Transition to Automated Ground-based Measurements

RA-V Workshop Day 1
Getting Started - Introduction

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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World Meteorological Organization
Organisation météorologique mondiale

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Objective: Introduction to instrument upgrades, changes and transitions – preparing for success

1. Full scope of tasks needed to ensure sustained success
2. Resources/training available to plan and carry out a successful transition to automation

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Commission for Instruments and
Methods of Observation

Mercury is banned !

Act now to ensure Network Data Quality – identify and commission alternatives to mercury instruments

The **UNEP Minamata Convention on Mercury** comes into force globally in 2020[1], and **bans** all production, import and export of **observing instruments** (thermometers, barometers, etc.) **containing mercury**.

Our meteorological observing networks have long involved the use of mercury-containing instruments, but now, to facilitate the rapid entry into force of the Minamata Convention, WMO's goal is to see the **progressive replacement** of these instruments well before 2020.

The Dangers of Mercury

Mercury is a very toxic substance, which has serious effects on both human health and the environment. Inhalation of mercury vapours can cause harmful effects on the nervous, digestive and immune systems. It can also cause neurological and behavioural disorders, and symptoms such as insomnia, memory loss, neuromuscular effects, headaches, and cognitive and motor dysfunction.

Within the environment, Mercury vapour can travel long distances before settling into the atmosphere where it bio-accumulates, further volatizes, or is converted to methyl mercury by microorganisms.

Minamata Convention on Mercury

This agreement is a global treaty to eliminate the use of mercury to protect both human health and the environment from the adverse effects of mercury. It was agreed at the 5th session of the Intergovernmental Negotiating Committee in Geneva, in January 2013.

Link to Flyer on Mercury in English, Arabic, Chinese, French, Russian, Spanish

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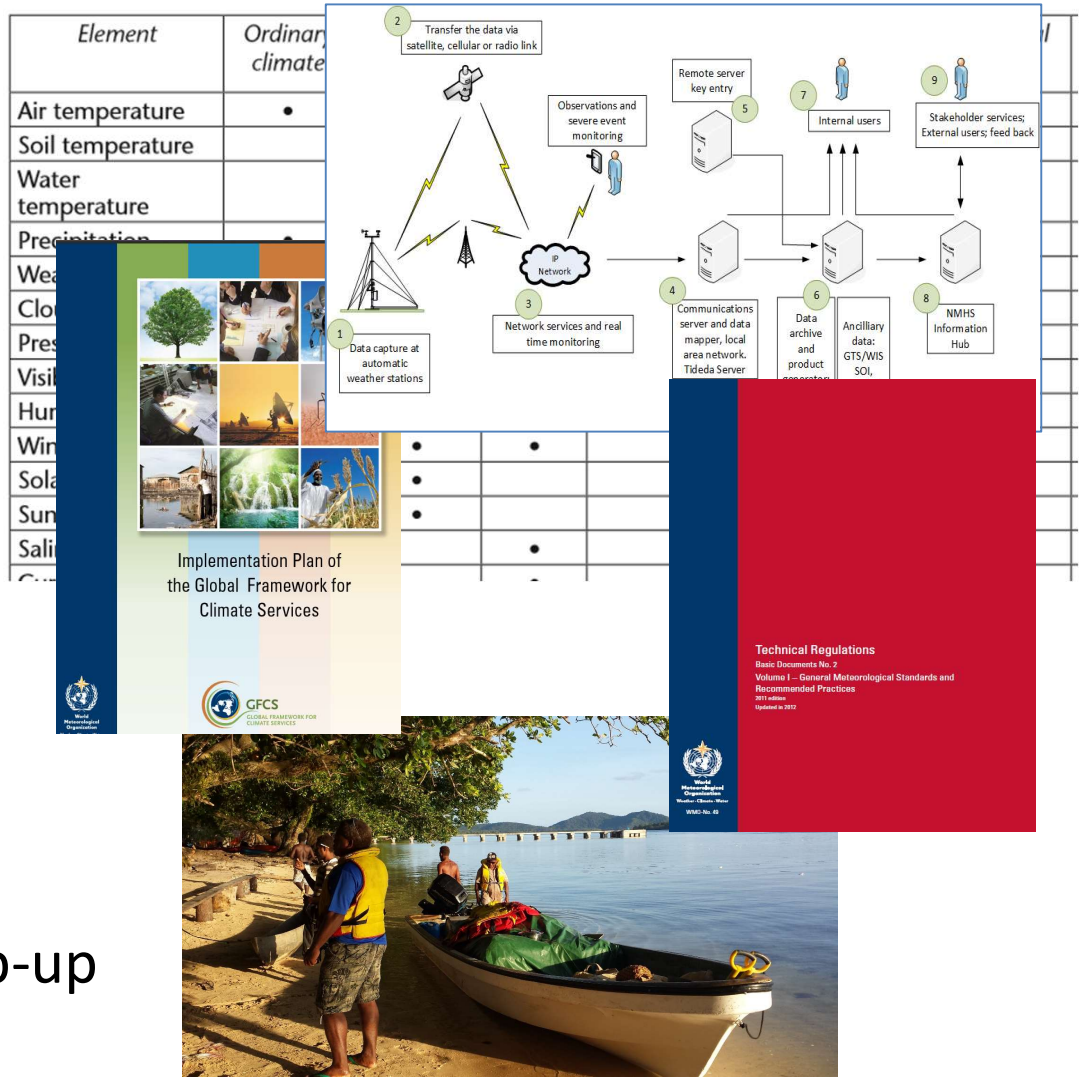
Workshop format

5 days – 2 hours each

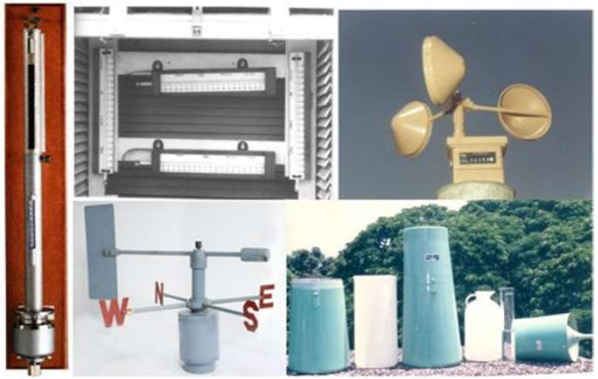
1. Transition strategy
2. Network planning
3. Project planning and management
4. People change
5. Risks
6. Generic AWS tender specifications
7. Options exercise/wrap-up



Day 1

Getting started – 90 minutes

- Welcome
- Housekeeping
- Introduction to workshop
- Introductions (1 minute per person!)
- Where to find things



Transition Strategy – 30 minutes

- Watch and discuss Transition Strategy movie

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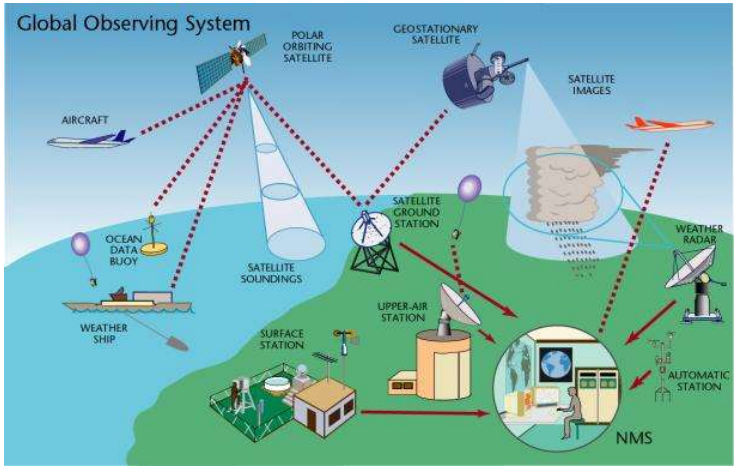
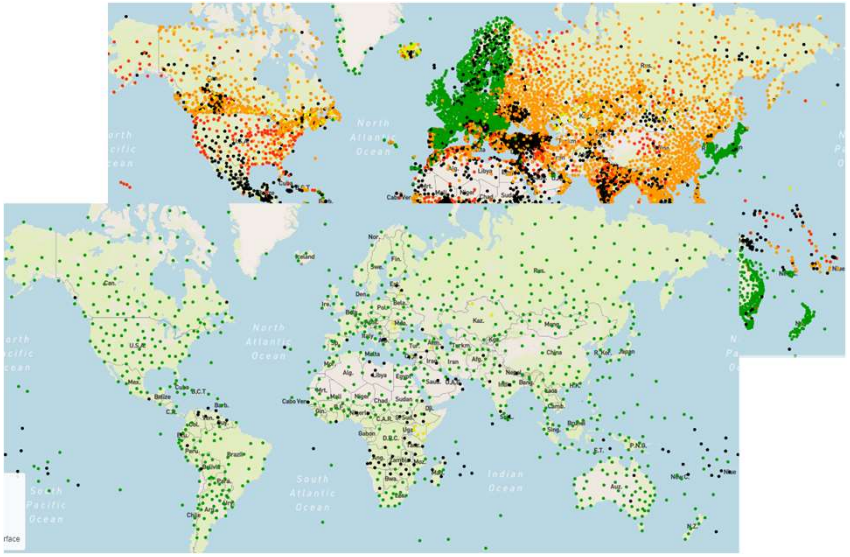
Day 2 (part 1)

Network planning – 50 minutes

- Where to get help?
- Links to Competency Framework
- WIGOS Implementation Plan, GBON, SOFF, Data Policy
- Network Design Principles
- GCOS Climate Monitoring Principles
- User requirements, multiple applications
- Current situation
- Network Resolution and Accuracy
- Redundancy (of measurement)
- Data collection and management
- Discussion





Day 2 (part 2)

Project planning and management – 50 minutes

- Introduction
- Project
- People
- Scope
- Responsibilities
- Project to operation transition
- Goal / deliverables
- Risks
- Discussion

Largely based on the Project Management Sectic
Compendium of Topics the support Management Development in National Meteorological and Hydrological Services

https://library.wmo.int/doc_num.php?explnum_id=5647

Short quiz and introduce exercise – 20 minutes

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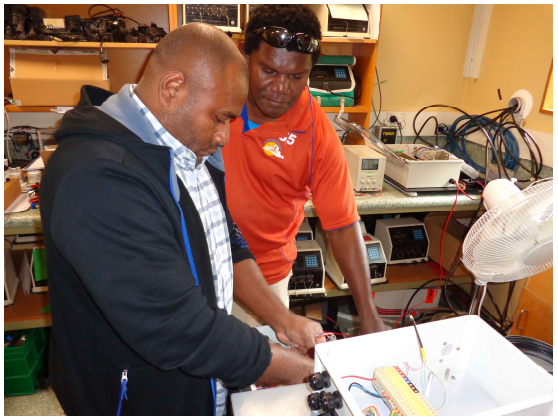
Day 3



People change - 50 minutes

- Introduction to change management and people change
- Resistance to change and why its natural
- Planning to succeed
- Share our experiences!

Risks - 50 minutes)

- Understanding risk
- Develop a risk analysis plan

Small quiz and exercise discussion - 20 minutes

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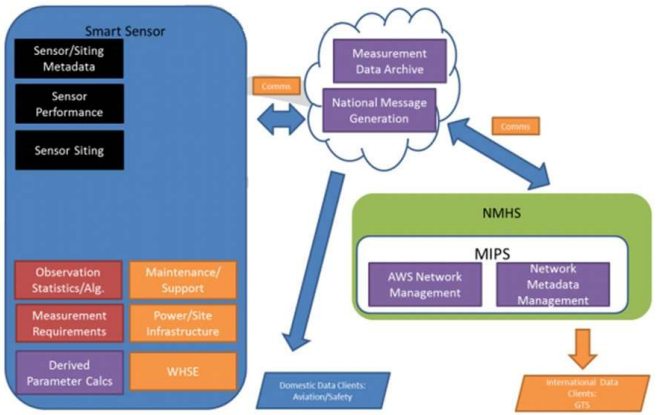
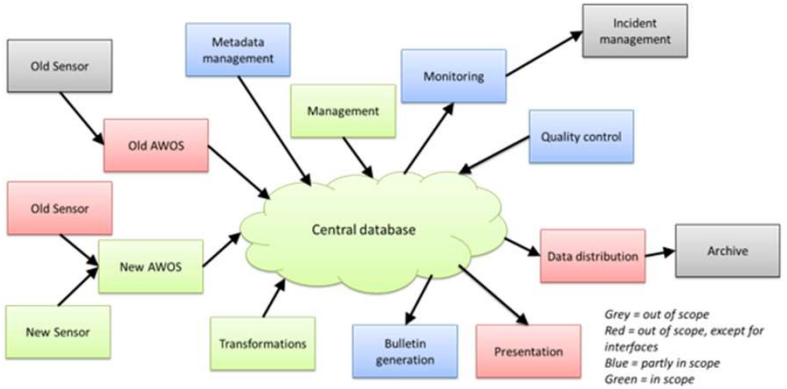
Day 4

AWS tender specification - 60 minutes

- Why a tender specification
- Description of the specification and its use
- Some real life examples



Options for change – 30 minutes



Wrap up - 30 minutes

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Day 5

5-minute presentations and discussion

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Housekeeping

- Must attend all 5 sessions
- Phones turned off
- Microphones off
- “Raise hand”
- Chat
- Active participation
- Ask questions
- We are a community – let us help each other

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Introductions

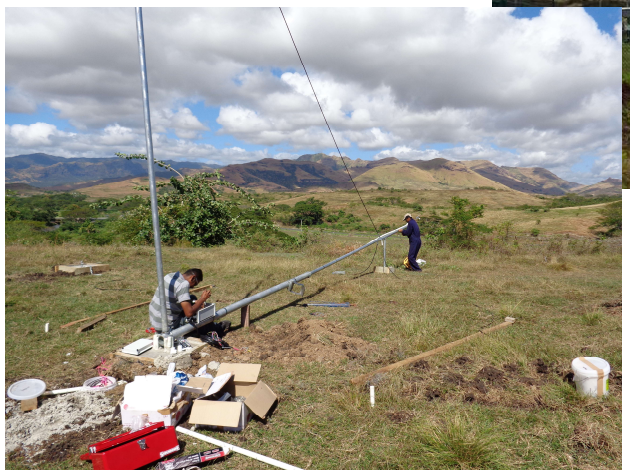
Name

Country

Experience with AWS

Current network and projects

Network plans



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Some places to look

Data Collection Network Modernisation – What you need to know
Available here

WMO Knowledge Sharing Portal
https://community.wmo.int/activity-areas/imop/knowledge-sharing-portal

WMO Library
https://library.wmo.int/

Generic AWS Tender Specification
https://community.wmo.int/activity-areas/imop/aws-tender-specifications

GCOS Essential Climate Variables
https://gcos.wmo.int/en/essential-climate-variables/

Neighboring countries/NMHSs

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Some reference documents

- A Compendium of Topics to Support Management Development in National Meteorological Services (ETR-24)
- **Guide to Instruments and Methods of Observation** (**WMO-No. 8, Vol I, II, III and V**)*
- Guide to Climatological Practices (WMO-No. 100)
- Guidance on Automatic Weather Systems and Their Implementation (WMO-No. 862)
- **Manual on the WMO Integrated Global Observing System** (**WMO-No. 1160**)*
- **Guide to the WMO Integrated Global Observing System** (**WMO-No. 1165**)*
- Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services (WMO-No. 1195)
- Challenges in the Transition from Conventional to Automatic Meteorological Observing Networks for Long-term Climate Records (WMO-No. 1202)
- Compendium of WMO Competency Frameworks (WMO-No. 1209)
- Guidelines on Homogenization (WMO-No. 1245)
- Guidelines for Managing Changes in Climate Observation Programmes (WMO-TD No. 1378)

* Regularly updated – every two years

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WMO-No. 8, Volume I, Measurement of Meteorological Variables

Chapter 1. General

- Annex 1.A. Operational measurement uncertainty requirements and instrument performance requirements
- Annex 1.B. Strategy for traceability assurance
- Annex 1.C. Regional Instrument Centres
- Annex 1.D. Siting classifications for surface observing stations on land
- Annex 1.E. Operating equipment in extreme environments
- Annex 1.F. Station exposure description

WMO-No. 8, Volume III, Observing Systems

- Chapter 1. Measurements at Automatic Weather Stations

Starting the discussion

- All our national observing capabilities are different
- Therefore, all our automations are different
- They are not easy (many fail) but it can be done ☺
- Integrated or multiple application areas – WIGOS Plan, GBON
- Tiered networks
- There is not a single and simple ‘How to’ document
- Success comes from a strategy that
  - Trains and ‘empowers’ Teams
  - Sets up well considered projects
- WMO has guidance on how to do that

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Tiered Networks

"Incorporating tiered networks as an integral part of the network of networks approach will facilitate the matching of observing solutions to needs, as well as the integration of externally contributed networks and observations"

https://public.wmo.int/en/resources/bulletin/wmo-integrated-global-observing-system-wigos

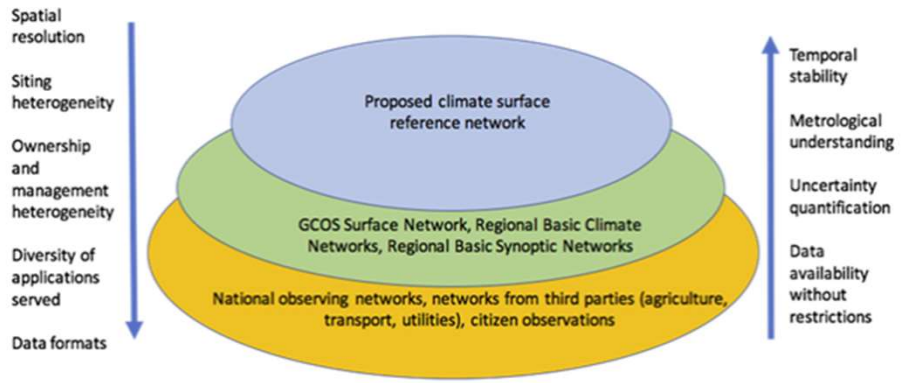

Figure 1. Conceptual outline of how surface observational capabilities for climate map onto the tiered system of systems approach of Thorne et al.(2017). The tiers from top to bottom are reference, baseline, and comprehensive. Arrows and associated text denote important facets of the measurements that increase as you move down tiers (left-hand side) or up tiers (right-hand side). The network types given for each tier are solely exemplars.

Reference climate stations – global surface reference network
GCOS - 226

Role and calculation of Climate Normals
WMO-No.1203

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Some of the key areas

- Network planning (including quality, lifecycle and risks)
- Project Management skills
- People and process change skills
- Planning to make the new system sustainable (support/maintenance/comms/theft)
- Budgeting and Procurement
- Equipment

Costs	Benefits	Risks
• Equipment purchase • Installation costs • Support and maintenance • Staff induction and training • Testing • Integration in existing infrastructure • Required tools/facilities for calibration, maintenance and monitoring	• Facilitate greater density of networks • 24/7 access • Improved reliability of measurement (digital techniques) • Homogeneity of networks by standardizing measuring techniques • Able to meet new observational needs and requirements • Reduce human errors • High frequency or continuous measurement • Eliminating mercury • Modern data archive	• Spares • Cost / Scope overruns • Lifecycle overhead • People change • Complexity • Technical constraints • Site visit/maintenance • Discontinuities in measurement series • Non-homogenous due changing techniques e.g., mean temperature (0.5 *(max + min)) • Predefined solution – not what is needed • Integration / compatibility • Non-conformance

Share our experiences...

Andrew's example.

- Climate focus – all climate stations are meteorological stations but not all meteorological stations are climate stations
- Was only aware of WMO-No-8 at time.
- Reluctance to expand network due to operational budget constraints.
  - CAPEX is relatively easy to get
  - Operating, maintenance and calibration costs always under-estimated
  - Importance of training under-estimated
- Competing with push towards low-cost options – need to maintain measurement standards
- Managing expectations – things do go wrong!

Can you share an experience?

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Thank you
Merci

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