

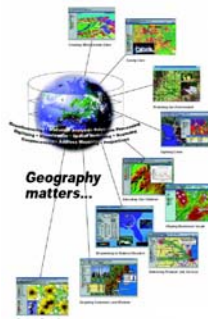
# King Fahd University of Petroleum & Minerals

## CRP 507: Computer Aided Planning



Term Paper

### **GIS:** **Supporting Environmental Planning and Management in West Africa**



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## Introduction

Saudi Arabia has intrigued travelers for centuries. Its vast swathes of desert were the swaddling clothes of infant Islam and the birthplace of the Arab race and of Arabic, a language considered holy by Muslims. It's also home to two of Islam's holiest cities - Mecca and Medina - and to a host of modern, thriving, oil-rich metropolises.

Today's Saudi Arabia has held on to its mystique by being incredibly difficult to visit - there's no such thing as a tourist visa in this country. But if you can find someone to sponsor you or decide to take an expensive 'approved' tour, it's worth coming here for the desert and mountain scenery, and some of the Middle East's best archaeological sites. And, of course, there's the fascinating spectacle of a society juggling deeply conservative religious beliefs and oil-boom modernity. Foreigners should be cautious in Saudi Arabia; there have been several bombings since November 2000, some of which were motivated by anti-Western feeling and some by foreign nationals seeking to control the illegal alcohol market. Demonstrations and political gatherings are best avoided.

## History

Parts of what is now eastern Saudi Arabia were first settled in the fourth or fifth millenium BC by migrants from what is now southern Iraq. The Nabateans had the biggest of the early empires, stretching as far as Damascus around the first century BC.

In the early 18th century the Al-Saud, the ruling family of modern Saudi Arabia, were the ruling sheikhs of the oasis village of Dir'aiyah, near modern Riyadh. When they formed an alliance, in the mid-18th century, with Mohammed bin Abdul Wahhab, the result was Wahhabism, the back-to-basics religious

movement which is still Saudi Arabia's official form of Islam. By 1806, the converting armies of Wahhabism had conquered most of modern Saudi Arabia as well as a large part of southern Iraq.

None of this went down well in Constantinople, as western Arabia was, at least in theory, part of the Ottoman Empire. In 1812 the empire retook western Arabia, and by the end of the 19th century the Al-Saud had retreated to Kuwait, where they were given sanctuary. From here one of the great Al-Saud leaders, known as Ibn Saud, brewed up an irresistible combination of piety, strategy and diplomacy and retook Riyadh and then, in 1925, Jeddah.

In 1938, Chevron found commercial quantities of oil in Saudi Arabia, and when WWII started oil production really took off. By 1950 the kingdom's royalties were running at about US\$1 million a week, and by 1960, 80% of the government's revenues came from oil. The Arab oil embargo, in 1973-74, increased the price of oil fourfold and Saudi Arabia became something of a world power. As the government raked in the cash, a building boom began and Saudi Arabia became one immense construction site. But the oil boom attracted a lot of interest from outside the country, and Saudi Arabia's relations with its neighbours became increasingly strained. The massacre of 400 Iranian pilgrims at the 1987 *haj* resulted in Iran boycotting the pilgrimage for several years.

When Iraq invaded Kuwait in 1990, the Saudis started getting nervous, and asked the USA to send troops to defend the kingdom. Although Saudi Arabia was not invaded, the crisis stirred up demands for political change, and in 1993 the king set up a Consultative Council - members are appointed by the king and can comment on proposed laws.

The days of easy oil money are just a fond memory and the country's population is growing rapidly (the average Saudi woman bears six children), presenting the Saudi Arabia and the aging King Fahd with an impressive

challenge. Two generations of generous public assistance haven't inculcated the country's youth with the strongest work ethic, either. In 1999, the first high-end tour groups entered the difficult-to-visit nation, but visas remain officially restricted to business travellers, Muslims making the annual pilgrimage to Mecca and Medina, and those few lucky folk able to convince a Saudi national to sponsor their visit.

## Environment

About 2.2 million sq km (0.85 million sq mi) in size, Saudi Arabia is mostly desert. It's bordered to the south-east by Oman, Yemen and the United Arab Emirates, to the north by Iraq and Kuwait, and to the west by Jordan. Western Saudi Arabia is dominated by a mountain chain which runs the entire length of the country, getting higher and wider to the south. About half the country (an area the size of France) is taken up by the Rub' al-Khali, or Empty Quarter, the largest sand desert in the world. A second great sand desert, the Nafud, stretches its way across the north-west of the country, while the centre and north of Saudi Arabia is mostly gravelly plains. The east is flat and low-lying, an area of *sabkhas* (or salt flats). Its main geographical feature is the gigantic Al-Hasa oasis.

Unsurprisingly, considering all that desert, there's not much in the way of flora and fauna in Saudi Arabia. There are a number of scrub species, as well as tamarinds growing in some deserts and evergreens in the forested regions of Asir. If it's fauna you're after, you'd better like camels. They're Saudi Arabia's most visible wildlife, although there are also nocturnal hedgehogs and sand cats in some areas, and Hamadryas baboons in Asir.

Saudi Arabia's deserts have extreme climates. From mid-April to mid-October, expect daytime temperatures of 45°C (113°F) or higher throughout the

country. In the dead of winter (December to January) things cool down in the cities: it's only around 15°C (59°F) during the day, and can be colder in the central deserts overnight. In the coastal areas it rains regularly, with high humidity in the summer, but there's very little rainfall in the capital Riyadh.

## Problem Statement

The problem is to create a poster about Saudi Arabia for geography awareness.

## Objective of the Project

To promote the use of GIS in Saudi Arabia and show how it can be used to present geography.

## Study Area

The study area include Saudi Arabia,

## Data

**Full country name:** Kingdom of Saudi Arabia

**Area:** 2 million sq km (1.2 million sq mi)

**Population:** 21.5 million

**Capital city:** Riyadh (pop 3 million)

**People:** Arabs, Bedouins, Najdis and expats from all over the world

**Language:** Arabic, English

**Religion:** Islam

**Government:** Monarchy

**Head of State:** King Fahd

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**GDP:** US\$186 billion

**GDP per head:** US\$9000

**Annual growth:** -9%

**Inflation:** 0%

**Major industries:** Oil, steel, cement, wheat

**Major trading partners:** Japan, United States, EU, India

### ***COUNTRY OVERVIEW***

**Head of State:** King Fahd ibn Abd al-Aziz al-Sa'ud

**Crown Prince:** Abdullah ibn Abd al-Aziz al-Sa'ud

**Independence:** September 23, 1932 (unification)

**Population (2001E):** 22.7 million (growing around 3% per year)

**Location/Size:** Between the Arabian Gulf and the Red Sea/865,000 square miles (about 1/4 the size of the United States)

**Major Cities:** Riyadh (royal capital), Jeddah (administrative capital), Mecca, Medina, Dammam, Jubayl, Buraydah

**Language:** Arabic

**Ethnic Groups:** Arab (90%), Afro-Asian (10%)

**Religion:** Muslim (100%) - predominantly Sunni

### **Economic Overview**

**Currency:** Riyal

**Market Exchange Rate (1/28/02):** US\$1 = 3.75 riyals

**Gross Domestic Product (GDP - market exchange rate) (2001E):** \$169.5 billion

**Real GDP Growth Rate (1995-2000 average):** 1.9% **(2000E):** 4.5%  
**(2001E):** 1.3% **(2002F):** 0.0%

**Inflation Rate (consumer prices)(2001E):** 0.0% **(2002F):** 1.0%

**Unemployment Rate (Saudi American bank estimate) (2001E):** 15%  
(unofficial estimates are higher)

**Current Account Balance (2001E):** \$4.7 billion **(2002F):** -\$5.8 billion

**Major Trading Partners (2001):** Japan, United States, European Community

**Merchandise Exports (2001E):** \$69.7 billion (mainly crude oil and petroleum products)

**Merchandise Imports (2001E):** \$29.7 billion (mainly industrial goods, metals, food)

**Merchandise Trade Balance (2001E):** \$40.0 billion

**Oil Export Revenues (2001E):** \$58.2 billion **(2002F):** \$49.6 billion

**Oil Export Revenues/Total Export Revenues (2000E):** 90%-95%

**Government Debt (2001E):** \$168 billion (nearly 100% of GDP; mainly owed to state institutions)

## Energy Overview

**Minister of Petroleum and Mineral Resources:** Ali bin Ibrahim al-Naimi  
(since 8/95)

**Deputy Minister for Petroleum Affairs:** Prince Abdelaziz bin Salman

**Minister of Industry and Electricity:** Hashim bin Abdullah Yamani

**Proven Oil Reserves (1/1/02E):** 264.2 billion barrels (includes half of Neutral Zone -- NZ)

**Oil Production (January-November 2001E; includes NZ):** 8.8 million barrels per day (bbl/d), of which 8.1 million bbl/d is crude oil and 682,000 bbl/d is natural gas liquids (NGLs)

**Crude Oil Production (January 2002E; includes NZ):** 7.1 million bbl/d

**OPEC Crude Oil Production Quota (as of 1/1/02):** 7.053 million bbl/d  
(down over 1 million barrels per day from February 2001)

**Oil Production Capacity (2002E):** 10.0-10.5 million bbl/d

**Oil Consumption (2001E):** 1.3 million bbl/d

**Net Oil Exports (2001E):** 7.5 million bbl/d



**Crude Oil Refining Capacity (1/1/02):** 1.75 million bbl/d

**Natural Gas Reserves (1/1/02E):** 219.5 trillion cubic feet (Tcf) (includes half of NZ)

**Natural Gas Production/Consumption (1999E):** 1.63 Tcf

**Electric Generating Capacity (2000E):** 25 gigawatts

**Net Electricity Generation (1999E):** 120 billion kilowatthours

## Environmental Overview

**Director General of Meteorology and Environmental Protection Agency:**

Dr. Nezar Tawfeeq

**Total Energy Consumption (1999E):** 4.3 quadrillion Btu\* (1.1% of world total energy consumption)

**Energy-Related Carbon Emissions (1999E):** 73.9 million metric tons of carbon (1.2% of world carbon emissions)

**Per Capita Energy Consumption (1999E):** 207.8 million Btu (vs. U.S. value of 355.8 million Btu)

**Per Capita Carbon Emissions (1999E):** 3.5 metric tons of carbon (vs. U.S. value of 5.5 metric tons of carbon)

**Energy Intensity (1999E):** 35,884 Btu/\$1990 (vs U.S. value of 12,638 Btu/\$1990)\*\*

**Carbon Intensity (1999E):** 0.61 metric tons of carbon/thousand \$1990 (vs U.S. value of 0.19 metric tons/thousand \$1990)\*\*

**Sectoral Share of Energy Consumption (1998E):** Industrial (43.5%), Transportation (39.0%), Residential (11.4%), Commercial (6.1%)

**Sectoral Share of Carbon Emissions (1998E):** Transportation (39.1%), Industrial (42.4%), Residential (12.1%), Commercial (6.4%)

**Fuel Share of Energy Consumption (1999E):** Oil (60.7%), Natural Gas (39.3%), Coal (0.0%)

**Fuel Share of Carbon Emissions (1999E):** Oil (66.5%), Natural Gas (33.5%), Coal (0.0%)

**Renewable Energy Consumption (1998E):** 0.17 trillion Btu\* (0% increase from 1997)

**Number of People per Motor Vehicle (1998):** 6 (vs. U.S. value of 1.3)

**Status in Climate Change Negotiations:** Non-Annex I country under the United Nations Framework Convention on Climate Change (ratified December 28th, 1994). Not a signatory to the Kyoto Protocol.

**Major Environmental Issues:** Desertification; depletion of underground water resources; the lack of perennial rivers or permanent water bodies has prompted the development of extensive seawater desalination facilities; coastal pollution from oil spills.

**Major International Environmental Agreements:** A party to Conventions on Climate Change, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea and Ozone Layer Protection.

## Oil And Gas Industries

**Organization:** The Supreme Petroleum Council governs the nationalized oil industry, including Saudi Arabian Oil Co. (Saudi Aramco) crude production, refining and marketing; Saudi Basic Industries Corp. (SABIC) petrochemicals.

**Major Oil Terminals:** Ras Tanura (world's largest offshore oil loading facility, on Persian Gulf), Yanbu (on Red Sea, fed by Petroline), Jubail, Ras al-Ju'aymah (on Persian Gulf northwest of Ras Tanura), Jiddah (on Red Sea south of Yanbu), Jizan (on Persian Gulf, refined products), Ras al-Khafji (on Persian Gulf in the Saudi-Kuwaiti Neutral Zone, crude oil), Rabigh (on Red Sea, south of Jiddah, crude oil and refined products), Zuluf (offshore Persian Gulf, linked to Zuluf oil field)

**Major Pipelines (capacity - million bbl/d):** Petroline (4.8), IPSA 1 (0.5 -- closed since August 1990), IPSA 2 (1.7 -- closed since August 1990), Tapline (0.5

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-- closed since 1984), Abqaiq-Yanbu NGL line (0.4)

**Major Refineries (capacity, 1/1/02):** Aramco - Rabigh 400,000 bbl/d, Ras Tanura 300,000 bbl/d, Yanbu 190,000 bbl/d, Riyadh, 120,000 bbl/d, Jeddah 60,000 bbl/d; Sadui Aramco/Mobil - Yanbu 340,000 bbl/d; Petromin/Shell - al-Jubail 305,000 bbl/d; Arabian Oil Company - Ras al-Khafji 30,000 bbl/d

## Tools Of study

- Adobe Photoshop



Adobe Photoshop 5.5.Ink

- AutoCad 2000



AutoCAD 2000.Ink

- ArcMap



ArcMap.Ink

- ArcToolbox



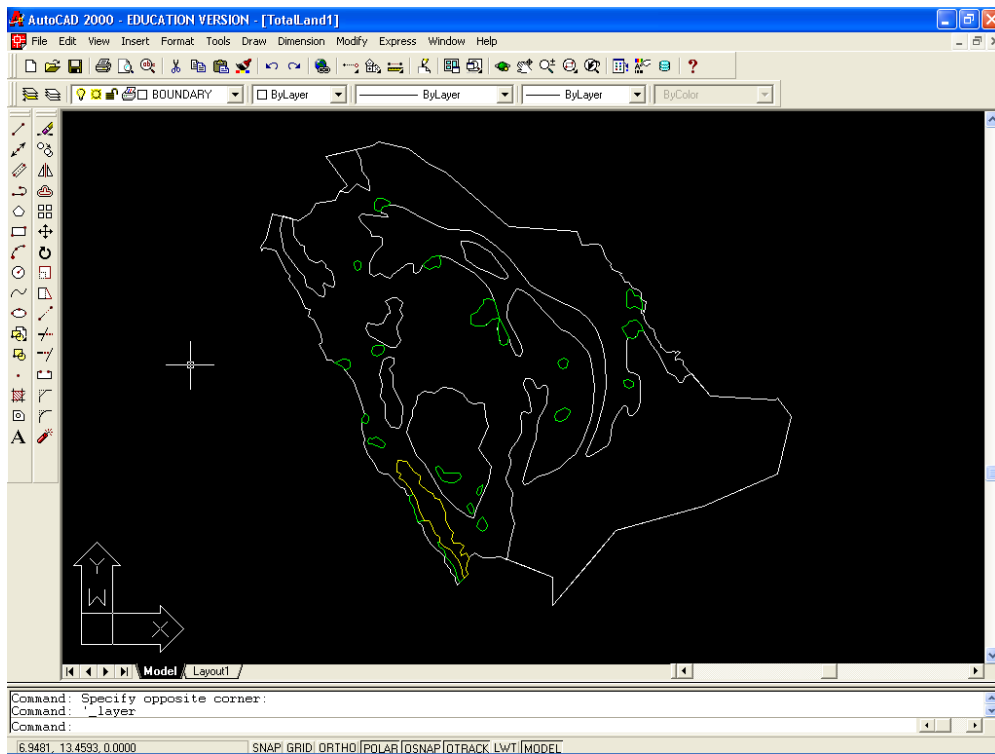
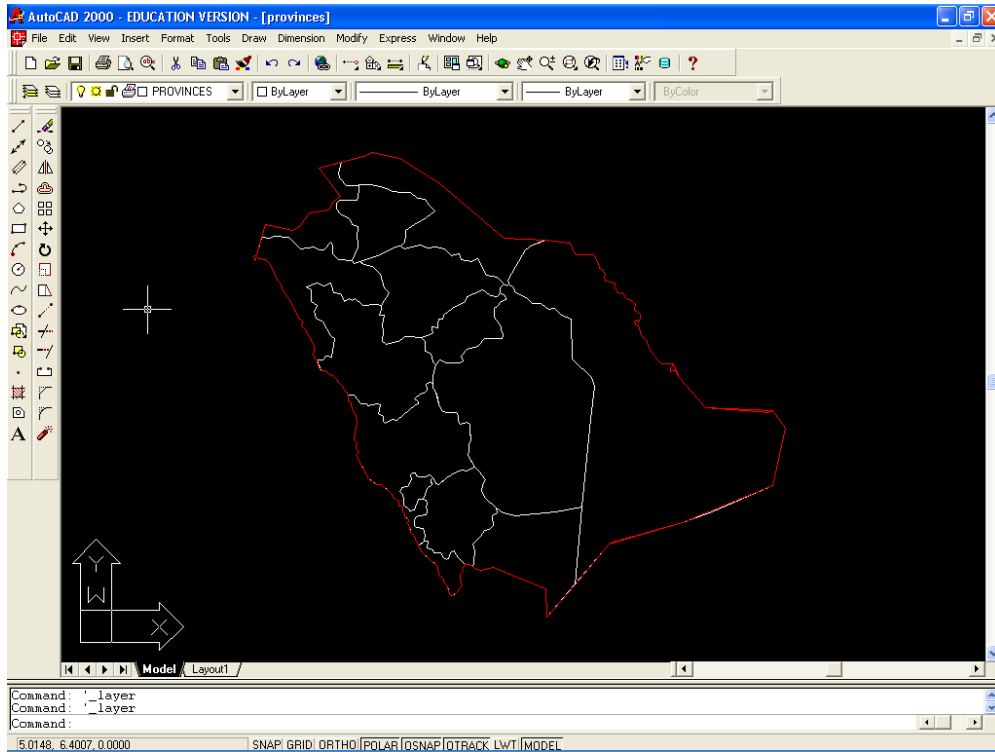
ArcToolbox.Ink

- ArcCatalog

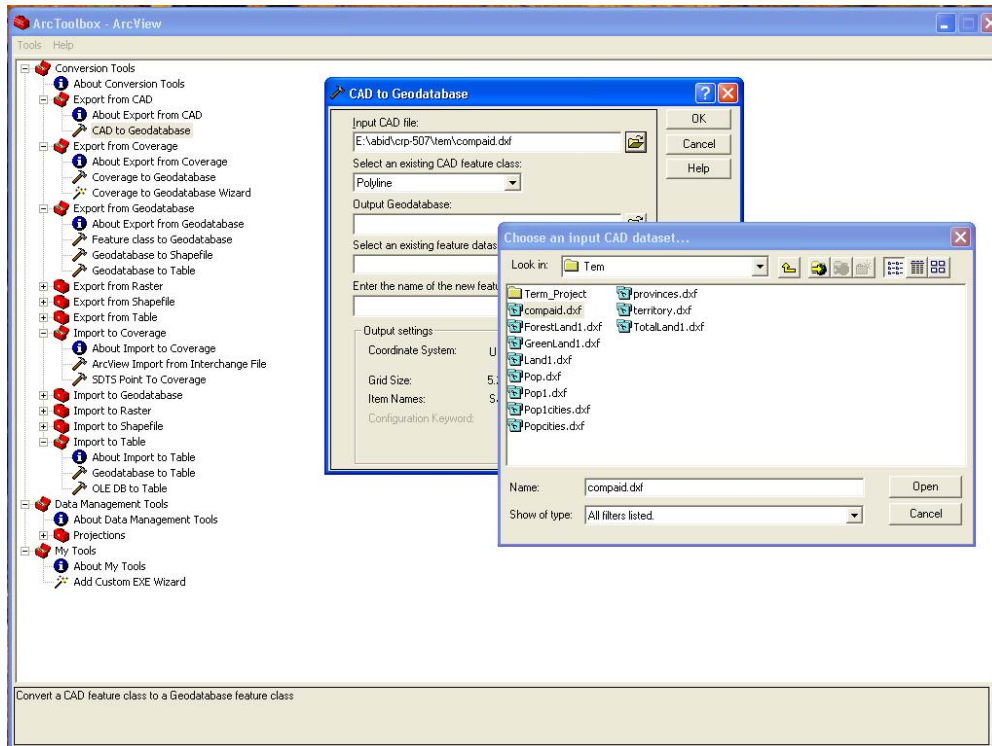


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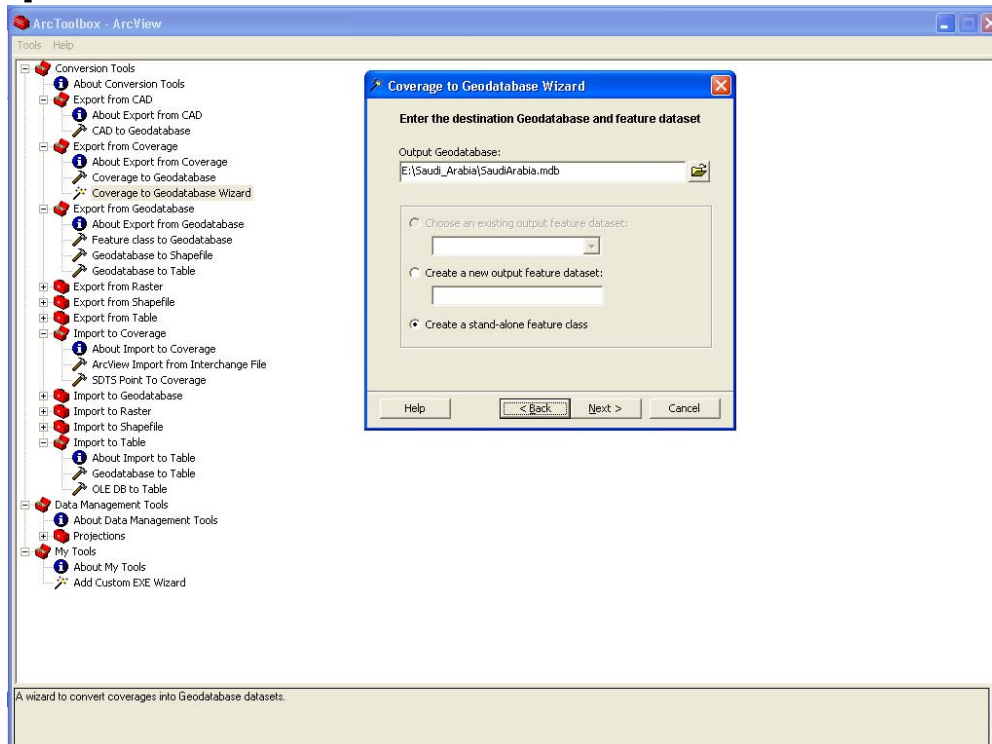
# Digitization Process



# Preparation of Coverages

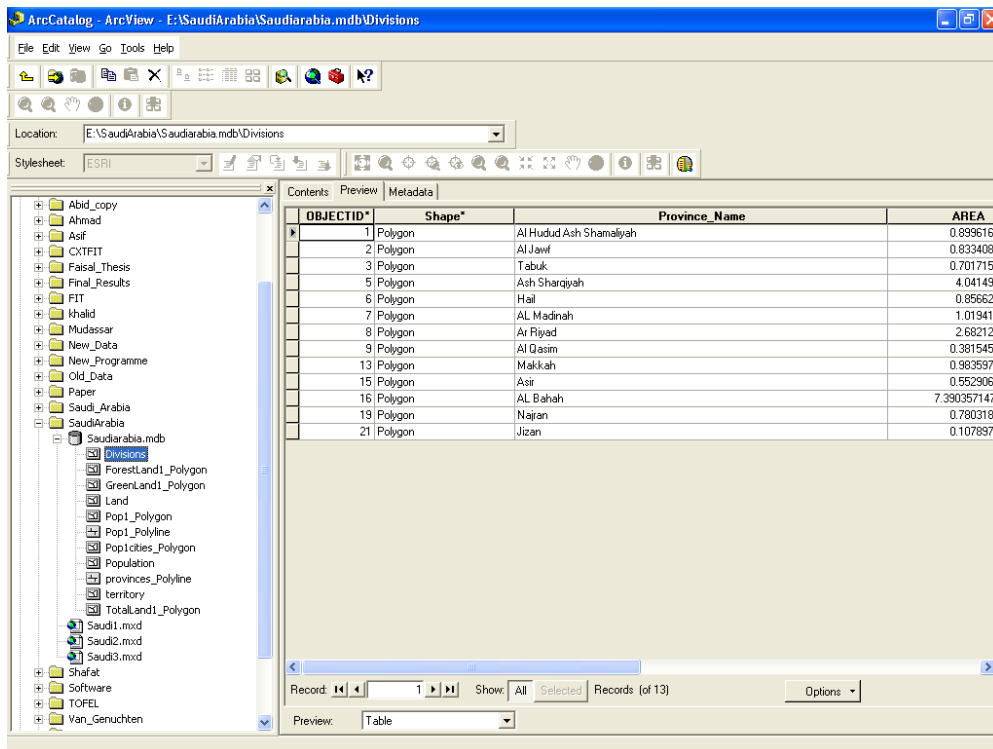
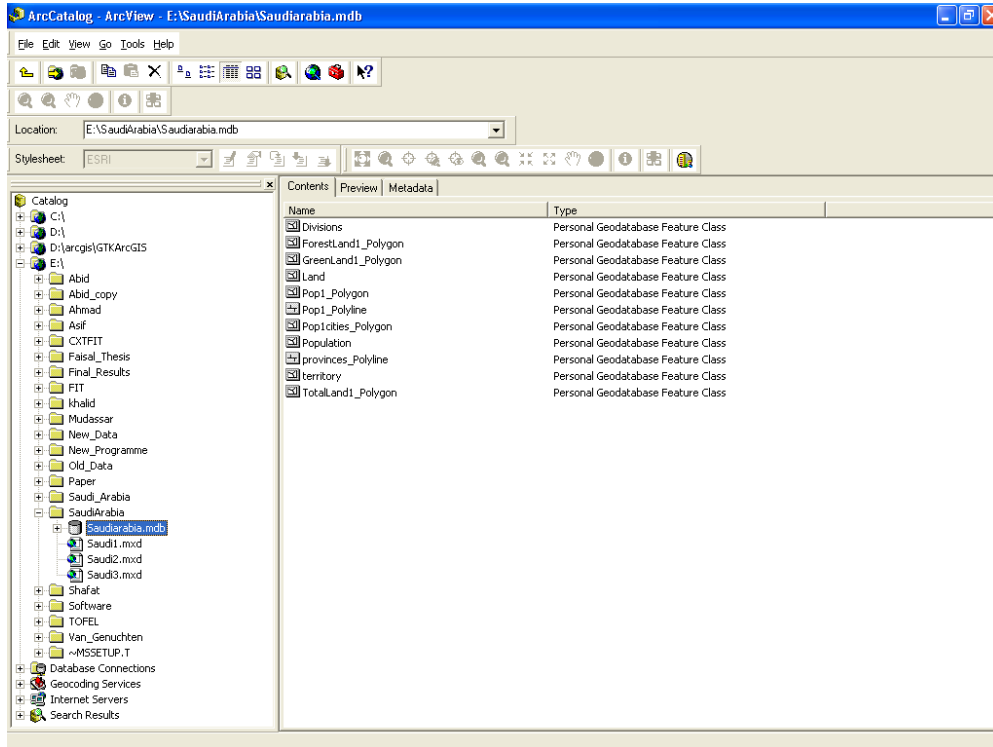


# Preparation of Personal Geo-database



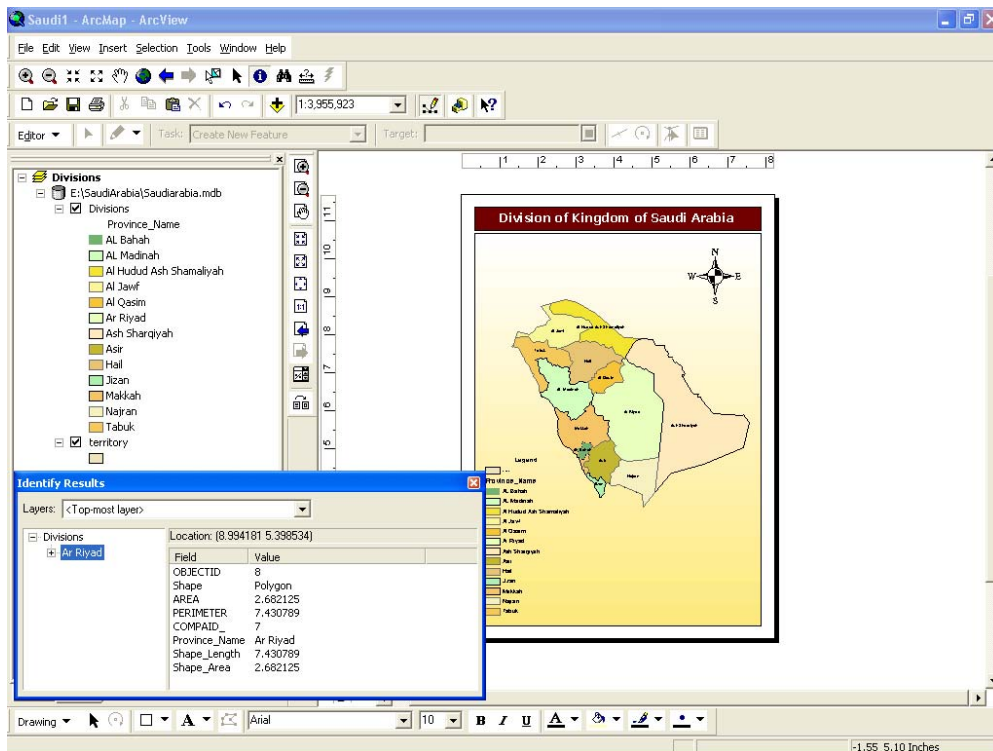
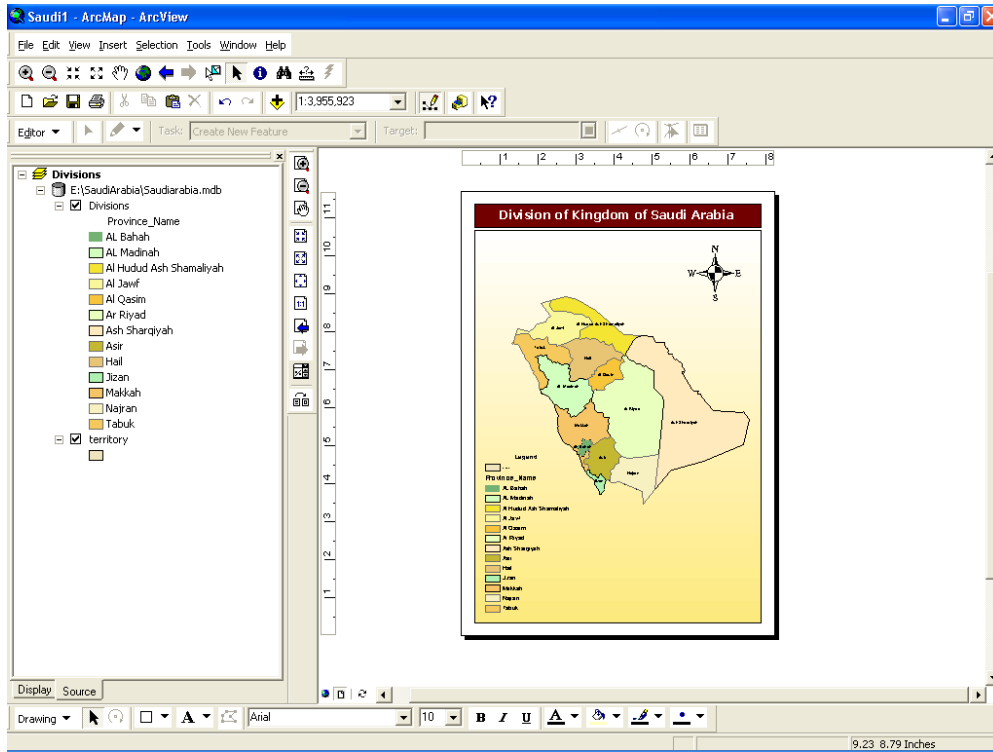
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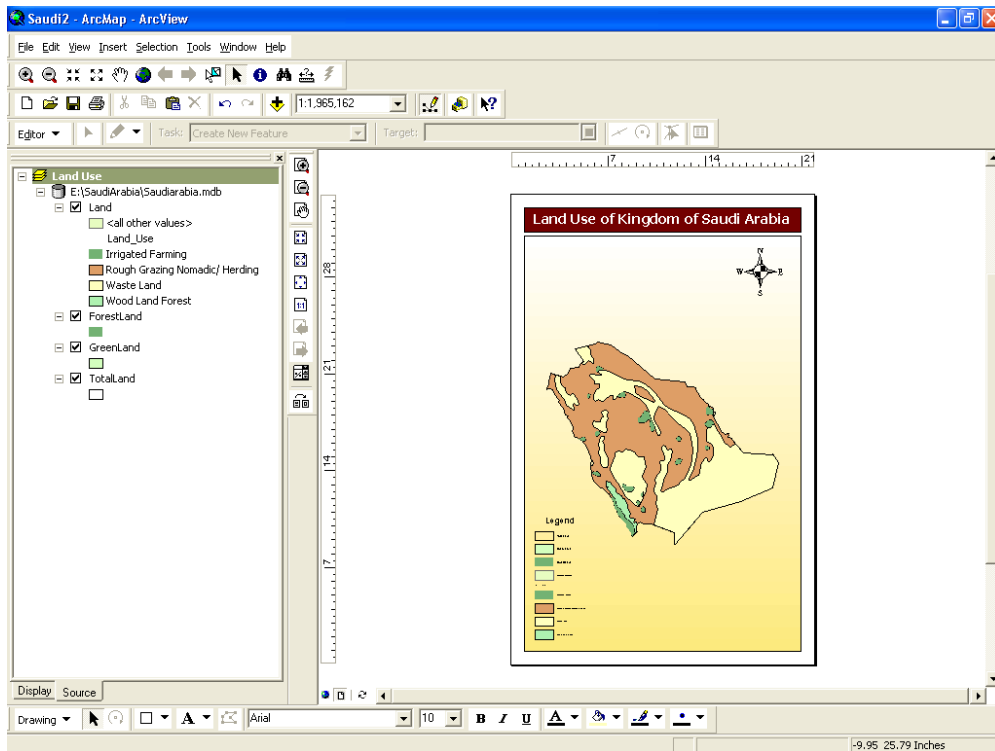
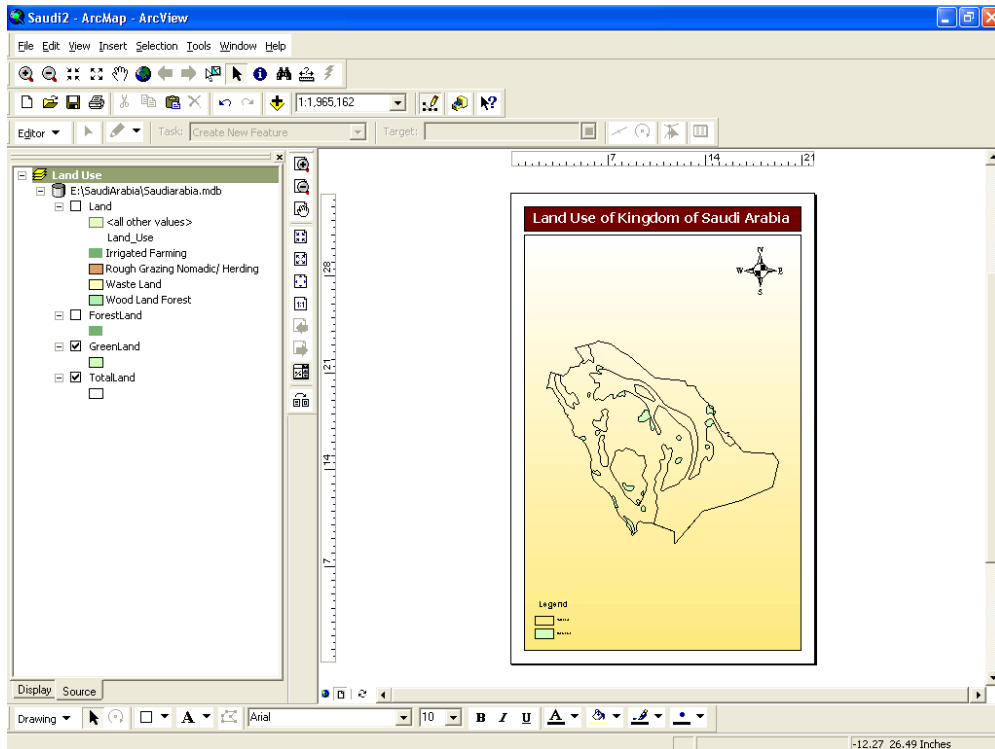
# Data Management



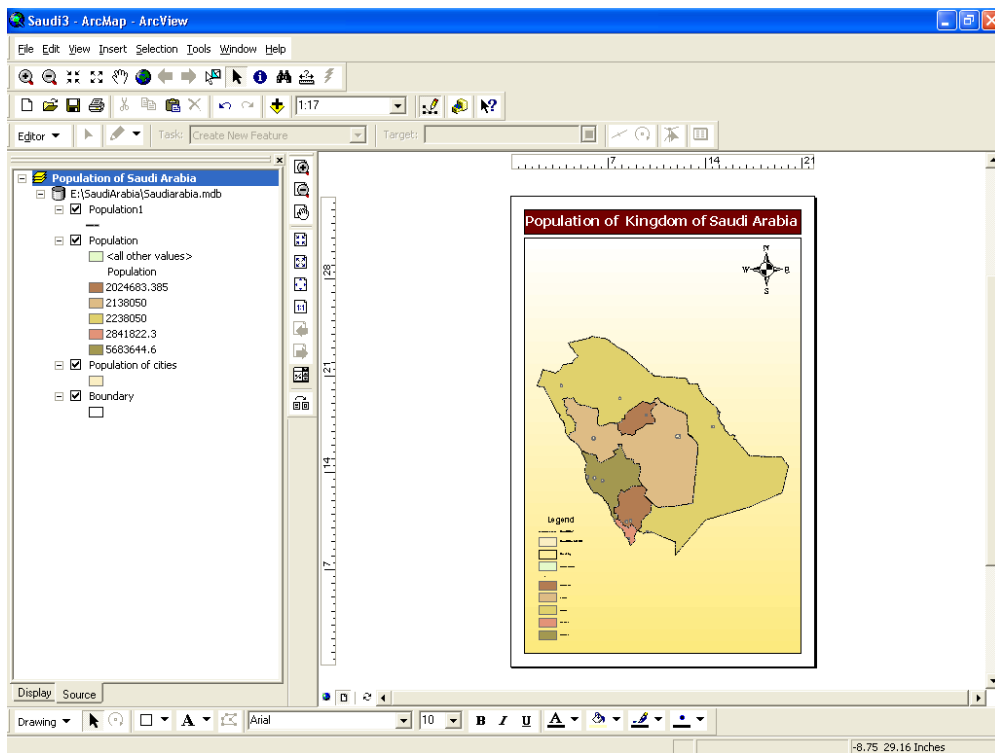
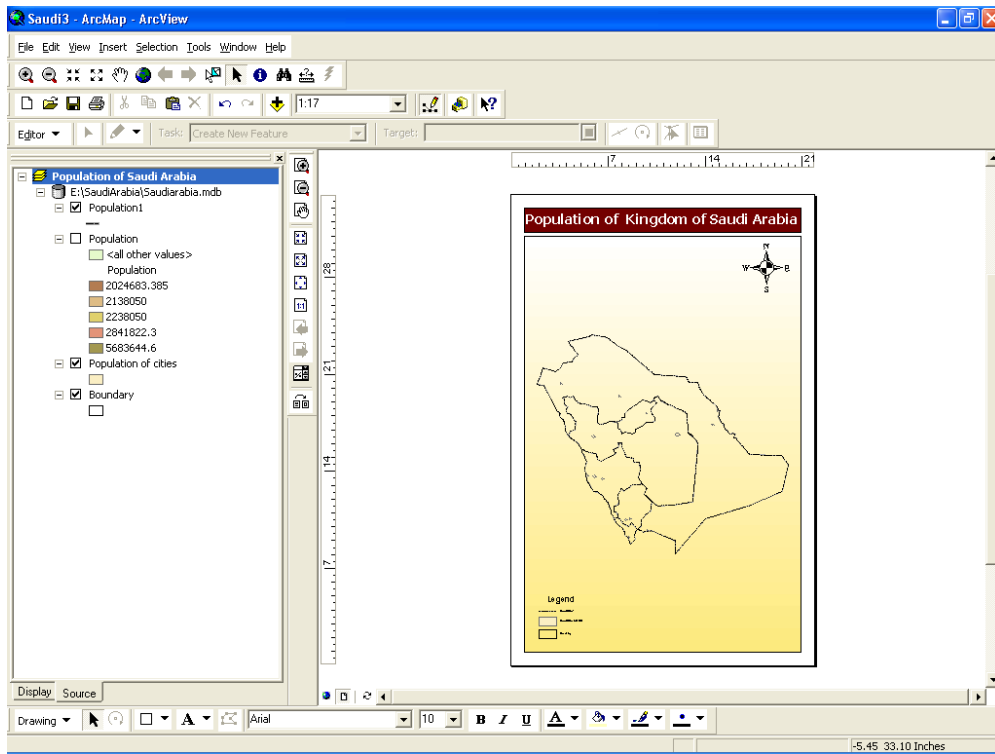
Kingdom of Saudi Arabia

# Preparation of Maps








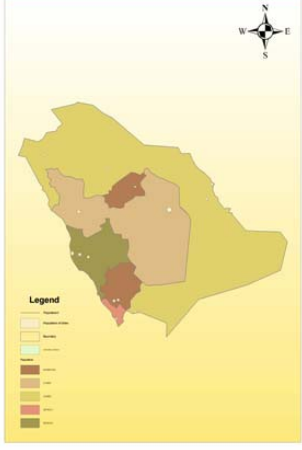


# The Final Posters

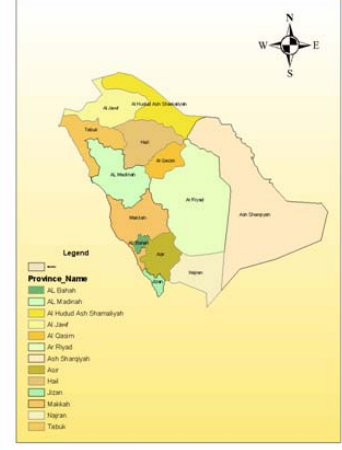


## The Final Posters

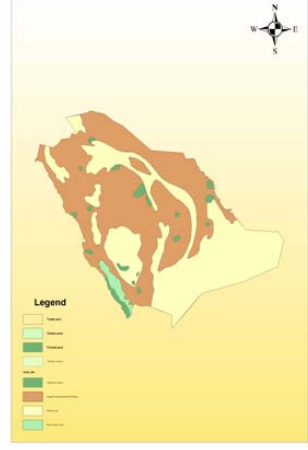
### Population of Kingdom of Saudi Arabia



### Division of Kingdom of Saudi Arabia



### Land Use of Kingdom of Saudi Arabia



## References

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