

POLICY BRIEF #2

THE FUTURE OF SINGAPORE – EUROPE EARTH OBSERVATION RESEARCH COOPERATION

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EPIC

Europe's ICT innovation
partnership with Australia,
New Zealand and Singapore

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SUMMARY

Earth observation and other technologies based on satellite imagery are increasingly dependent on accurate and timely data. Satellite data from European Earth observation offers a vast amount of current and historic data which can be used to develop novel applications in fields such as climate research and transportation. The coastal setting of Singapore, and its rapid responses to transport challenges make it an ideal collaboration partner for the joint development of solutions in urban transport and local air pollution mitigation advancements.

Europe and Singapore should jointly develop the existing potential applications in the field of spatial intelligence. Promising application fields include air pollution monitoring and mitigation and applications in transport. Joint activities should include research and innovation actions, and options for developing spatial intelligence marketplaces.

INTRODUCTION

The space sector – especially the areas of sensing and spatial intelligence – is undergoing a deep transformation.¹ A growing number of public and private players, and new opportunities brought by the digital revolution and advances in engineering – from micro-satellites to artificial intelligence – are opening new pathways for Singapore's collaboration with the European Union and its member states.

Singapore's premier location in South-East Asia has led to a high number of European researchers working there. The Strait of Malacca is one of the world's most important maritime passages and Singapore's proximity to large and growing markets has been attractive for many EU companies (for example Thales, Siemens, Infineon and many other major European ICT companies).

In the past, Europe and Singapore have fruitfully collaborated in satellite data and spatial intelligence. The recent EU-SG Free Trade Agreement has further reinforced this cooperation.² It includes the joint intention to use global satellite navigation systems, to establish a dialogue in transport policies and to collaborate in environmental protection, e.g. in climate change related best-practices. The agreement also includes cooperation in ICT-related research. In addition, the EU Commission has adopted new partnerships with Asia, for example in the area of digital connectivity – and satellite data may be one of its most demanding use cases.³

The potential for European satellite data in Singapore

Technological evolution, especially in terms of availability and accessibility, has made Copernicus the largest space data provider in the world, currently producing 12 terabytes per day. The clear majority of data and information delivered by the Copernicus space infrastructure and the Coperni-

¹ <https://spacewatch.global/2019/02/france-and-singapore-discuss-space-innovation-and-economic-development-cooperation/>

² https://www.bundestkanzleramt.gv.at/documents/131008/1028587/29_7_abk_en.pdf/ca84f964-55ae-4b61-863a-a648445c5fb0

³ <http://www.spacetechnasia.com/interview-dr-philippe-brunet-director-for-copernicus-on-the-programmes-asia-angle/>
Dr Philippe Brunet, Director for Copernicus, on the programme's Asia angle.

cus services are made available and accessible to any citizen and any organisation around the world on a free, full and open access basis. Copernicus Data and Information Access Services are available to everyone through the Copernicus Open Access Hub or the Copernicus Data and Information Access Services platform providers (see references).



Promotional image from the EU-Copernicus event, September 2018.⁴

The European Commission has acknowledged the importance of Singapore; in September 2018, it organised a Copernicus event there which brought together representatives from the European Commission with European and Singaporean companies and Singaporean authorities working in Earth observation or environmental monitoring.⁵ The significant investment by the EU into Copernicus and the open access to its data should be used as a door opener to new research collaborations.

DRIVERS OF RESEARCH & INNOVATION

The availability of Earth observation data is a strong push factor for activities in both research and innovation. In Singapore, a key driver for agencies funding research is the development of financially viable products and services. Applications of new methods for spatial intelligence are increasingly taken up by markets both in Europe and in Singapore.

“There are many potential benefits of Copernicus for Singapore. The programme’s free and open satellite data and information from the Copernicus Services can be used for a variety of applications relevant to the city-state’s particular situation. These include biodiversity monitoring, maritime surveillance, disaster risk reduction and emergency management are just a few examples of the Copernicus-related areas of benefit.” — Dr Philippe Brunet, Director for Space Policy, Copernicus and Defence at the European Commission.⁶

Furthermore, the persistent cloud cover in the Southeast Asia region renders current optical imagery difficult to use for monitoring. Therefore, access to Sentinel-1, the only free and open source of Synthetic Aperture Radar (SAR) imagery in the world which can see through

⁴ <https://twitter.com/copernicuseu/status/1022818524857819136>

⁵ <https://copernicusbenefits.eventsite.be/>

⁶ https://eeas.europa.eu/delegations/singapore_lv/50069/Copernicus%20In%20Singapore

⁷ <https://www.ipi-singapore.org/services>

⁸ The German Federal Ministry of Education and Research (BMBF) provides funds for exploratory and networking activities through its international department. The so-called “2+2” projects (one research institution and one company on each side) were promoted in collaboration with Singapore’s Agency for Science, Technology and Research (A*STAR) in the field of production technologies.

clouds, can also be a major game changer.

The effectiveness of these possibility-driven motivations is assisted by dedicated services such as Intellectual Property Intermediary (IPI)⁷, established under Singapore’s Ministry of Trade and Industry, which bring together the needs of industry with innovations and developments of researchers. Copernicus currently only provides data in a repository, which is not enough. Thought must be given to the potential usage of the data, as well as common goals identified to convince Singaporean agencies to co-innovate with European researchers and innovators. Some examples include:

*Applications in urban transport are at the forefront for international cooperation with Singapore. Major European organisations have local branches which develop innovative technologies for future transportation concepts in the city-state.

*Climate research — especially on local air pollution — and maritime transport are potential fields for increased collaboration.

*Environmental monitoring, which includes water quality monitoring around the shipping lanes, haze from forest fires, predicting marine ocean quality and fishing grounds, offers potential business cases for satellite data analytics.

Current challenges

In Singapore there exists a strong demand for foreign expertise and spatial intelligence is no exception. Once a technology has been deemed strategically important for research and development in the region, Singapore has been known to invest in key technologies and in attracting people. This relative ease of access to substantial funding increases Singapore’s attractiveness to European researchers, although the number of European researchers are comparatively small as Singapore also attracts large numbers of researchers from Asian countries. In addition, a sizeable proportion of young Singaporeans are keen to explore work opportunities outside Singapore. Establishing collaborative international funding models would have the benefit of keeping EU researchers more closely linked to their EU host institutions, especially compared to other researchers expatriating to Singaporean research institutes.

The interest in Singapore for collaboration with EU researchers and innovators is high. Current limitations include both a lack of international funding and the difference in the time to contract. Several bilateral agreements with European countries have been very effective —Germany and Singapore launched a joint call⁸ on Industry 4.0. Similarly, there have been joint calls between Singapore and France. To boost the research cooperation with Singapore, a coordinated effort at EU level is necessary. There are, however, no significant

programmes in Singapore funding researchers in Europe. European Union funding for researchers in Singapore is mostly limited to the highly competitive Marie Skłodowska Curie programme. However, this is not a limiting factor, as funding can be split. Furthermore, researchers from Singapore are welcome to participate in the calls of Horizon 2020 and can use Copernicus Sentinel data and Copernicus services free of charge for their research.

Technical challenges

The past five years have seen a rapid increase in the launch of private Earth observation (EO) satellites. Five companies are situated at the forefront of this, deploying between 100 and 300 satellites each. However, only one is based in the EU (until BREXIT) and it has yet to launch any satellites.⁹ These small satellites challenge the EU's position as the leading source of open EO data (i.e. from Copernicus). Joint activities¹⁰ between companies such as Planet and the EU, for instance, lead to further dependence on American satellite data sources and may discourage European start-ups from pursuing similar objectives and providing an EU source for private EO data.

Programme-level collaboration

Building on existing strengths

At the programme level, there is good collaboration between European Union member states and Singapore. For example, the PHC Merlion Program¹¹ is a joint French-Singaporean collaboration, managed by the Institut Français de Singapour in partnership with Singaporean institutions, to encourage and support new scientific research development between French and Singaporean laboratories through funding the scientists' trip exchanges. 2018 marked the 13th annual call¹² since the programme's launch. Following its inception, nearly 200 bilateral collaboration projects have been funded.

In addition, the French Centre National d'Études Spatiales (CNES) has established a targeted innovation dialogue in areas such as environmental and transport applications with key players in Singapore, for example with Nanyang Technological University (NTU), the Economic Development Board (EDB), and the Singapore Space Technology Association (SSTA).

Boosting EU-SG cooperation

Joint initiatives that address common Singaporean and EU research goals provide the most promising incent-

ives to increase collaboration. There have been calls in Horizon 2020 that addressed Singaporean partners¹³, but the funding situation made the proposals unattractive for Singaporean organisations to join. Of the currently funded projects¹⁴, none have a Singaporean entity as partner. A more coordinated approach with a defined funding strategy can reduce these uncertainties and increase participation. It would be beneficial if Singapore proactively establishes a mechanism to fund researchers applying in the Horizon 2020 consortia.

Initiatives to foster deployment of processing and exploitation capacities for Sentinel satellites' data, Copernicus services information and other Earth observation data would support the European Union's intentions to cross-fertilise different data sets, encourage the development of innovative products and services and to maximise the socio-economic benefits of Earth observation data in Europe.¹⁵ In addition, such collaboration could provide additional leverage of Europe's Open Science Cloud, for example through federating Copernicus data and added value services and potentially in the context of the OECD Global Science Forum.¹⁶

RECOMMENDATIONS

Singapore and the EU should jointly:

- #1** Research Earth observation data use-cases based on their respective existing developments. This requires the collaboration of government, industry and academia.
- #2** Develop collaborative or matching funding models in the field of Earth observation for high priority areas such as air pollution mitigation and urban transport research to leverage existing resources.
- #3** Develop joint activities that go beyond the sharing of satellite data.
- #4** Investigate options for developing marketplaces for European satellite data and joint applications.

⁹ <https://www.geospatialworld.net/blogs/top-small-satellite-start-ups-that-are-transforming-the-geo-industry/>

¹⁰ <https://www.planet.com/pulse/esa-vhr-high-resolution-europe/>

¹¹ <https://www.voilah.sg/the-merlion-programme/>

¹² <https://sg.ambafrance.org/Now-open-PHC-Merlion-Call-for-proposals>

¹³ DT-ART-01-2018, DT-ART-02-2018 – Calls are also open in 2019

¹⁴ As of 30.11.2018 https://cordis.europa.eu/project/rcn/218263_en.html https://cordis.europa.eu/project/rcn/218634_en.html

¹⁵ COM (2016) 178 final. *European Cloud Initiative – Building a competitive data and knowledge economy in Europe*.

¹⁶ *Implementation roadmap for the European Open Science Cloud*. Commission staff working document, SWD (2018) 83 final, Brussels, 14.3.2018. http://ec.europa.eu/research/openscience/pdf/swd_2018_83_f1_staff_working_paper_en.pdf

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Further References & Links

Copernicus website with access to data and services: <http://www.copernicus.eu>

Copernicus Data and Information Access Services platforms:

- * Creodias - <http://www.creodias.eu>
- * Onda - <http://www.onda-dias.eu>
- * Sobloo - <http://www.sobloo.eu>
- * MundiWebservices - www.mundiwebservices.eu
- * Wekeo - <http://wekeo.eu>

Copernicus in Singapore: https://eeas.europa.eu/delegations/singapore_de/50069/Copernicus%20In%20Singapore

5th Singapore Space Symposium (SSS) 2018 <http://www.eee.ntu.edu.sg/NewsnEvents/Pages/Events-Details.aspx?news=5b00a968-ef5e-430e-9b25-1d6d86a65fd9>



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