Space Industry Business Opportunities in Japan

Analysis of the Market Potential for EU SMEs Involved in the Earth-Observation Products & Services

Sept 15, 2016

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Agenda

1. Project Objectives
2. Research Approach
3. Japanese Space Industry
4. Industry Needs Analysis
5. Recommendations & Main Challenges

1. Project Objectives

■Project Objectives

Earth-observation (EO) products & services
→ next growth area! 2014 market value = US$1.6 Bn

1. Analyse the market potential for EO downstream applications in Japan
   - Strengths & weaknesses, complementarities, drivers & inhibitors for international cooperation

2. Identify & develop partnership opportunities in Japan for European EO companies

3. Produce recommendations with action items for European EO companies

2. Research Approach

■Research Approach

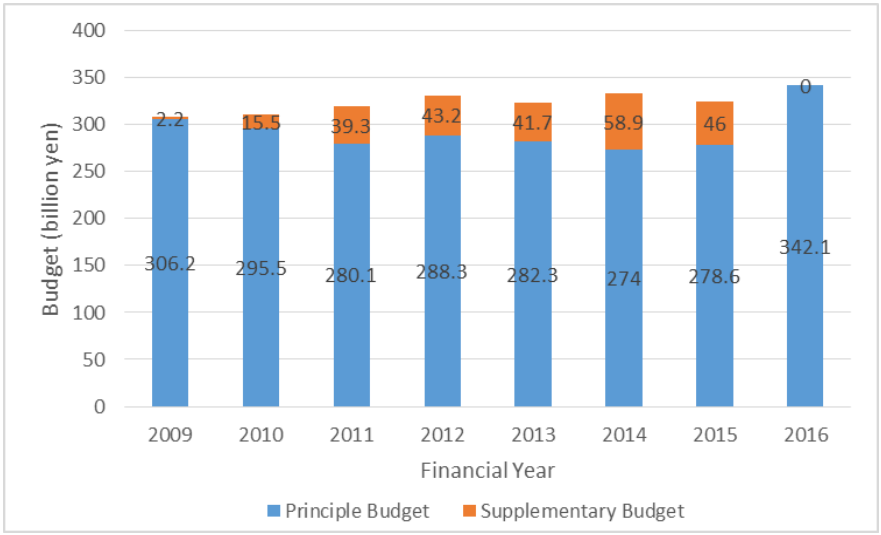
- Literature review → all in Japanese
  - Presentations & reports from the Japanese government
  - Academic papers & industry reports

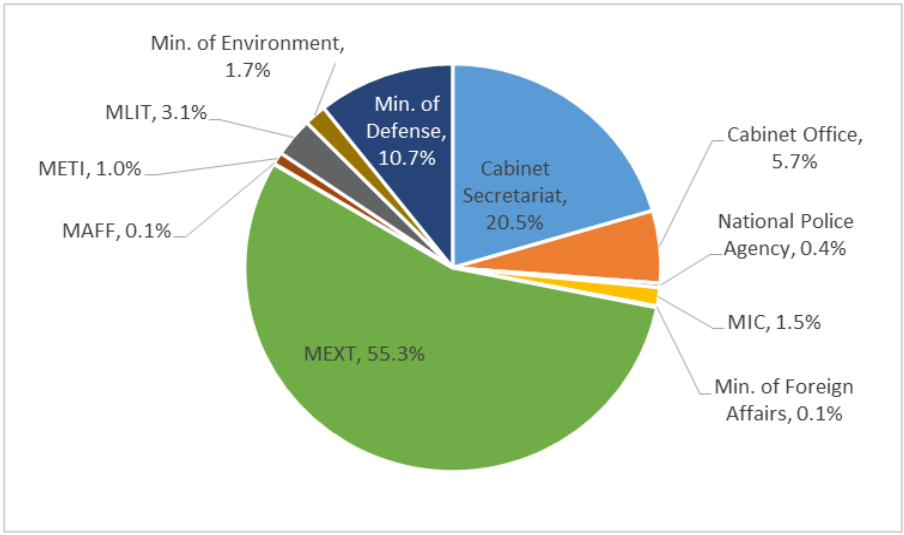
- Interviews → over 40 interviews
  - Japanese EO companies
  - University researchers
  - Ministries & agencies of the Japanese govt.

3. Japanese Space Industry

■Japan's Space Budget

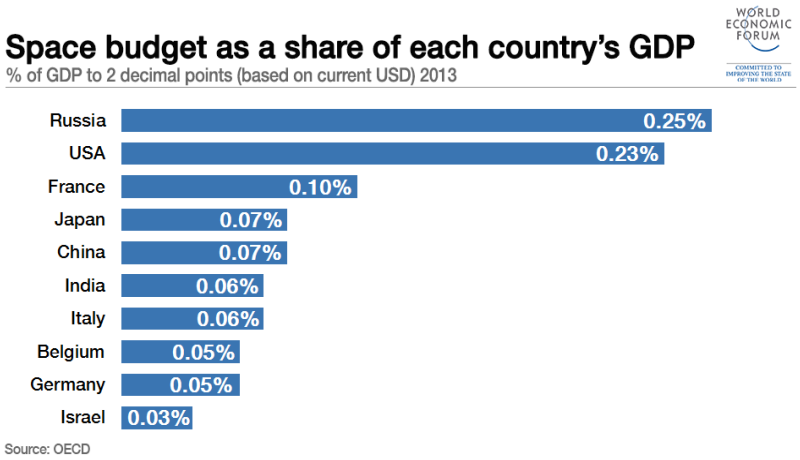
- 2016 budget = 342.1 Bn yen (approx. € 3 Bn)

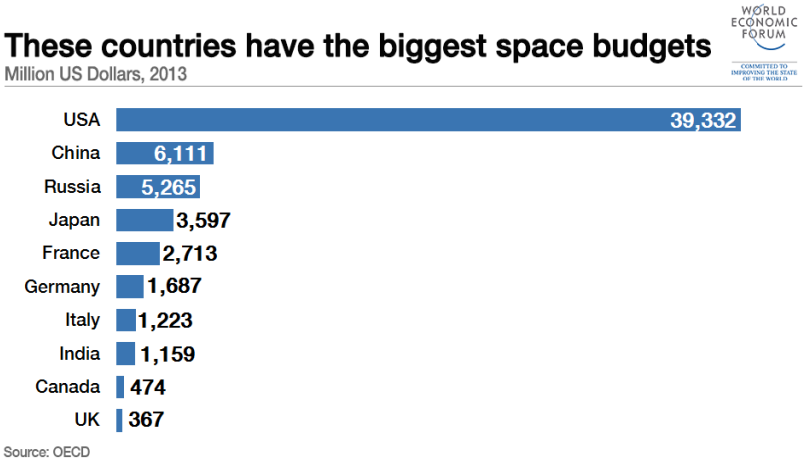




Japanese Space Program

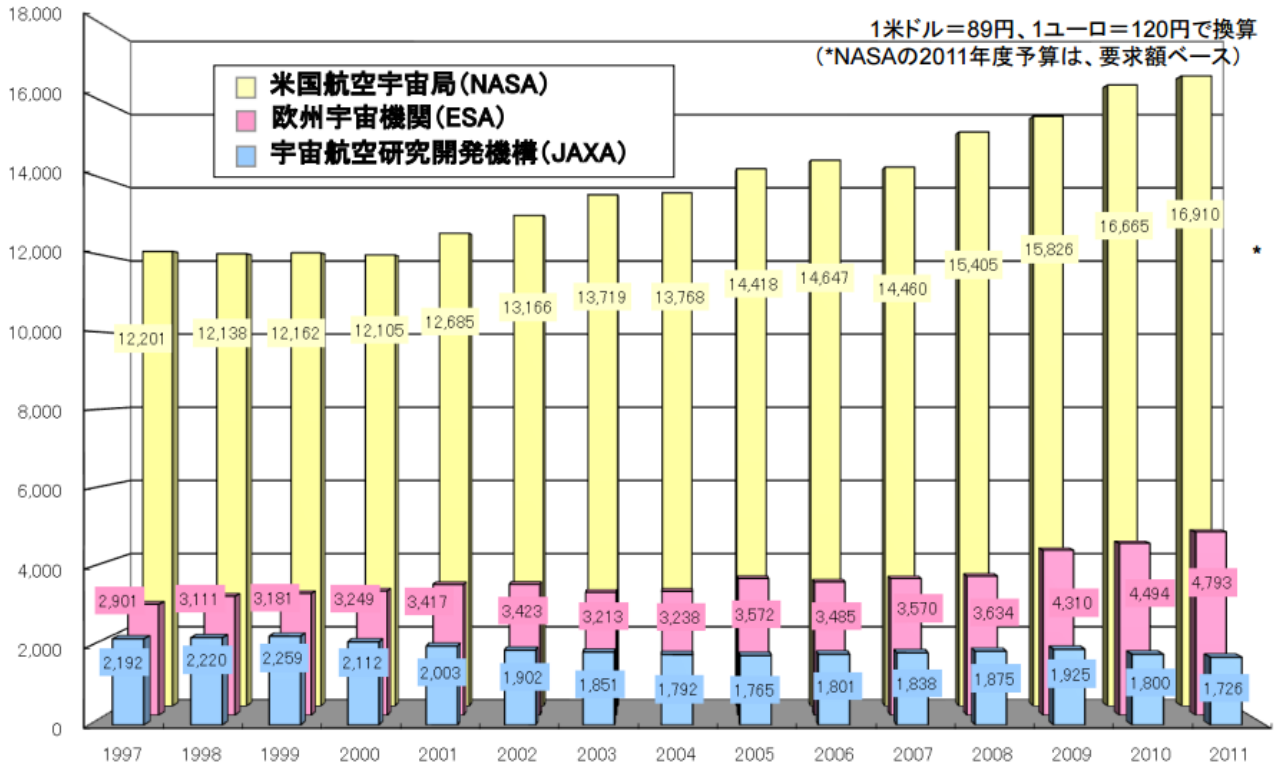
- Top 5 in the world (in 2013)



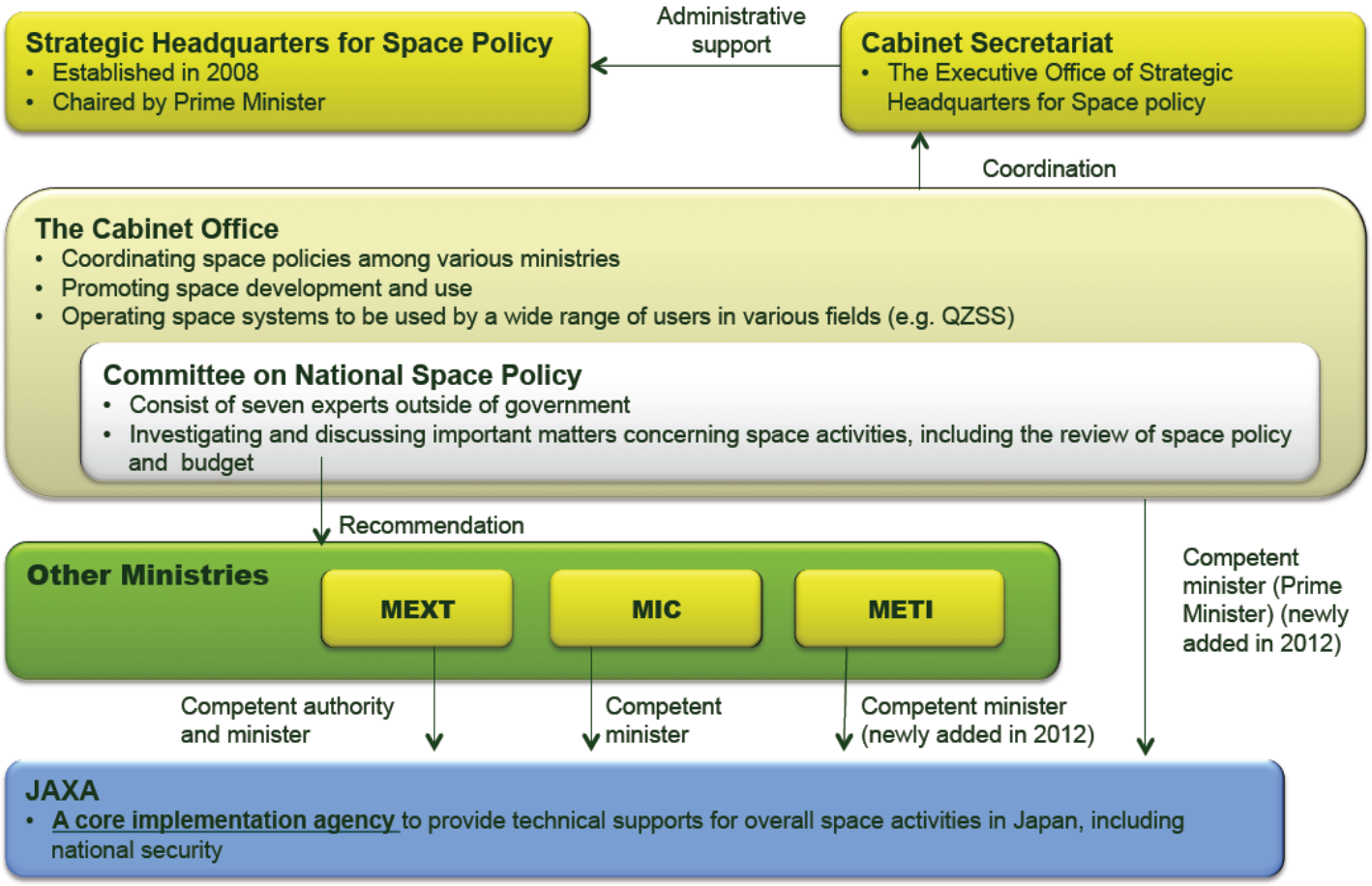


■Japanese Space Exploration Agency (JAXA)

- 2016 budget = 189.4 Bn yen (approx. € 1.2 Bn)
- Approx. 1/10 of NASA, 1/5 of ESA



Japanese Space Program Structure



■Japanese Space Policy

- Basic Plan of Space Policy (2008, 2013 & 2015)
  1) National security & disaster mgt.
  2) Industry development
  → grow the upstream market to a cumulative total of 500 bil yen by 2027
  3) Space science

- Space Activities Act (2016)
  - Approval for launch and management of sat. operation, liability

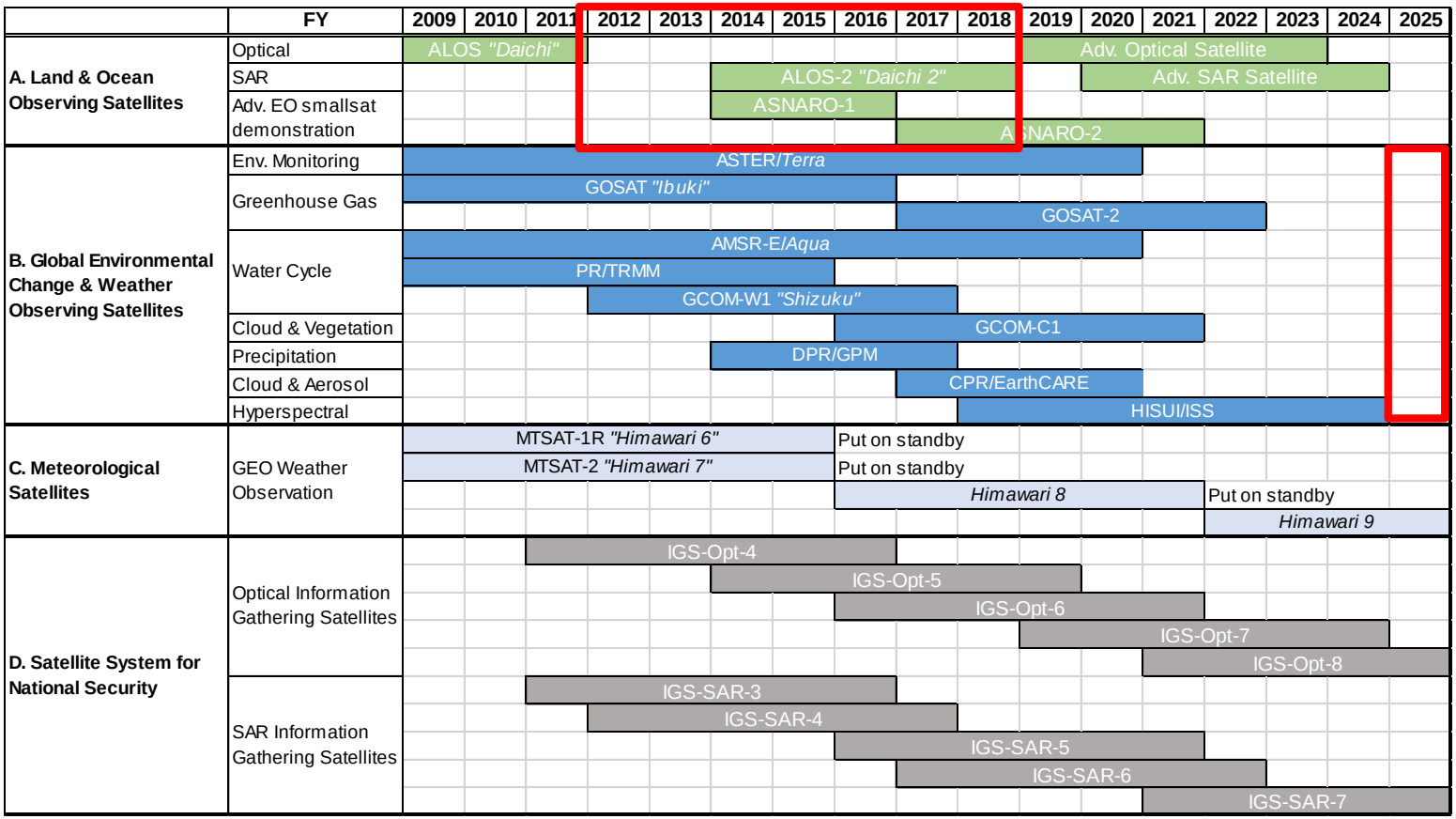
- Remote-Sensing Act (2016)
  - Clear legislative framework for commercial, sub-meter sat. images

■JAXA's Earth-Observation Program

- Global Change Observation Mission (GCOM)

No optical data!

No sat confirmed!



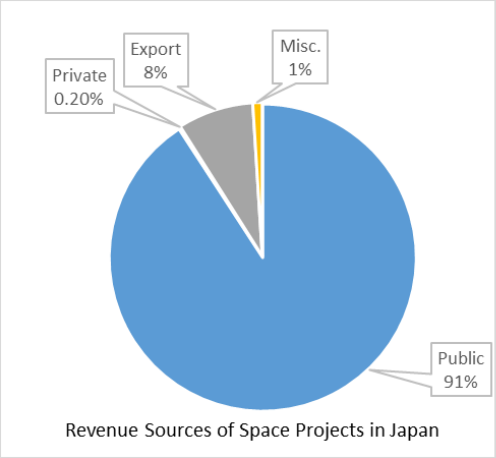
Japanese Space Industry

- US$64.5 Bn in 2013 (approx. €55 Bn)
- Space services = Total US$ 9 Bn
  - EO is < 10%, US$0.8 Bn (approx. €0.7 Bn)

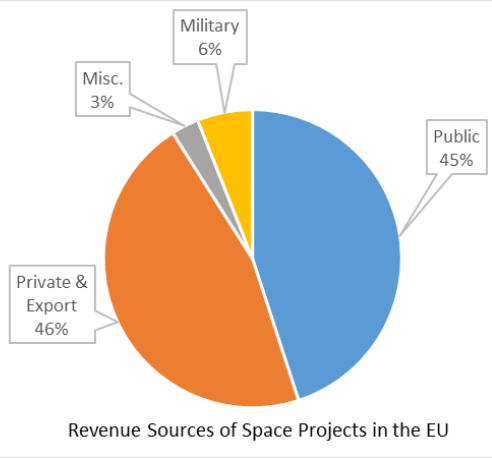
Category	Sales Volume (Bn US$)
Space Industry (Launchers, Satellites, Grd. Facilities)	2.83
Space Services Industry (Communication, Broadcasting, GNSS, EO)	9.0
Space Service Equipment Industry (BS TV, BS Tuner, Car-Navigation, GPS device)	17.1
Space Service User Sector (Utilisation of space services)	35.5
Total	**64.5**

■Japanese EO Industry – Challenges

- Government remains the primary user (>80%)



Revenue Sources of Space Projects in Japan



Revenue Sources of Space Projects in the EU

- Satellite applications not well endorsed/recognised
- Needs of the private sector not well-understood

■Japanese EO Industry – Strengths

- Strong expertise in L-band SAR (complement C & X-bands?)
- Strong expertise in disaster management & agriculture
- Experience in most areas of remote-sensing
- Posession of GOSAT – world's first satellite dedicated to monitoring greenhouse gas

Japanese EO Data Policy

- Free, open policy for all the data
  EXCEPT medium & high-res data of ALOS and ALOS-2

  GOSAT data is free only for educational purposes

Name	Data Provision
Current Missions	
AMSR-E on-board NASA's Aqua satellite	Free
ASTER on-board NASA's Terra satellite	Free
GOSAT "Ibuki"	Not Free
GCOM-W1 "Shizuku"	Free
DPR on-board NASA's GPM satellite	Free
ALOS-2 "Daichi-2"	Not Free
ASNARO-1	Not Free
Past Missions	
MOS-1	Free
JERS-1	Free
ADEOS	Free
PR on-board NASA's TRMM satellite	Free
ADEOS-II	Free
ALOS	Not Free

4. Industry Needs Analysis

■Industry Needs Analysis

- Interviewed potential user industries
  → needs & concerns with respect to EO data

- 41 companies and research institutes involved with...
  - Agriculture
  - Forestry
  - Fishery
  - Sea Ice Monitoring
  - Urban Infrastructure Mgt.
  - Disaster Mgt.
  - Maritime Mgt.
  - Renewable Energy

■Agriculture Industry

- Highly fragmented farm lands
  → can't apply economy of scale → inefficient → high cost

Country	Average Area per Farmer (ha)	Ratio with Japan
Japan	2.3	1
UK	78.6	35
France	52.3	23
USA	169.6	75
Australia	2970.4	1309

- Aging and declining workers population
- Main clients → Farmers cooperatives (JA), regional govts.
- Major food companies & supermarket chains entering farming business

■Agriculture Industry

Key requirements & needs → Do more with less resource!

Requirement ID	Description
REQ-AGR-01	Low cost, open, optical images
REQ-AGR-02	Spatial resolution of 5 – 10 m
REQ-AGR-03	Timely, reliable image acquisition (< 1 wk)
REQ-AGR-04	Overcome cloud cover (eg. time series algorithm)
REQ-AGR-05	Less IT intensive, more visual, intuitive interface
REQ-AGR-06	Not just tech. analysis, but offer **consultancy**
REQ-AGR-07	Combine with automated tractor operation → monitor with EO + guide with GNSS

■Forestry Industry

- Forests in Japan – 67.4% of the total land (18th in the world)
- Highly fragmented forest ownership
- Harsh terrain → high operational cost, low profitability
- 910,000 forest owners with area > 1 ha, 140,000 take part in regular commercial activity
- Aging and declining workers population
- No maintenance, unclear ownership & zones → underutilised
  → 4900 mil m3 in stock, only 19 mil m3 sold
- Main clients → Forest owners cooperatives, regional govts.

■Forestry Industry

Key requirements & needs → Do more with less resource!

Requirement ID	Description
REQ-FOR-01	Low cost, open, optical images
REQ-FOR-02	Spatial resolution of 1 – 5 m
REQ-FOR-03	Image acquisition of 1 or 2 times a year
REQ-FOR-04	Overcome cloud cover (eg. time series algorithm)
REQ-FOR-05	Differentiate & characterise indiv. trees - height, trunk thickness and amt. of biomass
REQ-FOR-06	Better algorithm to identify broad-leave trees
REQ-FOR-07	Predict outbreak of pests & diseases

■Fishing Industry

- Japan – 2nd largest consumer of fish & tonnage caught in the world (1st China)

- Biggest problem → Total Allowable Catch (TAC)
  → overfishing → not enough fish!

- Offshore fishing declined – 94% of operators are coastal fishing

- For offshore fishing – Fuel cost is a major cost

→ strong demand for fishing ground prediction → cut fuel cost

■Fishing Industry

Key requirements & needs → Support fishing grd. prediction

Requirement ID	Description
REQ-FIS-01	Near real time data update of 2-3 hrs
REQ-FIS-02	Spatial resolution of 100 – 300m for coastal, 1-2 km for offshore fishing
REQ-FIS-03	Fishing grd. prediction for coastal fishing
REQ-FIS-04	At least 1 in 3 chance of correctly predicting the fishing ground
REQ-FIS-05	**Big data analytics** to estimate water temperature in 3D
REQ-FIS-06	Red tide prediction and management for aquafarming
REQ-FIS-07	Estimate of the amt. of fish available for sustainable fishing practice

■Urban Infrastructure Mgt.

- Japan → highly prone to various natural disasters
- Over 50% of most infrastructures will be > 50 yrs old by 2033

Infrastructure Type	Approx. Qty.	2013	2023	2033
Road bridge	400,000	18 %	43 %	67 %
Tunnel	10,000	20 %	34 %	50 %
Waterway Structures (eg. dams, gates)	10,000	25 %	43 %	64 %
Sewage Pipeline	450,000	2 %	9 %	24 %
Coastal Structures (eg. wharfs, quays)	5,000	8 %	32 %	58 %

- Currently, based on sensor network & visual inspection
  → expensive, not enough staff
- Promising solution → SAR interferometry

■Urban Infrastructure Mgt.

Key requirements & needs → Better promotion of InSAR

Requirement ID	Description
REQ-URB-01	Ability to detect ground subsidence in mm accuracy
REQ-URB-02	Temporal resolution of once a month to once a year
REQ-URB-03	Target area of 10-100 km^2 with 1-10 m spatial resolution
REQ-URB-04	Monitoring of rivers and aqueducts in urban and rural areas for flood prediction and management (once a month, 1 m resolution)
REQ-URB-05	Monitor heat-island effect in cities in 10-20 m resolution
REQ-URB-06	SAR analysis software that is easier to use and understand

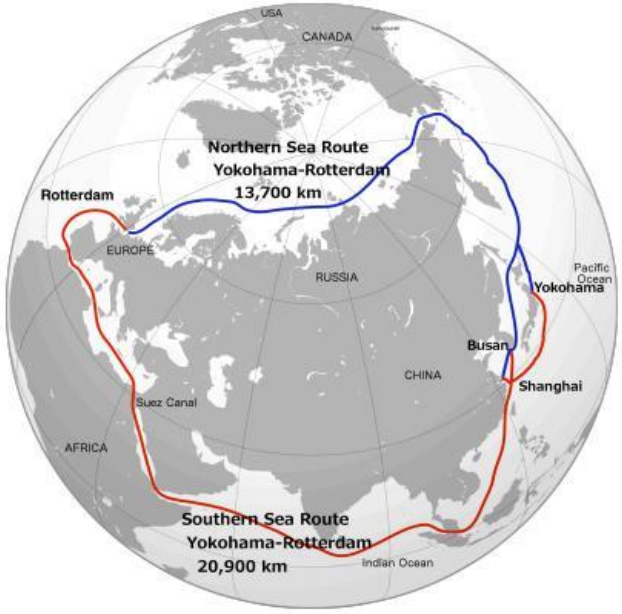
■Sea Ice Monitoring

- Japan → a significant interest in sea ice monitoring

  1. North Eastern coasts of Hokkaido
     - Estimated potential damage = 9.45 Bn yen (2000)

  2. Arctic Ocean shipping routes
     - Shorter route → reduced fuel cost?
     - Economic worth → TBC

- Axel Space & WEATHER NEWS



■Sea Ice Monitoring

Key requirements & needs → Better promotion of InSAR

Requirement ID	Description
REQ-ICE-01	Reliable, accurate, long-term forecast of the sea ice condition
REQ-ICE-02	Need to combine Sat. EO data with in-situ data from buoys, Argo Floats and ocean surveying vessels
REQ-ICE-03	Improved algorithm for estimating ice thickness, type of ice, and snow cover on ice
REQ-ICE-04	Ensure data continuity for microwave radiometer data by securing a successor of AMSR-E and AMSR-2 in future EO missions
REQ-ICE-05	Estimate the speed of moving sea ice
REQ-ICE-06	Investigate possible correlation between sea salinity and sea ice

■Other Industries

- Maritime Mgt. & AIS
  - Huge potential → Japan has the 6th largest marine territory
  - Need systems to combat illegal fishing, & maritime surveillance

- Disaster Mgt.
  - Insurance companies → analysis to assist damage assessment
  - Regional govts. → hazard map and risk assessment during non-emergent times

- Renewable Energy
  - Mega solar power plants → interests in preventative maintenance
  - Optimisation of wind, hydro & solar farm operation
    → still early phase

■Most Promising Industries for Partnerships

- Maritime Mgt. & AIS
  - PASCO has already formed distributorship agreement with ExactEarth (Canada)
- Urban Infrastructure Mgt.
  - Feasibility studies already underway with major infrastructure companies
  - TRE Altamira (Italy) and GMV (Spain)
- Agriculture
  - Large food companies entering the industry
- Forestry
  - Very high demand, need to address operational barriers
- Fishery
  - Coastal fishing

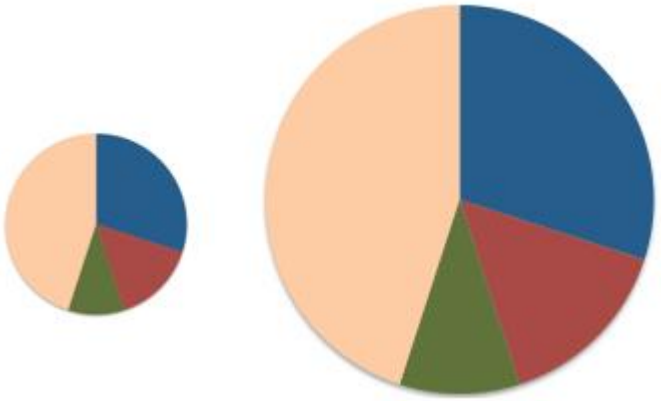
5. Recommendations & Main Challenges

■Recommendations

- For the European Comission

To foster EU-Japan partnership in EO applications...

****Establish a win-win situation that increases the *'pie'!* ****



Recommendations

1. Start a EU-Japan dialogue focused on EO downstream applications

2. Promote the EU's Copernicus Program in Japan

3. Formalise Japan's position on the use of Sentinel-data

4. Look for a common ground on EO data policy

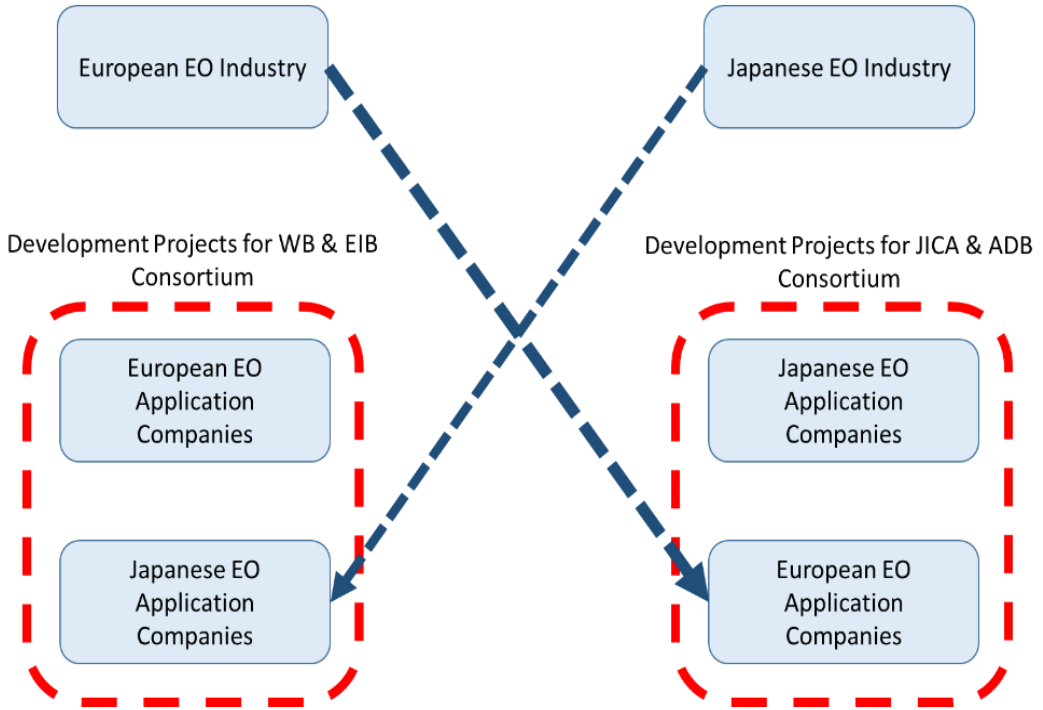
5. Use Horizon 2020 as a *'trial run'* and form joint-research projects for the EO-related calls

6. Agree on a common set of goals and roadmaps for increasing the use of EO downstream applications

7. Form a EU-Japan joint development project through JICA, ADB, WB & EIB

■Recommendations

7. Form a EU-Japan joint development project through JICA, ADB, WB & EIB



■Recommendations

- For the European SMEs in EO applications

To initiate partnerships with Japanese companies...

****Promote European success cases in EO downstream applications****

  - Emphasise the unique needs in the private sector in Europe
  - Use of Sentinel-data

■Recommendations

1. Build up relationship with Japan through information exchange, workshops & seminars

2. Participate on trade shows in Japan

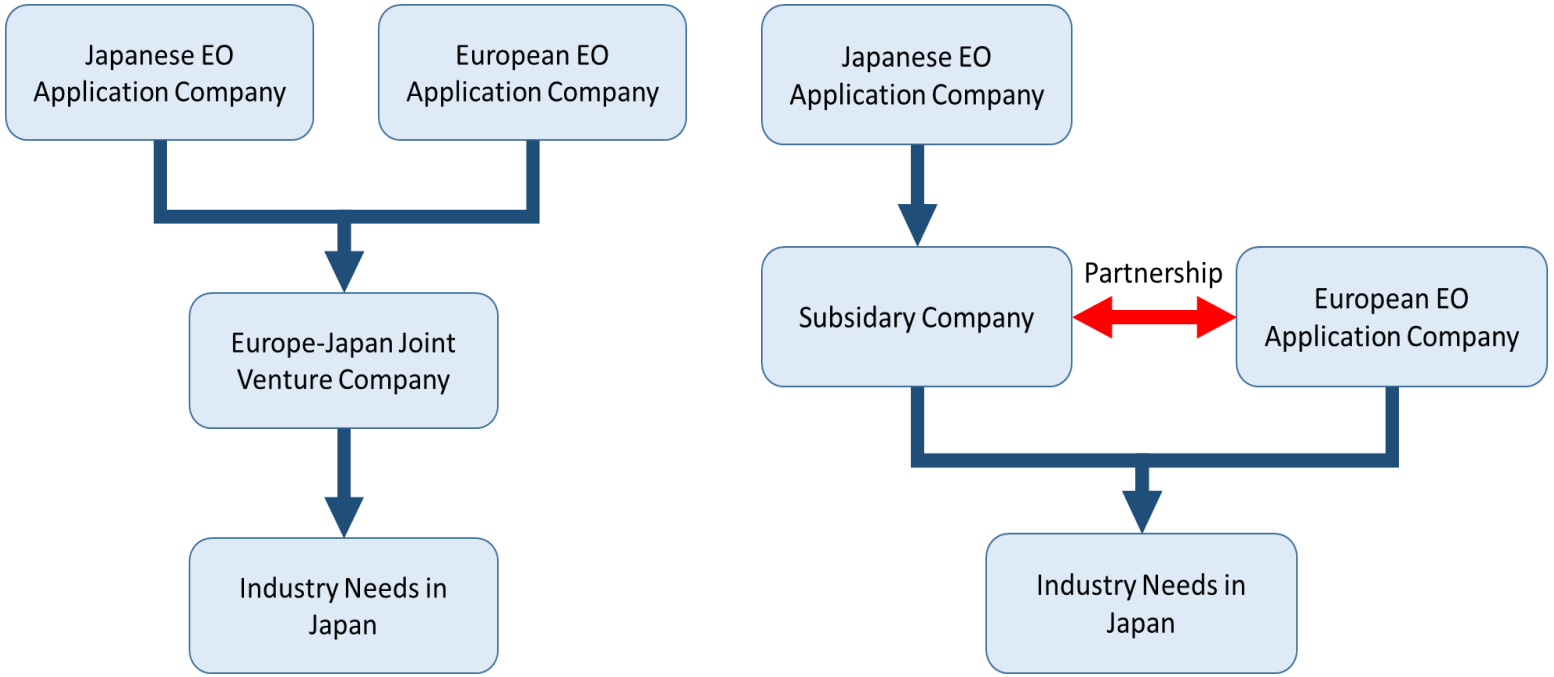
3. Jointly develop EO downstream application using the results of the needs analysis

4. Explore possible cooperation with the Japanese ICT industry and “New Space” companies

5. Approach prefectural and municipal governments on their smart-industry initiatives (eg. smart agriculture, smart forestry)

■Recommendations

3. Jointly develop EO downstream application using the results of the needs analysis



■Conclusion

- Japanese EO industry is changing → pivotal time
  - Open data policy, need of the private sector
- Japanese companies are interested in engaging with Europe
  - H2020, expansions overseas
- Needs in the private sector still not addressed
  - Suitable form of partnerships, strong business case
- Opportunities for European SMEs!

Thank you for your attention!