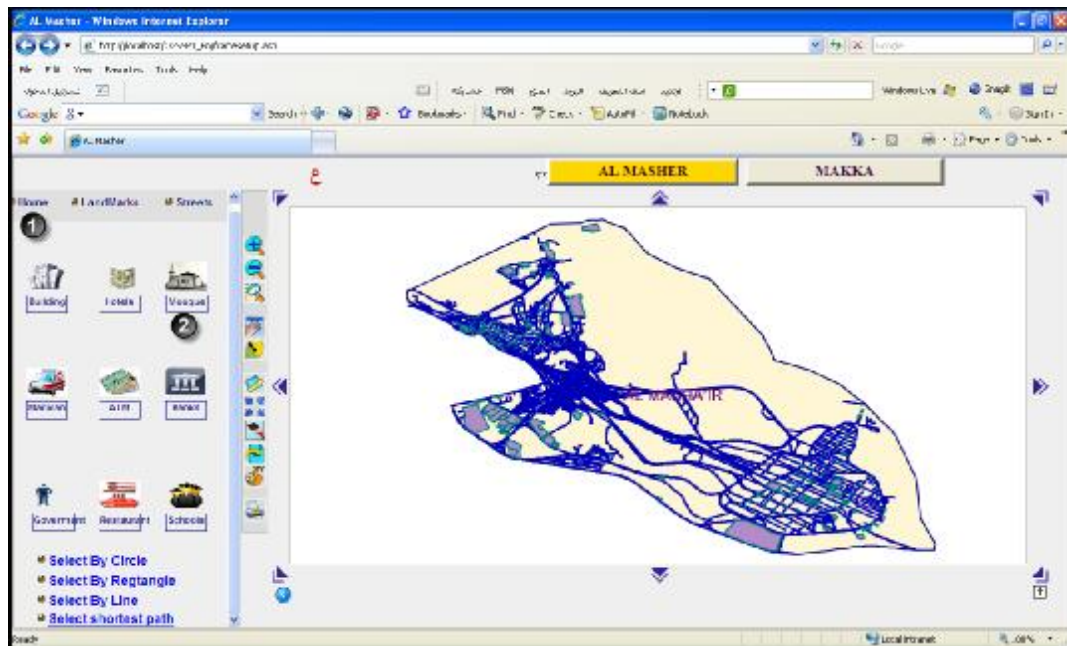


figure 4-7 search by main services(search for mosque)

Figure 4-7 shows:

1. After user selects Almasha'ir area they select the search icon with main services
2. Select mosques icon
3. After selecting mosques, a menu will appear with all mosques, religious and guidance centers within Almasha'ir area as explained as in Figure 4-8

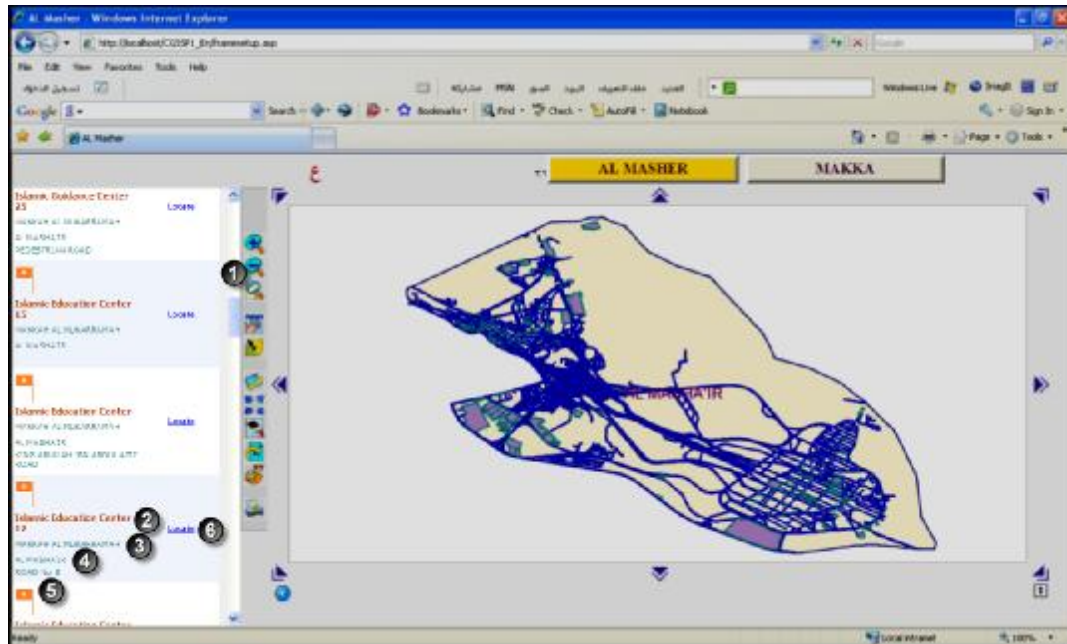


Figure 4-8: Search results for mosques after search using main services

Figure 4-8 shows elements of search results using main services:

1. Moving indicator from menu top to bottom and vice versa
2. landmark name
3. landmark city across the KSA
4. Area of landmark (Makkah/ Almasha'ir)
5. Road to landmarks
6. Possibility of locating landmark on map

When selecting the feature (locate landmark), the landmark will appear on the map as in Figure 4-9.

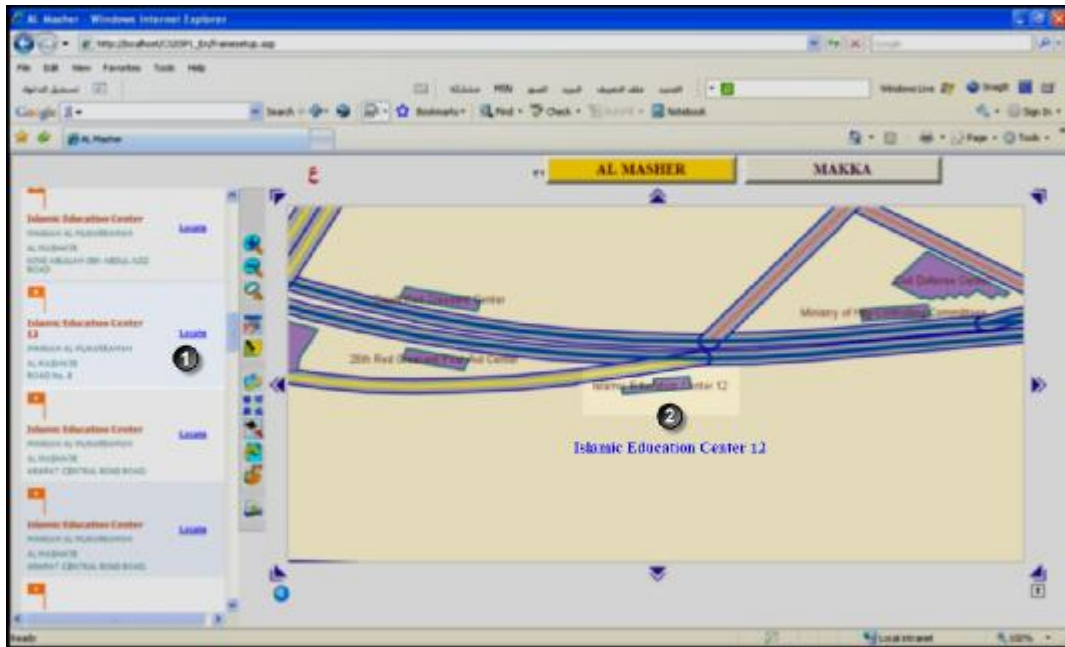


Figure 4-9: Locating Islamic Guidance Center number 12 on map

Figure 4-9 shows location of the Islamic Guidance Center number 12 on the map as it shows its location and services surrounding it. Also, the map control toolbar can be used to zoom in and out and move and print the map.

Also, with using the same steps, the search feature can be used to search for other services such as hotels, residences, banks, ATMs, health centers, schools, restaurants and security centers.

For example, to search for security centers at Almasha'ir area:-

After selecting CGSSP1_EN, select search with main services, then select security centers icon to show a menu of security centers as in Figure 4-10

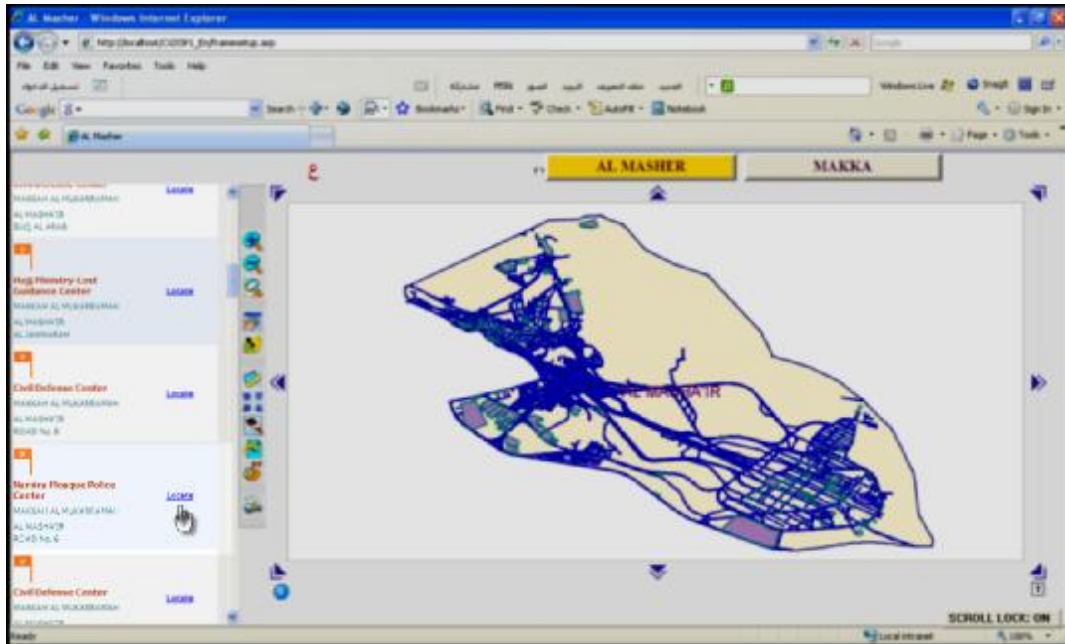


Figure 4-10 Search for security centers at CGSSP1_EN using search by main services

Figure 4-10 shows results of search for security centers at CGSSP1_EN, where the user can browse all security centers and select the desired center for example, Namira police station (NPS).

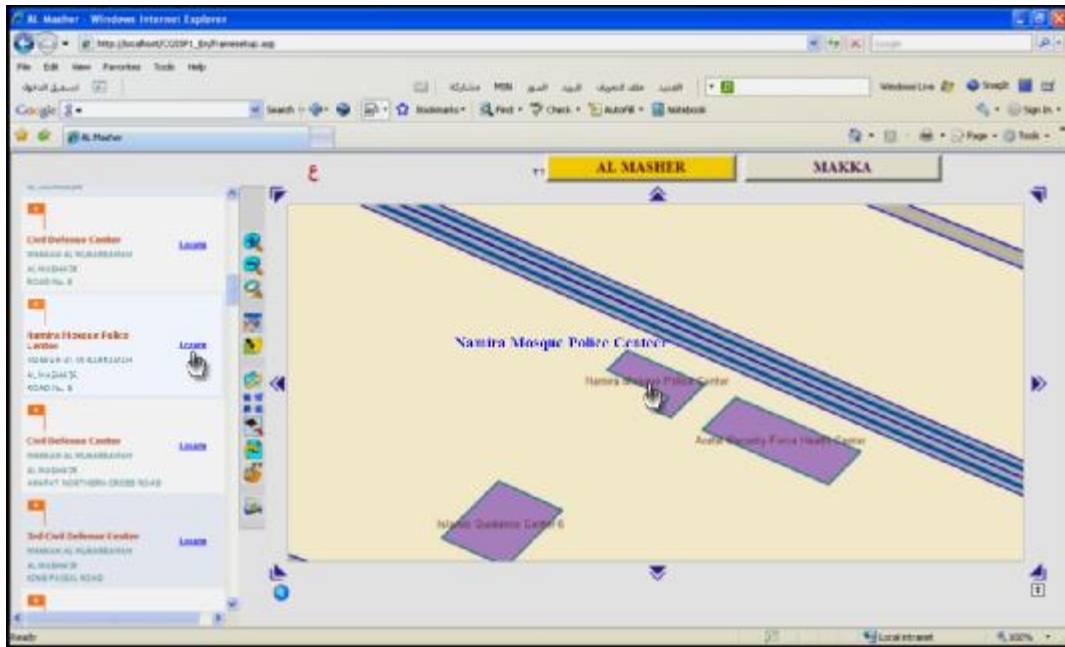


Figure 4-11 Locating NMPS on map with browsing information about the station

Figure 4-11 shows the possibility of locating the NMPS in the map with the possibility of benefitting from the map control toolbar such as zoom in or out and move or print any part of the map.

4-1-2-2: Search by facilities

When the system user wants to search for a certain facility then they should follow these steps as show in Figure 4-12:

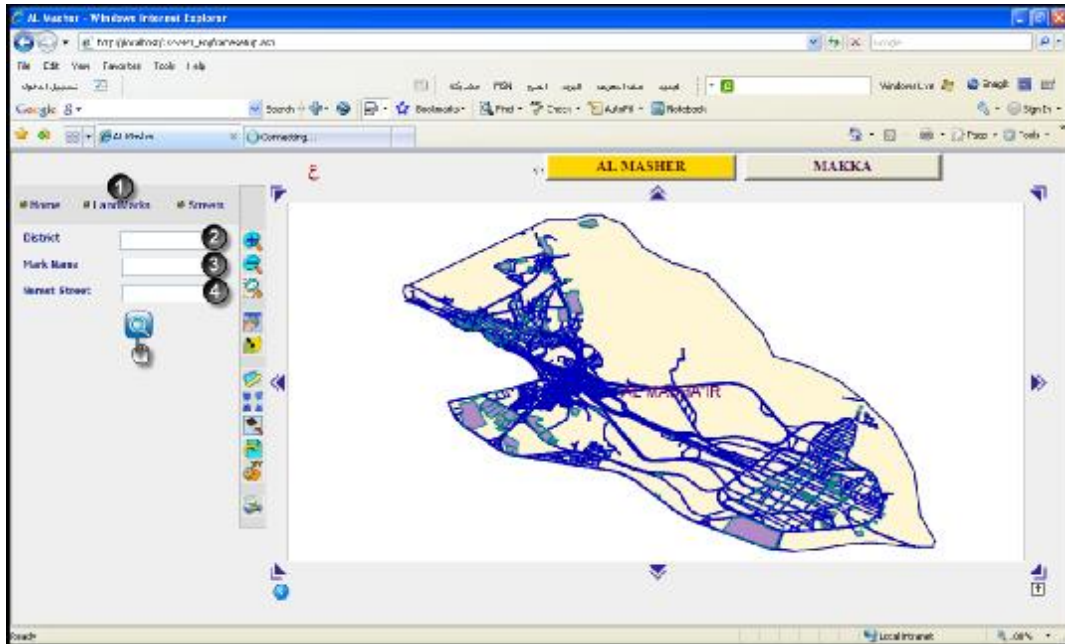


Figure 4-12 :- search by landmarks in CGSSP1_EN

Figure 4-12 shows elements of searching by landmarks:

1. Select landmark icon from search elements menu
2. Select the area in which the user seeks to search for the landmark
3. Type the name of the landmark in the right place (check spelling accuracy)
4. Nearest road to the landmark

Note: - User can use 2,3,4 all or each.

When the user wants to search for Jabal Alrahma Police Station (JAPS) at Almasha'ir, they should follow these steps as show in Figure 4-13

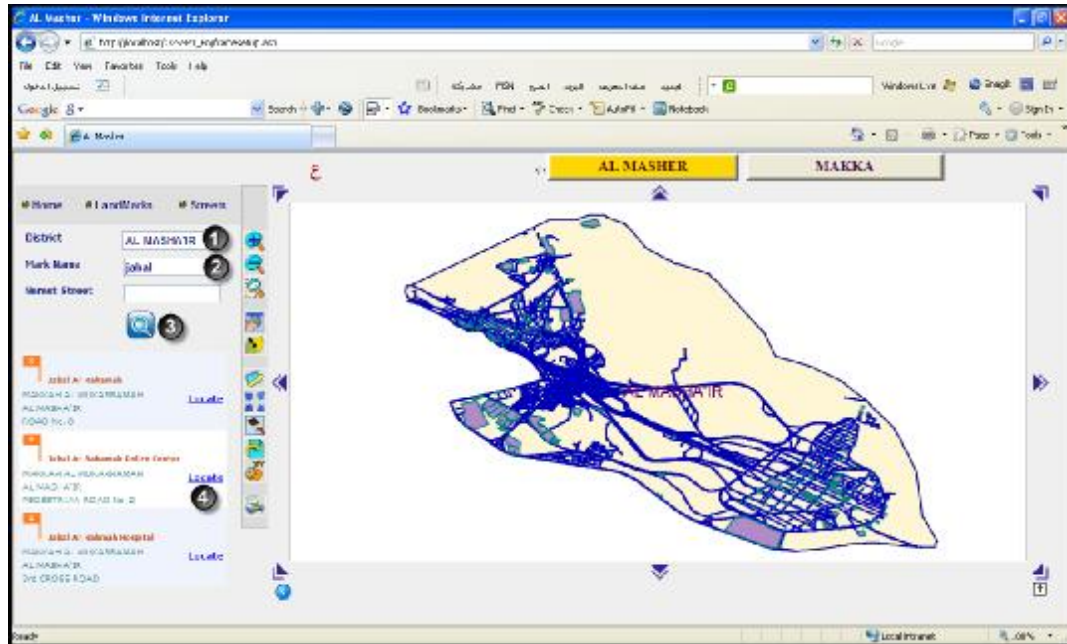


Figure 4-13 Search for JAPS

Figure 4-13 shows:

1. Select Almasha'ir area with the JAPS

Type the name of the landmark “Jabal Alrahma” then start search to show a menu of all services, roads and landmarks matching the phrase “Jabal Alrahma” then select JAPS and locate it on the map as explained in Figure 4-14

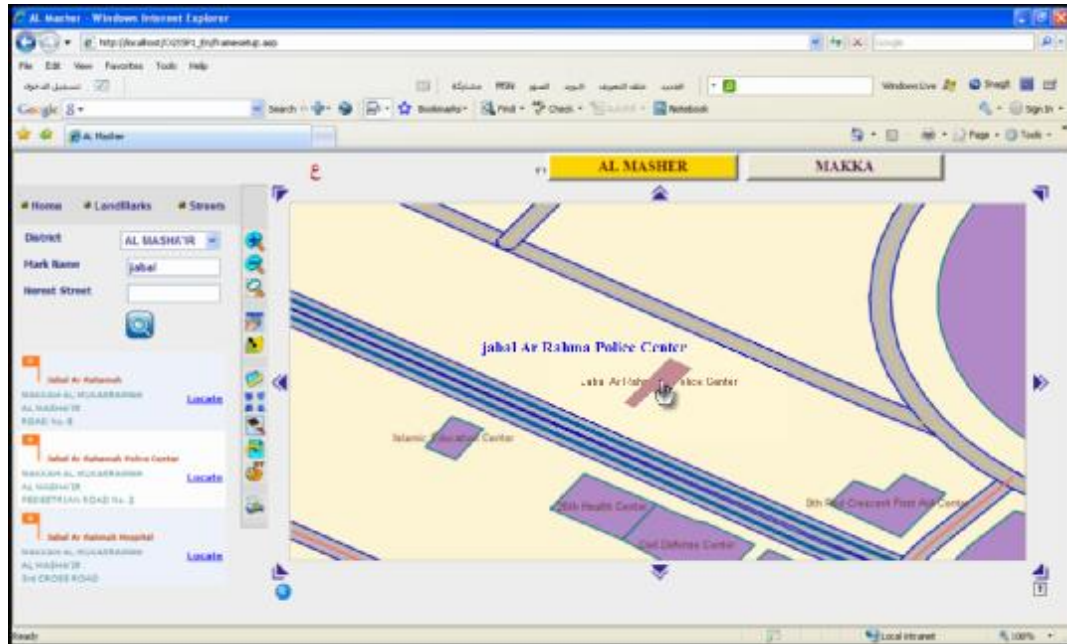


Figure 4-14: Location of JAPS on map

Figure 4-14 shows the location of JAPS on the map with the possibility of benefitting from the map control toolbar to zoom in , zoom out, move or print the map.

4-1-2-3: Search by roads:

When a system user wants to search for a certain road or tunnel then they should use the search by road feature.

The components of search by roads as shown in Figure 4-15

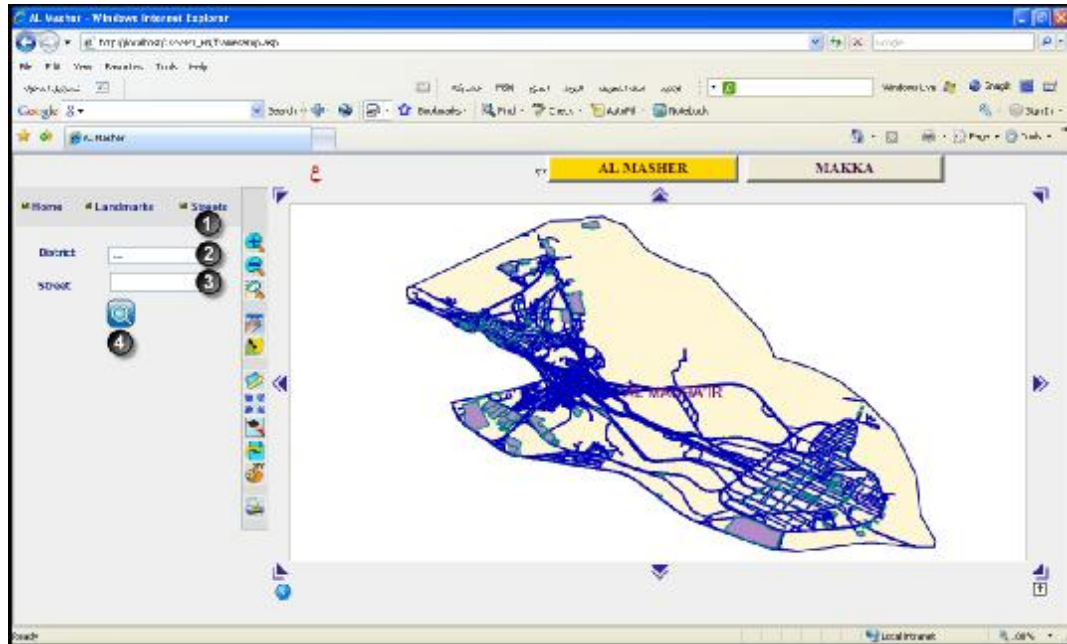


Figure 4-15: Components of search by roads window

Figure 4-15 shows components of search by roads:

1. Select roads icon from the search toolbar
2. Select the area which the user seeks to search for the road in
3. The road being searched for

For example, when the user wants to search for the King Fahd Tunnel (KFT) at Almasha'ir area they should follow these steps as show in Figure 4-16

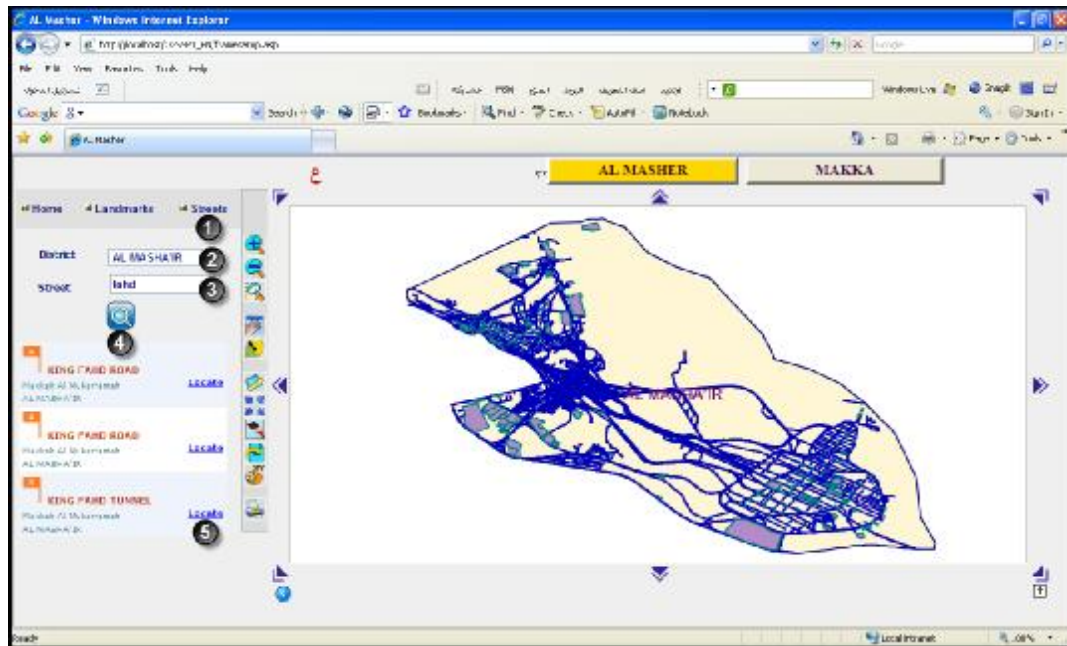


Figure 4-16: Search for KFT using search by roads feature

Figure 4-16 shows:

1. Select search by roads icon
2. Select Almasha'ir area where the tunnel is located
3. Type the name "Fahd" then start the search to show a menu of all roads and tunnels available at Almasha'ir including the name "Fahd"
4. Locate the KFT on the map. The tunnel appears at the bottom of the map as in Figure 4-17

1. Nearest path between two points, drawing this path and setting the estimated time needed to reach the target point.
 2. Possibility of locating the nearest services to the user's location, and drawing the path that leads to the target.
1. Select around you through a circle:

When the user wishes to learn about all services and roads available around a certain point, then he draws a circle around a certain points so that all services and roads around it would appear

Figure 4-18 shows drawing a circle around a certain point

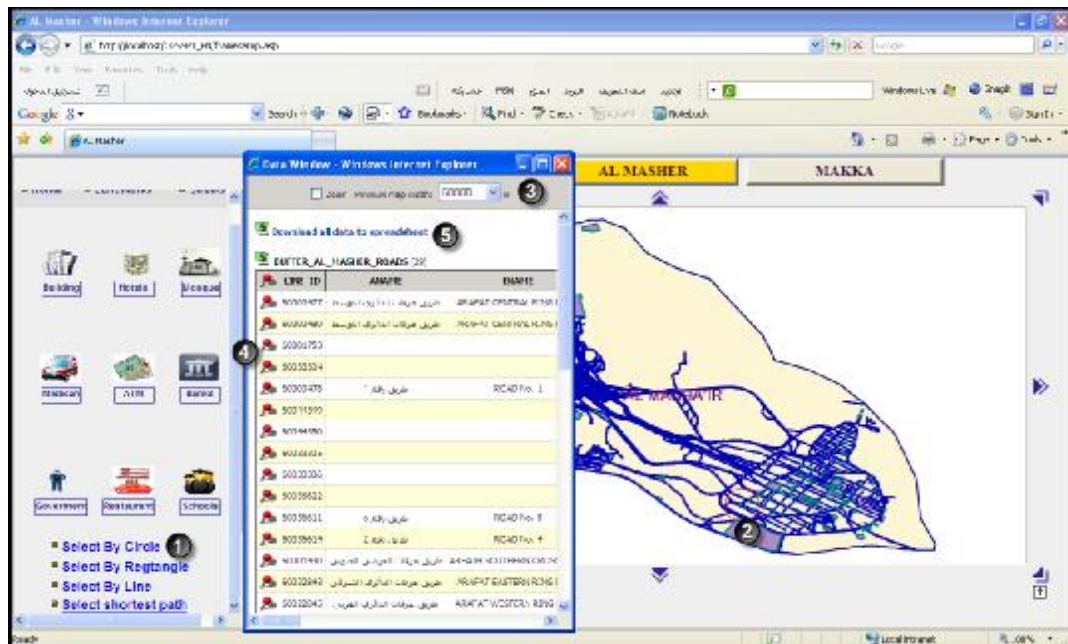


Figure 4-18: search by drawing a circle around a certain point

Figure 4-18 shows

1. A circle is drawn around a certain point
2. A table appears containing

- Possibility of showing service or road on map
- Possibility of saving data on an excel sheet

4-2 How to use Shortest Path

After studying AlMasha'ir area, which consists of three major sections as follows:

- Mina area.
- Arafat area.
- Muzdalefah area.

Since the Arafat area is one the most important sections and the largest (12 km²), and since being at Arafat is the Grand Hajj; we selected this area to implement the CGSSP on it.

After studying and visiting the Arafat area we found that there are two major milestones there:

- Namira Mosque
- Jabal Alrahma

After naming the most important milestones, we downloaded maps from Google Earth as follows:

- Four maps surrounding Namira Mosque from all directions
- Four maps surrounding Jabal Alrahma

Also, all government, security, financial and health services available within the area were entered.

Work Method:

- 1- When the user is near Namira Mosque he could select the right map suitable for his position through locating the direction of his position from the mosque. For

example, when he is at the east of Namira Mosque he selects the map for east of Namira Mosque as the following as:

- 2- After locating his position he could now select his location point, as virtual points had been placed on the map and the user should be near any of them. After locating his position point, the user could locate his access point or the service for which he wishes to reach on the menu, as he chooses the service type when all services appear on the map and then selects his access point.
- 3- After locating the start and end points, the user can find shortest path to reach his target
- 4- User can find all paths that lead to the target
- 5- User can estimated time for reaching his target

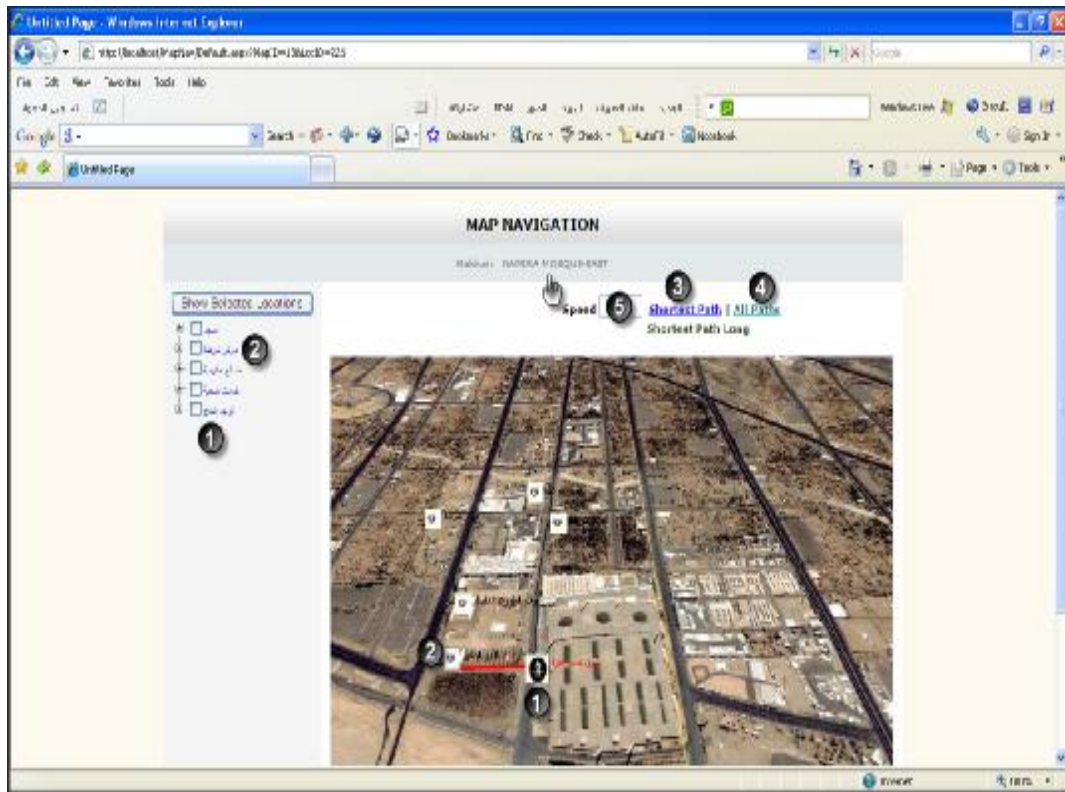


Figure 4-20 shortest path window

4-3 Advantages of CGSSP:

When designing the CGSSP it was considered to achieve several advantages which help users, especially pilgrims and visitors to Makkah from inside and outside the KSA, who have no complete awareness about places of distributing services and how to reach for their targets and help them perform their worships and prayers more safely.

Upon looking at how this system works, and with reviewing proposed scenarios which users may face, we find that this system has the following advantages:

(1) This system is considered to be a guide for pilgrims and all visitors to Makkah and Almasha'ir as it provides:

A. Possibility of searching for services that any user may need such as health, security, financial services, in addition to restaurants, hotels and several other services.

B. Possibility of locating the user's location on the map through looking for a nearby facility and locating it on the map and so locating the user's location.

C. Possibility of knowing services and roads available around a certain point through drawing a circle around location or between two points through drawing a line between the two points or at a certain area through drawing a rectangle around the user's location

(2) This system offers operational solutions that save time and effort of the user who has not enough knowledge about services, their locations, how to reach for them or roads leading to them whether they were in Makkah or Almasha'ir through:

A. Possibility of finding the shortest way between two points with drawing the path that has to be followed from start point to finish point.

- B. Possibility of estimating the needed time for the user to reach for the desired goal on assuming the user's speed.
- C. Offering alternative solutions if the user desires
- D. Finding nearest services to user through location as the system provides the ability to locate the nearest security center, health center, restaurant, ATM, etc.

CHAPTER FIVE: CONCLUSION AND FUTURE WORK

The government of the KSA exerts great efforts in spreading the awareness among the pilgrims; and there are 30 Saudi governmental authorities and departments in this respect. However, these efforts have been unable to achieve their goals due to the lack of coordination and integration among them. There is absence of a clear scientific vision that takes into consideration all the variables and determinants connected to the nature of pilgrims to whom the enlightening efforts are directed, like the diversity in the pilgrims' ethics, languages, social classes, cultures, their need to the enlightening programs, and the forms of such programs.

As for the study problem, previous studies such in (الكحلوت, 1426), (المديرية العامة للجوازات,), (1429) reveal at least two obstacles:

1. The lack of experience in the awareness professionals, the absence of coordination and integration technique among the departments concerned with awareness, the need for a clear strategy for comprehensive awareness to be the basis of the awareness programs, and the languages used in the awareness programs: Arabic (%30.89), English (%12.26) , and Indonesian (%8.96)
2. In the area, where the pilgrims throw the small stones, witnesses a severe crowdedness; out of many pilgrims' desire to throw the small stones and leave Mena within the shortest possible time. This crowdedness had its impact on changing the fashion in which the small stones bridge is used.

Thus, it is necessary to utilize the technology in easy way to participate in reducing the problem of performing Hajj. So, this study aims to produce a **CGSSP** that help

pilgrims in most of temporal and spatiality locality. This CGSSP is needed for the following reasons:

1- It provides several different solutions to identifying the pilgrims' locations during performing the duty. Whoever pilgrims can get connected to the GPS, can automatically identify their locations. On the other hand, the system provides an alternative solution for whoever cannot get connected to the said GPS; as the system asks the pilgrims about the prominent sites that are the closest to them in the Al-Masha'ir area they exist in (by identifying these prominent sites, the system can identify the pilgrims' locations in an appropriate manner). After this, a map showing the surrounding areas appears to the pilgrims, so that they can manually identify their locations.

2- It provides answers to the pilgrim's inquiries regarding the services offered in the Al-Masha'ir area by providing him/her with all the service-offering locations within the Al-Masha'ir area he/she exists in, illustrating the closest one to his/her location and showing the best road map the pilgrim shall follow to get to the given location.

3- This system constitutes a manual guide for every pilgrim since:

- It has bi-lingual language, at this time, Arabic and English interface.
- It shows all the services and how they are distributed on various locations in the Al-Masha'ir area; and Makkah.
- It provides all the steps the pilgrim shall follow as of the moment of his/her arrival and till he/she accomplishes al-hajj duty.

4- It displays constantly update information about the Al-Masha'ir areas.

A great effort were taken to collect data about the holy places: Makkah and all AlMasha'ir Areas; and governmental, educational, medical, banks, mosques, sports club, public parks, markets, enterprises, companies, hotels, residences, tourism and travel museums, parking, and station press. All these were integrated in the database of the system.

The system design and a prototype implementation has been explained, implemented and tested on Arafat area. The user interface deploy graphical user interface. The system can be installed in a special device such ad PDA or in a mobile phone.

The CGSSP is one phase in setting up a system that is suitable for pilgrims and visitors to the holy city: Makkah. For future work, the Mina area will be added along with major suburbs of Makkah were the most of the pilgrims are resided. Al-Madinah AlMunawarah will be added with its major suburbs as well. The CGSSP can be updated to operate on pocket PCs, cellular, website, and screens installed in specific places in all AlMasha'ir areas.

REFERENCES

i. Arabic References

- إدریس، محمد (1423)، دراسة تحليلية لمواقع الزحام في مشعر عرفات، معهد خادم الحرمين لابحاث الحج : جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- إدریس، محمد (1422)، المعايير التصميمية لمنطقة وجسر الجمرات، معهد خادم الحرمين لابحاث الحج : جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- البدوي، إبراهيم وكامل، محمود و مشاط، عبدالفتاح و البرهمنوشي، حسنين (1426)، تقييم نظام قياس كثافة الأعداد البشرية على جسر الجمرات لحج عام 1425هـ، معهد خادم الحرمين لابحاث الحج : جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- الشریف، محمد و خضر، عبدالعظيم (1425)، واقع جهود التوعية في الحج : دراسة ميدانية على القانمين بالتوعية في الجهات المعنية، معهد خادم الحرمين لابحاث الحج : جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- الكلوت، جمال (1426)، الاحصاءات الأساسية لحج 1425هـ وقياس معدل أزمئة الانتقال بين المشاعر حسب المذهب، معهد خادم الحرمين لابحاث الحج : جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- عبدالمجيد، رضوى والبدوي، أحمد ونعيم، محمد (1415)، دراسة منطقة الجمرات : خصائص حركة الحجاج الراجعين وبناء نموذج محاكاة احتمالي للكفاءة التشغيلية المثلى للمنطقة. معهد خادم الحرمين لابحاث الحج. جامعة أم القرى بمكة المكرمة، المملكة العربية السعودية.
- شدود، فائق (2005)، دور النظام العالمي لتعيين الإحداثيات GPS في تكثيف الشبكات الجيوديزية وتوسيعها في سوريا، رسالة ماجستير في الهندسة الطبوغرافية، جامعة حلب، مدينة حلب، سوريا (11-29)
- المديرية العامة للجوازات بالسعودية (1429)، اعداد حجاج بيت الله الحرام من داخل وخارج المملكة العربية السعودية من عام 1417-1428هـ، الإدارة العامة للجوازات بالمملكة العربية السعودية.

ii-English references

- Law , A.M and Kelton , W.(2000), **Simulation Modeling And Analysis**, (3rd) ed. Bostn: McGraw-Hill higher Education.
- Brimicombeo, Allan (2003), **GIS, Environmental Modeling And Engineering**, London : Taylor and Francis .
- Luger, George (2005) ,**Artificial Intelligence:Structures and stratigies for complex problem solving**, NewYork : Addison – Wesly .

Leick , Alfred(1995) , **GPS Sattelite Surveying**,(2nd), New York

Taylor,G(2002),**GIS and GPS Integration and Mobile Handset Positioing** ,
International Journal Conference on Web information System Engineering

Thomas P. Yunck, Liu C, and Ware R (2000) , **A History of GPS Sounding** , To
appear in *TAO* special issue on COSMIC

Parkinson, B. W. (1976), **Navstar global positioning (GPS)**, Proceedings of the
National Telecommunications Conference, Nov.

الخطة المرورية لحج 1429 هـ . وزارة الداخلية – الأمن العام قيادة قوات امن الحج لشئون المرور بالمملكة
العربية السعودية . (13 مايو 2009 م) , <http://www.hajjgis.net/trafficplan/1429/files/index.htm> ,

الخطة المرورية لحج 1428 هـ . وزارة الداخلية – الأمن العام قيادة قوات امن الحج لشئون المرور بالمملكة
العربية السعودية . (13 مايو 2009 م) , <http://www.hajjgis.net/trafficplan/1428/files/index.htm> ,

نظام دليل حاسوبي لدعم الحجاج أثناء تأدية مناسك الحج

إعداد
عبدالعزیز علي عبيدي الزبيدي

المشرف
الدكتور أحمد عبدالعزیز الشرايعة

المشرف المشارك
الدكتور محمد بلال الزعبي

ملخص

تتناول هذه الدراسة تقديم برنامج يساهم في دعم الحجاج وزوار مكة المكرمة اثناء أداء نسك الحج حيث نجد أن 69% من الحجاج هم من الذين يأتون من خارج المملكة العربية السعودية والنسبة المتبقية (31%) موزعة على كافة سكان السعودية , وبالتالي نجد أن نسبة كبيرة من الحجاج لا توجد لديهم معرفة كاملة بأماكن توزيع الخدمات او حتى كيفية الوصول للهدف المطلوب بشكل صحيح , حيث نلاحظ ان الكثير قد يهدر وقته وجهده وبالتالي تؤثر عليه اثناء اداءه نسك الحج .

هذه الدراسة قدمت حلولاً في المحافظة على وقت وجهد الحاج وبالتالي يستطيع الحاج من اداء نسكه بطمأنينة ونسك اكبر , حيث قدمت امكانية تحديد موقع الحاج وامكانية تحديد الخدمة المراد الوصول إليها وبالتالي تحديد امكانية اقصر الطرق اللازمة للوصول الى الهدف المطلوب وحساب الزمن المتوقع للوصول للهدف حسب سرعة الحاج وايضاً معرفة كل الطرق البديلة للوصول للهدف , كذلك قدمت الدراسة امكانية معرفة كل الخدمات والطرق الموجودة حول نقطة تواجد الحاج وايضاً البحث عن الخدمات والمعالم والطرق المتوفرة بمنطقة المشاعر او منطقة مكة المكرمة.