TRAINING COURSE 1: TRAINING OF TRAINERS

Getting to know TANGIS and the LTBP Database

Overview and Aims

Aims

1. To teach the use of the TANGIS interface for viewing and querying data
2. To teach the basics of geographical information and Arcview
3. To explore the currently available datasets in the project
4. To show how new data can be added to the system
5. To understand the metadatabase system.

What do you understand by GIS?

- Is it the computers?
- Is it the data?
- Is it the software package?
- Is it the whole System of people, hardware, software, data and application?

Presentation of LTBP GIS

PowerPoint Display of LTBP GIS.

- Introduction to the System
- Database
- Metadatabase
- Web Pages
- GIS Interface
- Implementation

Discussion

At what stage in the process of data creation and management do you have potential inputs?
Where can you help to pass information to the GIS metadatabase manager?
What information do you see as useful to the project?

Basic Tools of Arcview

Aims

In this section you will be introduced to the GIS package of the project, which is Arcview. You will learn how to use the basic tools. This will help you to:

- Navigate around Arcview
- Make different types of Documents
- Add data to a view
- Zoom and pan around your view

From this, you will have a better understanding how the TANGIS interface works.

Notes:

Introduction to a "Project"

Arcview is a program allowing you to manage your geographical documents. The documents are stored in a project. There are several different types of documents in an Arcview project. You can consider the project as a filing cabinet and each document is stored in a different drawer, according to its type.

The types of documents you will use in Arcview are:

A View - an interactive map showing your data

A Table - shows tabular representations of your data

A Chart - shows graphical representations of data

A Layout - allows you to put together tables, charts and views so that you can print out or present your data

Each of these documents has elements or objects associated with them:

E.g. a View is made up of different geographical layers, called Themes

Making a project.

When you open up Arcview, you are shown a project window. To look at the list of documents of any type, click once on its icon in the side of the project window.

E.g. **`Click on the table icon`**

A list of tables would appear here.

At the moment the filing cabinet is empty.

How to save a project

`Click on the Save button.`

`Write a name for your project. Click on OK.`

The name of the project now appears in the top of the window.

Help

You can get help in three ways:

1. **Menu** - Help Contents
2. Help using the  button (**Contextual help**) and highlight a menu or button in the Arcview window.
3. Help **Search** for a key term.

VIEWS

Making a view

For GIS users, the major function of a GIS is to show your data in map form. In Arcview this is done through using View documents. To make a view:

Highlight the View icon in the project window.
Click on the New button.

Elements of a View

A **View** has:

- a **Menu** - these list all the functions you can do with a view or elements of a view
- a **Table of contents (TOC)** - this is the grey area on the left which contains a list of all you data and how it is represented.
- a **Display** - this is the white area in the centre that contains all your data.

Adding data to a view - THEMES

Views are made up of **Themes** or layers of geographical information. Themes can be from many different data sources:

- Arc INFO Coverages.
- ArcView Shape Files.
- Satellite images.
- Point data saved in a table (e.g. GPS points).
- ARCINFO raster GRID data.

To display a theme, you need to click on the **Add theme** button:

To add an Arcinfo coverage or shapefile:

Make sure that Data type is set to Feature Data Source.
Now click on the directory where your data are stored and select the data set you wish to add.

To add more than one theme at a time, use the mouse button with the Shift button.
Click on OK.
The data are shown in the table of contents.

You can make a theme **visible** and **active**.
To make a theme **visible** (i.e. so you can see it in the display)
Click on the little check box.
To make it **invisible, turn the check box off.**

An **Active theme** is one highlighted in the table of contents. You can make a theme active by highlighting it in the table of contents (TOC). Click anywhere in the area of the theme in the TOC. When you make a theme active, it allows you to :

- **Zoom** to the extent of this theme
- Look at the associated **attribute table** for the active theme
- Look at the active theme's **properties**

You will notice that many of the buttons and menu items in the view become enabled when you have an active theme. Again, you can make more than one theme active at a time using the shift button.

Theme Properties

You can set a themes properties by making the theme active and selecting Properties from the Theme menu. A dialogue box appears.
You can change all the theme's properties in here.

- Name
- Definition
- Text label position
- Scale of view thresholds
- Hotlinks

Zooming and Navigating around the view

There are many ways you can zoom in to different parts of your display.

1. **Zoom in** button: Zooms in by two 
2. **Zoom out** button: Zoom out by two 
3. **Zoom in** tool : Click and drag 
4. **Zoom to active theme** - if you have made a theme active in the table of contents, you can zoom to the selected one: 
5. **Zoom to extent** of all themes: 
6. **Zoom to selected features** of active theme: 
7. **Pan** - using the hand tool, you can grab a part of the image and move it around the view.
8. Type a **new scale** in the scale box. The view resizes to that scale around the centre point of your current display.

Exercises

1. Start Arcview and save the project
2. Make a new view. Set the properties to decimal degrees units, and kilometres distance units
3. Add the following themes – the lakeshore, roads and rivers and settlement data
4. Experiment with the Zoom in and zoom out tools. Look at the scale bar. How does this change?
5. Use the Identify button to look at some of the data
6. Use the Find button (binoculars) to find your local town.

Use of web site and catalogue.

Aims

In this section, you will learn how to:
- Get access to the extensive web pages of the GIS and Remote sensing component of the project
- use the facilities in the GIS RS Centre
- use the catalogues

Notes:

To enter the web pages - either go to
www.ltbp.org and enter the site through the Private site (User Name: nyikal; password 36rty).
Or load the CD and follow the instructions to get to the main page.

To enter the GIS RS area , click on the GIS/RS Centre icon.
There are various functions in here to look at:
1. The Newsletters - this keeps you informed of all the updates of new data or programs
2. Links to other useful web sites
3. LARST Image requests - for satellite data
4. LARST Newsletter
5. Download Arc Explorer
6. Read the introduction to GIS

To enter the catalogue

The metadatabase has four levels of data:
LEVEL1 - Non digital data not held in the TANGIS archive. This data is known about but not held with the project centre. It may be held by project counterparts or in national databases, or it may be referenced through an Internet site. A reference in the metadatabase gives a contact name and address to investigate these data sources further.
LEVEL2 - Digital data not held by LTBP. This again could be an Internet site or held by project counterparts. A reference in the metadatabase gives a contact name and address to investigate these data sources further.
LEVEL3 - These are non digital data held with the TANGIS archive. They have been purchased during the duration of the project and will be kept with the archive. They may be loaned to people related with the project, depending on copyright restrictions.
LEVEL4 - These are digital data held with the TANGIS archive. This data can be fully integrated with other datasets using the TANGIS interface or other GIS software.

Non digital data may comprise any information with a spatial context useful to the project. This includes papers maps, conference reports, paper tables.
Digital data may be explicitly related to maps or with some geographical reference (e.g. based around administrative units, settlement or rivers), and can be GIS vector data, raster data, databases or text tables.

If you need Level 1-3 data, you need to make a note of the contact address at the bottom of the screen.

The easiest way to look at the metadata is through the Short catalogue - you can scroll down the datasets in alphabetical order and see the datasets. Then you can hyperlink to the long catalogue record and see more details.

The metadata normally contains:
- all the general information (title and main application)
- Geographical Information (Scale, projection and extents)
- copyright information and a description
- field information.

You can usually make some informed decision about the usefulness of this dataset.

Using the Web Pages
On the Internet site you can click on these pages, and link directly to other useful data sources. You can click on the pages and then select the Hypertext directly.

Reading the Newsletters
The newsletters give you an update on:
- What has happened recently in the project
- What datasets we now have
- What datasets we now need
- Contact addresses

Exercise: Finding relevant datasets

1. Use the dataset you used last time, find the co-ordinates of your local town?
2. Can you find some datasets that would be in the same area as your local town?
3. What is the procedure for getting some of the LEVEL 3 datasets?
4. What are the fields for the roads dataset?

Getting going in TANGIS

Aims

In this section - you will:
- learn how to open TANGIS
- learn how to navigate around the different interfaces
- Understand how to work the facilities in TANGIS

Notes

To open TANGIS there are several ways - the computer should be loaded up with the correct ODBC drives.
(if not, refer to page 33 in the manual and see "How to install ODBC")

The Metadatabase in TANGIS

TANGIS is supported by a metadatabase that contains all the information at LEVEL 4 - that is digital spatial data held by the project. You can view all LEVEL 4 data in TANGIS.

Starting with TANGIS

The first screen is the Special Studies screen

You can hotlink () to each of the special studies if you want to make a view:

You can navigate around TANGIS using:
- The Switch to menu
- The Document Manager
- The Window menu
- The Main Menu

See page 11 of the manual

You can make a new view in the Switch to menu.

Exercise - Navigating around TANGIS

Part One
1. Open TANGIS
2. Go into the Special Studies
3. Try to link to the Gombe National Park Sediments study
4. Query some of the data

Part Two
1. Use the document manager to go back to the Main View

Part Three
1. Make a new view for Biodiversity
2. Add a background Map in Geographic Projection

Types of data

Aims

In this exercise, you will learn:
- The differences between different types of datasets
- The advantages and disadvantages of using these datasets
- How some dataset types are of particular interest to existing Special Studies datasets.

Notes

Different Types of Datasets

Data in GIS come in many different formats. For most purposes you do not need to know the difference, but sometimes a few details will help:

Vector
Points, lines and polygons

Raster
Gridded data - for Digital Elevation Model or satellite images

Database
Such as the BIOSS database.

Text File - georeferenced datasets (e.g. from Excel spreadsheets).
Non Geo-referenced Text file - that can be joined onto Framework datasets

Comparison

Feature	**Vector**	**Raster**	**Database/Text File**
Data model types	Point, line , polygon	Grid cells	Point location
Overlay	Good	Very easy to model with.	Not easy to overlay
Creating data	Need GIS software	Need GIS, Image Processing Software	Can be integrated from many different forms
Modelling	Needs sophisticated software to model with.	Good for modelling data	Not easy to model with
Query	Easy to query with	Difficult to query	Very easy to query
Update/Modify	Need to extend original dataset	Difficult to update, unless getting a sequence of satellite images	Very easy to update
Digitising	Can digitise very easily	Difficult to digitise	Enter data in spreadsheet or database forms very easily.
Data size	Compact	Large	Compact
Attributes	Many	Restricted	Many

Adding and removing data from a view in TANGIS

To add data to a view

To add data to a view, click on the "Add data" menu and select one of the categories:
If you want to add data specific to the interface, click on the name of the interface (e.g. SEDIMENTS)
If you want to add from any of the datasets, click on "ALL DATA"
If you want data only of one type, select it (e.g., select Images, Other Raster, Map data (vector), Text data.

To remove data from a view

Select the Remove data from the menu

- If you want to remove all data select All data
- If you want to remove data of a certain type, click on type of data.

To add new data that has no geographical reference

First add the framework dataset which it relates to
Then make that theme active, go to the Add data menu, select Join Themes and select the dataset from the drop down list. It will load into the framework dataset and rename itself.

Types of dataset in the LTBP dataset

There are various sorts of data in the database; they can be classified different ways:
By type (e.g. raster, vector)
By application (e.g. Pollution study, Fishing Practices)
By source (satellite data, map data, Special study database, survey)

All these datasets can be stored in the Metadatabase and the digital datasets can be shown through TANGIS.
Web site – you can search for data through the web site. If you have TANGIS, though, you can directly search for the right datasets by using the Add data menus.

Some of the important datasets in TANGIS:

- Background maps – 1:1 Million scale maps of the main topographical features: roads, rivers, lakes, railways, settlements
- Extra land data – National parks and reserved land, land cover
- Elevation data – 1km^2 resolution raster data for the whole of the region, metre accuracy; slope map.
- Logistical data for project – study areas, project offices, GIS contacts database, sites of all special study activities, pollution, sedimentation survey sites.
- Bathymetrical data – bathymetry map of whole lake, index of individual sheets at higher scale, map of three basins
- Survey databases – BIOSS survey database, Pollution database (soon?), Core samples from ships' surveys.
- Geographical information – gazetteer of lakeshore, settlement names.
- Socio-economic/administrative data – districts and other administrative units, population statistics, boat surveys.

How do I get more data?

1. Check your copy of TANGIS
2. Search through the LTBP data catalogues on the web site
3. Use the web page to find more sources
4. Link in with the Environmental Information Centres in each country –
   - Burundi – MINATE
   - DR Congo?
   - Tanzania – NEMC/ TANRIC
   - Zambia - ECZ
5. Gather it yourself – use the guidelines in the fourth section

Check
When you get a new dataset source, check the source of the data – who originally made it and for what purpose
Check the format – will it fit into your GIS – is it a shapefile, image or database?
The scale – is it suitable for the work you are doing?
The time it was made – is it up to date?

Exercise: Loading datasets of different types into TANGIS

Try loading the following datasets - using the manual to add data to a view.

1. Make a new view in the Biodiversity Interface
2. Add the following datasets
   The background map
   The LTBP study area
   The BIOSS Survey dataset
   The Land cover raster dataset
   The core sample dataset for Gombe Park.
   Weather test information
   One of the NOAA satellite images

3. Zoom in and out of the view – which datasets show?

SYMBOLISING INFORMATION

Aims

In this section, you will learn
- The importance of symbolisation to visualise your data
- The use of legends in Arcview and TANGIS
- The ability to change the way you represent your data.

Notes

Presentation of your data in the most easily understandable form is one of the primary aims of using Arcview.

Arcview gives you many ways of presenting your data through the Legend Editor.
To open the **Legend Editor**, you need to make your theme active and then either double click on the theme in the TOC or select the  button.

You can represent your theme as:
- a **single symbol** - e.g. a road
- a **unique classified symbol** - based upon the categories of your dataset:

e.g. roads classified by road type (gravel, tarred, dual carriageway, single track)
- a **graduated classified symbol** (based on categories splitting your data into a few classes)

e.g. Population of villages in 5 classes; those between 0-1000, 1001-2000, etc.
- **charted** - e.g. the proportion of people working in agricultural, industry and services, with the population total as the symbol size.

In **Classify** – you can find a whole different number of ways to represent your data:
You can have different **numbers** of classes.
You can classify: By equal area
- **By Natural Breaks**
- **By Equal Interval**
- **Quantile**
- **Standard Deviation**

Symbols are presented for all types of features; lines, points, annotation and polygons. You alter what symbol is used and how the symbol appears in **Palette manager** - choose **Show Symbol Window** from Windows menu. You can vary the:
- **point** symbol (type, size, orientation)
- **line** symbol (width, pattern)
- **text** symbol (font, size, type)
- **colour** (of foreground, background, text or outline)
- **pattern**

To change the symbol for each class:
1. Double click on the symbol

A palette appears:
2. Choose the correct palette manager to edit your symbol:
3. Choose a symbol
4. Choose a colour

Notice how your choices in the palette manager are automatically updating the legend symbol you have chosen.

Once you have finished updating all fields, click on the **Apply** button in the legend editor to commit all the changes to the legend to the view itself. Notice how the changes are shown in both the TOC and in the representation of the dataset in the display.

Click on **Close** to close the legend editor and return to the view.

Exercise

1. Load your Population of Congo file as an event theme.
2. Experiment with the different ways to show the data - how does it affect what is shown.
   - Number of classes
   - Type of classification
3. Load the sample.shp file. Change the symbolisation of the data so that you can discriminate between the different substrate types.
4. Now change the symbolisation to show water depth.

INTERROGATING YOUR DATA

Aim

In this section, you will learn how to:
- Inquire about the attribute data held with a dataset
- Query the metadata about a dataset through a theme's properties
- Construct queries to show selected data.
- Explore the opportunities for complex selection queries.

Notes

There are various methods of inquiring into your data.

1. the Identify Tool 
2. the Find Button 
3. The Query Tool – spatial 
4. The Query Tool - the query builder 

With the query builder, you can build up quite complicated selection queries.

Use these tools to answer the following questions:
1. What is where?
2. Where is what?
3. Find me…

Depending on the attributes you have, these can be quite complex selections.

Metadata
The metadata for every dataset is written into various parts of the theme properties. You can search for the source of the data, the processing and description of the dataset are in the Theme's comments in Theme Properties. The maximum and minimum scale of display are stored in the display section.

Exercises

1. Load the settlement dataset. Find your local town using the find button.
2. Click on some of these settlements using the Identify tool – what does it tell you?
3. Select the Spatial tool – select an area with it (use click and drag)
   - Now click on the  button and the  button – what is shown in yellow?
4. Open the Population of Congo dataset. Select the Query Builder. Select all the districts with a population of more than 500 000.
5. Can you select all the areas where the population of Congo has increased dramatically -, e.g. more than 300 000 between 1984 and 1995?
6. Find the metadata for the Population of Congo Dataset

OUTPUTTING TOOLS

Aims

In this section you will learn how to:
- Create a view ready for a published report
- Convert your view into a layout
- Manipulate the layout so you can print out your data.

Notes

A **layout** is used to create a page that allows you to print out parts of your project.

You can add tables, charts, images and view to a layout but we shall concentrate here on outputting a view. You can make a layout from a view if you have the view open. First make sure your view has all the elements it needs inside it:
- A group of themes all properly labelled and symbolised
- A series of legends for each theme
- The view is zoomed to the correct location

Now go to the **View** menu and click on **Layout.**
You automatically get a landscape layout which contains **graphic objects**
- your **view** inside a **view frame**
- the table of contents shown as a **map legend**
- a **scale bar**
- a **title** taken from the view
- the LTBP **logo** in the top right hand corner

You can rearrange any of these features by clicking on the graphic with the select tool (). Small black boxes appear around the object to show it is selected.
- You can move the object now by clicking and dragging inside the box.
- You can resize by going to one of these black boxes and clicking and dragging the box to a new size.

To **add a new graphic to a layout**, you can select from the drop down tool menu:
For example:
 - add a new view frame
 - add a new chart
 - add a new table
 - add some text (e.g. a title)
 - add a scale bar
To edit what is in the view frame, you need to adjust the view:
- Change the view **zoom** to fit the area you want to display in the layout
- Click items in the TOC on or off to decide what is shown in the layout.

- If you want a data layer to appear in the view frame but not in the map legend, you can make the theme active, click on **Theme** menu and select **Hide/Show Legend.**

You can change the properties of the layout or any of the Graphic elements in a layout.

View Frame properties include:

Scaling the view frame:

You have several options here;

- preserve the view scale, create a new scale, fit to the view frame.

You can also edit the relationship between the view and the view frame:

- fit to frame, same as view.

Once you are satisfied with the layout, you can click off the **live link** between the view and the view frame. This means you can continue to use the view (even create a new layout in a different area with different components).

Layout Properties

There are several properties you can set here:

- You can **rename** the layout - this is how it appears in the project window, not the title as it is printed out. You have to edit text in the title if you wish to change this.
- Moving the graphical elements around is normally controlled by the grid - which helps in aligning features. You can change the **resolution** of the grid in the layout properties, or alternatively, click off the **snap to grid** option.

Printing out a layout

When you are satisfied with your layout, you can print it out.

1. Go to File **Print Setup**

It is worth checking that the printer is set up correctly.

2. Check the **landscape/portrait** settings, the **paper size** and the colour/quality settings
3. Click OK
4. Click on File **Print**
5. Click on OK

The system will take a few moments to start printing.

Saving the file as an image

1. Go to File and select Export
2. Select the file type
3. Locate where you want to place the file
4. Give the file a name
5. Press OK

Exercise

Make a view of a series of six datasets of your choosing, make the view look appealing and then make a layout as if you were printing out a map for a report.

SYNTHESIS

Aims

In this section, we review how the GIS may work for you.

Notes:

Key points:

1. Review of the LTBP data available in the system
2. Review of the Arcview Tools
   - Particularly - Zoom,
3. Review of TANGIS interface
   - Note that TANGIS is meant to help you look quickly at the data - at the end of each session, all the documents you have created will be deleted. They are easy to remake if you need the again.
   - Note also that if you want to use the TANGIS interface and store all the documents, there is a way of making a new Arcview project that does not delete all documents (e.g. if you want to make a layout or a view that you would like to keep).
4. Time factor in data
   - Most of the datasets that are for TANGIS are meant to be dynamic - that is they will change over time. Particularly with the Special Studies databases, these will continue to accrue monitoring data.
5. How the data relates to the SAP process.
   - Status maps
   - Update maps
   - Logistical maps
   - Querying data
   - Relating different datasets
   - Summary statistics
   - Modelling what if scenarios

Discussion

How would you intend to use the GIS in your work?
Can you identify which SAP activities could be facilitated by the GIS?

HOW TO TEACH TANGIS TO OTHERS

Key points:

Preparation

- Remember the aims of the course
- Know the skill level of your audience
- Make sure the exercise material are all to hand
- Make sure there are no problems with the software

During the Course

- Leave open ended enough to allow exploration
- Concentrate on help
- Concentrate on the data, the programmes and how it might be useful
- Try and get them to think about how it may provide outlets for the SAP.
- Break up the day
- Talk for no longer than 30 minutes at a time
- Have a discussion after each exercise
- Relate to the manuals all the time – get people used to finding help for themselves.

After the course

- Assess what has been learnt by asking questions
- Ask for feedback on what was good, bad or indifferent. What else needs including, what can be discounted

PROJECT

1. You are asked to produce some output of data in map form for your manager. In this practical, you area asked to construct a view in TANGIS that contains some features. Make sure the legend is correct, show the data in a particular way, and then prepare a layout for printing out.

1. Prepare your view:
2. Make a background view, and add a number of themes to it.
3. Query your data in a way.
4. Add some graphics
5. Label some features
6. Select a few items
7. Produce a layout
8. Prepare the layout correctly
9. Print out the layout if possible or export to a bitmap forward and paste as an image in a word document.