

Standards for Climate Data Stewardship

Expert Team on Data Development and Stewardship (ET-DDS)

"Needs and Applications of Climate Data Management to Support
State of the Climate Reporting"

23-26 June 2025, Astana, Kazakhstan

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Content

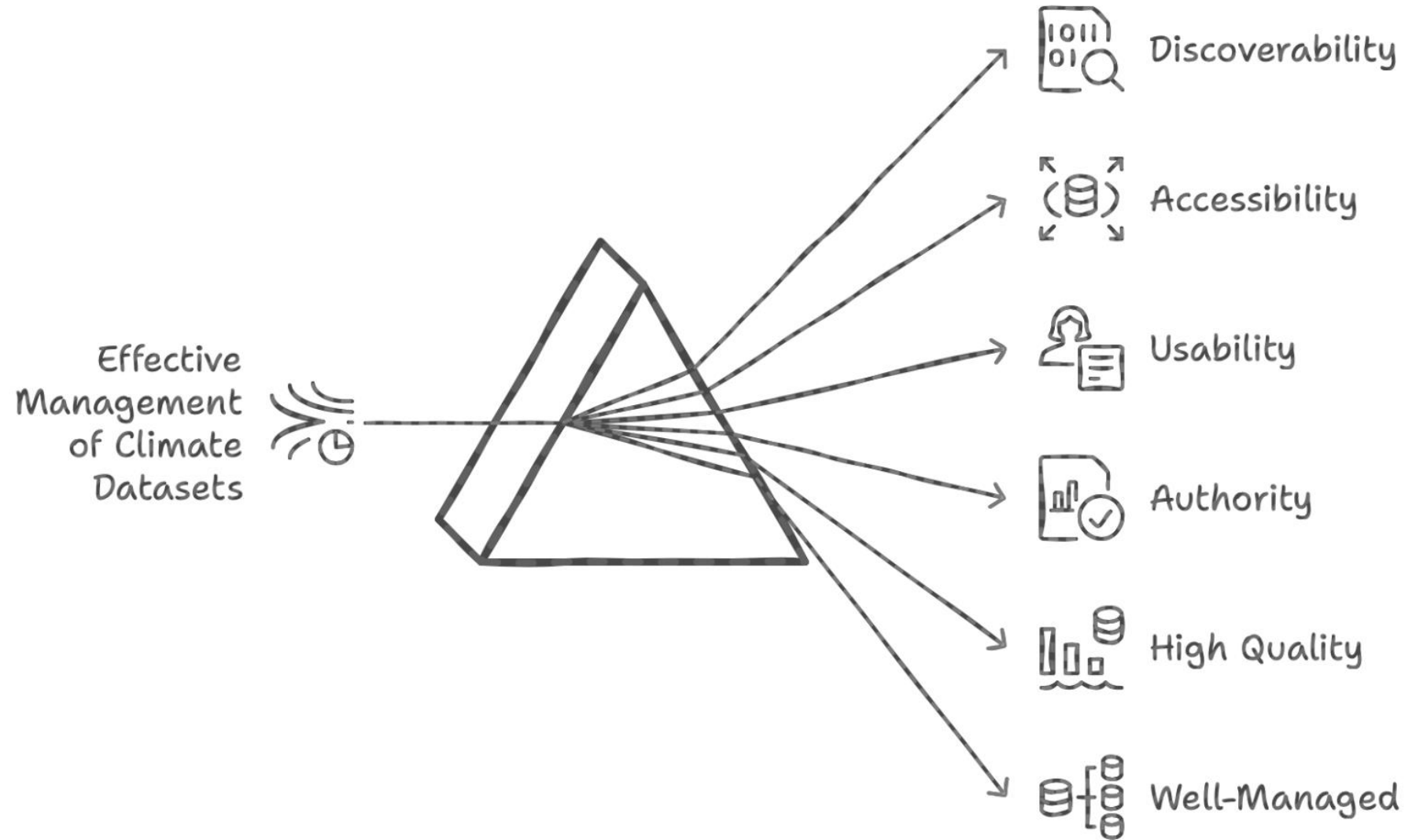
- ❖ Key features of climate data stewardship
- ❖ WMO High Quality Global Data Management Framework for Climate (HQ-GDMFC)
- ❖ WMO tool for access climate data stewardship
- ❖ Worldwide examples of assessments
- ❖ Workplan of ET-DDS on CD stewardship













WORLD
METEOROLOGICAL
ORGANIZATION



Empowering climate action through climate data (CD) stewardship



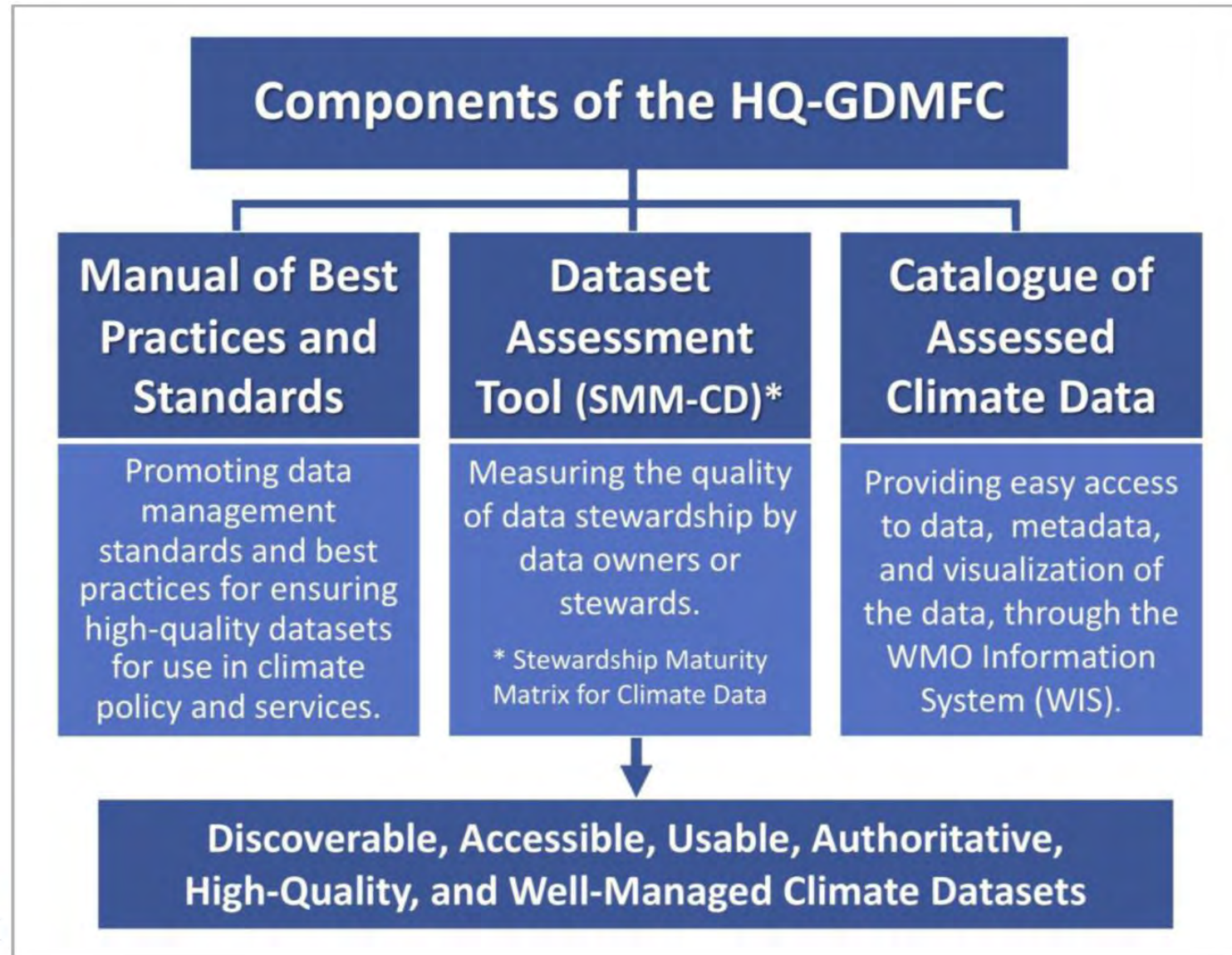
However on data management business there are good things and some drawbacks

Pros	vs	Cons
 Regular Updates		 Resource Intensive
 Data Stewardship		 Potential for Errors
 Backup Procedures		 Complexity
 User Feedback Loop		 Dependence on Technology
 Informed Decisions		 Privacy Concerns

WMO 1238: High Quality Global Data Management Framework for Climate (HQ-GDMFC)

- WMO has established a High-Quality Global Data Management Framework for Climate (HQ-GDMFC) as an international collaborative initiative for developing standards and recommended practices for sourcing, securing and managing climate data, and for sharing infrastructure and responsibilities for, e.g. data exchange, analysis and data service provision.
- The goal of the initiative is to ensure mature data management and governance in addition to the Global Climate Observing System (GCOS) climate data source reviewing process.
- WMO 1238 is currently being reviewed and harmonized with other WMO documents by INFCOM/ET-IM with the contribution of ET-DDS and its work during the last intercessional period (former ET-DRC).

HQ-GDMFC structure

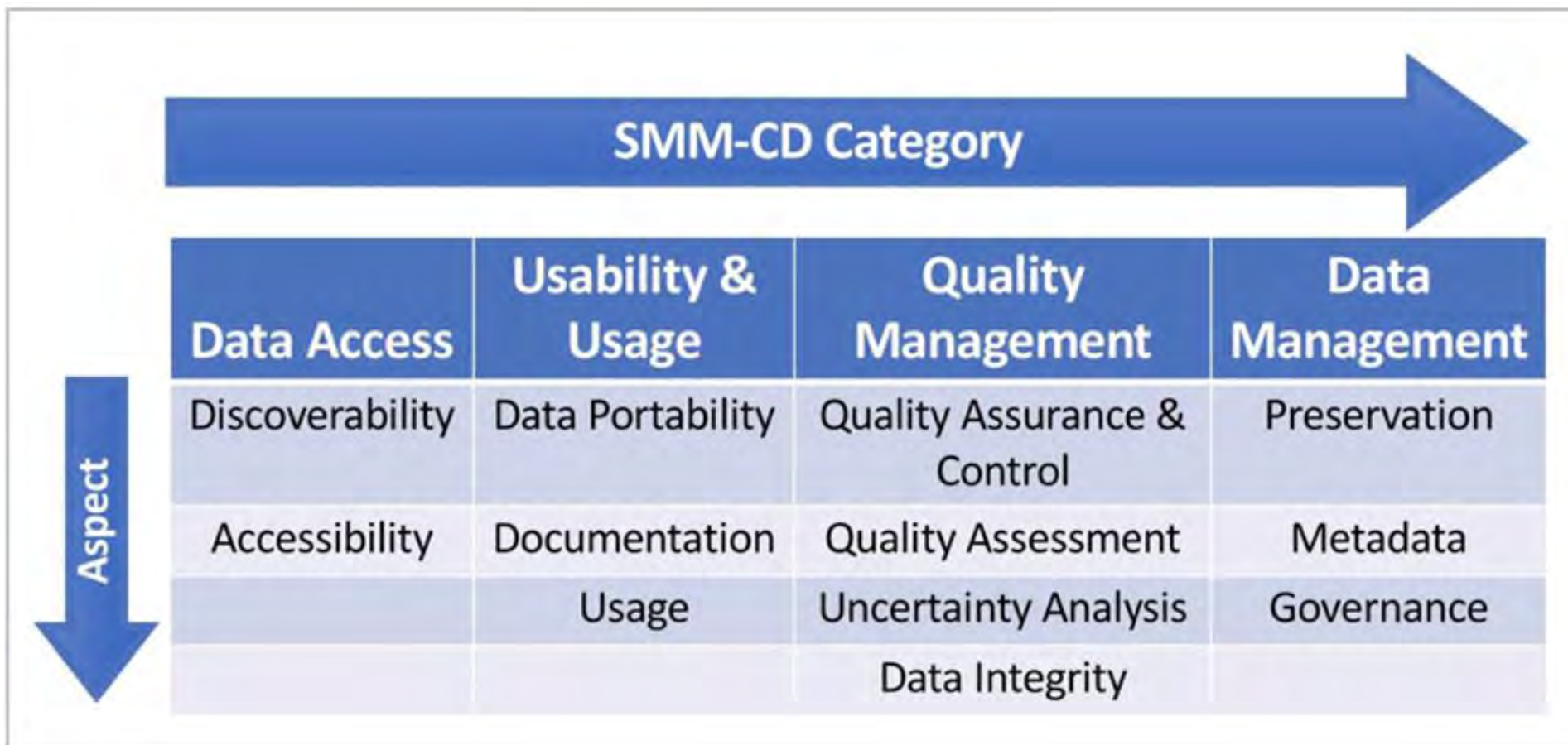


Stewardship Maturity Matrix for Climate Data (SMM-CD)

- ✓ A self-assessment tool developed by WMO expert teams to evaluate how well climate datasets are managed
- ✓ SMM-CD provides defined levels of data management and stewardship behaviours across a range of categories
- ✓ SMM-CD provides a structured, tiered approach to dataset stewardship assessment
- ✓ Applied for global and regional/local CD datasets

WMO_SMM-CD-Guidance Booklet

Categories and Aspects



WMO_SMM-CD-Guidance Booklet

Maturity Scale Level

Maturity Scale Levels for Each Aspect				
Level 1	Level 2	Level 3	Level 4	Level 5
AD HOC	MINIMAL	INTERMEDIATE	ADVANCED	OPTIMAL
Not Managed	Limit-Managed	Managed	Well-Managed	Level 4 +
	Not Defined	Defined	Well-Defined	
		Partially Implemented	Fully Implemented	
				Measured, Controlled, Audited

Output of the assessment matrix applied for regional purposes

- ✓ The data provider will produce scores in a **self assessment** manner for each aspect of data management and data stewardship
- ✓ As an example we consider the **operational data management** category and **data access** aspect:

Category	Aspect	Mandatory Maturity Assessment Criteria			Optional	User Input
		Level 1 (ad hoc) ★	Level 2 (medium) ★ ★	Level 3 (highest) ★ ★ ★	Highly Desirable ★ ★ ★ ★	Assessment Level with justification
Operational Data Management	Data Access	Dataset information not discoverable; data not available publicly; person to person contact.	Limited dataset information and metadata; basic online services available for data access (e.g. ftp).	Level 2 + comprehensive collection-level metadata; dataset searchable online; access provided with enhanced online data services.	Level 3 + interoperable data services; web services; conforming to international standards such as the WIS Core Metadata profile; auditable.	

Output of the assessment matrix applied for regional purposes

- ✓ Or also considering the **data stewardship** category and **data quality, governance and metadata** aspects:
- ✓ As result scores will be produced in order to rate **the stewardship maturity of each considered category and associate aspects.**

Data Stewardship	Quality and Usage	No QA/QC procedures defined or implemented and information not available online.	QA/QC procedures defined and available online but not systematically implemented.	Level 2 + data quality assessed and available online such as error or uncertainty estimates.	Level 3 + dataset citations in scientific publication in peer-reviewed journal.	
	Governance	Responsibility/accountability compliance mechanism is not defined; no contact information.	Responsibility/accountability compliance mechanism defined; user support contact information available.	Level 2 + adheres to data management competency standards.	Level 3 + compliance to community standards controlled and audited by ISO procedures.	
	Metadata	Collection-level metadata not publicly available and/or not usable.	Limited collection-level metadata available for the users.	Level 2 + metadata conforming to community standards and available online	Fully compliant with national and international standards; rich metadata content;	

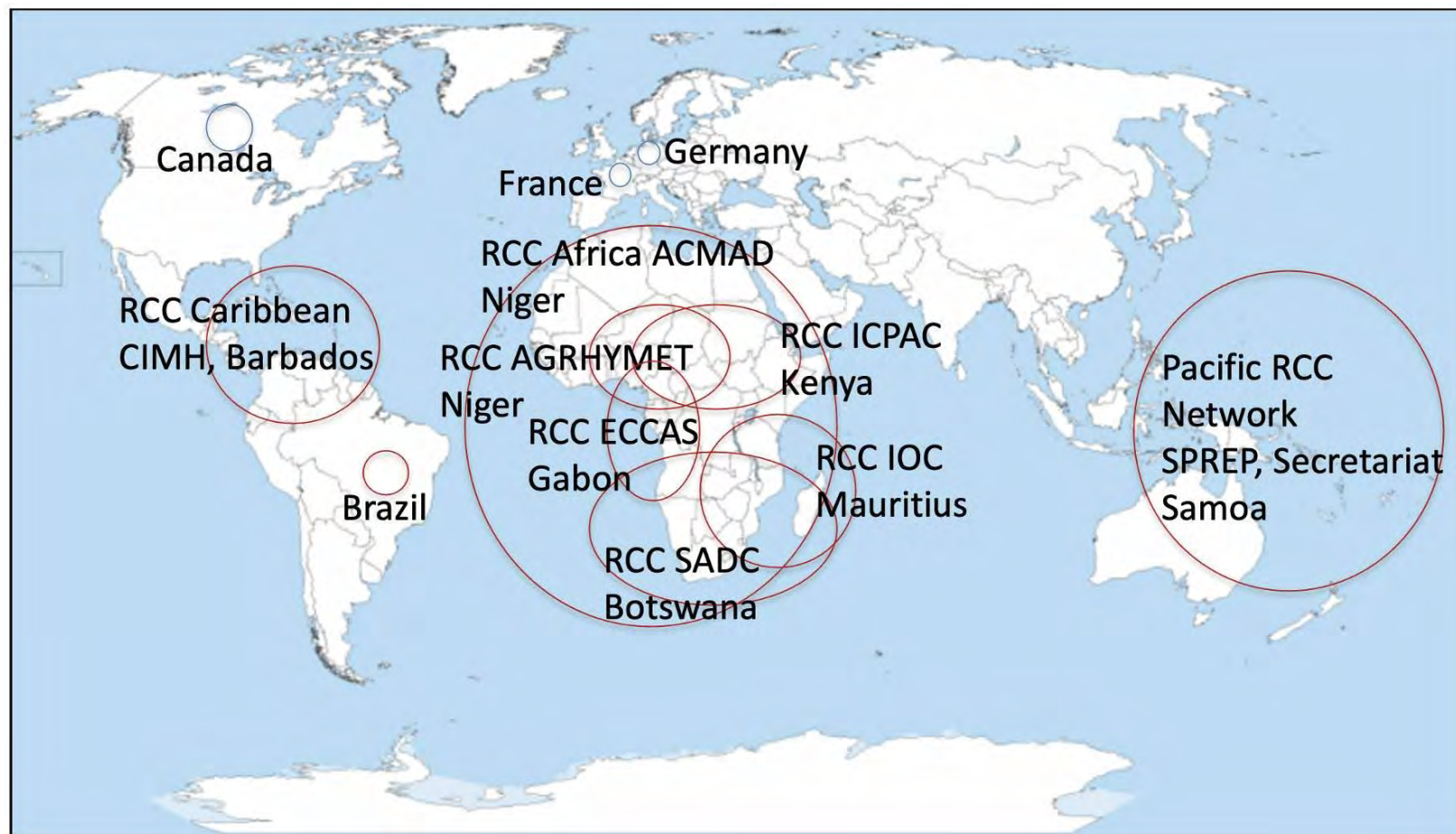
Worldwide assessed climate datasets

CD assessed datasets:

- ✓ 20 global
- ✓ 9 Regional
- ✓ 18 National

Last assessed datasets:

- ✓ Global: 30 November 2022
([GPCC](#))
- ✓ Regional: 28 June 2021
(CAROGEN)
- ✓ National assessed: 22
September 2021 (Seychelles)



Workplan of ET-DDS for CD Stewardship

- ✓ Strengthen (update) and promote the Global SMM-CD and Regional SMM-CD_NRP (WIS2, WIPPS, RCCs and NMHSs) also in the view other worldwide applications (C3S, NOAA, MeteoFrance,...)
- ✓ Keep the assessment examples for the Data Catalogue on a dedicated WMO web page
- ✓ Help the ET-MCCVC on updating the assessments of global and regional data set to be used in the WMO State of Climate Reporting
- ✓ Use SMM-CD and SMM-CD_NRP as **educational basis** to keep abreast the WMO HQ-GDMFC
- ✓ WMO Consultation: data control and CD stewardship

References

- WMO. 2019b. Manual on the High-quality Global Data Management Framework for Climate. WMO-No. 1238.
https://library.wmo.int/index.php?lvl=notice_display&id=21686.
- WMO 1328: WMO Stewardship Maturity Matrix for Climate Data Guidance Booklet: WMO <https://library.wmo.int/records/item/68238-guidance-booklet-wmo-stewardship-maturity-matrix-for-climate-data?offset=1>.
- Peng, G., Gross, W.S. & Edmunds, R. Crosswalks among stewardship maturity assessment approaches promoting trustworthy FAIR data and repositories. *Sci Data* **9**, 576 (2022). <https://doi.org/10.1038/s41597-022-01683-x>
- Peng, G, Wright, W, Baddour, O, Lief, C and the SMM-CD Work Group. 2019. The guidance booklet on the WMO-Wide Stewardship Maturity Matrix for Climate Data. Figshare. <https://doi.org/10.6084/m9.figshare.7002482>
- https://figshare.com/articles/online_resource/WMO_SMM-CD_NRP_Guidance_Booklet/13004606
- https://figshare.com/articles/online_resource/WMO_SMM-CD_NRP_v01r00_20200805_Assessment_Template_docx/13004018
- Dunn, R, Lief, C, Peng, G, Wright, W, Baddour, O, Donat, M, Dubuisson, B, Legeais, J-F, Siegmund, P, Silveira, R, Wang, XL and Ziese, M. 2021. **Stewardship Maturity Assessment Tools for Modernization of Climate Data Management**. *Data Science Journal*, **20**: 7, pp. 1–20. DOI: <https://doi.org/10.5334/dsj-2021-007>
- **WMO CLIMATEDATA CATALOGUE** <https://climatedata-catalogue-wmo.org/homepage>

Thank you very much!

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