

FUNDAMENTALS OF MAPS

THE SPHERICAL earth is best represented by a three-dimensional model of the earth, called a globe. All parts of the earth can be shown on it in their true shape, area and location along with correct cardinal directions and distances. But it cannot be made large enough to include detailed surface features. Hence, maps are much more useful tool than globes. A map is a two-dimensional diagrammatic representation of the whole or part of the earth and its surface features both natural and cultural at a given scale on a flat surface. However, all that is shown on the map is not drawn to scale. Only distances and areas are drawn to scale. We are familiar with the maps of the earth surface. But it is possible to draw maps of other planets and even the sky when pertinent

data becomes available to us. We already have crude maps of the Mars and the Moon. A map gives a picture of one or several of the elements of the earth's surface and being creation of humans, it gives only those details, which its maker intends to give. Instead of showing the details in their true or visible shape and size, it uses symbols that may or may not have similarities with the shape and size of objects represented. Maps have unique advantage of showing objects or patterns that may be intangible or invisible. For example, it may show political boundaries or rainfall pattern or crop distribution, which may not be marked on the ground. Thus, maps are basically symbolic drawing of visible as well as conceived locational and distributional patterns of whole or a part of the earth, the sky or any other heavenly body.

There are various ways by which the earth can be mapped:

- (a) by freehand sketches and diagrams;
- (b) by actual survey with the help of instruments like chain and tape, plane table, prismatic compass and theodolite etc.;
- (c) by photographs (ground photographs/aerial photographs);
- (d) by satellite and radar charts.

With the availability of high-speed computers and Global Positioning System (GPS), digital mapping has emerged as an important tool of mapping.

The amount of information given in a map depends on:

- Scale;
- Projection;
- Conventional signs and symbols;
- Skill of the cartographer;

- Method of map making; and
- Requirement of the user.

Types of Maps

Maps are of different types. Each map is unique in its design, content and construction and hence, a type by itself.

Maps are broadly classified on two bases: scale and purpose or content .

Based on the scale, there are two broad categories of maps:

- Large Scale; and
- Small Scale.

Large Scale : These maps represent small area of the earth on a large size of paper/cloth/plastic sheet with greater details. Examples of some of the large scale maps are:

(i) Cadastral Maps: The term cadastral is

derived from French word cadastre' meaning register of territorial property. The Cadastral maps are drawn to register the ownership of landed property by demarcating the boundaries of fields, buildings, etc. They are especially prepared by governments to realise land revenue and property taxes. The village maps of our country may be cited as an example of large scale maps. These maps are drawn on a very large scale, varying from 16 cm to a km to 32 cm to a km so as to fill in all possible details. The city maps may also be included in this category.

(ii) Topographical Maps: These maps are also prepared on a fairly large scale. They are based on precise surveys conducted by the Survey of India, Dehradun. They show general surface features in detail both natural and cultural. Principal topographic features depicted on these maps are relief,

drainage, swamps and lakes, forests, villages, towns, means of transport and communication like roads and railways, and canals. Indian toposheets are generally prepared on the scale of 1:50,000.

Small Scale : These maps represent large areas on a small sheet of paper. They have fewer details. Examples of small scale maps are Atlas and Wall maps. The maps included in this book are also small scale maps. They give only a general picture of the area represented.

(i) **Wall Maps**: These maps are generally drawn boldly so that they can be seen from a distance. They are used in classrooms and cater to a larger audience. These maps broadly show very large areas like world as a whole, hemispheres, continents, and countries, states and districts. The scale is smaller than that of topographical maps but larger than atlas maps.

(ii) Chorographical or Atlas Maps: The Atlas maps are drawn on a very small scale and give a highly generalised picture of the natural and cultural aspects such as the physical, climatic and economic conditions of different regions of the earth. Only a few atlases are prepared on a 1:1,000,000 scale like the 'Times Atlas of the World'. The Registrar General of India brings out Census Atlas from time to time. National Atlas and Thematic Mapping Organisation (NATMO) is a well-known important organisation in our country that publishes all kinds of maps for various purposes depicting different parts of the country. Thematic maps are usually prepared on small scale highlighting specific themes such as relief, temperature, and political divisions. According to purpose or theme, maps could be broadly categorised as follow :

(a) Physical or Natural Maps

(i) Orographic or relief maps represent features like mountains, plains, plateaus, drainage patterns, etc.

(ii) Bathymetric maps show the depth of the oceans and seas. They are also known as charts.

(iii) Geological maps represent rocks that form the crust of the earth, and their mode of occurrence and disposition.

(iv) Climate maps show average condition of temperature, pressure wind and precipitation of the world or part of it over a long period of time.

(v) Natural vegetation maps show natural flora of an area or region.

(vi) Soil map exhibits various types of soils covering the area.

(vii) Weather maps denote the average condition of temperature, pressure, wind and precipitation over a short period, which may range from a day to a season.

(viii) Astronomical maps show the position of stars and planets in the sky.

(b) Cultural Maps

These maps show the man-made features or human aspects.

(i) Economic maps show distribution of important minerals, agricultural and industrial products, and lines of transport and communication. They help in assessing economic development and potential of the area covered by the map.

(ii) Political maps show boundaries between different countries and states within countries.

(iii) Historical maps show the past events and facts.

(iv) Social maps depict elements like language, caste, ethnic groups and religion.

(v) Land utilisation maps exhibit the character of land use.

(c) Military Maps

Maps used by Defence Services are called Military maps.

(i) General maps on a scale of 1:1,000,000 or more depict only the broad topographical features. They are used by the Defence Services for general planning purposes.

(ii) Maps having scales ranging from 1:1,000,000 to 1:500,000 are often classified as strategic maps. These maps are used for planning concentrated military action.

(iii) Maps with a scale of 1:500,000 or less are called tactical maps. They serve as guides to small units like battalions and patrol units prior to and during movements anywhere near the front line.

(iv) Photomap is an air photograph with strategic and tactical data superimposed on it.

All maps have some common elements. Location and distribution of various features and phenomena are depicted using

distance, direction, and conventional signs and symbols.

Scale

Scale is the relationship between the distance on a map and the real distance on the earth's surface. It may be expressed as a representative fraction (ratio), a line scale or a statement scale. It is an important element of a map because it gives relative picture of the ground reality. As you have read earlier, maps are generally classified into large scale and small scale. However, there is no universally accepted standard for classifying maps according to scale. What one considers to be large, may appear to be small or medium for others. The same person may consider a map to be of large scale for one purpose but of small

scale for another purpose. As a result of this each specialised group of map users sets up its own standards for classification. As a matter of convention, maps having a scale 1:50,000 upto are classified as large scale maps, those falling between 1:50,000 and 1:1,000,000 as medium scale maps and those having scales above 1:1,000,000 are treated as small scale maps. The million sheets of the Survey of India and the National Atlas of India are considered to be medium scale maps.

Methods of Expressing Scales

The scales can be expressed in three ways:

1. Statement: The scale may be indicated in the form of a written statement. For example 1cm on the map represents 1 km on the ground. The scale is written as 1 cm to 1 km. This means that 1 cm on the map corresponds to 1 km on the ground.

Although it is simple to express in words, it is difficult for those who are not familiar with the unit of measurement used.

Besides, the scale will not be the same when the original map is reduced or enlarged. As such, this method is not very useful.

2. Representative Fraction (R.F.): It is also called as numerical scale. It is expressed as a ratio of map distance and ground distance. For example 1:1,000,000 means one unit of distance on the map corresponds to 1,000,000 units of distance on the ground. The advantage of R.F. is that it can be used universally irrespective of the local unit of measurement of distance. The map can be reduced or enlarged without changing the R.F.

3. Linear Scale or Graphical Scale: This scale is expressed as a horizontal or

straight line. The base is calibrated to express visual equivalents of representative fraction or verbal scale. The bases are divided into a number of equal parts and are marked to show what these divisions represent on actual ground. The scale has the advantage that it remains true even after reduction or enlargement of the map. However, it is useful only to those who are familiar with the particular unit of measurement.

Distances on the map are smaller than the corresponding distances on actual ground. Scale is the means which enables us to reduce the whole or a part of the earth to a size which is not only convenient and handy but also logical and scientific. A general definition of scale is that it is a ratio between the distance on a map and the corresponding distance on the earth.

For example if two points located 10 km apart are shown 1 cm apart on a map, then the scale of the map would be 1 cm to 10 km. It may also be converted into R.F as given below.

Suppose, 1 cm = 10 KM

MAP DISTANCE

GROUND DISTANCE

=

1 cm

10 km

=

1 cm

10 X 10,000 cm

= 1: 1,000,000

(Note: 1 km has 100,000 cm.)

Methods of Measuring Linear Distance

Linear distance on maps are of two types:

(i) Straight lines like roads, railway line, and canals;

(ii) Curved or Zigzag lines, showing streams, coastline etc.

(a) When the line is straight, the distance can be measured with the help of a divider. Open a pair of dividers and place one of its legs at one end of the straight distance and the other leg on the other end on the map. Then lift the divider and place it on the calibrated bar scale to get the distance on the ground

(b) When the route is zigzag, place one end of a thread at the starting point and carry the thread along the line. After completing the distance stretch the thread and measure the length. It will give approximate distance.

It can also be measured with the help of a plain divider, as explained earlier, but the measurement will be less accurate. It can also be done with the help of a strip of paper.

(c) Rotameter is an instrument having a route measuring wheel. Distance between two points is measured by allowing the wheel of the rotameter to move along the route.

Direction

Direction has been defined as an imaginary straight line on the map or the ground showing the angular position of various maps with respect to a common base direction. The line pointing to the north is regarded as the zero direction or base direction line.

A map must have the base directions represented on it to enable the user to locate different features with respect to each other. North, south, east and west are the four major directions. These are also called cardinal points. In between cardinal

points one may have several intermediate directions.

A rough estimation of direction of the true north can be obtained by the Means of an ordinary watch. In the northern hemisphere if the watch is held in the horizontal position and turned until its hour hand points to the sun, the line that bisects the angle made by the hour hand with the line joining 12'O clock through the centre of the watch will point to the south. A similar exercise in the southern hemisphere will indicate the true north. This is also a crude method dependent upon the sun .

Legends

Every map contains a legend or a key. It lists the features and the signs or symbols used in the map for showing these features. As you know various types of features or phenomena are represented on maps. They

relate to both land and sea and are shown with the help of conventional signs and symbols. The signs and symbols include lines, icons, alphabets, shadings and colours. As a convention, specific colours show certain area features.