GGOS: a service for society
(Ch4. “Maintaining a Modern Society”)

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"In innumerable ways, geodesy contributes to the functioning of a modern society. *While that contribution is critical, it is not necessarily well known or understood by most outside the geodetic community*."

„Selling“ Geodesy…

- Geodesy has *classically* provided pragmatic solutions:
  - National horizontal mapping datum & vertical datum
  - Gravity field for geophysical exploration, geoid, etc.
  - Satellite orbital determination/prediction (remote sensing, communications, etc.)
- Geodesy has also *underpinned* natural hazard studies
- Geodesy has been supported mostly by nations for *national benefit*, or space agencies for *science*
- To continue national support, capabilities of Geodesy must now be expressed in ***terms that society can understand*** (”outcomes”, “enablers”, “value-adding”, etc.)

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„Selling“ Geodesy…

- Geodesy is the ***foundation*** for spatial representation of all objects in a terrestrial reference frame
- Geodesy plays a role in ensuring *GPS/GNSS* operates at required levels of **accuracy** and **integrity**
- Geodesy makes possible many non-positioning applications of *GPS/GNSS*
- Geodesy is a *geoscience* that contributes to our **understanding** of the solid Earth, Atmosphere & Oceans

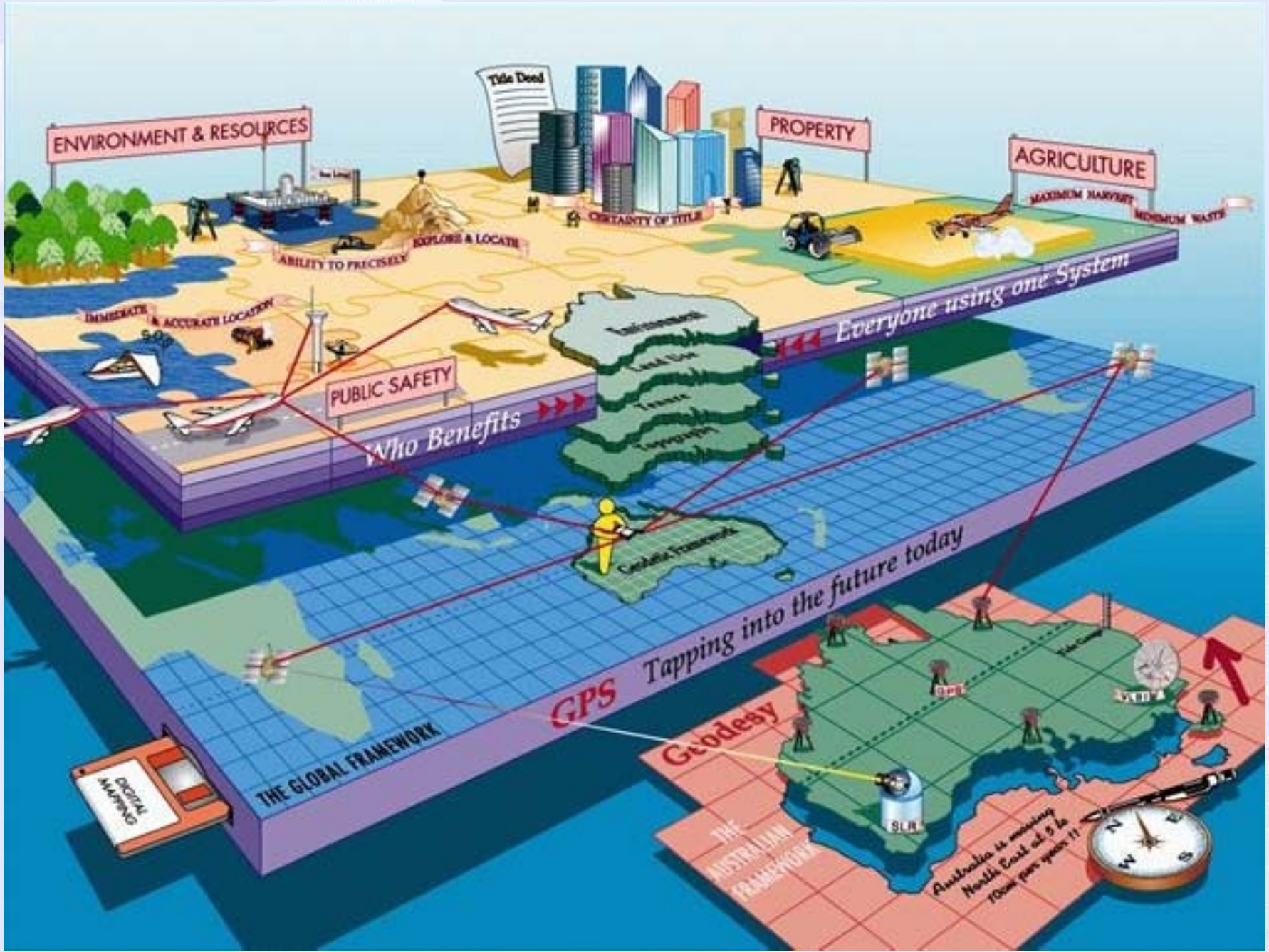
Chapter 4 "Maintaining a Modern Society" identifies the capabilities of Geodesy that are most closely linked to *society's 'day-to-day' applications*… related to two concepts: (1) (Geo)spatial Information, and (2) Position-Navigation-Timing (PNT).

Geodesy as the Foundation for GI

Geodesy defines unseen *framework* upon which different *'layers'* of (geo)spatial information (e.g., the geometric data and thematic description of spatial elements such as points, polygons, lines, 3D objects, and their topologies -- i.e., how they relate to each other --, and imagery from space and airborne platforms) are constructed so that they *align* with each other perfectly.

This infrastructure (framework & layers) is often referred to as the Spatial Data Infrastructure (SDI).

Geodesy and the Australian Spatial infrastructure



Geodesy and PNT

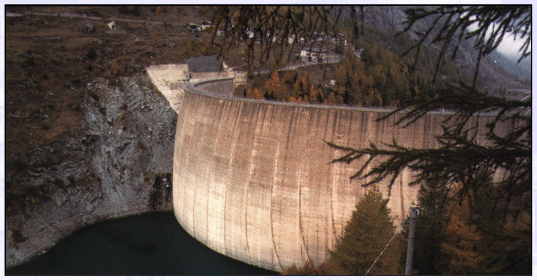
- Geodesy defines the *reference frame* for satellite-based & terrestrial positioning
- GPS/GNSS has *revolutionised* surveying, mapping, navigation & geoIT…
- IGS is a respected "brand" in the GNSS user community…*standards, high quality products, etc*.
- Geodetic ground infrastructure such as GPS/GNSS CORS networks enables *high accuracy* PNT
- Geodesy underpins *other GPS/GNSS services* such as integrity monitoring, atmospheric studies, etc.

Geodesy's continued relevance – *beyond its important role as a Global Change science* – is linked to the **expanding** use by (our 'spatially-enabled') society of the technology and services associated with: (1) (Geo)spatial Information, and (2) Position-Navigation-Timing (PNT).

Chapter 4 Topics…

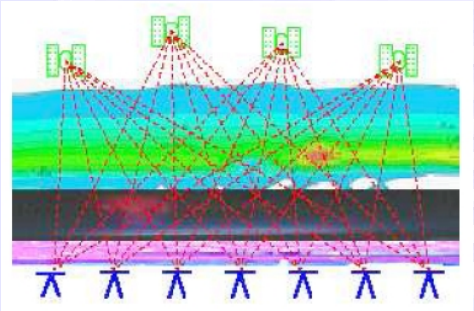
- Spatial Data Infrastructure
- Navigation:
  - Marine Navigation
  - Air Navigation
  - Land Navigation

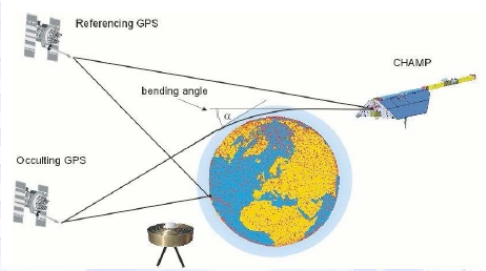
- Engineering, Surveying & Mapping:
  - Machine Guidance
  - Land Titling & Development
  - Engineering Geodesy & Structural Monitoring
  - GIS
  - Height Systems



Chapter 4 Topics…*(cont)*

- Timing Applications
- Early Warning & Emergency Management
- Infomobility
- Management of and Access to Resources:
  - Water Management & Hydrology
  - Energy Resources
- Monitoring the Environment & Improving Predictability:
  - GPS Meteorology
  - Space Weather



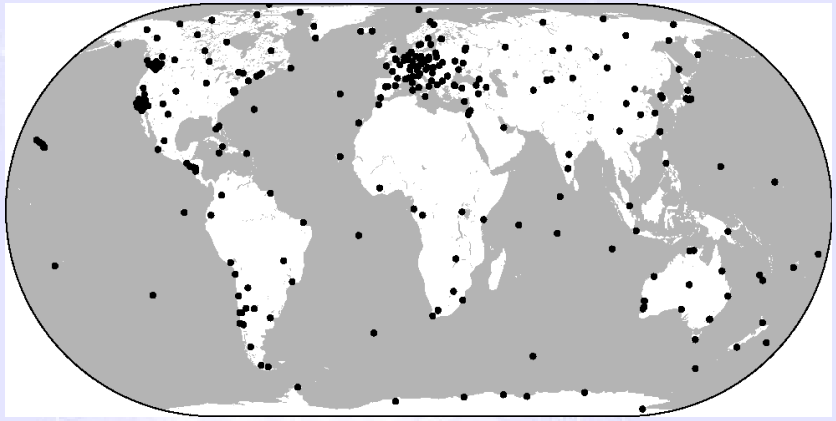


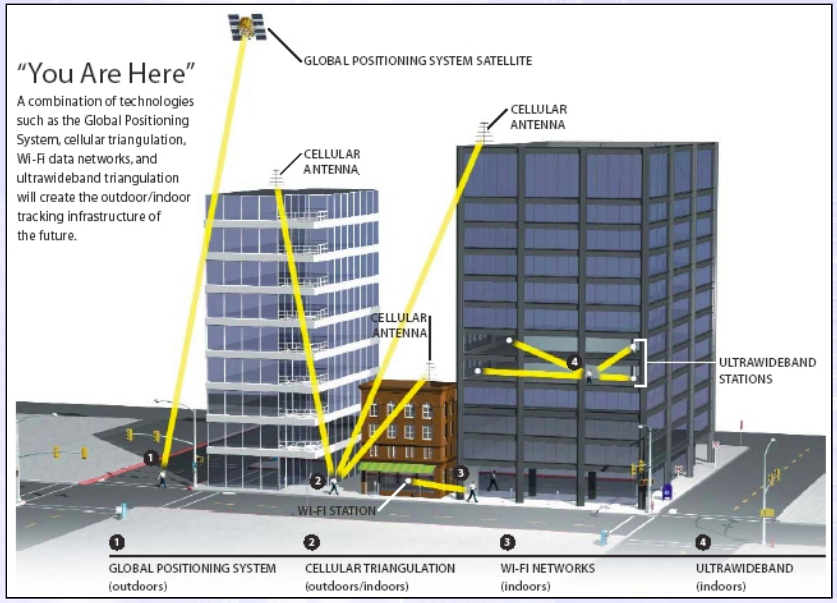
Geodesy *and its Continued Relevance in the Modern (Spatially-Enabled) Society*…

- GNSS applications are growing…*new apps, more reliable/accessible/RT PNT services*
- High accuracy/integrity GNSS services *expanding*
- Transition from GPS to GNSS poses *challenges*
- SDI underpins modern government functions… *e-government, emergency management, landuse planning, global change monitoring/analyses, etc*.
- ICT trends to increasing importance of GI & PNT in everyday life*…infomobility applications e.g. SatNav, PNDs, LBS, internet geoIT services, GE/VE, etc.*

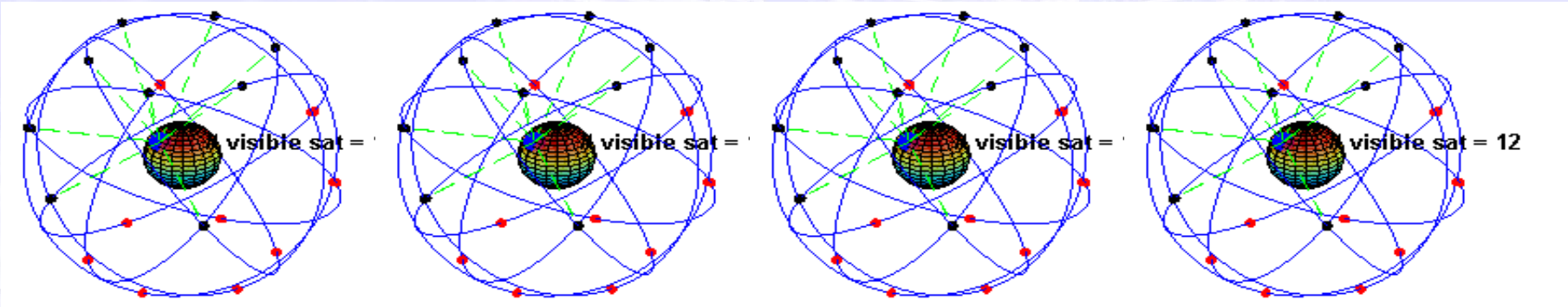
Trends: *Improved GNSS Services…*

- More ground-based augmentation… *CORS networks*
- Ubiquitous consumer positioning… *non-GNSS*
- High accuracy RTK… *cm-level positioning*
- Integrity monitoring… *mission-critical apps*





Trends: *From GPS to GNSS(+RNSS)*…



GPS III

ГЛОНАСС

GALILEO

COMPASS

2013: 4x no. of satellites,
6x no. of signals!

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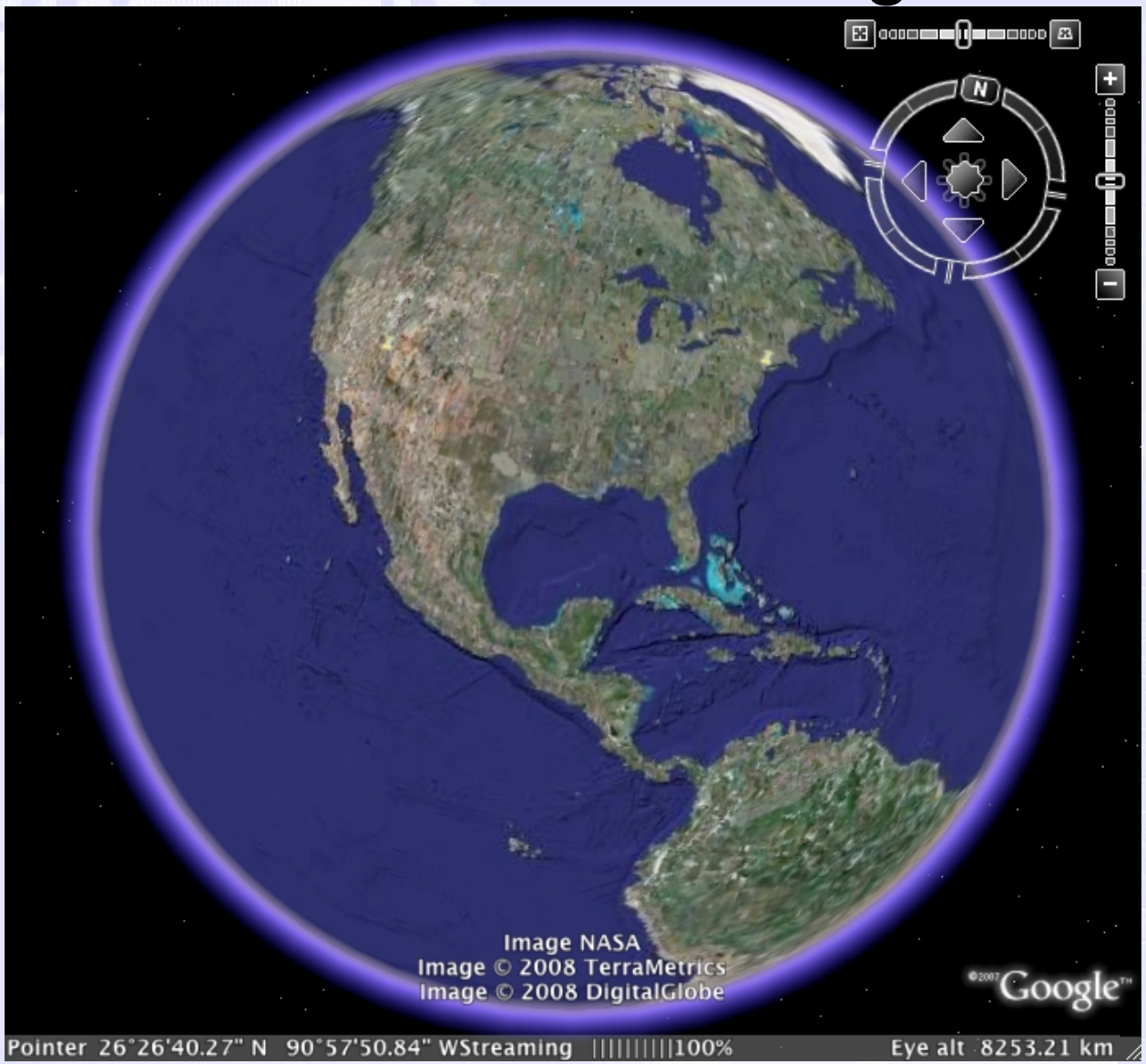
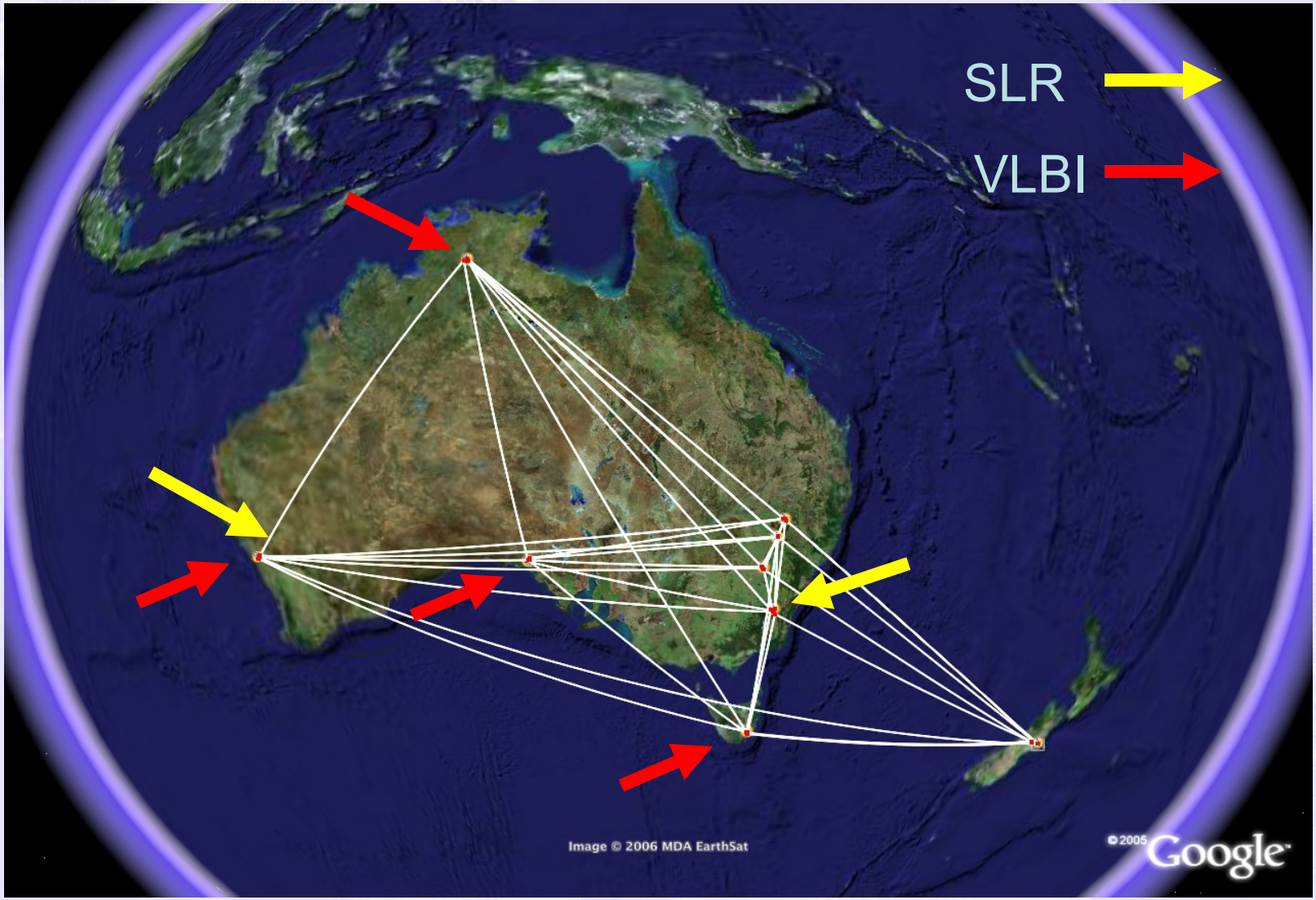
Trends: *From Pictorial to Digital Earth*…



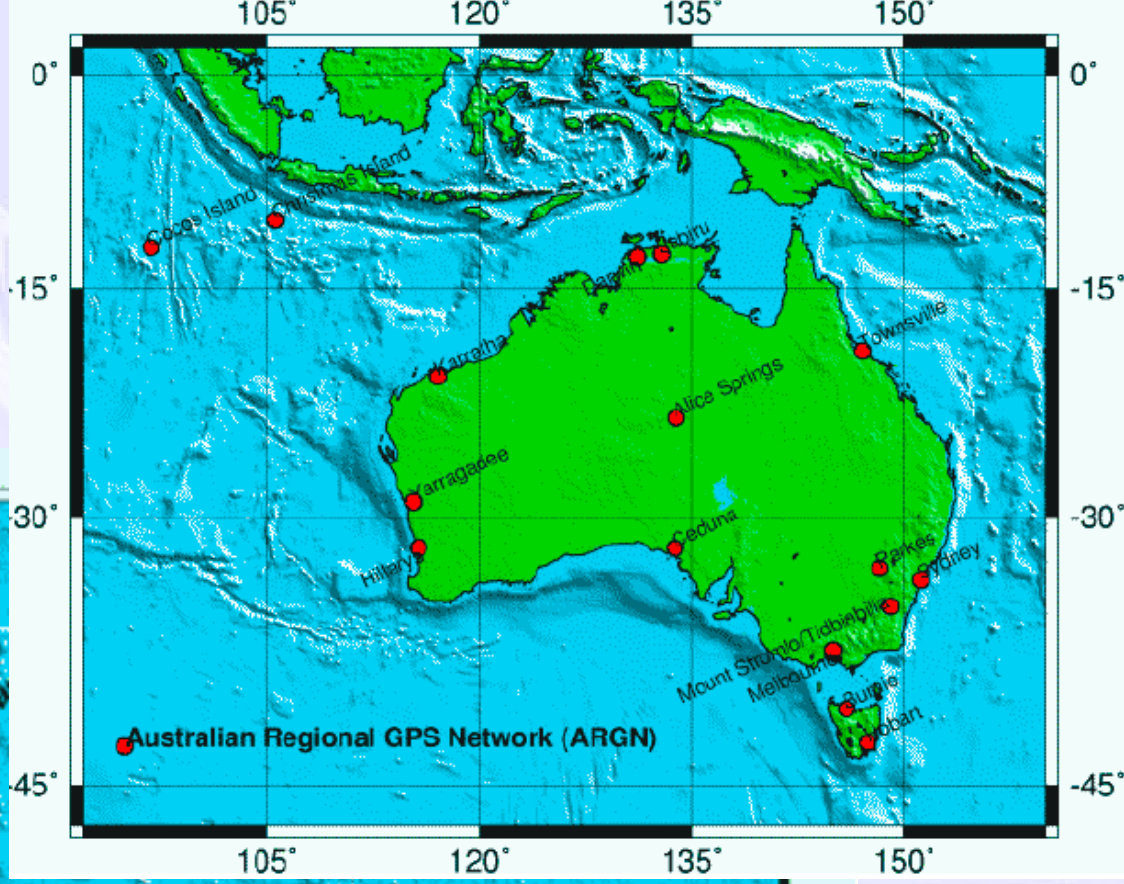
GGOS: *a service to society*

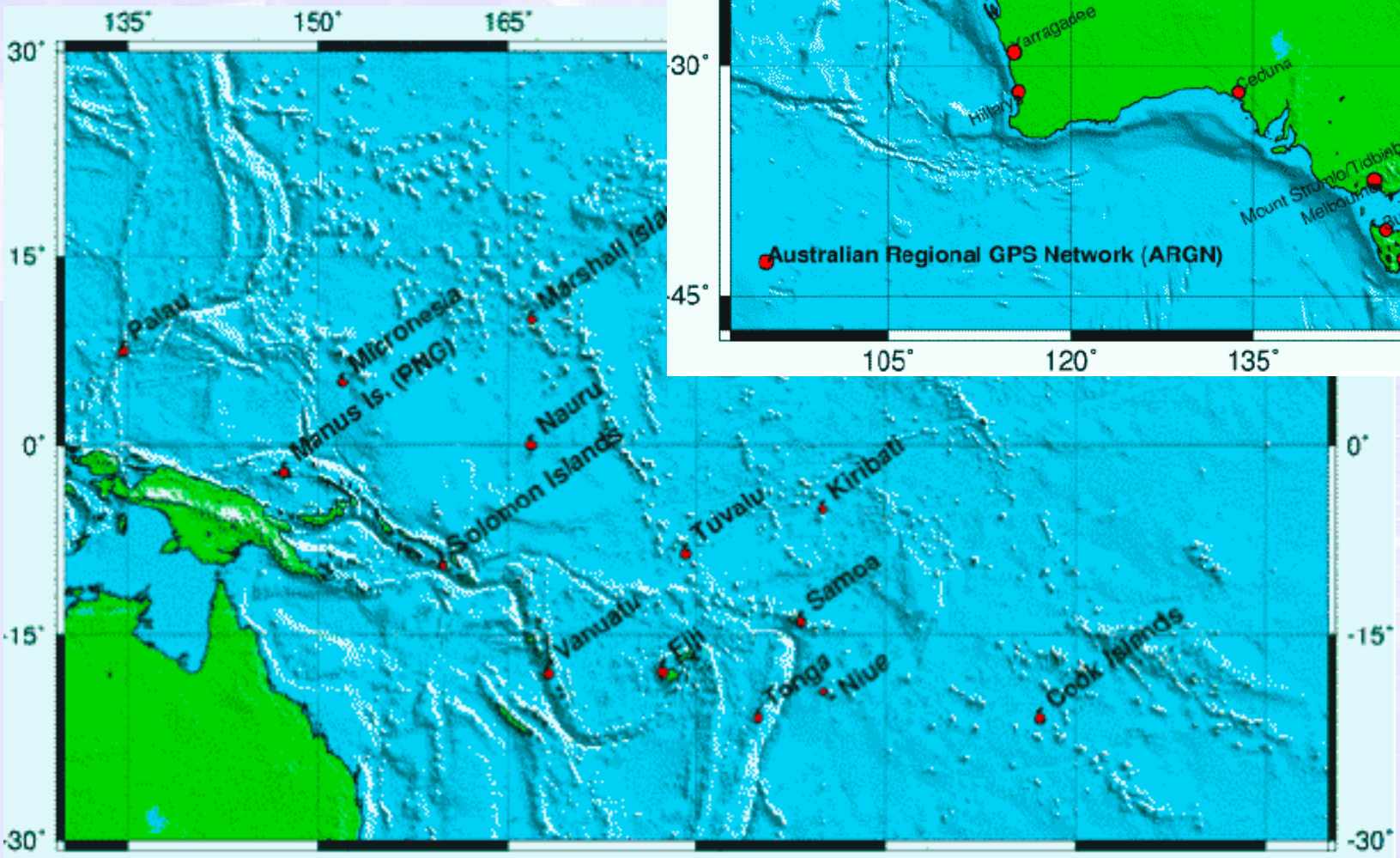
- GGOS will deliver a range of *geodetic capabilities* needed by society.
- Modern society is increasingly a *'spatially-enabled' society*.
- *Reference frames & PNT(GNSS, etc.) technologies* are critical to all existing & developing applications.
- Myriad 'stakeholders'…*governments, corporations, individuals…*
- Funding geodesy *infrastructure* will require reference to societal benefits beyond Global Change science.

AuScope: Upgraded VLBI & SLR Network



GA's GNSS CORS Stations





AuScope GNSS CORS…