

WORLD METEOROLOGICAL ORGANIZATION



**WHYCOS
INTERNATIONAL ADVISORY GROUP**

Fourth meeting

**Geneva, Switzerland
30 May -1 June 2001**

FINAL REPORT

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1. OPENING OF THE MEETING

1.1 The WHYCOS International Advisory Group (WIAG) held its fourth meeting from 30 May to 1 June 2001 in the WMO Headquarters in Geneva. The participants are listed in **Annex 1** to this report.

1.2 Mr D. Rutashobya, president of CHy, chairman, opened the meeting and extended a warm welcome to the participants. He recalled the general terms of reference of WIAG, as:

- to undertake a periodical review and assessment of the status of development of the overall Programme and of its regional projects and recommend adjustments as necessary;
- to discuss and recommend strategies for a coordinated development of the various WHYCOS components;
- to consider and propose plans to improve the visibility of the Programme; and
- to explore and propose ways and means to sustain and expand the Programme, notably through new financing mechanisms.

He also noted that a particular aspect of the meeting was to consider future actions with regard to the current phase of the three on-going projects which will all come to an end during 2001.

1.3 The Assistant Secretary-General of WMO, Mr A. Zaitsev welcomed the participants on behalf of the Secretary-General. He noted that WIAG was seen as an independent body of hydrological experts providing advice and guidance to the Secretary-General and the Executive Council. He expressed his appreciation to the regional bodies and to the donor community which are playing a very supportive role in the development of WHYCOS. He further noted that, in addition to the projects being implemented, a number of HYCOS projects are at various stages of development. He urged the meeting to be forthright in its recommendations, while at the same time imaginative and realistic with regard to future development of these projects.

1.4 Mr A. Askew, Director of the Hydrology and Water Resources Department, also extended a welcome to the participants.

2. APPROVAL OF THE AGENDA AND ORGANIZATION OF THE WORK

The meeting adopted the agenda, as given in **Annex 2**. It also agreed on the organization of the work of the meeting.

3. CONSIDERATION OF THE REPORT OF THE THIRD MEETING OF THE WIAG

3.1 The Group considered the report of its last meeting held in July 2000, and focused in particular on the recommendations made at that time.

3.2 As regards requirements of information systems for HYCOS (item 3 (f) of the report), WIAG noted that this was being incorporated within the WHYCOS standards and guidelines currently under preparation by the Secretariat (see paragraph 4.7).

3.3 With respect to the promotion of WHYCOS (items 4.6 to 4.8 of the report) the following comments were made:

- (a) Contacts were made by SADC/WSCU with the African Development Bank concerning possible support to the second phase of SADC-HYCOS and there was an expression of interest.
- (b) Missions from the NBA had visited Europe and USA .
- (c) Presentations were made at the Second World Water Forum by the WMO Secretariat and the WHYCOS programme is reflected in the Framework for Action prepared by the Global Water Partnership.
- (d) Continuing action should include promotion of the Programme to the World Summit for Sustainable Development (Johannesburg, 2002).
- (e) SADC-HYCOS was recognized as the most useful tool for regional flood forecasting at the Ministerial Conference on the Mozambique Floods (Maputo, October 2000).
- (f) The WMO Secretariat made a regular practice of highlighting WHYCOS as a major activity of WMO's Hydrology and Water Resources Programme and making specific reference to it in documents for external distribution.
- (g) The WMO Secretariat presented WHYCOS at the General Assembly of the International Network of River Basin Organizations (INBO) in Zakopane, Poland (October 2000), at the 48th Session of the Lake Chad Basin Commission held in Bangui, Central African Republic (April 2001), to the post graduate students of Ecole Polytechnique Fédérale de Lausanne (EPFL) and the University of Paris VI.
- (h) The chairman planned to present WHYCOS at the GCOS Regional Workshop for Eastern and Southern African countries to be held at Kisumu, Kenya in October 2001.
- (i) There was a need to foster links/partnerships with other initiatives such as those being supported by GEF for various river basins in Africa.

3.4 With respect to sharing experience between HYCOS projects (item 4.9 of the report), the meeting was informed by the coordinator of the SADC-HYCOS PRC of a visit he had made to the MED-HYCOS PRC in Montpellier France (July 2000) where he was introduced to the activities which are being carried out at the Centre, particularly the development of the regional information system. A substantial part of this work was carried out by experts seconded from the participating countries.

3.5 With respect to experience with on-going projects (item 5.1 of the report), the question of vandalism of solar panels was again raised. The coordinator of the PRC of SADC-HYCOS noted that, in one of the seven hydrological regions in South Africa, solar panels were no longer being installed. Instead data loggers with cellular telephone links were being used

3.6 The SADC-HYCOS PRC Coordinator informed the meeting that developmental work to produce a low power consumption logger interfaced with a communication unit for either GSM/SMS messaging (cellular phone), low orbit satellite, or geostationary satellite, was developed by a South African company. The Directorate of Hydrology of the Department of Water Affairs and Forestry had been offered a unit for evaluation. It is claimed by the manufacturer that the battery life of the system is three years without charging. The prototype would be installed at a gauging site before July 2001.

3.7 Regarding the use of the DCPs shipped to Angola (item 5.3 of the report), the Steering Committee of the Project (Johannesburg, September 2000) recommended that three DCPs shall be installed in Angola and three should be returned to the PRC for installation elsewhere within the project area where damages to DCPs occurred during the floods in February 2001.

3.8 With respect to the AOC-HYCOS server (item 5.4 of the report) the meeting was informed of the problems of Internet links between members countries and the PRC. Internet links between the Member countries and IRD Montpellier were much better. It had therefore been proposed to establish a mirror AOC-HYCOS server in Montpellier at one of the MED-HYCOS UNIX stations. An MoU between the PRC and IRD was being prepared for this purpose. An option of disseminating the information on a CD-ROM was being considered. Nevertheless, it was noted that the WEB has the clear advantage of making the project visible, "alive" and more accessible to the rest of the World.

4. CONSIDERATION OF THE REPORT OF THE LAST MEETING OF THE WHYCOS COORDINATION GROUP

4.1 The discussion was introduced by Mr Askew. He recalled that the WHYCOS coordination mechanism established by the Secretary-General consisted of the WIAG and of the WHYCOS Coordination Group (WCG) which is an in-house Secretariat body which includes representatives of the various Departments supporting WHYCOS activities. The WCG meets as required, but normally at six-monthly intervals. The last meeting of this Group was held in January 2001. The main points discussed which are of interest to WIAG are the following:

WHYCOS Office

4.2 This was a proposal of an earlier meeting of WIAG. It has been supported by the WCG and is still under consideration by the Secretary-General. It is felt that the establishment of such an office would give WHYCOS more visibility and hopefully attract more resources.

Task Teams

4.3 A task team has been established for each HYCOS project being developed. The team consists of four or five members drawn from the Departments concerned. One of the members is designated as team leader.

Ownership and Sustainability

4.4 Mr Askew recalled that the WHYCOS concept originated within WMO and that it was CHy-IX in 1993 that had first endorsed it, to be followed by Cg-XII in 1995. There was no doubt that WMO had ownership of the concept, where WMO is taken to include both the Secretariat and the Members. However, implementation of the concept in practice requires the establishment of partnerships between the Members in a region, in particular their National Hydrological Services, the WMO Secretariat and donors, each of which has an important role to play in the development and implementation of any HYCOS project.

4.5 Further, it was felt that it was necessary for participating countries in HYCOS projects to have ownership of the project both during and after its implementation. To ensure this, future HYCOS projects should, in addition to the objectives and goals of WHYCOS, better address institutional and human capacity building as a joint cost-sharing partnership between donors and participating countries.

Governance

4.6 Each HYCOS project is being developed to meet specific regional needs and the management structure has to be tailored to comply with these needs and with the requirements of the donor agencies. The basic institutional set-up usually includes the

following components: a steering committee, an executing or supervising agency, a regional centre, and participating NHSs. The responsibility and role of each of these bodies need to be clearly defined in the plans for the project.

4.7 The preparation of WHYCOS standards and guidelines currently underway by the WMO Secretariat will include recommendations on the governance of WHYCOS and its HYCOS components. The draft guidelines will be circulated to members of WIAG for their review and comments.

- *To finalize the draft of the WHYCOS guidelines and standards and to circulate them to the WIAG.* **WMO Secretariat**

5. REVIEW OF THE HYCOS PROJECTS TO BE COMPLETED IN 2001 AND CONSIDERATION OF FUTURE ACTIONS

5.0.1 A number of matters were raised in relation to the implementation of the current HYCOS projects which were of a more general nature. Principal among these was the concern that the flow of data to the regional centres was not as anticipated, for technical and other reasons.. WIAG recommended that the PRCs work together to develop a common strategy to overcome this problem in which the regional bodies and the WMO Secretariat have a role to play.

- *To develop a strategy for improving the data flow from the NHS(s) to the Regional Centres* **PRCs, Regional Bodies, WMO Secretariat**

5.0.2 The meeting considered it important to recall that one of the basic aims of any HYCOS project was, to quote Resolution 20 (Cg-XII), the provision of “timely, reliable and consistent data to regional data centres” on the understanding that “certain of these data could, then, be made available at the international level through centres, such as GRDC for runoff data”. This aim had been and must continue to be incorporated in the plans for all HYCOS projects and Members and their NMHSs should be reminded of it as and when appropriate so as to ensure the full implementation of the WHYCOS concept.

5.0.3 This resolution of Cg-XII was maintained in force by Cg-XIII in 1999 which then went on to adopt Resolution 25 (Cg-XIII) on the exchange of hydrological data and products. WIAG considered in particular the seven points under “Further Adopts” of the latter resolution and confirmed that, in its opinion, data obtained from stations installed under HYCOS projects and funded by external donors fall under the category referred to in Further Adopts (1). Consequently, they should be provided on a free and unrestricted basis.

5.0.4 The meeting welcomed the valuable contribution made by Members participating in HYCOS projects in providing additional data to their regional data bases in the true spirit of regional cooperation and recognized that this flow of data could be improved in many cases if the NHSs concerned were provided with small amounts of financial assistance to repair, upgrade and maintain their existing stations and data transmission equipment. WIAG advised that such assistance should be used for these specific purposes and should never be intended or seen as being for the purchase of the data themselves.

5.1 MED-HYCOS

5.1.1 The PRC Coordinator, Mr Marc Morell, reported on the status of implementation of the project and the results achieved so far. In particular, he referred to the establishment of a regional DCP network transmitting in real-time by METEOSAT, the creation of a regional

data bank containing data from the DCPs as well as historical data provided by the countries, and the development of a web-based hydrological information system with tools for retrieving, displaying and analysing data. The major contribution made by experts from a number of participating countries to the development of this MED-HYCOS Information System (MHIS) was acknowledged. Specific mention was made of problems faced in the implementation of the project, notably delays in installing the DCPs and in the provision of validated data and other information by the participating countries.

5.1.2 The Group endorsed a proposal by the coordinator that the funds still available in the project be utilized for the maintenance of the regional database, of the web site and related tools and for the preparation of the project's second phase.

5.1.3 For the second phase of the project, it is proposed that the main focus be on the implementation of a regional observation system for water resources. It is further proposed that thematic networks should be created in coordination with relevant existing programmes to address specific water-related problems of the region such as droughts, floods, pollution, climate change impacts, etc., and to address and develop new methodologies such as statistical analyses. The thematic networks will be formed by experts from NHSs, universities, research institutes and other regional projects. These networks will be coordinated by thematic centres having the required expertise in the relevant fields. These centres will be established at NHSs or other institutions as appropriate in the participating countries and will operate with oversight and coordination provided by the PRC. WIAG was informed that, during the meeting held in Belgrade, Yugoslavia in April 2001, the Federal Hydrometeorological Institute of that country had offered to host a thematic centre on the MHIS, the study of the effects of droughts on water resources and statistical analysis tools. The WIAG also noted that this proposal had received the support of the PRC and all Balkan countries.

5.1.4 In parallel with the establishment of the thematic networks, operational projects at basin level will be launched so as to address water-related problems such as management of hydraulic structures, pollution monitoring and control, flood forecasting and sharing of water resources in international basins.

5.1.5 Furthermore the activities at national level in support to the NHSs will be continued. This will address the rehabilitation and upgrading of observing networks, development of databases and information products and capacity building. One of the main objectives will be to transfer from regional to national level the technology related to the MHIS developed at the PRC during the first phase of the project.

- *To transfer to NHS(s) the technology related to MHIS which has been developed at the PRC.* **MED-HYCOS PRC**

5.1.6 In view of the need for external funding, the WMO Secretariat was requested to assist in promoting the project and in contacting potential donors. In this connection, the Secretariat requested that it be provided more details concerning the proposals being developed.

- *To inform WMO of the proposals developed and of the contacts made for further phase of the project.* **MED-HYCOS PRC**
- *To assist the PRC in promoting the project in the donor community.* **WMO Secretariat**

5.1.7 In noting this new approach to the development of the second phase of MED-HYCOS and the establishment of sub-projects, the WIAG urged that care should be taken to preserve the concept of WHYCOS, its HYCOS components and the PRC.

5.1.8 The Group welcomed the offer of the Government of France to continue hosting the PRC and supporting its activities for another four years.

5.2 Pilot Phase of AOC-HYCOS

5.2.1 The PRC Coordinator, Mr Oumar Ould Aly, presented the status of implementation of the project and the results which had been achieved to date. He mentioned in particular that the transfer of the Regional Hydrological Observatory for Western and Central Africa from Ouagadougou to Niamey had been completed and that this server was currently installed in the IRD Centre in Niamey (<http://www.aochycos.ird.ne>).

5.2.2 Among the difficulties faced by the project were the generally poor performance of the Internet infrastructure in the sub-region and the numerous breakdowns of the server. To overcome this situation, the creation of a mirror website is being considered, to be hosted by IRD in Montpellier, in order to facilitate the access to the information and increase the visibility of the web site of the project. An MoU between IRD and the NBA/AGRHYMET Consortium is being prepared for this purpose.

- *To implement a mirror Web site of the project in IRD Montpellier.* **PRC, IRD**

5.2.3 Arrangements are also being finalized between IRD and the NBA/AGRHYMET consortium for the specification of technical assistance, maintenance of the server and training of computer technicians.

5.2.4 A CD-ROM version of the web site has been produced and distributed to the participating countries, in order to overcome the severe problems of Internet connection in the region.

5.2.5 Mr Ould Aly informed the meeting of some problems being experienced with regard to the regular supply of data by the participating countries to the regional database. With the supply of computers and support to data collection activities the situation is expected to improve.

5.2.6 The PRC has also been very active in approaching potential donors to secure funding for the implementation of the further phase of the project. In this connection, visits had been made to the European Commission, the World Bank, FAO and other donors. Efforts had also been made by the PRC in promoting AOC-HYCOS with the other Member countries not currently participating in this pilot phase.

5.2.7 With respect to the development of the comprehensive AOC-HYCOS, the meeting noted the concept paper prepared by the WMO Secretariat which proposes a strategy based on large transboundary river basin components. These components are the basins of the Niger, the Volta, the Senegal, the Congo, Lake Chad and the coastal rivers.

- *To circulate the concept note presenting the development of AOC-HYCOS in the form of large river basin components.* **WMO Secretariat**

5.2.8 WIAG recommended that efforts be made to complete the project documents for the proposed basin-scale HYCOS Projects and to secure funds for their implementation. This will ensure a smooth transition from the pilot phase to the comprehensive phase of AOC-HYCOS.

- *To coordinate the preparation of proposals for the development of AOC-HYCOS in the form of large river basin components.* **WMO Secretariat**

5.2.9 The Coordinator further informed the Group of the ongoing GEF supported “Niger Basin” project and of the possibility of establish a link between that project and AOC-HYCOS.

5.2.10 The meeting was pleased to note that NBA had received a grant of US\$ 250,000 from the Arab Development Bank for Africa to finance institutional support to the HYDRONIGER Interstate Forecasting Center. The funds will be used for the installation of an additional 12 DCPs in the Niger River basin.

5.3 SADC-HYCOS

5.3.1 The PRC Coordinator, Mr Stefan van Biljon, reported on the status of implementation of the SADC-HYCOS project.

5.3.2 A total of 41 DCPs had been installed by the end of April 2000. The target for the installation of 50 DCPs according to the project document, had been modified to a target of 47 DCPs.

5.3.3 Angola was initially awarded six DCPs but indicated that the security situation prevented access to certain identified sites. Following the proposal of the project Steering Committee, Angola offered to return three DCPs to the PRC where they would be reserved as spares (see also 3.7 above).

5.3.4 Subsequently, due to the extreme flooding in South Africa, Botswana, Zimbabwe and Mozambique in the Limpopo Basin in 2000, a need was identified by Botswana and South Africa to increase the number of DCPs on the Limpopo River. In this connection, the PRC made a proposal that one DCP be installed on the Limpopo River in Botswana at a place called Seleka Farm. This was done in April 2001.

5.3.5 The original intent was to install a DCP on the Limpopo River at or near Pafuri to aid in flood warning to Mozambique. The Pafuri region was found to be unsuitable for flood gauging due to the width of the river and sand deposits. Two possible sites were found by means of a helicopter reconnaissance on the Limpopo River, one suitable site at Rock Bank where unfortunately there is no access road, and a less suitable site at Madimbo where road access exists. Both sites are situated downstream of the confluence of the Nzelele River in South Africa but upstream of the Bube River confluence in Zimbabwe. This implies that the Mutale River which joins the Limpopo River at Pafuri will not be gauged. South Africa is however engaged on flood damage reinstatement works of its gauging weirs and is planning the installation of two DCPs on the Mutale River. The Limpopo sites are situated in a pristine area for which an environmental impact study will have to be conducted before any developmental work can be undertaken.

5.3.6 An audit of the data stored in the RDB had been undertaken by the PRC. This revealed that maintenance of the DCPs should be improved and corruption of CREX messages investigated. A strategy had been devised whereby CEH (Wallingford) which provides the Technical Assistance undertook to visit all the participating countries and to recover data from the built-in data loggers of DCPs to fill in the gaps in the RDB time series.

- *To collect the data stored in the memory of the data loggers.* **Technical Assistance**
- *To update the regional data base.* **SADC-HYCOS PRC**

5.3.7 The utilization of SADC-HYCOS to provide river stage and discharge data for flood warnings was discussed. The shortcomings due to the physical characteristics of the installations, namely the height and proximity of instrument towers to the rivers, were highlighted. It was noted that SADC-HYCOS could contribute to the provision of effective flood warnings but that it should not be considered as a flood management system.

5.3.8 It was recommended that in future phases of SADC-HYCOS, particular attention should be paid to utilization of appropriate technology at each site. Attention was also drawn to an improvement in the design for installing probes in the river. This would require some limited additional civil works which may result in improved quality of the data captured. Installation of probes in a flank wall had been recommended. The issue of vandalism was discussed and the meeting noted the experience of South Africa in coping with this problem. **Annex 3**, prepared by Mr Stefan Van Biljon, presents some of the measures taken in South Africa and in the SADC-HYCOS project to inhibit vandalism and theft of hydrological field equipment.

5.3.9 South Africa indicated its willingness and commitment to the SADC-HYCOS project and re-iterated its offer to host the regional centre for the project and to extend its support to the participating countries should external funding be available to support the travel and per diem expenses of its personnel. WIAG thanked South Africa for this generous offer.

5.3.10 With the current phase of SADC-HYCOS ending in August 2001, the PRC decided to undertake visits to most countries to repair the DCPs not functioning well and to permit person-to-person hands-on maintenance training to staff of the NHSs.

5.3.11 With respect to future plans for SADC-HYCOS, the meeting was informed by the SADC water sector coordinator that the community had expanded from 12 to 14 members with the inclusion of the Democratic Republic of Congo and the Seychelles. There was need for these countries to participate in the project activities. Plans are underway for the development of a Phase II of the project. This will focus essentially on consolidation of the current project activities and of training of national staff. Emphasis will be placed on a river basin approach and on integrating "high tech" and conventional stations.

5.3.12 The meeting was informed that in March 2001, the SADC Heads of State and Government approved a new Institutional Structure which includes a centralized institutional framework. The traditional Coordination Units and Commissions are replaced by four Directorates in which thematically related sectors will be coordinated. Water is clustered under Food, Agriculture and Natural Resources Cluster (Directorate) and Infrastructure and Services. The restructuring will be carried out in way that ensures minimum disruption in the implementation of programmes/projects. A phasing-in approach has been adopted for the implementation of the new structure. The restructuring process is expected to take two years as from March 2001.

5.3.13 WIAG was pleased to note the intention of the Government of The Netherlands to support the implementation of the second phase of the project within the framework of a possible partnership under discussions between The Netherlands and WMO.

- *To pursue contacts and discussions with MFA of The Netherlands in relation with the development and implementation of SADC-HYCOS Phase II.* **WMO Secretariat**

6. PROGRESS AND CURRENT STATUS IN THE DEVELOPMENT OF OTHER HYCOS PROJECTS

6.1 The meeting noted that the continuing demand for new HYCOS projects puts an excessive load on the WMO Secretariat. It expressed its appreciation to the Government of France for making available the services of Jean-Marie Fritsch and of Serge Pieyngs before him. It further noted that more assistance of this nature would greatly improve the ability of the Secretariat to respond to requests of Members, regional bodies and donors.

6.2 In view of the limited staff available to support WHYCOS, there is need to set priorities with preference to on-going projects and those for which project documents already exist. Additionally, Members concerned should be more closely involved in developing projects. Projects where the Members do not show a substantial interest and make a consistent input to their development are likely to receive less priority.

6.3 The current status of development of the other HYCOS projects is as described in **Annex 4**. The relevant points raised in the discussion on each of these projects are included hereunder as follows:

IGAD-HYCOS

6.4 Following the discussion with the EC representative at the last meeting of the WIAG, it was proposed that the draft project document be revised into two phases namely a detailed preparatory phase and an implementation phase. This proposal has been agreed with the IGAD Secretariat and the terms of reference to carry out the preparatory phase have been prepared by the WMO Secretariat and formerly submitted to the EC by the IGAD Secretariat. The meeting was informed through an e-mail from the EC that the contract for the project was been considered by the legal counsellors of the EC. It is expected that the funding will soon be available to start work on this project. The representative of IGAD emphasized the importance of recruiting a competent consultant to undertake the preparatory phase of the project and requested the WMO Secretariat to make proposals for the consideration of the IGAD Secretariat.

- *To identify and select consultants for the preparatory phase of the project.* **WMO Secretariat,
IGAD Secretariat**

6.5 Note was taken of plans to develop a Nile-HYCOS. The representative of IGAD stressed the point that his organization could only support projects involving Member countries. It was noted that the development of Nile-HYCOS would follow that of IGAD-HYCOS and should therefore be designed to take account of the existing project.

6.6 In general, in any region where the development of one HYCOS project follows another and there is a geographical overlap, account should be taken of existing data collection and processing activities in the region, including those of earlier HYCOS projects, and these should be built upon. In other words, projects should be designed to be complementary and avoid duplication.

Nile-HYCOS

6.7 Over the past two years, the Nile Basin States have been engaged in the preparation of a portfolio of cooperative projects, which aim at building trust and capacity for socio-economic development. The portfolio was endorsed by the Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM) for presentation to the international donor community. The WIAG was informed that at the request of Nile-COM, the World Bank will organize the first meeting of the International Consortium for Cooperation on the Nile (ICCON), which will be held in Geneva from 26 to 28 June 2001. The ICCON meeting will support the Nile Basin Initiative (NBI) and launch ICCON, which is envisaged as a broad partnership between and among the Nile riparian States and the international community. WMO will participate in the ICCON meeting and discuss plans for a Nile-HYCOS.

Congo-HYCOS

6.8 The meeting noted that, in view of the prevailing security situation in the region, it would not be possible to take any further steps in its implementation of this project. As the

Democratic Republic of Congo had now become a member of SADC, it was proposed that the project document be used as a basis for discussions between the national authorities and representatives of SADC Water Sector that are planned for the near future.

Baltic-HYCOS

6.9 The meeting was informed of the willingness recently expressed by the Swedish Meteorological and Hydrological Institute to host the project regional databank, a first action to be undertaken without external funding in order to demonstrate to donors the interest and commitment of the participating countries in implementing the project. The SMHI also offered to act as Principal Contractor regarding application for funding with the European Commission. In particular, consideration is being given to submitting the project to the EC Fifth Framework Programme and to the Swedish Government. The meeting noted also the difficulties faced in identifying a single source of funding when countries with very different levels of economic development are involved in a project.

Danube-HYCOS

6.10 The meeting was informed that the final project document would be ready later in 2001. As agreed during several preparatory meetings, it will focus mainly on upgrading existing stations to enhance the availability of real-time data, mainly for purposes of pollution monitoring and flood forecasting. Its implementation will also be used as an opportunity to create a basin-wide organism working on issues related to water quantity, something which at present does not exist.

Amazon-HYCOS

6.11 The Regional Hydrological Adviser for RA III, Mr Roberto Coimbra, informed the meeting of the interest of Brazil in the establishment of an Amazon-HYCOS. He noted that, by the end of 2001, some 236 DCPs with rainfall and water level sensors would be in operation in the Brazilian part of the Amazon Basin. The region was served by three satellites (Brazilian data collection satellites 1 and 2 and the CIBERS satellite operated jointly by China and Brazil). The WMO Secretariat has been requested to take the lead in organizing a meeting of the Amazon basin countries (Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela).

- *To make contacts and to organize a preparatory meeting with concerned stakeholders for launching the process leading to for Amazon-HYCOS.* **WMO Secretariat**

7. FUTURE MEETINGS OF WIAG

WIAG expressed the view that its meetings serve as a valuable forum for an exchange of views and experiences in the development of WHYCOS and its HYCOS components and recommended that it should therefore continue on an annual basis. It was agreed that the dates of the next meeting be tentatively scheduled from 5 to 7 June 2002, this being immediately prior to EC-LIV.

8. ANY OTHER BUSINESS

8.1 The meeting was advised of the discussions on WHYCOS held during CHy-XI (Abuja, November 2000) and noted the support and encouragement offered by the Commission to

the further development of WHYCOS. The Commission had referred in particular to the valuable links forged within WHYCOS between the Hydrology and Water Resources Programme and other WMO Programmes and the need for each HYCOS project to specify its particular objectives.

8.2 All comments and recommendations of CHy-XI were directly in line with the WIAG's own views, as recorded above, including those concerning the importance of applying the principles of Resolution 25 (Cg-XIII).

8.3 It was noted that subsidiary bodies of CHy were making substantial inputs to the development of certain HYCOS projects and WIAG encouraged the chairman, in his capacity as president of the Commission, to encourage this practice and to advise the WMO Executive Council and WMO Congress of the importance of the WHYCOS programme.

- *To inform the WMO Executive Council and WMO
Congress on the status of development of
WHYCOS and to promote the Programme.* **Chairman and
members of CHy**

9. APPROVAL OF THE REPORT OF THE MEETING

The WIAG approved the report of its fourth meeting and requested the Secretariat to make any editorial revision deemed necessary to improve the presentation. It further requested that the recommended actions be highlighted.

10. CLOSURE

10.1 At the closure, the chairman thanked the participants for their valuable contributions to the work of the session.

10.2 The meeting closed at 12.35 on Friday 1 June 2001.

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AGENDA

1. OPENING OF THE MEETING
2. APPROVAL OF THE AGENDA AND ORGANIZATION OF THE WORK
3. CONSIDERATION OF THE REPORT OF THE THIRD MEETING (JULY 2000) OF THE WIAG
4. CONSIDERATION OF THE REPORT OF THE LAST MEETING (JANUARY 2001) OF THE WHYCOS COORDINATION GROUP
5. REVIEW OF THE HYCOS PROJECTS to be completed in 2001 and CONSIDERATION OF FUTURE ACTIONS
 - 5.1 SADC-HYCOS
 - 5.2 Pilot Phase of AOC-HYCOS
 - 5.3 MED-HYCOS
6. PROGRESS AND CURRENT STATUS IN THE DEVELOPMENT OF OTHER HYCOS PROJECTS (Presentation by the WMO Secretariat)
7. FUTURE MEETINGS OF WIAG
8. ANY OTHER BUSINESS
9. APPROVAL OF THE REPORT OF THE MEETING
10. CLOSURE

**MEASURES TAKEN IN SOUTH AFRICA AND SADC-HYCOS
TO INHIBIT VANDALISM AND THEFT OF HYDROMETRIC FIELD EQUIPMENT**

1. The Kwa-Zulu Natal regional office of Hydrology (one of seven regional offices in South Africa) experienced a high loss of equipment, especially solar panels and 12V batteries. In this region, DCPs transmitting to METEOSAT were replaced with loggers interfaced with GSM modems. No solar panels are currently installed but batteries are exchanged frequently, approximately once in 4 weeks. Batteries are then taken to the office where they are recharged.
2. Instrument shelters in the Kwa-Zulu Natal region are locked with a Multilock padlock plus hasp (a system to protect the lock). It has been found to be very effective and not one lock had been opened by vandals since installation 5 years ago. The cost of such a lock in South Africa is approximately US\$75.
3. Vandals and thieves have over the past 2 years shown no interest in low power consumption loggers operating from lithium penlight batteries. For that reason, SA Hydrology urged manufacturers to concentrate on the design of low power consumption loggers and communication modules. Recently a prototype system consisting of a 4-channel logger and GSM SMS communication unit was provided for evaluation purposes. The claimed battery life, without any recharging, is 3 years.
4. Local observers are housed at some of the SADC-HYCOS field installations to take regular manual readings and to protect the installations. This is applied with great success in Zimbabwe and the example is being followed to a lesser extent in Botswana, Malawi and Lesotho.
5. Solar panels and batteries were also found to be attractive to vandals and thieves in the SADC countries. In some instances, solar panels were completely destroyed. The PRC then requested a South African manufacturer of solar panels to provide a flexible solar panel with an inexpensive UV resistant plastic frame. Such panels were provided which were then pasted horizontally onto the roof of instrument shelters. A product called Sikaflex Pro2HP plus Sika Primer 3 was used for pasting. (Sika was founded in 1910 in Zurich, it is currently globally active in the field of construction chemicals and industrial materials: further information at www.sika.com). Instead of using a 20W output, solar panels of 25 to 30 W output are used to compensate for the energy loss of horizontal installation. Attempts were made to steal these solar panels but none could be removed. Instead cables were cut and the shelters broken into to steal the battery.
6. The extensive damage incurred during the February 2000 floods in South Africa provided an opportunity during re-instatement of the damaged gauging infrastructure to relocate instrument shelters further from the river above the high flood mark. Utilisation of pressure probes obviated the need for a stilling chamber close to the river as dictated by float operated instrumentation. Instrument towers are currently built from good quality (25Mpa) re-inforced concrete. Each tower is designed for prevailing site conditions. A 20 mm South African Bureau of Standards Category 2 anti-explosive door is used to protect the equipment. A hardened steel mast of approximately 9 m height is used to support the solar panel and antenna of METEOSAT DCPs. A revolving anti climbing device, designed to collapse under a weight exceeding 40 kg, protects the solar panel and antenna. All cabling are carried inside the mast and protected where it enters the instrument tower at the swivel point of the mast. The swivel point of the mast provides access to the solar panel and antenna for maintenance purposes by lowering the mast into a horizontal position by means of a small winch, also called a turfer. Cabling to the river is carried in a 90 mm HDPE pipe which is completely embedded into a concrete berm.
7. The methods described above utilise an approach of 'hardening' the installation. The 'soft' approach was tried at a number of localities in the SADC region by involvement of local communities. Unfortunately the 'soft' approach did not have the desired effect, although it did contribute in a number of cases in identifying the guilty person. Examples of successful prosecutions are known in Lesotho and Zimbabwe.

**STATUS OF THE HYCOS COMPONENTS
UNDER IMPLEMENTATION OR DEVELOPMENT
(as of June 2001)**

1. COMPONENTS WITH PROJECT DOCUMENTS AVAILABLE

1.1 IGAD-HYCOS

1.1.1 Based on a profile prepared by the WMO Secretariat, which had been endorsed during the meeting of the Directors of Meteorological and Hydrological Services of the IGAD countries in April 1997, the IGAD Secretariat requested WMO to develop a project document for a HYCOS component for the eight countries of the sub-region. The development of such a document was funded by the European Commission with a contribution of ECU 85,000.

1.1.2 A start-up meeting held in October 1998 reviewed and agreed on the overall objectives and expected results of the project and established an action plan for the development of the project document.

1.1.3 National experts were designated to prepare national reports on the status, perspectives and requirements of hydrological activities in their countries, which served as a basis for the work of a joint WMO/IGAD mission that visited the countries in early 1999 to prepare a draft project document, with the support of national experts.

1.1.4 The aim of IGAD-HYCOS is to strengthen the regional capacity to provide hydrological data and information and to develop regional co-operation for water resources assessment, monitoring and management. The project document has been reviewed and endorsed during the seventh annual meeting of the IGAD directors of Meteorology, Hydrological and Early Warning Systems (Nairobi, Kenya, 27-28.1.2000) and subsequently submitted to the European Commission.

1.1.5 The EC suggested that, because of the highly technical nature of the project and the need to establish more surely the project's sustainability and long term capacity to respond to the regional needs, a detailed project document was necessary including a detailed preparation and design phase followed by an implementation phase. The IGAD Secretariat requested WMO to assist them in drafting terms of reference (TOR) in line with the EC recommendation for the preparation of such a document.

1.1.6 To achieve the goals of the project, it is proposed to design the project in two phases:

- **Phase 1:** Identification of scope, design and budget, detailed project document; and
- **Phase 2:** Implementation

1.1.7 Phase 1 will focus on the development of a detailed project document including equipment issues (functional and technical specifications), detailed costing (including national contributions and operational costs), type of measurements required by the National Hydrological Services, capacity building and training, identification of the PRC and siting of stations, preparation of tender dossiers as well as the actual preparation of the Financing Proposal itself. During this phase a realistic timetable for a longer period of implementation can be considered.

1.1.8 Phase 2 will focus on the actions required to establish and operate the data collection network and the water resources information system.

1.2 Congo-HYCOS

1.2.1 Within the framework of the Regional Environmental Information Management Programme (REIMP) supported by the World Bank, the European Commission has funded (with a grant of ECU 126,800) the preparation of the project document for the Regional Hydrological, Meteorological and Climatological Information System (RHMCI). Congo-HYCOS represents the hydrological component of the RHMCI. Congo-HYCOS will be implemented concurrently with the strengthening of the regional component of the WWW Observing Network and Reference Climatological Stations. For both components the main objective is to build up an information system (data collection and information dissemination) to contribute to sustainable development and environmental protection in the region.

1.2.2 A start-up meeting, attended by representatives of national Meteorological and Hydrological Services, was held in September 1997 in Libreville, Gabon to provide inputs to the project. A mission to develop the project document was carried out early in 1998 by two international experts, one hydrologist and one meteorologist, in co-operation with national experts. The draft project document was finalized by the WMO Secretariat and, in 1998, it was sent for comments to the participating countries and to the European Commission, General Directorate VIII - Development. In view of the security problems in the basin no follow-up action has been taken since then.

1.3 CARIB-HYCOS

1.3.1 The development of the project for the countries of the Caribbean Basin was supported by most of the countries participating in the Conference on Water Resources in Latin America and the Caribbean (San José, Costa Rica, 1996) and by XII-RA IV (May 1997). Two missions to eight selected Central American and Caribbean countries were fielded in 1998 to assess the needs for the preparation of the project document.

1.3.2 The UN Commission on Sustainable Development (CSD), at its sixth meeting, recognized the importance of the WHYCOS programme, in particular of the CARIB-HYCOS component, in contributing to the assessment and sustainable management of water resources of small islands. CARIB-HYCOS will also contribute to a better knowledge and understanding of the impact of El Niño on the water resources of the region.

1.3.3 CARIB-HYCOS aims at providing support to natural disaster prevention and water resources management. In consideration of the different hydrological conditions and national priorities, CARIB-HYCOS is being developed in the form of two components; one covering the continental countries and the other the Islands States. The Continental Component (COC/CARIB-HYCOS) covers Belize, Colombia, Costa Rica, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama and Venezuela, and the Caribbean Islands Component (CIC/CARIB-HYCOS) comprises some of the islands of the Greater and of the Lesser Antilles, Cuba, Dominican Republic, Jamaica, Puerto Rico, Barbados, Martinique, and Trinidad and Tobago.

1.3.4 The proposals were been presented to the tenth session of the Caribbean Meteorological Council in December 2000. The Council endorsed the proposal but recommended that initially, in view of the level of technology, only those countries with established Hydrological Services and the technical capacities should participate. Discussion are on-going with IDB and the World Bank concerning funding.

1.4 Baltic-HYCOS

1.4.1 The proposal for the development of this HYCOS was discussed in October 1997 in Helsinki during the meeting of the Working Group on Hydrology of RA VI (Europe) and

received the support from eleven countries of the sub-region. A meeting was held in Geneva in February 1998 with representatives of the Swedish Meteorological and Hydrological Institute (SMHI) and the Polish Institute of Meteorology and Water Management (IMGW) to draft a project profile. This has been circulated to all the countries potentially involved.

1.4.2 A meeting to discuss actions to be taken for the development of the project proposal was held in September 1998 in the SMHI headquarters in Norrköping (Sweden) with the participation of representatives of twelve countries of the region.

1.4.3 Following the recommendations of the meeting, a draft project proposal has been prepared by volunteer experts from Estonia, Finland and Germany with the support of the WMO Secretariat and with inputs and contribution from all the countries concerned. The draft proposal has been reviewed during a second meeting of the country representatives, held in Warsaw, Poland in December 1999. The final draft of the project, taking into account the recommendation made by the Warsaw meeting, as well as the policy guidelines set up by the WHYCOS International Advisory Group (WIAG), was circulated in late 2000.

1.4.4 The main focus of the project is to establish a basin-wide system to acquire, manage and disseminate water resources and water-related environmental data and information in near-real time and in an integrated manner. It aims to foster the basin-wide adoption of internationally recognised, standardized practices of data and information management and dissemination and to enable the international exchange of the water-related data and information required to manage transboundary rivers, the Baltic Sea, and extreme hydrological events. This project is considered as a complement to BALTEX.

1.4.5 Actions are being taken to initiate some activities with the countries' own resources, notably the development of a regional data bank, while contacts are established with donors for the funding of the project. The SMHI of Sweden has expressed interest in hosting the regional data bank.

1.5 Aral-HYCOS

1.5.1 The need for establishing a WHYCOS component for the Aral Sea Basin (Aral-HYCOS) has long been recognized by the five countries sharing the basin (Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan) and by the WMO Secretariat, and dates back to the early stages of the preparation of the on-going programme for saving the Aral Sea. Since that time, significant progress has been achieved in the region, in terms of increased regional cooperation.

1.5.2 On 20 May 1998, in Tashkent, the National Hydrometeorological Services of the Central Asian States signed an "agreement for exchange of information on surface transboundary waters in the Aral Sea". On 16 June 1999 the same countries called upon WMO to launch the Aral-HYCOS project. One of the major outcomes of Aral-HYCOS would be a consistent regional information system in the field of hydrology, providing added value to other regional and national initiatives in the water sector. In particular, it would serve regional projects such as those managed by the GEF Project Agency and the Swiss Aral Sea Mission.

1.5.3 Since September 1999, the World Meteorological Organization has been working in close collaboration with representatives of the five Central Asian States of the Aral Sea Basin, the GEF project office in Tashkent and the Swiss Aral Sea Mission in developing a proposal for a Hydrological Cycle Observing System for the Aral Sea basin (Aral-HYCOS). Two meetings of representatives of the agencies concerned were held in Tashkent in December 1999 and in September 2000 respectively to discuss the proposal and review the draft project document.

1.5.4 The project is planned to build on the on-going hydrological activities being carried out under the GEF Transboundary Water Monitoring component and those of the Swiss Aral Sea Mission. In particular, it will provide for real-time transmission of hydrological data from a network of observation stations to national centres and a regional centre, for the establishment of a regional co-ordinating centre and for training of hydrological personnel. The overall goal of the project is to promote regional co-operation and upgrade the technical capacity and the infrastructure so as to improve the management of the water resources of the Basin. The project document was circulated to participating countries and potential donors (European Commission, GEF, USAID, Swiss Co-operation) in January 2001.

1.6 Pacific-HYCOS

1.6.1 The development of a HYCOS project for the South-West Pacific region was considered at a meeting of experts on "Hydrological Needs of Small Islands" held in Nadi, Fiji in October 1999. The meeting requested the WMO Secretariat to develop a project proposal, in collaboration with the countries and in consultation with the South Pacific Forum Secretariat. Two consultants from the region visited eight Island States for discussion with the local authorities and to gather information for the preparation of the draft project proposal. A first draft was prepared and, based on review by experts from the region, a second draft is now available and has been circulated in February 2001 to the countries concerned in the region. The document has also been sent to SOPAC to be considered as a joint initiative of the two organizations.

2. COMPONENTS UNDER DEVELOPMENT

2.1 Black Sea-HYCOS

2.1.1 As follow up to a meeting organized in Istanbul between the representatives of the Permanent International Secretariat (PERMIS) of the Black Sea Economic Cooperation (BSEC) and WMO in September 1998 BSEC PERMIS requested WMO's support for the preparation of a project profile of Black Sea-HYCOS. The Business Council, a BSEC body in charge of elaborating and regulating multilateral cooperation projects, expressed interest in supporting the process.

2.1.2 Representatives of three countries of the Black Sea Basin met in Geneva in June 1999 to prepare, in cooperation with WMO Secretariat, a first project profile. The profile document was submitted for comments to all member countries in accordance with BSEC regulations and the WHYCOS spirit. The project profile was then discussed, amended and adopted during the Black-Sea HYCOS start-up meeting, which was held in November 1999 in Istanbul, Turkey. On the basis of this profile and of the information provided by the countries through national reports, a project document is now being formulated and is expected to be completed in the latter part of 2001. The focus of the project is on enhancing the capacities of the participating countries to monitor the quality and quantity of inflow into the Black Sea.

2.2 Danube-HYCOS

2.2.1 Following a proposal from the Water Resources Research Centre (VITUKI) (Budapest, Hungary) and with the assistance of experts from Czech Republic, Hungary and Romania, WMO has prepared a first draft project profile for the development of a component of WHYCOS for the Danube River Basin (Danube-HYCOS).

2.2.2 The development of hydrological forecasting activities, through the implementation of a Regional Integrated Flow Monitoring and Forecasting System, is one of the main results expected of the project, as well as the support to on-going projects dealing with environment protection within the basin.

2.2.3 A planning meeting for the preparation of the Danube-HYCOS project was convened by WMO and hosted by the government of Hungary in Budapest from 24 to 26 November 1999. Actions for project preparation were agreed which will take account of existing hydrological initiatives such as those being implemented under the convention on cooperation for the protection and sustainable use of the Danube River. A second meeting was held in October 2000, again in Budapest, to review a first draft of the project document. The document is expected to be finalized in 2001. VITUKI has expressed an interest in hosting the project Pilot Regional Centre.

2.3 Amazon-HYCOS

2.3.1 A draft proposal has been prepared by the CHy Expert on Water Quantity, Mr V. Guimarães (Brazil), as part of his assignment for the WMO Commission for Hydrology. The project proposes incorporation of Brazil's existing large network of over 150 DCP stations into a project covering the whole Amazon Basin. The proposal is to be circulated for consideration and comments to the countries concerned. The need has been recognized for convening a meeting of the representatives of the NHSs to consider the project.

2.3.2 Earlier this year Mr Guimarães has informed the so-called WMO Project Desk in Brazil on the information made available by the Secretary-General of WMO during CHy-XI (Mr Guimarães was an observer of the session) on the existence of DCPs in WMO to be installed in the Amazon Basin. The WMO Secretariat informed that this was not accurate enough and when acknowledging receipt of this information a request was made to WMO on the cost of the subscription to WHYCOS. The WMO Secretariat also replied to this request. Plans to have a meeting on Amazon-HYCOS in September 2001 in Santa Cruz de la Sierra (Bolivia) were discussed with the Permanent Representative of Bolivia with WMO. Due to budget constraints, the meeting will have to be postponed.

2.4 Nile-HYCOS

2.4.1 At the request of TECCONILE, a project profile for a Nile-HYCOS was prepared in September 1996. It was endorsed by the TECCONILE Technical Committee and subsequently approved by the Council of Ministers for inclusion in the TECCONILE Action Plan. Due to the changes in the institutional arrangements for the Nile Basin, progress with the development of the project has been delayed. However, contact continues with the newly established Nile Basin Initiative Secretariat to follow-up on the proposal.

2.5 Caspian-HYCOS

2.5.1 A number of developments within the Caspian Sea Basin call for enhanced regional cooperation in the monitoring of its climate and hydrological elements, including the water level of the Sea. These are being studied in relation to the Caspian Environment Programme and proposals for an Integrated Programme on Hydrometeorology and Monitoring of Environment in the Caspian Sea Region (CASPAS). The NHMSs of the region are discussing the development of Caspian-HYCOS within the framework of existing programmes.

2.6 La Plata-HYCOS

2.6.1 Discussions are at an early stage with the Intergovernmental Coordinating Committee (CIC) of the countries of the La Plata Basin representing Argentina, Bolivia, Brazil, Paraguay

and Uruguay. The proposal is for the development of a water resources information system within the framework of a HYCOS project. There is already an existing large network of DCPs and an organizational structure which are favourable for the development of La Plata-HYCOS. A recently signed MoU between WMO and CIC provides the institutional framework for cooperation in the development of this project.

2.7 Himalayan-HYCOS

2.7.1 Organized by WMO and the International Centre for Integrated Mountain Development (ICIMOD), a high level consultative meeting on “Developing a framework for Flood Forecasting in the Hindu Kush Himalayan Region” was held in Kathmandu, Nepal, May 15-18, 2001. The meeting was sponsored by the US State Department, DANIDA and WMO. The Department of Hydrology and Meteorology of Nepal co-hosted the meeting. Official representatives of Bangladesh, Bhutan, China, India, Nepal and Pakistan participated in the meeting which was also attended by about forty observers from other international agencies and donor organizations. The meeting concluded to establish a consultative panel for the development of a Hindu-Kush Himalayan HYCOS project and agreed on an action plan until July 2002 for regional cooperation for flood information exchange. Primary tasks in this action plan are the development of a concept paper to solicit agreement by participating national government, the development of a draft project document, the organization of a follow-up technical meeting and meeting of the consultative panel and the establishment of a regional web-site for the regional exchange of information. The US State Department is committed to co-fund this process and DANIDA has indicated its interest to also fund the development of the project.

2.7.2 The proposal for the implementation of a Nepal component of the proposed HKH-HYCOS is being finalized at this moment and World Bank is expected to fund the project for a period between 12 and 24 months.

2.8 Arctic-HYCOS

2.8.1 The Steering Committee for the Arctic Climate System Study (ACSYS) and the Climate and Cryosphere project (CLiC) has proposed a study of the feasibility of establishing an Arctic-HYCOS. The focus of the project would be on freshwater surface fluxes into the Arctic Ocean. The participating countries would be Canada, Russia, USA and possibly Norway. The State Hydrological Institute in St. Petersburg, Russia is currently preparing a project description for consideration of the next meeting of the ACSYS/CLiC Steering Committee.

2.9 Mekong-HYCOS

2.9.1 Consultations were held with the Mekong River Commission (MRC) in March investigating the needs and perspectives for the establishment of a hydrological information system for flood forecasting and management including meteorological and climatological information in the framework the WHYCOS concept. A Memorandum of Understanding is currently being finalized between MRC and WMO to institutionalize cooperative activities. First works on the formulation of a Mekong – HYCOS project are planned to start in August 2001.
