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Equal Earth Map: UN Push for Area-Accurate World Mapping and Its Geographical, Political and Strategic Significance

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Recent Developments:

- The **United Nations General Assembly** has adopted a resolution supporting greater use of the **Equal Earth projection**, encouraging a shift away from the widely used **Mercator projection**, particularly for world maps where accurate comparison of land areas is important.
- The resolution, led by **Togo** and supported by **164 countries**, including India, received six abstentions, while the **United States voted against** it; because UN General Assembly resolutions are generally **non-binding**, the decision does not legally compel governments, schools, mapping companies or international organisations to replace existing projections.
- India supported the resolution while emphasising that any UN-supported map must accurately depict **India's sovereign territory**, including **Jamman Kashmir and Ladakh**, in accordance with India's official position.
- The development has renewed debates over **cartographic accuracy, colonial legacies, geographical representation, Global South visibility and the appropriate use of different map projections**.

Why No Flat Map Can Perfectly Represent Earth:

Three-Dimensional Earth and Two-Dimensional Maps:

- Earth is not a perfect sphere; it is approximately an **oblate spheroid**, with a slight equatorial bulge caused primarily by its rotation, while gravitational forces and the uneven distribution of continents and oceans contribute to its complex physical form.
- A **globe** provides the most intuitive three-dimensional representation of Earth, but its practical limitations make flat maps indispensable for education, navigation, administration, planning and statistical analysis.
- A **map projection** transforms the curved, three-dimensional surface of Earth into a two-dimensional representation, and this mathematical transformation inevitably introduces some form of distortion.

Four Fundamental Properties of Maps:

- Every flat map involves compromises among **area, shape, distance and direction**, because it is mathematically impossible to preserve all four properties simultaneously over the entire Earth.
- **Area** represents the relative size of geographical regions, **shape** represents the configuration of landforms, **distance** represents spatial separation, while **direction** represents bearings between locations.

Major Types of Map Projections:

Property-Based Classification:

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- **Conformal projections** preserve local angles and shapes, making them useful for navigation and detailed local mapping; the **Mercator projection** is the classic example.
- **Equal-area projections** preserve the relative areas of geographical regions, making them particularly valuable for thematic and statistical maps; **Equal Earth** belongs to this category.
- **Equidistant projections** preserve distance accurately from selected points or along selected lines, but cannot preserve distance everywhere simultaneously.
- **Compromise projections** distribute distortion among area, shape, distance and direction to produce visually balanced world maps; **Robinson** and **Winkel Tripel** are prominent examples.
- The appropriate projection therefore depends on the **purpose of the map**, rather than on the assumption that one projection is universally superior.

Mercator Projection: Origins and Purpose:

Development and Characteristics:

- The **Mercator projection** was introduced in **1569** by **Gerardus Mercator**, a Flemish cartographer and geographer whose work became highly influential in European navigation.
- It is a **conformal cylindrical projection**, conceptually produced by projecting Earth onto a cylinder and then unwrapping the cylinder into a flat surface.
- Its major advantage lies in **navigation**, because **rhumb lines**, representing constant compass bearings, appear as straight lines, allowing navigators to maintain a constant bearing along a plotted route.
- The projection became particularly important for maritime navigation because its straight-line representation of constant bearing simplified practical route planning.

Geographical Distortion:

- In the Mercator projection, the spacing between parallels increases progressively towards the poles, while the stretching of the east-west direction is correspondingly adjusted to preserve local angles and shapes.
- This produces substantial **area distortion at higher latitudes**, causing regions near the poles to appear much larger than their actual geographical areas.
- **Greenland**, for example, can appear comparable in size to **Africa** on Mercator maps, although Greenland is actually about **14 times smaller** than Africa.
- The distortion also exaggerates the apparent size of **Europe, North America and polar regions**, while comparatively diminishing the visual prominence of tropical regions such as Africa and South America.

Colonialism, Power and Cartographic Representation:

The Colonial Lens:

- Critics argue that the widespread historical use of Mercator contributed to a **Eurocentric visual representation of the world**, although the projection itself was originally designed primarily for navigation rather than political propaganda.
- The modern debate focuses on how repeated exposure to distorted world maps can influence people's intuitive understanding of the **relative geographical importance and size of different regions**.
- The issue therefore connects cartography with **post-colonial studies, geographical imagination, knowledge production and the politics of representation**.
- However, attributing the Mercator projection solely to colonial ideology would be analytically incomplete, because its enduring importance is also explained by its legitimate mathematical and navigational advantages.

Search for Alternative World Maps:

Gall-Peters, Robinson and Winkel Tripel:

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- The **Gall-Peters projection**, first presented by James Gall in 1855 and later popularised by Arno Peters in 1973, preserves area but introduces substantial distortion in the shape and appearance of landmasses.
- The **Robinson projection**, developed by Arthur H. Robinson in 1963, was designed as a **compromise projection** that produces a visually balanced representation of the world rather than preserving a single geographical property exactly.
- The **Winkel Tripel projection**, developed by Oswald Winkel in 1921, seeks to reduce overall distortion in **area, distance and direction** and was adopted by the National Geographic Society for many world maps from 1998.
- These alternatives demonstrate that cartography is fundamentally about **selecting the most appropriate compromise for a particular purpose**.

Equal Earth Projection:

Origin and Mathematical Character:

- The **Equal Earth projection** was introduced in **2018** by cartographers **Bojan Šavrič, Tom Patterson and Bernhard Jenny** as an **equal-area pseudocylindrical projection** for world maps.
- It was inspired visually by the Robinson projection but differs fundamentally because it **preserves the relative areas of geographical regions**.
- Equal Earth uses curved outer meridians and straight parallels to create a visually balanced world map while maintaining mathematical equality of area.

Advantages and Limitations:

- The principal strength of Equal Earth is that countries and continents are represented in their **correct relative areas**, making it useful for comparing population, resources, climate impacts, agricultural land and other spatially distributed variables.
- It does not eliminate all distortion, because **shape, distance and direction cannot simultaneously remain perfectly accurate** on a global flat map.
- The projection is therefore particularly suitable for **thematic maps, statistical maps, environmental studies and educational representations**, rather than replacing every specialised projection used in navigation or surveying.

Equal Earth and Global South Representation:

Geographical and Political Significance:

- Equal Earth gives greater visual prominence to large tropical landmasses such as **Africa and South America** by avoiding the severe area exaggeration characteristic of Mercator.
- The debate is especially significant for the **Global South**, because accurate area representation can influence public understanding of the geographical scale of Africa, South Asia and Latin America.
- The issue also illustrates how apparently technical choices in **cartography can have social, political and cultural consequences**.
- At the same time, a UPSC analysis should distinguish between **mathematical distortion** and claims of political intent, because a projection can have unintended representational effects without having been designed as a political instrument.

Choosing the Appropriate Projection:

Purpose-Based Selection:

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- **Navigation:** Conformal projections such as Mercator remain valuable because they preserve local angles and represent constant compass bearings as straight lines.
- **Thematic and statistical mapping:** Equal-area projections such as Equal Earth are preferable when the principal objective is accurate comparison of geographical areas.
- **General world reference:** Compromise projections such as Robinson and Winkel Tripel provide visually balanced representations when no single property must be preserved exactly.
- **Polar and point-centred mapping:** **Azimuthal projections** are useful when the analysis focuses on a particular central point or polar region.
- Modern digital cartography increasingly uses **interactive globes, satellite imagery and dynamic projections**, reducing dependence on a single universal world-map format.

UPSC Significance and Broader Linkages:

Geography and Environment:

- The issue is directly linked with **map projections, geographical information systems, spatial analysis, cartography and thematic mapping**, making it relevant to Physical and Human Geography.
- Equal-area projections are particularly useful for representing **climate change, deforestation, population distribution, biodiversity, natural resources and land-use patterns** without misleading area comparisons.

International Relations and Governance:

- The UN debate connects cartography with **decolonisation, Global South representation, multilateralism and the politics of geographical knowledge**.
- India's position highlights the importance of **territorial integrity and cartographic sovereignty**, particularly regarding the depiction of Jammu and Kashmir and Ladakh.
- The development also demonstrates how seemingly technical international standards can intersect with **national sovereignty and geopolitical sensitivities**.

Challenges and Way Forward:

Need for Projection Literacy:

- Governments and educational institutions should avoid treating any single projection as universally correct and should teach students **why different projections produce different distortions**.
- Schools should introduce projection choice as a component of **geographical literacy**, enabling students to interpret maps critically rather than treating every visual representation as an exact depiction of Earth.
- Mapping agencies should select projections according to **purpose, scale, geography and analytical requirement**, while digital platforms should provide appropriate alternatives where practical.

Value Addition for UPSC:

Prelims Facts:

- **Mercator:** 1569, conformal cylindrical projection, highly useful for navigation.
- **Equal Earth:** 2018, equal-area pseudocylindrical projection, developed by Bojan Šavrič, Tom Patterson and Bernhard Jenny.
- **Robinson:** 1963, compromise projection developed by Arthur H. Robinson.
- **Winkel Tripel:** 1921, compromise projection developed by Oswald Winkel.
- **Gall-Peters:** Equal-area projection associated with James Gall and Arno Peters.

Conclusion:

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- The UN's support for Equal Earth represents an important **symbolic and cartographic shift**, but it should not be interpreted as making Mercator obsolete for every application.
- The deeper lesson is that **maps are analytical tools rather than perfect mirrors of reality**, and responsible cartography requires selecting the projection that minimises the distortion most relevant to the intended purpose.