MEETING OF THE WMO COMMISSION FOR CLIMATOLOGY

TASK GROUP ON FUTURE WMO

CLIMATE DATABASE MANAGEMENT SYSTEMS

(GENEVA, 3-5 May 2000)

WCDMP-No. 46

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THE FOLLOWING ACRONYMS AND ABBREVIATIONS ARE USED IN THE REPORT

ACMAD	African Centre of Meteorological Applications for Development
ACSII	American Standard Code for Information Interchange
BUFR	Binary Universal Form for the Representation of meteorological data (a binary code designed to represent, employing a continuous binary stream, any meteorological data; the meteorological emphasis is the result of the origin of the code but the code form may be applied to any numerical or qualitative data type)
CCl	WMO Commission for Climatology
CDMS	Climate Database Management System
CLICOM	Climate Computing (WMO project involving hardware, software & training)
CLIMAT (C)	Report of monthly means and totals from a land station (CLIMAT)
CLIMAT (T)	Report of monthly aerological means from a land station (TEMP)
CLIMAT (CT)	Report of monthly surface and aerological means from a land station (CLIMAT TEMP)
CLIPS	Climate Information and Prediction Services
DBMS	Database Management System
GIS	Geographic Information System
GRIB	Gridded binary (processed data in the form of grid-point values expressed in binary form)
GRID	Processed data in the form of grid-point values
GTS	Global Telecommunications System
LAN	Local Area Network
Member	Member country of the WMO
METAR	Aviation routine weather report
NMS	National Meteorological Service
Normals	WMO-defined period averages, computed for a uniform and relatively long period comprising at least 3 consecutive 10-year periods
QC	Quality Control
RA	WMO Regional Association
RDBMS	Relational Database Management System
SHIP	Report of surface observation from a sea station
SQL	Structured Query Language
SYNOP	Report of surface observation from a land station
UNCTAD	United Nations Conference on Trade and Development
VCP	Voluntary Co-operation Programme
WAN	Wide Area Network
Web	World Wide Web
WDC	WMO/ICSU World Data Centres
WMO	World Meteorological Organisation

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Meeting of the WMO CCl Task Group on
future WMO Climate Database Management Systems (CDMSs)

(Geneva, 3-5 May 2000)

SUMMARY

A total of 15 climatologists and relational database management system experts met at the WMO in Geneva, Switzerland, from 3 to 5 May 2000. The purpose of the meeting was to decide how the WMO should proceed to meet the varied needs of its Member countries that want to take advantage of the latest technology to manage their climate data.

1.   OPENING OF THE MEETING

1.1   The meeting opened at 09h00 on Wednesday 3 May 2000. Mr Peter Scholefield welcomed the participants (listed in Annex 1). He described the practical details of the meeting including working arrangements and the provision of a PC with Web access for the participants' use. In his opening remarks (see Annex 2), he briefly described the history of the CLICOM project, the current need for more up-to-date software and the work of previous relevant meetings.

1.2   Mr Ken Davidson was elected as chairman for the meeting.

1.3   The draft agenda was discussed and altered by common agreement, then approved (Annex 3).

2.   BACKGROUND TO THE MEETING

2.1   The purpose of this Task Group meeting was to propose how WMO should proceed to meet the varied needs of its Member countries who want to take advantage of the latest technology to manage their climate data. A number of countries do not need assistance because they already have well-developed CDMSs. Some of them are offering to share their systems or expertise with other Members. There is a second group that is successfully using a CDMS (CLICOM or other) and is interested in adopting a more modern system. There is also a third group of countries that has no operational CDMS in place and is in need of a basic, easy-to-use CDMS that requires minimum resources to purchase, operate and maintain. The challenge before the meeting was to determine how to best take advantage of the latest technology and existing expertise in WMO to meet these diverse needs.

2.2   Questionnaires had been sent to the Members in October 1999 to find out what CDMS functions they want and which countries are prepared to offer their CDMS for sharing with other Members. The response was most encouraging with replies from 96 Members of whom 14 offered to share their CDMSs and 84.2% were interested in using, testing or helping to enhance future CDMSs.

2.3   The first questionnaire dealt with the current status of CDMSs in the Member countries. The second questionnaire asked the Members to rank the functional and support requirements for future CDMSs according to a scale of 3 (essential), 2 (useful - high importance), 1 (useful - low importance) and 0 (not required). In addition, those Members with CDMSs, that they are prepared to make available for use by other Members, were asked to complete as fully as possible the remarks columns of the tables in order to describe their systems for evaluation purposes.

2.4   The questionnaire replies were available to help the meeting decide what functional requirements the future WMO CDMSs need. The meeting also had to decide on the strategy to use for testing as well as the detailed plans for the in-depth testing phase. In addition, the meeting had to prepare an implementation plan to address the needs of those countries with no operational CDMS and, for those operating CLICOM or other CDMS systems, to facilitate the migration to new WMO CDMSs.

3.   GOAL AND OBJECTIVES OF THE MEETING

3.1   The **goal** was to develop a test, an implementation strategy and a plan for new CDMSs.

3.2   The **meeting objectives** were:

- To define the requirements of the system;
- To define the requirements of the test (what should be tested?);
- To define the test data set and the products of the test;
- To define the evaluation criteria;
- To prepare a plan for the migration and preservation of data.

4.   ANALYSIS OF QUESTIONNAIRE REPLIES

4.1   Mrs Valerie Gerard of the WMO presented the results of the questionnaires (see Annexes 4 and 5).

4.2   A discussion on database models (Item 1.1 of Functional Requirements Table in Annex 5) followed (see Annex 6: Some views on database models - by Mr Steve Palmer). Meeting participants held differing views on database models. It was felt that potential users would choose a suitable CDMS using functionality criteria. However, it is important that there is a classification of what model each system is based on. This is needed, for example, to determine how easy it is to add new elements and products.

5.   GENERAL DISCUSSION ON THE PURPOSE AND ATTRIBUTES OF FUTURE WMO CDMSs AND STRATEGIES FOR DEVELOPMENT AND IMPLEMENTATION

5.1   The **purpose of a future CDMS** remains consistent with that of the original CLICOM project software, namely to:

- facilitate the transfer of computer technology to NMSs of developing countries;
- provide the capability to establish and manage a digital climate database;
- facilitate the international exchange of climate data and related products.

5.2   Desirable **attributes of a future system** should include:

- sustainable operability;
- fulfilment of minimum functional requirements;
- generation of a sense of ownership in the recipients by promoting some in-country development, especially in developing countries;
- preservation of data;
- promotion of the international exchange of data, especially by facilitating the provision of climate data to the World Data Centres;
- adaptability to future technological developments.

5.3   Desirable **strategies for development** should include:

- taking advantage of existing national CDMS expertise;
- utilization of commercial or open source software (see Annex 7 - by Mr David McGuirk) to the greatest extent possible;
- giving preference to future systems that run on "current" industry-standard client/server architecture and have modular components;
- adopting rigorous project management practices including budgetary estimates and time-lines.

5.4   Desirable **strategies for implementation** should include:

- actively involving and consulting the users;
- supporting current CLICOM project installations as long as required;
- ensuring that current CLICOM project hardware continues to be upgraded;
- focusing, initially, on implementation in a few countries where there are good prospects for success and, subsequently, giving high priority to those countries that have not yet successfully implemented CDMSs (or have limited CDMS capabilities) and do not have the financial or personnel resources to operate and maintain an elaborate system;
- obtention of estimates and agreements for supporting operations and maintenance costs prior to implementation;
- ensuring that training is an integral part of the implementation plan;
- ensuring that operators of the CDMSs have some understanding of how a database functions;
- encouraging regional and international co-ordination of implementation and maintenance (e.g. through CLICOM Area Support Centres).

6.   WMO CDMS REQUIREMENTS

6.1   The requirements are based mainly on recommendations from:

6.1.1 Meeting on CLICOM implementation and development, Washington DC, USA, 29 August-1 September 1994;

6.1.2 Expert meeting to review and assess the ORACLE-BASED prototype for future climate database management system (CDMS), Toulouse, France, 12-16 May 1997;

6.1.3 RA III meeting on CLICOM implementation with awareness presentations on CLIPS, 20-30 April 1998;

6.1.4 Regional CLICOM training seminar in Obninsk, Russian Federation, 11-22 May 1998;

6.1.5 Meeting of experts on finalization of CLICOM 3.1, Moscow Russian Federation, 25-27 May 1998;

6.1.6 Meeting of the CCl Task Group on a future WMO CDMS, Ostrava, Czech Republic, 10-13 November 1998;

6.1.7 Follow-up Workshop to the CCl Task Group meeting on a future WMO CDMS (see above), Toulouse, France, 30 March-1 April 1999;

6.1.8 Regional CLICOM Workshop at ACMAD in Niger, May to July 1999.

6.2   The system should (see Annex 8 WMO CDMS Evaluation Criteria - Kevin Robbins):

6.2.1 in **general:**

- be user-friendly;
- be simple to install and operate and be self-documented;

- have on-line help for all modules;
- have automatic on-line error messages;
- be capable of translation in different languages.

6.2.2   have a **data-entry process** that:

- is efficient;
- includes a key-entry module that is easy to use by inexperienced computer users;
- includes key-entry quality control that checks for key-entry errors.

6.2.3   have **quality control procedures** that:

- are standardized;
- include a quality control module that checks for consistency between different types of data (e.g. daily data and synoptic data);
- include a quality control module that checks for consistency between the first line in a key-entry form and the last line on the previous form;
- have pop-up menus.

6.2.4   be **capable of dealing with different types of climatic data** by being able:

- to process them taking into consideration related environmental data including meteorological and hydrological data collected from a variety of sources (e.g. manual observations, upper air soundings, autostations, strip charts, remotely-sensed images) and meteorological messages received in different code formats (BUFR, GRIB);
- to generate derived data to be used in climatology and agrometeorology;
- to produce climatological summaries, maps, graphs and windroses usable in commercial word processing packages.

6.2.5   have **transparent links** to:

- the Internet (users should have the possibility to receive information from or to transmit information to the Internet);
- the GTS system;
- user applications.

6.2.6   allow users to **receive information from or to transmit information to**:

- GISs;
- Automatic Weather Stations.

6.2.7   make **data and metadata easily accessible** for national and international data exchange given the constraints of Resolution 40 by:

- making data and metadata available in standard formats that are easily readable on non-powerful computers and easily exchangeable for national or international needs;
- encoding of data into various WMO formats (e.g. CLIMAT).

6.2.8   be **flexible and adaptable to national particularities** and needs by allowing for:

- key-entry form creation;

- putting in control parameters;
- adding new parameters;
- adding local applications.

6.2.9 have data **compatibility with previous CLICOM Project data by**:

- allowing users to import from or export to previous CLICOM system or commercial database management systems;
- being able to produce output data files readable by commercial packages (e.g. EXCEL, LOTUS, SPSS, STATGRAPHIC, SURFER etc.).

6.2.10 allow for **evolutionary development and be easily upgradable** in order to be able to:

- take maximum advantage of the latest developments in computer technology and to adapt to new methods of climate data management and processing;
- move to a new platform without a major modification.

6.2.11 comply with **WMO Guides** by:

- adhering to the climatological techniques prescribed in the WMO Guide to Climatological Practices, especially those concerning data processing and archiving;
- being consistent with other WMO Guides.

6.2.12 have **reasonable operational and maintenance costs** given its size.

7. DIFFERENT GROUPS OF CDMS USERS

7.1 A number of countries do not need assistance because they already have well-developed CDMSs. Some of them are offering to share their systems or expertise with other Members.

7.2 A second group is successfully using a CDMS (CLICOM or other) and is interested in adopting a more modern system.

7.3 A third group comprises countries that have no operational CDMS in place and are in need of a basic, easy-to-use CDMS that requires minimum resources to purchase, operate and maintain.

8. SELF-TESTING AND EVALUATION OF OFFERED CDMSs

8.1 It was decided that all the CDMSs, that Members are offering to share with other Members (see Annex 9), should be tested. Given the number of these, the previously proposed idea of a centralized, one-off testing exercise was deemed to be too expensive and was abandoned in favour of self-testing by CDMS developers. Members, offering their systems for sharing, will be sent a test pack of materials (see Annex 10, paragraphs "Evaluation criteria" and "Test dataset", by Mr Peter Muraya) including a test dataset, a list of test output products and a questionnaire covering hardware and software requirements (recommended and minimum), human resources requirements (numbers and knowledge levels), training needed, etc. The test pack will include a feedback form to be sent to the WMO and will include a list of the items in the test data set as well as a proposed list of output products.

8.2   The test data set will include:

- SYNOP data;
- CLIMAT (C) report;
- CLIMAT (T) report;
- CLIMAT (CT) report;
- METAR data;
- Hard copy precipitation data;
- CLICOM data (examples from different CLICOM tables including Normals as DataEase .dbm files);
- Metadata (Station geography);
- Radiosonde data;
- CO-OP data on hard copy forms;
- WMO Publication No. 9 - Volume A - flat file from the Web.

8.3   Output product suite will include:

- Listing of data from archive;
- Statistical summaries;
- Daily, monthly reports;
- Time series graph;
- Data tables in comma-delimited form;
- CLIMAT (C) report;
- CLIMAT (T) report;
- CLIMAT (CT) report;
- Report on QC (errors handling).

8.4   The test data set above, plus a list of output products, should be packaged by the WMO and sent to all Members, who offered to share their systems with other Members, asking them to import the data into their system, and generate the required products.

8.5   The results (including comments of errors found in data in the test data set, etc.) should be sent to the WMO together with a completed form describing minimum and recommended hardware requirements (with costs), commercial software requirements including licensing needs (with costs), training costs, human resources requirements including level of knowledge.

8.6   A small group of CDMS experts should be convened to analyse the results of the self-testing and compile a comparative evaluation report. This report would subsequently be made available on the Web for consultation by potential users (i.e. Members wanting to move to a new CDMS).

8.7   A form should be sent to new users to enable them to give feedback on their experiences with installation and subsequent usage of these new CDMSs.

9.   OBJECTIVES DEVELOPED BY THE TASK TEAM FOR THE CDMS TEST, EVALUATION AND IMPLEMENTATION PHASES (see Annex 10: Testing Method)

9.1   For the test phase:

- to identify to what degree systems meet minimum performance functionalities (in the areas of key entry, electronic import, validation and quality control, data extraction, metadata management and database administration);

- to identify to what degree systems produce standard output products.

9.2 For the initial evaluation phase:

- to compile and analyse the system developers' self-testing results (including test data results, performance, documentation, estimated training, price and implementation requirements);
- to make these results available to potential users.

9.3 For the implementation phase:

- to prepare projects in recipient countries, in collaboration with donors and developers.

9.4 For the user evaluation phase:

- to obtain feedback from users on the implementation and operation of systems.

10. RECOMMENDED PLANNING SCHEDULE, INCLUDING FUTURE TARGET DATES AS "MILESTONES"

• June 2000	- Contributions to test data set to be sent by Task Group members to Secretariat
• August 2000	- Test data set to be sent to CDMS developers with explanatory letter and self-testing feed-back form;
	- test data set and other material to be provided by WMO to CDMS developers with explanations of how to use the data set, what standard output to produce and a self-testing feed-back form for completion;
	- CDMS developers to provide test results and related information to WMO;
• February 2001	- Subsequent analysis of the test results and related information from all the offered systems to be used to produce an evaluation report;
	- evaluation report to be made available to all Members and put on the Web;
	- report to be ready for VCP donor meeting February 2001;
	- CCl Members and CLICOM users group e-mail list to be notified of the report;
• from February 2001 on	- Implementation of projects in recipient countries in collaboration with potential users, developers and donors.

11. OTHER RELATED ACTIVITIES

11.1 The Czech Republic has bilateral agreements to donate and install their CLIDATA system as follows:

- Sep. 2000   Macedonia
- Dec. 2000   Ghana.

11.2   Promotional material should be available for:

- Feb. 2001   Report to VCP including, if possible, a brochure.

11.3   Self-testing and evaluation of self-testing results should be:

- Ongoing   - Updates and new self-testing and evaluation reports
                             - Feed-back reports from users should be added to Web
                             - Notify user email fora for different systems being offered.

12.   RECOMMENDATIONS

- A test data set should be prepared by the Task Group and assembled and distributed by the Secretariat.
- WMO should prepare a CDMS developer's feedback form for the self-testing, by early September 2000.
- WMO should prepare an information brochure, initially targeted for the VCP donor meeting in early 2001.
- The ability to expand the role of the WDC system to provide a secure repository with exchange restrictions for Members' climate data should be investigated.
- The number of CDMSs to be tested and evaluated should not be limited and the testing and evaluation process should be ongoing.
- Developers should provide systems with detailed information to encourage users to develop new modules.