MMDCB

MANUAL ON SPATIAL MANAGEMENT INFORMATION SYSTEM IN MAMMINASATA URBAN AREA

TABLE OF CONTENT

PART I : Introduction

PART II : GIS Operational Procedure

PART III : Database Management System

LIST OF TABLES

LIST OF FIGURES

Part I : Introduction

1. Background

Mamminasata Urban Area or Mamminasata Metropolitan Area[1] (hereinafter referred to as Mamminasata area), composed of the entire Makassar City, a part of Maros District, a part of Gowa District (Sungguminasa), and of the entire Takalar District, is the only and the largest Urban Area in Eastern Indonesia with population of over 2 million (Area: 2,476 km^2). Due to urbanization of Makassar City and surrounding areas and as an answer to assist the urban development and controlling, it is necessary to establish Mamminasata urban Area in order to strengthen efficient infrastructure, public service and land use control to secure urban environment and promote economic growth.

Government of Indonesia has enacted new spatial management law (No. 26 of 2007) in 2007, which becomes the legal umbrella for spatial management in Indonesia. The Law mandated the "Spatial Management" as "a system for process of spatial planning, spatial utilization, and spatial utilization control." Consequently, regional governments (province and district/city) are required immediately to formulate/revise and synchronize their general spatial plan along with specific spatial plans.

As one of the instructions of the Law and to set up the nation-wide spatial management, Government has enacted Government Regulation No. 26 of 2008 concerning National General Spatial Plan as the base for the spatial planning in Indonesia, by which Mamminasata Urban Area is designated as one of national strategic areas (KSN), which requires Presidential Regulation to stipulate spatial management of Mamminasata Urban Area.

In addition, Government Regulation No. 15 of 2010 concerning Implementation of Spatial Management has been enacted in 2010 as the implementing procedure of spatial management, which aims to realize the order of spatial management implementation, provide legal certainty to all stakeholders in regards to carry out the tasks and responsibilities as well as its rights and obligation in the implementation of spatial management, and realize a justice for all stakeholders in the whole aspects of spatial management implementation.

And finally, Presidential Regulation No. 55 of 2011 concerning Spatial Plan of Makassar, Maros, Sungguminasa, and Takalar (Mamminasata) Urban Area has been enacted in September 2011 as the legal umbrella for spatial management, which serves as operational tool of national general spatial plan and as coordination tools of development implementation in Mamminasata area and has function as guidance for:

a. Formulation of development plan in Mamminasata urban area;
b. Spatial utilization and control over spatial utilization in Mamminasata urban area;
c. Realization of and integration, synchronization and balance of development among district/city, as well as harmony among sectors in Mamminasata area
d. Stipulation of location and spatial function for investment in Mamminasata area;
e. Provincial and district/city spatial management in Mamminasata area;
f. Management of Mamminasata area;
g. Realization of integration of Mamminasata area development and its surroundings.

[1] According to Presidential Regulation No. 55 of 2011, Mamminasata is clarified as "Urban Area". Since "Metropolitan Area" had been used widely by stakeholders to describe Mamminasata prior to stipulation of the Presidential Regulation, Metropolitan Area is used for some legal bases issued before the Presidential Regulation is enacted.

For the smooth and efficient urban development management in Mamminasata Metropolitan Area, in 2003 government of South Sulawesi Province established a functional organization so-called Mamminasata Metropolitan Development Cooperation Board (hereinafter referred to as MMDCB) to take care of coordination aspects of Mamminasata. For operational aspects, in 2009 the Government of South Sulawesi Province has also established UPTD (Technical Implementing Unit) for Mamminasata under Dinas of Spatial Planning and Settlement of South Sulawesi Province.

Due to its status as the national strategic area, central government has established central government working unit in the region which is so called SNVT for KSN of Mamminasata Urban Area, hereinafter referred to as SNVT Mamminasata[2], for smooth implementation of national programs in South Sulawesi Province.
For effective and efficient implementation of spatial management, UPTD Mamminasata, BKSPMM and SNVT Mamminasata with support of JICA Technical Cooperation Project have prepared Manual on Spatial Management Information System.

Spatial information system is an effort to direct the progress of information technology in an efficient implementation of spatial planning and integrated in Mamminasata Urban Area. The availability of this system is implemented is crucial to the performance of the implementation of improved spatial development and implementation can be run in accordance with regulations stipulated in Law No. 26 of 2007, Article 55 paragraph 2 of the act of monitoring, evaluation, and reporting of the implementation of spatial planning. One way in preparing the spatial information system is to utilize the technology of Geographic Information Systems (GIS). GIS is a specialized information system that manages data that have spatial information (spatial referenced).

Concerned officials are expected to understand the function of spatial planning and the benefits of GIS especially in spatial planning, organizing and controlling the utilization of space. Mastery of GIS technology is very important because it can support all the activities, especially in information management and spatial analysis.

[2] SNVT KSN for Mamminasata Urban Area has been established in 2011 as the extension of central government (Directorate General of Spatial Planning, Ministry of Public Works) and there is a possibility for the change of the title depending on requirement and condition

2. Purpose of Manual

This manual is an attempt to provide the hand-note for local government officers, who are in charge of the spatial management, particularly in the field of "information management (guidance)", covering (i) Development of information and communication system of spatial management and (ii) Dissemination of information of spatial management to public.

This manual is composed of (1) GIS operational procedure and (2) Database management system. GIS operational procedure highlights ArcGIS operation and GPS use, and Database management system highlights database structure, management procedure, spatial utilization control, supervision for management of Mamminasata Metropolitan Area.

Provincial government and district/city governments will refer to the Manual for implementation of Mamminasata Urban Area including for planning, for development control, for a variety of analysis, and sharing data among stakeholders.

Part II : GIS Operational Procedure

1. GIS Concept

1.1. Introduction

Geographic Information System (GIS Called next) is a computer-based information system used for processing and storing data or geographic information (Aronoff, 1989).
In general terms GIS as follows: "A component consisting of **hardware, software, geographic data and human resources** that work together effectively to enter, store, refine, update, manage, manipulate, integrate, analyze and display data in a geographically based information."
GIS is an integrated system comprising various components, not just hardware along with software alone but must be available geographic data is right and human resources to carry out its role in formulating and analyzing the issues that determine the success of GIS.

1.2. Spatial Data

Most data to be handled in a GIS is a spatial data such as a geographically oriented data, has a particular coordinate system as a basic reference and has two important parts that make it different from other data, ie location information (spatial) and descriptive information (attributes) that described below:

a. Location information (spatial), associated with a geographic coordinates of both the coordinates (latitude and longitude) and the coordinates XYZ, including datum and projection information.
b. Descriptive information (attributes) or non-spatial information, a location that has some information relating to it, for example: type of vegetation, population, area, zip code, and so forth.

1. Spatial Data Format

In a simple format in a computer language means the forms and codes of different data storage among files with one another. In GIS, spatial data can be represented in two formats, namely:

a. Vector Data
Vector data is represented to the shape of the earth in a collection of lines, areas (the area bounded by a line beginning and end at the same spot), and point nodes (a point of intersection between two lines).
The main advantage of vector data format is the accuracy in representing point features, limitations and straight lines. This is especially useful for the analyses that require precision positioning. The main weakness of the vector data is its inability to accommodate gradual changes.

b. Raster Data
Raster data (or known as grid cells) is the data generated from remote sensing systems. In raster data, geographical objects are represented as grid cell structure called a pixel (picture element).
In raster data, resolution (visual definitions) depend on pixel size. In other words, pixel resolution describes the actual size of the earth's surface represented by each pixel in the image. The smaller size of the land surface is represented by a single cell, the higher resolution. Raster data is very good to represent the boundaries of gradual change, such as soil type, soil moisture, vegetation, soil temperature and so forth. The main limitation of raster data is the large file size, the higher the resolution of its grid, the

greater the file size and is very dependent on the available hardware capacity.

2. Spatial Data Source

GIS is one of the requirements of spatial data, which can be obtained from several sources, among others:

a. Analogue Map
An analogue map (including topographic maps, soil maps, etc.) that is in the form of printed maps. In general, the analog maps are made with techniques of cartography, likely has a spatial reference as the coordinates, scale, cardinal directions, and so forth.

b. Remote Sensing System Data
Remote Sensing data (including satellite imagery, air photos, etc.), is the most important data source for GIS because of availability periodically and cover a certain area.

c. Field Measurement Data Results
Field measurement data generated by its own calculation techniques, in general, this data is the data source attributes examples: administrative boundaries, boundaries of land ownership, parcel boundaries, boundaries of forest concessions and others.

d. GPS Data (Global Positioning System)
GPS technology provides an important breakthrough in providing data for GIS. The higher the accuracy of GPS measurements with the development of technology. This data is usually represented in a computer format.

1.3. Map, Map Projection, Coordinate System, Survey and GPS

This spatial data is needed on the GIS can be obtained in various ways, one through the survey and mapping, determination of position / coordinate in the field. The following will be explained briefly several aspects related to the position / coordinate as well as methods to obtain the position information in the field.

a. Map

Map is a picture of some or all of the good earth that lies above and below the surface and presented on a horizontal plane at a particular scale and projection (mathematically). Because limited by the scale and projection, then the map will never be as complete and as detailed as the original (the earth), because it required simplifications and the selection of elements to be displayed on the map.

b. Map Projection

Basically, the earth is not flat but rounded approach to describe some of the earth for the sake of making a map, the steps necessary to form a rounded approach can be leveled and the distortion can be controlled, for it is projected onto a flat surface.

1) Grouping Map Projection

a) Originally based Nature Preserve
1. The surface area is fixed (equivalent)
2. Fixed form (conform)
3. A fixed distance (equidistance)

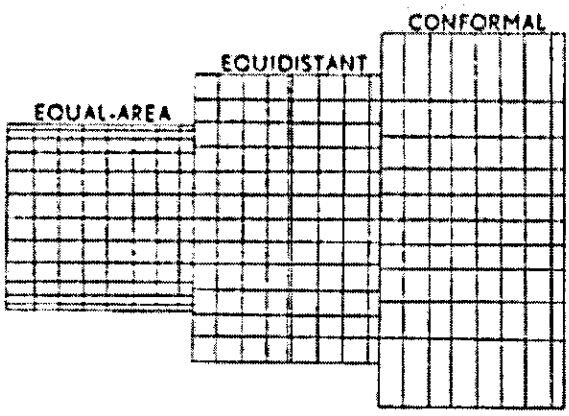


Figure 1. Comparisons of the same region for different projections

b) Used By Field Projection
1. Plane
2. Field cone
3. Cylindrical field

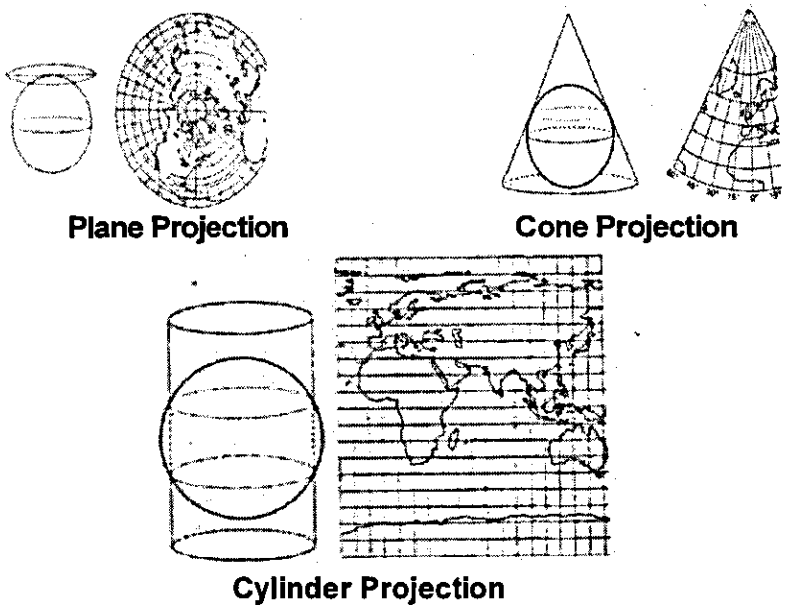


Figure 2. Projection types

2) Universal Transverse Mercator (UTM) Projection
UTM projection was made by the U.S. Army circa 1940s. Since then this becomes the standard projection for topographic mapping.

a) UTM Projection properties

1. This projection is the Transverse Mercator projection intersecting the sphere at two meridians, which is called the standard meridian. Meridian in the central zone is called central meridian.
2. Area between two meridians is called zone. Zone width is 6 so that the globe is divided into 60 zones.
3. Magnification at the center meridian is 0.9996.
4. Magnification at the standard meridian is the one.

5. Magnification at the edge of the meridian was 1.001.
6. Units of measurement used are meters.

b) UTM Coordinate System

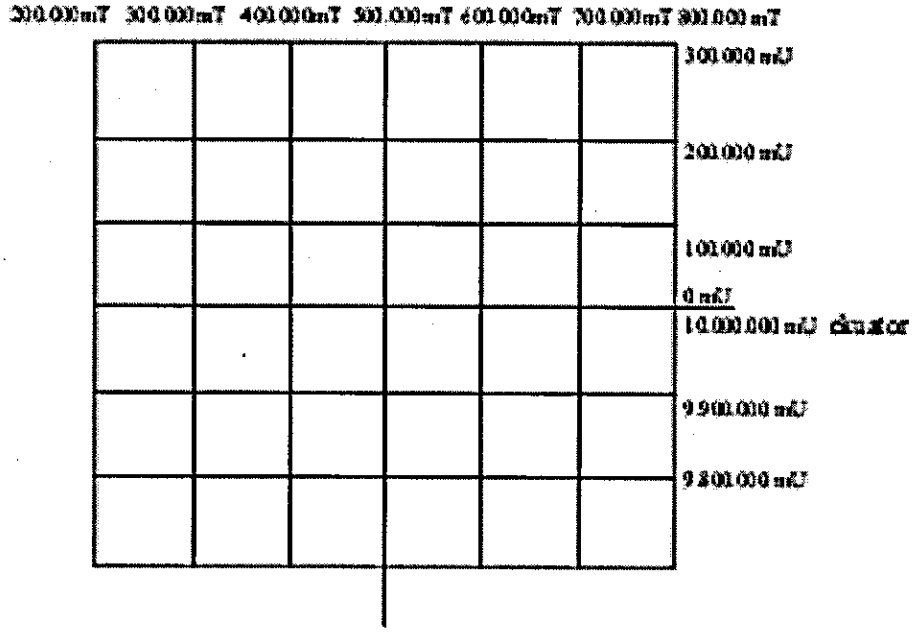


Figure 3. UTM coordinate system

To avoid negative coordinates in UTM projection center of each meridian in each zone will be priced 500 000 mT (meters east). For prices to the north, the equator is used as a datum line and were priced 0 mU (meters north). To calculate the direction south of the equator are priced 10 million mU

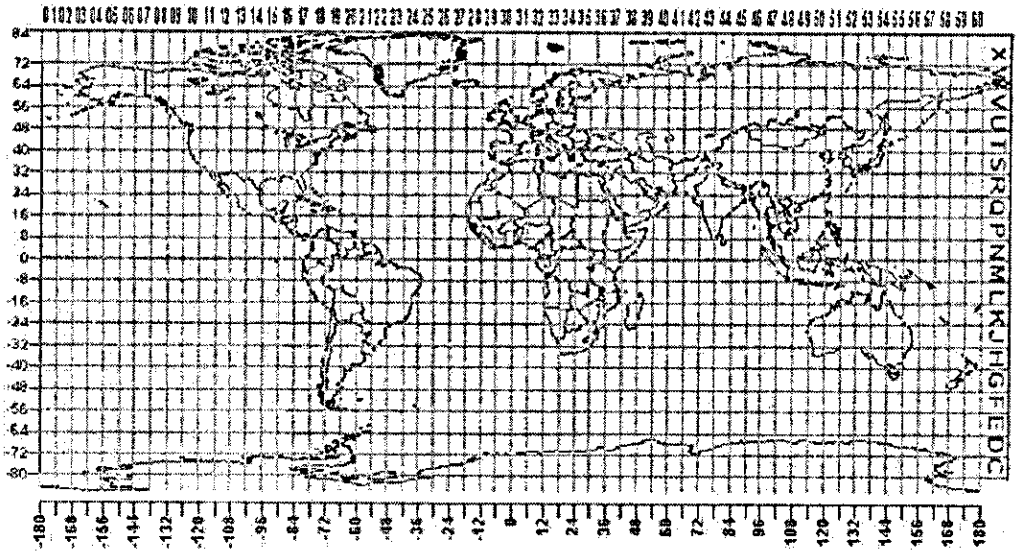


Figure 4. Datum line

Indonesia area (90° – 144° BT and 11° LS – 6° LU) is divided into 9 UTM zones, and thus Indonesian area starts from zone 46 to zone 54 (central meridian of 93° – 141° BT).

c) Positioning Method

Positioning method is a way to get information on the coordinates of an object (e.g. the coordinates of border points, the coordinates of land parcel boundaries, etc.) in the field. Positioning methods can be divided into two parts, namely terrestrial positioning methods, and methods for position determination of extra-terrestrial (satellite).

c. Coordinate System

Point position is usually expressed by coordinates (two-dimensional / three-dimensional), which refers to a particular coordinate system. Coordinate system itself can be defined by three parameters menspesfikasi follows, namely:

1) Zero Point Location of Coordinate Systems

The position of a point on the earth surface is generally set in / on a terrestrial coordinate system. The zero point of the terrestrial coordinate system can be located in the center of mass of the Earth (Geocentric coordinates coordinate system), and at one point on the earth's surface (the topocentric coordinate system).

2) The orientation of the axis-axis Coordinates

The position of the three-dimensional (3D) of a point on the earth surface is generally expressed in a coordinate system Geocentric coordinates. Depending on the parameters used definition of coordinates, known as the two coordinate systems in common use, namely the Cartesian coordinate system (X, Y, Z) and Geodetic coordinate system (L, B, h). Both are illustrated in the following figure:

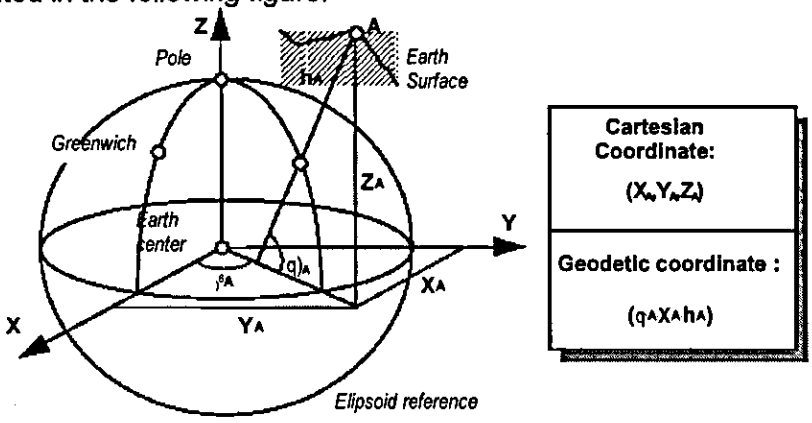


Figure 5. Illustration of cartesian and geodetic coordinate system

3D coordinates of a point can also be expressed as a topocentric coordinate system, which is generally in the form of the Cartesian coordinate system (N, E, U) is illustrated in the following figure.

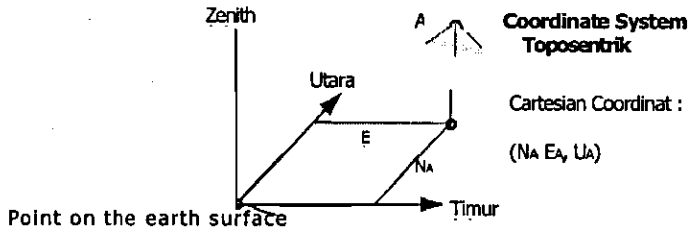


Figure 6. Illustration of 3D coordinates form of the cartesian coordinate system

Parameters - parameters (Cartesian, curvilinear) used to define the position of a point in the coordinate system. Point position can also be expressed in 2D, both in the (L, B), or in a specific projection system (x, y) such Polyeder, Traverse Mercator ™ and Universal Traverse Mercator (UTM).

d. GPS Method (GPS)

GPS is navigation and positioning systems using satellites, developed and managed by the United States Department of Defense. GPS can provide information about the position, velocity and time anywhere on earth at any time, with positioning accuracy within fractions of millimeters to meters. Capabilities range covers the whole world and can be used a lot of people at any time at the same time (Abidin, HZ, 1995). The basic principle of positioning with GPS is the intersection to the rear with simultaneous measurement of the distance to GPS satellites such as the following picture:

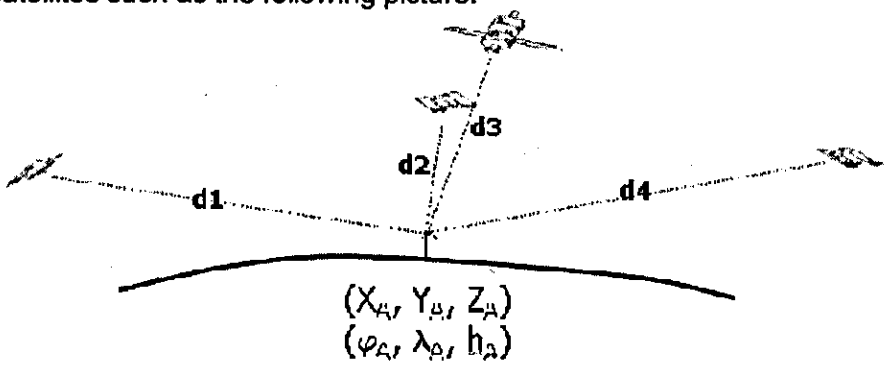


Figure 7. Basic principle of positioning with GPS

1) GPS System

To be able to implement the principle of determining the position of the above, the GPS is managed in a GPS system which consists of three major parts, namely part of space, the controller and the user, such as the following picture:

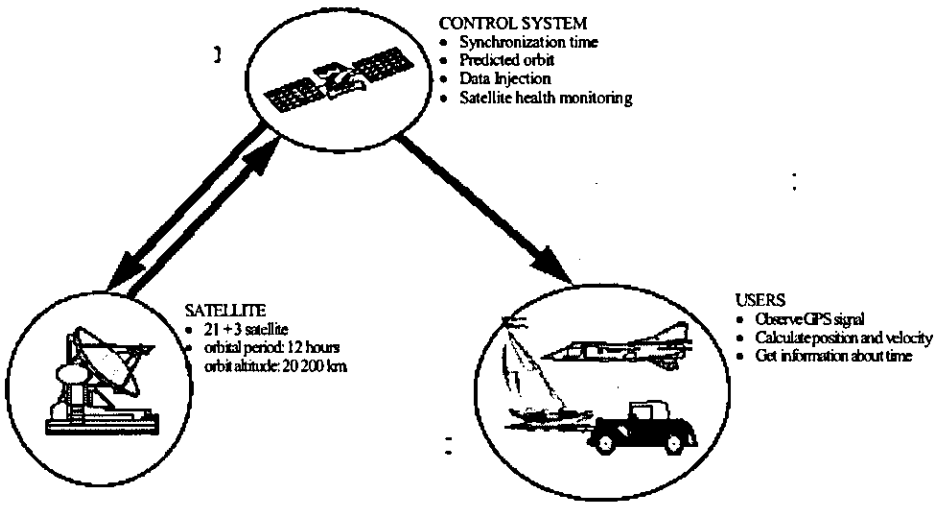


Figure 8. Three major parts of GPS system

a) Aerospace Parts

Consists of the GPS satellites orbiting around the earth, the number of GPS satellites is 24 pieces. GPS satellites orbiting around the earth in six areas of the orbit with an average height of each satellite ± 20 200 km from the surface of the earth.

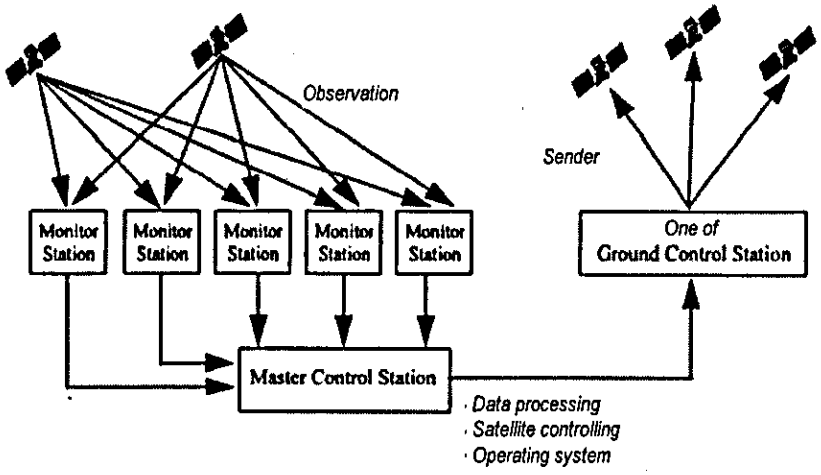


Figure 9. Constellation of satellites in space

Each GPS satellite transmits continuous wave signals at two L-band frequencies (called L1 and L2). By observing the signals from satellites in the number and sufficient time, then the data received can be computed to obtain position information, speed and time.

b) Control Section

Are satellite stations monitors and controllers whose function is to monitor and control the feasibility of GPS satellites. This control stations scattered throughout the world, namely on the island of Ascension, Diego Garcia, Kwajalein, Hawaii and Colorado Springs. In addition to monitor and control all satellite functions, also serves to determine the orbits of all GPS satellites.

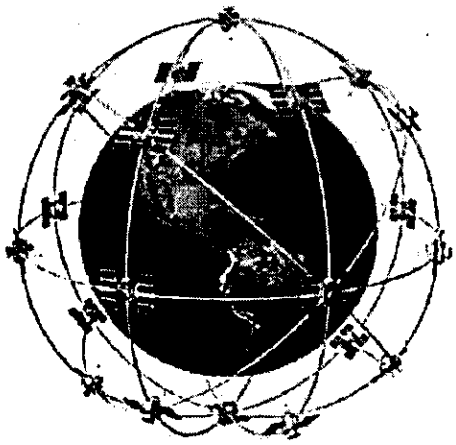


Figure 10. Satellite stations monitor and controller

c) User Section

This Is the equipment (GPS receiver) used GPS satellite users, whether on land, sea, air or in space. GPS receiver (GPS receiver) is required to receive and process signals from GPS satellites to be used in determining the position, velocity, and time.

In general, GPS receivers can be classified as follows:

- Military Receiver
- Navigation type receiver
- Geodetic type receivers

2) Methods Positioning with GPS

Basically, the basic concept of satellite positioning with GPS is binding to the back with the distance, which measures the distance to several satellites to GPS coordinates are known. Consider the following picture:

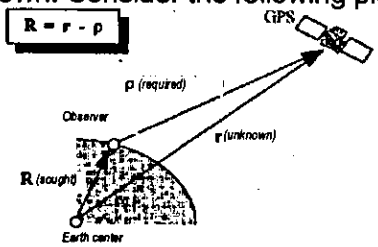


Figure 11. Basic Principles of Positioning with GPS

Positioning with GPS can be classified on several methods including: Methods of absolute and relative methods (differential).

a) Methods of Absolute

With GPS positioning method is the determination of absolute position using only one GPS receiver equipment. Characteristics of absolute positioning this way are as follows:

- Determined position in the WGS 84 system (towards the center of the earth).
- The principle of positioning is the intersection to the rear with the distance to several satellites simultaneously.
- Require only one GPS receiver.
- Points which determined the position can be silent (static) or moving (kinematic).

- Positioning accuracy ranging from 5 to 10 meters.
  The main application for navigation purposes, the absolute positioning method is commonly used pseudorange data and this method is not intended for applications that require high positioning accuracy.

b) Relative Methods (differential)

What is meant by the relative positioning or differential method is to determine the position of a point to another point of known coordinates, measurements were carried out simultaneously at two points within a certain time interval. Furthermore, the observation data is processed / calculated; we can extract three-dimensional Cartesian coordinate difference (dx, dy, dz) or also called the baseline between points to be measured.

General characteristic of this positioning method is as follows:

- Requires at least two receivers, one placed at the point of known coordinates.
- Point position is determined relative to a known point.
- The basic concept is the differencing process can eliminate or reduce the influence of some errors and bias.
- Can use the pseudorange or phase data.
- Positioning accuracy obtained varies from mm to dm level.
- The main applications: a survey mapping, boundary surveys assertion, geodetic survey and navigation with high accuracy.

3) Positioning Accuracy with GPS

With GPS positioning is influenced by factors as follows:

- Accuracy of data related to the type of data used, the quality of the GPS receiver, the level of error and bias.
- Satellite geometry, associated with the number of satellites observed, the location and distribution of satellite and long observations.
- Positioning method, is associated with GPS positioning method used, whether absolute, relative, DGPS, RTK and others.
- Data processing strategies, associated with real-time or post processing, and elimination strategies correction of error and bias, and smoothing of the baseline processing and network control quality.

4) GPS Applications

Some applications of GPS are as follows:

- Surveying and mapping.
- Surveys assertion administrative boundaries, mining and others.
- Geodesy, Geodynamic and Deformation.
- Navigation and transportation.
- Telecommunications.
- Troposphere and ionospheric studies.
- Land registration, Agriculture.
- Photogrametri & Remote Sensing.
- GIS (Geographic Information System).
- Marine Studies (currents, waves, tide).
- Sports and recreational applications.

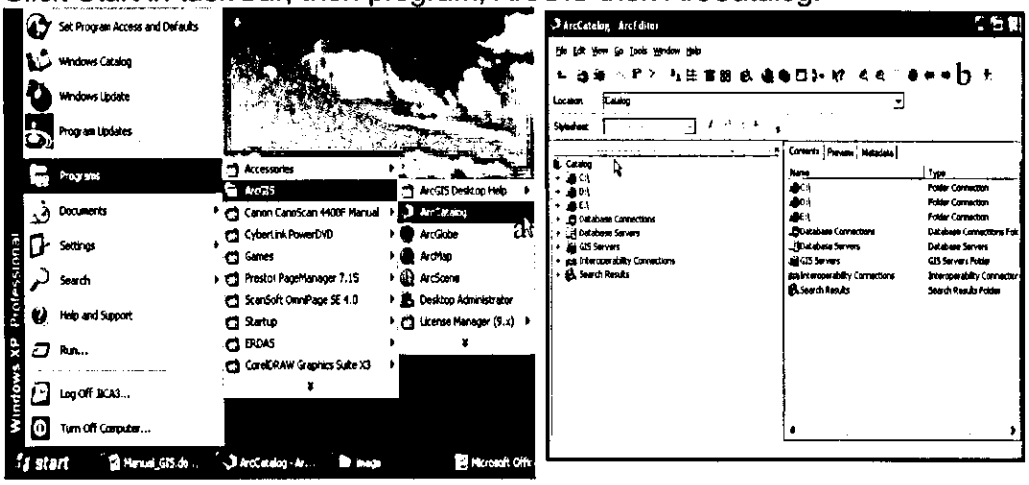
2. ARCGIS Operation (Basic 1)

2.1 Open and Draw IKONOS Data (Multi Band TIFF Data)

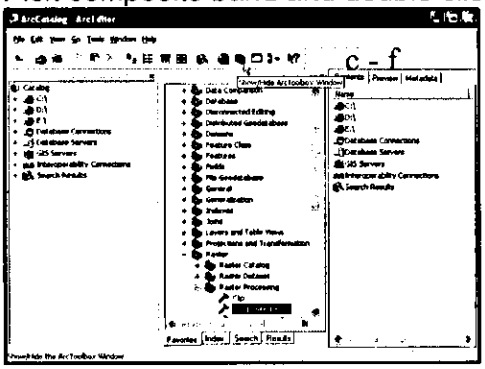
First, copy the IKONOS data in hard drive and named that folder.

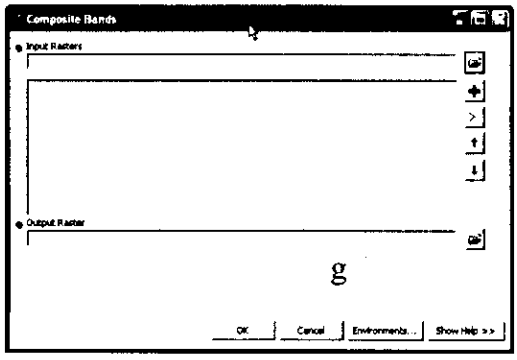
1) Open "Arc Catalog" to make composite data of IKONOS.

a. Click Start in task bar, then program, ArcGIS then ArcCatalog.



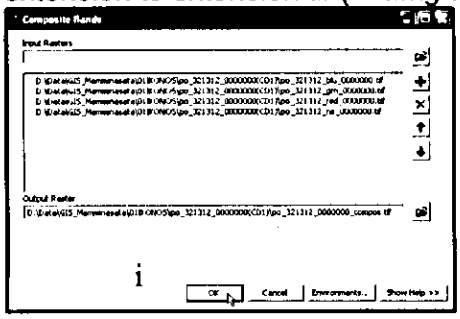
b. In ArcCatalog window, click Show/Hide ArcToolbox Window icon.
c. Find Data Management Tools and double-click.
d. Pick raster and double-click.
e. Pick raster processing and double-click.
f. Pick composite band and double click.





g. Composite band window will appear, select the location of the IKONOS data by click input raster icon.
h. Input the data according to this selection:
   1. Blue layer
   2. Green layer
   3. Red layer
   4. Nir layer

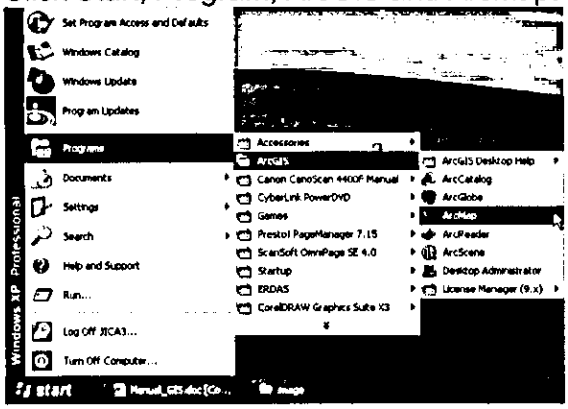
i. Change name of the file in output raster coloum and also change the file extension to extension tif (***.img to ***.tif) then click ok.

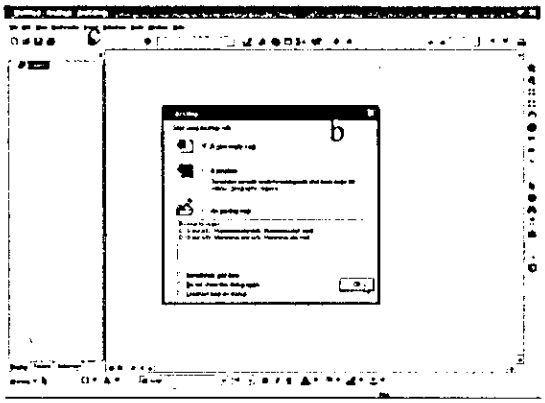


j. Wait until composite band process is finish.

2) Open ArcMap

a. Click Start, Program, ArcGIS and ArcMap.

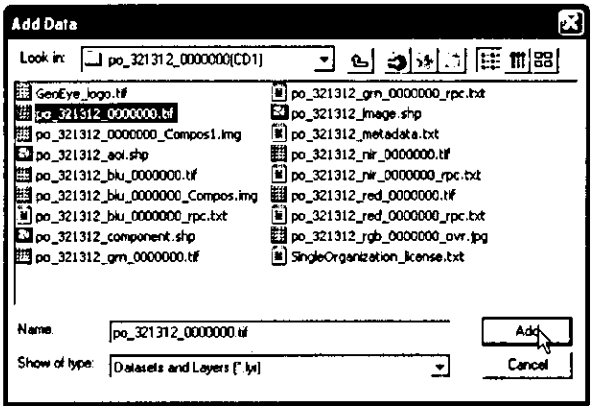




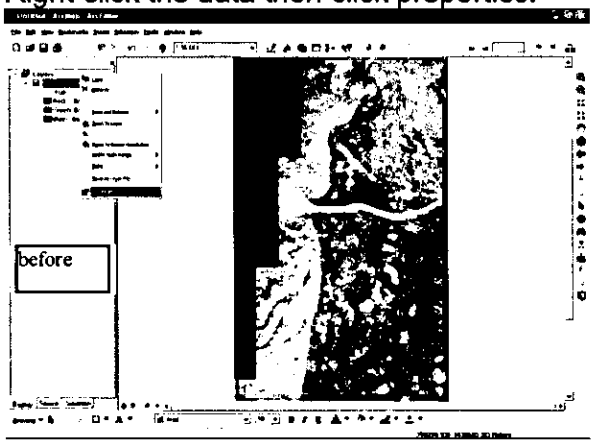
b. Click "A new empty map" then click ok.

c. Click "add data" icon. 

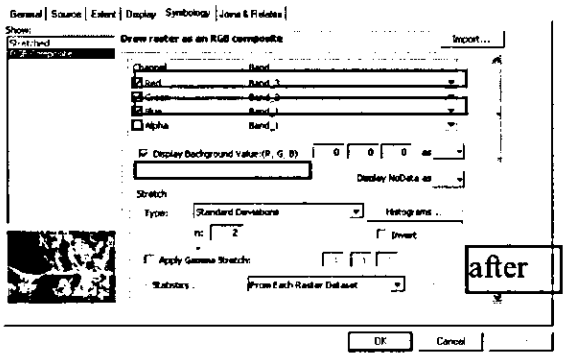
d. Find the data location and click the data (xxx.tif / xxx.lyv) then click add button.

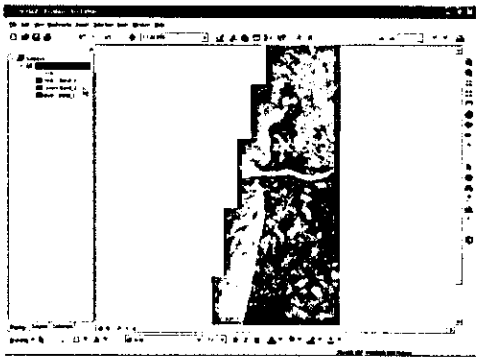


e. Right click the data then click properties.

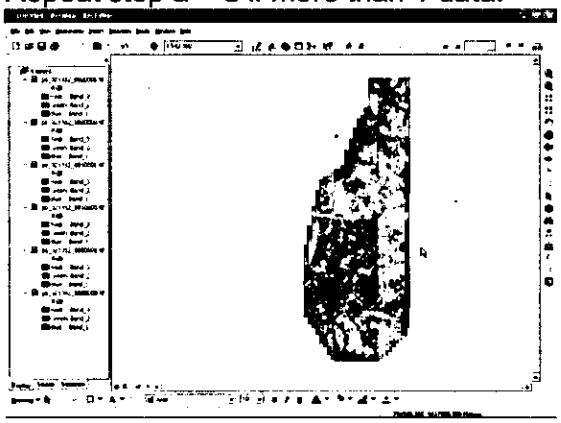


f. Then pick symbology, change red band to band 3, green band to band 2 and blue band to band 1, check display background value to no color then click ok.





g. Repeat step a – d if more than 1 data.

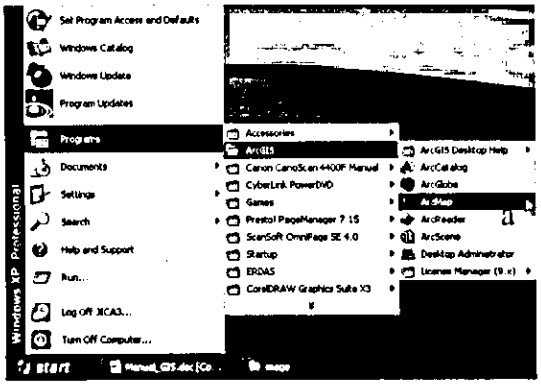


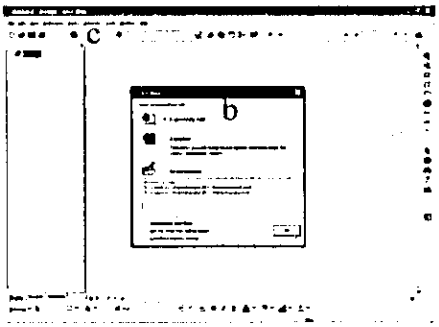
h. Save this file to your folder, click file then save or press ctrl+s and named it.

2.2 Open and Draw ALOS Data (Multi Band IMG Data)

First copy ALOS data to your folder and named it.

a. Click Start, Program, ArcGIS and ArcMap.





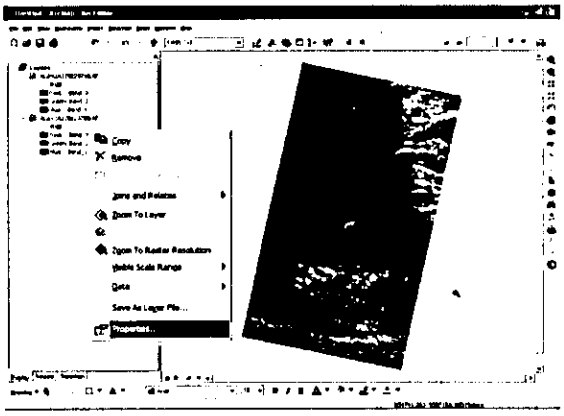
b. Click "A new empty map" then click ok.

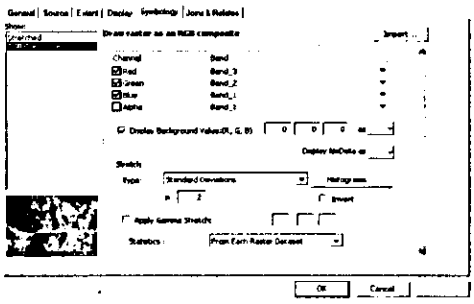
c. Click "add data" icon. 

d. Find the data location and click the data (xxx.tif / xxx.lyv) then click add button.

e. Right click the data then click properties.

f. Then pick symbology, change red band to band 3, green band to band 2 and blue band to band 1, check display background value to no color then click ok.





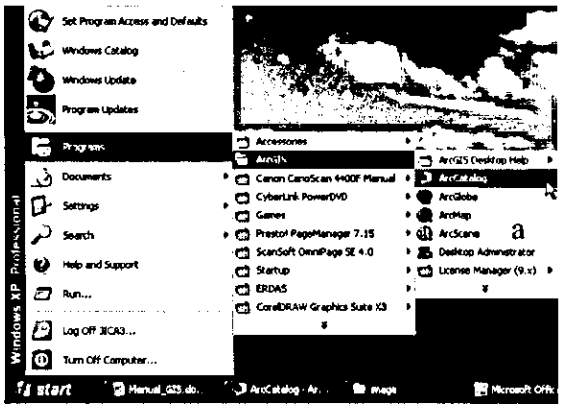
g. Repeat step c – f if more than 1 data.

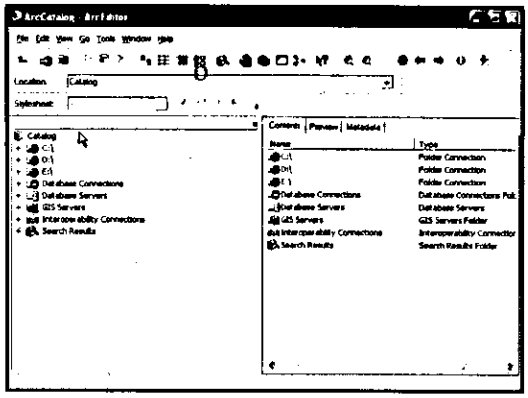
h. Save this file to your folder, click file then save or press ctrl+s and named it.

2.3 Open and Draw LANDSAT Data (Multi Band TIFF Data)

First, copy the LANDSAT data in hard drive and named that folder. Open the Arc Catalog to make composite LANDSAT data.

a. Click Start in task bar, then program, ArcGIS then ArcCatalog.





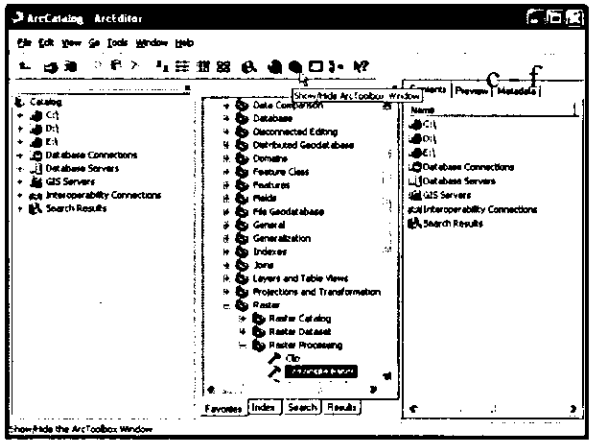
b. In ArcCatalog window, click Show/Hide ArcToolbox Window icon.

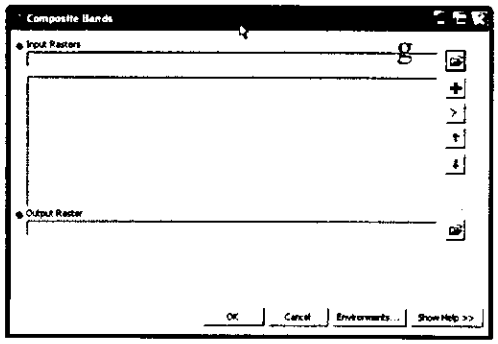
c. Find Data Management Tools and double-click.

d. Pick raster and double-click.

e. Pick raster processing and double-click.

f. Pick composite band and double click.



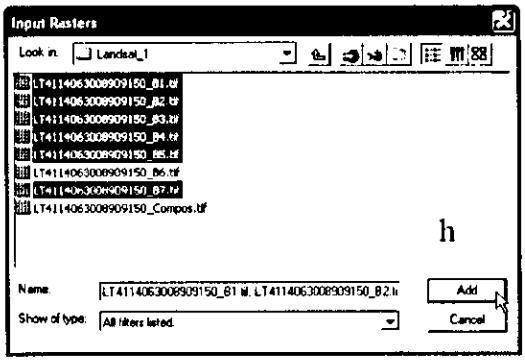


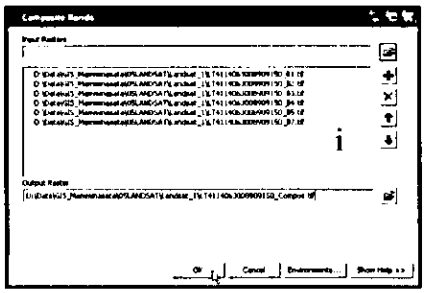
g. Composite band window will appear, select the location of the LANDSAT data by click input raster icon.

h. Input the data according to this selection:

1. B1	4. B4
2. B2	5. B5
3. B3	6. B7

i. Change name of the file in output raster column and also change the file extension to extension tif (***.img to ***.tif) then click ok.

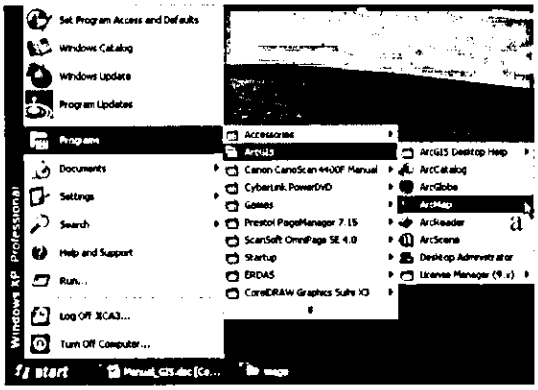


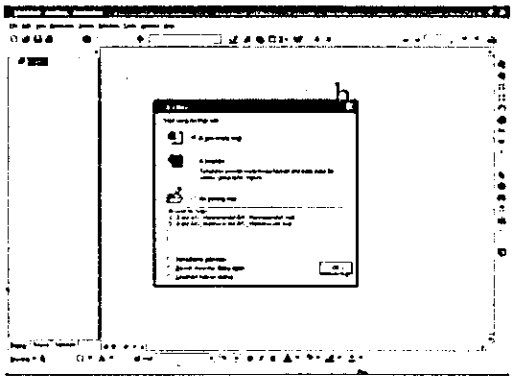


j. Wait until composite band process finish.

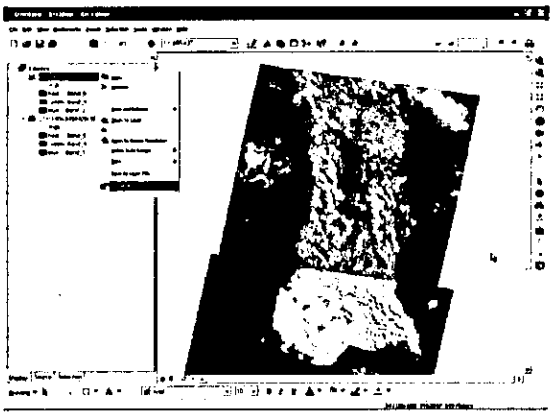
2.4 Open ArcMap

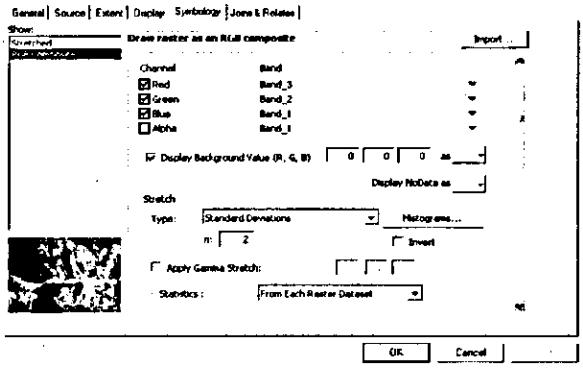
a. Click Start, Program, ArcGIS and ArcMap.
b. Click "A new empty map" then click ok.





c. Click add data icon. 
d. Find the data location and click the data then click add button.
e. Right click the data then click properties.
f. Then pick symbology, change red band to band 5, green band to band 4 and blue band to band 3, check display background value to no color then click ok.

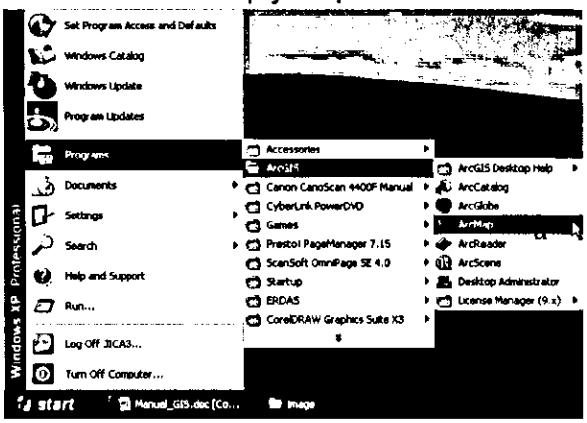


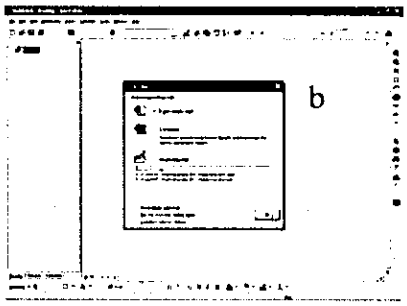


g. Repeat step c – f if more than 1 data.
h. Save this file to your folder, click file then save or press ctrl+s and named it.

2) Open and Draw GIS Data

a. Click Start, Program, ArcGIS and ArcMap
b. Click "A new empty map" then click ok.

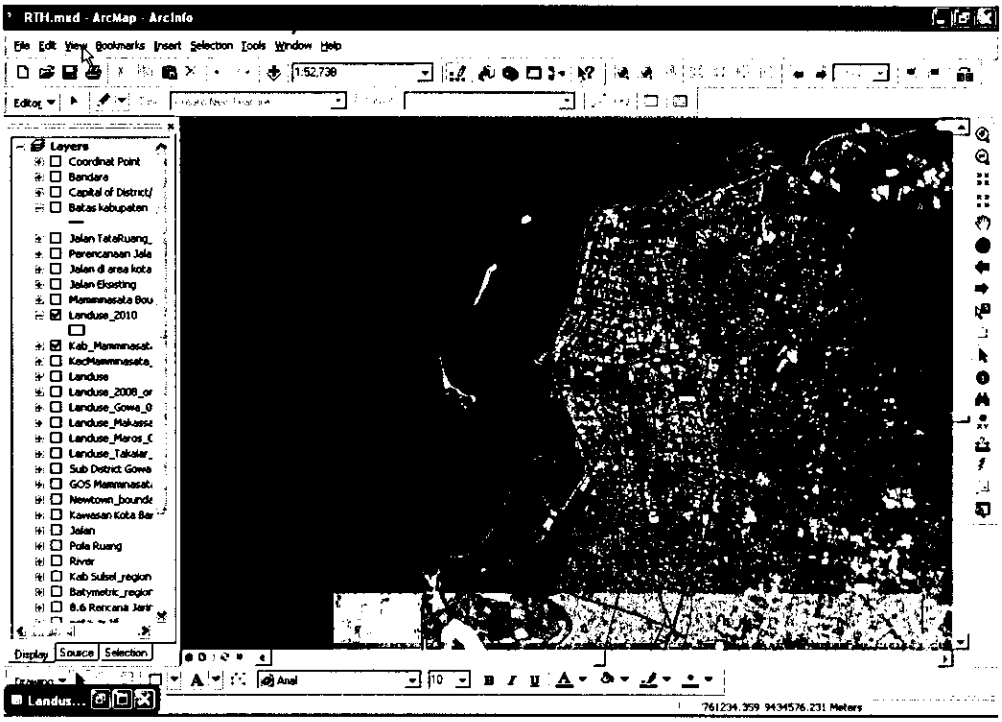




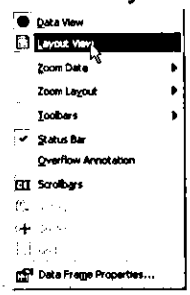
c. Select satellite imagery file / file with mxd extension(xxx.mxd) then click ok.
d. Select the file and click ok.
e. Then input the other data with shape extension "shp" (*.shp).

2.5 Arrange Thematic Map Layout

a. Click View in toolbar.

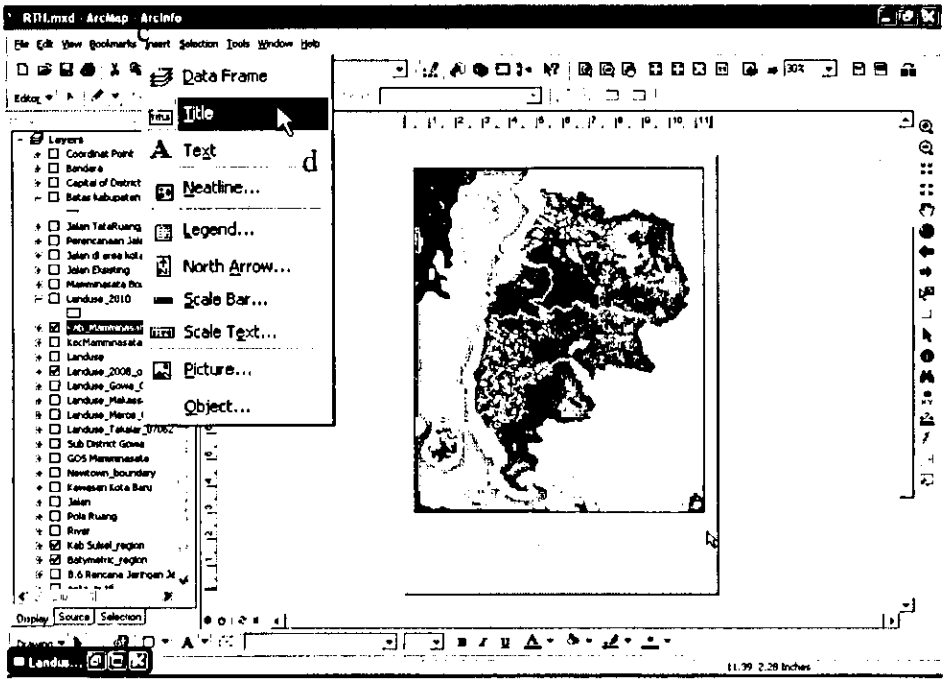


b. Click Layout View.

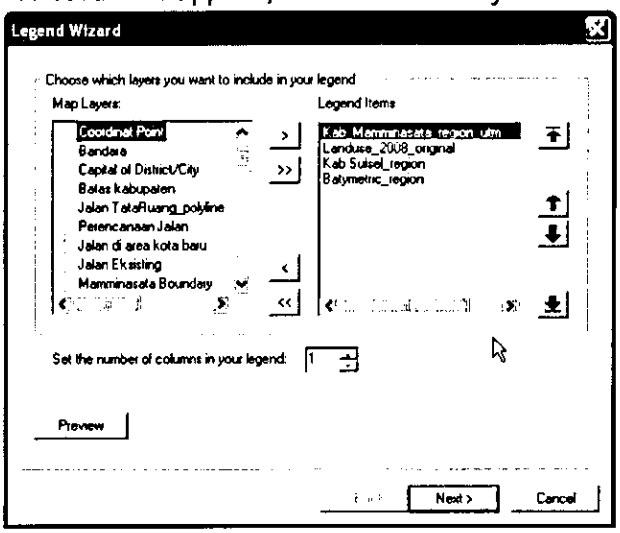


c. Then click Insert in toolbar.

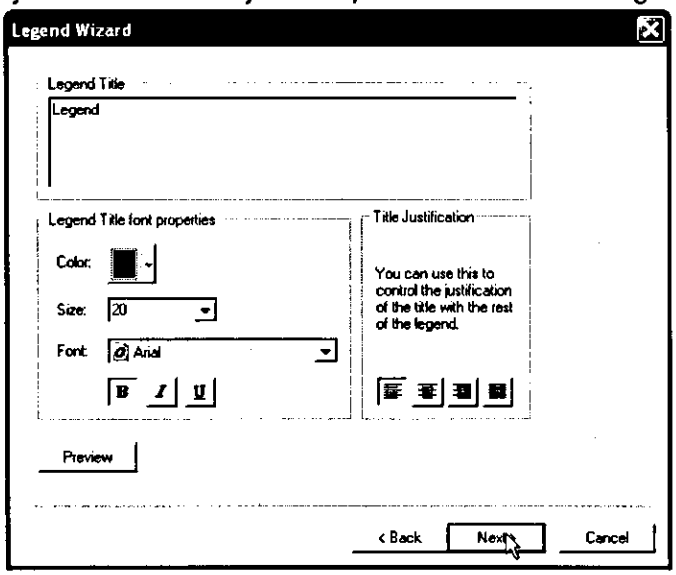
d. Click Title to enter the image title.



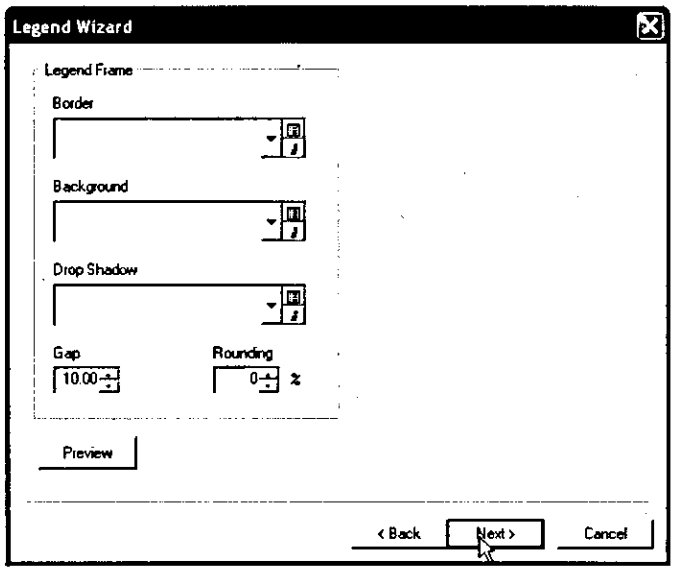
e. Click on "Legend" to enter the legend of the picture. window "Legend Wizard" will appear, and enter the layers to be displayed and click "next".



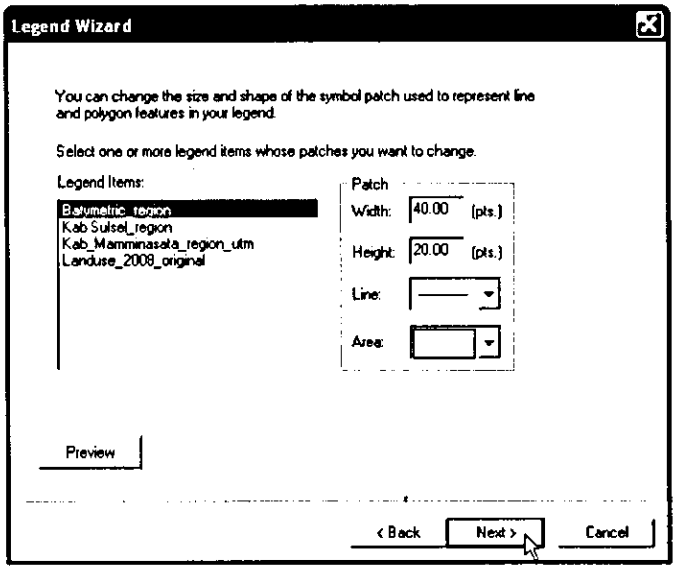
f. Fill in the "legends title" name of the legend, the column "color" to change the color, the column "size" to change the font size, column "title justification" to adjust the position title for the legend. Then click "next".



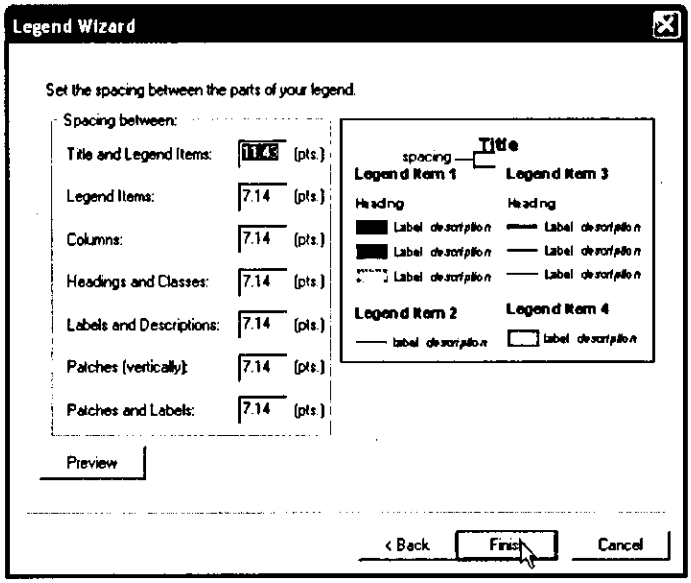
g. For the "Legend frame", the "border" coloumn to enter the line to legend, the "background" coloumn to include background color, the "drop shadow" to include the background image, column "gap" to include the value of the distance between. Then click "next".



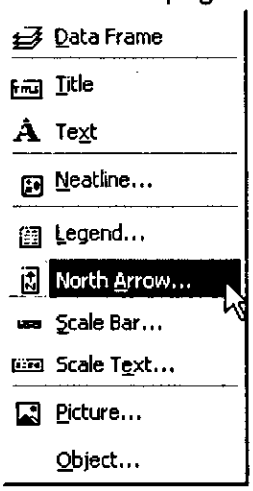
h. Furthermore, this section to change the size and shape of the symbol layer that is used to indicate the feature lines and polygons in the legend. Then click "next".

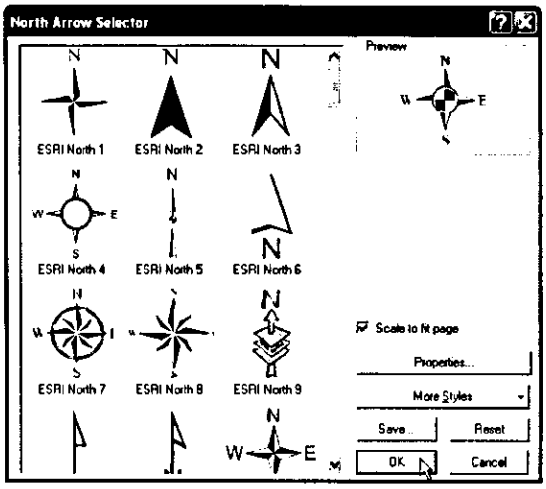


i. Next, adjust the spacing between the parts of the legend (title, items, columns, letterhead, labels and symbols layer). Then click "Finish".

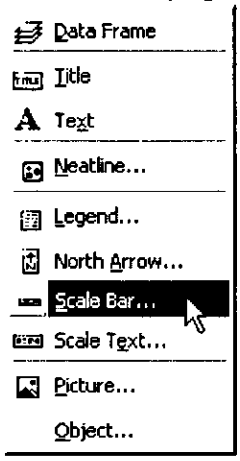


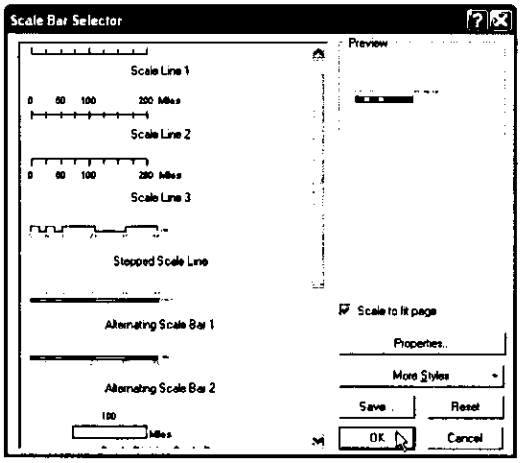
j. Click the "North Arrow" to enter a pointer towards the north. In the window "North Arrow Selector", select the desired symbol north and then check "scale to fit page" and click ok.



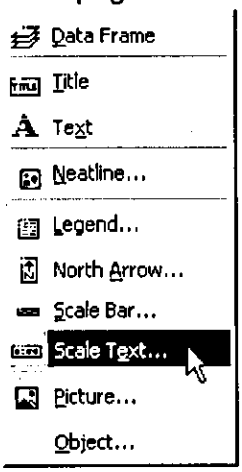


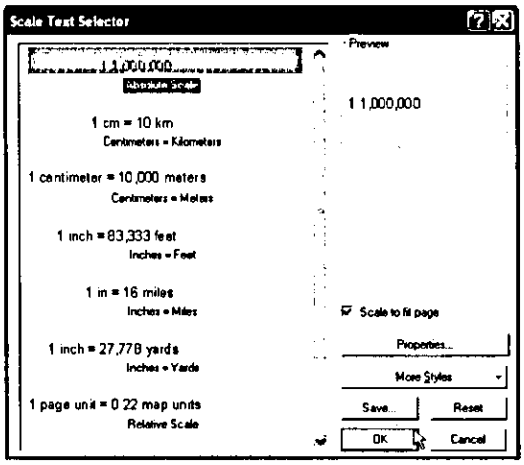
k. Click "Scale Bar" to include a scale bar for images. In the window "Scale Bar Selector", select the desired scale model of the stem and then check "scale to fit page" and click ok.



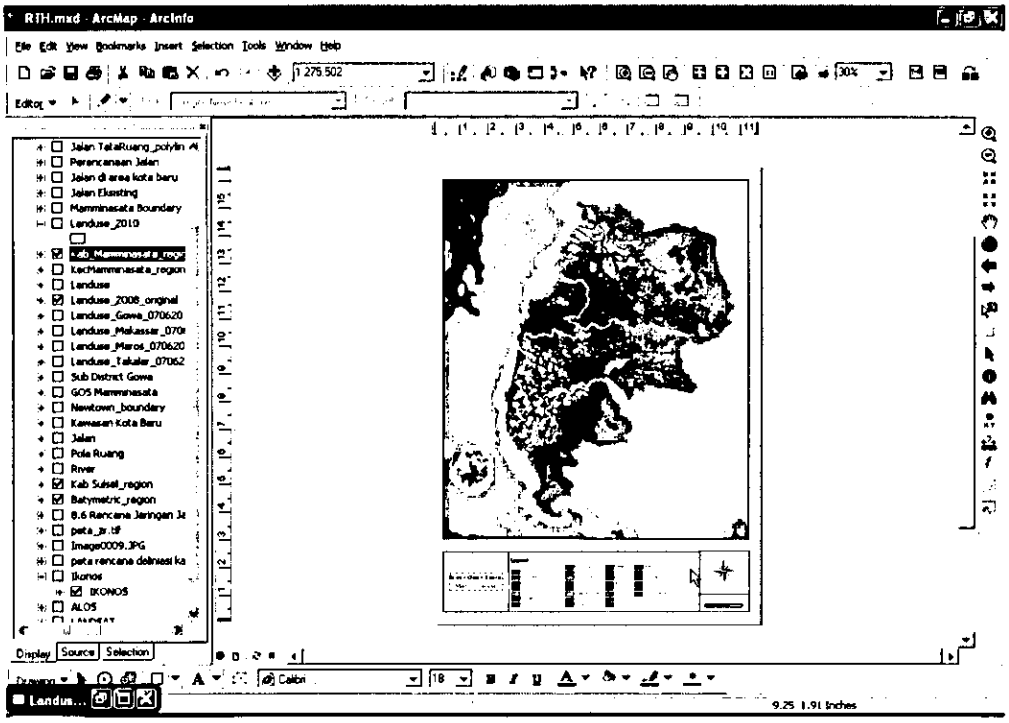


l. Click "Scale text" to include scale figures. In the window "Scale Text Selector", select the desired number of scale models and then check "scale to fit page" and click ok.





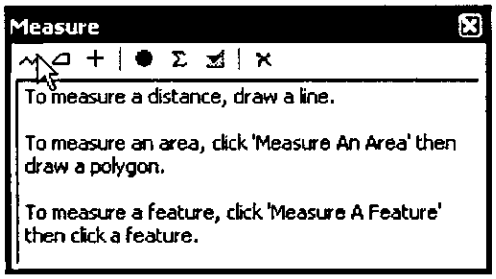
m. The end result will shown like this:



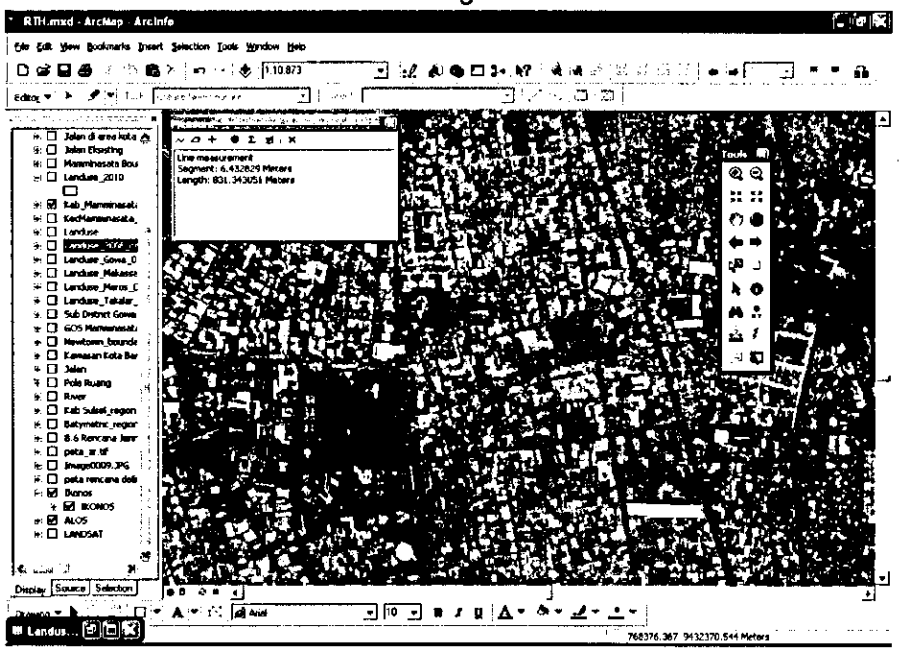
2.6 Measure Length and Area

a. Click Measure icon in Tools Toolbar.

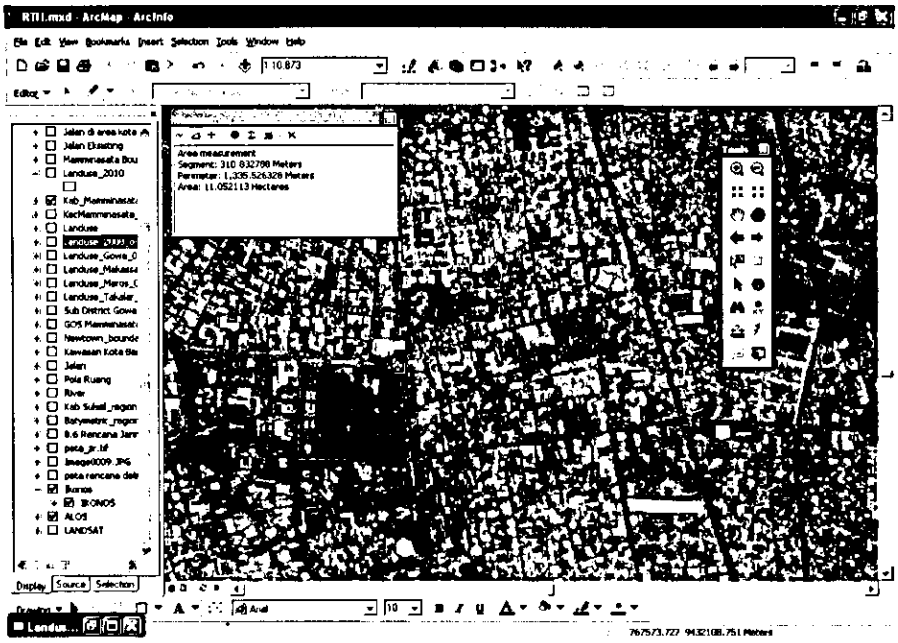
b. Measure window will open.



c. Select Measure line to measure length then click.

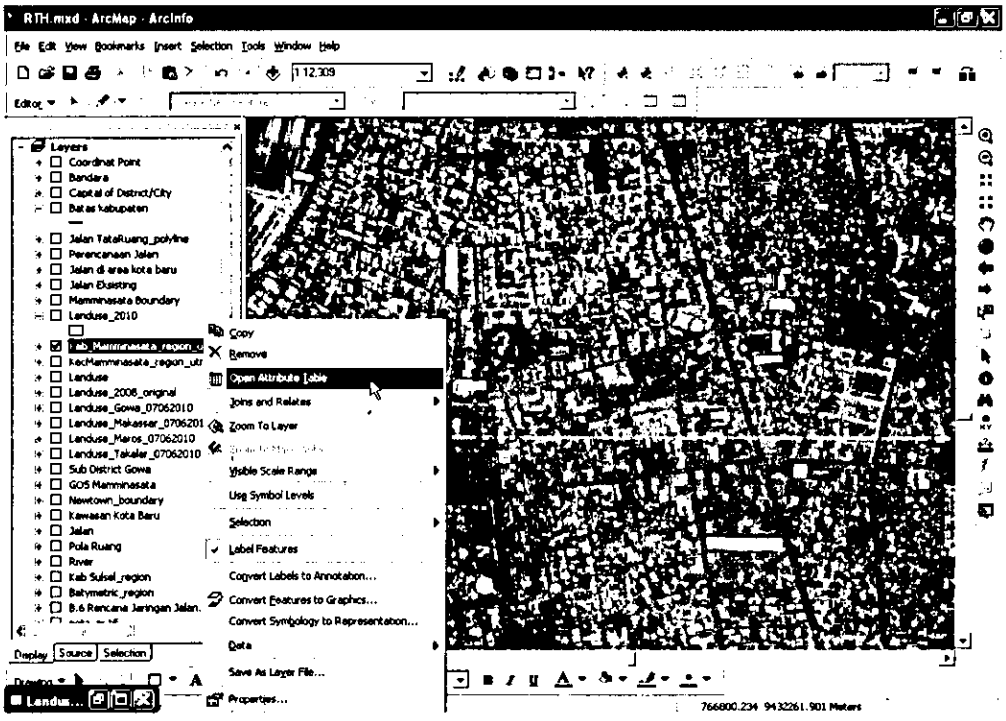


d. Select Measure An Area to measure the area then click.

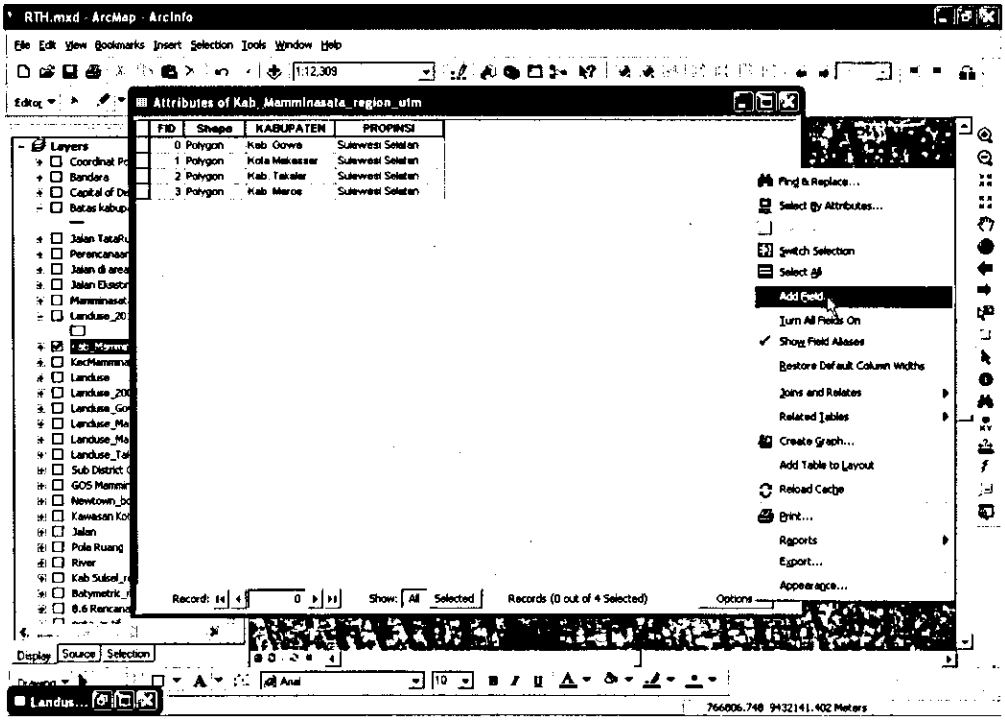


Other method

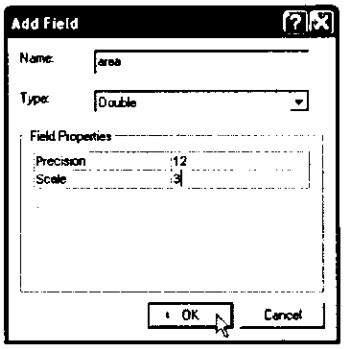
a. Open Attribute Table by right click in administration boundary layer.



b. Click Options, Click Add Field.

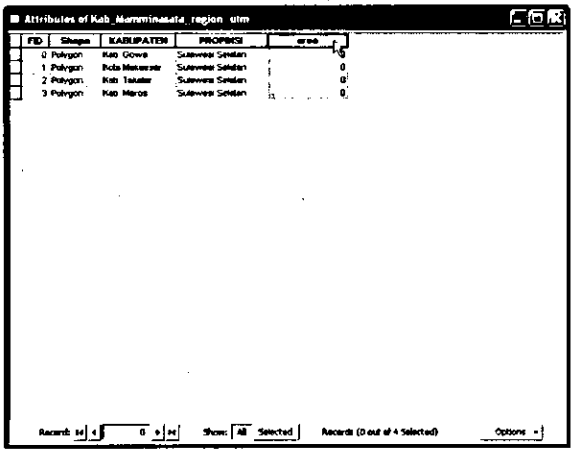


c. Fill name in name column, change the type to double then fill the precision and scale, click ok.

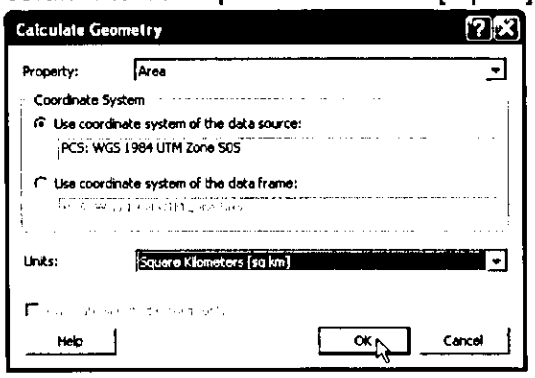


d. Right click in attribute table (name from add field).

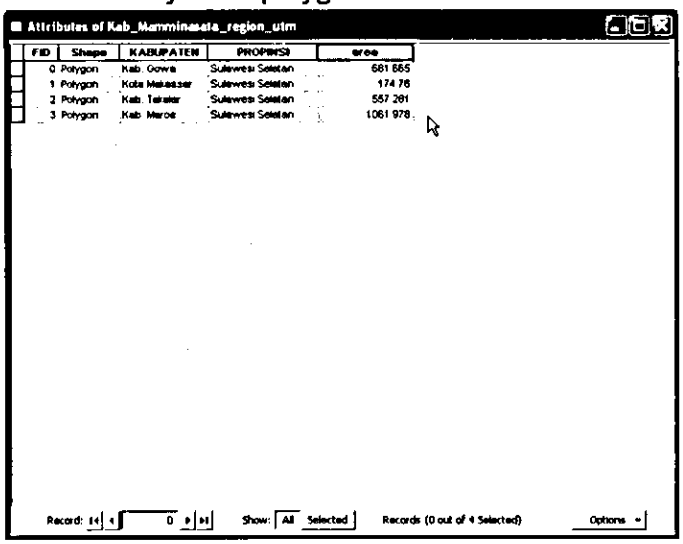
e. Click Calculate Geometry.



f. In the column property there is a column headings and replace the units column to be "square kilometers [sq km]" and click ok.

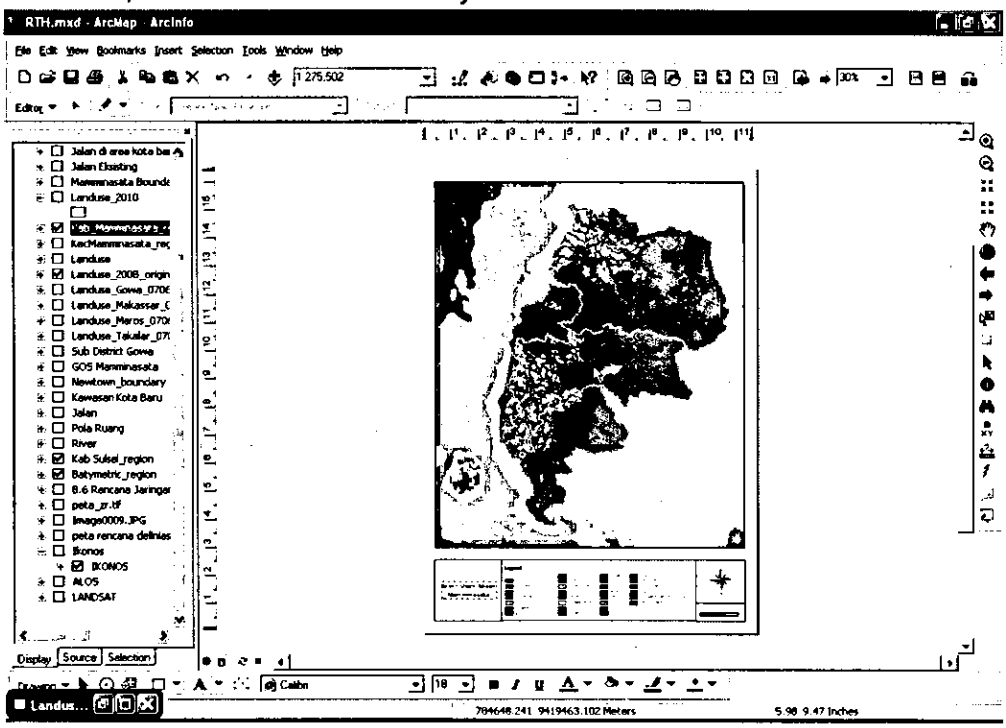


g. Automatically each polygon will be filled in column "area" with units of km2.

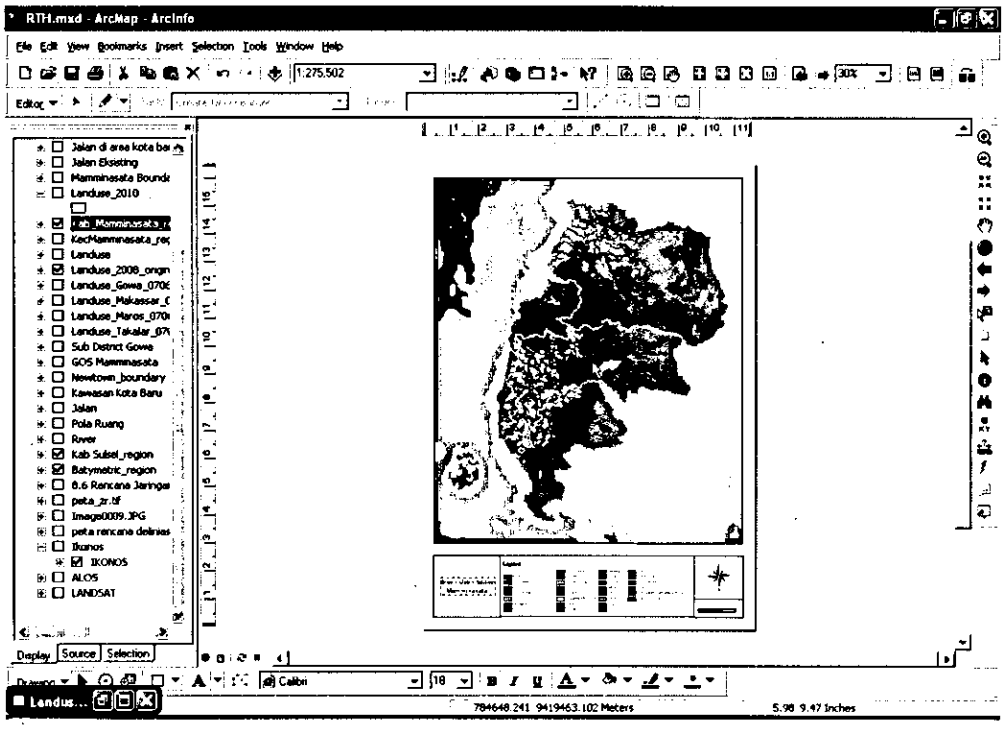


2.7 Export Image Data

a. First, arrange thematic map layout.
b. After that, click View and select Layout View then click.

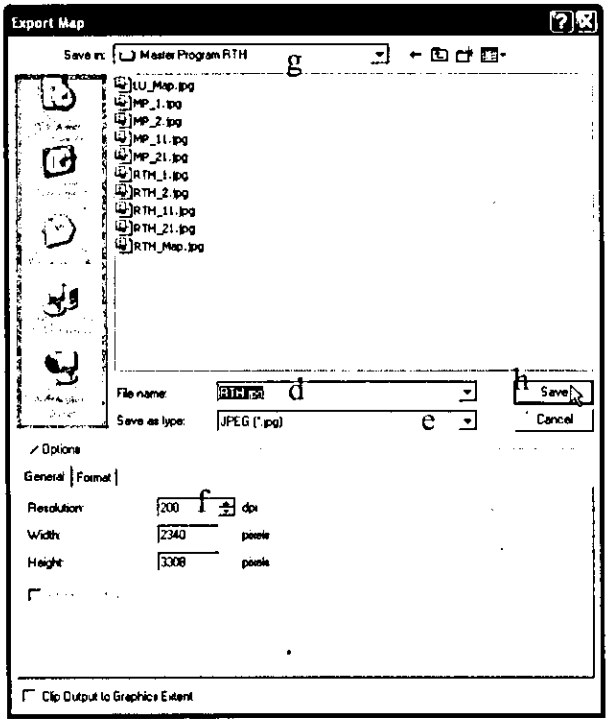


c. Click File and select Export Map..., then click.



d. Fill the name of the map in file name.
e. Change the type of the map into JPEG in save as type.
f. Change the resolution of the image to increase the quality of image.

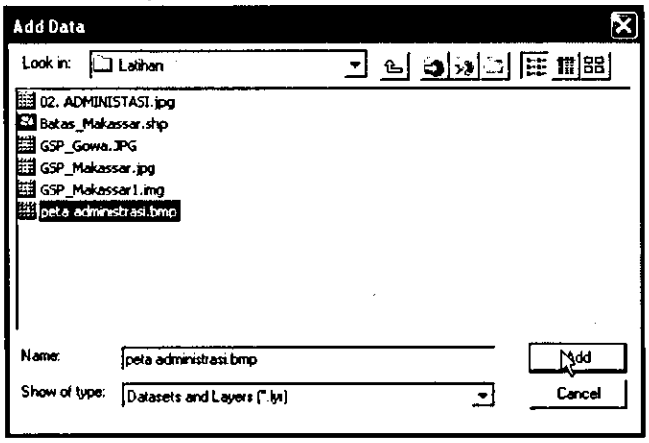
g. Then put into your folder.
h. Then click save.



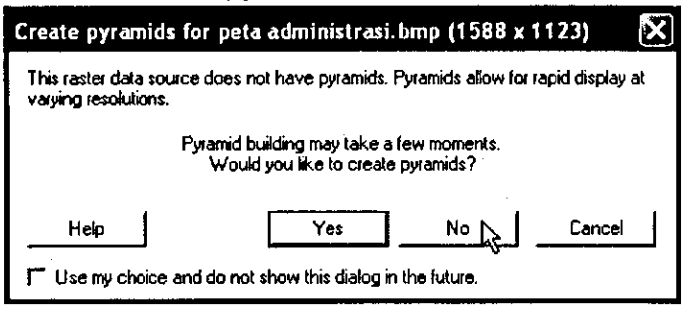
3. ARCGIS Operation (Basic 2)

3.1 Making Town/Urban Area Data

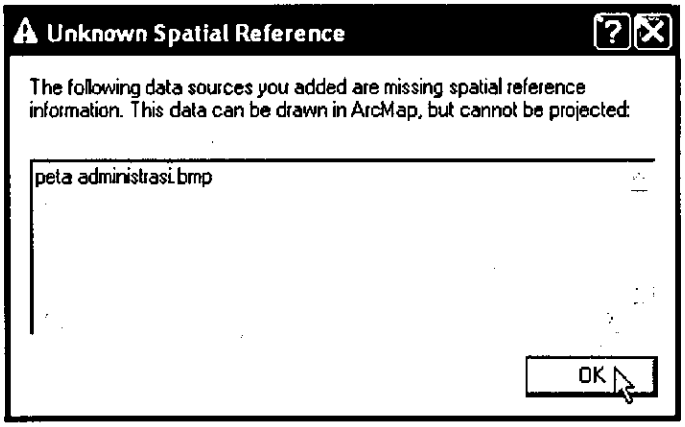
a. Click Start, Program, ArcGIS and ArcMap.
b. Click A new empty map then click ok.
c. Select and Click "add data" icon.
d. Located of the map file in folder that you want to add and click ok (for example: we use Map of Delineation Plan for Town and Village Area in Takalar District.



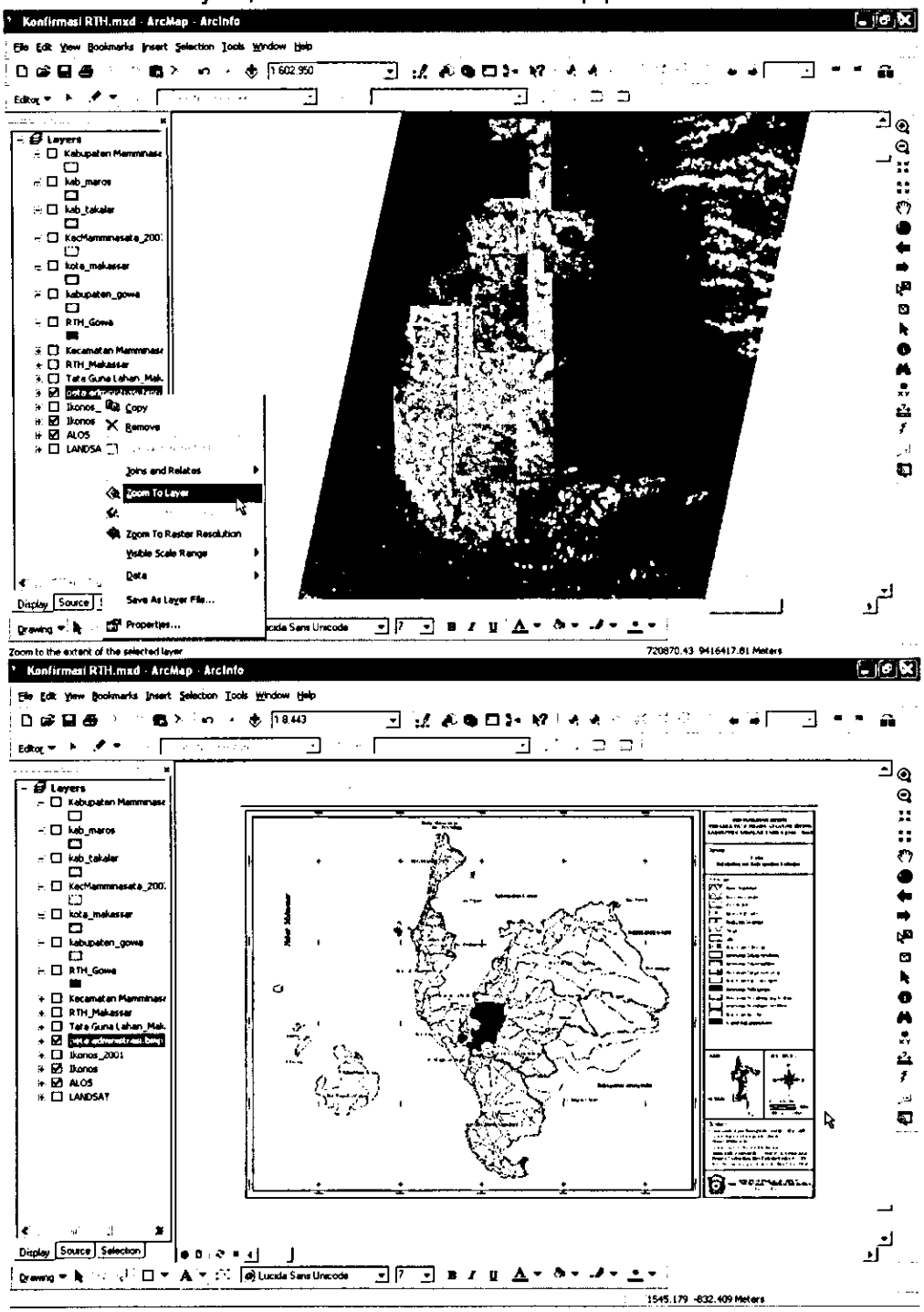
e. Window "Create pyramids for ..."will appear, click "No".



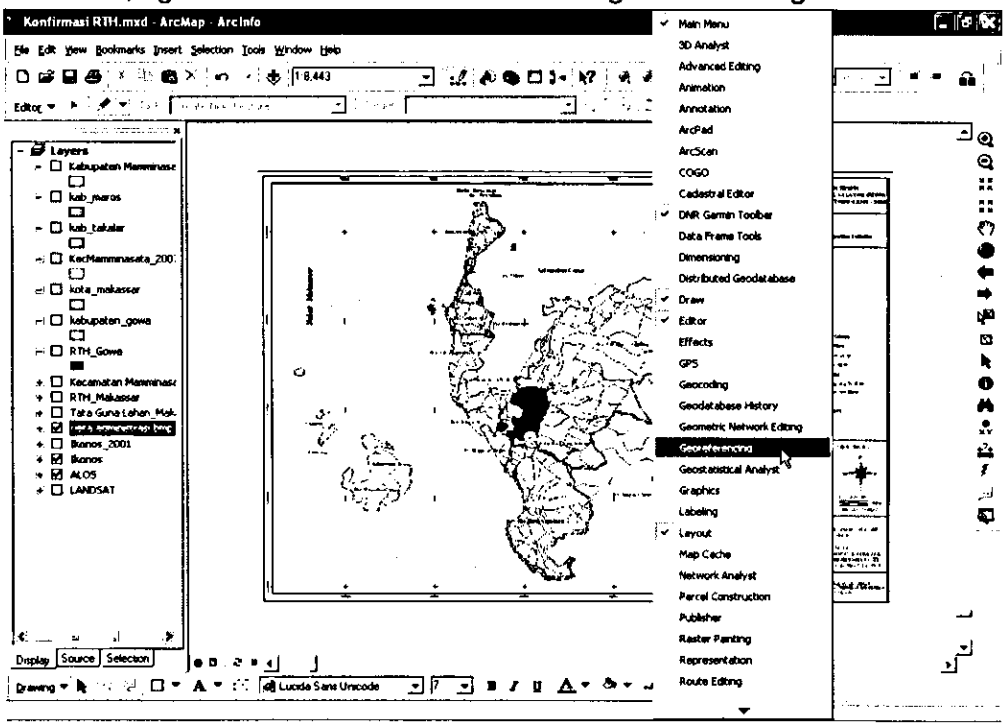
f. Then "Unknown Spatial Reference" will appear, click 'Ok"'.



g. After the raster map layer already appeared, then right click in the layer and click "zoom to layer", to determine the raster map position.



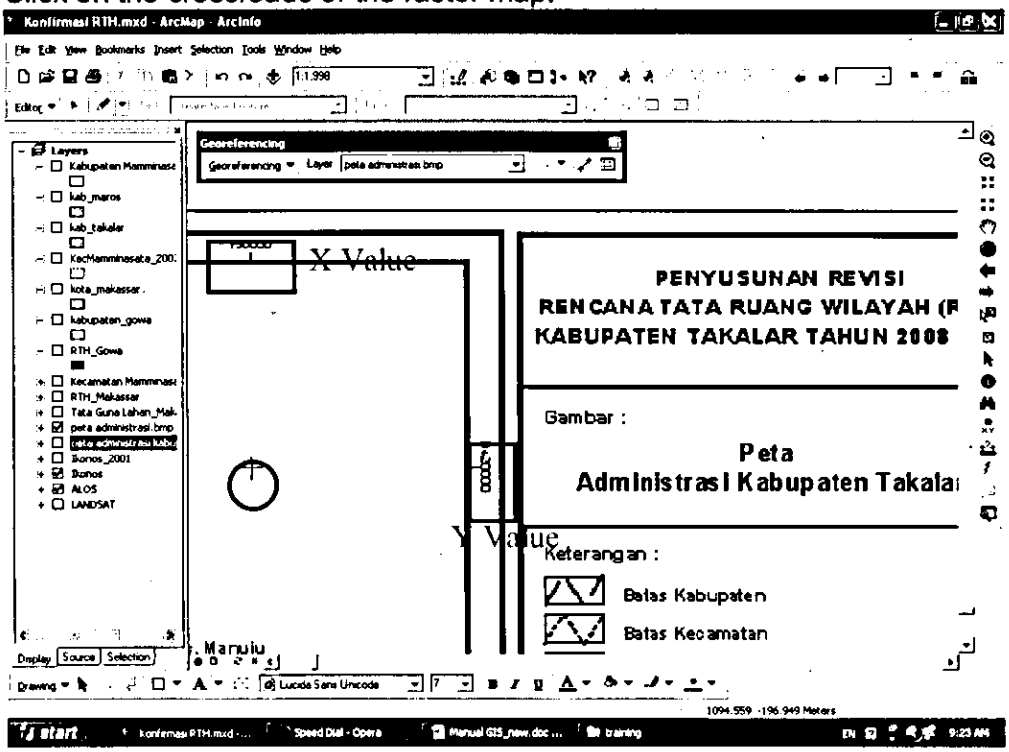
h. After that, right click on the toolbar and select georeferencing to activate.



i. Georeferencing window will appear. Make sure the column layer, the layer will be filled in the georeference.

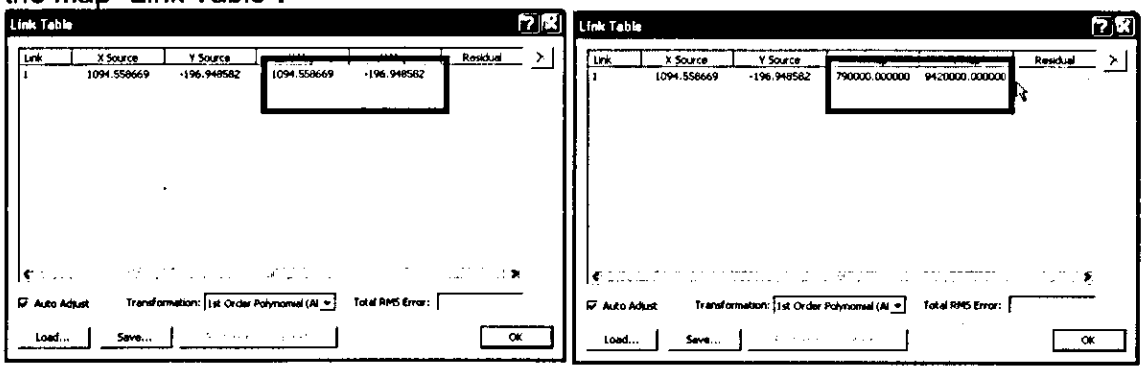
j. Click "add control points" to make a point to be adjusted with satellite imagery.

k. Click on the crossroads of the raster map.

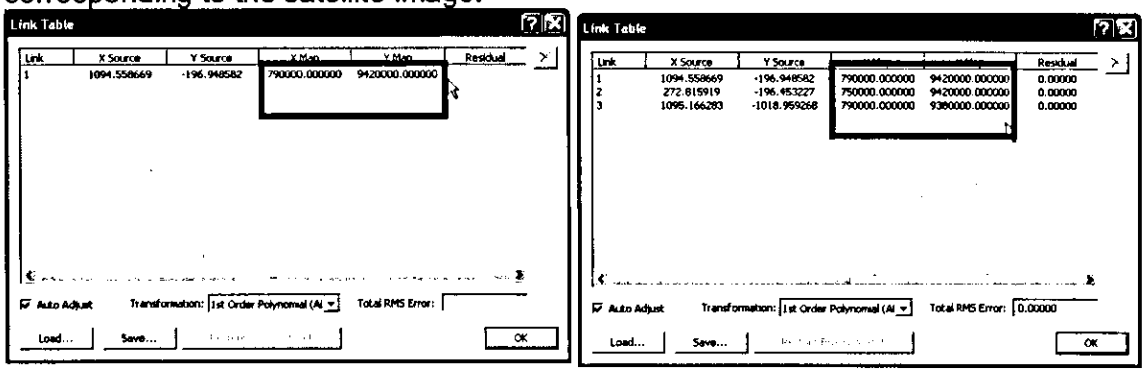


l. Click "link table" to display the coordinates table.

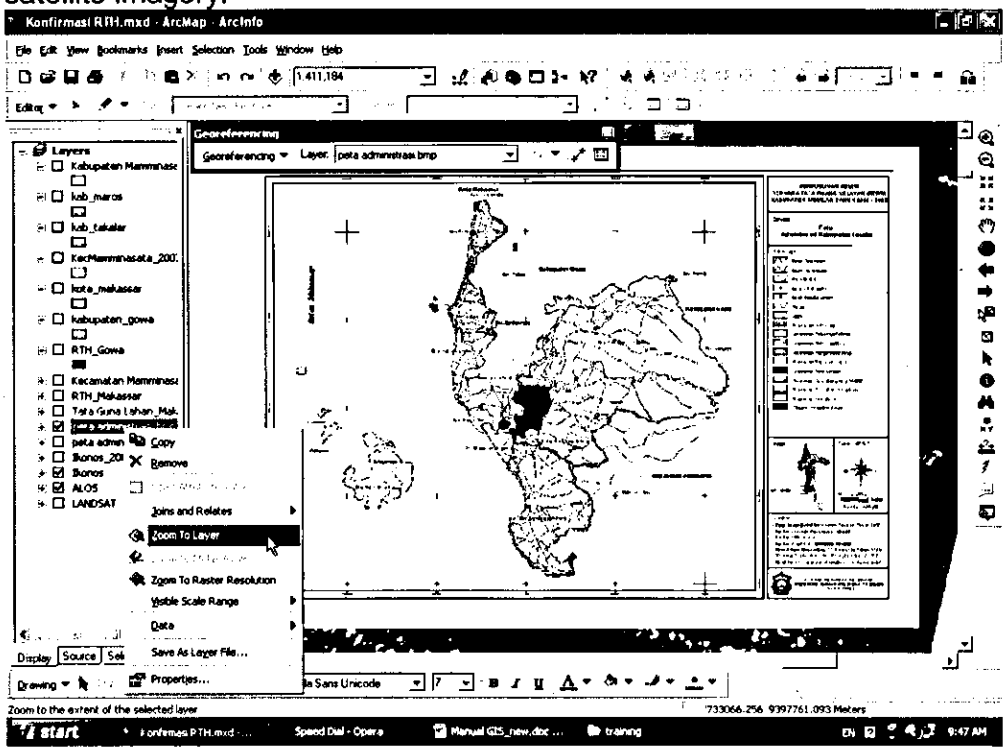
m. Enter the value of X and Y coordinates on the map in Map X and Y columns in the Map "Link Table".



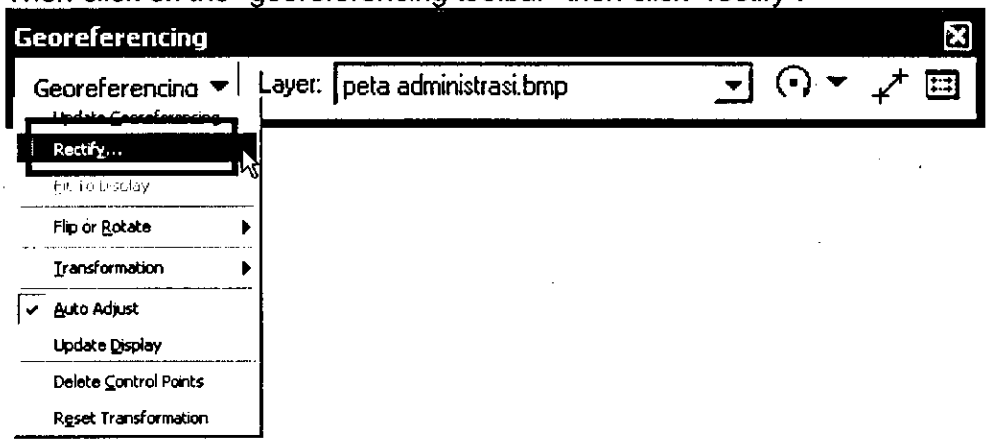
n. Repeat steps k - dm as much as two or three times, until the raster map position corresponding to the satellite image.



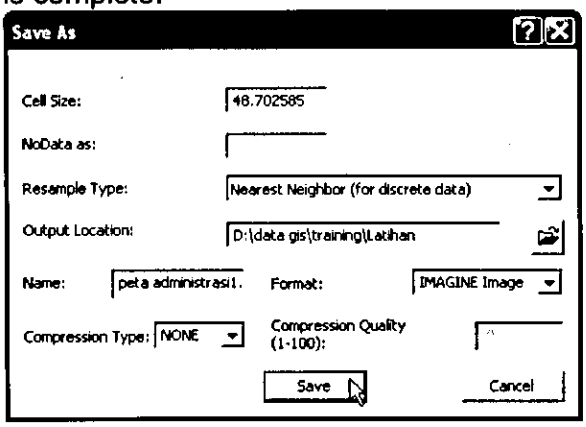
o. After getting three position coordinates, then right click on the administrative map layer and click the "zoom to layer" to ensure proper position on the raster maps satellite imagery.



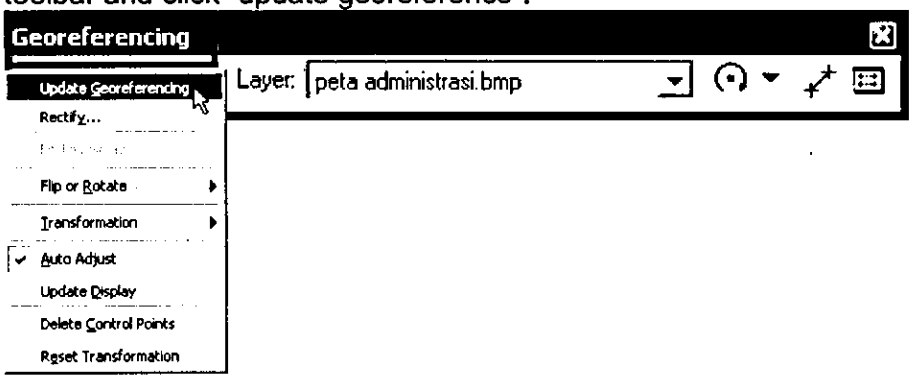
p. Then click on the "georeferencing toolbar" then click "rectify".



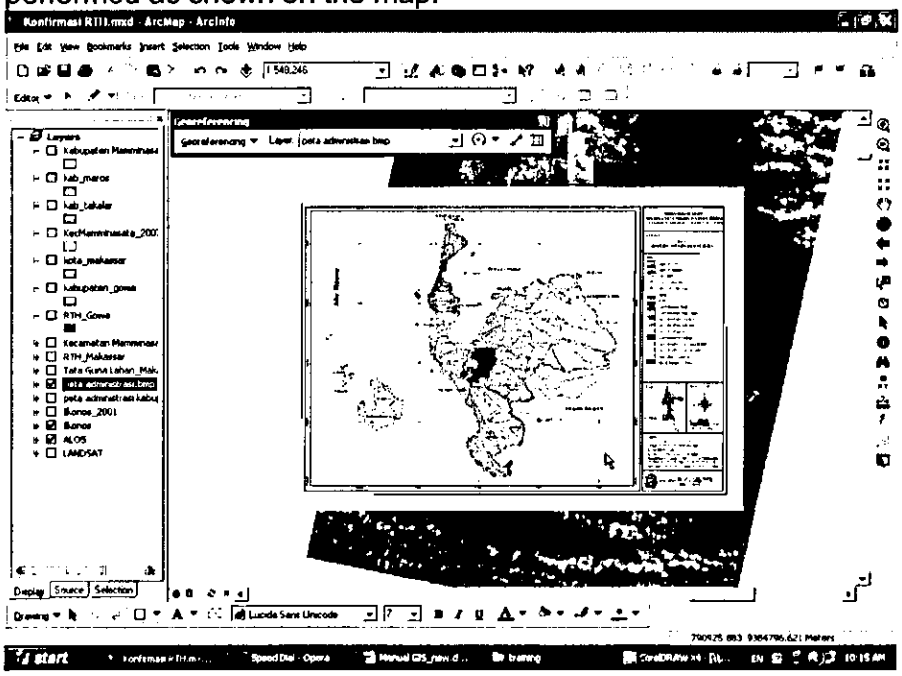
q. The window "Save As" will appear, then click "save". Wait until the save process is complete.



r. After rectify process is complete, click again georeferencing in georeferencing toolbar and click "update georeference".

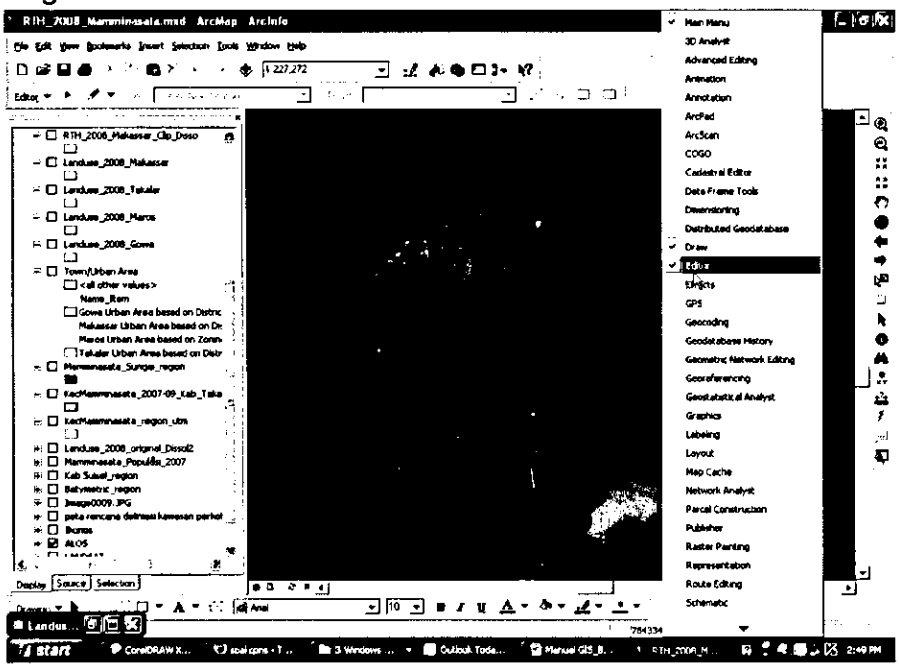


s. Raster map has been teregister into ArcMap and digitization process can be performed as shown on the map.

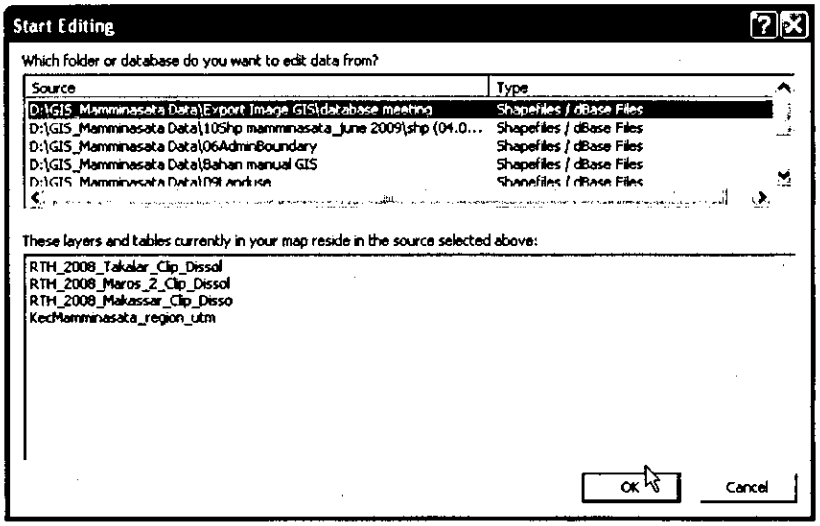


3.2 Revising Administrative Boundary Data

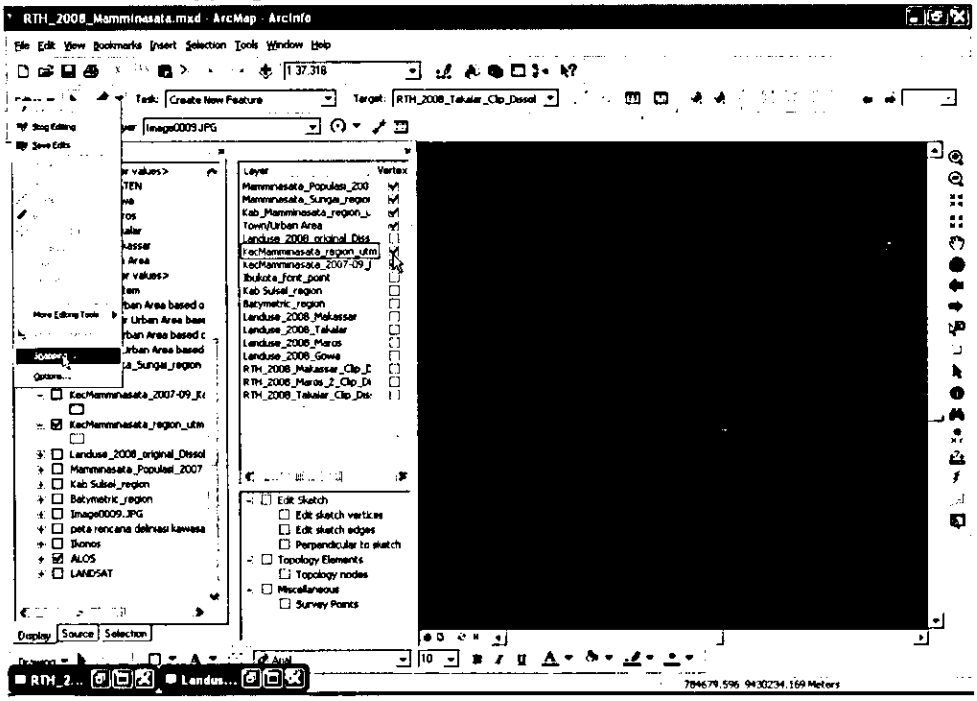
a. Click Start, Program, ArcGIS and ArcMap, click A new empty map then click ok.
b. Click add data icon.
c. Input shapefile of administration boundary to be revised.
d. Input shapefile of correct admjnistration boundary.
e. Right click in menu and select editor.



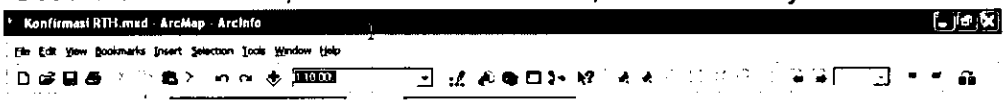
f. Select database which you want to revised.



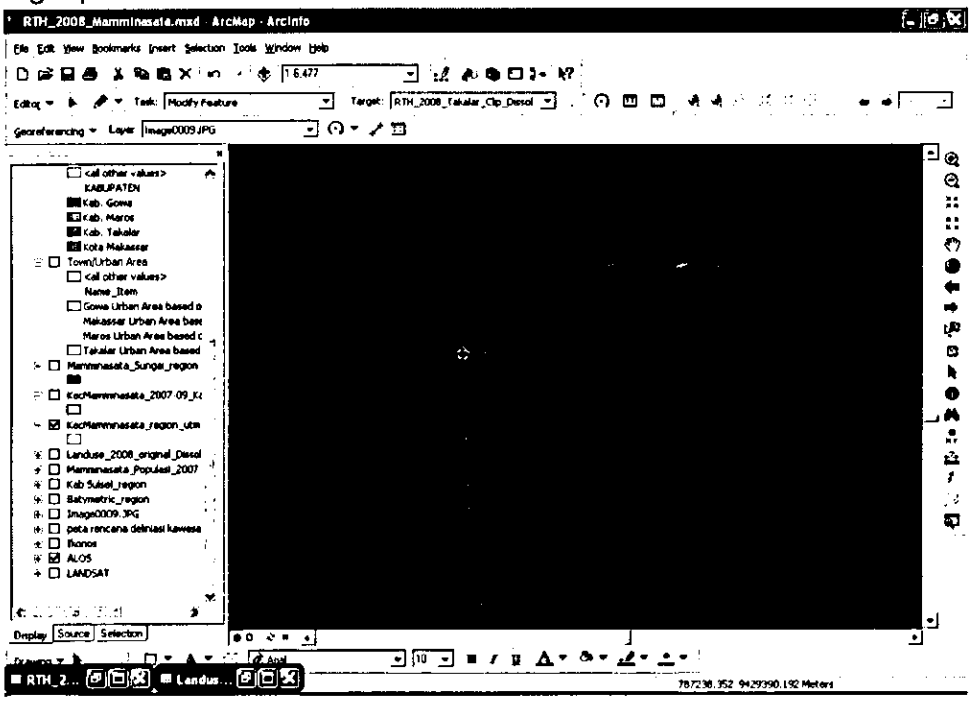
g. Activated snapping in editor.



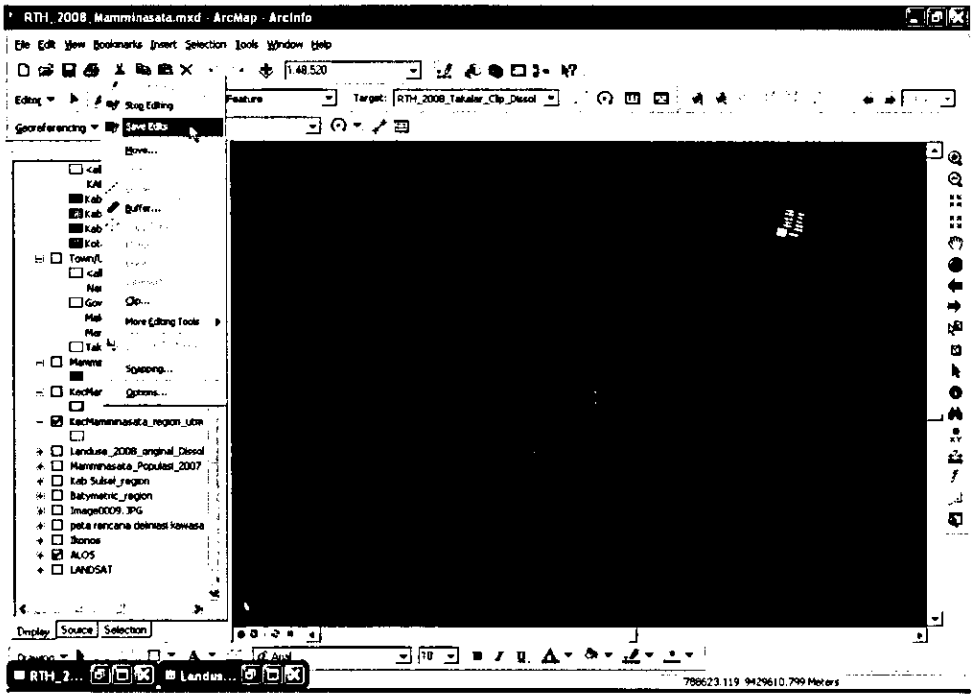
h. Set the scale to 1:10,000 for District and 1:5,000 for the City.



i. Double click in the line of administration boundary and sliding vertex into the right position.

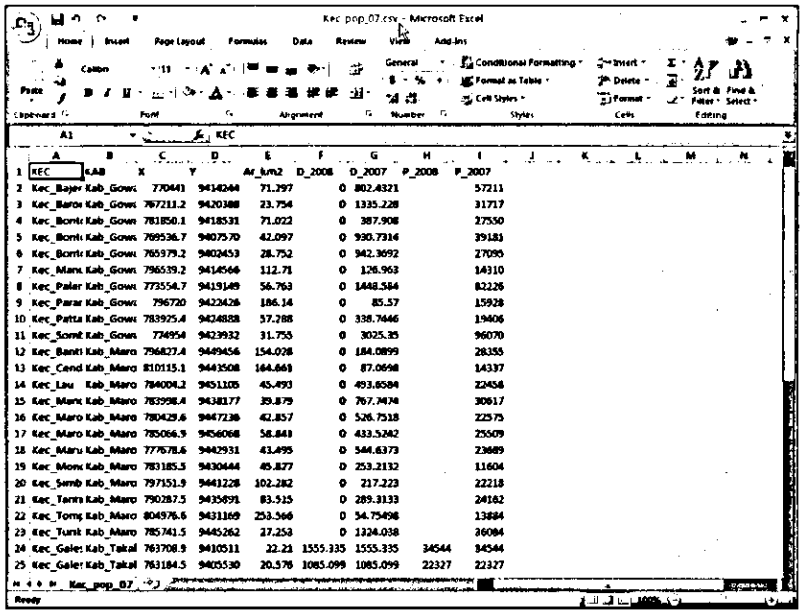


j. When finished revising, click the editor, then click save and stop editing editing (to stop the process of editing).

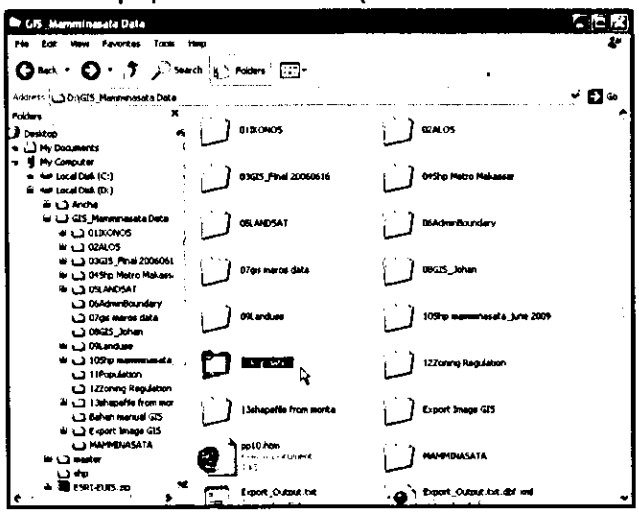


3.3 Open and Draw Population Data

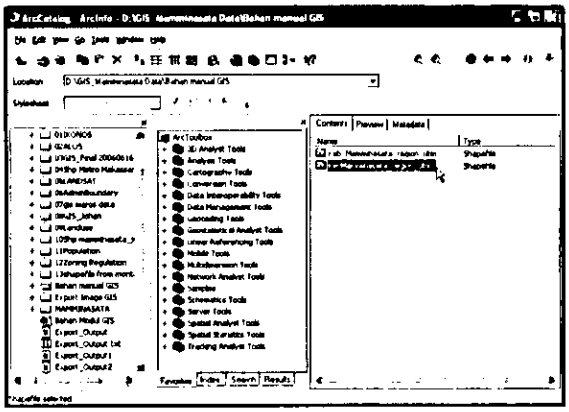
a. Make the data population in kecamatan area by Microsoft Excel.
b. Save as in "other format" and change in save as type in "Comma delimited" extension (*.csv).

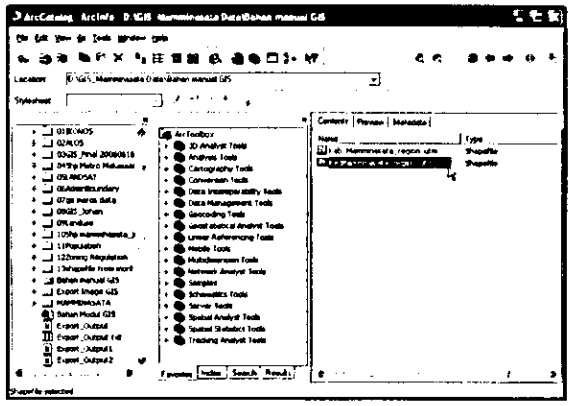


c. Put in "population" folder (make new folder and named it population)



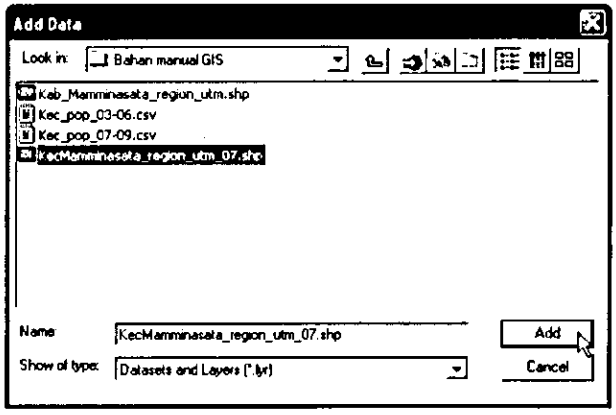
d. Copy "KecMamminasata_region_utm" file to "population" folder and change the file name to "KecMamminasata_region_utm_07" through ArcCatalog program.



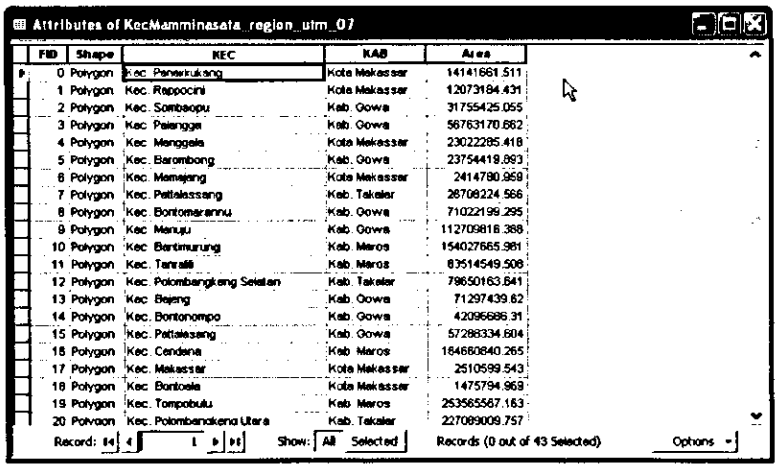


e. Open ArcMap program.

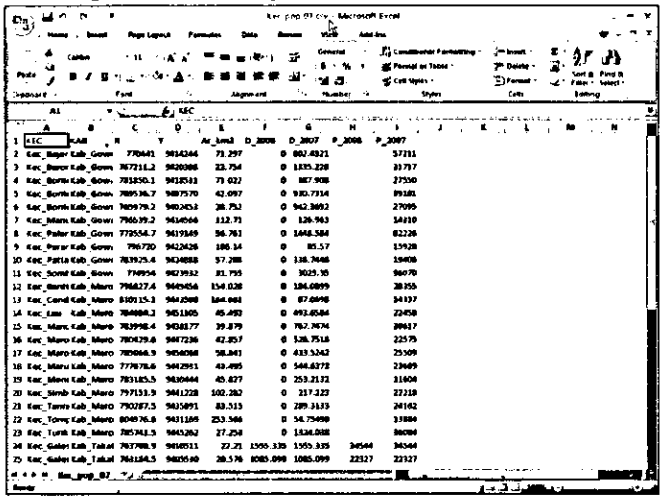
f. Add "KecMamminasata_region_utm_07" file from population folder.

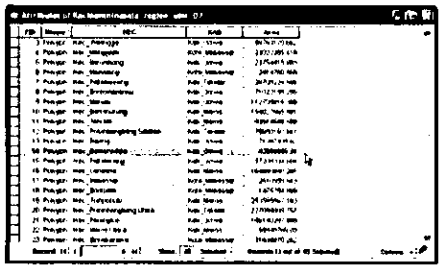


g. Right click in "KecMamminasata_region_utm_07" layer and select "open attribute table".

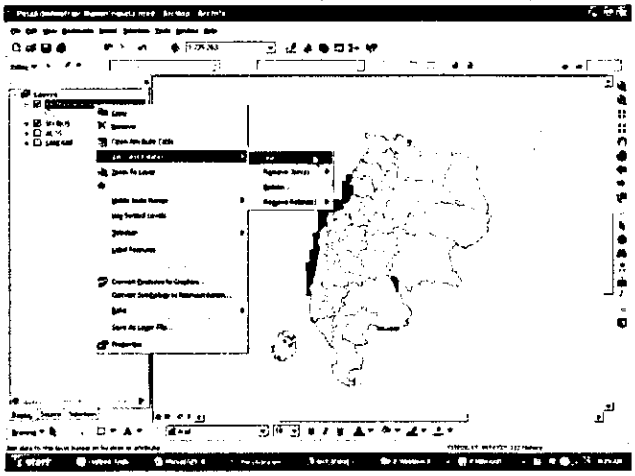


h. Check the different between "KecMamminasata_region_utm_07" layer and population data in Microsoft Excel for name of kecamatan. If there is a different, change it according to the data in Microsoft Excel.





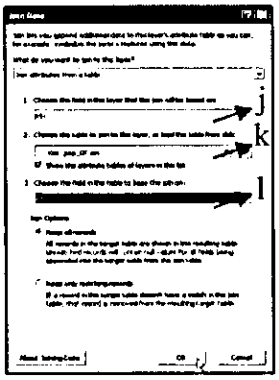
i. After change according to the data in Microsoft Excel, right click "KecMamminasata_region_utm_07" layer then select "join".



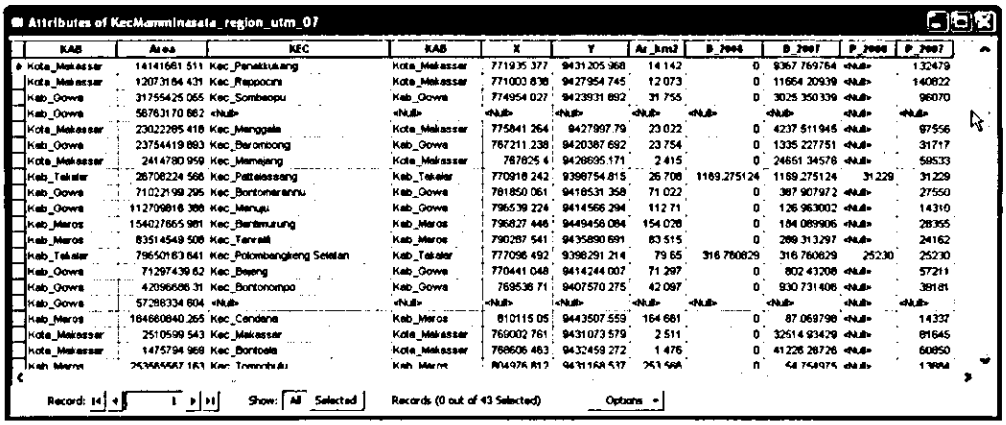
j. "Join Table" window will appear, select "KEC" in no. 1.

k. Select "Kec_pop_07.csv" in no. 2 (located the data from "population" folder by using icon).

l. Select "KEC" in no. 3, then click "ok".



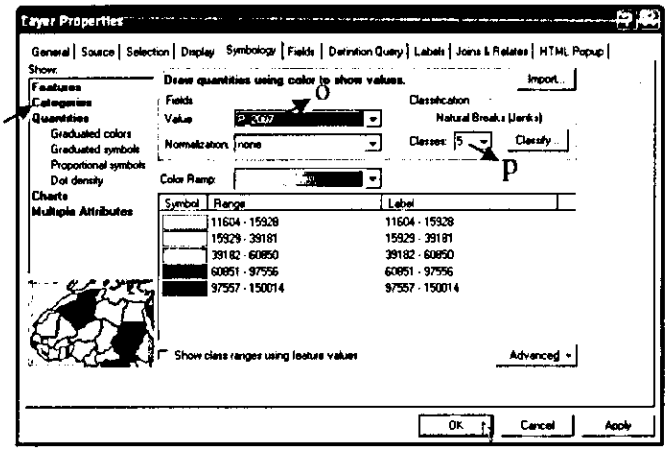
m. Open attribute table by right click in "KecMamminasata_region_utm_07" layer. If "join" succeed, attribute table of KecMamminasata_region_utm_07 will shown like this :



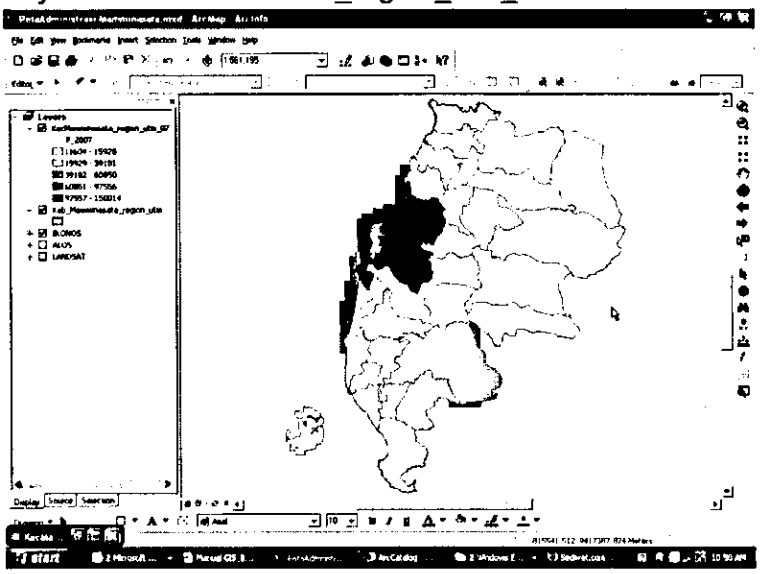
n. Right click again in layer "KecMamminasata_region_utm_07" and click "properties".

o. Select "Quantities" (Graduated colors), fill in "Fields – value" to P_2007.

p. In "Classification – classes" to 5. Then click 'ok".

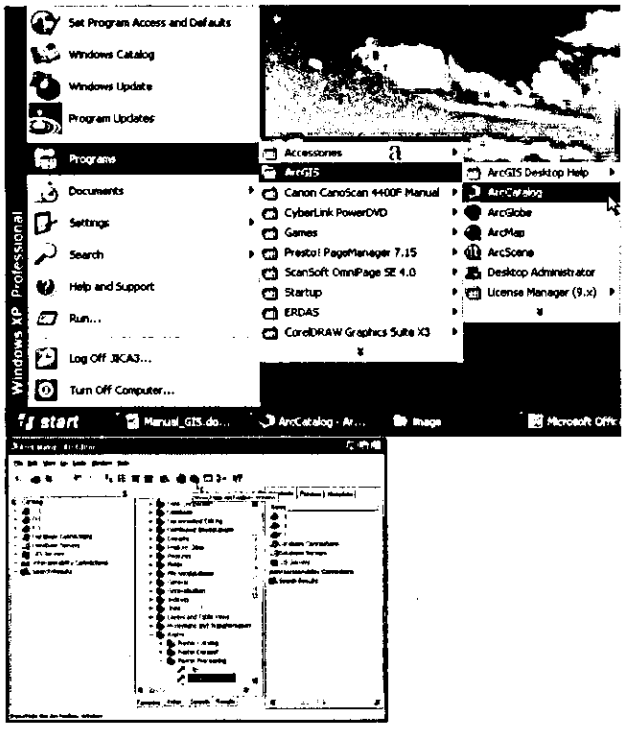


q. Layer "KecMamminasata_region_utm_07" will shown :



3.4 Digitizing Landuse

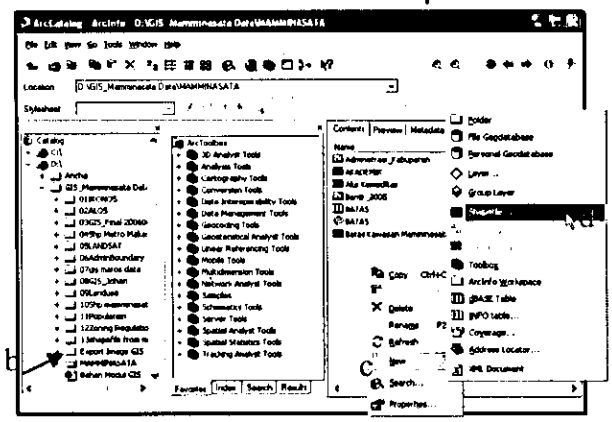
a. Click Start in taskbar, then program, ArcGIS then ArcCatalog.



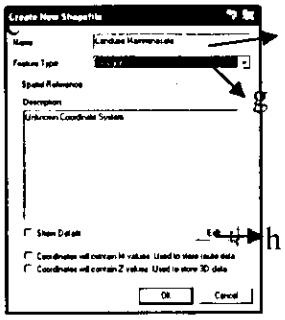
b. Make new folder for landuse shapefile.

c. Right click in content (after you open the landuse folder).

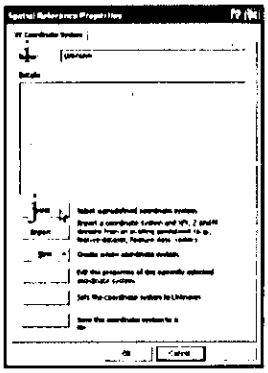
d. Then select new and click shapefile.



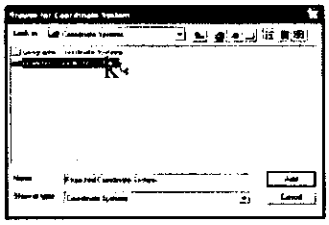
e. Create new shapefile window will appear.
f. Fill "name" column for "Landuse Mamminasata" shapefile name.
g. Pick and select "feature type" column for shapefile type (point, polyline and polygon).
h. Then click edit to enter the coordinate system.



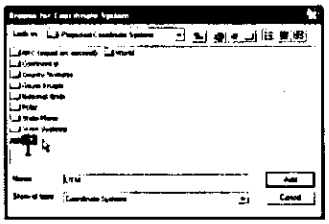
i. Spatial Reference Properties window will appear.
j. Click "select" in Spatial Reference Properties window.



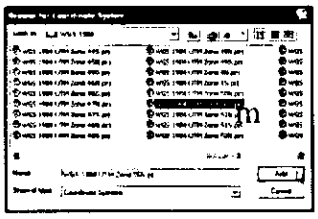
k. Double click in "Projected Coordinate Systems" folder.



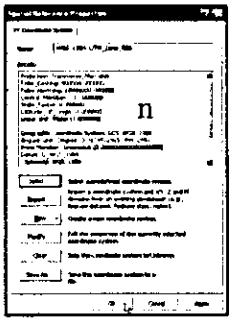
l. Double click in "UTM" folder.



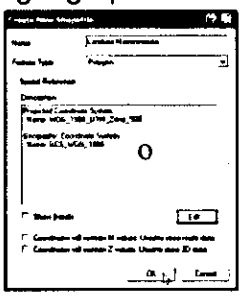
m. Double click in "WGS 1984" folder and select "WGS 1984 UTM Zone 50S.prj then click "add".



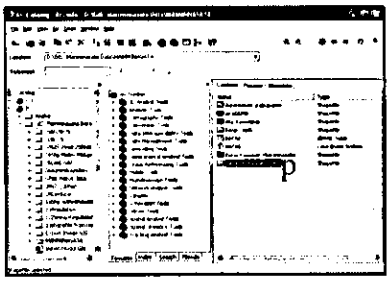
n. In "Spatial Reference Properties" window will show the coordinate system and click "ok".



o. In "Create New Shapefile" will show the description for projected and geographic coordinate system, then click "ok".

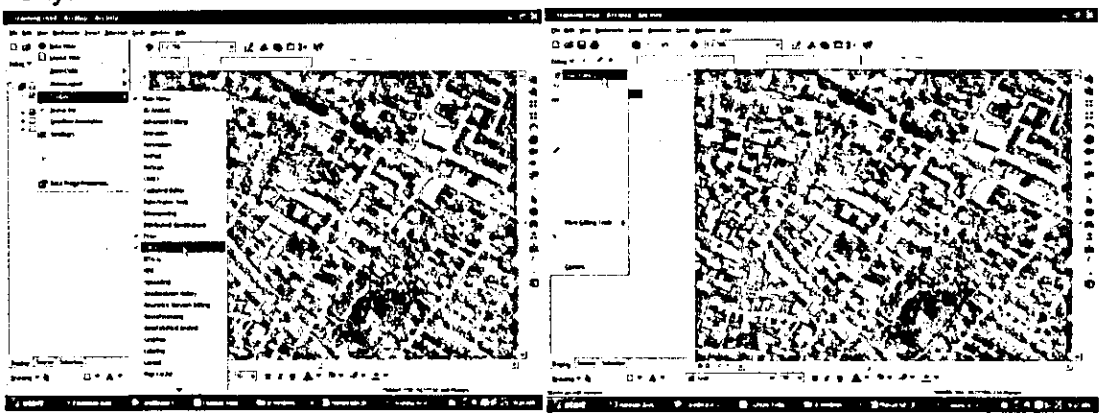


p. "Landuse Mamminasata" shapefile will appear in folder.

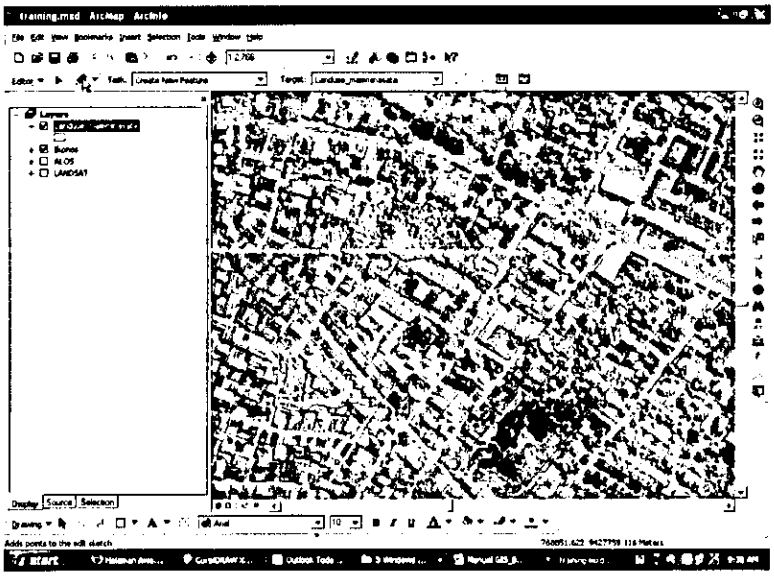


q. Select training.mxd and Add shape file "Landuse Mamminasata" in ArcGIS.

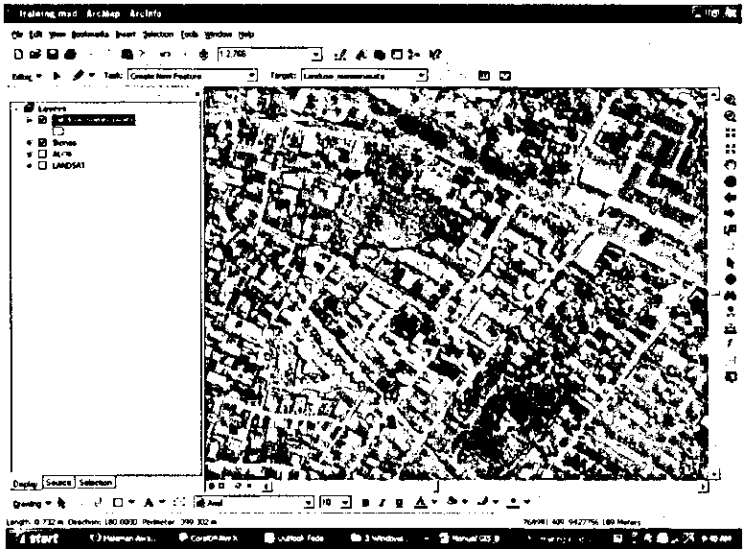
r. Select View > Toolbars > Editor > start edit and pick "Landuse Mamminasata" layer to start digitizing. Set the scale of 1:10,000 for District and 1:5,000 for City.



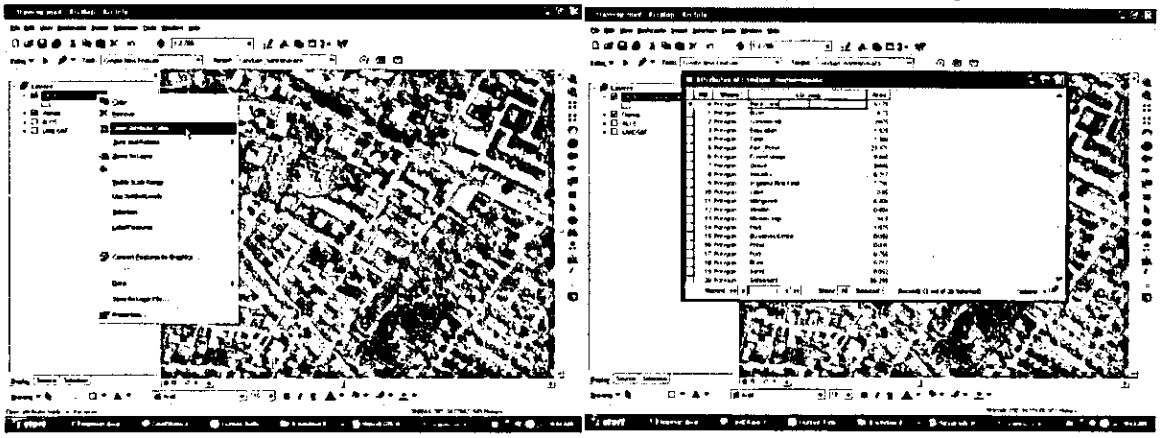
s. In dropdown list Task, select Create New Feature and pick Sketch Tool icon then ok.



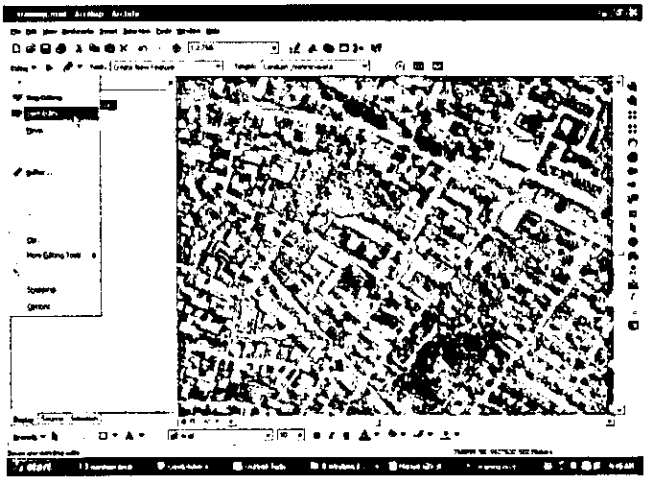
t. To start digitizing, select/click Sketch Tool icon and direct to the area in satellite imagery according to each subject (ex. : settlement, rice field, park, river, etc) and start to click those area using mouse (each click will shown dot called vertex) until finish.



u. After that, right click in "Landuse Mamminasata" layer and select open attribute table then make new field (column) and named it according to each subject.



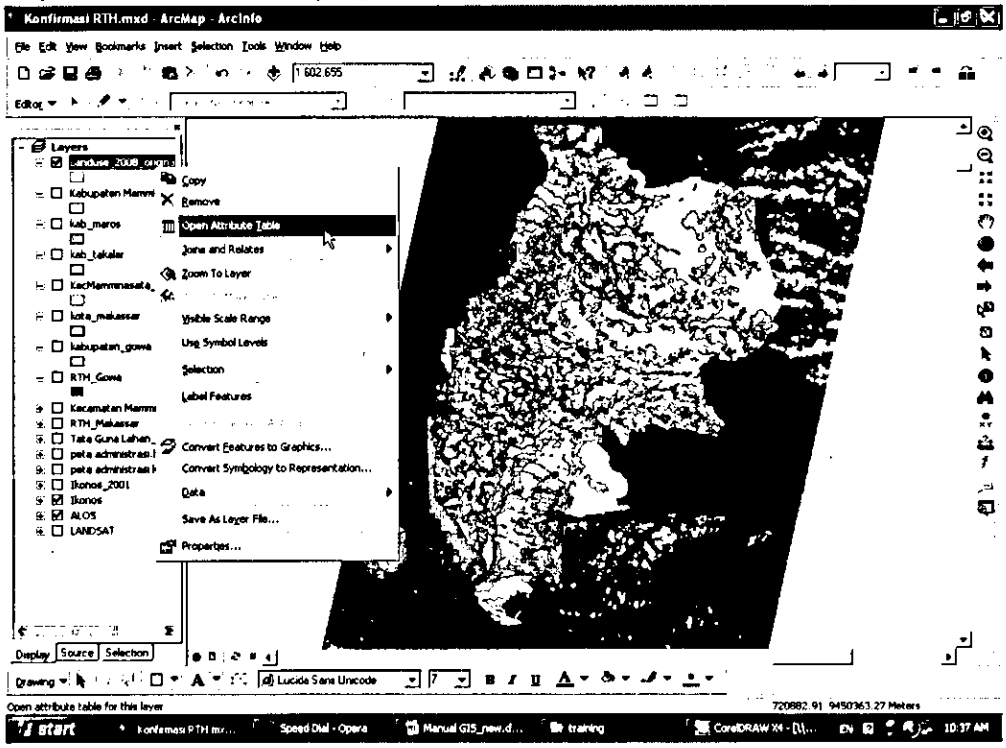
v. Select menu Editor and select save edit to save digitizing.

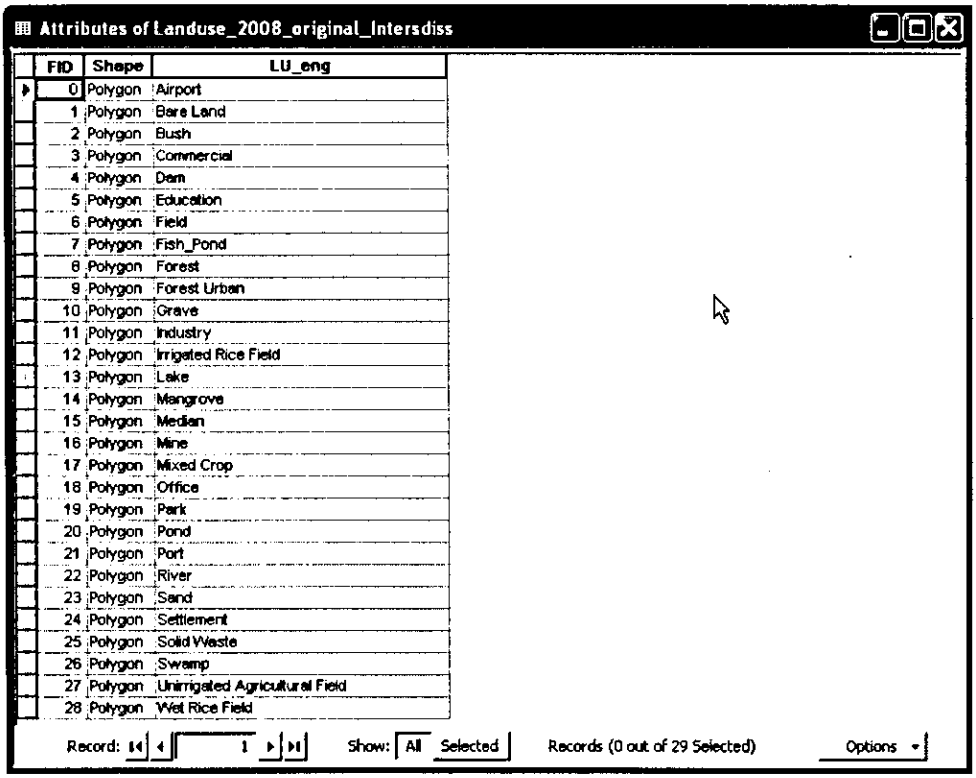


w. Select stop edit to stop digitizing.

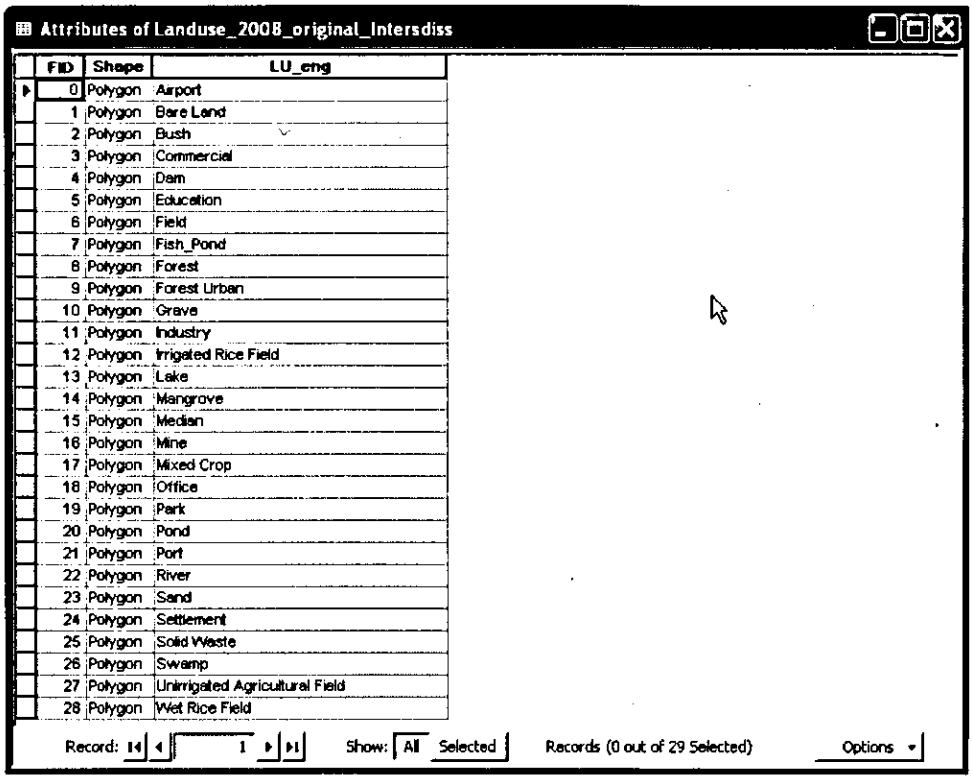
3.5 Calculating Land Use Area at Each Zone

a. First, we have to finish digitizing for landuse.
b. Open Attribute Table by right click in administration boundary layer.

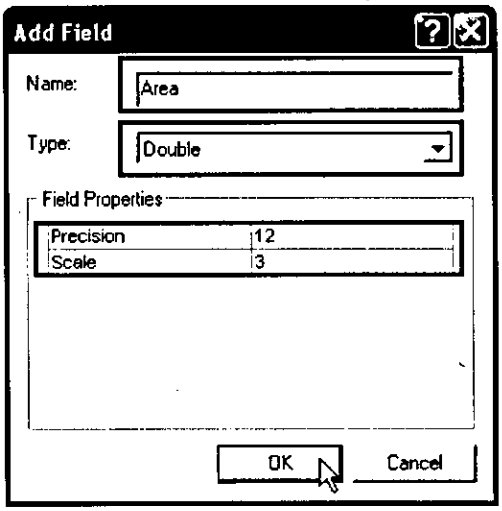




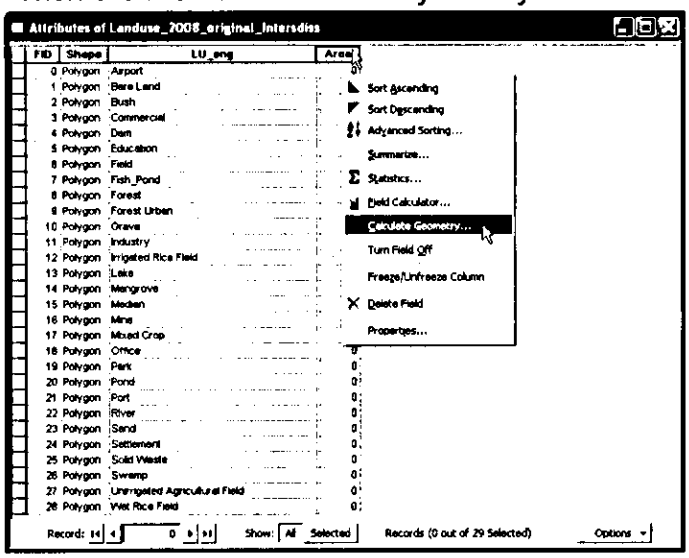
c. Click Options, Click Add Field.



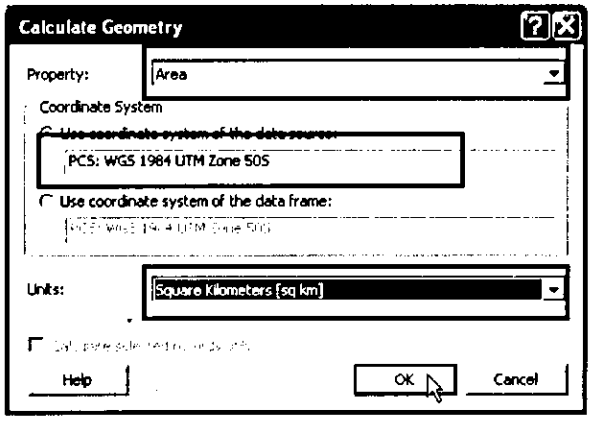
d. Window "add field" appears. Fill the column names, change the column type to double and then fill in the "precision and scale", then click ok.



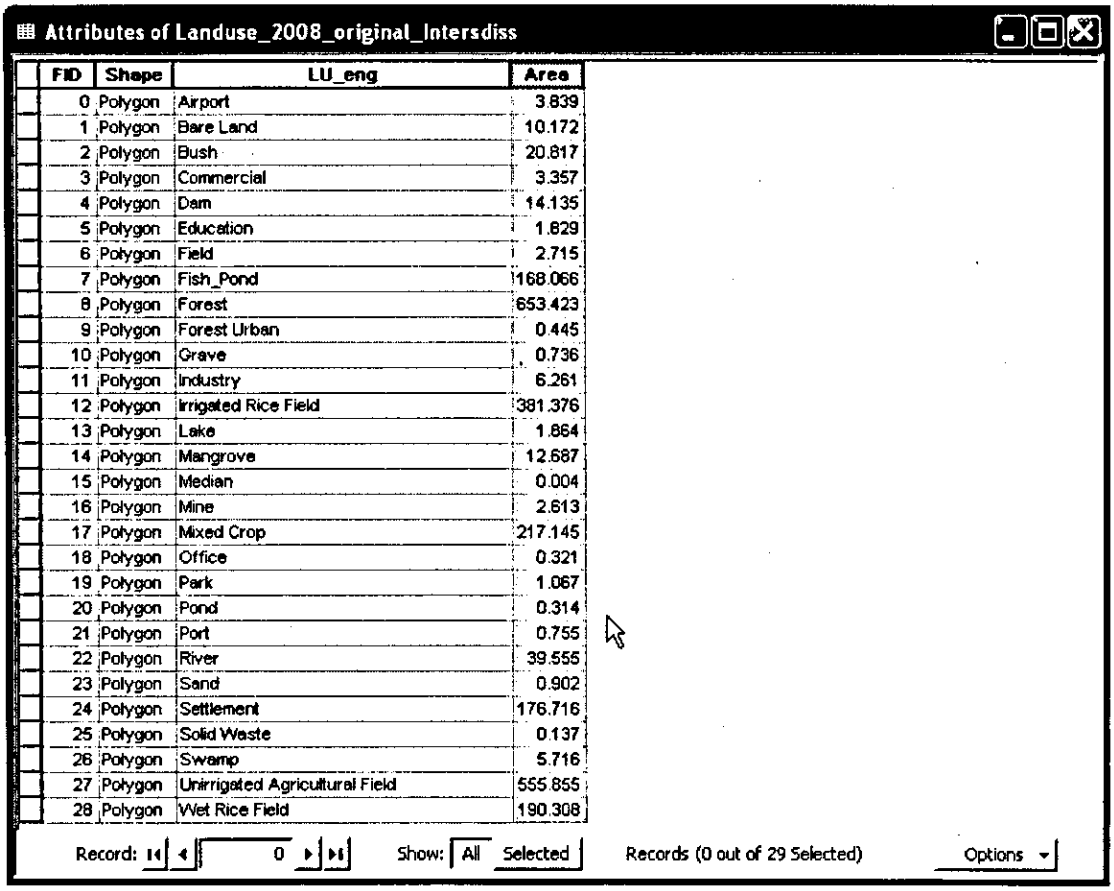
e. Right-click again on "attribute table" (the column has been given the name). Then click "Calculate Geometry" then yes



f. Window "Calculate Geometry" appeared. Change in column units to "square kilometers" and click ok.



g. Area calculation results will appear automatically.



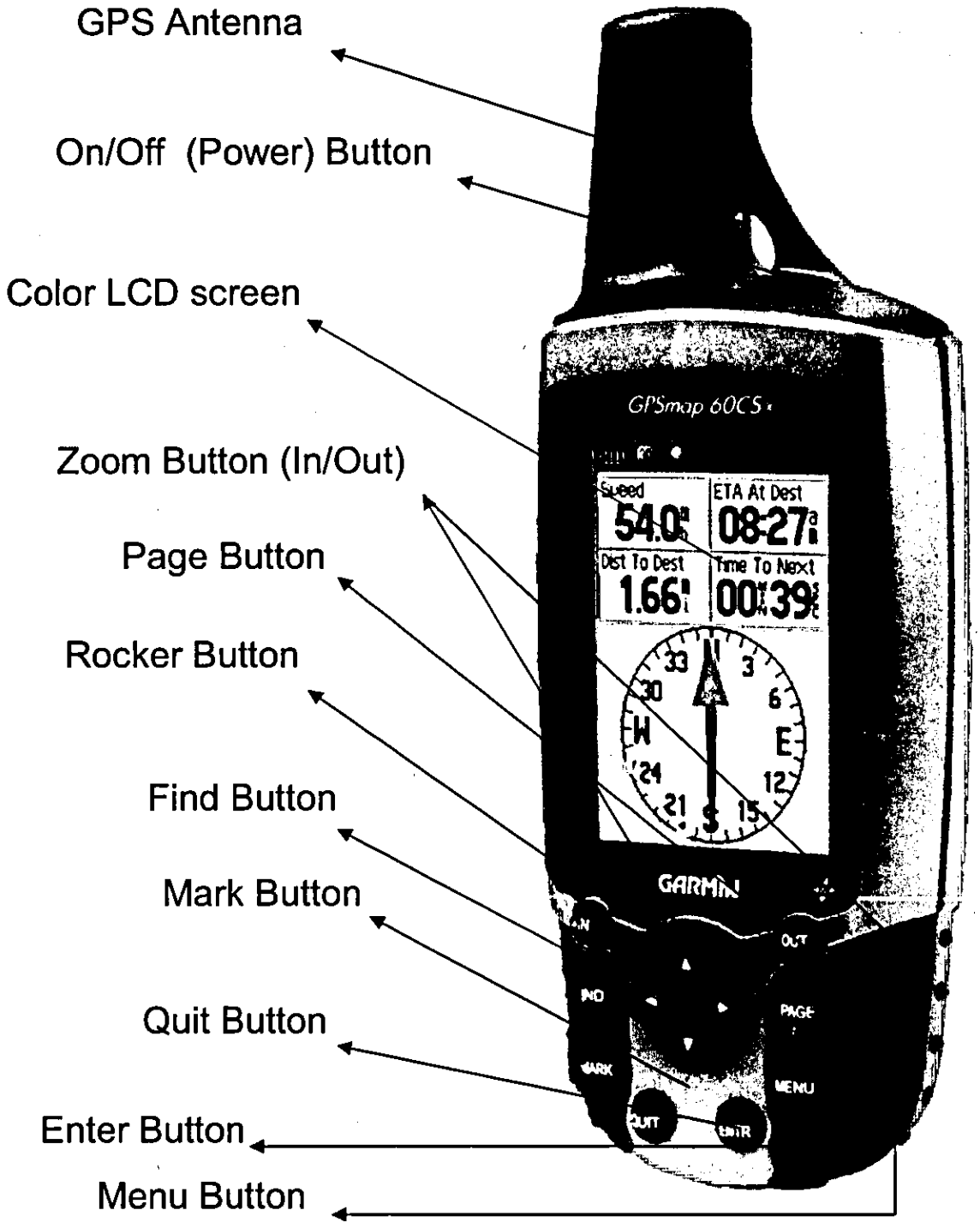
Attributes of Landuse_2008_original_Intersdiss

FID	Shape	LU_eng	Area
0	Polygon	Airport	3.839
1	Polygon	Bare Land	10.172
2	Polygon	Bush	20.817
3	Polygon	Commercial	3.357
4	Polygon	Dam	14.135
5	Polygon	Education	1.829
6	Polygon	Field	2.715
7	Polygon	Fish_Pond	168.066
8	Polygon	Forest	653.423
9	Polygon	Forest Urban	0.445
10	Polygon	Grave	0.736
11	Polygon	Industry	6.261
12	Polygon	Irrigated Rice Field	381.376
13	Polygon	Lake	1.864
14	Polygon	Mangrove	12.687
15	Polygon	Median	0.004
16	Polygon	Mine	2.613
17	Polygon	Mixed Crop	217.145
18	Polygon	Office	0.321
19	Polygon	Park	1.067
20	Polygon	Pond	0.314
21	Polygon	Port	0.755
22	Polygon	River	39.555
23	Polygon	Sand	0.902
24	Polygon	Settlement	176.716
25	Polygon	Solid Waste	0.137
26	Polygon	Swamp	5.716
27	Polygon	Unirrigated Agricultural Field	555.855
28	Polygon	Wet Rice Field	190.308

Record: 0 Show: All Selected Records (0 out of 29 Selected) Options

4. GPS Introduction and Training

GPS yang digunakan saat ini adalah GPS merek GARMIN dengan seri GPSMAP® 60 CSX. GPS ini telah dilengkapi dengan sensor dan peta dalam micro SD.



4.1 Start to Using GPS

1. Began to turn on the GPS by pressing the power button. Start page that appears is the satellite page, to get signals from satellites, should be in open spaces and bright and wait until appears on the screen coordinates of the position.

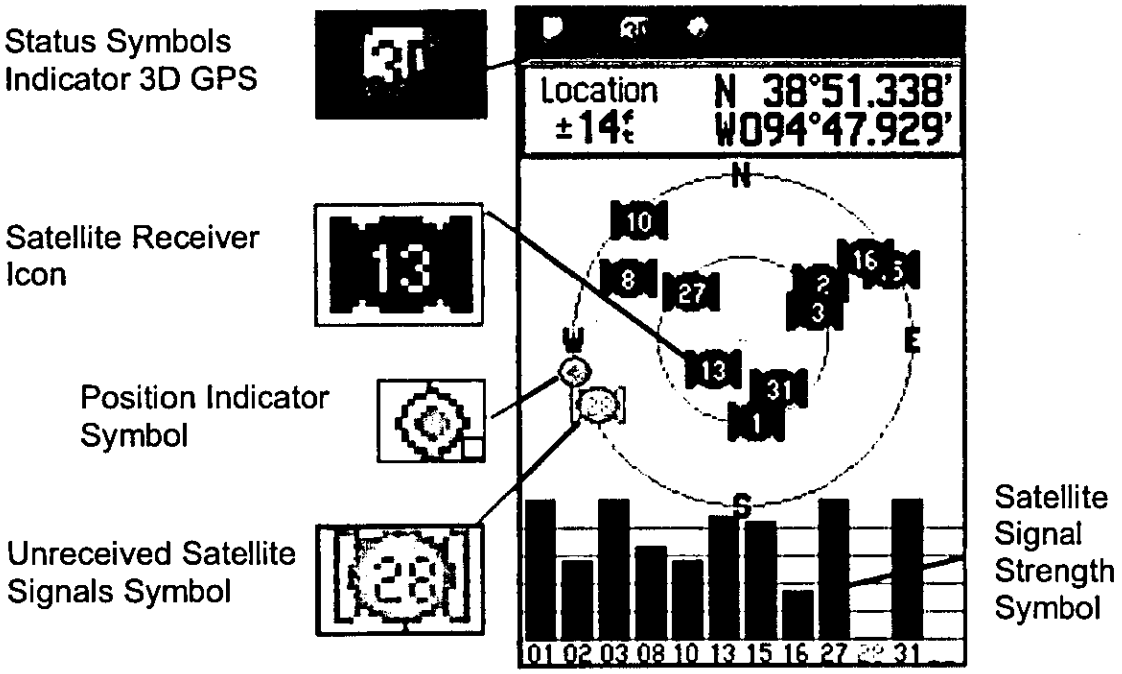


Figure 12. Preliminary views on gps screens

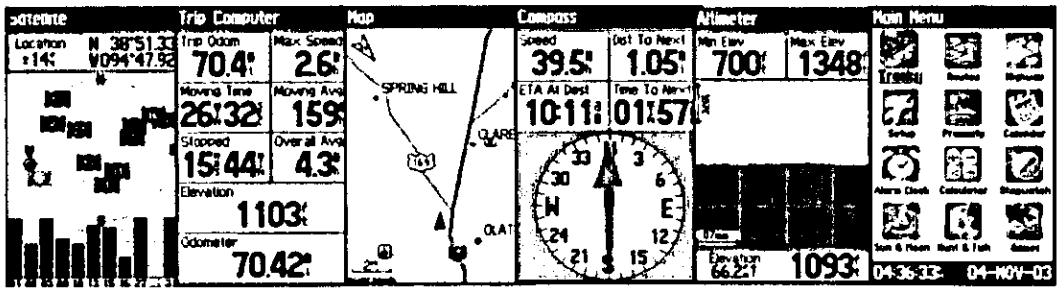
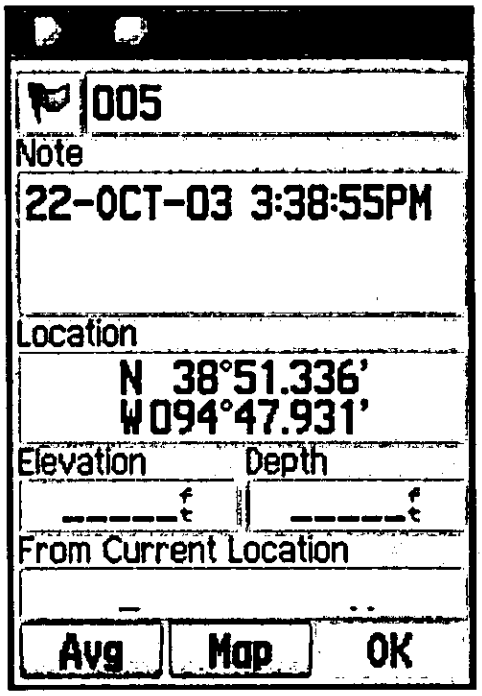
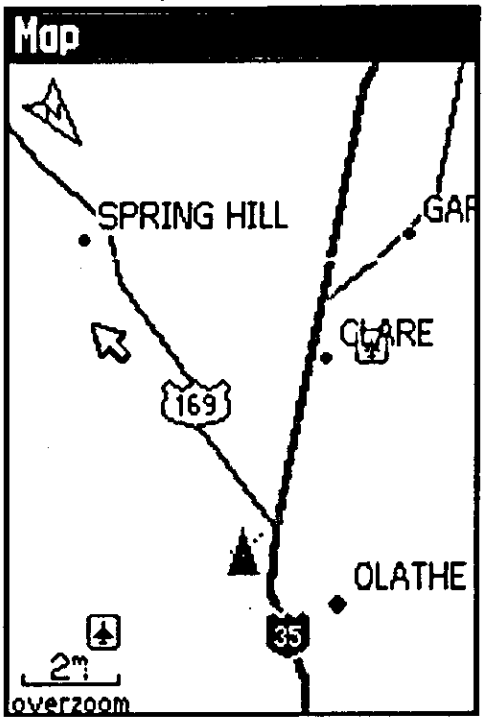


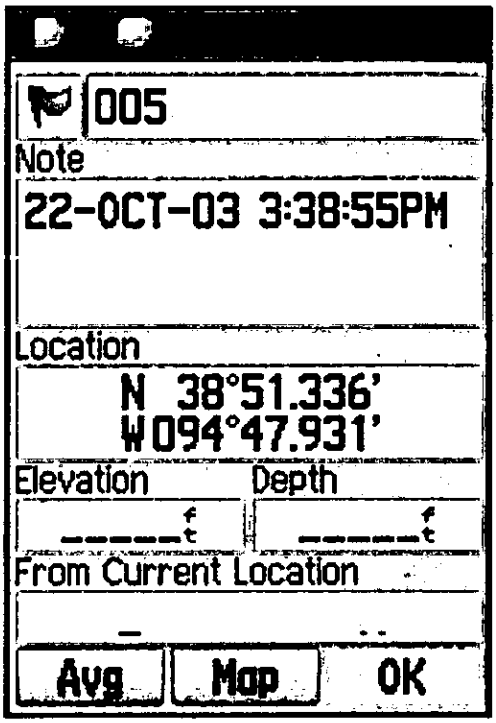
Figure 13. GPS display screens each page

2. Marks the location / waypoint. Can be done on any page, and press the MARK button and change the name by pointing the cursor above the column name, hit enter and edit the name. When you're finished and then press the ok button, then point the cursor on the option ok at the bottom and press. Location is already stored.

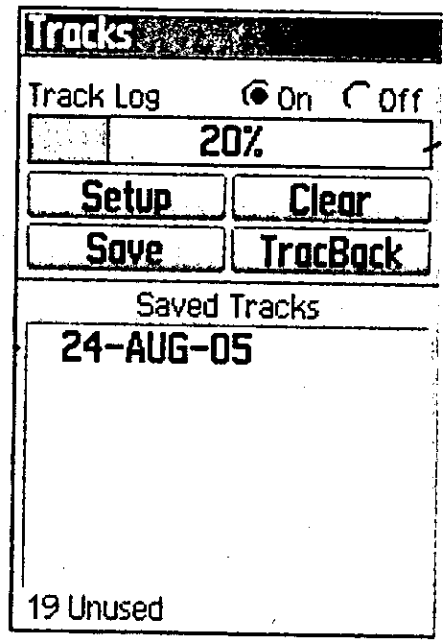


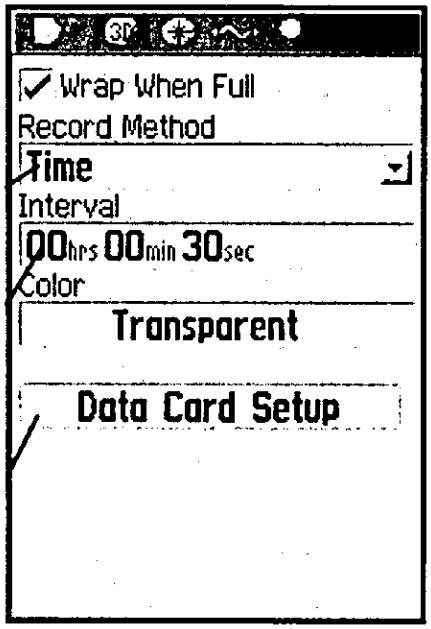
3. Marks the location by looking at the map. On the map page, point your cursor at the position will be stored and then press enter and hold. Then edit the name and symbol, if completed select ok.



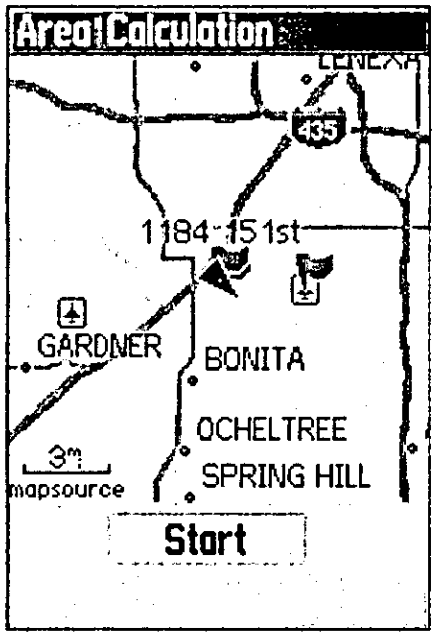


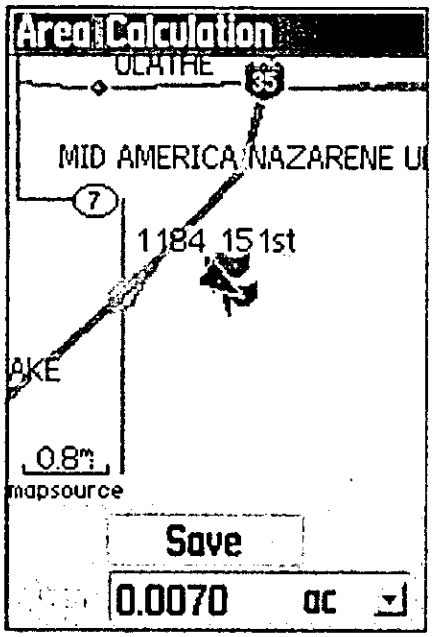
4. Enabling Function Track Log. GPS track log is the ability to record impressions of travel. How to activate it is to press the menu button 2x to show the Main Menu page, then select tracks, adjust the options on traklog. So every time a trip will be stored in his footsteps.



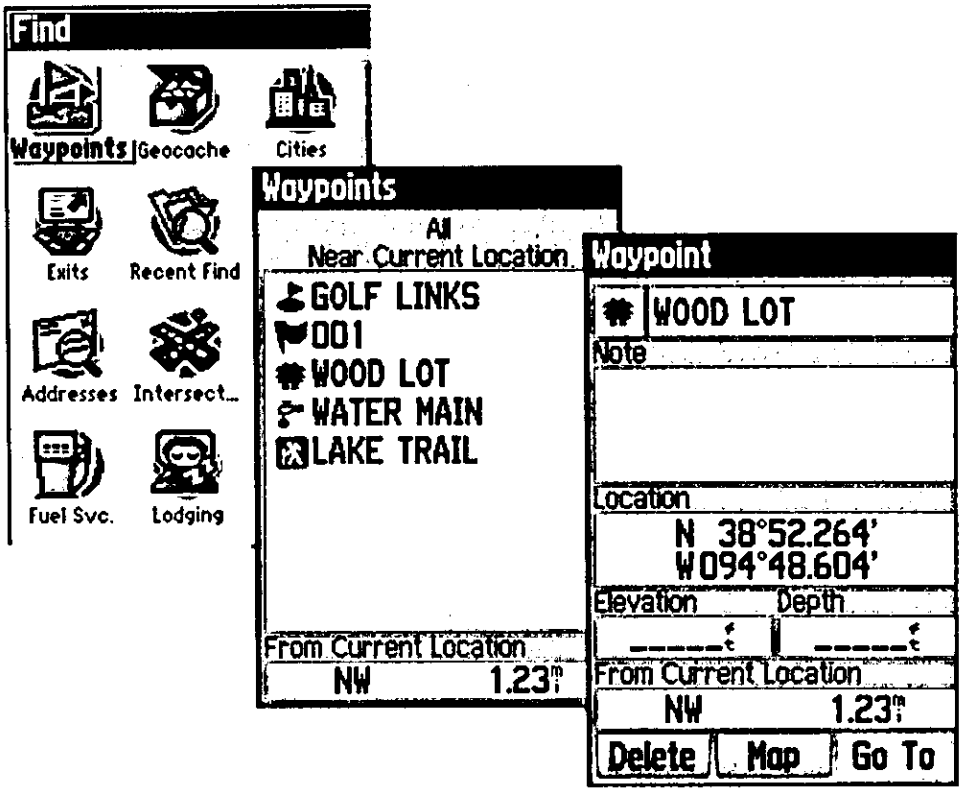


5. Calculating the area with tracks. Log tracks on the page press menu, then select the Area Calculation. Press the Enter key to start, then scroll around the area to be measured, when done press the Enter key to quit. If you have, it would appear that the area measured.



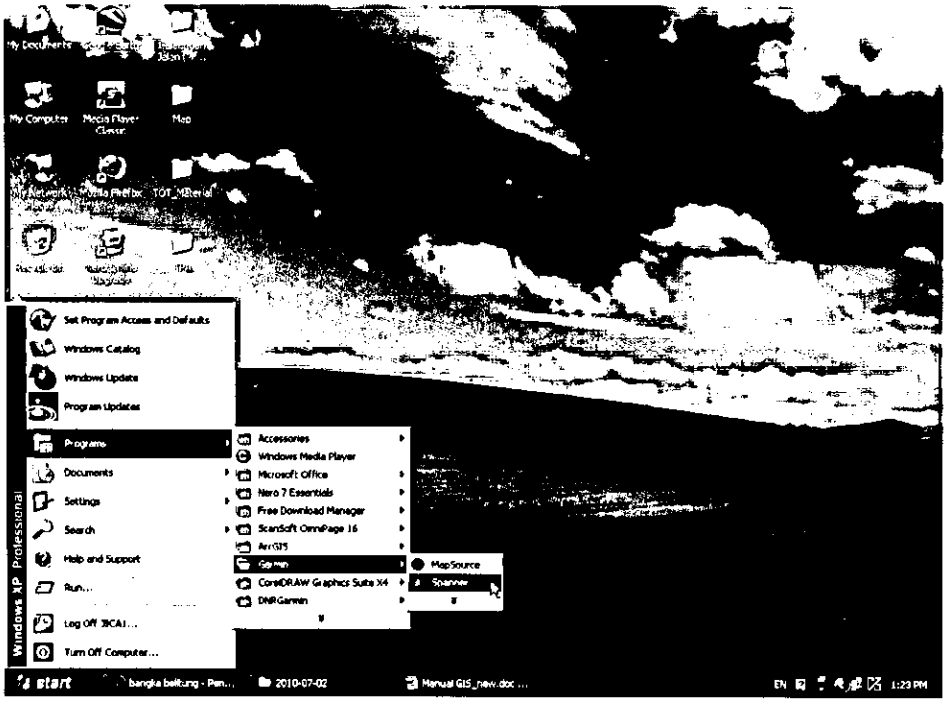


6. Navigating to a waypoint. The trick is to press the find button, select the waypoint menu, then select the waypoint that will be aimed, and then select Go To.

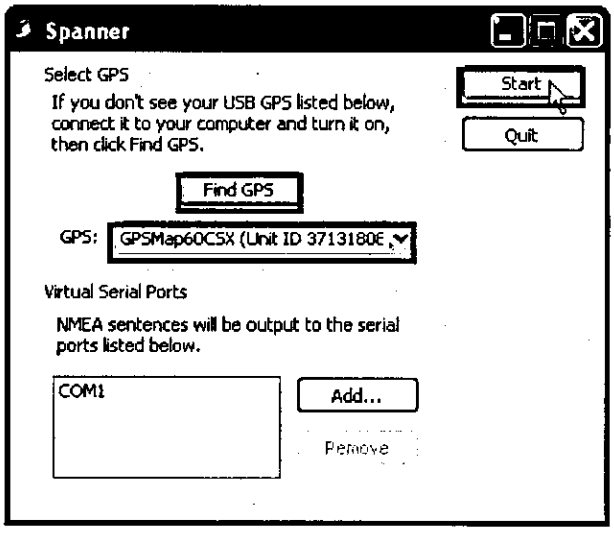


4.2 GPS Training

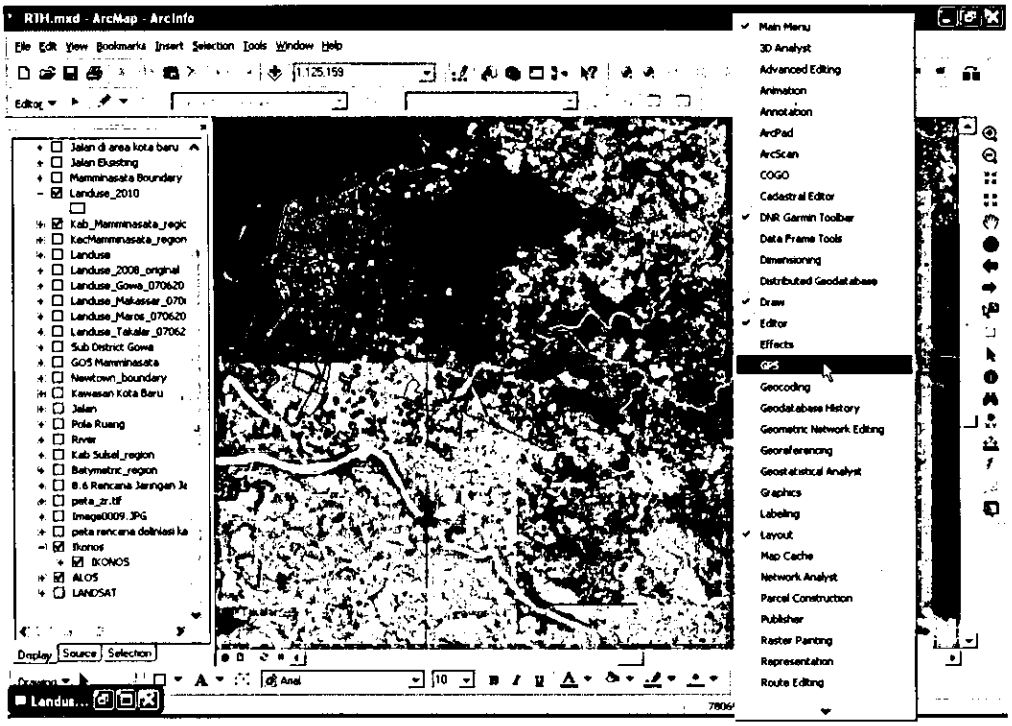
1. Start Spanner



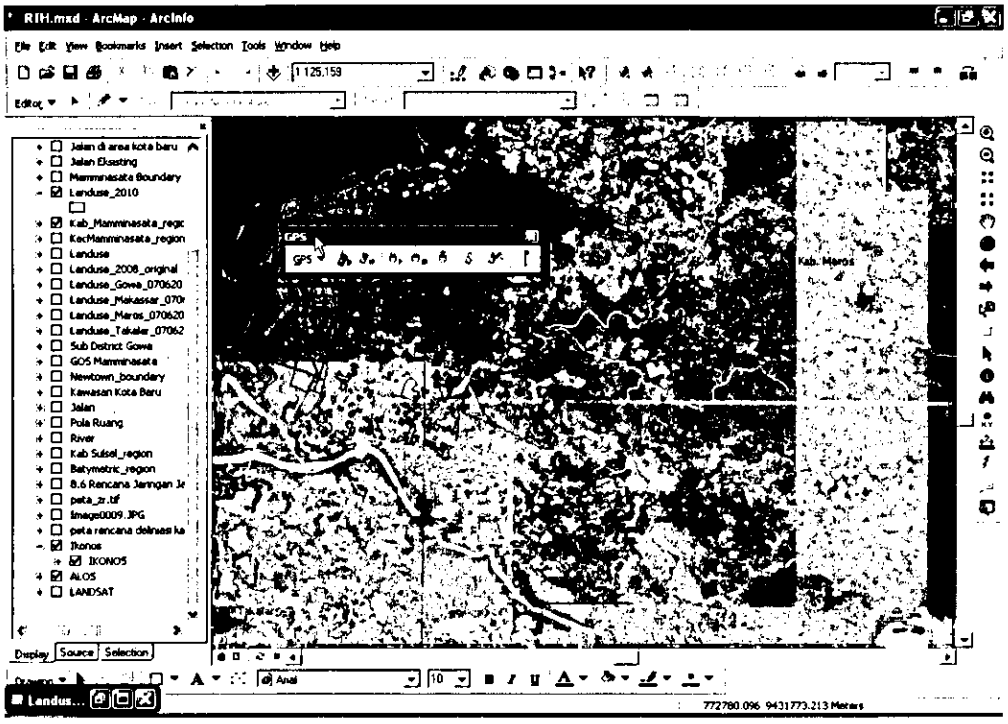
2. Window "spanner" will appear, then connect the GPS to the computer and turn it on.
3. Click on "Find GPS" to show up the type of GPS used in the GPS field, then click "Start".



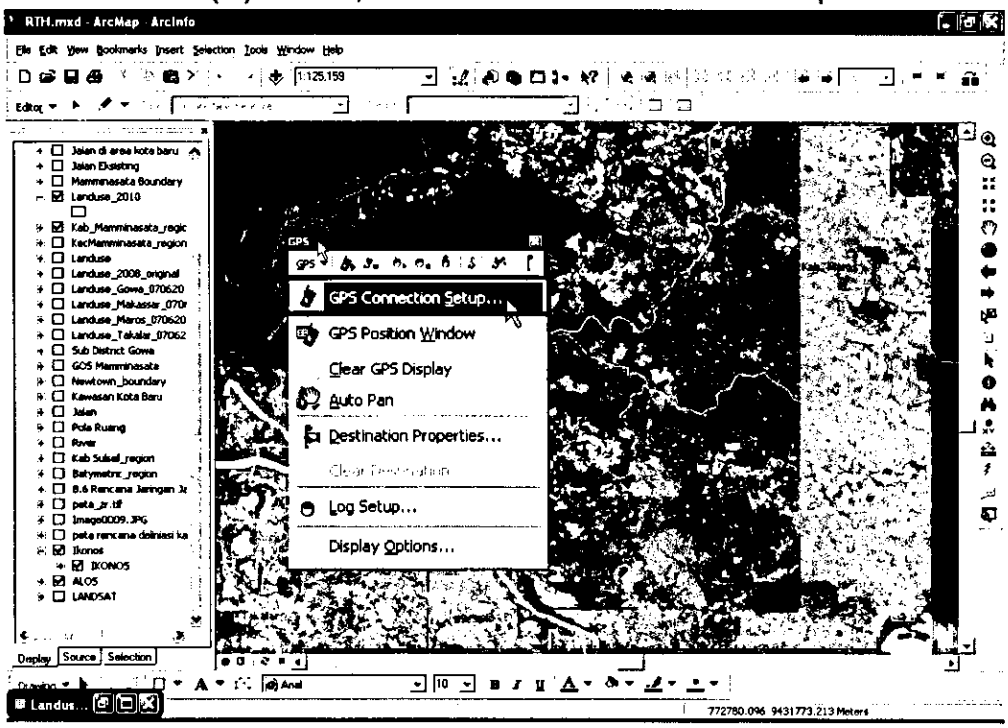
4. Open the ArcMap program, then switch the GPS Toolbar by right-clicking on the toolbar and select GPS.



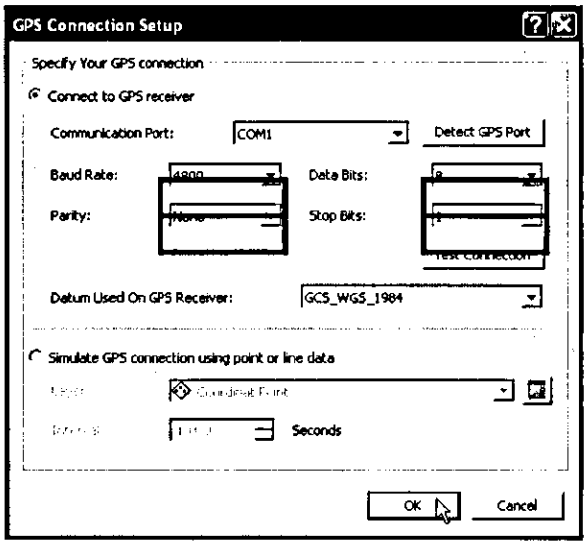
5. GPS toolbar will appear.



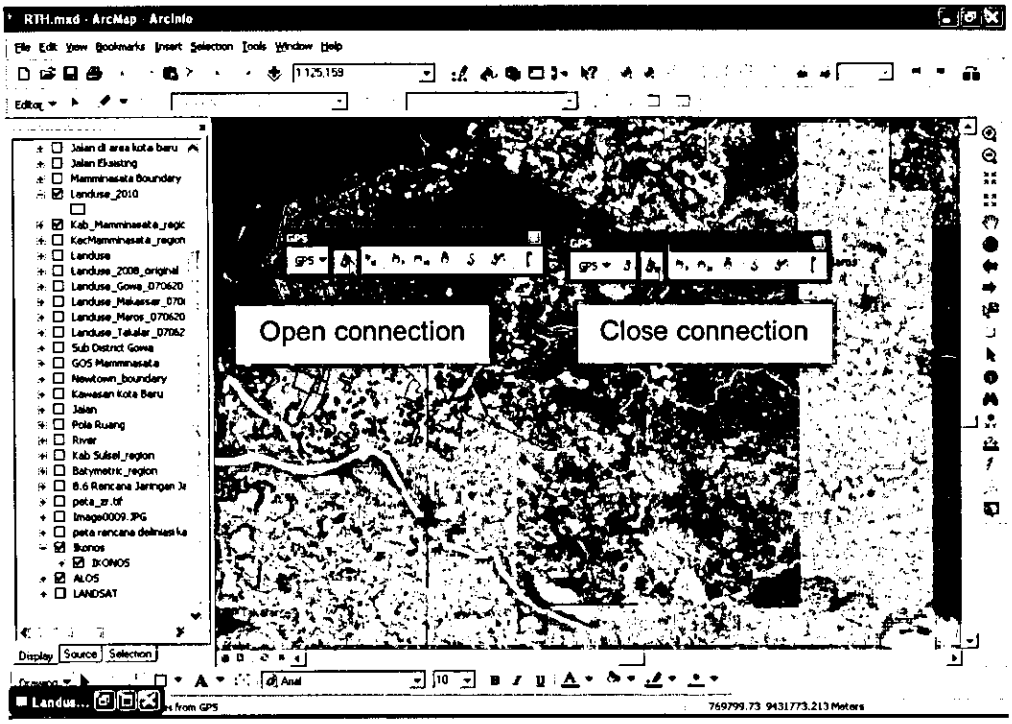
6. Click the "GPS (G)" button, and select "GPS Connection Setup".



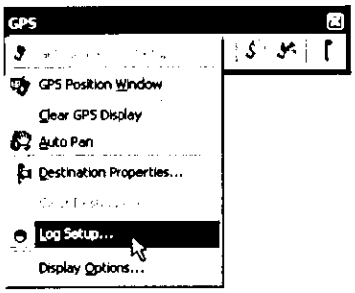
7. Window "GPS Connection Setup screen appears, then set the value in column" baud rate ", column" parity ", the" data bits "and the" stop bits ". Then set the column "Datum Used on GPS Receiver" to GCS_WGS_1984 ". Then click ok.



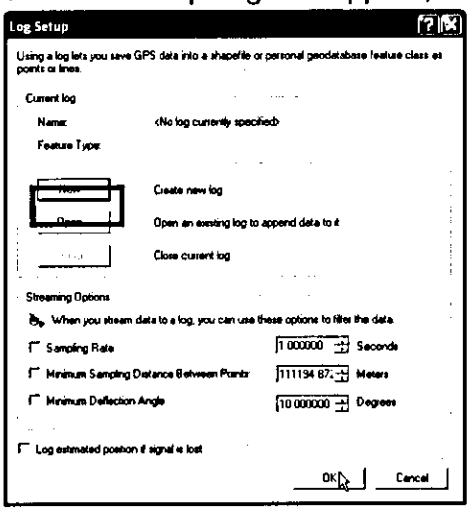
8. Click "Open connection" to the GPS immediately connected with the Arc Map. To turn off the connection, click the "Close connection".



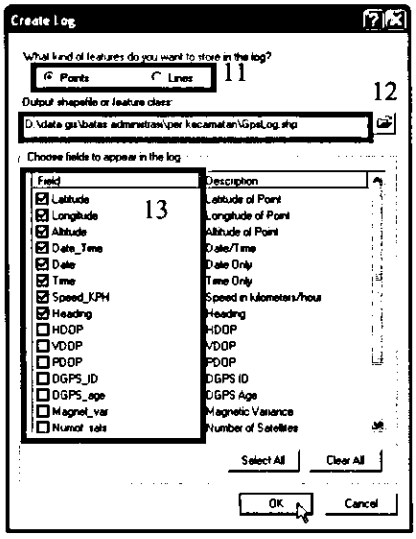
9. Save on GPS location into a log. Click the "GPS (G)" button and then select it and click "log setup.".



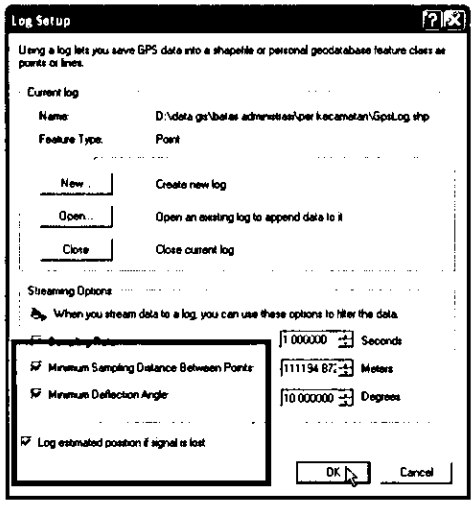
10. Window "Setup Log" will appear, then click "New" to create a new log.



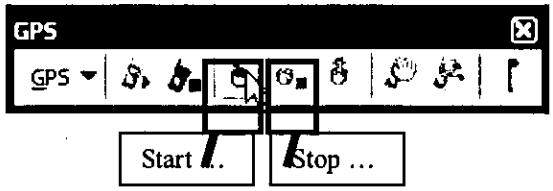
11. Window "Create Log" will appear. Choose the type of features that will be in store in the logs.
12. In the column "on the output shapefile feature class", specify a place to store the log by using icons . Then in column "Choose field to Appear in the log", tick the "field" to provide information that will be needed later. Then click ok.



13. After that, the windows "Log setup" will appear again. Then check that there are four columns at the bottom and click ok.

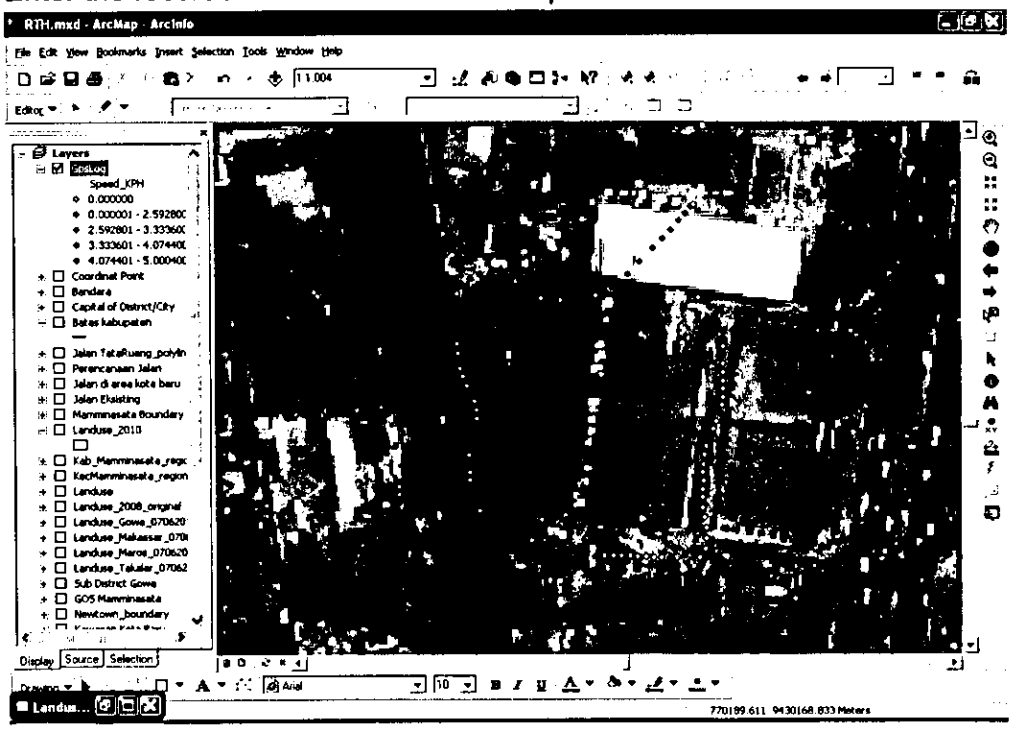


14. To begin the process of recording tracks, click the "Start Streaming to log" and to stop the process of recording tracks click the "Stop Streaming to log".



4.3 Analyze GPS Data

1. Enter the recorded GPS data into Arc Map.



2. Then, do analyze about the data.

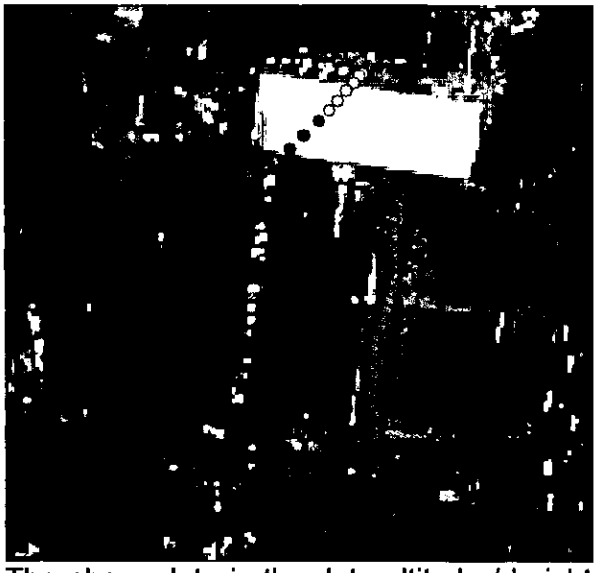
Legend

GpsLog

Speed_KPH

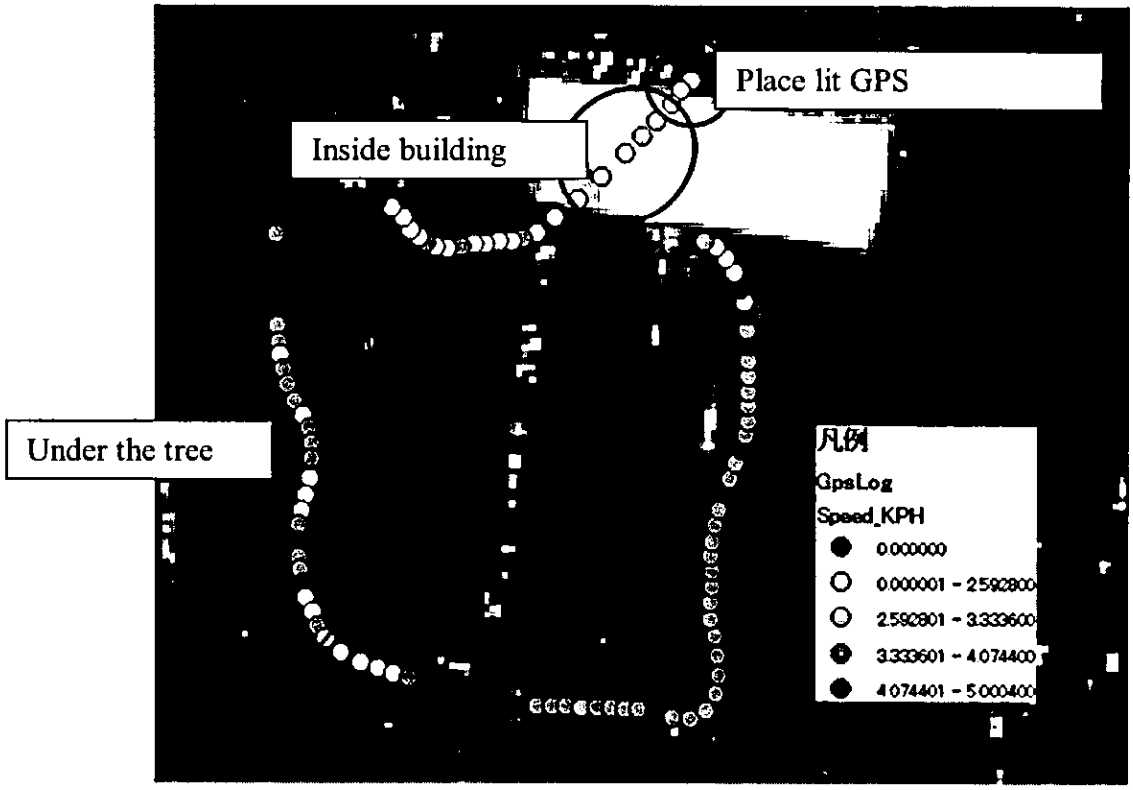
- 0.000000
- 0.000001 - 2.592800
- 2.592801 - 3.333600
- 3.333601 - 4.074400
- 4.074401 - 5.000400

The above data is the data speed (Speed_KPH), the image can show which area of low speed and what is high. In addition to the analysis of the causes of low velocity in the area, such as traffic problems or road damage, etc.



The above data is the data altitude / height, the image can show which areas are low and where high. Such data can be used as a basis for planning the manufacture of drainage, etc.

3. There are several areas that can decrease the accuracy of GPS data that is under the tree and d in the building.

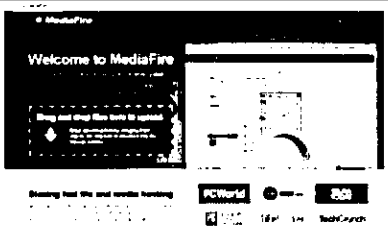
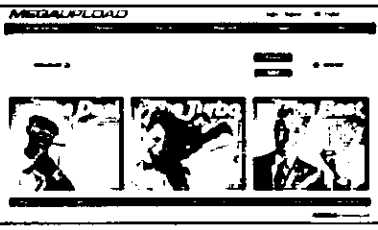


5. Sharing Data Introduction thorugh Internet Network

5.1 Sharing Data Introduction

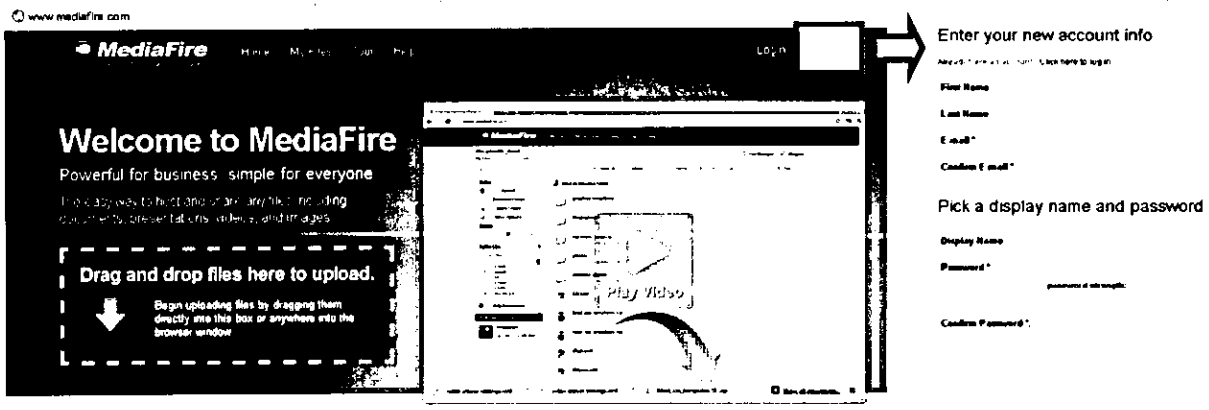
It is possible to share data easily by using file sharing service of internet.

Table 1. Types of file sharing service on Internet

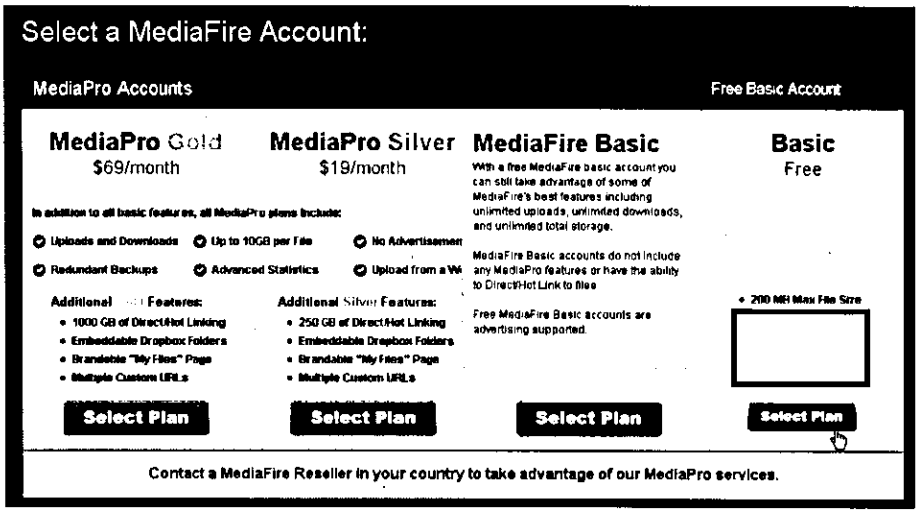
Website	Summery	Image
Media Fire http://www.mediafire.com/	-Share files: 200MB/file max. -Share with e-mail, twitter, facebook.	
Mega Upload http://www.megaupload.com/	- Your files will be stored until at least 90 days after their last download. - Share files : 1024MB/file max.	

Below, how to use Media file is introduced.

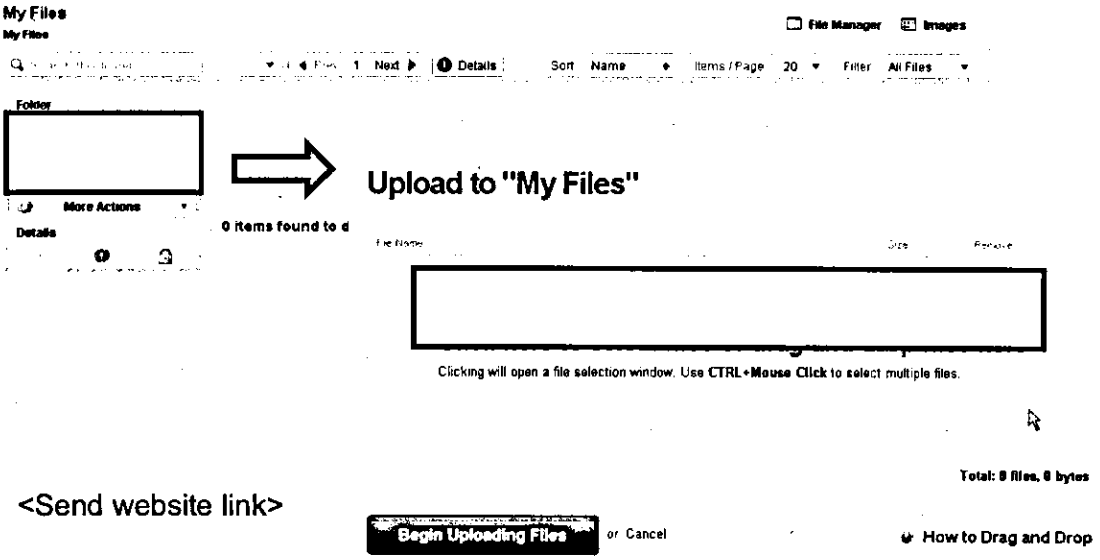
a. Click Start, Program, Internet Explore or Mozilla Firefox or Opera (browsing application).
b. Browsing window will open.
c. Input "http://www.mediafire.com/"and to connect the Media Fire web
d. Click sign up, and enter your new account information.



e. Select free basic account plan.

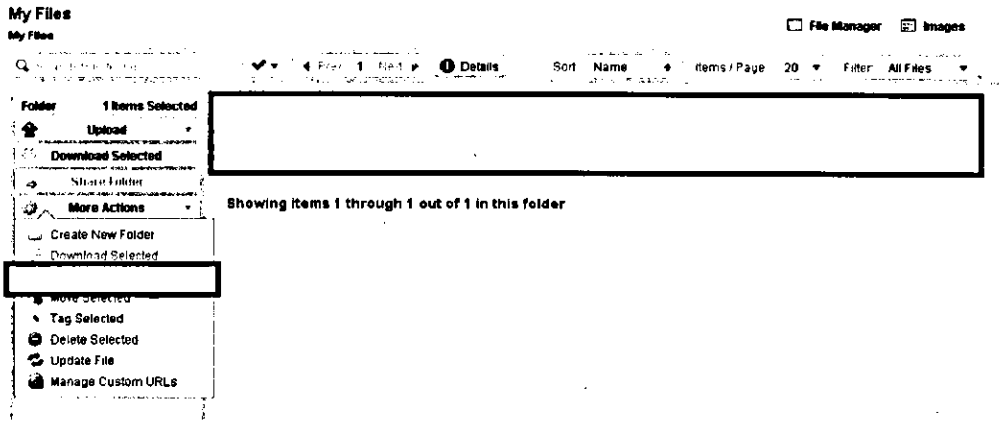


f. Click upload, and drag and drop files.



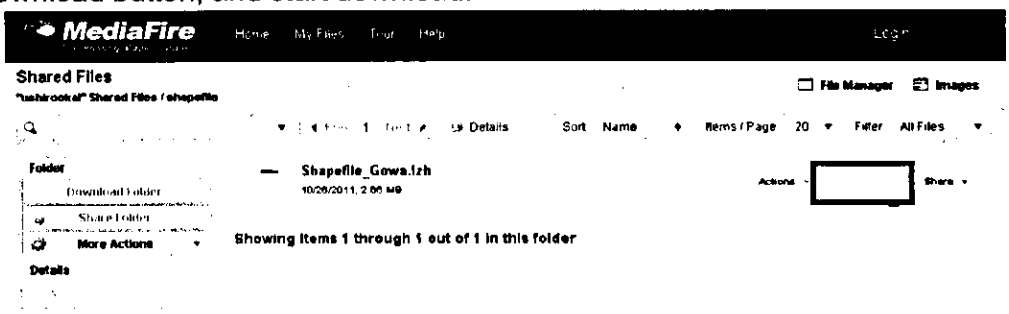
<Send website link>

g. Click upload file and click email selected. Enter the email address and send website link.



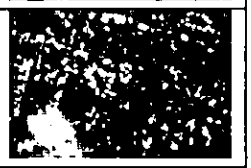
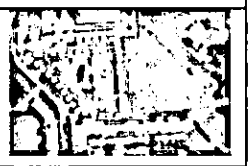
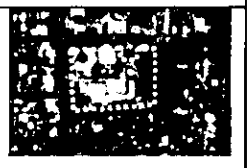
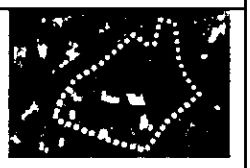
< Download Data>

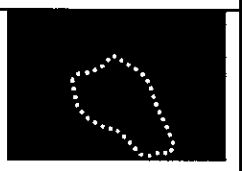
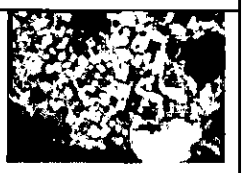
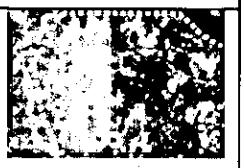
h. Receive the e-mail and open. Click website link and Browsing window will open. Click Download button, and start download.

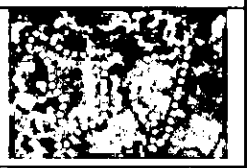
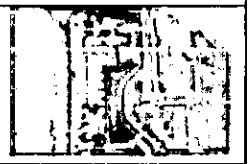
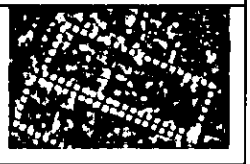
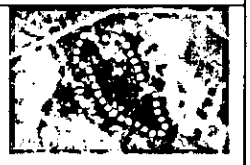


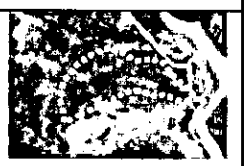
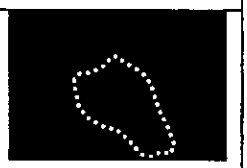
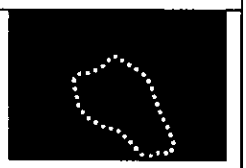
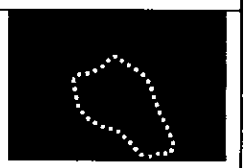
6. Landuse Classification

Table 2. Landuse classification

No	Classification	Definition	Image
1	Airport (Fire red)	A place where planes take off and land, with buildings for passengers to wait in. Hasanuddin airport is applied.	
2	Bare land (Heliotrope)	an area that is not covered by trees or grass, or not having any leaves	
3	Bush (Lemongrass)	a plant with many thin branches growing up from the ground	
4	Office (Medium coral light)	There are buildings that belongs to a company or organization	
5	Commercial (Rose Quartz)	an area related to business and the buying and selling of goods and services	
6	Dam (Sodalite Blue)	a special wall built across a river or stream to stop the water from flowing, especially in order to make a lake or produce electricity Bilibili dam is applied.	
7	Education (Rhodolite Rose)	an area teaching and learning, usually at school, college, or university:	

No	Classification	Definition	Image
8	Field/sport (Macaw Green)	an area of ground where sports are played	
9	Fish pond (Indicolite Green)	a small area of fresh water that is smaller than a lake, that is artificially made for fish	
10	Limited production Forest (Leaf Green)	a large area of land that is covered with trees, that is limited production	
11	Urban forest (Fir Green)	an area of land that is covered with trees in tha urban area	
12	Grave (Gray 10%)	the place in the ground where a dead body is buried	
13	Industrial (Medium Coral)	An area of the type used in industry	
14	Irrigated rice field (Autunite Yellow)	A field that supply rice with water	
15	Lake (Sodalite Bule)	A large area of water surrounded by land	
16	Mangrove (Malachite Green)	a tropical tree that grows in or near water and grows new roots from its branches	

No	Classification	Definition	Image
17	Median (Macaw Green)	a narrow area of land that separates the two sides of a big road in order to keep traffic travelling in different directions apart	
18	Mine (Gray 30%)	holes in the ground that people dig so that they can remove some minerals	
19	Mixed crop (Mango)	a plant such as wheat, rice, or fruit that is grown by farmers	
20	Park (Macaw Green)	a large open area with grass and trees, especially in a town, where people can walk, play games etc	
21	Pond (Sodalite Bule)	a small area of fresh water that is smaller than a lake, that is either natural or artificially made	
22	Port (Flame red)	a place where ships can be loaded and unloaded	
23	River (Sodalite Bule)	A natural and continuous flow of water in a long line into the sea	
24	Sand (Solar Yellow)	an area of beach	
25	Settlement (Fushia Pink)	A group of houses and buildings where people live, especially in a place where few people have lived before	
26	Swamp (Sugilite Sky)	land that is always very wet or covered with a layer of water	

No	Classification	Definition	Image
27	Solid Waste (Cattleya Orchid)	An atea that unwanted materials or substances that are left	
28	Un irrigated rice field (Mango)	A field that supply rice without water	
29	Wet rice field (Autunite Yellow)	A field that supply rice covered in or full of water	
30	Conservation forest (Olivenite Green)	a large area of land that is covered with trees, that is watching or carefully for a period of time	
31	Production forest (Fir Green)	a large area of land that is covered with trees, that is growing trees to be sold	
32	Protection forest (Spruce Green)	a large area of land that is covered with trees, that is protected	

Part III : Database Management System

1. Database Management System Concept

1.1. Concepts in database systems

- Database management is performed efficiently by a clarification of role that district/city updates the data and UPTD MM integrate and manage the data.
- To improve the accuracy of the database by UPTD MM check the data that is created each district/city. The variation in the accuracy of the data is lost, and fixed quality is secured.
- to use the database of the entire Mamminasata, it is possible to plan the project across district/city.

1.2. Database Management Purpose

1. Purpose of GIS database

- Purpose of GIS database is increased the efficiency/advancement in work of urban planning.

Table 3. Purpose of GIS database

Purpose	Remark
Efficient urban planning	Unified state municipal structure of database formats
Spatial Plan Support	<Base map maintenance> Spatial Planning (GSP, DSP) to develop a base map data needed to create
	<Creating thematic> Drawings necessary to extract only the information from the base map spatial planning (themes) to create
	<Validation of spatial planning> By superimposing a layer of regulation to other planning and spatial planning and the creation, you can easily check the validity of the plan consistent
Support the preparation of development approval	Application forms required for development approval (location drawings, plans and drawings) to create
Centralized management of key projects	Business Overview Major Business, drawings and progress of GIS to organize, and can be centrally managed
Data storage	Every year, save to accumulate a database, and check to make the aging

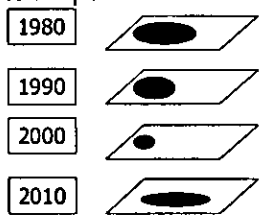
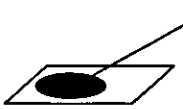
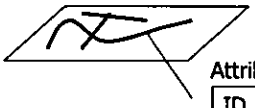
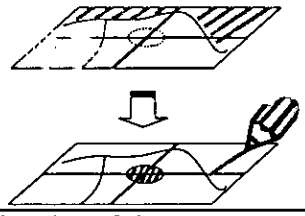
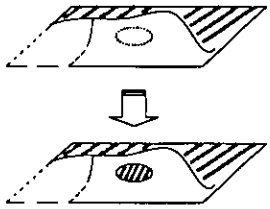
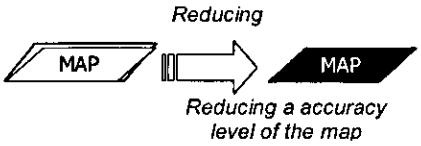
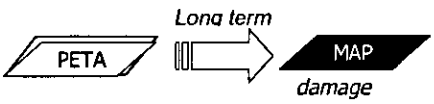
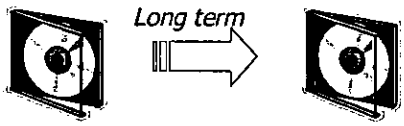
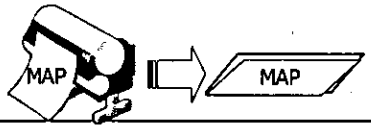
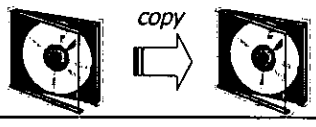
2. Purpose of GIS database management

- Build a system that only cities and counties in the state of creating and managing databases needed for urban planning.

3. Benefits of GIS database

- Work time is reduced, because it is possible to make it easy to measure distance and area and to analysis a variety..
- It is possible to maintenance and update, more quickly, more cheap and more accuracy.
- It is possible to be a long term storage and don't need storage space.
- Table of the comparison of paper maps and GIS shows to the next page.

Table 4. Comparison of paper map with GIS (digital map)

	Paper map	GIS (Digital map)
Comparison (time, subject)	Separate maps 	Consolidate information  Attribute table Year | Green area 1980 | 100m² 1990 | 50m² 2000 | 10m² 2010 | 50m²
Measurement (length, area, quantity)	Require significant effort 	Spatial analysis function  Attribute table ID | Length 01 | 100m 02 | 50m 03 | 10m
Visualization (Update of urban planning map)	Difficultly change the display style(color, line, design) 	Easily change the display style 
Update map	Deterioration of data accuracy 	Maintenance of data accuracy  Similar accuracy level
Storage space	Increase of storage space 	reduction of storage space 
Long-term storage	Discoloration and deterioration 	No deterioration 
Provide map	Print map in advance 	Provide map by CD-ROM 

4. Utilization of GIS database

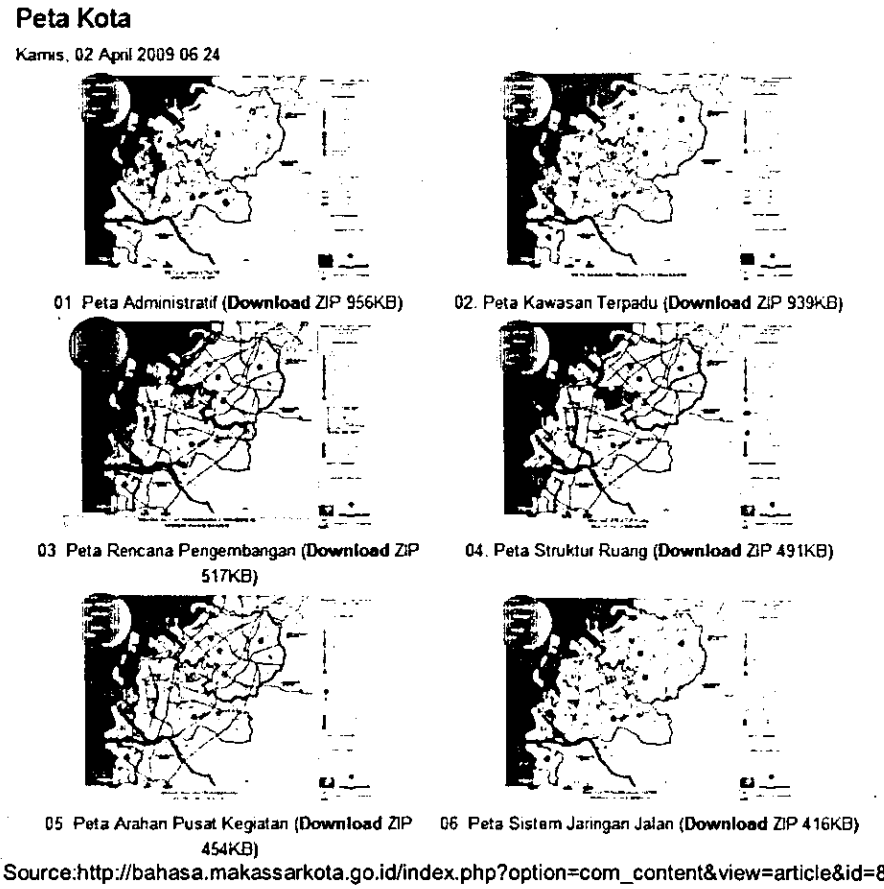
- GIS database can be utilized in a variety of situations. It is possible to carry out problem finding, analysis of project effect by usage is applied
- It is possible to support the following work by using GIS.

Table 5. Utilization of GIS database

Work	contents
Permit	· management and support of permit information
Assets management	· public facilities (road, river, water and sewer, etc) · lifeline (electronic, telecommunication, gas, etc)
Project planning	· urban planning · road planning · environment protection project planning · aging changing analysis
	Application : Problem finding · It is possible to understand the problem by overlaying road planning on the rare species of animals position or cultural assets
	Application : Analysis of go green program effect · it is possible to analysis the improving air quality effect by calculating planting design area and basic unit of improve air quality. Volume of CO2 reduction = basic unit of improve air quality * planting design area
Marketing	· site location planning of facility, factory · facilities distribution map
	For example ; hospital position · It is possible to decide a hospital position by overlay buffer from hospital on population density. Hospital is necessary area that hospital is far and population density is high.
Tourism	· position information of the tourist spots and hotel (tourism map) · traffic information (bus stop position, etc)
Disaster prevention	· damage estimation (hazard map) · evacuation facility information management
Residential information	· household size and composition of each house · welfare information
Statistics information	· population distribution (population density) · aging changing analysis (rate of population increase)

5. Providing data

- It is possible to improve service of disclose information to residents by publish a making figure to the website of district/city.
- The example of website in Makassar is shown below.



Source:http://bahasa.makassarkota.go.id/index.php?option=com_content&view=article&id=86

Figure 14. Map of Makassar City on Makassar City's website (city map)

2. Database Management System Procedure

2.1 Introduction

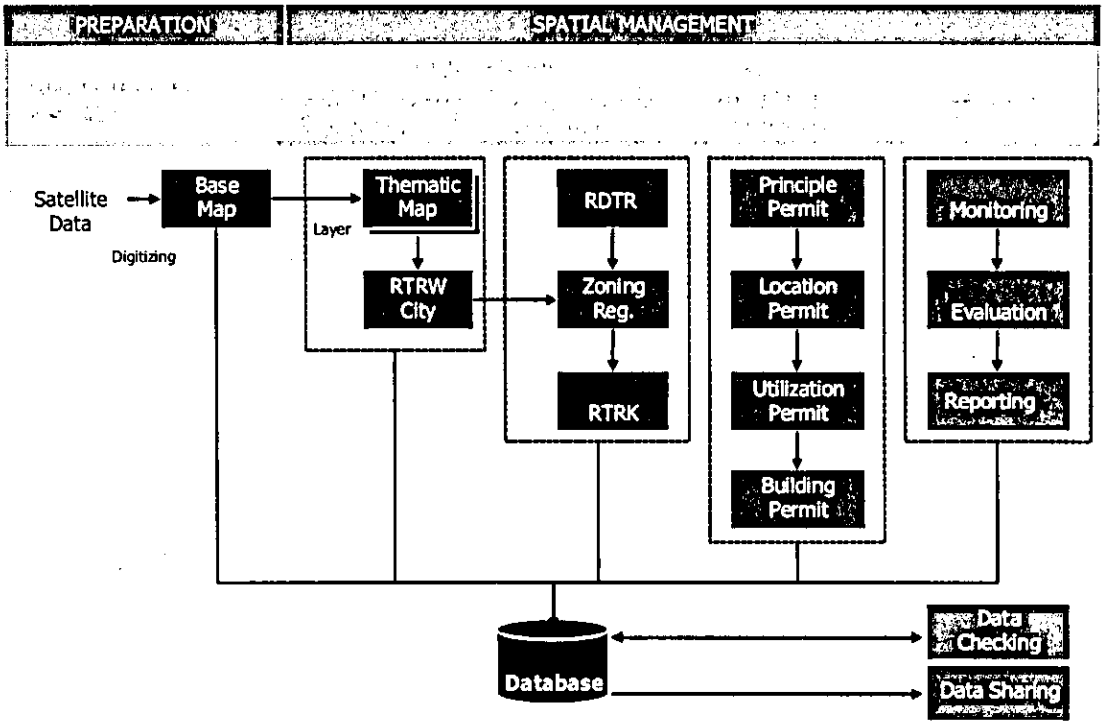


Figure 15. Flow chart of database management system

- Database management system is a system that carries out (1) Preparation of Base Map, (2) Spatial Planning (GSP, DSP), (3) Spatial Utilization Permission, and (4) Supervision, regularly.
  1. Creating a base map that is necessary to study the spatial planning.
  2. Study the spatial planning based on the base map.
  3. Creating data is utilized as a material of spatial utilization permission.
  4. Each data is organized as database and to check the accuracy and to shear to the relation institute.

2.2 Preparation of Database Management System

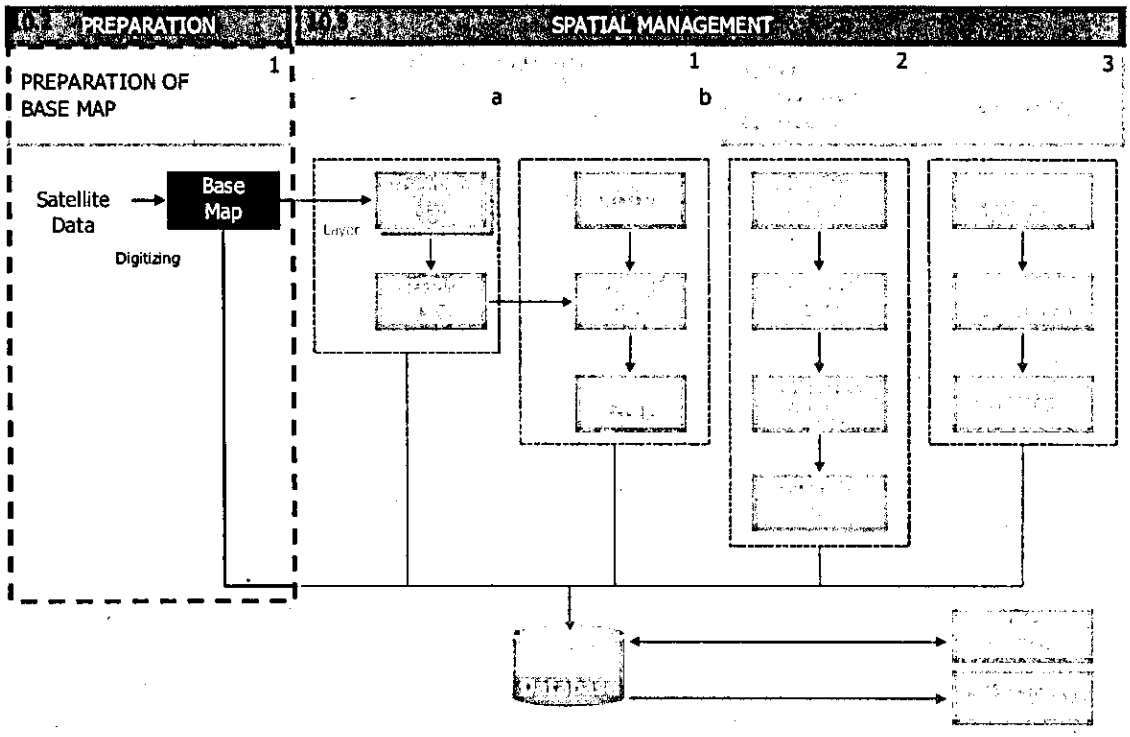


Figure 16. Creating a base map

1. Preparation of Base Map

a. Satellite Imagery Data

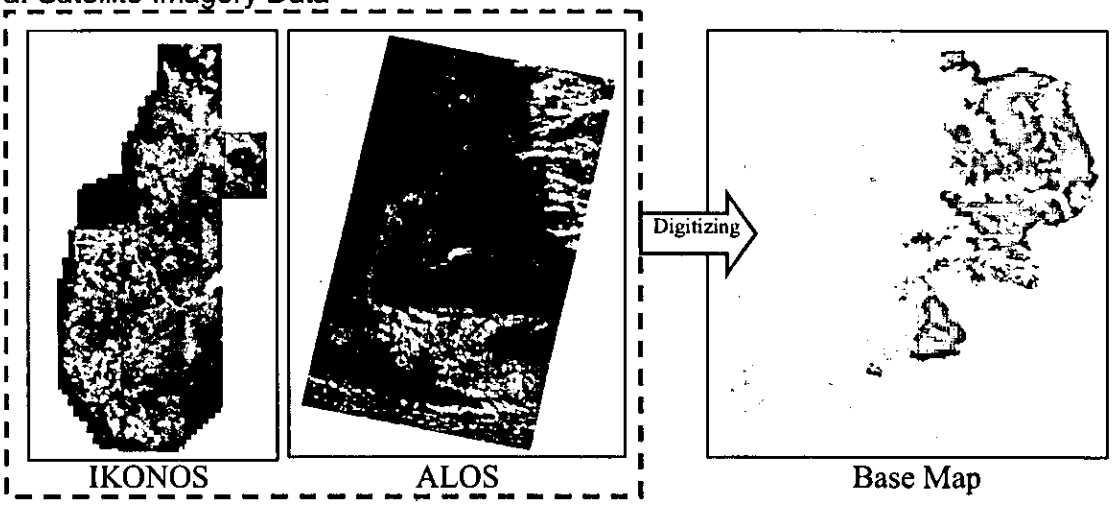


Figure 17. Preparation of base map activites

b. The step of creating base map

Table 6. Step of creating base map

Steps	Work	Map Contents	Reference of GIS operation manual
Base Map			
1	Purchase of satellite image	a. IKONOS b. ALOS c. LANDSAT	
2	Open and draw satellite image	a. IKONOS data b. ALOS data c. LANDSAT data	ArcGIS Operation (Basic 1) 1. Open and Draw IKONOS Data 2. Open and Draw ALOS Data 3. Open and Draw LANDSAT Data
3	Digitizing satellite image	a. Land use (32 classification) 1. Airport 2. Bare Land 3. Bush 4. Business/ Office 5. Commercial 6. Bili-Bili Dam 7. Education 8. Field 9. Fishpond 10. Limited Production Forest 11. Forest Urban 12. Grave 13. Industry 14. Irrigated Rice Field 15. Lake 16. Mangrove 17.Median 18.Mine 19.Mixed Crop 20.Park 21.Pond 22.Port 23. River 24. Sand 25. Settlement 26. Swamp 27. Final Disposal Site 28. Unirrigated Agricultural Field 29. Wet Rice Field 30. Conservation forest 31. Production Forest 32. Protection Forest b. Infrastructure 1. Road 2. Airport 3. Port	ArcGIS Operation (Basic 2) 1. Digitizing land use
4	Revising existing data	a. Administrative Boundary Data 1. District/city 2. Sub-district 3. Mamminasata	ArcGIS Operation (Basic 2) 1. Revising Administrative Boundary Data
5	Adding a new socio economy data	a. Socio economy 1. Population	ArcGIS Operation (Basic 2) 1 Open and Draw Population Data

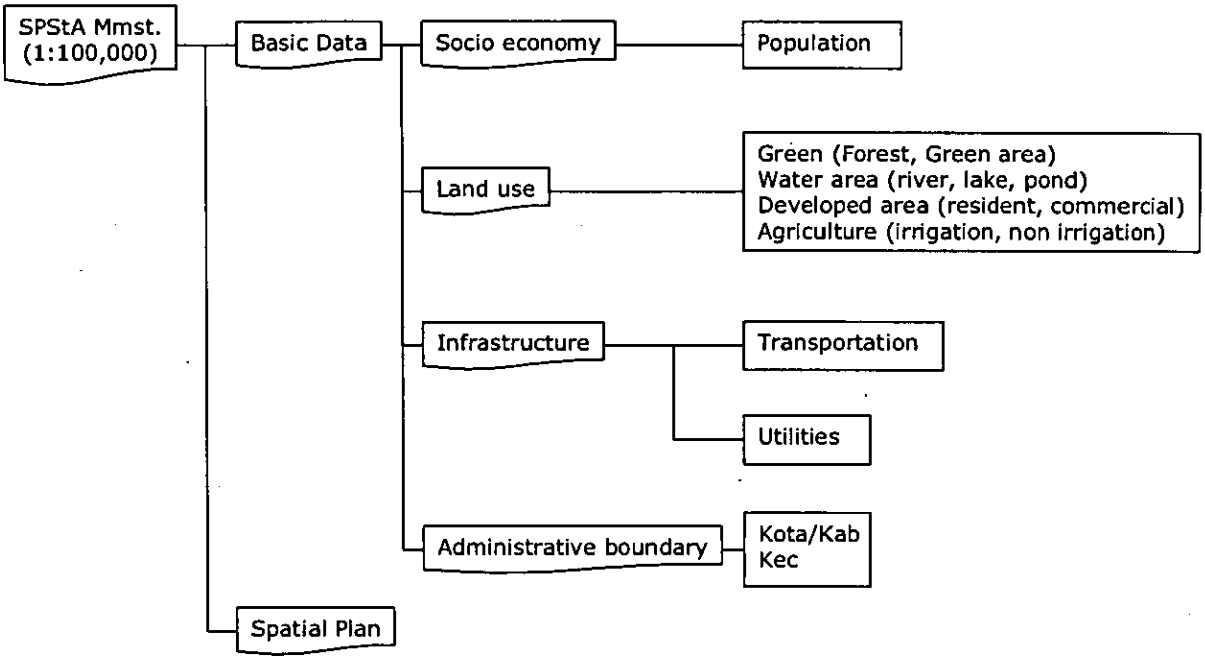


Figure 18. Base map database content

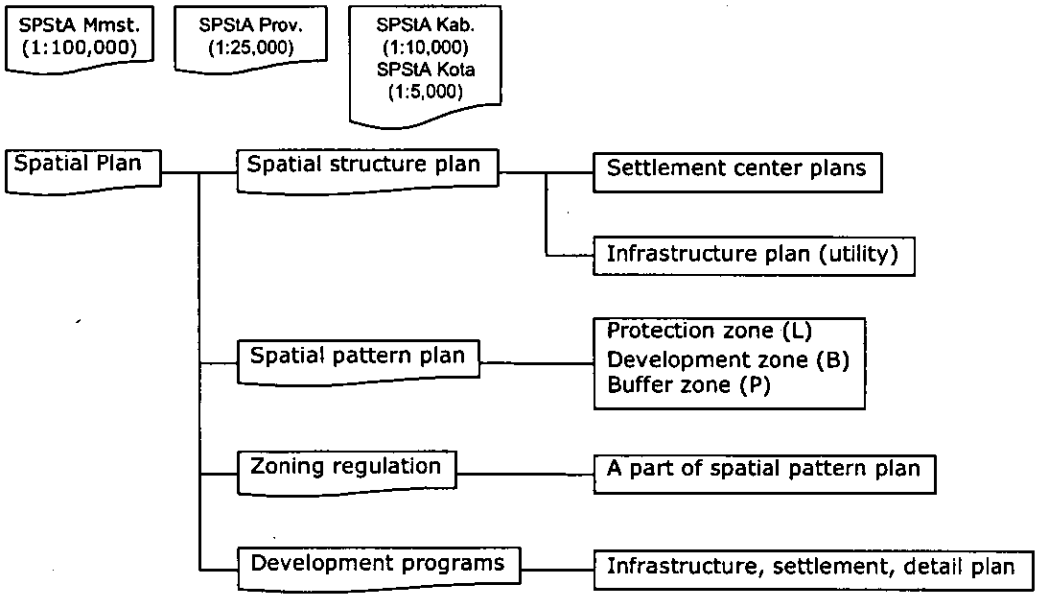


Figure 19. Spatial planning database content

2.3 Spatial Management

1. Spatial Planning

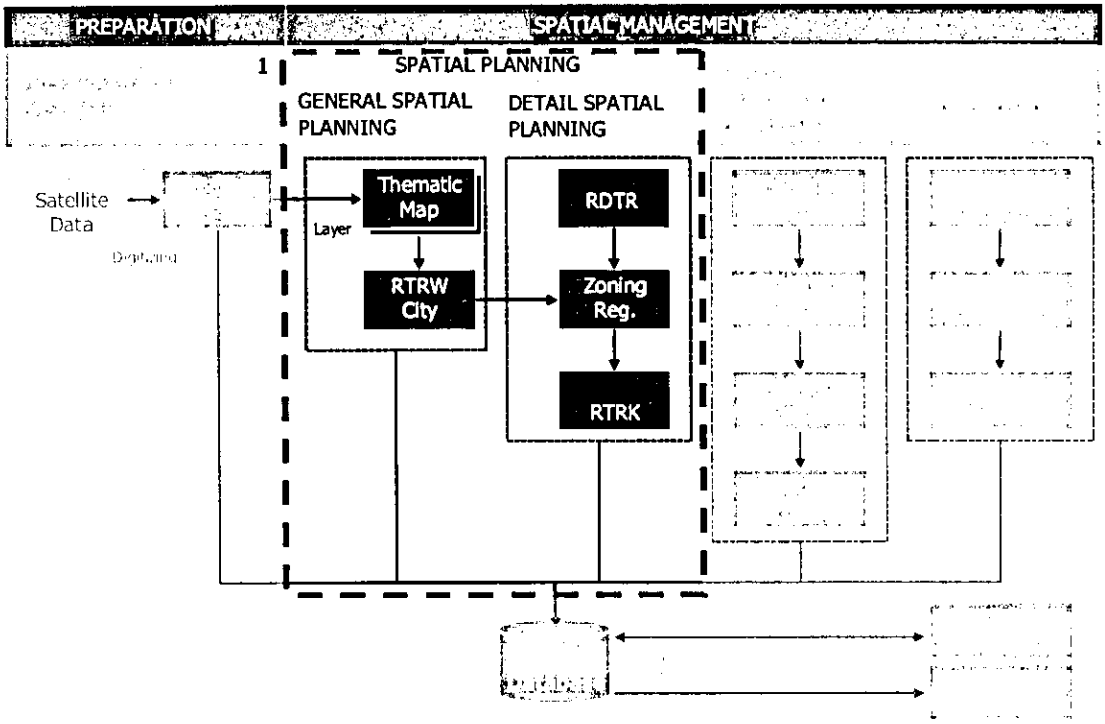


Figure 20. Frame of spatial planning activites

a. GSP Formulation

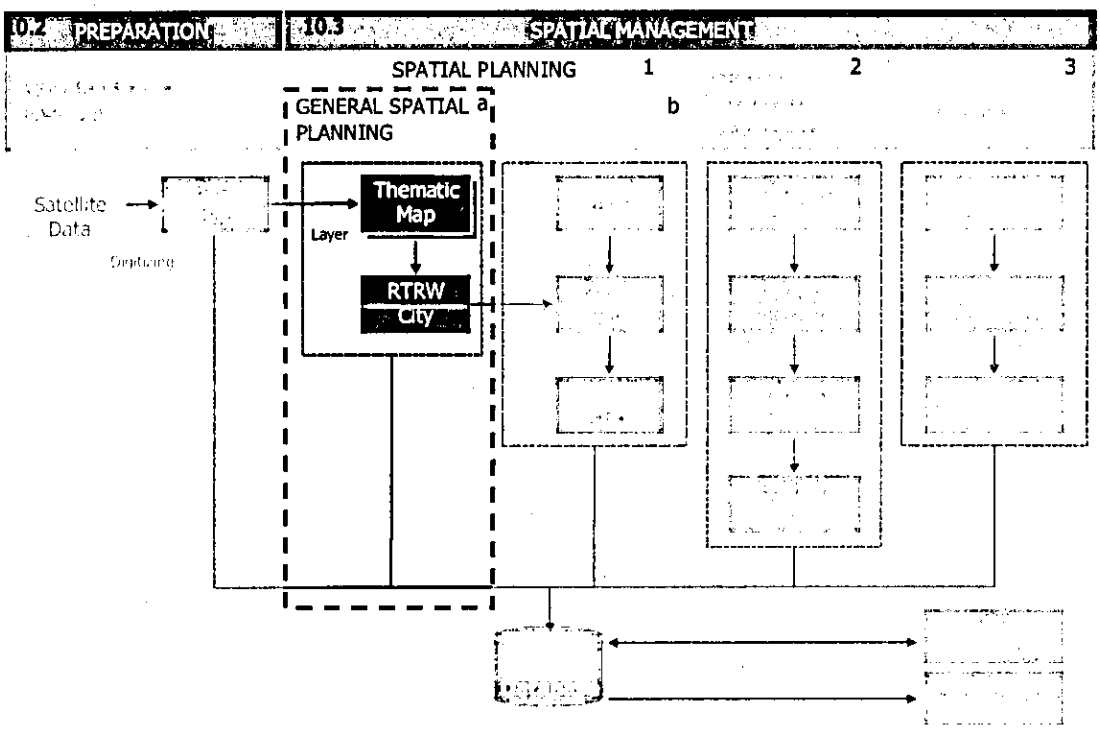


Figure 21. Frame of general spatial planning activites

- Objective of GSP
  Spatial plan is a reference for spatial utilization for the entire activities which require space through sectoral and regional development activities.
- Collecting database
  Database collecting are administrative data of region; physiographic data; demographic data; economy and finance data; data on availability of basic facility and infrastructure; land use data; spatial allotment data; disaster-prone areas data; and basic topographic maps and thematic maps required including land use map, space allotment map, and disaster prone areas map. The map scale is 1:50,000 (District) and 1:25,000 (City).
- The necessary map for GSP shows as follow. It is the same as Manual on District and City General Spatial Plan Formulation in Mamminasata Urban Area, page 51 (Appendix (8) Check List of Contents of District & City General Spatial Plans).

Table 7. Check List of contents of district & city general spatial plans

No	Map	District GSP Map Contents	Feature			Type of file
			Point	Polyline	Polygon	
A. District GSP Profile Maps						
1	Orientation Map	Small-scale map (adjusted to paper size), to show location of district within a larger area				Jpeg
2	Administrat -ive Border Map	a. Delineation of district		✓	✓	shp
		b. Delineation of subdistricts		✓	✓	
		c. Each subdistrict is given district central point.	✓			
3	District Land Coverage Map	a. Scale adjusted to paper size				shp
		b. Classification of spatial utilization is to follow current conditions (not bound by spatial pattern plan's classifications)			✓	
4	Disaster-Prone Areas Map	Delineation of disaster-prone areas, according to risk levels:				shp
		a. Scale adjusted to paper size;				
		b. Risk levels to be indicated using color-gradation.			✓	
5	Population Distribution Map	Population density per village/kelurahan to show district's population concentration:				Shp
		a. Scale adjusted to paper size;				
		b. Population density to be adjusted to data conditions, at least 3 intervals and at most 5 intervals			✓	
		c. Population density gradation (intervals) is indicated simultaneously.			✓	
6	Other maps deemed necessary	For Mamminasata Area: - Ecosystem Risk Areas, indicating fragile ecosystems or areas with threatened continuity.			✓	Shp
B. District GSP Maps						
1	District Spatial Structure Map	a. Scale adjusted to paper size				Shp
		b. Map contents: 1). Residential systems (PKW, PKL, PPK, and PPL);			✓	
		2). Road networks		✓		
		3). Railroad networks;		✓		
		4). Airports and seaports	✓		✓	
		5). Labels of infrastructures above.				

No	Map	District GSP Map Contents	Feature			Type of file
			Point	Polyline	Polygon	
2	District Infrastructure Network Plan Map	a. Scale adjusted to paper size; and				Shp
		b. Map contents:				
		1). Telecom;	✓			
		2). Energy infrastructures;	✓			
		3). Water infrastructures;	✓			
		4). Other infrastructures;	✓			
		5). Location labels				
3	District Spatial Pattern Map	a. Scale 1:50.000,;				Shp
		b. Map index and page numbers must be attached;				
		c. Map contents:				
		1). Delineation of spatial utilization allocation plans in accordance with district spatial patterns;			✓	
		2). Rivers, primary collectors 1-3, local primaries;			✓	
		3). Railroads		✓		
		4). Location labels				
4	District Strategic Area Establishment Map	a. Scale adjusted to paper size				Shp
		b. Map contents:				
		1). Delineation of national strategic areas (if applicable);			✓	
		2). Delineation of provincial strategic areas (if applicable);			✓	
		3). Delineation of district strategic areas;			✓	
		4). Rivers, primary collectors 1-2, railroads;		✓	✓	
		c. Location labels				

No	Map	District GSP Map Contents	Feature			Type of file
			Point	Polyline	Polygon	
A. City GSP Profile Maps						
1	Orientation Map	Small-scale map (adjusted to paper size), to show location of district within a larger area				Jpeg
2	Administrative Border Map	a. Delineation of city		✓	✓	Shp
		b. Delineation of sub-district		✓	✓	
		d. Each sub-district is given city central point.	✓			
3	Land Allocation Map	a. Scale adjusted to paper size				Shp
		b. Classification of spatial utilization is to follow current conditions (not bound by spatial pattern plan's classifications)			✓	
4	Disaster-Prone Areas Map	Delineation of disaster-prone areas, according to risk levels:				Shp
		a. Scale adjusted to paper size;				
		b. Risk levels to be indicated using color-gradation.			✓	
5	Population Distribution Map	Population density per village/kelurahan to show city population concentration:				Excel Shp
		a. Scale adjusted to paper size;				
		b. Population density to be adjusted to data conditions, at least 3 intervals and at most 5 intervals			✓	
		c. Population density gradation (intervals) is indicated simultaneously.				
6	Other maps deemed necessary	For Mamminasata Area: - Ecosystem Risk Areas, indicating fragile ecosystems or areas with threatened continuity.			✓	Shp

No	Map	District GSP Map Contents	Feature			Type of file
			Point	Polyline	Polygon	
B. City GSP Maps						
1	City Spatial Structure Map	a. Scale adjusted to paper size				Shp
		b. Map contents:				
		1). Residential systems (PKW, PKL, PPK, and PPL);			✓	
		2). Road networks		✓		
		3). Railroad networks;		✓		
		4). Airports and seaports	✓		✓	
		5). Labels of infrastructures above.				
2	City Infrastructure Network Plan Map	a. Scale adjusted to paper size; dan				Shp
		b. Map contents:				
		1). Telecom;	✓			
		2). Energy infrastructures;	✓			
		3). Water infrastructures;	✓			
		4). Other infrastructures;	✓			
3	City Spatial Pattern Map	a. Scale 1:50.000,;				Shp
		b. Map index and page numbers must be attached;				
		c. Map contents:				
		1). Delineation of spatial utilization allocation plans in accordance with district spatial patterns;			✓	
		2). Rivers, primary collectors 1-3, local primaries;			✓	
		3). Railroads		✓		
		4). Location labels				
4	City Strategic Area Establishment Map	a. Scale adjusted to paper size				Shp
		b. Map contents:			✓	
		1). Delineation of national strategic areas (if applicable);				
		2). Delineation of provincial strategic areas (if applicable);			✓	
		3). Delineation of district strategic areas;			✓	
		4). Rivers, primary arterial roads, primary collectors 1-3, local primaries;		✓	✓	
		c. Location labels				

b. DSP Formulation

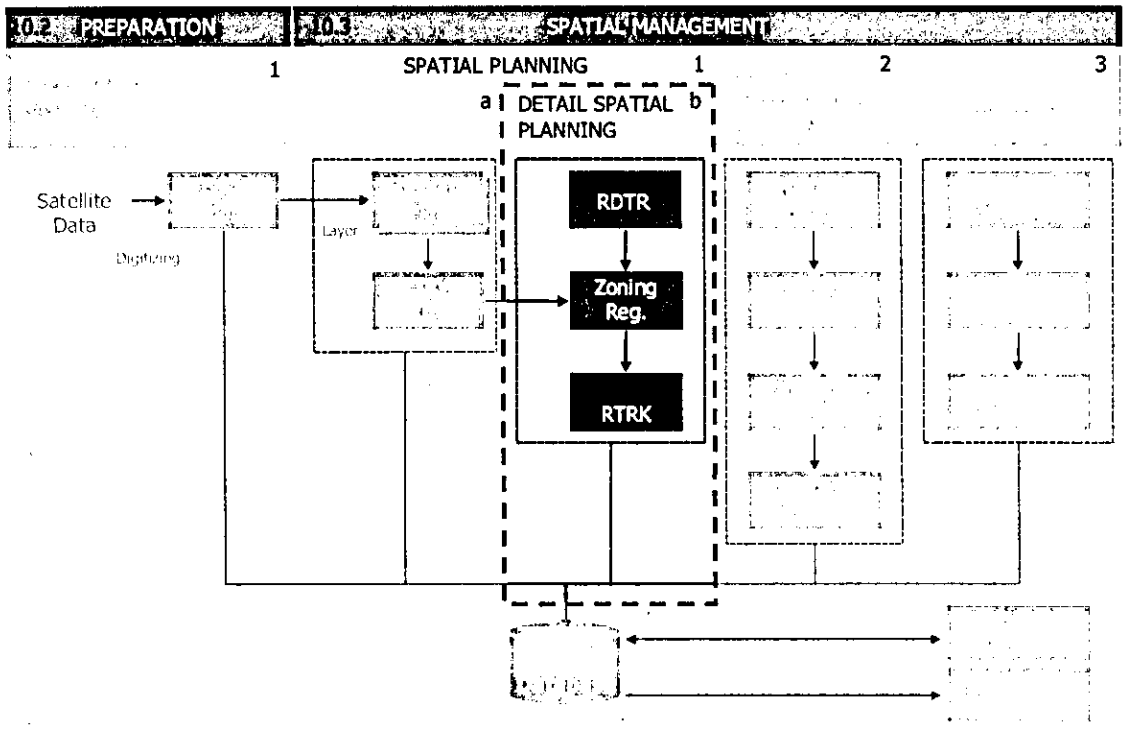


Figure 22. Frame of detail spatial planning activities

- District/city specific spatial plan constitutes the base for formulation of Building and Neighborhood Plan for zones in the specific spatial plan demarcated as prioritized zones.
- The necessary map for DSP shows as follow. It is the same as Manual on District and City Detailed Spatial Plan Formulation in Mamminasata Urban Area, page 34 (Appendix (4) Check List of Contents of District and City DSP).

Table 8. Check list of contents of district and city dsp

Title		Content (Minimum Requirements for Draft Regional Regulation on District and City Detailed Spatial Plans)	Feature			Type of file
			Point	Polyline	Polygon	
I	Collecting Data & Information	1. Orientation map (administrative boundary, forest boundary)		✓	✓	Shp
		2. Basic maps (cartographic, topographic, geologic, hydrologic, oceanographic, climatologic, satellite image/aerial photo)				Jpeg
		3. Existing maps (population and building density, land use, utility, public facility, infrastructure network, Green Open Space, Non-Green Open Space)	✓	✓	✓	Shp
		4. Maps of potential disaster-prone areas and potential disturbed ecosystem	✓	✓	✓	Shp
		Basic Map: Aerial Photos or satellite image record, especially for strategic or fast growth urban area, at least with scale of 1 : 5000, and 1 : 1,000 for more detailed area. Except for area with extensive function (agropolitan/ agriculture / plantation/cattle breeding/forestry/ fishery).	✓	✓	✓	Shp
II	Planning Map	1. Map of Spatial Utilization Pattern	✓	✓	✓	Shp
		2. Map of Population and distribution			✓	Shp
		3. Map of District and City Spatial Structure	✓	✓	✓	Shp
		4. Zoning allocation		✓	✓	Shp
		5. Block allotment		✓	✓	Shp
		6. Map of road network (halt / bus stop, crossing bridge, parking, station, terminal, etc.)	✓	✓	✓	Shp
		7. Map of railway network (station, rail-lane,)	✓	✓	✓	Shp
		8. Map of air and water transportation network (port, terminal, warehouse, container yard)	✓	✓	✓	Shp
		9. Map of Building and Neighborhood Plan (BCR, FAR, building density in areas to develop)	✓	✓	✓	Shp
		Planning Map: At scale of 1 : 5,000, except for more detailed, 1 : 1000 at scale is used.	✓	✓	✓	Shp
III	Utility and Facility Network Plan Map	1. Water supply (source, plant, and distribution)	✓	✓	✓	Shp
		2. Electricity and gas (source, plant and distribution sub- station)	✓	✓	✓	Shp
		3. Telecommunication (tower, terminal)	✓	✓	✓	Shp
		4. Drainage (hierarchy of surface discharge)	✓	✓	✓	Shp
		5. Wastewater and solid waste (garbage collection, plant and dumping area)	✓	✓	✓	Shp
		6. Green Open Space (open sport square, city forest, lawn and park),			✓	Shp
		7. Non-Green Open Space (gathering yard, plaza, play ground)			✓	Shp
		8. Social-public facilities (police station, post office, fire station)			✓	Shp
		Utility and Facility Network Map : At scale 1 : 5000, except if need more detail shown 1 : 1000 at scale.	✓	✓	✓	Shp

2. Spatial Utilization Permission

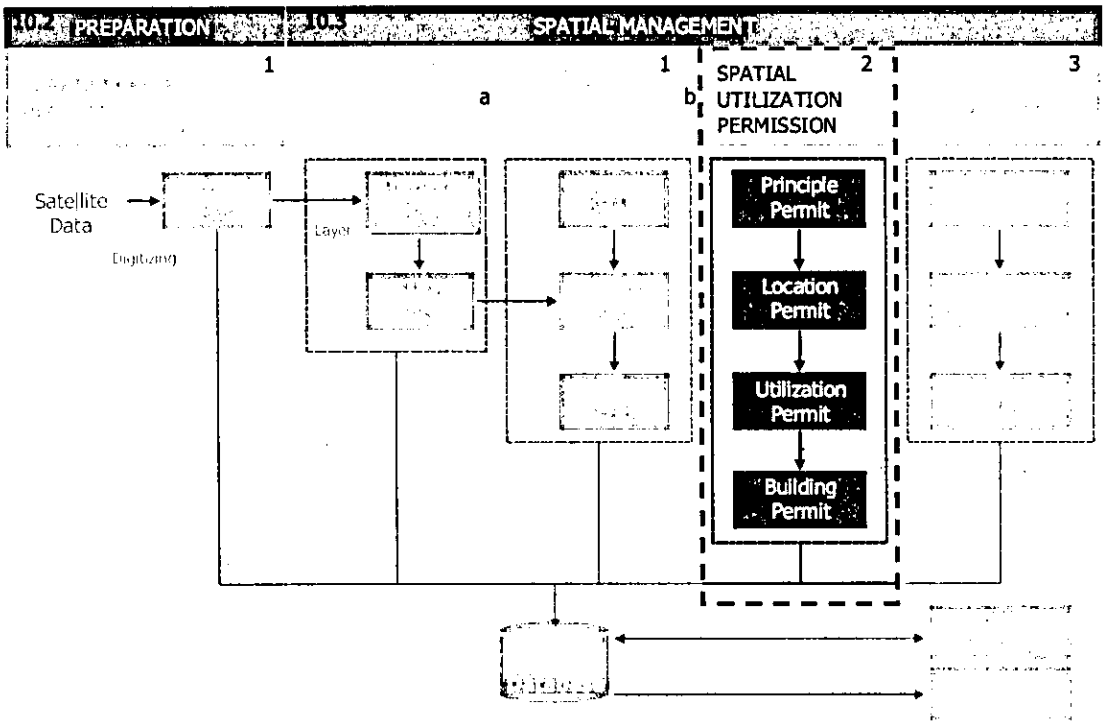


Figure 23. Frame of spatial utilization permission activities

- In spatial utilization, everyone is obliged to get permit prior to spatial utilization and to perform permit provisions in the implementation of spatial utilization.
- Permit of spatial utilization is provided aiming at:
  a. Ensuring that spatial utilization is relevant with spatial plan, zoning regulation, and minimum service standard in the field of spatial management;
  b. Avoiding negative impact of spatial utilization; and
  c. Protecting public concerns.
- Permit of spatial utilization is given to the candidate of spatial user who will conduct the activity of spatial utilization in a region/zone based on spatial plan.
- The necessary map for permit application shows as follow. It is the same as Manual on Spatial Utilization Control Implementation in Mamminasata Urban Area, page 52 (Appendix (4) Drawing and Map List for Permit Application).

Table 9. Drawing and map list for permit application

Item	Drawing/Map	Feature			Type of file
		Point	Polyline	Polygon	
Location map of project site	- Location of project site on General Spatial Plan Map	✓	✓	✓	Shp
	- Location of project site on Detail Spatial Plan Map	✓	✓	✓	Shp
Premises of project site	- Boundary of project site		✓		Shp
	- Province/City/District administration boundary		✓		Shp
Current condition analysis on project site	- Boundary of development area		✓		Shp
	- Existing road in/ around project site		✓	✓	Shp
	- River/stream in/around project site(with water flow direction)		✓	✓	Shp

Item	Drawing/Map	Feature			Type of file
		Point	Polyline	Polygon	
	- Forest/wood land			✓	Shp
	- Swamp/lake/pond			✓	Shp
	- Farm land			✓	Shp
	- Existing Utility/public facilities (including high-voltage power line)	✓		✓	Shp
	- Settlement (village/house)	✓		✓	Shp
Land use plan	- Boundary of project site		✓		Shp
	- Location, shape & name of road, park/green, utility & public facility	✓	✓	✓	Shp
	- Shape and usage of plot	✓	✓	✓	Shp
	- Location and shape of buffer area, river/stream, lake/pond			✓	Shp
Land reclamation plan	- Boundary of project site		✓		Shp
	- Distribution of earth cutting or filling	✓		✓	Shp
	- Location of cliff and retaining wall planned	✓		✓	Shp
	- Cross section of cliff/slope (in case of large cliff/slope)	✓		✓	Shp
	- Plan of surface protection of cliff/slope	✓		✓	Shp
Road plan	- Boundary of project site		✓		Shp
	- Location of road network by type of road		✓	✓	Shp
Public transportation plan	- Boundary of project site		✓		Shp
	- Location of public transportation facility such as bus stop	✓		✓	Shp
	- Typical design of public transportation facility such as bus stop	✓		✓	Shp
Water supply plan	- Boundary of project site		✓		Shp
	- Plan of water resource	✓		✓	Shp
	- Plan of water supply facility (location, shape, design of water-supplying facilities	✓		✓	Shp
	- Location of fire-plug (hydrant)	✓		✓	Shp
Drainage plan	- Boundary of project site		✓		Shp
	- Plan of drainage facilities (location, typical section, material, flow direction)	✓		✓	Shp
	- Drainage facility outside connecting drainage facility of project site (location, name, cross section, administrating organization)	✓		✓	Shp
	- Location, shape and capacity of flood control system inside project such as retention pond in case of needed	✓		✓	Shp
Waste water treatment plan	- Boundary of project site		✓		Shp
	- Plan of sewerage facility (location, typical section, material, flow direction) in case of off-site sewerage system is introduced.	✓		✓	Shp
Solid waste disposal plan	- Boundary of project site		✓		Shp
	- Typical design of garbage stock spot/yard in project site	✓		✓	Shp
Power supply plan	- Boundary of project site		✓		Shp
	- Location of power supply facility in project site	✓		✓	Shp
Park and green facility plan	- Boundary of project site		✓		Shp
	- Location of park and green facility/buffer green	✓		✓	Shp
	- Design of major parks			✓	Shp
Public facility plan	- Boundary of project site		✓		Shp
	- Location of public facility (education facility, healthcare facility, and other community facility)	✓		✓	Shp
Land registration	- Coordinates of major points of project boundary and major intersections of major road for registration in Cadastral map				Shp

3. Supervision

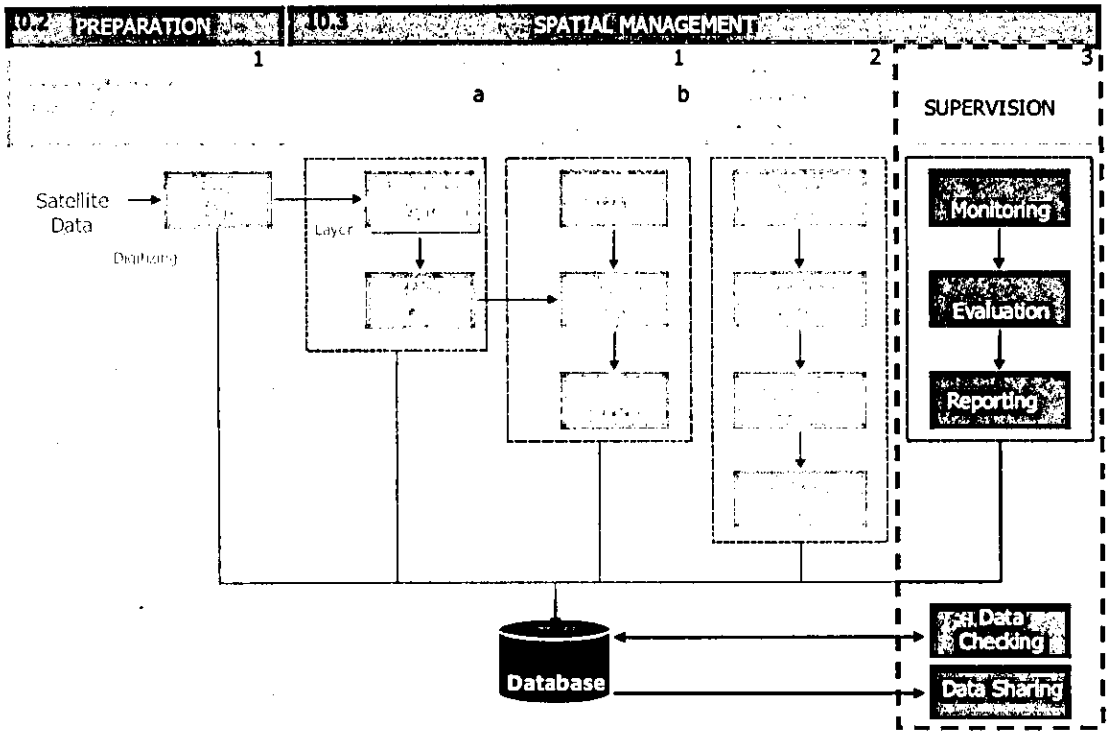


Figure 24. Frame of supervision activities

- Spatial Management Supervision is composed of monitoring, evaluation, and reporting activities. System administrator gathers a database from district/city, and to check and share the data.
- Monitoring is defined as observation conducted on spatial utilization implementations - whether directly, indirectly, and/or by means of community reporting.
- Evaluation is an activity intended to measure levels of achievements of spatial management implementation in a measurable and objective manner.
- Reporting is an activity where evaluation results are delivered.
- Data checking is confirmation of district/city's data accuracy
- Data sharing is to give the integrated gathering data from district/city

1) Role of province and city/district
   - GIS user is classified A: system administrator, B: person of maintenance map and database, C: other persons. A number of GIS users become pyramid like as follows.

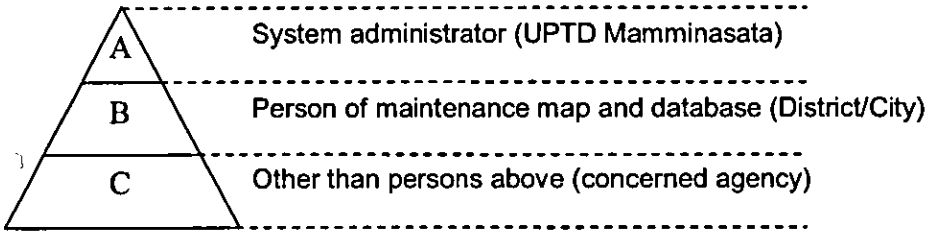


Figure 25. Classification of GIS user

- The person of UPTD Maminasata becomes system administrator, the person of each district/city becomes maintenance map and database. Data is exchanged among this person in charge.

Table 10. Role and the person of charge

	Role	Department	The person of charge
A	System administrator	• UPTD Maminasata	Mirza
B	Person of maintenance map and database	• Makassar City / Bappeda	Nurul Sri H. ST
		• Maros District / Spatial planning and settlement	M. Afdhaly
		• Gowa District / Public work dept	Shadrah Nur
		• Takalar District / Bappeda	Arie Elfira Mansyur
C	Other persons	• Concerned Agency	-

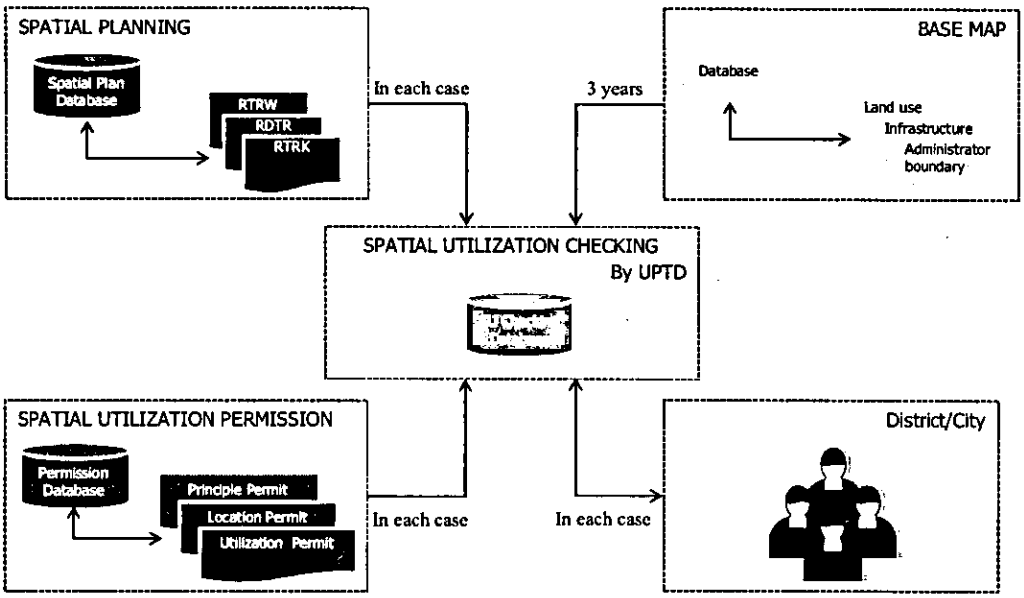


Figure 26. Data checking

- To introduce the method of data sharing by using internet in GIS operation procedure. And there is a comment that hoping to use webGIS. However, data sharing by using memory stick is recommended from the following reason;
  - It is difficult to use capacious database, because communication speed is slow.
  - Security is not safe
  - It is necessary to check when data sharing, because there are many computer virus in each PC

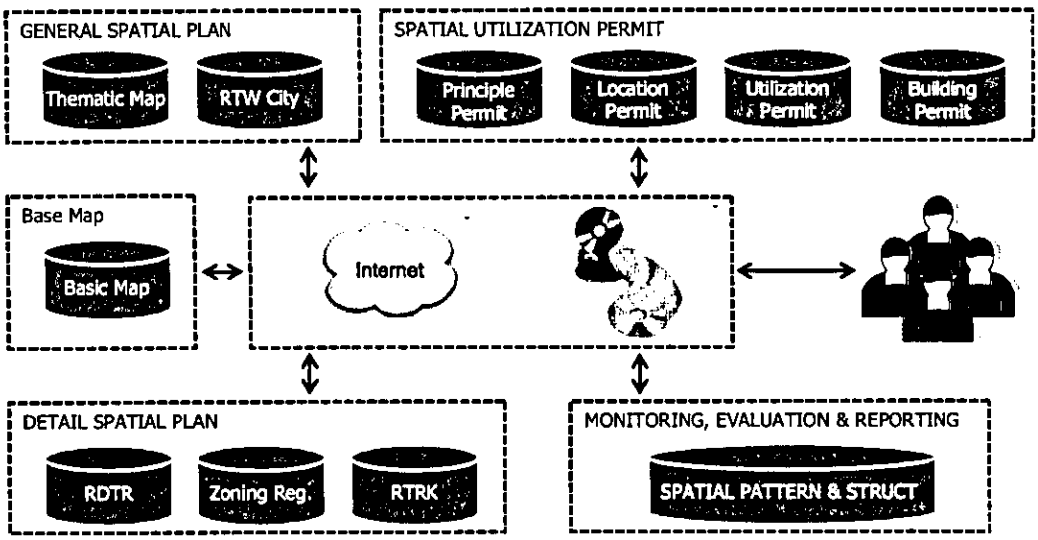


Figure 27. Sharing data

Table 11. Role of province and city/district

Item	Major Activities	City/ District	UPTD	Frequency
I. Preparation basic map	• Purchase satellite imagery		•	3 years
	• Landuse data creation	•		3 years
	• Infrastructure - Transportation, Utility	•		3 years
	• Administrative boundaries	•		3 years
	• Data on population	•		Annual
	• Consolidation with other member		•	Annual
II. GSP Formulation	• Thematic Map - According to GSP formulation	•		Annual
	• GSP Input - Cooperation with other member	•		Annual
	• Consolidation of GSP preparation		•	Annual
III. DSP Formulation	• DSP Input - Cooperation with other member	•		Each Case
	• Input ASP - Cooperation with other member	•		Each Case
	• DSP Integration		•	Annual
IV. Spatial Utilization Permit	• Principle permit form	•		Each Case
	• Location permit form	•		Each Case
	• Land utilization permit form	•		Each Case
	• Building construction permit form	•		Each Case
	• Consolidation with other dinas		•	Annual
V. Monitoring	• Monitoring, Evaluation and Reporting		•	Annual
	- Spatial Planning		•	Annual
	- Zoning Regulation		•	Annual
	- Landuse (GOS)		•	Annual
	- Project progress		•	Annual

Item	Major Activities	City/ District	UPTD	Frequency
	• PC checking data		•	3 years
	- Base Map · Checking data accuracy · Checking data attribute		•	3 years
	- GSP · Confirm with other plan and improve the consistency		•	Each Case
	- DSP · Confirm with zoning regulation · Confirm with other plan and improve the consistency		•	Each Case
	- Land utilization permit · Confirm with other plan and improve the consistency		•	Each Case
	• Checking data - Modification database	•		Each Case
	• Sharing data		•	Annual

2) Operation Cost and Database Maintenance
<UPTD MM>

- o UPTD MM carries out various data checking and store. Moreover, satellite imagery is updated every three years.
- o Approximate working time is as follows.

Table 12. Operation cost and database maintenance for UPTD Mamminasata

	Content	Period	Description
UPTD MM	Purchase the satellite image	15 Days	
	Base map - Integrate and store - Data checking	 3 Days 30 Days	 Once 3 years
	GSP - Data checking and store	 3 Days	<Cooperation with GSP person> In each case
	DSP - Data checking and store	 3 Days	<Cooperation with DSP person> In each case
	Spatial Utilization Permission - Data checking and store	 3 Days	<Cooperation with each person> In each case
	Monitoring, Evaluation and Reporting - Spatial plan - Zone regulation - Land use(Green open space) - Project progress	 1 Days 1 Days 1 Days 12 Days	<Cooperation with each person> In each case In each case Annually Once 3 months
	Data sharing	3 Days	Annually

- Purchase cost of satellite imagery is as follows.

Table 13. Purchase cost of satellite imagery

Content	Cost	Description	Map Scale	Accuracy on site	Pixel size
IKONOS	300,000,000 Rupiah	Area : 1,700 km2 Price : US$17 per km2	1:10,000	± 5.0 m	1.0 m
ALOS	20,000,000 Rupiah	Number : 2 scenes Price : \100,000 per full scene	1:25,000	± 12.5 m	2.5 m
LANDSAT	2,700,000 Rupiah	Number : 2 scenes Price : US$150 per scene	1:100,000	± 50.0 m	10.0 m

< City/District >

- City/District creates base map and spatial planning of each district.
- Approximate working time is as follows.

Table 14. Operation cost and database maintenance for city/district

	Content	Time	Description
City/District	Base map		
	- Land use	90 Days	Once 3 years
	- Infrastructure	60 Days	Once 3 years
	- Population data	5 Days	Annually
	GSP		<Cooperation with GSP person>
	- Thematic map	5 Days	In each case (as necessary)
	- Input RTRW	5 Days	In each case (as necessary)
	GSP		<Cooperation with DSP person>
	- Input RDTR	5 Days	In each case (as necessary)
	- Input RTRK	5 Days	In each case (as necessary)
	Spatial Utilization Permission		<Cooperation with each person>
	- Input Principle permit	5 Days	In each case (as necessary)
	- Input Location permit	5 Days	In each case (as necessary)
	- Input Utilization permit	5 Days	In each case (as necessary)
	- Input Building permit	5 Days	In each case (as necessary)
	Reflect data checking result		
	- Revising database	10 Days	In each case (as necessary)

3. Project Management Procedure

3.1 Program Implementation: Priority Program

- GIS project overview and location information to organize, centralized management of business (tracking) is performed
- Business overview information to be entered as attributes, priority program to enter the arrangement results.
- Digitizing each project contents and to make a feature.

Table 15. Priority programs

No	Priority Programs	Attribute	
		Each Program	Business Overview
1	Mamminasata Metropolitan Road Network (Maminasata road network) 1) Maminasata bypass 2) Hertasning road 3) Adbullah dg. Sirua road 4) Trans sulawesi road	• Length • Lane • District border	• Name • Conductor • Period • Contractor • Consultant • Progress • Plan • Fiscal year • Construction • Budget • Budget source • Project owner
2	Solid Waste Management- Mamminasata Regional Landfill (Waste management) 1) Transfer station in City & Districts	-	
3	Urban Water Supply(Water Supply Project) 1) Water Supply Plan for New Town 2) Water Supply Plan for MM	-	
4	Waste Water Management(Sewerage) 1) Waste Water Plan for New Town 2) Waste Water Plan for MM	-	
5	Go Green program(Promoting Green) 1) Green open space	• Area • Classification	
6	New Town (New urban development)	• Area • Planning road • Zoning • Existing road • Existing settlement	
7	Centre Point of Indonesia	-	
8	Drainage(Urban drainage projects) 1) Drainage around Airport Area 2) Drainage around UNHAS Campus Area 3) Drainage Plan for New Town 4) Drainage Master Plan for Mamminasata	-	
9	Industrial Area KIMA 2 (Industrial Park project)	-	
10	Hasanuddin University new campus at Gowa (Related Urban Development relocation)	-	
11	Takalar Maritime Area	-	

3.2 Project Progress Monitoring

- To review the project progress twice a year, and to input the progress information into database.
- If there is a problem of project progress, to input the information into the database.
- UPTD MM adjusts the project information, and to share to district/city. Everyone have a shared awareness of progress and problem of various project

4 GIS Operation Schedule

GIS Operation schedule is as the following. GSP, DSP and spatial utilization permission are carried out in each case. Population data is updated at October; project progress monitoring is carried out twice a year May and November; to share the database once a year.

Table 16. GIS operation schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	Remark
I. Preparation of base map													
1.Purchase of satellite data													Once three years
2.Disitizing satellite data													Once three years
- Land use													If it is necessary
- Infrastructure													If it is necessary
3.Revising existing data													
- Land use													In each case
-Infrastructure													In each case
-Administrative boundary													In each case
4.Adding new socio economy data													
-Population data													Annual
II.General spatial planning													In each case
III.Detail Spatial Planning													In each case
IV.Spatial Utilization Permission													In each case
V. Monitoring, Evaluation and Reporting													
1. Monitoring, Evaluation and Reporting													Annual
- Project progress monitoring													Once six months
2. Data Checking													In each case
3. Spatial data sharing (Store data)													Annual

5 GIS Training Content

- GIS training based on GIS manual is conducted 16 times

Table 17. GIS training contents

	Contents	Manual
1	Lecture : Explain GIS database	1. GIS Concept
	Practice : Open & draw file	[Basic 1] 1, 2, 3, 4 Open and Draw IKONOS, ALOS, IKONOS, GIS Data
2	Practice : Arrange thematic layout	[Basic1] 5 Arrange thematic layout map
	Practice : Calculate area	[Basic 1] 6 Measure length and area
	Practice : Export file	[Basic 1] 7 Export Map
3	Review : Review the previous contents [Basic 2]	
4	Practice : GPS training	B. GPS Training
5	Practice : Georeference	[Basic 2] 1 Georeference
6	Practice : Revise the feature	[Basic 2] 2 Revise administration boundary data
7	Review: Review the previous contents [Basic 2]	
8	Practice : Open and revise excel data Join data in ArcMap	[Basic 2] 3 Open and Draw population data
9	Practice : Digitizing	[Basic 2] 4 Digitizing landuse
10	Review: Review the previous contents [Basic 2]	
11	Evaluation of Training	
12	Go green program	[OJT] Procedure of Green Open Space monitoring flow
13	GSP / DSP	[OJT] Cleat Spatial plan flow
14	11priority programs	[OJT] Consolidation program flow
15	Review: Review the previous contents [OJT]	[OJT]
16	Evaluation of OJT	OJT

For detail, please refer to the Manual on Training Implementation in Mamminasata Urban Area.

Prepared through cooperation between

Mamminasata Metropolitan Development Cooperation Board (MMDCB)

Dinas of Spatial Planning and Settlement of South Sulawesi Province

through Technical Support by

Directorate General of Spatial Planning, Ministry of Public Works

JICA Technical Coordination Project on Enhancement of Urban Development Management in the Mamminasata Metropolitan


JICA
ジャイカ