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Politieke en Sociale Wetenschappen  
Speciale Licentie Documentatie- en Bibliotheekwetenschap

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## **WATER RELATED INFORMATION ON A GLOBAL SCALE**

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Promotor: Prof. Dr. L. Egghe

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## WATER RELATED INFORMATION ON A GLOBAL SCALE

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*CODA*

*Oceans of information...but where is the water? (W.W. de Mes)*

*Information is more rapidly lost than created. (F.H. Verhoog)*

*UNESCO is not a bank (A. Aureli)*

*Water, water, every where,  
And all the boards did shrink,  
Water, water, every where,  
Nor any drop to drink.*

*The Rime of the Ancient Mariner  
(Samuel Taylor Coleridge)*

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# List of Acronyms

**ABOS:** Algemeen Bestuur voor Ontwikkelingssamenwerking  
**ACSAD** Arab Centre for the studies of arid zones and dry lands  
**AFEE:** Information System of the 'Association Francaise pour l' Etude des Eaux'  
**AGRALIN:** Agricultural Literature Netherlands  
**AGREP:** Agricultural Research Projects  
**AGRIS:** International Information System for the Agricultural Sciences and Technology  
**AIT:** Asian Institute of Technology  
**ASFA:** Aquatic Sciences and Fisheries Abstracts  
**ASFIS:** Aquatic Sciences and Fisheries Information System  
**ATA:** Abstracts on Tropical Agriculture  
**CABI:** CAB International  
**CCF:** Common Communication Format  
**CD-ROM:** Compact Disc Read-Only-Memory  
**CDS/ISIS:** Computerised Documentation service/Integrated Set of Information Systems  
**CEPIS:** Centro Panamericano de Ingenieria Sanitaria y Ciencias del Ambiente  
**ENSIC:** Environmental Sanitation Information Center  
**CIEH:** Comité Interafricain d'Etude Hydrauliques  
**CILSS:** Comité Permanent Inter-états de Lutte contre la Secheresse dans le Sahel  
**CRD:** CODATA referral database  
**CRIS:** Cooperative State Research Service  
**CTA:** Centre Technique de Cooperation Agricole et Rurale  
**DRE:** Direction des Ressources en Eau  
**DRTC:** Documentation Reference Training Centre  
**EC:** European Community  
**ECPDM:** European Centre for Development Policy Management  
**ESA/IRS:** European Space Agency - Information Retrieval Service  
**FAO:** Food and Agricultural Organisation  
**IAHR:** International Association of Hydraulic Research  
**IAHS:** International Association of Hydrological Studies  
**IDRC:** International Development Research Centre  
**IHP:** International Hydrological Programme  
**INHR:** Institut National de Recherches Hydrauliques  
**INIST:** Institut de l'Information Scientifique et Technique  
**IOC:** Intergovernmental Oceanographic Committee  
**IODE:** International Oceanographic Data and Information Exchange  
**IRC:** International Reference Centre  
**IRTCUD:** International Research and Training Centre on Urban Drainage  
**ISI:** Institute for Scientific Information  
**ISO:** International Standardisation Organisation  
**IUPHY:** Inter-university Postgraduate Programme in Hydrology



**LILACS: Latin American Data Base on Health Sciences**  
**LUC: Limburgs Universitair Centrum**  
**LCWSS: Low Cost Water Supply and Sanitation**  
**NADLIN: National Documentation Centre, Library and Information Network on Water Resources**  
**NATIS: National Information Systems**  
**NISSAT: National Information System for Science and Technology**  
**NTIS: National Technical Information Service**  
**OCLC: Online Computer Library Center**  
**PADIS: Pan African Documentation and Information System**  
**PAHO: Pan American Health Organization**  
**PANGIS: Pan-African Network for a Geological Information System**  
**PUDOC: Food and Agriculture Organisation, Centre for Agricultural Publication and Documentations**  
**RDC: Regional Dispatching Centre**  
**REGIS: Regional Information System for African Aquaculture**  
**REPIDISCA: Regional Network for Information and Documentation**  
**RESADOC: Reseau Sahelien d'Information et de Documentation**  
**RURAL: Rural Development in the Tropics**  
**SCI: Science Citation Index**  
**SWRA: Selected Water Resources Abstracts**  
**TROPAG: KIT Tropical Agriculture Database**  
**UAP: Universal Availability of Publications**  
**UN-ECA: UN Economic Commission for Africa**  
**UNDP: United Nations Developmental Program**  
**UNESCO: United Nations Educational Scientific and Cultural Organization**  
**UNESCO-DBA: UNESCO's Department of Documentation, Libraries and Archives**  
**UNESCO-IHP: UNESCO International Hydrological Programme**  
**UNESCO-PGI or UNESCO-GIP: UNESCO General Information Programme**  
**UNISIST: World Scientific and Technological Information System**  
**USDA: U.S. Department of Agriculture**  
**USGS: United States Geological Survey**  
**VLIR: Vlaamse Interuniversitaire Raad**  
**VUB: Vrije Universiteit Brussel**  
**WASH: Water and Sanitation for Health Project**  
**WHO: World Health Organisation**  
**WMO: World Meteorological Organisation**  
**YUWAT: Yugoslavian Water Database**

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# Summary

Ways and means to improve the water-related information flow between North and South:

- *removal of information barriers*
- *projects: large scale versus small scale*
- *present flow of water-related information and its bottle-necks*
- *suggested improvements at the hand of a number of case-studies*
- *the legal aspects of downloading*

# Chapter 1 Introduction

Water not only serves as a vital substance for human existence but also plays an important role in advancing civilisation. (Chow, Ven Te 1964) Since water is related to so many things in nature as well as in human society, this knowledge is extremely broad and interdisciplinary. Various fields relating to water include agriculture, agronomy, biology, chemistry, city planning, climatology, drainage, economics, environment, erosion, forestry, geography, geology, groundwater, horticulture, hydraulics, hydrometry, irrigation, meteorology, oceanography, physics, recreation, sedimentation, surface hydrology, water management, water treatment, watershed management.

Basic sciences, engineering technologies, environmental aspects and human valuations are interwoven in the complex web of water systems, which in addition, are never stationary, but rapidly changing in time. (see Fig. 1)

Hydrology is the science that deals with the waters of the earth, their occurrence, circulation and distribution, their chemical and physical properties, and their interaction with their environment, including their relations to living beings.

Dr. F. Verhoog of the UNESCO Water Sciences Division classified the following types of water-related information (Nieuwenhuysen, P (ed.), 1988) :

- numerical data
- survey reports
- scientific research results
- methodological technology
- technological know-how
- legal and administrative requirements

Some of these types are relatively well cared for, such as meteorological and hydrological data. HOMS and CLICOM are efforts in this direction and recently the CODATA referral database (CRD) has been set up with UNESCO support. It provides an automated compilation of international records describing numerical data sources in science and technology.

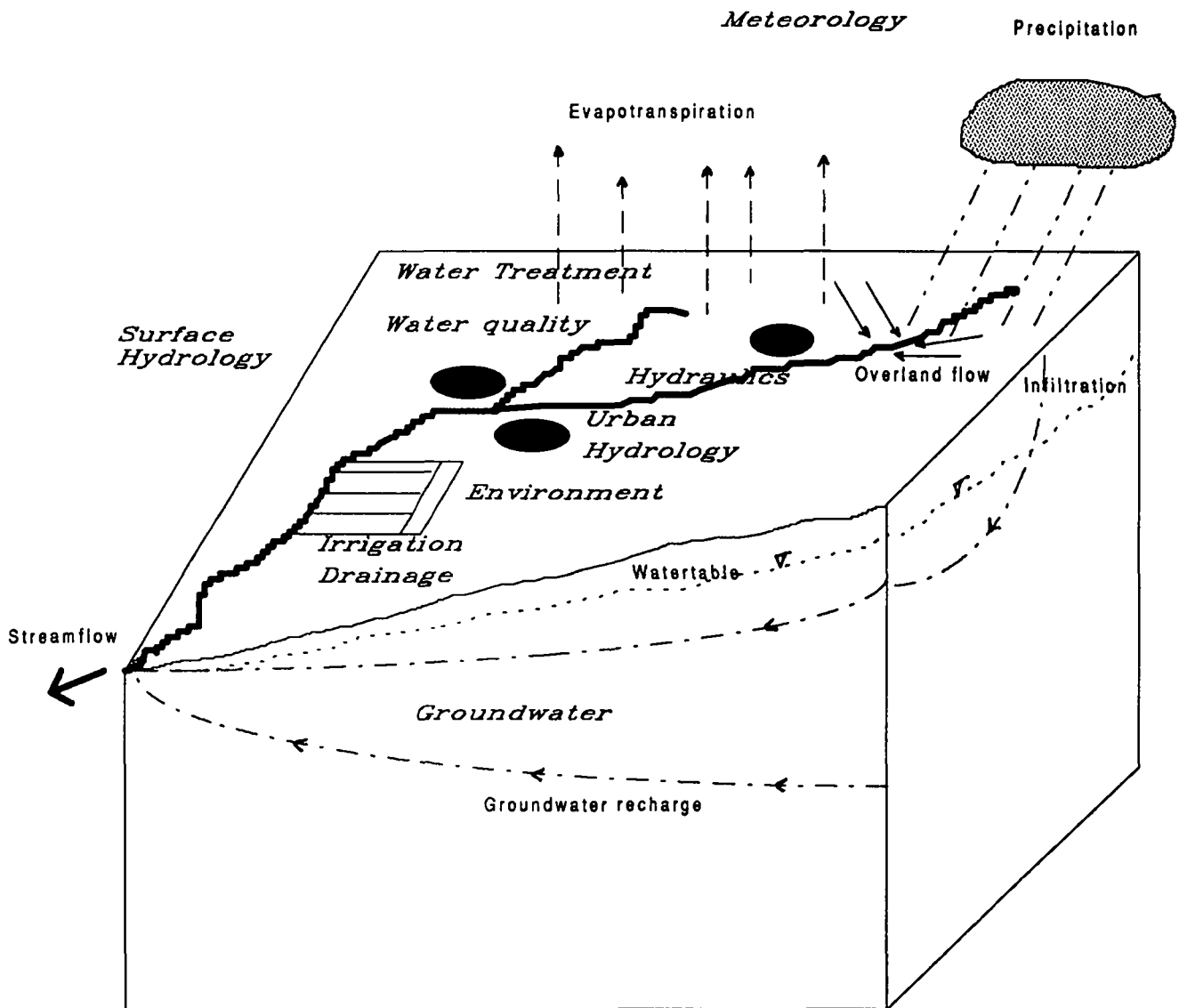
For technological know-how there are the basic handbooks.

For the legal requirements the government services in charge are normally aware of the developments. For scientific knowledge there are universities, the international scientific associations and international databases.

Local information should be available to tackle local questions and it could normally be assumed that data relating to national problems could easily be found within the national borders. This is unfortunately not always the case and it is not exceptional that international databases may have to be searched in order to obtain the required information about home problems.

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Fig. 1 The hydrological cycle



The UNESCO international hydrological programme (UNESCO-IHP) decided in 1980 to give a particular boost to "Water Resources Scientific and Technical Information Systems" with emphasis on non-numerical information since WMO was already dealing with its numerical counterpart. During the second phase of the IHP (1981-1984), a special project was launched with the aim of reviewing the need for the establishment of a water related national, regional and global scientific and technical information system. The idea behind it was to have a central location where all existing information sources would be centralised just as in the outstanding British Library Document Supply Centre.

This scheme proved to be too costly and would moreover have involved some overlap with already existing and internationally available information systems though these are not specifically devoted to water but to the related subjects as described above.

At this point in 1984 at the start of the IHP-III, P. Nieuwenhuysen was appointed as Chief Rapporteur. He attracted a hydrologist (F. Provost) and together with M. Sicevic (YU) and W.W. de Mes (NL), the IHP Working Group was formed.

In 1987, UNESCO decided that it would be better to direct efforts for the near future to:

- make known, promote and train in the use of internationally available water documentation and information systems
- promote and assist in the establishment of national water documentation and information systems.

The third phase of the programme ended in 1989 and after several meetings a Technical Document was published by UNESCO in which recommendations and guide-lines were proposed. This document (Nieuwenhuysen, P; Provost, F;..de Mes W.; Sicevic, M. ,1989) forms the starting point for this thesis. Some results can already be noted: A water-related seminar was held as a satellite event to the Online Meeting in London in December 1989.

In June 1990 the Working Group was invited by IRTCUD, a water engineering seminar to organise a session for demonstrating water-related information products such as CD-ROMs and the text retrieval softwarepackage CDS/ISIS made available by UNESCO.

In 1990, the Working Group entered Phase IV of UNESCO-IHP which has a duration of five years (1990-1994). The leading theme of this phase is:

*Hydrology and water resources for sustainable development in a changing environment*

The activities on water-related documentary information are set in a official framework outlined as follows:

**Sub-programme M:**

**Management of water resources for sustainable development**

**Theme M-2**

**Scientific and technical water-related information and documentation systems.**

**Project M-2-1:**

**Development of national water-related information and documentation systems, with emphasis on non-numerical information.**

**Project M-2-2:**

**The use of internationally available water-related information systems.**

As a combined geographer, hydrologist and prospective information and documentation specialist, my ambition is to make a worthwhile contribution to these projects. It was with that purpose in mind that this thesis for the Master Degree in Documentation and Library Science was written.

A list of used acronyms is available on page 5 and 6.

# Chapter 2 Documentary information in developing countries

## 2.1 Introduction

The 'Longman Dictionary of Contemporary English' defines a "developing country" as "a poor country that is trying to become richer and to improve the living conditions of its people".

However, three characteristics of developing countries can be listed:

- 1) A colonial past and resentment against the former colonial power and against imperialism.
- 2) Underdeveloped economies, compared to the advanced economies of Europe, Japan or USA.
- 3) As a consequence of 1 and 2, mass illiteracy is common and political life tends to be dominated by a small (often Western) educated elite.

Developing countries have a limited capacity to satisfy the basic daily needs of their people owing to a lack of capital, of technical know-how, of production capacity and markets for their limited production. They also experience great difficulty in breaking into the technological era. How to bridge this technological gap is a continuing concern for developing countries. It is against this background of economic and technological under-development that we want to have a general look at the scientific and technological information transfer in as well as at the state of the university libraries in developing countries.

## 2.2 Science and technology Information transfer In developing countries

### 2.2.1 *The information production in the South*

Is the scientific work done in the third world adequately represented in international bibliographic databases? At a workshop of an ad hoc International Task force for assessing the Scientific Output of the Third World (Moravcsik, 1985) considerable attention was paid to the Science Citation Index (SCI) created by the Institute for Scientific Information (ISI). Workshop participants estimated that only about half of the scientific output of the third world, which meets international standards of excellence, is included in the SCI. Recommendations and guide-lines were formulated during the workshop with the emphasis on inclusion of scientific output from developing countries into the SCI. Other suggestions were to provide seed money for encouraging manufacturers in developing countries to produce microfilm readers as microfilm from journals, books and reports, are less expensive to produce and to ship airmail than their respective hard copy. Objections may well be raised against such a centralisation of information by SCI since developing countries would once again be dependent on the goodwill of an organisation with a strong Western bias.

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Also, since funding by Western organisations would not go on indefinitely, one may ask how developing countries would be able to pay for consulting the expensive SCI online (if that is possible) or for the hard copy. In short, SCI is not the answer to the problem. These recommendations were formulated before the advent of CD-ROM.

Up to now, the recommendations, suggestions and guide-lines are failing concrete action plans. The scientific literature produced in developing countries does not always contain up-to-date scientific and technological information, and most developing countries rely for such information on literature produced in developed countries. For example, over 50% of the total output relating to science and technology was produced by only ten developed countries. Only 12 % was produced by the developing countries (Nazim Ali, 1989). | Jap

It is perhaps incorrect to state that the best sources of information about e.g. Africa exist elsewhere. It would be accurate to state that frequently, the most available sources of information are in documentation centres and libraries in the industrialised world. (Ballard, 1979)

### **The economical barrier**

And yet there is a crying information need. How do you organise a system of health-care delivery for teeming populations in rural areas where there are no doctors trained in modern medicine or in the slums that surround most major urban cities. Such information does exist. It has been produced by developing countries themselves in grappling with their own problems. But that information, if at all recorded, is in the form of typewritten reports sent to a few offices in the national or provincial civil service. Only an infinitesimal portion of it finds its way to Medlars or Excerpta Medica. For the real health problems of the poorer countries, Western databases are quite inadequate, being designed to respond to our own Western needs. Some of this information is certainly of value to developing countries but often they do not contain what would be of most interest and most value to developing countries which "is the information that they have themselves produced" (Woolston, 1984). 9-70

We cannot entirely blame the database compilers in Western countries for failing to include reports on health-care experiences somewhere in India. There is no market here for that type of information.

### **The language barrier**

Another main cause of this unbalance is the language. For although a majority of developing and developed countries use English or French in scientific and technological education and research, those that do not are at a disadvantage.

### **The telecommunication barrier**

Other major handicaps are the poor postal and communication systems: This requires capital investments which may be far beyond the capabilities of

those countries. It must be noted that information and wealth have much in common. Just as the wealthy are the ones more likely to get richer, so those who can acquire more information can gather and accumulate more knowledge.

The existence of profitable information suppliers in the private sector of any developed country confirms that fact (Brito, 1987).

### **The social barrier**

New concepts and approaches such as computerisation have hardly been introduced and as a result, graduates have difficulty in functioning efficiently in their own areas.

Education systems have not yet been brought up to modern standards.

Moreover, low social status and salaries do not encourage individuals to take part in professional meetings or conferences. Therefore many of the professionals are unaware of the latest research developments. A consequence of this is that good scientists in developing countries are moving to developed countries, where they have the right facilities and incentives. The "brain drain" is serious. It is difficult to keep a fine scientist at home.

### *2.2.2 The importance of university libraries*

A key-role in bridging the technological gap can be played by the university, which among other things, has the function of producing the high level manpower needed to promote technological change. The university library, the heart of the university, has a role to play in the nation's "organised procedure for collecting, processing, storing and retrieving documentary information to satisfy the technological and scientific advancement of the nation.

However water is considered as a strategic resource and thus of national interest. That is why most water-related information centres are situated in state departments. ( Max Fernandez, personal communication, 1990).

A feature of the university libraries in the developing countries is that they are inadequately stocked because of poor funding. Lack of scientific and technical books and periodicals, especially in foreign languages such as English has hampered the efforts of faculty and students in their search for information about the latest developments in science and technology. (Loveday and Gatterman 1983)

Another characteristic common to university libraries in developing countries is the lack of adequate staff (cf. also supra). Book culture is a recent development in many of these countries. Book-mindedness has not yet become part of the national ethos. The librarian profession has yet to achieve status and respectability in most of these nations. Attraction to the library profession is therefore not strong enough. Low salaries paid to university library staff in some countries as compared with their academic counterparts is also a contributory factor to the lack of adequate professional staff to man the libraries.

### 2.2.3 The information transfer from North to South

The problems and procedures in information transfer are many. Thinking about information need and supply, one does rarely consider the situation in developing countries. The information flow is mainly directed from North to South, is too often expensive and sometimes redundant and outdated too.

In most developing countries, a number of libraries have depository status. That is to say, they receive the publications of home organisations automatically as they appear. Such publications are important and form an important part of a library's collection for scientific research.

There are libraries and information centres, such as British Council Libraries, United States Information Services Libraries and Cultural Centres, Russian Cultural Centres, German Cultural Centres,...which are attached to embassies in developing countries. Membership of these centres, which are classified as special libraries, is restricted because of their popularity.

Libraries and information centres in developing countries prefer to acquire foreign scientific literature in hard copy. Microfilm is sometimes acquired but mostly for back-sets of periodicals. The usual procedure is to place orders with local agents or with agents in the developed countries, mainly in the USA and the UK. Vendors that are popular in the developing countries include Blackwell's, Baker & Taylor, Swets, Faxon,...Owing to the hard currency problem in developing countries, approval has to be obtained before placing an order with an overseas vendor. There is a need for the creation of a proper national system to co-ordinate the acquisition, processing and disseminating of scientific and technology information. In most cases, the absence of a national library is a common problem. What local publications are there? Perhaps, a national library should be established to perform the function of original cataloguing and the distribution of information. It is a costly undertaking for each library to create bibliographic records which are not compatible with those of other libraries. Most libraries and information centres in developing countries do not follow the established international library standards in the organizing and processing of their material. Coordination and cooperation will also enhance the interlibrary loan by identifying sources from which they might borrow items needed by local users. Much scientific literature is available in academic and special libraries. Such libraries or at least those attached to industrial or research institutes and centres, have acquired material in the parent institution's areas of specialisation.

need

Most libraries and information centres in third world countries are lacking in cooperation among themselves, either in interlibrary lending or in reciprocal borrowing privileges. Happily, some developing countries have recently started giving serious consideration to such matters as resource sharing, networking and interlibrary lending. International organisations are very active in providing materials in their areas of specialisation (agriculture, marine biology, geology). Noteworthy are the efforts of the FAO, UNESCO, WHO, WMO,...

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UNESCO's Department of Documentation, Libraries and Archives (DBA), has promoted the development of national information services and systems by stimulating the awareness of governments and by providing expertise. These activities culminated in 1974 in NATIS, a conceptual framework for the establishment of National Information Systems). In the meantime, another UNESCO department had initiated a programme in 1973 for the development and application of science and technology in developing countries, to be based on a World Scientific and Technological Information System called UNISIST. The two programmes, although both emanating from UNESCO, were offered separately and, finally, with a rivalling character (Gehrke, 1985). In 1977, after years of confusion, they were integrated in the newly established General Information Programme (GIP, or in French PGI). To have a detailed review of UNESCO's efforts during the past fifteen years in the field of information towards developing countries, one should read the "Review of the General Information Programme" (Anonymous, 1988).

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Developing countries have opted for national and regional approaches which offer better chances for co-ordination and cooperation. In 1973, the German Foundation was instrumental in setting up a Regional Committee/Council for the Development of Information Systems and Services in Eastern Africa which has held regular meetings since, but has not been able to secure the aspired support from the United Nations Developmental Program (UNDP). One may draw the conclusion that projects of regional cooperation in information training and information service production require permanent outside support, at best at UN level (Gehrke, 1985). This lesson seems to be at the root of a project initiated by the Canadian International Development Research Centre (IDRC) which has a long tradition in aiding and promoting documentation and information in developing countries. In 1975, IDRC enlisted the support of the UN Economic Commission for Africa (UN-ECA) for the establishment of PADIS (Pan African Documentation and Information System) which is a network planned for the subcontinent of Africa. PADIS has cost 160,000,000,000 US\$ (sic! Gehrke, 1985) for the period 1980-1989. The PADIS concept of creating a database which is centrally supplied with African data from African states and which is supplemented with foreign data when needed seems to be a well-balanced solution for the non-availability of information and thus for preventing new forms of dependence for the developing countries. Despite the huge sums of money invested, the prospects for PADIS do not seem bright. Intergovernmental PADIS meetings are hardly attended by African States. Developing countries whose economics are minimal might seek financial support from international organisations such as UNDP, UNESCO, US-AID, British Council,...(Heimbürger, 1988)

FOR RESULTS

One cannot invest so much money in arranging countless international meetings to deal with such general themes as "bridging the information gap" or "improving the information flow". With some money put in the right place and

with the right people, something can indeed be done to improve the information flow.

*Our approach is ad hoc.*

*Our slogan is "keep it simple and economical".*

A few examples of this approach are illustrated in chapter 5 "case-studies".

#### **2.2.4 The documentary flow from North to South**

The heart of the matter is: how to have the information in the pocket. If we focus on the several physical forms, in which developing countries can acquire information from the developed world, then we can distinguish (see Fig. 2):

- hard copy (paper)
- microform
- machine-readable magnetic media
- online access to databases
- optical discs (CD-ROM)

Whether the first or second options are widely used depends upon the existing situation. Hard copies are acquired mostly through a local vendor who supplies foreign material or directly as stated above, from vendors in the U.K. and the U.S.A. Hard copy is the most popular format available in libraries.

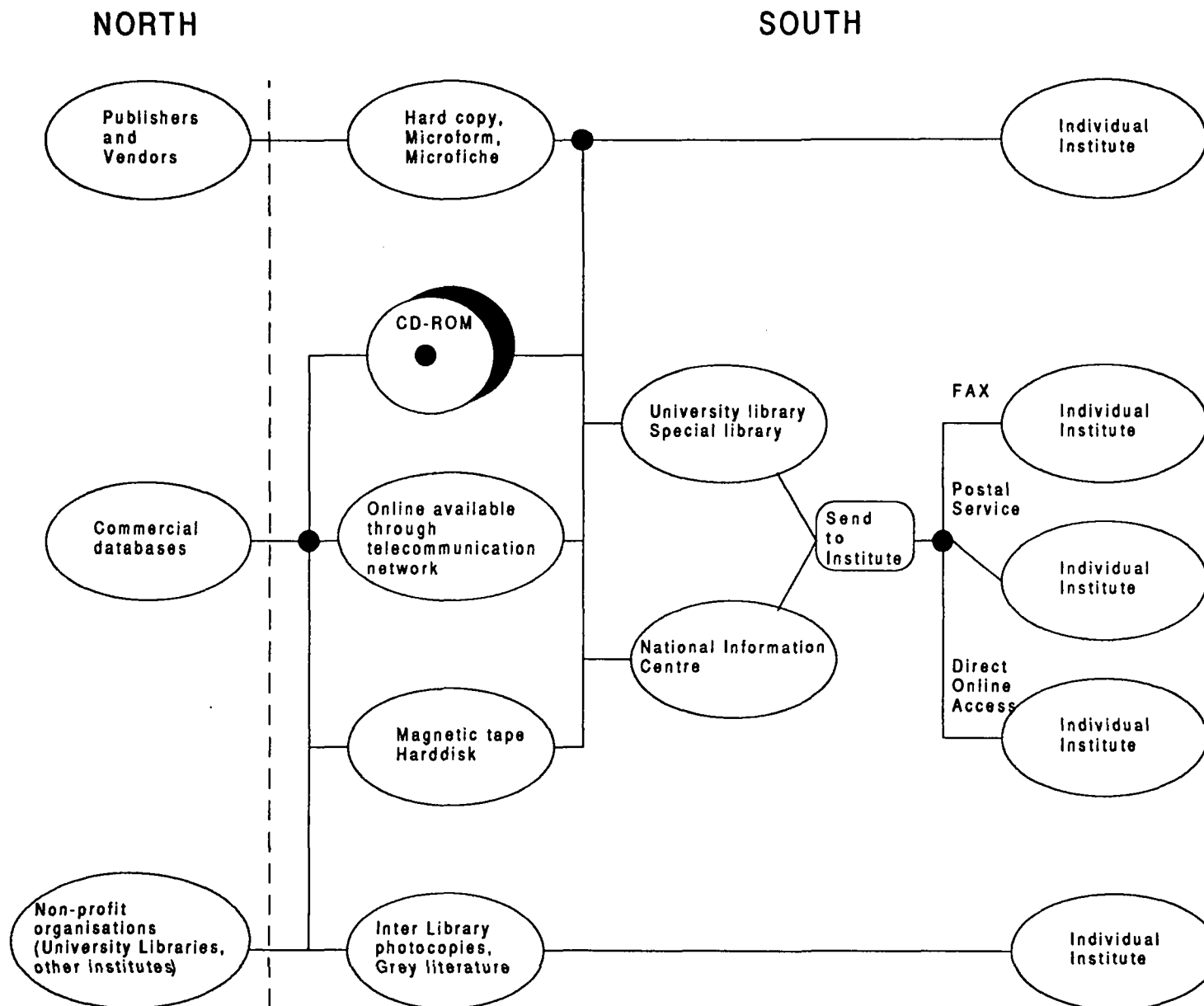
Microform is still not popular because it involves expenditure in buying and maintaining equipment but it is nevertheless gaining ground in the developing countries. Report literature, such as that of the U.S. National Technical Information Service (NTIS) and of the Educational Resources Information Center (ERIC), and specialised collections from major universities and national libraries have been acquired on microform.

Magnetic media are used only in selected situations, and then mostly in special libraries where research requires rapid and in-depth searching. Therefore, a few selected indexes and abstracts, such as Chemical Abstracts, Engineering Index and Biological Abstracts are acquired on magnetic tape.

The fourth option of online access had to be revised since the introduction of CD-ROM and is seen as a complementary way of retrieving information. Earlier, it was suggested that providing access to hundreds of online databases from developed nations was the best and cheapest method of fulfilling the information needs of developing countries. A problem associated with this, however, is the inability of most developing countries to join the necessary telecommunication networks because of poor internal communication structures and the high-tech support needed for maintaining such a service.

International organisations have been developing different databases for the international market, especially for the developing countries. United Nations agencies, such as FAO, UNESCO, WHO,... have been providing access to machine

**Fig. 2 Transfer of information products from North to South**



readable bibliographic databases in their areas of specialisation. For example, FAO has developed a system for agriculture called **AGRIS** (the International System for Agricultural Sciences and Technology), and WHO provides medical information through the subset of MEDLARS (Medical Literature Analysis and Retrieval System) via its regional centres in a number of developing countries; CAB International, provides countries with current information on agriculture and tropical medicine. The British Council and the United States Agency for Information Development (US-AID) are two other examples of organisations that provide information directly and indirectly to the developing countries.

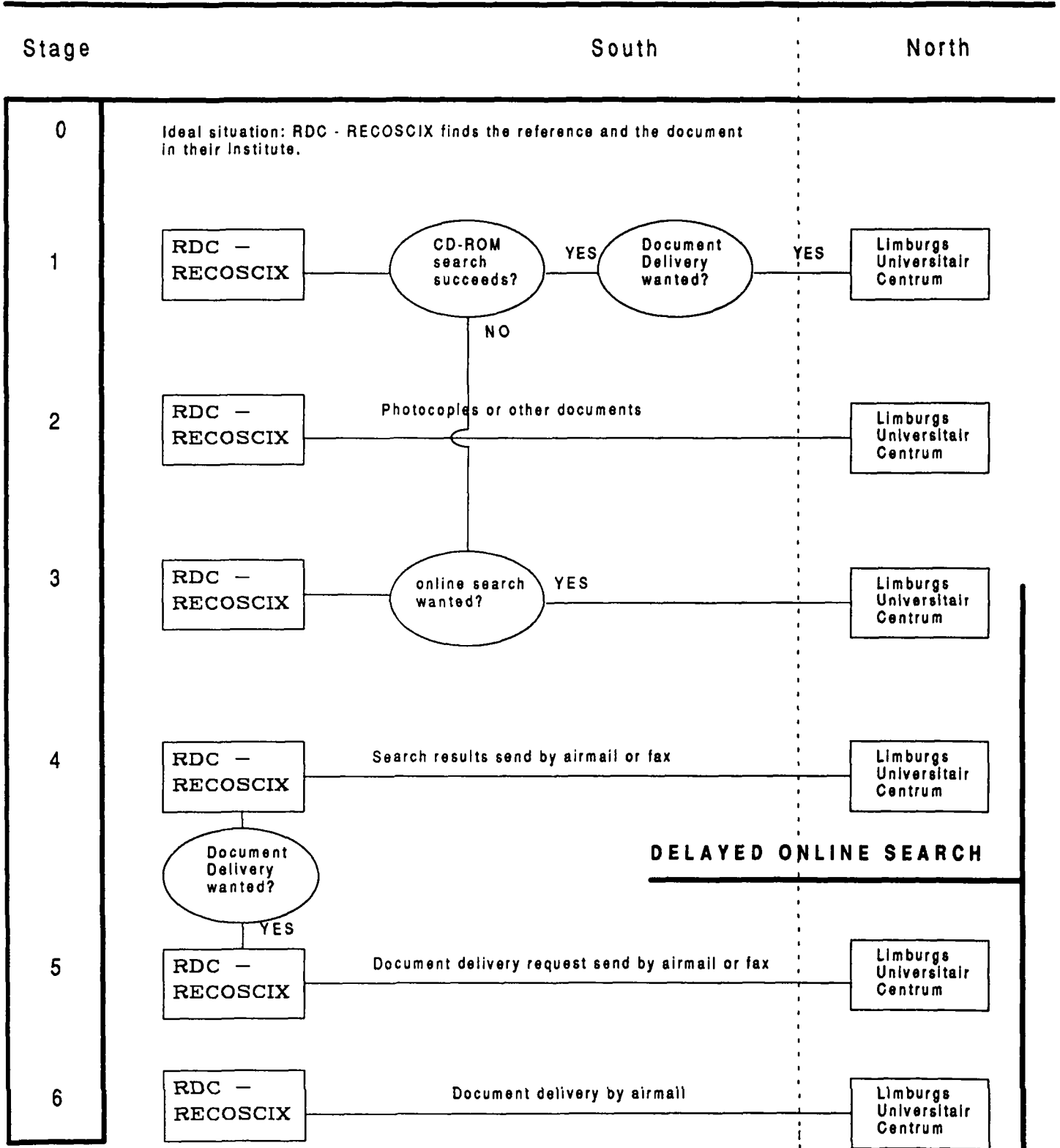
The US-AID has set up a delayed online database searching system in the National Centre of Egypt in Cairo which has links with a technology institute in the USA (El-Hadidy, 1983). International data communication network modes such as Telenet, Tymnet or Dialnet are not available at most local sites in the third world. Secondly, there was no well-trained personnel to serve as intermediaries between the information system and the end-users and to develop the search formulations. A technique "delayed online service" was developed. It involves forwarding search queries collected at the local site and sent by telex to an intermediary in the developed world who in turn conducts the online search. Staff members of the local site received a four weeks training in the intermediary institute and were taught in actual experience with user interviews, profile construction, and intensive hands-on experience in online searching. In turn, the trained staff members organised a workshop with a few experts from the intermediary institute in the developing country.

Another example of a delayed on-line (CD-ROM) information system, much cheaper but also good working, is the cooperation between an information centre of a developing country, the Regional Dispatching Centre (RDC) at Mombasa (Kenya) and the Library of the Limburgs Universitair Centrum (University of Limburg LUC, Prof L. Egghe) in Belgium (see Fig. 3). The investment in money is nil.

Of course, a delay of some weeks before getting the actual document is unavoidable but this is better than having nothing at all. To reduce costs for the RDC, the LUC accumulates the documents (photocopies) and send them in one package to Kenya by mail. On-line is considered here as to be consulted only as last resort. Only good agreements have to be made.

The fifth option for transferring information is optical storage media. This last option is in my opinion rapidly gaining in importance and a special chapter in this study will therefore be devoted to optical discs and especially CD-ROM.

Fig. 3 An example of an delayed online system with its document delivery system





## **2.3 The Impact of CD-ROM**

### *2.3.1 CD-ROM versus online in developing countries*

The phenomenal growth in the library/information market for microcomputers, used for performing a wide range of functions ranging from cataloguing and general housekeeping to intelligent on-line terminals, has brought a large amount of computing power within the range of most users and potential users. Magnetic tape versions of databases have been available on subscription for many years. The CD-ROM brings the same information technology down to the level of microcomputer. The IBM PC range of personal computers has become a de-facto industry standard, with many companies producing IBM-compatible microcomputers, including some developing countries. For example, a number of companies in India, now manufacture IBM-compatible PC's. (Hussain, 1990)

There are various forms of optical discs, such as the 12" videodisc, the WORM's (Write Once Read Many), the digital data discs and CD-ROM (Compact Disc-Read only Memory). The latter has a capacity of 550 Megabytes or 275,000 A-4 size pages. Because of its storage and retrieval capacity the CD-ROM technology has much potential for library use, especially in developing countries where importing the material in hardcopy format from developed countries has always been a problem.

Other advantages include a major breakthrough in the amount of information that can be distributed and used with a personal computer. In essence, with the optical disc developing countries that are not at present using online databases for the reasons referred to above can now have databases at their fingertips and provide unlimited local access to the information in these databases.

Other advantages offered by the optical media are easy retrieval methods and the development of user-friendly software. More and more CD-ROMs are now being produced. Producers of a CD-ROM directory find it hard to keep pace with the evolution. The available databases contain four major categories of information: bibliographic/indexing, reference/numerical, bibliographic/abstracting and full text.

Van Hartevelt (1987) showed that less than 4% of the searches in the online database TROPAG (Tropical Agricultural Database) were carried out by developing countries. At the same time, the hard copy of TROPAG, ATA (Abstracts on Tropical Agriculture), is used for 55% by developing countries. This proves that the information is relevant. ← LIT

The few developing countries with access to online databases are situated in Latin-America. Asia is dependent on expensive and unreliable telephone and telex communications and Africa lags far behind with the exception of the Ivory Coast, Gabon, Gambia and since Nov 1989 of Kenya. (P. Pissierssens of the RDC, personal communication)

Considering Table 1, the major differences in cost come from the striking disparity in information delivery cost represented by the telecommunications in the online model in contrast to the disc production plus mail distribution in the CD-ROM model.

Experience indicates that "who is in control of the machine" is one of the most important question to be taken account in the design and development of better user interface software (Brito, 1989). The consequence of this is that novice users who are given a choice between accessing a database online or via CD-ROM will prefer the latter in most cases. In developing countries, where most users are inexperienced, a database on CD-ROM, apart from cost considerations, will certainly be more attractive.

This choice is even more conditioned by:

- (1) The general lack of telecommunication;
- (2) The implementation of a global package (hardware, software and the heart of the matter, the information itself) and
- (3) Last but not least, CD-ROMs can contain full text, pictures and sound.

These characteristics permit the association of full-media features with databases or knowledge bases, making the CD-ROM an even powerful document delivery device.

The implementation of a CD-ROM installation could be located for instance in university libraries. The special libraries are too dependent on their hosts (private firms) and a National Water-related Information Centre is not available everywhere.

There is no doubt that online databases are able to provide the most up-to-date information. They provide information that cannot be put on optical storage media. Therefore, CD-ROM and online facilities must be seen as complements of each other in developed countries. On the other hand, in developing countries CD-ROM is possibly the only alternative.

Table 1: Comparison between CD-ROM and online databases

<b>Characteristics</b>	<b>CD-ROM</b>	<b>online databases</b>
<b>Capacity</b>	550 Mb of data is accessible Multidrives and jukeboxes will offer more in the future	Hundreds of gigabytes of data
<b>Currency</b>	The data on a CD-ROM disk are at least one month old	Most bibliographical databases are frequently updated
<b>Costs</b>	Fixed prices or annual subscription charge. NO telecommunication	Price related with respect to number of references and telecommunication time
<b>Response time</b>	Mainly due to the drive mechanism and the layout of the disk	Dependent on the remoteness of the host
<b>Cross file searching</b>	Not possible	Possible
<b>Hours of operation</b>	Unlimited	May be limited
<b>Equipment required</b>	- CD-ROM drive - Microcomputer - Printer - Interface - Power pack = Stabilisator + Battery The latter is useful in developing countries and ensures continuously electric power at the same voltage	- Terminal or preferably a microcomputer - Telephone - Modem - Communication Softw. - WELL functioning telecommunication system - Printer

## **2.4 Water-related information networks in the third world**

### **2.4.1 The Water Resources Network in North Africa**

The Maghreb countries (Algeria, Morocco and Tunisia) form an entity on climatological and geological point of view. Also, they share some river basins.

These has led to the idea of planning a documentation network in the three countries with the help of UNESCO. It was decided to use CDS/ISIS as tool for automation. For Tunisia the centre of documentation of the DIRECTION DES RESSOURCES EN EAU (DRE) is the focal point. For Morocco the focal point is situated in the ADMINISTRATION DE L'HYDRAULIQUE and for Algeria it is the MINISTERE DE L'HYDRAULIQUE and the INSTITUT NATIONAL DE RECHERCHES HYDRAULIQUES (INHR) which fulfil that function. (d'Olier, 1986)

The focal points have as main objectives to:

- collect national information concerning water-related information
- make national information available for the other participating countries by using CDS/ISIS.

### **2.4.2 The Arabic Network**

The ACSAD (Arab Centre for the Studies of Arid zones and Dry Lands) is a regional organisation serving 22 Arab countries with its headquarters in Damascus (Syria). They ensure document data and information relevant to arid regions, natural resources and agricultural development, to disseminate and exchange information with other organisations in the Arab world. It was decided to use the IBM/PC/AT as the hardware to develop the database and to use the Mini/Micro version of CDS/ISIS as the software for creating and maintaining the database.

ACSAD maintains a database concerning bibliographic, non-bibliographic data and numeric data (data on water, plant, animal, soil resources, climatological and statistical data).

Arabisation of CDS/ISIS will enable input of data in Arabic as well as in English and also the possibility of producing information products in Arabic.

Member state information divisions were concerned about retrieving information by the subject matter of their reports or studies of a geographic area or country that was of concern and by nature of the study (interpreted maps, inventories, field surveys,...). These special needs were incorporated in the database structure (Haravu, 1988).

The use of CDS/ISIS will permit the export of the database or subsets in an exchange format. This will not only ensure the exchangeability of the database with other IBM/PC/AT's or compatibles, but also with mini or mainframe users equipped with software that can read ISO 2709 formatted data. A good example is the possibility to upload a CDS/ISIS database for use on a MINISIS system.

### 2.4.3 The West African water-related network

Worthwhile to mention are the planned network activities of the COMITE INTERAFRICAIN D'ETUDE HYDRAULIQUES (CIEH) with its headquarters in Ouagadougou (Burkina Faso). The Information and Documentation Centre of the CIEH with financial aid of IDRC has as main objectives to:

- computerise their documentary activities with CDS/ISIS
- serve as nodal point (established in an university library) for hydraulic, rural development and water sanitation literature by publishing the national bibliographies on this subject of the state members Benin, Togo, Burkina Faso, Gabon, Congo, Ivory Coast, Cameroon, Mali, Tchad, Niger, Senegambia, Mauritania, Guinee Bissau and Republic of Central Africa.

Closely linked, le COMITE PERMANENT INTER-ETATS DE LUTTE CONTRE LA SECHERESSE DANS LE SAHEL (CILSS) which is a cooperative regional organisation, possesses two specialised institutions

- AGRHYMET centre in Niamey
- Institut de Sahel in Bamako

One of the achievements was the implementation of the RESEAU SAHELIEN D'INFORMATION ET DE DOCUMENTATION (RESADOC). This network has installed in each member state a focal point and publishes RESINDEX.

CIEH provides RESADOC with their information and uses thus the database structure of RESADOC. The network uses as library software MINISIS and CDS/ISIS.

### 2.4.4 The Agricultural Network

An international assessment programme dealing with water-related information has been set up by CABI (CAB International) with the help of such donor organisations as CTA (Centre Technique de Cooperation Agricole), IDRC, ← UT USAID and World Bank. (Metcalf, 1987). Some forty organisations in twenty-six countries are testing CD-ROM over a six to nine month period. CABI has provided the test sites with detailed documentation to assist the user in CD-ROM data processing and text retrieval. Users in developing countries were excited at the prospect of having, literally at their fingertips, access to information on a scale and at a speed and convenience previously only dreamt of. All CD-ROM databases offer simple to complex searching facilities. However, the use of different software retrieval commands for different CD-ROM databases should be avoided. (Nazim Ali, 1988).

AGRIS, the International Information System for the Agricultural Sciences and Technology, was established following recommendations at the 1971 conference of the Food and Agricultural Organisation (Auger, 1989). It covers agricultural literature world-wide, including water related aspects such as fisheries, irrigation and drainage,..AGRIS is the most recently established of the abstracting and indexing services which aim at coverage of all branches of

agriculture, and it is also available in a monthly paper version called AGRINDEX. It is the intention of AGRIS to provide for the input of non-conventional material by national and regional contribution centres.

Currently AGRIS appears to be working satisfactorily for the material originating in the Third World countries and Eastern Europe, but problems have still to be overcome with respect to the output from the United Kingdom and United States, which of course already have their own well established services.

REGIS (Regional Information System for African Aquaculture), a cooperative international project of FAO, UN and National Agricultural Library (NAL), is designed to provide improved access to information on aquaculture in Africa. The prototype system merges two popular technologies, hypermedia and expert systems, into a useful and easy-to-access information retrieval system which runs on a microcomputer. Hypermedia can be used by an expert to link terms or graphics within one or more documents, allowing a user to browse. Expert systems mimic some of the problem solving abilities of human experts in a given field. Together hypermedia and expert systems provide structure, procedural control, and the ability to explore information. The next phase of the project will include a selected number of bibliographic citations and explore CD-ROM database connexions. The knowledge and experience gained from this project-which connects hypermedia, expert systems, CD-ROM and bibliographic citations-may be applied to future projects resulting in benefits specific to document delivery (Harris, 1990)

To be exhaustive, AGREP, a permanent inventory of agricultural research projects in progress in the European Community is a co-operative venture on a narrower basis.

#### *2.4.5 The Sanitary Engineering networks*

##### **2.4.5.1 REPIDISCA**

The lack of timely access to information has been identified as one of the principal constraints to meeting the goals of the Water Decade (1980-1990). To help resolve this problem the Pan American Health Organisation (PAHO) has undertaken, at the request of its member countries, to sponsor and coordinate the Regional Network for Information and documentation (REPIDISCA) covering the areas of water supply, sanitation and environmental health. REPIDISCA is a cooperative information network offering bibliographic and document delivery services. Sanitary engineering and hygiene deal a lot with the availability of water of good quality.

CD-ROM technology was selected by the PAHO Office of Information Coordinating (DIC) as the most suitable one for delivering information to all collaborating countries. A joint project was therefore developed by DIC and another organisation (BIREME) aiming to put both LILACS, a health science database and REPIDISCA databases on CD-ROM. As a consequence of this project, some 150 libraries in the Region were provided with the necessary hardware using project funds together with a grant from the Brazilian Research Council. This CD-ROM production and distribution effort has also UNESCO support allowing the use of Micro-CDS as the database management system.

REPIDISCA is a regional system whose main objective is to collect and provide access to specialised information on sanitary engineering and the environmental sciences. To meet these objectives, REPIDISCA has the following components:

- CEPIS, the Regional Coordinating Centre operating in Lima, Peru as part of the Environmental Health Program of the Pan American Health Organisation (PAHO);
- the National Coordinating Centres, responsible for the network development in each country of the Region;
- the Cooperating Centres established throughout Latin American and Caribbean countries, forming an extended regional network.

These institutes enter information to REPIDISCA and disseminate its products and services.

For the Latin American and Caribbean countries the importance of a database such as REPIDISCA stems from the fact that it is a source of bibliographic information on public health intimately related to the problems affecting the region. It can therefore provide vital information about subjects no longer addressed by researchers in the more developed countries.

#### 2.4.5.2 ENSIC

ENSIC or the Environmental Sanitation Information Center was established in August 1978 with the aim of making relevant information on sanitation problems readily available to people in developing countries. The publication of the Environmental Sanitation Abstracts is a direct result of that intention. It has its headquarters in Bangkok in the Asian Institute of Technology (AIT). The subject coverage is limited to non-conventional and conventional methods of collection, treatment, reuse and disposal of domestic wastewater, human wastes and agro-industrial wastes.

#### 2.4.6 The Marine Science Network

The RECOSCIX-WIO network operates in the framework of IOC's Technical Committee for International Oceanographic Data and Information Exchange (IODE) and of the FAO-IOC-UN Aquatic Sciences and Fisheries Information System (ASFIS); it has its headquarters in Mombasa, Kenya.

RECOSCIX-WIO provides:

- bibliographic information: the project provides a *query handling and document delivery service*
- directories and bibliographies: the project is building a directory of marine scientists in the region. Special bibliographies on specific topics are prepared as well.
- newsletter *Window*, published 4 to 6 times a year
- a library data-base WIOLIB will be set up by the cooperating libraries. This database using CDS/ISIS software will put emphasis on grey literature.
- training and equipment: the project will provide training and equipment for the library staff of the region in the framework of the WIOLIB database.

Countries expected to participate in the first phase are the seven IOC Member States in the region, which are Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania and also Ethiopia.

The network already offers the ASFA (Aquatic Sciences and Fisheries Abstracts) CD-ROM to end users. Scientific keywords can be sent to the Regional Dispatch Centre (RDC) in Mombasa. These will be matched into the ASFA database. The references produced will be sent to the applicant. If the query in the ASFA should fail, a delayed online system and document delivery system can be applied through the LUC (see Fig. 3).

RECOSCIX-WIO is about communication between scientists, mainly in the field of marine science. It can only work well with the enthusiastic involvement of individual researchers and librarians in the participating countries. The IDRC supports this activity.



#### ***2.4.7 The Geological Network***

The objective of PANGIS (Pan-African Network for a Geological Information System) is to facilitate the collection and dissemination of information on the earth sciences that African countries urgently need for their development.

It consists of a group of European and African institutions involved in African geology and aims at establishing links among them for the exchange of information, supply of data, support for training and where possible, assistance in the preparation of publications and syntheses. The first step in the development of PANGIS is the setting-up of a bibliographic database of information in the Geological Survey organisations of the African countries. National PANGIS centres have already been established with UNESCO support in Guinea, Uganda and Zimbabwe. Each PANGIS installation receives a micro-computer, a documentary database package with a standard PANGIS application, and an extensive training programme. The average international cost for the implementation of a national PANGIS project is about US\$ 30,000.

#### ***2.4.8 Water related national networks in developing countries***

Countries involved in international networks have of course good functioning national networks. This is the case for the examples mentioned above.

National networks covering all aspects of water related information as such are rare. However, some examples are given.

India has set up the NISSAT (National Information System for Science and Technology) with INSDOC located in New Delhi and the Documentation Research Training Centre (DRTC). INSDOC receives and retains all journals which may be of use to the country, issues monthly bulletins of abstracts, supplies photocopies and translations of articles and is a national depository for reports and other grey literature of Scientific and Technical work and consequently also water related information for the nation. It is also the national science library.

Pakistan has set up the NADLIN (the National Documentation Centre, Library and Information Network on Water Resources). They seek contact with other water related information intermediaries and technologists in developing countries.

## **2.5 Conclusion**

Libraries and information centres in the South suffer from most of the same problems that plague libraries everywhere. They do not have money to build needed collections. They have inadequate staff to get the work done. Professionals do not have sufficient contact with their peers, and there is no time or money for professional development.

The difference with the North is that in the South the problems are far more acute. This stems from the cultural tradition in which books, libraries, and teaching students how to conduct research are not parts of the educational curriculum and in which publishing houses cannot find sufficient markets to survive. In these cultures, people do not automatically turn to the library for information.

Library users do not always appreciate the library and almost never understand how much work it takes to get the job done. Scientists and researchers are learning that information availability is crucial to the success of their activities. Administrators and planners have been slower to see the value of information, but that awareness is growing too.

According to the climate change forecasting models, weather prospects do not seem very bright for the South. Africa and India will suffer heavily from drought. Water and the information around it will play an even more decisive role than it does now.

## **Chapter 3 The water-related information system and suggestions for improvement**

### **3.1 Introduction**

If we focus on the field of bibliographical water-related information, we obtain a clear but ideal picture of how the end-user can get the information he seeks. If we take a practical view, however, we have to ask ourselves what could go wrong. It is easy to detect a flaw in the system, but is less easy to give constructive advice. In contrast to many outlines of documentary information systems, we prefer to start from the user who needs information, and not from the information products. This chapter is accompanied by a diagram (in the form of a flow chart; see Fig. 4) of a search for information by an end-user who is confronted with the existing water-related information system. What follows serves as an introduction to the more concrete recommendations (see Fig. 4) which, at a later stage, will be turned into concrete proposals (see numbers in Fig. 4 and see Chapter 4).

Let us imagine a hydrologist or, more generally, an end-user of (water-related) documentary information. He or she may for instance require information concerning a hydrologic problem, or more generally a water-related problem in his or her region.

### **3.2 Recommendations at the level of the end-user (A)**

The production of information is characterized by a steady increase, also in the field of water-related science and technology. Every potential end-user should be information-minded. This means that she/he is aware of

- the importance of already existing information, and of
- the available methods to make a search for information successful.

All potential users of information should therefore undergo appropriate training designed to generate or develop their information-awareness.

In particular, we recommend the training of end-users in the framework of UNESCO-supported courses, seminars, conferences and programs (for instance, the Inter-university Postgraduate Programme in Hydrology, IUPHY, at the Free University of Brussels in Belgium, and the summer schools at the 'Jaroslav Cerni' Institute for the Development of Water Resources, in Belgrade, Yugoslavia).

The end-user should be offered all the available information which is concerning the workings of UNESCO and other organisations in the field of water-related information. The end-user should know the general organisational structure of the water-related information system. This should include national water-related information intermediaries and regional centres. Information about this system can take the form of leaflets, folders, reports, training and edu-

UNESCO  
IHP

INTERNATIONAL

NATIONAL

END USER

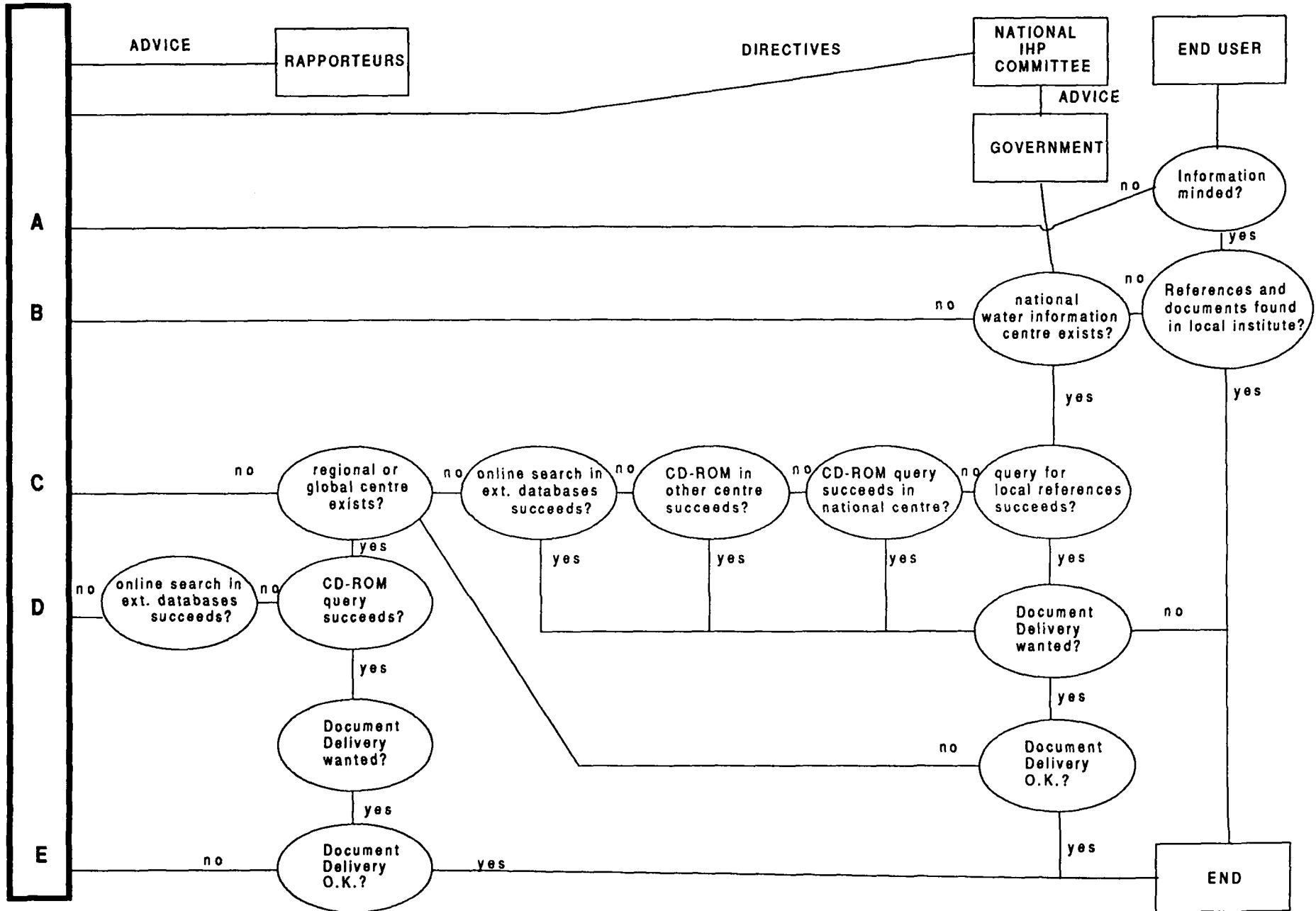


Fig. 4 The Water-Related Information System

cation programs. An effective publicity and education program which is permanently updated can achieve these goals.

### **3.3 Recommendations at the national level (B)**

#### ***3.3.1 Supporting the existing national water-related information centres***

Let us first suppose that the end-user is aware of an existing local or national water-related information intermediary institute, for instance a library. Ideally this organisation should be advised and supported through UNESCO-IHP by a training and education program. Leaflets or brochures explaining the complexity of the organisation should be available. Librarians and information specialists should be available to ensure that the end-user receive the maximum benefit from the library resources. They should also provide information through searches using internal, local databases or national and international databases on CD-ROM or online.

Searching CD-ROM databases should be preferred to online searching in developing countries. (see Chapter 2). If the national centre should not be in the position to perform CD-ROM searches, another information centre may well be able to do so.

The end-user should have access to an outline of the available information resources (e.g. a list of all institutes equipped with one or more water-related CD-ROMs) and of the experience of the available information intermediaries (= persons assisting the end-user at the information intermediary institute).

The information intermediary/centre should publish catalogues or descriptive lists (for instance annually) of newly published or acquired books, reports and maps. Contributors to local and national databases would require training.

The staff should be able to select incoming information which is best suited to the purpose of the end-user (e.g. documents dealing with specific subfields of water resources management). Again the education and training program is essential.

We recommend the support of a publicity and education program at the national level aimed at library and information science and at end-user education. Such an activity could perhaps be related to the national information intermediary.

To avoid that a potential end-user should not be able to locate the existing local or national information intermediary, all potential end-users should receive a list of intermediaries in a region or country, in the field of water-related information

In conclusion, if a water-related information intermediary already exists, it should be supported.

### *3.3.2 Creation of new national water-related information centres*

Where a co-ordinating, specialised water-related information intermediary/centre/unit does not yet exist, UNESCO-IHP should stimulate its creation. The members of such a national unit should ideally consist of one or more professionals skilled in information science and of hydrologists.

Any international water-related information system in any country can only function in a proper way if that country has developed or is prepared to develop a national water intermediary. By working through the UNESCO-IHP National Committees, the ministerial and departmental involvement and commitment to the establishment of a water-related information intermediary should grow. Recommendations should therefore be given to the governments of the countries involved.

A possible scenario could look as follows. Initially, each National Committee organizes and subsidizes a sensitizing meeting to be held for policy makers, information specialists, members of national water-related bodies and agencies, and members of the water industry of that country. Such a meeting should stimulate awareness and a better understanding of the aims of a water-related information system, and of its vital importance to their country and/or company. It can be followed by an online information retrieval session, in which available water-related databases are searched (for instance, a local database, as well as an international one). The water-related community should become aware in this way of the whole range of facilities and services of a good water-related information system. The national committees should help to raise the funds required for the personnel and the infrastructure of national water-related information centres in the various countries. The national committees should help to choose which intermediary to support primarily, after a study of the merits of candidate institutions related to water information. This should keep the costs relatively low, in comparison with the creation of completely new information centres 'ab initio', which does not seem efficient and would simply be too

expensive. The national intermediary may be a university department, or a department of the national library (if this exists in the particular country). Many contacts have to be established among:

- the National Committees for IHP,
- the National Committees for the General Information Programme of UNESCO (PGI), and
- the contributors to this project.

The National Committees for the IHP of the countries which are interested in the water-related information system make their choice known to a coordinating unit, established by UNESCO-IHP in Paris.

### *3.3.3 Tasks of the national water-related information centres*

In actual fact, we will find that most cases will fall between the two extremes outlined above (immediate retrieval of the required information or lack of information-mindedness). In general however, the national centres should at least try to accomplish the following tasks:

- To collect copies of water-related documents, with an emphasis on those documents which were created within the country.
- To take part in the creation of a computerized water-related bibliographic database of references to their own national documents and other data collections; to make this database internationally available.
- To search CD-ROM available databases related to water information.
- To create a directory of CD-ROM water related information products and their locations in the whole of the country
- To search online computerized databases (if possible) for end-users, which requires online information retrieval equipment and skilled personnel.
- To maintain or establish a telecommunication system between various water-related institutions.

An expert intermediary on supra-national scale and/or a consultant with an advisory group chosen by UNESCO should advise the national water-related intermediaries and guide them, e.g. in their efforts to establish their own national water-related files/database.

### **3.4 Recommendations at the international level: a network of water-related information centres (C)**

Even in the case when a suitable national centre functions, problems are likely to arise. For example, the end-user cannot find the needed references in the national water information system, or if his query should succeed, the document (if needed) is not available or does not exist in the local library files. Therefore, the creation of at least one globally oriented or a few regionally oriented water-related information centres will offer advantages. The staff there should also provide information through database searches (online); telephone reference should also be available. These regional centres should function in the same way as the national centres, but in a complementary way. They can also advise on activities of national centres.

UNESCO-IHP can stimulate the establishment of an expert water-related information centre, or of a few regional centres related to hydrology information, i.e. on a supra-national scale, within the broader framework of other water information services. This information intermediary should clearly supplement, rather than replace, the other existing services. The co-ordinating unit within UNESCO-IHP should draw up a list of possible candidate institutes for this role; all the national water-related information centres are obvious candidates. Of course, the co-ordinating unit should outline criteria which have to be fulfilled by an institute in order to serve as an expert supra-national water-related information intermediary. The national committees and the co-ordinating unit should invite and interview candidates, evaluate the proposals, and make up a choice which should lead to the provision of support and assistance (in part financial) of the selected water-related intermediaries.

Co-ordination between several regional intermediaries (or between an expert water-related intermediary and all national intermediaries related with water information) is essential to avoid overlap of activities and duplication of effort. This co-ordination will also ensure a balanced coverage of material from all relevant disciplines, subject fields, and document types (e.g., conference papers and dissertations).

The expert water-related intermediary or a regional intermediary should draw up (and afterwards update) a list of intermediaries related to water information and of all their activities for all users. However, the first version of such a directory can also be created by a consultant in the framework of UNESCO-IHP, because this seems an important project, while the selection of one or a few UNESCO-IHP supported centres may perhaps take a too long time.



### **3.5 Recommendations at international level for water-related bibliographic databases (D)**

#### **3.5.1 National water-related databases**

The end-user has used all possible means to achieve his goal, but has drawn a blank. If he is not to be left out in the cold, then new recommendations should be formulated.

One of the aims of an information system is the cataloguing of all documents related to water information in a bibliography. The co-ordinating unit of UNESCO-IHP should advise the National Committees to establish a depot where all authors concerned with water information are to send one copy of their work, so that references and documents will become more widely available.

The creation or, and even better, the support and enlargement of an existing specialized database is recommended; such a database will then contain at least a reference to the documents, including grey literature (unpublished documents). Of course a computerized database is to be preferred.

#### **3.5.2 Internationally accessible water-related database**

Most of the water-related documents which have been included in a national database, as discussed above, should also be recorded in one or more databases which can be accessed internationally by the public. Therefore, the cooperation with one or more of such existing computerized water-related databases is desirable. A host computer should load the common computerized water-related database to make the data available through the world-wide data-communications network. UNESCO-IHP should support those efforts.

The host ESA/IRS has already expressed its willingness to load databases from developing countries. (UNISIST newsletter, vol. 12, p. 55, 1984) Pergamon Infoline has also shown interest in this matter.

### **3.6 Universal availability of publications in the area of water-related information (E)**

#### **3.6.1 Interlibrary loan**

The universal availability of publications is one of the ideals we should have in mind; the universalised well-recognized importance of this ideal has even led to the well-known acronym 'U.A.P.'

A better cooperation between water-related intermediaries should improve the exchange of catalogues (in hard copy as well as computerized) and the related interlibrary loan arrangements. This should result in the faster delivery of any document.

### **3.6.2 National water-related information centres**

The national centres should collect water-related documents and make these available. The national production should of course be emphasized.

### **3.6.3 International water-related information centres**

These centres should collect water-related documents of regional or global interest and make these available to all interested users. This function should be complementary to the role of other international institutes concerned with document delivery, which are less specialized in water-related information.

## **3.7 Conclusion**

The recommendations can be summarized as follows:

### **3.7.1 at the level of the end-user: (A)**

- Training-scheme for the users of water-related information and documentation
  - Training-scheme for (potential) end-users
  - Training-scheme for information intermediaries/specialists
- Creation of a directory of information intermediaries (centres/institutions, as well persons) which/who provide services to end-users.

### **3.7.2 at national level: (B)**

- Support for the creation of local and national water-related databases
- Creation of/compiling of guidance material on database building for water-related information intermediaries

### **3.7.3 at international level: (C)**

- Support for the merging of local and national water-related databases with internationally accessible systems
- Support for one or more international referral centres on water-related documentary information
- Cooperation with other international information systems
- Creation of a directory of water-related information products

## **Chapter 4 The formulation of concrete proposals in the framework of UNESCO-IHP Phase IV**

### **Introduction**

Given the systems and its problems as set out in Fig. 4 and given the existing network as sketched in Chapter 2, a number of concrete proposals can be put forward to carry out the improvements suggested in the previous chapter for submission to the UNESCO Water Sciences Division.

### **Proposal 1:**

#### **The VUB University Library - Department information and documentation - executes searches for water-related information on request**

The VUB University Library has the required technical facilities (hardware and software), and the specialized personnel (including an information specialist with a background in hydrology). The VUB University Library is willing to carry out online searches requested by any end-user wherever in the world. The end-user fills in a form (enclosed with this text) to define properly his information problem or communicates with VUB by any other means. The costs charged to the end-user(s) are indicated on the enclosed form. VUB are willing to report about this activity to UNESCO-IHP, for instance yearly. The end-user can also send complaints, if any, about the results of a search or about this way of working, to UNESCO-IHP in Paris. This guarantees the potential end-user that she/he will not become the victim of some obscure, distant information service.

## **Proposal 2:**

### **The VUB University Library- Department Information and Documentation - performs a current awareness service related to water**

The VUB University Library, in cooperation with the Inter-University Postgraduate Programme in Hydrology (IUPHY) in Brussels directed by Prof. A. Van der Beken, already helps end-users, in particular those in the third world, to find water-related information connected with their country. Indeed, after their graduation, the IUPHY students are offered this service for free. This helps them to continue research in their own country. Many potential end-users from the third world are studying in IUPHY; they will have a key function in the water-related scientific activities of their country after their studies.

A microcomputer system is needed to maintain and expand that information service. Printed references, such as the IUPHY booklets are easy to read as long as the numbers of references are limited. The physical arrangement of the documents confines you to only one of its access points, either by author or by title or by journal or by subject. It becomes unmanageable if the end-user wants to retrieve information in different entries such as author and title and specific topics. He can only classify his downloaded references manually with one entry e.g. authors-field. The advantage of a computerised system is that the electronic description of an article or another document type is created only once. The power of the computer allows to search this single electronic description for whatever information chosen, such as authors, title, subject headings, etc...

A bibliographic information retrieval system on a computer, such as CDS/ISIS, can lead to a document in the collection by allowing the combination of any of the pieces of information. A microcomputer information retrieval system provides convenience in maintaining access to your collection. To allow the computer to search the references, the data must be arranged in a special format. CDS/ISIS allows you to create searchable fields of electronic information and more, it gives you the possibility to print out in your own format downloaded information of a specific topic in your own country.

The required microcomputer programs include

- communications software for information retrieval from external databases and for downloading, and
- software for the local storage, retrieval, formatting and output (to floppy diskettes and to a printer) from the local, growing files on a microcomputer.

The suitability of CDS/ISIS in the latter has already been tested by Dr. Paul Nieuwenhuysen and Mr. H. Besemer of PUDOC and proved to be satisfactory. VUB are also willing to extend this service to postgraduate courses sponsored by UNESCO, and to other water-related institutions.

### **Proposal 3:**

#### **Pilot project: Current awareness service related to water for Kenya**

The VUB University Library is prepared (in cooperation with the LUC) to collect water-related information relevant for Kenya, to store it in CDS/ISIS format and to transfer it on floppy disk to the Regional Dispatching Centre in Mombasa (Kenya).

RECOSCIX-WIO is an activity of the Intergovernmental Oceanographic Commission of UNESCO (UNESCO-IOC) within the scope of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean (IOCINCWIO). Initial proposals for RECOSCIX-WIO were produced, with the support of IOC and the UNESCO Division of Marine Sciences, with a view to expanding the regional scale of the information activities provided by the Kenya-Belgium project for the Marine Sciences. Countries expected to participate in the first phase are the seven IOC Member States in the IOCINCWIO region, which are Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia and Tanzania and also Ethiopia.

For the first phase, a Regional Dispatch Centre (RDC) for RECOSCIX-WIO will operate out of the Kenya Marine and Fisheries Institute, Mombasa, Kenya, staffed by Mr. Peter Pissierssens, an IOC Associate Expert provided by the Belgian Government. The IOC has also assigned an ASFA CD-ROM bibliographic search system offered by the USA under the IOC's Voluntary Co-operation Programme for use by RECOSCIX-WIO and now installed at the RDC. The host laboratory is providing necessary in-kind support. The Kenya-Belgium Project for the Marine Sciences, the Free University of Brussels (Vrije Universiteit Brussel) and the UNESCO Regional Office of Science and Technology for Africa, Nairobi are also co-operating.

The RDC Centre is offering a bibliographic search service and a document delivery service and has contacts with several libraries outside the region (e.g. the LUC in Belgium). The query of the scientist is translated into ASFA CD-ROM search language and a search is performed using the ASFA CD-ROM database. The result is a print-out (or a file on floppy disk) of all article abstracts found which deal with the topic. To obtain the copies of the chosen articles, one can use the document delivery service. The copies are returned to the scientist through the centre (RDC). Each participating country has one agreed national contact point. Scientist from participating countries should therefore contact these points. (see also proposal 10)

We can extend the service by supplying country based water-related information through downloading from online databases. By using the Fangorn conversion programme (Nieuwenhuysen and Besemer, 1990) it is easy to convert the downloaded ASCII file into the ISO 2709 format of CDS/ISIS. The RDC in Mombasa which is using CDS/ISIS can act as regional or nodal point for water-related information of the North and Central Western Indian Ocean. This has to be discussed with the water-related official institutions of Kenya and of course with UNESCO-IOC.

#### **Proposal 4:**

##### **Organisation of a water-related workshop in Dubrovnik, June 1990**

M. Sicevic, member of the Working Group, organised a water-related workshop in the framework of IRTCUD during the last week of June 1990 in Dubrovnik (Yugoslavia). A meeting and contributions (lectures and demonstrations) by the Working Group to the Workshop was planned.

The proposals mentioned in this chapter were discussed. A number of well-defined activities will be put into two contracts, one between UNESCO and VUB and one between UNESCO and the Jaroslav Cerni Institute. Only a part of the proposals can be realised in this period due to the limited budget \$ 18,500.

A list with priorities was made up.

#### **Proposal 5:**

##### **Evaluation of the usefulness of the UNESCO software package CDS/ISIS for UNESCO IHP**

P. Nieuwenhuysen of the Vrije Universiteit Brussel studies the usefulness of, and problems associated with the bibliographic software package CDS/ISIS for water-related information and reports the results to UNESCO-IHP and to UNESCO-PGI.

Already, conversion specifications from online water-related databases to CDS/ISIS are operational (e.g. for GEOBASE, FLUIDEX,...).

## **Proposal 6:**

### **Creation of a referral guidebook to the tools to build water-related databases, including the software package CDS/ISIS and the Common Communication Format (CCF)**

CDS/ISIS is one of the most widely-known and widely-used microcomputer software packages for text-oriented database applications. Although it has an improved manual (version 2.3), potential water-related intermediaries may find it not user-friendly. Therefore, we propose to create a referral guidebook to explain to information intermediaries how to set up a national or regional database for water-related information. This proposal is supported by the International Reference Centre for Community Water Supply and Sanitation (IRC) in The Hague, The Netherlands.

One of the chapters in this guidebook should explain to information intermediaries how well existing databases and their methodology can be adapted to serve as national water-related database systems, especially for those countries that are willing to construct a national database for water-related information or that consider water-related information as an important part of their collection. Parts of the national bibliographic databases should ideally be merged in one international database. A high degree of compatibility between the national and international databases should be ensured for efficient international cooperation. The new guidebook should make suggestions concerning the use of one or more common

- computer programs for the management of text-oriented databases (and the required hardware),
- database structures supported by those programs.
- classification and keyword or thesaurus systems.

Concerning the software used for databases, the usefulness of the package CDS/ISIS is being studied. It has proved to be very helpful up to now (Nieuwenhuysen and Besemer, 1990).

It may be more efficient to let the creation of the proposed guide run parallel with concrete consulting work in a project aimed at the establishment of a national intermediary. We are thinking of RECOSCIX-WIO at the Regional Dispatching Centre RDC in Mombasa (Kenya). We would like to emphasize that not only water-related information could be handled, but also geological, agricultural and marine biological information. The experience of the consultants could then be incorporated immediately in the guidebook. Therefore, preliminary contact should be made among UNESCO-IHP, UNESCO-IOC and RECOSCIX-WIO

Concerning the database structure of the national databases, the Working Group should attract an expert in this field such as Mr. A. Hopkinson. Or perhaps adequate reference to his published work in the framework of UNESCO-PGI may be sufficient. The database structure should be based on the Common Communication Format (CCF). This will enhance the compatibility among the national and international water-related databases.

The resulting preliminary version of the guide should be criticised by experts and a discussion (at UNESCO headquarters in Paris for instance) should follow.

#### **Proposal 7:**

##### **Creation of a directory of water-related information intermediaries, in machine-readable form**

Intermediaries can be persons as well as institutions. The creation of such a directory seems a very useful task. It can be offered to potential end-users. It can also give an idea about the availability and expertise of intermediaries in the world. It will help to organise water-related meetings, symposia and cooperation among information intermediaries as well. The VUB library is in the process of creating such a directory in the form of a database of intermediaries and is willing to distribute it as an ASCII file. Searching and retrieving using country names as search terms will be easy with any word processor (MS-Word, Word-Perfect, WordStar,...). Regular updating is required. A query should be sent to all IHP national committees with a call for addresses of all water-related institutions and/or water-related scientists in that particular country.

#### **Proposal 8:**

##### **Developing a guide of water-related online accessible databases and CD-ROMs**

A review of online water-related databases has already been prepared by the author. Regular updating is also required.

CD-ROM seems to be very useful in developing countries. What is now available on CD-ROM in the field of water-related sciences? The VUB Library is willing to create the guide of water-related online database and CD-ROMs, to be published by UNESCO-IHP and to update these every year.



## **Proposal 9:**

### **Training of water-related information specialists in Brussels**

The Vrije Universiteit Brussel (VUB) - University Library has submitted a proposal for two three months courses to the VLIR (Flemish Interuniversity Council) and ABOS. The purpose of the proposed course is to train future water-related information specialists from developing countries. The participants will receive a scholarship from the Belgian Government. The participants will gain knowledge of all aspects of microcomputers, information and documentation. She/he will also learn how to build a national or regional water-related database.

In the long run it is our purpose that such courses should be held in the developing countries themselves and should be presented by participants of this proposed course.

In case this course takes place, a contribution from UNESCO-IHP is expected.

## **Proposal 10:**

### **Cooperation and co-ordinating of related organisations**

*see PA-1013 p 42*

The objective of the following five organisations, UNESCO-IOC, PANGIS, CTA, IRC, UNESCO-IHP, is to facilitate the collection and dissemination of information in specific scientific domains, including some aspects of water-related sciences.

#### **1 RECOSCIX-WIO**

The RECOSCIX-WIO network operates within the framework of IOC's Technical Committee for International Oceanographic Data and Information Exchange (IODE) and of the FAO-IOC-UN Aquatic Sciences and Fisheries Information System (ASFIS).

Countries which are expected to participate in the first phase are the seven IOC Member States in the IOCINCWIO region, namely Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania and also Ethiopia.

RECOSCIX-WIO is planning to build a regional database containing grey literature. The laboratories participating in the RECOSCIX-WIO network will be asked to build up a database for their own library, using ASFIS bibliographic methods and the CDS/ISIS bibliographic software package, developed by UNESCO. At the Regional Dispatching Centre, the databases from all laboratories will be merged to form a WIOLIB Regional database. The participating laboratories will receive a copy of the merged database. Training courses for library staff are foreseen.

RECOSCIX-WIO is about communication between scientists, mainly in the field of marine science. It can only work well with the enthusiastic involvement of individual researchers and librarians in the participating countries.

## **2 Cooperation with Pan African Network for a Geological Information Network (PANGIS)**

The objective of PANGIS is to facilitate the collection and dissemination of information on the earth sciences that African countries urgently need for their development.

It consists of a group of European and African institutions involved in African geology and aims at establishing links among them for the exchange of information, supply of data, support for training and where possible, assistance in the preparation of publications and syntheses. The first step in the development of PANGIS is the setting-up of a bibliographic database of information in the Geological Survey organisations of the African countries. National PANGIS centres have already been established with UNESCO support in Guinea, Uganda and Zimbabwe. Each PANGIS installation receives a micro-computer, a documentary database package with a standard PANGIS application, and an extensive training programme. The average international cost for the implementation of a national PANGIS project is about US\$ 30,000.

One can conclude from the above that the aims of PANGIS are quite similar as those from UNESCO-IHP. Co-ordination and cooperation is therefore highly recommended between UNESCO-IHP and PANGIS.

## **3 Cooperation with CTA (Centre Technique de Cooperation Agricole et Rurale)**

CTA has been established in 1985 under the Convention of Lomé. This convention settles trade-agreements and also cultural agreements among the European Community and 66 countries in Africa, the Caribbean area and the Pacific, hereafter called ACP countries. Two institutes were established, the CDI (Centre pour le Développement Industriel) in Brussels, Belgium, and the CTA in Ede-Wageningen, The Netherlands. Other initiatives include the establishment of ECPDM (European Centre for Development Policy Management) at Maastricht in The Netherlands.

CTA aims to improve access to agricultural information for the ACP countries. There was no need for new institutes. The flow of information on agricultural developments, research, innovations, etc among the countries was not existent or very poor. This is the main task for the CTA.

CTA organises seminars, circulates an inventory of agricultural information services of the EC and ACP countries. Its information service acts as support for local information services. The CTA organises congresses to improve contacts among politicians, librarians and scientists from developing countries and from the Western world. CTA organises also training courses for information

intermediaries, delivers journals and other basic library tools in the agricultural sciences, CD-ROMs and training courses to use CD-ROM.

#### 4 Conclusion

It is evident that similarities exist among the described projects on the one hand:

- RECOSCIX-WIO deals with information about marine science.
- PANGIS deals with geological information.
- CTA deals with information about agricultural science and with UNESCO-IHP dealing with water-related information, on the other

hand.

There is an overlap between PANGIS and UNESCO-IHP (hydrogeology, geohydrology, groundwater, water quality,...).

There is an overlap between RECOSCIX-WIO and UNESCO-IHP since both deal with water-related aspects.

There is an overlap between CTA and UNESCO-IHP (drainage, irrigation, watershed management,...).

The VUB University Library therefore proposes to try to avoid overlap and to organise a contact and sensitizing meeting of all organisations together or to organise separate meetings of PANGIS, CTA, RECOSCIX-WIO and UNESCO-IHP in order to achieve cooperation and co-ordinating, for instance by

- exchanging addresses of institutions/intermediaries with a mention of their main research branch
- making an overview of already existing nodal points on a global scale (for instance RECOSCIX-WIO nodal point in Kenya has an ASFA CD-ROM; are they willing to serve as a nodal point for geological, agricultural or water-related purpose?).

#### **Proposal 11:**

#### **The creation of an overview of intermediaries which make water-related CD-ROM's available**

UNESCO-PGI has ordered and published a guide to CD-ROM, written by (Heimbürger, 1988). Water-related information is already available on CD-ROM. In particular, let us mention the bibliographic databases ASFA, CABI, WATER RESOURCES ABSTRACTS, GEOREF... CD-ROM is easier to use than online access databases, because the user requires less technical knowledge and because a sophisticated data-communications system is not needed. Especially in the developing countries the new medium should be welcome. It is likely therefore that many CD-ROM disks will find their way to the developing countries. Many organisations sponsor this trend. A problem here is that a potentially interested

end-user or information-intermediary should be aware of the availability of CD-ROM systems and relevant disks. This situation is the same as in the case of other information sources. Here however, the amount of information contained in one disk is relatively large, so that a special effort is probably justified here. The practical approach can go as follows.

A person interested to undertake the work should first be found of course.

In order to locate potential national or regional information centres or information specialists, we should use the address list (see proposal 7) and specify these intermediaries having water-related CD-ROM. The willingness to serve as a water-related centre could be investigated by a qualified information specialist, possibly someone working for UNESCO. He/She could contact the most important CD-ROM producers and distributors and ask them for the names and addresses, of organisations and individuals who use their products. The producers and distributors will have to ask their clients' approval before giving the addresses to UNESCO. Clients having a public function are the most interesting category in the framework of this proposal. The producers will gain a lot of free publicity by providing names and addresses since this will increase the visibility of their products. In turn, the IHP could offer the addresses of institutes working in the framework of the IHP, which may be valuable for the marketing of CD-ROM and related information products by the producers and distributors. The addresses can then be distributed by UNESCO to information intermediaries.

This project should be carried out continuously. Unfortunately, UNESCO-IHP will not have the necessary funds to continue this work permanently. Therefore, the aim of this proposal is to provide a theoretical and practical basis for the project. The methodology should be developed, tested and refined. If successful, the methodology can be transferred to other agencies, or it can be sponsored by non-UNESCO institutes, or it can be taken over by institutes with a more narrow scope (geographically limited for instance). The catalytic function is seen as important here.

A first step has already been undertaken. The YUWAT Information Centre within the "Jaroslav Cerni Institute of Water Resources" in Belgrade offers a user service for retrieval of the database: Selected Water Resources Abstracts (SWRA) provided by the U.S. Department of the Interior, Geological Survey (USGS).

#### **Proposal 12:**

**Co-ordinating on a global scale of Water Supply and Sanitation Literature in cooperation with the International Reference Centre (IRC)**

See Case Study 3

### **Proposal 13:**

#### **Seminar on water-related information retrieval**

To enhance cooperation in the field of water-related information among different countries, more seminars should be held, preferably organized as a satellite event of an information meeting (such as the London International Online Information Meeting in 1991, or of a hydrologic meeting (IAHS, LAHR meetings)).

Staff members of other organisations such as PANGIS, CTA, IRC...should be invited.

### **Proposal 14:**

#### **Lectures about water-related information can be presented by information specialists in postgraduate hydrology courses sponsored by UNESCO**

In cooperation with the course organiser and the UNESCO Division of Water Sciences, water-related information courses should be given in all postgraduate hydrology courses. The lecturer should have the degree of Master in Documentation and Library Science or should prove that she/he has the necessary capacities and is versed in the subject.

### **Proposal 15:**

#### **Belgian focal point for water-related information.**

The VUB library is willing to give essential support for the formation of a Belgian focal point for water-related information. Scientific institutions and the water-related industry should be informed about the possibility to act as a focal point. They should also know the advantages of a water-related information centre (e.g. better informed about the state-of-the-art in Belgium, world-wide recognition when grey literature is made available internationally,...)

A high priority could be given to bibliographical descriptions of books, reports and dissertations (Bachelor, Postgraduate, Phd, Geaggregeerde Hoger Onderwijs); articles published in international journals are normally dealt with by other database producers.

The focal point should thus collect all secondary Belgian water-related information and store it in a text retrieval software package. The suitability of CDS/ISIS should be tested. The possibility of merging Belgian water-related information with an internationally water-related bibliographic database is a desirable option.

Already, the VUB library has made contact with AGRALIN (bibliographic agricultural information from the Netherlands). They show interest to incorporate the Belgian file into AGRALIN which is itself internationally available through AGRIS.

The database could also be incorporated in VUBIS.

## **Chapter 5 Case studies**

### **5.1 The VUB University Library- Department Information and Documentation - performs a current awareness service related to water = Proposal 2**

When Prof. Van der Beken of the Hydrology Department formulated the idea of a current-awareness search for each member of the IUPHY course, the database GEOREF was (until now) chosen because this database was the only database which had at that time (1983) an easy country based search facility and mentioned hydrology as a subject heading. If a term appears in the indexing of a document, it does not necessarily follow that its broader terms will also appear in the document. For example, Prof Van der Beken requests all water-related information with geographical location in Brasilia. For most databases all rivers, lakes, catchment names should be added in the search formulation. Can you imagine all the subsidiaries of the river Amazon? GEOREF however implemented autoposting indexing since 1978. That means each time a river or lake is entered by the indexer, the computer automatically adds the country (Brasilia). This makes it extremely easy for intermediaries to search for country based literature. Since 1983, Prof Van der Beken possesses water-related information for many developing countries extracted from the GEOREF database.

One disadvantage of GEOREF for a water-related user is its restriction to hydrogeology, geohydrology and groundwater. This means that the IUPHY course-member has received nearly all the relevant information about the geological aspects of water-related information in his country.

What other databases and on which medium (online or CD-ROM) are available in the water-related field?

The author already compiled a list of all available online accessible databases in the field of water-related information (see appendix in Nieuwenhuysen, P; Provost, F.; de Mes, W.; Sicevic, M., 1989). A synopsis is given on page 54. This should be completed with a list of all CD-ROM available water-related databases. (see proposal 8). With the help of that guide we can conclude how to complete the current awareness search for the IUPHY course-member.

## **5.2 Developing a guide of water-related online accessible databases and CD-ROMs = Proposal 8**

### **5.2.1 Introduction**

The following list reflects the state-of-the art of databases in the beginning of 1990 which deal some way or another with water-related aspects. More information can be obtained in the Directory of Portable Databases published by Cuadra Elsevier (see bibliography). LIT ✓

Please, bear in mind that this list is time-dependent and other databases will for sure become available.

Of course, more general databases such as the SCI Compact Disk Edition or NTIS can be important for end users.

### **5.2.2 Water Related Databases on CD-ROM**

#### **AGRICOLA**

Agricultural information about water resources can be found. The database refers for non U.S. material to the online AGRIS database.

Type: Bibliographic, referral

Information Provider: U.S. Department of Agriculture (USDA), National Agricultural Library (NAL)

Vendor: Quanta Press, Inc.

Online equivalent: AGRICOLA

Hard copy equivalent: Bibliography of Agriculture

#### **AGRICOLA and CRIS**

Same as for AGRICOLA but with additional information about current and completed research projects conducted by USDA research agencies.

Type: Bibliographic, referral

Information Provider: Cooperative State Research Service (CRIS); U.S. Department of Agriculture (USDA), National Agricultural Library (NAL)

Vendor: OCLC Online Computer Library Center, Silver Platter Informations

Online equivalent: in part to AGRICOLA

Hard copy equivalent: in part to Bibliography of Agriculture



**AGRIS** has just been published on CD-ROM by SilverPlatter.

This is an international agricultural database with a strong emphasis on literature from developing countries. The sections irrigation and drainage are of are of interest to water-related end-users.

**Type:** Bibliographic, referral

**Information Provider:** FAO

**Vendor:** SilverPlatter Informations

**Online equivalent:** AGRIS

## **AQUATIC SCIENCES AND FISHERIES ABSTRACTS**

An international database for marine scientists with an emphasis on covering third world literature

**Type:** Bibliographic

**Information Provider:** Food and Agricultural Organisation (FAO)

**Vendor:** Cambridge Scientific Abstracts

**Online equivalent:** Aquatic sciences and Fisheries Abstracts

**Hard copy equivalent:** Aquatic sciences and Fisheries Abstracts

Part 1 Biological Sciences and Living Resources

Part 2 Ocean Technology, Policy and Non-Living Resources

ASFA Aquaculture Abstracts

## **CITIS**

CITIS contains over 50,000 abstracts of articles in civil engineering and details of nearly 2,000 computer programs for construction industry. CITIS covers hydraulic engineering, surface hydrology and coastal and harbour engineering.

**Type:** Bibliographic, referral

**Information Provider and Vendor:** CITIS Ltd

**Hard copy equivalent:** International Civil Engineering Abstracts and Software Abstracts for Engineers

## **EARTH SCIENCE DATABASE**

This database contains for the water-related end user references about groundwater topics. In fact, the database contains three files:

The Earth Science Data Directory, with references to intermediaries in the area of earth science and natural resources. This is of course very useful for the end user. It will help him to turn to the appropriate intermediate in his region. The second one is Geindex and the third one is USGS Library Catalog with materials on earth sciences held by the USGS Library. Maybe this library can serve as a document delivery centre.

**Type:** Bibliographic, referral

**Information Provider:** U.S. Department of the Interior, Geological Survey  
(USGS)

**Vendor:** OCLC Online Computer Library Center, Inc.

## **FOOD, AGRICULTURE AND SCIENCE**

This database provides information on aquaculture farming systems, especially in the developing countries. Some aspects of irrigation and drainage can be found.

**Type:** Full text, Images

**Information Provider:** CGIAR (Consultative Group on International  
Agriculture Research)

**Vendor:** Knowledge Access Int.

**Important:** free to research and educational institutions in developing  
countries

## **GEOREF**

This database provides information about the geological aspects of water-related information. Topics are: groundwater, groundwater quality, hydrogeology.

The product will be launched in August 1990.

**Type:** Bibliographic

**Information Provider:** American Geological Institute

**Vendor:** Silver Platter

## **KIT ABSTRACTS**

Water-related end users can find information on irrigation and drainage or water supply and sanitation problems.

The database is directed towards developing countries.

**Type:** Bibliographic

**Vendor:** Royal Tropical Institute Amsterdam

**Online equivalent:** TROPAG

**Hard copy equivalent:** Abstracts on Tropical Agriculture (ATA), Abstracts on Rural Development in the Tropics (RURAL)

## **NATURAL RESOURCES DATABASE (NRDB)**

This database has relevant information in the field of aquatic sciences but the literature only covers the Northern American hemisphere (USA and Canada). For further information, see the "Directory of portable databases"

## **PASCAL on CD-ROM**

This is a multidisciplinary, multilingual (French, English) bibliographic database which covers also the earth sciences. It is particularly interesting aspects of surface hydrology, meteorology. Important is also its multilingual aspect (French and English).

**Type:** Bibliographic

**Vendor:** INIST (Institut de l'Information Scientifique et Technique)

**Online equivalent:** Pascal

**Hard copy equivalent:** Bibliographie Internationale (previously Bulletin Signaletique)

## **POLLUTION/TOXICOLOGY**

This database is mentioned for its bibliographic references in water quality, sludge treatment, disposal problems,...The coverage is international. The database has some references covering issues in developing countries.

**Type:** bibliographic

**Information Provider:** Cambridge Scientific Abstracts and others

**Vendor:** Cambridge Scientific Abstracts

**Online equivalent:** Pollution Abstracts is a subset

**Hard copy equivalent:** Pollution Abstracts is a subset

## **REPIDISCA**

This database gives information about water sanitary engineering (e.g. low cost water supply in the Latin American region. (For more information see Case study 3)

## **WATER RESOURCES ABSTRACTS - Volume I**

The end user finds bibliographic references in the water-related aspects of the physical, social, and life sciences. It covers also the nature of water and water cycles; water supply augmentation and conservation, water quantity management and control, water quality management and protection, water resource planning and engineering works. The database has been renamed. It still contains the whole of the SWRA (Selected Water Resources Abstracts) database but this will shortly be complemented by volume II which comprises important water information files licensed from a number of sources around the world.

**Type: Bibliographic**

**Information Provider: U.S. Department of the Interior, Geological Survey  
(USGS)**

**Vendor: OCLC Online Computer Library Center, Inc.; National Information  
Services Cooperation**

**Online equivalent: Water Resources Abstracts**

**Hard copy equivalent: Selected Water Resources Abstracts**

### 5.2.3 Directory of accessible online water-related databases

A list of water-related online databases, made by the author, has already been given in the appendix of "Scientific and Technical Water-related Documentary and Information Systems" (Technical documents in hydrology, UNESCO)

A synopsis of databases useful for the IUPHY student is given in table 2: With usefulness we mean databases biased on third world problematics.

Name database	Abstracts search possible?	Country search possible?	CD-ROM	Topics
AFEE	Y	N	N	Z, K, W, E, H, G
AGRIS	Y	N	Y	IR, D, E
AQUALINE	Y	Y	N	Z, K, W, E, H, G, R
CAB	Y	N	Y	IR, D, E, W
FLUIDEX	Y	N	N	HY, K,
GEOBASE	Y	N	N	E, H, ER,
GEOREF	N	Y	Y	G, ER
PASCAL	Y	Y	Y	H, G, ER, W, IR, D, R
WATER RESOURCES ABSTRACTS	Y	Y	Y	Z, K, W, E, H

#### Abbreviations of the topic codes:

- D drainage
- E environment ✓
- ER erosion and sedimentation transport
- G groundwater
- H surface hydrology
- HY hydraulics
- IR irrigation
- K water quality
- R urban hydrology
- W water management ✓
- Z water treatment

#### 5.2.4 The choice of databases

We possess now lists of water-related CD-ROM and online databases. According to the information problem the intermediary can suggest the most appropriate databases.

We should solve the information problem of the IUPHY student based on following criteria:

- Is country search from 1990 on ALWAYS provided?
- Were abstracts with the bibliographic references provided?
- How to search databases as cheap as possible?

##### Criterion 1: country based search possibility

The most important criterion is the country based search possibility. The intermediary should be able to search the name of the country in a special field (e.g. geographical location field) or in the descriptor field.

The author has conducted a simple search (W.W. de Mes, personal communication; and see appendix) in a number of databases to compare the most important criterion "the country based search possibility". The simple search *au=hargreaves? and irrig?* gave references of irrigation projects in the Senegal river in which the countries Mali, Mauritania and Senegal were involved. (see appendix)

GEOBASE mentioned the three countries only in the abstract field.

CABI placed in its geographical location field "Africa" for the same reference which is of course not sufficient.

WATER RESOURCES ABSTRACTS placed the three countries in the *major* descriptor field for the same reference which is satisfactory.

The PASCAL database gave also satisfaction by placing the three countries in the descriptor field.

The AGRIS database does not always give geographical location specification but they do mention the focal point (country) from which they received the reference. This give problems whenever projects are multilateral.

AQUALINE gives a "country of origin" field to mention the country in which the project was done.

GEOREF scored no hits which is quite obvious as geological database.

##### Criterion 2: Are abstracts available?

The availability of abstracts is of interest to the end-user because he can judge the relevance of the reference. It will spare him time and money.

### Criterion 3: How to retrieve information as cheap as possible?

The consultation of the same database online costs less in the evening than during day-time. Costs reduce to one third when using *Knowledge Index* (from 6 P.M. on)

If a CD-ROM version of the online database is available, then it should be preferred for the online database.

In the case of our IUPHY student, he will be lucky to find that the VUB Library is willing to buy the CD-ROM version of PASCAL.

The YUWAT centre in Belgrade offers a user service for retrieval of the WATER RESOURCES ABSTRACTS on CD-ROM. (see proposal 11).

The Royal Museum for Central Africa can be asked for permission to consult the GEOREF database on CD-ROM.

#### 5.2.5 Conclusion for Case study 1: current awareness related to water with the help of Case Study 2: guide for online and CD-ROM water-related databases.

For the course-member of IUPHY who is interested in the components of the hydrological cycle, a CDS/ISIS database (see proposal 5) with input from following databases is recommended:

- the CD-ROM of the Selected Water Resources Abstracts. It emphasizes topics such as surface hydrology, meteorological aspects. Country based searching is possible.
- the CD-ROM of GEOREF which reflects more the Anglo-saxon literature in groundwater, hydrogeology. Country based searching is possible.
- the CD-ROM of the PASCAL database which reflects more the francophone literature in the earth sciences. Country based searching is possible.
- the CD-ROM of REPIDISCA for low cost sanitary engineering problems in Latin-America (e.g. how to install a hand waterpump in a small village in the mountains). This CD-ROM is available at the VUB library but contains only references till Dec 1988. Country based searching is possible.

All topics are covered. For more agriculturally biased topics CABI (also on CD-ROM but for the moment in Belgium unavailable) or AGRIS online on *Knowledge Index* can be searched.

Duplicate records can easily be deleted manually through the CDS/ISIS database.

The author is aware of information gaps that still may occur but thinks that a compilation of these databases can fulfil nearly all the information hunger of an end-user. For special topics in sanitary engineering, he can turn to the IRC at Den Haag in the Netherlands.

This means that agreements have to be made with institutions possessing the CD-ROM of SELECTED WATER RESOURCES ABSTRACTS, GEOREF and CABI.

### **5.3 Proposal: Cooperation between UNESCO-International Hydrological Programme and International Reference Centre**

#### **5.3.1 *Scope of the cooperation***

The IRC library at present includes some 6,000 documents specifically related to water supply and sanitation problems in developing countries, many of which are unpublished or difficult to obtain from other sources. Many of these documents are included in a computerised database, IRC.DOC, which constitutes a unique record of this fugitive literature. IRC is keen to make this literature available on a cost-recovery basis. Alternative sources in Water Supply and Sanitation should be exploited too. IRC plans to produce IRC.DOC on CD-ROM. However, 6,000 records are too little for producing a single CD-ROM.

A feasibility study should point out what kind of characteristics different databases have and in a later stadium what costs could be involved by coordinating the Low Cost Water Supply and Sanitation literature, now called LCWSS.

#### **5.3.2 *Feasibility of proposed cooperation***

### **2.0 Introduction**

Parameters such as overlap ratio, type of publications and geographical coverage give interesting information about the databases.

If the overlap is considerable and the nature of the references and the geographical coverage should not vary too much, then it is not worth while to load those files on one CD-ROM.

Retrievability aspects such as abstract availability, different kind of data entries,... could not be investigated since different information carriers were studied (CD-ROM, hard copy). The KIT and REPIDISCA databases are available on CD-ROM which highlight retrievability aspects in a different way than hard copies.

### **2.1 Creation of a random sample**

It would surely be interesting to know in what extent IRC.DOC and the others have the same or different characteristics.



We may consider that the databases of the following institutions cover the world literature relating to Water Supply and Sanitation.

- (1) WASH or WATER AND SANITATION FOR HEALTH PROJECT
- (2) CILLS or COMITE PERMANENT INTER-ETATS DE LUTTE CONTRE LA SECHERESSE DANS LE SAHEL.
- (3) ENSIC or ENVIRONMENTAL SANITATION INFORMATION CENTER,
- (4) KIT or KONINKLIJK INSTITUUT DER TROPEN,
- (5) CEPIS or CENTRO PANAMERICANO DE INGENIERIA SANITARIA Y CIENCIAS DEL AMBIENTE
- (6) Water Research Centre
- (7) AFEE

The random sample generated consists of records of the hardcopy productions or CD-ROMs from the following databases:

(the number between brackets refers to its producer.)

- > ABSTRACTS ON RURAL DEVELOPMENT (4) on CD-ROM
- > ENVIRONMENTAL SANITATION ABSTRACTS (3)
- > IRC.DOC inhouse online
- > REPINDEX (5) on CD-ROM
- > RESINDEX (2)
- > WASH (1)
- > AQUALINE ABSTRACTS (6) online section: appropriate technology

This should give a reasonable reflection of the world literature published, in English or other languages on LCWSS.

## 2.2 Sample size

Due to the unavailability of some documents, the WASH and the RESINDEX hardcopy could not be investigated.

The method of two stage sampling was chosen. The number of records totals 199 (no duplicate records were allowed, that is why the sample of IRC.doc has 39 records in stead of 40) with entry date 1988 and are taken proportionally to the size of each database to form a provisional random sample as listed in Table 3. Later on, the total number of one sample with regard to a certain accuracy has been calculated.

Database	# records	Total for 1988 (approx.)	Total till 1988
REPDISCA	50	2800	14000
IRC.DOC	39	1000	4100
KIT	50	2000	9000
ENSIC	30	500	2500
AQUALINE	30	300	895
TOT 199			

The following parameters are investigated:

- type of publications (reports, books, proceedings, dissertations,...)
- geographical coverage (geographical location of the study, report, fieldwork)
- overlap ratio : ratio between the number of records from the random sample also appearing in the other full databases and the total number of records of the sample. Since the documents do not always appear in the database under the year in which they were published, searching will have to extend beyond the basic time period to be sure of retrieving such delayed entries.

### 2.3 Type of publications

In viewing the samples, one finds the indication that IRC.DOC (67%) REPIDISCA (>50%) and ENSIC (60%) contain much grey literature while AQUALINE shows few examples (3%). KIT appears to specialise in books (40%). (see Fig. 5). It should be remarked that REPIDISCA also includes dissertations and explanations of software programmes. That does not mean that the databases are lacking in other types. It simply does not appear in the samples.

### 2.4 Geographical coverage

%	KIT	REPINDEX	IRC.DOC	AQUALINE	ENSIC
GLOBAL	12	12	38	30	7
NORTH	2	20	8	10	57
ASIA	42	2	18	47	30
AFRICA	28	4	21	13	7
LAT. AM.	16	62	15	0	0

"Global" means that the bibliographical reference does not refer to any particular geographical region.

The North refers to the geographical coverage of the Northern hemisphere and Australia.

All databases are oriented to cover literature in the developing countries. However, the sample of ENSIC contains a lot of literature focused on topics in the North.

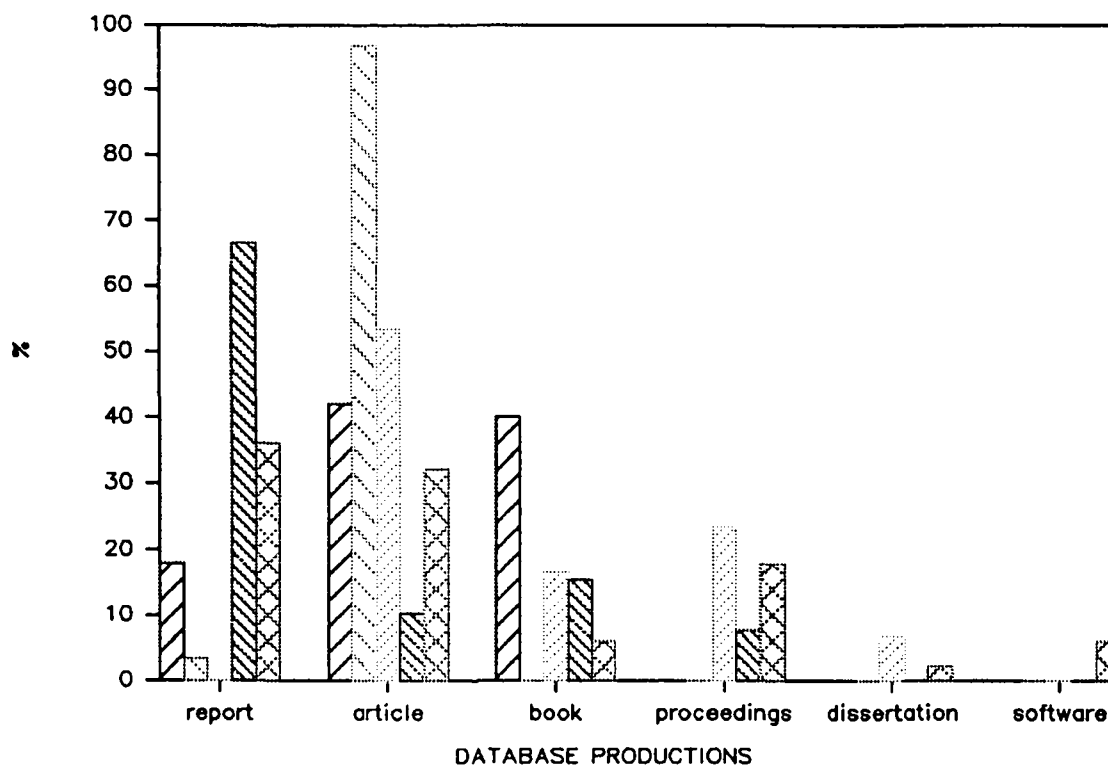
The literature in IRC.DOC has a well balanced geographical distribution.






It is obvious that REPIDISCA mainly covers Latin American literature.

As an international database, AQUALINE gives due coverage to articles from the South (except Latin America).

Asia gets attention from KIT, AQUALINE and ENSIC. Africa does not have a specific representative database in our international list. As previously mentioned there is a network (CILLS) which deals exclusively with African covering LCWSS topics but their output (RESINDEX) is scarcely available at international level.

Fig. 5 Types of publications



-  KIT Rural Development in the Tropics
-  Aqualine
-  Repidisca
-  Environmental Sanitation Abstracts
-  IRC.DOC

## 2.5 The overlap ratio

Each respective sample was compared with a complete database (see Table 5)

	<i>Sample</i>									
	REPDISCA		IRC		KIT		ENSIC		AQUALINE	
<i>Database</i>	#	%	#	%	#	%	#	%	#	%
REPDISCA			11	28	1	2	1	3	4	13
IRC	4	8			2	4	3	10	3	10
KIT	1	3	0	0			0	0	2	7
ENSIC	1	2	2	5	1	2			0	0
AQUALINE	2	4	1	2.5	0	0	12	40		

# = number of hits (reference occurring in both the sample and the complete

database, REPDISCA scores 4 hits in a total of 50 records compared with the complete IRC database, that is to say that 8% of the REPDISCA sample also appears in the complete IRC database).

### (a) Frequency sampling

Are these results statistically significant?

The binomial probability distribution is considered as appropriate for frequency sampling. Let either:

p: the record  $x$  of sample database 1 is also a member of database 2 or

q or (1-p): the record is unique in the sample database 1 and consequently does not appear in database 2.

We must first of all ensure ourselves that the samples were not biased and that they were taken at random. If we are satisfied on that scored, we can proceed:

Let  $p$  be the observed proportion of successes in  $n$  binomial trials. Then a 95% level confidence interval for the population proportion  $\Pi$  is approximatively given by: (Egghe, 1988)

$$\pi \in \left\{ \mu - z_c \sqrt{\frac{\mu(1-\mu)}{n}}, \mu + z_c \sqrt{\frac{\mu(1-\mu)}{n}} \right\} \quad (1)$$

$z_c$  equals (for 95% confidence level) 1.96

For  $n > 30$  and  $n \cdot p > 5$  we may state that the normal approximation is adequate.

Since these requirements are not always fulfilled, the binomial distribution is used instead of the normal distribution to describe the sample.

In Table 5, we obtained a value for  $p$  and applying (1), the confidence interval for  $p$  is given. (see Table 6)

One of the reasons for non-detection ( $p=0$ ) could be the small number of references taken into the provisional sample.

This reasoning leads to the obvious question of how large a sample must be taken in order to obtain a specified degree of accuracy?

One approach is to regard an accuracy (ACC) of 0.01 on either side of the centre of the confidence interval as acceptable.

Thus we require:

$$ACC > z_c \sqrt{\frac{\mu(1-\mu)}{n}} \quad (2)$$

We should bear in mind that this formula for a 95% confidence interval is valid for  $N \gg 10.000$  which is not often the case. Therefore a correction factor is applied by multiplying (2) with (3) giving (4)

$$\sqrt{\frac{N-n}{N-1}} \quad (3)$$

$$ACC > z_c \sqrt{\frac{\mu(1-\mu)}{n}} \sqrt{\frac{N-n}{N-1}} \quad (4)$$

which is algebraically equivalent to

$$n > \frac{N \cdot z_c^2 \cdot p(1-p)}{(ACC)^2 (N-1) + z_c^2 p(1-p)} \quad (5)$$

Applying (5) to the considered databases gives Table 6.

**Table 6: The overlap ratio, its confidence intervals, its significance and the minimum number for sample taking**

Sample	Database	p %	Conf. Int. 95%	Signific?	n for acc=0.01	TOT Records
IRC	KIT	0	-	-	-	4100
ENSIC	KIT	0	-	-	-	2500
REPIDISCA	KIT	2	3.9	N	715	14000
AQUALINE	KIT	7	9.1	N	223	895
KIT	IRC	4	5.4	N	1268	9000
ENSIC	IRC	10	10.7	N	1451	2500
REPIDISCA	IRC	8	7.5	J	2352	14000
AQUALINE	IRC	10	10.7	N	709	895
IRC	ENSIC	5	6.8	N	1406	4100
KIT	ENSIC	2	3.9	N	695	9000
REPIDISCA	ENSIC	2	3.9	N	715	14000
AQUALINE	ENSIC	0	-	-	-	895
IRC	REPIDISCA	28	14.1	J	3420	4100
KIT	REPIDISCA	2	3.9	N	695	9000
ENSIC	REPIDISCA	3	6.4	N	839	2500
AQUALINE	REPIDISCA	13	12.1	J	740	895
IRC	AQUALINE	2	5	N	840	4100
KIT	AQUALINE	0	-	-	-	9000
ENSIC	AQUALINE	40	17.5	J	1967	2500
REPIDISCA	AQUALINE	4	5.4	N	1335	14000

Judging from the results of Table 6, we can conclude that the first provisional sample of the two stage sampling method (cf. supra) was not big enough to fulfil the accuracy of 0.01 with a confidence interval of 95%. Additional samples should be taken. Note that for REPIDISCA, only a small portion (5%) of the whole database must be taken to obtain reasonable accurate results (e.g. in the comparison with KIT 665 (715-50) additional records from the 14000 should be taken.) On the other hand much more records from the AQUALINE database are proportionally needed.

To have "significance", a reading of 0% should not occur in the confidence interval of p (e.g. although the sample of AQUALINE points to an overlap of 10% with IRC.DOC the confidence interval is actually 10.7%). The overlap can be read as p + 10.7% (20.7%) or as p - 10.7% (0%). To solve the problem additional samples should be taken. The sample of 30 records therefore does not possess significance. (see column significance in Table 6)  
The following samples reveal a significant overlap (and in that order) with other databases:

- ENSIC with AQUALINE
- IRC.DOC with REPIDISCA
- AQUALINE with REPIDISCA
- REPIDISCA with IRC.DOC

The biggest significant overlap (minimum 22 % and maximum 57 %) appears between the ENSIC and the AQUALINE database. This points to an arrangement between both database producers to load a part of ENSIC into AQUALINE and in this order (According to information received on Mr. W.W. de Mes). This would of course be good policy on the part of ENSIC but even then their file can only be consulted if the searcher has a good functioning telecommunication networks at his disposal.

Compared with the REPIDISCA file, the IRC.DOC database gives an overlap of at least 14% and a maximum of 42% with an 95% confidence interval which is quite considerable..

The third significant overlap but smaller than the previous two is the overlap between the AQUALINE and the REPIDISCA database. (min. = 1%, max. = 25%)

The fourth and smallest significant overlap is that of the sample REPIDISCA and IRC.DOC with a min of 0.5% and a maximum of 15%.

For the rest we can find no other instances of significant overlap but this does not mean that none would appear if a larger sample were taken.

#### *(b) Type of overlap*

The overlap between the ENSIC sample and AQUALINE exists for 2/3 of journal articles covering topics from the North.

The overlap between the irc sample and REPIDISCA consists for the most part of reports covering topics focused on Latin America.

The inverse overlap between the sample of REPIDISCA and IRC.DOC also consists of reports but covers topics focused on all regions.

The last overlap between the sample of AQUALINE and REPIDISCA consists of journal articles covering general topics without reference to a specific geographical region.



We may conclude that the overlaps consist for the most part of general themes which appeared in international journals and the reports (grey literature) in the case of IRC.DOC and REPIDISCA .

### *5.3.3 Conclusion*

The first provisional sample can only provide us with indications. One of these is the overlap between IRC and REPIDISCA. The overlap could be quite considerable. It should surely be further investigated.

IRC.doc and REPIDISCA are the most important LCWSS databases covering grey literature an area which is so vital for developing countries.

The supposed arrangement between ENSIC and AQUALINE to load a portion of their records into AQUALINE as reflected in the study can be seen as a way to open the ENSIC file to a broader public but only if they have access to online systems.

Perhaps some centre should be appointed as a focal point to ensure a better collection of the literature of Asian LCWSS.

All literature with Latin American coverage should be sent onto the REPIDISCA database.

KIT has no significant overlap with any other database because it deals more with agricultural topics and of course with more rural development than LCWSS.

One of the weak points of this study is the absence of African literature. Fortunately, in pursuance of proposal 4 known as "the organisation of the water related workshop in Dubrovnik" contacts have been laid with the CIEH of the West African water related network.

IRC.DOC fills in an information gap; that is the coverage of grey literature from all parts of the world except Latin America.

Since IRC.DOC is operational on MINISIS, it can easily be loaded into CDS/ISIS. REPIDISCA which collects water supply and sanitation references of Latin-America in MINISIS format, has produced a CD-ROM with CDS/ISIS software. One CD-ROM combining IRC.DOC and REPIDISCA would go a long way to meet the LCWSS information needs.

Generally, information exchange among the databases is always recommended.

The LCWSS databases should have access to the contents of each other's catalogue in computer readable form in order to enhance interlibrary loans and to reduce costly overlap. Ideally, they should use the same software package (for instance CDS/ISIS) (IRC, and REPIDISCA are using MINISIS or micro CDS/ISIS) and should use the same database structure based on CCF in order to achieve compatibility. This operation costs nearly nothing compared with the benefits which can derived from it.

If other databases relating to water supply and sanitations could format their bibliographic records into CDS/ISIS then it could be suggested that IRC, as closely linked with UNDP, UNICEF, WHO and WORLD BANK would become the nodal point for collecting the literature in water supply and sanitation. The other institutes can send their CDS/ISIS files to IRC. In turn, IRC provides the cooperating institutions with relevant literature of other regions. Consultants looking for local relevant information in the field of water cost supply and sanitation could be guided by IRC to the appropriate database.

Representatives of the involved databases should meet to discuss possible cooperation.

# Chapter 6 Legal aspects of downloading water-related information

## 6.1 Introduction

Whether you retrieve data from an online service or CD-ROM, or messages from an electronic mail service, downloading is economical and convenient. Once the material has been stored on disk in the computer and after signing off from the service, searchers can inspect the material at their leisure and print it if required.

With downloading of water-related information in the framework of our current awareness service, we mean capturing water-related information from a proprietary database into any machine-readable format from a text retrieval software package (CDS/ISIS) running on a IBM or compatible microcomputer (see Nieuwenhuysen and Besemer, 1990).

The availability of BRS, ESA/IRS or Dialog's tagged records makes this transfer possible at high quality. Can we consider this transformation of originally downloaded ASCII file into a structured ISO file as a legitimate deed? Or are we breaking the law by infringing on the database producer's proprietary rights? In other words, do we conflict with the database producers' economic interest?

We can, of course, ask the database publisher's permission, but what if there is a change of policy later on or a new management decides against downloading? To acquire a certain independence from changing database policies, one should consider other possibilities.

Let us try and consider the position of the three parties concerned.

We have:

- those who stand in need of information; such as the developing countries whose need is acute.
- those who possess the information such as the database producers, and
- those who can act as an intermediary between the two.

## 6.2 The plea for developing countries

In its report to the UNESCO General Conference in 1980 on the subject of information and communication, the Mac Bride Commission stated amongst other that the removal of internal and external barriers should guarantee the free flow of information to the developing countries (Hemels, 1982). No one may be denied the right to information, least of all the developing countries. Downloading from CD-ROM should be unrestricted, the searching of backfiles of online databases may be less frequent. The potential exists to create internal files on magnetic media from CD-ROM, for use in multiple locations and only to use the online databases only for the search of recent and current materials. However, this is only true for developed countries. Developing countries will not have a choice between CD-ROM and online. They will find themselves lucky to have any option at all. Some of the database publishers allow unrestricted downloading. No one thinks they can know whether their rules are being observed or not. The majority base their decisions on their online database policies. It is clear that the issue of downloading from CD-ROM is unresolved.

## 6.3 The plea for the database producers

*"The database or any part of it, may not be reproduced, stored in machine readable form, or transmitted in any means, electrical, mechanical, photocopy or otherwise without written permission of the publisher."*

In the documentation supplied to users from an online service and CD-ROM publisher there is usually a statement (see above) that spells out what may or what not may be done with data retrieved from that service. The primary factors in determining the need for permission and acknowledgement of the source are the nature of the dissemination and the quantity and quality of the materials being quoted. It is a violation of copyright to copy large quantities of protected material or a significant part of a protected work for commercial purpose unless permission is obtained and credit is given to the source.

The advent of downloading capability has increased awareness of copyright restrictions. Most database publishers inform their customers that a limited quantity of information retrieved through online searching may be retained temporarily in machine readable form solely to produce a single copy through word processing, printing, or displaying. Whether the materials are downloaded, printed or displayed, the same copyright laws apply.

Database producers are fearful that their profits could suffer if large parts of their files were downloaded and reused.

## 6.4 The plea for the intermediaries

If downloading is indeed illegal, then there are many searchers running foul of the law, and any searcher using a microcomputer may be suspect. It is not a straightforward issue of black or white. The intention of copyright protection is to protect the expression of information, not the information as such. During the past years, most online searchers have made the transition from searching on dumb terminals to using microcomputers for online searching, and for word processing and database management activities. Micros offer a wide range of new capabilities for online searches. Uploading preplanned search strategies, downloading searches, cleaning them up with a text editor, are only a few of the advantages of using microcomputers for online searching. Front ends, sometimes produced or supported by database publishers also allow downloading as one of their features..

Many searches routinely download and edit search results, delivering to the client a "clean" product.

## 6.5 An amicable settlement in sight?

### 6.5.1 *The fair use principle*

Most of the database producers make a distinction between downloading for single and individual use and downloading for multi-copy distribution or storage in internal databases. Interpretation of the results of the survey would indicate that the issue does not lie with the manner of reproduction, the existence of one or two copies, or the format. Instead, the issue of concern to the publishers is the intent and use made of downloaded information. We can define the "fair use principle" as it applies to the use of downloaded data as seeking to reconcile the convenience of the user with the protection of the commercial rights of the supplier of data. Written policies of some database publishers have begun to recognize this "fair use principle" and the different uses for downloaded information. BIOSIS and CAB International permit downloading and retention for short periods of time or single use.

Most of the database publishers responded in the survey that they allowed multicopy **inhouse** distribution of search results and storage in internal databases.

Payment of online per record charges may allow the user to copy, store or reuse records for internal purposes, but not for commercial sale or resale. Publishers have obviously decided to charge high enough up-front charges for the retrieval of records, so that the future internal use of retrieved records may not be an economical problem.

The database producers realise that the practicality of their downloading policies comes into question. They are prepared to give in on certain points concerning inhouse distribution but not for external purpose as is desired.

So, in the main, we are still left facing the question of what may be downloaded (whole reference?, only the bibliographical part, abstracts, descriptors?) and what not?

#### *6.5.2 Formulation of point of view according to Belgian law*

With the help and guidance of Mrs. F. Brison, barrister at the Brussels bar and Scientific Researcher for the Law Faculty Vrije Universiteit Brussel, an attempt was made to sketch a point of view with reference to Belgian law.

Let us see what it says on the subject (for the argumentation, reference must here be made to the article of Mrs. Brison listed in the bibliography).

#### *The abstracts*

Our jurisprudence has explicitly set two conditions to qualify for protection. These are:

- the physical form
- the originality

The latter is very important for abstracts.

Data, that is to say pieces of information in a given form, are, as every written work, granted the protection of copyright on condition that they are original. No one will deny that a translation or an adaptation of an existing work can be original. By the same token, protection could be claimed for a summary, for to condense what was stated at length is to change the form of the original composition. This seems to me to be a most important conclusion in that it means that abstracts from, for instance, GEOBASE, CABI and other databases may not be sent freely on magnetic media to the developing countries.

#### *The descriptors or controlled indexterms*

The listing of key-words, descriptors or controlled indexterms will only in a few, rare instances qualify for protection (Denis, S.; Poulet, Y.; and Thunis, X., 1988) although some degree of originality may be involved in the make-up of a thesaurus for a database producer according to the way classification and combinations are devised. To that extent, the producers would be entitled to claim their due.

## **6.6 Conclusion**

The question we face is whether or not it is within the law to provide the developing countries with vital information in the form of references which they cannot obtain by any other means.

Judging by the Belgian law on copyright, it should not be an offence to copy bibliographic references from databases. Key-words could, however, form a stumbling block in so far as the producer has created his own thesaurus. There can be no question that abstracts fall within the trims of the copyright laws on the ground of their originality so that they may not be copied without previous consent.

The Green Book (anonymous, 1989) where dealing with the subject of copyright and the technological challenge states in connexion with the storage of and the search for information by means of databases, that the existence of bibliographical information relating to published works as well as to registers, references and similar material in no way implies that these works may be manifolded in whole or in part. Bibliographical references may therefore be stored in personal databases without misgiving. According to the Green Book, the Commission is now considering whether, short of actual copyright, some form of protection is not called for against non-authorized reproductions in view of the substantial outlay which the collection of data sometimes requires. The bibliographical references as such are not protected but it is argued by some that the collection of the selected references or their arrangement in the database should be.

This specific aspect of the information flow and the need to line its channels with legal beacons may well be a good subject for debate by the UNESCO-PGI.

## **Chapter 7 Conclusion**

An efficient through-flow of information from North to South presupposes the removal of all barriers and impediments which can stand in its way, be they technical, social-cultural, economic or of any other nature. It cannot obviously all be done at once as has been proved in the past if only on account of the large sums involved.

The former strategy of large scale projects has now been abandoned in favour of smaller limited projects aimed at achieving the same results step by step.

With the help of a flow-chart an attempt was made to localise the main obstacles which can block the flow of water-related information:

- at the level of the end-user, where training is the key factor;
- at the national level, where a clear-cut policy is called for;
- at international level, where cooperation with other networks is essential.

Not only the end-user but also the information intermediary should receive suitable training, for instance by being offered the opportunity to attend a workshop or an appropriate course in order to gather the necessary know-how. The usefulness of CD-ROM should figure prominently in such courses.

In this way, the process of tracking down the necessary information and documents in connexion with a given problem is greatly simplified when one knows and can make use of the services of such local information centres as the Limburgs Universitair Centrum (LUC) and the RDC of RECOSCIX-WIO.

Small scale local projects like those proposed in the chapter of case-studies are already being considered for Africa, Asia and Latin America and can lead to a snowball effect in that they may carry the seed for better cooperation and more ambitious projects.

To function properly, care should be taken to have the right men in the right places.

The work and achievements of UNESCO should be mentioned in this connexion as should the stress they lay on cooperation as an essential factor for good communication. Wasteful duplication can in this way be avoided. The beneficial effects of cooperation should soon become apparent in the field of interlibrary loans and the collection of material,...

Cooperation here should be understood in its broadest sense, involving all parties who are concerned with water-related information in all its aspects.



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pp. 39-47.

## Appendix :

### 1. Search: *au=hargreaves? and irrig?*

#### *Example from the Selected Water Abstracts*

5/5/1 (Item 1 from file: 117)

AN- <SWRA NUMBER> W86-01432 |

TI- Agricultural Benefits for Senegal River Basin |

AU- Hargreaves, G. L.^Hargreaves, G. H.^Riley, J. P. |

CS- Army Engineer Battalion (79th), APO New York 09360. Company B. |

SO- Journal of Irrigation and Drainage Engineering, Vol. 111, No. 2, p  
113-124, June, 1985. 4 Tab, 6 Ref, 1 Append. |

JA- SWRA1905 |

AB- A multipurpose water resource development project is proposed for construction and development in the Senegal River Basin. The plans include the irrigation of an area of 274,805 ha by the year 2030 in three countries: Senegal, Mauritania, and Mali. Agricultural benefits were estimated and analyzed by means of a computer program. The factors influencing crop yields were analyzed and summarized including crop selection, water, fertility, and management. Some of the considerations that will produce higher crop yields in future years are presented. It is proposed that the irrigation project management should be responsible for calculating crop water requirements and insuring acceptable irrigation efficiencies. A method is presented for estimating crop water requirements from maximum and minimum air temperatures. The desirability of using irrigation supplemental to rainfall for maximizing benefits from limited water is presented. The maximum contribution of a unit of irrigation water to yield is possible during the rainy season. Projected revenues and costs and years required for each crop to become economically profitable are presented in tables. (Author's abstract) |

DE- \*Senegal River Basin ^\*Mauritania ^\*Mali ^\*Water resources development  
^\*Agriculture^^Economic aspects ^Costs ^Crops ^Computer programs  
^Irrigation ^Water requirements |

SH- 3B (Water Supply Augmentation and Conservation--Water Yield  
Improvement)^6B (Water Resources Planning--Evaluation Process) | |

**3. Search: au=hargreaves? and irrig?**

**Example from Geobase**

5/5/3 (Item 1 from file: 292)

AN- <DIALOG> 0566032|

AN- <GEOBASE> 86V-2469|

TI- Agricultural benefits for Senegal River Basin. |

AU- HARGREAVES, G. L.^HARGREAVES, G. H.^RILEY, J. P. |

CS- <AFFILIATION> 79th Engr Bn, US Army, APO, New York, NY 09360, USA. |

SO- <JN> Journal of Irrigation & Drainage Engineering - ASCE |

SO- <PY> 1985 |

SO- <VO> 111(2) |

SO- <PG> pp 113-124. |

LA- English |

AB- A multipurpose water resource development project is proposed for construction and development in West Africa. The plans include the irrigation of an area of 274 805 ha by the year 2030 in three countries: Senegal, Mauritania, and Mali. Agricultural benefits are estimated and analyzed by means of a computer programme. The factors influencing crop yields are analyzed and summarized including crop selection, water, fertility and management. Some of the considerations that will produce higher crop yields in future years are presented. The irrigation project management will be responsible for calculating crop water requirements and insuring acceptable irrigation efficiencies. A method is presented for estimating crop water requirements from maximum and minimum air temperatures. The desirability of using irrigation supplemental to rainfall for maximizing benefits from limited water is also presented.-from ASCE Publications Information |

SC- 1 (Geography) | |

2. Search: au=hargreaves? and irrig?

Example from the CABI

5/5/2 (Item 1 from file: 50)

AN- <DIALOG> 0365232|

AN- <CAB> 0S048-10741^0R027-05836^2R008-01565^7S011-01699|

TI- Agricultural benefits for Senegal River Basin. |

AU- Hargreaves, G. L.^ Hargreaves, G. H.^ Riley, J. P. |

CS- [Hargreaves, G.H.] International Irrigation Center, Dept. of Agr. and  
Irrigation Engrg., Utah State Univ., Logan, Utah 84322, USA. |

SO- <JN> Journal of Irrigation and Drainage Engineering |

SO- <PY> 1985 |

SO- <VO> 111 |

SO- <IS> 2 |

SO- <PG> 113-124 |

NT- 6 ref., 1 tab. |

LA- English |

DT- NP (Numbered Part) |

ST- REVISED |

SF- 0S (Soils and Fertilizers)^0R (World Agric Econ & Rural Soc Abs)^2R  
(Rural Development Abstracts)^7S (Irrigation and Drainage Abstracts) |

AB- A multipurpose water resource development project is proposed for construction and development in West Africa. The plans include the irrigation of an area of 274 805 ha by the year 2030 in three countries: Senegal, Mauritania, and Mali. Agricultural benefits are estimated and analyzed by means of a computer program. The factors influencing crop yields are analyzed and summarized, including crop selection, water, fertility, and management. Some of the considerations that will produce higher crop yields in future years are presented. It is proposed that the irrigation project management should be responsible for calculating crop water requirements and insuring acceptable irrigation efficiencies. A method is presented for estimating crop water requirements from maximum and minimum air temperatures. The desirability of using irrigation supplemental to rainfall for maximizing benefits from limited water is presented. The maximum contribution of a unit of irrigation water to yield is possible during the rainy season. Projected revenues and costs and years required for each crop to become economically profitable are presented in tables. |

DE- economics^irrigation^africa^west africa^water management^projects^water sheds |

DC- 0S267^ 0S933^ (66)^ 0S26^ 0S93 |

GL- Africa |

SC- 0S267000^7S0200^0R11000101^2R03400101 |

SH- 2 FERTILIZERS. SOIL AND CROP MANAGEMENT - 267 IRRIGATION  
(SC=0S267000)^WATER MANAGEMENT (SC=7S0200)^AGRICULTURAL

ECONOMICS -

LAND AND NATURAL RESOURCES POLICY- INFRASTRUCTURE POLICY  
(SC=0R11000002/)^PHYSICAL RESOURCES - WATER (SC=2R03400002/)| |