Economics Legislation Committee
ANSWERS TO QUESTIONS ON NOTICE
Industry, Innovation and Science Portfolio
2017 - 2018 Budget Estimates
31 May – 1 June 2017

AGENCY/DEPARTMENT: DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE

TOPIC: Space Activities

REFERENCE: Questions on Notice (Hansard, 1 June 2017, page 76)

QUESTION No.: BI-42

Senator KIM CARR: There was a review of the Space Activities Act, if I recall.
Senator Sinodinos: That is right. It has concluded.
Senator KIM CARR: You were proposing to have legislation by August. Dr Byrne, is it still the proposal to have legislation ready by August?
Dr Byrne: Just to confirm, government implemented the review and that is complete, and we are in the process now of seeking feedback through a legislative proposals paper process, which tries to set out the terms under which the new legislation would be framed. The expectation is that we will be able to introduce the legislation in the spring sittings. But clearly we need to go through a series of steps, including taking account of that consultation. But our effort will be to introduce the legislation in the spring sittings.
Senator KIM CARR: Given you have undertaken this review about the importance of the space industry to the Australian economy, in terms of the latest information the department has, how many departments or agencies have regulatory or other activities around space?
Dr Byrne: Certainly there are a number of different agencies that have regulation responsibilities regarding space, and they range from the Department of Defence, with particular security and other related legislative requirements; and the department of communications and the associated agency ACMA, with its issues around radiocommunications. In fact, they have just been introducing some changes to their legislation as well. There are obviously issues around international relations, through DFAT. So there are forms of advice that need to be included through that agency. So essentially we have also Air Safety Australia. There in fact could be other agencies that need to be consulted in relation to whole-of-government regulation for different purposes. Our minister, the Minister for Industry, Innovation and Science has responsibility for the Space Activities Act, which is the core mechanism by which project proponents can apply for licenses to be able to—
Senator KIM CARR: This department has prime responsibilities for space activities?
Dr Byrne: For the Space Activities Act, but there is related legislation from a whole-of-government perspective, which needs to be factored in.
Senator KIM CARR: Can you confirm there are around 90 separate programs operating in the Commonwealth? There is the Australian government relying upon earth observational technologies.
Dr Byrne: I am not able to confirm that. We can take that on notice.
Senator KIM CARR: And can I have a list of those, please, on notice. I do not expect you to carry that in your head. Certainly, my recollection from notes that I have from this matter because—the total value of programs was well in excess of a $1.5 billion. Is that still the case?
Dr Byrne: I am really not in a position to comment on the quantum. I would need to understand the scope.
Senator KIM CARR: Take that on notice, please. Can you provide me with a list of the programs the department has which provide support for space science research?
Dr Byrne: I would really need to look to my colleagues for—
Senator KIM CARR: Take it on notice.
Dr Byrne: Okay.

Q1 *Can you confirm there are around 90 separate programs operating in the Commonwealth? There is the Australian government relying upon earth observational technologies? [Sic]*

And can I have a list of those, please, on notice. I do not expect you to carry that in your head. Certainly, my recollection from notes that I have from this matter because—the total value of programs was well in excess of a $1.5 billion. Is that still the case?

Answer

The Department of Industry, Innovation and Science consulted with all Commonwealth agencies that rely on earth observational technologies in responding to this question. Not all agencies were able to respond or respond in a comprehensive manner in the time available. The below program-specific information was provided by Commonwealth agencies. There is no current estimate of the value of those programs.

Department of Agriculture and Water Resources

Australia's National Forest Inventory
This program produces Australia's forest cover and associated spatial datasets for reporting domestically and internationally including through the Australia's State of the Forests Report series. Data from a number of satellites (AVHRR, MODIS, Landsat, Sentinel and SPOT) is used as a major input to this inventory.

This and other work serves as a very valuable support to sustainable forest management in Australia and thus to Australia's domestic and international markets for forest products.

Australian Collaborative Land Use and Management Program (ACLUMP)
The national land use datasets (at national and catchment scales) are recognised as Foundational Spatial Datasets by ANZLIC and Essential Statistical Assets by ABS. ABARES produces the national scale dataset every 5 years and uses remote sensing data (currently AVHRR with the intention to move to MODIS and possibly Landsat) in the allocation of agricultural land uses. ABARES releases annually a national compilation of updated catchment scale land use mapping undertaken by state ACLUMP partners. The states and NT rely on satellite imagery (such as Landsat, Sentinel and SPOT) with aerial imagery to undertake detailed land use mapping to scales down to 1:10 000 (individual paddocks).

ABARES uses freely available satellite imagery. Spatial land use data (now to commodity level for several agricultural crops) is used for:

- biosecurity preparedness and response (such as Panama Disease Tropical Race 4 in bananas and white spot in prawns)
- to assess impact of natural disasters on agriculture (such as for the mango industry following Tropical Cyclone Debbie)
- agricultural productivity and sustainability (used as an input to CSIRO National Outlook 2015)
- land use planning
- biodiversity conservation and
- natural resource condition monitoring and investment.

Ground Cover Monitoring for Australia
The Department has funded the calibration and validation of a MODIS-derived vegetation cover product developed by CSIRO. These same reference sites were also used in the calibration and validation of Landsat-based vegetation cover (developed by the Joint Remote Sensing Research

Program through TERN AusCover and now hosted on the GA Digital Earth Australia). These are time-series products (10+ years for MODIS and 30+ years for Landsat). The Department is developing reporting tools for NRM bodies to monitor their ground cover levels (particularly under grazing) as part of the National Landcare Programme.

Monitoring ground cover is a key performance indicator of the adoption of sustainable management practices for the Department.

Fisheries and Quantitative Sciences
Satellite sea surface temperature is currently used for modelling the maximum potential range of invasive marine species. The Invasive Marine Species Range Mapping Tool Methodology is the preferred method of determining the potential distribution of marine pests in the National Environmental Biosecurity Response Agreement (NEBRA).

Department of Communications and the Arts

Mobile Blackspots Program
The Australian Government has committed $220 million to the Mobile Black Spot Program to invest in telecommunications infrastructure to improve mobile coverage along major regional transport routes, in small communities and in locations prone to natural disasters.

Rounds 1 and 2 of the program are delivering over $600 million in combined Commonwealth, State, mobile carrier and third party investment in new mobile infrastructure in across Australia. The program uses satellite imagery to complement with other geospatial information when consider coverage issues and program outcomes.

Department of Environment and Energy

Australian Antarctic Science Program
A number of Australian Antarctic science projects utilise satellite and remote sensing data and imagery. Satellite data connections facilitate the collection and transfer of large amounts of scientific data from Antarctica to researchers in Australia (and around the world) including the automation of some data collection such as cosmic ray data and meteorological data from automatic weather stations. These project activities include:

- understanding the cryosphere and Antarctic ice sheet and improving estimates of East Antarctic fast-ice extent and thickness
- mapping wildlife populations to inform estimates of wildlife distribution, abundance and change
- observing geological and geographic change in dynamic areas such as Heard Island
- tagging and tracking wildlife (flying seabirds, penguins, seals and whales) for year-round observations
- data and imagery for mapping
- Argo floats delivering real-time Southern Ocean observations.

CSIRO

Sustaining Soil and Landscapes
Program observes and predicts trends across agricultural landscapes and seeks to understand the interconnection with the wider economy and environment.

BlueLink
Improving Navy, fishing industry & offshore oil/gas operations and reduced drownings.

eReef's
Improvements in commercial fishing, reef management, and sustaining tourism and recreations.

Sustainable Commercial Fisheries
Aims to reduce effort per catch, reduced adverse ecological impact, and created long-term sustainability of fishing industry & resilience of fishing communities.

Integrated Marine Observing System (IMOS)
Marine observation and remote sensing infrastructure as a national collaborative research infrastructure operated by a consortium of institutions (including CSIRO) with the University of Tasmania as lead agent.

CSIRO Climate Science Centre

Illegal, Unregulated and Unreported (IUU) Fishing
Satellite-based Vessel tracking and R&D.

Marine Water Quality Dashboard
Performs routine operational mapping of the water quality for the entire GBR World Heritage area.

Inland Water Algal Alert
Satellite-based monitor algal bloom status of inland water bodies across NSW for algal bloom alerting. Undertaken on behalf of NSW Department of Primary Industries Office of Water.

Chile Harmful Algal Bloom
Satellite data and tools for harmful algal bloom altering in Chile's three southern regions in order to better manage and secure Chile's aquaculture assets.

Coal Mining Research
Focusses on improving mine safety, energy production efficiency, developing smarter extraction methods and delivering carbon capture techniques that aid lower emissions.

Natural Hazards, Infrastructure and Disaster Management
Development of data analytics and modelling integrated with spatially derived datasets for the purposes of natural hazards prediction (mainly floods and fires but also some landslides), urban planning, infrastructure assessment post disasters and evaluation and implementation of climate adaptation measures in an urban context.

Hovermap and Resq
Develops fully autonomous aerial systems that can operate with minimal human supervision and within difficult terrain. Some of the systems rely on the availability of GPS/GLONASS.

Zebedee
Program around 3D LiDAR mapping. This program optimizes and develops 3D laser mapping and localization algorithms for GPS denied areas such as indoors. However, the fusion of these maps

with outdoor areas is necessary to derive the global positioning of these maps, which is done by integrating GPS information when available.

Gator
This program develops fully autonomous ground vehicles that can navigate in complex terrain. The vehicle uses GPS information where available to assist in navigating.

Legged-Robots
This program develops a series of robots that can navigate in complex terrain based on legged locomotion. These robots use GPS information where available to assist in their positioning.

AgScan 3D
A program around using locally captured hyperspectral information for precision agriculture and horticulture. This system may use hyperspectral satellite data to calibrate and/or reference its local data captures.

National Inventory
Land cover (forest, perennial woody, trend) change for emissions estimation.

Offshore Seeps and Oil Spill Response and Shore Line Aurveys
Synthetic aperture radar and high resolution imagery - various projects.

Discovery Program
Projects: (1) Bulong Gold 3D Mineral Mapping project (2) The ASTER version 2 geoscience maps produced for the Geological Survey of QLD. (3) Capricorn Distal Footprints to map mineral footprints related to sedimentary-hosted base metal mineralisation in the Edmund Basin and to investigate the potential of mapping manganese minerals at the surface, which are vectors towards mineralisation in this regolith dominated region.

GISERA Regional Methane Emissions

Land-Cover Mapping NRM (Dept. of Ag.&W)

Northern Australia Resources Assessment

Sustainable Development Investment Portfolio
Australian government initiative with the goal of increasing water, food and energy security in South Asia, targeting the poorest and most vulnerable.The SDIP focusses on three major river basins: the Indus, Ganges and Brahmaputra.

Basin Futures
Model-data platform that brings together global and local datasets to support water planning in developing countries. The system is designed to leverage investment in existing data (global + local), and then use this to empower decision-makers to understand their opportunities and constraints in managing their water resources.

The Murray-Darling Basin (MDB) Environmental Water Knowledge and Research (EWKR): Waterbird Theme.
Improve the science available to support environmental water management, and thereby contribute to achieving Basin Plan objectives. The MDB EWKR Waterbird Theme is using satellites to track and analyse the breeding and foraging movements of waterbirds, and to map the locations and characteristics of nesting sites and foraging sites in order to provide advice for land and water management.

Waterbird movements and breeding success in the Macquarie Marshes, NSW 2016-2017
Using satellites to track and analyse the breeding and foraging movements of waterbirds, and to map the locations and characteristics of nesting sites and foraging sites in order to provide advice for land and water management.

Restoration of Paika Lake and Associated Wetlands - Floodplain Biomass and Biodiversity Responses to Managed Flooding
Facilitated restoration, management and protection of a large and biodiverse floodplain wetland system (Paika Lake and surrounding area). CSIRO used satellite data to assist with on-ground monitoring and mapping of sites and of floodplain ecological responses to managed environmental flows.

Ecohydrological Remote Sensing

- Accurately measuring mine-pit water evaporation for use in environmental compliance
- Monitoring cereal crop yields across all of Australia
- Real-time monitoring of root-zone moisture availability for Australia
- National Real-time Hourly Rainfall Analysis Ensemble Prediction System
- Enhanced CO2: How will vegetation and catchments respond?
- Resource monitoring with High-resolution / high-frequency imagery
- Spatial and temporal downscaling of long-term average actual evaporation

NESP North Australian Carbon Sequestration (2016- 2018)

Developing HCAS (a habitat condition assessment system)
Uses remote sensing of environment (land cover) and habitat condition training data to develop a model to inform National investment decisions and support monitoring, evaluation and reporting across jurisdictional scales.

Biodiversity and Ecological Integrity Indicators for a Baseline Assessment
Status and condition prior to commencement of the Biodiversity Conservation Act 2016.

Macroecological Modelling Projects Using TERN
Soil and Land grid derived products and TERN AusCover derived products and global land cover products:

- BASE GDM modelling component project
- DoEE GDM capability building and applications
- RECA GDM modelling
- Global GDM modelling and Science Leader

Harmful Algal Blooms Program (various projects)

TERN AusCover Program
Production and delivery of nationally consistent long-time series of satellite-/airborne-based land-surface biophysical map products and next generation remote sensing research data that is validated for Australian conditions.

<u>Geoscience Australia</u>

Digital Earth Australia Program

Geoscience Australia’s Digital Earth Australia (DEA) program will unlock the value of satellite Earth observations from space for Australia. DEA will deliver a unique capability to process, interrogate, and present Earth observation satellite data in response to the nation's most important

challenges. It will track changes across Australia in unprecedented detail, identifying soil and coastal erosion, crop growth, water quality, and changes to cities and regions.

It builds on the successful, international award winning, Australian Geoscience Data Cube prototype developed by Geoscience Australia in collaboration with CSIRO and the National Computational Infrastructure.

The Australian Government will invest $15.3 million in new funding in Budget 2017-2018 to establish the DEA over the next two years. This investment will be through the Department of Finance's Public Service Modernisation Fund.

Once operational DEA will deliver enduring data infrastructure, information products, and tools that will increase the efficiency and effectiveness in the development and delivery of other Australian Government programs reliant on monitoring environmental change as it happens. Economic benefits are expected to be realised from better targeted government investment, reduced burden on the recipients of government funding, and increased productivity.

The *2026 Spatial Industry Transformation and Growth Agenda* and the *Australian Earth Observation Community Plan 2026* provide a focus to drive growth that will transform the Australian spatial sector and location-dependent industries over the next decade. Both agenda and plan recognise Digital Earth Australia as a key part of the infrastructure needed to realise the full benefits of spatial information.

National Positioning Program

The National Positioning Program provides infrastructure, data, analysis and expertise utilised by government, industry, academia and the public to undertake location / positioning based activities. It supports Earth Science research, Earth Observation satellite programs, industry based positioning services and government land management and spatial data infrastructure.

The Program consists of two broad components:

- a National Geodesy program including the Global Navigation Satellite System ground networks, Satellite Laser Ranging observatories, Very Long Baseline Interferometry Array (AuScope) and the associated analysis activities.
- a Satellite-based Augmentation System Testbed.

Q2 *Can you provide me with a list of the programs the department has which provide support for space science research?*

Answer
As set out in the answer to question 1, all Commonwealth agencies use space derived information to inform their programs.

The Department of Industry, Innovation and Science does not have any programs which provide support for space science research.