



Image: ESA/ATG medialab

MALTA NATIONAL SPACE POLICY 2017



The Malta Council for
Science & Technology



MINISTRY FOR EDUCATION AND EMPLOYMENT

PARLIAMENTARY SECRETARIAT
FOR RESEARCH, INNOVATION, YOUTH AND SPORT

MALTA NATIONAL SPACE POLICY **2017**

- Essential Services
- Economic Dimension
- Educational Investments
- Extended Opportunities



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Acknowledgments

The Malta Council for Science and Technology would like to express its gratitude to all those who contributed to the realisation of this document.

In particular, the Malta Council for Science and Technology would like to thank all the stakeholders who took part in the consultation meeting for their valuable feedback which helped shape this national document.

The Malta Council for Science and Technology would also like to extend its gratitude to the members of the Space Governance Group for providing their respective expertise and input in order to help shape this policy document and make it a holistic one.

Disclaimer

All information provided is valid at the time of publication.



Address by Hon. Evarist Bartolo Minister for Education and Employment



Life today is definitely not as it was a few hundred years ago or even a few decades ago. Likewise, it is expected that life in the coming years and centuries will continue to change and be different from what it is now.

Science and technology have been, and will continue to be major agents of change. Great ideas, daring to dream and the transformation of ideas into reality are at the heart of this change. The mythological flight of Icarus is nowadays an everyday reality thanks to the Wright Brothers' first attempt at flight in 1903.

Space presents a myriad of opportunities. Space is not only about astronauts and launchers. It is also a part of everyday life, from making a phone call to finding our way around while driving. Therefore, space is an excellent platform for new ideas and innovations which can be of benefit to everyday life.

Great ideas and their transformation into reality are dependent on people, and therefore investing in people is crucial to our success as a country. Indeed, this first National Space Policy places emphasis on the importance of education and employment in space and the links between space and economic opportunities linked to our strengths.

Malta's biggest asset is its human capital, and because of this, the Government strongly believes in investment in those sectors and new economic niches which present opportunities for the future of our workforce.

The vision presented in this document ties in very well with Malta's vision to establish itself as a knowledge-based economy. It also ties in with other areas within my Ministry and with the wider drive of this Government towards a stronger economy and improved quality of life for all. The Government that I form part of is convinced that space technology will enhance the education experience of our students in all sectors, will boost the economy and will create additional quality employment for our citizens, thus providing a way to improve the quality of life of people.

It is therefore my pleasure to endorse this document.

**“This first
National Space
Policy places
emphasis on the
importance of
education and
employment in
space”**

Address by Hon. Chris Agius

Parliamentary Secretary for Research, Innovation, Youth and Sport

In today's world, scientific and technological innovation play a crucial role in our lives. Innovation and scientific breakthroughs have made it possible for humanity to face challenges and to solve them, as they arise from time to time, while improving the general quality of life of people.

Being innovative does not only mean finding solutions to address today's challenges but also being able to look beyond one's immediate situation, beyond one's borders and explore new avenues which future generations can exploit.

I strongly believe that space has the potential to provide opportunities for innovation and economic growth in Malta. It still has a lot of potential for Malta to explore. There are still too many misconceptions around the term 'space' and I am pleased that this document will help clarify what we mean by opportunities in space and the potential of space.

This policy obviously goes beyond merely clarifying the term 'space', but extends into identifying and describing what space means, and could mean, for Malta's present and future. This policy, while focused on the thematic area of space, should not be read in isolation. On the contrary, it should be seen in a holistic manner in the wider context of research, innovation, education and economic growth.

Malta has no indigenous resources. Yet through the centuries it has managed to capitalise on opportunities that arose in different circumstances, transforming the challenges it faced into valuable opportunities that enabled it to flourish. Space is another such opportunity that Malta can and should capitalise on. This first policy presents a means of achieving just that, building on the momentum gained through the policy's development and the collaboration among all stakeholders.

I look forward to the realisation of this policy.



**“Space has
the potential
to provide
opportunities
for innovation
and economic
growth in Malta”**

Address by Dr Jeffrey Pullicino Orlando Executive Chairman of the Malta Council for Science and Technology



It is with great satisfaction that MCST presents this first National Space Policy for Malta. This policy is the fruit of a lot of work by MCST coupled with the close collaboration and invaluable input from the various stakeholders involved.

This policy ties in well with other policies and initiatives undertaken by the Malta Council for Science and Technology in shaping the future of the country's endeavours in Science, Technology, Research and Innovation. Indeed, following the launch of the National Research and Innovation Strategy in 2014, the work undertaken on the development of the Research and Innovation Action Plan, and the opening of Esplora, the launch of this Space Policy marks another milestone for MCST. It will provide a stronger platform for Malta to better reap the benefits arising from the opportunities in this area. A lot of important work remains ongoing, including the support that MCST provides to participation in Horizon 2020 and the management of Fusion, the National R&I Funding Programme.

As stated earlier, the National Space Policy does not only represent the work and ideas of MCST but it also encompasses the views, contributions and expectations of stakeholders and related players. Together with the members of the Space Governance Group, they kindly accepted our invitation to share their experience and knowledge in their respective fields.

Striking a balance between the views of different parties is never an easy task, but in the end it is a worthwhile endeavour which ensures that the final policy is comprehensive and can act as a common guiding document for all involved. The interest shown and the support provided by stakeholders in itself attests to the need that was felt for a more coordinated and coherent approach to space policy at a national level.

MCST is therefore proud to be presenting this document, a first for Malta.

**“The launch
of this National
Space Policy
marks another
milestone for the
Malta Council
for Science and
Technology”**



1.0 Introduction

The 20th century is considered to have been an eventful one in the history of our world, not only in terms of socio-political and economic developments, but also in technological advancements. Interest in space-related activities picked up at a rapid pace towards the second half of the century.

At an international level there is no universally-accepted legal definition of the terms ‘space’ or ‘outer space’. For the purpose of the present document, ‘space’ is defined as the region beyond the major portion of the Earth’s atmosphere. However, the related activities and technologies are very pertinent to terrestrial applications.

Space is often perceived as abstract. Yet, space-related activities have enabled the development of several disruptive technologies and benefits. There are numerous satellites orbiting around the Earth on which many systems are dependent. In addition, through activities in space, a number of applications have been developed that were originally intended for space-based use but which later found their way as useful applications on our planet.

In the international sphere, investments in space activities are remarkably high, which demonstrates a high confidence and belief in success by the respective players. For instance, the National Aeronautics and Space Administration (NASA) budget for financial year 2016 was estimated at \$18.5 billion¹, representing a 0.5% of the total federal budget of the United States, while the budget of the European Space Agency (ESA) for the year 2016 amounts to €5.27 billion².

Malta does not have a dedicated budget for a space programme.

Malta’s general expenditure on Research and Development (R&D) has however been steadily increasing in real terms over the past years. Provisional figures for 2015 indicate that Malta’s R&D expenditure amounted to €67.603 million³, with the bulk of the expenditure undertaken by the private sector. Malta has set an ambitious 2020 target for gross expenditure of R&D as a percentage of gross domestic product (GDP) at 2%.⁴ The provisional values for 2014 indicate that the R&D expenditure value for Malta was 0.83%⁵. There is therefore scope to further invest in R&D in order to reach the national target. This policy and its implementation will contribute to this end.

The National Space Policy, while taking into account Malta’s current state of play and constraints, presents a vision that enables the country to exploit reasonable opportunities presented by space systems.

This policy, although particularly focused on the thematic area of space, should not be viewed in isolation, but should be seen within a holistic approach from the wider perspective in the areas of research, innovation and education. This policy is intended to complement other relevant policies and support in the achievement of their respective objectives.

The National Space Policy adheres to the principle of technology neutrality.

1.1 The need for a National Space Policy

Space-related technologies and applications have in recent years been employed and used in a wide variety of applications, some of which have also made their way to Malta. Indeed, many of these technologies have permeated into our everyday lives without the realisation that these depend on space technologies.

For example, the use of Global Positioning System (GPS) has been incorporated in numerous commonly used devices including mobile phones, and for a number of years has also been popularly employed as a navigational aid in automobiles. GPS technology makes use of numerous dedicated satellites that orbit our planet.

Satellite systems are also widely used for the provision of electronic communication services, such as broadcasting, voice and broadband applications.

While certain satellite system applications, such as communications services in Malta

are rather mature and well-regulated, there are numerous other niche markets which are considerably underexploited. In view of the fact that space applications have been on the rise, there is scope to maximise the benefits and to better capitalise on the investments made in this sector.

This policy is intended to lay the foundations so that work in this sector is undertaken in a more co-ordinated manner. In addition, the National Space Policy aims to ensure a common approach to space-related activities so as to avoid duplication of effort and resources, thus making investments more efficient.

Space systems could also serve as a platform to build a relatively new economic activity complementary to the country's effort to modernise its industry by transforming it into a knowledge based one.

This will support the creation of new high-value employment opportunities for future generations.

1.2 Timeframe

This first National Space Policy reflects the national setting and context in 2016-2017 and its implementation will span the next few years. Its implementation will be monitored over time. Lessons learned and experience gained will feed into an updated policy document which is planned to be available by 2020. An updated policy would take into consideration developments in research, innovation and markets at the time, as well as the opportunities which will be emerging as a result of new funding frameworks at EU level.

Image: NASA/GSFC/MITI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team

1.3 Relationship with Smart Specialisation Strategy

The National Research and Innovation Strategy covering the period 2014-2020, published in June 2014, identifies a limited number of economic areas where Malta has particular potential for growth through innovation. One identified area within the smart specialisation is the Information and Communication Technology (ICT) sector both as a source of innovation as well as an enabler of innovation in other smart specialisation areas. Indeed, this policy places an emphasis on the use of ICT as an enabler of downstream innovative applications of space technologies.

In addition, other identified smart specialisation sectors, such as aerospace,

aquaculture and maritime services, are seen as other potential areas where space systems could be of relevance. This ties in with Malta's approach to smart specialisation, which focuses on innovation at the intersection between different smart specialisation areas.

The R&D and economic elements however are only two components related to space activity. There are other elements within space activities that, while not necessarily featuring in the Smart Specialisation Strategy, are equally important for Malta. Amongst others, these include areas related to education, planning, environment and national security.



Image: ©GSA, ©European GNSS Agency



1.4 European and International Dimension

Many activities related to space, although very important, are sometimes not economically viable and otherwise feasible to be carried out by individual countries. This is especially so for small states which are typically characterised by limited resources. Activities in space are thus normally undertaken by means of collaborative partnerships, where resources are pooled, and tasks collectively shared. This model is commonly used by many countries,

including those whose physical dimensions, population size and economic situation are much bigger than those of Malta. Smaller states have naturally sought adequate partnerships through which space-related activities can be carried out as part of bigger programmes. A non-exhaustive overview of the main European and international players in space is provided below.

1.4.1 European Space Agency (ESA)

The Government has entrusted the Malta Council for Science and Technology (MCST) with representing Malta's interests in space and with building relations with ESA.

In recent years, Malta has explored closer collaboration with ESA. ESA encompasses the majority of European Union (EU) Member States.

In June 2011, Malta together with nine other EU Member States, that were not members of ESA, were granted observer status by ESA, and were subsequently "invited to attend ESA Council and its subordinate bodies' meetings for those matters of common interest between ESA and the EU."⁶ In addition, discussions between Malta and ESA with respect to a cooperation agreement resulted in a five-year Cooperation Agreement between Malta and ESA which entered into force on 20th February 2012.⁷

Whilst Malta's Observer status is at no cost, ESA obtains most of its funding through ESA Member States' contributions, in turn allowing paying Members to access ESA contracts and research projects. Employment opportunities with ESA are only open to ESA members. By coordinating the financial and intellectual resources of its members, ESA can undertake programmes and activities far beyond the

scope of any single European country. Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom all hold a status of Members of ESA. Slovenia is an Associate Member. Canada also takes part in some projects under a Cooperation Agreement.⁸

Those countries that have signed a European Cooperating States (ECS) agreement, starting the official process for progression towards eventual Membership are: Latvia, Cyprus, Slovakia, Lithuania and Bulgaria. Malta is currently the only EU country holding an observer status with ESA that has, at the time of publication of this policy, not yet progressed to an ECS agreement or beyond. Finally and at the time of publication of this document, Croatia is the only EU Member State that does not yet have an association with ESA, although this is being pursued.

Due to the nature of Malta's Observer Status with ESA, further opportunities for engagement with ESA and within the space sector remain limited to trainee placements. MCST is thus actively exploring avenues for closer cooperation with ESA, that are in line with Malta's ambitions for capacity-building and engagement in concrete projects.

1.4.2 The European Union (EU)

The EU has a keen interest in space and it funds several activities in this respect. Between 2014 and 2020 over €12 billion will be spent in the implementation of the EU Space Programme⁹ which is divided into three parts, namely:

- Satellite Navigation – Galileo¹⁰ and European Geostationary Navigation Overlay Service (EGNOS)¹¹ programmes.
- Earth Observation (EO) – Copernicus¹² programme.
- Space Research – Part of Horizon 2020¹³ Framework Programme for Research and Innovation.

This document also takes into account recent policy developments at EU level in the area of space, particularly the “Space Strategy for Europe” (COM (2016) 705), published on 26 October 2016.¹⁴

1.4.3 EURISY

Eurisy¹⁵ is a non-profit association made up of 30 European and international entities (governmental, research, commercial, etc.) from different states with the aim of raising awareness of current and emerging satellite applications with broad exploitation routes. It aims to provide support to potential satellite end-users through its network by sharing of experiences. Eurisy also provides feedback to decision-makers for them to overcome barriers in fostering space-derived innovation. Malta, through MCST, became a member of Eurisy in 2015.

1.4.4 European Defence Agency (EDA)

All EU members, except Denmark, are members of the EDA¹⁶. The EDA has a specific interest in the use of space technologies.

1.4.5 United Nations Office for Outer Space Affairs (UNOOSA)

The United Nations (UN) Office for Outer Space Affairs¹⁷ (UNOOSA) is the UN body responsible for space activities. Malta, as a UN member, is consequently associated with UNOOSA and has thus ratified space-related treaties adopted by this agency.



1.4.6 European Maritime Safety Agency (EMSA)¹⁸

Set up in 2003, EMSA provides technical assistance and support to the European Commission (EC) and Member States in the development and implementation of EU legislation on maritime safety, pollution by ships and maritime security. It has also been given operational tasks in the field of oil pollution response, vessel monitoring and in long range identification and tracking of vessels. EMSA employs the use of satellite systems in its work.

1.4.7 European Global Navigation Satellite Systems Agency (GSA)¹⁹

GSA is the EU Agency responsible for managing public interests related to European Global Navigation Satellite Systems (GNSS) programmes, EGNOS and Galileo.

Additionally, the European Commission delegates responsibility for performing specific tasks relating to one or both of the GNSS programmes.

1.4.8 International Telecommunication Union (ITU)²⁰

ITU is a UN specialised agency for ICT, which sector is nowadays closely linked to space technologies²¹.

In addition, the ITU has a Space Services Department (SSD) which is responsible for coordination and recording procedures for space systems and earth stations. The Department handles capture, processing and publication of data and carries out examination



Image: ©GSA, ©European GNSS Agency

of frequency assignment notices submitted by administrations for inclusion in the formal coordination procedures or recording in the Master International Frequency Register (MIFR).

1.4.9 Others

Some other related bodies include:

- European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)²²
- International Telecommunications Satellite Organization (ITSO)²³
- European Telecommunications Satellite Organization (EUTELSAT)²⁴
- International Mobile Satellite Organization (IMSO)²⁵
- Committee on Earth Observation Satellites (CEOS)²⁶

1.5 Space Governance Group

Over the last few years, as local space-related activities began to increase, the need to bring the main actors together to share experiences and information and explore the possibilities of joining efforts and resources became evident. To this end, in 2016 MCST invited local entities with interest in EU-related space activities to form a governance group.

This informal group, called the ‘Space Governance Group’ meets every quarter in order to ensure information sharing and proper communication among Maltese entities having an interest or responsibility within the local space sector. The group discusses outcomes from space fora, and policy positions prior to going for wider consultation, identifies opportunities and aids in the establishment of a common position at EU level. Through its work, the Space Governance Group helps avoid the duplication of effort, thus achieving results more efficiently.

The informal set-up is made up of the following entities:

- Malta Council for Science and Technology (MCST)
- Malta Communications Authority (MCA)
- Armed Forces of Malta (AFM)
- Planning Authority (PA)
- Environmental Resources Authority (ERA)²⁷
- National Aerospace Centre (NAC)
– Observer Status

Other participants whose contribution would be considered useful will be invited to join the group and participate in the meetings as the group matures.

1.6 Stakeholder Consultations

In drafting this national document, MCST aimed at having a common position amongst the local stakeholders and at the same time ensuring that the policy is comprehensive and covers all aspects. In October 2016 MCST distributed a document entitled “Framework towards a National Space Policy: Malta 2017 – 2020” to stakeholders, in preparation for the formal dialogue/consultation session, in which 31 participants from various entities took part. The list of participants attending the event, held on 2nd November 2016, is found in Appendix 1. The Space Governance Group was also engaged throughout the process.





1.7 Ethical Considerations & Gender Balance

Any activity undertaken as a result of this policy will be executed in accordance with the highest ethical standards in force.

Gender balance will be pursued to the fullest extent possible in the deployment of this policy.



1.8 Space Policy Framework

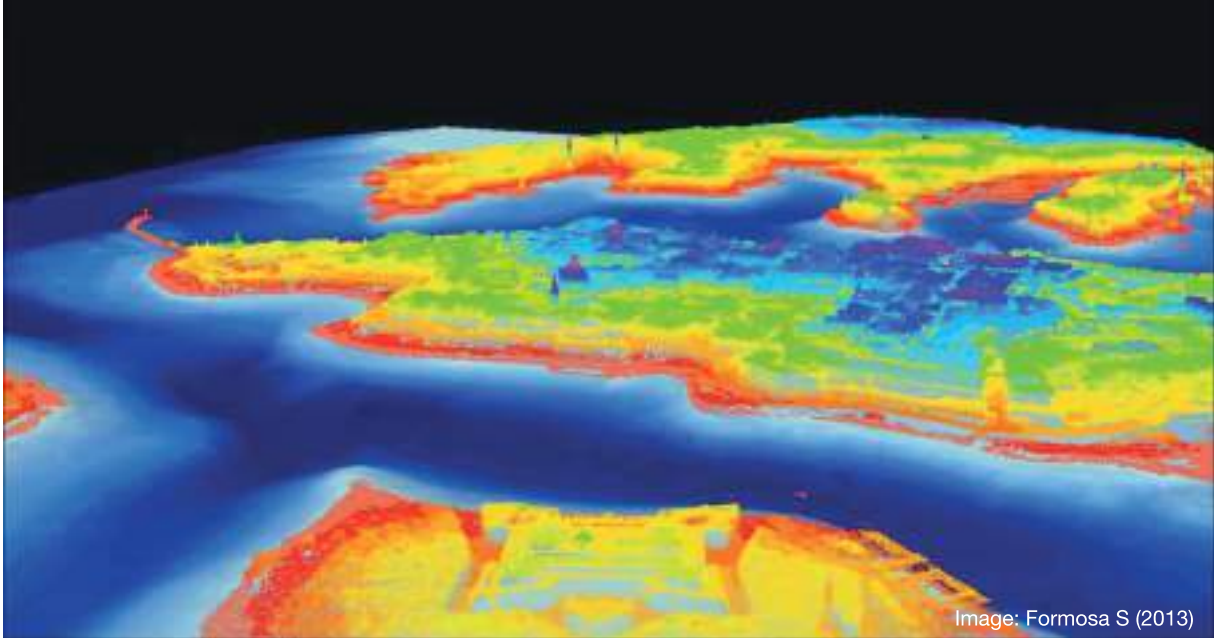
The National Space Policy presented in this document is based on four dimensions, identified as “the four Es”, namely:

- Essential Services
- Economic Dimension
- Educational Investments
- Extended Opportunities

Each of the four dimensions of the National Space Policy will be further discussed in Chapters 2 to 5 within this document.

Cross-linkages between dimensions are also considered and supported.

Image: Martin Pillow (2017)



2.0 Essential Services

Satellite systems have become a vital tool, enabling various Governmental entities to carry out their remit more effectively. The Maltese Government will support current essential services assisted by satellite technologies and data while raising awareness of under-exploited satellite applications. The following are examples of services usually considered as essential, which are notably aided by satellite systems.

2.1 Border and Coastal Security Services

The Government recognises that border security and related services are essential to help guarantee a secure and stable environment for its citizens.

Through the exploitation of satellite-based data, the EU's border control agency, Frontex, in collaboration with other entities, such as the EU Satellite Centre (SatCen), supports Maltese and all other EU border control authorities in enhancing their situational awareness. When integrated with other information sources, such as the local Vessel Traffic Monitoring and Information System (VTMIS) and higher-resolution imagery from airborne platforms, satellite data helps gather intelligence in Maltese territorial waters. This aids Maltese border control authorities in combating criminal activities, such as illegal trawling, human trafficking as well as drug, fuel or weapon smuggling.

The Government recognises the importance of such technologies and is committed to support future programmes and development in this field.



2.2 Emergency Services

Through the Copernicus Emergency Management Service (Copernicus EMS), the European Commission provides all actors involved in the management of natural and man-made disasters, emergency situations, and humanitarian crises with timely and accurate geo-spatial information augmented through satellite remote sensing. Such services include a rapid mapping capability with the capacity of making imagery available within hours of the request.

In addition to satellite-based imagery, the utilisation of satellite-based navigation (SATNAV) and satellite communication (SATCOM) technologies within emergency locator beacons, amongst others, has drastically helped improve search and rescue services within the various transportation domains.



Image: Agriculture and Rural Payments Agency

2.3 Urban Planning, Rural and Agricultural Land Administration

While aerial orthophotos provide high spatial resolution necessary for the delineation of areas associated with urban and maritime spatial planning processes, the use of satellite imagery can play an important role in providing a holistic spatial planning analysis. The additional information extracted from satellite imagery helps add value to a multitude of different themes, particularly when substantiated by other datasets such as high-resolution optical or LIDAR (Light Detection and Ranging) imaging sourced through Unmanned Aerial Vehicle (UAV) or aerial platforms. This emphasises the importance of dataset harmonisation and interoperability as stipulated by the EU's INSPIRE Directive²⁸ (2007/2/EC).

Additionally, as part of the EU's Common Agricultural Policy (CAP), the respective Maltese authorities periodically utilise satellite-based remote sensing in substantiating systems used in administering agricultural subsidy schemes, such as the Land Parcel Identification System (LPIS). Such tools help enable a cost-effective and transparent agricultural land administration, preventing abuse and irregularities.

The Government recognises the importance of space technologies in mapping, planning and related administrative processes and endeavours to support and encourage future activities in this sector.



Image: NASA Earth Observatory (2016)

2.4 Meteorological Services

Satellite imagery is a crucial tool in the provision of weather and climate data to the meteorological offices.

Apart from the imaging of weather systems providing for short-term weather prediction, satellite systems gather valuable statistical datasets which help improve weather models.

2.5 Environmental Monitoring and Protection

Satellite-derived information, substantiated by in-situ measurements, is increasingly considered as an essential tool to monitor coastal, marine (including fisheries), terrestrial and aerial environments as required by various EU Directives. For Malta the utilisation of EO data at the sufficient resolution has the potential to be a valuable tool for the further assessment of various national, EU and international ecosystem land cover initiatives which include those required by the Corine Land Cover programme, the 'National Biodiversity Strategy and Action Plan' and the 'EU Biodiversity Strategy to 2020'.

Satellite imagery also plays an important role in near-real-time marine oil-spill detection. The CleanSeaNet²⁹ service, which is administered by EMSA, advises the respective authorities in near-real-time whenever a potential oil spill is detected through a network of EO radar satellites constantly observing the Earth. Timeliness of information is critical, both to mitigate the repercussions of ecological damage due to the spillage, and also to identify the vessel responsible for the pollution incident.

The Government acknowledges the important role satellite imagery and related data play in

monitoring and safeguarding the environment and, while supporting mature application areas, will encourage further uptake of relevant space data. This will be done, in line with European initiatives focused on raising awareness of the Copernicus Programme and related services.



Image: Sentinel-2A imagery, Copernicus Sentinel Data 2016

3.0 Economic Dimension

Apart from significantly improving various essential services supporting smarter solutions to societal challenges, the advancement in space technologies enables the evolution of high-tech industries, which directly benefit the economy. As with various other business sectors, the space industry is commonly subdivided into “upstream” and “downstream” activities. The former encompasses industries developing space technologies and the associated infrastructure and operations, while the latter covers the exploitation of such technologies and related data, delivering solutions to users.³⁰

While Malta is still an emerging state within the space domain, some activity already exists within both the upstream and downstream sectors. The current economic landscape

within the sector extends from academic and applied research within the upstream sector to mature and well-regulated applications within the downstream sector.

The Government intends to encourage established and already developed economic sectors utilising satellite technologies and related data, whilst also encouraging start-ups and small and medium enterprise (SME) investment in new economic areas, particularly those encompassing synergies with existing competencies. This will help the country diversify its economy, with niche-markets requiring new skill sets resulting in the creation of high quality employment opportunities. This is in synergy with efforts to transform the economy into a knowledge based and value added one.

3.1 Upstream Sector

The local upstream space sector is considered to be at an early stage, with activity focused mainly on the academic sector. For instance, a research group within the University of Malta is currently developing a technology demonstrator of a small satellite platform³¹. Such projects serve various functions, including capacity building and the development of transferable technologies. Additionally, such initiatives are often a mechanism for attracting students opting for Science, Technology, Engineering and Mathematics (STEM) subjects.

It is recognised that the research being undertaken within academia in the area of space has potential in generating Intellectual Property (IP) which could, in the long term, lead to research spin-offs directly benefitting the economy.

3.2 Downstream Sector

The downstream sector is considered to be a comparatively more mature one. In view of this, Malta’s initial economic deployment activities in space could in fact stem from this aspect. The following are some of the main areas of activity.



Image: Formosa S (2017)

3.2.1 Telecommunications (SATCOM)

In today's increasingly connected world, Satellite Communications (SATCOM) are also employed in the global broadcasting and telecommunications industry, although Malta's current international connectivity is done through other means. In addition to forming part of the backbone infrastructure of internet, telephony and television service providers, the reliability and integrity of SATCOM has enabled uptake of space technologies in other domains.

The technology is nowadays well-established and regulated for use within the maritime, offshore and aviation sectors, amongst others, providing remote connectivity for both voice and data link services. Communication via satellites is also supporting emerging markets, such as Machine to Machine (M2M) systems and the Internet of Things (IoT), particularly for devices located in remote areas.





Image: ©GSA, ©European GNSS Agency

3.2.2 Satellite-based Navigation (SATNAV)

Global Navigational Satellite Systems (GNSS) and related augmentation technologies, such as the European Geostationary Navigation Overlay Service (EGNOS), are today an indispensable navigation aid for various users. While the United States' GPS is perhaps the most recognised SATNAV system, Europe's own GNSS, Galileo, started delivering initial services in December 2016.³² The Galileo satellite constellation, which is interoperable with both GPS and the Russian Satellite Navigation system, GLONASS, is scheduled to be completed by 2020.²⁶

As with SATCOM technologies, SATNAV uptake is well regulated in various domains and has been crucial in improving the safety, dependability and quality-of-service of land, maritime and aeronautical transportation systems. Being an accurate and reliable source of navigation, SATNAV is additionally at the core of transportation surveillance systems, such as the Automatic Identification System (AIS) in the maritime domain and Automatic

Dependant Surveillance-Broadcast (ADS-B) in the aeronautical sector. Moreover, SATNAV utilisation in land transportation is nowadays often considered an indispensable tool for navigation.

The proliferation of smartphones in the past decade has enabled SATNAV uptake by the general mobile phone user, generating a niche-market of Location Based Services (LBS). Smartphone applications are today, not only locating the user's position on a map, but are also providing a multitude of services, such as location-based advertising and other related mobile commerce.

While supporting downstream activities making use of SATNAV technologies, the Government supports the exploitation of novel SATNAV applications and related services, particularly in niche-markets which traditionally do not utilise SATNAV. Such support is to be in alignment with GSA initiatives focused towards vertical applications in downstream markets.

3.2.3 Earth Observation (EO)

Europe's system for monitoring the Earth, Copernicus, makes available numerous datasets collected from EO satellites that may support a wide range of applications areas. These include environment and resources protection, sustainable management of urban and rural areas, local planning, agriculture, fisheries, health, transport, climate change, sustainable development, blue growth and good environmental status in Malta's marine waters, civil protection and tourism³³. While Copernicus delivers services relevant to some end users, the full potential of Copernicus data, and its respective free and open-data policy³⁴, can only be exploited by value-added downstream services, which are tailor-made to specific public or commercial needs. As demonstrated by several EU-economic studies³⁵, this niche-market harbours potential for high-quality job creation and the development of innovative

and smarter solutions for local societal challenges. Such solutions, often encompassing research and development at the intersection of science and ICT, translate the data derived from EO satellites and other in-situ sensors into useful information as required by the end user.

Significant activity within the EO downstream data processing sector already exists locally, particularly within the academic and applied research sectors. Various institutes and research groups within the University of Malta have significant competence in processing remotely-sensed satellite data over the

Maltese Islands, including Copernicus datasets. Application thematic areas include, amongst others, marine, terrestrial and aerial environmental monitoring, physical oceanography and urban planning. Some of the applied research has been carried out through collaborative partnerships between the research entity and local authorities, enabling the public sector to explore solutions substantiated by information derived from satellite EO data.



Image: ESA/ATG medialab

Additionally, academic and applied research within space sciences and astronomy, namely through the Square Kilometer Array (SKA), also exists within the University of Malta. Such data processing competencies are easily translatable to EO data processing.

Other institutions within the tertiary education sector, such as the Malta College for Arts and Technology (MCAST), have the potential to participate in similar research activities.

Apart from improving numerous essential services, as described in section 2, the Government recognises that the EO downstream sector harbours untapped economic potential.

The Government will support the exploitation of satellite remote sensing in alignment, amongst others, with EO data uptake initiatives stemming from the EC's Copernicus programme. Additionally, the Government intends to encourage and support collaborations between public authority users and the research institutions or private entities delivering added-value downstream solutions.



3.3 Information and Communications Technology (ICT)

The critical mass of knowledge within the local ICT sector offers ample opportunities to support an emerging space sector. This is, in part, due to the various transferrable skills between ICT related technologies and the space sector, in particular downstream activities. Apart from often requiring minimal infrastructural investment to penetrate the market, making the downstream a reasonably appealing sector, there exist various synergies and complementarities between the sectors. Opportunities range, amongst others, from the development of LBS utilising SATNAV and SATCOM technologies, to the processing of EO datasets and related data in the provision of information which is exploitable by an end-user.

Various ICT-based solutions have strong internationalisation potential, thus extending opportunities across borders. The Government recognises this potential and shall capitalise on existing strengths within the ICT sector. This will be done by supporting, in synergy with other policy areas, the development of home-grown innovative enterprises that could make a global mark.

Additionally, the Government believes that Malta is appropriately placed to attract foreign direct investment in the sector and shall create the right conditions to foster and incubate such business opportunities.



4.0 Educational Investments

Human capital is one of Malta's most important resources. Consequently, investments in education and related sectors, such as academic and applied research, are given high importance because of the resulting positive knock-on effect on the economy.

The local space sector is still in its infancy. There exists a significant amount of untapped space data and information. This is, in part, due to a number of misconceptions brought about by a lack of awareness in understanding and applying the available information, both

by end-users and businesses. Investment in education, awareness raising and capacity building is one important dimension to improve uptake and achieve a critical mass of knowledge in the sector.

Space-related educational efforts therefore will be given priority. These shall span various levels: from perception-changing and awareness raising measures to practical workshops that for example help ICT professionals recognise the business potential behind downstream satellite data processing.

4.1 Compulsory Education

By targeting the compulsory education sector, Malta would be fostering space education among future generations.

Introducing space elements into modules, already forming part of the compulsory curricula, is an effective and practical approach to bridge the gap between space technologies and their applications. This helps 'bring space down to Earth', with the younger generation appreciating the various day-to-day uses of satellite technologies. Education at compulsory levels shall be delivered in synergy with initiatives at other levels, attracting students to science and technology subjects from a young age, while supporting higher level uptake in later years.

Consequently, the development of educational material and resources (such as applications, posters, info-graphics and video clips) in collaboration with educators could be considered. This supplements the material already in the syllabi and helps transform the students' learning journey into a realistic, closer to home experience.

Other initiatives include outreach activities through Malta's newly opened Interactive Science Centre, Esplora³⁶. With its multitude of interactive exhibits and conference facilities, Esplora, offers various opportunities to make space and related subjects, such as science and engineering, more attractive to the younger generation.

4.2 Post-Secondary and Tertiary Education Sector

While the focus of the compulsory education sector is to attract students to the science and related technology streams and raise general awareness on space applications, the aim of the post-secondary and tertiary sectors is to, *inter alia*, retain their interest and prepare them for the world of employment. It is envisaged that students in this segment would be given the opportunity to explore career avenues related to the space sector. As with the compulsory education sector, it is envisaged that embedding a space element at a study unit level will help to, not only raise awareness, but also to build capacity within the sector. This

is particularly true in the case of technology diplomas and degrees, which inherently already include study units on core space technology aspects, such as sensors, electronics, control systems, materials and ICT.

Students furthering their studies to post-graduate and doctoral levels (MQF Level 7 and 8³⁷), together with professionals in related science and technology areas, may have the opportunity to follow traineeships and fellowships at specialised foreign space facilities, such as the state-of-the-art ESA establishments.



4.3 Research Infrastructures (RIs)

RIs play a pivotal role in capacity building and consequently in the advancement of research and innovation. The term ‘research infrastructures (RIs)’³⁸ refers to facilities, resources and related services, which are utilised by the scientific and technical community to conduct research in their respective fields. While the upstream space sector usually requires substantial investment in developing appropriate RIs, the downstream sector often requires relatively less investment.

At present, local RIs specific to the space sector are limited to small-scale test rigs and downstream data processing software packages, amongst others. The importance of drawing up specific plans to further invest in the necessary RIs, particularly those supporting profitable niche markets, is thus recognised. The identification of appealing niche areas of investment, which will serve as a platform for future development in the field, shall be identified by the respective stakeholders and market players.



Image: University of Malta (2017)

4.4 Collaborative Research Partnerships

The Government recognises the importance of collaborating with EU and international bodies that are well-established within the space sector. The geographical and strategic location of the Maltese Islands, the favourable weather conditions and the strong maritime experience, are considered as important assets in establishing collaborative partnerships between Maltese and European or International entities for EO application testing and the collection of ground-truth data for the calibration of satellite remote sensing.

Malta shall seek to exploit collaborative opportunities that enable it to resourcefully benefit from educational and research activities in the space domain. The Government will seek to encourage public and private entities to collaborate with their European counterparts in space-related research. EU funding programmes, such as the Horizon 2020 Framework Programme



enable collaborations which are often considered vital to help close competence disparities between different EU Member States. Such partnerships (including cross-border co-operation) may play a pivotal role in elevating local capacity within the space sector.

Additionally, the Government may consider using national funding, such as the national FUSION programme, run by MCST, or even dedicated funds for space, to help support research and innovation within the field.

4.5 Capacity Building Measures

Although still in its infancy, the past years have already seen a number of targeted capacity building activities which can be used as good examples for further support and initiatives in this respect. Such examples are reproduced hereunder in the form of case studies.



4.5.1 Case Study: The Satellite Solutions for Smarter Islands Conference

In November 2015, MCST together with Eurisy, co-organised in Malta the international conference entitled 'Satellite Solutions for Smarter Islands'. With the participation of entities, such as ESA, GSA and the European Commission, the conference discussed how island economies can leverage Europe's investments in satellite services to boost their economies and live up to current challenges. The conference exposed how island nations can be real labs for such ICT-driven space technology innovation. Case studies from the private and public sectors exhibited the potential of satellite applications in various sectors such as tourism, transport and maritime.



Image: Steve Zerafa, water.com.mt (2017)

4.5.2 Case Study: The Malta App Challenge³⁹

As a follow-up to the ‘Satellite Solution for Smarter Island Conference’ of November 2015, MCST in collaboration with the then Malta Environment and Planning Authority (MEPA), and the Malta Information Technology Agency (MITA), launched the Malta App Challenge: an initiative focused on building capacity on the ‘downstream sector’ of satellite EO. The challenge invited participants to come up with creative ideas about how to use EO satellite data in untapped market needs. Two strands were launched: The first was a collaboration with MEPA, which invited competitors to develop App prototypes making use of satellite-derived information in combination with data from other sources to help solve specific environmental and urban planning challenges. The second strand was launched in collaboration with MITA, which sought similar proofs-of-concept outlining innovative applications. In contrast with the first strand, the winning teams were to develop a commercial solution eventually marketed through an incorporated company.

This initiative was supported by Eurisy and included training sessions delivered by EO experts from ESA and Airbus Defence and Space, including sponsorships from the same.

4.5.3 Network of Copernicus Relays

Malta will be part of the EC’s Network of Copernicus Relays, through a consortium led by the PA. The other partners are MCST and ERA.⁴⁰



4.6 Additional Opportunities in Education

Apart from enhancing human capital, education in space technologies has the potential to open additional avenues in the academic sector that to date have not yet been explored.

The Government believes that Malta, through its educational institutions, could host high quality training in space-related matters and possibly become a regional hub in providing specialised first class education and training in related areas.



Image: ©GSA, ©European GNSS Agency

5.0 Extended Opportunities

The benefits of embracing space-related technologies extend beyond the opportunities described in previous chapters.

Through its many cross-linkages, space has various positive knock-on benefits on other sectors of the economy. The following are some examples.



Image: www.viewingmalta.com



5.1 Creating Value Chains

Increased activities related to space technologies would inherently create additional economic value chains that would provide multiplier benefits to the country's economic growth.

Investments in space-related technologies, frequently positively impact other areas of the economy. Notable sectors are the tourism and services industry, thus indirectly creating employment opportunities in sectors that are not directly linked to the space industry.

5.2 Improvement in Quality of Life for Citizens

By creating highly specialised knowledge based employment opportunities, such as those related to space technology, Malta would in the future be raising the general standard of living of its citizens and therefore assisting in the general improvement of quality of life.

The utilisation of space technologies will also help deliver smarter solutions which are more effective in tackling societal challenges. Consequently Maltese citizens would benefit from a better quality of life.



5.3 Green Economy

Activities through this policy will also have a positive impact on the green economy which would result in the ongoing creation of additional green jobs.

5.4 Other Opportunities

There are other opportunities which stand to flourish from space activities. These include activities being undertaken by the MCA related to filing of satellite slots and associated frequency resources with the ITU and licencing thereof. In other jurisdictions, these activities have given rise to complementary economic activities in the field of financial, legal and insurance services.

There are also opportunities within related subjects, such as space law, particularly where it comes to the offering of specialised courses.

Another application which stands to benefit from space technologies is that of heritage conservation whereby, the technologies developed can be used as a tool for cultural heritage monitoring and preservation.

Moreover, space research develops technologies that are highly transferable to

other sectors and therefore create opportunities beyond the space sector.

In addition, Malta has the potential to become a hub and offer services related to space systems testing.



Image: © NASA (2012)



6.0 The Way Forward

This first National Space Policy is a step forward towards venturing into an emerging local sector while ensuring synergies and coherence with other policies and strategies currently in force.

The Government recognises that the sector harbours additional potential which is currently not appropriately exploited. Resourceful utilisation of satellite technologies and related data would enable smarter solutions to societal challenges. Delivery of such solutions is in turn done through niche market downstream industries, resulting in high-quality employment opportunities and directly benefitting the economy. Investment in R&I relevant to such niche market activity would support the country's endeavours in transforming the economy to become more competitive in a globalised world.

6.1 Awareness-Raising Measures

Government considers education as a key policy dimension upon which the country could build sustainable long term opportunities. Human capital development would not only benefit society in general, but would also support economic development.

Awareness-raising measures, focusing on both the end-user and technical level are considered essential to leveraging the benefits of the significant EU investments made on

European flagship space programmes such as Copernicus and Galileo.

To positively enhance public perception of space and its relevance to society, awareness-raising initiatives could go further through the consideration of education curricula as a vehicle for promoting space.

6.2 Capacity-Building Measures

While the space sector in Malta is still in its inception phase, capacity-building measures become ever more critical. In fact, despite the importance of awareness-raising measures, a more focused capacity-building approach is necessary. Training and collaborative opportunities for public-private projects, as well as internationalisation efforts where possible, provide the means for developing critical mass. Market-driven research and development provides a greater likelihood of successful deployment of smarter solutions to societal challenges stemming from user needs.

Capacity-building measures should be focused on national needs, yet with due consideration given to European initiatives and programmes. Such consideration ensures European-calibre development to help reduce disparities between established players and emerging ones like Malta. This approach would enable Malta to be in a better position in terms of accessing EU markets on satellite data and the eventual provision of new products and services.



6.3 Exploitation within the ICT sector

The Government believes that Malta could potentially capitalise on current technical competencies by diversifying existing critical mass in ICT, amongst other sectors, in additional lucrative areas such as space. Transferrable skills from sectors such as ICT could in fact be advantageous to leveraging opportunities in downstream satellite applications, big data and IoT, whilst observing developments in the upstream domain.

There is particular interest in EO locally, from both the public sector and current EO research efforts within academia. The strong local ICT sector has very good potential to penetrate the EO market due to commonalities in the knowledge base. Additionally, the relatively small RIs investments required to support such niche markets, makes the downstream sector more appealing.

6.4 Collaborative Partnerships

The Government encourages and supports collaborative activities with established EU and international bodies within the space sector. Additionally, the Government will encourage and support stronger collaboration with all respective local stakeholders within the industry, academia and the public sector. Furthermore, the Government shall ensure that

the right climate exists for private investment in the area of space technologies and the associated applications.

It is indeed the Government's commitment to engage and work with all relevant stakeholders, in order for the country to prosper in space technologies for the benefit of all its citizens.

6.5 Reviewing and Revising this Document

As highlighted in Section 1.2, this document presents a first space policy for Malta. Its implementation over the next years will guide the eventual review and updating of this policy. The Space Governance Group will be actively involved in the implementation of this policy.

It will also be actively involved in any updates to this policy and forthcoming future space policies for Malta. An updated National Space Policy is envisaged to be in place by no later than 2020.

Appendix 1

List of stakeholders who participated in the dialogue/public consultation session on 2nd November 2016.

Institution
Armed Forces of Malta
Jobsplus
Malta Airport Meteorological Services
Malta College of Arts, Science & Technology
Malta Communications Authority
Malta Enterprise
Malta Environment and Resources Authority
Malta Information Technology Agency (MITA)
Ministry for Competitiveness, Digital, Maritime & Services Economy
Ministry for Economy, Investment & Small Business
Ministry for Education and Employment (DCM)
Ministry for Foreign Affairs
Ministry for Home Affairs and National Security
National Aerospace Centre
Transport Malta
University of Malta



Image: www.viewingmalta.com

References

1. https://www.nasa.gov/sites/default/files/files/NASA_FY2016_Summary_Brief_corrected.pdf
2. http://m.esa.int/spaceinimages/Images/2016/01/ESA_budget_2016_by_domain
3. EUROSTAT: Total intramural R&D expenditure (GERD) by sectors of performance.
4. <http://www.mcst.gov.mt/Media/0f3855ec-025c-48b5-8ade-2171b8749276.pdf>
5. [http://ec.europa.eu/eurostat/web/products-datasets/-/tipsst10\(R&D\)](http://ec.europa.eu/eurostat/web/products-datasets/-/tipsst10(R&D))
6. http://m.esa.int/About_Us/Welcome_to_ESA/ESA_Council_opens_up_to_ten_EU_Member_States
7. http://www.esa.int/About_Us/Welcome_to_ESA/Malta_signs_Cooperation_Agreement
8. http://www.esa.int/About_Us/Welcome_to_ESA/New_Member_States
9. http://ec.europa.eu/growth/sectors/space_en
10. https://ec.europa.eu/growth/sectors/space/galileo_en
11. https://ec.europa.eu/growth/sectors/space/egnos_en
12. https://ec.europa.eu/growth/sectors/space/copernicus_en
13. <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/space>
14. <http://ec.europa.eu/DocsRoom/documents/19442/attachments/2/translations/en/renditions/native>
15. <http://www.eurisy.org/members-and-partners.php>
16. <https://www.eda.europa.eu/Aboutus/who-we-are/member-states>
17. <http://www.unoosa.org/>
18. <http://www.emsa.europa.eu/>
19. <https://www.gsa.europa.eu/>
20. <https://www.itu.int/en/Pages/default.aspx>
21. <http://www.itu.int/ITU-R/go/space/en>
22. <http://www.eumetsat.int/>
23. <http://www.itso.int/>
24. <http://www.eutelsat.com/>
25. <http://www.imso.org/>
26. <http://ceos.org/>
27. PA & ERA were formerly known as the Malta Environment and Planning Authority (MEPA) but have since April 2016 demerged into separate Government Authorities.
28. <http://inspire.ec.europa.eu/>
29. <http://www.emsa.europa.eu/csn-menu.html>
30. Brünner C., Soucek A., 'Outer Space in Society, Politics and Law', pp. 59
31. <https://www.um.edu.mt/eng/ese/astrea>
32. http://www.esa.int/Our_Activities/Navigation/Galileo/What_is_Galileo
33. <http://copernicus.eu/main/copernicus-brief>
34. <http://copernicus.eu/main/data-access>
35. <http://copernicus.eu/main/economic-studies>
36. <http://esplora.org.mt/>
37. <https://ncfhe.gov.mt/en/Pages/MQF.aspx>
38. http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=what
39. http://www.eurisy.org/event-app-challenge_60/about
40. <http://www.timesofmalta.com/articles/view/20161110/local/malta-to-form-part-of-european-earth-monitoring-system.630593>



Image: Earth Science and Remote Sensing Unit, NASA Johnson Space Center, eol.jsc.nasa.gov (2012)

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Villa Bighi, Kalkara, MALTA

www.mcst.gov.mt

**The Ministry for Education and
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Great Siege Road, Floriana, MALTA

www.education.gov.mt