

Compound pyramids d(or Popln pyramids

- Sex & Age structure
- Growth & occupational structure

Cartogram

- Representation of statistical data on map in a diagrammatic way by purposefully distorting the original shape or appearance of area

Rectangular Cartogram

Rectangle are made to follow outline of subdivision so that of there be need the outline of region c its subregions may marked easily.

PROJECTIONS

A globe cannot be presented accurately on a plain sheet blo converting 3Dpicture into 2D is difficult c involves 3 issues

1. Shape
2. Area
3. Direction

So on plain paper we can assure only 2 issues for this globe is useful

Problems c Globe

1. Otherside cannot be seen
2. Globe can be made on small scale only
3. Portability is not that much easy

A concept called developable surface and non developable surface c can or cannot fold into a small space.

Developable surface

- Can infold into a flat surface
- Cone and cylinders are developable
- Spheres are indevelopable while pasting definitely wrinkles should be there
- Our task in map-making is complicated b/o sphere c is underelopable

Types of Projection

A. On the basis of method of construction

- i. Perspective Projection Src of light is used in the map making
- ii. Non-perspective Projection

i). Perspective Projection using light 3 types

- 1. Gnomonic – Light is in the centre**
- 2. Stereographic - If light is placed opposite side of the place**
- 3. Orthographic - Rays coming from infinity**

In perspective projection longitude & latitude & small division on a grid is known as Graticule

ii). Non-Perspective

- Light is not used
- Mathematical calculation are used for development

B. Based on the developable surface used

- i. Conical
- ii. Cylindrical (eg. Mercator's projection)
- iii. Azimuthal / Zenithal – developable surface is plane
- iv. Connectional (mathematical projections)
 - Uses a no of developable surface
 - Border of cone touches on only one latitude other portions having some distortions
 - The latitude along c cone touches known as std \parallel^{el} . We tried to have more std \parallel^{el} so it becomes a multiconical / conventional projection
Eg of Conventional projection is
Bonnes Projection, Multiconical Projectin.

C. Based on preserved qualities

- i. Homolographic - ensure that area is not distorted
 - Equal area projection.
- ii. Orthomorphic - ensure that shape is maintained

- Also known as conformed / shape
- iii. Azimuthal (or) Bearing
 - ensure the direction
- iv. Equidistant
 - based on the concern of perfect distance preservation

D. Based on the position of the tangent surface

- i. Equatorial or Normal Zenithal – sheet is placed vertical, touching the equator
- ii. Oblique (at any angle)
 - (Developable surface we used is a sheet)
- iii. Polar – sheet is placed on poles 11^{el} to equator

E. Based on the position of the light

- i. Gnomonic
- ii. Stereographic
- iii. Orthographic

F. Based on the geometric shape of the final sheet

- i. Rectangular
 - ii. Circular
 - iii. Elliptical
 - iv. Butterfly shaped
- Cylindrical Projections are suited for low latitudes (equatorial areas)
 - Conical Projections – suited for middle latitudes
 - Zenithal Projections – Polar regions

Both zenithal & cylindrical projections are variables of conical projections

If we set the angle of conical projection to 180°

It will become zenithal & reduced to 0° it will become cylindrical

1. Zenithal

- Direction is ensured
- Bearing is maintained

- 2 types

1. Perspective

2. Non perspective

3 types



1. Stereographic polar zenithal

2. Gnomonic polar – Z

3. Orthographic polar – Z

a. Stereographic – Polar Zenithal projection

- light is on one pole & sheet is on opposite pole
- meridians - Str lines
- latitudes – circular / concentric circles
- distance b/w motions towards equator
- length of latitude is towards equator
(As we move away form centre)
- distorted view as shape will be there as we move away from the centre
- shape will be maintained for the small areas near the centre
- it is both azimuthal and conformed (slightly more than equator)
- commonly used for hemispherical maps

b. Gnomonic Polar zenithal projection (light at centre)

- Also known as great circle sailing chests
- The shape of meridians' and l1els enormously outward from the map centre
- Impossible to draw map on one hemisphere boos equates become infinite
- Suited for small areas around the pore
- Also used in air navigation – all great circles are str times and short list bet 2 pts can be directly seen (sheet no 3 fig 2011)
- Rhomb line – line along c dir is donaintained also known as loxodromes

C. Orthographical polar zenithal (light from infinity dist)

- Parallels or latitudes crowed together near the outer margins

- Largest possible piston of a globe c can be shown is a hemisphere
- Parallels or latitudes crowd together near the outer margins
- Give clear picture
- Very similes to the photograph of the globe
- In Books, Articles, Illustrations it is used because looks like a photograph
- Astronomical purposes

Normal zenithal projections

- Latitudes grand nears the post
- Meridians will be elliptical in shape
- Used in studying the astronomical maps
- Astronomers used to see the position of heavenly bodies every time on such a map

NON-PERSPECTIVE

a. polar – Zenithal exult – area projections

- Designed by lambent
- Dir is maintained in zenithal and we are trying to maintain area also
- lles are concentric circles
- Meridians have true or prefect angular dist
- To maintain the area we are forcing to reduce the spacing



Circles of latitudes become closes away from the poles to maintain area



Equal – area projection or Lambert projection



b. Polar – Zenithal equidistant projection

Azimuthal equidistant projection

- Dir or dist is maintained
- Meridian are equidistance

- Arbitrary projection
- Not a perspective projection
- In any case Π^{el} can never to be equidistant
- Near poles can be used for smaller areas around 30° latitudinal extent (for Artic circle)



Dist & dir are perfect

c. Stereographic Normal Zenithal

- Light, opposite side, sheet touching the equator
- Orthomorphic
- Central meridian and equator are \perp to each other (st. lines) other Π^{el} and meridians are curved lines

CONICAL PROJECTION

a). Conical perspective

- Touch the globe on one std Π^{el}
- If std Π^{el} is the slope
- Meridians are st. lines radiating from common centre
- Scale can be preserved only along std Π^{el}
- If the std Π^{el} is 30° , the shape of the map will be a semi-circle
- If the std Π^{el} is $<30^\circ$, the shape of the map will be more than a semicircle
- If the std Π^{el} is $>30^\circ$, the shape of the map will be less than a semicircle
- If con show more than a hemisphere
- Limited utility it has to be adjusted mathematically
- Suitable to that area having less than 20° latitudinal extent especially those countries lies in mid-latitudes (Baltic, States, Ireland etc)
- Used first time by Ptolemy

b). Modified conical perspective projection (non-perspective) c two std Π^{el}

- Neither the cone, touches the sphere nor cuts the sphere

- Instead two circles of the cone corresponds to the two respective \parallel^{el} of the globe and form ordinary cone independent of the globe
- Neither equal area nor orthomorphic (shape)
- Suitable for mid-latitude countries c small latitudinal extent. So that 2/3 rd of the N-S extent of the ctry should lie within the 2 \parallel^{el}
- Eg to show trans Siberian Railway

c. Polycmic projection

- Multiple std \parallel^{el}
- As many cones as the circle of latitude to c they correspond
- Latitudes are not concentric circle a in case of simple conic / Bonne's projection
- Neither conformal nor equal area
- The scale is true along the central meridian and all parallels
- Good for maps of Europe toposheets international maps
- Not suitable for more than 60° latitudinal extent

d. Bonne's projection (non-perspective)

- All \parallel^{el} true to scale with one \parallel^{el} as std along c it can be drawn
- Equal area projection – LAMBERTS
- Projection (Shape) is conformal along central meridian
- All \parallel^{el} are equispaced and drawn as arcs of concentric circles from a common centre
- Modified version of simple conic projection
- Suitable for drawing single continent except Africa
- (For Africa, Sinusoidal projection is used c is a spl case of Banne's projection where equator is taken as std \parallel^{el})

c. Conical equal area projection c one std \parallel^{el} (or)

Lambert's conical equal area projection

- Parallels are arcs of concentric circles
- Meridians are radial st. lines at equal angular intervals

- λ^{el} intersect to meridians
- Scale along the std λ^{el} is correct
- λ^{el} are unequally spaced
- Scale along λ^{el} exaggerated
- Exaggeration away from std λ^{el}
- Scale along meridian is minimized
- Widely used in world aeronautical charts exp. USA coast and Geodetic survey
- λ^{el} are deliberately spaced to ensure conformal properties
- if we take std λ^{el} as 33° or 45° then scale of error is only 0.5%
(No need for any gnomonic projections in mainland USA)

CYLINDRICAL PROJECTIONS

i. Natural cylindrical projection or Gnomonic perspective

- Cylinder wrapped around the Globe touching the equator
- Meridional and λ^{el} scales are exaggerated away from equator true only along equator
- Poles cannot be shown
- Not useful for any purpose

ii. Simple cylindrical projection (non perspective)

- Cylindrical equidistant are kept equidistant
- λ^{el} lines & RT angles
- Length of all λ^{el} are equal to equator
- All meridians are the length half that of equator
- Scale along equator is true
- Latitudinal length away from the equator
- Along meridians scale is true
- Exaggeration of area towards poles as well as great distortion of shape towards pole

- Neither orthomorphic nor homolographic

iii. Cylindrical equal area projection (Lambert's)

- Deceived by using λ^{el} light rays (orthographic)
- Longitudes & latitudes str lines for to each other
- Areas are made equal at the cost of great obliteration in shape towards higher latitudes
- Meridians are equally
- All λ^{el} have same length
- Orthomorphic only near equator
- Used to show distribution of commodities
- Dist bet λ^{el} goes on towards the poles

iv. Mercator's Projection

- Cylindrical orthomorphic projection
- Shape is maintained
- Most popular for world map
- 1st map used for navigation
- λ^{el} & meridians as to each other
- dist betn λ^{el} towards poles
- meridians are equidistant
- Scale is considerably towards poles
- Orthomorphic and azimuthal
- Greenland appears to be bigger than South American
- At 68 area is 4 times and 75° area is 15 times 80° → 33 times exaggerated
- Projection is used to show only upto 80° λ^{el}
- Any line we draw it will cut equal c longitudes & latitudes – Rhomb lines – loxoderms
- Used for navigation

- Suitable for showing ocean currents wind system dirs, navigation routes, drainage pattern, political map
- λ^{el} & meridian c with same proposition

v. Homolosize – Goods projection

- Combination of sinusoidal & molleweide proj
 - Equal area
 - Molleweid's is homolographic for pole ward regions
 - Sinusoidal is homolographic for equational regions
- So towards pole – mollweide
Towards equator – sinusoidal

Eckert iv projection

- Equal area
- Meridian are ellipres
- λ^{el} equally cut by the meridians
- poles are shown as half the length of equator

v). Samson Flamstend Projection (Sinusoidal) conventional

- Used sine curves
- Mollification of cylindrical equidistant and Bonne's Proj
- Each λ^{el} is true to scale and is divided in equal dist division by meridians
- Equator as std λ^{el}
- Std meridian as st line
- Equal area
- All λ^{el} and std meridian are str. Lines
- Great distortion along the margins of the globe
- Suitable for equatorial cries small E – W & N- S oxen distribution maps, Africa, South America

Mollweide's Projection (Elliptical Projection) conventional

- Equal area
- All

- Spacing does towards poles
- Easily recognized by the ellipsoid boundaries
- All meridian except central at the 90th one form ellif
- So called elliptical projected
- Used as distribution maps
- Distortion in shape towards the margins nut less as compare to sinusoidal

Gall's Projection – 45 ll^{el} true to scale

- Stereographic, cylindrical, Similar to Mercator's projection
- Dist betn ll^{el} towards the poles but not so much as in Mercator
- Net an equal more projection
- Cylinder thus halfway (i.e.45° – N.S)
- Used in Gen. purpose world map.