



An Earth Observation Platform to Support Pacific Island Nations Environmental, Climate and Livelihood Needs - Consultation Workshop

Final Report

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For more information about the workshop visit <https://research.csiro.au/cceo/earth-observation-for-pacific-consultation-workshop/>

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Acronyms

AIS	Automatic Information System	LOI	Letter Of Intent
AOGEO	Asia Oceania Group of Earth Observations	MDA	Maritime Domain Awareness
APEC	Asia-Pacific Economic Cooperation	NOAA	National Oceanic and Atmospheric Administration
ARD	Analysis Ready Data	PACSSAP	Pacific-Australia Climate Change Science and Adaption Planning
BOM	Bureau of Meteorology	PEOP	Pacific EO platform
CEO	(CSIRO)Centre for Earth Observation	PICTs	Pacific Island Countries and Territories
CEOS	Committee on Earth Observation Satellites	PI-RCC	Pacific Islands Regional Climate Center
CoSPPAC	Climate and Oceans Support Program in the Pacific	PIGRSC	Pacific GIS and Remote Sensing Council
CROP	Council of Regional Organisations in the Pacific	PIF	Pacific Island Forum
CSIRO	The Commonwealth Scientific Industrial Research Organisation	POA	Plan of Action
CSST	Centre for Space Science Technology	REF	Radiant Earth Foundation
DFAT	Department of Foreign Affairs and Trade	RESAP	Regional Space Applications Programme for Sustainable Development
DRR	Disaster Risk Reduction	SAR	Synthetic Aperture Radar
EEZ	Exclusive Economic Zone	SCO	Space Climate Observatory
EO	Earth Observation	SDG	Sustainable Development Goals
ESA	European Space Agency	SIBA	The Spatial Industries Business Association
EU	European Union	SIDS	Small Island Developing States
FFA	Forum Fisheries Agency	SLR	Sea Level Rise
GA	Geoscience Australia	SPC	The Pacific Community
GEO	Group on Earth Observation	SPREP	The Secretariat of the Pacific Regional Environment Programme
ICRI	International Coral Reef Initiative	SST	Sea Surface Temperature
IORA	Indian Ocean Rim Association	UAV	Unmanned Aerial Vehicle
IUU	Illegal, unreported and unregulated fishing	UN	United Nations
LDN	Land Degradation Neutrality	VMS	Vessel Monitoring System
LiDAR	Light Detection And Ranging	WGISS	Working Group on Information Systems and Services

Executive Summary

This report summarises the key outcomes from a two-day consultation workshop that brought 75 delegates together to develop a shared understanding of the Earth Observation (EO) needs of Pacific Island countries and territories and to collectively cooperate to meet these needs in the future.

Pacific Island countries and territories require access to Earth Observation capabilities that could inform decision-making related to a range of environmental, climate, security (food and maritime) and disaster management issues. Fortunately, a range of new satellite capabilities (e.g. increased spatial temporal and spectral resolution), processing and analytical tools (e.g. platforms like Data Cubes) and access (free access to EO archives and new telecommunication links to Pacific Islands) will make it possible to deliver EO products and services that are useful to these island communities.

The workshop was held in Brisbane, Australia on the 11th and 12th October 2018 and was hosted by the Commonwealth Scientific Industrial Research Organisation (CSIRO) with support from the Department of Foreign Affairs and Trade (DFAT), Geoscience Australia (GA), and the French and EU Embassies. The workshop brought representatives from 22 Pacific Island states as well as from key Council of Regional Organisations in the Pacific (CROP) agencies together with some of the world's leading providers in satellite EO data and data analysis.

This report provides: (1) a brief overview of the approach taken in the workshop, (2) summaries of key findings that resulted from thematic discussion groups and (3) identifies agreed next steps to be implemented to build upon this initial dialogue and to establish a 'Plan of Action' for establishing a Pacific Earth Observation Platform.

Discussion was informed by brief presentations of needs and technical capabilities, which were framed around six key themes: Land, Marine, Freshwater, Food Security, Operational Surveillance and Disaster Risk Reduction. Climate, and Sustainable Development Goals (SDGs), were considered as 'cross cutting' thematic areas.

The workshop identified capacity as a key issue by the country representatives and data providers. There was also a need to help decision makers understand the full potential, limitations, and application of EO data. The workshop identified the need for regional communities of practice to share expertise as well as existing tools and awareness of available data sets and access to available data exploitation tools.

Recommendations from the workshop included a strategic framework for coordination and a Pacific Earth Observation Data Platform that can be used for regional, national, and sub-national needs. This could provide access to data and derived information products, to build indicators to meet the needs of the Pacific countries. However, there are important infrastructure challenges (internet speed and reliability) that need to be addressed to allow countries to fully benefit from any eventual EO platform. A demonstration project was suggested to showcase what can be undertaken and build collaborations between stakeholders and scientists.

Immediately following this workshop the outcomes and recommendations were presented at the Committee on Earth Observation Satellites (CEOS) Plenary in Brussels (2018), and the 2018 GEO week in Kyoto. GEO has also expressed a willingness to assist, and to also increase Pacific Nations' representation under the Group on Earth Observation (GEO) and the GEO Work Program.

In the medium term, a 'Plan of Action' for the development of a Pacific Earth Observation Platform is to be developed which will engage users in further defining functional requirements for the development and implementation for the platform, and multi-lateral support from governments and non-governmental funding bodies will be sought.

1 Introduction

1.1 About this Report

This report summarises the key outcomes from a two-day consultation workshop that brought 75 delegates together, to develop a shared understanding of the Earth Observation (EO) needs of the Pacific Island Countries and territories (PICTs), and to collectively cooperate to meet these future needs.

The workshop was held in Brisbane, Australia on the 11th and 12th October 2018 and was hosted by Commonwealth Scientific Industrial Research Organisation (CSIRO) with support from the Department of Foreign Affairs and Trade (DFAT), Geoscience Australia (GA), and the French and EU Embassies.

The workshop brought representatives from 22 PICTs as well as key Council of Regional Organisations in the Pacific (CROP) agencies, together with some of the world's leading providers in satellite EO data and data analysis. Appendix 5.5 provides a full list of participants and Appendix 5.2 shows the agenda of the workshop.

This report provides: (1) a brief overview of the approach taken in the workshop, (2) summarises the key findings that resulted from thematic discussion groups and (3) identifies the recommended next steps to be implemented to build upon this initial dialogue to establish a Plan of Action (PoA).

1.2 Background

With a combined ocean area of 37 million square kilometres, 22 PICTs manage 20% of the world's ocean within their Exclusive Economic Zones (EEZ).

In 2017, the Pacific Island Forum endorsed the 'Blue Pacific' identity, to re-capture the potential of the region's shared stewardship of the Pacific Ocean and to reposition themselves as large ocean states, rather than 'small island states'.

The State of Pacific Regionalism report (PIF, 2018) advocates that a shared Pacific Ocean identity, ocean geography, and ocean resources can provide the basis for deepening Pacific regionalism and its contribution towards a sustainable, prosperous and resilient Blue Pacific. The Framework for Pacific Regionalism sets out a high-level political ambition for forum member countries to work together on achieving four principal objectives: sustainable development, economic growth, strengthened systems, and security for all.

[The 2017 Pacific Island Forum](#) (Pacific Islands Forum Secretariat 2017) also acknowledged 'the need to strengthen cooperation and information sharing in Maritime Domain Awareness' (MDA) seeking to integrate policy on climate change, maritime security, fisheries and ocean biodiversity. Pacific Island states face a pressing need to understand more about what's happening in the waters that surround them and to work more closely to deal with threats and crises. There is a need to identify and counter behaviours ranging from the trafficking of people, drugs, small arms and other illicit goods; illegal, unreported and unregulated (IUU) fishing; and other environmental crimes.

At the 2018 Leaders Forum (Pacific Islands Forum Secretariat 2018) the *Boe Regional Security Declaration* endorsed an 'expanded concept of security that is inclusive of human security, humanitarian assistance, prioritising environmental security, and regional cooperation in building resilience to disasters and climate change. The *Boe Declaration* identifies climate change as 'the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific', reaffirms forum members' and commitments to progress the implementation of the Paris Agreement.

Given this background and in this context, reliable access to high quality, timely, authoritative and comprehensive EO data is critical. This data is vital to enhancing how PICTs can collectively address and decide how best to manage surveillance of maritime activities, food security, climate, sustainability of land and water resources and forecasting of conditions and hazards. EO data is also recognised as an important tool and a good source of information¹ to measure progress towards or help achieve the United Nation's Sustainable Development Goals (SDGs), Climate Change programs, and a number of other initiatives (e.g. GEO and CEOS) which seek to provide the necessary data, tools and support. For example, a recent report on SDG implementation in the Asia Pacific notes that in many areas the region is falling behind and at the time of writing, there was only data for 25% of the SDG indicators (UNESCAP 2018).

Fortunately, Earth Observation, combined with modern data processing and big data analytic technologies such as cloud-computing, offers unprecedented opportunities to assist with rapid decision-making and to inform policy development and assessment. Furthermore, some of the new 'remote', cloud-based data archive and processing approaches that are emerging, would significantly reduce the need for very high band-width internet access.

A range of new satellite capabilities (e.g. increased spatial, temporal and spectral resolution), processing and open-source analytical tools and free access to EO archives will make it possible to produce and deliver EO products and services that are useful to Pacific communities.

PICTS also have unique challenges particularly relating to infrastructure and capacity and specific needs in relation to the access and use of EO data and products, all of which are quite variable across this large region.

With this in mind, this workshop was initiated to bring together Pacific Island representatives and EO providers to listen to their needs, and to jointly progress a shared understanding of these EO needs and challenges. From the workshop outcomes, a Plan of Action (PoA) can be jointly developed for a regional-scale platform that in the future can provide this critical data information.

¹ Transforming our world: the 2030 Agenda for Sustainable Development, paragraph 76," We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, including earth observation and geo-spatial information, while ensuring national ownership in supporting and tracking progress.."

1.3 Workshop Aim and Objectives

The workshop aim was to build a shared understanding of the Earth Observation needs for the Pacific Island countries and Territories with the following objectives:

1. Identify EO needs of PICTs for environmental monitoring and reporting on SDGs.
2. Identify areas of common interest and expertise between EO Providers and end-users.
3. Discuss opportunities and develop an action plan for implementation of a common data platform that meets the needs of Pacific countries and territories and links to the common interests of EO providers.
4. Establish an action plan of implementation of the EO Data platform(s).
5. Identify key messages and outcomes to be communicated to high-level fora.

Terms and definitions to note for the workshop

While today the term “platform” is most commonly associated with data access and sharing applications, this workshop embraced other definitions including a “policy framework and principles” and to “raise all people” to the same level. Similarly, the term “Earth Observation” was understood to mean not just satellite derived data, but to include the collection of in-situ data from other platforms, such as drones or underwater autonomous vehicles.

1.4 Workshop Organisation

Participants

Pacific representatives were the key stakeholders at the workshop, and funding was provided to bring delegates from as many island nations as possible as well as regional fora to listen and elicit their EO needs. The Pacific countries and territories that were represented included: Fiji, Solomon Islands, Samoa, Cook Islands, Kiribati, Papua New Guinea, French New Caledonia and French Polynesia.

The following regional agencies were represented: Pacific Islands Forum Fisheries Agency (FFA), Pacific Environment (SPREP), the Pacific Community (SPC) and the Pacific Island Forum (PIF).

Countries, including Australia, European Union, France, Japan, New Zealand, United Kingdom, and the United States of America, who have active EO data programs in the Pacific region.

A range of providers, from large commercial companies, to small regional enterprises, and governmental and inter-governmental organisations were also represented to showcase what is currently possible with EO and future opportunities for the Pacific region. Appendix 5.6 provides a list of participants.

Workshop Agenda

The workshop was designed to be interactive and discussion-focused, whilst providing short talks that gave all participants a level of understanding on the contextual and technical issues that facilitated their participation. A professional facilitator, Deanna Hutchinson from Spatial Industries

Business Association (SIBA) was engaged, as was a company, *Symbios*, experienced in reporting EO meetings to assist in summarising and reporting the discussions.

The agenda (Appendix 5.2) was informed by a pre-workshop survey sent to participants that captured issues including: relevant policy drivers, prioritisation of issues and identification of constraints (Appendix 0).

Six key themes were identified for discussion in the workshop:

- 1) Land: land change/use/degradation, urbanisation, vegetation mapping
- 2) Marine: Sea Level Rise and flooding, coastal and marine habitat and water quality
- 3) Fresh water
- 4) Food security
- 5) Operational surveillance: Vessel tracking, IUU fisheries, other illegal activities
- 6) Disaster risk reduction

The logic of the agenda was to organise the workshop into three sessions over two days to progress, from developing a common understanding of EO needs through to a Plan of Action that could be implemented:

A BUILDING A COMMON UNDERSTANDING

- 1 ***Understanding Pacific EO needs:*** each country and regional agency presented an overview of their EO needs, their current capability, and their desired EO outcomes using a standard template.
- 2 ***Understanding what is possible with EO:*** A technical overview was also given by EO providers and coordinating organisations on their role in civic applications and their current capabilities and applications of EO in the Pacific.

B EXPLORING THEMATIC NEEDS

- 3 ***Thematic applications of EO to the Pacific Islands:*** A Pacific Island representative and a technical expert gave short overview presentations of the needs and challenges related to the following six domains: Land, Marine, Freshwater, Food Security, Operational surveillance, Disaster and risk reduction. This was followed by a table discussion.
- 4 ***From Data to decision-making Products:*** A Pacific State and CROP representative facilitated discussion on the following issues: capacity building, infrastructure needs, informing the SDGs, research and data validation needs, information sharing, and role of citizen science.

C DEVELOPING A PLAN OF ACTION (PoA)

- 5 ***Developing a plan for harnessing EO for Pacific Island Needs:*** Thematic working groups for each of the six thematic domains to identify future objective project collaborations, funding sources for potential partners, country programs and resources that can be leveraged in order to: (a) develop the platform and defined products, and (b) deliver the required training and capacity building.
- 6 ***Group presentations on proposed Plan of Actions and way forward:*** Presentations were made by each group of their thematic PoA. This was followed by panel discussions for

firstly Pacific Island Representatives and subsequently by a panel of EO providers to reflect on the key learnings from the meeting and recommend next steps.

Presentations and other material are available at the following [link](#):



Figure 1. Photos from workshop. Top: Pacific Islander representatives presenting on their user needs; Middle: Freshwater working group discussing thematic needs; Bottom left: Panel discussions on the second day, Bottom Right: Group photo of workshop attendees.

2 Workshop Outcomes

2.1 Questionnaire results

To inform the agenda a pre-workshop survey was sent to 173 candidates and asked 15 questions relating to current and future uses of EO data and constraints and opportunities. The survey was completed by 43 respondents (~25%) and the key results from the survey are shown in appendix 5.4. In short, these results highlight:

- Increased frequency of data was slightly more important than international engagement, improving detail or consistency.
- Thematically, food security (incl. fisheries) and surveillance were ranked of higher interest than marine and land use issues.
- The most important global policy drivers for respondents were the UN SDGs, followed by the Sendai Framework for Disaster and Risk Reduction (DRR), and the Paris Agreement on Climate Change.
- There was interest regarding environmental aspects, a large range of internet and technology capacities, and SDG's as key themes for many respondents.
- A need for ongoing collaborative partnerships for capacity building was identified, which was strongly expressed during many presentations. Many island states have good existing capacity to conduct these analyses, but capability development is still of interest.
- Internet and data access were most commonly reported from portable computers, but a wide range of multiple platforms were also used. Internet access was generally reported as good, but variable between countries and regions.
- Costs for image acquisition were considered too expensive and internet access was often reported as being too costly.
- Engagement with the PICTS needs to be collaborative and sustainable over the longer term, not just for the duration of an individual project. This is often a greater challenge than the funding of projects.

Some of the key comments from the survey included:

"It is often difficult to keep the ongoing momentum of the project after initiation".

"Collaborative partnerships with equal power are essential for the future of our Pacific".

"Funds need to be more appropriately directed to the Pacific Countries".

"To ensure that the research program and project outcomes benefit the Pacific Community and continue to after the initial funds have been exhausted".

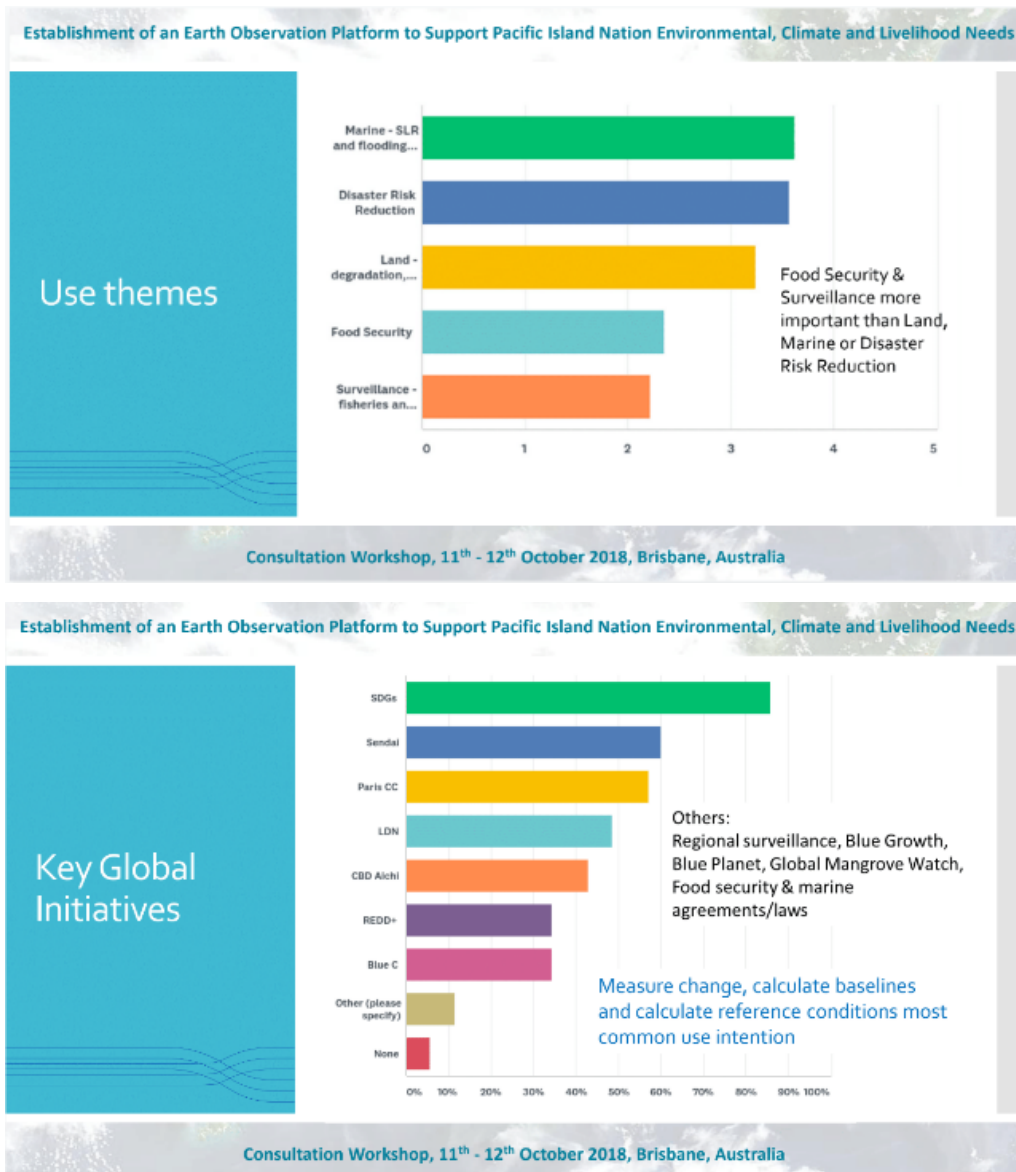


Figure 2. Graphs of key survey results to survey questions. Top; what themes were important to the need for earth observation technologies? Bottom: For which global initiatives will you use, or do you want to use Earth observation technologies?

2.2 Building a Common Understanding

2.2.1 Understanding Pacific Islands Needs

Presentations were made by representatives from nine Pacific Island countries and the three CROP agencies. This was followed by table discussion amongst the participants and mind-mapping of the identified issues (e.g. Figure 3).

Thematic Priorities

- There was a clear recognition by country representatives that the thematic needs in the region could benefit from an improved ability to exploit EO data.
- A number of specific areas were raised including disasters (risk management and response), national security (sovereignty, law enforcement), environmental monitoring (oceans,

terrestrial, biodiversity, planning), food security (drought, freshwater), and planning (infrastructure, land use).

- Observations play an important role in providing a source of independent, variable, trusted information for decision makers.
- A wide variety of observational sources are employed or desired including satellites (imagery and data), UAVs, LiDAR (currently aircraft), and *in situ* observations.
- Climate, and to a lesser extent SDGs, were raised as ‘cross cutting’ thematic areas.

EO Capability

- Across PICTs there is a wide range of in-country capabilities, technical maturity, methodologies, and skills.
- Challenges to realising the full potential of EO data for the region include a lack of:
 - Knowledge amongst decision-makers about the potential capabilities and limitations of EO tools and data to help deliver societal outcomes.
 - Regional communities of practice to share expertise as well as existing tools and data.
 - Data discovery tools, awareness of available data sets and access to available data exploitation tools.
- There is a need to address local engagement (expertise traditional knowledge), and capacity building. There is also a need to help decision-makers understand the full potential, and limitations, of the application of EO data.
- There are important infrastructure challenges (internet speed, cost and reliability) to be addressed to allow countries to fully benefit from any eventual EO Platform.

Platform Development

- There is significant diversity of geography, governance, needs, capacity, and infrastructure across the region which suggest the need for a flexible, scalable platform and associated EO data archives that can be deployed for regional, national, and sub-national areas of interest.
- Key Platform functionalities identified include data collection (streamlining data access), correlation of information (across observations, maps, activity data, local/traditional knowledge), and the production and dissemination of data products.
- One of the key challenges will be to describe and define the social context in which any eventual EO Platform might be developed.

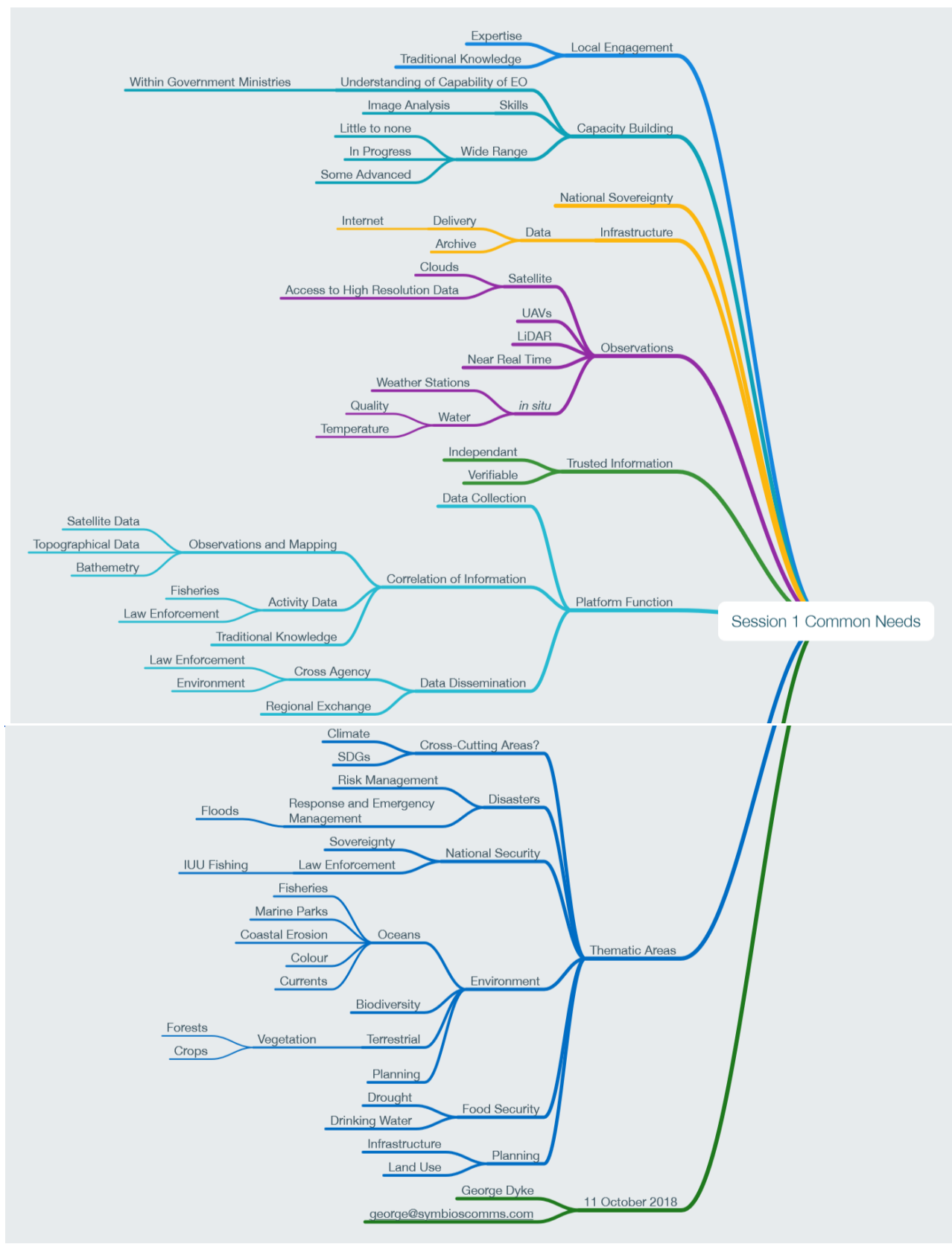


Figure 3. Schematic mind map of the most common perceived needs based on the country presentations.

2.2.2 What is Possible with Earth Observation?

Eleven short presentations were given that summarised the current and future capabilities of EO, the roles of several organisations and the capabilities of individual national agencies that provide EO data and imagery or downstream processing, products and services. The following key points emerged from the presentations and ensuing discussion:

- Rapid technological progress, and recent free and open data policies in many parts of the world have provided better access to a much greater variety, volume, and frequency of EO data streams, which have the potential to open several new domains, where EO data can be applied. However, challenges around data volumes (data distribution), pre-processing (analysis ready), and exploitation platforms (time series, data cubes) need to be addressed.
- EO community coordination bodies such as GEO, CEOS, and initiatives within APEC, can help and support coordination of the deployment of EO-based solutions.
- A number of satellite data providers (governmental and commercial) are seeking to promote uptake and increase the impact of EO data in support of the ambitions of Pacific Island countries. The pre-processing of satellite data by providers to make it 'analysis ready' is key to support uptake.
- There is a strong potential role for data hubs (e.g. Australian Copernicus Hub) to support the development of an EO platform.
- Pilot instances of the Open Data Cube in support of Pacific Island Countries (e.g. Samoa, Common Sensing) and UN SDGs (e.g. SDC15 LDN) have been established, and should provide useful examples, lessons learned, and a potential basis for next steps.
- The *Space Climate Observatory* (SCO) is a France-initiated, international initiative combining satellite and in-situ data with modelling capabilities, to better understand and gauge the impacts of climate change at global and local scales. The SCO hopes to inform decisions about mitigation and coping strategies for present and future climate events (<https://www.spaceclimateobservatory.org/>).

2.3 Thematic Needs and Ideas Going Forward

The following six tables relate to the thematic areas and summarise the key points emerging from the group discussions relating to purpose, need issues and ideas that came out of discussion amongst breakout group participants. No attempt has been made to synthesize these results, but rather to capture the specific comments. A mind map of these issues can be accessed [here](#).

2.3.1 Land

<i>Purpose</i>	<i>Make land use cover and potential information available for Pacific users.</i>
<i>Needs</i>	<ul style="list-style-type: none"> • Availability of finer spatial and spectral resolution data which is matched to the needs of small island monitoring. • Availability and access to data and to identify and fill data gaps.
<i>Issues</i>	<ul style="list-style-type: none"> • Sovereignty of data. • Hard to secure contributions or commitment from key actors.
<i>Ideas</i>	<ul style="list-style-type: none"> • Approach data providers to further develop the acquisition and supply of high-resolution image data over the Pacific region. • Approach the European Space Agency to improve the coverage of Sentinel image data over the Pacific region. • A time series for monitoring change in land cover and land productivity in support of SDG indicator 15.3.1. • Increasing awareness of the value of information to end users through capacity building exercises. • Mapping / counting coconut trees a possible activity. Could use existing models for banana plants, adapted for coconut palms with possible coconut industry engagement. • Possible test case in Fiji, developing a scalable and flexible platform starting small and scaling up.

2.3.2 Marine

<i>Purpose</i>	<i>To empower Pacific Island people and develop more resilience for coastal and marine environments.</i>
<i>Needs</i>	<ul style="list-style-type: none"> • To identify appropriate indicators for monitoring, which will help identify the required data sources (e.g. satellite, <i>in situ</i> and UAV). • To identify what issues can be addressed with earth observation data.
<i>Issues</i>	<ul style="list-style-type: none"> • A current lack of local statistics. • Identify stakeholders and address a range of audiences. • Engagement in common work. • Appropriate technology as it is currently not well-adapted. • Current limitations of satellite imagery for productivity analysis.

<i>Ideas</i>	<ul style="list-style-type: none"> • Simplify the technology, such as ‘off the shelf’ aerial photography for seagrass belt observations. • Demonstrations in each country. • Encourage the scientific community to identify indicators for areas such as reef, mangrove health and algorithms for Pacific relevant products. A simple vegetation index is required. • Bringing the technology closer to the end user, and engaging locals for statistics which are significant to the EO data and decision making.
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2.3.3 Freshwater

<i>Purpose</i>	<i>To leverage EO to improve water security quality and quantity for Pacific countries.</i>
<i>Needs</i>	<ul style="list-style-type: none"> • 50% of residents lack access to safe drinking water, with both quantity and quality being important. The risk to supply is amplified by inundation from rising sea-levels.
<i>Issues</i>	<ul style="list-style-type: none"> • Water quantity and quality are broken down into several products describing water. • Large regional differences for example volcanic islands face issues with water quality, while atolls have water quantity issues and more risk to supply e.g. sea level. • In situ measurements have been undertaken for some time, however a basic gap analysis shows systematic satellite and other measurements are not being performed.
<i>Ideas</i>	<ul style="list-style-type: none"> • Gap analysis - systematic in situ measurements, UAV and satellite. • Develop a coherent and comprehensive in situ measurement program. This could be cloud based and local node based. • Include local knowledge and engage with regional programs. • Develop and create coherent earth observation and in situ capability. Timing could be within the next few years. • Radar coverage data is very important. • Approx. cost \$5M to build and \$1M to operate. A possible GEO 2019 announcement.

2.3.4 Food Security

<i>Purpose</i>	<i>To use and leverage available data for food security.</i>
<i>Needs</i>	<ul style="list-style-type: none"> • How can activities be prioritised, addressing capacity and capability? • The need for data on food crops, and separating food crops from cash crops. • Better use of data. • People to identify and monitor land cover. • The FAO land cover map is not sufficient. Rainfall, temperature, and sea level measurements are required and maps need to be available regularly.

	<ul style="list-style-type: none"> • Atolls: sub 5 m to produce 1:10000 mapping. Vegetation ID requires < 1 m. Detailed crop maps need red-edge and sub-meter resolution. Soil type information and soil maps have not been progressed, and are not possible by earth observation. • The need for identification of baseline changes and changes over time. • Volcanic island context (sub 50m resolution for 1:50000). • Need to suit taro, coconut, sweet potato, Sago and other Pacific Island crops.
<i>Issues</i>	<ul style="list-style-type: none"> • Understand how to better use and access the available data. • Understanding what variables will impact crops e.g. water, temperature and sea level rise. • Crop types and scale is unique to the region, therefore global approaches don't always apply. • Rainfed production is vulnerable to climate change, with atolls and volcanic islands at particular risk.
<i>Ideas</i>	<ul style="list-style-type: none"> • Identify priority activities and the role of artificial intelligence. • Leverage people for the validation of data. • Atolls - sub 5m for 1:1000 mapping, sub 1m for vegetation identification, red edge sub 1m. Soil mapping needs to be updated/redone. • Volcanic - coarser scale sub 50m resolution and 1:50000 mapping. Regular updates required.

2.3.5 Operational Surveillance

<i>Purpose</i>	<i>To better integrate EO science in the marine domain to improve sovereignty and security</i>
<i>Needs</i>	<ul style="list-style-type: none"> • A centralised data repository
<i>Issues</i>	<ul style="list-style-type: none"> • National sovereignty is a key concern, in particular around vessel tracking (IUU fishing). Other concerns include ocean productivity markers such as sea surface temperature (SST) and currents. • Governance issues fit into larger structures and regional organisations. • Data sharing regulations - what can be shared with, who and how? • How to track small vessels? Is different technology required?
<i>Ideas</i>	<ul style="list-style-type: none"> • Products: Ocean productivity monthly tracking, SST, habitat and Argos. • Vessel tracking targeted on demand. For larger vessels: Sentinel 1 every ~ 6 days would be enough to track or validate Vessel Monitoring Systems (VMS)/Automatic Information Systems (AIS). Based on this, more and more targeted queries could be performed. • Small vessels: require fine resolution data (expense and are not feasible for 37m sqm of Pacific Region). • Human intelligence is required for the requests. Current tracking and modelling –a large amount of data generated already, important to ensure VMS and AIS can be integrated and fully utilised. • Regional fusion centre: for coordinating and data sharing.

2.3.6 Disaster Risk Reduction

<i>Purpose</i>	<i>How best to manage disasters in a coordinated way.</i>
<i>Needs</i>	<ul style="list-style-type: none"> • Historical experience context. • Forecasting. • Communications (agencies-citizens and infrastructure). • Preparedness. • Ethical and legal responsibility for providers. • The need for audience relevant information. • Increased communication and workshops.
<i>Issues</i>	<ul style="list-style-type: none"> • Synthetic Aperture Radar (SAR) access to volcanic regions that are under cloud.
<i>Ideas</i>	<ul style="list-style-type: none"> • Identify coverage gaps and priority areas. • Flood, volcano and drought forecasting. • Ensure Adequate SAR coverage e.g. volcanic ash, gaps and priority areas. • Pacific regional agency to support data interoperability, historical data from public and private providers. Cross agency coordination. • Two-way secondments between organisations and EO providers. • Purchase commercial bandwidth from communication satellites for increased internet capacity, or utilise the NOAA Chatty Beetle program (https://www.iepas.ucar.edu/core-programs/chatty-beetle-overview/). • GEO/CEOS training on ethical and legal responsibilities for EO data providers and training on cross-jurisdictional disaster risk management and response. • GEO 2019 to help address cross-jurisdiction/ boundaries. • Enable citizen scientists to contribute in the case of an emergency or disaster. • Establish a satellite tasking agency, to inform programs and rapid tasking protocols. • Identify coverage gaps and priority areas. Flood, volcano and drought forecasting. Ensure adequate SAR coverage e.g. volcanic ash, gaps and priority areas. • Pacific regional agency to support data interoperability, historical data from public and private providers. Cross agency coordination.

2.4 Take-home Messages from Workshop

The following section summarises the key learnings articulated in the panel sessions with the two primary stakeholder groups; representatives of the Pacific Island and the EO communities.

2.4.1 Key learning from Pacific Island panel members:

Technical

1. Not all islands can afford to engage full time with an EO expert, therefore developing a regional cadre of experts should be considered.

2. Identifying the links to the Sustainable Development Goals is an important way to build upon existing frameworks.
3. It is crucial that the data needs are identified and not only the technical problems.
4. How to apply the science, not just at the government level, but also at the community level.
5. The internet is still a limiting factor, but should not prevent working in EO, and is being addressed in the medium term.

Communication, education and collaboration

1. There are strong centers of excellence, but improvements are required to build government capacity to ask questions, understand technology, and identify possibilities.
2. Maintain EO careers in the region.
3. A strategic framework for coordination represents a good opportunity, and continued discussions and linkages are important.
4. A lack of knowledge on where the data is, and how to use it.
5. Including a network and communications channel will be important going forward. Access to knowledge about web available data with limited resources.
6. Developing a demonstration project to persuade leaders and to increase regional understanding and sharing is important.

2.4.2 Key learning from data provider panel members:

Technical

1. Lack of capacity is clearly an issue.
2. Meet user needs and engage in a constructive way to fit with their needs.
3. Effective and uniform data access is required.
4. A regional platform can provide access to data and build the right indicators to meet specific needs.

Communication and collaboration

5. There isn't a major technological problem, but an underlying communication issue. CROP agencies are largely unnoticed by Australia.
6. A demonstration project should be commenced to show what can be undertaken and build collaborations between stakeholders and scientists.
7. Opportunity to engage with other international initiatives following the Paris Agreement.

Geographical

8. Pacific Islanders needs are different to the rest of South East Asia.

3 Plan of Action for developing a Pacific Earth Observation Platform

3.1 Introduction

This workshop started a conversation between PICTs and EO providers on how we can collectively harness the capabilities of EO information to provide relevant and timely information that assists policymakers, practitioners and scientists in the Pacific.

All national representatives and CROP Agencies expressed a dependency upon, and growing need for access to EO data, for performing their core business. The workshop endorsed the utility of EO and noted that continued developments in satellite coverage and capability were providing greater access to imagery and data (often at substantially lower, or at no cost). It was noted that for some applications the spatial resolution of publicly accessible imagery was too coarse, and while commercial imagery has the necessary resolution, the cost of acquisition is prohibitive. The participation of a number of commercial providers at the workshop provided opportunities to discuss cost-effective and regional arrangements. Analysis and storage of EO data is complex and expensive; hence cost effectiveness and consistency is key. There was limited awareness of some of the newer satellite capabilities or missions (e.g. SAR) or technologies and initiatives such that will enable more efficient processing and access to analysis ready data (ARD).

The workshop developed a richer understanding of the needs and products for each of the six thematic areas, identified priorities and suggested actions to address the challenges identified in the workshop (see section 2). The point was clearly made that the Pacific region has an individual identity and set of requirements which is not fulfilled by current global products alone, or being amalgamated with other regions (e.g. Asia).

At the policy level, the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction and the Paris Agreement collectively constitute a new integrated global development agenda, which will play a crucial role in shaping the world well beyond 2030. In addition to these 3 global frameworks, the Pacific Regionalism and the *Boe* declaration will continue to shape the regional context with a more encompassing definition of regional security, principles and framework for cooperation and self-determination.

Important infrastructure challenges (internet speed and reliability) will need to be addressed to allow countries to fully benefit from EO. While there will be a significant improvement in telecommunications infrastructure over the next few years, sharing data across more remote geographies, will be an issue. While there is a wide range of mapping, GIS tools and products, there is a lack of standardization, and as a result, there are significant issues of interoperability.

The need for enduring (c.f. one-off) capacity development was highlighted by a number of participants. While there is a great desire amongst the global community and in particular, countries with a strategic interest in the region, to assist in the provision of EO data, infrastructure and capacity, it should also be recognized that there is good capability across the Pacific, particularly within **CROP agencies**, while forums such as the *Pacific GIS and Remote Sensing Council* (PIGRSC, <http://www.picgirs.org>) and the annual user conference they host, supports a pan-Pacific network.

3.2 An EO Platform for the Pacific

Participants endorsed the need to develop a *Pacific EO platform* (PEOP) that would enable multilateral access to EO information and that could inform a multiplicity of needs, such as those articulated in the 6 themes addressed in the workshop.

However, developing a PEOP must go beyond just addressing the technological challenges of making EO data available, but provide a level playing field that enables spatial literacy as well as access to data, imagery and information for all, and in forms that support relevant national, regional and global policy priorities. The PEOP must make it easy to collaborate across borders, languages and cultures.

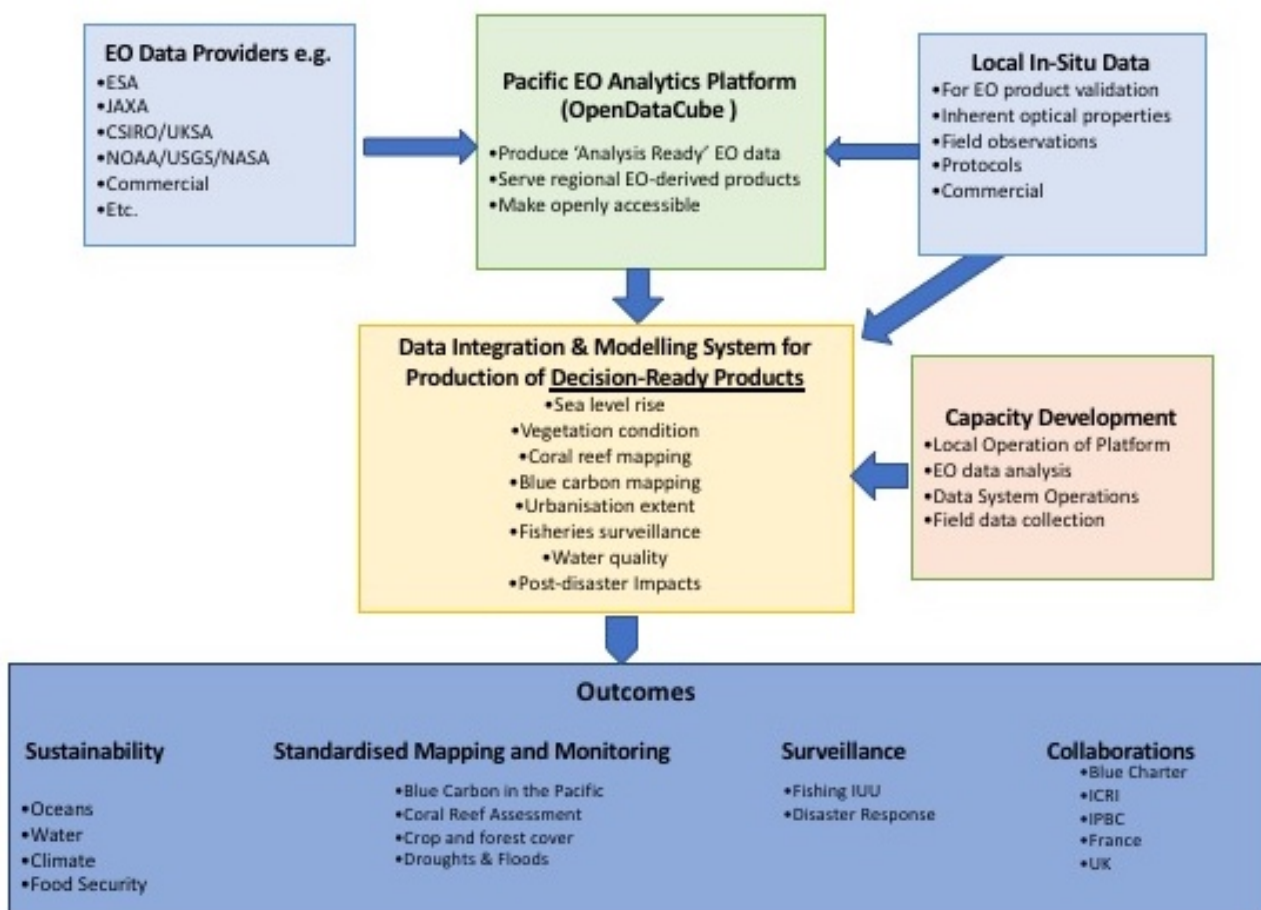


Figure 4. Showing a schematic diagram of the EO Platform for the Pacific.

Given the significant ocean expanse of, and central importance to the Pacific peoples, the EO platform should also include a digital representation (i.e. a model) of the Pacific Ocean and PICT coastal environments to provide services that inform MDA (e.g. vessel and illicit activities, environmental conditions (e.g. bleaching, marine litter) disaster response (oil spills) weather and climate forecasting and projections shipping and port activities and defence. These information services would include be provided by the development of nested hydrodynamic and biogeochemical modelling, that would provide current and short-term forecasts of ocean and coastal conditions.

3.3 Short term Actions and Outcomes from Workshop

Outcomes from this workshop were communicated to several international fora to raise awareness and to seek technical solutions to some of the issues raised.

Committee on Earth Observation Satellites (CEOS):

The results of this workshop were reported to the CEOS Plenary held in Brussels in October 2018 and helped to identify opportunities for engagement which included:

- Discussions with the European Space Agency (ESA), to leverage increased Copernicus coverage for the South-East Pacific Region. This has subsequently resulted in a planned new acquisition campaign by ESA for Sentinel 2 (optical) and Sentinel-1 (radar) for 2019 and 2020 (Figure 5).
- Engagement with CEOS data discovery (e.g. Working Group on Information Systems and Services (WGISS)) and data exploitation platforms (e.g. CEOS Data Cube).
- Discussions with the *ad hoc* team on Sustainable Development Goals and other CEOS entities to further explore activities (capacity building, Open Data Cube) in the region.



Figure 5. Proposed future, comprehensive EO data acquisition campaign by the Copernicus Sentinel-2 mission over Oceania. Sentinel-1 (radar) acquisition will cover a smaller marine area around each Pacific Island.

Group of Earth Observations (GEO):

Outcomes of the workshop were communicated both at the Asia Pacific GEO (AOGEO) Conference and the GEO Plenary meeting, which were held back-to-back in Kyoto, Japan in late October 2018. While PICTS were unfortunately under-represented at these meetings there was uniform acknowledgement that the challenges faced by the Pacific Islands are existential and there is a great desire to assist in the provision of EO data and products. To that end:

- Discussion is progressing with relevant Japanese and Korean agencies to make relevant Pacific data available. To date Korea has agreed to make its KOMPSAT data available.
- Under AOGEO a proposal has been developed to create the *AOGEO Asia-Oceania Data Hub* which would provide, through cloud computing, a regional data syncing infrastructure that

would deliver ARD to users (See Table 2 for more information). While this is broader in scope than just the Pacific, the underpinning data, acquisition, storage and pre-processing to agreed ARD levels is similar in concept to requirements for a Pacific platform.

- To raise the level of EO literacy AOGEO hosted a workshop in Indonesia in April 2019 that to provide training in coastal applications including the use of data cubes and bio-optics.
- Under Horizon 2020, the DT-SPACE-06-EO-2019 funding call is available for International Cooperation with Copernicus to design EO downstream applications with international partners (<https://ec.europa.eu/programmes/horizon2020/>). There is significant interest from European technology providers to partner in developing capability and products for the Pacific.

2019 The GEO Ministerial Summit

This Ministerial Summit will be held in Canberra, 4-9 November 2019 (<https://www.earthobservations.org/geoweek19>) and will be accompanied by a number of plenary, side and exhibition events. There is a strong focus on engaging with the south Pacific and it is the intention of the organisers to invite a significant number of head of states, or their delegates. This event will provide the opportunity for discussing, and potentially endorsing and announcing the development of a Pacific EO platform.

3.4 Development of Plan of Action (PoA)

The intent is to develop a fully detailed PoA that will be followed by an approach to governmental, regional, and non-governmental funding bodies for support. The following principles would underpin such a PoA and the following steps are envisaged.

3.4.1 Context

This workshop endorsed the need to continue dialogue to develop and implement a Plan of Action (PoA) for developing a Pacific Earth Observation Platform that can be deployed for regional, national, and sub-national areas to provide access to data and build indicators to meet the needs of the island states.

The user interface will not only need to allow users with different technical competencies to discover the data and download it if needed, but to directly 'execute' data analysis routines on the data, without users having to download it to their local processing machines if not needed. The portal should enable users to access both 'free' international EO data, but also allow for 'ordering' of commercial data if needed for specific uses.

In discussing the development of the PoA, a number of other relevant initiatives (Table 1) – some of which were also proposing various integrated data platforms – and existing portals (Table 2) were identified and where opportunities for synergy should be explored.

Table 1. Summary of known initiatives to establish information platforms for the Pacific Region.

<p>Pacific Islands Regional Climate Center (PI-RCC) https://www.pacificclimatechange.net/</p> <p>The Pacific Climate Change Center is currently at the main office of the Secretariat of the Pacific Regional Environment Programme (SPREP) in Samoa. The PCCC functions as a base for human resource training in the field of climate change in Oceania to improve the resiliency of the region to environmental and climate change. The project makes it possible for about 1,400 government officials and development project staff members from countries in Oceania to participate in training each year, and it is hoped that these human resources will contribute to measures to fight climate change in Oceania.</p>
<p>Space Climate Observatory https://www.spaceclimateobservatory.org/</p> <p>The SCO programme will play a key role in monitoring the implementation of Sustainable Development Goals The observatory is currently gearing up to be operational as quickly as possible. CNES is tasked with implementing it and has proposed to the other space agencies that an international team be set up to define the observatory’s architecture and refine its medium-term and long-term objectives. The aim is to sign an SCO charter, along the same lines as the International Charter on Space and Major Disasters, to mark the first anniversary of the One Planet Summit in December 2018, thus materializing an important commitment from governments.</p>
<p>CEOS Open Data Cube https://www.opendatacube.org/ https://www.opendatacube.org/ceos</p> <p>The Open Data Cube (ODC) initiative which seeks to provide a data architecture solution that has value to its global users and increases the impact of EO satellite data. The objective of the ODC is to increase the impact of satellite data by providing an open and freely accessible exploitation tool, and to foster a community to develop, sustain, and grow the breadth and depth of applications that can:</p> <ul style="list-style-type: none"> • Minimize time and specialised knowledge required to access and prepare satellite data • Free and open EO satellite data and application algorithms • Open source software solutions that are advanced through community contributions • Consistent data architectures that allow sharing of code, tools and algorithms • Efficient time series analyses to support land change applications • Use of multiple datasets together (e.g., interoperability and complementarity) • Use of common GIS tools (e.g. QGIS, ArcGIS) • Local and regional solutions that avoid commercial and internet dependence • Sustained customer service and user support
<p>Pacific Fusion Platform</p> <p>Australia has committed to establishing a Pacific Fusion Centre for maritime domain awareness to bring together information from government agencies across the region, dealing with illegal fishing, people trafficking, drugs smuggling and maritime safety. Gaining an understanding of the position and intention of actors in the maritime environment, is an essential foundation of maritime security and advances in sensor and computing technology now make it possible to create a shared real-time picture of developments in the maritime domain. It brings together all information available to military and civil agencies with maritime responsibilities, as well as commercially available information.</p>
<p>AOGEO Data Hub</p> <p>This proposal seeks to create the AOGEO Asia-Oceania Data Hub - a hub for Analysis Ready Data for Asia - Oceania delivered through cloud computing infrastructure. This initiative will be established in the first half of 2019 with the goal of announcing full operational capability at the GEO Ministerial Summit in Canberra, Australia during November 2019.</p>
<p>Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018-2030)</p> <p>https://www.unescap.org/our-work/ict-disaster-risk-reduction/space-technologies-and-gis-applications-sustainable-development/about</p> <p>ESCAP’s Regional Space Applications Programme for Sustainable Development (RESAP) has recently released a 12-year plan for the region. The Plan includes interventions at the international, regional and national levels, focusing on the six priority areas identified in the Regional Road Map: (1) social development; (2) disaster risk reduction and</p>

resilience; (3) climate change; (4) management of natural resources; (5) connectivity; and (6) energy. The POA will identify means and modes of implementation, plans, reporting structures and relevant stakeholders, and formalise obligations of member States, United Nations agencies and donors in the implementation of the Asia-Pacific Plan of Action on Space Applications (2018 – 2030). It plans to build on existing work, such as the Regional Drought Mechanism to develop and coordinate new operational platforms that utilise geospatial information. For geospatial information to be used more widely across thematic regional priority areas, core baseline datasets must be made available and supplemented with additional data and information relevant to each thematic area and sector to generate meaningful and value-added geospatial information.

Radiant Earth

<https://www.radiant.earth>

Radiant Earth Foundation (REF) aims to simplify the overall process of using satellite imagery. Globally accessible to anyone, the REF technology platform helps people discover the resources of Earth imagery, data sets, tools, and knowledge, accelerating improved decision-making and fuelling new solutions, discoveries and innovations. REF is aggregating the world's open Earth imagery and providing access and education on its use to the global development community. At the center of REF is an open technology platform that will help people discover and analyse the vast resources of Earth imagery, accelerating improved decision-making and fuelling new solutions, discoveries, and innovations. In support of this user-driven platform, REF offers an integrated and robust community development program to guide people in the use of imagery, geospatial data sets and tools. A focus on capacity building and through leadership led to the REF creation of a Global Development Machine Learning Working Group (MLHub Earth) and the Global Development Imagery Consortium. REF currently focuses on use of satellite imagery for crucial development issues such as agriculture and food security, climate change, forestry, mining, journalism, conservation, and global health.

Common Sensing

<https://www.unitar.org/commonsensing-building-climate-resilience-small-island-developing-states>

The Common Sensing Project aims to improve climate and disaster risk resilience for Small Island Developing States of Fiji, the Solomon Islands and Vanuatu. The International consortium, funded by Space Agency's International Partnership Programme, working in close partnership with stakeholders in each SIDS, brings together experts from a range of fields with the aim to develop a cutting-edge satellite data system to help islands reduce the impact of natural disasters and increase future food security. The Common Sensing platform will incorporate Open Data Cube technology, with provision of Analysis Ready Data for various Earth Observation missions. Data-based evidence will also support policy-making and aid access to investment for major climate change initiatives.

The IPP grant is supplemented by contributions from the project partners and matched with in-kind contributions from the three nations.

The project is led by the United Nations Institute for Training and Research through its Operational Satellite Applications programme (UNOSAT) in partnership with the Satellite Applications Catapult, the Commonwealth Institute, Radiant Earth Foundation, Devex International, Sensonomic and the University of Portsmouth. CommonSensing's programme of activities over the next three years will see teams of experts in geospatial intelligence, food security, climate information and climate finance working in partnership with senior officials and wider community groups across the three islands. It will focus on the design and development of bespoke data tools that address the key challenges faced by each country:

- **Disaster risk reduction for natural hazards.** Satellite imagery and elevation models will be used to develop tools to highlight at-risk areas for climate driven hazards and support disaster risk reduction planning.
- **Food security.** Computer simulations on satellite data and other data collected by the islands will be used to build a detailed picture on the robustness and economics of each nation's food production systems.
- **Accessing climate finance.** The data tools will help strengthen applications to climate finance funds that are available to help countries implement major infrastructure programmes and will be coupled with a comprehensive capacity building programme.

Table 2. Summary of portals and information centres for the Pacific

Portal Name	Web Address	Issues addressed
Regional Portals		
Pacific Climate Change Portal	https://www.pacificclimatechange.net	Climate
Pacific Environment Portal	https://pacific-data.sprep.org	Environment Information
Pacific Ocean Portal	http://oceanportal.spc.int/portal/ocean.html	Marine information also includes CoSPPAC
Pacific Island Marine Portal	http://www.pimrisportal.org	Marine information
Pacific Island Oceans Observing System	https://www.pacioos.hawaii.edu	Marine information
Pacific Island Forum Fisheries Agency	https://www.ffa.int/	Fisheries surveillance
PacGeo	http://www.pacgeo.org	geospatial data repository providing geophysical, geodetic, and marine spatial data sets
Country level Portals		
Fiji GeoPortal	http://www.fijigeoportal.gov.fj	Disaster Risk Reduction and Sustainable Development
Micronesia GeoPortal	http://fsm.iclim.net/link/fsm-geoportal	Disaster Risk Reduction
Tonga Geoportal Research Forecasting (WRF) Model	http://met.gov.to/index_files/staff/	Meteorological and maritime radio services
Papua New Guinea Drought Monitoring System	http://www.pngmet.gov.pg/climate_division	Drought monitoring
Pacific Islands Climate Adaptation Science Centre	http://pi-casc.soest.hawaii.edu/	Climate change and other landscape-scale stressors

The purpose of the Pacific EO platform is different from, and upstream of many of these other initiatives, being primarily to enable access and processing of EO data to an ARD standard. Thus, establishing the relationships and the value-add among these initiatives will be essential in order to avoid duplication, and harness the variety of data in forms that meet Pacific-user’s needs.

The remainder of this section briefly outlines some of the principles that would underpin the design and operation of the Pacific Earth Observation Platform and the steps for implementation.

3.4.2 Principles

Access: The Platform should provide open access to satellite imagery and data, raw and pre-processed or “Analysis-Ready Data” (ARD), and customised products tailored to Pacific needs.

Equity: The Platform must go beyond just addressing the technological challenges of making EO data available; but it should provide a level playing field that enables spatial literacy as well as access to data, imagery and information for all, and supports relevant national, Pacific region and global policy contexts and priorities.

Trusted: To ensure the accuracy of data and products validation with in situ data will be required; there are a number of extant initiatives and capacity to provide this data. Quicker analysis through simpler analysis through predictable and standardised access to EO data and faster data analysis.

Actionable: The products should provide information in formats that inform evidence-based decision-making.

Costs: Cost savings (see below) not only on image acquisition but, reduced costs would accrue through sharing – which would involve strategic partnerships, a single transfer and reorganisation of the data within the region, efficiencies for processing and reprocessing and the potential to negotiate discounts on commercial imagery. Data and products could be accessed by portals (identified in Table 3) delivering further cost saving and consistency.

Inclusiveness and Co-development: To ensure the long-term sustainability and use, Pacific Island technical representatives and academic institutions should be involved from the start of the design, capacity development and establishment phases of the platform, as well as decision making on the functionality and day-to-day operation of the platform once established.

Governance: While a light touch is desirable, bringing together relevant actors from the Pacific Island Community, including both national and regional entities, the EO provider community, Policy and resourcing entities will be important in developing the PoA.

3.4.3 Steps in developing the Plan of Action

The Plan of Action for a Pacific EO Platforms should be developed based on a detailed scoping of user requirements, and an appreciation of the challenges and opportunities. Such a scoping study should be jointly funded by interested parties and a multi-institutional/representative team tasked with delivering the recommended PoA, over ideally a 3-6 month period. It must actively engage Pacific representatives must be actively engaged in the design and development of the PoA. Key steps will include:

- 1. Consultation and Engagement:** A detailed user-needs analysis framed by the six themes identified in the workshop should be undertaken.
- 2. Review and Analysis of Needs:** Tables 1 and 2 summarises a number of current or proposed initiatives being proposed for the Pacific Region. A thorough review of these initiatives in consultation with their proponents, will be required to identify synergies.
- 3. Demonstration Project:** A demonstration project that showcases what can be undertaken, learn about user needs and specific functionalities. This will also build collaborations between stakeholders, and gain valuable practical experience. Agreement on the nature and scope of the demonstration will need to be brokered and modest levels of resourcing secured.

4 References

Web resources

<https://www.devpolicy.org/2018-pacific-islands-leaders-forum-20180912/>

<https://www.devpolicy.org/the-indo-pacific-and-the-blue-pacific-20180822/>

Reports

Mobilizing finance for sustained, inclusive and sustainable economic growth, ESCAP 2018

Pacific Community Strategic Plan 2016–2020: Sustainable Pacific development through science, knowledge and innovation / Pacific Community

The framework for Pacific Regionalism, 2014

The State of Pacific Regionalism, 2017

Regional Road Map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific: Progress Report 2019

Foreign policy papers

Foreign Policy White Paper, 2017

Submission to Regionalism and Regional Forum Policy

Communiqués

The Forty-Eighth Pacific Islands Forum, Apia, Samoa 2017

The Forty-Ninth Pacific Islands Forum, Yaren, Nauru, 2018

The Pacific Community Governance Compendium

5 Appendices

5.1 Earth Observation Supporting Pacific Island Nation Environmental, Climate and Livelihood Needs - Concept note

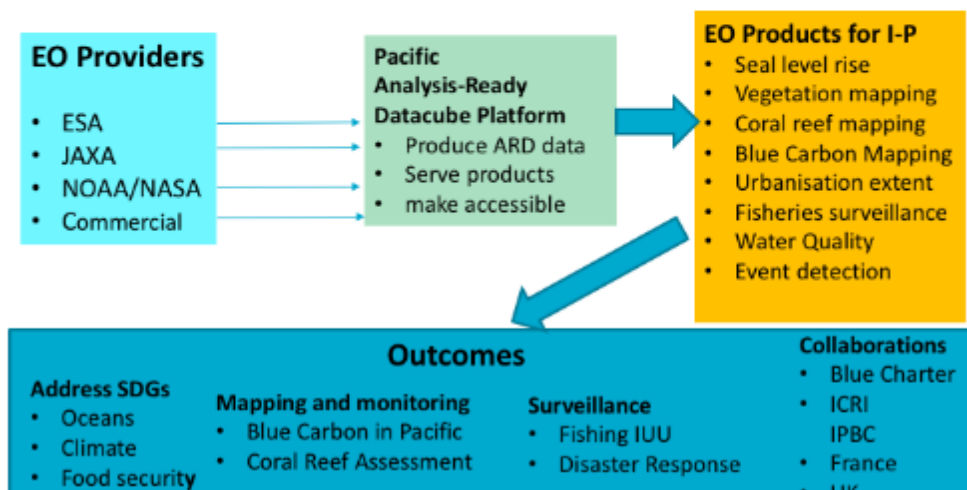
Pacific Ocean Island States require access to Earth Observation (EO) capabilities that would inform their decision-making in a range of environmental planning, mapping and assessment (e.g. blue carbon stocks, coral reef condition) responsibilities as well as reporting obligations including a Sustainable Development Goal targets, operational surveillance (e.g. illegal unreported and unregulated fishing) and forecasting of conditions and hazards (e.g. sea level rise and extremes, coral bleaching).

Fortunately, a range of new satellite capabilities (e.g. increased spatial temporal and spectral resolution), processing and analytical tools (e.g. Data- Cubes) and access (free access to EO archives and new telecommunication links to Pacific Islands) will make it possible to deliver EO products and services that are useful to these Island communities.

The Australian government, through bilateral arrangements and the Pacific Regional Program, seeks to assist Pacific Island nations with economic growth, effective regional institutions, healthy and resilient communities and the empowerment of women and girls. Addressing regional climate and environmental challenges through the ecosystem benefits from coastal carbon communities (i.e. Blue carbon) and coral reefs are key regional priorities that the Australian government is working cooperatively with a number of governments on, through a \$6 million Blue Carbon Pacific Initiative and the International Coral Reef Initiative (ICRI).

The application of EO will be foundational to these and other (e.g. Commonwealth Blue Charter) initiatives, and there is great benefit and economy in providing a consistent platform with web-based access to analysis-ready products to island communities to address many of the terrestrial and marine needs described above.

The figure below conceptualises a central coordination role that that Australia and its science agencies (CSIRO, GA, BoM) could play in linking EO services with Pacific Island user-needs through the development and (initial) hosting of technology.



As a first step, a workshop is proposed that will bring together representatives from island nations, regional (e.g. CROP, IORA) and international (e.g. CEOS, GEO), agencies with EO providers from France, UK, USA, Australia and New Zealand as well as potentially other providers (China, Japan,

Korea, Germany) to consider the EO data needs of these island nations and how cooperative assistance including access, training and development of useful products could be cooperatively delivered.

5.1.1 Objectives

1. Identify the needs of the Pacific Ocean nations and regional organisations in relation to EO data for reporting on progress towards their agreed SDGs
2. Identify areas of common interest and expertise between Australia, New Zealand, UK, France and the EU in Earth Observation for the SDGs
3. Develop an action plan and/or proposals for joint projects to help meet the needs of the Pacific and Indian Ocean island states, and develop key enabling capacities in the region based on the common interests of EO providers.
4. Communicate this action plan to high-level fora including upcoming CEOS, GEO and APEC meetings.

5.1.2 Format

- A two-day workshop in Australia (Brisbane) in early October 2018.
- Day one would include sessions on:
 - the current use and capabilities of EO for SDGs
 - the needs of the Pacific for EO related to SDGs
 - the Open Source Data Cube initiative, the DIAS and Copernicus programmes, and relevance to SDGs and the Pacific,
 - the Asia Oceania GEOSS

Day two would draw on the outcomes of the first day's sessions and develop proposals for EO projects and agreed actions to help meet the needs of the Pacific and Indian Ocean nations. The day will also identify future project collaborations, funding sources for potential partners, country programs and resources that can be leveraged in order to (a) develop the platform and defined products, and (b) deliver the required training and capacity building.

These outcomes would be communicated to a number of upcoming high-level meetings, including:

- Upcoming Committee for Earth Observation Satellites (CEOS), and the Group of Earth Observation (GEO) annual plenary meetings in October 2018,
- APEC meetings hosted under the leadership of Papua New Guinea and the UNFCCC COP24 meeting in Poland in December 2018.

Based on the Pacific EO-users meetings and feedback and support from these high-level meetings a detailed project proposal for implementation would be developed.

5.2 Workshop Agenda



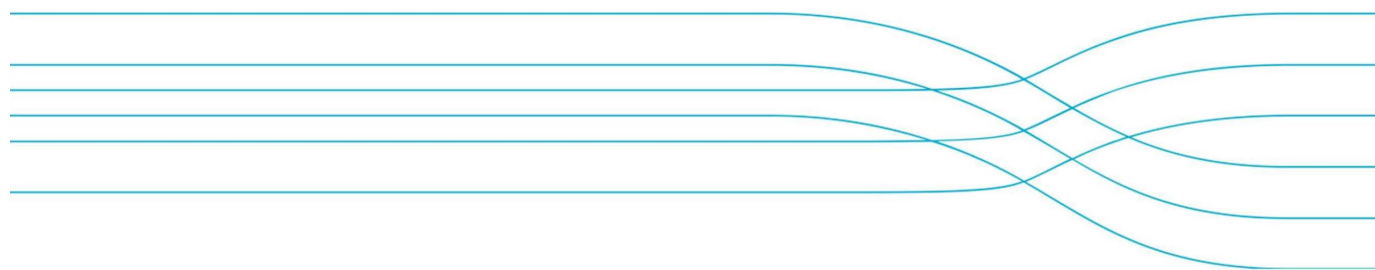
Establishment of an Earth Observation Platform to Support Pacific Island Nation Environmental, Climate and Livelihood Needs - Consultation Workshop

11TH - 12TH OCTOBER 2018

BRISBANE EXHIBITION AND CONVENTION CENTRE
BRISBANE, AUSTRALIA

DAY 1 – 11 October 2018 – Sky Room, Sky Level

08:00	Arrival and Registration of Participants – tea and coffee	
	Workshop Opening Remarks	Andy Steven
08:30	Welcome to Country	Shannon Ruska
	Welcome from Sponsor	Christophe Penot, French Ambassador to Australia
08:45	Meeting Objectives and Introductions	Deanna Hutchinson (Facilitator)
	Housekeeping briefing	Venue management
Session 1: Understanding Pacific EO needs		
09:00	<i>Keynote speech: Regional overview of Pacific policy frameworks and needs</i>	Dame Meg Taylor
09:15	Presentations from Pacific Countries and CROP agencies (5 minutes each)	
	1. Fiji	Hon. Aliveriti Nabulivou
	2. Solomon Islands	David Hiriasia
	3. Samoa	Ulu Crawley
	4. Cook Islands	Timoti Tangiruaine
	5. Kiribati	George Taobaba
	6. PNG	Ramakrishna Akkinapally
	7. New Caledonia	Damien Buisson
	8. French Polynesia	Keitapu Maamaatuaiahutapu
	9. Marshall Islands	TBC
	10. FFA	James Movick
	11. SPREP	David Loubser
12. SPC	Allan Illingsworth	





10:30	Group Exercise to define key issues and aggregate takeaways Pre workshop survey results	George Dyke & Luke Smith (Symbios) Neil Sims
10:45	Morning tea	
	Session 2: Understanding what is possible with EO	
11:05	<i>Keynote Speech: EO current and future capabilities</i>	Alex Held
	<i>EO Providers and coordinating organisations and their role in civic applications</i>	
11:15	<ol style="list-style-type: none"> 1. GEO 2. CEOS 3. Australia Space Agency 4. NZ CSST 5. CNES, EC and ESA 6. NOAA 	Stuart Minchin Jonathan Ross TBC Rafael Kargren & Dave Kelbe Selma Cherchali & Jonas Rupp William Skirving
	<i>Current Capabilities and Applications of EO in the Pacific</i>	
11:50	<ol style="list-style-type: none"> 1. French Pacific - EO capabilities and applications 2. Japan - EO capabilities and applications 3. USP - EO capabilities and applications 4. Datacube Pilot & Applications in the Pacific 5. Commonsensing - UK Catapult 	Jean Massenet & Remi Andreoli Tsugito Nagano Stuart Kinimonth Neil Sims TBC
12:15	<i>Discussion</i>	Deanna Hutchinson (Facilitator)
12:30	Lunch	
	Session 3a: Thematic application of EO to the Pacific Islands	
	<i>Land Applications</i> (Land change/use/ degradation, urbanisation, vegetation mapping)	
13:30	<ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	Wolf Forstreuter Neil Sims
	<i>Marine Applications</i> (SLR and flooding, coastal and marine habitat and water quality)	
14:00	<ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	David Loubser Thomas Schroeder
	<i>Fresh Water Applications</i>	
14:30	<ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	Regional - TBC Arnold Dekker & Tim Malthus
15:00	Afternoon Tea	
	Session 3b: Thematic application of EO to the Pacific Islands	



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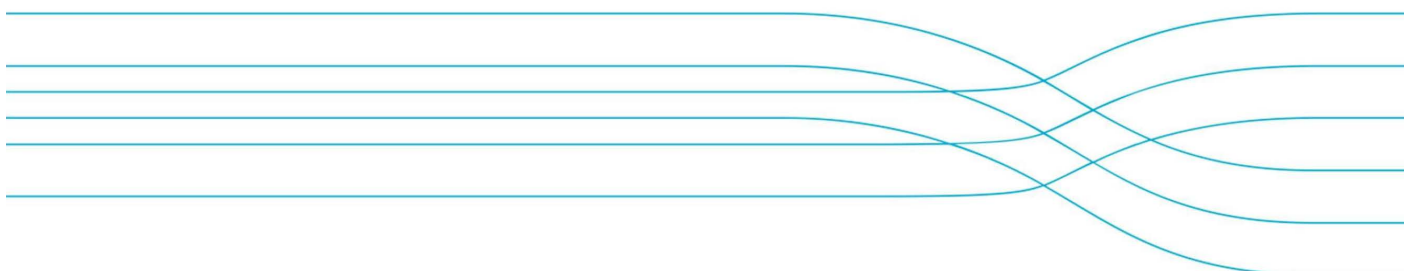


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15:30	<p>Food Security Application</p> <ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	<p>Ramakrishna Akkinapally Alex Held</p>
16:00	<p>Operational Surveillance Applications (IUU fisheries, other illegal activities)</p> <ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	<p>James Movick Jessica Ford & Bryan Scott</p>
16:30	<p>Disaster Risk Reduction</p> <ul style="list-style-type: none"> • Regional Needs • Technical Feasibility • Table Discussion 	<p>Timoti Tangiruaiane Jonathon Ross</p>
17:00	Summary of Discussions	Rapporteurs report back major findings for each theme
17:30	Close of first day	

Reception and networking event – Sky Room and Terrace
Please join us for drinks and nibbles

17:55	Bar open	
18:00	Remarks from Sponsors	<p>Dario Morosini, DFAT Deputy State Director Stuart Minchin, Geoscience Australia Jonas Rupp, on behalf of EU Delegation to Australia</p>
18:20	Signing of Australia – New Zealand LOI	CCEO and CCST
18:30	Indigenous Performance	Nunukul Yuggera Aboriginal Dancers
19:00	Networking	
20:00	Close	





DAY 2 – 12 October 2018 – Sky Room, Sky Level

08:00 *Arrival – tea and coffee*

08:30 Overview of Day 2 and Recap of Day 1

Session 4: From data to decision-making products

09:00	<ul style="list-style-type: none"> • Capability Building 	Keitapu Maamaatuaiahutapu & Stuart Kininmonth
	<ul style="list-style-type: none"> • Infrastructure Requirements for accessing EO data 	Remi Andreoli & Allan Illingsworth
	<ul style="list-style-type: none"> • Informing Sustainable Development Goal (SDG) Indicators 	Ulu Crawley & Neil Sims
	<ul style="list-style-type: none"> • Research Needs and Validation of EO Data 	Tim Malthus & Duncan McIntosh
	<ul style="list-style-type: none"> • Information sharing, Open Data and Platforms 	Matt Paget & TBC
	<ul style="list-style-type: none"> • Role of Citizen Science 	Janet Anstee & Robert Hollow

10:00 **Report back**

10:30 *Morning tea*

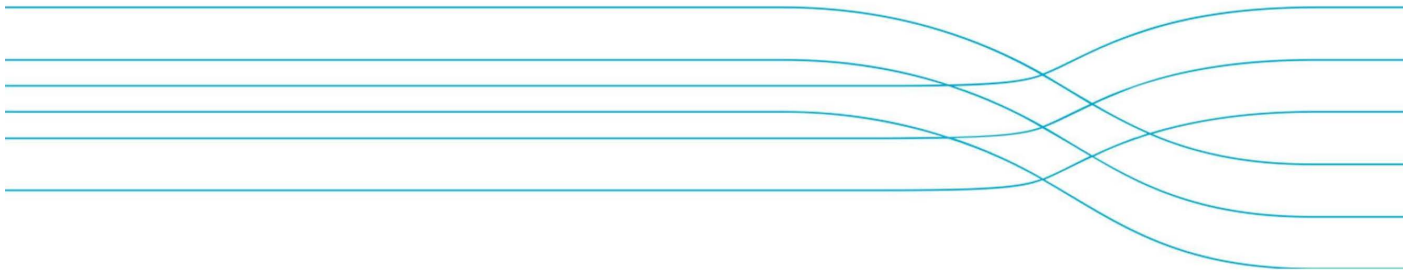
Session 5: Developing a Plan of Action for better harnessing the potential of EO for Pacific Island needs

11:00	Overview of Process	Deanna Hutchinson (Facilitator)
	<ul style="list-style-type: none"> • Land 	Alivereti Nabulivou
	<ul style="list-style-type: none"> • Marine 	Lionel Loubersac
	<ul style="list-style-type: none"> • Water 	Heidi Prislán
	<ul style="list-style-type: none"> • Food Security 	Jonas Rupp
	<ul style="list-style-type: none"> • Operational Surveillance 	Andrew Riplinger
	<ul style="list-style-type: none"> • Disaster Risk Reduction 	Liz Yuncken

13:00 *Lunch – commercial EO data providers’ dialogue*

Session 6: Breakout Group presentations on Thematic Plan of Actions

14:00	<ul style="list-style-type: none"> • Land 	Rapporteurs and presenters to be confirmed by groups
	<ul style="list-style-type: none"> • Marine 	
	<ul style="list-style-type: none"> • Water 	





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- Food Security
- Operational Surveillance
- Disaster Risk Reduction

15:00

Afternoon tea

Session 7: The Way Forward

15:30

Panel Discussion of EO providers: responding to thematic Plan of Actions

Deanna Hutchinson (Facilitator)
Panelists: cross section of government and commercial providers

16:00

Outline and Discussion of Synthesis Report and proposed engagement with upcoming fora

George Dyke & Luke Smith (Symbios)

16:30

Longer term strategy

Discussion (all)

16:50

Final remarks from hosts

Andy Steven

17:00

Close of workshop

THANK YOU FOR YOUR ATTENDANCE – SAFE TRAVEL HOME

5.3 Question slides sent to Pacific Islanders and representatives

Establishment of an Earth Observation Platform to Support Pacific Island Nation Environmental, Climate and Livelihood Needs

[your country and flag]

1. What do you **currently use** Earth Observation data for?
2. What current **expertise / capacity** do you have to analyse Earth Observation data?
3. What are the **main barriers** to using Earth Observation data in your country (if any)?
4. Do you have **questions for EO data providers**
5. What would you like to **use** Earth Observation data for, and **how can we help?**

Consultation Workshop, 11th - 12th October 2018, Brisbane, Australia

Questionnaire

This survey will be used to highlight some key challenges for Pacific island and regional States in their use of Earth observation technologies. This survey should take less than 10 minutes to complete and will help us to streamline the workshops that we can spend more time discussing the issues and challenges that are important to you.

All responses to this survey will remain confidential, and will not be linked to individual countries without seeking your permission first. Results from this survey may be shown in aggregate, or they may be used to group countries for breakout sessions based on similarities in existing Earth observation capacity needs.

Please answer every question, and select any of the options that apply to you. When you're finished you can either click the 'OK' box or just scroll down to the next question. Please feel free to add as many comments as you like for each of the questions.

Do not hesitate to contact any of the workshop organisers if you would like more information about this survey or the workshop. We hope to see you in Brisbane on October 11 & 12.

OK

* 1. Which country, State or nation do you represent?

- | | |
|---|---|
| <input type="checkbox"/> Australia | <input type="checkbox"/> Palau |
| <input type="checkbox"/> Belgium | <input type="checkbox"/> New Zealand |
| <input type="checkbox"/> Cook Islands | <input type="checkbox"/> Papua New Guinea |
| <input type="checkbox"/> Fiji | <input type="checkbox"/> Samoa |
| <input type="checkbox"/> France | <input type="checkbox"/> Solomon Islands |
| <input type="checkbox"/> Germany | <input type="checkbox"/> Spain |
| <input type="checkbox"/> Guam | <input type="checkbox"/> Switzerland |
| <input type="checkbox"/> Italy | <input type="checkbox"/> Tonga |
| <input type="checkbox"/> Kiribati | <input type="checkbox"/> Tuvalu |
| <input type="checkbox"/> Republic of the Marshall Islands | <input type="checkbox"/> United Kingdom |
| <input type="checkbox"/> Federated States of Micronesia | <input type="checkbox"/> United States of America |
| <input type="checkbox"/> Nauru | <input type="checkbox"/> Vanuatu |
| <input type="checkbox"/> New Caledonia | |
| <input type="checkbox"/> Other (please specify) | |

* 4. How important are the following issues to your need for Earth observation?

	Not important	Somewhat	Moderate	Highly	Extremely important
Engagement with international development initiatives	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving the detail and accuracy of spatial data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving the consistency of spatial data across your country	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Increasing the frequency and currency of spatial data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments (please specify)

5. For which global initiatives will you use, or do you want to use Earth observation technologies?

- Sustainable Development Goals (<https://sustainabledevelopment.un.org/?menu=1300>)
- Land Degradation Neutrality (<https://www.unccd.int/actions/achieving-land-degradation-neutrality>)
- REDD+ (<http://www.un-redd.org/>)
- The Blue Carbon Initiative (<http://thebluecarboninitiative.org/>)
- The Sendai Framework for Disaster Risk Reduction (<https://www.unisdr.org/we/coordinate/sendai-framework>)
- Convention on Biological Diversity including Aichi Biodiversity Targets (<https://www.cbd.int/sp/targets/>)
- The Paris Agreement on Climate Change (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>)
- None

Other (please specify)

* 6. The Group on Earth Observations ([GEO](https://www.earthobservations.org)) has identified eight Societal Benefit Areas where Earth observations can be used to support decision-making. How important are each of these to your need for Earth observation technologies?

	Not important	Somewhat	Moderately	Highly	Extremely important
Biodiversity and ecosystem sustainability <i>(https://www.earthobservations.org/area.php?a=bes)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disaster risk reduction <i>(https://www.earthobservations.org/area.php?a=dr)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy and mineral resource management <i>(https://www.earthobservations.org/area.php?a=emrm)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food security and sustainable agriculture <i>(https://www.earthobservations.org/area.php?a=fsaa)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure and transport management <i>(https://www.earthobservations.org/area.php?a=itm)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public health surveillance <i>(https://www.earthobservations.org/area.php?a=pbs)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainable urban development <i>(https://www.earthobservations.org/area.php?a=sud)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water resource management <i>(https://www.earthobservations.org/area.php?a=wrn)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

* 7. How are you using, or how do you intend to use Earth observation technologies in these initiatives?

- To provide general background information
- To provide an historical reference (or baseline)
- To calculate a baseline from which change can be assessed
- To inform performance (monitor and measure change against the baseline)
- Other (please specify)
- To create maps for inclusion in the reports
- To calculate the data on which the reports are based (inventory reporting)
- None

* 8. Rate your current costs to access to Earth observation data, technologies or services

	Too expensive	About right	Would be happy to pay more for better data or services	N/A or Not Sure
image acquisition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
image processing and calibration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Map and model production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Map validation against field data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comment on your rating

* 9. Rate your current capacity to use Earth observation data, technologies or services

	No existing capacity	Some but needs improving	Sufficient and increasing	We do this routinely for reporting purposes	Not sure
image acquisition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
image processing and calibration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Map and model production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Map validation against field data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

* 10. How good is internet access in your country, State or nation?

	Poor	Moderate	Excellent	Not sure
Speed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coverage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments (please specify)

* 11. How do you normally access the internet? (select all that apply)

- Desktop computer
- Portable (laptop) computer
- Other mobile device including phone or tablet
- Other (please specify)
- Cable connection
- Wifi connection

* 12. Which other countries, States or nations do you think most closely share your environmental concerns and Earth observation needs?

- | | |
|---|---|
| <input type="checkbox"/> Australia | <input type="checkbox"/> Palau |
| <input type="checkbox"/> Belgium | <input type="checkbox"/> New Zealand |
| <input type="checkbox"/> Cook Islands | <input type="checkbox"/> Papua New Guinea |
| <input type="checkbox"/> Fiji | <input type="checkbox"/> Samoa |
| <input type="checkbox"/> France | <input type="checkbox"/> Solomon Islands |
| <input type="checkbox"/> Germany | <input type="checkbox"/> Spain |
| <input type="checkbox"/> Guam | <input type="checkbox"/> Switzerland |
| <input type="checkbox"/> Italy | <input type="checkbox"/> Tonga |
| <input type="checkbox"/> Kiribati | <input type="checkbox"/> Tuvalu |
| <input type="checkbox"/> Republic of the Marshall Islands | <input type="checkbox"/> United Kingdom |
| <input type="checkbox"/> Federated States of Micronesia | <input type="checkbox"/> United States of America |
| <input type="checkbox"/> Nauru | <input type="checkbox"/> Vanuatu |
| <input type="checkbox"/> New Caledonia | |
| <input type="checkbox"/> Other (please specify) | |

13. What would be the most important outcome from the workshop for you?

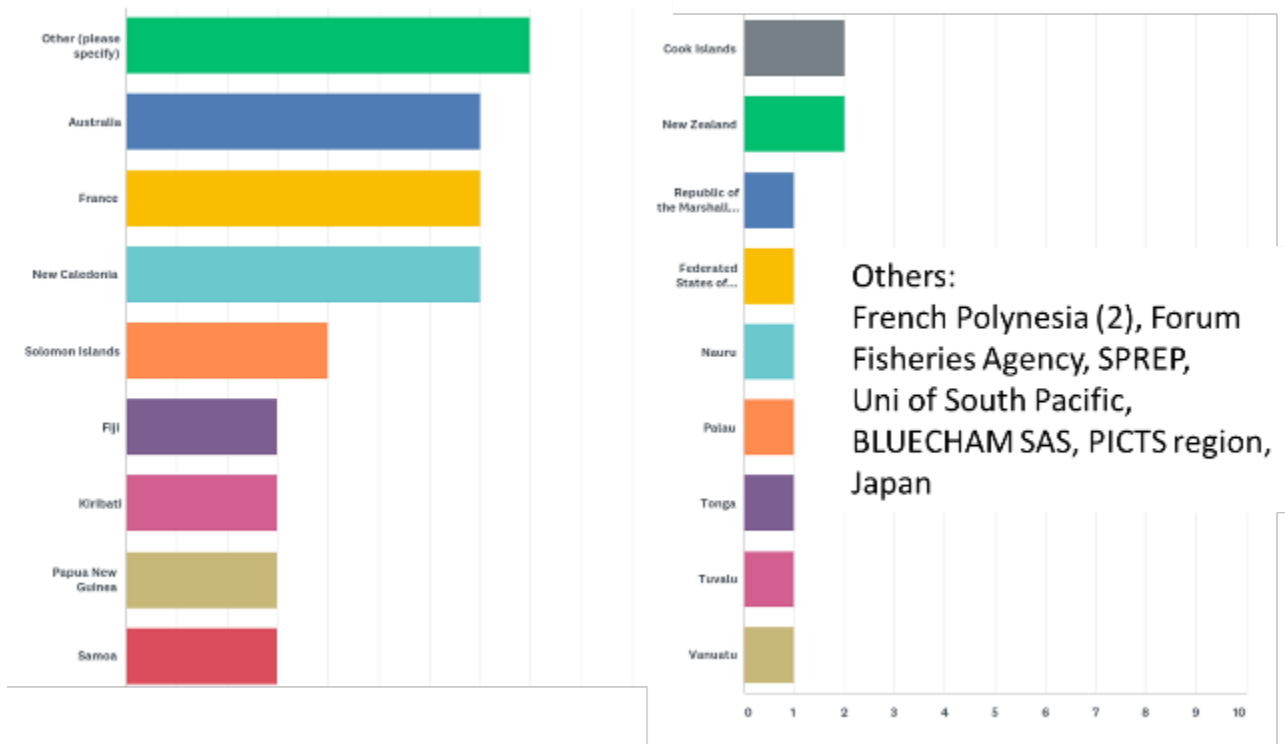
14. What are you hoping to contribute to the workshop?

15. Do you have any other comments, questions or requests?

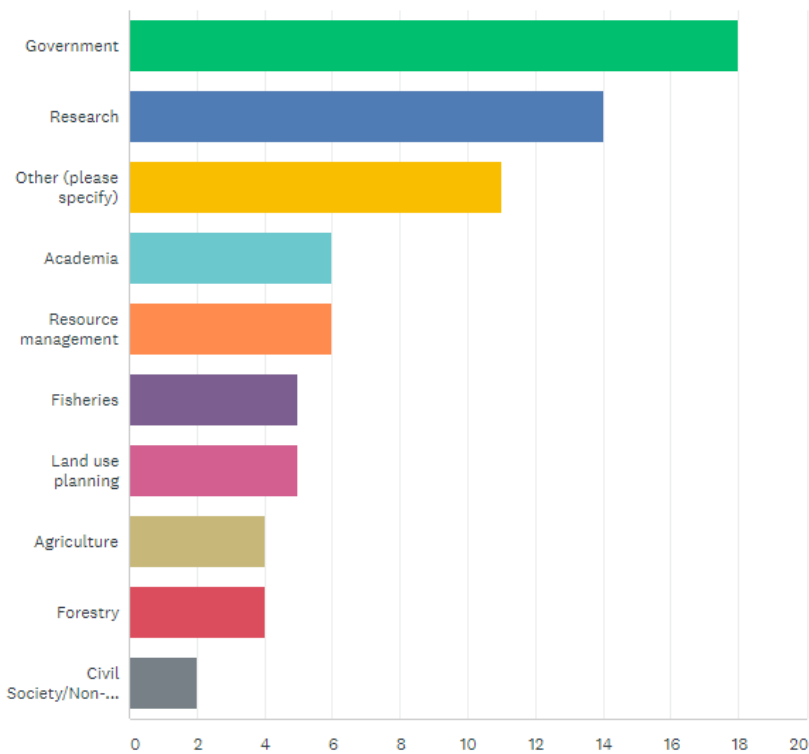
DONE

5.4 Results from Questionnaire

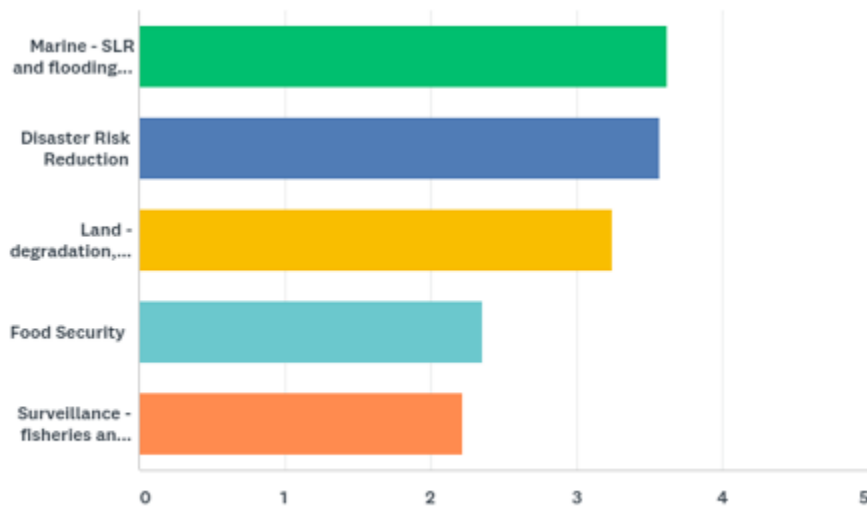
1. Which country, state or nation do you represent?



2. Which is your industry sector?

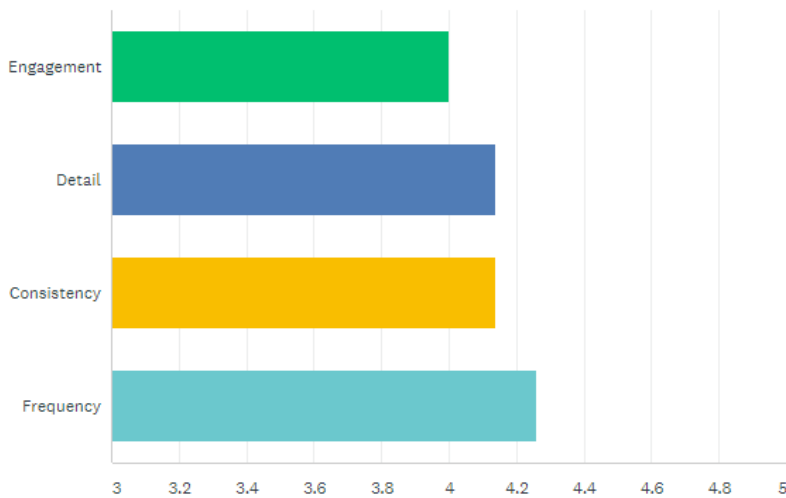


3. Rank the following Earth Observation use themes on their importance to you?



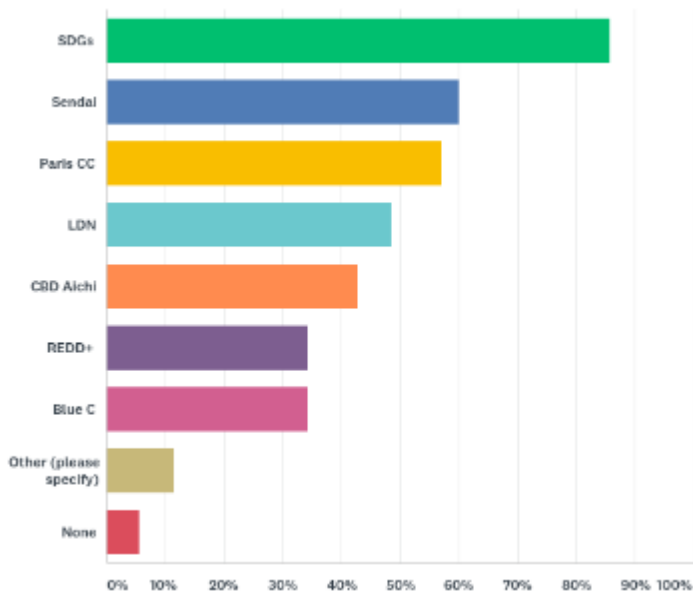
4. How important are the following issues to your need for Earth Observation?

- Increased frequency of data slightly more important than international engagement, improving detail or consistency

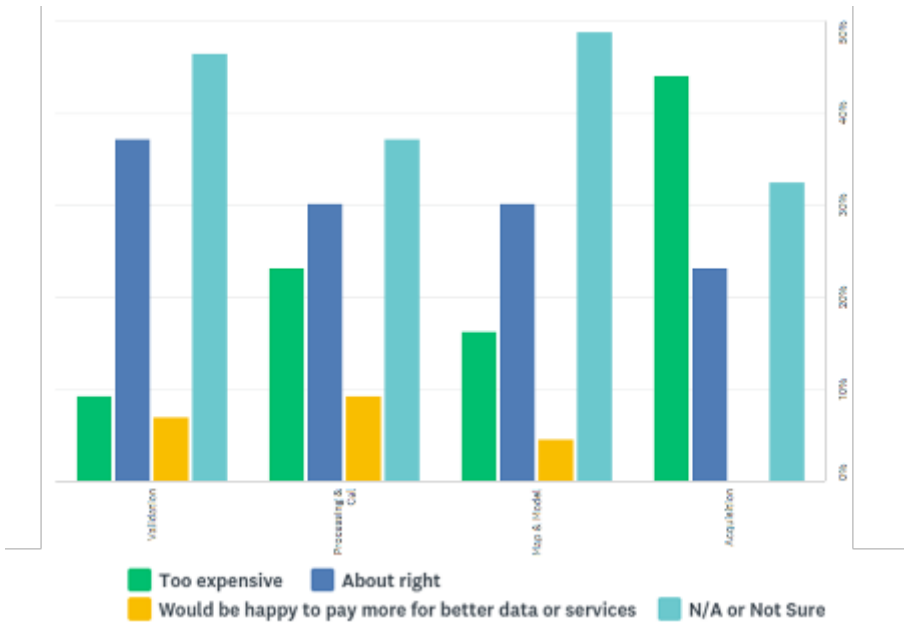


5. For which global initiatives will you use, or do you want to use Earth observation technologies?

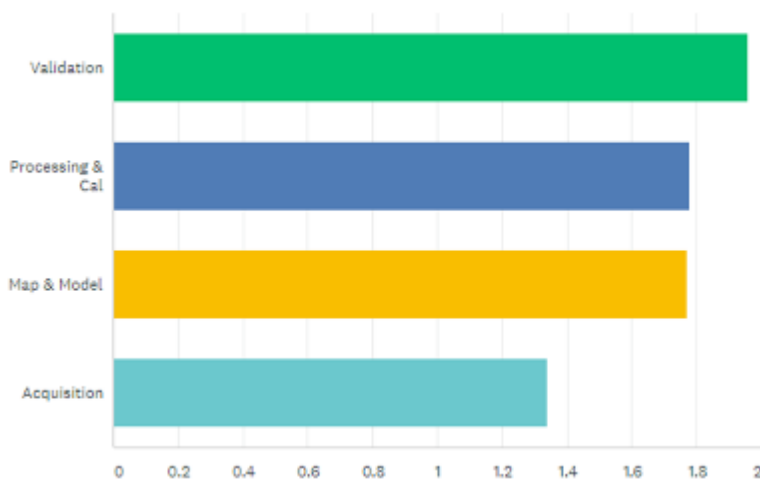
- Measure change, calculate baselines and calculate reference conditions most common use intention
- Others: Regional surveillance, blue growth, Blue planet, Global mangrove Watch, Food security and marine agreement/law



6. The Group of Earth Observation (GEO) has identified eight Societal Benefit Areas where Earth Observation can be used to support decision-making. How important are each of these to your need for Earth observation technologies?
 - No significant indication - GEO Societal Benefit Areas
 - 'Environmental' (DRR, Biodiversity, Food security and Water) slightly more important than 'development/health' based areas
7. How are you using, or how do you intend to use Earth observation technologies in these initiatives?
 - No significant indication
 - Wide range of levels in all aspects of acquisition, processing and analysis chain
8. Rate your current costs to access to Earth observation data, technologies or services.



9. Rate your current capacity to use Earth observation data, technologies or services



10. How good is internet access in your country, State or nation?

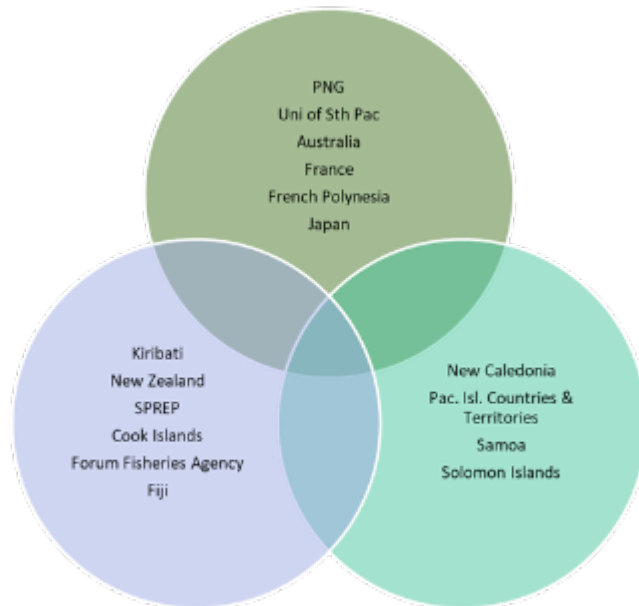
- Most commonly reported as accessed from portable computers, but a wide range and/or multiple platforms also usually reported

11. How do you normally access the internet?

- Internet access generally reported as good, but variable between countries and regions within countries

12. Which other countries, States or nations do you think most closely share your environmental concerns and Earth observation needs?

- This question may not have been framed in exactly the right terms to interpret the intended information, and the methods were sensitive to changes in the grouping variables. The figure below presents one possible grouping that appeared to be consistent with the available information and our perceptions of the associations between countries.



13. What would be the most important outcome from the workshop for you?

14. What are you hoping to contribute to the workshop?

15. Do you have any other comments, questions or requests?

- Below are results from questions 13 – 15. Word clouds were produced to analyse the data.

areas Australia information Learning countries available
 Pacific Island access data Earth Observation
 understanding building use products EO management needs
 change share address

countries perspective Share observation system needs new
 experience providing Pacific earth observation data
 Australia working capacity EO risk use information Island region

5.5 List of contacts

TITLE	FIRST NAME	LAST NAME	POSITION	ORGANISATION
Dr	Ramakrishna	Akkinapally	Deputy Director General	PNG National Agricultural Research Institute
Mr	Remi	Andreoli	Director Of Space Applications	Quintesens Pty Ltd / Bluecham SAS
Ms	Janet	Anstee	Team Leader	CSIRO Oceans & Atmosphere
Mr	Jeffrey	Aquilina	Pacific Sea Level And Geodetic Monitoring Project - Team Leader	Bureau Of Meteorology
Dr	David	Blondeau-Patissier	Research Scientist	CSIRO Oceans And Atmosphere
Mr	Damien, Mathieu	Buisson	Head Of The GIS And Rs Department	Gnc De La Nouvelle Caledonie
Dr	Sophie	Caillon	Researcher	CNRS
Dr	Selma	Cherchali Ép. Amram	SCO Program Director	French Space Agency Cnes
Mr	Robert	Coorey	CEO	Geospatial Intelligence Pty Ltd
Mr.	Bismarck	Crawley	Chief Executive Officer	Ministry Of Natural Resources And Environment
	Morosini	Dario	Deputy Director, Queensland	Department of Foreign Affairs and Trade
Prof. Dr.	Arnold	Dekker	Director And Honorary Science Fellow	SatDek Pty Ltd and CSIRO
Dr	Marc	Despinoy	Research Engineer	IRD
Dr	Laurent	Durieux	Head Of Mission Ai, Big Earth Data & Sdgs	IRD
Mr	George	Dyke	Consultant	Symbios Communications
Mr	Mathieu	Estebe	GIS Manager	Province Nord
Dr	Jessica	Ford	Research Scientist	CSIRO
Dr.	Wolf	Forstreuter	Team Leader Geoinformatics	SPC (pacific Community)
Mr	Karl	Haby	Policy Officer	Department Of The Environment And Energy
Mrs	Lauren	Hardiman	Program Support Officer	CSIRO

Dr.	Alex	Held	Director Centre for Earth Observation	CSIRO
Mr	David	Hiriasia	Director	Solomon Islands Meteorological Service
Mr	Robert	Hollow	Education & Outreach Specialist	CSIRO Astronomy and Space Science
Mr	Allan	Illingworth	Manager - GEM	Pacific Community (spc)
Mr	Rafael	Kargren	Director Of Operations	Centre For Space Science Technology
Dr	David	Kelbe	Principal Scientist	Centre For Space Science Technology
Dr	Stuart	Kininmonth	Senior Lecturer	University Of South Pacific
Mr	Peter	Kinne	Regional Director	Digitalglobe
Ms	Nikola-maria	Komailevuka	Executive Coordination Officer	Pacific Islands Forum Secretariat
Mr	Sebastien	Lagarde	Technical Referent	Insight
Mr.	Didier Maurice Armand	Lille	Founder & Ceo	Bluecham SAS / Quintesens Pty Ltd
Dr	Lionel	Loubersac	Manager	New Caledonia Maritime Cluster And New Caledonia Interclustering
Mr	David	Loubser	Vanuatu Country Manager	SPREP
Dr	Keitapu	Maamaatuaiah utapu	Lecturer	University Of French Polynesia
Dr	Timothy	Malthus	Research Group Leader	CSIRO Oceans And Atmosphere
Mr	Jean	Massenet	Product Manager	Insight
Dr.	Duncan	McIntosh	Oceanography Officer	Secretariat Of The Pacific Regional Environment Programme
Dr	Stuart	Minchin	Chief, Environmental Geoscience Division	Geoscience Australia
Mr	Seyed	Miri	Applications And Solutions Manager	Airbus
Mr	Richard	Moreno	Space Climate Observatory Project Manager	CNES
Mr	James	Movick	Director General	Pacific Islands Forum Fisheries Organization
Mrs	Emily	Muirhead	Administration Officer	CSIRO
The Hon Mr	Alivereti	Nabulivou	Government Member Of Parliament	Parliament Of The Republic Of Fiji

Mr.	Tsugito	Nagano	Deputy Manager, Business Strategy Office	RESTEC
Mr	Kwang	Oon	Director	CLS OCEANIA/SATELLITE IT PTY LTD
Mr	Matthew	Paget	Data And Systems Specialist For Earth Observation Sciences	CSIRO
Profes sor	Stuart	Phinn	Professor	University Of Queensland, Earth Observation Australia
Ms	Heidi	Prislan	Assistant Director	Department Of Foreign Affairs And Trade
Mr.	Andrew	Riplinger	Environment, Science, Technology, And Heath Officer	U.s. Embassy Canberra
Mr	Jonathon	Ross	Director	Geoscience Australia
Mrs	Anne	ROUAULT	S&T attachée	French Embassy In Australia
	Guillaume	Rousset	Phd Student	Espace-dev, Ird
Mr	Jonas	Rupp	Adviser - Science, Research And Innovation	Eu Delegation Canberra
Dr	Thomas	Schroeder	Research Scientist	CSIRO
Mr	Bryan	Scott	Database Administrator	Forum Fisheries Agency
Dr	Neil	Sims	Remote Sensing Research Scientist	CSIRO
Mr	Luke	Smith	Consultant	Symbios
M	Benoît	Soulard	Ingeneer	Ifremer
Dr.	Jan	Steffen	Project Director	GIZ - Macbio
Dr	Andrew	Steven	Research Director - Coasts	CSIRO
Mr	Timoti	Tangiruaine	Geoportal Officer	Emergency Management Cook Islands (emci)
Mr	George	Taoaba	Environment Inspector	Environment And Conservation Division, Ministry Of Environment Lands And Agriculture Development
Dame	Meg	Taylor	Secretary General	Pacific Islands Forum Secretariat
Dr.	Lauric	Thiault	Postdoctoral Researcher	CNRS
	Giovanna	Varra	International Relations at Bluecham Sas /Quintesens Pty Ltd	Bluecham Sas / Quintesens Pty Ltd
Mr	Jonah	Williams	Sales Manager	Airbus
Ms	Elizabeth	Yuncken	Senior Adviser Global Partnerships	CSIRO

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FOR FURTHER INFORMATION

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Pacific Islands Forum Secretariat (2017). *Forty-eighth Pacific Islands Forum*. Apia, Samoa.
Pacific Islands Forum Secretariat (2018). *Forty-ninth Pacific Islands Forum*, Nauru.
UNESCAP (2018). *Mobilizing finance for sustained, inclusive and sustainable economic growth*.