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NATIONAL SPACE MONITORING

Report 2019



The Malta Council for
Science & Technology





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List of Acronyms

ASI	Italian Space Agency
CERN	European Organisation for Nuclear Research
CNES	National Centre for Space Studies / French Space Agency
EO	Earth Observation
ESA	European Space Agency
ICT	Information and Communications Technology
IP	Intellectual Property
KPI	Key Performance Indicators
LoC	Library of Congress
MCST	Malta Council for Science and Technology
MEDE	Ministry for Education and Employment
OAR	Open Access Repository
OECD	Organisation for Economic Co-operation and Development
R&D&I	Research & Development & Innovation
SME	Small-to-Medium Enterprise
STEM	Science, Technology, Engineering & Mathematics
TRL	Technology Readiness Level
UM	University of Malta



Introduction

In 2017, Malta launched the first National Space Policy¹ with the aim of valorising those sectors which are already using space technologies while supporting numerous other niche markets which are as yet underexploited. The 2017 Space Policy notes that space applications have been on the rise locally for several years. There was therefore scope to maximise the benefits and better capitalise on the investments made in this sector. This policy also sought to ensure that work in this sector proceeds in a more co-ordinated manner to avoid duplication of effort and resources.

This approach focuses on the context of local requirements with due consideration given to the European context.

The local space sector is still in its infancy. The 2017 Space Policy, grounded in this reality, sought to achieve its aims by focusing on four priorities (termed 'dimensions' in the policy itself):

1. **Essential Services** - Highlighting the importance of essential services that are assisted and facilitated by satellite technologies and data, such as border and coastal security, emergency and meteorological services, urban planning and land administration as well as environmental monitoring and protection.
2. **Economic Dimension** - This dimension illustrates the potential of exploiting downstream space technologies to advance local high-tech industry which in turn benefits the economy.
3. **Educational Investments** - Prioritising investments in space-related educational efforts and capacity building measures creates a positive effect on local human resources capacity and applied research.

Extended Opportunities - This dimension highlights the benefit of utilising space-related technologies beyond the opportunities mentioned in the above dimensions through cross-linkages since space technologies are highly transferable to other sectors.

Since the launch of the 2017 Space Policy, several developments have taken place, most notably the launch of the National Space Fund and the setting up of the Space Task Force. In substantiating space-related awareness raising, MCST sought to establish a Space Research Fund that provides financial support for research, development and innovation within the area of Satellite Earth Observation. This funding programme, which is supported through the technical expertise of the European Space Agency through a formalised Implementation Arrangement, is a modest but important start to capacity building within the sector.

A Space Task Force was set up in 2019, together with Malta's vision for a National Space Strategy. The role of the Space Task Force is to identify and develop key policy directives that can be enacted in order to create a regulatory environment favourable to the development of a commercial space sector. The Task Force will review ways and means of working with the private sector to attract space commercialisation and innovation to Malta.

The aim of this Space Monitoring Report is to evaluate the level of implementation of the 2017 National Space Policy until end 2019 through a set of identified indicators. Further details on the methodology employed in compiling this monitoring report can be found in the next section.

1. <http://mcst.gov.mt/space-directorate/national-space-policy/>

Methodology

The National Space Policy 2017 did not identify key performance indicators (KPIs) at the time it was adopted and launched. Therefore, the first task undertaken was the identification of relevant indicators for each of the four dimensions of the Strategy. The identification of indicators was conducted in consultation with stakeholders to ensure that the indicators chosen would be relevant, feasible, and would not put an unreasonable burden on stakeholders.

The identified indicators were as follows:

2017 Space Policy Dimension	Identified indicators	Relevant definitions	Data source/s
Educational Investments	A1: Number of participants in space-related student educational activities	Participants in workshops, competitions and similar initiatives targeted at primary and secondary level students in the context of the schools' syllabi/curriculum	Esplora Interactive Science Centre MCST Space Education Programme
	A2: Number of Planetarium visits	Number of visits by the general public including repeat visits	Esplora Interactive Science Centre
	A3: Participation in space-related events	Number of participants at events organised for the general public	Esplora Interactive Science Centre
Extended Opportunities	B1: Number of participants in space-related training	Training for individuals working in STEM-related careers to further their knowledge of and engagement with space-related research and innovation	MCST
	B2: Number of formalised commitments for international collaboration regarding space-related activities	Formalised commitments include Memoranda of Understanding, Implementation Agreements, Framework Agreements and Memberships with international space agencies and organisations (such as ASI, CNES, ESA, EURISY etc); extensions to existing commitments are also included	MCST

Economic Dimension	C1: Number of Maltese applications for EU funds in space	Number of applications involving at least one Malta-based researcher for Horizon 2020 space-related funds	Cordis Database
	C2: Number of applications for Space Research Fund	Number of applications submitted annually for funding under the Space Research Fund managed by MCST	MCST
	C3: Funds awarded further to formalised commitments for international collaboration regarding space-related activities	Amount of funding awarded on an annual basis to space-related research projects stemming from the formalised commitments/agreements made	MCST
	C4: Public funds allocated for space-related R&D	Government Budgetary allocation addressing the socio-economic objective: Exploration and exploitation of space	NSO
	C5: Number of space-related publications	Number of publications per year related to space involving at least one Maltese-based researcher	OAR@UM Scopus Web of Science
Essential Services	D1: Number of applications of downstream space-related technologies	Number of new applications per year of space-related technologies by departments and entities within the Government sector	All ministries
	D2: Number of registered users on Copernicus	Number of local registered users with Copernicus	Copernicus Support Office

Table 1: Space Policy Monitoring Indicators, Definitions & Data Sources



Further clarifications and support were provided to stakeholders as required during the data collection process

Requests for data covering the years 2017 – 2019 were sent out to all stakeholders in early January 2020 with a cut-off point for receipt of data by March 2020. While MCST sought to define terms and clarify meanings in the identified indicators ahead of the data collection request, further clarifications and support were provided to stakeholders as required during the data collection process.

With regards to the indicator titled Number of space-related publications, a list of keywords was extracted from the policy document and from this list a more targeted set of Library of Congress (LoC) approved terms were extracted². Data was also generated from the University of Malta Library's licensed abstract and indexed databases: Scopus and Web of Science.

For indicator A3 Participation in space-related events, several space-related events were organised by other entities besides Esplora, however data on number of participants was not available. The scope of this indicator will be analysed further and possibly extended to provide a more comprehensive evaluation in future reports.

The following section presents the results of the first data collection exercise for the National Space Policy Monitoring Report.



2. The list of keywords used can be found in Annex 1 of this report.

Data & Results

A. Educational Investments

This dimension within the policy was established with the aim of enhancing public perception and awareness of space and the space sector while also emphasising the importance of raising awareness about potential opportunities for academia and applied research in the local sector.

Indicator A1: Number of participants in space-related student educational activities

Scholastic year	Number of Workshops	Number of Participants
2017/2018	4	1131
2018/2019	7	1098 ³
2019/2020 ⁴	3	62 ⁵

Table 2: Number of participants in space-related educational activities

For the 2017/2018 scholastic year, four space-related workshops were included in Esplora's Educational Programme for that time period; only one of the workshops was repeated for the 2018/2019 scholastic year while the rest were new workshops. The figures include primary and secondary school students from Church, Independent and State schools.

The above figures also include Space Education Programme projects *CanSat*, *AstroPi* and *Climate Detectives*. These projects are funded through the National Space Fund and administered by MCST with the support of the *European Space Agency*. The aim of the Space Education Programme is to further engagement and awareness on space technologies and related sectors for all primary, middle, secondary, and post-secondary schools in Malta.

Indicator A2: Number of Planetarium visits

	2017	2018	2019
Number of visitors	Not available	Not available	12,252

Table 3: Number of Planetarium visits

For the year 2019, 473 activities (films, shows, etc) were held at the Esplora planetarium. The total seating capacity for all the planetarium activities held amounts to 24,114.

Indicator A3: Participation in Space-Related Events

	2017	2018	2019
Number of participants	935	1489	634

Table 4: Number of participants in space-related events

In addition to its educational programme Esplora, Malta's Interactive Science Centre, organises a number of events aimed at the general public to encourage public engagement with STEM. Primary and secondary school students are also welcome to attend these events. The above figures show the number of participants in space-related events organised by Esplora. In 2017 one space-related event was organised, whilst in 2018 and 2019 two events were organised each year.

3. The available data for the total number of participants for one of the workshop held during the scholastic year 2018/2019 was listed as '20 to 30 attendees' and an average was used for the purpose of adding all participants to all events.
4. Data for this scholastic year only includes activities related to the Space Education Programme that commenced in 2019 and will continue in 2020.
5. Data on number of participants for one of the teams was not collected.

B. Extended Opportunities

The Extended Opportunities dimension outlined in the policy aims to encourage public-private-academia collaboration on space-related research and extend the benefits of space-related technologies and activities for the local economy.

Indicator B1: Number of participants in space-related training

	2017	2018	2019
Number of participants	Not available	Not available	25

Table 5: Number of participants in space-related training

The training and traineeships held in 2019 involved an ESA traineeship scheme stemming from an agreement between the European Space Agency (ESA) and the Malta Council for Science and Technology (MCST) for on-the-job training of Maltese graduates on space matters.

Indicator B2: Number of Formalised Commitments for international collaboration regarding space-related activities

	2017	2018	2019
Number of Commitments	3	1	1

Table 6: Number of Formalised Commitments for international collaboration regarding space-related activities

These formalised commitments are listed below:

- Agreement between the European Space Agency and the Republic of Malta Concerning Space Cooperation for Peaceful Purposes (2012-2022) [signed in February 2012 and extended in January 2017]
- Declaration of Intent between the Malta Council for Science and Technology and the Italian space agency (ASI) on cooperation in the field of space activities for peaceful purposes [signed in June 2017]

- Framework Agreement between the Malta Council for Science and Technology and the Centre National d'Etudes Spatiales (CNES) concentrating on the promotion of cooperative activities in space [signed in October 2017]
- Implementation arrangement between the European Space Agency and the Republic of Malta regarding technical assistance and expertise (2018-2023) [signed in March 2018]
- Agreement between the European Space Agency (ESA) and the Malta Council for Science and Technology (MCST) for the on-the-job training of Maltese graduates on space matters [signed in June 2019]

C. Economic Dimension

The aim of this dimension is mainly to assess the access to EU space-related markets and the eventual provision of new space-related technologies, products and services. The Economic Dimension chapter of the National Space Policy focuses on the potential of utilising downstream space-related technologies in an effort to incentivise the growth of the local high-tech industry. With regards to local applications of upstream technologies, the sector is still in its very early stages however research is being undertaken with the potential of generating Intellectual Property (IP).

Indicator C1: Number of Maltese Applications for EU funds on space

Between 2017 and 2019 a total of five space-related proposals were submitted for Horizon 2020 funds (three in 2017, one in 2018 and one in 2019); none of the submitted proposals were successful.

Indicator C2: Number of applications for the Space Research Fund

The Space Research Fund was set up in 2017 and is a nationally funded R&D&I programme operated by the Malta Council for Science and Technology, with input from European Space Agency as well as aid from Malta Enterprise with regards to commercial aspects when evaluating proposals. This funding programme is

exclusive⁶ to Maltese researchers and provides grants via two streams: Technology Concept Research which addresses Technology Readiness Levels (TRL) 1 to 4, and Applied Technology Development aimed at TRL 5 or more.

	2018	2019
Applications	9	7
Beneficiaries	2	3

Table 7: Number of applications for the Space Research Fund

Out of the nine applications submitted in 2018: three were submitted by SMEs; four by academia, one of which was in partnership with a public entity; one was submitted by a public entity in partnership with a Small-to-Medium Enterprise (SME); and one application was deemed ineligible.

Seven applications were submitted in 2019: two were submitted by SMEs, one of which in partnership with a academia entity and the other in partnership with another SME; and five were submitted by academia, one of which in partnership with a public entity and another in partnership with an SME.

Indicator C3: Funds awarded further to formalised commitments for international collaboration regarding space-related activities

- *SRF Projects stemming from implementation arrangement between the ESA and the Republic of Malta regarding technical assistance and expertise. Funds for the SRF were first awarded in 2018 and the funds captured below are tranches awarded per year.*

	2017	2018	2019
Funds awarded	Not applicable	€202,194.47	€ 297,696.73

Table 8: Funds awarded to SRF Projects stemming from implementation arrangement between the ESA and the Republic of Malta

- *MCST-CNES Space Bilateral Fund stemming from Framework Agreement between the Malta Council for Science and Technology and the Centre National d'Etudes Spatiales (CNES) concentrating on the promotion of cooperative activities in space. First award of funds took place in 2019.*

	2017	2018	2019
Funds awarded	Not applicable	Not applicable	€79,980

Table 9: Funds awarded to MCST-CNES Space Bilateral Fund projects

Indicator C4: Public Funds allocated for space-related R&D

	2017	2018	2019
Exploration and exploitation of space (GBARD)	nil	€ 308,000	€ 308,000

Table 10: Public funds allocated for space-related R&D

Indicator C5: Number of space-related publications

	2017	2018	2019
Publications on OAR@UM	3	8	2
Publications on Web of Science & Scopus⁷	78	116	113
Total:	81	124	115

Table 11: Number of space-related publications

6. Foreign entities may apply as partners but do not receive financial aid from Malta.

7. Duplicate publications were removed

D. Essential Services

The 2017 Space Policy for Malta recognises that the utilisation of downstream space-related technologies to cover essential services including marine, maritime, migration, and agriculture among others has become crucial for local authorities to function more effectively. However more awareness is needed on the potential of satellite applications.

D1: Number of applications of downstream space-related technologies

For this indicator only data for 2019 was available.

In 2019 there were three applications of downstream space-related technology carried out by one Ministry.

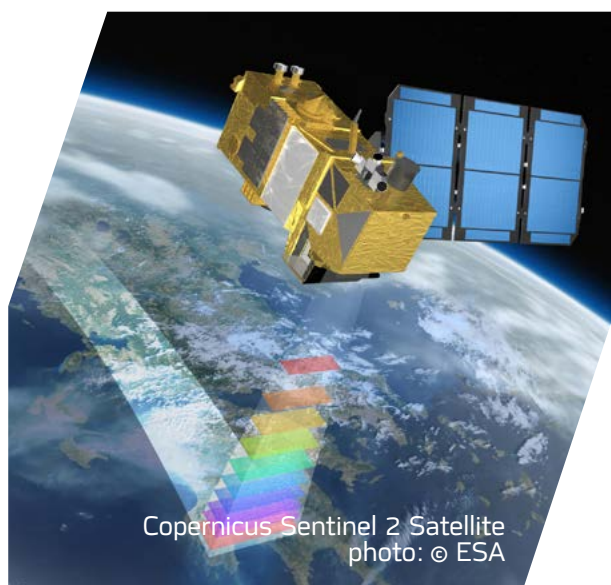
D2: Number of registered users on Copernicus

D2.1 Number of User Registrations from Maltese entities:

	2018	2019
Copernicus Services	3	0

Table 12: Number of Maltese registered users on Copernicus Services

The Copernicus Services address five thematic areas⁸ and supports a number of Earth Observation (EO) data applications such as environment protection, border and coastal security, emergency services, urban planning, and rural and agricultural land administration,



among others. These Services offer restricted data access based on the eligibility of the user category. The entities in the above table are categorised as either Public Authority User or Public User⁹.

D2.2. Number of Sentinel Open Access Data Hub¹⁰ Registrations from local individuals:

The Sentinel Missions are six kinds of satellites with different Earth Observation objectives such as land, oceanic and atmospheric monitoring. The latest figure available is 177 sentinel open access data hub registrations from Maltese individuals. A yearly breakdown of this data was not available and the above figure may therefore include registrations between 2014/2015 (i.e. since the Copernicus portals have been available online) and April 2020.

8. Thematic areas include: Land, Marine, Emergency, Security and Atmosphere (<https://spacedata.copernicus.eu/web/cscda/copernicus-users/user-categories/copernicus-services>)

9. Public Authority Users include:

- Any government or other public administration of States participating in the Copernicus Programme including public advisory bodies, at national, regional or local level
- Any natural or legal person performing public administrative functions under national law, including specific duties, activities or services in relation to an EU policy
- Any natural or legal person having public responsibilities or functions, or providing public services relating to an EU policy under the control of a body or person falling within (1) or (2), such as a contractor of a public authority
- Any research and academic organisation
- Contractors of such entities

Any natural or legal person is registered in the Public User category.

10. The Open Access Hub provides complete, free and open access to Sentinel-1, Sentinel-2, Sentinel-3 and Sentinel-5P. Other Hubs provide restricted access to certain Sentinels data such as the Copernicus Services Data Hub.

Conclusions & Recommendations

The aim of this report was to commence a process of monitoring developments in space research and innovation in Malta, further to the publication of the 2017 National Space Policy. The short timeframe covered by this report makes it difficult to interpret the numbers and identify trends, while the absence of targets in the 2017 Policy makes it difficult to quantify progress and achievements. Despite these challenges, this report remains a useful first step towards establishing a baseline for future monitoring of trends, as well as for the eventual review of the Policy and the consideration of targets and KPIs for a future revision of this Policy.

In order to progress towards this, it is worth highlighting a few limitations encountered in the preparation of this report so that these can be addressed in future iterations:

1. Definitions: One issue that requires further attention in future reports is that of defining the space sector in the local context. The *OECD Handbook on Measuring the Space Economy*¹¹ states that: “*The Space Economy is the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space... It follows that the Space Economy goes well beyond the space sector itself...*”. Since the creation and utilisation

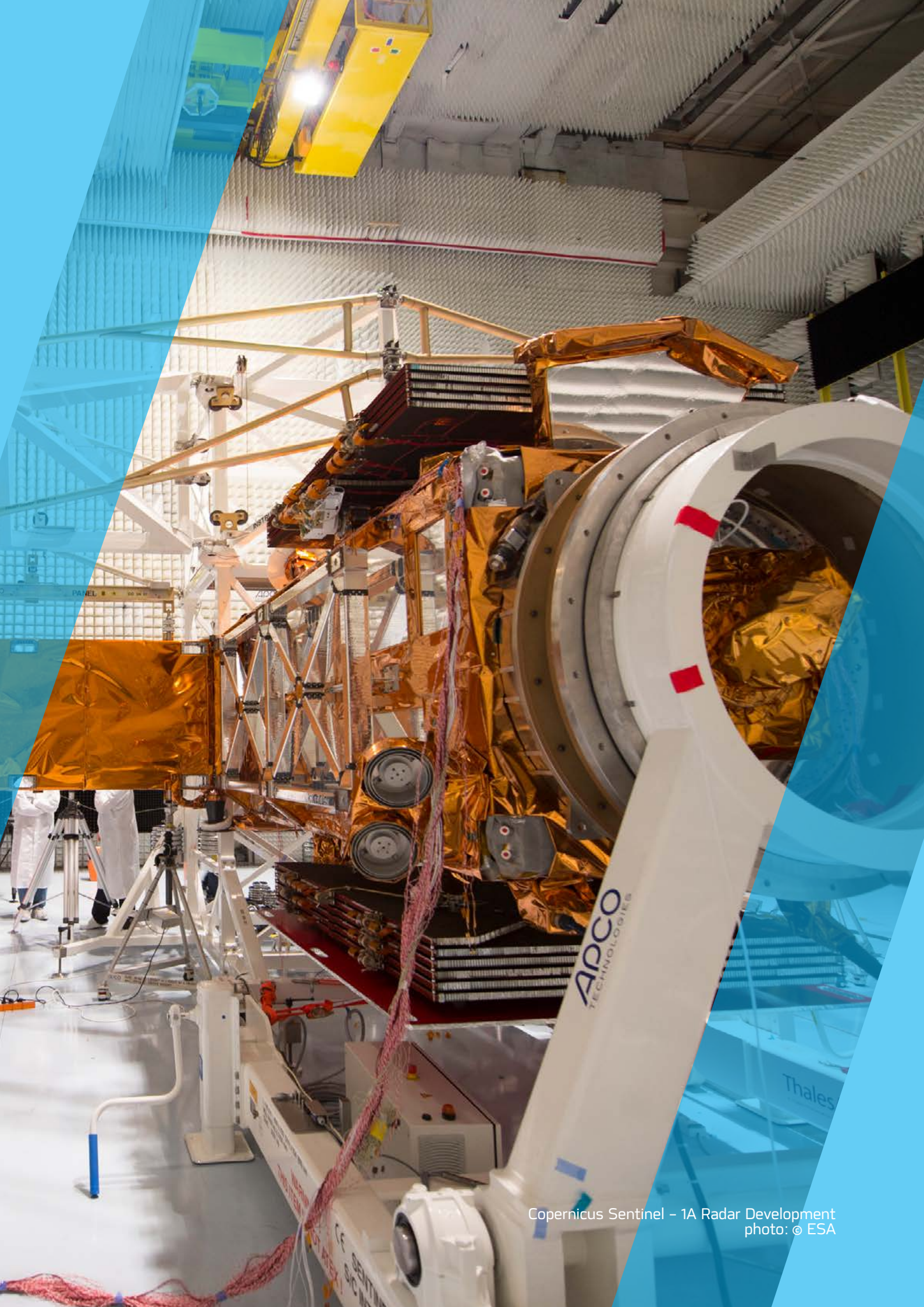
of space-related technological innovations are reliant on other sectors such as manufacturing, engineering, aerospace, ICT and others, there is no clear-cut definition of what the space sector encompasses.

This situation also indirectly points towards fragmentation in the sector, with the concomitant disadvantages that result from said fragmentation. In order to properly assess progress within the local space sector, more effort needs to be made to define and conceptualise what encompasses the local space economy. An emphasis needs to put on contextualising space-related activities for the capacities of the local economy as well as its access to resources. Defining the sector also helps in identifying key performance indicators and formulating a more targeted space policy for the coming years.

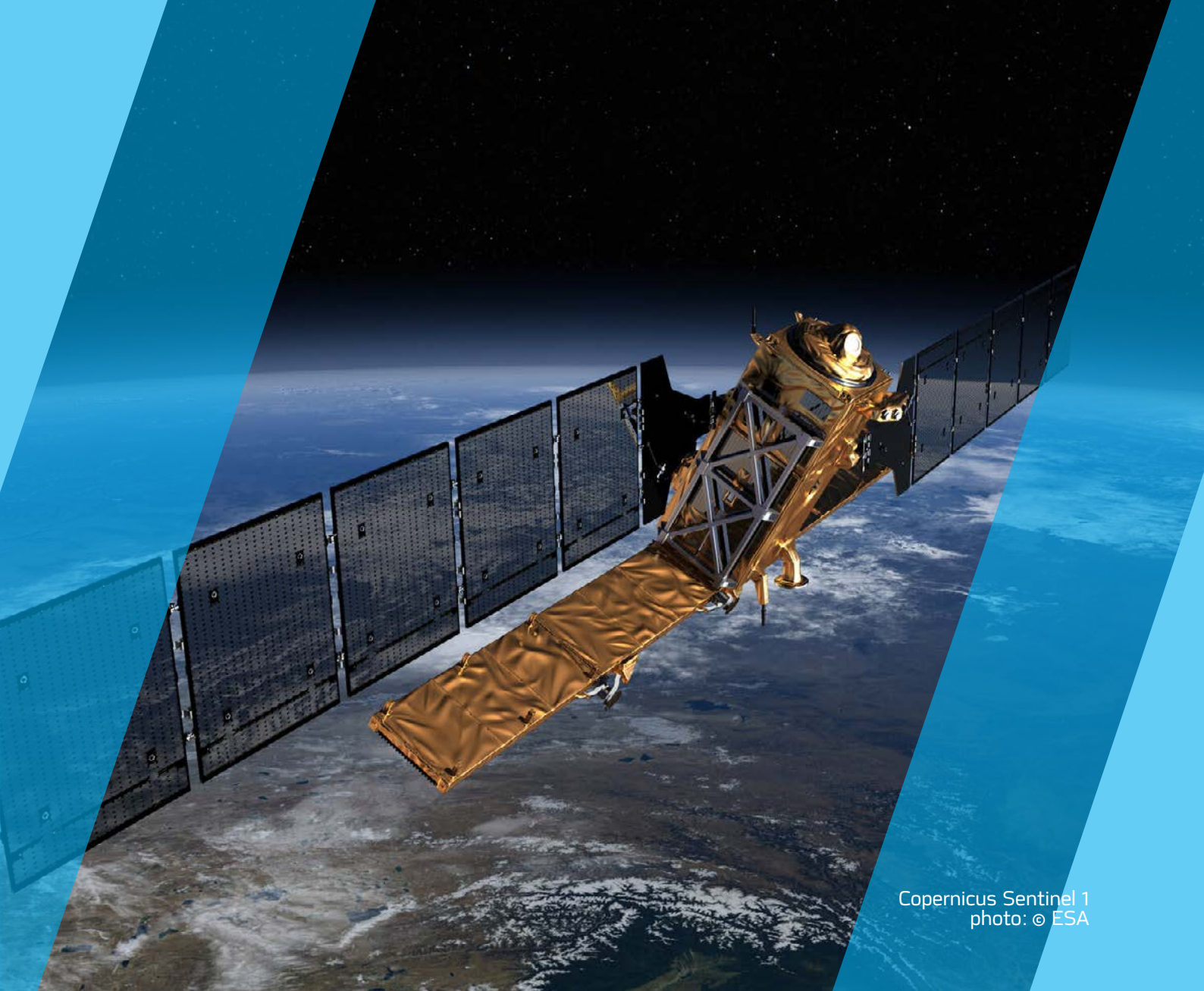
2. Data availability: During the process of data collection, the issue of data availability at the required level of granularity proved to be a stumbling block at times. This will be addressed by ensuring a more robust framework for the identification of indicators, the breakdown of figures over time and the level of (dis) aggregation required at the earliest possible stages, to ensure that data is collected in the required format from the very beginning. This would save time and effort for both stakeholders providing data and MCST.

The aim of this report was to commence a process of monitoring developments in space research and innovation in Malta

11. https://www.oecd-ilibrary.org/economics/oecd-handbook-on-measuring-the-space-economy_9789264169166-en



Copernicus Sentinel - 1A Radar Development
photo: © ESA



Copernicus Sentinel 1
photo: © ESA

Annex 1

List of Keywords used for Indicator C5 Number of space-related publications:

- Space
- Space research
- Telescope(s)
- Satellite(s)
- Satellite data
- Space telescopes
- Universe
- Space sciences
- Earth (Planet)
- Remote sensing
- Global Positioning System (GPS)
- Orbit(s)
- Solar system(s)



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