Establishing the WMO Competence Framework for Climate Services.
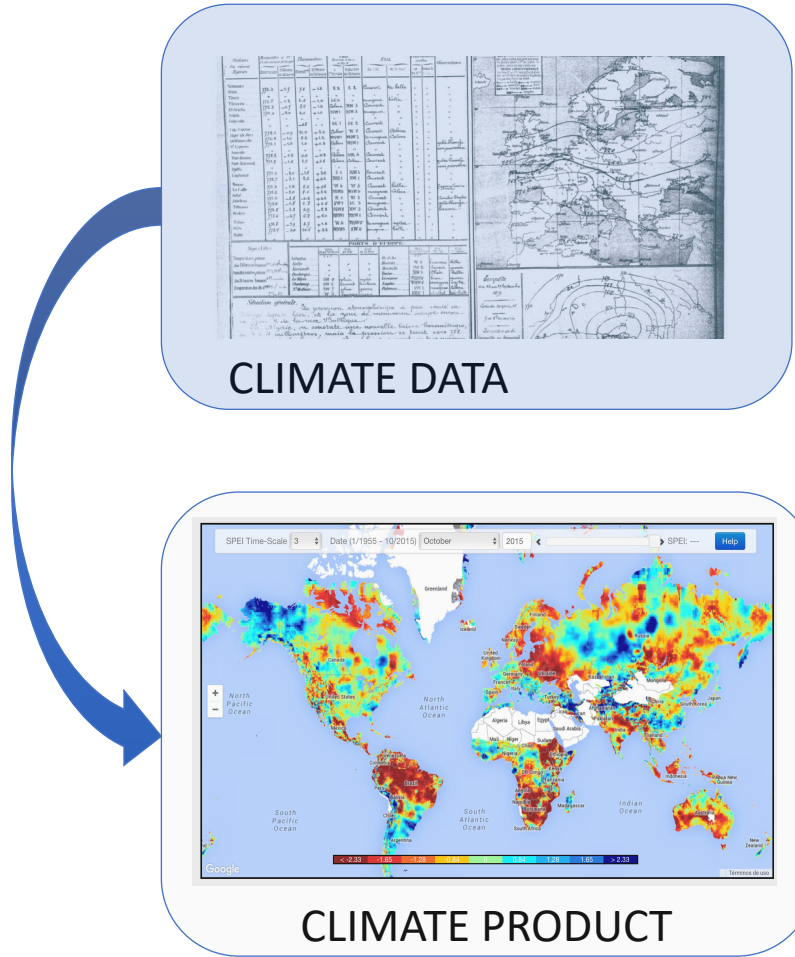
Dr. Enric Aguilar (C3/URV, Tarragona, Spain)

OUTLINE

- Climate Services

- Competency Framework for the Provision of Climate Services.
    - Rationale
    - Scope
    - Implementation

- Summary

CLIMATE SERVICES

CLIMATE DATA

CLIMATE PRODUCT

POLICY MAKERS ▶

BECOMES A SERVICE

WHAT IS NECESSARY TO DELIVER CLIMATE SERVICES?

- To ensure the availability of high-quality climate data
- To derive climate products from climate data with state-of-the-art techniques (remote past recent past, near future, distant future)
- To interact with the end users to understand their needs, adapt the climate products to them and communicate them in an adequate manner
- To assess the quality of the process to and ensure that the delivered climate services are reliable, timely and user driven.

WMO COMPETENCY FRAMEWORK FOR THE PROVISION OF CLIMATE SERVICES (*from data to service*)

- The **institutions (CLIMATE SERVICES PROVIDERS, NMHSs), through collective skill of their staff,** should demonstrate the following competencies, **or an appropriate set of them**, according to their mission and **institutional capacity.**

  - Create and manage climate data sets;
  - Derive products from climate data;
  - Create and/or interpret climate forecasts and model output;
  - Ensure the quality of climate information and services;
 - Communicate climatological information with users.

FROM WMO-No 1083:

- ***Competence*** can be described as ***possessing – and being able to apply – appropriate basic knowledge and technical skills***.

- ***Classification is related to qualifications***, while job tasks are related to competencies. It ***is the responsibility of individual Members*** to decide how they allocate particular tasks to the different classifications.

FROM WMO-1083

I-6   MANUAL ON THE IMPLEMENTATION OF EDUCATION AND TRAINING STANDARDS IN METEOROLOGY AND HYDROLOGY
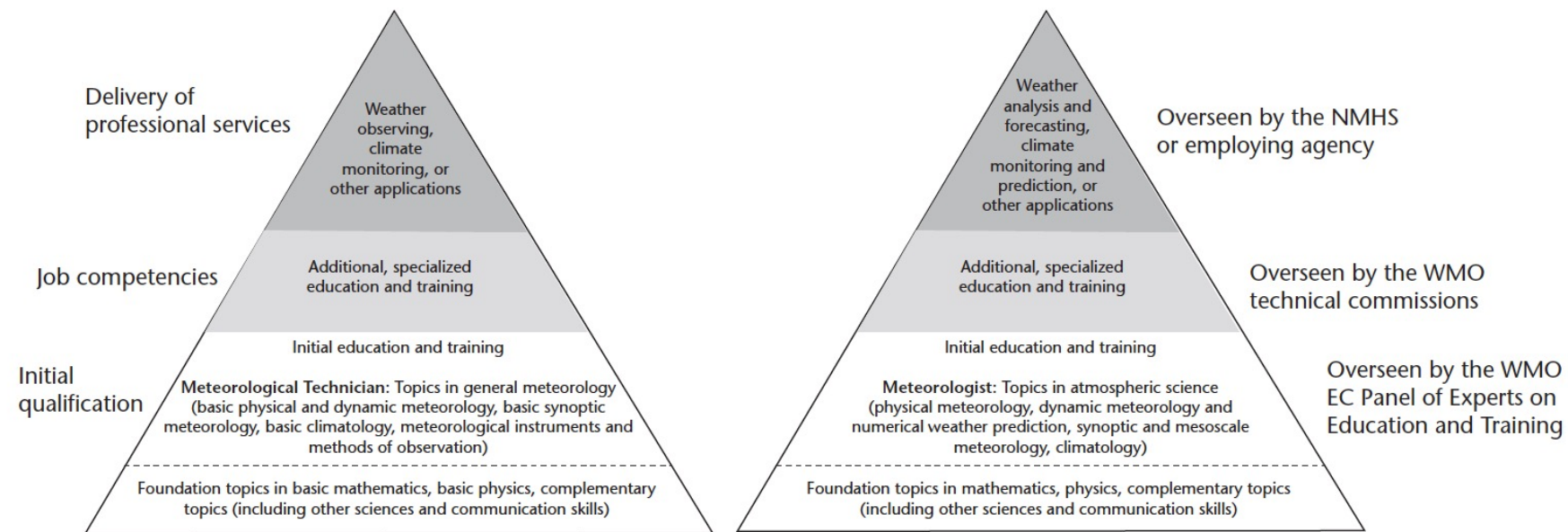
Schematic of the links between initial qualifications, job competencies and delivery of professional service along with the allocation of responsibilities. Note that if a technical commission does not specify the job competencies that responsibility falls to each NMHS.

FROM WMO-No 1114:

Box 2.1. Organizational goals, job tasks, competencies, learning needs and outcomes

Learning outcomes are directly connected to organizational goals through a series of related concepts, with job competencies playing an essential role (adapted from a learning resource created for WMO by Ian Bell).

Goals	The goals of the organization or programme are primary; they are the reason why the organization exists.
Strategic support	The organization supports its goals through trained staff, infrastructure, services, policies, data, etc.
Job tasks	Job tasks are designed to ensure that the goals of the organization are met.
Competencies	Competencies are the knowledge and skills required to be able to perform the job tasks.
Learning needs	Learning needs are the existing gaps in competency that must be filled through learning.
Learning outcomes	Learning outcomes are what learners should be able to demonstrate as a result of participation in a learning opportunity; it is intended that learners become competent and help meet organizational goals.

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IN TERMS OF THE GFCS

IV. Ensure the quality of climate information and services

C A P . D E V E L . E T R

Category (number of baseline 2010 territories)
Note: 6 countries are not able to provide Category I services.

Climate Services Offered.
Note: each Category offers the services provided by the lower categories, plus those indicated.

Category (number of baseline 2010 territories)	Climate Services Offered.
Category I: Basic Capacity (64)	
Category II: Essential (56)	adjustment
Category III: Full Capacity (39)	Development and/or provision of tailored and downscaled climate products on timescales ranging from seasonal to climate — Capacity and skills to engage with users communities — Technical Expertise for training climate specialists — Regional Cooperation and Support
Category IV: Advanced Capacity (24)	Research and modeling capabilities for climate and applied climate studies — cooperation and support

I. Create and manage climate data sets

II. Derive products from climate data

V. Communicate climatological information to users

III. Create and/or interpret climate forecasts and model output

ovide advice on climate information and products

INCREASING CAPACITY

- Create and manage climate data sets;
- Derive products from climate data;
- Create and/or interpret climate forecasts and model output;

All institutions, at different levels

- Ensure the quality of climate information and services;
- Communicate climatological information with users.

FROM WMO-1114. BLOOM'S TAXONOMY.

Table 4.1 Classification of intellectual behaviour and related descriptors

Cognitive skill level	Examples of descriptors
Remembering: the learner recalls information	list, define, identify
Understanding: the learner explains ideas or concepts	explain, interpret, discuss
Applying: the learner uses new knowledge in a familiar situation	apply, use, relate
Analysing: the learner differentiates between constituent parts and relates them to the whole	analyse, compare, investigate
Evaluating: the learner justifies a decision or course of action	evaluate, argue, recommend
Creating: the learner generates new products, ideas or ways of looking at things	create, organize, assess, predict

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[2] This table is based on the classification of intellectual behaviour developed by Benjamin Bloom and colleagues (see Bloom B. et al., 1956: *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. London, Longman) later modified by L. Anderson and D. Krathwohl (see Anderson L. and D. Krathwohl, 2001: *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman).
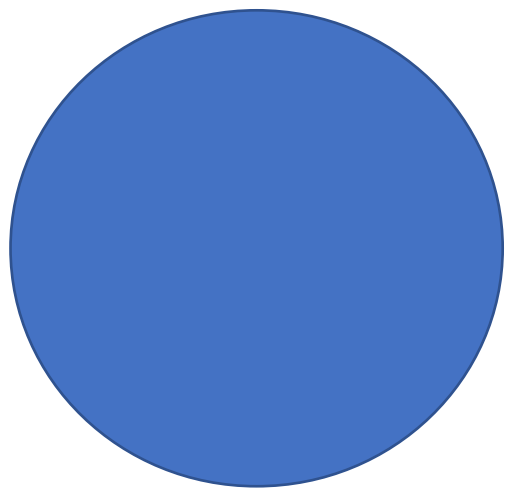
What "I"do

How "I" do it

What "I" have learnt to do it
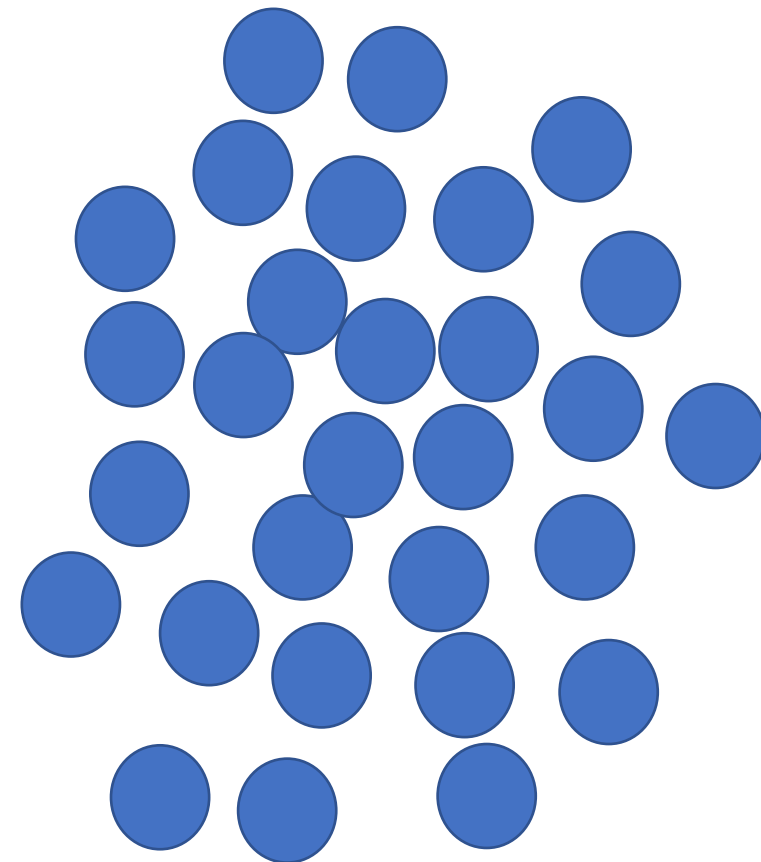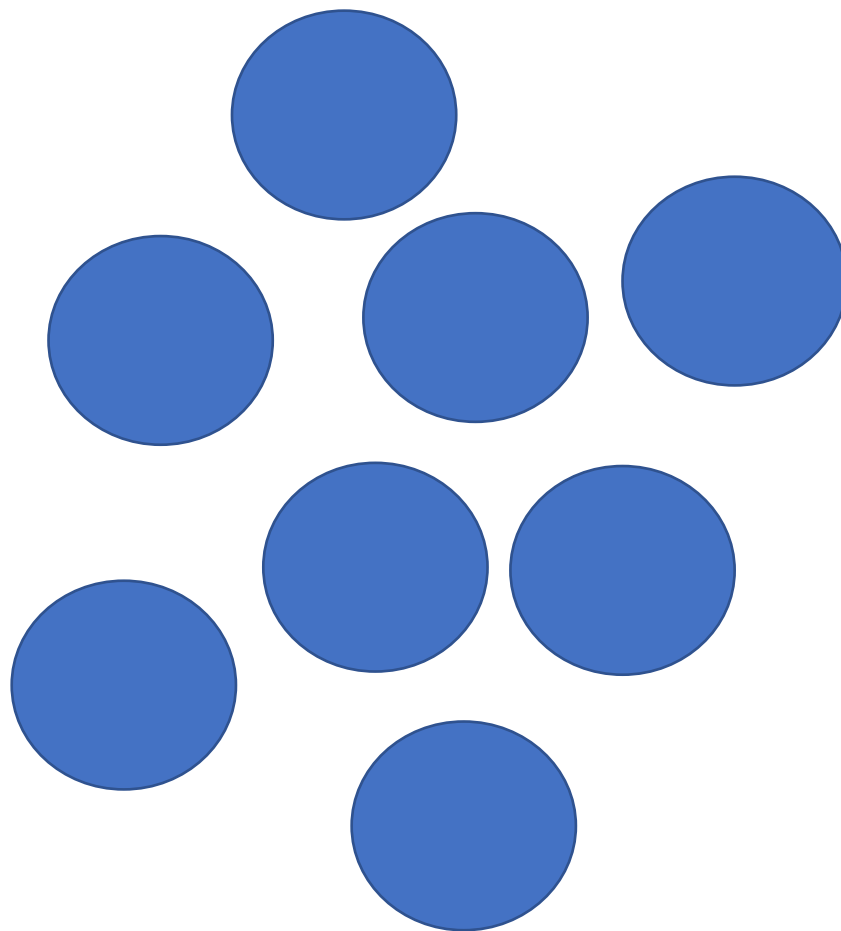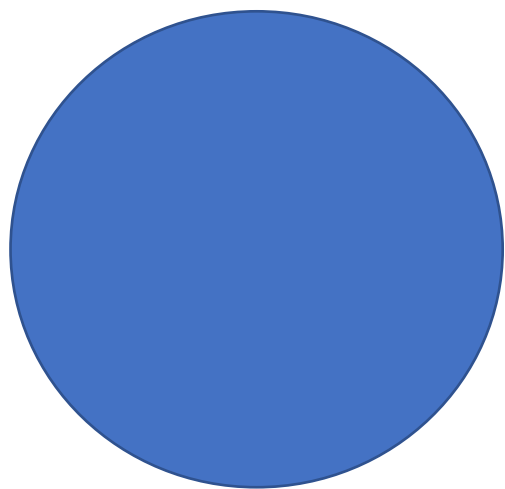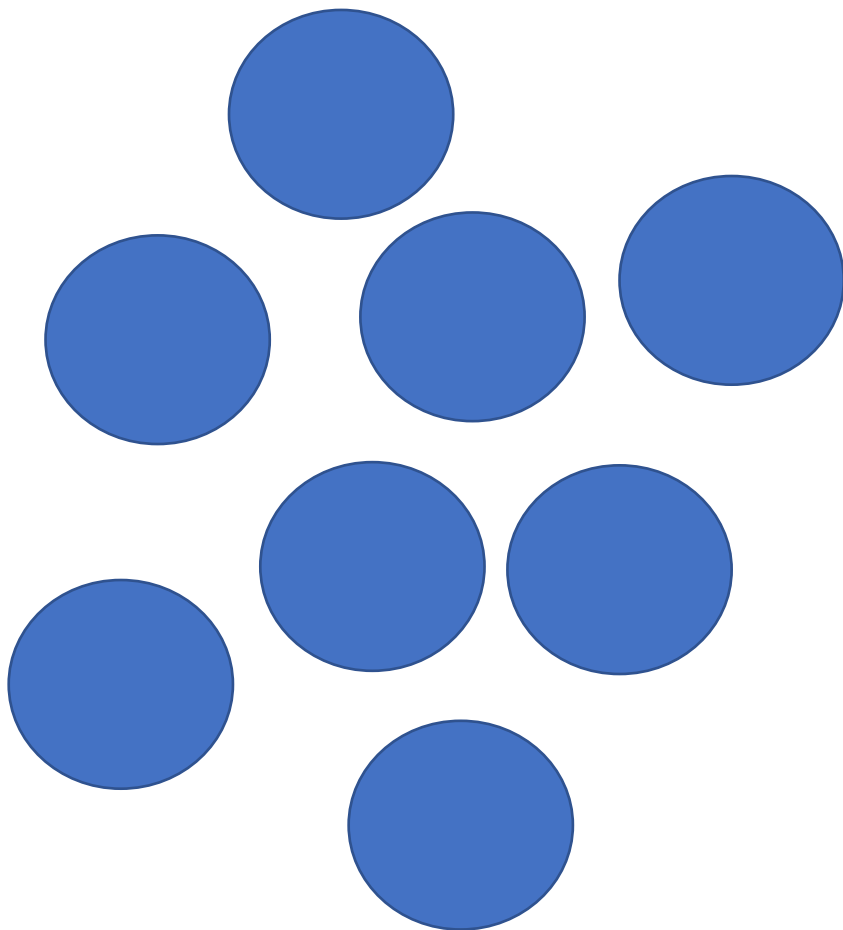
Competencies

Performance Criteria

Learning outcomes

What "I" do

"Create and manage climate data sets"

Top level Competencies

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How "I" do it

Performance Criteria

- Conduct climate data preservation and rescue procedures;

- Assess the location and characteristics of the observation sites against the requirements for a climate observation reference network;

- Collect and store in relational databases climate data and metadata;

- Apply quality control processes to climate data and resulting time series;

- **Assess climate data homogeneity and adjust inhomogeneous time series**;

- Create, archive and document climate datasets;

- Apply spatial and temporal interpolation to ensure data continuity.

What "I" have learnt to do it
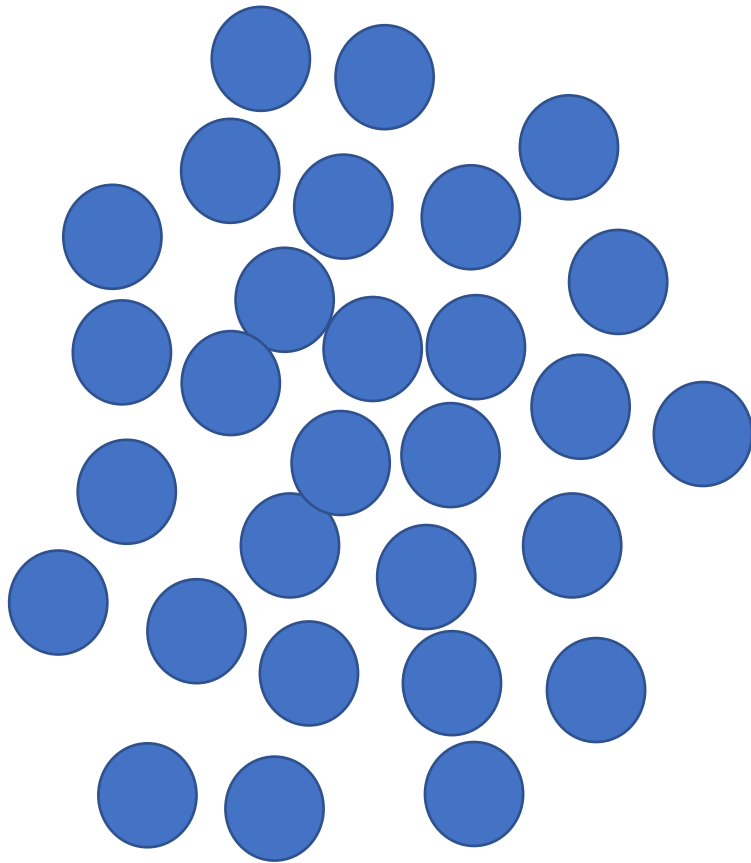
Learning outcomes

- Explain the work flow of climate dataset management and creation, including the successive application of data rescue, quality control, homogenization and integration into a Climate Database Management system
- Explain the normal climate of the area of study and describe its variability and recent changes.
- Identify the climatological similarities and differences across the area of study, relate them to climate controlling factors and explain them using a climate classification.
- Explain the concepts of climate time series quality and homogeneity and the causes of quality problems and inhomogeneities.
- Demonstrate computer literacy and the ability to use and adapt commercial and specifically designed software, including office-suites, statistical packages, graphical packages and specific homogenization packages.
- Apply statistical concepts associated with homogeneity problems, namely descriptive statistics, hypothesis testing, probability distributions, correlation, regression models and multivariate statistics.
- Apply homogenization techniques and evaluate the homogeneity of a climate data network after gathering documentary, statistical and graphical evidences.

COMPETENCY FRAMEWORKS IMPLEMENTATION

- The WMO competency framework implementation is conditioned by:
  - The organizational mandate, mission, priorities and stakeholder requirements;
  - The way in which internal and external personnel are engaged in the provision of climate services;
  - The available resources and capabilities (financial, human, infrastructural and technical);
  - National and institutional legislation, rules, organizational structures, policies and procedures;
  - WMO guidelines, policies and procedures for climate data and products;

IMPLMENTING THE COMPETENCY FRAMEWORK

The *Competency Framework for provision of Climate Services*, Resolution 5 (EC-68) constitutes a reference for the Members. Its implementation by each organization follows a four-stage logic, as described in the WMO Guide on Competency:

• Stage 0: Awareness of the Competency Framework

• Stage 1: Adaptation and adoption of the Competency Framewo

• Stage 2: Establishment of a Competency Assessment Process

• Stage 3: Completion of the Competency Assessment and planning of Competency Oriented Training to fill the identified competencies gaps.

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AT THE WORK PLACE: job roles description is the sole responsibility of each institution

Table 6 Sample Assessment Matrix

		Example Job Role									
		I. Written Test	II. Completion of ETR events	III. Official Datasets Evaluation	IV. Work on example datasets	V. Supervisor's report	VI. Example Report	VII. Self assessment	VIII. Oral Questioning	IX. Customers' report	X. Potfolio of evidences
C1.4 Apply quality control processes to climate data and resulting time series	a)	X							X		X
	b)				X						X
	c)				X						X
	d)		X	X	X						X
C1.5 Assess climate data homogeneity and adjust inhomogeneous time series	a)	X									X
	b)				X						X
	c)				X						X
	d)		X	X	X						X
C2.3 Compute Climate Indices for the monitoring of climate change, climate variability and climate extremes	a)	X							X		X
	b)		X		X						X
	c)		X	X	X						X
C4 Ensure the quality of climate information and services (to be developed)	a)					X		X		X	X
	b)					X		X		X	X
	c)					X		X		X	X
	d)					X		X		X	X
C5. Communicate climatological information with users (to be developed)	a)						X		X	X	X
	b)							X		X	X

Table 6 provides different options to assess each one of the learning outcomes required. Offering more than one option is aligned with the properties of a good CAP outlined in the previous paragraphs. The assessment will consist in certifying a pre-fixed number of evidences for each item, allowing customization to the needs of each candidate. Notice

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IDENTIFYING LEARNING NEEDS

C A P . D E V E L . E T R

| Category (number of baseline 2010 territories) Note: 6 countries are not able to provide Category I services.	Climate Services Offered. Note: each Category offers the services provided by the lower categories, plus those indicated.		
Category I: Basic Capacity (64)	foundational		
Category II: Essential (56)	Homogeneity testing and	Seasonal prediction and	Some interaction with users
Category III: Full Capacity (39)			
	seasonal to climate		
Category IV: Advanced Capacity (24)	Research and modeling capabilities for climate and applied climate studies	High level of global/regional cooperation and support	

TRAINING GAP?

Why a NMHS is not competent in providing some degree of Climate Services?
a) Lack of awareness
b) ***Need for TECHNICAL/SCIENTIFIC training. DOES IT EXIST?***
c) Lack of motivation
d) Lack of resources

THE LEARNING PROCESS. WMO-No. 1114
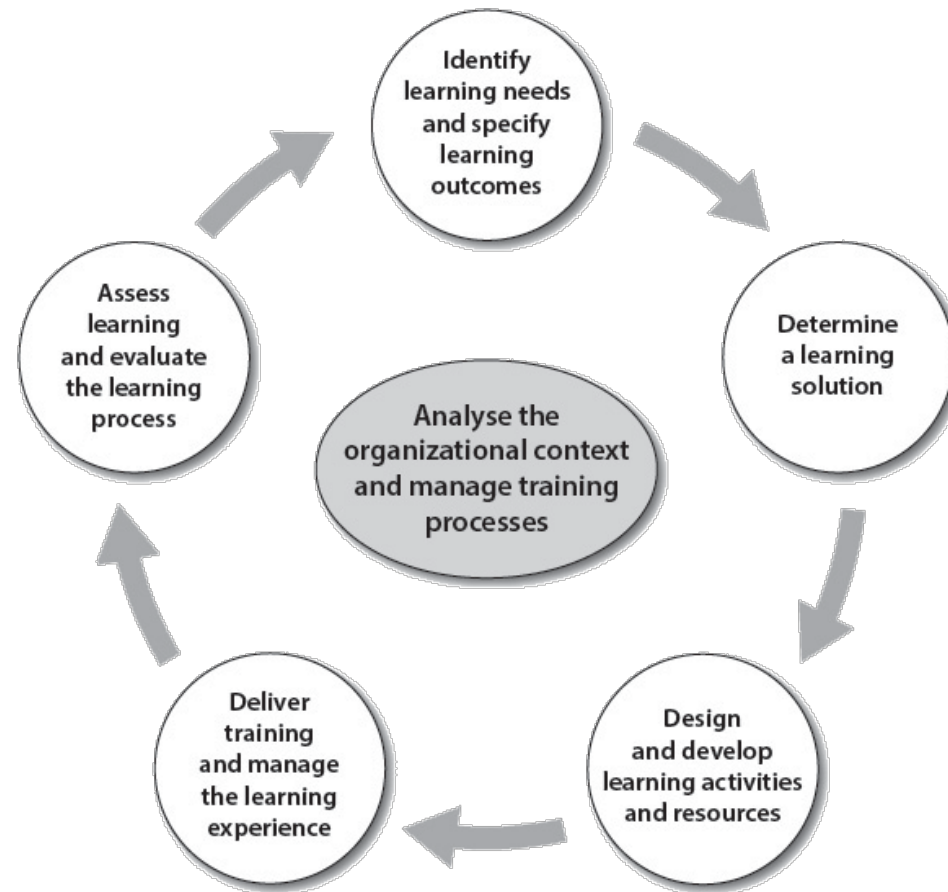
SUMMARY

- WMO Competency Framework for the Provision of Climate Services is designed to assist institutions providing Climate Services

- It is not an instruction package

- An instruction package and educational problems may be designed in compliance with this framework or part of it.

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Thank you!