NATURE ANS SCOPE OF CARTOGRAPHY

INTRODUCTION

- Cartography is the art, science and technology of map making.
- Maps are used as research tools and as sources of information.
- Maps have existed since the time of the Egyptian, Mesopotamian and Chinese civilizations, with the latter maps dating back to 6000 years.

CARTOGRAPHIC PROCESSES

- The communications model of Cartography emphasizes maps are used by variety of users.
- The role of the cartographer is to understand the subject matter of maps and also how the map will be likely used.
- Map making involves three stages:

1. Collection, Organization and manipulation of data.
2. Design and preparation of Maps
3. Map Reproduction

1. Collection, Organization and manipulation of data.

- Data collection from existing maps, aerial photographs or digital imagery, documents e.g. legal descriptions of property boundaries, historical documents, etc., field work or questionnaire surveys.
- Data organized to understand the phenomena being represented.
- Data manipulation - in a form suitable for map making i.e. aggregating data to some specified set of spatial units, percentages, densities or other summary measures.

2. Design and Preparation of Maps

- Many decisions go into the design of an effective map.
- These include geographic features and thematic attributes.
- The choices depend upon purpose of the map, the intended audience and the cartographer's understanding of the phenomena being represented.
- Maps of large areas it is a must to choose an appropriate map projection.
- Small scale maps are less detailed but covers a larger area.

3. Map Reproduction

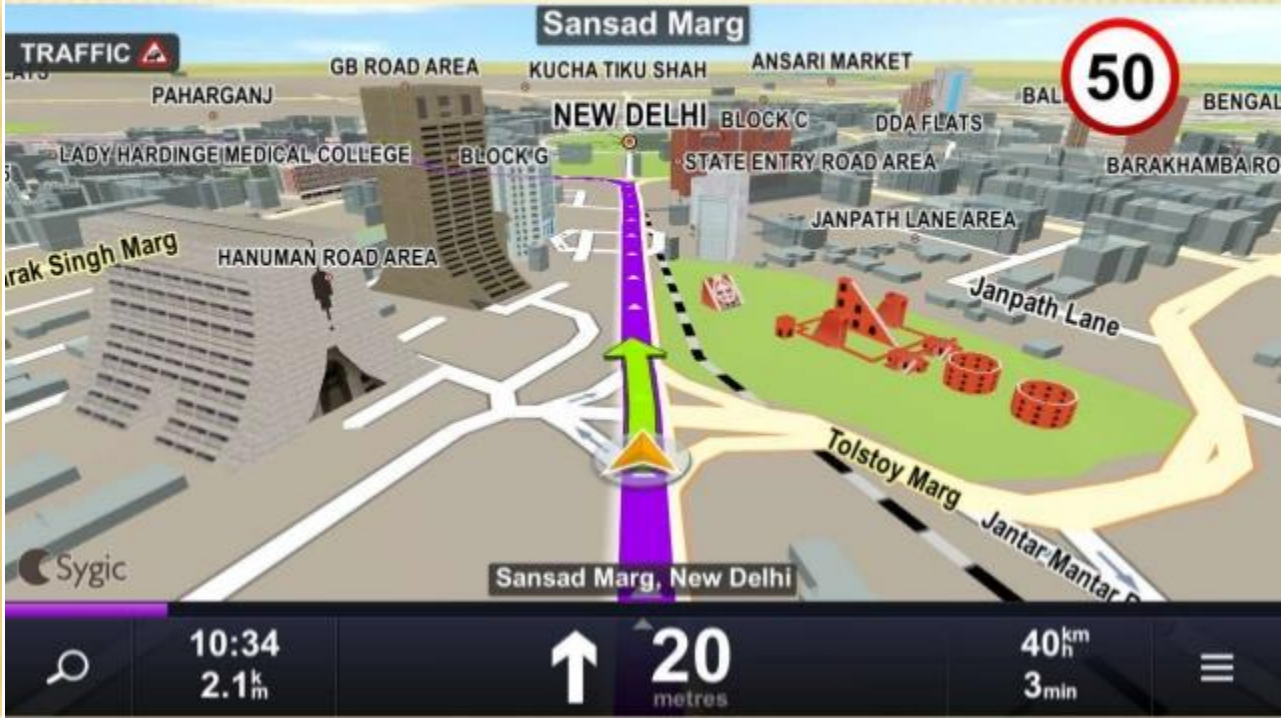
- Map reproduction methods acts as a constraint on the map design process.
- If only few copies of maps are required then black and white and colour laser printing and Xeroxing technology is ideal.
- If large number of copies then offset printing is the only practical alternative.
- Digital formats on tapes, disks or CD-ROM is replacing or reducing the need for printed maps.

USES OF MAPS

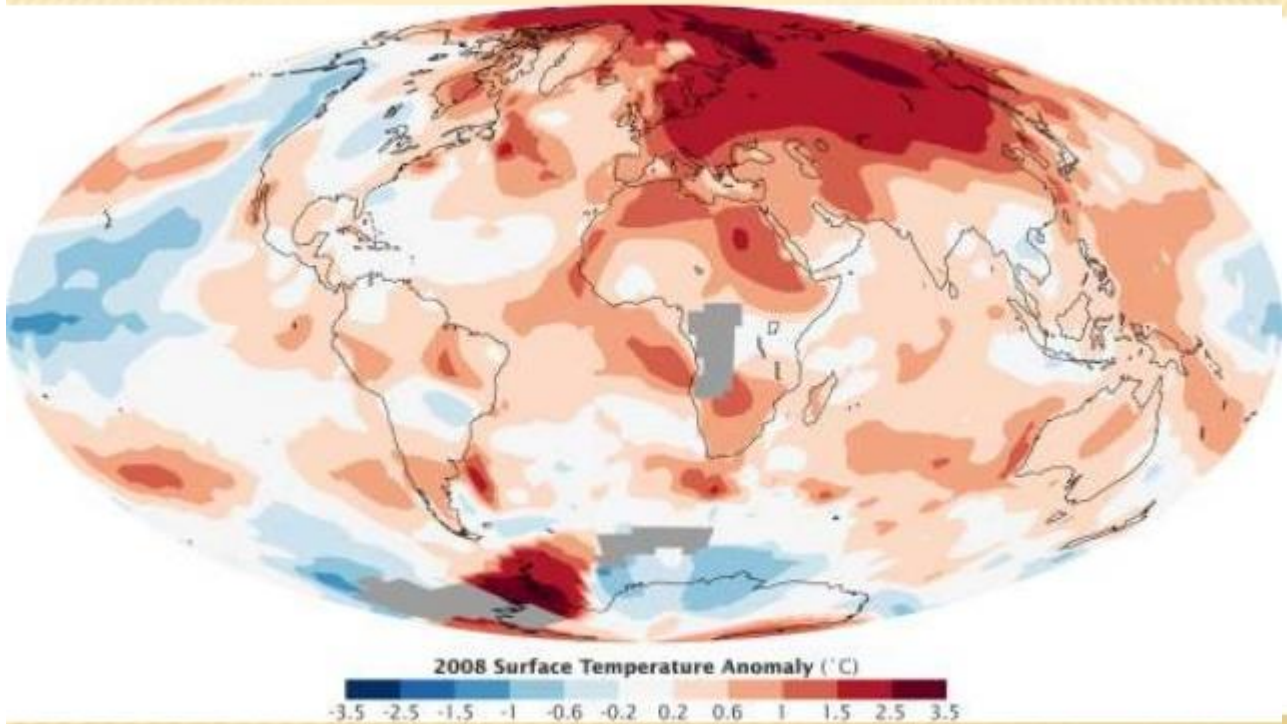
- It is a learned process requiring a variety of skills.
- Using a Map involves, three processes:
  - Map reading
  - Analysis
  - Interpretation

FUNCTIONS OF MAPS

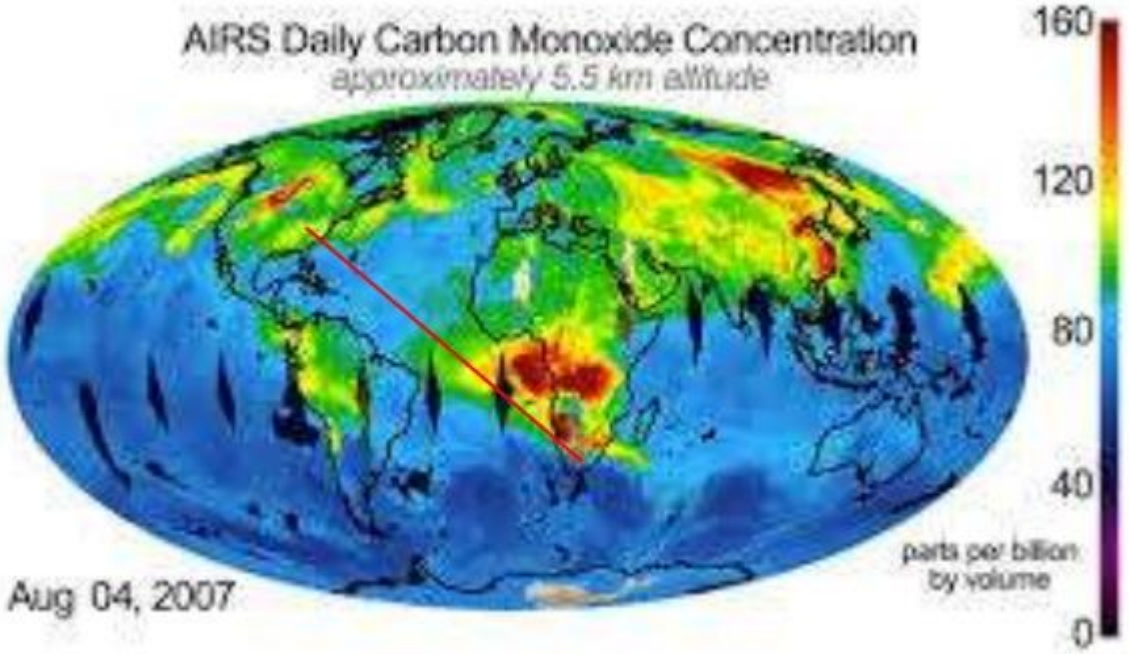
1. *Navigation*



2. Visualization



3. Measurement

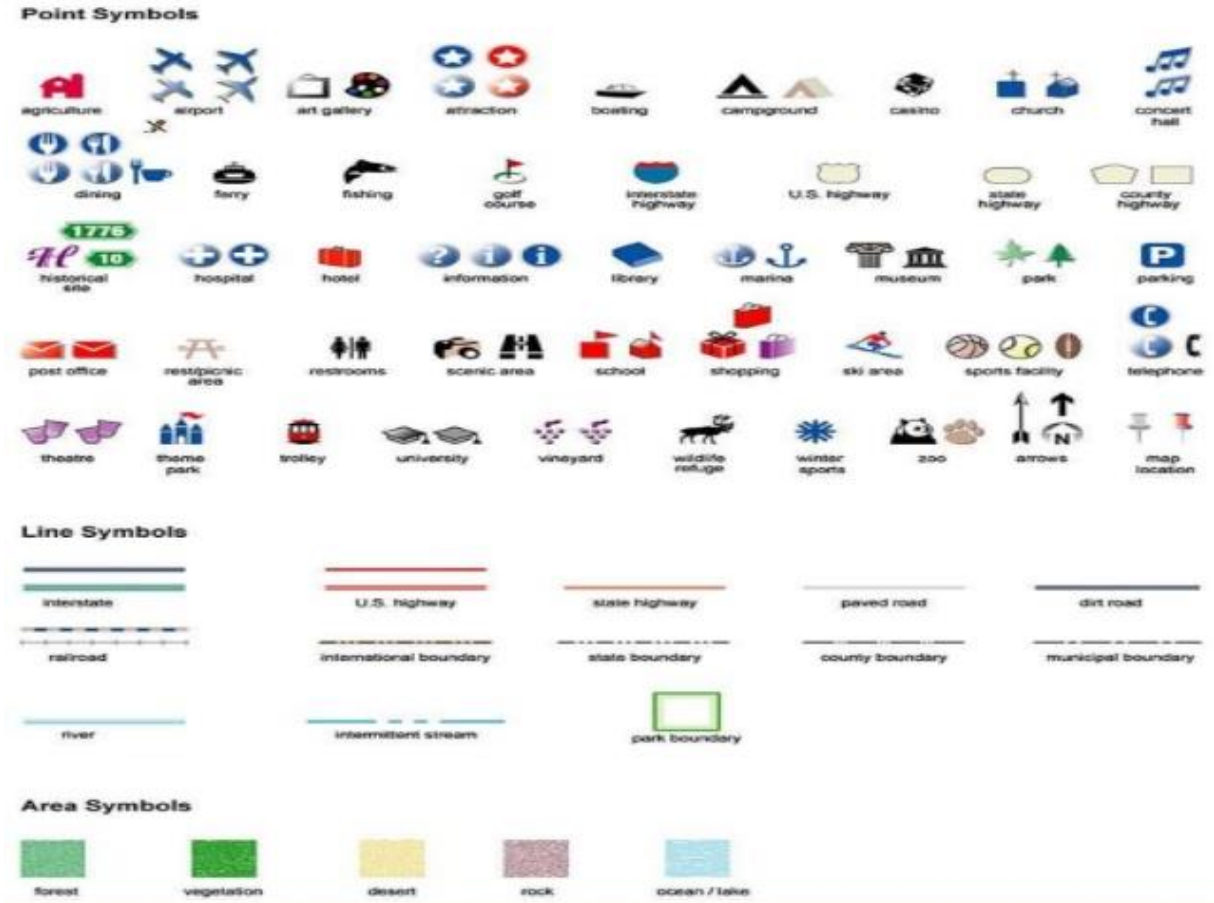


TYPES OF MAPS

- Hundreds of Maps Prepared for Various Purposes
- General vs. thematic cartography
- Topographic vs. topological

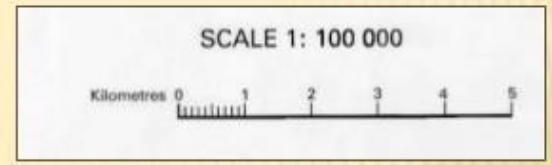
MAP SYMBOLS

- In cartography symbols are everything.
- Cartographic symbology has been developed in an effort to portray the world accurately and effectively convey information to the map reader.
- A legend explains the pictorial language of the map, known as its symbology.



ALL MAPS NEED

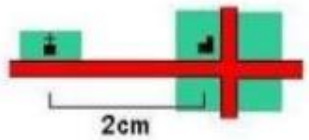
- A scale
- A north arrow
- A key or legend



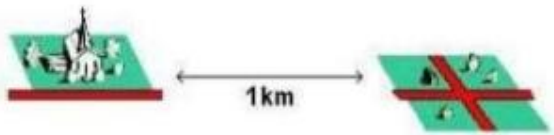
Scale

- Shows how large objects on the map are in the real world
- A map scale is therefore a ratio

Maps are made to **scale**. In each case, the scale represents the ratio of a distance on the map to the actual distance on the ground. For example, if 2 cm on a map ...



represents 1 km on the ground ...



the scale would be **2 cm = 1 km**, or...

$$\frac{\text{Distance on the Map}}{\text{Distance on the Ground}} = \frac{2\,\text{cm}}{1\,\text{km}} = \frac{2\,\text{cm}}{100\,000\,\text{cm}} = \frac{1}{50\,000}$$

= **1/50 000 Scale**

Source: http://www.nrcan.gc.ca/earth-sciences/geography-boundary/mapping/topographic-mapping/10091

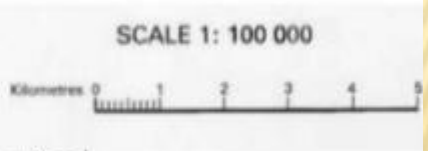
Scale

- Problem with small and large
- Small numerical scale e.g. 1:1000 = large scale map
  - Large scale maps show a smaller area but greater detail

- Large numerical scale e.g. 1:500,000 = small scale map
  - Small scale maps show a larger area but less detail

Ways of writing scale

1. As a ratio: for example 1/10,000 or 1:10,000
   - Advantage: easy to read
   - Disadvantage: becomes inaccurate when a map is copied
2. As a scale bar: for example



   - Advantage: easy to visualize
   - Remains accurate when map is copied
   - Disadvantage: some scale bars do not start at zero and may be misinterpreted

MAP PROJECTIONS:

- Any system for transferring parallels and meridians from a globe onto a flat map is called a projection.
- Mapmakers create projections according to mathematical formulas, often with the aid of computers.

- It is impossible to project a sphere, such as the earth's surface, onto a flat surface with complete accuracy.
- Every flat map has inaccuracies in scale that result from shrinking the globe in some places and stretching it in others to flatten it.

- Projections by surface
  - Cylindrical
  - Pseudocylindrical
  - Hybrid
  - Conic
  - Pseudoconic
  - Azimuthal (projections onto a plane)
- Projections by preservation of a metric property
  - Conformal
  - Equal-area
  - Equidistant
  - Gnomonic
  - Retroazimuthal
  - Compromise projections

- A map projection may be classified according to which properties of the globe it distorts least.
- Equal-area projections represent the sizes of regions in correct relation to one another but distort shapes.
- Conformal projections show angles and directions at any point accurately but distort size relationships.
- A map cannot be both equal-area and conformal, but many maps are neither. There is no name for this third category of projections classified by distortion.

- A second way of classifying projections is according to the geometrical shape of the surface onto which the projection is drawn.
- Many maps are--in theory--projections onto a cylinder, a cone, or a plane.

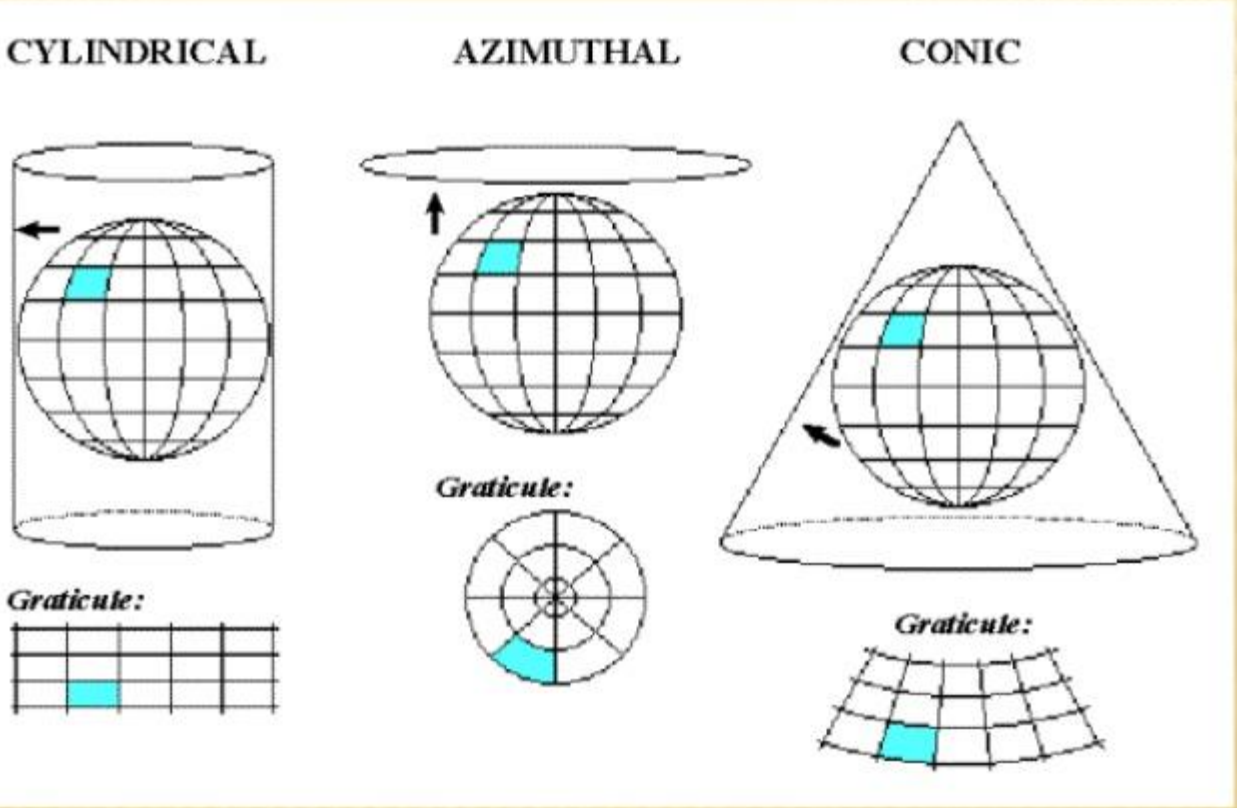
- Cylindrical projections are projections of the globe onto a cylinder.
- Although constructed by mathematical formulas, such projections can be visualized by imagining a paper cylinder wrapped around an illuminated globe.
- Lines from the globe would be projected onto the cylinder, which would then be slit and unrolled. The resulting map has one or two lines that are free from distortion.

- Conic projections are projections of a globe onto a cone.
- To visualize a conic projection, imagine a paper cone with its open end resting over part of an illuminated globe.
- Lines from the globe would be projected onto the cone, which would then be slit and unrolled.
- If the point of the cone lies directly above one of the poles, the meridians are projected as straight lines radiating from the pole.
- The parallels appear as portions of a circle.

- Azimuthal projections are used most commonly to map compact areas of the earth's surface, such as the polar regions.
- One type of azimuthal projection, called a gnomonic projection, shows the shortest distance between any two points on the earth as a straight line.
- This distance is known as a great-circle route.
- Gnomonic projections are especially useful for planning intercontinental flights.

Other projections:

- Several useful projections are not based on the cylinder, cone, or plane. For example, projections that are oval in shape fall into a different category.
- Equal-area oval projections have little distortion along the equator and along the meridian that runs through their center.
- Mapmakers can achieve even less distortion by splitting the oval into several arching shapes.



TECHNOLOGICAL CHANGES

- In cartography, technology has continually changed in order to meet the demands of new generations of mapmakers and map users.
- The first maps were manually constructed with brushes and parchment; therefore, varied in quality and were limited in distribution.
- Advances in mechanical devices such as the printing press, quadrant and vernier, allowed for the mass production of maps

ADVANTAGES OF MAPS

- Maps are more objective and more efficient than verbal descriptions.
- A map makes it simpler to visualize and understand the spatial patterns.
- Maps can be useful sources of data and can give an historical perspective.
- Maps can be used to solve complex problems.

CONCLUSION

- Cartography is the theory and practice of map making and map use.
- Map is a form of communication between the map maker and the map user.
- As maps are synoptic they should be carefully designed to ensure the information is effectively conveyed.
- Earliest known maps were hand drawn whereas the modern day maps are digitized using high end softwares and instruments.