

PROJECTION

i. What is Projection?

The term *projection* means the presentation of image on screen. A map projection means the representation of latitude and longitude of the globe on a flat sheet of paper. The network thus formed is called *graticule*.

Bradly speaking, Map projection is defined as the systematic drawing of a network of parallels and meridians on a plain sheet of paper portraying a part or whole of the earth's surface. Naturally, it is scale – dependent and is done in accordance with a set of geometric and mathematical principles to satisfy certain objectives of the user.

ELEMENTS OF MAP PROJECTION

a. Graticule:

It refers to the net of mutually intersecting parallels and meridians drawn to a certain scale and based on certain principles. The term *graticulation* is used to specify the procedures by which the network of graticules are drawn.

- b. *Reduced Earth:* A model of the earth is represented by the help of a reduced scale on a flat sheet of paper. This model is called the “reduced earth”. This model should be more or less spheroid having the length of polar diameter lesser than equatorial and on this model the network of *graticule* can be transferred.
- c. *Parallels of Latitude:* These are the circles running round the globe parallel to the equator and maintaining uniform distance from the poles. Each parallel lies wholly in its plane which is at right angle to the axis of the earth. They are not of equal length. They range from a point at each pole to the circumference of the globe at the equator. They are demarcated as 0° to 90° North and South latitudes.
- d. *Meridians of Longitude:* These are semi-circles drawn in north south direction from one pole to the other, and the two opposite meridians make a complete circle, i.e. circumference of the globe. Each meridian lies wholly in its plane, but all intersect at right angle along the axis of the globe. There is no obvious central meridian but for convenience, an arbitrary choice is made, namely the meridian of Greenwich, which is demarcated as 0° longitudes. It is used as reference longitudes to draw all other longitudes
- e. *Global Property:* In preparing a map projection the following basic properties of the global surface are to be preserved by using one or the other methods:
 - (i) Distance between any given points of a region;
 - (ii) Shape of the region;
 - (iii) Size or area of the region in accuracy;
 - (iv) Direction of any one point of the region bearing to another point.

Developable Surface: A developable surface is one, which can be flattened, and on which, a network of latitude and longitude can be projected. A non-developable surface is one, which cannot be flattened without shrinking, breaking or creasing. A globe or spherical surface has the property of non-developable surface whereas a cylinder, a cone and a plane have the property of developable surface.

On the basis of nature of developable surface, the projections are classified as cylindrical, conical and zenithal projections.

- i. *Cylindrical projections* are made through the use of cylindrical developable surface. A paper-made cylinder covers the globe, and the parallels and meridians are projected on it. When the cylinder is cut open, it provides a cylindrical projection on the plane sheet.
- ii. A *Conical projection* is drawn by wrapping a cone round the globe and the shadow of *graticule* network is projected on it. When the cone is cut open, a projection is obtained on a flat sheet.
- iii. *Zenithal projection* is directly obtained on a plane surface when plane touches the globe at a point and the *graticule* is projected on it. Generally, the plane is so placed on the globe that it touches the globe at one of the poles.

These projections are further subdivided into normal, oblique or polar as per the position of the plane touching the globe.

- a. If the developable surface touches the globe at the equator, it is called the *equatorial or normal projection*.
- b. If it is tangential to a point between the pole and the equator, it is called the *oblique projection*;
- c. and if it is tangential to the pole, it is called the *polar projection*.

Generating Globe

It refers to the globe from which projections are generated or developed. Normally it is a small skeleton globe made of glass or wire. The parallels and meridians are shown by black lines (glass globe) or wires (wire globe) placed at their true angular distances apart. Naturally the generating globe is a geometrically accurate earth reduced in size.

Central Meridian

For a given longitudinal extension, it refers to that meridian, which lies exactly at the median or middle-most position of that extension. It has only constructional importance and is normally drawn as a straight line. The mesh of graticules on one side of the central meridian (CM) is in fact the mirror image of the other side.

Standard Parallel

The parallel(s), along which a projection plane or a developable surface touch(es) or intersect(s) the generating globe, are called standard parallel(s). Along the standard parallels, the tangential scale is essentially 1:1. Hence, these are always the lines of zero distortion.