

SKAO

Big Science
Business
Forum
2022

SKA Observatory

BSBF 2022

Philip Diamond, Director-General

5 October 2022

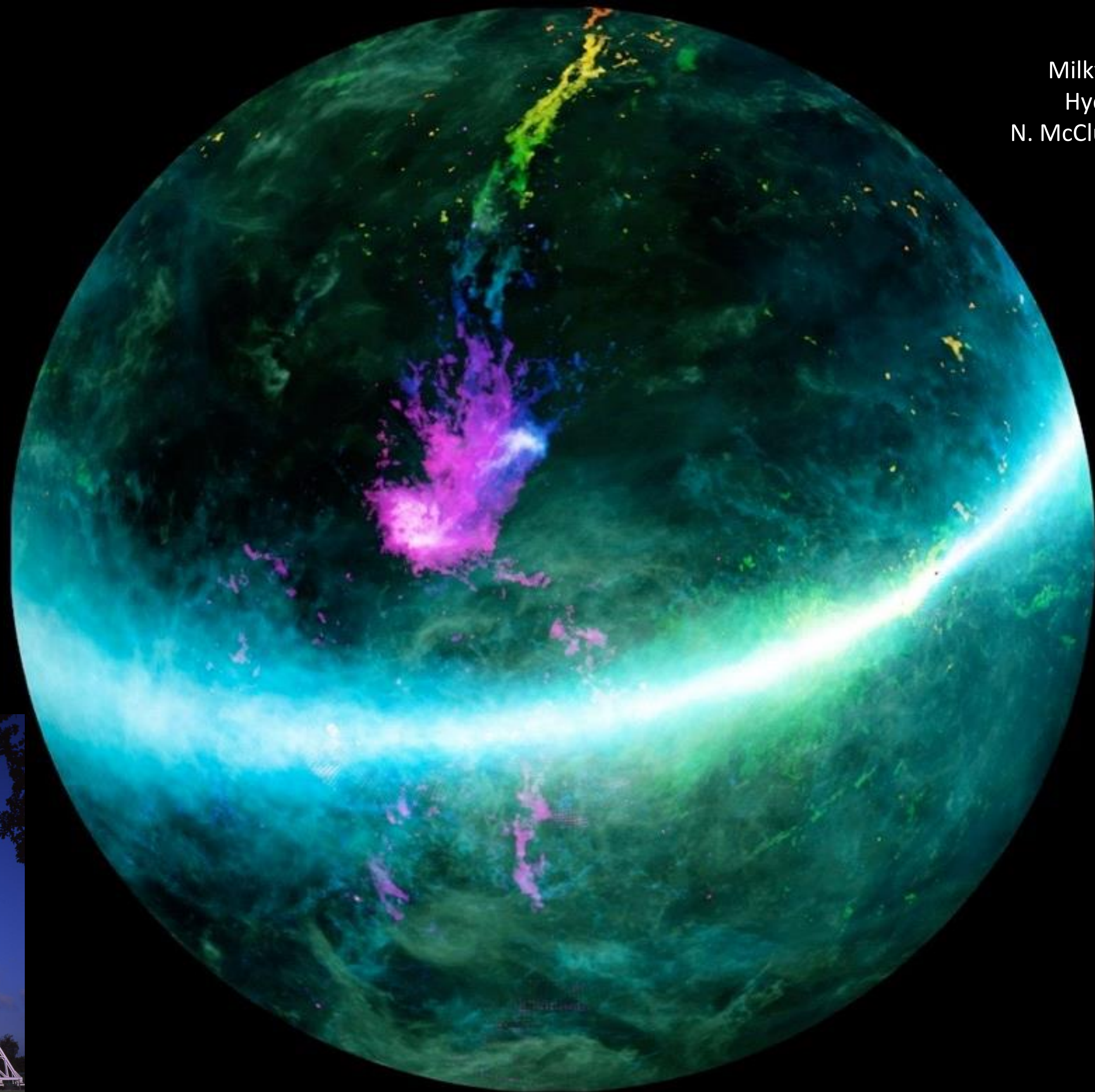


Milky Way in
Optical
Axel Mellinger



Milky Way in
Optical
Axel Mellinger

Milky Way in
Hydrogen
N. McClure-Griffiths



Who are we?

The Square Kilometre Array Observatory (SKAO)

An inter-governmental organization, governed by a treaty. SKAO was born on 4th February 2021.

Full membership

Australia, China, Italy, Netherlands,
Portugal, South Africa, Switzerland, UK

Accession stage

France, Spain

Membership negotiations

Germany

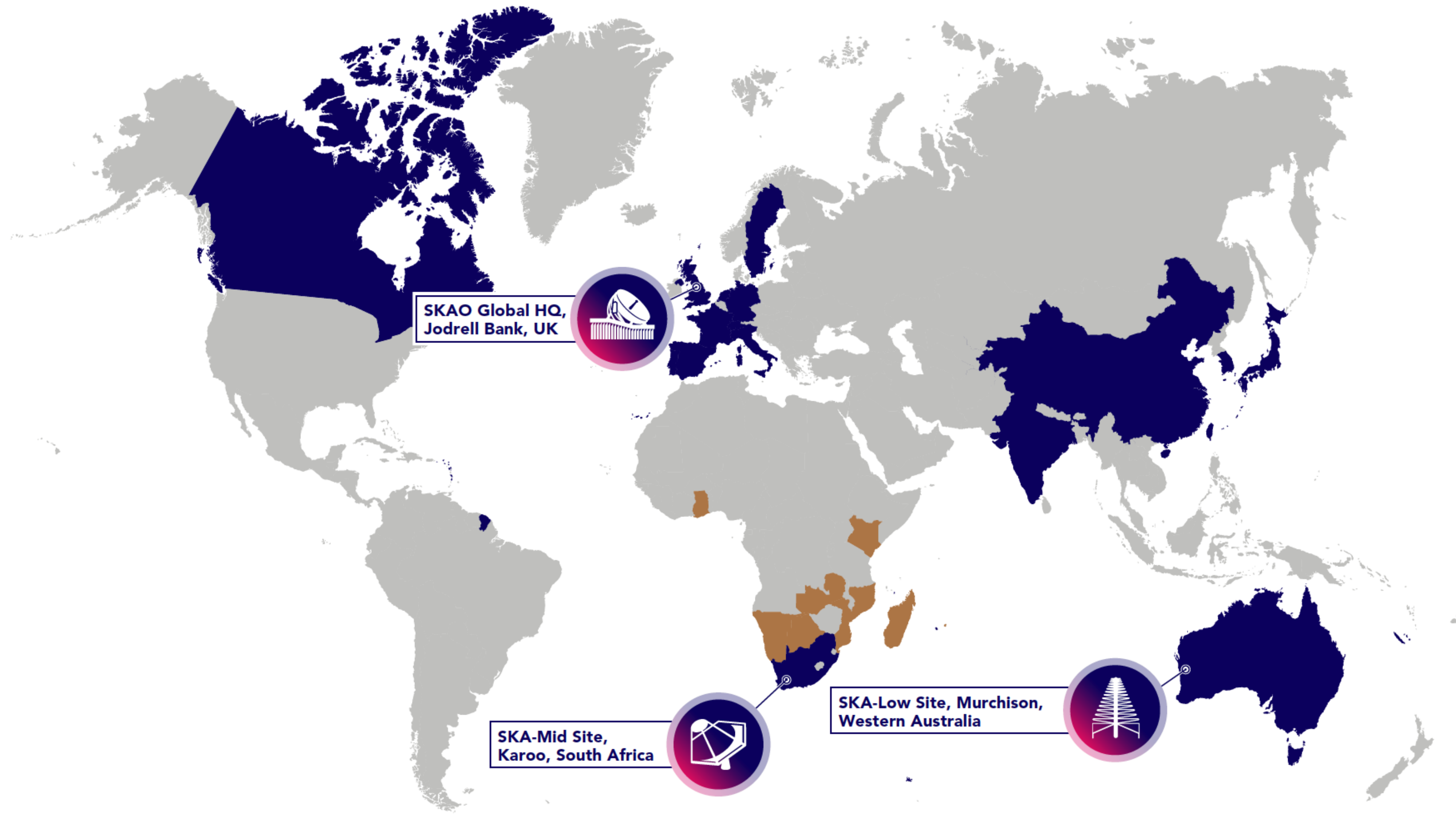
Interim agreements

Canada, India, Sweden

Early stages

Japan, South Korea





SKAO Partnership - includes SKAO Member States* and SKAO Observers (as of June 2022)



African Partner Countries



What are we building? One Observatory, Two Telescopes, Three Sites

SKA-HQ

Jodrell Bank, UK



SKA-Mid

THE SKA'S MID-FREQUENCY TELESCOPE



LOCATION:
SOUTH AFRICA



197 DISHES
(INCLUDING 64 MEERKAT DISHES)

FREQUENCY RANGE:

**350 MHz–
15.4 GHz**

WITH A GOAL OF 24 GHz



MAXIMUM BASELINE:

150km

SKA-Low

THE SKA'S LOW-FREQUENCY TELESCOPE



LOCATION:
AUSTRALIA



**131,072
ANTENNAS**
SPREAD ACROSS 512 STATIONS

FREQUENCY RANGE:

**50 MHz–
350 MHz**



MAXIMUM BASELINE:

~65km

Sites selected for their radio quietness → low population density

Total project cost: ~€2.1B; operational in 2029/2030



The SKA project in numbers

€1.3
BILLION

CONSTRUCTION
COST (2021 €)

131,072
ANTENNAS

IN WESTERN AUSTRALIA

710
PETABYTES

OF SCIENCE DATA DELIVERED
TO SCIENCE USERS

€0.7
BILLION

FIRST 10 YEARS
OF OPERATIONS
COST (2021 €)

197
DISHES

IN SOUTH AFRICA
(INCLUDING 64
MEERKAT DISHES)

1 GLOBAL
NETWORK

OF DATA CENTRES TO DELIVER
SCIENCE-READY DATA PRODUCTS
TO END-USERS

8
YEARS

TO CONSTRUCT

16
COUNTRIES

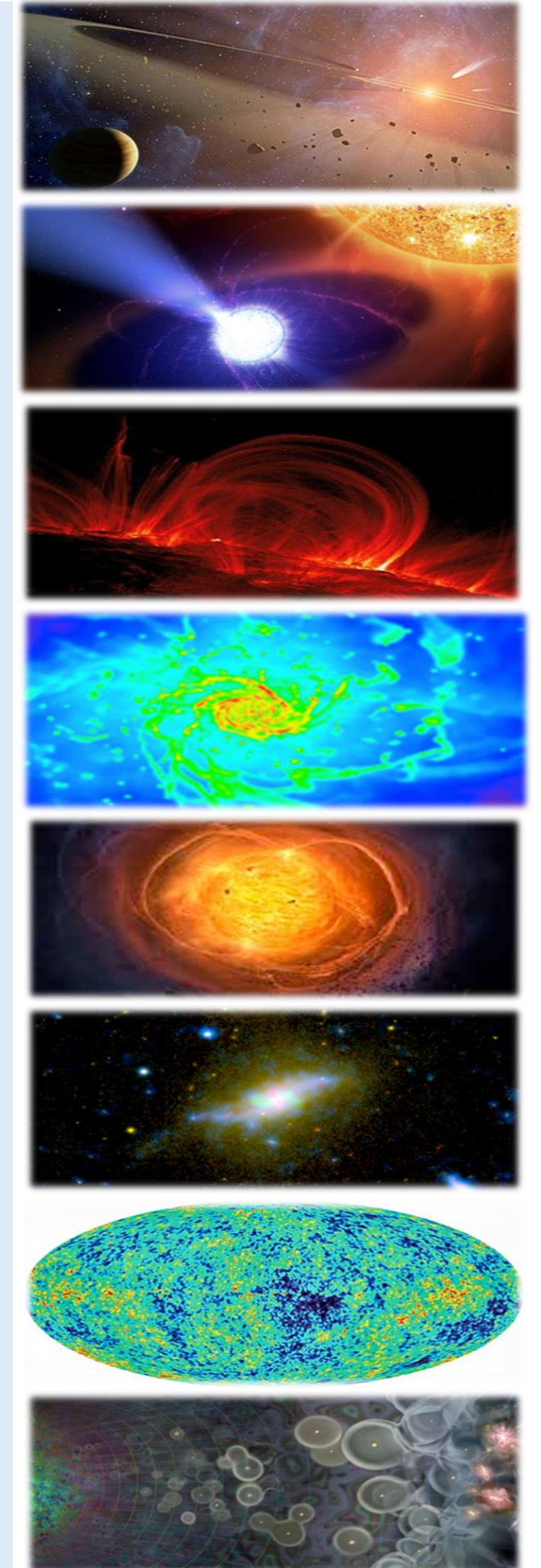
PARTICIPATING IN 2021

50+
YEARS

OF TRANSFORMATIONAL SCIENCE

Some of the big SKA Science questions

- **The Cradle of Life & Astrobiology**
 - *How do planets form? Are we alone?*
- **Strong-field Tests of Gravity with Pulsars and Black Holes**
 - *Was Einstein right with General Relativity?*
- **The Origin and Evolution of Cosmic Magnetism**
 - *What is the role of magnetism in galaxy evolution and the structure of the cosmic web?*
- **Galaxy Evolution probed by Neutral Hydrogen**
 - *How do normal galaxies form and grow?*
- **The Transient Radio Sky**
 - *What are Fast Radio Bursts and how can we best utilise them? What haven't we discovered?*
- **Galaxy Evolution probed in the Radio Continuum**
 - *What is the star-formation history of normal galaxies?*
- **Cosmology & Dark Energy**
 - *What is dark matter? What is the large-scale structure of the Universe?*
- **Cosmic Dawn and the Epoch of Reionization**
 - *How and when did the first stars and galaxies form?*



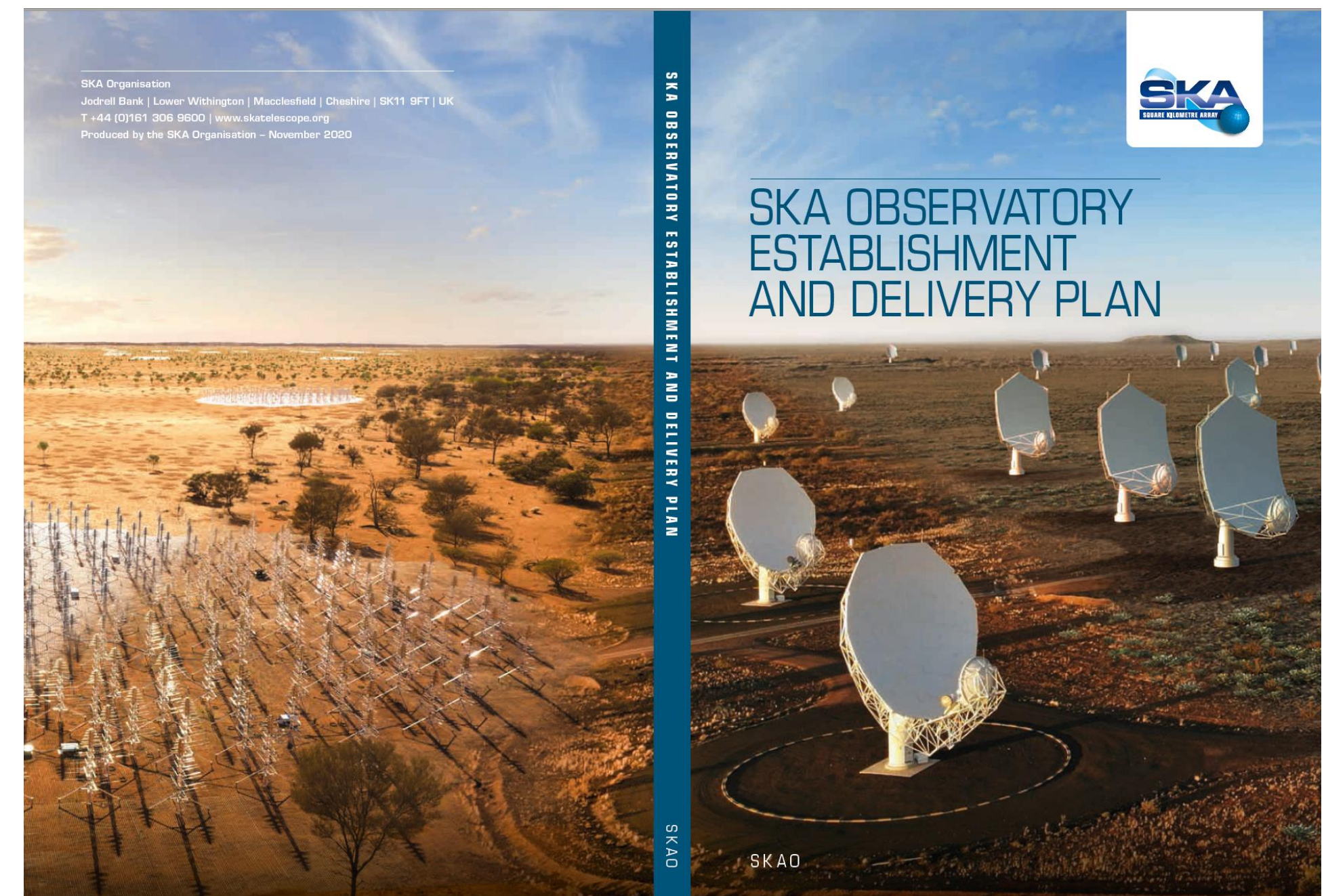
Delivering SKA Observatory

Feb 2021: SKAO born

June 2021: SKAO Council approved the Construction Proposal and the SKAO Establishment and Delivery Plan

July 2021: Construction activities began

Sept 2022: 46 contracts awarded, total cost ~€216M; more major contracts being prepared



Construction Strategy

- Target: the SKA Baseline Design (197 Mid dishes; 512 Low stations: AA4)
- Not all funding yet secured, therefore follow Staged Delivery Plan (AA*)
- First Milestone: Develop the earliest possible working demonstration of the architecture and supply chain (AA0.5).
- Then maintain a continuously working and expanding facility until achieve the baseline design.

Milestone Event	SKA-Mid (date)	SKA-Low (date)
AA0.5	2024 Jul	2024 May
AA1	2025 Sep	2025 May
AA2	2026 Jul	2026 Jul
AA*	2027 Jun	2027 Aug
Operations Readiness Review	2027 Aug	2027 Oct
End of Construction	2028 Jul	2028 Jul



Recent Progress



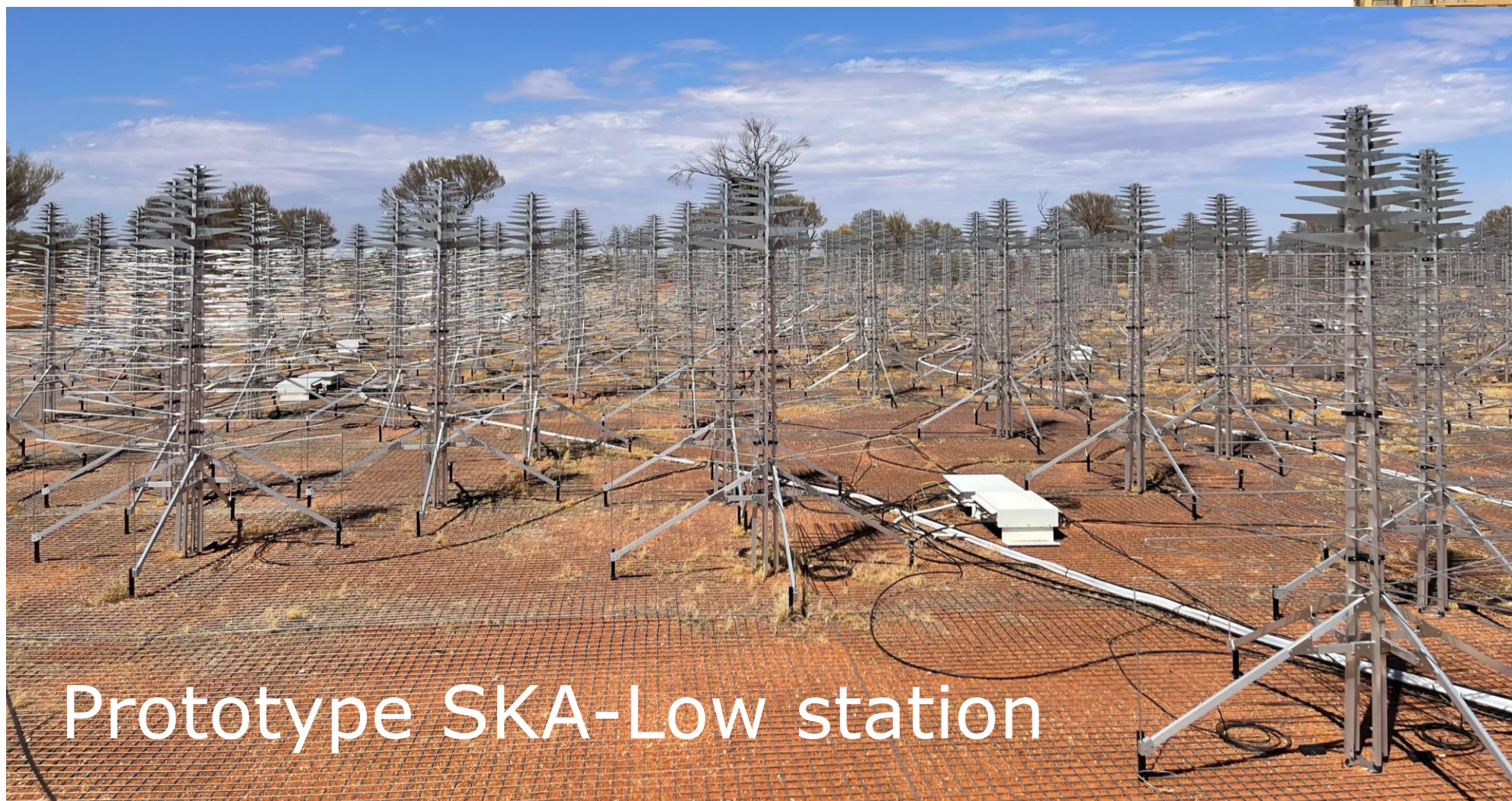
Band 5a/5b feeds
5 - 15 GHz



Prototype SKA-Mid dish



First SKA dish foundations



Prototype SKA-Low station



Establishing SKAO in Australia and South Africa

- Staff in Australia: currently ~22, eventually ~140.
- Staff in South Africa: currently ~20, eventually ~140
- [Staff in UK: currently ~165, eventually ~175]



SOC Perth



Interim EOC Geraldton



Interim SOC Cape Town

- Facilities in host countries:
 - Science Operations Centres (Perth, Cape Town)
 - Engineering Operations Centre (Geraldton, Klerefontein)
 - Australia only: Boolardy Accommodation Facility



SKAO Approach towards SMEs

SMEs are encouraged to work with the SKAO:

- 14 contracts so far awarded to SMEs with a value \sim €25m, so a little over 10%
- Complex design and prototyping (AA0.5) often undertaken by SMEs. However, industrial AA* volumes favours larger manufacturers – something for everyone
- Several interesting contracts awarded to tech start-ups such as Fourier Space in Australia
- The Observatory has a contract value/percentage of turnover rule, however, this is always applied 'reasonably'
- Direct contracts with leading universities (e.g. Porto Uni in Portugal, Guangzhou Uni in China) as well as organisations closely associated with universities such as ICRAR in Australia



SKAO approach towards Local Participation

Tenderers are always encouraged to include smaller local subcontractors. Within both telescope host countries tenderers are advised to include a strong local participation plan within their offer.

Various methodologies are applied to encourage both high levels of participation from local businesses and SMEs:

- **De-bundling** – large procurements are consciously broken down into smaller work-packages
- **Weighted evaluation methodology** – tenders with a strong local participation plan are prioritised
- **Payment profile** – neutral payment profiles that don't require smaller companies to self-finance
- **Source locally where possible** – vehicles, cleaning, communications, office supplies, HSE supplies etc



Summary

- Construction activities underway are proceeding at pace; residual design issues are being dealt with professionally and expeditiously
- Level of risk for the project has increased due to the global economic shock; mitigations are planned, but they require the commitment of additional resources from Members and the accession of new Members.
- SKAO's reputation and global visibility is growing substantially and positively.
- SKAO's Head of Procurement speaking on Wednesday
- SKAO Booth



Thank you.

We recognise and acknowledge the Indigenous peoples and cultures that have traditionally lived on the lands on which our facilities are located.

SKAO

We acknowledge the Wajarri Yamaji people as the traditional owners of the Murchison Radio-astronomy Observatory site.

www.skao.int