Training module # SWDP - 47

How to work with map layers and network layers

New Delhi, February 2002

Table of contents

1. Module context

While designing a training course, the relationship between this module and the others, would be maintained by keeping them close together in the syllabus and place them in a logical sequence. The actual selection of the topics and the depth of training would, of course, depend on the training needs of the participants, i.e. their knowledge level and skills performance upon the start of the course.

2. Module profile

Title	:	How to work with map layers and network layers
Target group	:	HIS function(s): ……
Duration	:	x session of y min
Objectives	:	After the training the participants will be able to*:*
Key concepts	:	•
Training methods	:	Lecture, exercises
Training tools required	:	Board, flipchart
Handouts	:	As provided in this module
Further reading and references	:	

3. Session plan

No	Activities	Time	Tools
1	*Preparations*		
2	*Introduction*:	min	OHS x
	Exercise	min	
	Wrap up	min	

4. Overhead/flipchart master

5. Handout

Add copy of the main text in chapter 7, for all participants

6. Additional handout

These handouts are distributed during delivery and contain test questions, answers to questions, special worksheets, optional information, and other matters you would not like to be seen in the regular handouts.

It is a good practice to pre-punch these additional handouts, so the participants can easily insert them in the main handout folder.

7. Main text

Contents

How to work with map layers and network layers

1   Map layers and Network layers

1.1   What are map and network layers in HYMOS

HYMOS provides for a graphical user interface, component called NETTER, in the form of maps showing various topographic features. Various features like rivers, canal, lakes, reservoirs, observation stations, elevation contours, roads and other transport/communication lines, cities, districts/province and other administrative boundaries etc. are normally of interest to the hydrologists while working for hydrological data processing. Information on all these topographical features is required in digital form for making use in various software systems. This digital information is produced in various forms as vector or raster by various digitising procedures in different formats. Such information is generally used in any typical Geographical Information System (GIS) for purpose of reference and analysis.

In NETTER, the observation stations are depicted by **nodes** of the monitoring network and are combinedly taken as a **network layer**. A distinction is made between the map information on the location of observation stations (to be associated with the database) and that on all other map features. Locations of observation stations are considered as nodes and lot of data for the same is maintained in the associated databases. These location and other attributes of these observation stations (called as nodes in NETTER) are kept in separate file called "HYMOS.NTW". The important attributes of the observation stations being kept in the network layers are the latitude, longitude and the type of the station (i.e. the node type). These network layers are created for a database by either adding observation stations one-by-one or by importing stations from a transfer database.

The **map layers**, in HYMOS, on the other hand are those features which are required to be used for the purpose of reference. Such layers are though not strictly related with the data in the database but may sometimes be used during certain hydrological computation. The basic building blocks of any network or map layer are the geometric entities as point(s), line(s) and polygon(s). Any line or polygon feature also, in fact, is a composition of several points only. And that any map layer is a collection of blocks of the required point(s), line(s) and/or polygon(s). Usually, point, line or polygon type of features are kept in separate layers with due distinction but may also be combined in certain cases is so required. Similarly, one or more topographical features as river, lakes, spot levels, elevation contours etc. can be in separate or combined files as per the requirement of the user. Also, for a certain feature like river, the information can be organised for individual rivers separately or in combined form as per the requirement.

1.2   How to obtain map layers

Map layers are obtainable from various types and sources of information like topographical maps and remotely sensed data in digital form etc. Any topographic feature can be considered as comprised of point(s), line(s) or polygon(s). From the base topographic maps such information is to be digitised using a digitiser. The digitising operation can be accelerated by scanning the topographic maps and then digitising directly on the computer screen, in a semi-automatic manner, on the basis of scanned image.

While digitising any information from the topographic maps, certain aspects like the scale of the base map (which affect the accuracy), map projection system and format of the digital output required etc. must be taken into account. There are standard software, like Didger, specifically for digitising the information from a paper map and from scanned images on

computer screen directly. Also, most of the standard GIS software like ARC-INFO, ILWIS etc. come with such digitising components. It is also necessary and possible to check on the consistency of the digitised information using certain tools embedded in the digitising software. Various formats used by different digitisation software are:

- *.BNA   (Atlas GIS, but also PC-Arc/Info can export this format)
- *.MIF   (Map Info Format)
- *.MOS   (MOSS format, a grid based GIS)
- *.SHP   (Universal Shape Format)

Under HP the desired information is tried to be prepared State-wise by digitising topographical themes from 1:50,000 scale toposheets of Survey of India. Some of the additional themes like soil type, land use and geology would be prepared from information available on 1:250,000 scale with related agencies like National Bureau of Soil Survey & Land Use (NBSSLU), Nagpur and Geological Survey of India (GSI), Calcutta.

Since the above process of digitisation by the agencies will take considerable time, it is planned that for the time being readily available digitised information on 1:1000,000 from other sources like Digital Chart of the World (DCW) is used. Such information has been distributed to all the users in the form of a CD containing digital data on themes like rivers, lakes, canals, contours, spot heights, roads, country, cities, villages, etc. on 1:1000,000 scale for around the globe. Users can obtain information on any of these themes from this CD for any desired area.

For extracting information from "DCW" CD, a software called "DCW-Clipper" which is available on the same CD, is to be installed. This Installation provides two components: (a) DCW-Mapper and (b) DCW-Clipper. First, DCW-Mapper software is to be run which brings the map of the globe as shown in Figure 7.1. User can then zoom-in to any portion of interest on the map and use the option of "Clip" to input data for extracting desired map information as shown in Figure 7.2. The digital map information can be extracted in any of the formats like "Atlas*GIS (*.BNA), MapInFo (*.MIF), Mapper (*.MPL) and ArcView Shape (*.SHP).

The extracted information is thus exported at the user specified location.
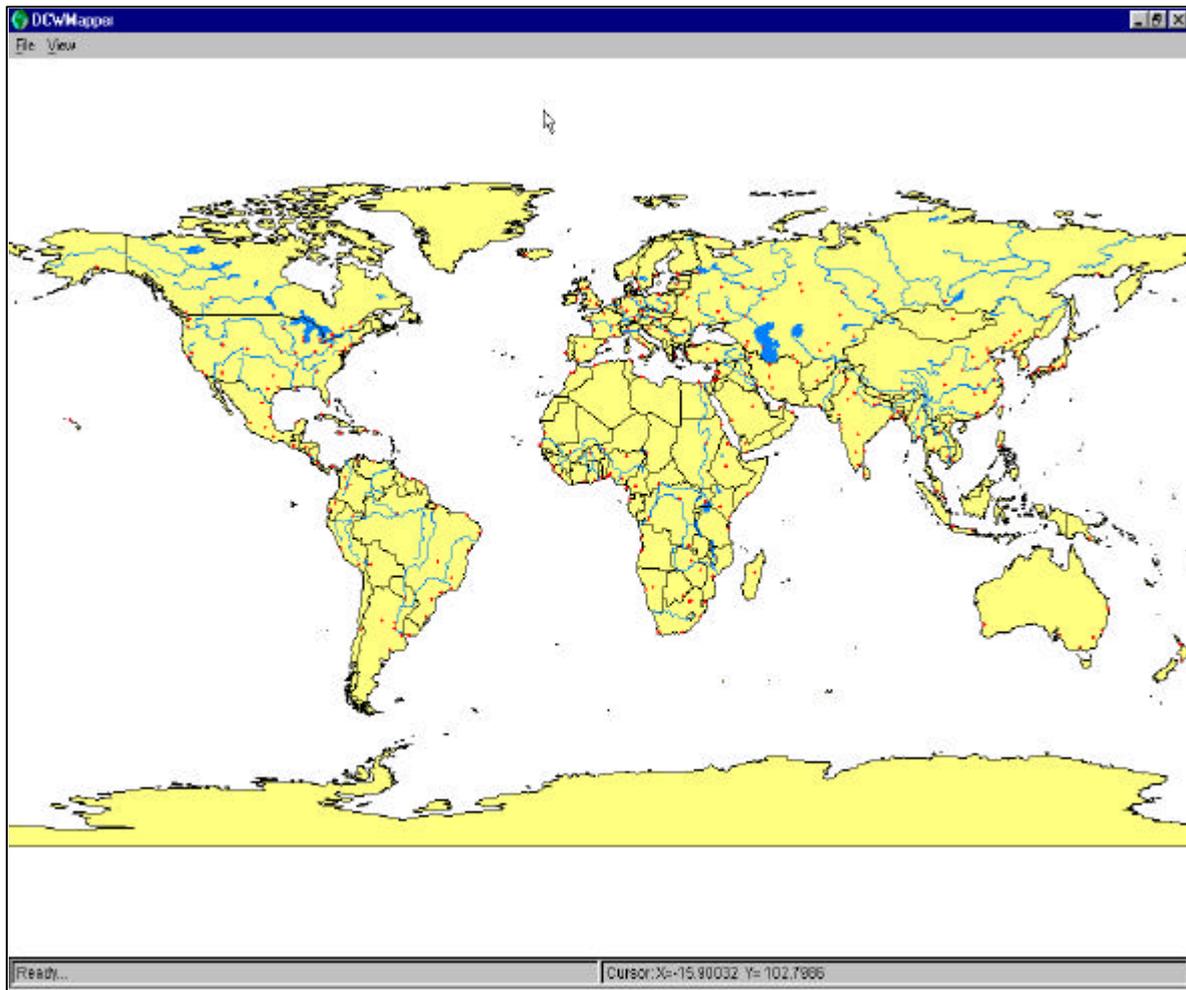
Figure 1.1: **DCW-Mapper screen showing map of the World for defining area of interest to be clipped**
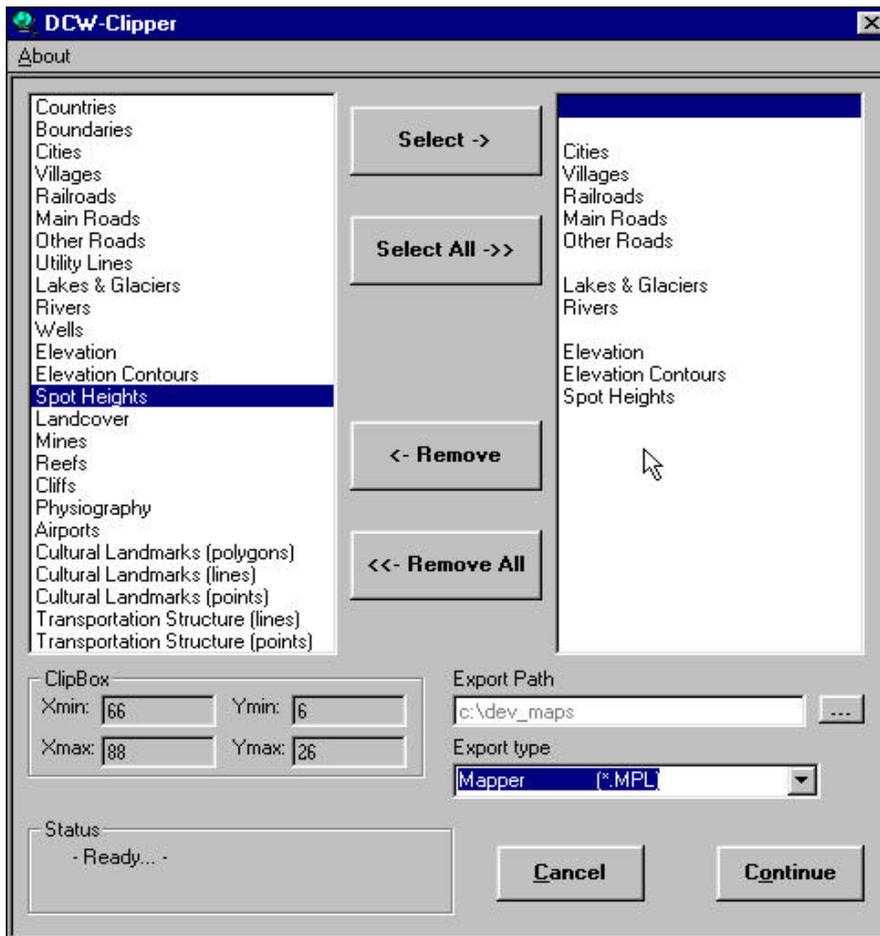
**Figure 1.2:
DCW-Clipper screen
showing input box
for selection of
layers to be clipped**

Though NETTER can work with any of the formats mentioned above, a conversion program called "MAPLINK" is also provided. This program helps converting digital map layer information in one format to another. In fact, this program was necessary with previous versions of NETTER which use to accept map layers in "*.MPL" format only. For converting information in one format to another the MAPLINK program is used as shown in Figure 7.3. User has to specify the path at which the files to be converted are located together with the input and output file types. After the desired input is given, conversion is done by the program and user obtains information in the desired format.
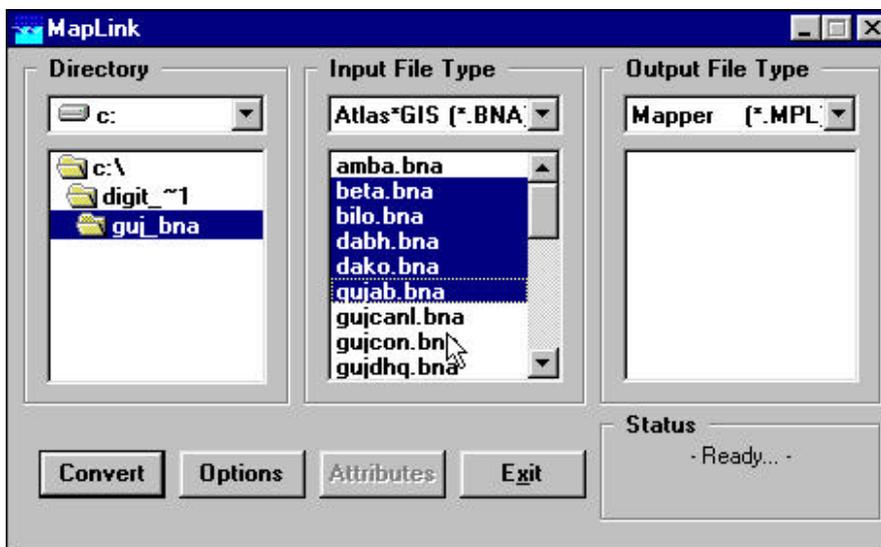
**Figure 1.3:
MAPLINK program
for conversion of GIS
layers from one
format into another**

1.3 How to make network layers

Network layer comprise of observation stations of different types. Any number of types of observation stations can be defined in the system. Some of the pre-defined types of stations are:

- water level
- discharge
- groundwater
- water quality
- meteorological
- rainfall
- structure
- spatial average etc.

In HYMOS, the observation stations are depicted by **nodes** of the monitoring network and are combinedly taken as a **network layer**.

In NETTER, a distinction is made between the map information on the location of observation stations (to be associated with the database) and that on all other map features. Locations of observation stations are considered as nodes and lot of data for the same is maintained in the associated databases. These location and other attributes of these observation stations (called as nodes in NETTER) are kept in separate file called **Network layer**. The important attributes of the observation stations being kept in the network layers are the latitude, longitude and the type of the station (i.e. the node type). These network layers are created for a database by either adding observation stations one-by-one or by importing stations from a SWDES transfer database.

Observation stations (network nodes) can be manually added in HYMOS using "Edit Network option" of Netter. Various options like "Add", "Move", "Delete", "Node Type", "Rename" and "Properties" are available as editing options (see Figure 7.4).
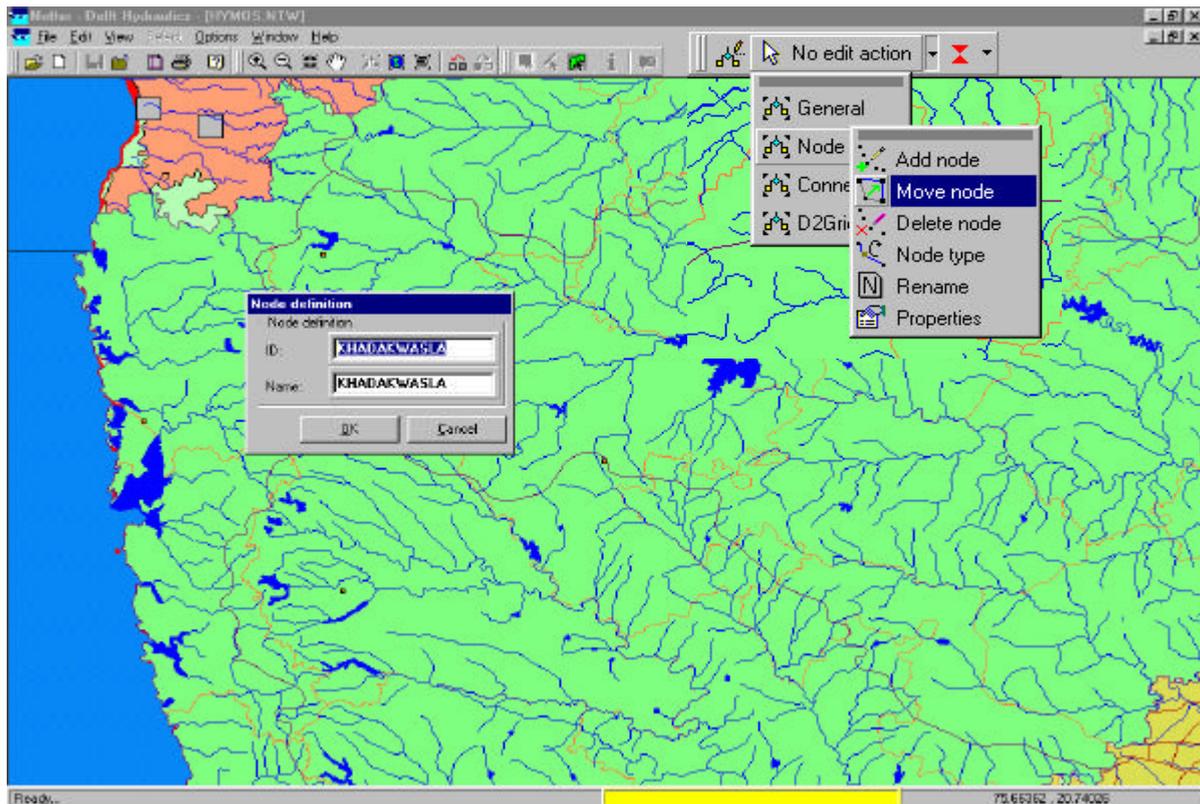
Figure 1.4: Editing option for management of network nodes.

By using "Add" option an observation station can be created on the map. User is to give details on the station code and name and the station has to be located by the mouse pointer. Similarly, the created station can be moved elsewhere, if required, by choosing the option of "Move" or can be deleted by the "Delete" option. The station type is the category of the station which it belongs to and can be edited by using "Node Type" option. In case the name of a station is to be edited then "Rename" option can be used. The option on "Properties" is used for relocating the station by numerically changing the co-ordinates. The station automatically takes the new position as per the changes made. Normally, the "station codes" are displayed adjacent to the location of the station but in case it is needed to display "station names" or not to display anything then suitable changes can be made using "options" from the main menu and "options …" from the list of sub-menus. In this manner the network nodes can be created and maintained.

In case the network is to be established by directly importing the stations from the SWDES transfer database, the procedure is very simple. From SWDES the required stations are exported using the "Export to HYMOS" option and then the transfer database thus created is imported in HYMOS database. As soon as the import is over all the stations are created together with the associated characteristics.

1.4 How to work with map layers

Once the map layers are available they can be copied in the "Maps" directory in a particular database. Though these layers can be accessed from anywhere without placing them in a particular directory but it is always better for the sake of convenience that they are available in the folder of the concerned database itself. Maps layers are managed using the sub-option of "Map Options" under "Options" item on the menu bar of Netter program. Upon selecting this "Map Options" item, an input box as shown in Figure 7.5 appears on the

screen. There are few entities on this input box through which the display and use of any map layer can be effected.
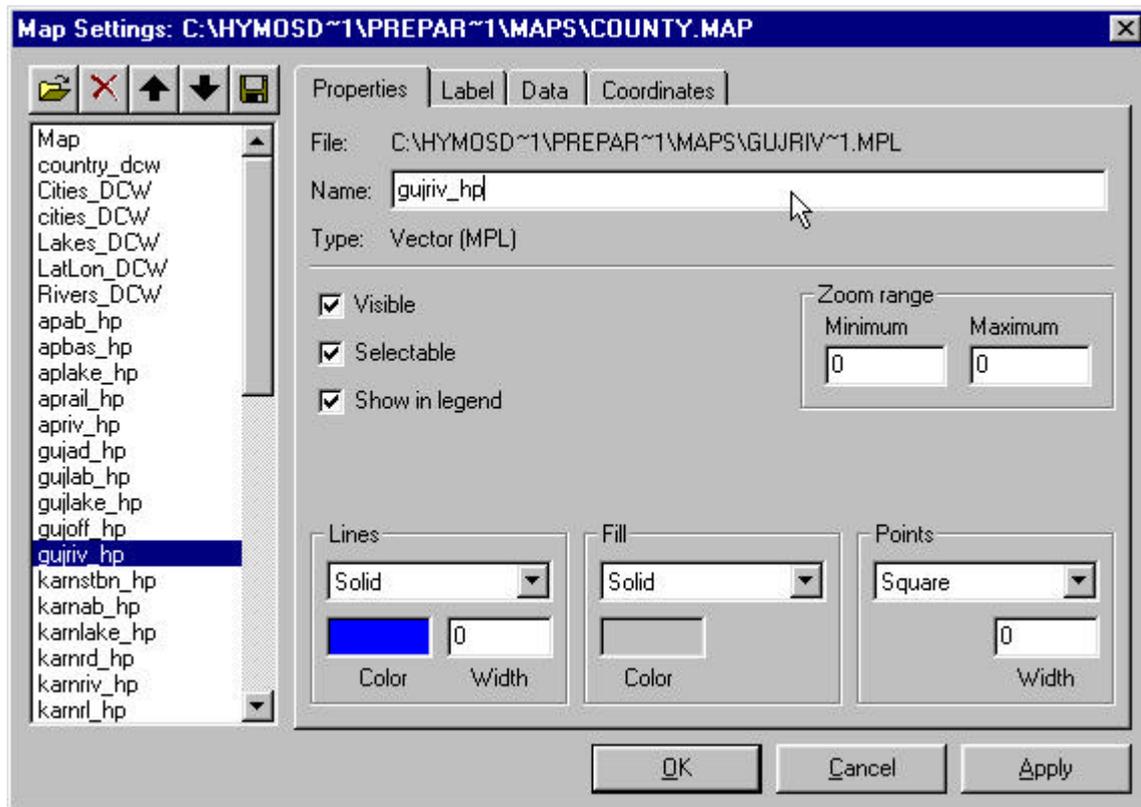
Figure 1.5: Input dialog box for management of map layers.

First of all, there is a list box in the left-hand side showing all those map layers which are registered with a particular database. There is a button on the top for locating and opening up any new map layer. Few more buttons are available for deleting, advancing or retreating any map layer. Further, there are some more options for setting the properties of any layer. Using the option of "Properties" any map layer can be made visible or selectable or if it is to be reflected in the legend. The colour and thickness of the lines or the colour of the fill of a polygon or the size and type of the points can all be settable from this "Properties" option. A very useful option is to set the minimum and maximum zoom range for any map layer so that the layer ceases to show up when the scale of the map becomes less than or more than the specified limits respectively by zooming out or zooming in. The minimum limit is very useful for avoiding display of certain details which otherwise may make the map cluttered.

Secondly, provision is available for setting the properties for the point items on the map by using "Lable" option. Settings like name and identification of the point and location of the label, its size, fonts etc.. Also, the option on "Coordinates" shows the areal extent of the map layer towards the four sides.

Most of the map layers are used for the purpose of reference by displaying on the screen. It may also be possible to look at the properties of these layers such as length of the river, area or perimeter of a catchment, value of the contour provided that the same is available in the database. However, few layers such as the catchment boundaries are also used for calculation of areal estimates of rainfall etc.

1.5   How to work with network layers

Network layers are basically the nodes and their inter-connections denoting observation stations and hydrological links as river or channel reaches. After the network is established as mentioned in previous section, these nodes can be used for selection of stations and thereupon processing the data available at any of the selected stations. Selection of stations can be made in two ways: (a) by individually selecting stations by clicking with mouse (multiple stations by keeping the SHIFT key pressed) or (b) by selecting all the stations within a map item like a basin or sub-basin. For the later case it is required to choose the option of "Select by map item" under the "Select" option in the menu bar of Netter.