

# Data and Digital

**Goal: To provide our customers and colleagues an outstanding experience all day, every day.**

The Data and Digital Group (DDG) is responsible for the Bureau's data, observation and information technology that underpins the Bureau's core operations through to production and dissemination to customers. The group's focus is to efficiently manage service-focused, secure, resilient and adaptive information and observations technology portfolios that leverage emerging technologies and data, enabling the Bureau to deliver personalised services and products.

For 2022–23 the group consisted of 6 programs with the following responsibilities:

Program	Responsibilities
<b>Planning and Architecture</b>	<ul style="list-style-type: none"> <li>• Technology policies and standards</li> <li>• DDG planning uplift</li> <li>• Demand and pipeline management</li> <li>• Enterprise architecture</li> </ul>
<b>Observing Systems and Operations</b>	<ul style="list-style-type: none"> <li>• Operation of the observing network</li> <li>• Observations planning and delivery</li> <li>• Maintenance and sustainment of the network</li> </ul>
<b>Data</b>	<ul style="list-style-type: none"> <li>• Data governance, advice and standards</li> <li>• Data management specialised services</li> <li>• Data requirements and quality</li> <li>• Managing data partnerships</li> <li>• Data services</li> </ul>
<b>Digital Channels and Customer Experience Design</b>	<ul style="list-style-type: none"> <li>• Customer research and user experience design</li> <li>• User design and prototyping</li> <li>• Digital channel development and operations</li> <li>• Digital customer analytics</li> <li>• Digital planning</li> </ul>
<b>Application Services</b>	<ul style="list-style-type: none"> <li>• Delivery of ICT applications and platforms</li> <li>• Digital workplace services</li> <li>• Testing and quality assurance</li> </ul>
<b>Service and Infrastructure Management</b>	<ul style="list-style-type: none"> <li>• Reliable and secure ICT operations</li> <li>• High-performance computing</li> <li>• ICT support services</li> <li>• Cyber operations</li> </ul>

Throughout 2022–23, the Data and Digital Group focused on delivering 4 outcomes that support the achievement of the Bureau’s Strategy and purpose. The group’s achievement in delivering each of these outcomes is discussed below.

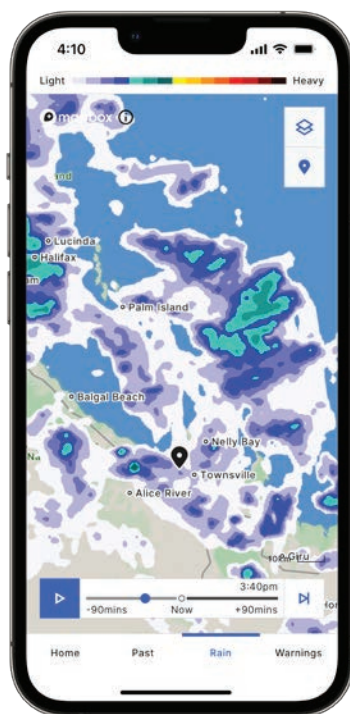
**Outcome 1: Strengthen our customer focus to maximise the Bureau’s Information Technology (IT), Observations Technology (OT) and Data capabilities to meet the needs of Bureau customers both now and into the future in collaboration with our colleagues who engage with customers.**

## Achieving the outcome

### Using customer insights to drive service improvements

The Bureau is committed to improving digital channels to continue to meet customer needs. The Bureau implemented an improved customer analytics tool that helps collect, analyse and develop insights to enhance and improve customer experience. The feedback helped deliver enhanced customer features on the BOM Weather app, such as warning notifications and 90-minute rain radar forecasting.

In June 2023, the Bureau’s website and BOM Weather app received 106 million visits, equivalent to 2,445 visits starting every minute. The Bureau’s website continues to be Australia’s most popular and reliable source of weather, water, climate, ocean and space weather services. The Bureau continued to progress development of its new website to improve security and resilience to meet the needs of the Australian community.



The BOM Weather app delivers critical features such as 90-minute forecasted rain radar.

## Improving the Bureau’s data and information management maturity

Under the Australian Government’s Building Trust in the Public Record Policy (Building Trust Policy), agencies are required to self-assess their data and information management maturity and performance using an assessment survey developed by the National Archives of Australia (NAA).

The Bureau’s latest benchmarked results for the Check-up Plus survey show a steady improvement in maturity, from 3.3 in 2020 when the survey was last completed, to 3.6 during 2022.

During the year, the Bureau created a new position – a Chief Statistician – in response to a recommendation of the Bureau’s Data Integrity, Advisory and Assurance Committee. This is an external committee of independent experts providing advice and assurance to the Bureau on matters including metrology, observational processes, data collection, data management, policy, governance, data analysis, quality control, quality assurance and communication. The Chief Statistician will complement the Committee’s expertise in understanding of measurement uncertainty, through closer alignment of statistical and metrological (measurement science) approaches.

## Highlights and significant events

### Delivering live, local weather to over 10 million Australian devices

In 2022–23 the BOM Weather app achieved the significant milestone of 10 million downloads since release in 2020. Customer satisfaction has significantly increased from 61% (June 2022) to 86.4% (June 2023). The app currently ranks number one in Australia for free weather app usage in both the Apple and Google Play stores.

Key features delivered during 2022–23 include an enhanced radar mapping experience, with up to 90 minutes of forecast rain activity now visible in the animated Rain screen. An Apple iOS widget was released, allowing users to get the day’s weather highlights at a glance, in addition to a number of safety features, including updated fire danger ratings, the addition of heatwave and marine wind warnings, and the ability for users to receive warning notifications for up to 3 locations.

The growing suite of safety features help users to make informed decisions when it matters most.



The Bureau shared its success with social media users.

## Next steps

Key activities to be delivered in 2023–24 to help achieve Outcome 1 include:

- implementing key priorities of the Digital Channel Roadmap focused on enhancing BOM Weather app features
- completing the public beta testing phase of the new Bureau website
- implementing the data maturity uplift roadmap.

## Outcome 2: Information Technology (IT) and Observations Technology (OT) operations delivering resilient and secure services all day, every day.

### Achieving the outcome

#### Delivering an Enterprise Integration Platform

The Bureau's new Enterprise Integration Platform (EIP) went live within a secure network environment in November, providing the Bureau with a modern data exchange platform that will be used to share information with customers, partners, and internal Bureau applications in a more secure and resilient way.

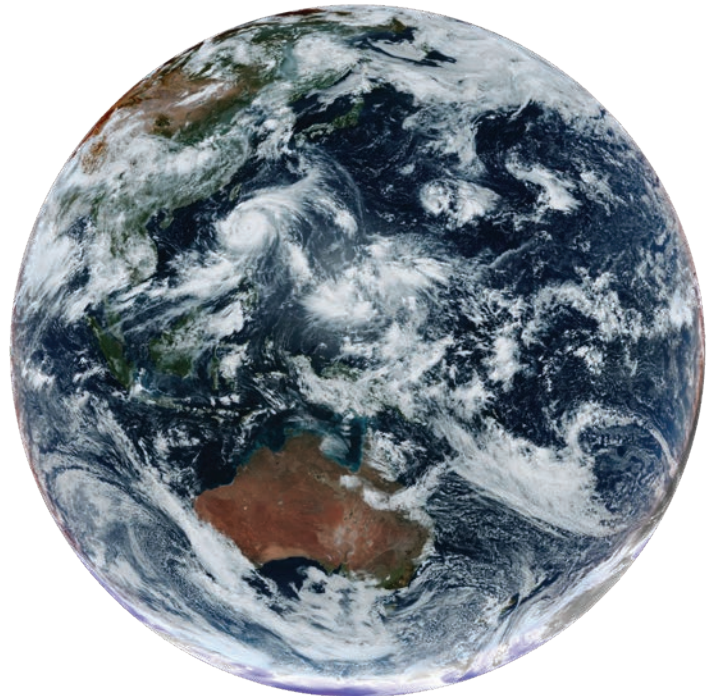
Interfaces to the European Centre for Medium-Range Weather Forecasts (ECMWF), MetService New Zealand and the Fiji Meteorological Service were commissioned and made operational on the EIP. Services required to connect to over 20 partner national meteorological and hydrological agencies – including the UK Met Office and the US National Oceanic and Atmospheric Administration – were also delivered.

#### Collaborating with Japan on Earth observations from space

The National Space Mission for Earth Observation (NSMEO) was established in 2022 to address Australia's civilian satellite data supply risks and gaps by enabling Australia to develop and have control over its own Earth observation satellites. This program concluded in June 2023.

A key outcome of the program is the commitment by the Australian Government to collaborate with Japan on the next Himawari satellite which will be launched in 2029. Prime Minister Anthony Albanese and Prime Minister of Japan, Fumio Kishida made the announcement at the Japan–Australia annual leaders' meeting on 22 October 2022.

This partnership will enhance Australia's extreme weather and multi-hazard monitoring capability and deepen the Bureau and Japan Meteorological Agency's decades-long relationship and cooperation in the use of geostationary meteorological satellites.



Himawari-9 full disk, true colour image from the 2023/07/25 03:00 UTC observation, with tropical cyclone Doksuri to the north of the Philippines.

## Developing a data centre for the future

Development of the Bureau's Future Data Centre (FDC) commenced in September with the new centre to provide updated, non-production and Disaster Recovery (DR) capability to enhance the future security and resilience of the Bureau's services to its customers.

The FDC Establishment Project was mobilised as part of the Data Centre Consolidation Program to manage the relocation of target infrastructure into FDC. The new data centre design and fit out to house the new DR High Performance Computer (HPC) was completed in March.

## Establishing a mobile radar capability

Following the successful deployment of a mobile X-band radar as part of a research project by Monash University and the Bureau in 2021–22, establishment of an ongoing Bureau mobile radar capability commenced in 2022–23. An X-band radar was procured to be used as a prototype system, enabling the Bureau to identify and resolve issues related to mobility, manoeuvrability, durability, storage, road safety, siting, electrical power and sustained operations. The lessons learned will significantly contribute to improving mobile radar product development, and deployment during severe weather events.

## Upgrading radars across Australia to improve quality and reliability

During 2022–23, new radars were installed to replace existing radars at Serpentine in Western Australia and at Gove in the Northern Territory. A temporary radar was installed at Brisbane airport while the Marburg radar was offline undergoing an upgrade. Work to replace the radar at Mackay in Queensland has commenced with the radar to be offline from June – December 2023.

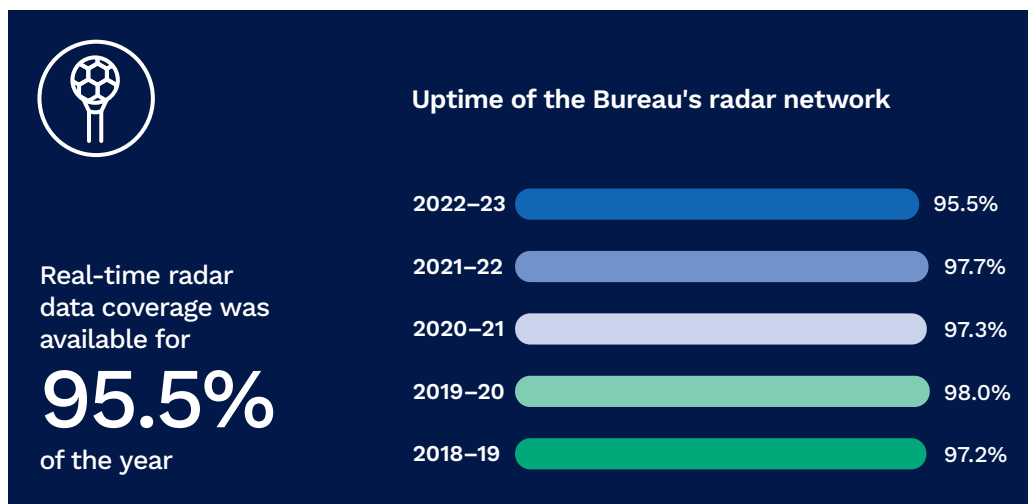
Older model radars at Warruwi and Berrimah in the Northern Territory, Cairns and Willis Island in Queensland and Mount Koonya in Tasmania were offline for approximately 8 weeks each while undergoing an upgrade. These upgraded radar systems will improve the tracking of winds, quality of rainfall images and predictions for severe storms, and will improve radar reliability and resilience.



Dome scaffolding at Serpentine (left) and completed Serpentine dome (right).

In addition to upgrades, the Bureau further expanded its radar network with the delivery of the Richmond (Flinders Catchment) radar in Queensland in September.

Works to improve radar reliability in the long term impacted network availability over 2022–23 compared to previous years, with 60% of radar downtime due to planned outages, including upgrades (40%) and planned maintenance (20%), and 40% due to faults. However, overall radar availability remained above the target level of 95% for the network.



### Automating ozone observations

In August and March, Brewer spectrophotometers were installed to replace the Dobson spectrophotometers at Darwin and Perth airports respectively. These installations completed the rollout of this technology and automation of the network. Instruments already installed at Brisbane and Melbourne airports and Macquarie Island are improving the operational efficiency of the network.



Calibration of Brewer spectrophotometers at the Bureau of Meteorology Training Centre in Broadmeadows, Victoria prior to deployment using the reference instrument from International Ozone Services in Canada (the small instrument on top of the Brewer on the left).

The Brewer is a fully automated alternative to the manual Dobson, both of which measure 'total column ozone'. The Bureau's first Dobson was ordered as long ago as 1936 and Dobsons have formed the backbone of the long-term ozone record maintained by the Bureau, to fulfil Australia's commitments under the Vienna Convention for the Protection of the Ozone Layer (1985), to which Australia is a signatory.

The Brewers will be run side-by-side with the Dobson for an extended period, enabling a careful comparison of the difference between ozone measurements from the 2 instruments.

## Testing weather station capabilities

The Bureau's automatic weather stations (AWS) need to operate effectively in a broad range of climates – from the tropical north to Antarctica – and withstand extreme weather conditions. To assess their capabilities, the Bureau tested 39 ALMOS AWS data acquisition cards over an environmental temperature range from -30 °C to +60 °C and completed initial acceptance testing for future AWS equipment.

The design of a comprehensive parallel observations field test setup for new AWS has been completed. Prototype testing of the additional sensors commenced and the first test sites at Darwin and Cape Grim have been installed and are operational.

## Deploying new field reference equipment to verify temperature and humidity observations

Weather observations form an important part of Australia's climate record, providing information for current and future generations. As such, there needs to be confidence that measurements are accurate, and the information is reliable. To ensure the veracity of its temperature and humidity observations, the Bureau deployed new temperature and humidity observations field reference equipment, processes and training to all Observing Operations Hubs replacing the obsolete DOSTMANN fleet for AWS verifications. This completed Recommendation A1 of the 2011 Australian Climate Observations Reference Network – Surface Air Temperature (ACORN-SAT) dataset Independent Peer Review. The new equipment ensures the temperature probes are accurate to  $\pm 0.2$  °C.

## Continuously improving the Bureau's physical security across Australia

The Bureau further improved the physical security of its observing sites around Australia building on the Access Control System (electromechanical locking system) implemented in 2021–22. Works this year have included implementation of additional physical security measures at field station buildings and installation of new security fencing around observing instrumentation. Implementation of a CCTV monitoring solution at prioritised sites has commenced, enabling detection of unauthorised access to Bureau facilities and providing the Bureau with more options to monitor and manage site access.

## Improving our meteorological balloon launching capability

To improve its meteorological balloon launching capability in 2022–23, the Bureau implemented 4 new automatic meteorological balloon launching systems (AMBLS) at existing sites to provide improved operational service, increased reliability and efficient remote support options.

New AMBLS were implemented in Lord Howe Island, at Ceduna in South Australia, Cocos Islands and at Port Headland in Western Australia. The replacement AMBLS have an increased capacity allowing for the efficient release of a greater number of balloons, making a significant contribution to the sustainability of the Bureau's upper air program. The new systems also present a simplified maintenance regime and are fully supported by the system vendor.



The new AMBLS at Lord Howe Island.

## Piloting new space weather ionosondes

Data from the ionosonde network is critical to the Bureau's space weather capability, providing space weather forecasts, alerts and warnings to customers. Following on from the new ionosonde proof of concept in 2021–22, the pilot site for the new ionosonde equipment was completed at Townsville in August 2022, followed by new ionosondes at Perth in March 2023 and Casey in June 2023.

## Achieving certification of operational technology and engineering functions

In November, the Bureau's Operational Technology and Engineering (OTE) team was successful in achieving certification of its Quality Management System (QMS) in compliance with the internationally recognised ISO 9001:2015 Quality Management Standard. The QMS ensures efficient and effective delivery of products and services, while meeting the needs of customers.

A particular highlight was OTE's comprehensive technical authority framework, which enables the recognition of staff qualifications, experience and skills. It is used to define and empower engineering and technical actions and decisions and ensures that only competent and appropriate staff make critical technical decisions that impact Bureau-managed equipment and the related services to customers.

Under the International Organisation for Standardization (ISO) and the International Electrotechnical Commission (IEC), the Bureau also conducted over 420 accredited temperature instrument calibrations and more than 120 accredited barometer calibrations, ensuring the Bureau can provide trusted observations all day, every day.



## Highlights and significant events

### Celebrating Centennial Stations

In June, five long-term observing stations located across Australia were recognised by the World Meteorological Organization (WMO) for providing valuable weather, hydrological and climate observations for over a century.

Four of those recognised were meteorological observing stations at Adelaide (West Terrace/ Ngayirdapira) in South Australia, Low Head in Tasmania, Marble Bar in Western Australia and Palmerville in Queensland. The fifth was a marine station at Fort Denison in New South Wales.

West Terrace/Ngayirdapira has been recognised as Australia's earliest observing station, operating since 1839. Fort Denison is the first Marine Centennial Observing Station recognised in Australia, and one of only 10 world-wide. It has been recording sea level and tidal patterns since 1914.



**Louise Wicks, International Relations Manager, accepting Australia's certificates from WMO President Professor Gerhard Adrian in a ceremony during the 19th World Meteorological Congress (Image courtesy of the World Meteorological Organization).**

### Next steps

Key activities to be delivered in 2023–24 to help achieve Outcome 2 include:

- completing the Data Centre Consolidation Program including implementing the new IT DR Framework and Policy
- continuing the uplift in lifecycle asset management
- improving operational asset management with the rollout of the enterprise asset management (EAMS) Mobility App for field staff
- continuing the implementation of the Australian Capital City Airport project
- completing the Observing System Strategy and automation of field stations with installation of AMBLS at Gove and Alice Springs.

## Outcome 3: Cultivate our partner ecosystem to optimise resource utilisation for Information and Observations Technology delivery.

### Achieving the outcome

#### Establishing a vendor partnership capability

The Bureau is engaged with a significant number of third parties to build and deliver the technology services required to support the delivery of essential products and services to its customers. During 2022–23, the Bureau established a vendor partnership capability and supporting vendor frameworks to ensure compliance with our obligations and to achieve efficiencies in service delivery, sourcing and value for money arrangements.

#### Calibrating instruments for international consistency of weather observations

As part of its responsibility as a WMO Regional Instrument Centre and Regional Radiation Centre, the Bureau has calibrated 4 instruments for Fiji, 2 for Indonesia and 2 for New Zealand. Having reference instruments that measure pressure, temperature, humidity and solar irradiance calibrated by regional (South West Pacific Region of WMO) standards is important for global sharing of data, ensuring that data shared every hour across the region are comparable and can be trusted for providing warnings and forecasts.

The Bureau also collaborated with Japan Meteorological Agency to hold a joint Regional Pyrheliometer Comparison at Mt Tsukuba, Japan in January. The event involved participants from 2 WMO Regional Associations (RA-II / RA-V). Staff from the World Radiation Centre Switzerland participated, bringing global irradiance standard equipment, so that national standards in the Asia Pacific region could be calibrated to them. As a result, the Bureau's RA-V Regional standard and that of several member state national standards were restored to the World Radiometric Reference.

### Highlights and significant events

#### Contributing to the Global Basic Observing Network

The Bureau meets WMO global basic observing network requirements for the automatic weather station network across Australia and benefits from receiving the observations of other nations for use its Numerical Weather Prediction models.

In January, the Global Basic Observing Network (GBON) was launched as a standard for land, upper air and marine-based weather stations reporting internationally in real-time. GBON data is used to deliver high-quality global weather forecasts by meteorological agencies using numerical weather prediction models.

Australia contributes approximately 550 surface stations, 50 marine stations and 38 upper air (weather balloon) stations. The Bureau was nominated to be a peer advisor for 6 Pacific Island nations, to uplift their weather networks to meet GBON requirements under the WMO Systematic Observations Financing Facility (SOFF). Work commenced in partnership with these countries in April 2023.



Staff from the Bureau and the Solomon Islands Meteorological Services (SIMS) inspecting an automatic weather station at Honiara in June as part of the Bureau's role as a SOFF Peer Advisor to the SIMS. Together the 2 national meteorological services are assessing the level of compliance of the SIMS network to GBON standards and preparing an investment report on how their network should be upgraded to meet GBON standards and, in turn, benefit from improved global forecasting products prepared by the international meteorological community.

## Next steps

Key activities to be delivered in 2023–24 to help achieve Outcome 3 include:

- refining the Bureau's Service Delivery Management capability through more structured governance processes and stronger partnerships with vendors to improve efficiencies
- uplifting vendor management, risk management and inventory management capability in the Observing Systems and Operations Program to manage supply risk and improve service levels
- strengthening cyber defence capability and cyber hygiene foundations through Australian Cyber Security Centre (ACSC) government uplift program partnership activities.

## Outcome 4: Build and sustain distinctive capabilities and a workforce for the future.

### Achieving the outcome

#### Future proofing data and digital operations

A detailed DDG Workforce Plan was delivered by a dedicated people and capability focused team to support the future operating of DDG's Operating Model and 2023 Ambition. The plan informs future resourcing and training needs to support staff to deliver and sustain data, IT and OT functions to help deliver services to customers. An early element of the plan that was implemented was the establishment of an IT testing capability focussed on people, processes and tools to mature testing capability across the Bureau.

#### Partnering APS-wide to enable and extend capacity

The Bureau is an active member in several APS-wide data forums, including the Data Professions and the Data Champions Network, through which data uplift projects are underway. The Bureau participated in a pilot project to build out the data asset management capability (starting with a data asset inventory and governance playbook) to manage assets more effectively. This project was facilitated by the Office of the National Data Commissioner.

#### Raising awareness of the importance of data and information management

In May, the Bureau organised and celebrated Data and Information awareness month. The event contributes to the collaboration between Australia's data and information management, archives, library, information security and knowledge communities, building on National Information Awareness Month and Privacy Awareness Week.

This year, a dynamic and engaging program of events were held to assist Bureau staff to learn about all the important ways that they could use data to make a difference for themselves and for customers. Presentations and training sessions demonstrated ways to ensure the Bureau is trusted by its customers and follows good privacy and data practices.



Poster for the Bureau's Data and Information Awareness Month activities.

### Next steps

Key activities to be delivered in 2023–24 to help achieve Outcome 4 include:

- implementing the DDG Workforce Plan
- establishing and implementing an enterprise test framework
- uplifting digital skills through a digital workforce plan
- developing OT and IT asset plans for sustainment.