



Investment in Space in South Africa and the

October-November 2022

PRESENTER: P Maruping



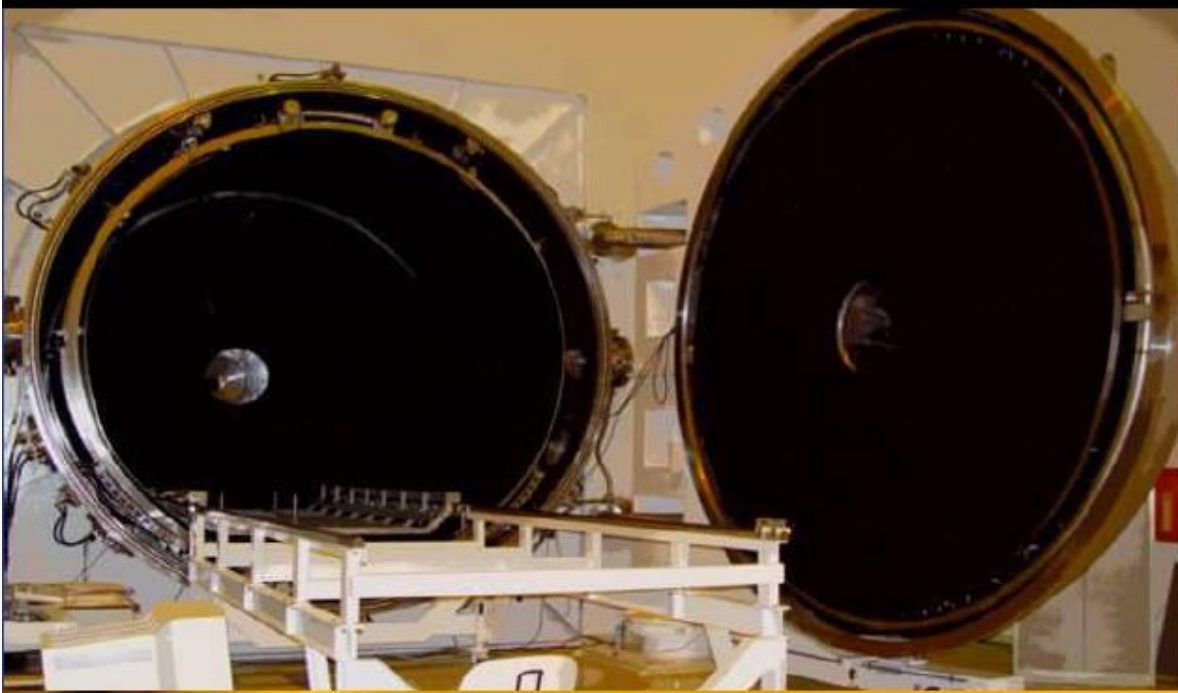
Sumbandila Experience

Small satellite with a big
mission

Where did it all start?

Date	Events
1820	Royal observatory opened
1961	Deep Space Station 51 built in Hartebeeshoek by NASA to track deep space probes
1950s -1970s	Satellites tracked by scientists upper atmospheric effects on orbits
1965	First images of Mars received at Hartebeeshoek
1968-1981	South Africa ratifies space treaty and signs conventions
1975	Deep Space Station converted to Hartebeeshoek radio astronomy observatory
1980s - 1994	Program to build and launch reconnaissance satellites is implemented
1993-94	Space Affairs Act passed and amended
1999	Sunsat satellite launched
2008	SANSA Act passed
2009	Sumbandila launched

Where did it all start?



Project objectives

- Develop an 80 Kg satellite
- Launch
- Train engineers

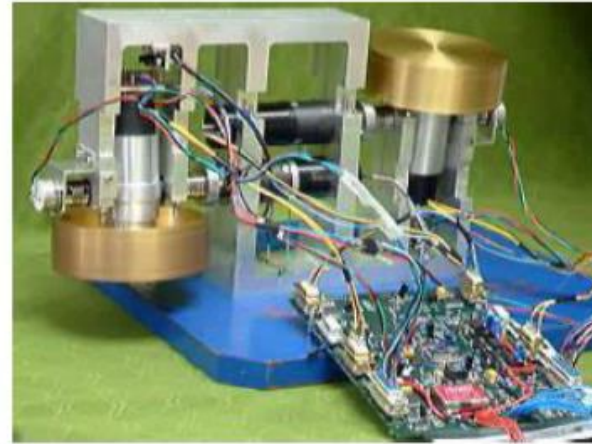
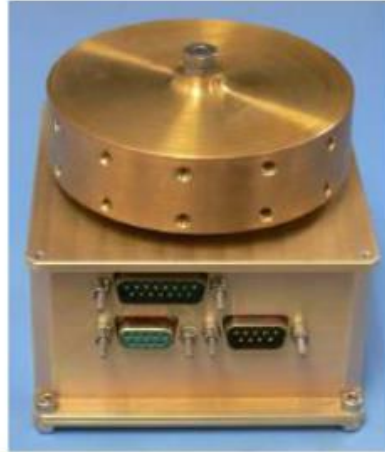
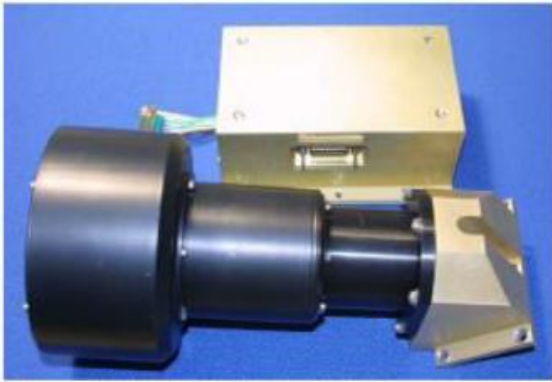
What was delivered?



Cape Town, 20/2/2010, Sumbandilasat, False colour RGB, Roll angle = 19°

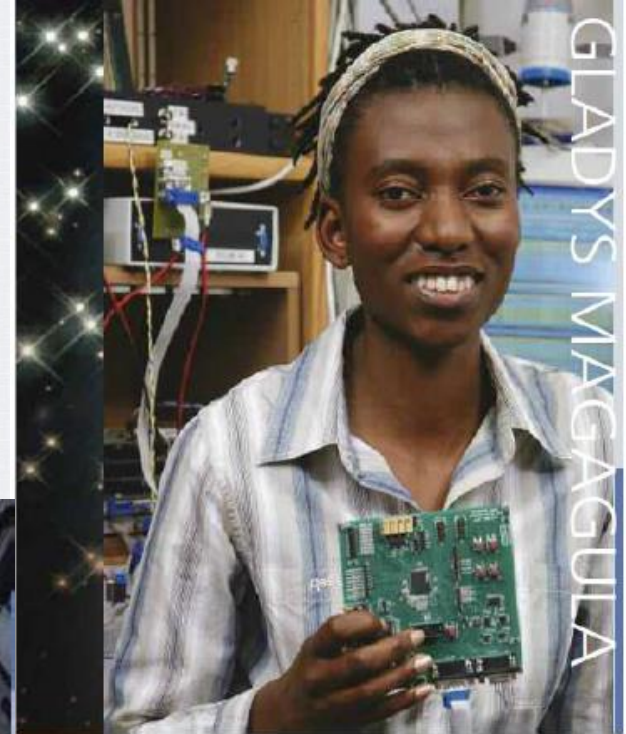


And....



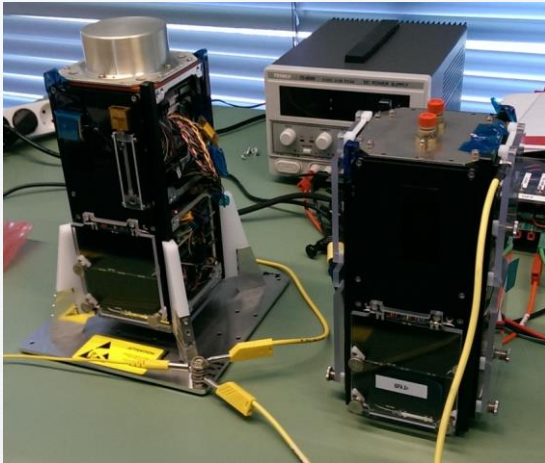
And.....

- Trainee engineers
- 19 plus Masters
- 3 plus PhD
- Experience for 78 engineers
- SPACE LEGACY



Capacity and Industry growth

- TshepisoSAT launched in 2013
- 2 cube sats as part of QB50 mission in 2017
 - Supplied 15 ADCS supplied to other teams
- More than 97 satellite engineering post grads
- Multiple spin offs



CubeSat S-Band Transmitter

Part number: **CS-CPUT-STX-01**

Cost: **£10,000.00**

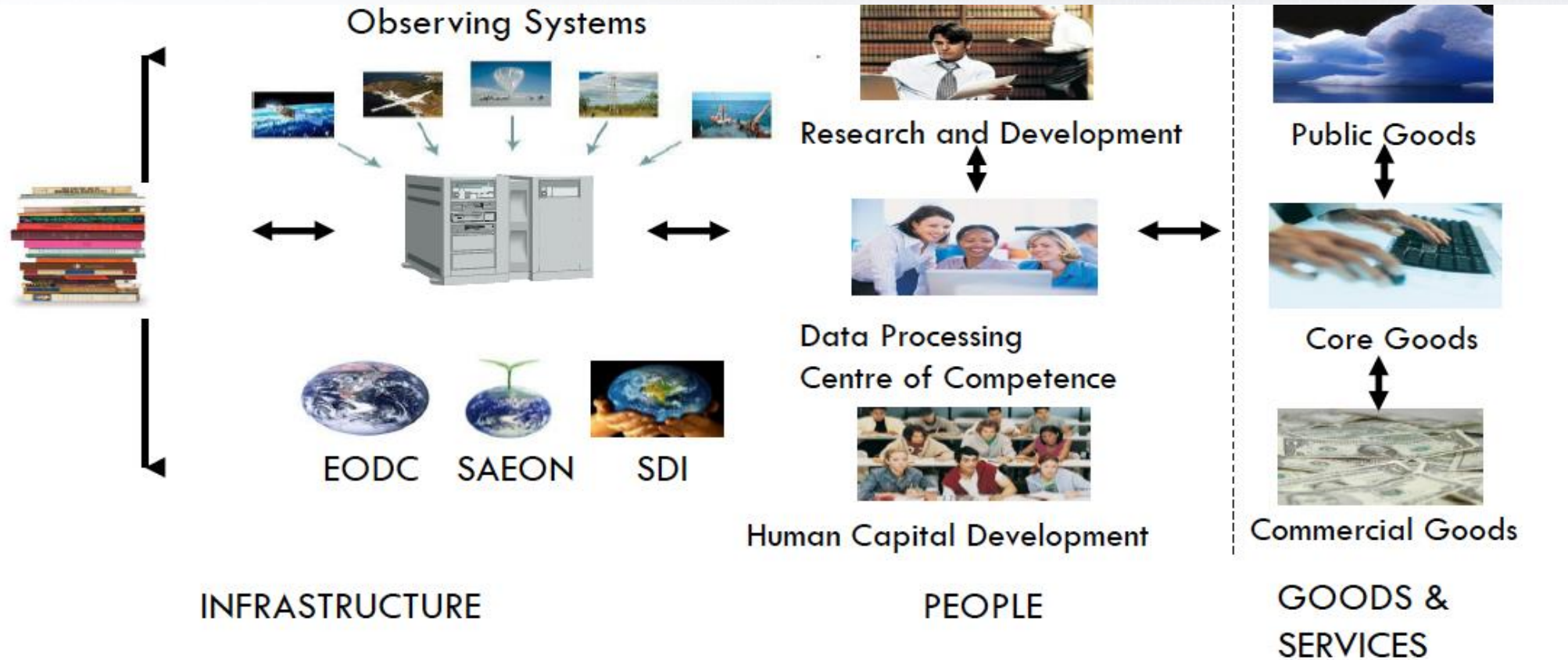
The STX is a compact S-Band Transmitter designed for CubeSat missions. It is compatible with the CubeSat standard, with a CubeSat Kit PC104 form factor. The STX implements QPSK modulation with transmission data rates of up to 2 Mbps.

The STX is ideal for space missions where a high data-rate downlink is needed. The STX uses an open network encoding scheme based on the IntelSAT IESS-308 specification which makes this product compatible with low-cost commercial receivers.



ZOOM

More upstream and downstream activities...



SKA experience

Big ambition and even bigger
mission

Where it all started – building astronomy

- Optical Astronomy as the front runner
 - ❑ SAAO with smaller telescopes and investments in Sutherland - 200 yrs anniversary in 2020
 - ❑ SALT with significant investment (R300m) and bigger impact - 15 yrs
- Radio Astronomy
 - ❑ HartRAO dish donated by NASA - 50 yrs old
 - ❑ KAT7, MeerKAT and SKA and AVN - huge investment and huge impact (R4,7bn to date) - 10-15 years
- Gamma Ray Astronomy - Participation in HESS telescope in Namibia – 10-15 years
- Multiwavelength Astronomy Strategy approved in 2016

Why?

- **Geographic natural advantage** - dark and clear skies in the Karoo, radio silence in Carnarvon and AGA Act (2007) to protect astronomy sites.
- **Scientific returns** - growth in scientific outputs, global rankings in astronomy grew from 33 to 21.
- **Technological returns** - revived Printed Circuit Boards (PCB) manufacturing industry with the development of SKARAB, developed digitizer technology that is expected to last for 30 year in the Karoo environment.
- **HCD and skills development** - 1161 grants/bursaries awarded, 700 additional grants to be awarded in the next 10years, an SKA Artisan Training Centre established in Klerefontein has already produced a number of artisans.
- **Socio-economic returns** - 75% of MeerKAT components sourced locally, more than R110 million spent on local SMMEs, 7284 jobs created to-date

Some key indicators to consider

Strategic Objective	Scientific impact	Technological impact	Training and education impact	Economic impact	Societal impact
1. Be a scientific leading RI and enabling facility to support science	<ul style="list-style-type: none"> • # of citations • # of publications • # of project • # of users • # of collaborations 				
2. Be an enabling facility to support innovation		<ul style="list-style-type: none"> • Patents with commercial use • Innovations codeveloped with industry • Collaborative projects with industry partners 		<ul style="list-style-type: none"> • Foreign income • Increase in 	
3. Be the hub to facilitate international collaboration	Papers co-authored with local and international universities	Local and international firms using or collaborating with the RI facility		# of full time equivalent within RI # of local and international suppliers	
4. Promote education, outreach and knowledge dissemination			Students trained Educational outreach		Public visibility of RI Knowledge sharing
5. Social responsibility				<ul style="list-style-type: none"> • Spend in local area • Training of SMMEs • Local procurement 	<ul style="list-style-type: none"> • CSI • Housing and essential services

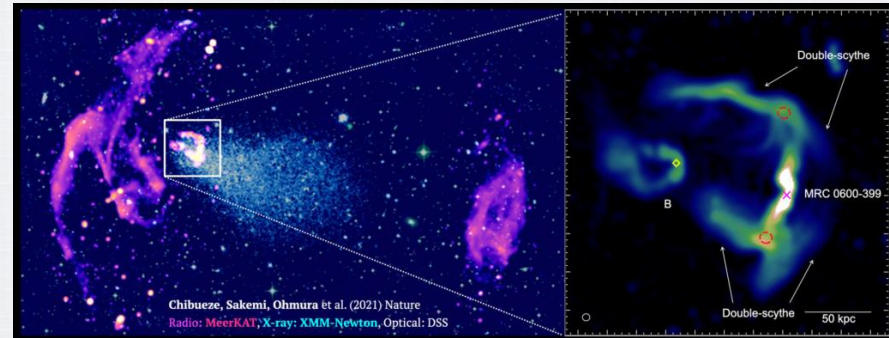
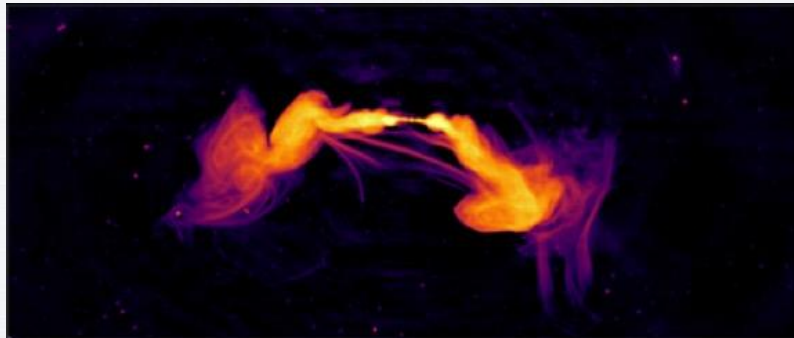
What was delivered?



MeerKAT (64-dish SKA precursor)

Research outputs

- Science started 3 years ago
 - ✓ 139 [refereed articles published containing MeerKAT data](#) from 58 different projects
 - ✓ 9 [data releases](#) for wider unrestricted scientific exploration
 - ✓ 16,500 hours of [science observations](#) done to date, for nearly 250 different projects
 - ✓ 21 [press releases](#) (most with very pretty images)
 - ✓ Global ranking in astronomy increased from 33 to 21
 - ✓ Size of astronomy community tripled over 15 yrs from 60 PhD astronomers to over 200 and growing

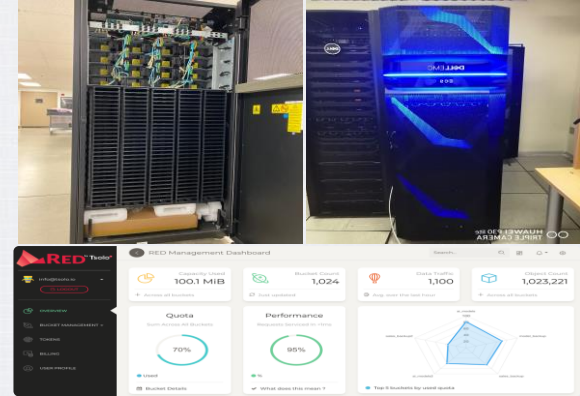


Technology development and enabling innovation

National Ventilator Project



Compute and storage



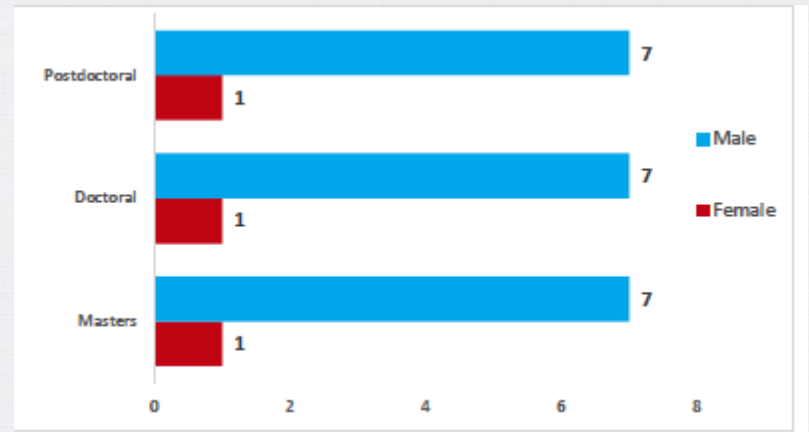
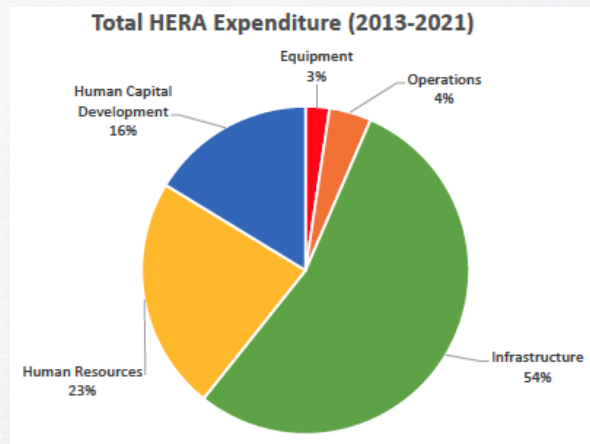
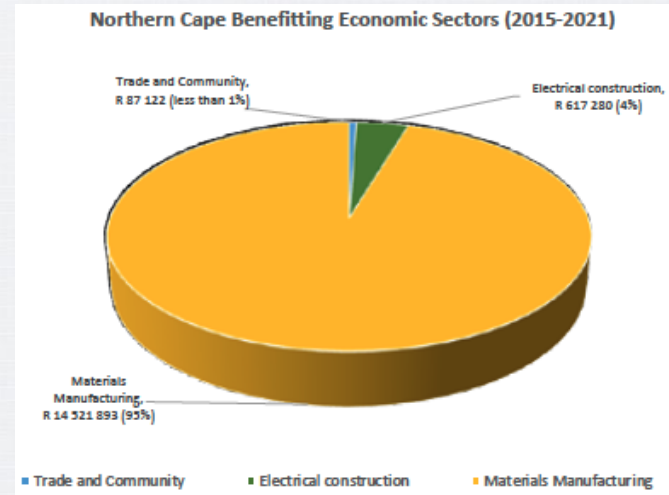
Digitiser



COMRAD



Collaboration



SKAO contracts for South Africa

Contract	Entity	Value [M Euros]	Invoiced to Date [M Euros]	Cash/In-Kind	Comments
Placed					
Software Development (SDH&P)	SARAO	8.9	0.16	In-Kind	Excl. Jan-Feb
Software Development (SDH&P)	Vivo	2	0	Cash	
Infrastructure Professional Services	SARAO	2.2	0.2		
Infrastructure Professional Services	Zutari	4.4	Unknown		Contract value to Zutari is estimated
Currently In Procurement Pipeline [Values are Estimates]					
AIV	SARAO	13.5			
	Portugal Space	2.3			
Infrastructure (Civils and Radio Network)	To be confirmed	84.8			Minimum 10% Civils Contract Value (~R1bn) to be placed with local SMMEs and emerging contractors
Future Expected Opportunities					
MeerKAT Integration	SARAO	3.4			
Digitisation	SARAO	0.3			
Dish Structure Professional Services	SARAO	14.9			
Dish Receivers and Services	Industry	18.7			
Estimated Total		155.4			

Human Capital Development

- Six astronomy research chairs
- More than 1000 bursaries awarded
- Internships
- Trade skills training
- High-school STEM support
 - ✓ STEM teachers
 - ✓ Bursaries – more than 180 learners
 - ✓ Robotics...

2018 SARAO Postgraduate Scholarship Conference



Social capital

- CSI – grants for social projects such as sports clubs a
- SMME training and support
- Housing development
- Support to municipality
- Tourism potential

KAROO SMMES

[Home](#)[Training](#)[SMMEs](#)[Contact](#)



SKA KAROO Enterprise Development

The SARAO Enterprise Development Programme is an initiative by the [South African Radio Astronomy Observatory](#) to empower local SMMEs situated in *Carnarvon, Van Wyksvlei, Williston and Brandvlei* with the required skillset to manage sustainable business ventures that can create jobs and impact the local economy.

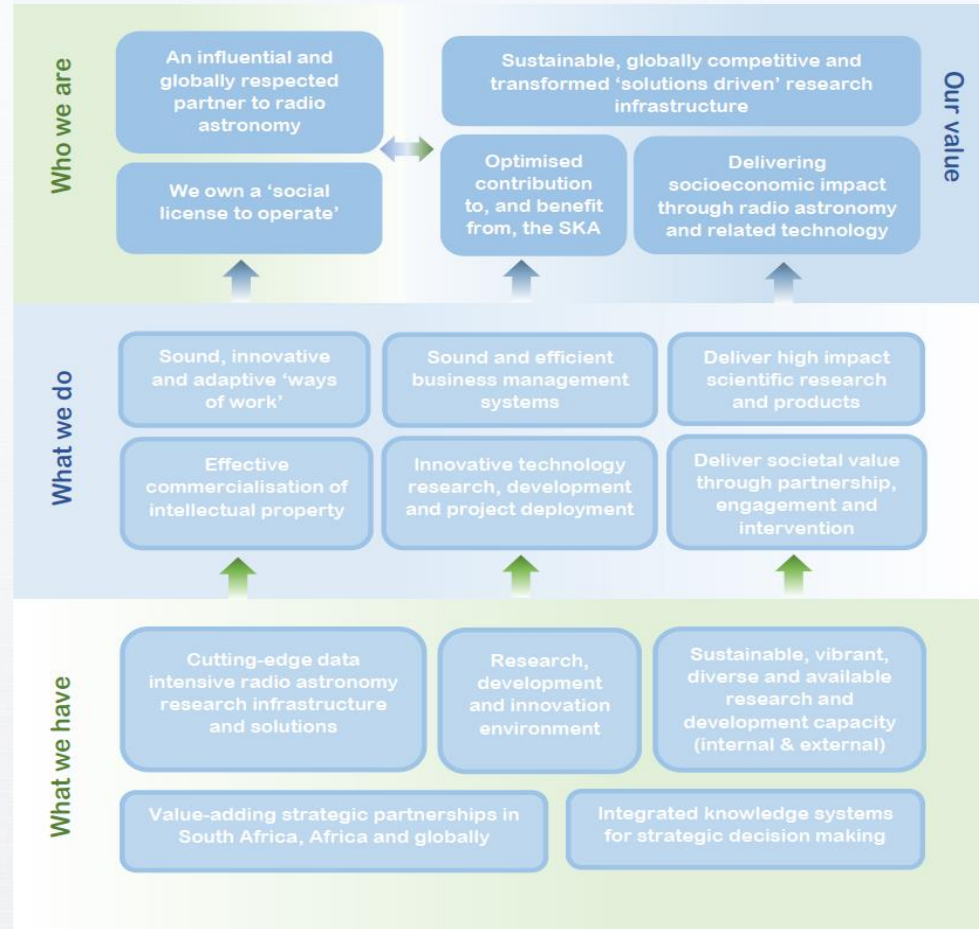
[Find Out More](#)

NORTHERN CAPE
SMME TRUST
2016 Development Finance Institute of Excellence

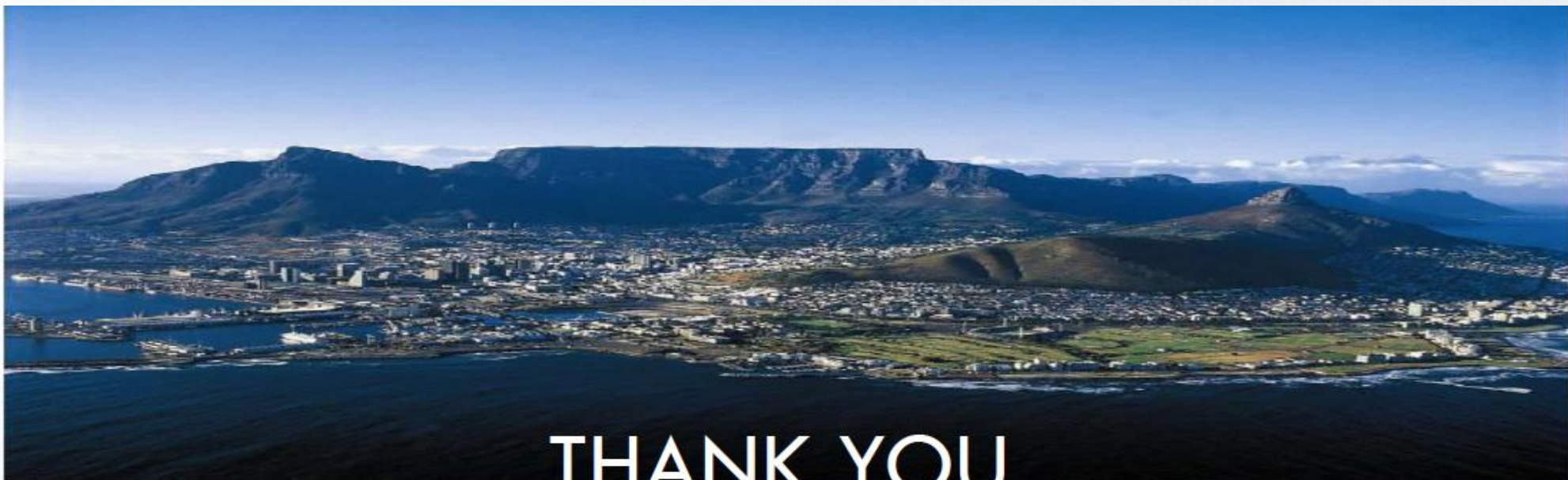
NRF
National Research Foundation

SARAO
South African Radio Astronomy Observatory

What would it take?



Underpinned by a critical mass of highly skilled teams in key strategic areas



THANK YOU

