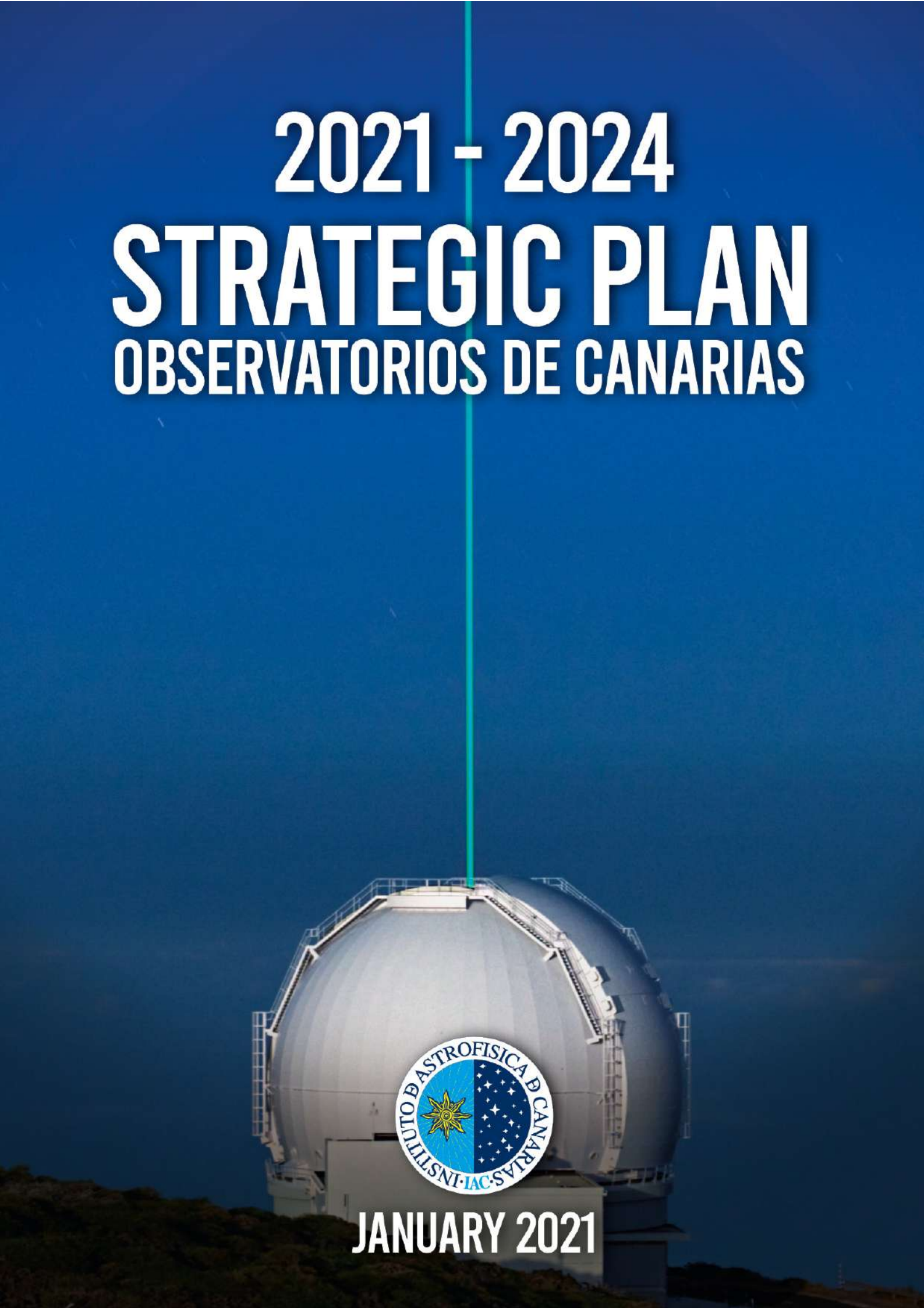
2021 - 2024
STRATEGIC PLAN
OBSERVATORIOS DE CANARIAS



INSTITUTO DE ASTROFISICA DE CANARIAS · IAC ·

JANUARY 2021

EXECUTIVE SUMMARY

The *Observatorios de Canarias (OOCC)* are one of the most productive and lowest cost astrophysical resources in the world, available to Spanish researchers.

It is an "*Infraestructura Científico Técnica Singular (ICTS*)" dedicated to the exploitation of the sky, a natural resource in the Canary Islands. The Observatories are an astronomical reserve, protected by Law, which have attracted, over the last 40 years, more than 75 institutions of 27 countries to install their telescopes and instruments. This fact is a clear demonstration of the advantageous conditions offered by the host country. In addition to the remarkable RTD returns for the Spanish community, the estimated total international investment at the OOCC from its origin is more than 800 million euros, and in the years to come it will be possible to even double this quantity.

The advanced knowledge and skills involved in this new era of astronomy together with the international dimension of the OOCC have stablished the framework to propose a very ambitious plan for the period 2021-2024, with a total of 27 strategic actions, 12 of them as high priority actions. For this period of time, the full proposal requests 34,69 Meuros to the ICTS National Plan.

Our main effort will be focussed in enabling high-impact science by facilitating and supporting the development during this period of forefront international telescopes: the Cherenkov Telescope Array Northern Observatory (CTA-N), the ASTRI array, the European Solar Telescope (EST), the New 4m Robotic Telescope (NRT), the prototype of new technology hybrid telescope Exo-life finder (ELF), an ATLAS Node for asteroid planetary defense, and the implementation of the design studies of TOT4 (4m Optical Infrared robotic telescope), a Dark Matter telescope (DALI) and the European Low Frequency Survey Telescope. Furthermore, we aim to carry out definitive characterization of the Observatories atmospheric boundary layer, monitoring new operational parameters, and a global environmental analysis which is compulsory for the period to come.

In addition, we plan to develop new key technologies to keep the OOCC at the forefront in the design and construction of world-class astronomical instrumentation for both national and international telescopes, including, among others: installation of a quantum key distribution equipment at the OGS telescope; advances on Laser Guide Star systems, upgrades of current telescopes like the 1.5m TCS and the CMBlab at Teide Observatory, a multi-line integral field unit spectro-polarimeter for the solar THEMIS and GREGOR telescopes, and microwave technologies for CMB polarization and spectroscopy.

Finally, we propose to reinforce the Observatories' support infrastructures to guarantee the adequate performance at both observatories (access, telecommunications, electricity, water supply and sewerage, security and other support installations).

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1. MISION, VISION AND VALUES

Mission.

Provide and support state-of-the-art facilities to perform frontier research in Universe Sciences, ensuring the best natural, technological and logistical conditions, while fostering a fruitful framework of international collaboration.

Vision.

Become one of the best astronomical reserves of the world, promoting the installation and operation of world-class research infrastructures and enabling Spanish scientific community to reinforce its leadership in Astrophysics, favouring synergies with other major research infrastructures.

Core values.

SUSTAINABILITY:
A sustainable exploitation of the Canarian`s skies, protected by law and characterized over a period of several decades, as well as a functioning sustainable model based on international collaborations.

EXCELLENCE:
The pursuit of excellence in research as the ultimate goal, providing the infrastructures, conditions and genuine communication among User Institutions to achieve this objective.

TEAMWORK: To favour education and training of early-stage researchers and technicians, and the transfer of knowledge among scientific communities.

-INTEGRITY: Contribute towards social awareness on research and the importance of a knowledge-based economy.

2. FULFILMENT OF THE OOCC STRATEGIC PLAN 2017 - 2020

GENERAL CONTEXT AND FOREWORD

The OOCC undoubtedly represents one of the largest collections of multinational telescopes to be found anywhere in the world. This has been the result of the extraordinary astronomical properties; the continuous characterization and the proper conditions of infrastructure or services developed, maintained and offered in an optimized and flexible manner. The OOCC had to adapt to the needs of both large telescopes and the simplest experiments, from on-site observations to remote or even fully robotic operations.

The OOCC works somewhat as a "community of neighbours" coordinated by the CCI (International Scientific Committee), established by the 1979 Agreement on Cooperation in Astrophysics. The IAC manages properly the common services and ensures that the support infrastructures are well maintained and developed by obtaining specific funding. Moreover, the IAC has modernised the entire communications network by laying optical fibres to connect both Observatories with the main headquarters and the world-wide academic network.

In the past years, there has been considerable progress at the OOCC, in spite of the global covid-19 pandemia, with the installation of 6 new facilities, including the first 23m prototype telescope, LST1. In addition, the OOCC will host the European Solar Telescope (EST), the New Robotic 4-m Telescope (NRT) and the ORM is considered as alternative site for the installation of Thirty Meter Telescope (TMT), if it cannot be settled in Hawaii, with a final decision expected for 2023.

As a reference concerning the quality and quantity of the science carried out at OOCC, it is worth to mention a high scientific productivity of more than 2250 peer-reviewed papers in period 2016-2020 for telescopes at the OOCC.

The Strategic Plan 2017-2020 approved for the *Observatorios de Canarias (OOCC)* in 2018, stablished three major goals broken down in **33 specific actions with a requested funding of roughly 40 million euros**. These actions complement each other to provide and support state-of-the-art facilities to perform frontier research in Universe Sciences, ensuring the best natural, technological and logistical conditions, while fostering a fruitful framework of international collaboration. A group of 19 actions were ranked as top priority amounting to a total requested budget of almost **29 million euros**.

A total of 12 of these prioritized actions activities are on-going through two specific cooperation agreements signed with the Ministry of Science and Innovation:

1. *INfraestructuras científico-técnicas y Servicios Institucionales para el Desarrollo Estratégico de los Observatorios de Canarias* (**INSIDE – OOCC**), grouping 11 actions for a total budget of **8139 keuros**. **Agrement signed in May 2019.** Ongoing actions:

- **Implementation of the Preparatory Phase of the European Solar Telescope (EST)**. The EST group started working on the tender for the design of the AO and calibration systems, on the technical specifications for the preliminary design of the Heat Rejecter has begun.
- **Develop and construct leading astronomical instrumentation: ARES: HARPS3 & HORUS.** The HARPS3 group hired a Mechanical Engineer to collaborate in the tender for the new Coudé Room at the INT. For the spectrograph HORuS two postdocs (optics and software) were hired for the data reduction and data analysis pipeline
- **Major upgrade of detectors to carry out specific observing programmes.** A new software engineer joined the group to work on the CAMELOT2 interface. A new FastCam user interface has been developed (pending testing of the preliminar versión). Two sCMOS were installed at IAC, pending for testing.

- **Control system for TCS and IAC80.** The group has worked on the design of the overall software architecture. The first electrical components, necessary for the hardware implementation, have been procured.
- **Upgrades for WHT.** A telescopic crane has been purchased. Its installation is excepted to take place in the coming months. The process to contract a new mechanical engineer has begun.
- **Scientific instrumentation of the CMB laboratory at Teide Observatory**. Most of the expenditure took place during 2019-2020, with the procurement of microwave components, and the acquisition of optical and thermal sensors. A mechanical engineer, and electronics technician was incorporated to the group. A post doc will be hired during 2021.
- **Support infrastructure to adequate weather / fire conditions at ORM.** The technical specifications to purchase a new multipurpose truck plus accessories have been prepared to support the ORM infrastructure during adverse weather conditions.
- **Improvement of ORM electrical infrastructure.** An electrical engineer will be hired to support on the tender for the improvement of the medium voltage network within the ORM. A report on the situation and layout of the external network was performed by an external contractor. The preparatory work for tendering to repower the external network has started.
- **Connection to RedIRIS-NOVA.** Most of the expenditure took place during 2019-2020. The tender for the computer and telecommunications equipment was awarded to a company with experience in technical solutions. The OT fiber optic inventory was done and the ORM fiber optics will take place along with the tender for the medium voltage network in the ORM.
- **Investment for Characterization of the OOCC's Atmosphere**. The contract of a new engineer with experience in characterization will start soon aiming at collaborating in the design of the acquisition algorithms. Instruments for the AO and monitors will be acquired on 2021.
- **Development of Laser Guide Star Facility**. The activities during 2020 were focused on the closing of the optical and optomechanical design for the launch telescope (LLT). The group have made progress on the preliminary design of the subsystems Laser Transfer System and the Wavefront Laser Sensor. One software, one electronic and two mechanical engineers joined the group on 2021 to collaborate on the subsystems of the LGSF.

2. *Los Cinco Medium Size Telescopes de CTA Norte en el ORM* (**5MST-CTAN**), including one single action for a total budget of **9900 keuros**. **Agreement signed in February 2021.** The goal is to build the mechanical structures and support infrastructure of 5MST.

Another five top priority actions of the Observatories Strategic Plan 2017-2020 were not considered elegible to receive ERDF funds and their scope was adjusted to be implemented with IAC's own funds. All of them are in progress:

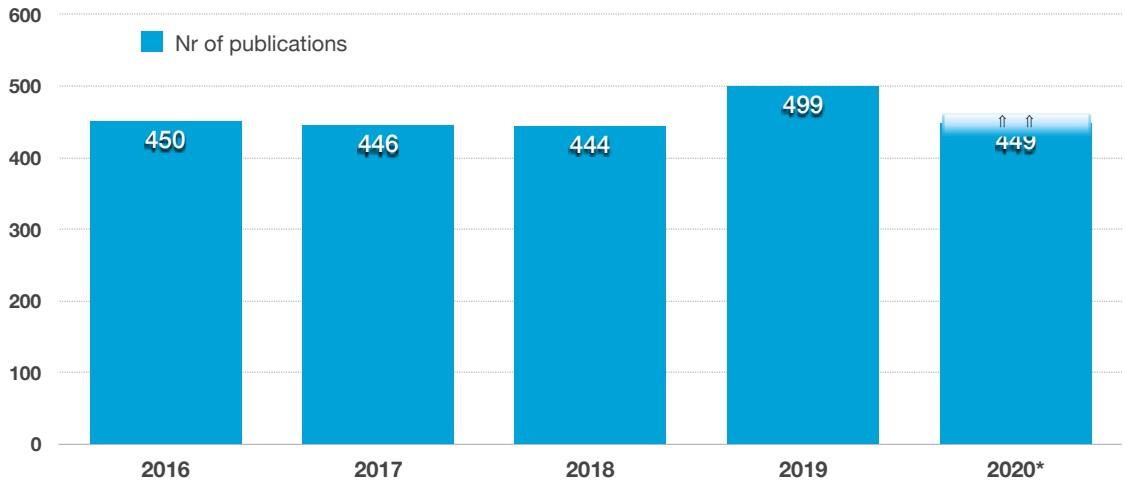
- Develop and construct leading astronomical instrumentation: WEAVE for WHT.
- Extension of the general services building at OT.
- Outdoor lighting's control to reinforce Sky Quality.
- Coordination and Management.
- Advanced Training.

Finally the following actions reduced their priority, due to various contingencies, to a lower level (from 1 to 3), not requesting funding through the ERDF funds:

- Develop and construct leading astronomical instrumentation: Improving GREGOR/TIP capabilities. *It was accomplished with other funding sources.*
- Advanced support to Observers: Software development for the activities of the Time Allocation Committee*. It was postpone to be addressed in the coming years.*

SCIENTIFIC OUTCOMES 2017 - 2020

As a reference concerning the quality and quantity of the science carried out at OOCC, we provide a viewgraph for scientific productivity (most relevant peer-reviewed papers) in the last 5 years, bearing in mind that data for 2020 are preliminar:



In the last 4 years, 6 new telescopes installations have arrived to the OOCC:

Facility name	RI	Last update	OT	ORM
FRAM	OOCC	2019		X
LST1	OOCC	2018		X
GROUNDBIRD EXPERIMENT	OOCC	2018	X	
GOTO	OOCC	2017		X
ARTEMIS (SPECULOOS)	OOCC	2017	X	
COAST & PIRATE	OOCC	2017	X	
		TOTAL	3	3

A quick update about these new installations an other forthcoming facilities is shown below:

- LST1 is the prototype of the four Cherenkov telescopes of this type which will be installed in the northern branch of the CTA. The LST-1 has a reflecting surface of 400 m2 supported by a structure of carbon fibre and Steel tubes. It is 45 m tall, and weighs around 100 tonnes. Nevertheless it can be moved rapidly to a new position on the sky in as little as 20 seconds to receive signals form gamma ray bursters (GRB's). In general the very high energy gamma rays which will be detected by the LST's come from distant objects outside our Galaxy, suchas active galactic nuclei (AGN).
- On 12/12/2016 The RIKEN Center for Advanced Photonics (RAP) agreed to install and operate in collaboration with IAC the GroundBIRD Experiment at the Observatorio del Teide. This instrument joins the expanding set of radio Telescopes that are studying the microwave background and will complement Japan's Litebird Satellite. Dome installed at the Observatory in October 2018 (provided by Baader Planetarium). Telescope installed in September 2019. First light with KIDs at 250GHz from SRON.
- In 2019, the ARTEMIS robotic telescope hunter of Earth-like planets that outshine some of the smallest and coolest stars in our solar neighborhood joined the SPECULOOS network of 1m robotic telescopes, of which the University of Liège (Belgium) and the Massachusetts Technological Institute (MIT) are members.
- At the end of 2016 the OPEN UNIVERSITY (UK) agreed to install and operate the COAST & PIRATE telescopes at the Observatorio del Teide. These two robotic telescopes are now operated as part of their STEM laboratory graduate and post-graduate distance learning programme. They can be used for research by both the UK and Spain.

The last 4 years of research observing programmes have allowed to address key problems on: very high energy phenomena in the Big Bang and around black holes, the genesis of cosmic and gamma-rays, the formation and evolution of galaxies, the life cycles of stars, the physics under strong gravity fields, the physics of magnetic fields in the Sun, and the detection

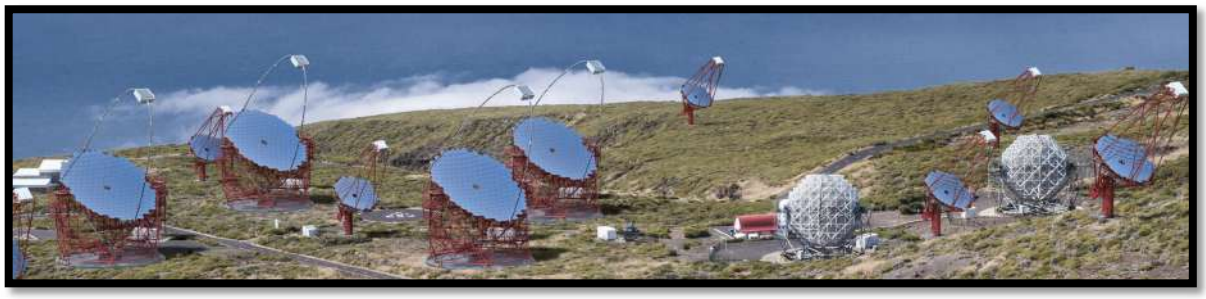
and characterization of Earth-like planets around nearby stars. Since 2017, more than 450 research publications per year (on average) based in open access observing campaigns, has strongly contributed to reinforce the worldwide recognistion of the ICTS.

Some of the the most relevant scientific highlights can be found in the CCI (International Scientific Committee) Annual Reports (2017-2020): http://www.iac.es/es/observatorios-de-canarias/comite-cientifico-internacional

Milestones related to New major Research Infrastructures

During the period 2017-2020, several advanced international projects have been consolidated: CTA, ASTRI, EST and NRT:

CHERENKOV TELESCOPE ARRAY - CTA



The Cherenkov Telescope Array (CTA) is the next generation ground-based observatory for gamma-ray astronomy at very-high energies. CTA will be the world's largest and most sensitive high-energy gamma-ray observatory. CTA comprises two sites, one in the northern hemisphere at the Roque de los Muchachos Observatory (ORM) of the IAC at La Palma, and one in the southern hemisphere near ESO's Paranal site in Chile. The CTA design builds upon the experience gained with the successful current instruments (including the MAGIC telescopes currently in operation at ORM).

The CTA baseline array layout includes the construction of four large-size telescopes (LST) and the construction of 9 mid-size telescopes (MST) at the ORM. The construction of the first LST was completed at ORM in 2018. The construction of the remaining 3 LSTs at the ORM site are planned to be completed in 2023. IAC will contribute with 50% of the 4LST and 50% of the MST that make up CTA-North. A project office was set up in 2019 at IACTEC, in order to implement the IAC participation in CTA.

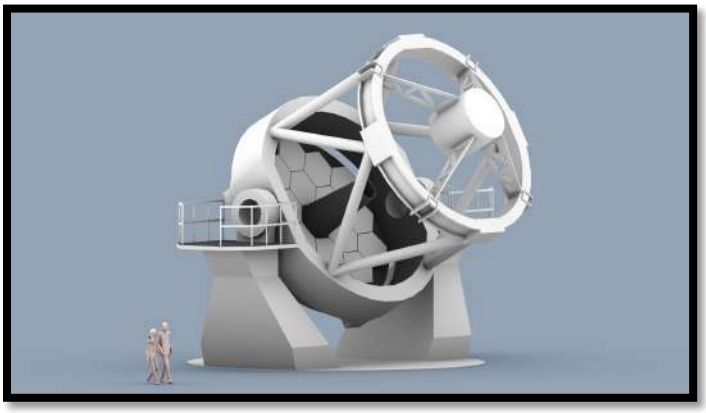
THE EUROPEAN SOLAR TELESCOPE - EST

The European Solar Telescope (EST) is a revolutionary project aimed at the design, construction and operation of a 4-meter class solar telescope, to be located in the Canary Islands. It will be used to make vital advances in studies of the magnetic coupling between the deep photosphere and upper chromosphere. This will require diagnostics of the thermal, dynamic and magnetic properties of the plasma over many scale heights, by using multiple wavelength imaging, spectroscopy and spectro-polarimetry. To achieve these goals, the EST will

specialize in high spatial and temporal resolution using instruments that can efficiently produce two-dimensional spectral information. EST will contribute to maintain Europe at the frontier of solar physics research, while at the same time will mobilise European industry to fully participate in the technological challenges to be faced up in the next decade.

The EST, under the coordination of the IAC, is promoted by the European Association for Solar Telescopes (EAST), currently formed by solar physicists of 18 European countries, aimed to keep Europe on the front line of Solar Physics. The total budget for the Preparatory Phase is around 15 M€ (2016-2023), and represents an investment of about 205 M€ euros for its construction during a period of 6 years. Its useful life is estimated in 30 years.

NEW ROBOTIC TELESCOPE (NRT)

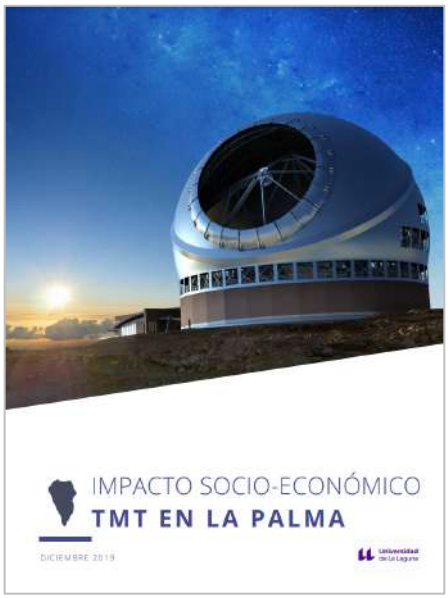


NRT will be a modern, 4-metre class facility located at the OOCC and dedicated to time domain astrophysics with a focus on astrophysical transients, that aims to build on the success and experience gained with the Liverpool Telescope. This new robotic telescope with a 4-metre aperture will be a powerful tool for the study of supernovae, since the flexibility of robotic scheduling allows observing cadences to be optimised for each individual object. It is now starting its construction phase and once the required funding is secured by all the partner institutions.

The design, construction and commissioning of the telescope is planned within a period of 8 years (2018-2025).

THIRTY METER TELESCOPE – TMT

The OOCC could also host the TMT, at the ORM near the summit of “Caldera del Taburiente”. For facilities co-located at the same mountain there will be many opportunities to integrate science programs and to develop complementary instrumentation, in particular, with Gran Telescopio Canarias. TMT will dedicate an important part of its programs to the time-domain science, and some synergies can certainly be drawn from CTA’s observations of the cascades and TMT follow-up with deep observations of high-energy sources.



From a socio-economic perspective the Canaries would benefit on many levels by hosting TMT at the ORM, in particular from a more diverse economy, increased GDP and the creation of high quality jobs.

3. SWOT ANALYSIS

Following standard methodologies we have identified the strengths, weaknesses, opportunities and threats listed below:

Strengths

- The extraordinary astronomical quality of the summits of the Canary Islands, protected by law (Law 31/1988 and R.D. 580/2017) and continuously monitored.
- International recognition as one of the best observatories in the world.
- Scientific productivity of the observatories for Spanish astrophysicists.
- Strong and established institutional commitment towards the continued characterization and protection of the skies.
- Sustainable financing model.
- Ownership and operation by a top-level international scientific and technological centre.
- Strong implementation in the Canaries; a reference for regional society. Social support to the Observatories.
- Recognition and significant presence in EU funding programmes.
- The excellent telecommunications infrastructure.
- Possibility of synergies for simultaneous multi-telescope multi-instrument and multi-wavelength observations.

Weaknesses

- Decreasing funding for maintenance and update in terms of both user-institution investment and basic common infrastructure.
- Limited flexibility in financial management.
- The financial support for infrastructures of the Spanish ICTS is timely unpredictable.
- Difficulties in multi-year planning and management.
- Excessive rigidity on environmental standards as a result of being installed in national park areas (Natura 2000).
- Complexity and dilated-time of installation permits procedures for new infrastructures and telescopes (independently if its size).
- Difficulties in following up the scientific publications resulting from access awarded by all the telescopes.
- Loss of human resources (scientists and engineers) as a result of the low salary competiveness.

Opportunities

- An ‘astronomical reserve’, capable of attracting newest and most advanced international projects currently under way (CTA, ASTRI, EST, NRT, TMT, etc.).
- Added value within the European Research Area (ERA) as the European Observatory of the Northern Hemisphere.
- Specialization in robotic telescopes.
- The development of advanced instrumentation in close collaboration with industry, contributing thus to industrial development and commercialization of innovative value-added products.
- Touristic exploitation of the OOCC as an economic activity and funding source.
- Construction of the ORM Visitor Centre as a base to foster social roots an support.
- Astrophysics is considered as one of the main priorities under the Smart Specialization Strategy RIS3 for the Canaries.
- The Canary Islands as a excellent place for meetings and workshops.
- Boost nature preservation as a resource to gain general knowledge.
- Synergies of ground-based and satellite observations.

Threats

- The new laws that changed the procedure to obtain authorization to sign any national or international agreement or MOU.
- The current economic situation affecting the maintenance of RTD activities worldwide.
- Closure or diminished performance of facilities currently in operation.
- Use of telescope time for research of low interest and poor quality.
- Loss of prominence as a first-class observatories attracting advanced instrumentation for astrophysical research.
- Inability to manage the funding obtained in relation to corresponding commitments.
- Not being able to attract and retain the best international facilities/partners.
- Application of generic procedures of the Spanish AGE unsuitable for management in an international context.
- Some local small groups related to environment preservation against the installation of new facilities at the OOCC.
- The covid-19 pandemia could lock-down the OOCC if the global situation gets worse.

4. MAIN GOALS 2021 - 2024

4.1 Objectives

This plan outlines the strategic direction, goals, and priorities we will pursue to make our Vision of the future a reality. We highlight the following three main goals that will strengthen OOCC's ability to accomplish its Mission:

1. LEADERSHIP:

To ensure leadership of the Observatories for the next decade and beyond. The OOCC is internationally renowned for hosting one of the largest batteries of telescopes all around the world, the development and construction of innovative telescope instrumentation and related technologies, and the subsequent cute-edge science providing key insights in the understanding of the Universe. To maximize the scientific impact of OOCC facilities, and to continue the great trajectory of discoveries, we will not only maintain our existing instruments, telescopes, and infrastructure to ensure the most efficient possible use of telescopes' precious time, but also to attract new and excellent Research Inferastructures (RIs), including the major RIs future projects, all within the broader context of the OOCC user community and the forthcoming enormous scientific opportunities

2. INTERNATIONALITY:

To promote a sustainable framework of international collaborations for the joint operation of first-class research facilities at the Observatories. The OOCC complex is open to the international astrophysics community through the participation of some 75 scientific institutions in 27 countries. Its international scope has grown largely with the installation of new facilities and with the deployment of fibre optic networks allowing the terabytes of data generated by its activity to be transmitted to all countries involved. New model of collaborations will ensure the long-term sustainability of this world-class ICTS.

3. INNOVATION: To update the set of basic and advanced supporting infrastructures available at the Observatories, and to introduce valuable innovation of services provided.

The OOCC, whose capabilities are highly valued by the user institutions and scientific community, will continue being developed to assure the best quality and efficiency in logistic, safety and technical support, including new modes of operation and observing.

4.2 Strategic Approach

The present Plan will pursue five specific strategies, broken down in subsequent actions over the period 2021-2024:

STRATEGIES	OBJECTIVES 1	2	3
 **S1: ENABLE WORLD-CLASS RESEARCH** The OOCC will continue to enable high-impact science by facilitating and supporting the installation of the forefront international telescopes with major investment in the construction and instruments of these major Research Infrastructures, with specific effort towards the installation of the cutting edge international telescopes in the main research fields of Astrophysics: the Cherenkov Telescope Array Northern Observatory (CTA-N), ASTRI, the European Solar Telescope (EST), the New 4m Robotic Telescope (NRT) and the Thirty Meter Telescope (TMT).	✓	✓	✓
 **S2: ENHANCE THE SCIENTIFIC SUPPORT AND TECHNOLOGICAL CAPABILITIES AT THE OBSERVATORIES, INCLUDING THE JOINT DEVELOPMENT OF STATE-OF-THE-ART INSTRUMENTATION.** In this area the OOCC will continue to develop key technologies, extend collaborations with external research groups, pursue international contracts, and recruit and retain outstanding skilled staff, to keep the OOCC at the forefront in the design and construction of world-class astronomical instrumentation for both national and international telescopes. The OOCC will work with industry partners to identify and develop commercialisation opportunities based on instrumentation technologies.	✓		✓
 **S3: CONTINUE TO IMPROVE THE QUALITY AND QUANTITY OF THE SERVICES AND SUPPORTING INFRASTRUCTURES AT THE OOCC.** The OOCC will strive in guaranteeing the adequate performance of general purpose infrastructures at both observatories (access, telecommunications, electricity, water supply and sewerage, residence and other support installations), simplifying logistics for the scientific institutions working at the observatories.		✓	✓
 **S4: SKY QUALITY AND ENVIRONMENT PROTECTION**. The OOCC will work continuously monitoring the quality of the sky and updating the technology and tools according to the new needs and opportunities. The OOCC are also committed to protect the exceptional quality of the Canary Islands' sky, so that astronomers can continue to pursue world-leading science with telescopes already in operation or to be located there, assuring at the same time appropriate preservation of surrounding environment.	✓	✓	✓
 **S5: STRENGTHENING THE SCIENCE, TECHNOLOGY AND ENGINEERING SKILLS AND IMPROVING SOCIAL PERCEPTION.** The OOCC will assist students at every level and make the public aware of its scientific, technological and engineering achievements in astronomy. The OOCC will attract and retain highly skilled employees, and use its research and technological environment to enhance and broaden technical training and capacity within the workforce of the Observatories. Moreover, it will ensure a more active involvement from the society of the region, increasing awareness on astrophysics and improving social perception.	✓		✓

4.3 Actions

The proposed strategies are further broken down into a series of actions that will serve as a roadmap towards 2025. All the identified actions are broad in scope and are designed to be carried out throughout the lifetime of the Strategic Plan. Here below we include a brief description of each action, including a more detailed description in the corresponding Annex:

ACTIONS UNDER STRATEGY 1: ENABLE WORLD-CLASS RESEARCH

A1 OOCC The Cherenkov Telescope Array Northern Observatory (CTA-N)

CTA comprises two sites, one in the northern hemisphere at the ORM, and one in the southern hemisphere near ESO's Paranal site in Chile. The CTA baseline array layout foresees the construction of 4 large-size telescopes (LST) and 9 mid-size telescopes (MST) at the ORM site. The 4 LST and 5 MST are expected to be completed by end of 2024, and the remaining four MST at the ORM site are planned to be ready for operation in 2026.

A2 OOCC The European Solar Telescope (EST)

The European Solar Telescope (EST) is aimed to be the worldwide leading 4,2-meter class instrument dedicated to study fundamental processes shaping magnetic activity of the Sun. Thanks to the progress carried out so far by the EST Consortium and Project Office led by the IAC, the detailed design is in an advanced status. The goal is to present the funding authorities a final Construction Plan in 2023, this further design works need to be implemented. Due to its expertise, the IAC is interested on (1) the development of a spectrograph for EST that will operate in the near-infrared with an IFU-based on image slicers, (2) contributing to the design of the EST MCAO system and (3) providing the EST Construction Project.

A3 OOCC The New Robotic Telescope (NRT)

NRT will be a 4-metre class, optical telescope feeding several instruments, optimized for rapid-response and high cadence observations of variable and explosive objects. NRT will provide a variety of capabilities to explore the wealth of transient targets in the night sky and test the physical processes that create them. Such rapidly varying objects are too challenging for existing telescope facilities to observe effectively. The investment related to this plan is related to the manufacturing of the telescope optics, the development of the robotic control software, as well as for the telescope's optomechanics and scientific instrumentation.

A4 OOCC New technology hybrid optical telescope (mini ELF)

This strategic action will focus on the development of the miniELF that will serve as a technology demonstrator for the much larger ExoLife Finder, which is proposed with an effective diameter of about 30-40m. miniELF will feature 15 mirrors of 0.5m in diameter, each with a small, elliptical secondary mirror; mounted on a "bicycle wheel" support structure of 3.5m in diameter which will be lightweight and simple to construct. We now have a conceptual design for miniELF, which provides optical, mechanical, and electronic solutions with bottom-up cost estimates

A5 OOCC TOT4 – OPTICAL INFRARED ROBOTIC TELESCOPE FOR THE OT

The aim of this action is to develop a modern, state-of-the-art 4m-class IR wide field telescope to be used in normal, remote and robotic modes. The inclusion of such a telescope among the pool of facilities to which the Spanish community has access at the Observatorio del Teide (OT) would give a leap in quality both to the astronomy carried out there and to numerous research and instrumental programs in which the Spanish astronomers are involved.

A6 OOCC DETAILED DESIGN OF A DARK MATTER TELESCOPE

S1

Axion detection would be one of the most important moments in the entire history of Science. The Dark-photons & Axion-Like particles Interferometer (DALI) is proposed for the search for the quantum chromodynamics (QCD) axion in the poorly explored 25-250 μeV range, or equivalently 6-60 GHz. The aim of this action is to complete the detailed design of the DALI telescope over a 3-year period.

A7 OOCC AN ATLAS NODE AT OT FOR PLANETARY DEFENSE

S1

ATLAS is an asteroid impact early warning system developed by the University of Hawaii and funded by NASA. The installation of an ATLAS telescope in the OT will put the OT at the head of Planetary Defense. The objective of this proposal is to achieve the installation of an ATLAS telescope in the OT contributing with two important components, the detector and the dome.

A8 OOCC UPGRADE OF THE COSMIC MICROWAVE BACKGROUND LABORATORY (CMBLAB) AT THE TEIDE OBSERVATORY

S1

The CMB group at the IAC leads the QUIJOTE and Tenerife Microwave Spectrometer experiments, which are part of the CMBLab at the Teide Observatory. QUIJOTE aims to characterise the polarization of the CMB and other physical processes, Galactic or extragalactic, emitting in the microwave range and TMS is a ultra-high sensitive spectrometer in the 10-20GHz range, that will accurately measure absolute distortions of the sky spectrum. The main proposed actions are related to QUIJOTE building, telescopes and auxiliary equipment, TMS building, dome and auxiliary equipment and to implement the design of the European Low Frequency Survey telescope and its instrumentation.

A9 OOCC ASTRI MINI-ARRAY of gamma-ray telescopes

S1

ASTRI is a Flagship Project mainly financed by the Italian Ministry of Education, University and Research, and led by INAF, the Italian National Institute of Astrophysics. The OT will host an array of 9 SSTs during the implementation of the present Strategic Plan. IAC will provide the basic infrastructure support.

ACTIONS UNDER STRATEGY 2: ENHANCE THE SCIENTIFIC SUPPORT AND TECHNOLOGICAL CAPABALITIES AT THE OBSERVATORIES, INCLUDING THE JOINT DEVELOPMENT OF STATE-OF-THE-ART INSTRUMENTATION

A10 OOCC DEVELOP AND CONSTRUCT LEADING ASTRONOMICAL INSTRUMENTATION: ARES: HARPS3

S2

HARPS3 is the next generation instrument for the 2.5m Isaac Newton Telescope (INT) located at the ORM. The IAC contribution to the HARPS3 project is the preparation and conditioning of the Coudé room and thermal enclosures of the instrument.

A11 OOCC NEW LEADING SOLAR INSTRUMENTATION: MULTI-LINE INTEGRAL FIELD UNIT SPECTRO-POLARIMETERS FOR THÉMIS AND GREGOR

S2

The aim of the IAC solar group is to consolidate as a world leader in the observation and interpretation of spectro-polarimetric data of the outer Sun's atmosphere. The precise determination of the thermal and magnetic conditions of the Sun's outer atmosphere requires unique observations: high precision spectro-polarimetry of a two-dimensional area of the solar atmosphere at different spectral lines with high spatial resolution. To reach this target human effort is requested to support the design,

fabrication and installation of an IFU in THÉMIS and for the installation and commissioning of an existing IFU in GREGOR

A12 OOCC UPGRADE THE OGS AND PRODUCTION OF PILOT INTERFERENCE FILTERS FOR WIDE FIELD SURVEYS

This action forsees to upgrade the OGS telescope by installing a new field corrector and filter wheel. These actions will transform the OGS into a powerful wide field facility (the only one left at the OOCC after the recent instrumental actions on the WHT and INT), thus boosting the scientific capabilities of the telescope and, thus, of the OOCC.

A13 OOCC MICROWAVE TECHNOLOGIES FOR CMB POLARIZATION AND SPECTROSCOPY

Microwave Spectroscopy and polarimetry are the fundamental measurements carried out within the Cosmic Microwave Background studies at the Teide Observatory. Strategic investments are required to upgrade the instrumentation at CMB Laboratory.

A14 OOCC INSTALLATION OF A QUANTUM KEY DISTRIBUTION EQUIPMENT AT THE OGS TELESCOPE

Optical communications in space have been identified as a key technology for present and future information transmission between satellites and with Earth. The OGS telescope has a long history in the field of the optical communications in free-space. The objective of this action is to provide the necessary upgrade to become a reference in the reception of quantum key distribution from satellites, a field which is nowadays being strongly pushed in Europe, and which has a clear commercial future.

A15 OOCC TCS UPGRADE IN THE AGE OF TIME DOMAIN ASTRONOMY

The passage of the years has made the control system and elements of the TCS telescope obsolete, and an update is urgently needed for the scientific use of this telescope. The current dome suffers from very important structural problems that cause it to fail several times every night. This is fatal for time domain astronomy, where long and stable series of observations are needed. This action aims to find a solution ot this problem.

A16 OOCC ALIOLI, AN ADAPTIVE OPTICS MODULE FOR WHT, NOT AND TCS

AOLI is a state-of-the-art instrument intended to deliver the highest spatial resolution ever obtained in the visible. AOLIOLI is being designed to be used in WHT, NOT and TCS. Once manufactured, ALIOLI will be thoroughly tested on the TCS before moving it to other telescopes. This requires a detector, a deformable mirror, a space light phase modulator and some optical components.

A17 OOCC DEVELOPMENT OF A LASER GUIDE STAR LAUNCH SYSTEM

The astronomical seeing conditions on a given night at a given location describe how much the Earth's atmosphere perturbs the images of stars as seen through a Telescope. Adaptive optics (AO) solves this problem by combining the latest technologies to correct for distortions introduced by the atmosphere. To do this, the AO system needs the light from a sufficiently bright star that is close to the target in the sky as a reference, or alternatively, produced by an artificial star (the laser). This major upgrade is necessary to duly support the coming era of instruments at the OOCC.

A18 OOCC PARTICIPATION IN THE DEVELOPMENT OF SCIENTIFIC INSTRUMENTS FOR THE THIRTY METER TELESCOPE (TMT)

One of the IAC's undertakings in the TMT installation agreement is to collaborate in its program of first light instruments from the moment the TMT takes the decision to install the telescope at the ORM. In this sense, the TMT has selected three early light instruments: a wide-field, multi-object spectrograph working at optical wavelengths called WFOS; an integral-field unit spectrometer with imaging capability working at near-infrared wavelengths called IRIS; and a multi-slit, near-infrared spectrometer with imaging capability called IRMS. In case TMT were installed at ORM this action will ebnable the Spanish participation in the TMT implementation program.

ACTIONS UNDER STRATEGY 3: CONTINUE TO IMPROVE THE QUALITY AND QUANTITY OF THE SERVICES AND SUPPORTING INFRASTRUCTURES AT THE OOCC

A19 OOCC ELECTRICAL SYSTEM IMPROVEMENTS ON TEIDE OBSERVATORY. RING CONFIGURATION.

The Teide Observatory has an "antenna" or "branched" high voltage network. The network begins at the Sectioning Center located outside the Observatory. The nominal maximum capacity of the Observatory is currently 700 kW, working over 80% of this capacity. The present system has several problems that could endanger the scientific operations and hampered the implementation of futures infrastructures. The proposed action is to develop a ring high voltage network and expand the Observatory's capacity to 1,250 kW, increasing the power of the Transformation Centers, getting the necessary power for future telescope installations.

A20 OOCC OOCC DATA NETWORK IMPROVEMENTS

Each Observatory (OT y ORM) already has a fiber footprint without redundancy. This redundancy can be achieved by a new fiber footprint using additional ducts and paths for bringing to the telescopes a high availability network. The requested action include: (1) Renew some network devices ready for 10G interfaces; (2) Fiber deployment in the new canalization at the ORM; (3) Improvement in the canalization of the fiber segment that goes to the ORM and (4) continue building canalization and fiber sections at OT.

A21 OOCC IMPROVEMENT OF THE SECURITY FACILITIES AT OOCC

In order to handle emergency situations and provide a better security service, both sites require cameras, software and mobile stations that will be set-up as a integrated system connected to the IAC's Headquearter.

ACTIONS UNDER STRATEGY 4: SKY QUALITY AND SURROUNDING ENVIRONMENT

A22 OOCC PRESERVE NATURAL NIGHT SKY BRIGHTNESS OF OOCC

The natural night sky is never completely dark. The loss of darkness due to the increasing use of the artificial light at night has a dangerous, but sometimes neglected, impact on natural ecosystems. Evaluating the effects of ALAN on the night sky brightness (NSB) on dark places requires extensive ground-based observations. The main goal of the proposed action is to acquire night photometers and all-sky cameras to monitor and preserve the natural NSB of Canarian Observatories.

A23 OOCC GLOBAL ENVIRONMENTAL ANALYSIS & MONITORING PLAN OF THE OOCC

S4

This action will focus investment in two complementary issues: regulations (Knowledge & enforcement of environmental regulations affecting the OOCC) and the application of measures to ensure environmental and sustainable management in accordance with environmental awareness, including the Elaboration of Environmental Monitoring Plan, Updating the waste plan for OOCC and the development of the recycling point's area for temporarily, and centralized management for the various institutions and facilities operating in the OOCCs.

A24 OOCC SUSTAINABILITY, EFFICIENCY AND ENVIRONMENTAL PROTECTION

S4

An improvement in the OOCC sustainability, is based on some key features, like, Energy, Waste and Sustainable and Responsible use of water and other resources. This action will address Developing the photovoltaic park on the roofs of the Residence and Common Services building with about 200KWp, to be implemented in the next years, Installation of windmills in wind farms, to compensate the power consumption of the OOCC, Waste management (hazardous and non-hazardous) and completion the zero discharge project of waste water after purifying at ORM, its reuse and the development of fire protection networks in both Observatories, including the use of rainwater

A25 OOCC DEFINITIVE CHARACTERIZATION OF THE BOUNDARY LAYER AND MONITORING NEW OPERATIONAL PARAMETERS

S4

Specific tasks will develop the software to provide databases worldwide, implement algorithms of forecasting, to automatize the operation and complementary studies on the sodium layer for laser guide stars. Furthermore the Sky Quality Group will support the compilation of atmospheric valuable information, providing new data and developing taylor-made analysis.

ACTIONS UNDER STRATEGY 5: STRENGTHENING THE SCIENCE, TECHNOLOGY AND ENGINEERING SKILLS AND IMPROVING SOCIAL PERCEPTION

A26 OOCC COMMUNICATION TO GENERAL PUBLIC & VISIBILITY OF OOCC

S5

To achieve a consolidated international projection of the observatories we will foster the dissemination of key features and main outcomes on online social platforms and other applications (virtual visits, presence in massive impact tools...): meeting all the demands of information and management, which would translate into a good image and prestige of the ICTS.

A27 OOCC Coordination and Management

S5

The scope of this action is to ensure a proper implementation of the Strategic Plan in accordance with administrative, financial and legal issues defined by the ERDF regulations and national guidelines. Some of the tasks assigned to this action will be reporting to the IAC Steering Committee to ensure the overall success of the Strategic Plan (completed on time, within budget, and with the best possible quality), managing the Plans' resources; developing the proposed strategies, and assuring that system documentation is kept up to date using a formal work configuration control process.

4.4 Resources

The proper implementation of the OOCC Strategic Plan for the period is subject to the availability of the following financial resources:

1. The budget from the Spanish National Administration (Administración General del Estado, AGE) and from the Canary Islands' Regional Government (CAC), as part of the contributions to the IAC's budget. In 2020, it corresponded to 13,156 k€ (AGE) and 5,640 k€ (CAC).
2. Annual contributions from user institutions (UIs) at the Observatories and service contracts with some UIs. On average, the IAC has received 2M€/year.
3. External funding obtained through collaborative agreements with the National Government.
4. External funding collected from International Consortiums fostering the construction of major Research Infrastructures.
5. External funding obtained under competitive calls.

From the funding contribution provided by the Spanish National Administration (70%) and the Regional Government (30%) the IAC's annual budget, around 2 million euros per year are devoted to the operation and functioning of the *Observatorios de Canarias* and the IAC telescopes. Moreover, UIs – apart from being directly invoiced for their differentiated expenses related to their presence at the observatories, such us electricity, water, telephone, etc. – contribute in solidarity to the undifferentiated common costs, such as management, telecommunications infrastructure, safety, etc

In total, around **4.5 million euros form the annual budget for the operation of the Observatories and IAC telescopes**, which allow to cover properly all the ongoing actions related to the regular operation of the OOCC. Additional funding is required for the development of the new Research Infrastructures.

4.4.1 Human resources strategy

A total of 65 people worked full-time or part-time at the IAC during 2020 in the running of actions related to the Observatories (present and futures facilities, as well as in advanced support infrastructures and services). In total, they accounted for 55 full-time equivalent (FTE) staff per year, devoted to regular operation of the OOCC or to execute, coordinate and supervise several of the proposed actions. On the other hand, new major RIs are in their respective implementation and preparatory phases, concentrating a total of 32 FTE staff per year from 2020 onwards. In addition to this workforce, we expect to recruit new staff for the implementation of other strategic activities subject to external funding availability. According to the actions described, this new staff would represent another 26 FTE per year.

The table on the next page summarizes the human resources plan for the reference period:

Group	Profile	2021	2022	2023	2024	Extra 2025
Permanent staff	Researchers	11	11	11	11	*11*
	Engineers & technicians	18	18	18	18	*18*
	Management/support	24	24	24	24	*24*
	Total staff	53	53	53	53	*53*
	FTE	*42*	*42*	*42*	*42*	*42*
New staff for development of new Research Infrastructures (CTA, EST, NRT, …)	Researchers	0	0	0	0	*0*
	Engineers & technicians	27	27	27	27	*27*
	Management	4	5	5	5	*5*
	Total staff	31	32	32	32	*32*
	FTE	*31*	*32*	*32*	*32*	*32*
Temporary staff for the implementation of other strategic actions	Researchers	4	4	4	4	*4*
	Engineers & technicians	15	18	18	18	*18*
	Management/support	4	4	4	4	*4*
	Total staff	23	26	26	26	*26*
	FTE	*23*	*26*	*26*	*26*	*26*
	Total	**96**	**100**	**100**	**100**	***100***
	Total Full-Time equivalent	***96***	**100**	**100**	***100***	***100***

4.4.2 Financial strategy

The external funding to cover additional personnel and operation costs will be ensured through competitive programmes at all levels and through other special programmes that the IAC has access to (e.g. RIS3, ERDF, RRF). In this sense, the IAC is actively participating in different public funding programmes (at regional, national and European level) to obtain the needed resources, as well as in bilateral actions with strategic partners all over the world. It is also foreseen to implement a strategy to obtain financial support from private entities.

The table below summarise by strategies and actions the breakdown of the total budget and requested funding under the current Strategic Plan (*a detailed investment Plan is available in the Annex*). A considerable amount of the required funding is required to ensure our participation in **Large Institutional Projects** (LIP) like EST, CTA, NRT and other forefront astronomical facilities. It is assumed that these projects can be undertaken only if decisions by funding agencies, i.e. beyond the IAC capacity, are taken, and other additional funds are made available. **The permanent staff is not included here as part of the total or requested budget.**

FUNDING DISTRIBUTION FOR THE PROPOSED PRIORITY ACTIONS

STRATEGIES / ACTIONS	TOTAL BUDGET (€) for Spanish contribution	ICTS Requested Budget (€)
S1: ENABLE WORLD-CLASS RESEARCH	**126300000**	**15085000**
AN ATLAS NODE AT OT FOR PLANETARY DEFENSE	450000	450000
CONSTRUCTION OF THE CHERENKOV TELESCOPE ARRAY NORTHERN OBSERVATORY (CTAN)	40000000	2000000
DETAILED DESIGN OF A DARK MATTER TELESCOPE	2000000	525000
EUROPEAN SOLAR TELESCOPE (EST)	55000000	3400000
NEW TECHNOLOGY HYBRID OPTICAL TELESCOPE (MINIELF)	2300000	830000
THE NEW 4M ROBOTIC TELESCOPE (NRT)	12000000	5600000
TOT4 – IR ROBOTIC TELESCOPE FOR THE OT	12000000	1230000
UPGRADE OF THE COSMIC MICROWAVE BACKGROUND LABORATORY (CMBLAB) AT THE TEIDE OBSERVATORY	2500000	1000000
ASTRI MA	50000	50000
S2: TO ENHANCE RTD SUPPORT TO THE OBSERVATORIES	**21875000**	**6425000**
ALIOLI, AN ADAPTIVE OPTICS MODULE FOR WHT, NOT AND TCS	250000	215000
DEVELOP AND CONSTRUCT LEADING ASTRONOMICAL INSTRUMENTATION: HARPS3	1500000	170000
DEVELOPMENT OF A LASER GUIDE STAR LAUNCH SYSTEM	5000000	1700000
INSTALLATION OF A QUANTUM KEY DISTRIBUTION EQUIPMENT AT THE OGS TELESCOPE	3365000	1100000
MICROWAVE TECHNOLOGIES FOR CMB POLARIZATION AND SPECTROSCOPY	240000	200000
NEW LEADING SOLAR INSTRUMENTATION: MULTI-LINE INTEGRAL FIELD UNIT SPECTRO-POLARIMETERS FOR THÉMIS AND GREGOR	900000	450000
TCS UPGRADE IN THE AGE OF TIME DOMAIN ASTRONOMY	220000	190000
UPGRADE THE OGS AND PRODUCTION OF PILOT INTERFERENCE FILTERS FOR WIDE FIELD SURVEYS	400000	400000
PARTICIPATION IN THE DEVELOPMENT OF SCIENTIFIC INSTRUMENTS FOR THE THIRTY METER TELESCOPE (TMT)	10000000	2000000
S3: IMPROVE SERVICES AND SUPPORTING INFRASTRUCTURES AT THE OOCC.	**6815000**	**6565000**
ELECTRICAL SYSTEM IMPROVEMENTS ON TEIDE OBSERVATORY. RING CONFIGURATION.	1670000	1420000
OOCC DATA NETWORK IMPROVEMENTS	4545000	4545000
IMPROVEMENT OF THE SECURITY FACILITIES AT OOCC	600000	600000
S4: SKY QUALITY AND ENVIRONMENT PROTECTION.	**6844000**	**6185000**
DEFINITIVE CHARACTERIZATION OF THE BOUNDARY LAYER AND MONITORING NEW OPERATIONAL PARAMETERS	2112000	2112000
PRESERVE NATURAL NIGHT SKY BRIGHTNESS OF OOCC	612000	526000
SUSTAINABILITY, EFFICIENCY AND ENVIRONMENTAL PROTECTION	3910000	3367000
GLOBAL ENVIRONMENTAL ANALYSIS & MONITORING PLAN OF THE OOCC	210000	180000
S5: TO STRENGTHEN RTD SKILLS AS WELL AS ICTS VISIBILITY	**450000**	**430000**
COMMUNICATION TO THE GENERAL PUBLIC AND VISIBILITY OF THE OOCC	250000	230000
EFFECTIVE COORDINATION AND MANAGAMENT OF THE STRATEGIC PLAN	200000	200000
Total general	**162.284.000**	**34.690.000**

The optimization of existing resources annually provided by the IAC Consortium administrations and by Observatory partners, as well as the appropriate strategy as described above, for the preparation and submission of specific proposals under the funding programmes – individually or in collaboration with our international partners – represent basically the resources work-plan to be followed by the IAC for the successful implementation of the Strategic Plan.

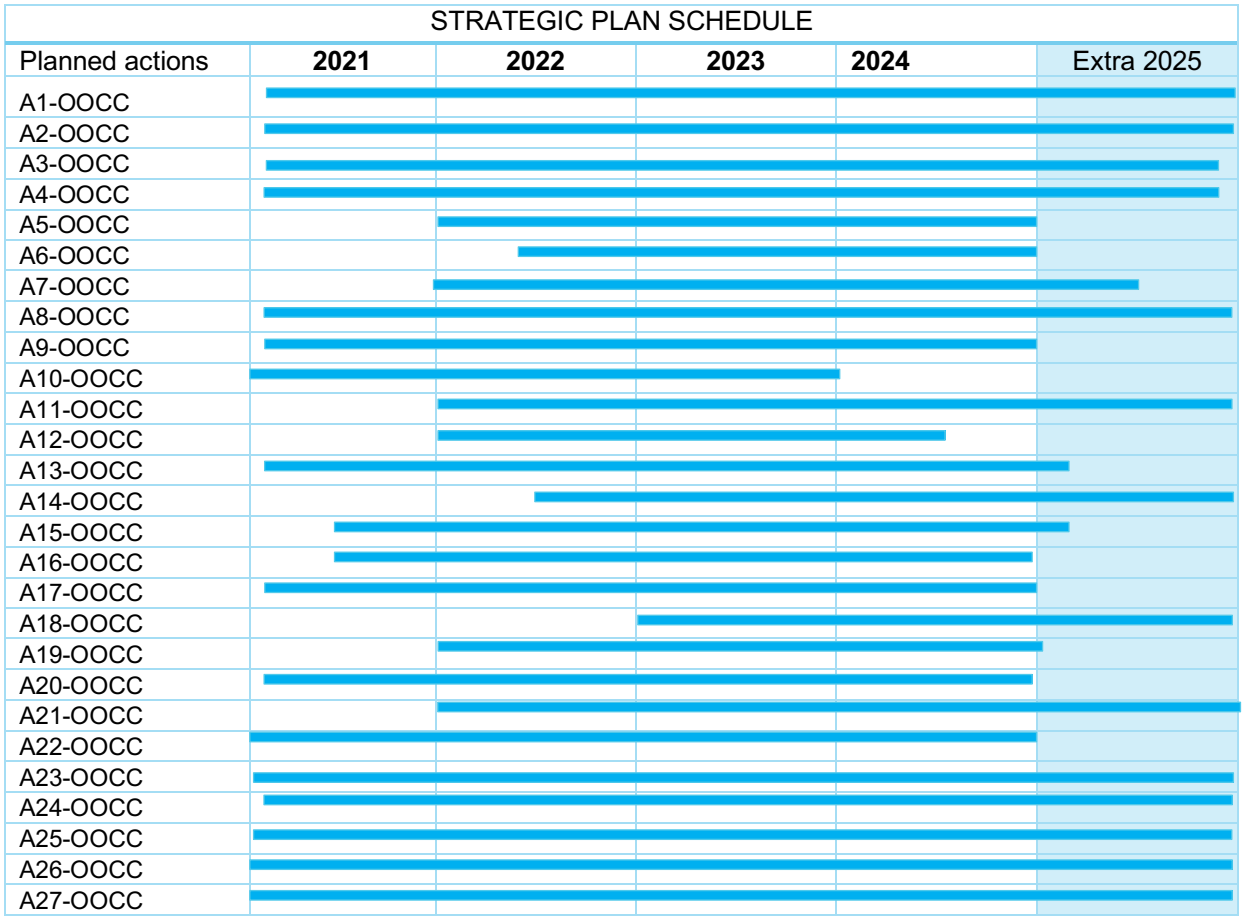
5. PLANNING AND ASSESSMENT

5.1 Planning

The specific strategies identified to accomplish the three major goals of this Strategic Plan are broken down in a total of **27** defined actions. Our strategic goals are challenging, but with a strong performance focus, we believe we will accomplish much toward this Plan over the period . We embrace transparency and accountability and we commit ourselves to being leaders and identifying best practices for communicating our performance both our successes and our setbacks to our stakeholders.

For the proper execution of the aforementioned actions we need to consider the own resources available, which include the people, materials, technologies, funds, etc., and those resources that are subject to the grant of external funding.

In the gantt chart we summarise the Strategic Plan schedule, showing the sequence of actions:



As part of the strategic planning, specific progress reports for each action will be produced including major achievements and possible deviations of the planned work.

5.2 Assessment

Since the Strategic Plan will be continuously monitored and new opportunities for this ICTS could arise during this 4-year period, the set of proposed actions is subject to modifications and new ones could be included in the Strategic Plan. Some flexibility to adapt our work plan to the opportunities that could arise in the near future is also a must for the OOCC.

The IAC has an adequate number of committees and structure, at several levels, to ensure proper follow-up of the 2021-2024 Strategic Plan. The IAC Steering Committee meets on weekly periodicity, to monitor all activities related to this research centre, but it is twice a year, immediately before the meetings of International Scientific Committee (CCI, in April and

October generally), when a comprehensive monograph on the Observatories is conducted. Similarly, the various subcommittees of the CCI, which also meet with the same periodicity, address and give follow-up to specific topics of special relevance for the observatories:

- ORM/OT Common Services Committees: Advisory body to the IAC and to the CCI on those matters related to the operation of ORM/OT observatories, as well as on their future developments. Management of Common Budget (contributions from UIs).
- SUCOSIP: To advise to the IAC and CCI on site characterisation issues and protection of the sky quality for astronomical research.
- SUCOSIP lasers WG: To advise on the use of lasers for astronomy and develop the laser traffic control system protocol at the OOCC

Apart from these committees, there are two on-site managers at ORM and OT observatories, responsible for the day-to-day activities. Given the relevance of the Strategic Plan, the Director of the IAC assignes its management to the "Institutional Projects and Transfer of Knowledge Office (OTRI)", which depends on the Director´s Office, with wide experience on strategic projects´ management and monitoring of the different activities. In this sense, it is expected the recruitment of one Project Manager specifically devoted to the follow up of the strategic Plan. Moreover, the Sky Quality Group is also the Institutional link at IAC between the different departments to coordinate whatever efforts are directed towards the characterization and protection of the canarian sky for Astronomy.The corresponding departments at the IAC or at the UIs will be directly responsible for the implementation of these activities. The project manager in close coordination with the on-site managers, will report to the IAC Steering Committee and to the CCI - through the aforementioned sub-committees when appropriate-, about the progress of the Strategic Plan and about possible corrective actions, if any.

It is proposed that the project manager will prepare a progress report every three months, supervising the proper execution of the Plan, to be presented at the IAC Steering Committee. This committee will decide about informing or not at that moment to the corresponding sub-committees and to the CCI, or to wait until the next scheduled meeting.

The project manager will be also responsible for the preparation and implementation of a Risk Management Plan,bearing in mind the specificities of each action. For each of the foreseen risks at least one preventive or mitigating measure has been defined. Should these measures prove to be insufficient to reduce risk to an acceptable level then the project will take further steps in order to identify and implement appropriate corrective measures

Above the Steering Committee, the IAC Governing Body (Consejo Rector) is responsible for the approval of the IAC Annual Action Plan, including the observatories. A "Research Advisory Committee", whose members are scientists of international prestige, provides also their opinion and recommendations to the IAC Governing Body on achievements and long-term activity of this research centre and its observatories. As part of this top-level follow up, the OOCC Strategic Plan will be properly reviewed and monitored.

Key Performance Indicators (KPIs)

In order to measure OOCC's performance, a set of specific indicators is initially proposed. Some of them refer to one single action, but the majority will be related to the achievements from several ones. Main criteria and monitoring of the Strategic Plan will refer to:

- Nº new collaboration agreements and renewal of existing ones.
- Nº new facilities and upgrades
- Nº proposals received for observing time, access provided and oversubscription rate.
- Nº service programmes carried out.
- Nº facilities offering remote observing.
- Nº and ratio of successful proposals for funding, related to the Strategic Plan.
- Nº of publications at peer-review journals.
- Nº visits (open days, etc), publications and outreach material.
- Nº training activities.
- Nº activities organised for the touristic sector.
- Nº actions on nature preservation and social awareness.
- Nº of workhops and conferences.