



Searching for the origin of the universe using GIS:

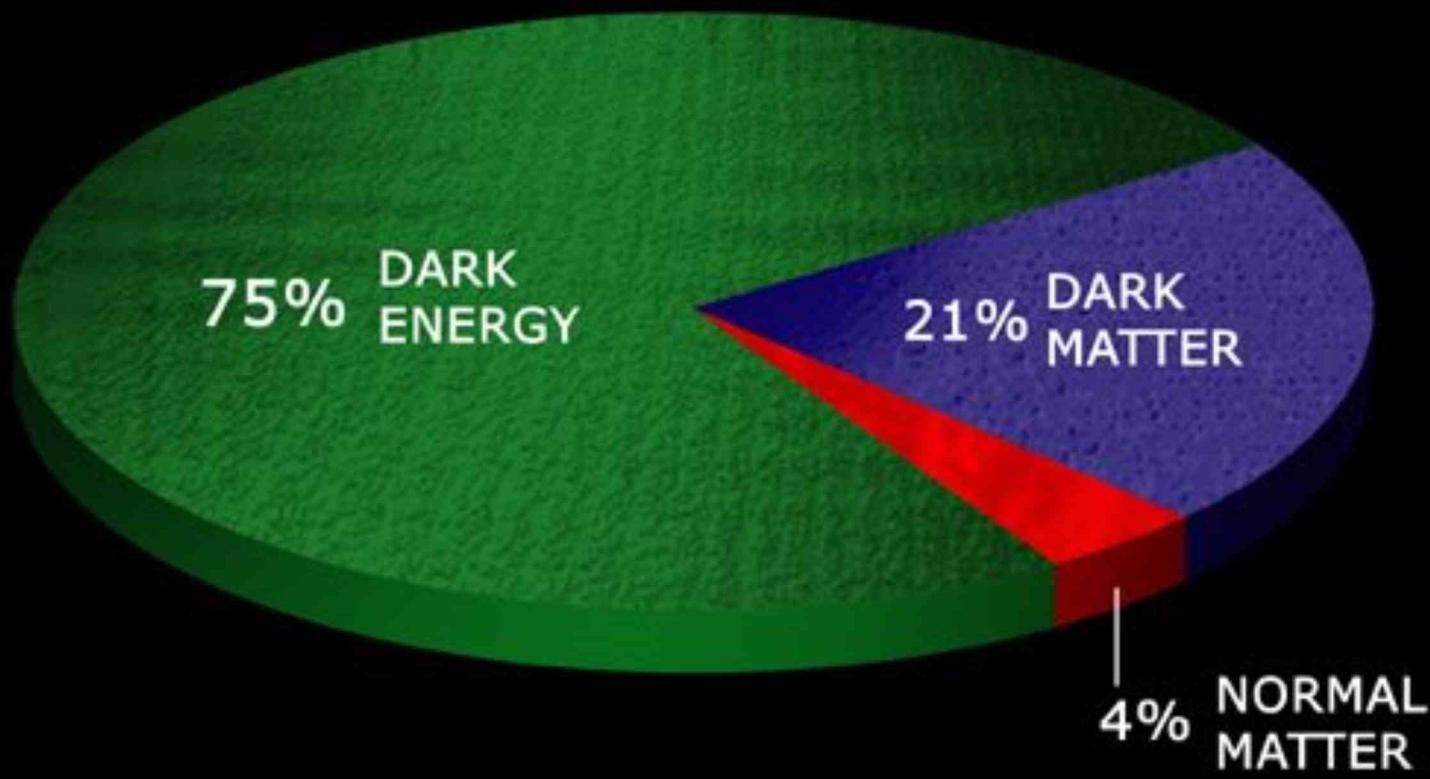
The role of GIS in the construction of the world's largest radio telescope, the Square Kilometre Array.



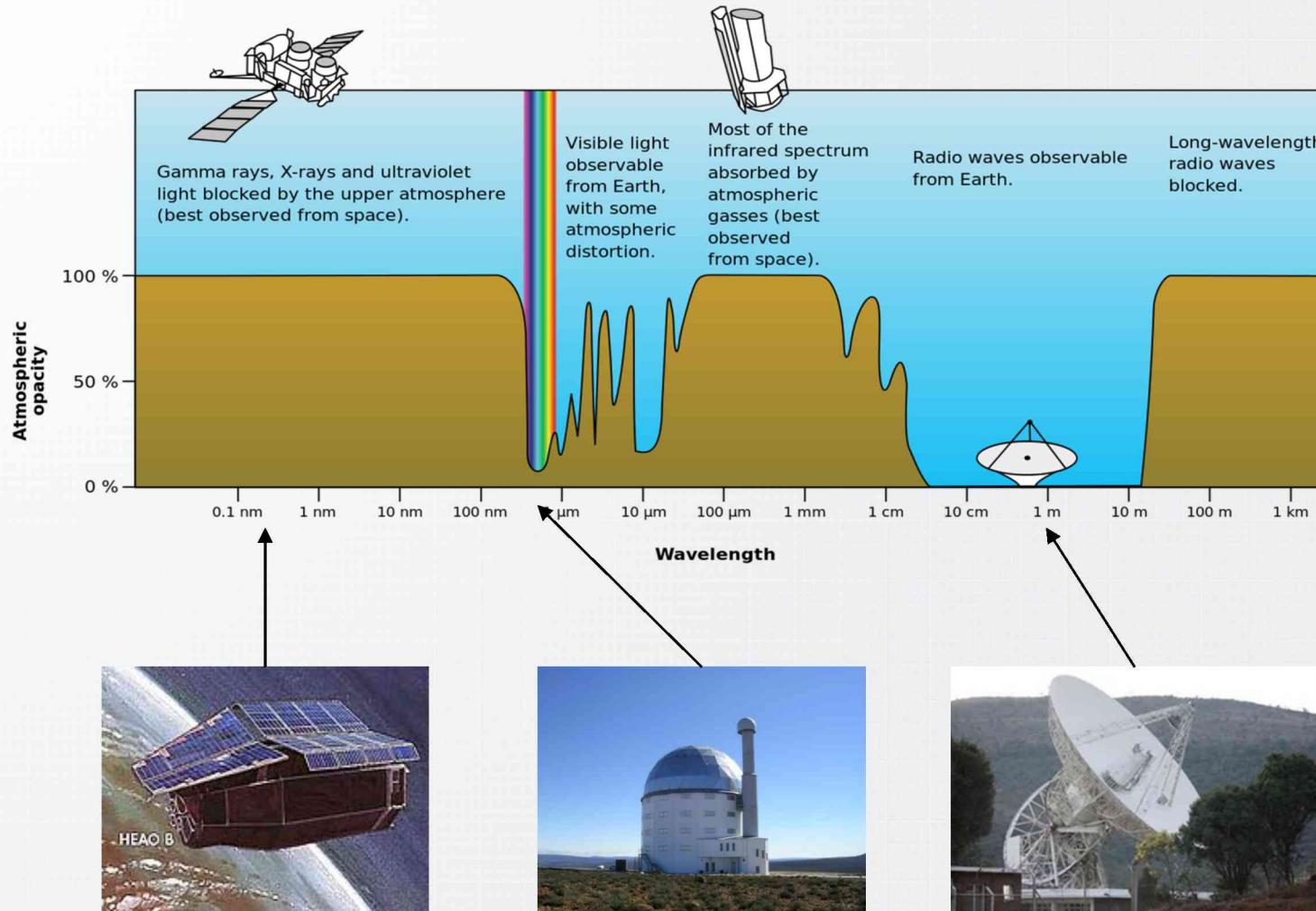


Disclaimer

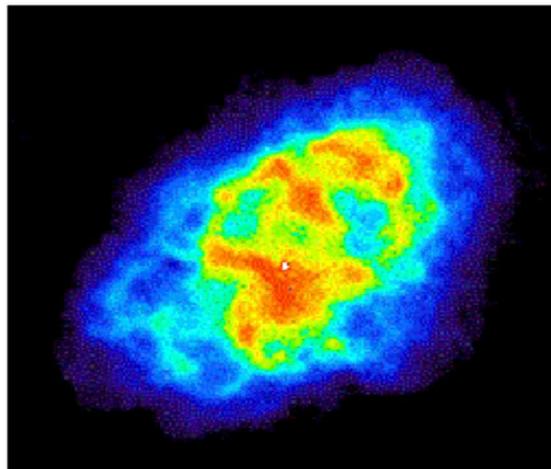




Electromagnetic Spectrum and Astronomy



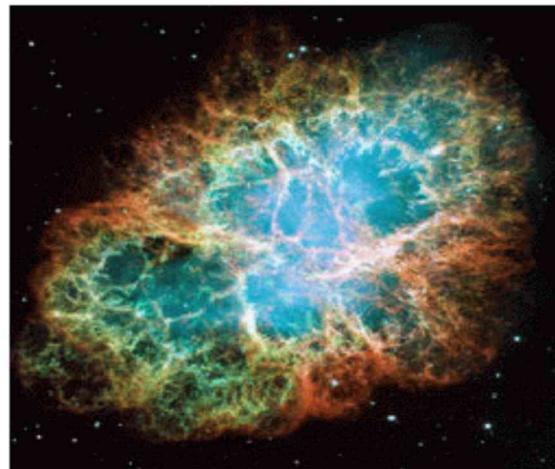
Crab Nebula: Remnant of an Exploded Star (Supernova)



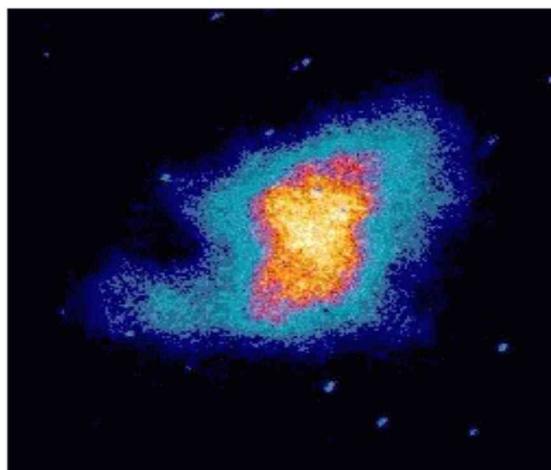
Radio wave (VLA)



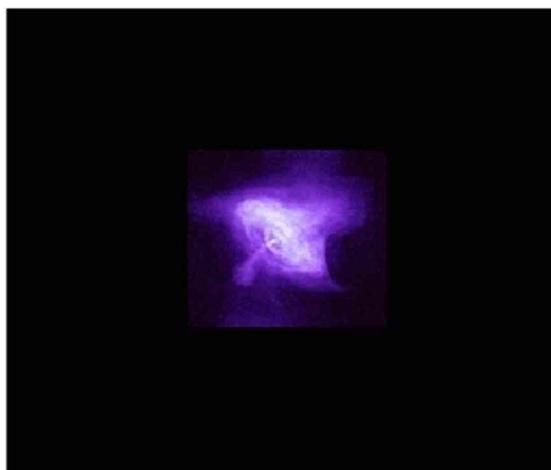
Infrared radiation (Spitzer)



Visible light (Hubble)



Ultraviolet radiation (Astro-1)



Low-energy X-ray (Chandra)



Pixel Size
→ ←

High-energy X-ray (HEFT)
*** 15 min exposure ***

Radio Telescopes. Bigger is better

Hartbeeshoek Radio Telescope (26m)



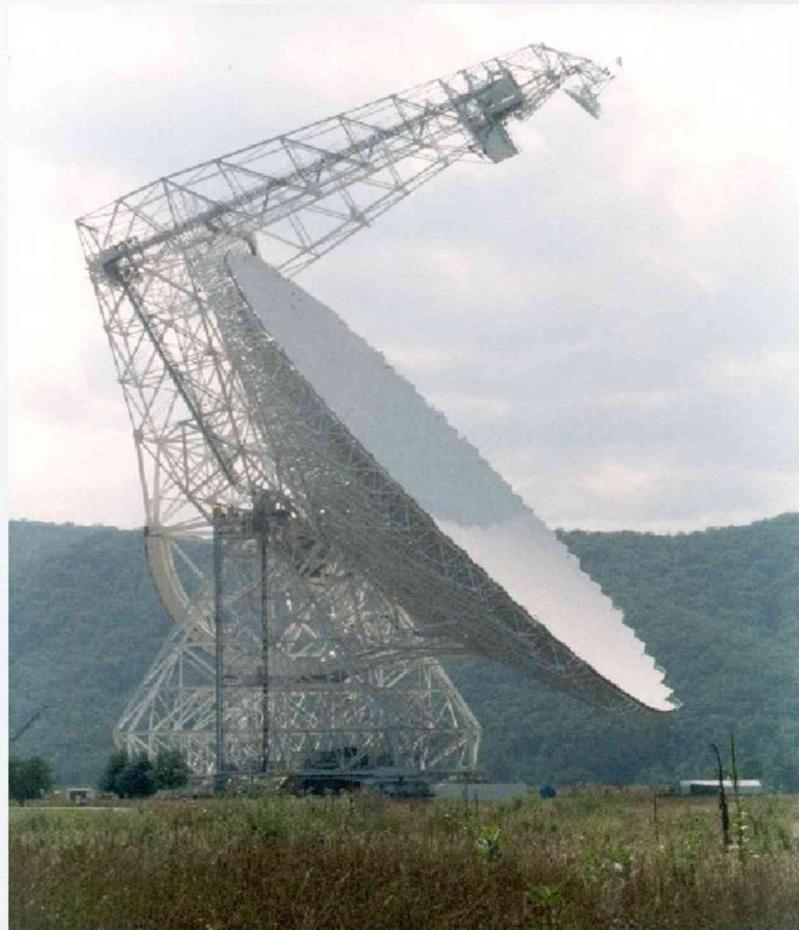
Radio Telescopes. Bigger is better

Parkes Radio Telescope (64m)



Radio Telescopes. Bigger is better

Green Bank Telescope (100m)



Radio Telescopes. Bigger is better

Arecibo Radio Telescope (~300m)

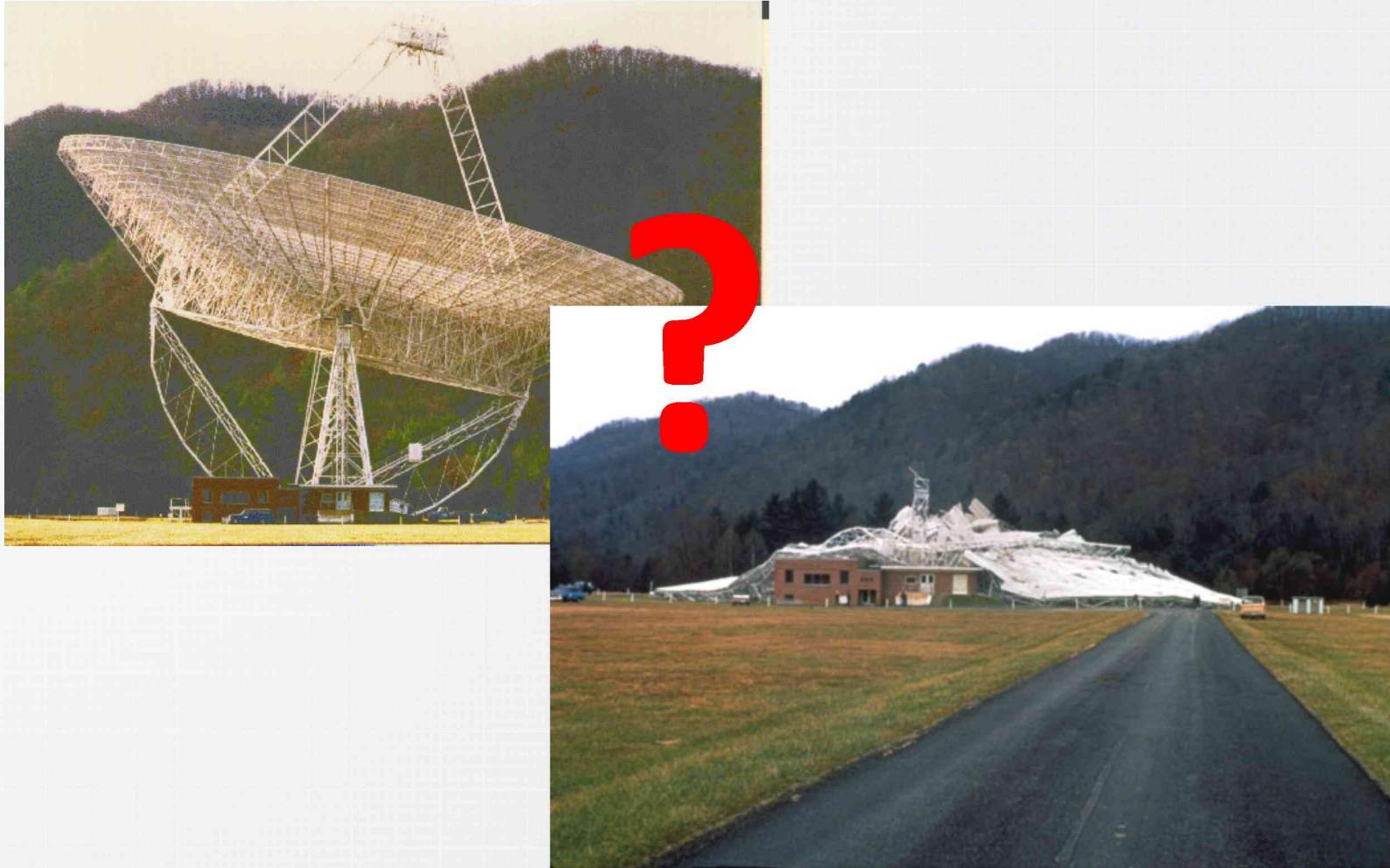


Radio Telescopes. Bigger is better

The Five hundred meter Aperture Spherical Telescope-FAST (500m)



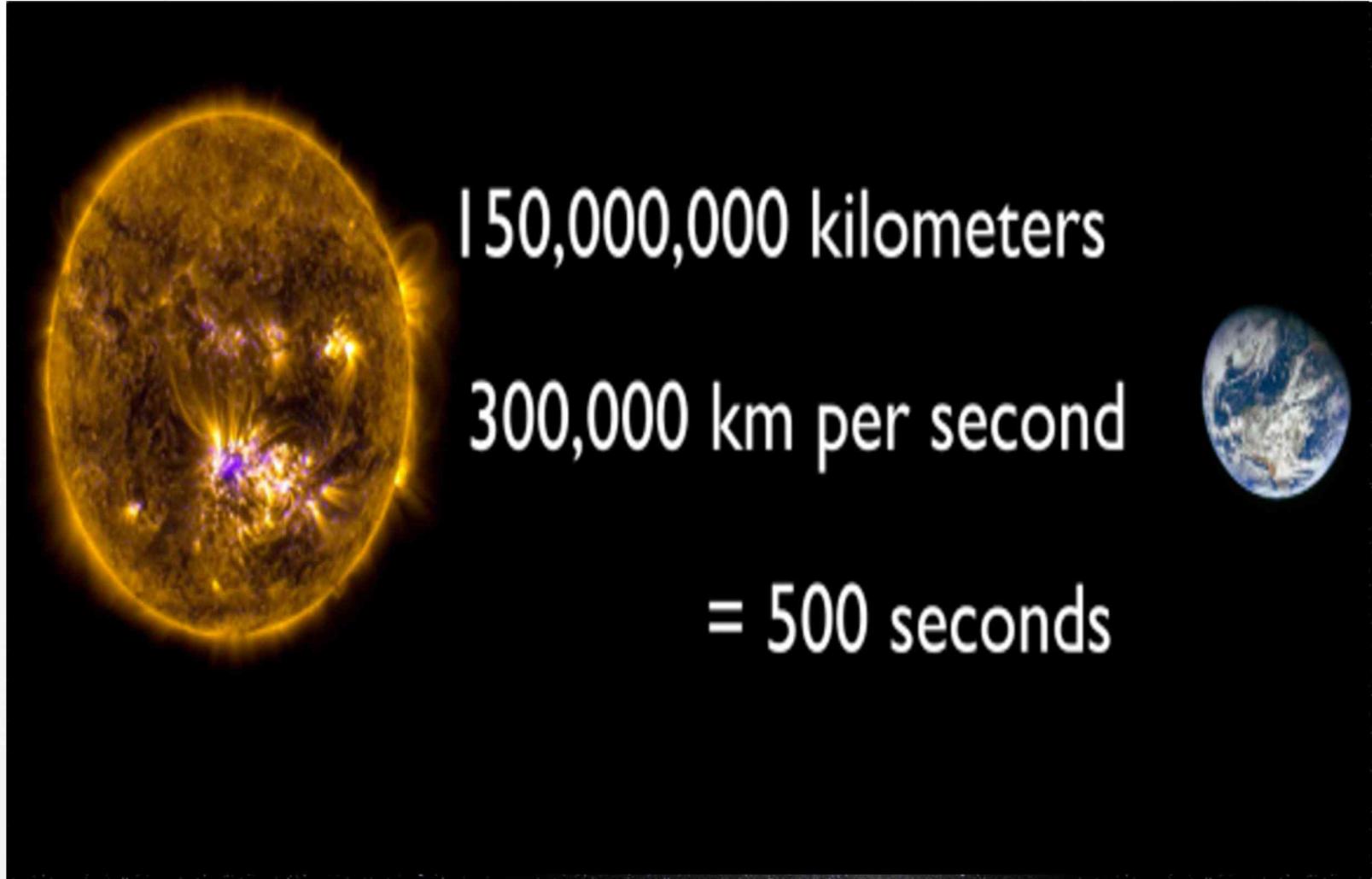
~ 100m Telescope – 7,600 TONS



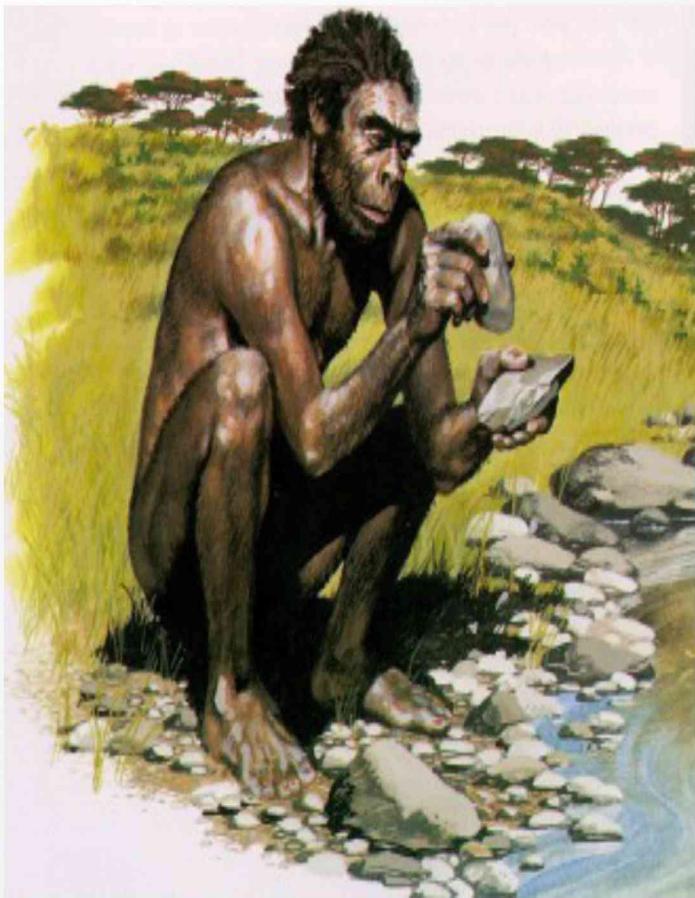
Interferometry



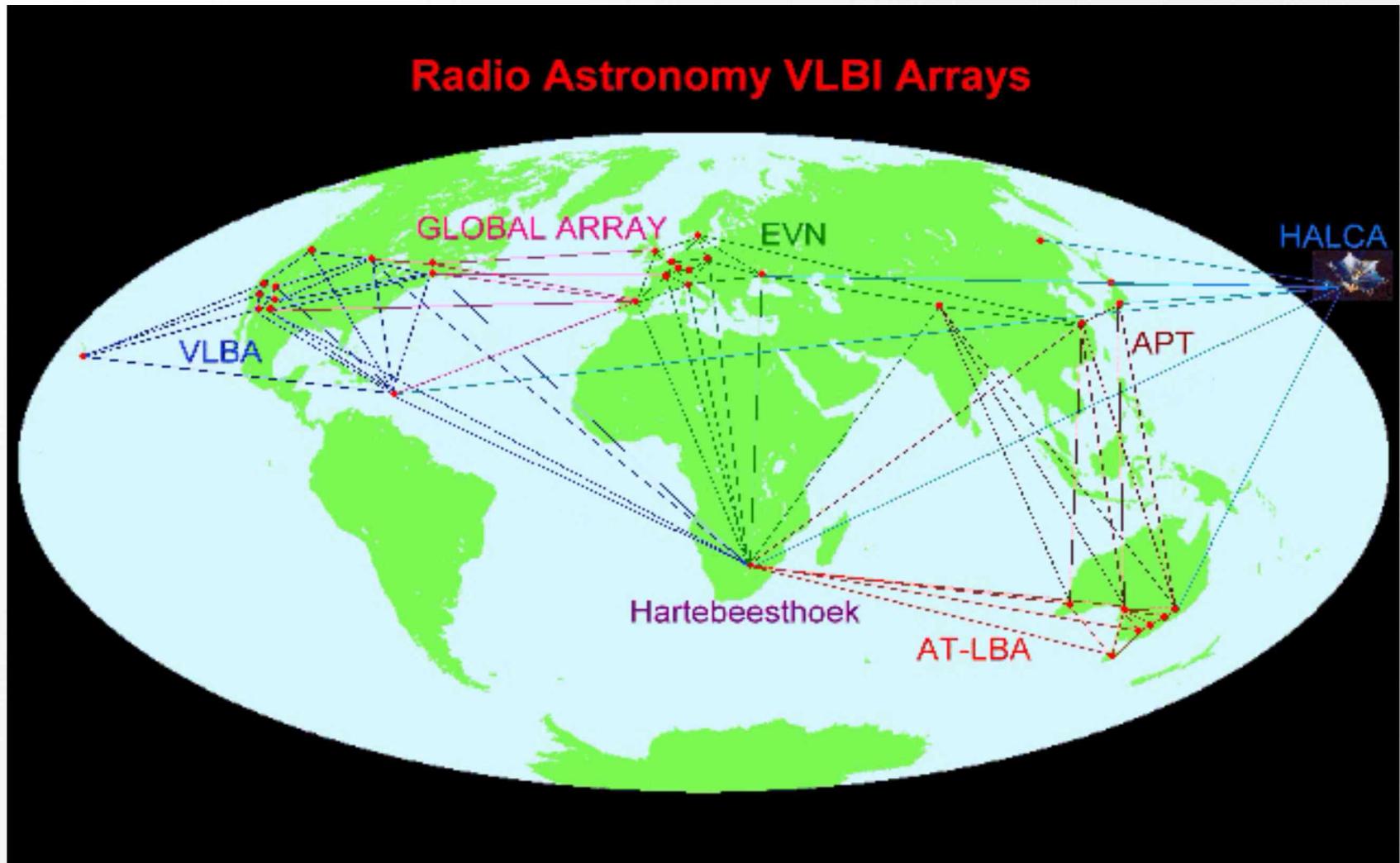
Why the buzz ?



Why Africa?



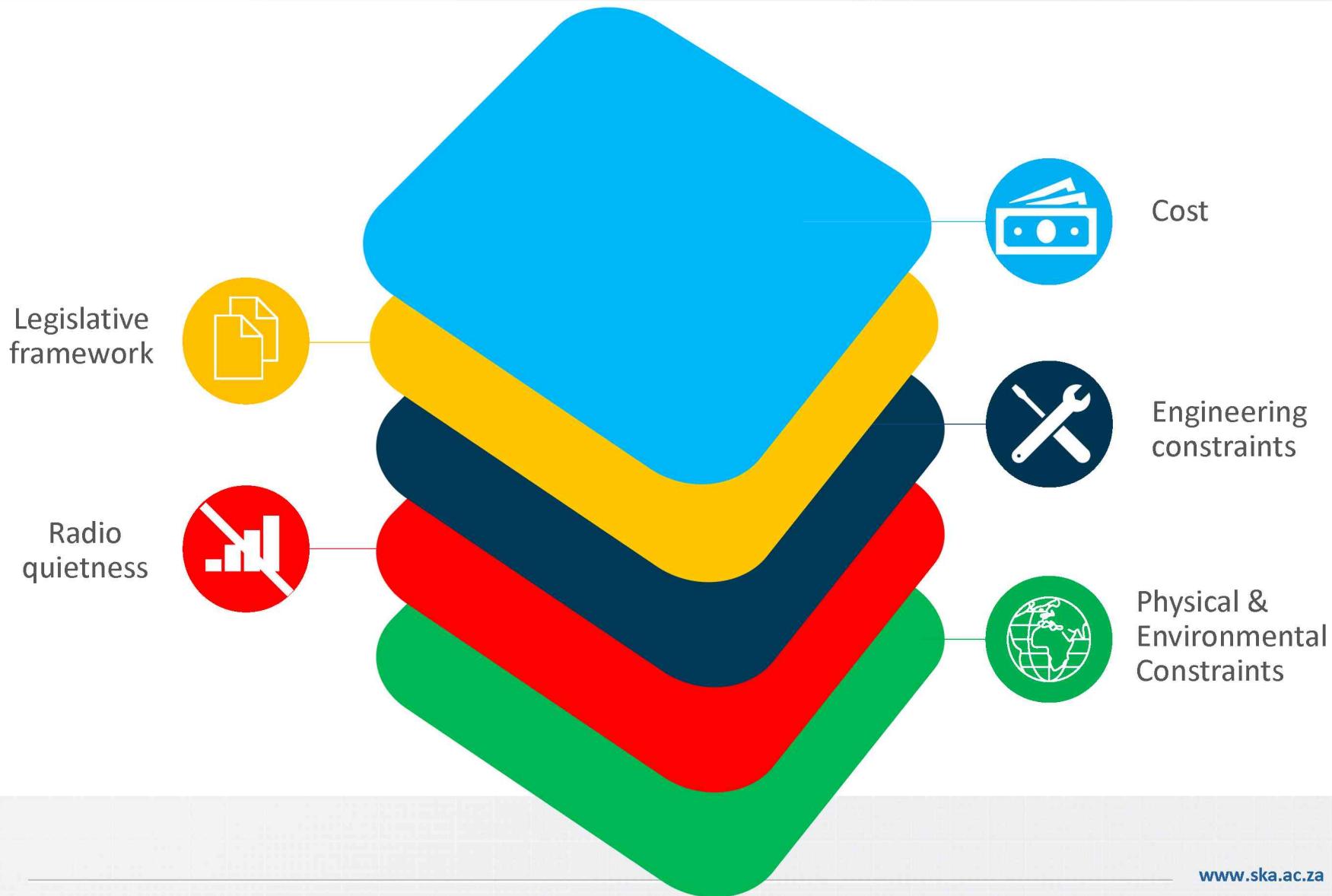
Location, Location, Location



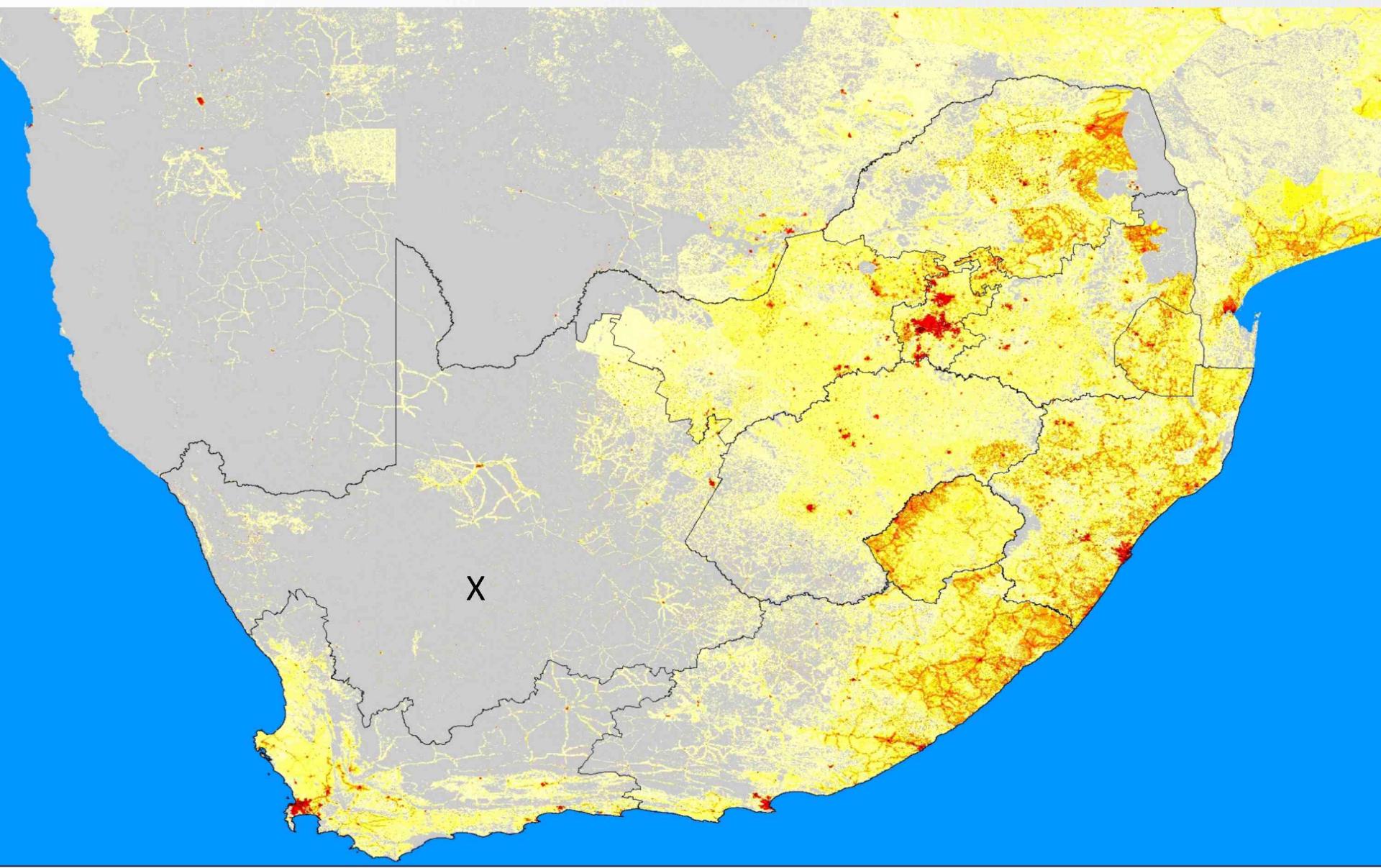
So, what role does GIS play?

- Site selection & Array Optimisation
- Infrastructure Route Design
- Protection
- Strategic Decision Making
- Site Operation

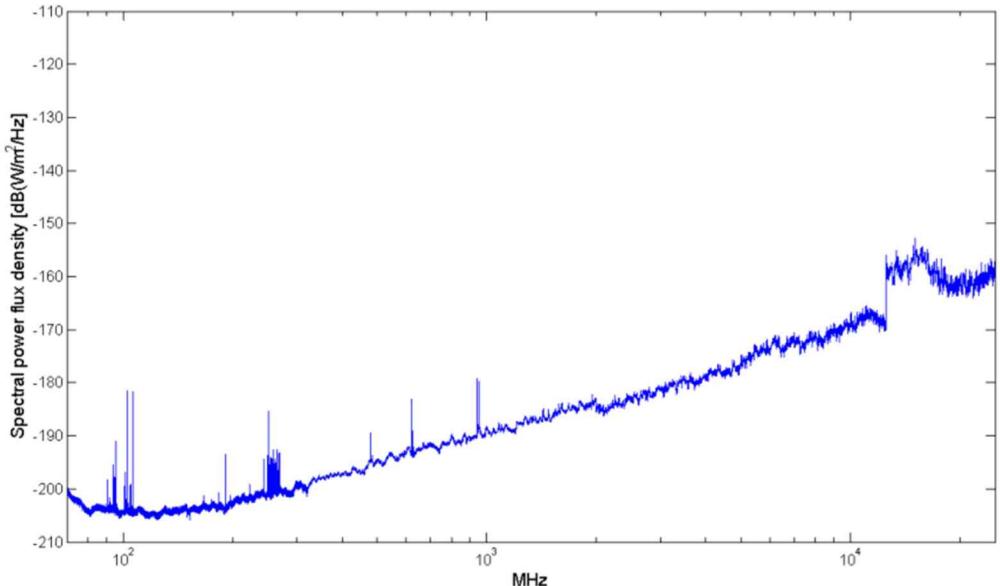
Site Selection Process



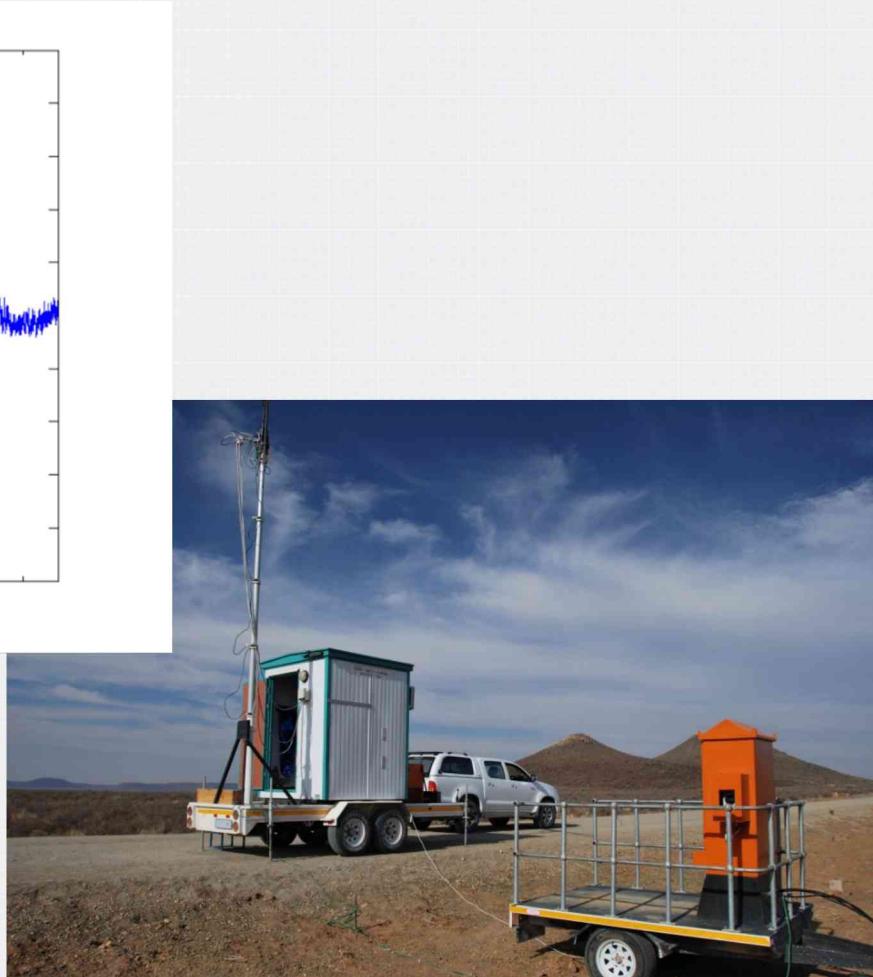
Site Selection Process



Site Selection Process

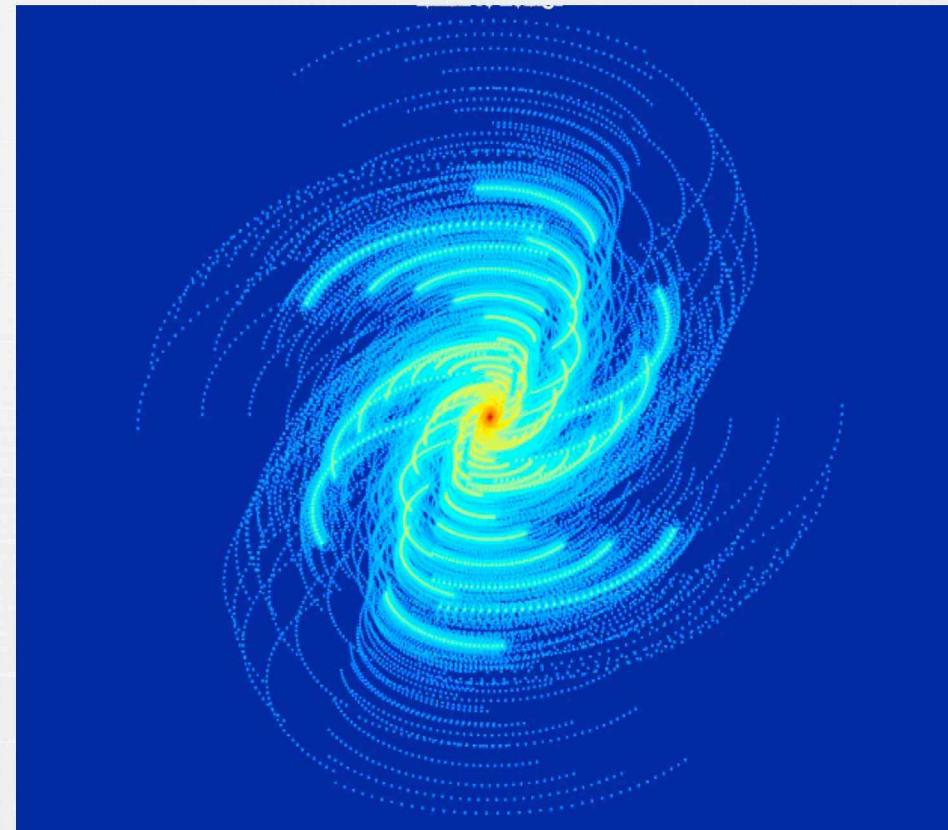
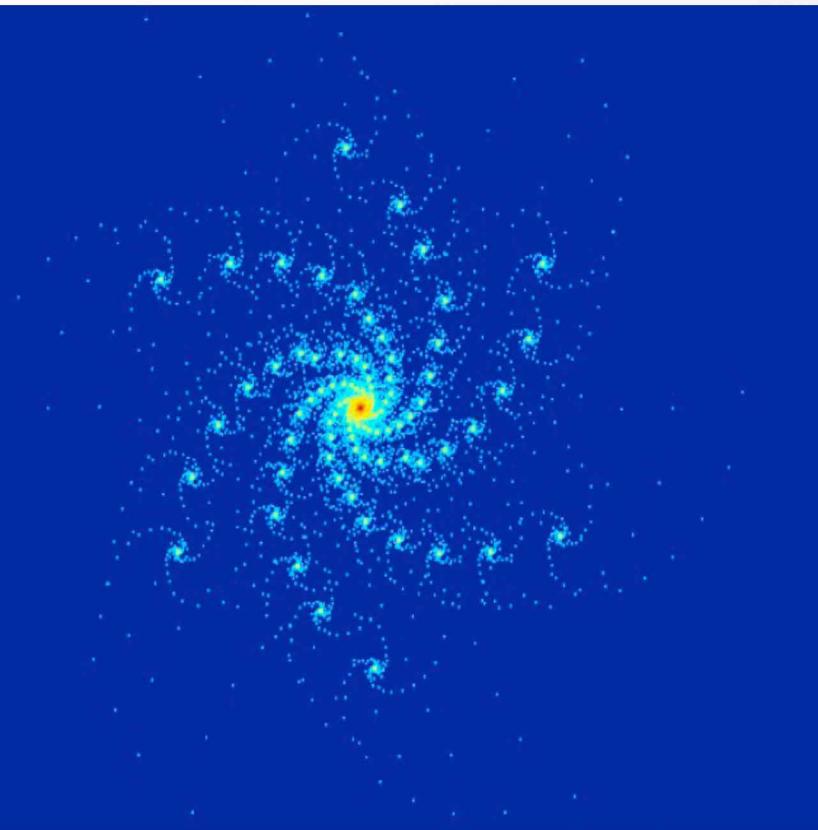


Radio frequency spectrum at the South African MeerKAT/SKA site



Site Selection Process

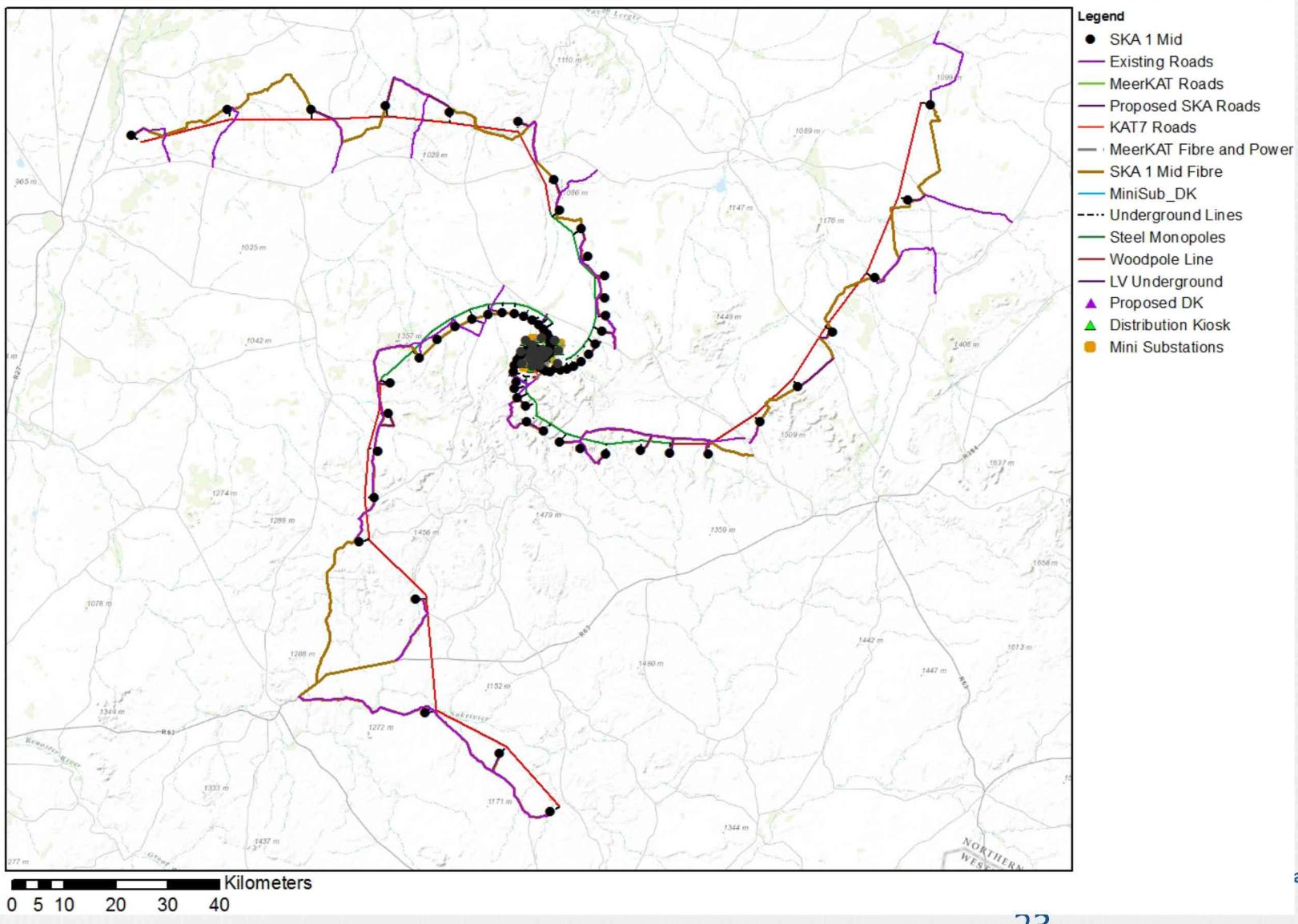
- High level scientific performance simulation



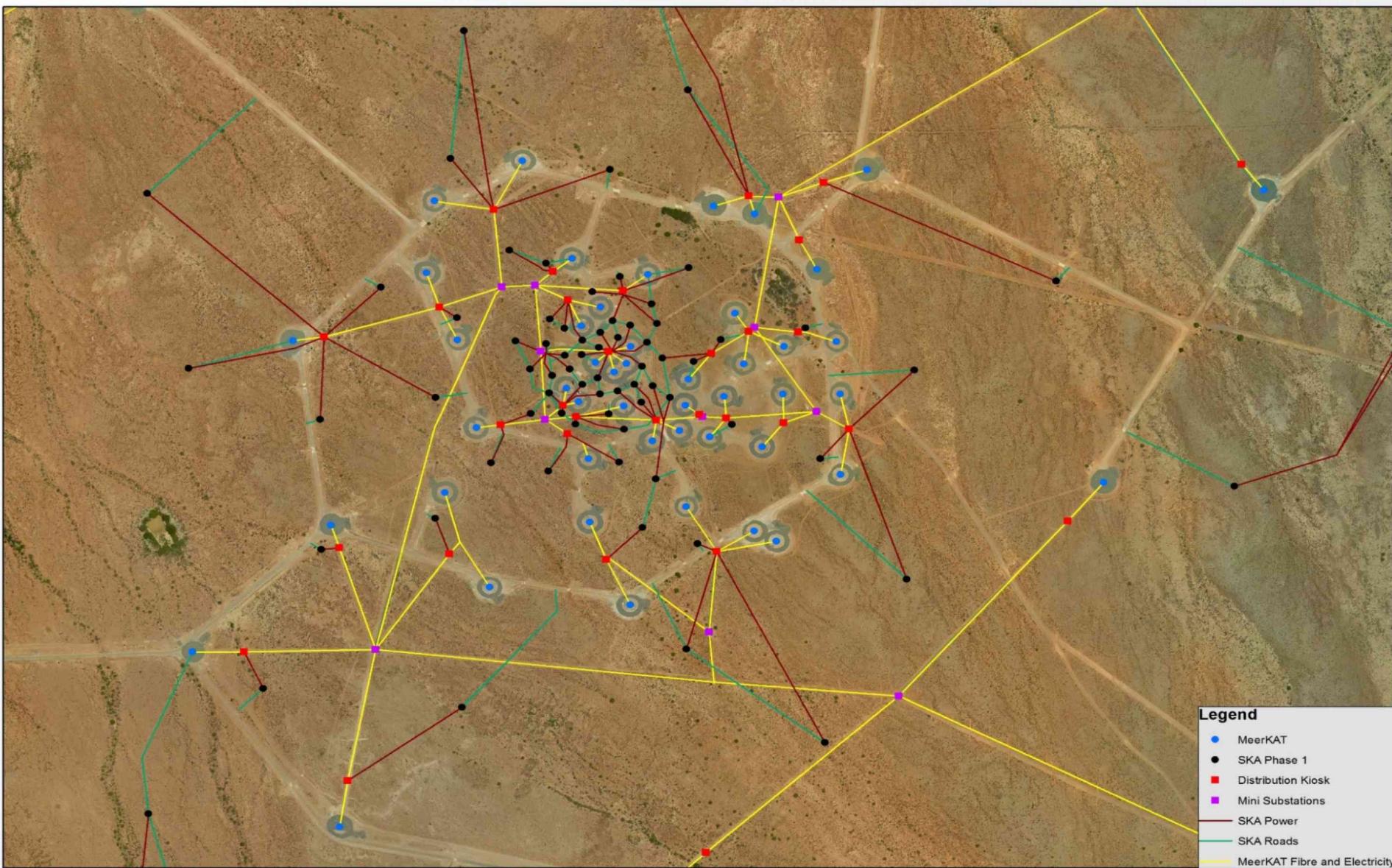
Infrastructure Route Design

- Power (Site selection for PV plants)
- Fiber Optic
- Roads
- Alternative telecom site

Infrastructure Route Design



Infrastructure Route Design



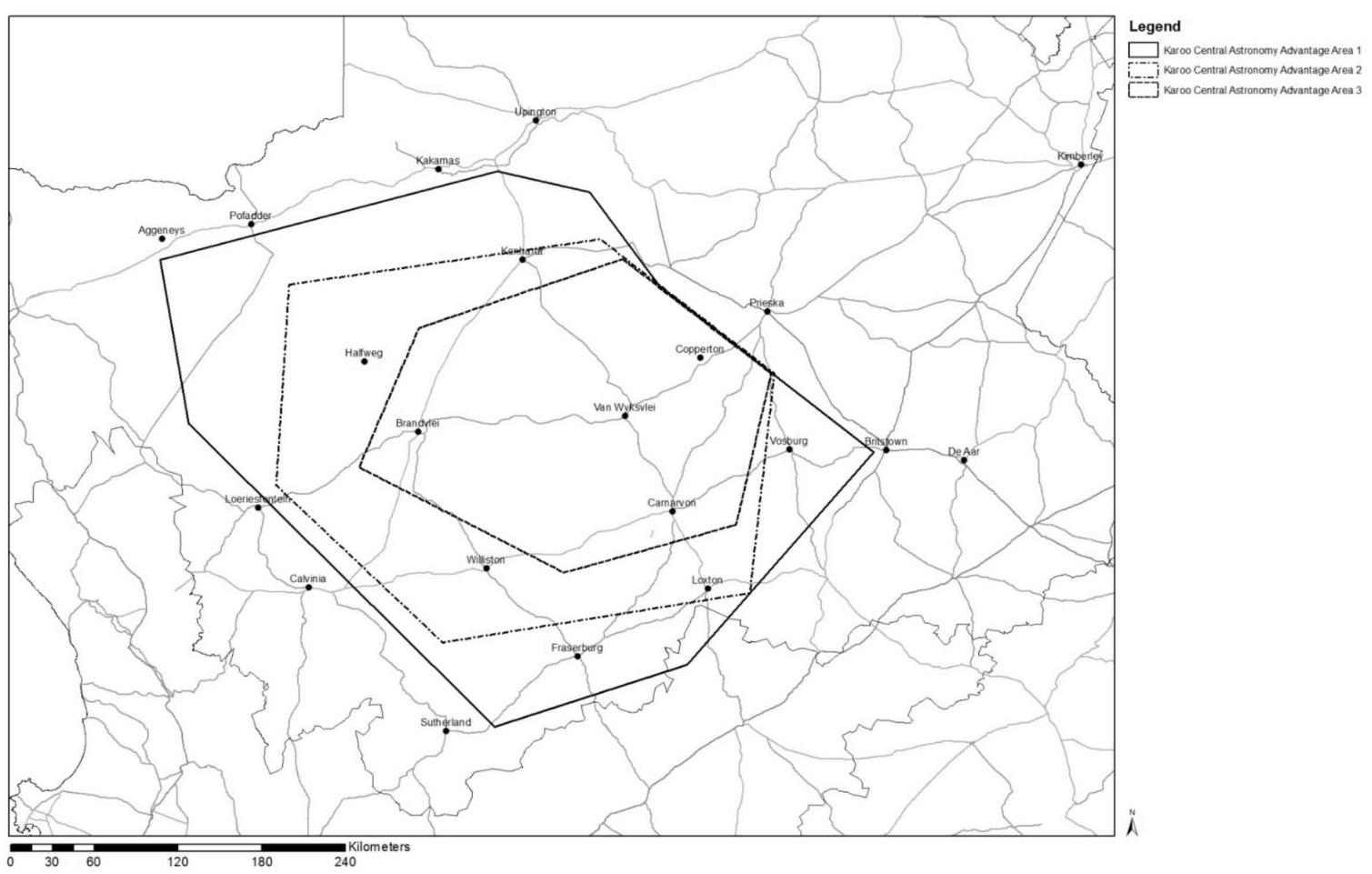
Protection

Astronomy Geographic Advantage Act

- Protecting already existing astronomy investment
- Maintain an environment for global astronomy hub that will continue to attract international investment
- Create a competitive edge for South Africa to win the bid to host SKA

Protection

- Astronomy Geographic Advantage Act

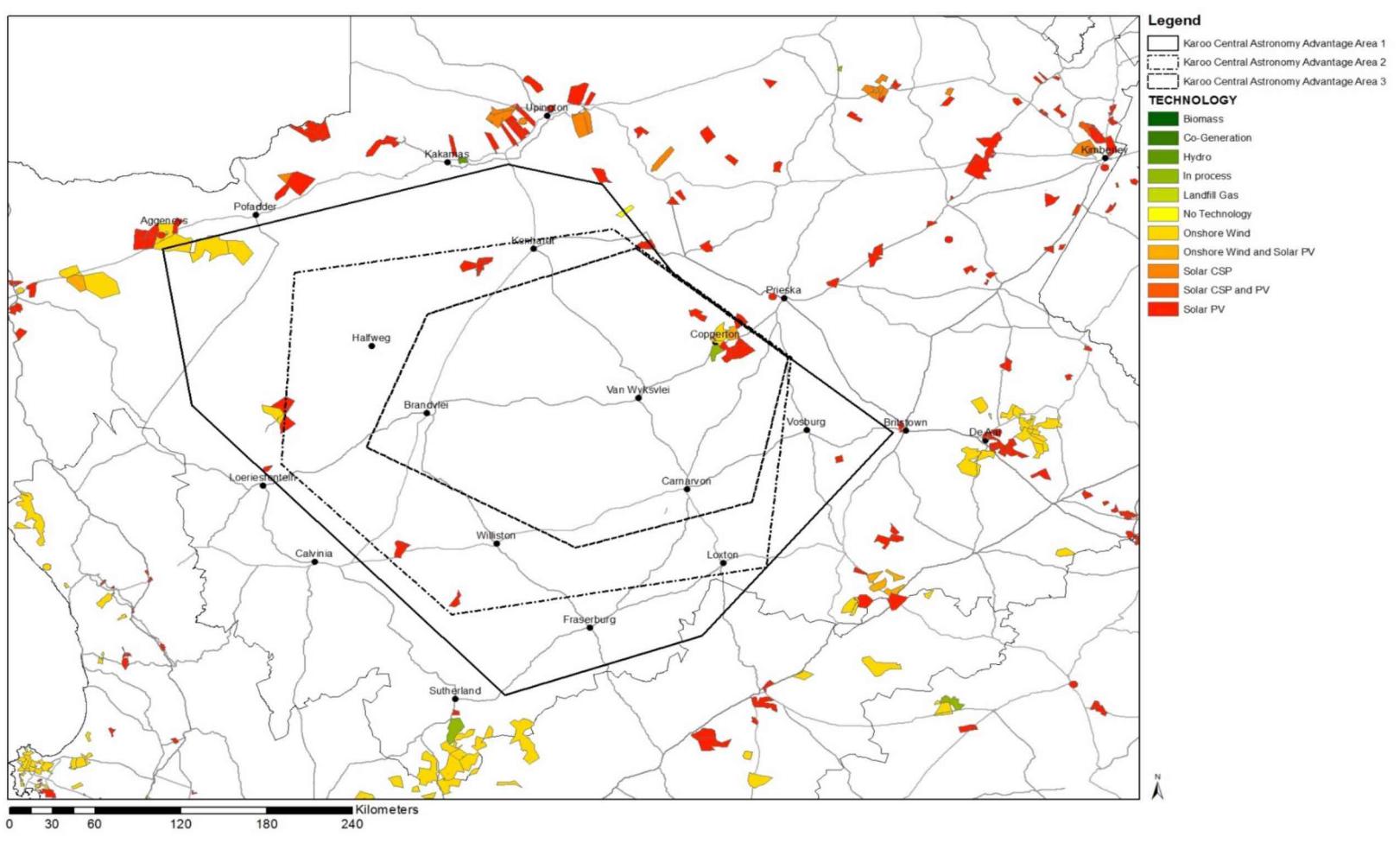


Telescopes on sites



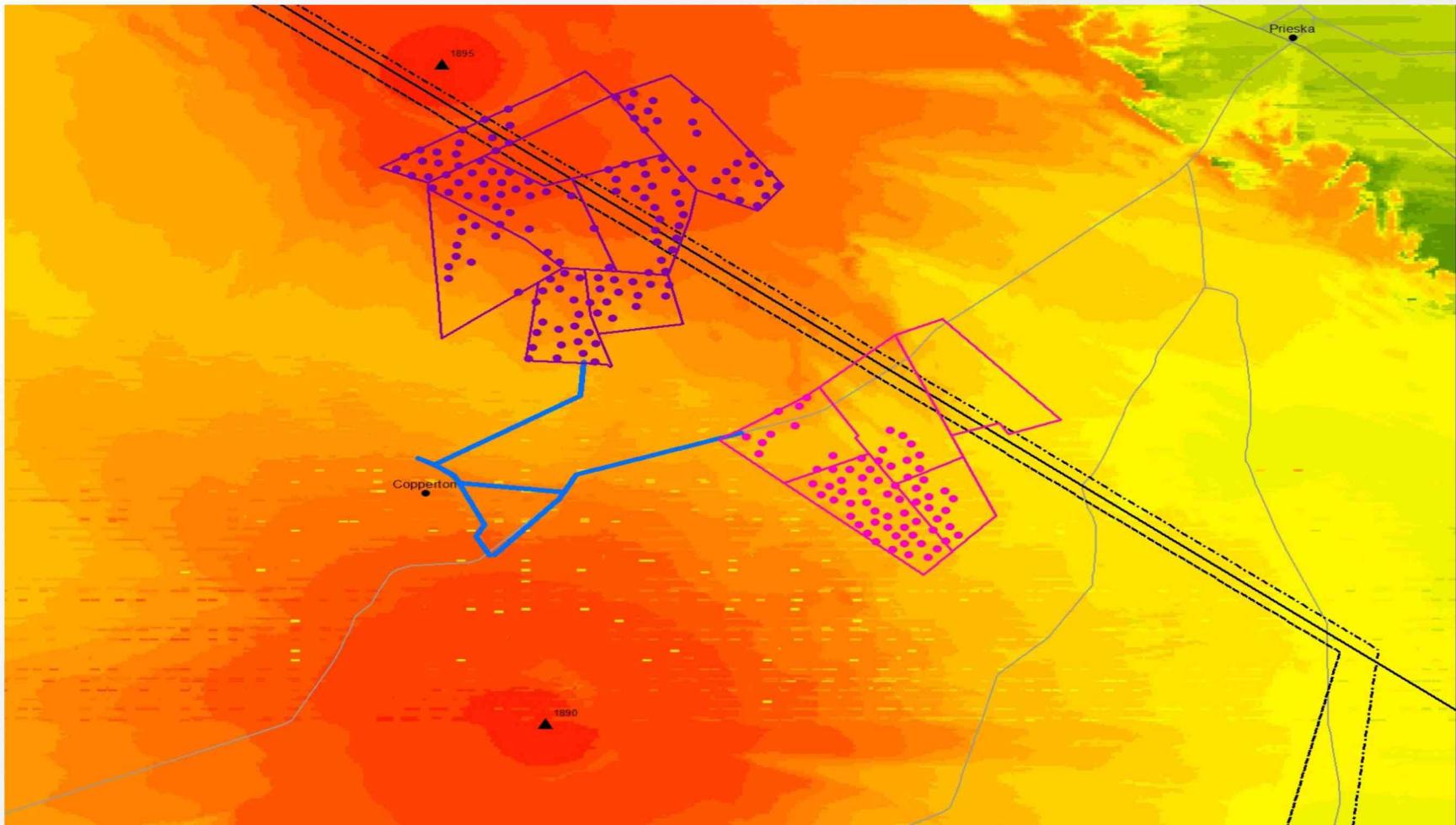
Protection

- Renewable Energy Project (REP) and Other RFI source database



Protection

- REP Risk assessment

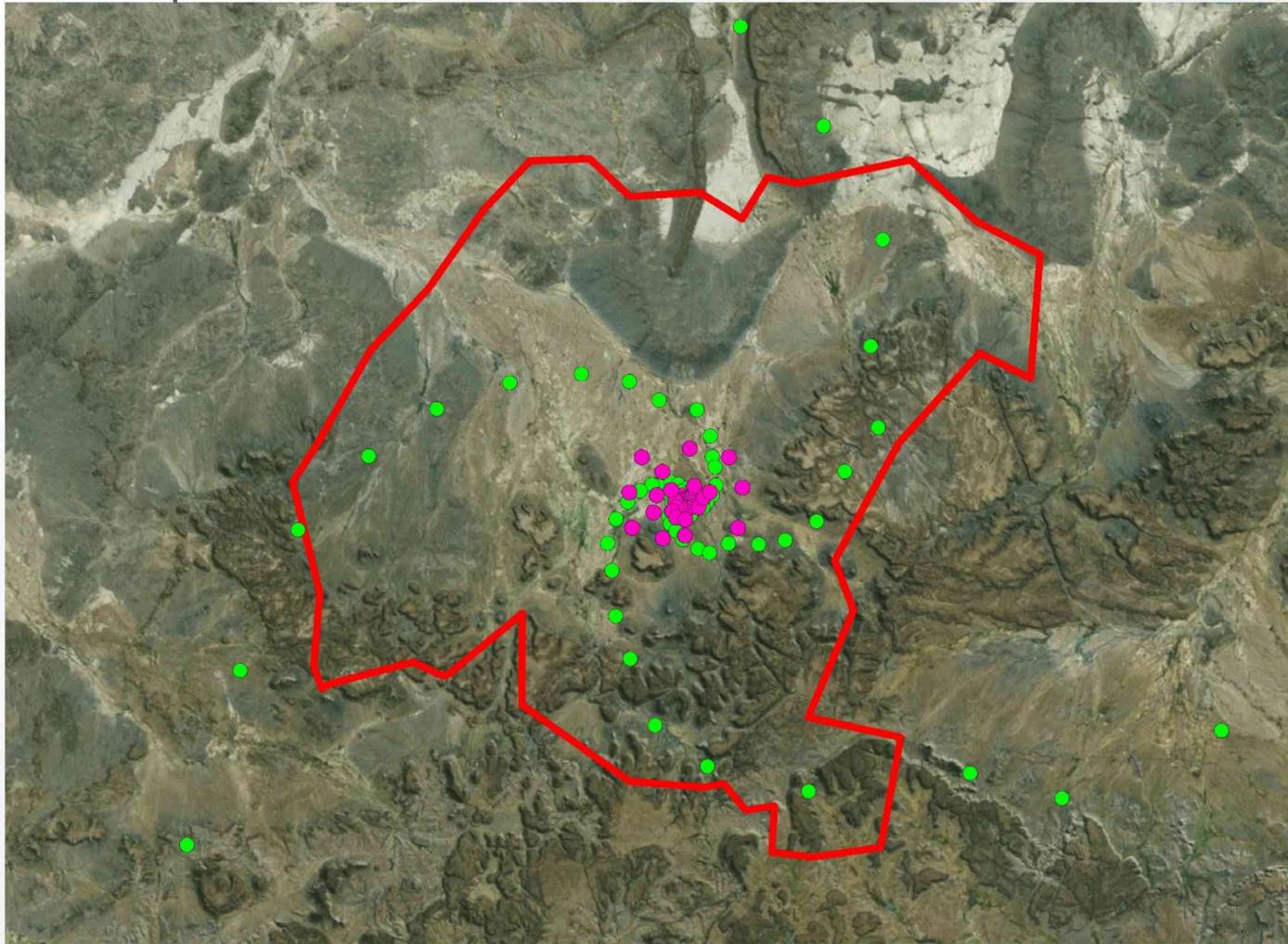


Strategic Decision Making

- Deployment of alternative telecommunication
- Land acquisition
- Scenario modelling

Strategic Decision Making

- Land acquisition



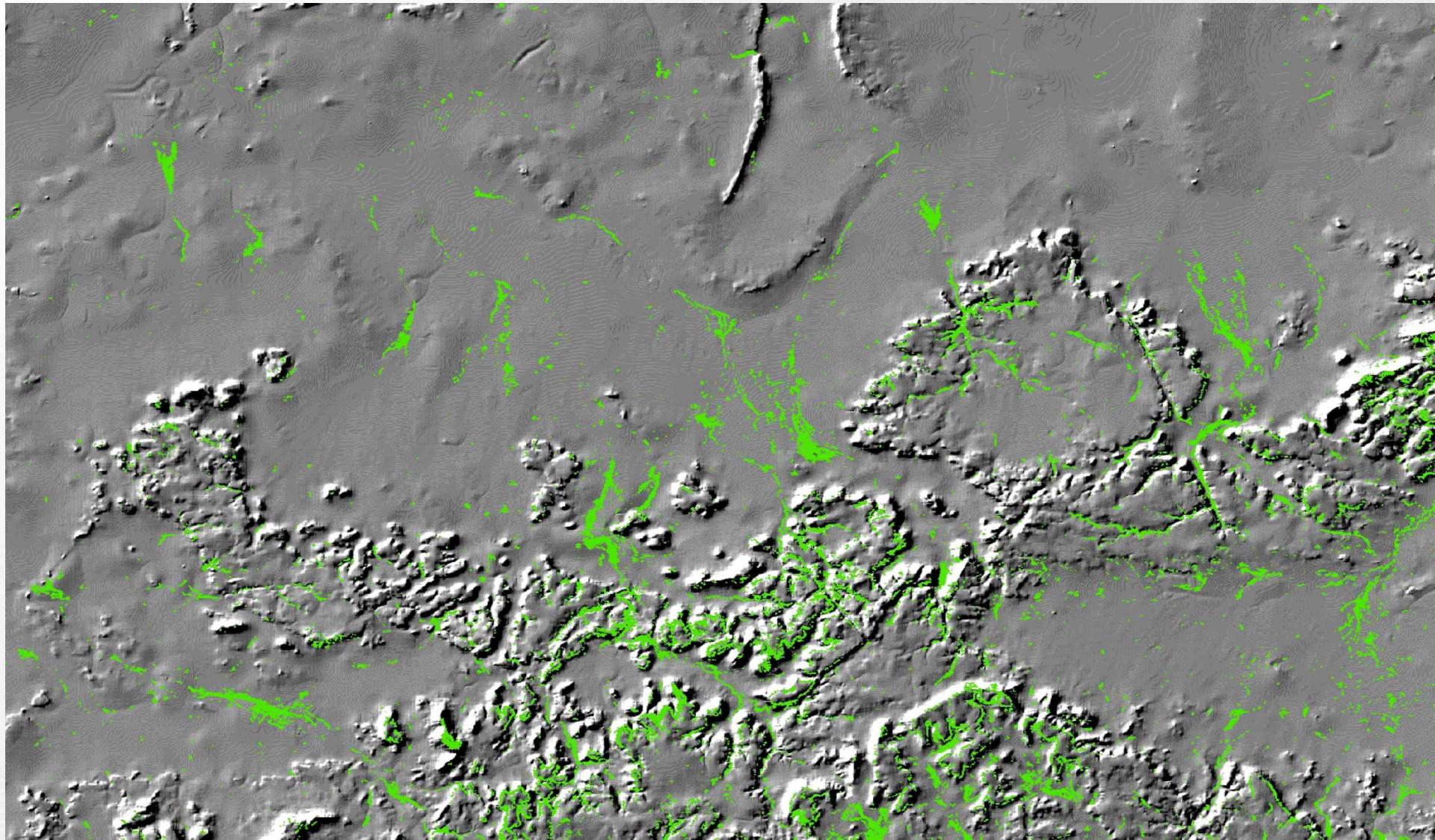
Strategic Decision Making Tool

- Land Management Prosopis mapping



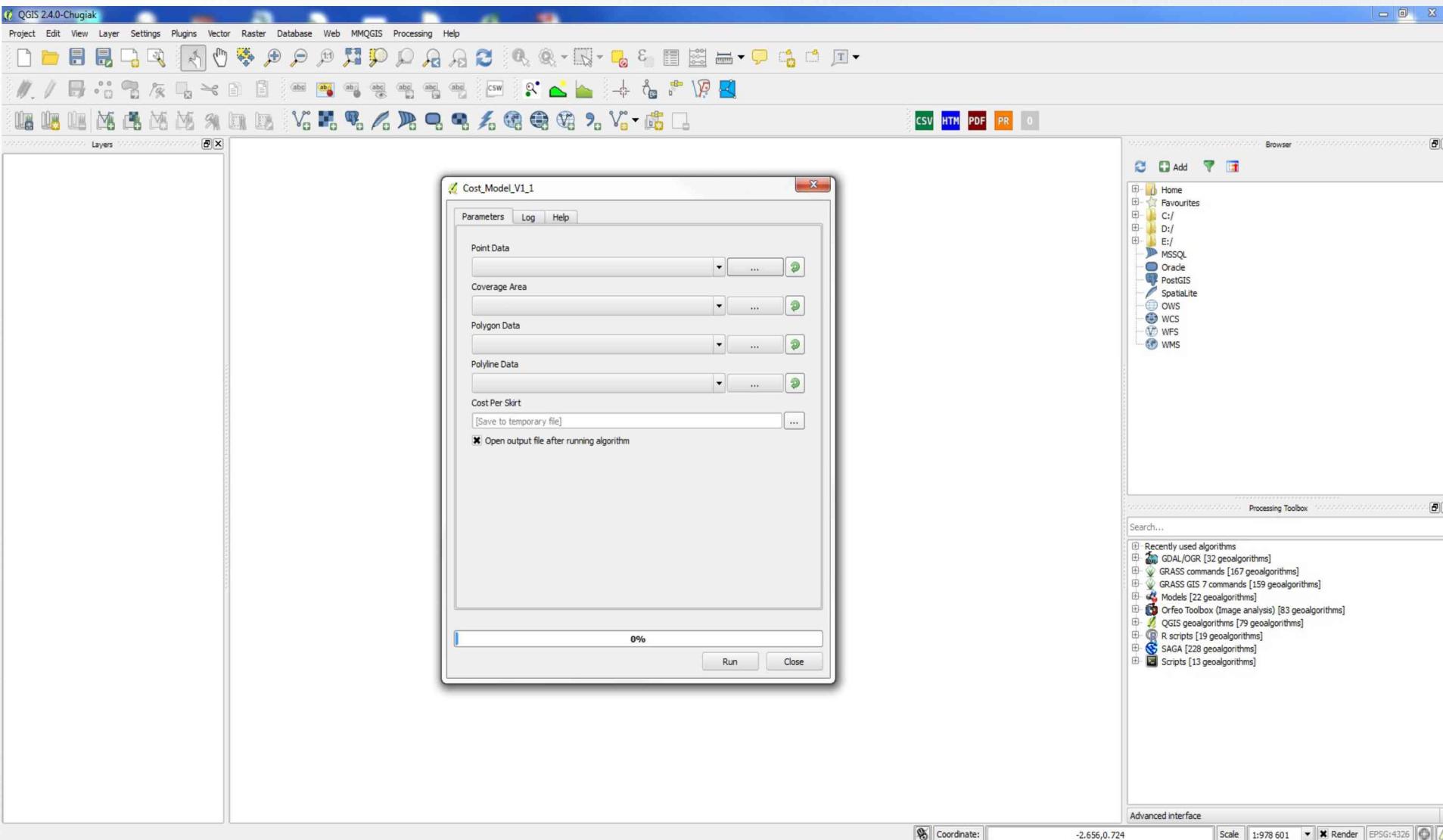
Strategic Decision Making Tool

- Land Management Prosopis mapping



Strategic Decision Making

- Scenario modelling



Site Operation

- Infrastructure asset management
- Onsite mobile RFI tracking
- Land management

GIS within SKA

- GIS has proven itself as a valuable tool used for making critical strategic decision relating to the development of SKA radio telescope in Africa.
- It is pervasive as a cross-cutting strategic decision tool within the organisation.
- The integration of GIS with other scientific fields is encouraged for the purpose of developing secondary dataset.



Thank You

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