



Evaluation of Alternative Telecommunication Technologies for the Karoo Central Astronomy Advantage Area

Presentation to the Portfolio Committee on
Higher Education, Science and Technology

2 February 2022



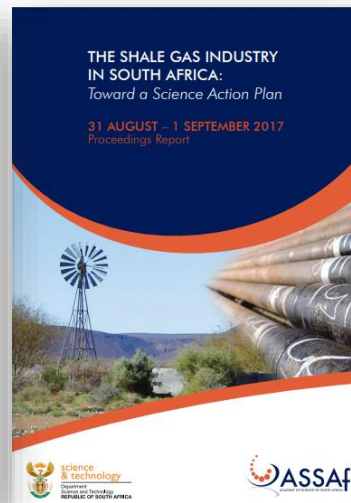
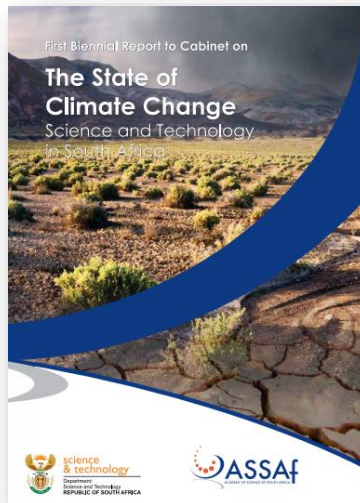
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ASSAf MANDATE

To honour distinguished scholars through election to membership of the Academy



To offer evidence-based science advice to government and other stakeholders



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VALUE OF ACADEMY ADVICE

“Supreme court of science” or “brains trust of the nation”

Independent

Authoritative,
trusted,
credible

Objective

Rigorous
analysis of
evidence &
peer review

Transparent

Multidisciplinary

Volunteerism

Locally based

Expert
knowledge



STUDY OVERVIEW

Consensus Study Methodology

- Commissioned by NRF on behalf of **SARAO**;
- **Initiated** May 2019, **concluded** October 2020, **approved** by ASSAf Council May 2021; **published** August 2021;
- Undertaken by a **panel** of seven experts;
- Report compilation, including findings and recommendations, **agreed upon by consensus**;
- **Peer-reviewed** by three experts.



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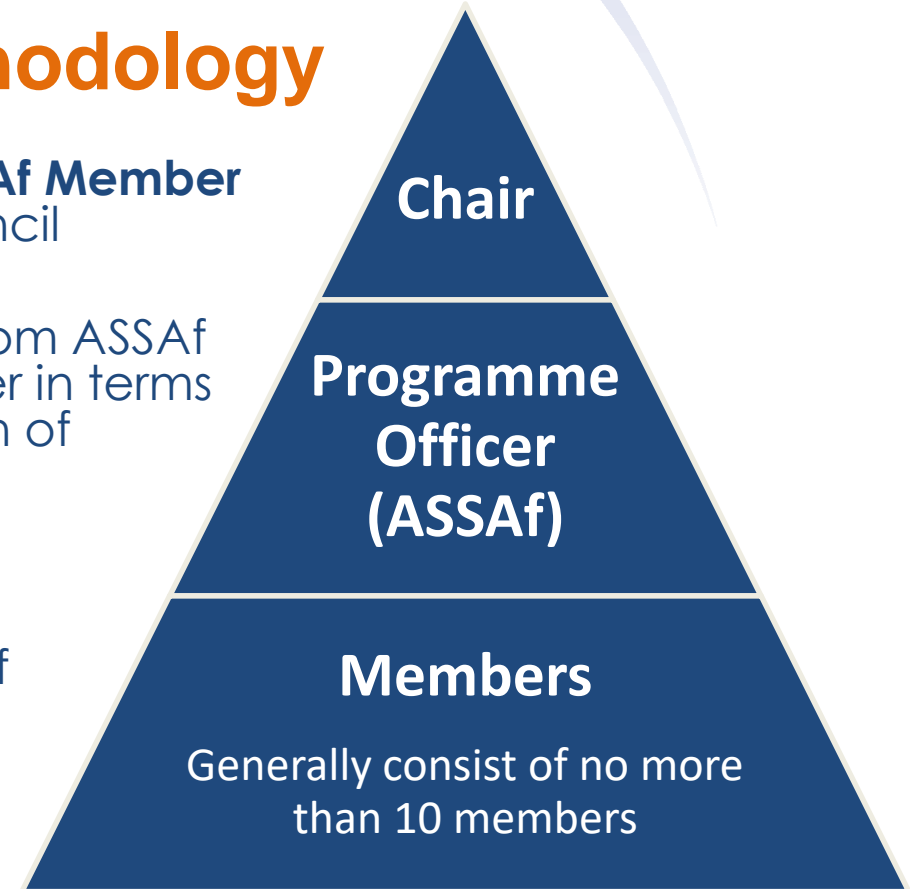
STUDY OVERVIEW

Consensus Study Methodology

Chaired by an **ASSAf Member** appointed by Council

Supported by **Programme Officer** from ASSAf staff who reports to Executive Officer in terms of study logistics and the production of report/s

Members appointed on basis of **expertise** – ensuring a balance of perspectives, gender and race and absence (or clearly defined and admitted in advance of the study) of a conflict of interest



All members serve in their individual capacities and are free to exercise their judgement



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STUDY OVERVIEW

Panel

Name	Affiliation	Background
Prof Francesco Petruccione (CHAIR)	UKZN	Theoretical physics (MASSAf)
Dr Michael Gastrow	HSRC	Innovation, skills development, and the public relationship with science
Dr Senka Hadzic	UCT	Electronics and telecommunications; expanding access or improve network performance on poorly connected or rural areas
Mr Carl Kies	Reutech	Radar systems (SAAE)
Prof Justine Limpitlaw	Wits	Communications law
Prof Babu Paul	UJ	Mobile Communication, vehicular communication
Prof Riaan Wolhuter	SU	Radio communications analysis and systems design



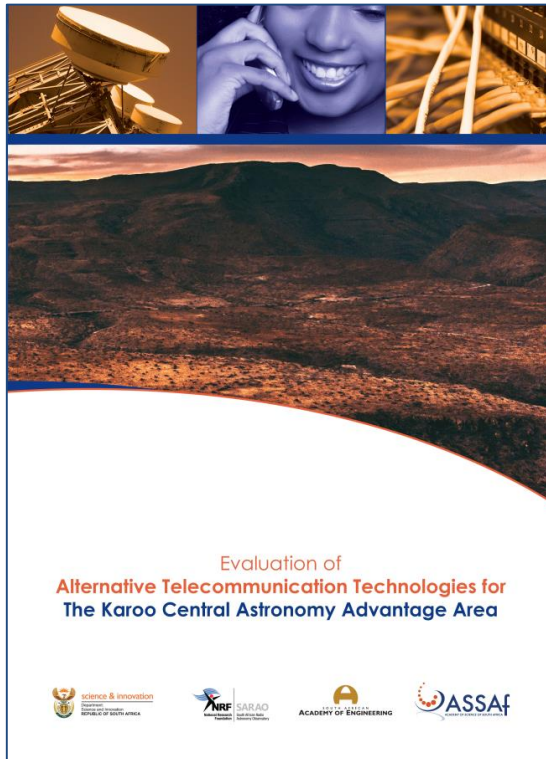
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STUDY OVERVIEW

Objectives



1. Assess the technologies **currently being, or planning to be, deployed** through existing alternative communications programs managed by SARAO, including whether these technologies are comparable with market available technologies that could feasibly be deployed in the KCAAA;
2. Assessment of **current and future telecommunication technologies that may act as suitable replacement and/or improvement** (functional and feasible) for existing detrimental technologies, utilised in the KCAAA



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STUDY OVERVIEW

Investigations

1. Establishment of the timelines of the SKA arrival in South Africa
2. Socio-economic assessment, with a specific focus on telecommunications of the study area
3. Technical assessment of the potential for RFI of various telecommunication technologies
4. Technical assessment of potential wide area telecommunication technologies and solutions



STUDY REPORT

Report Outline

1. Introduction
 2. Legislative Framework
 3. The SKA, ICT access, and social dynamics in the Karoo area
 4. Alternative Telecommunication Technologies
 5. Conclusions and Recommendations
- *Table of Contents*
 - *Figures/Tables/Units/Acronyms*
 - *Executive summary (including an Afrikaans version)*
 - *References*
 - *Appendices*



STUDY REPORT

Legislative Framework

- Astronomy Geographic Advantage Areas Act and related regulations
- Report by Prof Kobus Van Rooyen (“Declaration of Central Astronomy Advantage Areas”, 2013)
- Independent Communications Authority of South Africa (ICASA) Act (2000)
- Electronic Communications Act (2005)



STUDY REPORT

ICT Access and Social Dynamics

Context:

- In terms of ICT access, the local context is that of an underserved area, as defined by ICASA. The socio-economic context is one of severe poverty, inequality, and unemployment, together with slow rates of transformation.

Findings:

- Uncertainty about access to universal ICT services, and in some instances the curtailment of services, negatively impacts local communities, both socially and economically.
- Inconsistent messaging and limited public engagement have undermined the trust of some local communities.
- Civil society opposition to the SKA project, including its ICT impact, has emerged, posing a risk to the SKA's social contract in the Karoo.



STUDY REPORT

ICT Access and Social Dynamics

Recommendations:

- A fully-fledged **communication and engagement strategy** for ICT interventions in the Karoo must be developed
- Engagement processes must be **open and inclusive** throughout
- All messaging must be **valid and consistent**
- There is a need to more closely co-ordinate with the NRF and the DSI to **align messaging**, particularly in the political arena
- Previous failures to meet valid expectations and communicate consistently must be **surfaced, acknowledged, and remedied**
- SARAo should **reflect on its organisational culture**, and build closer partnerships between the natural and social sciences to better address the social challenges associated with scientific infrastructure.



STUDY REPORT

Alternative Telecommunication Technologies

- Technology solutions must be:
 - feasible
 - desirable
 - viable
- Technology strategy must address:
 - voice and data communication
 - safety and emergency (mobile) communication
- Three overarching requirements of local ICT users:
 1. Convenient and affordable data access at residences and immediate surroundings, for farm owners and workers
 2. Mobile phone coverage wherever possible
 3. Personal wide-area voice communications for emergency and safety



STUDY REPORT

Alternative Telecommunication Technologies

Findings:

- A **hybrid fibre-wireless solution** which could be set up according to relevant specifications of power, radiated power and distance
- Conventional cell based mobile coverage is ideal, but problematic in terms of RFI except in a few specific locations
- **Data access via microwave and fibre connectivity** (Option A) is technically excellent, but will be very expensive to install and maintain
- **VSAT data connectivity** (Option B) is a feasible and economical option
- It is possible to have a **combination of Options A and B**
- A **VHF Low Band DMR emergency communications network** is feasible and could be implemented to provide good coverage over a sufficiently wide area



STUDY REPORT

Alternative Telecommunication Technologies

Recommendations:

1. Internet connectivity be provided to **all priority farms/user locations**, by means of **VSAT** in the short term at least
2. A **subsidy model be investigated** for the installation and data cost
3. The proposed **VHF Low Band DMR emergency communications network** should be implemented as a priority – **already initiated**
4. As for VSAT, a **subsidy model be investigated** for obtaining the radios, system operations and maintenance



STUDY REPORT

Alternative Telecommunication Technologies

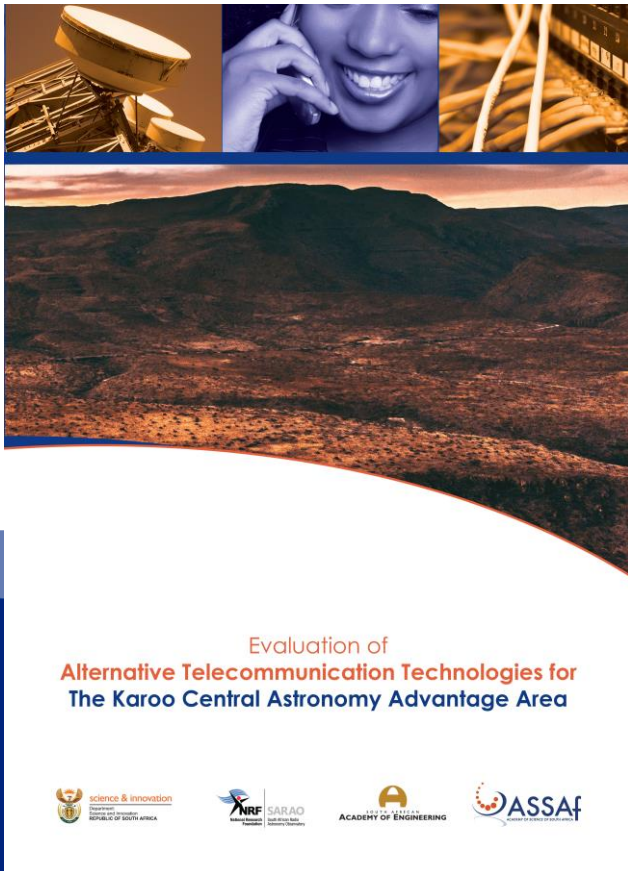
Recommendations (cont.):

5. An '**Operational, Management and Control Centre**' be established for safety and operational reasons, and for network monitoring and management.
6. A Section 21 company (e.g. public-private-partnership) be formed to **oversee and undertake monitoring, admin and maintenance of these networks**
7. That SARA0 be approached for financing of the infrastructure as recommended





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