

**THE USE OF GIS FOR MAPPING HIV//AIDS
SUSCEPTIBLE AREAS IN ADDIS ABABA,,
ETHIOPIA**

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Background

- Addis Ababa is the capital city of Ethiopia and is also the political, economic, and the cultural, center of the country.
- Addis Ababa has an estimated total population of 3.2 million. Over 51% of the population is female.
- There are 24 hospitals in Addis Ababa (five of which are owned by the Addis Ababa Health Bureau). 24 health centers and 46 health posts. In addition, there are 487 clinics categorized into lower, medium, higher and special types; these include privately owned clinics and those owned by non-governmental organizations
- In Addis HIV/AIDS is the most challenging problem in terms of social, economical, political, and cultural aspects. Even nowadays it is a common thing to lose someone so close due to this disease.

CONT.....

- The groups most vulnerable to infection were identified as commercial sex workers and young people, particularly unemployed educated young adults.
- A preliminary assessment conducted by Zelalem on 105 poor women (including housewives, maids, students, unemployed youth and commercial sex workers) found that 69 were found to be carriers of the virus. Some respondents felt that women in low economic classes are victims as they are exposed to many sex partners to fulfill their need for food, clothing, and other necessities.
- In order to alleviate this major problem different strategic plans have been proposed and carried out by different governmental and non-governmental bodies; Of course, most of the strategies are good but if it was for GIS techniques manipulated to develop these strategies; then it would have been better.
- In order to ease this acute spread of the disease, an integrated and well-planned method of prevention planning, evaluation, and surveillance of the HIV/AIDS spread is necessary.

- GIS and remote sensing is one of the recent tools in identifying, classifying and mapping areas vulnerable to the problem.

Geographic Information System

- Geographic Information System (GIS) is an organized collection of computer Hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.
- GIS is a set of tools increasingly being used in the Public Health arena for analyzing, planning, decision making, problem solving, and research.

Objectives

General Objectives

- To apply GIS techniques to HIV/AIDS prevention planning, evaluation, and surveillance in the Addis Ababa city.
- To recommend the best strategy to resource allocation for prevention of the spread of HIV/AIDS, and to give care and support to those parts of the society who have fallen victim to the disease.

Specific objectives.

- To assess the spatial distribution of high HIV/AIDS susceptible areas of the Addis Ababa city.
- To maximize the number and quality of VCT centers in the city and to identify top priority areas of the city and establish such health facility centers.
- To identify those areas of the city that show high HIV/AIDS prevalence and to investigate the factor/s associated with this high incidence and to establish a strategic plan to combat the problem.
- To monitor the entire progress of the prevention and care/support activities.

Methods

- Projected population data of the year 2006 and the 1994 Census for each Woreda of the Addis Ababa city (Source: Central Statistics Authority 2005). From which the following demographic characteristics were derived:

TABULAR DATA

Young Population Data
Female Population Data
Sex Workers Population Data
Establishments with Sex Workers
Low Income Population Data

Attaching the
Tabular data to the
shape file Attribute
of each Woreda

**AA Woredas
Shape Data**

SHAPE DATA (VECTOR)

Young Population Shape data
Female Population Shape Data
Sex Workers Population Shape Data
Establishments with Sex Workers
Low Income Population Shape Data

Interpolation (Contour Creation)

Clipping
Themes

RASTER DATA

Young Population Raster data
Female Population Raster Data
Sex Workers Population Raster Data
Establishments with Sex Workers Data
Low Income Population Raster Data

Deriving Commensurate Criteria Maps

Linear Scale Transformation

STANDARDIZED RASTER DATA

Female Population Raster Data
Sex Workers Population Raster Data
Establishments with Sex Workers Data
Low Income Population Raster Data
Young Population data

Assigning
Criterion
Weighting
**Pair wise
Comparison
Method**

Young Population Raster data (Wt1)
Sex Workers Population Raster
Data (Wt2)
Establishments with Sex Workers
Data (Wt3)
Female Population Raster Data
(Wt4)
Low Income Population Raster Data
(Wt5)

**Youth
Female
Sex Worker
Establishments
Low Income**

**GIS
Overlay
Analysis**

HIV/AIDS Susceptibility Map

GIS-BASED DATA PROCESSING AND ANALYSIS TECHNIQUES

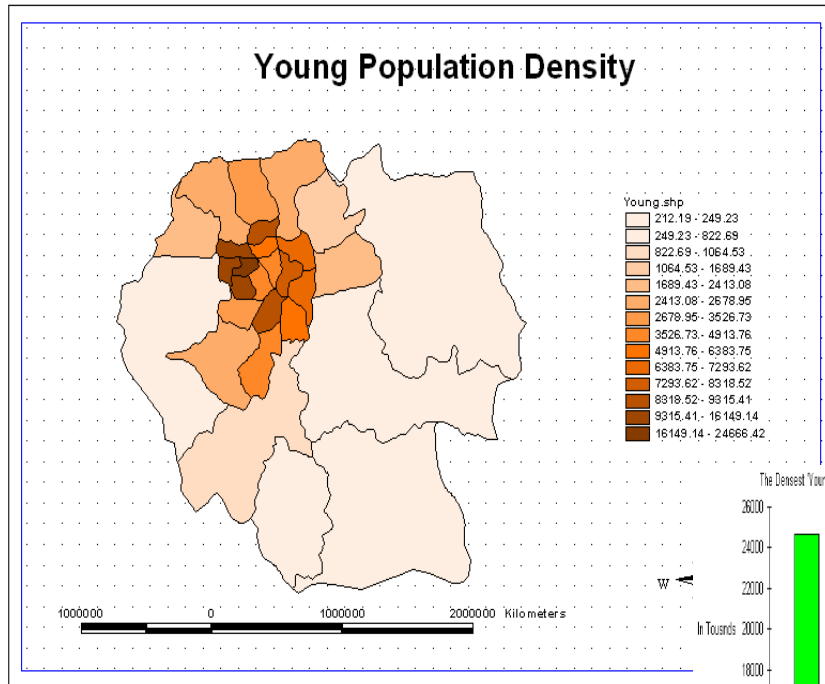
Processing the 'Young Population' GIS Layer:

Young Population

Density=

Tot. Young Pop. in each Woreda

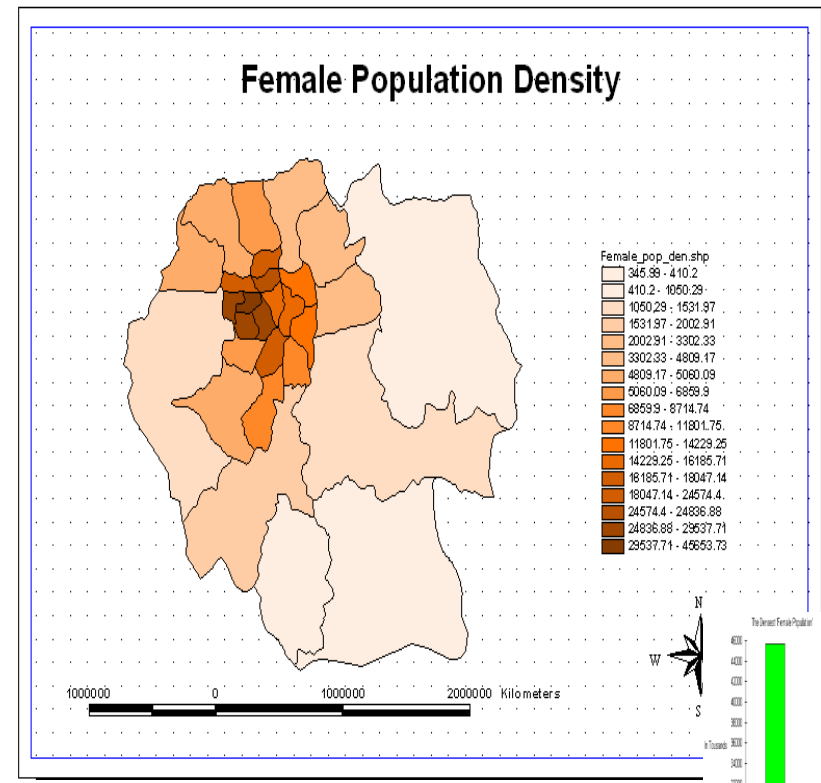
Area of each Woreda



Female Population Density =

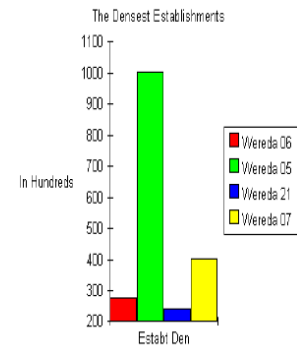
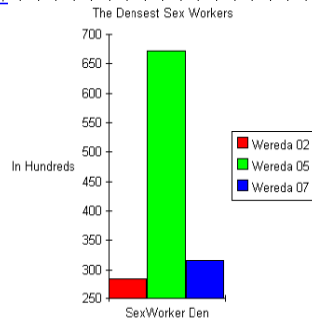
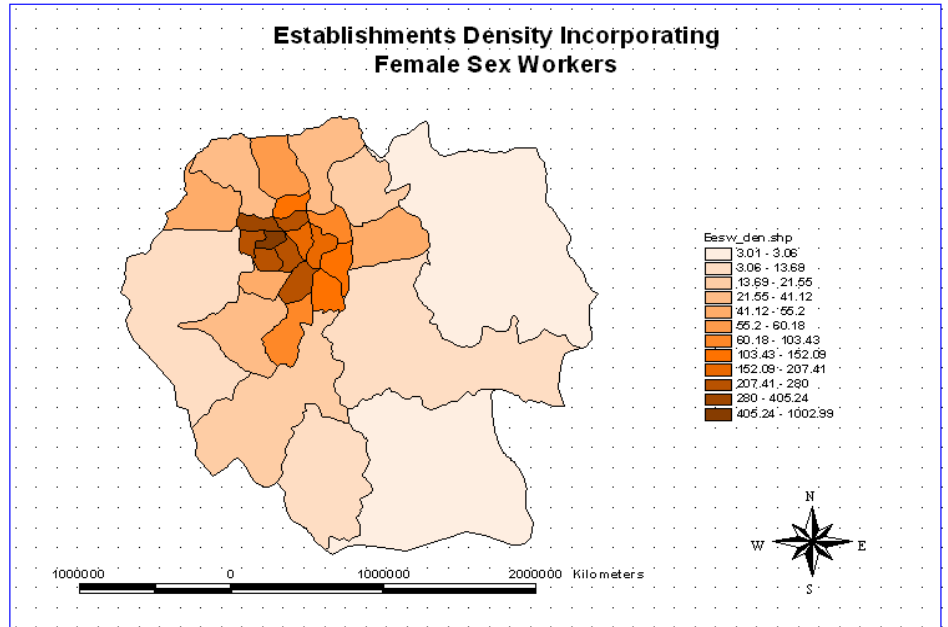
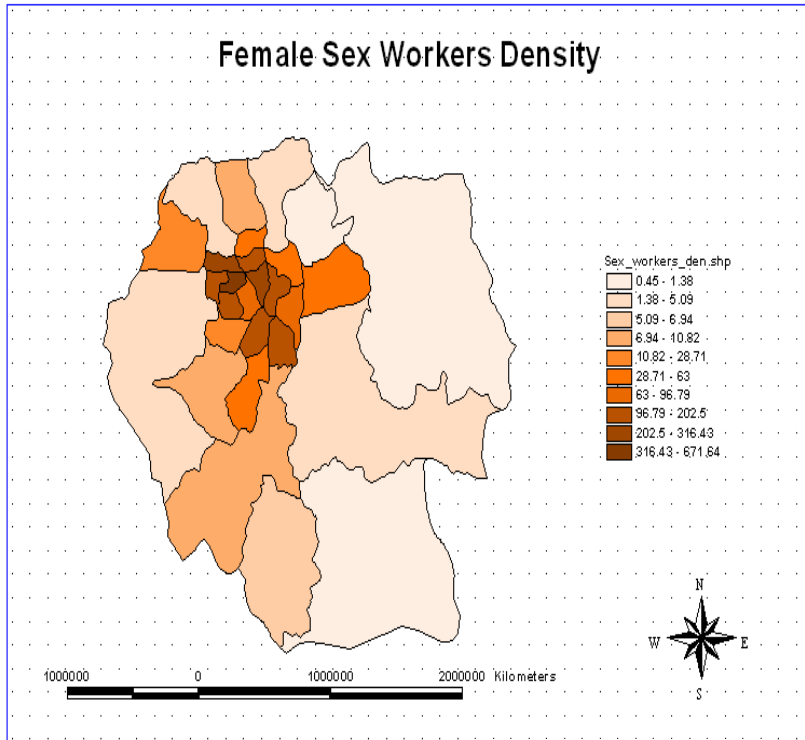
Tot. Female Pop. in each Woreda

Area of each Woreda



Sex Workers Population Density= Tot. Sex Workers Pop. in each Woreda
Area of each Woreda

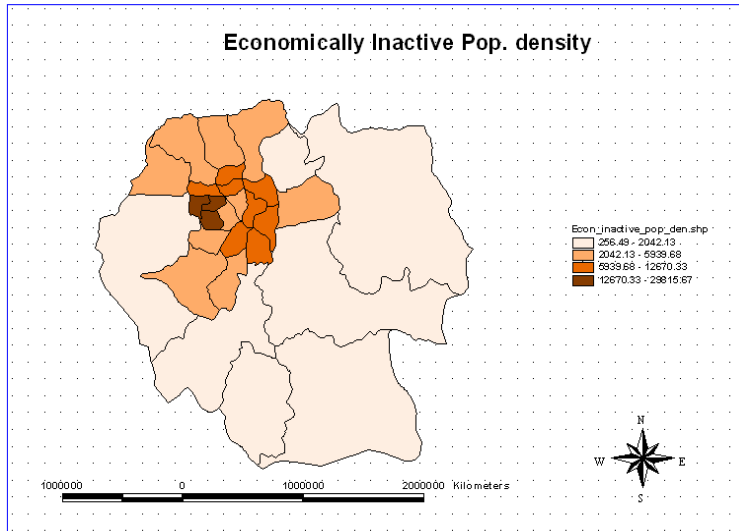
Establishments
Density =
Tot. Establishments. in each
Woreda
Area of each Woreda



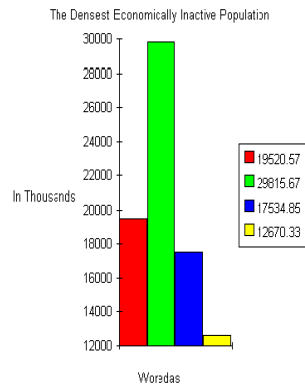
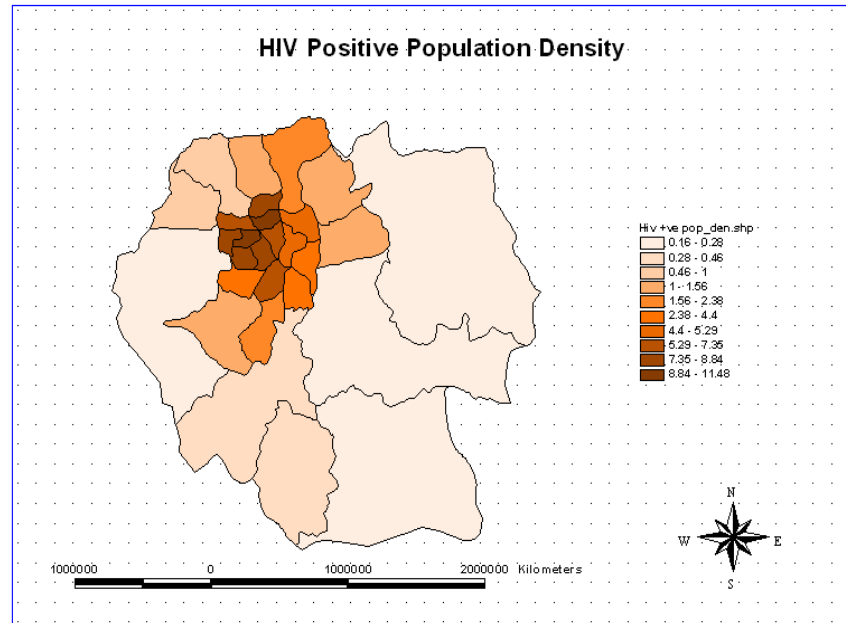
Economically Inactive Population Density

=

Tot. Economically Inactive Population in each Woreda Area of each Woreda



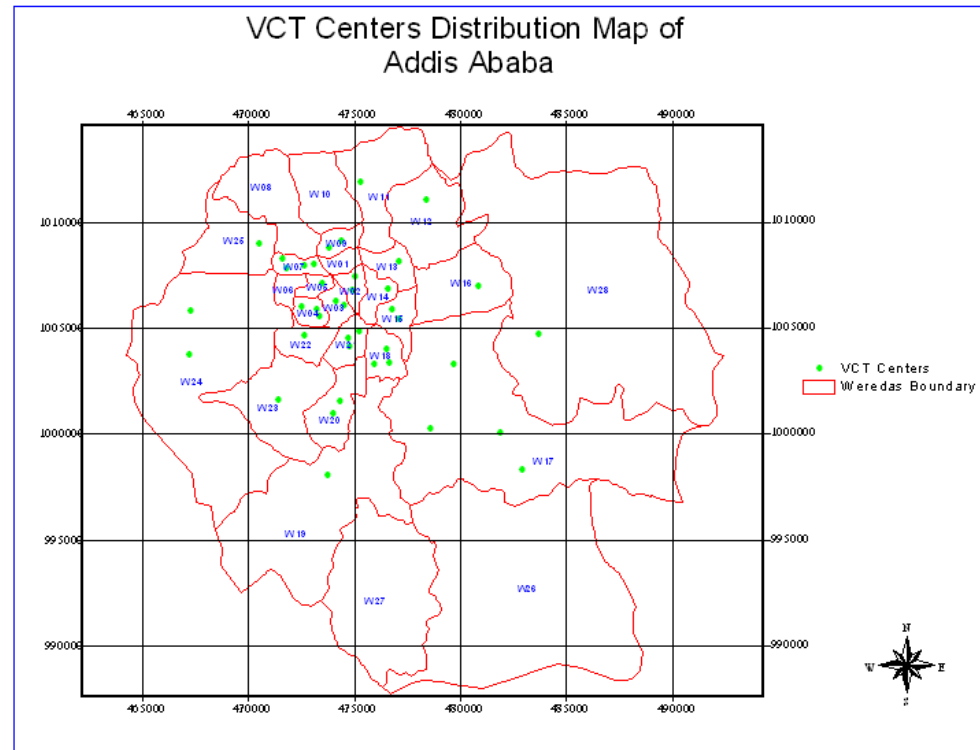
Mapping the Existing HIV Positive Population Distribution



In order to create the HIV/AIDS susceptibility map of the Addis Ababa city, the existing spatial distribution of the HIV/AIDS epidemic must be mapped, and then compared to the suggested spreading factors. The degree of correlation between each factor map and the existing HIV/AIDS spatial distribution map is calculated, so that it will be helpful when giving weights to each of the criterion map.

4.1.7. Mapping the VCT Centers Distribution

In order to see the spatial distribution of the Health Centers that work in the areas of HIV/AIDS prevention and control activities, it is important to have a separate map that shows the spatial distribution of such facilities (for example the spatial distribution of VCT center).



Criterion Weighing

The resulting weighted sum vectors are:

<i>YP</i>	<i>FP</i>	<i>SW</i>	<i>ES</i>	<i>EI</i>
1.113	0.521	2.245	1.447	0.182



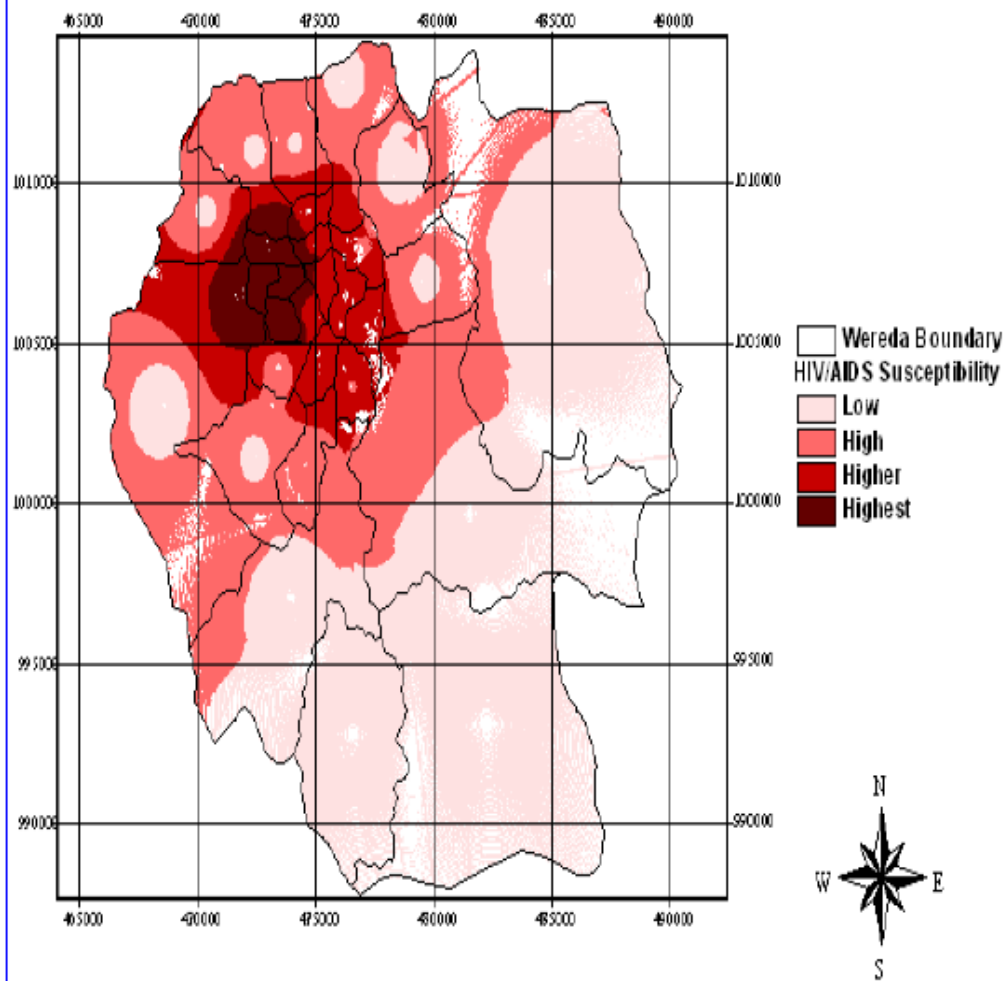
Output Layer



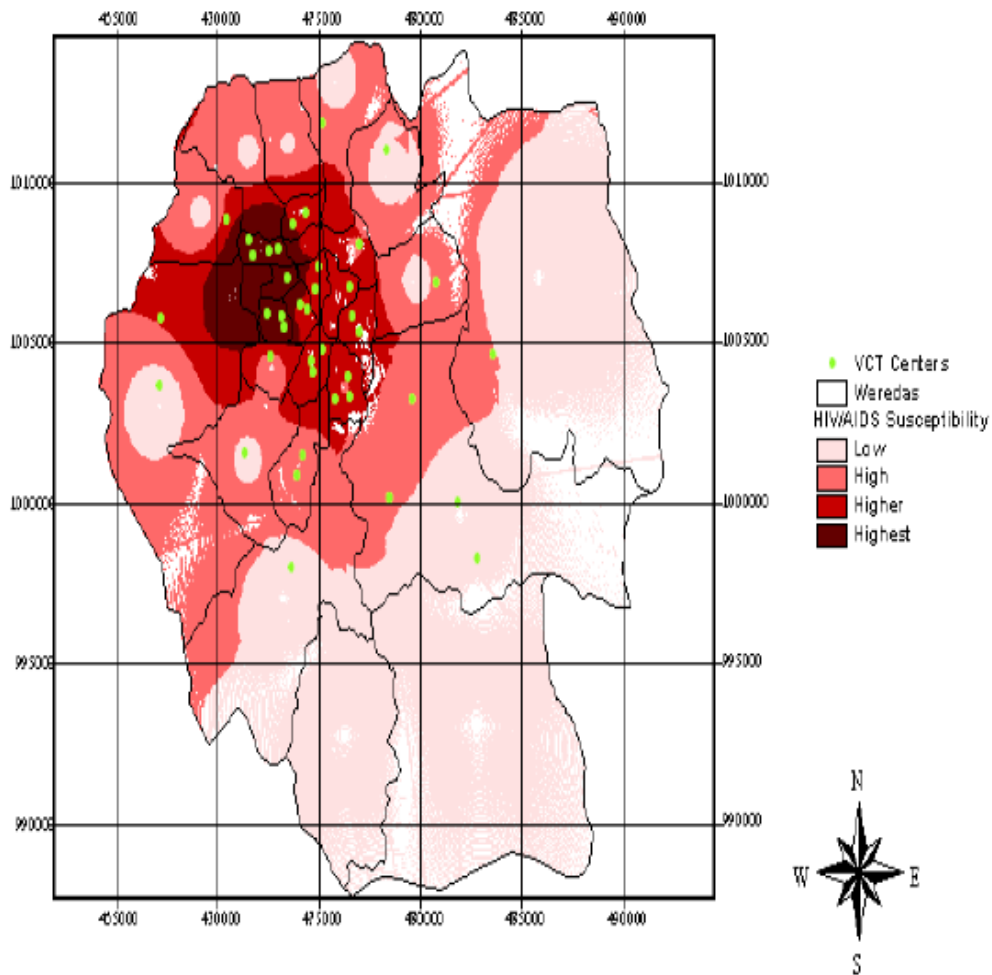
Reclassification and Ranking

The GIS map-overlay facility

HIV/AIDS Susceptibility Map of Addis Ababa



HIV/AIDS Susceptibility Zones and VCT Centers distribution in Addis Ababa



DISCUSSIONS

- The HIV/AIDS susceptibility map of Addis Ababa, which is developed by integrating the GIS techniques and Multicriteria Decision Support System, has four major HIV/AIDS susceptibility zones. These susceptibility zones are ranked in relative terms as: the 'Highest', the 'Higher' the 'High', and the 'Low' susceptible zones to HIV/AIDS risk.
- The Susceptibility map that the majority of Addis Ababa is found in the 'Low' susceptible zone. Generally, the central northwest part of the city is found under the 'Highest' and 'Higher' HIV/AIDS susceptible zones, whereas the eastern and southern parts of the town are found in the 'Low Susceptible' zone.