

Project Report

**Evaluating Japanese university-led space technology development  
and utilisation capacity building programmes in emerging countries**

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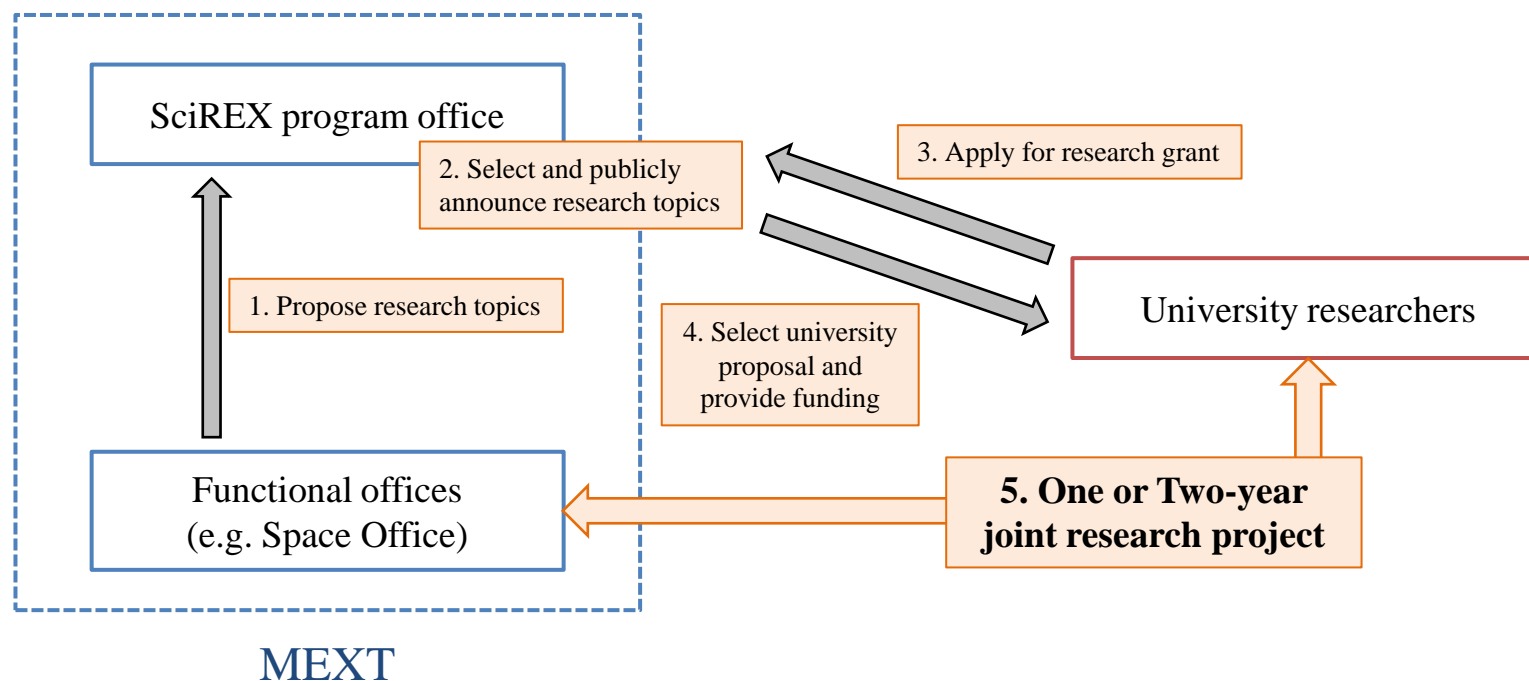
The University of Tokyo



## Funding

Science for REdesigning Science, Technology and Innovation Policy (SciREX) program,  
Ministry of Education, Culture, Sports, Science and Technology (MEXT)

## Co-evolution project



## Research Team

Name	Affiliation	Position
Hideaki SHIROYAMA	The University of Tokyo, Graduate School of Public Policy	Professor
Shinichi NAKASUKA	The University of Tokyo, Graduate School of Engineering	Professor
Quentin VERSPIEREN	The University of Tokyo, Graduate School of Public Policy	Researcher
Yuichiro NAGAI	Nihon University, College of International Relations	Assistant Professor
Do Xuan PHONG	The University of Tokyo, Graduate School of Engineering	Doctoral Candidate

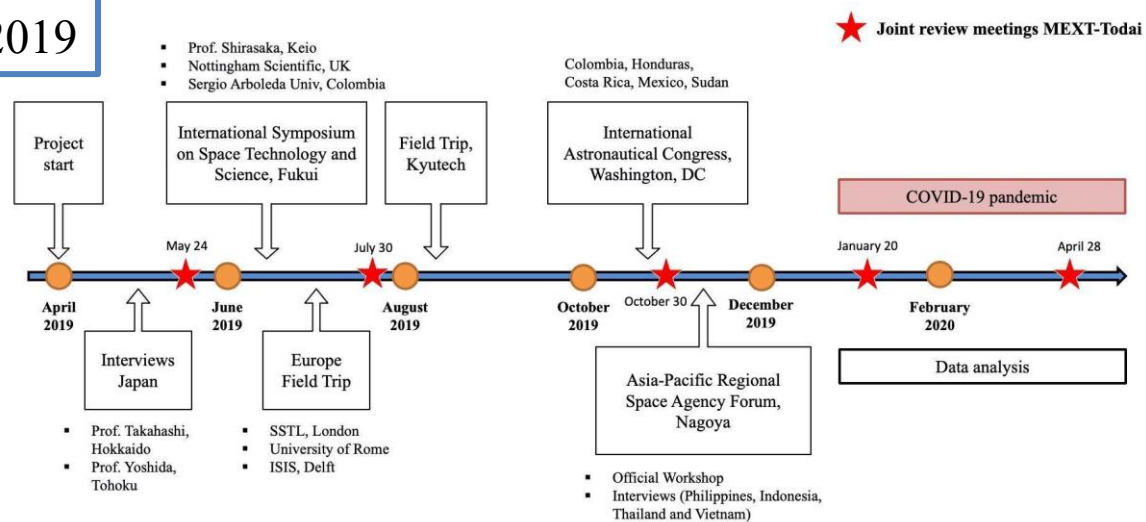
## MEXT Administrators

Name	Affiliation	Project Period
Emiko ISHIDA	Office for Space Utilization Promotion Space Development and Utilization Division Research and Development Bureau	2019-2021
Seiko KURISU		2019-2020
Kuniko TAKEDA		2020-2021

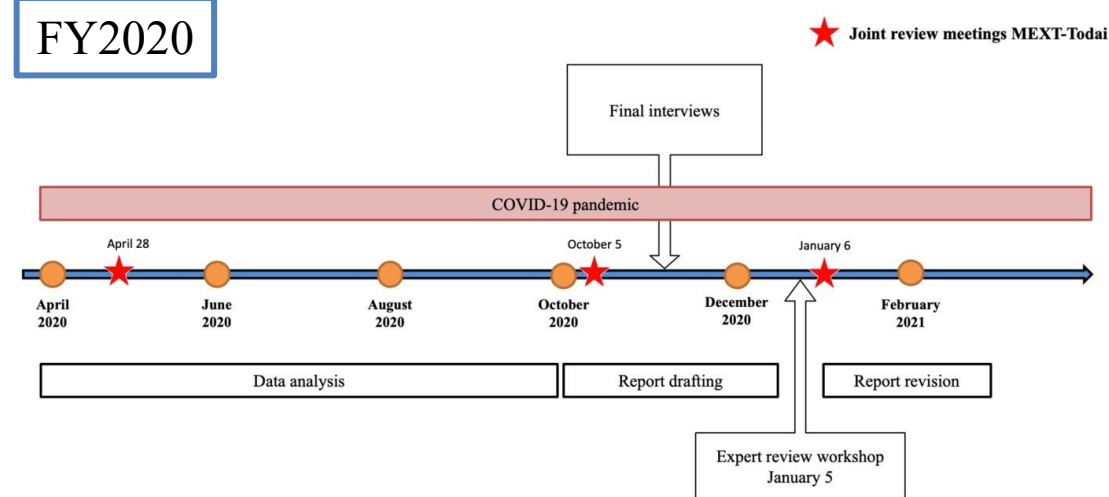
1. How to evaluate the success of a space technology development and utilisation capacity building programme?
2. What are the strengths and weaknesses of a “Japanese way” of individual university-led space technology development and utilisation capacity building?
3. What schemes can be developed at national level to combine the strengths of each Japanese university for space technology development and utilisation capacity building, in a sustainable way embedded in higher education policies?
4. How can these schemes be designed and funded to promote the involvement of small and mid-size universities in space technology development and utilisation capacity building programmes with developing countries?
5. What are the most appropriate institutional layouts and timeframes for such schemes?

# Project timeline and scope

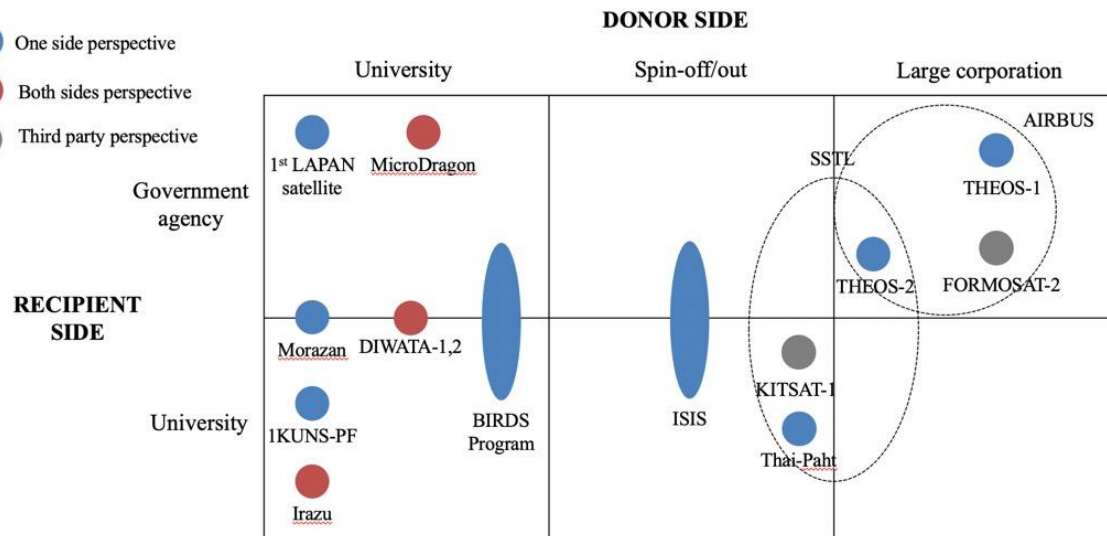
FY2019



FY2020



- One side perspective
- Both sides perspective
- Third party perspective



## Japanese projects studied

**PHL-Microsat program**  
Hokkaido University and Tohoku University

**MicroDragon project**  
The University of Tokyo, Keio University,  
Hokkaido University, Tohoku University  
and the Kyushu Institute of Technology

**RWASAT-1 project**  
The University of Tokyo

**BIRDS program**  
Kyushu Institute of Technology

## Elements of analysis

Motivation of donor  
universities

Role of university  
headquarters

Role of the central  
government

Interactions with the  
private sector

## Foreign donors

**The University of Rome La Sapienza (Italy)**

**Surrey Satellite Technology Ltd. (UK)**  
Spin-off of University of Surrey,  
now part of Airbus

**ISIS - Innovative Solutions In Space (The Netherlands)**  
Spin-off of TU Delft

**Satrec Initiative (Republic of Korea)**  
Spin-off of KAIST

## Elements of analysis

Role of universities vs  
role of commercial  
providers

Benefits of spin-offs for  
scaling up projects

Role of the government

Differences of approach  
with Japanese providers

## Diplomatic effectiveness

Impact on Japan's  
image abroad

Establishing long-  
term relationships

Impact on bilateral  
cooperation beyond  
space

Grooming future  
leaders with ties with  
Japan

Obtaining markets for  
Japanese companies

GoJ policy  
target

## Educational effectiveness

Recipients'  
knowledge retention  
strategies

Implications for  
Japanese university  
donors

## Impact of COVID-19

Impact on  
universities

Impact on  
commercial providers

Ongoing  
issue



## Strengths

**Affordability  
compared to  
private providers**

**Benevolent  
image and  
flexibility in  
negotiations**

**Ability to  
provide degrees**

**Ability to provide multi-year, step by step training and  
education, including space law, policy and project  
management**

No commercial constraints

**General strengths of universities**

**Launch opportunities, in particular  
affordable Kibo deployment (but ending)**

**Alignment with government: space-related  
ODA from JICA**

**Easy decision-making of independent  
laboratories**

**Specific strengths of  
Japanese universities**

Already mentioned:

Additional funding

Additional project opportunities

Development of infrastructure

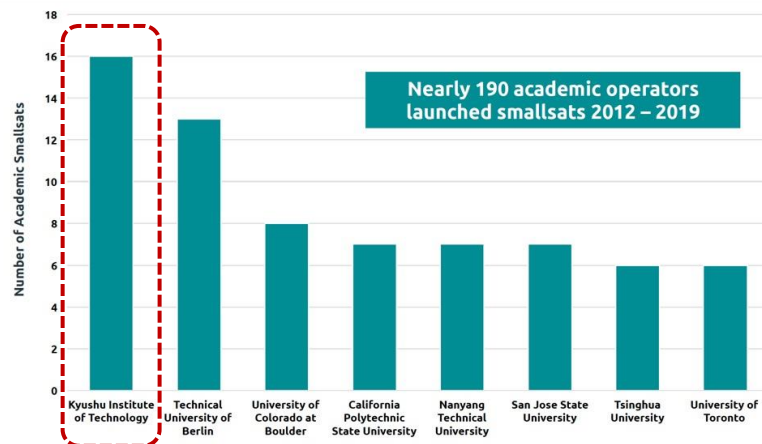
Etc.

## Huge publicity and very positive ‘university branding’: e.g. Kyutech

- Huge media coverage in numerous countries having got their first satellite thanks to Kyutech
- International awards and recognition: IAF Frank J. Malina Medal for Professor Cho, numerous students recognized IAF Emerging Space Leaders
- Top 1 of academic small satellite operator Bryce ranking: more than big government agencies like: JAXA, ISRO, DLR, ESA...

### Number of Academic Smallsats by Institution

Academic and Non-Profit Smallsats



**BRYCE**  
space and technology



## Structural weaknesses

**Limitations induced by laboratory/university size**

**Lack of satellite testing infrastructure in universities**

**Reliance on professors' personal connections**

**Concerns on continuity and stability**

## Needs (1 to 5)

**Need 1: National coordination mechanism to identify and combine the most appropriate capacity building providers, according to the needs for the recipient**

**Need 2: More small satellites testing centers across Japan**

**Need 3: National point of contact to connect prospective recipients with prospective donors**

**Need 4: national repository of capacity building know-how**

**Need 5: extract programs from their dependency on each professor**

## Government-related weaknesses

**Inadequate strategic vision of the central government**

**Expiration of JAXA's Strategic Partnership program with selected universities after FY2020**

## Needs (6 to 11)

**Need 6: The government should develop a national strategy on space cooperation with developing countries, to inspire partnerships**

**Need 7: The government should not have a too strong direct involvement in partnerships as it could frighten foreign partners**

**Need 8: Ensure affordable satellite deployment opportunities for all Japanese universities**

**Need 9: Enhance intra-university coordination leveraging all relevant departments of the university, to include social sciences in capacity building programmes**

**Need 10: ensure that the knowledge transferred will be retained before initiating a program**

**Need 11: facilitate responsibility sharing with private contractors**

## Programmatic weaknesses

**Excessive focus on engineering and science**

**Limited concerns about knowledge retention in recipient organizations**

**Limited involvement of the private sector**

## Benefits

Single point of contact for prospective recipients

Expertise to evaluate the quality of requests and create appropriate consortia allowing smaller and private providers to participate

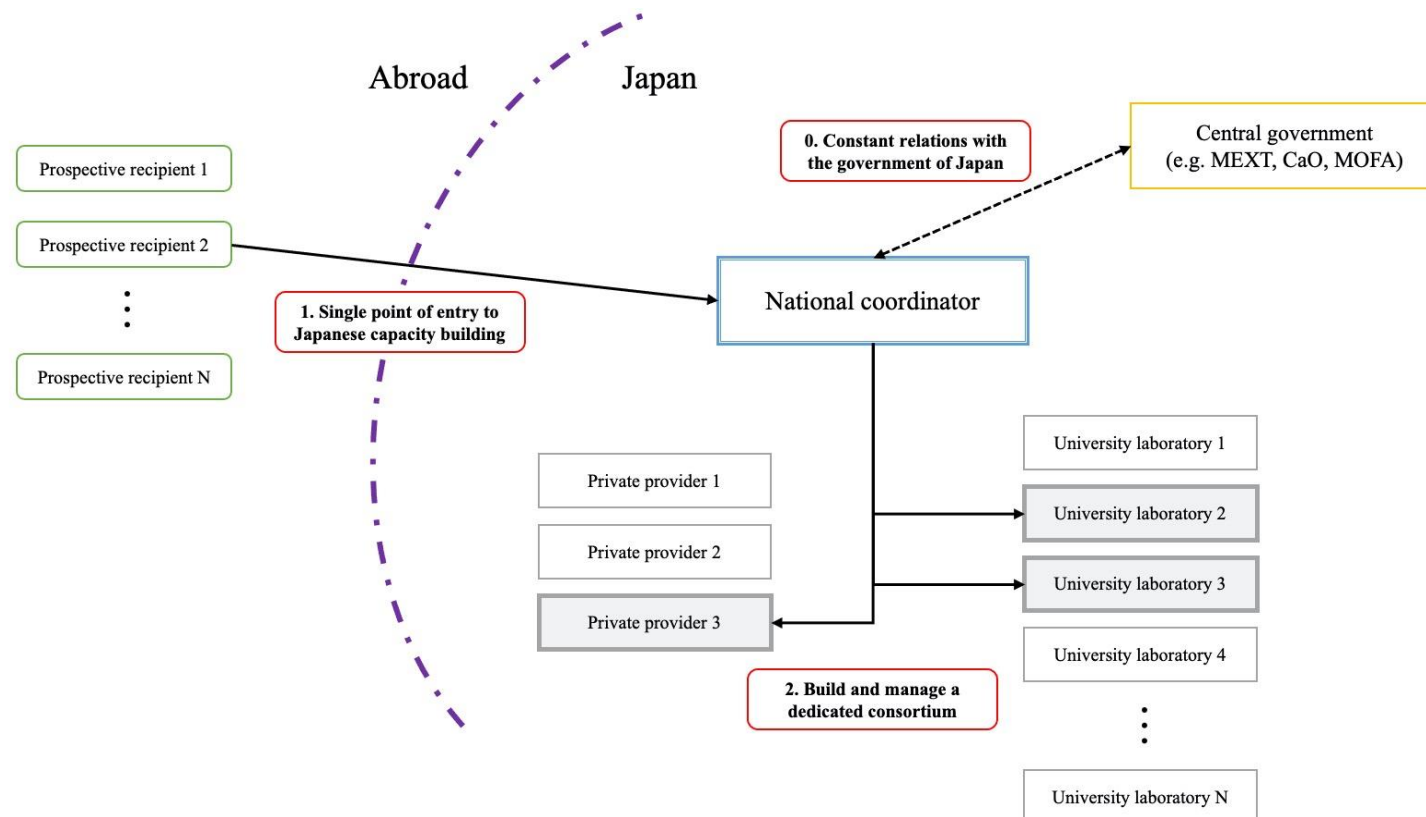
Centralized repository of capacity building knowledge and on the space development level of foreign countries

Advisory body to recommend a national strategy regarding space partnership with foreign countries

## Two scenari

Government-led

Independent non-profit



Challenge: balancing between coordination and competition

## Recommendation 2. Internal schemes to foster capacity building programs in Japanese universities

Reinforcing university headquarters' involvement in capacity building programs

Leveraging all departments and institutes within the university

Fostering university spin-offs

## Recommendation 3. Establishing geographic poles for satellite assembly and testing in Japan

No facilities in northern Japan

Need government support, in collaboration with a local university

Could help replicated successful programs like BIRDS

## Recommendation 4. Regulatory and/or promotional tools available to the MEXT

Funding targeted to international capacity building (e.g. space education ODA)

Maintaining affordable J-SSOD small satellite deployment opportunities after FY2020: four different scenarii evaluated

		○: positive contribution, △: neutral, ×: negative contribution	Need 1	Need 2	Need 3	Need 4	Need 5	Need 6	Need 7	Need 8	Need 9	Need 10	Need 11
<b>3.1. National coordination mechanism for capacity building providers</b>													
	3.1.2. Scenario 1: Government-led national coordination mechanism		○		○	○	○	○	×			○	○
	3.1.3. Scenario 2: Independent non-profit national coordination mechanism		○		○	○	○	○	○			○	○
<b>3.2. Internal schemes to foster capacity building programmes in Japanese universities</b>													
	3.2.1. Reinforcing university headquarters' support to capacity building programmes						○				○		
	3.2.2. Leveraging all departments and institutes within the university										○		
	3.2.3. Fostering university spin-offs			○									○
<b>3.3. Establishing geographic poles for satellite assembly and testing in Japan</b>				○									
<b>3.4. Regulatory and/or promotional tools available to the MEXT</b>													
	3.4.1. Funding targeted to international capacity building			○				○					
	3.4.2. Maintaining affordable J-SSOD small satellite deployment opportunities after FY2020												
	Scenario 1: maintaining JAXA's Strategic Partnership after FY2020, without change												
	Scenario 2: maintaining JAXA's Strategic Partnership after FY2020 and expanding the membership									○			
	Scenario 3: direct contract with JAXA for affordable deployment									○			
	Scenario 4: subsidise contracts made with commercial providers									○			

- Need 1: National coordination mechanism to identify and combine the most appropriate capacity building providers, according to the needs for the recipient
- Need 2: More small satellites testing centers across Japan
- Need 3: National point of contact to connect prospective recipients with prospective donors
- Need 4: national repository of capacity building know-how
- Need 5: extract programs from the dependency on each professor => university wide strategy on capacity building
- Need 6: Government should make national strategy to inspire partnerships (identify suitable partners)
- Need 7: BUT not be involved in partnerships as it could frighten foreign partners
- Need 8: Ensure affordable satellite deployment opportunities for all Japanese universities
- Need 9: Enhance intra-university coordination to leverage all department of the university to include social sciences in capacity building
- Need 10: ensure that the knowledge transferred will be retained before initiating a program
- Need 11: facilitate responsibility sharing with private contractors

- ❖ Useful overview of (university-led) space capacity building programs in Japan and abroad
- ❖ Lessons and good practices for both donors and recipients
- ❖ Policy recommendations targeted to Japan, but the needs identified can be applicable to other countries
- ❖ Need to study other areas of the world and find lessons from other fields

=> 2-year budget extension by the MEXT



Thank you for your attention

Questions? Comments?

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Report freely available on the STIG program's website

<https://stig.pp.u-tokyo.ac.jp/?p=4061>