



THE WORLD BANK GROUP



WMO

MED-HYCOS Balkan Countries Meeting
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MED-HYCOS PRC

C/O IRD

BP 5045 - 34 032 - Montpellier - France

Tel : (33) 04 67 63 64 20 Fax : (33) 04 67 41 21 33

Email : morell@ird.fr

[http : // medhycos.com](http://medhycos.com)

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Introduction

M. Jacques Ganoulis, Co-ordinator of the INWEB project, planned a meeting with his partners on 26 April in Belgrade. M. Marc Morell was invited to present the MED-HYCOS project as Co-ordinator of the Pilot Regional Centre.

It seemed an excellent occasion to organise a meeting with all the different partners of MED-HYCOS project in the Balkan area.

The following MH representatives were invited by M. Momcilo Zivkovic, Director of the Federal Hydrometeorological Institute of Yugoslavia :

Albania :	M. Agim Selenica
Bosnia-Herzegovina :	Ms Esena Kupusovic
Bulgaria :	M. Dobri Dimitrov
Croatia :	M Milan Zupan
Greece :	M. Anathasias Nianios (<i>excused</i>),
Macedonia :	M. Lefko Manchevski
Slovenia :	M. Jose Milavcic
Romania :	Ms. Liliana Fugaciu
WMO :	M. Tommaso Abrate (<i>excused</i>)
PRC :	M. Marc Morell / Ms Manuelle Rival
Yugoslavia :	M. Dejan Lekic / M. Mihajlo Gavrie (Deputy Director of FRY)

Following invited people were present during the meeting :

Bulgaria :	M. Eram Artinian
Macedonia :	M. Vasko Stojov
Yugoslavia :	M. Zoran Radic, M. Slavimir Stevanovic , Ms. Kristina Peric, M. Vladan Kojanic and Ms. Spegar Gordana

The main targets of this meeting were :

- 1 – to present the achievements of the Balkan countries MH activities from 1995 to 2001
- 2 – to get an overview on the ongoing projects in the Balkan countries related to water resources assessment and management
- 3 – to propose concrete actions to do at short term (before end of May), at middle term (September 2001) to improve the MED-HYCOS Information System and the MED-HYCOS Web site
- 4 – to propose for each country the redaction before the end of May 2001 of specific papers on the activities to be developed during the MH phase II (2002-2005)
- 5 – to analyse the proposal of the FRY to implement a subregional centre in Belgrade
- 6 – to exchange information between INWEB and MED-HYCOS projects and to propose a mode of collaboration between these two projects.

Agenda

The agenda of the meeting was as following.

24 April : Arrival of the participants

25 April :

- 09h00 : Administrative aspects
- 10h00 : Adoption of the agenda and presentation of the main targets of the meeting
- 10h30 : Presentation of the present status of MED-HYCOS by the co-ordinator
- 11h00 : Presentation of the activities of the countries and proposal for the future :
Bulgaria, Albania, Croatia
- 13h30 : Lunch
- 15h00 : Presentation of the activities of each countries and proposal for the future :
Bosnia-Herzegovina, Macedonia, Slovenia, Romania, Yugoslavia
- 18h00: General discussion
- 18h30 : cloture

26 April :

- 9h00 : Joint INWEB and MED-HYCOS meeting
 - Presentation of INWEB by its Co-ordinator Jacques Ganoulis
 - Presentation of MED-HYCOS by Marc Morell
 - Presentation of EUROWATERNET by Tim Lack
- 11h00 : MED-HYCOS meeting
 - Possible collaboration with INWEB and review of future MH planned activities
- 13H30 Lunch
- 15h00 : Joint INWEB/MED-HYCOS
 - presentation by M. J. Ganoulis and M. Morell of the main conclusions of separated INWEB-MH meetings
- 17h00 : Cloture of the joint INWEB and MED-HYCOS meeting
- 20h00 : Joint INWEB/MED-HYCOS dinner

27 April :

- 8h30 : Presentation by each country of their proposals of actions at short term (dead line 15 May) and proposals for actions during the MED-HYCOS phase 2.
 - Conclusions concerning the implementation of thematic centres and decisions.
- 12h30 : cloture
- Departure of all participants except A. Selenica; Ms Rival and M. Morell

28 April :

- Departure of Agim Selenica and Manuelle Rival
- 14h00 : Meeting in the FHI of Belgrade
 - M Momcilo Zivkovic (Director),
 - M Mihajlo Gavrie (Deputy Director of FRY)
 - M Stevanovic (Head of the Hydrological Service)
 - M. Dejan Lekic (Head of the database)
 - M. Marc Morell
- 18h30 : cloture

29 April : Visit of Belgrade

30 April : Departure of M. Morell from Belgrade to Montpellier

Conclusions of the meeting

We hold such meeting in Belgrade taking into account the geopolitical situation and being aware that we may have the opportunity to answer to some funding proposals within this year 2001 focusing on some specific developments of MED-HYCOS activities in the Balkan countries.

We have to recognise the very strong involvement of the Balkan countries in MH activities during the first phase (70% of the data inserted in the RDB are from the Balkan, all experts working in PRC came from Balkan countries such as Albania, Bulgaria, Croatia, Slovenia, Romania and Yugoslavia - 2 of them were not eligible : Romania and Yugoslavia, 4 of them are members of the Initial Co-ordinating Group : Albania, Bulgaria, Slovenia, and Romania).

This strong involvement can be considered not only as the proof of the strong interest of Balkan countries for HYCOS concept initiated by WMO but it represent an essential advantage for all the countries involved in the MED-HYCOS project and for all ongoing HYCOS projects, especially DANUBE and BLACK-SEA projects.

The meeting agreed that :

- 1 – At the end of the initiative phase, the achievements must appear as very strong and attractive in order to prepare the next phase and to attract the attention of users, partners and donors.
- 2 – Only very concrete proposals will constitute the basis of the next MED-HYCOS phase
- 3 – All future actions which have been proposed during this meeting in Belgrade and which concern mainly future DANUBE and/or BLACK-SEA HYCOS will be put in these projects when there will be operational.
- 4 – By this way, the Balkan countries should confirm their essential role to be the interface between the Mediterranean/Danube/Black Sea HYCOS projects.

The meeting had to answer these two main questions :

- How to improve quickly the MH Information System and the MH Web Site ?
- How to prepare MH phase 2 (2002-2005) ?

Besides, a questionnaire was established by Zoran Radic (Belgrade) during his stay in PRC (Montpellier October-December 2000) to recognise primary needs of the MED-HYCOS participating countries, concerning :

- Global NHS needs
- Education and transfer of technologies needs
- New tools developing needs, and
- Priorities for Macro tools development

The answers to this questionnaire will help PRC to prepare the final project document of the of phase 2.

How to improve quickly the MH Information System and the MH Web Site ?

The needs to reinforce at short term the MED-HYCOS activities in the Balkan countries were recognised :

- through a more efficient Hydrometeorological information system with more data
- and through a more attractive WEB site with more information and knowledge products

Concerning the improvement of the MED-HYCOS Information System (MHIS), general principles were adopted and each country must put in maximum efforts :

- to keep operational all the DCP which are not installed, which have some technical problems and are not working (with a more efficient help from ELTA company and PRC),
- to supply PRC with all necessary rating curves to transform in real time water levels into flow discharges,

- to validate the real time data already put in MHIS,
- to complete the historical series available in the MHIS,
- to extend the historical data series to other key stations,
- to supply the MHIS with more data collected on "near real time" key stations (weekly or monthly frequency),
- to supply the MHIS with near real time rainfall and meteorological daily data (daily or weekly frequency),
- to supply the MHIS with metadatabase : inventories of national data available in the National Services whatever their form (paper, numerical files, part of databases).

It is noted that a complete inventory of all data available in MHIS on 20 April 2001 was given to all the participants to facilitate the updating of their data.

Concerning the MED-HYCOS Web Site (MHWS), last July in Tunis, the decision was taken to enlarge the subjects on which MED-HYCOS could provide information on the Web site in the fields of :

- History of water in the Mediterranean, as useful background for cultural aspects,
- Climate and Weather, as elements participating in the water cycle,
- Fresh Water, under its different aspects with not only assessment but also management, etc,
- Mediterranean sea which clearly contributes to the water cycle in this region.

However, a lot of efforts must be done very soon to put more **information / knowledge on water related information** that users must absolutely find on a project whose name is **MEDITERRANEAN HYDROLOGICAL CYCLE OBSERVING INFORMATION SYSTEM**.

This is why, in order to improve the quantity and the quality of the information disseminated on the MH WEB site, each country is asked to publish synthesis analysis, studies, articles, etc. under the form of text documents, tables, graphics, maps, pictures, etc. in connection with one or several subjects presented on the MHWS.

The representatives of the Balkan countries are strongly requested to give **metadata** related to the inventory of the hydrological data available in their services (according the decision taken in Tunis June 2000).

During the meeting, the representatives of the countries proposed **very concrete and short term actions** both to improve the MHIS and the MHWS. They were asked to precise these proposals before **15 May** and to concentrate their efforts on the actions which will be realised before **the end of May**. The list of these actions is presented in Appendixes.

The concept of the Mediterranean Water Resources Observatory

WHYCOS recommends to implement a global network of key stations on the main rivers and streams and to strengthen the institutional and technical capabilities of the countries in the field of water resources assessment and management.

It was proposed and accepted that the main objective of the MH phase II would be to implement :

On the basis of the proposals of each representative of the countries and after an opened discussion, the meeting agreed that MED-HYCOS activities in the future will concentrated on three main tasks :

- at regional level : to implement Thematic Networks (TN) animated by Thematic Centres (TC)
- at subregional level : to implement River Basins Projects (RBP)
- at national level : to support the Hydrological Services Activities (HSS)

Technical and scientific activities must be considered as means to meet these 3 main tasks.

The implementation of a Mediterranean Water Resources Observatory (MWRO) is the main objective of MED-HYCOS Project. Developing thematic and river basins approaches as well as the organisation of capacity building activities is essential to reach this major goal : MWRO .

The Mediterranean Water Resources Observatory, which MED-HYCOS name would be maintained, is composed by :

- the MED-HYCOS Information System (MHIS) : regional database (RDB) and related tools,
- the MED-HYCOS Web Site (MHWS) as a water related information base and as the interface between users and RDB,

MHIS is composed by the hydrometeorological regional database itself and by tools using internet technologies (inside browser tools) or running as standalone modules.

The RDB composed by 5000 station-year on 113 stations must be improved by pertinent data and information especially to get a right overview on the variability in space and in time of the main water resources of the Mediterranean region.

Some studies conducted by experts from partner countries should be realised to define the expected ideal network to meet some specific needs of the MWRO :

- assessment of water resources at national and international basins level,
- monitoring of water resources in terms of quantity and quality,
- contribution to the evaluation of pollutants flowing in the Mediterranean sea,
- impact of droughts on water resources,
- diagnostics on floods, etc.

Considering a national approach, this work will be based on the experience of specialised experts of the NHS. Considering the purposes necessitating an international approach (international basins, regional phenomena, etc...), it will be necessary to benefit from exchanges of knowledge between the national experts and from scientists working in the related domains at regional scale.

The development and the implementation of the tools to access, to retrieve, and to deal with the data are well advanced. Very efficient tools are implemented to access the data through the WEB site using cartographic approach. New tools were developed at the beginning of 2001 to establish the inventory of the national data available in the countries. This work can be done "on line" by the NHS themselves.

Futures efforts should be done in the implementation of new tools showing through the WEB an user-friendly and efficient representation of the data in space.

MHWS has been strongly improved during the last 8 months integrating large subjects as "History of water", "Climate and weather", "Mediterranean sea", and rubrics on "Fresh Water". It will be necessary to intensify these efforts and to improve very quickly the WEB site with products as synthesis studies using thematic and river basin approaches. MHWS must be considered as the water resources portal in the Mediterranean. Pedagogic aspects should be integrated. MHWS must be also a support to the dissemination of training material especially in the field of water resources assessment (Network design, Hydrometry, Data collecting and processing, etc).. MHWS must be considered as a part of knowledge basis on environment aspects : water must be considered not only as a natural resource for human activities but also as an essential element of natural ecosystems).

Thematic and river basin approaches seem necessary to set-up and to improve the Mediterranean Water resources Observatory,

Thematic networks :

Thematic networks will be implemented on different transversal themes as follows :

- Technical aspects :
 - Data collecting networks (labellisation of the stations, DCPs network, near real time data
 - Med-Hycos Information System
 - Retrieving and processing tools, cartographic tools, statistical analysis, etc.
- Scientific aspects :
 - Quantity and Quality of water resources survey

- Hydrological trends,
- Droughts diagnostics,
- Floods diagnostics,
- Pollution flows to the sea,
- Evapotranspiration.

The thematic networks would be led by thematic centres.

During the meeting, it was decided that the Federal Hydrometeorological Institute of Yugoslavia with the help of the Faculty of Civil Engineering, University of Belgrade will host a Thematic Centre on :

- Med-Hycos Information System including statistical analysis tools,
- Identification and Impact of drought on water resources.

River Basin Projects (RBP) :

Several basin projects were presented during the meeting. By the end of May, concrete proposals must be detailed by the concerned representatives : Background , Objectives, Expected Output, Estimated Support. These proposals are :

- Albania :
 - Monitoring, assessment and sustainable use of water resources of Drini River (FYR, Albania, Macedonia and Greece)
 - Monitoring, assessment and protection of Vjosa River (Greece, Albania)
 - Preservation and Protection of Ohrid and Prespa Lakes (Greece, Albania and FYR)
- Bosnia : "Monitoring of the Neretva river" (Bosnia, Croatia)
- Bulgaria : Struma basin (FYR, Bulgaria)
 - Maritza river "floods and drought forecasting system (Bulgaria, Greece, Turkey)
- Croatia : "Sava river water quality" (Croatia, Bosnia)
- Macedonia : "bordering lakes" (Greece, Albania, Macedonia and FRY)
- Slovenia : "monitoring of the water quality in Sava river (Slovenia, Croatia, Bosnia and FRY)

A collaboration may be set up with INWEB Project based on these proposals or others, according to the requirements of potential donors.

Support to the Hydrological Services Activities (HSS) :

Supporting Hydrological Services Activities (HSS) is based on :

- the organisation of training courses in the fields of Data acquisition, management and processing (hydrometry, data management systems, statistical analysis tools, cartographic tools and GIS, digital elevation models, etc.),
- the supply of hydrometric devices, of computers and dedicated software,
- the rehabilitation of hydrometrical networks, when needed.

These activities may be presented in different proposals (by country, by subregional region, by subject, etc.) and funded by different donors.

In conclusion, all participants of this meeting agreed that the main targets of the meeting were reached in a very friendly mood and with the effective contribution of each country representative.

APPENDIXES

APPENDIX 1 : COUNTRIES REPRESENTATIVES COMMITMENTS AND REQUESTS

ALBANIA

Commitments

- to update near real time data of 4 stations (end of May)
- to update historical data of 4 stations (end of September)
- to prepare three regional project :
Monitoring, assessment and sustainable use of water resources of Drini River (FYR, Albania, Macedonia and Greece)
Monitoring, assessment and protection of Vjosa River (Greece, Albania)
Preservation and Protection of Ohrid and Prespa Lakes (Greece, Albania and FYR)

Needs

- Data base improvement (expert mission)
- Rehabilitation of the network and measurement instruments (expert mission)
- To Update the software sent 2 years ago by the PRC
- Training on the MH tools
- Installation of the DCP (expert mission)

BOSNIA-HERZEGOVINA

Commitments

- to send rainfall historical and near real data
- to propose one regional project "Monitoring of the Neretva river" (Bosnia, Croatia)

Needs

- Data base improvement (expert mission)

BULGARIA

Commitments

- To refresh of the data series (end of June)
- to provide the rating curves from the DCPs
- to fill in the gaps into the historical series
- to use the MH tools for the data base management (end of august)
- to launch the fourth MH DCP (July)
- to provide more (near) real time data on Struma basin (September)
- to supply PRC with data coming from other projects
- to provide PRC with papers related to the basin where the DCPs are installed
- to provide PRC with technical papers, reports and studies related to water resources in Bulgaria

- to propose one regional project on Struma basin (FYR, Bulgaria)
- to propose one regional project on Maritza river "floods an drought forecasting system (Bulgaria, Greece, Turkey)

Needs

- additional cable for the DCPs sensors
- help to use the MH tools (expert mission)

CROATIA

Commitments

- to provide the PRC with real time data from stations located on the Danube basin
- to update historical series (year 2000)
- to send papers and publications concerning water resources in Croatia (May 2001)
- to propose one regional project "Sava river water quality" (Croatia, Bosnia)

Needs

- sensors for the water quality

MACEDONIA

Commitments

- to propose one regional project "bordering lakes" (Greece, Albania, Macedonia and FRY)

Needs

- additional DCPs
- Data base implementation (Expert mission)

ROMANIA

Commitments

- to provide PRC with scientific papers
- to use the MH tools for the data base management
- to send more data maybe from the Danube basin
- to propose one regional project

Needs

- to improve the data base (expert mission)
- equipment : one computer and software

SLOVENIA

Commitments

- to send real time data every week
- to send more historical data
- to animate the working group 1 (DCPs)
- to propose one regional project "monitoring of the water quality in Sava river (Slovenia, Croatia, Bosnia and FRY)

YUGOSLAVIA

Commitments

- to send to the PRC additional historical and rainfall data
- to update and develop the software that have been developed in the PRC (MEDMAP,...)
- to organise training course on MH tools in Belgrade
- to disseminate this tools to the MH partners
- to create a thematic sub regional centre in Belgrade working on:

information system

drought

statistical analysis and presentation

Needs

- support to implement thematic centres on Information system
- translation of papers or studies

PRC

Commitments

- to use remaining funds to prepare the next phase
- to accelerate DCPs fixing
- to provide financial assistance to translate the papers, reports, documents coming from the countries into English
- to survey European call for tenders and to look after new donors (public and private)
- to improve the regional database and the web site with data and documents coming from countries
- to organise support missions when needed (DCP installation, database expertise, national hydrological network expertise)
- to support the implementation of thematic centres

Needs

- the DCPs network must be operational, the countries must provide the rating curves and validate the data (July)
- to update the historical data (end of May)
- to receive more near real time data from the countries especially on the larger basins (May)
- to receive meteorological near real time data from the countries (May)
- to receive reports, documents, scientific papers on water resources (end of May)
- to receive from the countries thematic and basin approach proposals (end of May)
- to welcome staff in the PRC : database manager, web master, electronician engineer (July)

APPENDIX 2 : INTERNATIONAL NETWORK OF WATER ENVIRONMENT CENTRES FOR THE BALKANS : INWEB

MINUTES OF MEETING 26th APRIL 2001, BELGRADE

09h00-11h00 Joint meeting INWEB and MED-HYCOS

Mr. Nikolaous Papageorgiou (NP) thanked INWEB for its efforts for humanity, emphasizing that the preservation of clean water must be a matter of urgent concern to all of us, as it affects the entire ecosystem. He stressed Director-General Koichiro Matsuura's commitment to making water a priority for UNESCO and to promoting a protective and multi-disciplinary approach towards water resources management. UNESCO, by declaring 22nd March World Water Day, has demonstrated its interest in this subject. This year's World Water Assistance Programme (WWAP) focuses on water and health, health being a pre-requisite for any kind of development. In a world where half a billion people do not have access to clean water, UNESCO has pledged not to sit back, as polluted water develops sickness and kills. NP indicated the full support and commitment of UNESCO to the INWEB project, and provided details on a UNESCO prize for water resources (man-made river), on UNESCO's hydrological programme, and on a study about women's contribution to education in water issues in Africa.

Mr. Jacques Ganoulis (JG) mentioned that INWEB insists on using the term Balkans, with the aim of reversing its old meaning of conflict and stress to one of co-operation and peace. He explained that according to the latest European Union (EU) directive, water must be managed on a watershed basis, and not according to political boundaries. Master plans have to be set up accordingly by working together. INWEB, as a network of networks, with a fully flexible virtual structure, has the ability to work in this way.

A brief history of INWEB (its conception at the 1999 NATO ARW in Thessaloniki), a presentation of its website www.inweb.gr (giving news and information when you need it) and a description of INWEB's results to date (information database) followed.

JG explained that the scientific database now underway should assist the development of plans for water management and environmental protection. As such it should provide data on water quality related to the environment, and information on pollution sources. The database will focus on transboundary issues.

Mr. Marc Morell (MM) presented the Mediterranean Hydrological Cycle Observing System (MED-HYCOS), which was the first component of the World Hydrological Cycle Observing System (WYCOS). All participants were invited to visit its website www.medhycos.com, and to review the presentation CD-Rom, which has details on its database and tools, its website and its constitution. The project was launched in 1995, financed by the World Bank, supported by the World Meteorological Organisation (WMO) and hosted by the Institute of Research for Development (IRD) in Montpellier, France. The MED-HYCOS information system deals with the managing and numerical/graphical processing of hydro-meteorological data. MED-HYCOS, in recognizing a need to provide accurate and reliable hydrological data, aims to strengthen the technological and institutional capabilities of hydrological services in the Mediterranean region.

MM presented the database and tools provided by MED-HYCOS and invited participants to think about how INWEB and MED-HYCOS could be integrated, providing compatible and complementary information.

Mr. Tim Lack (TL) told participants how in the early 90's, a meeting of EU environment ministers revealed that not only was there a serious lack of base-line data, but also what data was available on a national and sub-national level was either unprocessed or not presented in a form suitable for pan-European assessment. An agency called the European Environment Agency (EEA) was thus founded and is now based in Copenhagen with a staff of some 70 persons. The EEA has a political mandate from the EU Council of Ministers to produce objective, comparable and reliable information to allow the Commission, Member States and the general public to judge the effectiveness of policy and the needs for policy development. The EEA works by networking to harness skills and knowledge that exist at national and sub-national levels. This network is called the European Environment Information and Observations Network (EIONET), and acts as the single clearing house for data on the environment in the EU, to be used by policy makers, academics and citizens alike.

The European Topic Centre on Inland Waters (ETC/IW), of which TL is the manager, has designed and tested an information and monitoring network called EUROWATERNET, which provides the EEA with information both on the quality and quantity of Europe's inland water resources, and on how the state of water resources relates and responds to pressures on the environment. EUROWATERNET aims to harmonize activities, to improve efficiency and to make all data held at national level comparable for pan-European assessment. As monitoring is expensive, EUROWATERNET is firmly based on existing programmes, as in most cases national networks are more than adequate in terms of number of stations, frequency of monitoring and determinants monitored, to meet the EEA's need. EUROWATERNET focuses not only on monitoring and measuring the environment, but also on gathering information on the pressures, such as pollutants (due to human, industrial or agricultural activities), that affect the state of the environment, and the driving forces behind these pressures, for example changes in society and global changes (such changes might include shifts in population from the country to the cities, or an increase in the number of automobiles). Information is also needed on the impact of the state of the environment on, for example, health or the eco-system in general, and on the responses given in terms of policies and targets, which ideally should alter or steer the driving forces at the beginning of the chain.

TL invited participants to think about how INWEB and MED-HYCOS could be integrated into EUROWATERNET. INWEB members had all already received a copy of the technical guidelines for the implementation of the EEA's Monitoring and Information Network for Inland Water Resources.

11h30-13h30 Separate INWEB meeting

JG reminded participants that INWEB is committed to completing the UNESCO database by the end of May. This means that all inputs should be submitted in electronic format by then. Participants were then invited to present their own national situation:

FR of Yugoslavia

Prof. Dejan Ljubisavljevic (DL) showed a map of water quality and quantity monitoring stations in the FR of Yugoslavia, and suggested using the last 5 years raw data from 5 stations in Serbia and 4 in Montenegro. All data is in official written form. He suggested a future case study for water quality protection.

Slovenia

Prof. Mitja Brilly (MB) explained that although there are 1500 lakes in Slovenia, all but 2 are too small to be considered according to the specifications of the European directive.

Croatia

Prof. Ogjnen Bonacci (OB) proposed the stations from which he will collect raw data for the last 5 years, and stressed the need not just to collect and present data, but also to produce a result, which could perhaps be published in a scientific journal. He suggested that INWEB should investigate the general trend of decreasing volumes of water in the Balkans.

Greece

JG told participants that this summer water supply in Thessaloniki will be limited and in Athens will be insufficient. The drought will also affect other Balkan countries, for example Bulgaria. Greece is divided into several water districts, within which there are administrative districts. He explained that whereas data does exist in Greece, it is theoretically not available until published by the Ministry. TL stated that he already had access to this unpublished data.

Bosnia and Herzegovina (B&H)

Prof. Tarik Kupusovic (TK) provided participants with a written report on the situation in B&H. He explained that B&H has 7 river basins, and thus according to the EU directive, there should be 7 main water districts. Regarding data, he would be able to provide data from 6 - 7 stations, however all these would only be able to reflect the pre-war situation i.e. 10 years ago. Some monitoring stations started operating again in 2000. He told participants that there is interest from the Dutch government to support river basin projects in B&H within the Stability Pact for Balkan countries.

Turkey

Prof. Atil Bulu (AB) suggested providing data only for the European part of Turkey, and was requested by Prof. Ganoulis to include data from the Marmara Sea, as this is the connection between the

Mediterranean and the Black Sea, and will give an integrated picture for the Balkans. He will be able to provide data going back 10 years.

Bulgaria

Prof. Roumen Arsov (RA) has access to general data with comments already published in a series of books in the Bulgarian language, which he could translate. JG said that raw data would be of greater value for INWEB's purposes.

Romania

Prof. Petru Serban (PS) told participants that Romania is divided into 11 river districts, and has an integrated monitoring system. He indicated which stations he would select for the INWEB database, and confirmed that data would be available. He also gave INWEB updates and corrections for the information database.

FYR of Macedonia

Prof. Cvetanka Popovska (CP) had already submitted a report on transboundary waters in the FYR of Macedonia and will now select stations for internal waters as well. She indicated her support of INWEB's activities, and stated her belief that INWEB will help to improve monitoring in the FYR of Macedonia. She expressed her concern on water quantity caused by rapid climate changes - winters with no snow, and no rain in autumn and spring. She explained that whereas there is a plethora of data available in the FYR of Macedonia, it is not published, although the authorities had assured her that they would be open with available data. However the data available are often incompatible due to different parameters and different methodologies. Prof. Ganoulis explained that INWEB's aim is not to improve monitoring systems in the Balkans, but to find ways of using existing data for useful projects with meaningful results.

JG invited participants to consider how INWEB's scientific database might be used. He reiterated Prof. Bonacci's sentiment that having the information is pointless if you do not do something useful with it.

JG told participants that the Ministry of Environment, Physical Planning and Public Works of the Republic of Greece was somewhat hesitant to continue financial support of the INWEB project, having decided to allocate funds this year only for private enterprise. However, he called for the support of all colleagues in this matter by suggesting that each country representative should appeal in writing to the Vice-Minister of Water/Environment, and promised to provide the exact address of the Ministry by e-mail.

JG plans to approach the Ministry of External Affairs, and to contact Mr. Vasilis Papadopoulos, responsible for regional integration for the Southern Mediterranean and Middle East, coming under Directorate B in Europeaid.

Signatures were collected so that INWEB's constitution may be submitted to the Greek authorities.

15h00-17h00 Joint meeting INWEB and MED-HYCOS

TL stated that whereas the EEA were clearly interested in INWEB's activities, it could only keep in contact in an informal way with observer status.

INWEB and MED-HYCOS agreed that they should collaborate to attract more users of their products and services, and encourage those users to produce original case studies, as data is useless per se, but invaluable for actual case studies.

MM stated that MED-HYCOS plans to identify each country's needs and problems and their ability to solve these problems. JG added that INWEB's action plan covers the same activity, and told MM that country reports had already been published in a book in the NATO Science Partnership Sub-Series 2 entitled "Transboundary Water Resources in the Balkans: Initiating a Sustainable Regional Co-operative Network", a copy of which he would send to MM. He suggested requesting permission from the publishers to print extracts from this book on INWEB's website.

Participants felt the need for an inventory of projects concerning the Mediterranean and the Balkans to be available on the Internet. JG suggested that INWEB subscribe on behalf of all its country representatives to the Techware newsletter, which would partly cover this need, as well as give other useful information on water-related topics.

JG emphasized that INWEB wants to focus mainly on transboundary problems in monitoring and planning, and to adopt a multi-disciplinary approach involving the co-ordination of experts from the fields of economics, social sciences and engineering. To achieve this not only is training required, but also an exchange of experiences such as that of MED-HYCOS. He stated his belief that the larger a network, the greater the proportion of inactive members, and felt that the optimum size for a successful and active network was about 10 like INWEB.

NP promised to keep INWEB up to date with relevant news from the UNESCO organization. He stressed that UNESCO is not a moneymaking enterprise, and therefore care should be taken that meetings were not held just for the sake of it. He said that care was also needed in decision-making within INWEB and MED-HYCOS, and in choosing a direction, and offered his assistance in these areas.

APPENDIX 3 : LIST AND ADDRESSES OF THE PARTICIPANTS

Joint meetings INWEB and MED-HYCOS

Abrate, T.	World Meteorological Organisation, Geneva, Switzerland
Arsov, R.,	University of Architecture, Civil Engineering & Geodesy, Sofia, Bulgaria
Artinian, E.	National Institute of Meteorology and Hydrology, Sofia, Bulgaria
Bonacci, O.	University of Split, Split, Croatia
Brilly, M.	University of Ljubljana, Ljubljana, Slovenia
Bulu, A.	Istanbul Technical University, Istanbul, Turkey
Dimitrov, D.	National Institute of Meteorology and Hydrology, Sofia, Bulgaria
Fugaciu, L.	National Institute of Meteorology and Hydrology, Bucharest, Romania
Ganoulis, J	Aristotle University of Thessaloniki, Thessaloniki, Greece.
Grbovic, J..	Hydrometeorological Institute of Slovenia, Ljubljana, Slovenia
Kupusovic, T.	Hydro-Engineering Institute, Sarajevo, Bosnia and Herzegovina
Kupusovic, E.	Federal Meteorological Institute, Sarajevo, Bosnia and Herzegovina
Lack, T.	Water Research Centre, Marlow, U.K.
Lambova, I.	Sofia University St. Kliment Ohridski, Sofia, Bulgaria
Lekic, D.	Federal Hydrometeorological Institute, Belgrade, FR of Yugoslavia.
Ljubiljavljjevic, D.	University of Belgrade, Belgrade, FR of Yugoslavia
Manchevski, L.	Republic Hydrometeorological Institute, Skopje, FYR of Macedonia
Miklavcic, J.	Hydrometeorological Institute, Ljubljana, Slovenia
Morell, M.	MED-HYCOS Pilot Regional Centre, Montpellier, France
Papachristou, E.	Aristotle University of Thessaloniki, Thessaloniki, Greece.
Papageorgiou, N.	UNESCO, Athens, Greece.
Perraud-Rival, M.	MED-HYCOS Pilot Regional Centre, Montpellier, France

Popovska, C. University of Ss. Cyril and Methodius, Skopje, FYR of Macedonia
Quartano, K. Aristotle University of Thessaloniki, Thessaloniki, Greece.
Rebelo, F. Rebelo Publishing, London, U.K.
Selenica, A. Institute of Hydrometeorology, Tirana, Albania
Serban, P. Apele Romane, Bucharest, Romania
Stojov, V. Hydrometeorological Institute, FYR of Macedonia
Vukcevic, S. University of Montenegro, Podgorica, FR of Yugoslavia.
Zivkovic, M. Federal Hydrometeorological Institute, Belgrade, FR of Yugoslavia.
Zupan, M. Meteorological and Hydrological Service, Zagreb, Croatia.

Separate INWEB meeting

Arsov, R.	Ljublisavljevic, D.
Bonacci, O.	Papachristou, E.
Brilly, M.	Papageorgiou, N.
Bulu, A.	Popovska, C.
Ganoulis, J.	Quartano, K.
Grbovic, J.	Rebelo, F.
Kupusovic, T.	Serban, P.
Lack, T.	Vukcevic, S.
Lambova, I.	

Names and addresses of the participants INWEB/MED-HYCOS meeting – Belgrade 25-28 april 2001

NAME	SURNAME	TITLE	ORGANISM	ADDRESS	CITY	PHONE	FAX	EMEL	COUNTRY
SELENICA	Agim		Institute of Hydrometeorology	Rruga. Durrësit, 219	TIRANA	(355-42) 23518 / 22439	(355-42) 23518	Agim.selenica@mpl.ird.fr	ALBANIA
KUPUSOVIC	Esen	Head of Hydrological Department of federal Meteorological Institute	Meteorological Institute Bardakcije 12		SARAJEVO	387 71 230 470		esenakupusovic@usa.net	BOSNIA-HERZEGOVINA
KUPUSOVIC	Tarik	National Coordinator	Hydro-Engineering InstituteMediterranean Action Plan 1 Stjepana Tomica Street		71 000 SARAJEVO	387 71 53 34 38	387 71 20 79 49	Mapbh@bih.net.ba lhgf@utic.net.ba	BOSNIA-HERZEGOVINA
DIMITROV	Dobri		National Institute of Meteorology and Hydrology Bulgarian Academy of Science Forecasting Department	66, Tzarigradsko Shosee boul	1184, SOFIA	(359-2) 88 23 08/72 22 71	(35 92)97 335 69 359 2 884 494	dobri.dimitrov@meteo.bg	BULGARIA
ARSOV	Roumen	Ass. Prof.	University of Architecture, Civil Engineering	1, Chr.Smirnenski Blvd	1421 SOFIA	359 2 668 668995/656 648	359 2 668 995/656648	R_arsow_fhe@uacg.acad.bg	BULGARIA

			and Geodesy Faculty of Hydrotechnic s						
LAMBOVA	Ilika	Ass. Prof.	Faculty of Mathematics and Informatics Sofia University	5, James Bourchier Blvd	1164 SOFIA	359 2 6256584/625 6565	359 2 687180	llambova@fm i.uni.sofia.bgf	BULGARIA
ARTINIAN	Eram	Hydrotechnic Engineer	National Institute of Meteorology and Hydrology Bulgarian Academy of Science Forecasting Department	66, Tzarigradsko Shosee boul	1784, SOFIA			eram.artinian @meteo.bg	BULGARIA
ZUPAN	Milan	Head of Hydrological Department	Meteorologic al and Hydrological Service	Gric 3, Hrvatska	10 000 ZAGREB	(385-1) 27 72 01	(385-1) 431026	zupan@cirus. dhz.hr	CROATIA
BONACCI	Ognjen	Prof.	Faculty of Civil Engineering University of Split	Matice hrvatske 15	21000 SPLIT	385 21 303340	385 21 465 117	Obonacci@gr adst.hr	CROATIA
MORELL	Marc	CRP co- ordinator	IRD CRP MED- HYCOS	911 Avenue Agropolis BP 5045	34032 MONTPELLI ER CEDEX 1	(33 4) 67 63 64 28	(33 4) 67 41 21 33	marc.morell@ orstom.fr	FRANCE
PERRAUD- RIVAL	Manuelle	CRP administrator	IRD CRP MED- HYCOS	911, avenue Agropolis BP 5045	34032 MONTPELLI ER CEDEX 1	(33 4) 67 63 64 20	(33 4) 67 41 21 33	manuelle.perr aud@orstom. fr	FRANCE

GANOULIS	Jacques	Prof.	Department of Civil Engineering Hydraulics Laboratory Aristotle University of Thessaloniki		54 006 THESSALONIKI	30 31 99 56 82	30 31 99 56 81	IGANOULI@civil.auth.gr Inweb@inweb.gr	GREECE
PAPACHRISTOU	Eleftheria	Prof.	Department of Civil Engineering Hydraulics Laboratory Aristotle University of Thessaloniki		54 006 THESSALONIKI	30 31 99 56 44			GREECE
QUARTANO	Katie		Department of Civil Engineering Hydraulics Laboratory Aristotle University of Thessaloniki		54 006 THESSALONIKI	30 31 99 56 82	30 31 99 56 81	Inweb@inweb.gr	GREECE
MANCEVSKI	Lefko	Director	Republic Hydrometeorological Institute of Macedonia	Street Skupi b.b.,	SKOPJE 91000	(389-91) 36 21 16	389 91 397 118	radica@tmet.rthsf.meteo.bg	FYR of MACEDONIA
POPOVSKA	Cvetanka	Prof.	Faculty of Civil Engineering Partizanski odredi bb	PO Box 560	SKOPJE	389 91 116066	389 91 117367	Popovska@stobi.ga.ukim.edu.mk	FYR of MACEDONIA

STOJOV	Vasko		Republic Hydrometeorological Institute of Macedonia	Street Skupi b.b.,	SKOPJE 91 000	(389-91) 39 71 12	(389-91) 397 118	vasko@meteo.gov.mk	FYR of MACEDONIA
FUGACIU	Liliana	Head of	National Institute of Meteorology and Hydrology	Sos. Bucuresti- Ploiesti 97	BUCHAREST 71552 sect 1	(40-1) 230 31 16	(40-1) 230 31 43	liliana@meteo.inmh.ro	ROMANIA
SERBAN	Petru	Dr.	Water Management, Hydrology and Meteorology Division Apele Romane	Str. Edgar Quinet nr.6 Sector 1	70106 BUCHAREST	40 1 3122174	40 1 3122174	Serban@ape.rowater.ro	ROMANIA
MIKLAVCIC	Joze		Hydrometeorological Institute of Slovenia	Vojkova 1b	1001 LJUBLJANA	(386 61) 436 27 84	(386 61) 13 31 396	joze.miklavcic@rzs-hm.si	SLOVENIA
GRBOVIC	Jasna	Dr.	Hydrometeorological Institute of Slovenia Vojkova 1b		1000 LJUBLJANA	386 61 327 461	386 61 133 1396	Jasna.grbovic@rzs-hm.si	SLOVENIA
BRILLY	Mitja	Prof.	University of Ljubljana Faculty of Civil Engineering	Hajdrihova 28	1000 LJUBLJANA	386 4253324 1	386 2519897 1	Mbrilly@fagg.uni-lj.si	SLOVENIA
BULU	Atil	Prof.	Istanbul Technical University Faculty of Civil	Maslak	80626 ISTANBUL	90 212 285 37 35	90 212 285 37 10	Bulu@itu.edu.tr	TURKEY

			Engineering						
LACK	Tim	Manager	Water Research Center EIONET	Henley Road , Medmenham Marlow Bucks	SL7 2HD	44 1491 636 590	44 1491 579 094	Lack@wrcplc. co.uk	UNITED KINGDOM
REBELO	Fernando	Rebello Publishing		PO Box 18069	LONDON EC1V 2RJ	Mob 44 77 806 45834		London@rebello- publishing.co m	UNITED KINGDOM
ZIVKOVIC	Momcilo	Director	Federal Hydrometeorological Institute	Bircaninova 6, P.O. Box 604	11001 BELGRAD	381 11 645 779 mob : 381 63 35 94 43	381 11 646 369	Momcilo.zivkovic@meteo. yu	FR of YUGOSLAVIA
STEVANOVIĆ	Slavimir		Federal Hydrometeorological Institute	Bircaninova 6, P.O. Box 604	11001 BELGRAD	381 11 646 555	381 11 646 369	Stslava@meteo.yu	FR of YUGOSLAVIA
LJUBISAVLJEVIĆ	Dejan	Prof.	Faculty of Civil Engineering University of Belgrade	Bulevar Kralja Aleksandra 73	11000 BELGRAD	381 11 321 8557	381 11 337 0223	Ljubisav@irc. grf.bg.ac.yu	FR of YUGOSLAVIA
VUKCEVIC	Slobodan	Prof.	Institute for technical Research Cetinjski Put B.B.		81 000 PODGORICA	381 81 214 456	381 81 214 456	Slobov@yahoo.com	FR of YUGOSLAVIA
LEKIC	Dejan		Federal Hydrometeorological Institute	Bircaninova 6, P.O. Box 604	11001 BELGRAD			dlekic@meteo.yu	FR of YUGOSLAVIA
SPEGAR	Gordana	Adviser – Hydrological	Federal Hydrometeorological Institute	Bircaninova 6, PO Box	11001	381 11 646	381 11 646		FR of YUGOSLAVIA

		studies production and analysis	ological Institute (FHMI)	604	BELGRAD	555	369		A
KOJANIC	Vladan		Federal Hydrometeor ological Institute	Bircaninova 6, P.O. Box 604	11001 BELGRAD			vladan@mete o.yu	FR YUGOSLAVI A
PERIC	Kristina	Adviser	Federal Hydrometeor ological Institute	Bircaninova 6, P.O. Box 604	11001 BELGRAD	(381 11) 64 65 55	(381 11) 646 364	kperic@mete o.yu	FR YUGOSLAVI A
RADIC	Zoran	Head of the Hydrological Department	Federal Hydrometeor ological Institute	Bircaninova 6PO Box 604	11001 BELGRADE	381 11 318 560	381 11 646 369	Radicz@eun et.yu	FR YUGOSLAVI A

APPENDIX 4 : TOPICS PROGRAMME PROPOSALS

The list of countries proposals is not exhaustive. The following proposals were sent to PRC by countries representatives before 31 May 2001.

Albania

3 proposals were prepared by Agim Selenica. They address basin approach issues.

THEME 1: Monitoring, assessment and sustainable use of water resources of Drini River

Background

The Basin of Drini is situated at southwestern part of Balkan Peninsula and concerns to the Adriatic Sea Catchment. The surface of the Drini basin is 19582 km² and the annual average discharge about 700 m³/s. It is the third biggest European river which discharges its water in the Mediterranean Sea after Rone (France) and Po (Italy).

Drini is a transboundary river shared between Greece, Macedonia, Albania and Yugoslavia. In the Drini Basin are situated Ohrid Lake and Prespa Lake (both under the patrimony of UNESCO) and Shkodra (Skadarski) Lake, the biggest lake in Balkan Peninsula. In the Drini River 5 dams are constructed, 3 in Albania (mainly used for hydroenergy production) and 2 in Macedonia and 1 is on the way of construction in Albania (hydropower plant of Bushati). During floods the inundation in the lower part of the basin (Albania) causes very important damages in human life and economy.

Objectives

- To organize the monitoring of quantity and quality of the water
- To assess the water resources
- To organize a forecasting service
- To prepare a master plan for the sustainable use of its water
- To prepare a project for the river management in order to create a navigation axes from Adriatic Sea (from Velipoja in Albania) to the Skadarski Lake (Podgorica in Montenegro).

Expected results

- Establishment of the hydrological network by installation of DCPs : 1 in Prespa Lake (Greece), 1 in Ohrid Lake (Macedonia), 1 in Drini Zi (Crni Drim in Macedonia), 1 in Belli Drim (Yugoslavia), 1 in Moraca River (Yugoslavia), 1 in Shkodra Lake (Albania) and 1 close to outlet (Albania).
- A monograph on water resources of Drini River - Development of a model for flood forecasting
- A master plan for the sustainable use of water in different sectors (energy production, irrigation, water supply for industry and drinking water etc)
- Design navigation axes from Adriatic Sea (Velipoje in Albania) to Skadarski lake (Podgorica in Montenegro) through Buna (Bojana) River.

Topic Co-ordinator: Agim Selenica, National Hydrometeorological Institute, Tirana

THEME 2: Monitoring, assessment and protection of Vjosa River

Background

Vjosa Basin is situated at the southwestern part of the Balkan Peninsula and concerns to the Adriatic Sea Catchment. Its sources are in the mountains of Pindi in Greece. The basin has a surface of 6706km² and an annual average discharge of 202 m³/s. Vjosa River is shared between Greece

(where is situated one third of the basin) and Albania. During floods the inundation in the lower part of the basin causes import damages in human life and economy. The river has a natural regime and only a few of its water is used for irrigation and water supply of urban areas. Its high quality of water make him a very pure river which can be used from all the water sectors, including the drinking water. It is mentioned for its rich fauna and flora. A hydropower plant is planned to be constructed in the lower part of the river. It not exists any cooperation or other agreement between Greece and Albania for the sustainable use of its water.

Objectives

To organize the monitoring of quantity and quality of the water

- To assess the water resources
- To plan the reciprocal use of its water
- To take all the measures on both sides for the protection of its water.

Expected results

- Installation of 2 DCPs, one in Greece(probably in Konica)and 1 other in the Albanian side (in Dorza)
- A monograph on water resources of the river
- A plan on the reciprocal use of the water
- A plan of measures and an agreement for the protection of the river on both sides.

Topic Co-ordinator: Agim Selenica, National Hydrometeorological Institute, Tirana

THEME 3 : Preservation and Protection of Ohrid and Prespa Lakes

Background

Ohrid and Prespa Lakes are located within the basin of Drini Zi River, atributary of Drini River. Ohrid Lake is shared between Fyrom and Albania and Prespa Lakes between Fyrom, Albania and Greece. Both Lakes are under the patrimony of UNESCO.

The Ohrid Lake is located in the altitude of 692 m and has a surface of 363 km² and a depth of 295 m, being thus the second deepest lake in the Europe, behind the Lake of Geneva (depth 370m). With its volume of water of 50 km³ it is of important economic value for both countries. The Ohrid Lake is the origin of the Drini Zi (Crni Drim) River.Prespa Lakes are located in the altitude of 847 m, or 157m higher than OhridLake. The Great Prespa Lake has a surface of 285 km² and a maximal depth of 35m. The Small Prespa Lake has a surface of 43.9 km². Due to the difference of altitudes (157 m) and a very developed karstic phenomenon an average amount of about 20 m³/s is discharged from Prespa to the Ohrid Lake. Both Lakes are of tectonic origin with an alpine regime and a very rich fauna and flora. Some endemic species are found in Ohrid Lakes.

The lakes have a very important tourist richness. Due to the urban and industrial developments the water quality of lakes is deteriorating. Some urgent measures are to be taken in order to protect these lakes. Meanwhile, starting from 1970 years a catastrophic falling of the lake level is observed in the Prespa Lake probably from human influence (using water for irrigation) or/and natural phenomenon (climatic changes) Researches are to be undertaking to calculate the water balance between lakes, as well as limniological studies in order to explain these phenomenon's and to take measures to preserve the lakes. Currently an important project is going on with the financial support of WB for the protection of Ohrid Lake.

Objectives

- To organize hydrological and limniological monitoring (on water level, water quality and biological observations) of the Lakes ;
- To organize limniologic researches for a better understanding of phenomenon's in the lakes;
- To prepare a plan for a sustainable use of these lakes;- To prepare an agreement between the riverain countries for the preservation and protection of these lakes.

Expected results

- a) Installation of 3 DCPs in each lake;
- b) A monograph on the Limniological Regime of Lakes;
- c) A plan for the sustainable use of the lakes;
- d) An agreement for the preservation and protection of lakes.

Topic Co-ordinator: Agim Selenica, National Hydrometeorological Institute, Tirana

Bosnia-Herzegovina

The proposal sent by Esena Kupusovic is related to basin approach linked with national activities support.

THEME : Neretva river (downstream of Mostar), Improvement of water discharge estimation

Objective

To define rating curves in segment of high water levels on three profiles.

Federal Meteorological Institute

Description

Neretva is one of the biggest rivers of Mediterranean region. Actually, downstream of Mostar city, there are few automatic stations – H.S. Zitomislici, H.S. Gabela, H.S. Dracevo. Owner of stations and data is Public Company for Adriatic Watershed – Mostar city. Data from the period before the war are situated in Federal Meteorological Institute in Sarajevo.

Unfortunately, there are no possibility to measure water discharges (velocity-area method) during higher water levels. This proposal insist on the fundamental role of real measurement.

This project would be the first phase to join current observed water-level data (performed by Public Company), rating curves (made by Federal Meteorological Institute), and measurements of Neretva river in Metkovic (performed by Hydrometeorological Institute from Zagreb – Croatia).

Med-Hycos would have values of water discharges for H.S. Metkovic, H.S. Zitomislici, H.S. Gabela and H.S. Dracevo.

Output

Rating curves for Neretva river – three profiles: Hydrometric station (H.S.) Zitomoslici, H.S. Gabela and H.S. Dracevo (Dracevo is situated close to the border between B&H and Croatia – have in mind Med-Hycos station in Metkovic), with possibility to get exact values of high water discharges of Neretva river.

Expected support

1. Double-Drum winches for cable-way installation (H.S. Zitomislici)
2. Universal current meter with single-drum winch and movable trolley for the measurement e.g. from a bridge (for H.S. Dracevo, and H.S. Gabela).
3. Boat for water discharge measuring.

Topic Co-ordinator: Kupusovic Esena, National Hydrometeorological Institute, Sarajevo

Bulgaria

The following proposal from Dobri Dimitrov is related to international basin approach.

THEME : Struma/Strymonas Flood Forecasting and Warning System – functional up-grade and extension to the Macedonian and Yugoslav part of the river basin

Background

- Struma river basin hydrologic conditions, hazardous floods generation due to heavy rainfall and intensive rainfall/snowmelt phenomena.
- Existing large Greek reservoir “Kerkini” (started operating in early sixties) 20 km. downstream the Bulgarian border. The Struma river is transporting sediments quite intensively and the reservoir flood retention volume is very small. The optimal and safety management of the reservoir needs flood forecasting.
- Bulgarian – Greek project aiming to investigate the flood formation factors and establish flood forecasting and warning system has been started in 2000. Some telemetric automatic hydrometeorological stations were installed at the Bulgarian part of the basin. Automatic telemetric stations do not cover the Macedonian and Yugoslav parts of the basin, which could generate hazardous floods.

Objectives

- Ensure real time information on river discharges and some important meteorological parameters from the Macedonian and Yugoslav parts of the Struma river basin.
- Up-grade the present data collection system, ensure possibilities for real and near real time data transfer to the MedHycos database and WEB side.
- Create hydrological data and products dissemination system for the Struma river basin countries by transferring up-to-date MedHycos data presentation and dissemination technology to the Struma project sub-centres, training the Struma project staff in the utilization of the MedHycos tools and WEB presentation software.

Expected results

- Complete data collection and dissemination system covering the whole Struma river basin, including high tech solutions for data presentation using GIS and WEB technology;
- Up-to-date reliable flood forecasting model comprising capabilities for flood generation from the territory of Macedonia and Yugoslavia, which are neglected at present;
- Increased number of key stations for the MedHycos system.

Participating countries

Bulgaria, Greece, Macedonia, Yugoslavia

Macedonia

Experts from Macedonia were proposed by M. Lefko Mancevski. These experts will be welcomed in PRC (Montpellier) from August to October.

Romania

Experts from Romania were proposed by Ms Liliana Fugaciu. These experts will be welcomed in PRC (Montpellier) from July to August.

Yugoslavia

Official proposals were sent by M Mihajlo Gavric, Deputy Director of the Federal Hydrometeorological Institute. These proposals constitute the basis of the implementation of a MED-HYCOS Thematic Center in Belgrade as it was proposed during the meeting. In order to setup the implementation of this TC, collaborations are being established between the Federal Hydrometeorological Institute and Faculty of Civil Engineering, University of Belgrade. They are as following :

- 1 - MED-HYCOS Information System : Improvement and Development
- 2 - Statistical Tools Development
- 3 - Hydrological Droughts Identification and Study of Drought Impact on Water Resources
- 4 - Hydrological Stations Network Revitalisation

The first 3 themes directly concern the Thematic Center.

The proposal 1 - MHIS - is one fundamental element of the MED-HYCOS project.

The proposal 2 is related to methodologies and tools which will be disseminated to all the MED-HYCOS partners ; collaborations would be established with other teams of other MH partner countries or/and other programs.

The proposal 3 will be applied to Balkan countries ; methodologies could be transferred to other areas ; other TC on droughts would be implemented in other countries of the Mediterranean region.

The fourth one constitutes a national activity which must be supported by MED-HYCOS Project.

THEME 1 : MED-HYCOS Information System Improvement and Development

Background

The development of MED-HYCOS Information System (MHIS) started in 1995. as a second objective in the list of immediate objectives defined by the Regional Co-operating Group for the initial phase of the project. At the beginning of the MHIS development regional database has been developed as well as standalone tool for accessing the database, stored on MED-HYCOS server, through Internet connection. Access to the database has been provided using dynamically created HTML pages as well. Starting with the year 1999 serious improvements were made concerning MHIS. Engagement of seconded experts working in Pilot Regional Centre (PRC) in Montpellier has brought implementation of new technologies in MHIS and creation of a complete system for database management, data access and a possibility of using MHIS as a solution for National Hydrological Services (NHS) database systems. During year 2000 training session has been organised in PRC with the idea of knowledge and technology transfer to the NHS involved in the Project.

Idea for Thematic Centres creation originate from the conception that was accepted on the meeting of the Initial Co-ordinating Group (ICG) held in Tunisia, year 2000. That conception is based on the activation of regional sub-centres for topics of common interest for chosen region. During last few years main contributors in a sense of MHIS creation and development were experts from Balkan countries. Having this in mind, during the regional meeting held in Belgrade in April 2001 constitution of Thematic Centre in Belgrade was proposed and accepted by countries of the Balkan region. First theme that was proposed is MED-HYCOS Information System Improvement and Development.

Present State Description

Current state of MHIS is represented through two interconnected products/systems:

- ◆ PRC Information system located in Montpellier, France;
- ◆ MED-HYCOS CD ROM used for delivery of applications to the participating countries.

On the other hand MHIS can be represented as a system containing three different groups of products divided on the basis of used information technology:

- ◆ Regional Database (MHIS kernel)

- *MED-HYCOS Oracle 8 Database Server*, stored on the MED-HYCOS server in PRC, updated with real-time data coming from DCP stations on the daily basis after a first checking ;
 - *MED-HYCOS Access Database* delivered on the MED-HYCOS CD as a copy of Oracle Database, used as a model for database structure for NHS and providing local copy of database for use with MED-HYCOS applications.
- ◆ Standalone Applications (delivered on MED-HYCOS CD)
- *MED-DAT, Data Manager & Data Retriever*, an application written in Visual Basic with possibilities for:
 - Maintaining the structure of both Oracle and Access MED-HYCOS databases.
 - Transferring information coming from DCP (flat Access table) to the variable oriented Access and Oracle tables;
 - Exporting from both databases (local user database) and to remote PRC – Oracle database;
 - Editing, updating, adding and deleting particular records in both databases using a developed graphic interface;
 - Converting water levels to streamflow discharges using imported rating curves;
 - Importing any data received in ASCII format, like "near real time" data series;
 - Visualising data series from both databases in graphic and tabular format;
 - Automatic updating of PRC - Oracle database with newest data coming from the DCP.
 - *MED-MAP, Mapping tool*, an application written in Tcl/Tk with possibilities for:
 - GIS interface database browsing, connection and data accessing of both Oracle and Access MED-HYCOS databases;
 - Zooming, moving and selecting objects organised as four layers displayed on the map;
 - Layer control, displaying/hiding different layers;
 - Graphical, textual and tabular data representation;
 - Data, graph and table exportation in the format appropriate for use in other common applications;
 - Charts superposition for different types of variables and aggregation levels
 - Textual representation of general information for the selected station.
 - *MED-CLIM, Climate Data Viewer*, an application for:
 - Linear (time series) and spatial (interpolated monthly, averaged monthly and yearly values) representation of monthly temperature and rainfall data (GHCN) from more than 500 stations from the Mediterranean region;
 - Chronological rainfall and temperature series can be visualised from the MED-HYCOS Web Site.
- ◆ Web Site & Web Applications (accessible through Internet)
- *MED-HYCOS Web Site* <http://medhycos.com> powered with Apache Web server with PHP support included, containing project description/activities and information related to water resources assessment and management, pollution, climate, Mediterranean sea, etc;
 - *MH Database Inventory & Download*, Web application giving the representation of the current MED-HYCOS database inventory in tabular and graphical form. Database inventory can be browsed by Object/Variable/Aggregation or viewed as a full inventory table.
 - *IE Mapping Tool*, Web application giving database access through map interface, using new VML vector graphics standard. MH Data visualisation in the form of Table & Graph and data download.

- *Animated Climate Viewer*, Web application for animated representation of the interpolated yearly and monthly temperature data and rainfall data in the Mediterranean basin.
- *Countries Database Statistics*, Web application giving statistical information about variables, stations, countries; inventory of data available in a selected country; graphical representation of variables attached to countries/rivers/basins; report on DCP state.

Objectives

During last two years and creation of the newest version of MHIS and MED-HYCOS CD valuable feedback has been received from several NHS and a lot of connections have been established between engineers who worked on the MHIS and experts from NHS for evaluation of developed tools. This co-operation gave several possible directions for further development, improvement and maintenance of these tools. Interest for MED-HYCOS tools and software has been shown from different countries representing all particular regions included in the Project. MHIS became one of the main factors of cohesion between the NHS involved in the Project. Knowing all this it is necessary to establish the organisational structure that will provide continuous work on the MHIS maintenance and update. This will assure system compatibility with new operating systems such as Windows 2000 or Windows XP as well as to continue with further development in the direction that will be defined through co-operation with NHS. It is also important to emphasise the dynamical nature of information technology (IT) at the present moment and to ensure use of the newest technologies in MHIS. Using of the newest technologies and their incorporation in MHIS can be done only with persistent and continuous work on MHIS aiming the integration of new standards and technologies into already developed tools or design of new tools based on IT standards accepted world-wide. Thematic centre in Belgrade and co-ordinator of theme named "MED-HYCOS Information System Improvement and Development" should create a base for a new kind of organisation that will implement the idea of regional co-operation having the same goal as a project on the large scale. Exchange of experts, ideas and solutions in the field of IT between countries in the region, followed by exchange between all the participating countries, has to be the main objective. List of tasks that will lead to the accomplishment of this objective can be presented as:

- ◆ Further improvement and development of MHIS core - Regional Database ;
- ◆ Work on the application development, meaning upgrading existing tools by incorporation of different utilities, like:
 - Statistical tools;
 - Spatial charts displayed directly on the map;
 - Map colouring as a result of spatial interpolation;
 - Report creation tools;
 - Possibility of adding layers representing different features;
 - Interfaces for manual data input.
- ◆ Creation of new applications specially in the sense of using up-to-date Internet technologies, creating the system that will have an organisation of so called "thin clients" giving the possibility of database access and use of different tools using only the Internet browser without the need of installing standalone application on client computers.

Expected Results

The results of this project, being a part of MED-HYCOS project, will strongly depend on the co-ordination between PRC and the co-ordinator of presented theme. The timeline for achievement of proposed tasks and objectives will be adjusted to the development of the second phase of MED-HYCOS project. Expected results of thematic centre creation and work on the proposed theme can be defined as:

- ◆ Establishment of a thematic network between NHS based on the idea of knowledge exchange specially in the field of MED-HYCOS software tools utilisation;
- ◆ Capacity building of NHS through the co-operation with MED-HYCOS and Thematic Centre, training session organisation, exchange of MED-HYCOS experts, etc.

- ◆ Creation and publishing of next versions of all MED-HYCOS software tools;
- ◆ New version of MED-HYCOS Web site tools as a compilation of existing tools representing a complete Web Application that will incorporate newest technology;
- ◆ Maintenance of existing MHIS.

Needed Support

Two types of support from PRC are needed for achievement of proposed objectives:

- ◆ Organisational support, for the tasks that includes co-operation between different NHS;
- ◆ Financial support that will provide the base for engagement of experts who will contribute to the realisation of proposed objectives

Topic Co-ordinator: Dejan Lekic, Federal Hydrometeorological Institute, Belgrade

THEME 2 : Statistical Tools Development

Background

Statistical methods are one of the main hydrological tools. The results of statistical analyses of meteorological and hydrological data are used for planning water management systems (reservoirs dimension, spillways, flood protection systems projecting, the choice of intakes and outlets locations, planning and maintaining of water ways, river moles projecting and so on). Beside, statistical analyses are used for defining the amount of water which can be intaken for different users (water supply, irrigation), for planning of biological and ecological discharge minima related to water quality parameters and so on. Water level and discharge states are also defined using statistical analyses in hydrological practice, on the basis of which, floods and droughts timely warnings are made, as well as, the estimation of extreme events causing major or minor damages.

Due to evident global (climatic) and/or local changes occurring in the Mediterranean basins (because of changing of land use manners, changing of vegetation and so on) or water regime changing (caused by hydrotechnic works and water use in water management), it is necessary to make the correct statistical analysis and results interpretation.

Present State Description

There is a sequence of available statistical packages of programmes (frequency analysis tools) on software market or in free exchange. In practice, the above results frequently in inadequate application or wrong interpretation of hydrological data statistical analysis results.

Most frequent errors are as follows:

- ◆ inadequate data (non-representative samples),
- ◆ not following the basis statistical hypotheses,
- ◆ neglecting of statistical parameters reliability analysis,
- ◆ adopting of inadequate theoretical distributions,
- ◆ neglecting of confidence interval distribution,
- ◆ making conclusions based on "point" estimation instead on regional analysis and physical interpretation of parameters and distribution.

Having in mind the applications of hydrological data statistical analysis results, the errors and wrong results interpretations might cause great damages.

Objectives

The adequate procedure of statistical analyses and results interpretation will be developed in WINDOWS environment, thus providing the availability to the greatest number of users from the National Hydrological Services (NHS). For each step the user will have the corresponding explanation like: "Why", "When", "What" and "How", as well as HELP support like: "When-Yes", "When-No" and "What-Now". In this way, the errors caused by inadequate application of statistical programmes will be eliminated.

Special tools will be developed for frequencies analysis:

- ◆ discrete (discontinual) variables (e.g. precipitation), and
- ◆ continual variables (e.g. water level and discharge)

Two methods will be used for the analysis of maxima:

- ◆ Annual extremes theory
- ◆ POT series (Peak Over Threshold Method).

Together with the above methods application the selection of different durations of low flow periods will also be used for low flow analyses. The special attention will be paid to low flow analyses of drying water flows.

Regional statistical analyses methods will also be included.

The other possibilities and advantages for everyday application are described in the Document "Future of MED-HYCOS" (Radic, 2000) pages 12-14, marked by "Including".

Expected Results

Finally developed statistical tools will have three components:

- ◆ Teaching statistical tools,
- ◆ Windows oriented applicative tools for NHS, and
- ◆ MED-HYCOS oriented statistical tools connected by ORACLE data base.

Specially attractive for NHS and potential users of HS products, will be:

- ◆ Internet oriented tools for statistical products presentation (table of quantiles and probability plot diagrams) and searching through developed map tools.

Needed Support

Starting from the fact that:

- ◆ Teaching tools must be written in the form of an electronic book,
- ◆ Applicative tools must have full help support and characteristics of packages of "know-how" type, and
- ◆ Presentation tools must be INTERNET oriented.

It is clear that preferred tools could be made by the highly skilled experts with the knowledge both in hydrology and information technology.

Three experts from the Faculty of Civil Engineering will be included in the different stages of statistical tools developing, testing and application and three ones from the FHMI.

Some computer system upgrade and modernisation, peripheries and legal software will be necessary.

The sources will be dependant on the accepted dynamic and needs for tools developing expressed by the NHS and MED-HYCOS RPC.

Topic Co-ordinator :

Dr Zoran M. Radic, The Faculty of Civil Engineering, University of Belgrade

THEME 3 : Hydrological Droughts Identification and Study of Drought Impact on Water Resources

Background

As an extreme hydrological phenomenon, droughts are one of the most delicate problems. They are of special importance for the area of Southern Mediterranean (Northern Africa), but recently the widespread regional droughts have affected the Balkans and most of the European continent.

The hydrological aspect of droughts is directly connected with agrometeorological and specially water management droughts resulting in water restriction which depends on the total amount of available water and particular users needs.

Due to the above reasons the analyses of hydrological and water management droughts should be of interest for all NHS and due to its regional character the common interest of some sub-regions and the whole Mediterranean.

Present State Description

In most of NHS, droughts analyses are made a posteriori, the analyses of consequences being analysed, only. For droughts severity estimation the simplified statistical methods based on analytical frequencies have been used most frequently not taking into account the effects of water resources reduction.

Since water management droughts have occurred more frequently recently, the adequate methods and indicators for timely warnings have been developed. From the theoretical and scientific points of view, the above analyses should be used urgently as the tools for the current NHS hydrological practice. They also can be a basis for development of timing measures for water resources management in the periods of droughts specially in the case when water reservoirs in the catchment are available.

The existing knowledge and contemporary technologies for spatial presentation and monitoring of regional droughts are a good basis for development and application of adequate models which can be used for particular NHS an for the Mediterranean.

Objectives

Starting from the historical data on daily discharge values the tools for adequate detection, warning and drought mitigation strategy will be made using:

- ◆ statistical methods and probability theories for droughts character detection,
- ◆ stochastic methods for the analyses of warning and detailed detection of drought periods,
- ◆ parametric methods for the analyses of base discharge components affecting mostly the possibility of water use in the catchment.

For the analyses of water management drought influence the following method will be used:

- ◆ the analyses of volumes deficits and their duration, developed within FRIEND-NWE Project UNESCO-IHP

Expected Results

The methods for analyses and application of various discharge state indicators will be developed and can be used for drought warning and analyses. Further on, the methods for the analyses of total and base discharges in real time, as well as, the methods for spatial analyses and drought presentation at the catchment level in wider areas (regional droughts) in INTERNET environment, will also be developed.

In the first phase, the applicative tools will be made for the needs of NHS and the adaptation and inclusion into MED-HYCOS Information System will be made later on.

The model demo version will also be made as well as the optimum strategies for reservoir water resources management in the case of water management drought warning.

Needed Support

Preferred tools could be made by the highly skilled experts with the knowledge in hydrology, hydraulics, water resources management and information technology.

Three experts from the Faculty of Civil Engineering and three from the FHMI will be included in the different stages of statistical tools developing, testing and application.

Some computer system upgrade, peripheries modernisation and legal software will be necessary.

Sources will be dependant on the accepted dynamic and needs for tools developing expressed by the NHS and MED-HYCOS PRC.

Topic Co-ordinator

Dr Zoran M. Radic, Faculty of Civil Engineering, The University of Belgrade

THEME 4 : Hydrological Stations Network Revitalization

Background

The main reason of this Project initiation is the necessity for the hydrological information provision aimed at the optimum use and management of water resources on the territory of FR Yugoslavia (FRY) and surrounding countries. This is due to the fact that the FRY observation system (HOS) does not provide either the minimum of indispensable hydrological information, neither for our needs nor for the surrounding countries needs. The unfavourable situation related to the HOS has resulted from the reasons which could not be either predicted or prevented by the owners/users, so that this problem has been generalised.

Present State Description

FRY has been constituted after the administrative division of the Socialist Federal Republic of Yugoslavia (SFRY), resulting in HOS formation. During the previous 50 years SFRY had been developing its own HOS, following the requests of ex Yugoslavia and the neighbouring countries and in concordance with the adequate agreements and conventions. The catchments areas had been cut, that is, the hydrological entireties had been disturbed. As a result, the inefficient subsystems had been made, so, the Danube makes the frontier between Croatia and SFRY, the Drina between the Bosnian Federation and Srpska Republic on one side and SFRY on the other side. Beside, the Sava and some minor rivers have obtained the status of the international rivers. There is around 50.000 km waterflows on the territory of FRY (192 173 km²), 25000 km of which with important length (> 10 km), so that the river network density amounts around 500 m/km².

This complex hydrological situation can be explained by the fact that only 15% of the total runoff (207*10⁹ m³) belongs to the FRY waterflows and that the major European rivers such as the Danube, the Sava and the Tisa flow through Yugoslavia.

At the moment, there is a special problem related to Kosovo and Metohija on the territory of which the significant part of FRY HOS does not function, which might be prolonged in future and reduce the possibility for planning and establishing the system on the surrounding territory. In the past two years the international community (the territory of Kosovo and Metohija being under its protectorate) did not started any activities related to this problem.

The international sanctions against FRY and its bombing have damaged severely HOS technical basis. Therefore, the equipment for automatic registration and hydrological measurements is functioning at the level under the technical minimum resulting in unreliable observed and registered data. Having in mind our financial resources, the financial support to this matter cannot be expected.

The Objective of the Project

Before all, this Project should enable the reliable functioning of the minimum dimensioned HOS on the territory of FRY and the neighbouring countries. It would also provide the favourable conditions for inclusion of HOS of ex republics into the unique HOS, that is, the renewal of the system on the territory of FRY, as well as its linking with neighbouring countries HOS.

Since this Project can be treated as a new system establishing on a particular administrative territory, revitalisation of the damaged HOS and inclusion into surrounding countries systems, the results of the Project are of general importance and can be used in the situations mentioned before. Further on, the Project is in accordance with the basic idea of MED-HYCOS, that is, the obtained results are at the disposal of all users and participants in the Project.

Expected Results

The realisation of the Project covers the following phases:

- ◆ The selection of the locations and establishing of temporary hydrological stations at the water courses making frontiers or are cut with frontiers. (refers to ex YU republics) and the hydrological stations which are significant for the neighbouring countries. The hydrological stations would be provisional until the final inclusion into the unique HOS which is the subject of the following phases;

- ◆ The analysis of the requests for the hydrological data in the current situation and the possibility for meeting them in the existing HOS;
- ◆ The assessment of the existing stations quality following the criteria of data reliability and real benefit of these data;
- ◆ The proposal for the minimum of stations which would constitute the basic network enabling the optimum hydrological information according to all agreed requests;
- ◆ The analysis of the HOS support technical system reliability and the preparing of proposals for modernisation;
- ◆ The analysis of requests for minimum automatic hydrological stations network and water quality stations network establishing;
- ◆ Fixing the priorities and placing of automatic hydrological stations and water quality stations;
- ◆ The analysis of the present situation and the proposal for contents and dynamics of system modernisation for automatic acquisition and dissemination of hydrological data at the national and international level.

Necessary Assistance

The engagement of various experts for the current state and making proposals for future HOS functioning is indispensable. Most of these experts have been already engaged in the Yugoslav Hydrometeorological Service, therefore, there will not be any problem related to their engagement in the Project. The serious problem is the provision of the urgent financial support for the reliable functioning of the hydrological stations which data are used for the international exchange and timely warning to the consequences of hydrological phenomena. Before all, it is necessary to provide the financial support for the restoration of the damaged hydrometric installations, for constructing and equipping of hydrological stations planned for the first phase of the Project and for the renewal of the instruments for water level and discharge registration and measurements. The request related to this matter has been communicated to WMO.

Topic Co-ordinator

Slavimir Stevanovic, Federal Hydrometeorological Institute, Belgrade