UNIT 9 UNDERSTANDING MAPS

Structure

9.1 INTRODUCTION

In Unit 8, we have discussed about the shape and size of the planet Earth, datum, coordinate system (latitudes and longitudes) and various types of map projections. As you know map projections are very important for transferring the spherical network of latitudes and longitudes of the Earth on a flat surface or on a piece of paper. It simply means that a map can be drawn with the help

of a system of map projections. A thorough knowledge of cartography – an art and science of designing, constructing and producing maps – is essential for map making and its understanding. In this unit, we will discuss about maps and their types, elements, scale, visual aspects and colour composition. We will also make a comparison between various map layouts at the end of the unit.

Objectives

After studying this unit you should be able to:

- define a map;
- classify maps and outline their elements;
- discuss significance of maps having different scales;
- compare various maps;
- select an appropriate map for a specific purpose; and
- identify a good or a bad map.

9.2 WHAT IS A MAP?

We know that the Earth is large and is fully covered by natural (physical) and cultural (man-made) features. Hence it is impractical to communicate the picture of the whole Earth and its features verbally. To overcome this problem, a projection has been developed to represent the Earth along with the location, distribution and relationship of its features through pictorial representations known as maps. A ***map*** is the graphical two dimensional representations of all or part of the Earth's surface and its features on a plane surface drawn to a specific scale. Since, it is also impractical to represent all features of the Earth's surface in their actual sizes and forms on a map, maps are drawn at reduced scales. This attempt to show the surface of the Earth or a portion of the Earth on a flat surface is known as map. Map projections help to represent the three-dimensional features of the Earth's surface in two-dimensional forms. With the help of scales and map projections a correspondence of every point on the map to the actual ground position can be established. In a map, the real-world features have been replaced by symbols, signs, shades and colours. In other words, maps are really selective, symbolised and generalised representation of real-world phenomena on a plane surface at a reduced scale. Maps, therefore, are the paper storehouses of geospatial information.

Cartography is the art and science of making maps and ***Cartographer*** is a person who creates maps.

It is very important for you to understand the difference between maps and sketches. A ***sketch*** is simple arrangement of lines, polygons, etc., with no scale and spherical coordinates. A ***map*** on the other hand always shows scale and coordinate system. Maps are mainly prepared and published by the national mapping organisation of every country of the world.

9.3 TYPES OF MAPS

There are several types of maps. Each map may show one or different kinds of information. Maps are generally made according to the function and scale. For example, some maps are used for forecasting the weather, while others are

used to plot the population in an area. Depending upon the function and scale, maps are classified into various types as shown in Fig. 9.1.

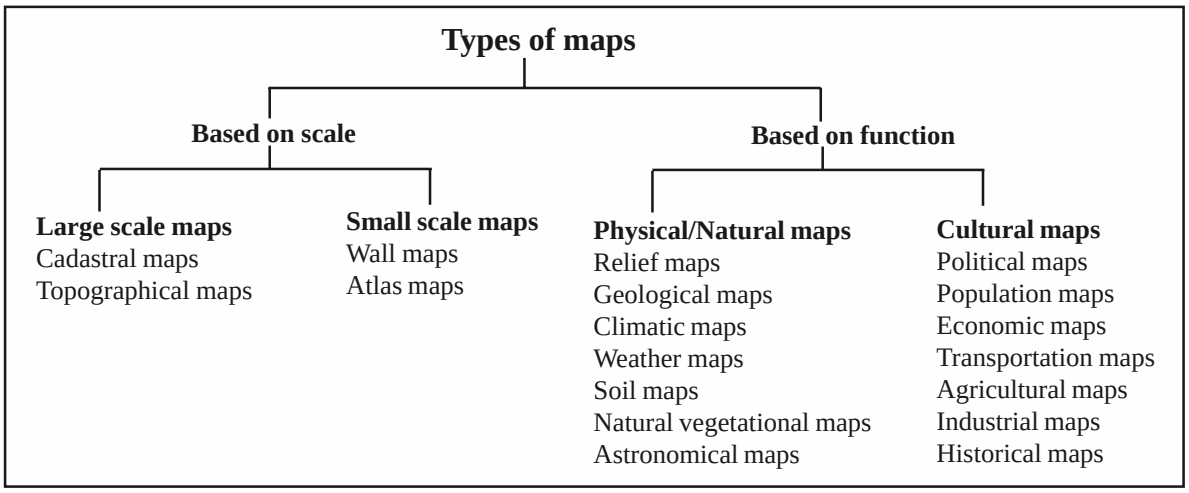

Fig. 9.1: Types of maps

9.3.1 According to Scale

According to the scale, maps may be classified into large scale and small scale maps.

Large Scale Maps

A map which shows a small area with detailed information is referred to as a ***large scale map***. Large scale maps represent an area in higher detail; thus, map may contain more information but coverage of an area is small. US Geological Survey maps are drawn at a scale of 1:62,500, the Canadian Centre for Topographic Information maps at a scale of 1:50,000, the Survey of India maps at a scale of 1:25,000 are few examples of large scale maps. Large scale maps are further sub-divided into cadastral and topographical maps.

Scale represents the ratio of distance on the map to the actual distance on the ground.

a) Cadastral Maps

The term 'cadastral' is derived from the French word 'cadastre' which means 'register of property' are related to land. These maps are drawn on a very large scale such as 1:3,960, 1:1,900 or even more. They are used to show the ownership of land properties by demarcating the boundaries of agricultural fields and buildings. Cadastral maps are prepared and compiled by the government agencies and are used for revenue and taxation purposes. Village maps prepared by *Patwari* may be put under this type.

b) Topographical Maps

Topographical maps are also drawn on a fairly large scale but their scale is relatively smaller than cadastral maps. Topographic maps are based on precise topographical surveys and are published in the form of series of maps by the national mapping agencies. These maps are drawn at different scales, like 1:250,000; 1:50,000; 1:25,000 by the various mapping agencies. A topographical map, for example, shows only natural and cultural features and does not show the boundaries of individual agricultural lands (Fig. 9.2). These maps follow a standard system of symbols, signs, contours and colours to show topographic information. You will read more about topographical maps in Unit 10 of this course.

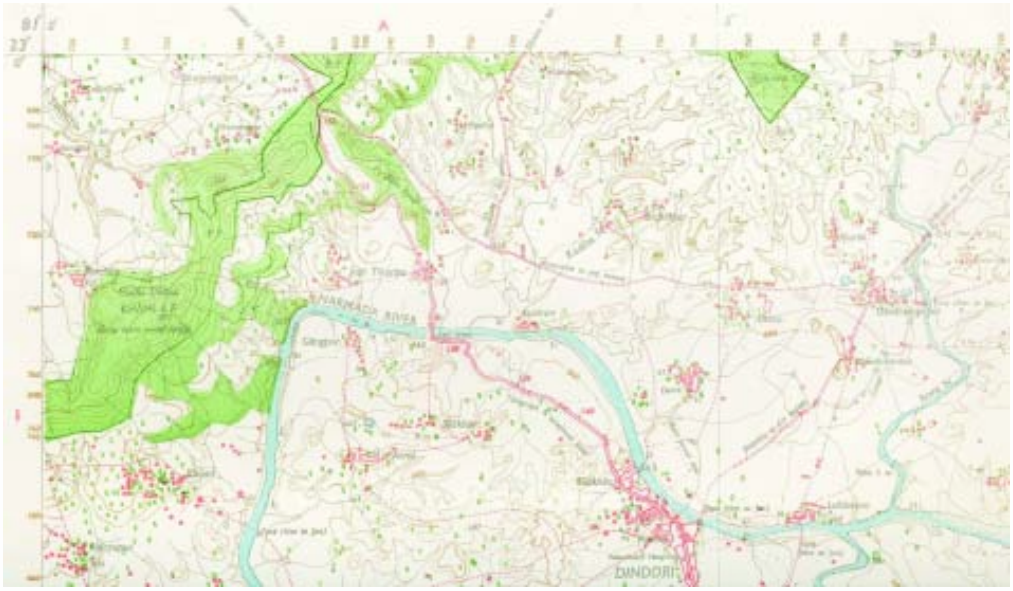

Fig. 9.2: A sample topographical map

Small Scale Maps

Small scale maps refer to maps on which objects are relatively small. For instance, a map depicting a large area, such as an entire country is considered to be a small scale map. They are drawn to show large areas e.g. a map of the world that fits on one/two page would be a small scale map. Small scale maps are further sub-divided into wall and atlas maps.

a) Wall Maps

Wall maps are usually drawn on large size papers or plastic sheets. After unfolding these maps you can hang on the wall. Wall maps look like posters (Fig. 9.3). Wall maps are small and simple, and used for many purposes. They are used in classrooms, lecture halls, and also help to navigate highways, roads, and locations. Scale for these maps is smaller than those of topographical maps.

Fig. 9.3: Wall map of the world (source: www.worldmapsonline.com)

b) Atlas Maps

These maps are generally drawn on a very small scale. Therefore, they represent large areas and also provide highly generalised information of physical and cultural features of different regions of the world. Scale of atlas maps is smaller than wall maps.

9.3.2 According to Function

Maps can also be classified according to their functions and purposes. For example, a political map shows an administrative arrangement of a nation or a state and a climate map shows different types of climatic zones. Based on the functions and purposes, maps are also classified into physical and cultural maps.

Physical Maps

Physical maps are especially prepared to show natural features such as heavenly bodies, relief, soils, rocks, vegetation, drainage, weather, climate, etc. These maps further sub-divided into following types:

a) Astronomical Maps

Astronomical maps are prepared to show heavenly bodies, like stars, galaxies, or surfaces of the planets and the Moon. Modern astronomical maps are based on a coordinate system similar to geographic latitudes and longitudes. These maps have both large and small scales.

b) Relief Maps

Relief maps are drawn to show the actual relief (topography) features of surface of the Earth, like mountains, valley, plains, plateaus, drainage, slopes, river systems, etc.

c) Geological Maps

These types of maps are prepared to show different types of rocks, minerals, and geological structures.

d) Climatic Maps

Climatic maps depict different types of climate zones of an area (Fig. 9.4).

Fig. 9.4: Climatic map of the world (source: www.map.com)

e) Weather Maps

These maps are drawn to show the average conditions of weather's elements (temperature, pressure, rainfall, direction and velocity of winds, etc.) over a short period, which may range from one day to one season.

f) Soil Maps

Maps are also drawn to show different soil types found in a region or continent using different shades and colours.

g) Vegetation Maps

These maps are prepared to show distribution and types of vegetation in an area, nation or the whole Earth.

Cultural Maps

Cultural maps are drawn to represent man-made features such as buildings, canals, dams, rails and road networks, etc.

a) Political Maps

These maps represent boundaries between various political regions, such as tehsil, district, state and country. For example, political map of India shows 28 states and 7 union territories of India (Fig. 9.5).

Fig. 9.5: Outline of political map of India showing States and Union Territories with major cities and capitals (www.nationsonline.org/oneworld/india_map.html)

b) Population Maps

These maps are drawn to show distribution and density of population, and related features such as growth rate, age and sex composition, religious distribution, occupation, etc.

c) Economic Maps

These maps depict distribution and production of agricultural, mining and industrial products. In addition, economic maps also show location of industries and markets, trade routes, commercial centres, etc.

d) Transportation Maps

These maps are drawn to show the network of roads, railway lines, air and shipping routes.

e) Agricultural Maps

These maps represent production and distribution of different types of crops in an area, nation, or the whole world.

f) Industrial Maps

These maps are drawn to show location of industrial hubs in a region, nation or continent.

g) Historical Maps

Historical maps are drawn to show past events.

9.4 MAP SCALE

From the last section you would have realised that maps can be drawn that are region specific e.g. map of a district, a state, a country, a continent or the whole world. It is impossible to represent the whole surface of the Earth on a single plane piece of paper in its actual size because for this we need a very long paper of the same size as the Earth. To overcome this problem, we make use of a scale to represent a part or entire surface of the Earth. A scale helps us to reduce whole or a portion of the Earth to a size which is convenient and handy to represent the portion to be shown as well as has scientific and logical values. Therefore, maps are scaled down so that they fit on available paper.

9.4.1 Definition

We can define a map scale as the relationship between distance on a map and distance on the ground. In other words, map scale can also be expressed as the ratio of distances between any two points on map and their corresponding distance between the same two points on the ground. Thus, map scale is a method for expressing relationship between map distance and ground distance or distance on the surface of the Earth. Understanding map scale is very important to know the size of the land features represented on a map and relative distances between them. During the process of scaling down of a map, every part of the map should be scaled down by the same amount. This will ensure that every feature on the map is in same proportion. Suppose, if a city is twice as large as a neighbouring town, an accurate scaled map will show the same relationship on paper. The drawn city will be twice as large as the drawn town.

For example, let us assume that 1cm on a map represents 1 km on the ground. It means scale would be

1 cm = 1 km or

Distance on the map / Distance on the ground

= 1 cm/1 km

=1 cm/1,00,000 cm

= 1/1,00,000 scale.

9.4.2 Methods of Representation

There are three ways to represent a map scale:

Statement of Scale

It is the simplest method of scale representation. In this method, scale of a map is expressed in written statement like 1 centimetre (cm) equals to 10 kilometre (km). It means 1 cm on map is representing 10 km of the corresponding distance on the ground. The main demerits of this method are a) people who are not familiar with the used system of measurements, find it difficult to understand the units and b) when a map is reduced or enlarged, the statement of scale will change.

Graphical Scale

The second way of expressing relation between a distance on a map and corresponding distance on the ground is the graphical scale. Graphical scale is also known as linear scale, bar scale, or scale bar. In graphical scale, distance is shown graphically along a line with primary and secondary divisions marked on it (Fig. 9.6). Length of a segment of line represents some distance on the Earth. In a graphical scale, zero point is located on the left end of the scale. To the right of zero point, the scale is graduated in primary divisions and from left of zero scale is graduated in secondary divisions. The advantage of this method is that when a map is reduced or enlarged scale will get proportionally reduced or enlarged.

To the right of the zero, the scale is marked in full units of measure and is called the *primary scale*. To the left of the zero, the scale is divided into subunits and is called the *secondary scale*.

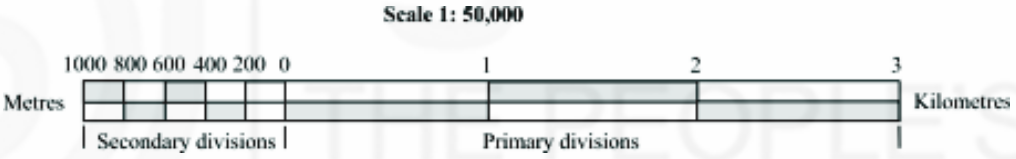

Fig. 9.6: Graphical scale

Representative Fraction

We may also specify scale as a representative fraction (R.F.). R.F. shows a relationship between map distance and corresponding distance on the ground in units of length. For example, if we have a R.F. of 1/1000 or 1:1000. It means one unit of measurement on a map represents 1000 units on the ground. R.F. is always written with map distance as 1 and is independent of any unit of measurement e.g., yards, meters, inches, cms, etc. But it is important to remember that both values of the fraction must have same units of measurement, like 1 inch represents 1000 inches, or 1cm represents 1000 cms. In this method, numerator shows distance on the map while denominator represents distance on the ground and its value changes according to the scale.

In R.F., ground distance between two points can be determined by measuring distance between the same two points on the map and then multiplying map measurement by the denominator of R.F. For example, R.F is 1:1000 and map distance of two points say from point A to point B is 5 cm then ground distance is 5×1000 = 5000 cm. R.F. is a versatile method as it can be used with any system of measurement.

Check Your Progress I

Spend 5 mins

1) Name three ways of representing the scale on a map.

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9.5 MAP ELEMENTS

Maps are not domain of only geographers. In fact, they are also used by different people and professionals all over the world for various purposes. Therefore, the amount of information a map communicates, or a reader can extract from it, is dependent on certain elements of maps. For better representation of maps, cartographers used some terms or elements to make readers understand maps easily and to interpret information displayed on them correctly. The main types of map elements as shown in Fig. 9.7 and include title, legend, scale, north arrow, projection type, date of publication, neat lines, and map notes.

9.5.1 Title

Title is a very important feature of maps. A title of a map will tell you what it is for. It should be simple and clearly indicate its purpose. Title is usually displayed on top of the map to provide a clear indication on the thematic and geographic region displayed.

Fig. 9.7: Labelling of map of India

9.5.2 Legend

Legend is a guide which lists symbols and colours used on a map to represent different geographic features. Legend helps to identify what symbols and colours represent. It is important to note symbols appearing in the legend should remain same as they appear in the body of the map. Legend should be described clearly.

9.5.3 Scale

As you learnt in section 9.3, scale represents the relationship between distance on a map and actual distance on the ground. Scale provides important information regarding linear aspects on the maps to the users. Scale on a map can be shown as a statement of scale, graphical scale and/or R.F. Most of the cartographers prefer graphic form of scale representation during map making.

9.5.4 Direction

It is another important map element. With help of direction, you can determine orientation of the map. As a rule, each map should have a north arrow that points to the North Pole. North arrow is a symbol indicating the direction in which north lies. Generally, the “north arrow” is placed at the top of a map. In some maps “compass rose” is used as symbol to indicate the cardinal directions such as N (North), S (South), E (East) and W (West) (Fig. 9.8).

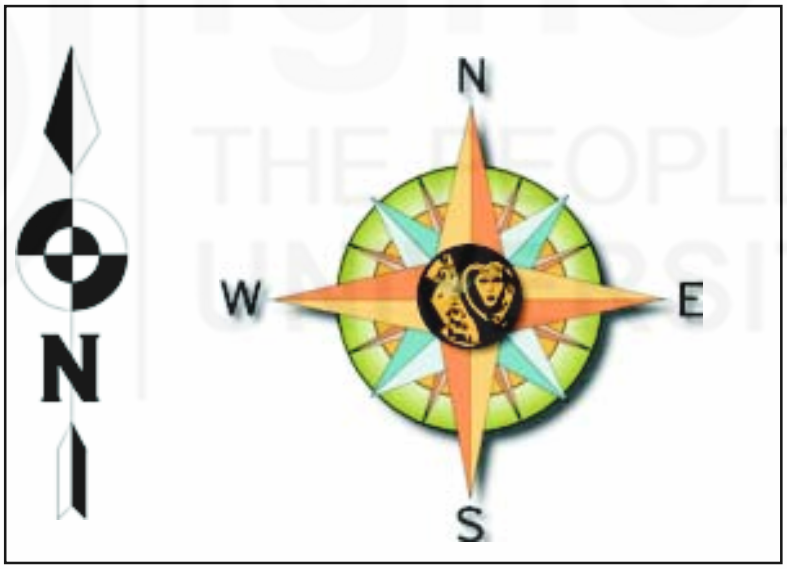

Fig. 9.8: (a) North arrow and (b) compass rose

9.5.5 Credits

Credits include name of cartographer/s and organisation responsible for map making. Credits also indicate accuracy of map, date of publication or revision, and other explanatory material. Credits should be written in small readable text.

9.5.6 Spherical Coordinate System

Spherical coordinate system includes latitudes and longitudes. This system helps us to determine absolute position of an object or an area on the surface of the Earth. Left and right margins of the map are marked by position of

latitudes while top and bottom margins are marked by position of longitudes (Fig. 9.9). Cartographers have taken the equator (0° latitude) as the starting point for latitudes and the prime meridian (0° longitude) for longitudes. Latitudes above the equator show north and below the equator show the south. In the same way, lines to the right of prime meridian show east and to the left show west.

9.5.7 Border and Neat Lines

Both these elements are optional. Borders help to frame the whole map composition to focus the attention of readers on different elements of information. Neat lines are finer lines than borders and drawn inside the borders. Neat lines are used to indicate where an area of a map begins and ends.

9.6 COLOUR COMPOSITION OF MAPS

If you see a map, you will find that it has a number of colours. Actually, cartographers use different colours to represent features on maps. Many colours used on maps have a relationship to features on the ground. For example, in a map, blue colour is used for representing water bodies, brown for mountains and hills, green for vegetation, etc. It is very important for you to become familiar with different colours which are used by the cartographers to show various features on the maps. A general scheme of colours and their representation of features are given in Table 9.1. However, it is important to note that different maps can use colours in a variety of ways. For example, political maps which show mostly human-made features usually use more map colours than physical maps. Physical maps show the natural features of the Earth. As a result, it is important to have a serious look at the legend of a map before taking any decision.

Fig. 9.9: Map of the world showing position of latitudes and longitudes

Table 9.1: Features by map colours

Colours	Features shown
Blue	Water bodies such as lakes, swamps, rivers, drainage, reservoirs, and oceans.
Black	Cultural features such as buildings, roads, railways, highways, bridges, place names, borders surveyed, spot elevations, and all labels.
White	Areas that are mostly clear of trees - fields, plains, sand flats, etc.
Green	Dense vegetation – areas covered by forests, woods, jungles, parks, golf courses, forest, orchards, etc.
Brown	Contour lines that help to identify all relief features and elevation.
Red	Classifies cultural features, such as populated areas, main roads, and boundaries.

9.7 PLACEMENT OF FEATURE'S NAME ON MAPS

By now you would have become familiar with the fact that maps represent spatial information. The way in which spatial information or geographical entities on maps are represented is called ***map naming or name placement*** on maps. Map naming is a time consuming task but it forms an important part of a map for many reasons. The most obvious reasons are given below:

- labels tell the names of the spatial features
- make maps more readable and interpretable
- provide understanding of the linear extent and orientation of map features
- provide information about the nominal class to which spatial features belong and
- provide understanding of the relative size and importance of the features

Over centuries, cartographers have developed various methods of placing names on maps. Generally, map labelling can be accomplished through cartographic text which includes font size, spacing, orientation and placement of labels. Finally, good name placement makes map reading considerably effective and enhances aesthetic appearance of a map. Imhof (1975) stated that 'good form and placing of type makes a good map' in the same way as 'clothes make the man'. Thus, labels are an essential aspect of maps, and quality of a map depends on the way these (labels) are annotated.

Eduard Imhof was a professor of cartography at the Swiss Federal Institute of Technology, Zürich, from 1925 - 1965. In 1949 he was awarded by an honorary Doctorate of Philosophy from the University of Zurich for his work as a cartographer.

9.7.1 Basic Principles of Map Naming

Imhof (1975) suggested six basic principles that should be taken into consideration before placing names on maps. These are:

- names should be easily readable and locatable
- name and object to which it belongs should be easily recognisable
- names should not disturb to other map contents as little as possible so that there is no overlapping and concealment of object/names
- names should assist directly in revealing spatial situation, territorial extent, connections, importance and differentiations of features

- arrangement of names should reflect the classification and hierarchy of objects on the map
- names should neither be evenly dispersed over the map nor be densely clustered

9.7.2 Data Representation by Maps

Generally, three types of data/designations are represented in a map (Fig. 9.10).

These designations are given below:

Point data consist of small and localised places on a map whose surface extent is so small that names cannot be placed within them e.g. cities, villages, ports, towns, churches, mines, mountain peaks, historical sites, triangulation points, etc.

Line data refer to spatial features that have linear or ribbon-like extent e.g. rivers, roads, railways, canals, streets, ship routes, etc.

Area data show a region on a map e.g. tehsils, districts, states, countries, lakes, oceans, bay, etc. An area data is usually represented by closed boundaries on maps in which names can be set.

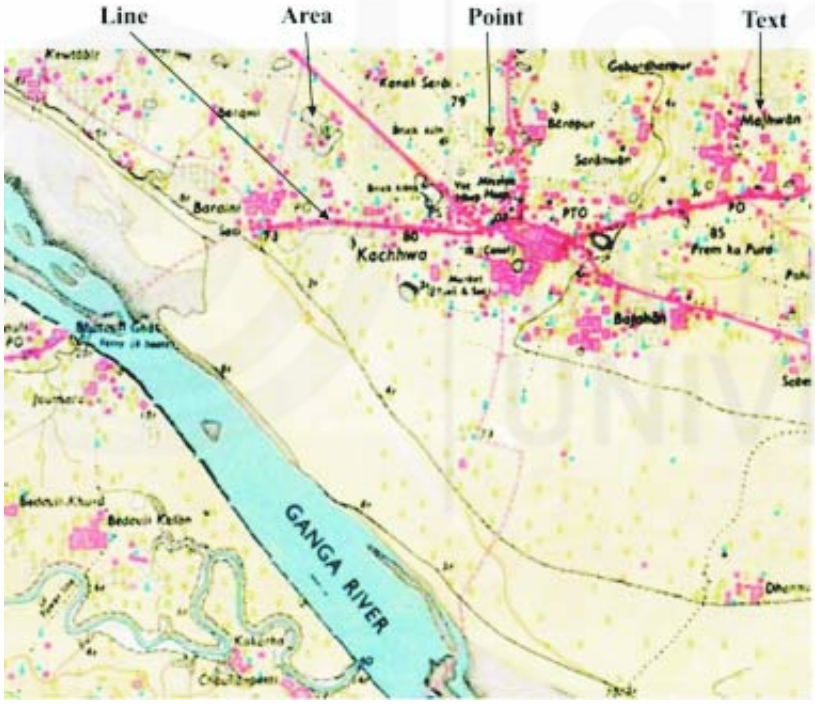

Fig. 9.10: Example of point, line, and area data along with name placement in a map

9.7.3 Types of Map Naming

Based on data, map labelling can be divided into point, line and area labelling. It is also important to note that placing a name in any type of data mentioned above depends on the scale of maps e.g., in a large scale map names can be set within a building but same is not possible in a small scale map. Ahn and Freeman (1983) suggested certain rules for naming point, line, and area features, which are given below:

Point Features: The rules that apply to name the point features are as follows:

- label for a point feature should be horizontal i.e. east-west direction and parallel to one of the map boundaries

- point feature labels should not spread out
- a point feature label should be close to the point feature to which it refers, but a minimum distance must be maintained
- position of a point label may be somewhat above and to the right of the point but other positions in connection to the feature can also be considered.

Line Features: Rules for labelling line features are:

- labels for a line feature should conform to the curvature of the line
- complicated and extreme curvatures should be avoided
- line feature labels should not spread out, but may be repeated at reasonable interval along the line
- for horizontal line features, the names should be placed above the line
- for vertical line features, names of left half line features should be placed on the left side of the line to be read upward and names of right half line features should be placed on the right side of the line to be read downward
- avoid placing a name near an end point of the line feature.

Area Features: For area features, naming is somewhat more difficult than line and point naming because of the complicated shapes of areas and variety of naming methods. The following rules apply to name area features:

- the label for an area feature should span entire area and conform to the general shape of the feature, leaving about one and one-half letter spaces at both ends. However, if there is no significant difference between this placement and horizontal placement of an area name, then preference should be given to horizontal placement
- non-horizontal placed names should not be straight but curved. The arcs should not be greater than 60 degrees
- a name that reads away from the horizontal is preferred over a name that reads towards the horizontal.

You should keep in mind that generally, point names are preferably positioned above and to the right of the feature. Line names should follow line feature and be placed in unoccupied space and preferably be almost horizontal. In area naming, name is set inside the area, and stretched so that it represents whole area. It is also equally important to take into consideration the fact that distribution of features should be even as much as possible, within the map frame to avoid unnecessary crowding or leaving large blank areas.

9.8 VISUAL ASPECTS OF MAPS

Once geographic features and data are selected and classified for compilation of a map, it is important to choose appropriate symbols to represent them on maps. A specific set of symbols that can be used to communicate information is called ***visual variables*/*visual aspects*** of maps. Originally, a French cartographer, Bertin (1967), has given a comprehensive account of the theories of visual aspects of maps and their uses.Visual variables include location in

space, shape, size, orientation, hue (colour), and colour value (Fig. 9.11). The visual variables are the building blocks for map making.

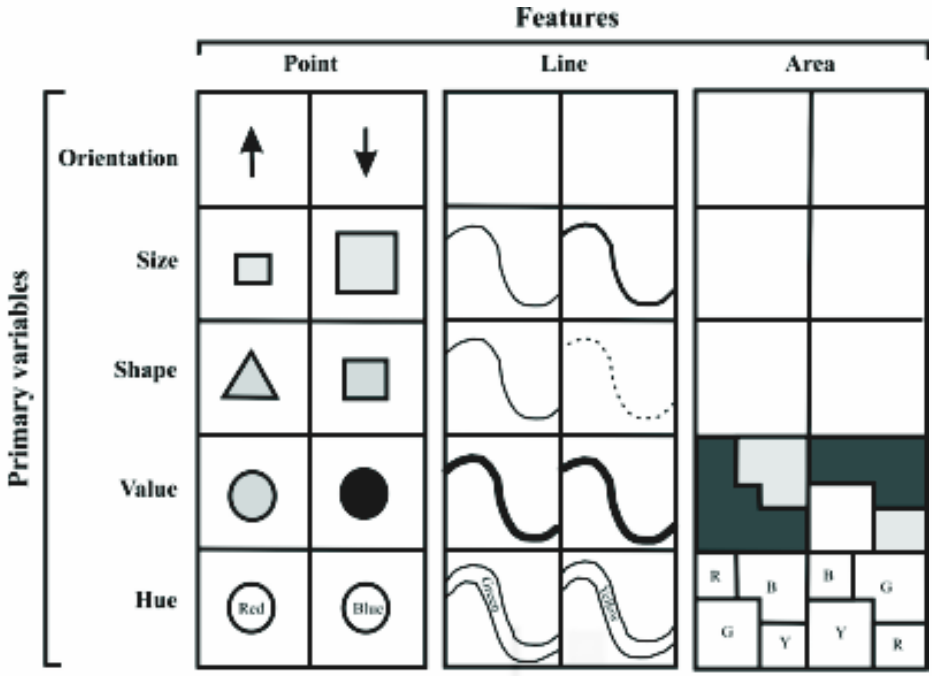

Fig. 9.11: Primary visual variables with examples of their application to the classes of symbols (redrawn after Robinson and others, 2004)

Visual variables are of two types namely, primary and secondary visual variables.

9.8.1 Primary Visual Variables

Primary visual variables are shape, size, orientation and colour. Let us look at Fig. 9.11 to understand how they are used.

a) Orientation

Orientation provides another mode of visual distinction. It is best suited for vector fields, like wind, gravity and magnetism. Map symbols used by meteorologists to denote wind direction and speed combine orientation with shape (1st Row, Fig. 9.11).

b) Size

The size of the displayed object reflects the unit value of the feature of interest. Size is limited by the ability of the map reader to estimate the difference between sizes (2nd Row, Fig. 9.11). Size differences may be displayed by adjusting linearly or by adjusting the area, for example, by increasing twice the length of the sides of a square or by increasing twice its area. In another example, size of line features corresponds to width, in which wider lines correspond to interstate highway and narrow lines to local streets.

c) Shape

Shape is represented in the form of a graphic mark. For example, a shape may be regular and geometric in case of a square, circle, triangle, etc. (Fig. 9.11). Shapes can also be irregular, for instance, in the case of a pictographic version of a bridge or tree (3rd Row, Fig. 9.11).

d) Colour

Colour is the most important single medium in map design. It enables us to create a better contrast in symbols. Used in conjunction with other graphic symbols, it makes the portrayal of data visually more interesting. It also enables more information to be fed in a map without making it congested. The colours perceived by us have following three characteristics:

- **Value:** Is the vertical division of hues. Each hue has ten shades of values ranging from white at the top to black at the bottom (4th Row, Fig. 9.11).
- **Hue:** It is the quality which differentiates one colour from the other. There are following 10 types of hues: yellow-red (orange) yellow, yellow-green, green, blue-green, blue, purple-blue, violet, purple, red-purple (magenta). The shades between any two hues can be further subdivided into 10 steps, to make 100 hues in all. Each of the hundred hues is further divided vertically and horizontally (5th Row, Fig. 9.11).
- **Intensity:** Here each hue is again divided into 10 shades to give the varying degrees of intensity or brightness or relative saturation of colour area. These 10 shades vary from gray to pure colour.

In all, we get combinations to form over 5,000 colours. These colours are designated to give all the three characteristics. For example, Y.R. 4/3 means yellow-red of fourth gradation in darkness (value) between black and white and third gradation in brilliance (intensity) from grey to full yellow-red.

9.8.2 Secondary Visual Variables

The various combinations of primary or graphic visual variables produce an areal graphic effect which is known as ***pattern***. A pattern is characterised by the arrangement, texture and orientation of graphic elements (Fig. 9.12). Hence pattern arrangement, texture and orientation forms secondary visual variables.

a) Texture

Texture refers to the size and spacing of component elements (graphic variable, combining size, value, hue, shape and orientation) that make up a pattern (1st Row, Fig. 9.12). A fine texture is formed by the close spacing of small elements while a coarse texture is formed by an open arrangement of larger elements (Fig. 9.13). It is used for nominal and ordered attributes of areas and lines.

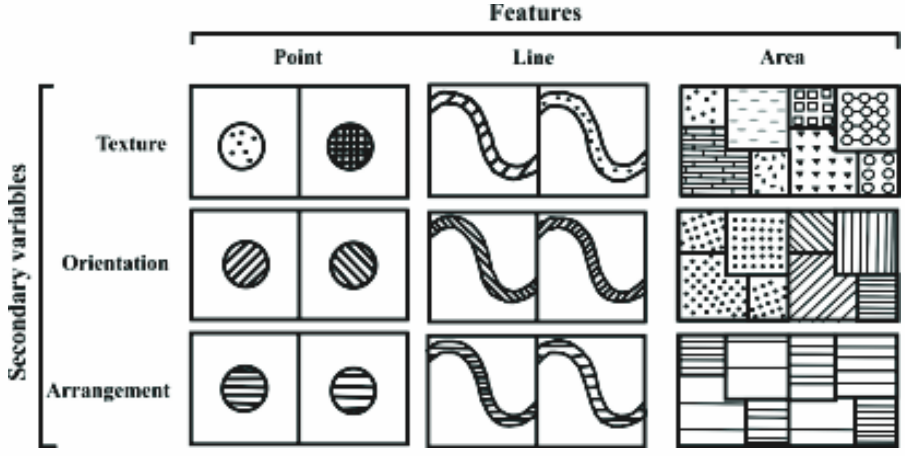

Fig. 9.12: Secondary visual variables with examples of their application to the classes of symbols (source: Robinson et al, 2004)

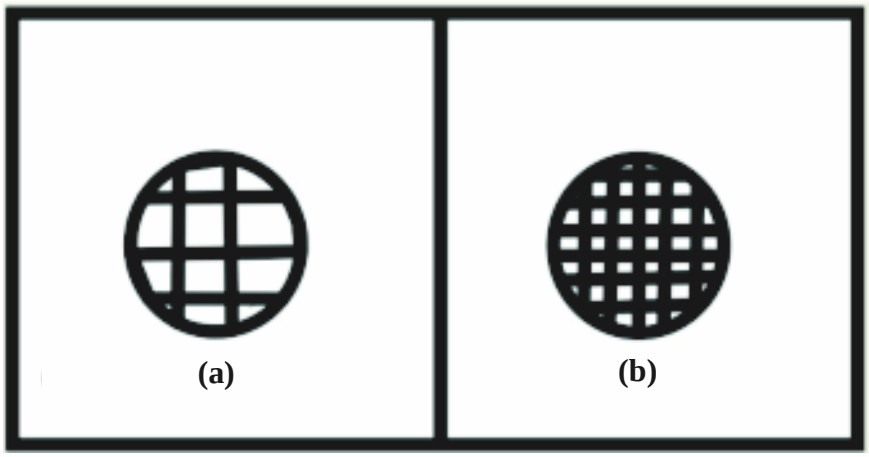

Fig. 9.13: (a) Coarse and (b) Fine textures

b) Orientation

It is directional arrangement of parallel rows of elements (2nd Row, Fig. 9.12).

c) Arrangement

It refers to the shape and configuration of component elements that make up a pattern. The point or line patterns generally have systematic structure (3rd Row, Fig. 9.12).

Check Your Progress II

Spend 5 mins

1) Name three types of geographic data shown on the map.

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9.9 COMPARSOIN OF DIFFERENT MAP LAYOUTS

A ***map layout*** is basically a plan or design in which a map can be drawn. It can be portrait or landscape. Map layouts are very important in creating good composition and visual balance of maps. There are five basic principles behind making map layouts:

- you should understand the concept and the requirements of the person using the maps so that you get an idea how to display data on the map and which map elements should be included
- you should understand the hierarchy with harmony. This means the kind of interrelationship between various elements on maps. Emphasis should be given according to the level of importance of the elements of the map. Associated features must be given an associated treatment. A perfect harmony of features leads to a neutral bloom in a map
- readers can gain maximum information from map at a glance with minimum cost and time

- your map layout should be designed to engage attention of its readers. This can be done by taking into account how the readers would like to visualise the information in the map. Map layout consists of map elements, balance, and focus of attention

9.9.1 Map Elements

For each map element, the cartographer must determine its importance and priority within overall map design. Most important elements in a given design should feature in more prominent positions and occupy a larger area within the map frame than other less important elements. In this way, the importance of the various map elements can be matched to the visual hierarchy of map itself (Fig. 9.14).

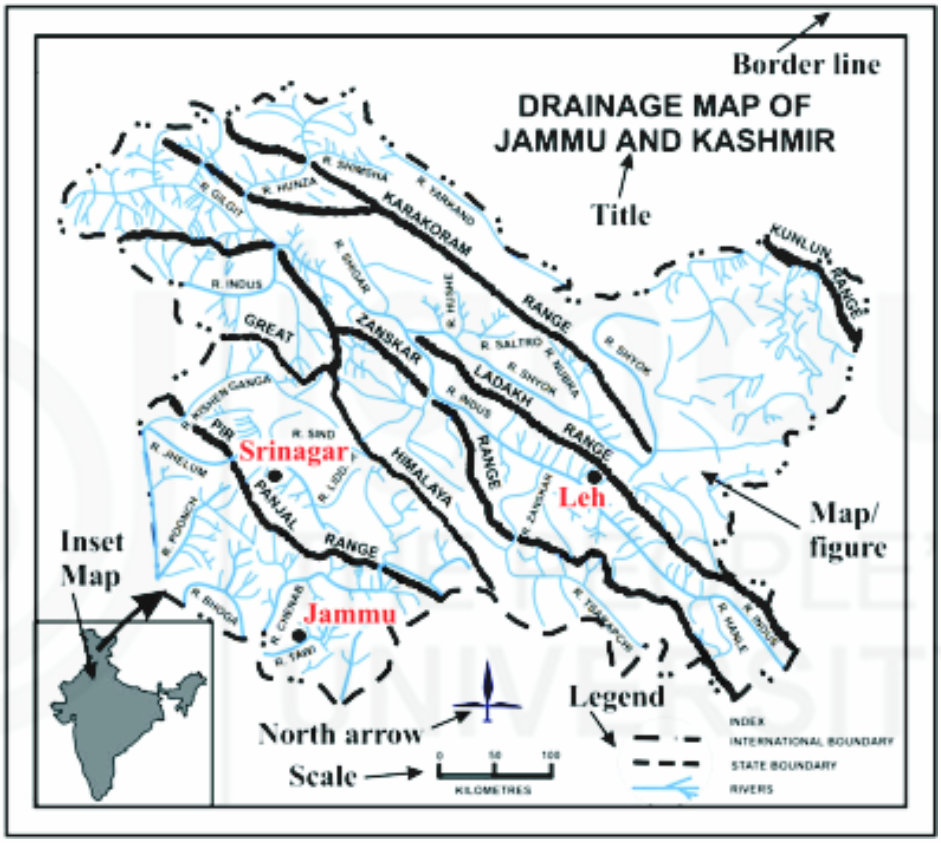

Fig. 9.14: Arrangement of map elements

9.9.2 Balance

Balance in graphic design refers to the visual balance of positioning of various visual components (legends, boxes, colour areas, scale, map figure, etc.) in such a way that their relationship appears logical. Nothing should appear to be out of place. In fact, layout is the process of arriving at a proper balance. In a well-balanced design, nothing is too light or too dark, too long or too short, or too small or too large.

Generally, visual balance depends on the relative position and visual importance of basic parts of a map. It also depends on the relationship of each item to other items and to the optical center of the map. A map has two centers namely geometric center and an optical center (Fig. 9.15). An optical center is a point that lies slightly above the geometric center. For achieving better visual balance, designer should arrange map elements around the natural (optical) center, rather than the geometric center.

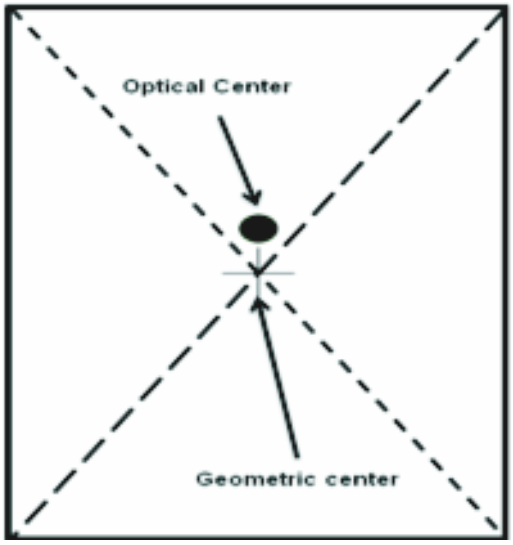

Fig. 9.15: Optical and geometric centers of an image. Balancing is achieved around the optical center.

If you study the Fig. 9.16, you will be able to find that first three layouts are unbalanced because there is poor balance between various objects of map such as margins, white space, bounding boxes and alignment. But the fourth layout has a very good combination of different objects of the map hence, it is a balanced layout.

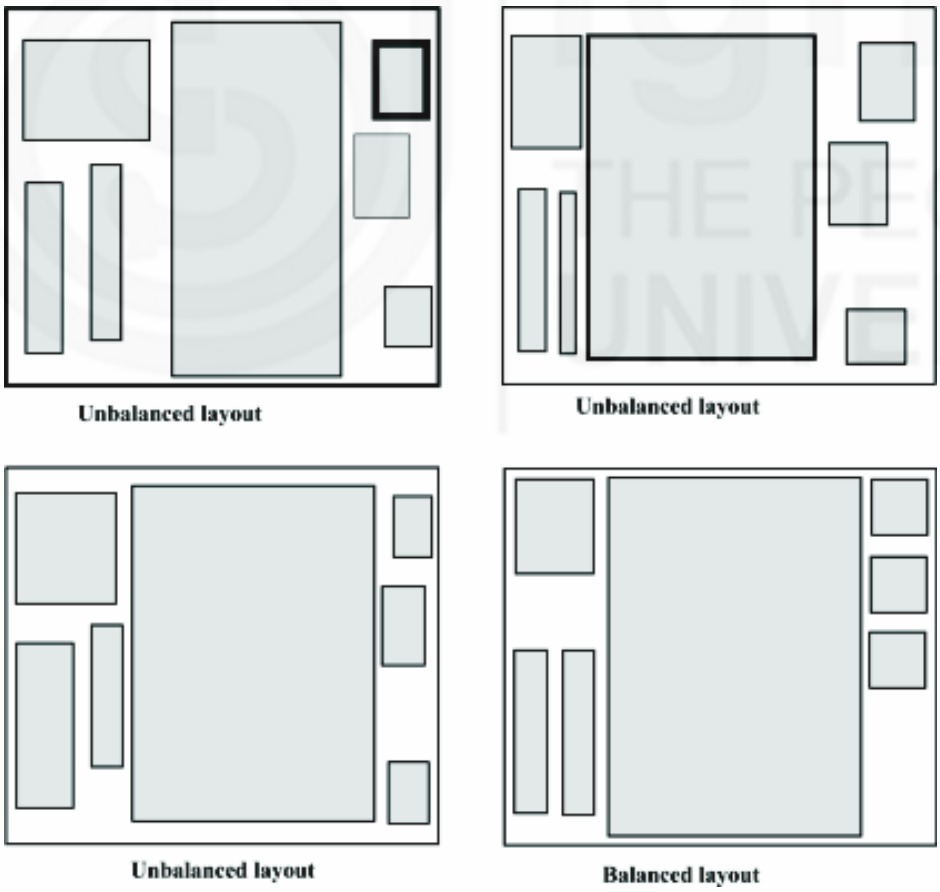

Fig. 9.16: Comparison between unbalanced and balanced layouts of map

A simple way to understand how balance can affect impression one would have while viewing a map, is illustrated in Fig. 9.17. The figure shows several different locations of the shape of India. Can you find which appears better balanced within the map frame?

Fig. 9.17: Different layouts of map. The A, B, and C panels leave more space on right, left and top of outlines, respectively. Position in panel D shows visual equilibrium and appears better balanced within the map frame

9.9.3 Focus of Attention

Normally, the optical center of a map attracts the viewer's eye. As a result, the eyes follow a path from upper left, proceed through the optical center and exit the space at the lower right (Fig. 9.18). Cartographic designers may use this pattern when arranging the map elements, so that positions of important objects on the map correspond to natural eye movement.

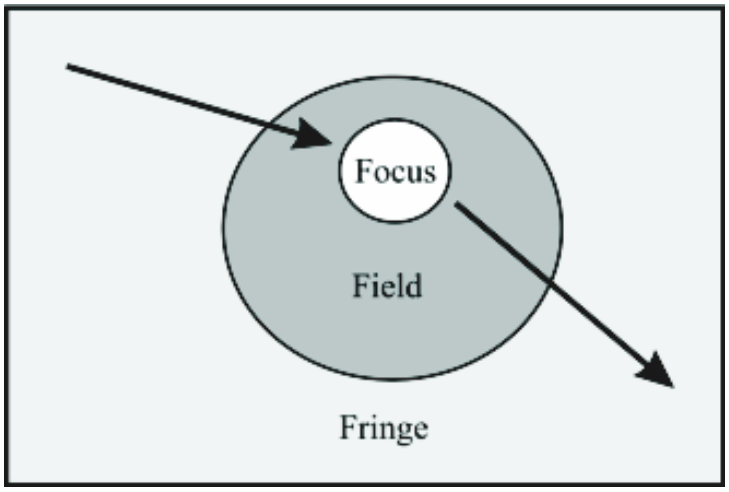

Fig. 9.18: Eye movement through the image space, arrow indicates direction of movement (redrawn after Dent, 1999)

9.10 SUMMARY

- Maps are the graphic representation of all or part of the Earth's surface and its features drawn to a specific scale.
- There are three methods of scale representation on maps *viz.* statement of scale, graphical scale and R.F.
- Maps are classified into large and small scale maps based on scale as well as into physical and cultural maps based on their function.
- As you know maps are used by a number of audiences hence, certain map elements comprising title, legend, scale, orientation, directional arrow, credits, latitudes and longitudes have been used by cartographers to communicate geographical information.
- For better understanding of features, cartographers also use a combination of colours and visual variables, like shape, size, orientation, colour, colour value and pattern to represent spatial information on maps.
- Good name positioning increases legibility, clarity, and aesthetic value of maps. Although name placement is a very time consuming process but it gives a clear understanding of various spatial (point, line and area) features shown on the maps.
- Layouts of maps tell us which is a good or a bad map. A good map has balanced layout in which map elements, visual variables, colours and name placement done in a proper manner. Overall, a good map shows even distribution of its various components within map frame without leaving any overcrowding or large blank areas.

9.11 UNIT END QUESTIONS

Spend 30 mins

1) What is a map?
2) Name the visual variables, and explain one of them.
3) Give a concise account of types of maps.

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9.13 FURTHER/SUGGESTED READING

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9.14 ANSWERS

Check Your Progress I

1) i) by a statement of scale,

   ii) by a graphical scale and

   iii) by representative fraction (R.F).

Check Your Progress II

2) Line data, Point data and Area data.

Unit End Questions

1) A map is the selective, symbolised and generalised representation of the whole or a part of the Earth at a reduced scale.

2) Visual variables include shape, size, orientation, colour pattern arrangement, texture and their orientation. Colour is the most important single medium in map design. It enables us to create a better contrast in symbols. Used in conjunction with other graphic symbols, it makes the portrayal of data visually more interesting. It also enables more information to be introduced in a map without making it congested.

3) According to scale, maps may be classified into large scale and small scale. Large scale maps are drawn to show small areas with more detail information. Small scale maps are drawn to show large areas in less detail. Maps are also classified according to their function into physical and political maps.