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CANADIAN GEOSPATIAL DATA INFRASTRUCTURE

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NRCAN'S CCMEO INTRODUCES FAIR+: MAKING SCIENTIFIC DATA EASIER TO FIND AND ACCESS TO BENEFIT ALL COMMUNITIES

Cameron Wilson
Peter Rushforth
Tiana Thomas
Shannon Denny

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NRCan's CCMEO Introduces FAIR+: Making scientific data easier to find and access to benefit all communities

When it comes to managing scientific data, including location-based data, scientists, researchers and technicians around the world, including those at NRCan, work under the principle of FAIR, defined by a paper in the journal Scientific Data in March 2016.

While FAIR is widely accepted in data management activities, a group in NRCan's Canada Centre of Mapping and Earth Observation (CCMEO) would like to put forward an expanded definition that would help to empower digital transformation and innovation.

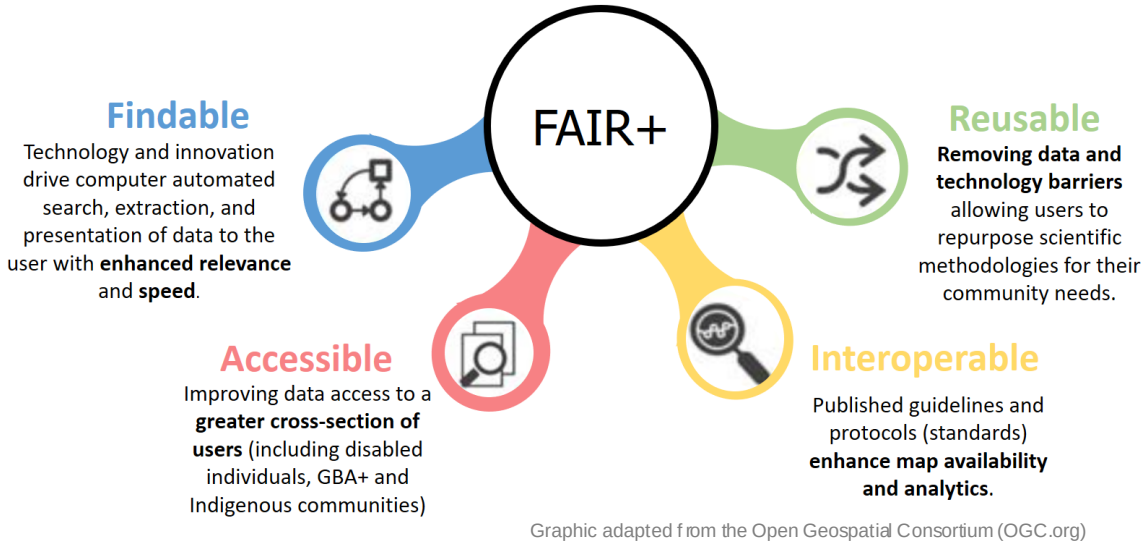
"Depending on one's interpretation, the current definition of FAIR is effectively analogous to a library catalogue paradigm. For example, borrowing a book or paper map from a library is a form of FAIR, which has been done since the Library of Alexandria in 246 BC," says Cameron Wilson, Manager of NRCan's GeoConnections Program. "In this rudimentary interpretation, FAIR principles may not move us beyond manual discovery, downloading, and republishing of metadata."

FAIR represents four guiding principles:

1. **Findable** – data and metadata should be easy to find by both humans and computers
2. **Accessible** – the user should know how to access the data
3. **Interoperable** – the data should be able to be integrated with other data
4. **Reusable** – metadata and data should be well-described so that they can be replicated in different settings

CCMEO hypothesizes that this definition needs to acknowledge technological advancements and innovation to modernize FAIR principles. The current definition of FAIR lacks an implementation framework to support computer automation of the data discovery process and the removal of technology and data barriers through innovation to democratize data and tools making them accessible to all users. To overcome this, CCMEO is proposing a working, innovative, definition called **FAIR+,** which has the potential to support forward-looking, data-related initiatives and objectives established by the Government of Canada.

FAIR+ acknowledges that information and technology shapes contemporary life and advocates for access to data for all people, by leveraging computing resources separating data from interpretation of data (facts vs values), and harvesting information from the Internet. FAIR+ will facilitate **automation**, **convenience**, and **innovation**.



Graphic adapted from the Open Geospatial Consortium (OGC.org)

Let's explore each FAIR principle in the context of FAIR+:

Findable: In addition to humans finding data, computers can harvest networks of online resources. The results are refined and massaged between computers and to the user with relevant data for their community of practice. Evergreen catalogues harvest other data services and entries are validated through heuristics and artificial intelligence. Limited manual intervention is required and catalogues are more akin to a Google search paradigm.

Accessible: The Government of Canada's open data policy is a huge step forward for access. In FAIR+, accessibility includes enabling access to standardized data services by individuals with disabilities (e.g., blind or low vision users) or other challenges, such as marginalized or remote communities. Automated computer-to-computer accessibility is a critical component.

Interoperable: With so many different platforms and services, the ability to combine and analyze data in real-time via standardized protocols of data streams across the Internet is essential. For geomatics, these Internet-based protocols are developed and published by standards organizations including the International Organization for Standardization (ISO), the Open Geospatial Consortium (OGC), the International Hydrographic Organization (IHO), and the World Wide Web Consortium (W3C). One may view maps, spatial data, standardized web-based data services and complete spatial analysis without the need to physically download and manage data.

Reusable: Science is based on the ability to repeat experiments that prove or disprove a hypothesis without bias. But by whom, is the question. Is it done by another scientist or by an Indigenous nation where the study was conducted? With FAIR+ standardized data streams, a community can repurpose a scientific paper within a community based on the values of that community. Values and bias are influenced either by the dichotomy

of annual corporate reporting versus Indigenous seventh generation caretakers of Turtle Island.

FAIR+ already exists, just not defined

Even though FAIR+ hasn't been adopted, we can see it in action in policies like the Accessible Canada Act of 2019, which aims to create a Canada without barriers by 2040.

With FAIR+ principles, the text of websites, which is standards-based via HTML, can be translated into any language, copied and transformed into braille, transferred into audio applications, and embedded into maps, making it readable by anyone, even those with auditory and visual disabilities. The broad implementation of FAIR+ principles in data and information management will contribute to making communications, resources, and other technologies more accessible to all.

Implementing FAIR+ principles to data and information management practices in keeping with the Treasury Board Policy on Service and Digital will provide NRCan and the Government of Canada with a set of comprehensive and informative resources that will bring social, economic, and political benefits to Canadians. This will be achieved by:

- Creating more transparency and improving relationships between the government and the public
- Offering greater social inclusion
- Improving the feasibility of addressing policies
- Modernizing the internet so people can experience all of its advantages

Undoubtedly, the consideration of these four simple principles can have a big impact on organizations, and a transition to FAIR+ can drive data innovation further, bringing many benefits to NRCan, Canada, Indigenous communities, stakeholders, and rights-holders.

Opting for FAIR+ principles over the classic FAIR approach can potentially serve all government departments, not just ones that are science- or technology-focused. CCMEO's proposed definition of FAIR+ needs further socialization and simplification, but it carries great potential.