



# The European Southern Observatory's Programme & Opportunities for Industry

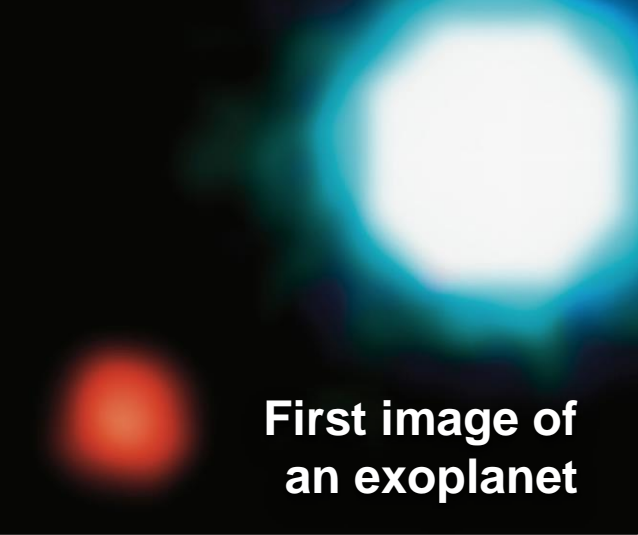
Xavier Barcons  
ESO Director General



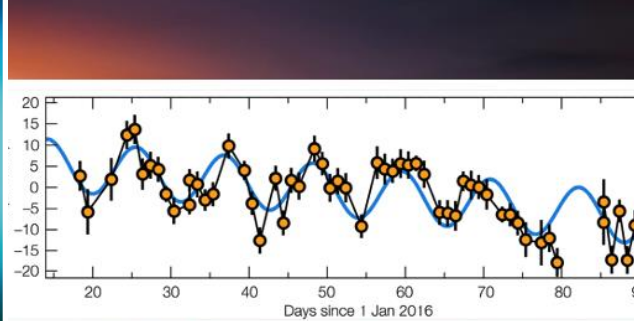
## Our mission

To design, build and operate the most advanced observatories on the ground, and to foster international collaboration for astronomy.

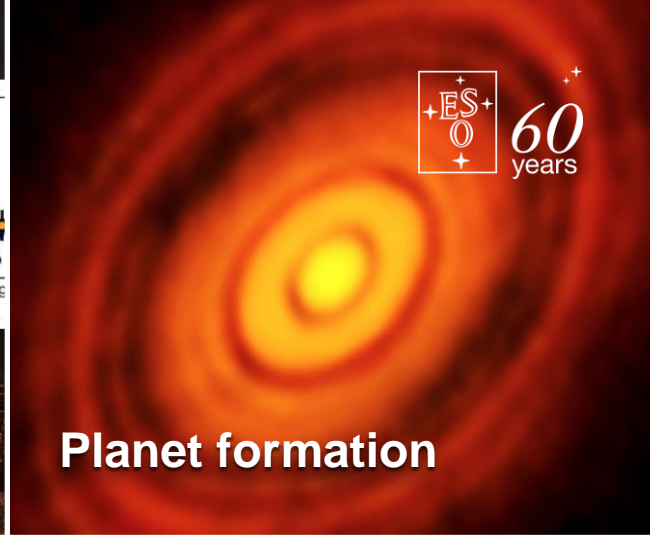




**First image of  
an exoplanet**

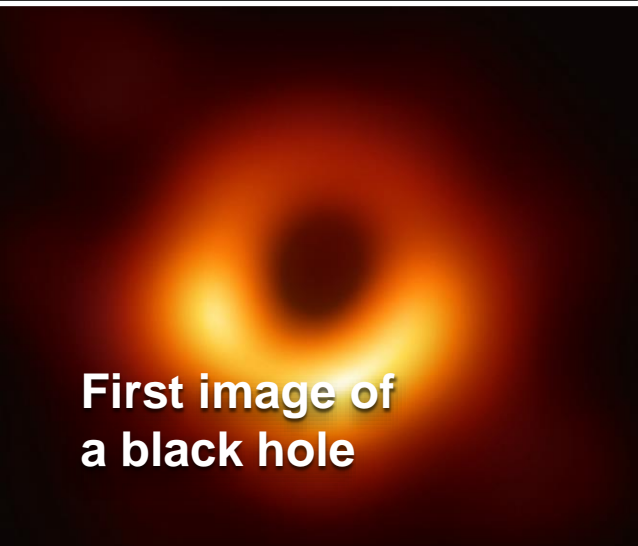


**Closest exoplanet to us**

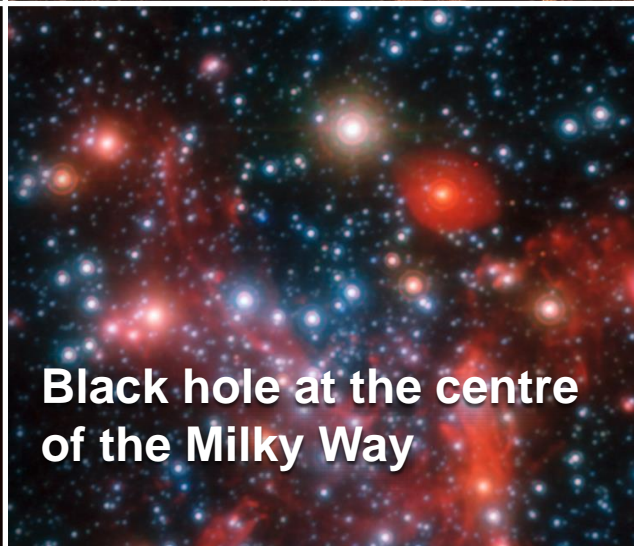


ES+  
O  
+  
60  
years

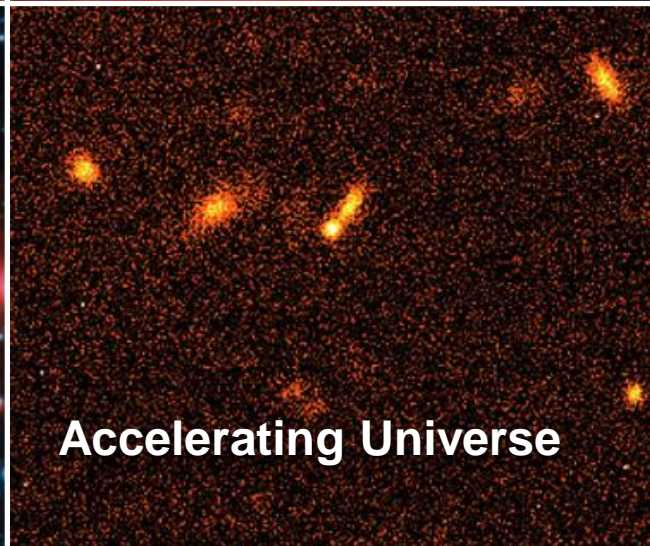
**Planet formation**



**First image of  
a black hole**

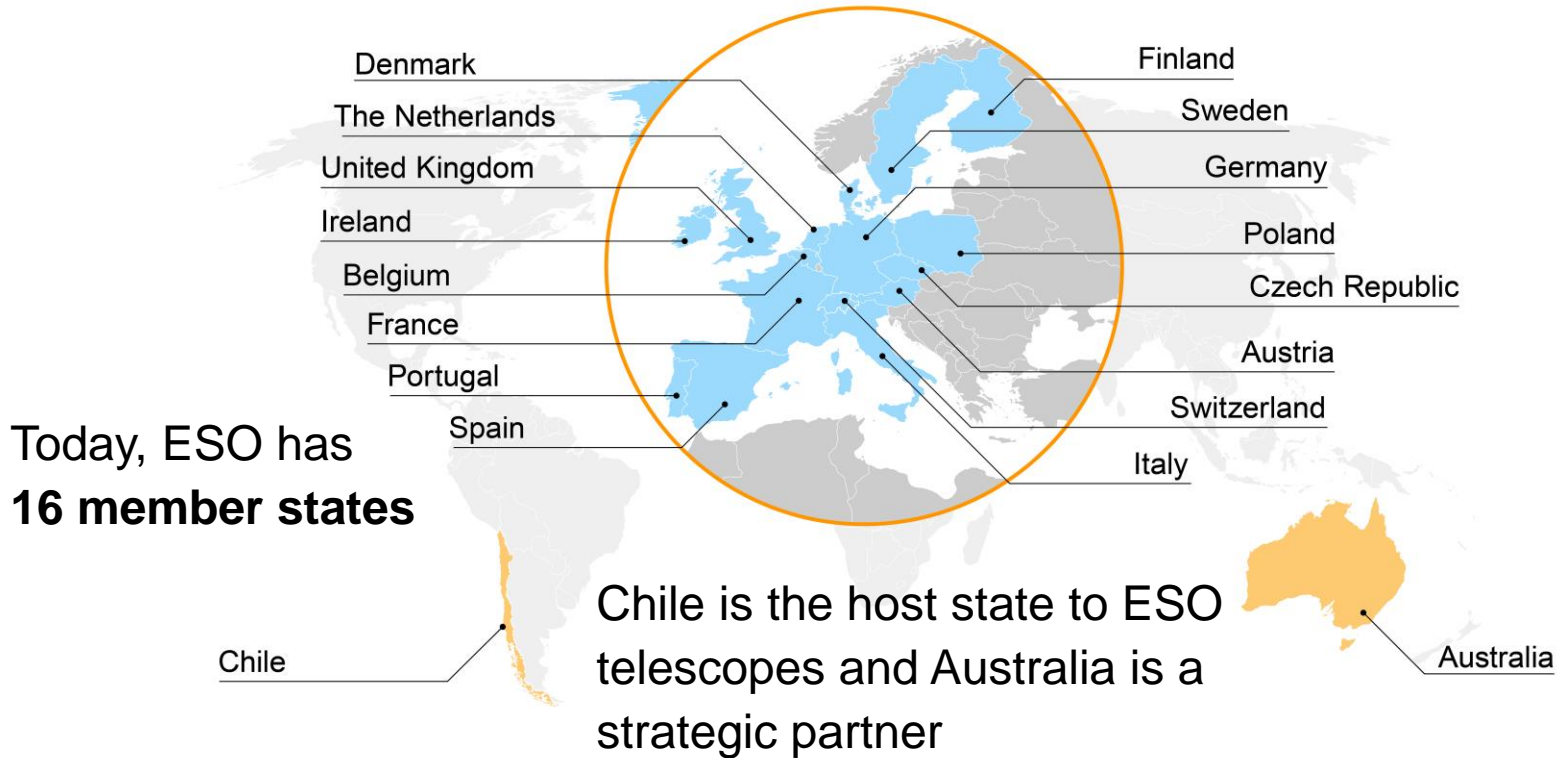


**Black hole at the centre  
of the Milky Way**



**Accelerating Universe**

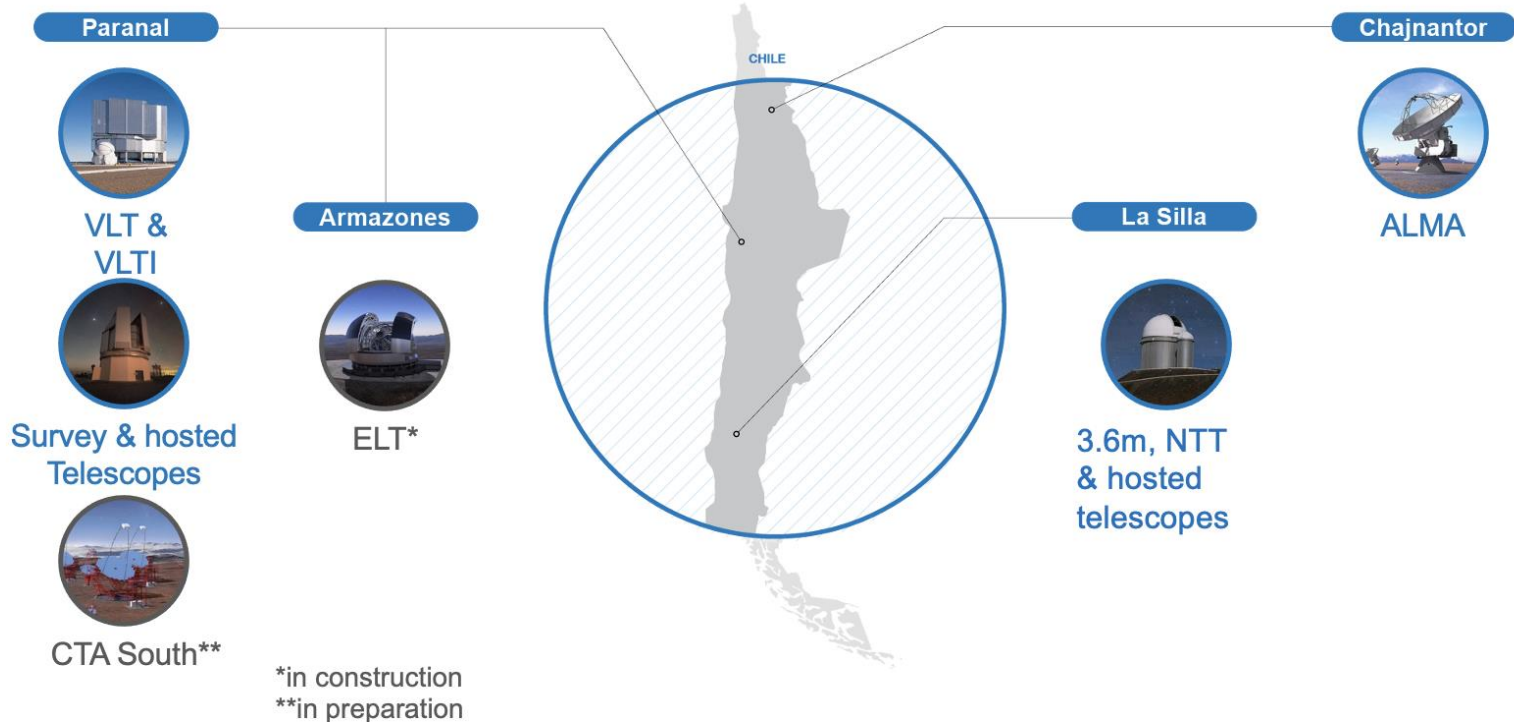
# ESO's Member States and Partners



## Usage of ESO data

More than **22 000** astronomers, other scientists, teachers, students, journalists, etc. in **over 130 countries** worldwide use ESO data

# ESO Telescopes



UT1

UT2

UT3

UT4

VISTA

VST

## 4 Unit Telescopes

Each primary mirror:  
8.2-metre diameter,  
17.5 cm thick,  
weighing 23 tonnes

## Auxiliary Telescopes

4 movable AT's,  
1.8-metre mirror

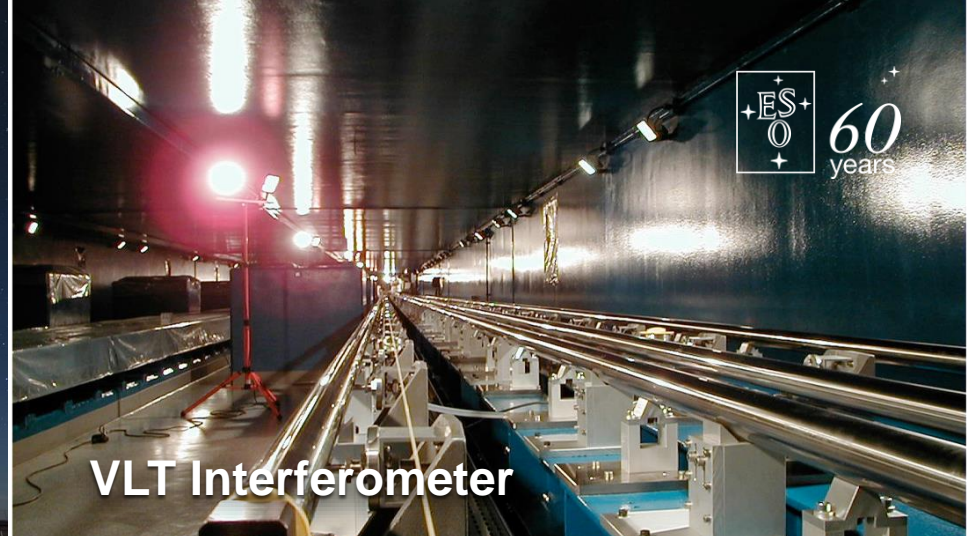
# Paranal Observatory

Control  
Building

V  
S  
T



**VLT with Laser Guide Star**



**VLT Interferometer**



**MUSE VLT instrument**



**GRAVITY VLT instrument**





# ALMA



- Largest sub/mm radio interferometer (in operations since 2011)
- Global partnership between:
  - ESO – 37.5%
  - NSF (USA) – 37.5%
  - NINS (Japan) – 25%
  - In cooperation with the Republic of Chile



# ESO's upcoming Extremely Large Telescope

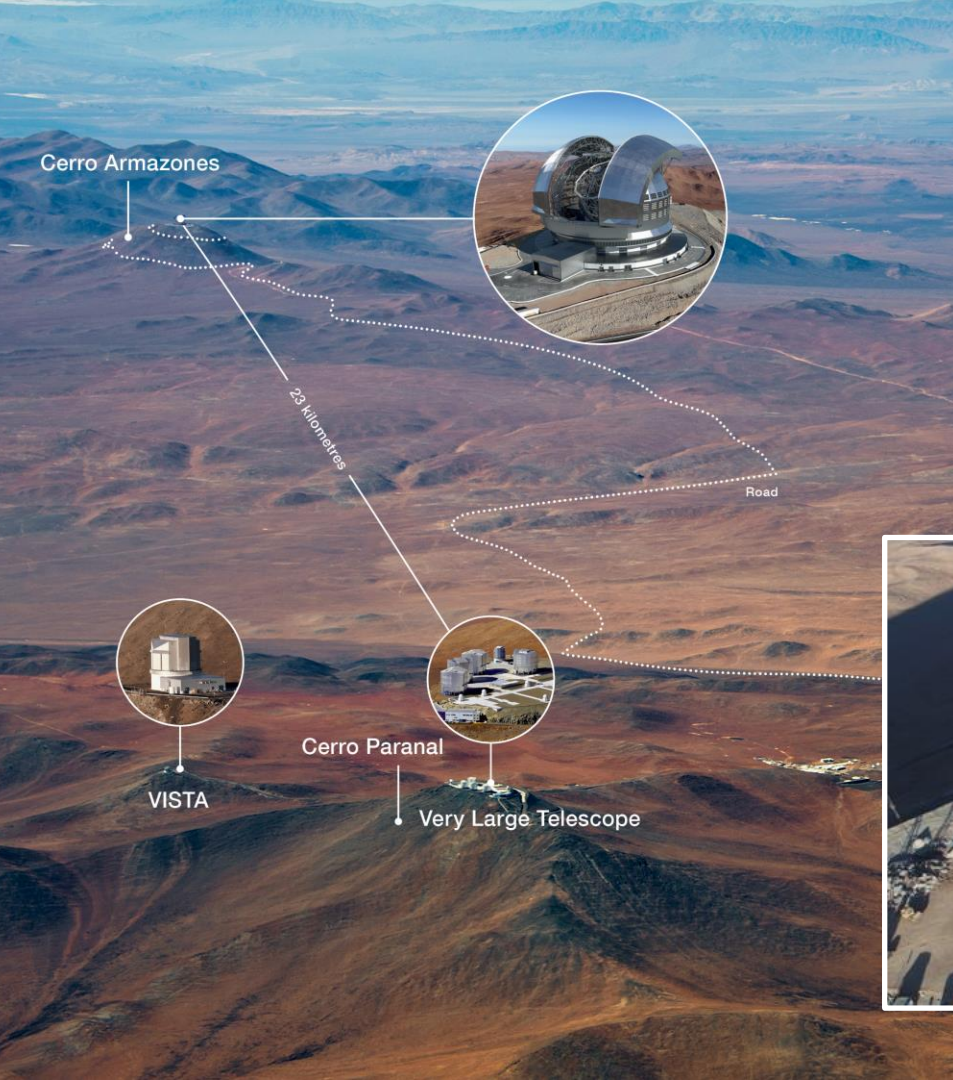
Largest optical/infrared telescope in the world

- 39.3-m segmented primary mirror and adaptive optics
- Construction 2015-2027 (~1300 MEUR)
- **First science observations in Sep 2027**

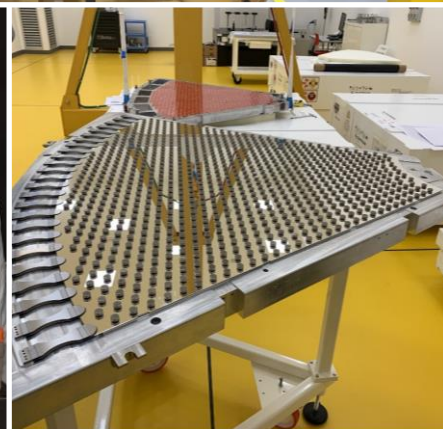
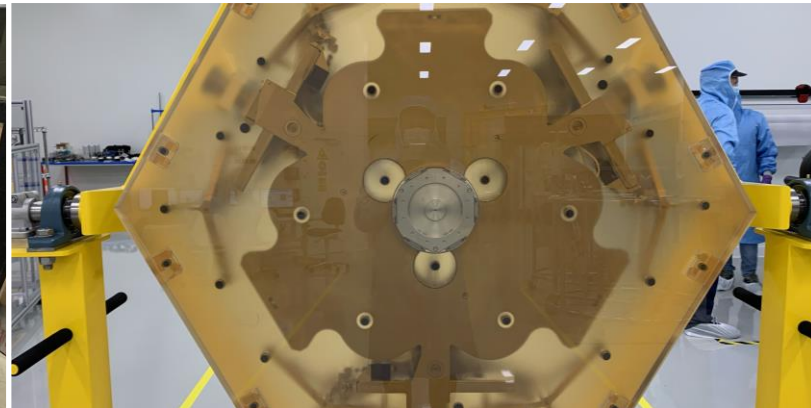


# ESO's ELT

is being built on Cerro Armazones in the Chilean Atacama Desert, at 3046 metres altitude and just 23 kilometres from the site of ESO's Very Large Telescope (VLT) at Paranal.




# ELT manufacturing



# A sustainable way to better serving society



Open data for open science

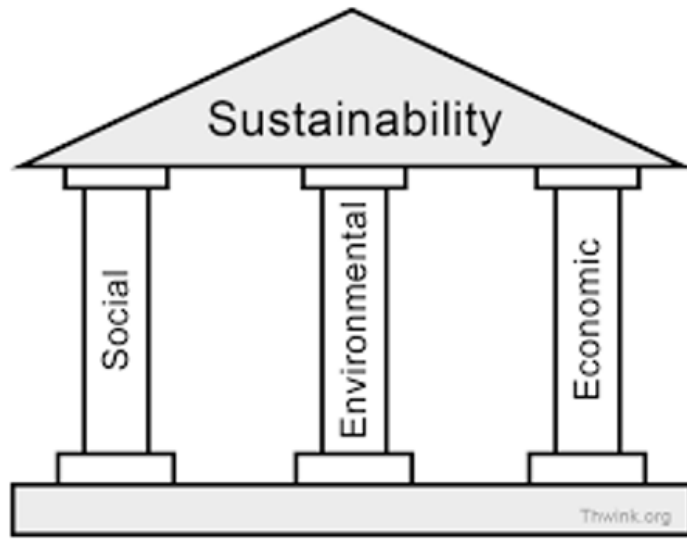


Protecting the dark and quiet skies



Programmes for the new generations







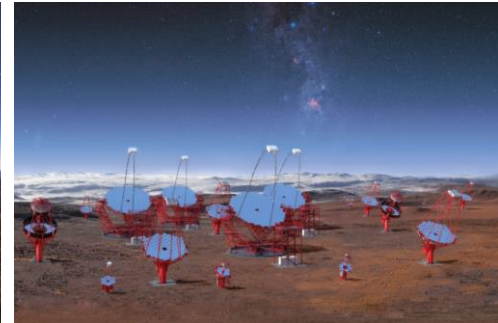
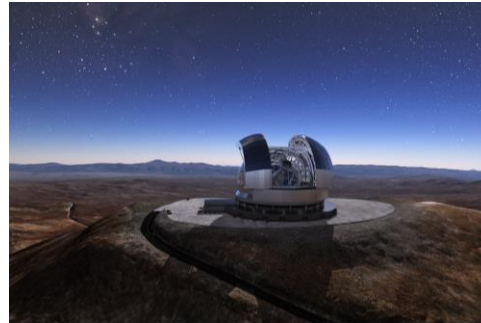




# The future of Paranal, world-leading observatory site

# The Future of Paranal Observatory

- Paranal will operate in the future a set of world-leading telescopes
- The current observatory operations model is the result of a smooth update of the way ground-based telescopes have been operated for decades.
  - But it is hardly scalable to the ELT!
- A new operational concept needs to be developed based on digitisation and making use of Industry 4.0 tools.



# The Integrated Operations Programme

*IOP*



- The IOP is an ESO-wide programme led by the Paranal Observatory aiming at a sustainable (financially, environmentally and even socially) operations paradigm: **Lean, remote and high-performance**
- Integrated (science and technical) operations of Very Large Telescope & the Extremely Large Telescope (& possibly CTA-South).
- **IOP is currently in Phase A. Projects to start around 2025. Stay tuned!**

# Forward Look

- ESO@60 remains at forefront of world-wide astronomy
  - Building largest & most advanced optical/IR telescope, fully funded, and more advanced in construction
  - Multi-project and multi-wavelength: addressing broad science objectives and serving a large community
- Ambitious strategic objectives for the current decade and beyond
  - Depending on financial situation
- Need to modernise Paranal observatory operations, using Industry 4.0 tools, to make it sustainable.

# Thank you!

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**Xavier Barcons**  
**ESO Director General**

-  ESOAstronomy
-  esoastronomy
-  ESO
-  european-southern-observatory
-  ESOObservatory

