UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Communicating geodesy

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 4, Session 1 [4_1_1]

Acknowledgements: Anne Jørgensen (UN-GGCE); Martine Woolf (AUS)

WHERE Session 1:
Making geodesy understandable and visible

Stronger. Together.

Talk to decision makers


Photo: Dag Høgvard

THE GLOBAL GEODETIC REFERENCE FRAME

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), established in 2011 by the Economic and Social Council (ECOSOC), recognizes the growing demand for more precise positioning services, the economic importance of the global geodetic reference frame, and the need to improve global cooperation within geodesy.

Geodesy provides a coordinate reference frame for the whole planet, fundamental for:

- *Monitoring changes to the Earth including the continents, ice caps, oceans and the atmosphere*
- *Mapping, navigation and universal timing*

This coordinate system allows us to know where people and features are on the Earth. "Location" is a vital component for effective decision making.


PHOTO: BJØRN-OWE HOLMBERG


PHOTO: ANNE JØRGENSEN


PHOTO: MORTEN BRUN

IMPORTANT APPLICATIONS ARE:

Natural hazard and disaster management

Decision makers need an accurate and stable global geodetic reference frame to make good decisions for the future and to identify areas under threat of flooding, earthquakes or drought and to adopt preventive measurements to protect them. Geodesy provides the location basis for such decisions.

Climate change and sea level monitoring

Climate change is a global challenge that puts stronger requirements on the precision of the global geodetic reference frame. Geodesy provides information about sea level changes, plate movements, land uplift, and ice sheet and glacier changes. Global society requires information about current trends at a scale measured in millimeters to detect changes of the Earth system with sufficient accuracy, for local, regional and global planning.

To be able to monitor and estimate future sea level variations, significant improvements in both geodetic infrastructure and data analysis are needed.

Geospatial information, mapping and navigation

'Location-based' services are becoming increasingly important in modern society.

The global geodetic reference frame supports satellite positioning technology and is a critical enabler of geospatial information interoperability and applications such as land titling and ownership, engineering construction, precision agriculture, intelligent transport and navigation.

UN-GGIM | United Nations Initiative on Global Geospatial Information Management ggim.un.org

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Talk to industry

Photo: Ryan Keenan

United Nations

United Nations Global Geodetic Centre of Excellence

POLICY BRIEF NO 001

Hidden Risk

How weaknesses in the global geodesy supply chain could have catastrophic impacts on critical infrastructure and national economies

INTRODUCTION

Modern society is dependent on satellites. In many countries, satellite information is essential for economic growth, the operation of critical infrastructure, and is a cornerstone of national defence forces.

In some cases, the dependence is so strong that countries have developed sovereign space systems. For example, several countries or regions, e.g., the European Union (EU), have their own Global Navigation Satellite System (GNSS) to provide Positioning, Navigation and Timing (PNT) services for civilian and defence applications including the Global Positioning System (GPS; USA), GLONASS (Russian Federation), Galileo (EU) and BeiDou (PRC). These countries recognize that a loss of PNT services, either due to technological failures or malicious activity, would have catastrophic and cascading effects for their economy and critical infrastructure. This reliance and need for control is not limited to GNSS satellites which provide PNT services, but extends to telecommunications satellites and Earth Observation (EO) satellites.

Observing the Earth

Satellites providing vital defence and civilian applications are reliant on constant updates about their 'place in space' (satellite orbit information) and the Earth's 'place in space' (shape, orientation, gravity field, and coordinate reference frame).

This Earth and satellite 'place in space' information are collectively known as geodetic products. Constant updates to the geodetic products are needed because the Earth and satellites are always moving. Without updates to geodetic products, satellite applications that society takes for granted, and all the benefits they provide would degrade or fail.

GLOBAL GEODESY SUPPLY CHAIN

The geodetic products are created through the global geodesy supply chain (Figure 1) which includes:

- ground observatories and scientists who constantly observe the movement of the Earth and satellites;
- data centres and data centre operators who quality check the data from observatories and make it available to the global geodesy analysis community; and,
- analysis centres, correlation centres and analysts who translate the raw data into geodetic products.

It is a *global* geodesy supply chain because the observatories and highly qualified people need to be distributed around the world to achieve the required accuracy and reliability of the geodetic products.

Recognizing the risk of a degrading supply chain, the United Nations General Assembly adopted resolution 69/266 in 2015, entitled 'A Global Geodetic Reference Frame for Sustainable Development'. The resolution encourages Member States to

Key Messages

- Society's dependence on satellite services for economic development, the operation of critical infrastructure, and defence applications is very high and growing at a rapid pace.
- Satellite services are at risk of degradation or failure due to the lack of resources provided to the global geodesy supply chain.
- For satellites to operate accurately and reliably, their 'place in space' and Earth's 'place in space' need to be observed and analyzed constantly. This information is provided through the global geodesy supply chain.
- The global geodesy supply chain is the collection of ground observing stations, data centres, analysis centres and highly qualified experts who observe the Earth and convert these observations into geodetic products which are essential to communicate accurately and reliably with satellites.
- Although the supply chain is a vital foundation of the space sector, it is relatively unknown and therefore under-resourced. Less than 0.05% of the revenue generated from GNSS and EO services are reinvested in the global geodesy supply chain.
- Member States and partners are forming a Joint Development Plan describing how they will work together to strengthen the supply chain to enhance the reliability and integrity of the geodetic products.
- Key activities for Member States include: strengthening national awareness and governance in geodesy, recognizing the global geodesy supply chain as national critical infrastructure and engaging in bilateral or multilateral agreements with other Member States.

Authors: Nicholas Brown and Sarah Kowal, United Nations Global Geodetic Centre of Excellence, UNDESA.

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Talk to the media

- Define goal and mission and takeaways of event
- What do you want your audience to think about after the event
- Prepare the message and agenda in detail
- Combine program with key note speakers (both internal and external) and out in the field (show – don't tell)
- Invite the national press
- Learn and practice key talking points / messaging (+ for media)
- Prepare for Q&As

SHOW – DON'T TELL-EVENTS: Events in the field: Excursion glacier change and geodetic research. Example from an event in Ny-Ålesund, Svalbard. Photo: Bjørn-Owe Holmberg

Events to mark a milestone

NY-ÅLESUND: Inauguration of Norway's Geodetic Earth Observatory.
Photo: Bjørn-Owe Holmberg

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Events to advocate for the decision you want

Photo: Anne Jørgensen

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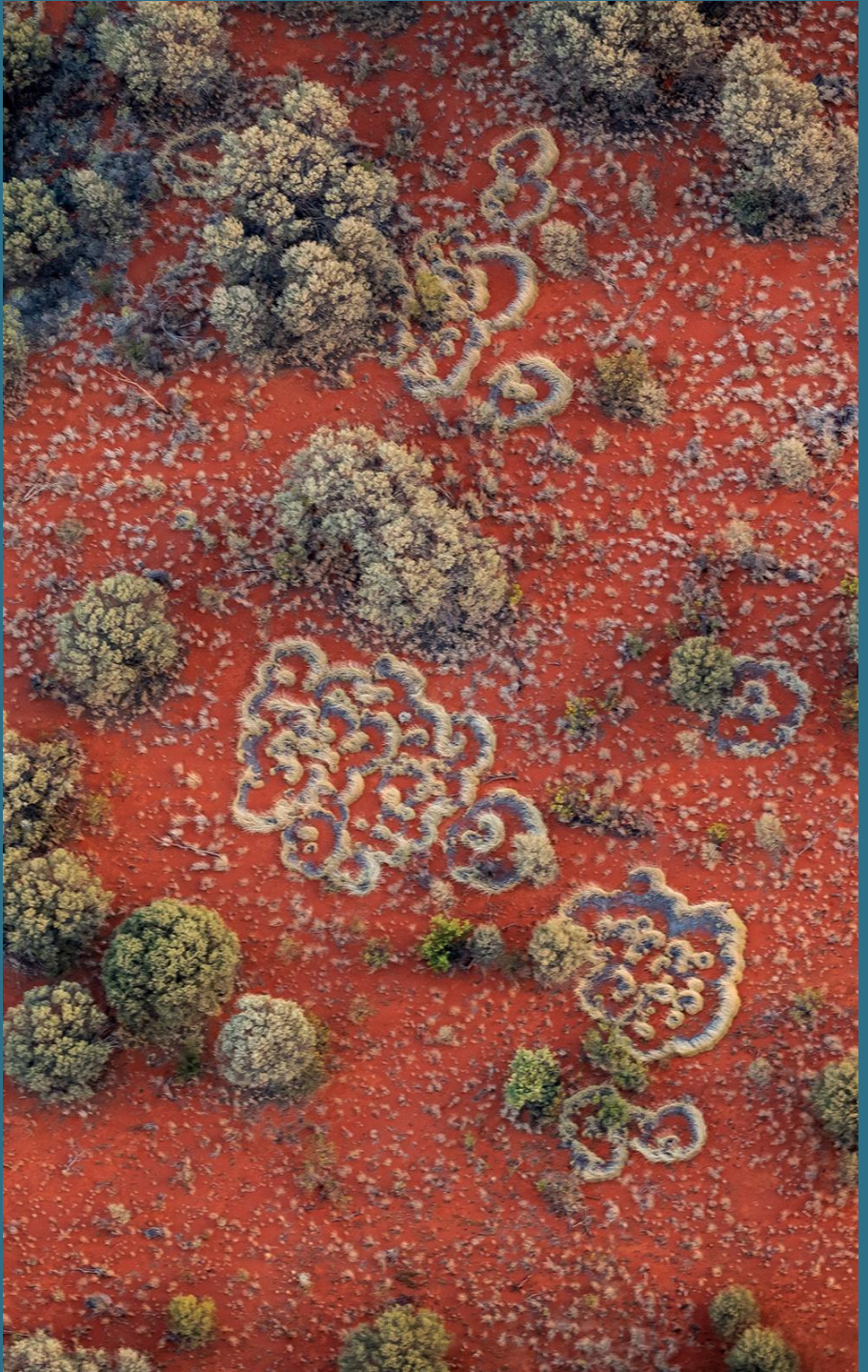


Australian Government
Geoscience Australia

Positioning Australia

Building the case for investment in geodesy in the Australian Government

Dr Martine Woolf, Branch Head Positioning Australia

Space Division, Geoscience Australia

Positioning Australia

Since 2018/19 Australian Government has invested additional funding (more than $84.6m p.a.) ongoing, to the geodesy supply chain through:

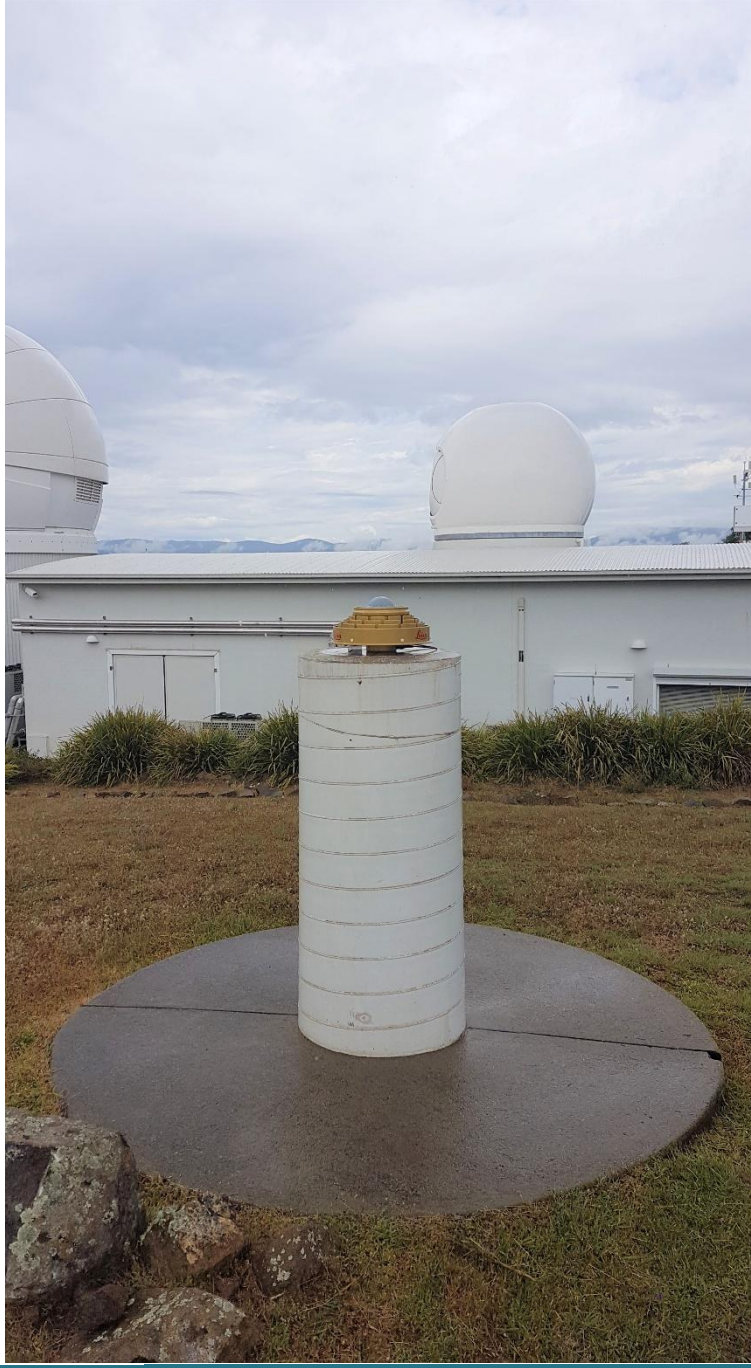
- ✓ Upgrade and expansion of a national-scale high quality GNSS Infrastructure, with over 700 stations across the country;
- ✓ Very Long Baseline Interferometry infrastructure and operations;
- ✓ Satellite Laser Ranging infrastructure and operations;
- ✓ Development of an innovative multi-GNSS analytical capability;
- ✓ Operational data facilities, delivering FAIR geodesy data

How was the business case made?

PARK00AUS – Parkes, New South Wales

Business case

- ✓ Simple, consistent narrative, no jargon
- ✓ Stated in terms of strategic impacts:
  - ✓ Politically strategic: thinking outside our box
  - ✓ Find the baubles
  - ✓ Spoke to domestic stakeholders
- ✓ Built evidence-base
- ✓ Return On Investment
- ✓ Built stakeholder support across governments, industry, academia
- ✓ Who does what?
  - ✓ Academic vs government funding
  - ✓ Industry partnerships
  - ✓ Working governance structures & networks
- ✓ Keeping time: Slow, slow, quick-quick slow…



STR200AUS – Mount Stromlo, Australian Capital Territory

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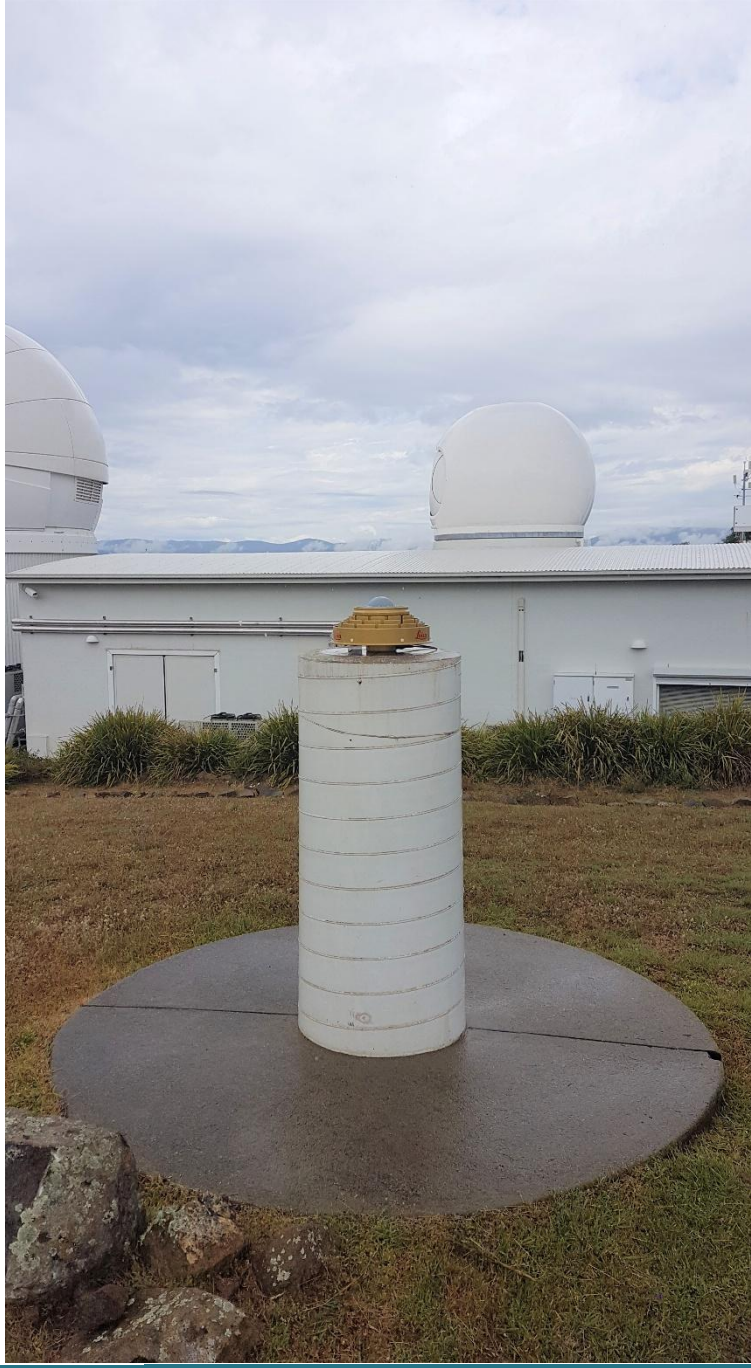

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Australian Government
Geoscience Australia

Positioning Australia

Accurate and reliable positioning for everyone

The allocation of **$83.6 million p.a. ongoing funding** to Geoscience Australia to establish a world-class satellite positioning capability.

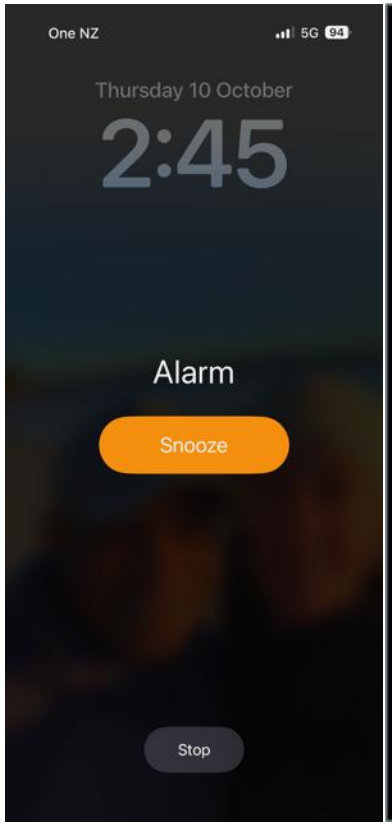
1. Better GPS for regional Australia

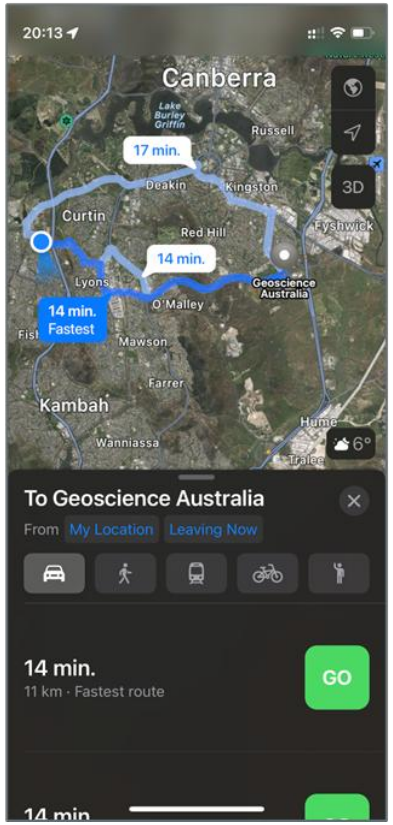
- as little as 10 cm accurate positioning service across Australia
- high integrity for safety-of-life applications

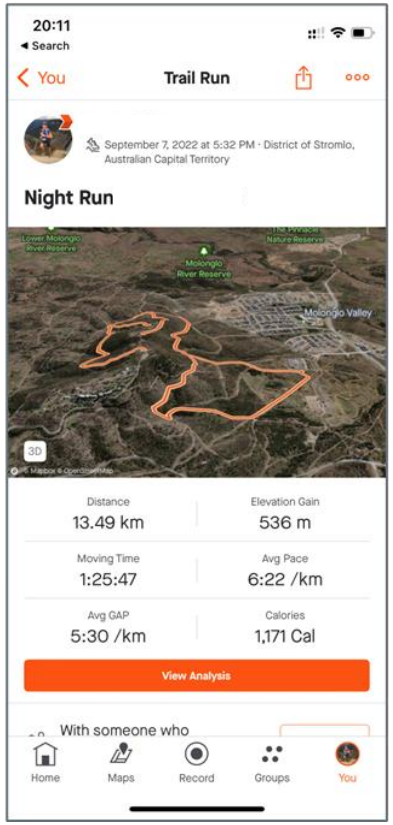
2. Better GPS to support Australian businesses

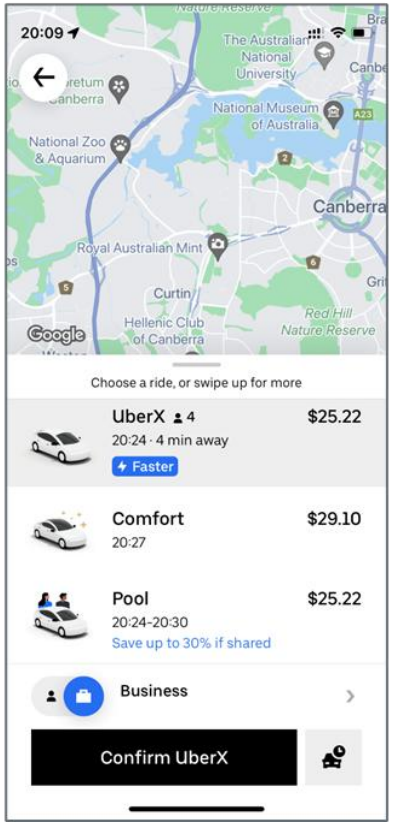
- a 3-5 cm accurate positioning capability in areas with mobile coverage
- open-source tools and software to deliver positioning services

How have you used positioning, navigation and timing today?









PNT in the city:

- ✓ Electricity networks
- ✓ Banking system

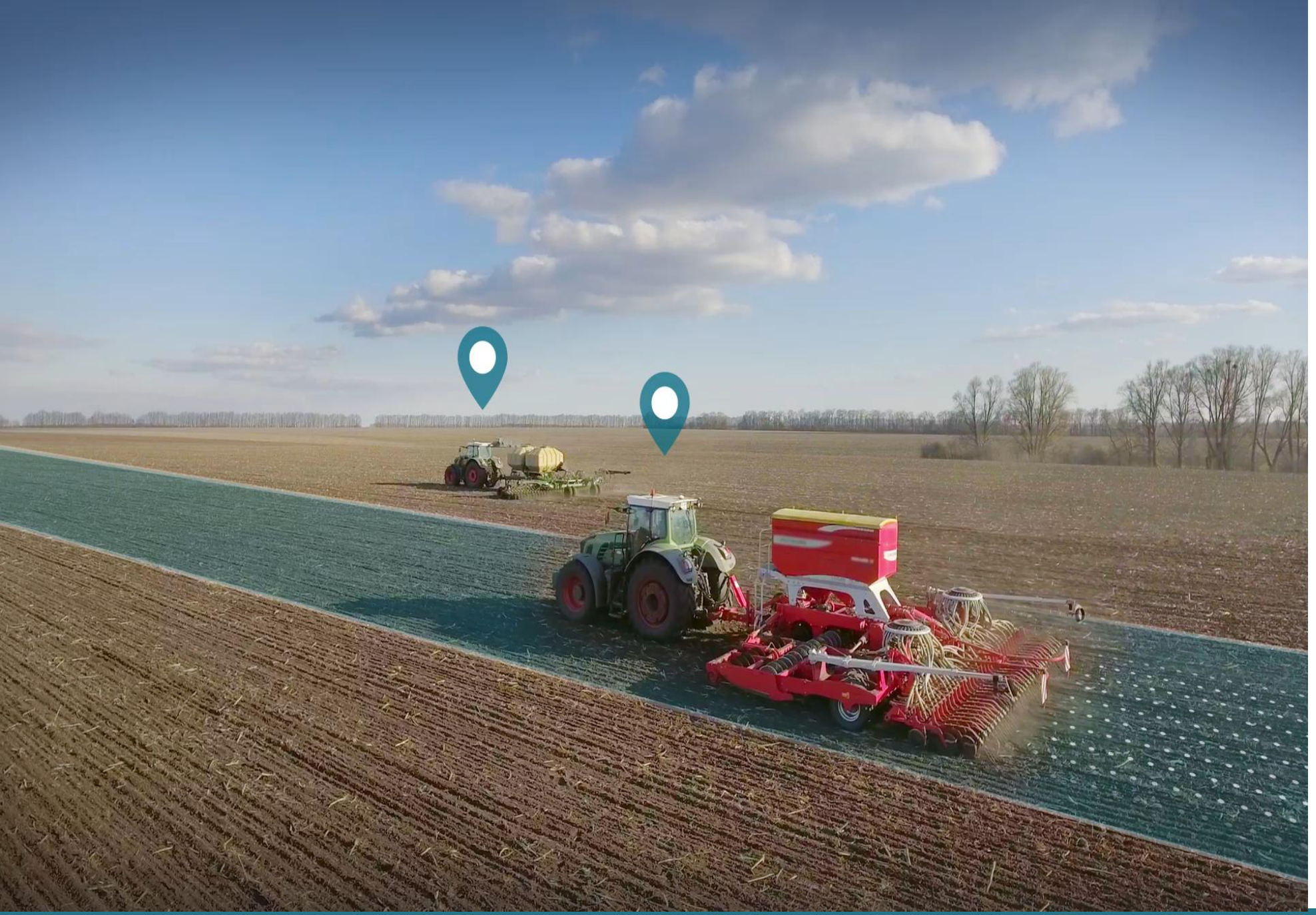
- ✓ Intelligent transport
- ✓ Traffic lights
- ✓ Toll roads

- ✓ Supermarket logistics
- ✓ Just in time supply chains
- ✓ Parcel delivery

- ✓ Cadastral systems
- ✓ Building and construction
- ✓ Dial-before-you-dig

- ✓ Uber and taxi
- ✓ Aviation
- ✓ Electric scooters

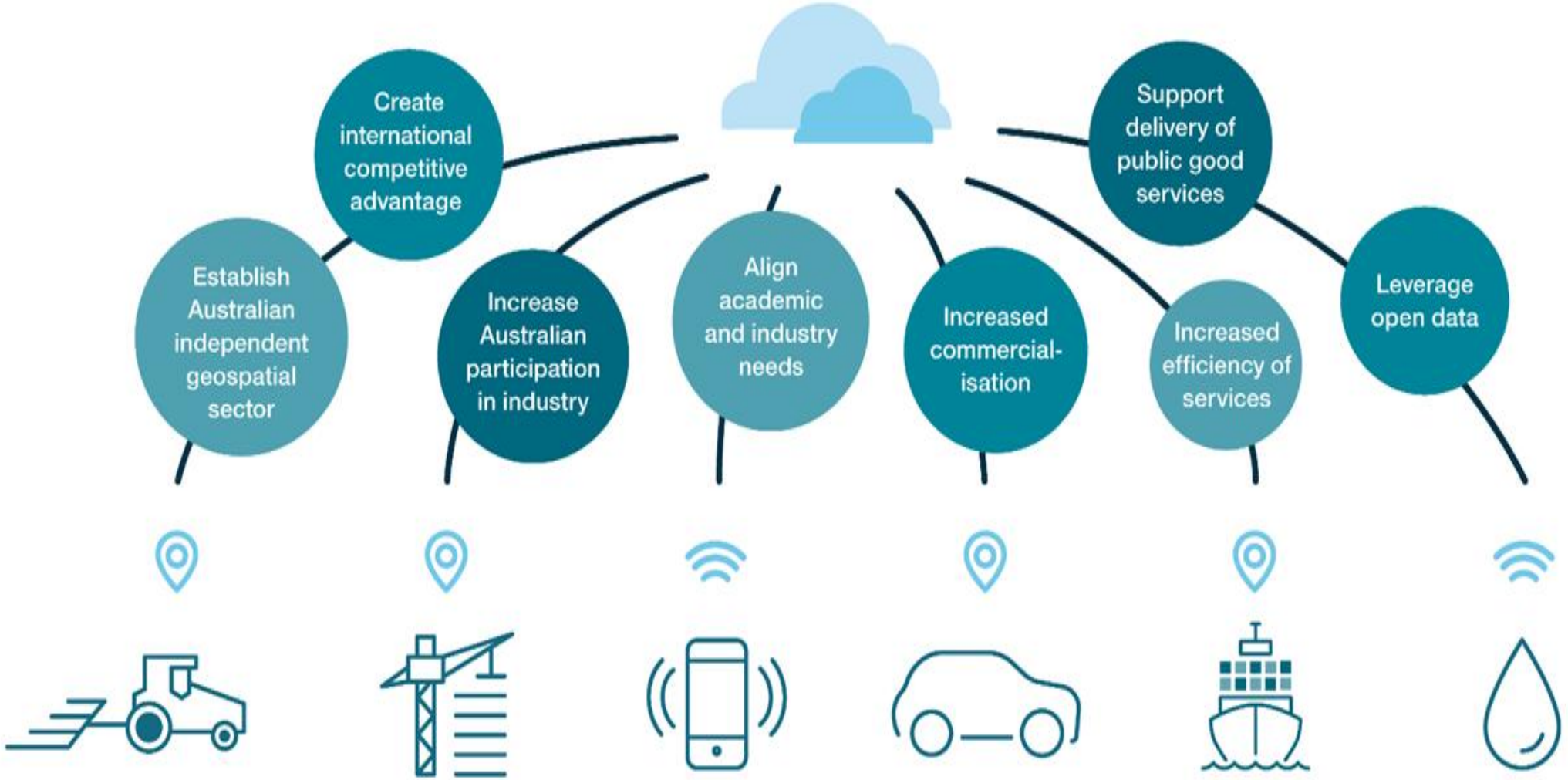
- ✓ Internet of Things



Agriculture Sector:

- ✓ Precision agriculture
- ✓ Precision water and nutrient spraying
- ✓ Automated strip grazing and virtual fencing
- ✓ Livestock monitoring
- ✓ Inter-row seeding
- ✓ Environmental and disease hazard monitoring and relocation
- ✓ Enhanced yield mapping
- ✓ Controlled traffic farming

Positioning Australia



Mastering Innovation NT –

National Positioning Infrastructure Capability

September 4, 2018 @ 11:00 am - 12:30 pm ACST

National Positioning Infrastructure Capability – World-leading positioning for Australia

The Australian Government announced an investment towards developing a world-leading satellite positioning capability for Australia. Funding will support the development of an Australian Satellite-Based Augmentation System (SBAS) to upgrading Australia's ground Global Navigation Satellite (GNSS) network. The funding will also improve coordination across government and the private sector and ensure Australian industry has access to world-leading software tools for positioning.

hoto by Mike Fizer.

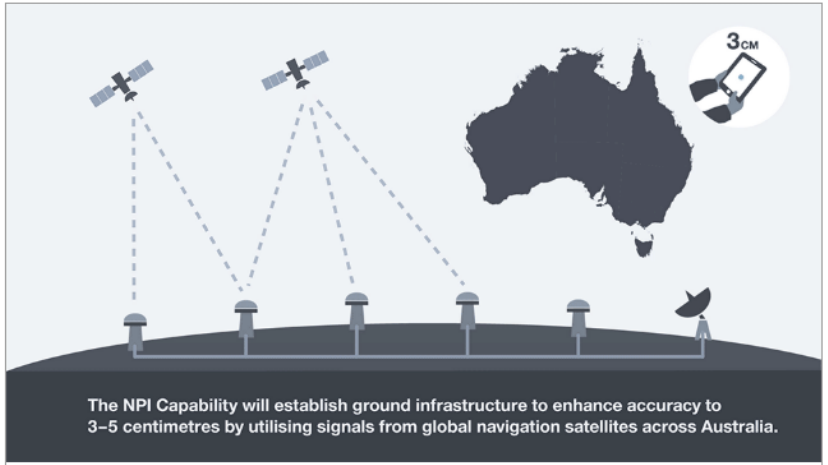
BAS is analogous to the Wide Area Augmentation System (WAAS) in the United States, and the lack of it utside major airports has left Australia and New Zealand "well behind" comparable countries, according t ne GA advocate.

To remedy that trend, the aircraft owner and pilot associations of

Minister for Resources and Northern Australia, Senator Matt Canavan, said the government is investing more than $260 million to develop the satellite technology.

"We rely on satellite and GPS technology for just about every aspect of our lives — from Google Maps on our individual phones, through to air traffic control at the busiest airports," Canavan said. "More precise technology will make Australian businesses more productive, safer and more efficient.

Specifically, Canavan said, "More accurate GPS will improve productivity by allowing new technology to be created and used across the economy. Growing Australia's digital economy will also benefit developed sectors such as mining, transport, construction, aviation and agriculture. "This investment will improve competitiveness and secure jobs across the Australian economy."



(Image: © Commonwealth of Australia (Geoscience Australia) 2018)

Economic Benefits

$6.2BN

Benefits from SouthPAN positioning Services over 30 years.

Accessibile city navigation: enable assitive technologies

for the visually impaired, reducing the risks of incidents associated with trips, falls and collsions

Decrease of network delays by 29% and $36 million savings

through SBAS enabled C-ITS

Livestock monitoring: save $100 per dairy cow

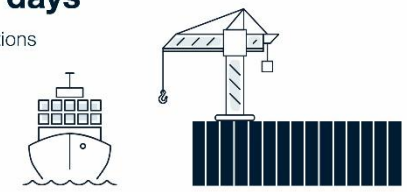
every year with virtual fencing and 6 million sellable Australian sheep valued at $80 million

Increase of 1866 successfully completed

medical helicopter rescue missions in remote locations

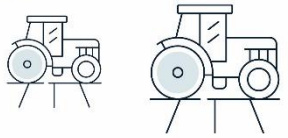
Increased vessel capacity of 1375 days

for port operations



Precision agriculture

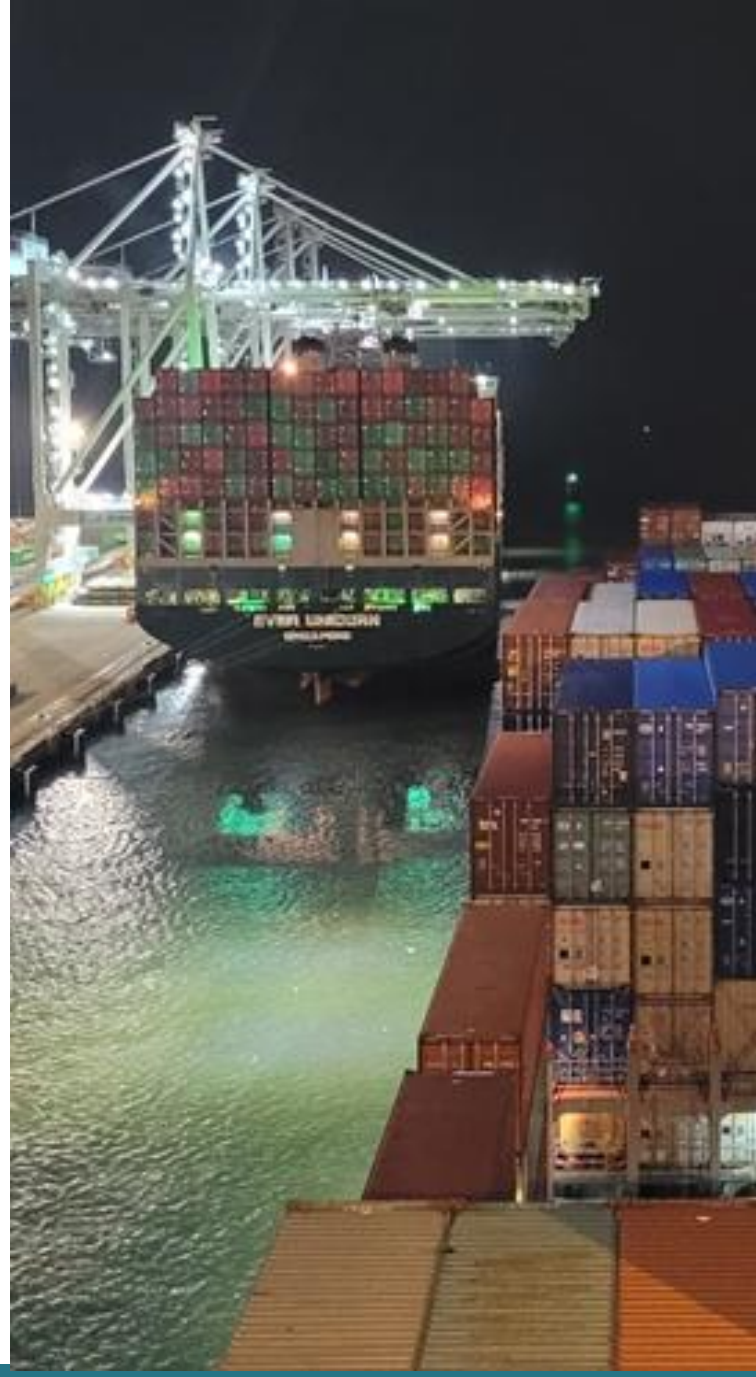
Improve the efficient spraying of nutrients, chemicals and water by 1-7%



Sea Pilots

- ✓ Reliable, highly accurate navigation information with integrity for Port Philip operations to increase safety and efficiency of port activities.
- ✓ Improve situational awareness, aid decision-making and provide recordings for training and investigation purposes
- ✓ SouthPAN offers Precise Point Positioning services, providing reliably high accuracy. Operations efficiency improvements, Open Services provides cost effectiveness for maritime port operations throughout Australia.

PORT PHILLIP SEA PILOTS



Who is using National Positioning Infrastructure Capability?

Direct Subscribers

+6500

Research and Development

20%

Agriculture

20%

Mining

9%

Geospatial and Surveying

40%

Construction

20%

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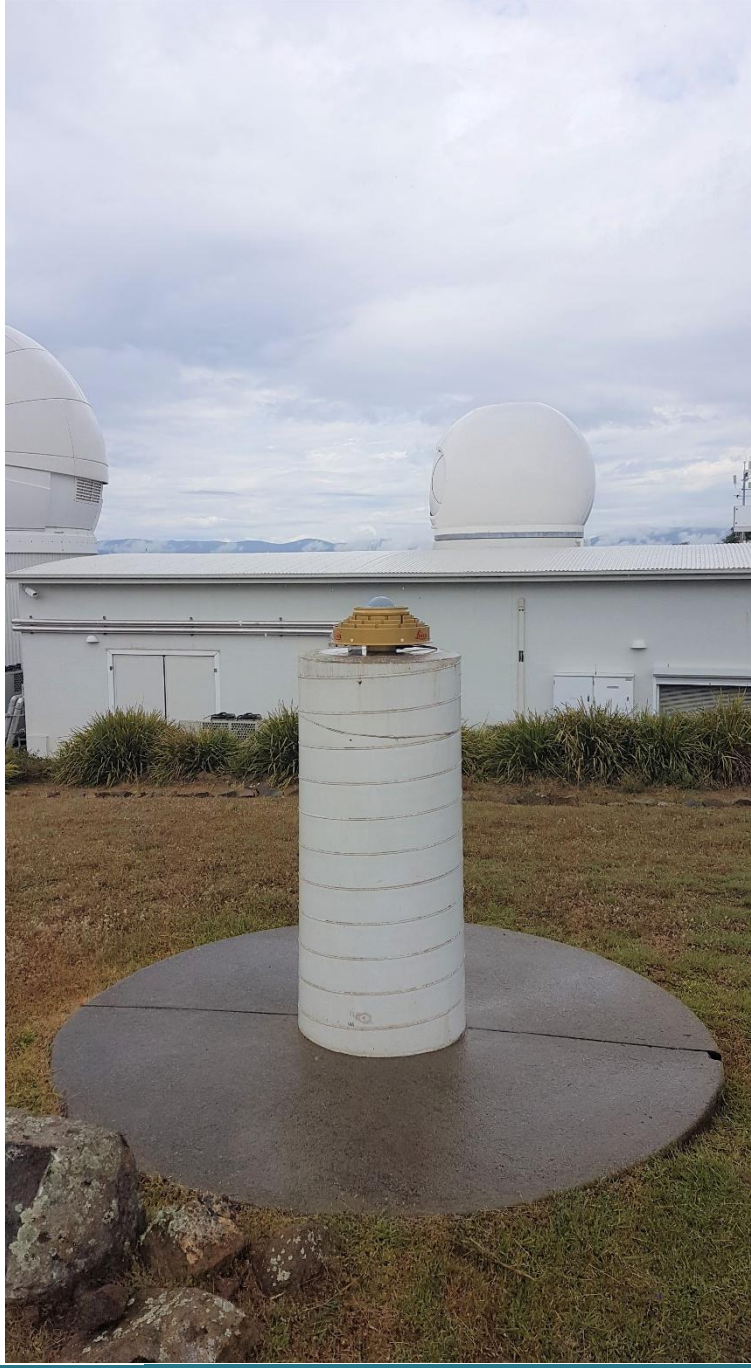
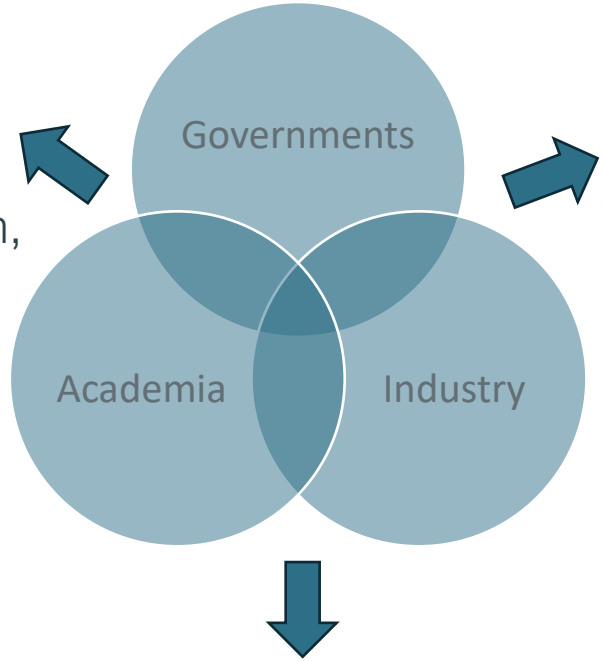


STR200AUS – Mount Stromlo, Australian Capital Territory

Mobilising Stakeholders

GNSS infrastructure
Other geodetic infrastructure
Global Geodetic Observing System, ITRF



Positioning services
Geospatial services

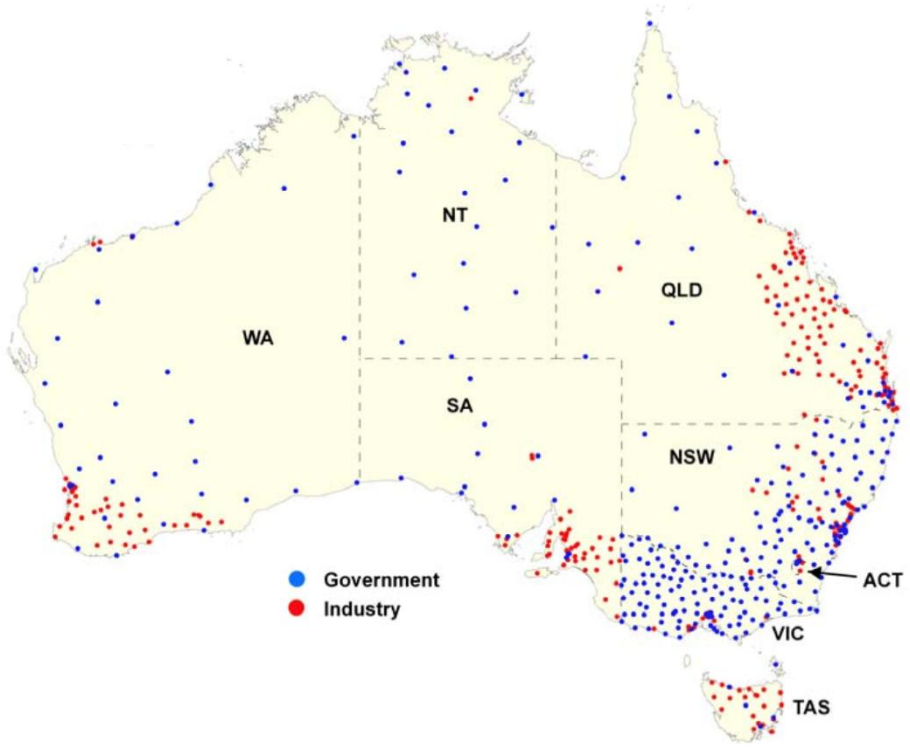
Innovation, technology & standards

Government stakeholders

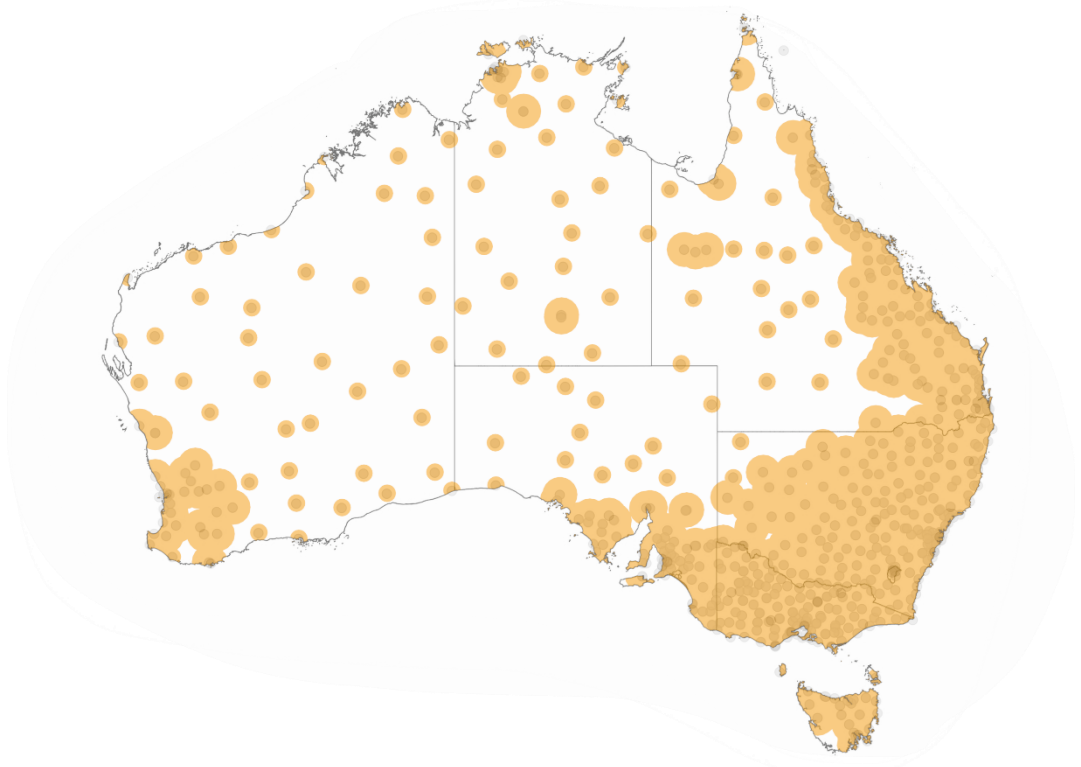
PNT Working Group

ANZLIC
The Intergovernmental Committee on Surveying and Mapping (ICSM)

Bringing stakeholders together: challenges and opportunities



Before NPIC* (2014)



NPIC (2024)

Before NPIC map is courtesy of Hausler, G. 2014. "National Positioning Infrastructure: Technical, Institutional and Economic Criteria for Coordinating Access to Australia's GNSS CORS Infrastructure." PhD thesis, University of Melbourne.

Value of National Positioning Infrastructure Capability

A **unified** approach to the management of the nation's positioning infrastructure to ensure **consistent**, **fit-for-purpose** data.

- ✓ **Underpins Australia's geospatial fabric**
  - define and deliver the national datum
- ✓ **Supports research and encourages innovation**
  - free and open data, products and services
- ✓ **A platform for Australian business**
  - strengthening the positioning sector in Australia

COCO00AUS – Cocos Islands, Western Australia

Slow, slow, quick-quick, slow

- 2006 AuScope (academic) $16m to uplift & expand Australia's geodetic infrastructure

- 2012
  - National Positioning Infrastructure Plan '*Instantaneous, reliable and fit for purpose positioning and timing services anywhere, anytime across the Australian landscape and its maritime jurisdictions'*
  - ANZLIC National Positioning Infrastructure policy *'..underpins the referencing and application of the majority of spatial data'*
  - National Satellite Utilisation Policy
- 2014 NPI in ICSM roadmap
- 2016 $12m funding Test Bed
- 2017-2020 Test Bed operational
- 2018 *Better GPS for Industry* policy
- 2023 Additional funding under Landsat policy

Media relations

Stronger. Together.

Make the media come to your events

- Learn how the media works
- Invite journalist exclusively or open invitation – exclusive and targeted better payoff
- Offer good interview situations and sources

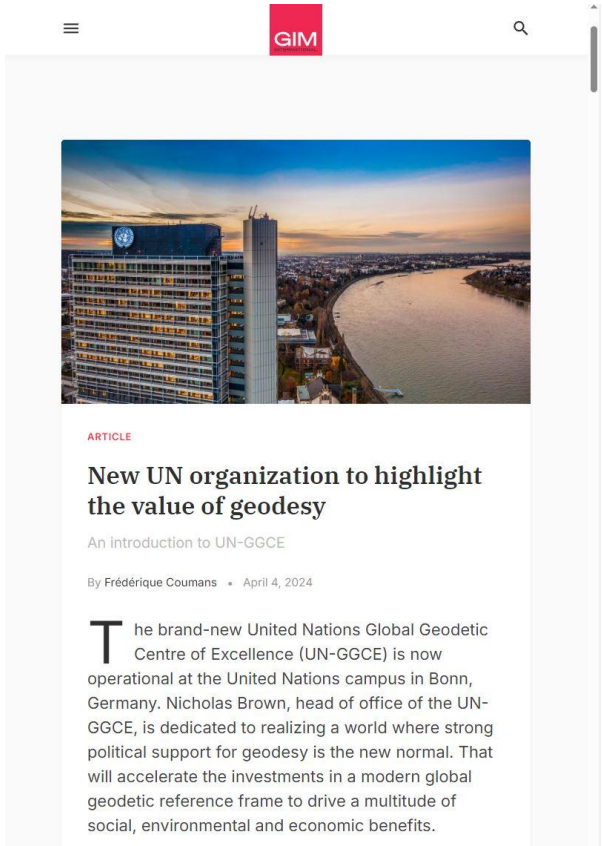
Photo: Bjørn-Owe Holmberg

The interview situation

Good advice:

- Be yourself
- Speak the truth
- Be prepared
- “Kill your darlings”
- Ask for review of your quotes before print or broadcast
- Take pauses
- Speak clearly, use short sentences
- Look at the journalist
- Practice in the mirror

Understand the news criteria: What makes something newsworthy?



- Conflict
- Impact
- Proximity
- Sensational
- Currency

Video interviews

- Work in groups of 2.
- Prepare an elevator pitch
- ***Why should your country modernise the national geospatial reference system?***
- Record on video, message for a journalist or your government officials in maximum 30 seconds!