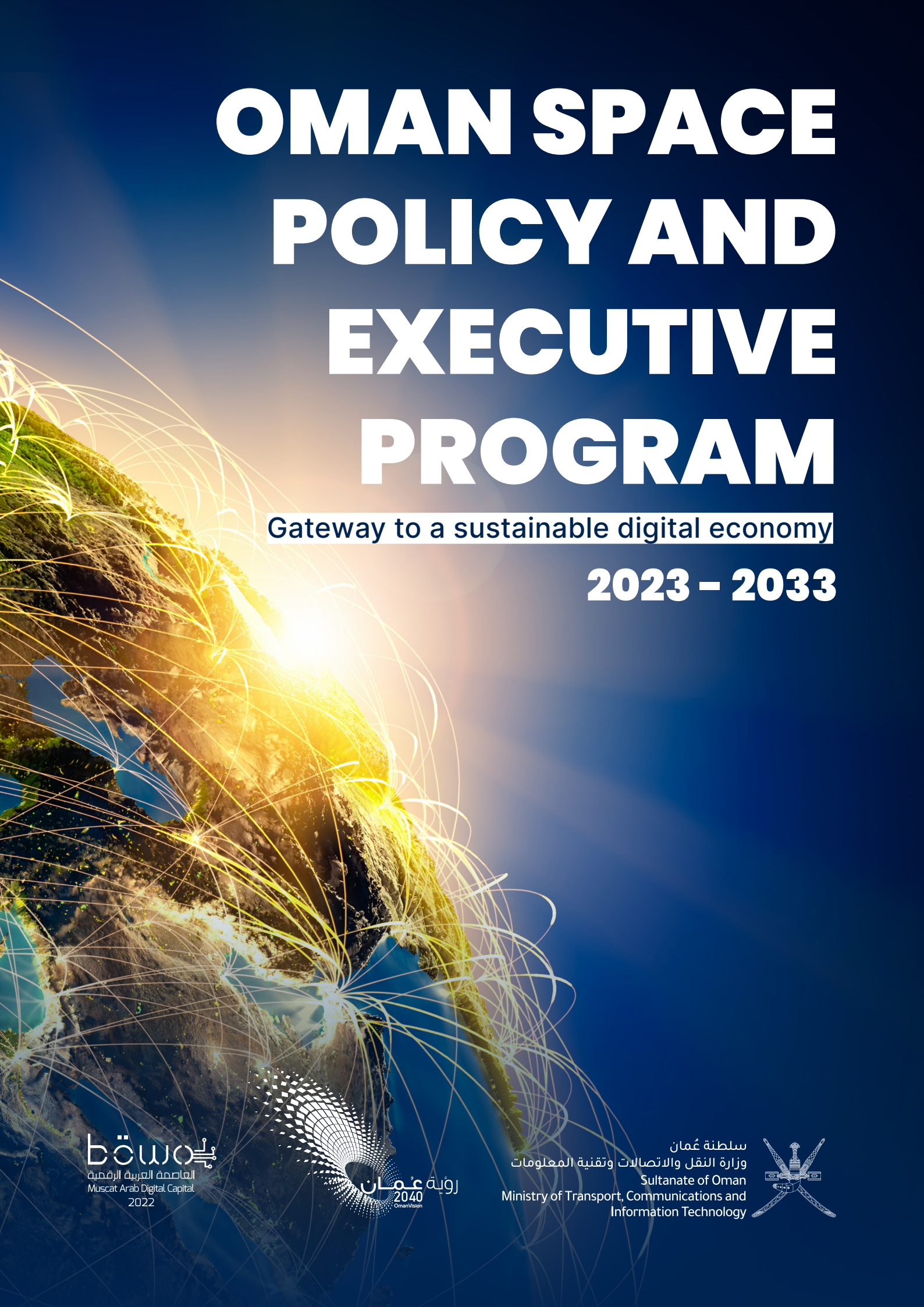
OMAN SPACE POLICY AND EXECUTIVE PROGRAM

Gateway to a sustainable digital economy

2023 – 2033



مسقط
العاصمة العربية الرقمية
Muscat Arab Digital Capital
2022

رؤية عُمان 2040
OmanVision

سلطنة عُمان
وزارة النقل والاتصالات وتقنية المعلومات
Sultanate of Oman
Ministry of Transport, Communications and Information Technology

Our government will follow up progress in various sectors, including small and medium enterprises, and entrepreneurship, particularly those based on innovation, artificial intelligence, and advanced technologies. This is in addition to training and enabling youth to benefit from the opportunities made available in this vital sector, so that it could form a cornerstone in the national economy.

HM's speech Sultan Haitham bin Tarik, 23 February 2020
Source: Oman News Agency

In case of any discrepancies between the English and Arabic versions, the Arabic original version shall prevail.

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Message from H.E. Eng. Saeed Bin Hamoud Al-Mawali,

Minister of Transport, Communications and Information Technology

Space, unique among human activities, has the power to propel human imagination and innovation. As a nation of pioneers and explorers in the pursuit of knowledge and prosperity, Oman has much to offer to—and benefit from—space.

Our strategic location has contributed to the flourishing of maritime activity throughout the ages and now supports global connectivity across continents. Our culture is rich in customs and traditions borne by values of humanities, spirituality and tolerance, making Oman a unique partner to support open international dialogue and a launchpad for future opportunities in a domain humanity has just touched the surface, space. We have engaged an unparalleled transformation of our economy and society under the strategic direction of Oman's Vision 2040.

Looking forward, Oman's future will be based on innovation and knowledge, pursuing opportunities that were not accessible in the past. In that regard, the tremendous changes in the global space sector offer unique perspectives for our country to leverage capabilities, respond to our most critical national challenges and support our way towards a flourishing digital economy to fuel a sustainable knowledge-based economy.

Today, we set our eyes on our next goals. This policy highlights Oman's space vision, values and priorities. It lays the foundations and charts the path of our space sector for the years to come.

Ministry's mandates in space sector according to the Royal Decree 90/2020

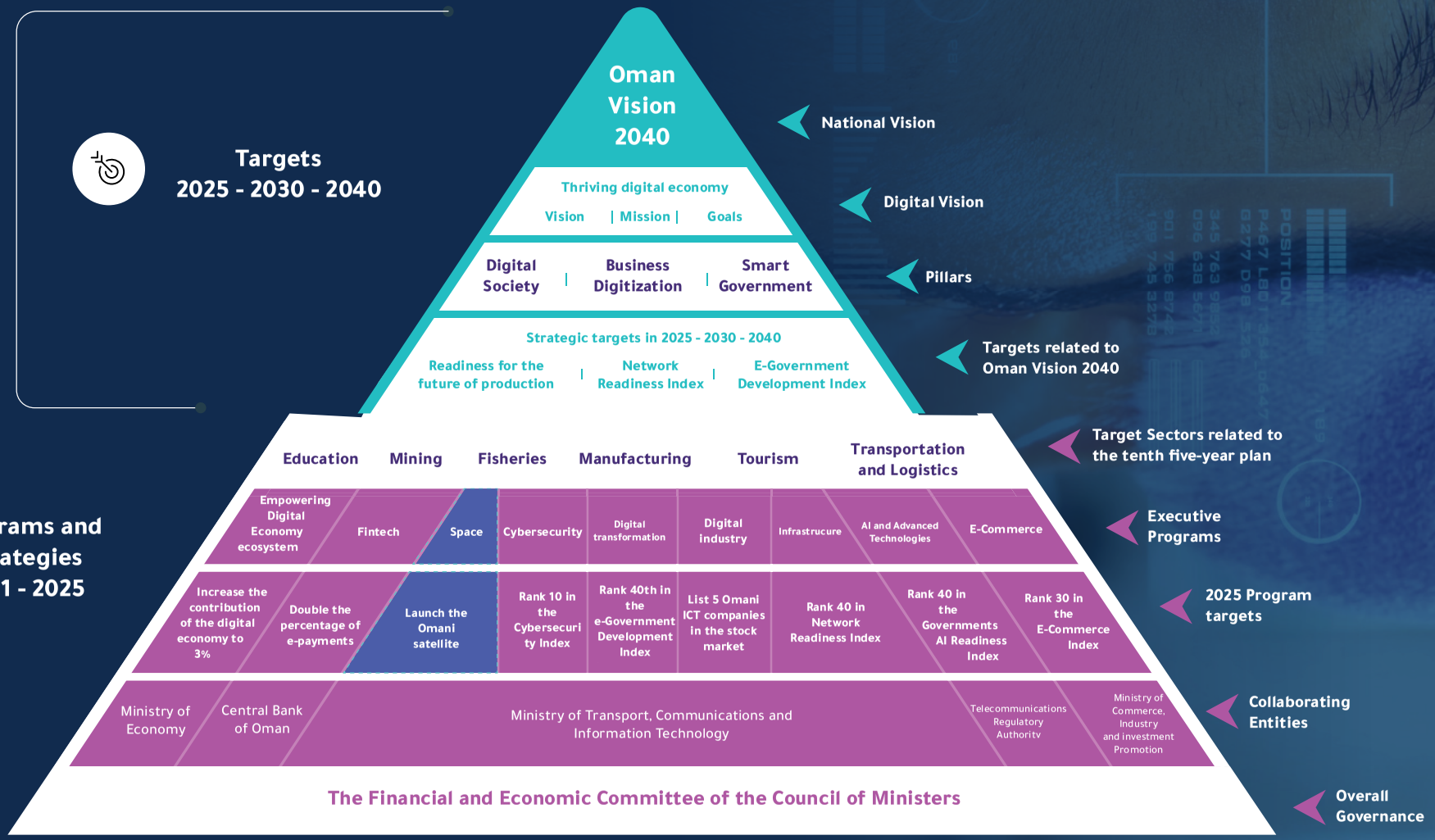
Propose policies and strategic plans related to technology and space sciences in a way that contributes to achieving the goals of the Oman development plans.

Establish the national space program in the short, medium and long term, and follow-up on its implementation.

Support programs to develop uses and applications of space science and technology.

Work towards the establishment of an infrastructure for the development and manufacturing of space systems and satellites.

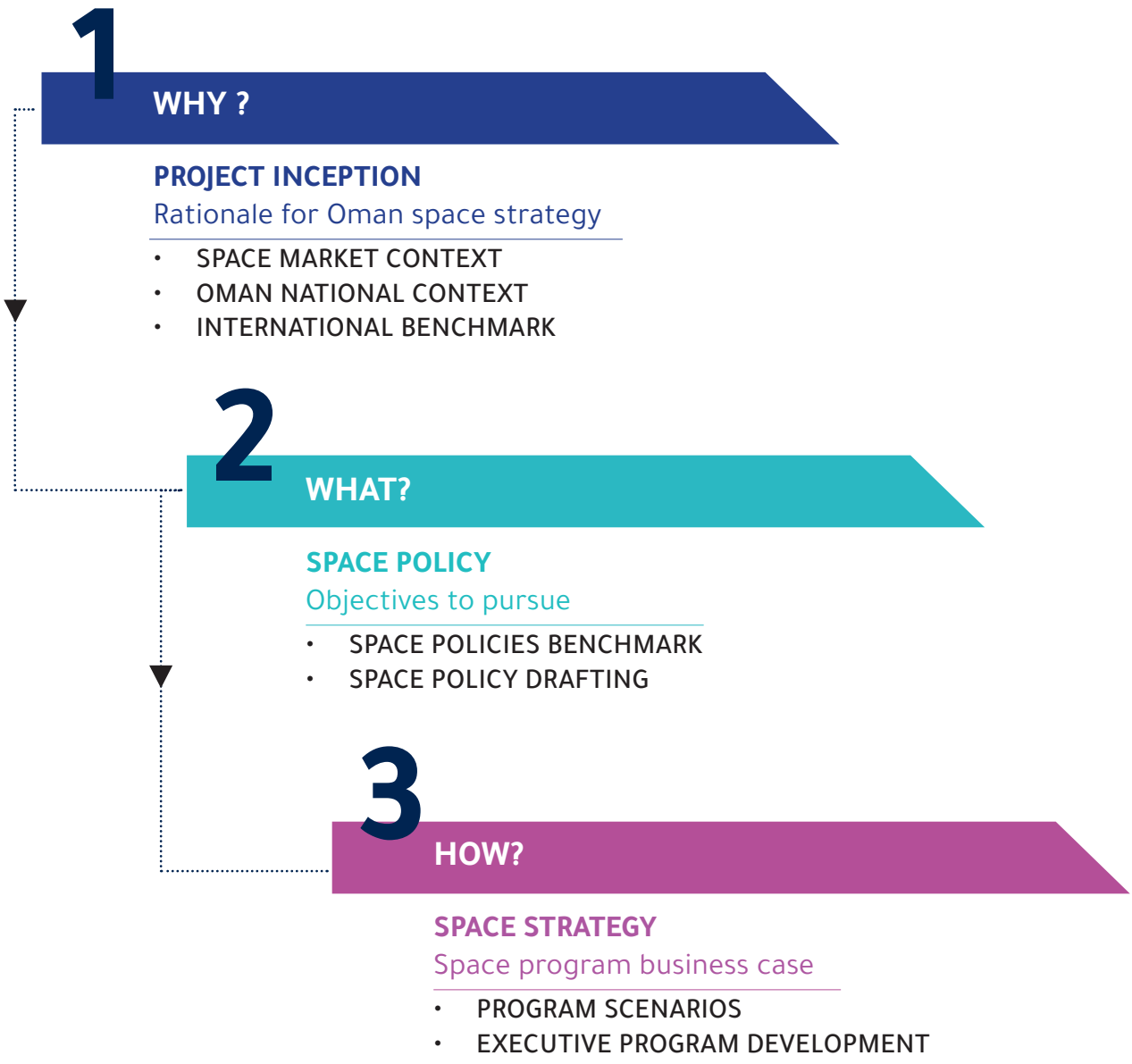
The National Direction of Digital Economy



Oman Space Policy and Executive Program

Development Methodology

The purpose of this project is to study and analyze the current situation of the space sector in Oman, on both levels Local and global, and determine the future directions of the sector.
The project will be implemented in 3 stages:

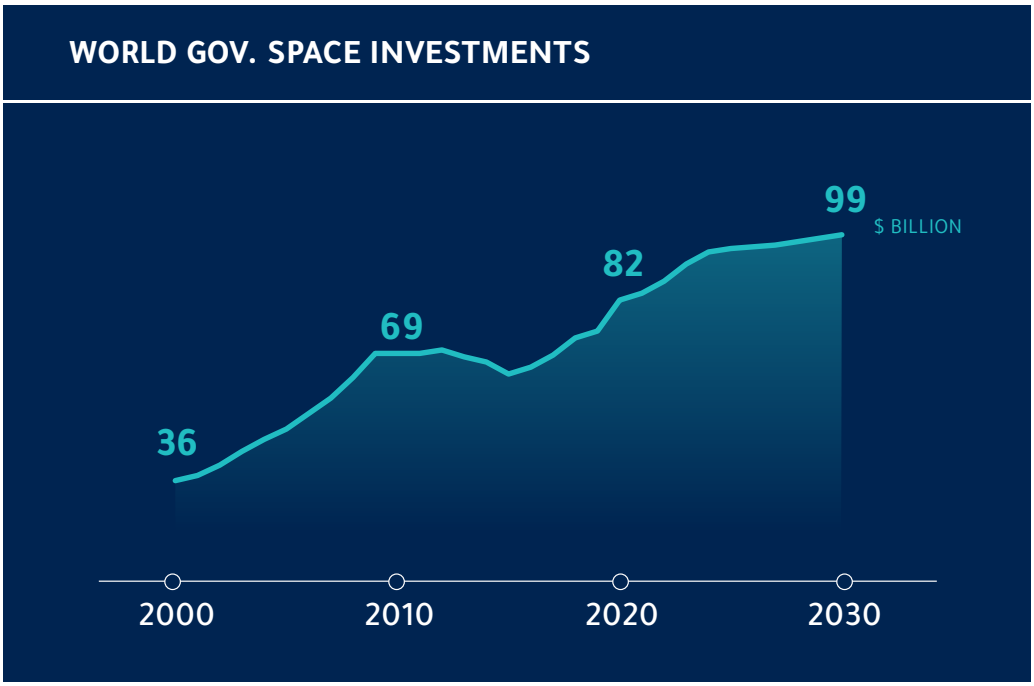


Market Opportunities in Space Markets Are Driven By Downstream Applications and Services

The emergence of new players combined with sustained investments from historical leaders is pushing governments budgets for space worldwide with priorities towards defense, space exploration, the development of sovereign assets and capability building for new entrants.

GOVERNMENTS' ALL TIME HIGH INTEREST IN SPACE

- 2020 marked an all time high with **85 countries investing in a space program** and **$82 billion** reached globally by space budgets (a 10% increase over 2019 and an annual growth rate not seen since 2009).
- A growing number of countries are investing in space attracted by s**ocio-economic benefits of space assets**, **boost innovation** and technical capabilities, support their **armed forces**, but also by the promise of capturing a share of the rapidly-growing **commercial space market.**
- Still, investments remains largely concentrated with the top 5 space programs accounting for 81% (v 93% 20 years ago), with the US alone accounting for more than 59%



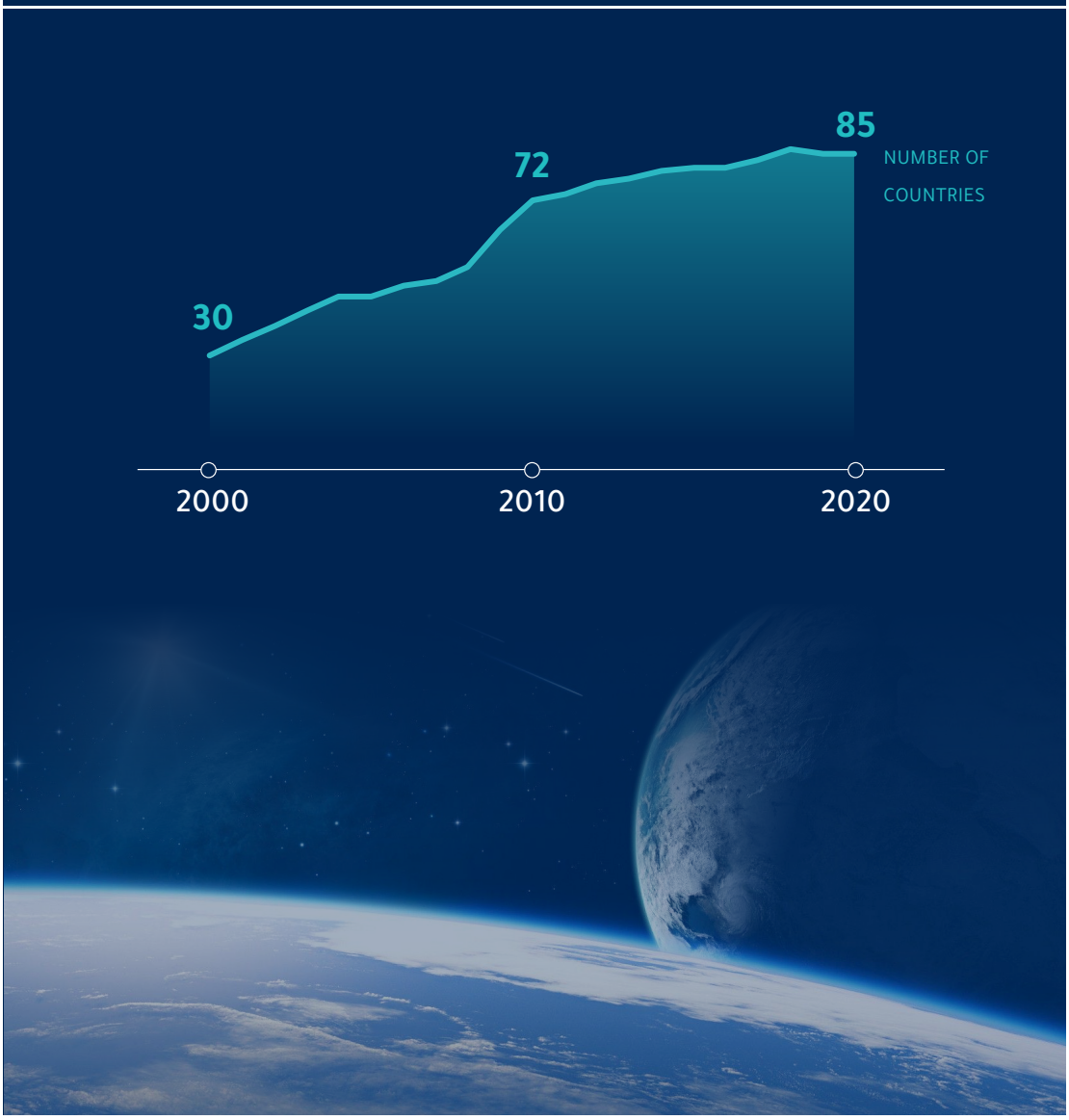
DEFENSE AND EXPLORATION AS KEY DRIVERS

Governments are anticipated to maintain their growing investment trend n the decade to reach $99 billion by 2030, driven by two strategic priorities:

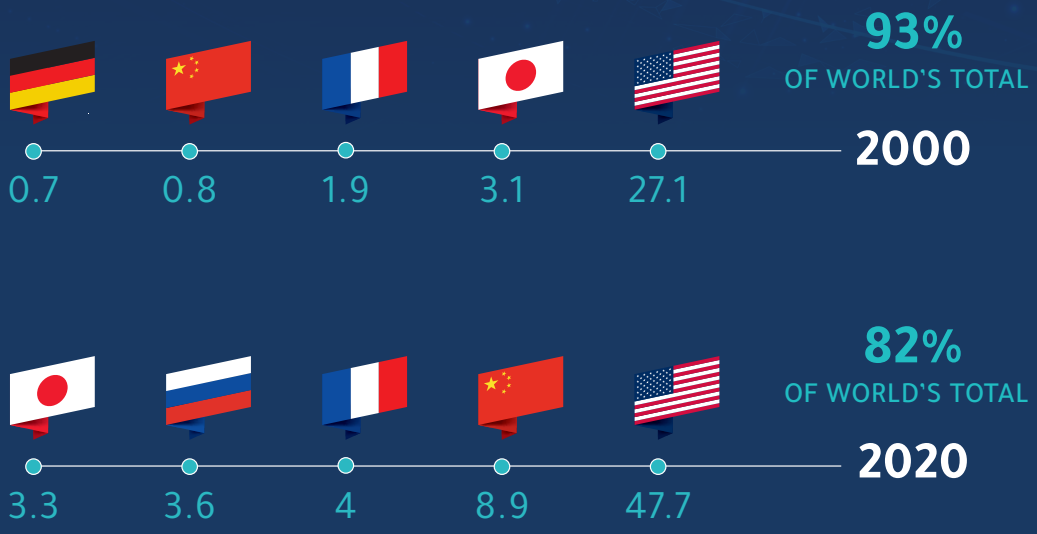
- **Defense satellite programs** as, leading and newcomer space countries seek to reinforce their leadership in an increasingly complex geopolitical environment.

- Affirmed ambitions towards **space exploration** with convergence towards Moon and Mars missions.

COUNTRIES INVESTING IN SPACE



TOP 5 WORLD'S INVESTMENTS



CIVIL V. DEFENSE SPENDINGS

Market Environment Global Trends in Space Markets

The global space sector is experiencing strong market dynamics pushed by new supply and demand drivers, disruptive innovations and transforming business models.

MARKET VALUE TO REACH ~$570B BY 2020

- World's revenues from space activities totaled $315B in 2020, up from $290B in 2015. While the sector has experienced strong growth over the years (+4% annual) Covid crisis impacted the sector in 2020 with revenues down by ~6%.

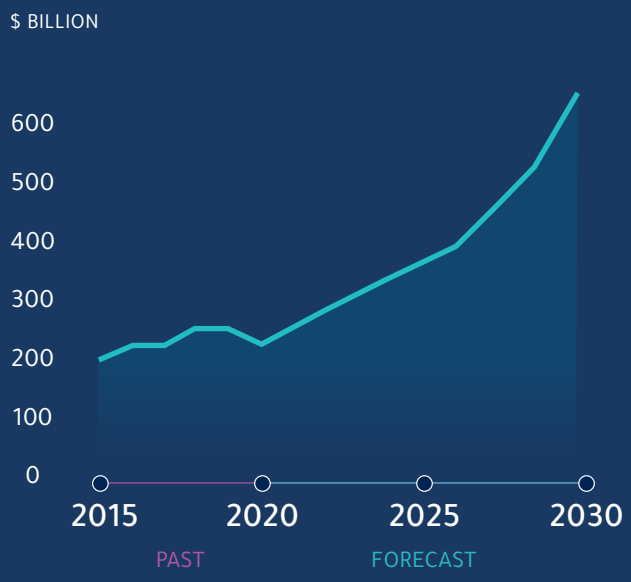
- Still, the sector is posting strong recovery with 2021 revenues back to 2019 levels. **By 2030, the market is expected to reach ~$570B**, i.e +80% over 2020 driven by **the development of services and applications.**

DOWNSTREAM GENERATE MOST OF THE VALUE

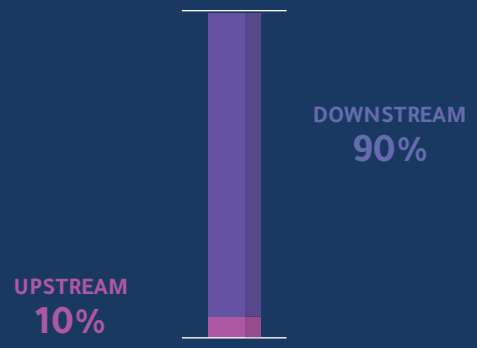
- Upstream activities represent the core of the space industry from manufacturing to operations of space systems. These segments experience generate moderate **revenues and growth, 10% of the total market,** as infrastructure business.

- Downstream activities include operations, services and end-users terminals. They account for the **majority of the total market value (90%)** driven by satellite communications and navigation services (consumer applications), growing at around 6% CAGR over the decade.

TOTAL SPACE MARKET VALUE



BREAKDOWN PER SEGMENTS (2021)



TOTAL
MARKET VALUE:

337
B$

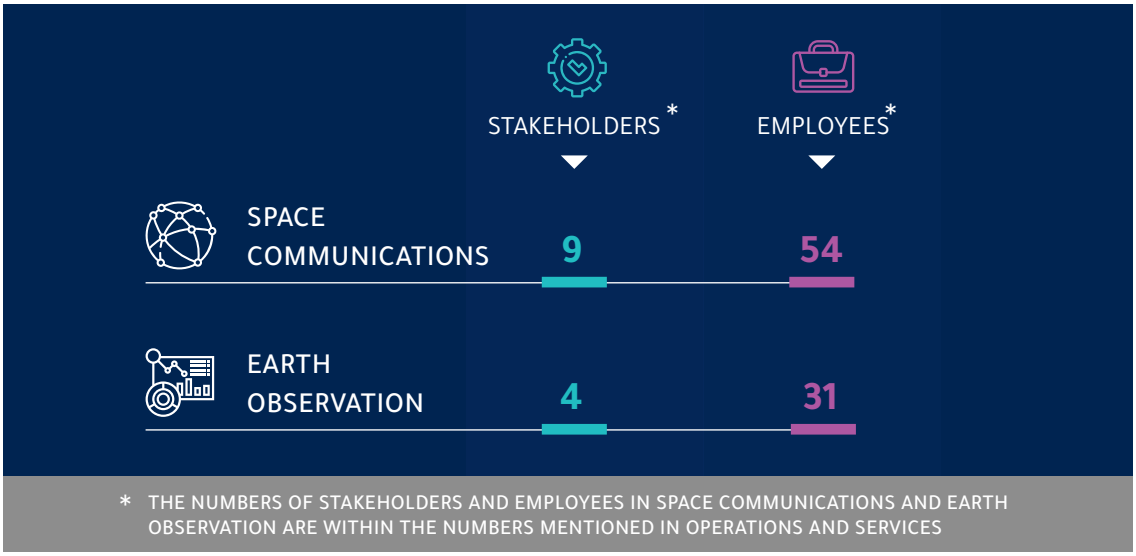
WORLD'S SPACE INDUSTRY REVENUES ALONG THE VALUE CHAIN

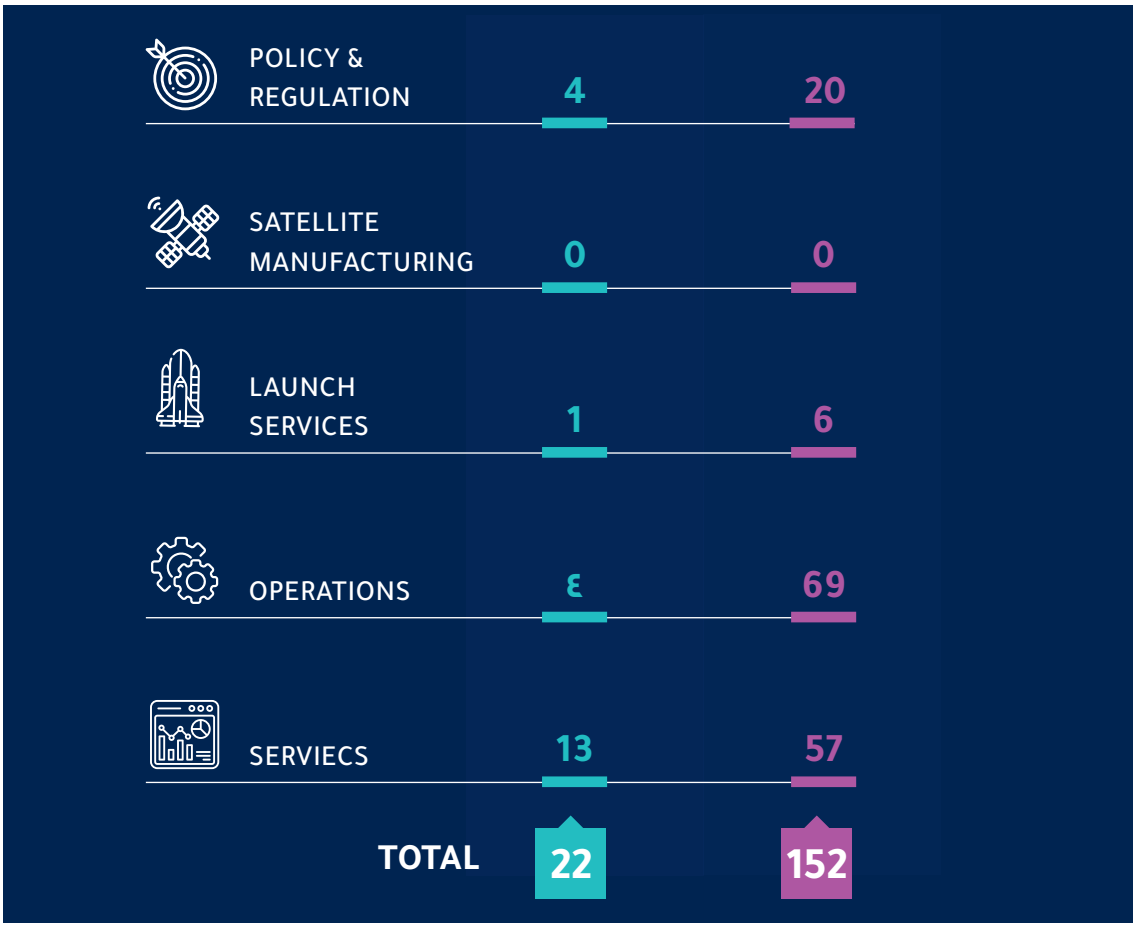
IN 2021 ($ BILLION)

Oman's Sectorial Sapabilities

Space Sector's Indicator

Oman space sector remains small in terms of entities involved, employment and revenue generated. Mostly concentrated downstream as satcom and EO services have developed over time. No revenue generated upstream yet as players have not started commercial business.





Oman's Space Sector SWOT Analysis

The analysis performed in Phase 1 has allowed to identify strengths and weaknesses to build upon as well as opportunities and threats to consider when developing Oman's space Executive Program. Key outcomes are summarized below.

STRENGTHS

- Favorable national policy context for the establishment of a space program
- Oman unique diplomatic position in the Middle East opening range of cooperation
- Geographical position offering a competitive advantage for specific space applications as well as specific needs to be served.
- Telecom regulation aligned with international standards
- Existing capabilities and ground infrastructure for satcom and remote sensing
- Existing space related players well connected internationally
- Strong pool of engineering/ICT graduate students
- Advanced telecom infrastructures (Fiber coverage, submarine cables..)
-

OPPORTUNITIES

- Future space initiatives able to respond to top national priorities across sectors, if well defined and aligned. Strong leveraging effect potential.
- Growing challenges faced by the country requiring use of satellite-based technologies (natural disasters, connectivity, maritime domain awareness…)
- Business regulations improving with respect to international standards
- Small but existing network of players with ambitious space development plans
- Several sectors' enablers that can be activated (incubators, Oman Investment Authority, Oman Vision 2040 Follow Up Unit etc…)

WEAKNESSES

- Still a limited share of technology sectors into national economy and job market
- Small number of players with no capabilities upstream to build upon
- Weak synchronization between stakeholders in S&T incl. space
- Absence of legal provisions tailored/adapted to space technologies and applications outside telecom, impeding sectorial development
- Legal/regulatory environment still presenting gaps to attract FDIs
- Small national market for space technologies and services (gov and commercial)
- Fragmented sector governance.

THREATS

- Pressure on public finances constraining investment opportunities
- Multiple regional players already active in space with ambitious plans creating a regional competition to attract partners and fund projects
- Fragile ecosystem dependent of a handful numbers of players not sustainable in the short term without government support
- Duplicating initiatives between existing stakeholders creating intra-competition, lack of visibility and possibly investments redundancies.

Oman Space Policy at a Glance

The policy determines the vision of the sector 2023 – 2033, the four pillars that will support the realization of the vision, and the requirements for each pillars.

The Policy Structure

Economic Diversification

Space to generate commercial opportunities in a digital economy

Capacity Building

Space to boost innovation in a knowledge-based society

Vision

To become the regional gateway for space applications to empower economic diversification and unlock future opportunities

National Security

Space to safeguard sovereignty for a secured country

Environment & Natural Resources

Space to support sustainable exploration and use of resources

Pillars of Oman's Space Policy

1. ECONOMIC DIVERSIFICATION

As a sector based on science and technology, knowledge and innovation, space offers great opportunities to contribute to the diversification of the economy and to support the transition towards a digital society. National space initiatives will be directed towards supporting the development of a commercially oriented and competitive Omani space sector.

In order to achieve this, we will:

1 **PRIORITIZE INVESTMENTS IN THE SPACE DOWNSTREAM SECTOR IN AREAS WITH STRONG COMMERCIAL GROWTH POTENTIAL**

- Become a center of excellence in space-based applications and services that support growth of key national economic sectors.
- Target markets offering high commercial opportunities such as satellite broadband, mobile connectivity, Earth observation and navigation services.

2 **SUPPORT THE GROWTH OF THE NATIONAL SPACE ECOSYSTEM**

- Provide sustained support to the private space sector, establishing the conditions for a vibrant, sustainable and competitive space ecosystem.
- Attract Foreign Direct Investment (FDI) to accelerate the development of the national space sector.

3 **DEVELOP A SPACE SECTOR SUPPORTING THE DIGITAL ECONOMY**

- Position Oman as a regional space gateway, building and offering a unique ecosystem of digital infrastructures and professional skills to develop cutting-edge downstream applications.
- Specialize in satellite data processing and analytics to offer very high value-added services and generate economic benefits.

4 **LEVERAGE NATIONAL STRENGTHS TO BECOME A KEY REGIONAL SPACE PLAYER**

- Use Oman's world-class ICT infrastructure to support the space sector.
- Accelerate the growth of the space sector by capitalizing on Oman's strong field of STEM graduates.
- Leverage Oman's domestic political stability, business environment and favourable geopolitical position to build a robust space sector.

2. CAPACITY BUILDING

National capacity plays a key role in supporting a sustainable and growing space sector, contributing to the achievement of the national technology and innovation strategy. The space sector will increase industrial and human capabilities, helping to create the jobs of the future.

In order to achieve this, we will:

1 BUILD SPACE CAPABILITIES MEETING THE NEEDS OF KEY SECTORS

- Orient the development of space solutions tailored to the requirements of leading national sectors such as maritime, security, energy, urban planning, and logistics.

2 ALIGN SPACE TECHNOLOGY DEVELOPMENT WITH INNOVATION PRIORITIES

- Emphasise the development of capabilities in technologies enabling Oman to position itself as a regional space gateway, including data analytics, cybersecurity, cloud computing, and other digital technologies.

3 EMPOWER GRADUATES AND PROFESSIONALS

- Upskill professional competencies by establishing space-specific educational curricula, mentorship programmes, business coaching, and other training opportunities.
- Align educational training opportunities with space market demands for skilled labour.

4 PROMOTE SPACE SCIENCE AND TECHNOLOGY COOPERATION

- Strengthen academia - industry partnerships to spark innovation and facilitate knowledge-sharing.
- Capitalize on opportunities for international collaboration facilitating technological and knowledge transfer.

3. NATIONAL SECURITY

Space offers valuable solutions for protecting national security and safeguarding Oman's sovereignty, such as monitoring land and maritime borders and increasing resilience against natural disasters. To reduce foreign reliance, Oman's space activities will pursue strategic autonomy and leadership in critical areas.

In order to achieve this, we will:

1 SECURE SOVEREIGN SPACE INFRASTRUCTURES AND COMPETENCIES

- Prioritize strategic capabilities in satellite communications and earth observation. These space applications will require sovereign ground infrastructure, further advancing Oman as a regional space gateway.

2 IMPROVE RESILIENCE AGAINST NATURAL DISASTERS

- Develop space applications to reduce, mitigate and recover from damage caused by extreme weather and natural disasters which threaten the safety and well-being of our people.

3 LEVERAGE SPACE TO RESPOND TO THREATS AND TACKLE SOCIO-ECONOMIC CHALLENGES

- Deliver space-based services to rural and underserved areas such as e-government, e-health and e-education, as well as promote digital inclusion.
- Maximize the use of satellite-based solutions to enhance safety and security on land, air and sea.

4 COLLABORATE INTERNATIONALLY TO HELP SHAPE GLOBAL NORMS FOR THE RESPONSIBLE AND PEACEFUL USE OF SPACE

- Conduct national space activities in respect of the international principles of the peaceful use of space.
- Engage in diplomatic initiatives with international partners and advocate for space safety, security and sustainability.

4. ENVIRONMENT & NATURAL RESOURCES

Oman pledges to be a responsible steward of both earth and space environments. We will encourage the development of space applications geared towards protecting the environment, ensuring the sustainable use of natural resources to support the national economy and improve quality of life.

In order to achieve this, we will:

1 SUPPORT THE SUSTAINABLE USE OF NATURAL RESOURCES

- Emphasize space-based applications to explore, utilise and protect natural resources including fresh water, oil & gas reserves, and fish stocks.
- Use space technologies to contribute to UN Sustainable Development Goals (SDGs) such as increasing agricultural yields, protecting fragile ecosystems, and preventing biodiversity loss.

2 LEVERAGE SPACE SOLUTIONS TO OPTIMISE ENERGY INFRASTRUCTURES

- Support the use and development of space-based applications to optimise the operation of energy infrastructures and green technology projects.

3 TACKLE CLIMATE CHANGE WITH SPACE SCIENCE AND TECHNOLOGY

- Support space initiatives to monitor air, land and sea environments and protect them against the effects of climate change.

4 CONTRIBUTE TO THE SUSTAINABLE USE OF SPACE

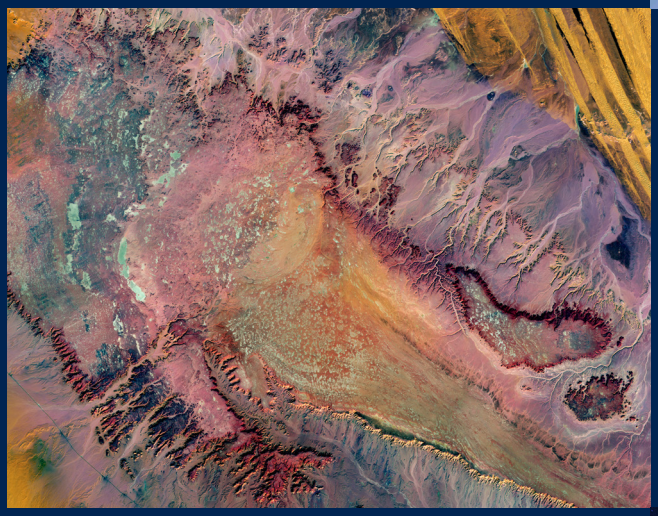
- Develop and provide access to national assets and infrastructures supporting space sustainability initiatives such as space situational awareness (SSA) and space debris monitoring.
- Undertake diplomatic initiatives to encourage the responsible and peaceful use of outer space.

Priority Space Focus Areas

Activities under the strategic Pillars of Oman's Space Policy will be guided by the Priority Space Focus Areas.

Satellite Communications

As a commercially mature and rapidly evolving market, Satellite Communications (Satcom) contribute to a thriving digital economy. Offering multiple business opportunities, Oman's space sector can leverage its competitive ICT infrastructure and experience in Satcom services supply. Building sovereign Satcom capability will further contribute to achieving Oman's broadband strategy and support its national security.



Earth Observation

Oman has built world class expertise in Earth Observation (EO) applications for public and private sector needs, including disaster management, meteorology, environment, energy, urban planning and security. Oman will enhance support to its EO sector to become a center of excellence for high value-added applications via developing skills in AI, data analytics, data fusion and multi-sourcing capabilities.

Ground Networks

Changes in the space industry are transforming the way satellite systems are connected to ground networks. Oman will make full use of its unique geographical advantages, extensive cloud and ICT infrastructure and legacy in telecommunication networks to become the new Space Gateway for the world space sector supporting satellite and science applications.

Downstream space applications open up considerable opportunities for Oman's space sector

The commercial space sector is experiencing strong market dynamics, disruptive innovations and transforming business models unlocking new market opportunities.

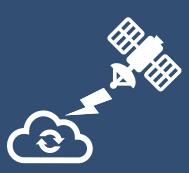
Downstream applications and services will continue to concentrate most of the space market value. Leveraging on legacy capabilities and innovation, they will represent **Oman's entry point in the global space sector**.

Space economy key highlights

90 countries invest in space in 2022

The space economy will hit **$642B by 2030**

Grows **x2 time faster** than the world economy



Downstream applications account for **90%** of the space market value.

Space account for **0.44%** of the world's GDP

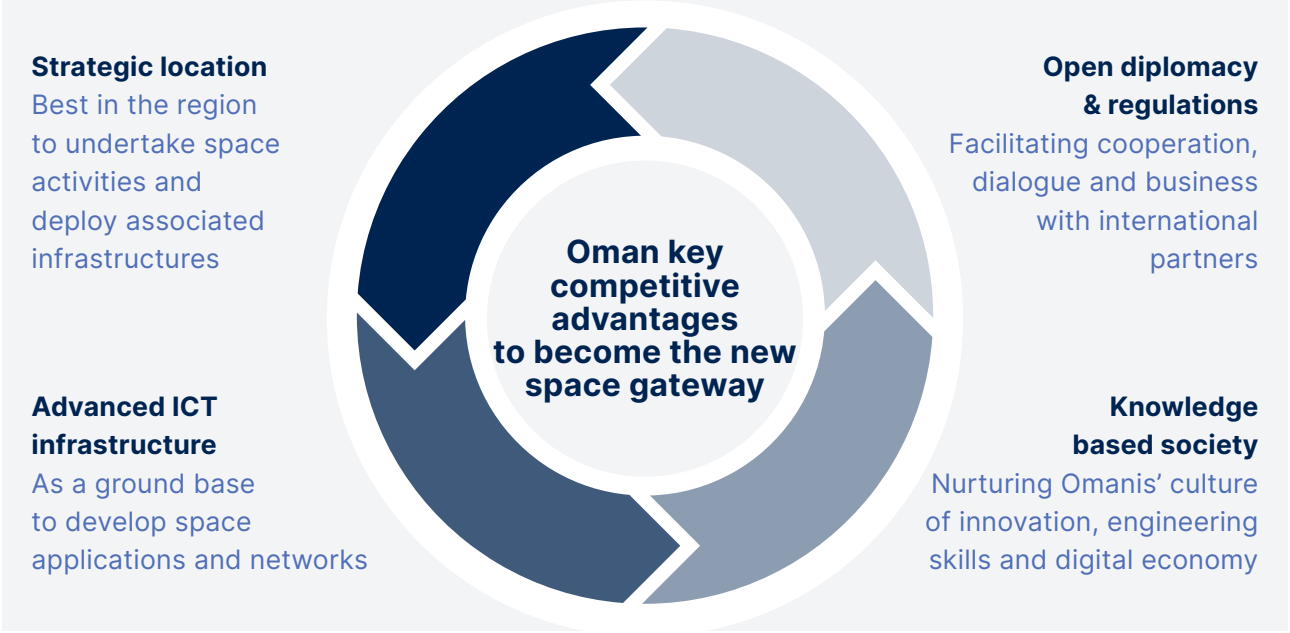
But **only 0.05%** of Oman's GDP

Oman as a New Space Gateway

Oman has embarked on a long-term, ambitious plan initiated by Vision 2040 founded on innovation, integration of roles and equal opportunities to build a productive and diversified economy. Under joint actions by the government, private sector and civil society, Oman is shaping its future building on its heritage, values and competitive advantages.

The global space sector is heading towards the inception of a new era that, under the impulsion of the newspace revolution, will be marked by democratized access to space-based solutions, a new ecosystem of stakeholders and renewed government ambitions to serve global agendas.

As emerging space nations expand globally, motivated by the variety of socio-economic returns that space activities can generate, it is crucial for Oman to begin its space journey, building on its national assets that makes it unique in the region and worldwide.



Several initiatives have taken place already paving the way for the development of Oman's space-based capabilities. This is particularly true in the satellite communication and Earth observation domains where Omani organizations have built internationally recognized expertise and excellence. Oman's government fully recognizes the vital importance of the space sector to stimulate national development as the Royal Decree 90/2020 mandated the formulation of the National Space Program. It is now time to act and pursue more ambitious goals for Oman's space sector, taking advantage of global opportunities and leveraging the full potential of our nation and its people.

The executive Program for The Omani Space Sector

The executive program aims to support the Sultanate of Oman's vision in the field of **the space sector** with its various sciences, technologies, applications and services. The positive results of the sector for the country within **10 years** will be determined through partnership in implementing various projects and initiatives.

Oman's Space Market: Downstream Applications

With no or marginal activities upstream so far, the Oman space market is essentially concentrated downstream. It is estimated at $155M in 2021 with Satcom and Satnav services representing 95% of total market value. These figures are based on consultation and requires additional stakeholders' input to be collected in Phase 3.

INVESTMENT OPPORTUNITIES:

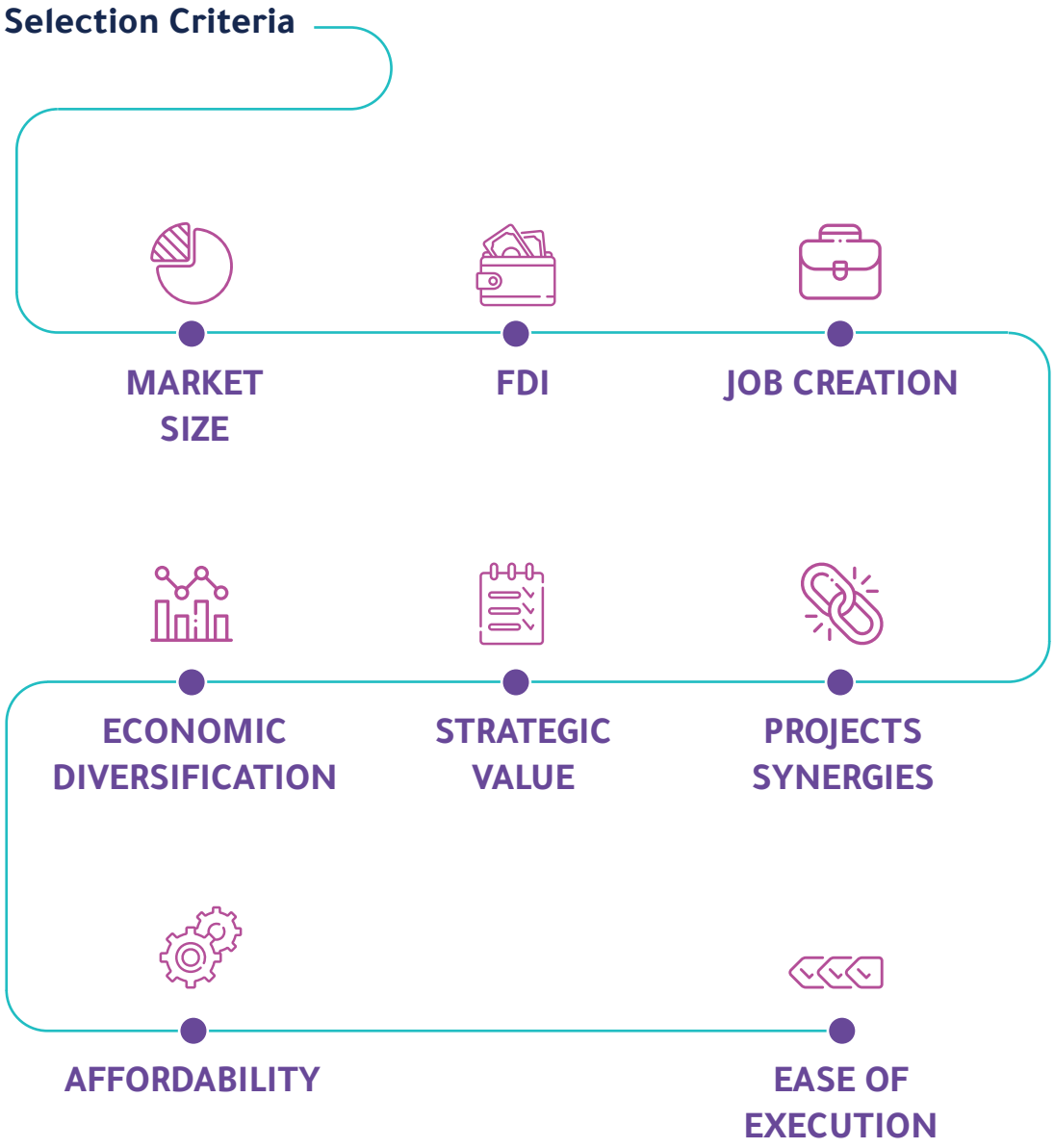
- With no government or commercial satellite in development or procured, Oman's "space" market remains marginal upstream with no known revenues generated in 2021 and in the recent past.

MARKET VALUE DOWNSTREAM:

- All applications combined, commercial revenues related to satellite operations and services are estimated at $144M in 2021, based on assumptions as no detailed information were provided to us by stakeholders. Satnav is a particular case representing 80% of the market value, entirely derived from services & equipment sales and not generated by Oman-based companies but foreign GNSS applications available in the country (e.g. LBS, road). Satcom accounts for 18% driven by connectivity (such as rural broadband). Most revenues are generated by Oman companies (SCT, Omantel…).EO is estimated at $3M in 2021, i.e. 2% of Oman's satellite market.

Project Selection Criteria

The executive program projects for the sector were proposed and evaluated based on several criteria, the most important of which is the contribution of the project to the development of the sector, harmony with other sectors projects, attracting investments in the sector and ease of implementation:



Space Executive Program: Projects and Initiatives

14 projects and investment opportunities have been identified as part of Oman's future space program. They all pursue, at different levels, objectives set by Oman's Space Policy Pillars. Most projects align with several pillars with capability building and economic diversification coming first. 8 projects are quick wins.

	Economic diversification	Capability building	National security	Environment & natural resources
● Space Cloud Partnership	☐	☐	▣	▣
● Satellite ground station hub	☐	☐	▣	▣
Direct receiving station	▣	▣	☐	☐
National Space Data Platform	▣	☐	▣	▣
● End user applications booster program (Sandbox)	☐	☐	▣	▣
● Center of Excellence for space applications	▣	▣	▣	▣
● Cubesat project	☐	☐	▣	☐
Space Accelerator	☐	☐	▣	▣
● National space observatory	▣	▣	☐	☐
● World conference	▣	▣	☐	☐
● Satellite R&D program	☐	☐	▣	▣
National Satcom Initiative (2 options)	☐	▣	▣	▣
Regional Satnav augmentation system	☐	▣	☐	▣
Launch site partnership	☐	▣	▣	☐

▲ Quick win

Core projects

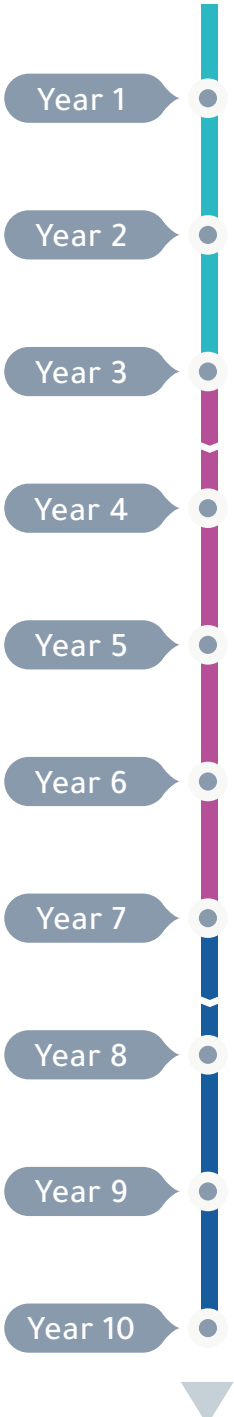
Must have to pursue Omani space sector development.

Non-core projects

Would accelerate Oman's space sector development

Program Implementation Roadmap a 3 Phase Approach

The 10Y space program is divided in 3 phases to gradually develop and build up domestic capabilities, starting with the development of downstream activities and moving progressively upstream.



PHASE 1 : IGNITION

Support development of space-based applications by stimulating the national ecosystem of service providers and national market expansion

- End user applications booster program
- National Space Data Platform
- Incubation Program
- World conference
- Center of Excellence for space applications
- Space Cloud Partnership
- Ground stations hub
- Direct receiving station
- National Cubesat program

PHASE 2 : LIFT-OFF

Develop the required infrastructure (in space and on the ground) to support expand Oman's space sector capabilities and business opportunities

- National Satcom initiative
- National Space Observatory

PHASE 3 : ORBITING

Prepare Oman's space sector for its next development cycle by starting investments in more complex systems and capabilities

- Regional Satnav augmentation system
- Launch site partnership
- Satellite R&D Program

Investment Opportunities

Space Cloud Partnership

Gateway to Space Data

Partner with a world class leading space and cloud partners to develop and deliver space-based cloud (satellite sourced data) service ecosystem that is intersecting with the edge computing and data analytics. The ecosystem will contribute to develop downstream space industry- the development of space applications and services in Oman.

This project will enable the development of the space sector through the followings:

- Provide an ecosystem for digital application development
- Allows local entrepreneurs to get access to solutions developed by the space-cloud provider for stimulating space applications development
- Facilitate access to qualified space data
- Support the development of local skills and workforce

Ground Stations (GS) Hub

This project is mainly based on the advantage of the strategic location of Oman with respect to the equator for hosting GS for satellite operators or for companies that intends to provide GS as a service (GSaS) for satellite operators.

In addition to the strategic location, Oman has a set of 21 submarine cables that could easily link in real-time the data downloaded from satellites to end users, or to develop data analytics services in the country and offer the final products, including solutions or applications, for the end users.

This project will enable the development of the space sector through the followings:

- Facilitate space-oriented technology and knowledge transfer by allowing foreign satellite operators to benefit from a strategic locations for their satellite systems
- Provide an ecosystem for development of digital applications
- Establish Oman as a space gateway in the region
- Enhance the utilization of space-ground telecom infrastructure including submarine-cables
- Support the development of local skills and workforce.

Direct Receiving Station

This project aims to attract foreign satellite operators to establish their DRS in Oman while allowing Omani users to access data received through the station.

The foreign partners will benefit from volume of data needs in Oman which is profitable through long term contracts with Government and private sectors.

Moreover, Omani users will benefit from real-time data for development of applications and solution. This project intersects with the Ground Stations as Services (GSaS) project.

This project will enable the development of the space sector through the followings:

- Facilitate and accelerate data downlink in Earth Observation
- Develop services with more rapid response for critical issues such as disaster management or agriculture
- Autonomy without capex required to launch an EO satellite
- Develop capabilities in EO ground operations

National Space Data Platform

This project aims to provide the EO sector with a state-of-the-art digital platform to gather, process and share data fostering applications and ecosystem development. The national space data platform is the EO strategy backbone to build a national capacity in downstream sector to support digitalization and economic diversification. The platform will be accessed by public and private sectors, researchers and partners.

This project will enable the development of the space sector through the followings:

- Coordinate efforts and avoid duplication of initiatives with the country and open the market for foreign investment.
- Set up a fertile ground for EO service providers
- Boost innovative solutions development across economic sectors.
- Pave the way for digitalization of the EO sector

End-user Applications Booster Program (Sandboxing)

The main objective of this project is to encourage key economic sectors to use space-based solutions via pilot and demonstration projects supporting the development of national service providers. As well, it supports developers and end users (from key industrial sectors such as O&G, agriculture, maritime, urban planning, etc.) to develop and use satellite-based solutions (EO, satcom and others). Besides, it provide the best environment to build and demonstrate applications and services (using EO data, AIS, IoT…) with a rapid go-to-market strategy.

This project will enable the development of the space sector through the followings:

- Develop innovative solutions matching key industrials needs
- Support job creation and private sector entrepreneurship and start-ups
- Boost technology transfer from academics to private sector
- Raise expertise and know-how in space sector
- Expedite commercial solutions to local and international market.

Launch Site Partnership

Leverages on Oman's best location in MEA for launch activities and relies on a partner's investment. The project aims to attract foreign partners to establish in Oman the first MEA regional spaceport. This port will server the region commercial and research needs. The project would help foster regional cooperation in space, be a source of prestige, help to position our partners as a major space hub service provider in the region.

Oman can use its favorable diplomatic position to favor its implementation and foster regional cooperation through shared infrastructure and funding.

This project will enable the development of the space sector through the followings:

- Attract FDI from foreign partners, enabler of international cooperation
- Source of prestige enabling our partners to access to space capability
- Position our partners and the country as a key facilitator for regional cooperation in space and as the regional "gateway to space"
- Accelerate local/partner and investors space capability development

Future Impacts of Omani Space Program

Oman entering the space age has numerous other positive impacts beyond the space sector revenue, job creation and GDP impact.

National Center for Space

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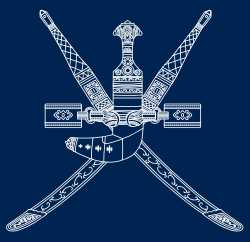

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