Navigating the Interface: Lessons from South Africa's Engagement Between Astronomers and Industry

WORKSHOP ON DARK AND QUIET SKIES FOR SCIENCE AND SOCIETY

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Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

2030 NDP

Outline

- Astronomy as Flagship Science
- National efforts
- International efforts
- What worked for South Africa
- Key Lessons learned
- Conclusion

Astronomy as Flagship Science

Visionary Policy Foundations

- **1996 White Paper on Science & Technology**

  Identified astronomy as a priority science with global potential

  Recognized South Africa's geographic advantage: clear skies, low light pollution, and radio silence

- **2002 National R&D Strategy**

  Positioned astronomy as a mission-driven science

  Emphasized its role in human capital development, innovation, and international collaboration

Impact on National Strategy

- Astronomy has been elevated to flagship status within the Department of Science, Technology and Innovation (DSTI)
- Enabled the development of world-class infrastructure: MeerKAT, Square Kilometre Array (SKA), Southern African Large Telescope (SALT)
- These facilities position South Africa at the forefront of astrophysics, cosmology, and data science, contributing to discoveries about dark matter, galaxy formation, and gravitational waves.
- Led to the establishment of the AGA Act (2007) and the Astronomy Management Authority (AMA)
- Attracted international investment and partnerships

NATIONAL EFFORTS

The SKA site is a National Key Point (NKP Act No. 102 of 1980)

- Declared by the Minister of Police in 2010.
- Recognizes the SKA as critical to national security, scientific advancement, and economic development.

Astronomy Geographic Advantage (AGA) Act, 2007 (Act No. 21 of 2007) – 18 years

- **preserve South Africa's geographic advantage** for astronomy by protecting areas with exceptional conditions for optical and radio astronomy.
- **regulate activities** that could interfere with astronomical observations, especially radio frequency interference.
- **support the development** of large-scale astronomy projects like the **SKA** and **SALT**.
- empowers the Minister of Science, Technology, and Innovation to declare certain areas as *Astronomy Advantage Areas (AAAs)*—regions uniquely suited for optical and radio astronomy.
- Ministerial powers are delegated to the AMA regulatory unit within the Astronomy Subprogramme.
- Signed Memorandum of Agreements with Independent Communications Authority of South Africa (ICASA) for cooperation on telecommunications and radio frequency spectrum
- Signed Co-agreement with National Research Foundation (SARAO and SAAO)

NATIONAL EFFORT CONT……

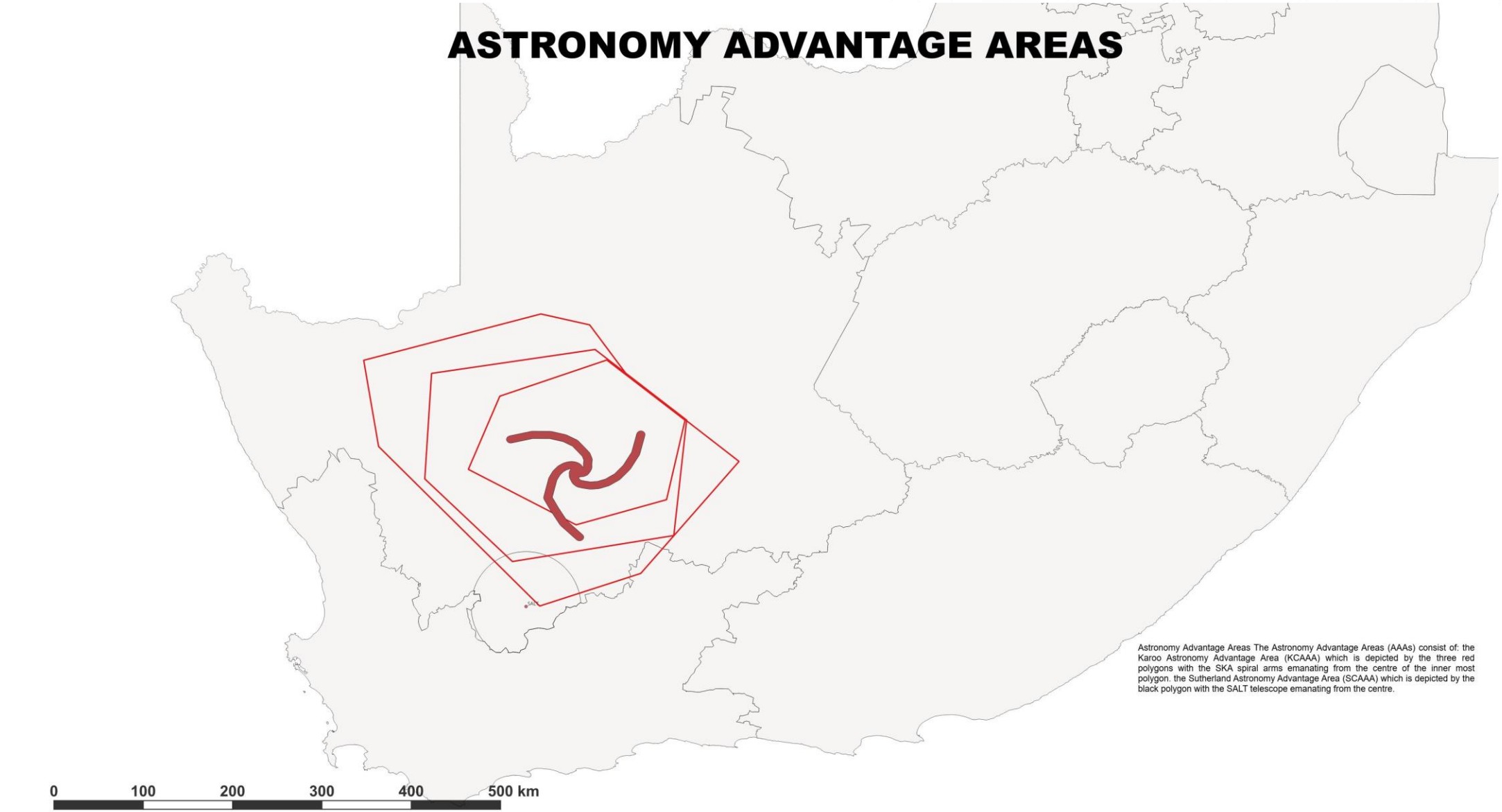
Karoo Central Astronomy Advantage Area (KCAAA): MeerKAT/SKA Area

- Regulations published in the Government Gazette No.41321 under Notice No. 1411 on 15 December 2017
- Amended in 2024 redefine the protection corridors.
- Prohibits and restricts the use of certain radio frequencies and transmissions within the KCAAA.
- Applies to any activity that could cause radio interference, including mobile networks, broadcasting, and certain wireless technologies.
- Regulates electrical activities that could emit electromagnetic noise, such as power lines, transformers, and industrial equipment.
- 1367 permit applications received to date, with 1200 permits issued.

Sutherland Central Astronomy Advantage Area (SCAAA): SALT Telescope Area

- Regulations published in the Gazette No.42492 under Notice No. 805 and 806, 29 May 2019
- Protection against light and dust pollution to establish Dark Skies for Optical Telescopes

NATIONAL EFFORT CONT……



INTERNATIONAL EFFORTS

- South Africa is a member state of the ITU, represented by the DCDT as the lead department.
- DSTI represents South Africa's science and innovation policy interests, ensuring that astronomy infrastructure is protected within international regulatory frameworks.
- As the operator of MeerKAT and the South African component of the SKA, SARAO provides the **technical expertise** and data to support DSTI's policy positions at ITU forums.
- South Africa, through DSTI and SARAO, successfully advanced a **proposal on the protection of Radio Quiet Zones**.
- Resolution 681, adopted at WRC-23, is the product of two (2) major regions (European Administration and African Administration).
- The proposal addressed the **impact of Low Earth Orbit (LEO) satellite constellations** on radio astronomy, leading to the adoption of studies on coexistence measures
- This matter is now being discussed as Agenda Item 1.16 for WRC-27 at Working Party 7D.

What Worked for South Africa

- **Legislative backbone**: AGA Act enabled enforceable protection of Astronomy Advantage Areas
- **Designated zones**: KCAAA and SCAAA regulations created clear boundaries for science and industry
- **Interdepartmental MOUs**: Enabled alignment across infrastructure, energy, and telecom sectors
- **Stakeholder outreach**: Early engagement built trust and reduced regulatory conflict
- **Science diplomacy**: Strategic participation in International forums elevated South Africa's global voice
- **Institutional leadership**: AMA provided consistent, coordinated implementation of the AGA Act

KEY LESSON LEARNED

- **Stakeholder Engagement -** Early, structured consultation with telecoms, municipalities, and landowners is essential to avoid conflict
- **Permit Processing Requires Streamlined Systems -** The 30–60-day permit turnaround targets were sometimes difficult to achieve. A centralized digital permit system with automated tracking and stakeholder alerts improved efficiency and transparency.
- **Regulatory Clarity Is Essential -** Early versions of the KCAAA and SCAAA regulations and public consultations gave stakeholder opportunities to submit written and oral representation. Regulations must be clear, accessible, and adaptable to evolving scientific and infrastructural realities.
- **Interdepartmental Agreements Accelerate Implementation -** MOAs and MOUs with DOT, DOD, and SAPS helped align infrastructure planning with astronomy protection goals. Formalized interdepartmental agreements are vital for cross-sectoral integration and regulatory coherence.
- **Technical Capacity Is a Shared Responsibility -** Industry partners often lacked awareness of spectrum interference risks or mitigation techniques. Joint technical workshops and shared modeling tools foster mutual understanding and practical solutions.
- **International Forums Enhance Strategic Positioning -** Participation in International forums elevated South Africa's voice in global spectrum and satellite governance. Science diplomacy is a strategic asset—it must be resourced and embedded in AMA's core functions.

CONCLUSION

- Protecting our skies is a shared responsibility between science, policy, and industry
- Regulatory clarity, stakeholder trust, and technical capacity are the pillars of effective governance
- South Africa’s leadership in science diplomacy positions us to shape global norms on satellite coexistence
- Dark and Quiet Skies are not just scientific assets—they are developmental opportunities

Dankie
Enkosi
Ha khensa
Re a leboga
Ro livhuwa
Siyabonga
Siyathokoza
Thank you

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