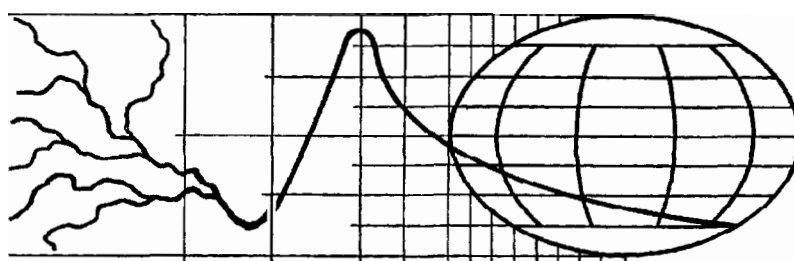


Weltdatenbank Abfluß
Bundesanstalt für Gewässerkunde
Koblenz, Deutschland

Global Runoff Data Centre
Federal Institute of Hydrology
Koblenz, Germany

Report No. 7

GRDC - Status Report 1994



GRDC



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GRDC - Report 1994

1. General

The GRDC, established at the Federal Institute of Hydrology in Koblenz, Germany, operates under the auspices of WMO for the benefit of WMO member countries and the international scientific community. Operating under WMO gives the GRDC an identity with regard to the UN system which is essential in establishing co-operative arrangements with UN agencies and various international programmes and in compliance with programmes of many individual countries.

2. Rational for data collection

The hydrological cycle is a sensitive indicator of consequences of climate change and information about the expected change of runoff is therefore required to calibrate and validate output of climate models. Likewise, the knowledge of streamflow is the basic information for the assessment of water resources potential and availability. The global, regional and catchment scale monitoring of runoff is therefore indispensable for water resources planning and management on all scale levels.

The documented use of GRDC-data covers mainly the following areas: Coupling of meteorological and hydrological models, water balance studies, investigation of trends in long-term hydrological time series, flux of fresh water and matter into the oceans and the coupling of runoff with water quality data. There is also an observed trend in comparative research with regard to the sensitivity of runoff in different climate regions.

3. Science, research and development in 1994

3.1 Scientific tasks

In 1994, the priority of the GRDC work was oriented towards the requirements of the WCRP. The WCRP and within this important programme of WMO mainly GEWEX are interested in a global data set of discharge data to study the global atmospheric circulation with special emphasis to the coupling of ocean - atmosphere models. In this respect, quantitative knowledge of the freshwater flux from the continents into the oceans is of principal interest. This interest stems from observations that the thermohaline circulation of the oceans which in itself regulates the ocean-atmosphere energy exchange is largely influenced by the freshwater flux into the oceans. This is a new angle of view in hydrology which has not been treated sufficiently in the past.

Based on this research priority of GEWEX, the GRDC has worked for a large part of the year in the assembly and user-ready processing of the following data sets:

- Report about the database of the world's 20 largest rivers.
- Compilation of all available discharge data from gauging stations which are close to the mouths of rivers into the oceans; this dataset is also of great interest for the freshwater programme of UNEP.
- Compilation of the hydrological database for the GEWEX project "Arctic Climate System Study" (ACSYS). In this project, the role of the Arctic Sea on the global climate is studied. An important component is again the freshwater flux into the Arctic Sea.

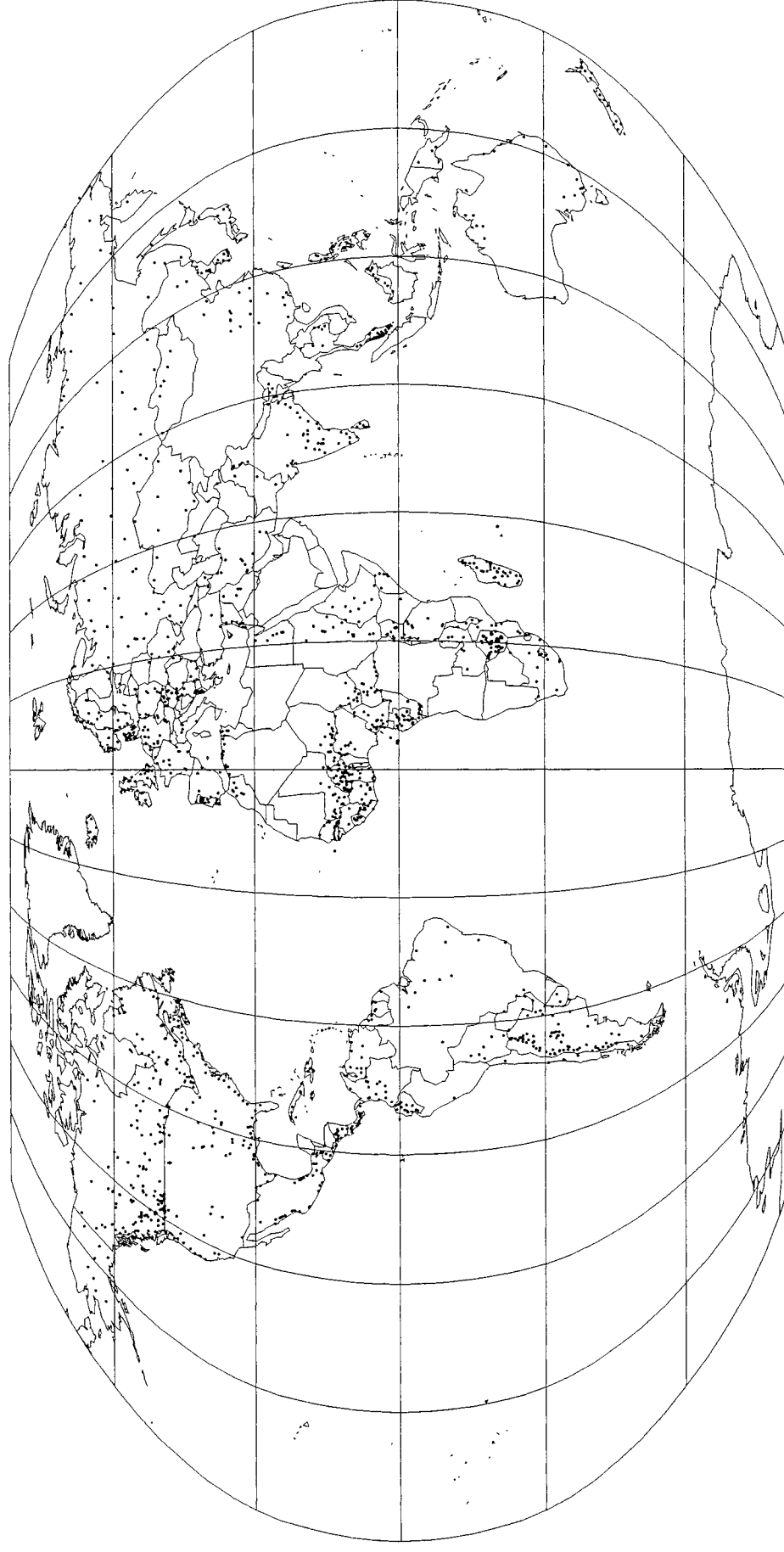
All these databases are ready for distribution. The reports relating to these databases are under preparation or already published (GRDC-Report No. 5: "Hydrological Regimes of the 20 Largest Rivers of the World").

The request for naturalized flow for large rivers cannot be met by the GRDC for two principal reasons: The information from river basins is in most cases insufficient to apply methods for the computation of natural flow conditions (the dataset from Iceland however, contains only naturalized flows provided by the Icelandic Hydrological Service. The Centre has a CD-ROM on the U.S. Hydroclimatic Data Network; the data are not entered in the database as these data collide with regular streamflow data of the U.S.). To derive information about anthropogenic influences on the change of river regimes and the water balance of river systems a GIS-based information system is necessary which contains such information as: River diversions and impoundments, flow regulations, water abstraction for irrigation, urban and large-scale domestic use. Information about large-scale irrigation schemes could be requested from the Secretariat of the Food and Agriculture Organization (FAO), Rome. Likewise, information about large dams and reservoirs will be requested from the International Committee on Large Dams (ICOLD). After feed-back with data users, the GRDC will contact ICOLD to obtain the meta-data of documented dams and reservoirs. Contacts have been made to obtain information about wetlands. This additional information will be used to give data users additional information about dams, reservoirs and wetlands for the rivers where data are requested. However, it is not intended to keep these databases, they are for cross-reference purposes only. It would be decided at a later stage how this additional information could be stored in the GRDC and made available to data users.

3.2 Research activities

The Federal Institute of Hydrology (FIH) carries out two nationally funded research projects in close liaison with the GRDC. These projects are undertaken as contribution to the WCP-Water Projects B.3 and B.7. The projects are: "Transformation of measured flow data to grid points" and "Comparison study of areal mean monthly precipitation and streamflow for selected basins: The Niger river".

Fig. 1: GRDC Monthly Stations - Jan 1995



The GRDC encourages researchers to use the GRDC database for studies and research in direct collaboration with the Centre and the Centre is prepared to invite and accept guest researchers. The Centre expects in return that the results of such studies are published under the GRDC as host institution with the collaboration of the guest institution, where appropriate.

3.3 Monitoring of global runoff

The specifications of a high level data product have been elaborated and a contract extended to a company to develop a computer programme to monitor grid-oriented monthly runoff for continents and on a global scale. This tool enables the GRDC to supply map-based graphic displays of the continental or global runoff situation for any month and for all stations where data are available. The tool serves to demonstrate relative runoff surplus/deficit areas for a given comparison period and/or the long-term mean runoff. This tool is expected to be operational by mid-1995 and will be widely published. The grid-oriented runoff information thus provided may however not be confused with "gridded runoff" in a scientific sense.

3.4 Database development

Figure 1 shows the global distribution of GRDC stations as of January 1995. By comparison with previous figures of this kind the increase of stations is visible also in areas with no or little hydrological information some time ago. Presently, 143 country have contributed to the development of the database which contains now mean daily and monthly discharge from 3.325 stations of 2.619 rivers worldwide.

3.5 Update of database

Priority was put in the update of the time series of already existing stations in the GRDC database. Up to January 1995, the time series of 115 stations have been updated partly until 1993.

In annex 1 the updated and new rivers and stations are listed. These tables also demonstrate the data deliveries into the GRDC in 1994. Data processing into the GRDC after January 1995 will be reflected in the GRDC report for 1995.

The implementation of an "Intelligent Interface" now allows the import of data with a large variety of data formats which makes the programming of tailored interfaces in most cases redundant. This interface enables the update of the database almost continuously which is important in view of the growing data stream into the database.

It is highly appreciated that also countries which in the past have been hesitant to transmit data to the GRDC are now sending data. The Peoples Republic of China, Nepal but also South Korea and a few other countries are worth to be mentioned in this context.

3.5.1 *Limited capacity of national hydrological services*

The update of hydrological information from member countries is very resource intensive in terms of time, personnel and finance. In many parts of the world, the GRDC observes a decline of national hydrological services. In the opinion of the GRDC this trend can only be halted or reversed if multilateral donors assist national governments in the establishment of national water resources development strategies which are reflected in the respective national development plans and adequately funded. This would enable national hydrological services to define their increasingly important role and with internal and external assistance become pro-active in terms of capacity building and professional services rendered to data users. The GRDC observes the debate and actions with regard to the privatization of hydrological services.

The past experiences show clearly, that close contacts between the GRDC and national hydrological services are indispensable for the mutual exchange of information. Therefore, the GRDC is offering a range of advisory services to national hydrological services as incentive for data suppliers.

3.6 *Criteria for data collection*

The present criteria for data collection are: Data should be collected for rivers with mean annual discharge greater than 100 m³/s, from rivers with catchment areas greater than 1.000.000 km² and from river basins with more than 1.000.000 inhabitants. With specific regard to GEWEX requirements which have been outlined during the 6th session of the Scientific Steering Committee of GEWEX in January 1994, the following data should be collected:

- Discharge from closed basins and continents to oceans.
- Information to verify the runoff produced by coupled models in drainage basins in the order of 1.000 - 100.000 km².
- Runoff Information for parameter estimation of the hydrological component of atmospheric models, streamflow data to support water resources applications derived from atmospheric model information.

The data collection criteria are in a process of re-definition under the headings: General, Project-oriented, Availability-oriented. The Centre aims to broaden the scope of data collection to react to increasingly diverse user requirements. The re-definition of data collection priorities will be agreed upon at the 2nd session of the Steering Committee-meeting in June 1995.

3.7 *Quality control of data*

The GRDC is responding to the growing demand for quality-controlled data. In 1994, a software profile for the plausibility control of GRDC data has been elaborated and a contract signed with a software company for the implementation of this tool. The tool "Plausibility Control" allows a rapid check of incoming as well as resident data mainly in a graphical way: Obvious data errors can be detected and statistically rectified. Questionable data can be flagged to inform users about the data quality.

For further statistical data processing it is also possible to close data gaps in time series with several statistical methods. Aside from this tool which will be a part of the GRDC data screening procedure, the GRDC tests hydrological software programmes such as "HYDROM 3" and others for their suitability for data quality control. The cost factor of other commercially available hydrological software such as "HYDATA" and "HYMOS" has prevented the use of this software for the GRDC as of now.

As a principal GRDC policy however, the responsibility for the quality of data lies with the national hydrological services as it is not possible for the GRDC to make a comprehensive quality control in a meaningful way without background knowledge of such details viz: Condition of the gauging station, instrumentation and linked with this the reliability of the station observer, current rating curves, river morphology and riverbed processes.

It is in most cases reasonable to assume that hydrological services perform a quality control of their data prior to publishing the data in yearbooks and other media forms.

Past experience shows that the issue of quality controlled data in hydrology is not transparent enough especially in the meteorology community and hydrological services in temperate regions. There are many variables which influence the data quality in different ways; the cases of poorly-paid station observers at stations with maintenance deficits, obsolete equipments and logistic problems is a common reality in a large number of countries. It is also overlooked, that there are many steps involved from the acquisition of water level data, the collection and transport of the data to the central service, the digitization and further processing of the data until the original water level data are converted into discharge and published in a yearbook.

This makes the quality control of hydrological data quite uncomparable with the quality control of, say, space-based sensors and platforms which operate usually under continuously controlled high-tech environments.

4. *User services*

Data users are supplied with GRDC data and/or specific data products on request. Users of GRDC data are asked to refer in their presentations and publications to the Global Runoff Data Centre as the data source and to send results of their studies/research to the GRDC for reference. Policy guidelines for the dissemination of data and costing of services is under preparation and will be endorsed during the 2nd session of the Steering Committee of the GRDC in June 1995. In particular, users have to agree to stipulate the specific intended use of the data and also on the non-proliferation of GRDC data to third parties.

The primary service for users is the free availability of a catalog of the GRDC database. The catalog of available data and a similar catalog of missing data within time series is available on diskette together with a search-and-query tool on the same diskette.

An example of a typical user product is given in figure 2.

With increased publicity of GRDC activities, the request for data has strongly increased in 1994:

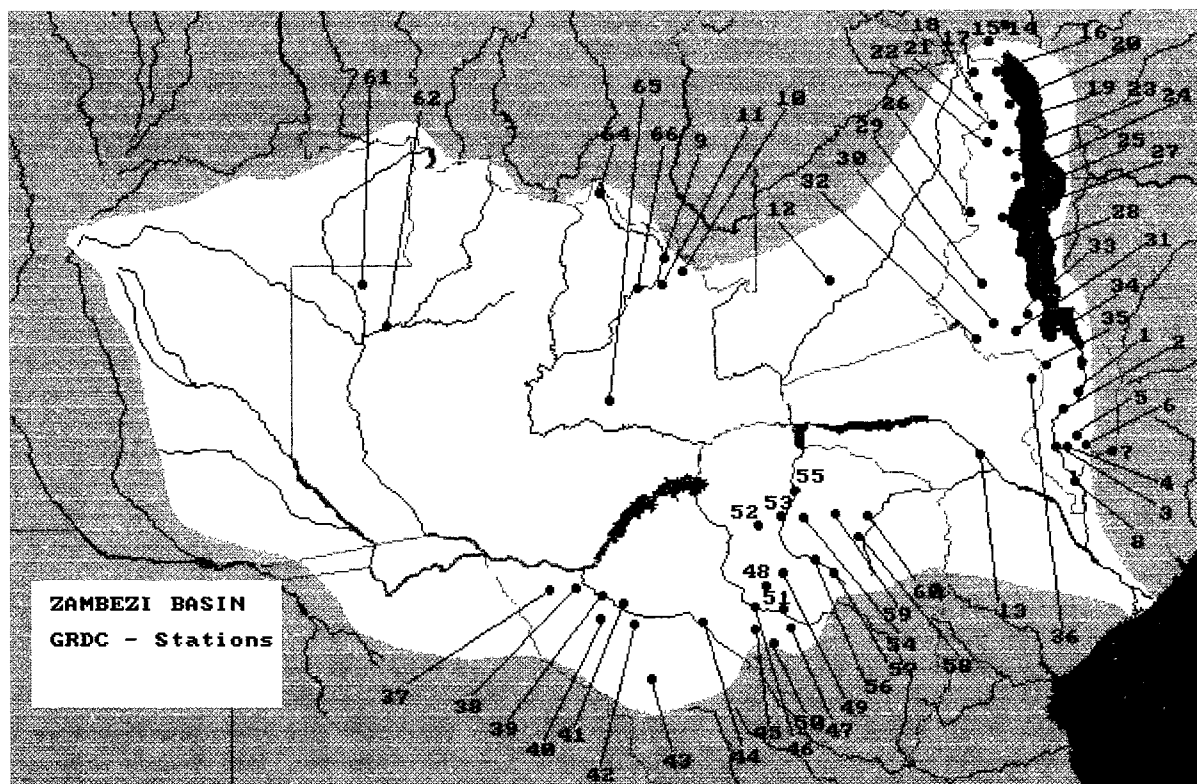
Year	Number of requests
1992	10
1993	24
1994	61

The majority of requests have been received from universities and research organizations of developed countries. There is a tendency however, that graduate and post-graduate students studying in institutions of higher learning in western countries request data from their home countries for hydrological and climate oriented research in their home countries or for regional studies.

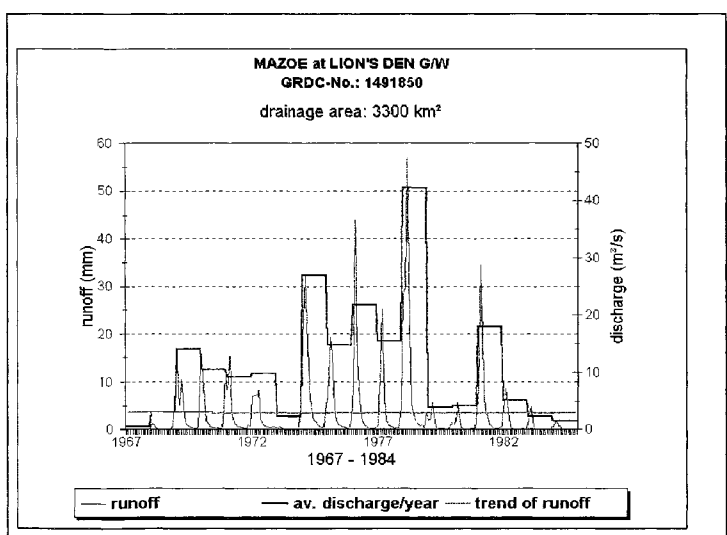
The numbers of requests do not include requests for catalog information of which about 80 were sent out in 1994. Most of the requests use the data for water balance studies, research on climate change, regional and operational hydrology and - increasingly - also for water quality studies.

The tables in annex 2 summarize the data requests. These user summaries are of high value to the data suppliers to document who has used which data for specified research and studies. The tables therefore serve as feed-back tool to the national hydrological services which transfer data to the GRDC.

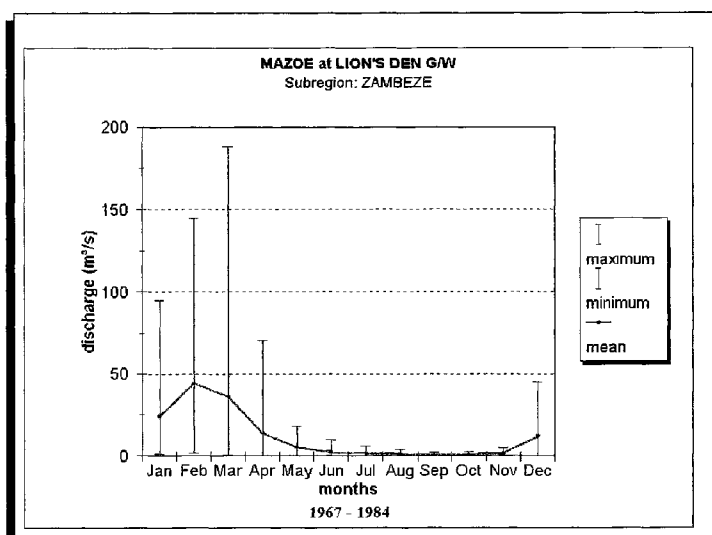
Fig. 2: Example for Retrieval and Data Processing Services



No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	Day/Month
60	Mazoe	Lion's Den G/w	3.300	17.28 S	31.55 E	12.1967	9.1984	M



Runoff, average yearly discharge and linear trend of runoff



Variability of mean monthly discharge

5. *Organizational tasks and issues*

5.1 *Establishment of a Steering Committee*

In collaboration with WMO and other organizations, a Steering Committee for the GRDC has been established in 1994 which subsequently held its 1st meeting in June 1994 in Koblenz. The results of this meeting have been published as GRDC Report No.6.

The principal objective of the Steering Committee is to provide advice on policy matters, the functions of the GRDC, services and on the implementation of various tasks. It also advises on liaison with international organizations and global and regional projects. The members of the Steering Committee represent WMO, UNESCO, UNEP, World Bank, ICSU (nomination open), Federal Institute of Hydrology, Japanese Ministry of Construction.

5.2 *Organizational progress and presentations of the GRDC*

Organizational issues including presentations and country missions have been a dominant issue in 1994. The main objective had been to engage the GRDC in relevant activities and programmes from the planning stage onwards to enable the GRDC to actively participate in the planning and implementation rather than reacting on new developments. The country missions will form a major activity in this context in the future.

5.2.1 *Agreement reached with GEMS/Water of UNEP*

Increasingly, water quantity and quality issues are viewed concurrently. To optimize available resources, the GRDC and GEMS/Water (Global Environment Monitoring System - Water) agreed to share country missions for data collection. This enables the GRDC to execute country missions and collect data both, for GRDC and GEMS/Water while GEMS/Water on their country missions will also try to obtain data for GRDC. The country visits for 1994 and 1995 are coordinated between the GRDC and GEMS/Water.

5.2.2 *Assistance with regard to the linkage between the GRDC and Geographic Information Systems (GIS)*

An agreement was reached between the Department of Hydrology, University of Arizona and the GRDC that the Department will assist the GRDC in GIS-matters with special regard to vector data sets of drainage basins. In return, the GRDC will assist the Department with data for regional and global hydrological studies.

5.2.3 *GRDC-visit at the International GEWEX Project Office (IGPO)*

Following an invitation by the Director of IGPO during the 6th GEWEX SSC, where the GRDC introduced its plan of activities, the IGPO was visited in Washington in August 1994. The visit was used to discuss and agree on practical aspects of a closer cooperation between GRDC and GEWEX. In particular, the GRDC contribution to ISLSCP (International Satellite Land Surface Climatology Project) was reviewed and the possible participation of the GRDC in NASA - EROS (EROS = Earth Resources Observation System) related activities was discussed.

5.2.4 *GRDC-visit at The World Bank*

The visit aimed at a better understanding of the views of the Directors of the regional Departments of the World Bank with regard to organizational and technical assistance in the water sector, including hydrology. The aims and objectives of the GRDC were explained and a meeting held to review the opinions about the development of the World Hydrological Climate Observing System (WHYCOS) project which is a joint undertaking between the World Bank and WMO. The common baseline was that WHYCOS should be implemented in a phased regional approach in international river basins, where the GRDC is regarded as potent partner to acquire, process and disseminate hydrological data.

5.2.5 *GRDC-visit at GRID, Geneva*

During this visit, the mutual interest in terms of data and communication was clarified. While the GRDC serves GRID with data and data products on request and vice-versa, GRID is in a position to offer its know-how in the installation and operation of INTERNET and World Wide Web (WWW) for the GRDC. The GRDC will make use of this offer as soon as the facilities become available at the Centre.

5.2.6 *GRDC presentation at the Sub-Saharan Assessment of Hydrological Services, Paris*

This workshop was jointly organized by WMO and The World Bank to review the activities of this project. During the meeting progress with regard to the joint WMO-WHYCOS project was discussed and the GRDC expressed the view, that no new bureaucracy should be created to manage WHYCOS-activities, but that the GRDC should be strengthened with the aim to channel hydrological data through the GRDC. The GRDC is capable to establish the reference databases for WHYCOS.

5.2.7 *GRDC representation at ESCAP, Bangkok*

In October 1994, the GRDC was represented in an ESCAP (Economic and Social Commission for Asia and the Pacific) expert meeting on the protection of water resources and water quality water quality issues in Bangkok. During the meeting, the GRDC stressed the need to link quantity and quality issues in a much more stringent way as this is done presently. This view was widely shared by the participants. The GRDC offered its services to the representatives of 13 countries present during the meeting.

5.2.8 *Visit at the Mekong Secretariat, Bangkok*

The visit at the Mekong Secretariat highlighted the good relationship between the Secretariat and the GRDC. The GRDC receives regularly hydrological information about the Mekong and the visit aimed to strengthen the ties and expand it in view of possible services the GRDC could deliver to the Secretariat as well as background hydrological information about the Mekong river which the Secretariat is asked to the GRDC. Detailed discussions were held with respect to the design of data products for specific uses so that the Secretariat as well as the GRDC will streamline efforts to respond to specified demands for hydrological data products.

5.2.9 *Country mission to Thailand*

To update the hydrological database from rivers of Thailand, a visit to the Hydrometeorological Department of Thailand was used to explain the objectives and tasks of the GRDC and to encourage the respective authorities to further contribute data to the GRDC which consequently was promised. In exchange for the processing of data for the GRDC, the GRDC assisted with a FORTRAN compiler for the Department. Discussions were held about the role of the hydrometeorological service in the GEWEX Asian Monsoon Experiment (GAME) and its links with the GRDC. In-depth information was provided on the services, products and also the constraints of the Department.

5.2.10 *Country mission to Nepal*

During a visit to the Department of Hydrology and Meteorology (DHM) in Kathmandu, Nepal, the authorities agreed to update the Nepali streamflow data and to send updated data regularly. The Nepali database has since been updated with new data. Also, an agreement was signed with respect to the participation of Nepal in the GAME-project between the DHM and the GAME representative. In this context, data from the Himalayan region obtained during an 8 year long Technical Assistance project between Nepal and Germany will serve as key input data.

5.2.11 *Other missions*

The participation of the GRDC in various other symposia, workshops and meetings aimed at the introduction of the role and benefits of global hydrological data, improved management of data within the programmes of WMO, and the participation of the GRDC in GCOS.

6. *Activities of the GRDC with regard to the World Climate Programme - Water (WCP-Water).*

The WCP-Water projects listed below are relevant to the GRDC. In line with the recommendations of the Steering Committee the GRDC-activities in these projects are commented with respect to activities in 1994.

WCP-Water Project A.2 Analyzing long time series of hydrological data and indices with respect to climate variability and change.

The GRDC will continue to collect and make available any new data received, and any sets of results generated by the project.

WCP-Water Project A.5 Collection of global runoff data sets.

This is equivalent with the operation of the GRDC itself.

WCP-Water Project A.8 Detecting global and regional runoff trends by monitoring discharge of selected rivers.

The export of vector data of river systems and watersheds through RAISON in ASCII-code will be continued. Stations will be selected and the project further developed in conjunction with GEMS-Water. Links have been established to obtain drainage basin boundaries other than those obtained from RAISON. However, these efforts are going on.

WCP-Water Project A.9 Monitoring changes in the characteristics of extreme hydrological events (floods and droughts).

The highest and lowest recorded discharges from GRDC files should be published as a contribution to this project.

WCP-Water Project B.3 Development of grid related estimates of hydrological variables.

The GRDC further supports this project with the supply of data and other information as available. In the medium to long term, gridded runoff data should be included as a GRDC product.

WCP-Water Project B.7 Comparison study of time series of areal mean monthly precipitation and streamflow of selected catchment areas.

A nationally funded research project "Comparison study of areal mean monthly precipitation and streamflow for selected basins: The Niger river" is further supported in the Federal Institute of Hydrology with data from the GRDC.

7. Cooperation of the GRDC in international projects

GRDC-GEWEX

The GRDC is listed as a project under the GEWEX (Global Energy and Water Cycle Experiment) activities and emphasizes the importance of the Centre for the success of this programme. The GRDC has responded to GEWEX calls for database provision as stated in section 3.1. With the progress made in the regional projects of GEWEX such as GAME, BALTEX, LAMBADA the GRDC expects valuable data contributions to supplement a real global hydrological coverage of the earth. The GRDC is compiling a database of river gauging stations close to the mouth of rivers to the oceans with the objective to calculate freshwater flux into the oceans. This activity is also of interest to other programmes (see below).

GRDC - GCOS

The GRDC is observing the activities of GCOS (Global Climate Observing system) and is prepared to assist GCOS when desired. The state of development of GCOS does not allow the use of the GRDC services at present.

GRDC - GPCC

The cooperation between the GRDC and the GPCC (Global Precipitation Climatology Centre) is expected to bear results in the contribution of the GRDC in the WCP-Water Project B.7 (see above). It is intended that the GRDC and the GPCC will extend the common time series where runoff and precipitation data are available. However, this is a medium- to longer term perspective due to the enormous amount of precipitation data required to extend the GPCC timeseries backwards.

GRDC-GEMS/WATER

The GRDC participates in the Freshwater Programme of UNEP and contributes in the implementation of regional freshwater programmes of UNEP. UNEP has allocated operating funds for the GRDC dedicated mainly for country missions, data acquisition and production of primary data products. In this respect, GRDC and GEMS/WATER join forces in country missions to strengthen water quantity and quality data exchange arrangements and exchange information about planned and current activities. The calculation of freshwater flux from continents into the oceans is of high interest to GEMS/Water.

GRDC - WHYCOS

In line with the development of the World Hydrological and Climatology Observing System (WHYCOS), which is a joint undertaking of WMO and the World Bank, the GRDC participates actively in WHYCOS activities. It is expected that the Centre will actively contribute to the WHYCOS concept in such international basins like the Zambesi, Aral Sea the mediterranean Hycos and possibly the Arun river in Nepal.

GRDC - IHP/OHP

The GRDC has link functions between the International Hydrology Programme (IHP) of UNESCO and the Operational Hydrology Programme (OHP) of WMO and contributes to both programmes.

GRDC - FRIEND

The GRDC seeks closer links with the programme FRIEND (Flow Regimes from International Experimental and Network Data) of UNESCO. The GRDC seeks to obtain meta-data from FRIEND and selected hydrological records. An agreement has been signed between the GRDC and FRIEND with regard to the cooperation between the two programmes. The modalities of data exchange and use and the policy for data acquisition have to be worked out in detail.

8. *Funding*

The Centre is funded by Germany. Basic services can be provided by the Centre and the Centre has made progress in the past years which was duly recognized by WMO and UNEP. To satisfy the growing requests of the international community for data, data products and services from the Centre it is felt that additional resources should be allocated to the GRDC in a joint effort to meet the long-term requirements. At present, WMO and UNEP are co-funding specialized activities of the Centre such as country missions, participation in meetings and symposia, assembly of databases.

ANNEX 1

UPDATE OF GRDC DATABASE IN 1994

GRDC-IMPORT

AUSTRIA

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
07.09.94	6243800	ANTIESEN	HAGING	OS	1989	1989	D	U
07.09.94	6243850	INN	SCHAERDING	OS	1989	1989	D	U
07.09.94	6246700	MUERZ	KINDTAL	OS	1989	1989	D	U
07.09.94	6235100	BREGENZERACH	MELLAU	OS	1989	1989	D	U

GRDC-IMPORT

BENIN

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
07.09.94	1731450	MOGOU	TIELE	BJ	1989	1992	D	U
07.09.94	1731400	PENJARI	PORGA	BJ	1991	1992	D	U
07.09.94	1734500	NIGER	MALANVILLE	BJ	1991	1992	D	U
07.09.94	1734480	IRANE	KOUTAKOUKROU	BJ	1991	1992	D	U
07.09.94	1734600	SOTA	COUBERI	BJ	1991	1992	D	U
07.09.94	1734300	MEKROU	KOMPONGOU	BJ	1990	1992	D	U
07.09.94	1734200	MEKROU	KEROU	BJ	1991	1992	D	U
07.09.94	1734410	ALIBORI	KANDI-BANI	BJ	1991	1992	D	U
07.09.94	1732100	MONO	ATHIEME	BJ	1991	1992	D	U

GRDC-IMPORT

CHINA

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
21.12.94	2106500	SONHUAJIANG	HAERBIN	CI	1898	1987	M	U
21.12.94	2106600	SONHUAJIANG	JILIN	CI	1933	1987	M	U
21.12.94	2178300	YONGDING	GUANTING	CI	1925	1989	M	U
21.12.94	2178500	LUANHE	LUANXIAN	CI	1930	1989	M	U
21.12.94	2180500	JINGHE	ZHANGJIASHAN	CI	1932	1987	M	U
21.12.94	2180700	HUANGHE	SANMENXIAN	CI	1980	1989	M	U
21.12.94	2180750	YILUO	HEISHIGUAN	CI	1934	1987	M	U
21.12.94	2180800	HUANGHE	HUAYUANKOU	CI	1980	1989	M	U
21.12.94	2181400	WUJIANG	GONGTAN	CI	1989	1983	M	U
21.12.94	2181600	CHANGJIANG	YICHANG	CI	1982	1987	M	U
21.12.94	2181800	CHANGJIANG	HANKOU	CI	1980	1987	M	U
21.12.94	2181850	GANJIANG	JIANG	CI	1973	1985	M	U
21.12.94	2181900	CHANGJIANG	DATONG	CI	1923	1987	M	U
21.12.94	2181950	HUAIHE	BENGBU	CI	1980	1987	M	U
21.12.94	2182100	HANJIANG	ANKANG	CI	1935	1987	M	U
21.12.94	2186500	YUJIANG	NANNING	CI	1936	1985	M	U
21.12.94	2186800	XIJIANG	WUZHOU 3	CI	1915	1985	M	U
21.12.94	2186900	BEIJIANG	HENGSHI	CI	1953	1988	M	U
21.12.94	2186950	DONGJIANG	BOLUO	CI	1960	1988	M	U

GRDC-IMPORT

COSTA RICA

Date	GRDC-Nr	River	Station	Landcode	Data from to	Monthly/ Daily data	Update/ New
07.09.94	4876500	TELIRE	BRATSI	CS	1990 1993	D	U
07.09.94	4876800	SIXAOLA	SIXAOLA	CS	1990 1993	D	U
07.09.94	4875710	ESTRELLA	PANDORA	CS	1990 1993	D	U
07.09.94	4875310	BARBILLA	BARBILLA	CS	1990 1993	D	U
07.09.94	4875330	CHIRRIPO	PLAYA HERMOSA	CS	1990 1991	D	U
07.09.94	4875210	PACUARE	PACUARE	CS	1990 1993	D	U
07.09.94	4875250	PACUARE	DOS MONTANAS	CS	1990 1993	D	U
07.09.94	4875140	REVENTAZON	ANGOSTURA	CS	1990 1993	D	U
07.09.94	4875160	REVENTAZON	PASCUA	CS	1990 1993	D	U
07.09.94	4875125	PEJIBAYE	EL HUMO	CS	1990 1993	D	U
07.09.94	4875130	PEJIBAYE	ORIENTE	CS	1990 1993	D	U
07.09.94	4875111	NAVARRO	LA TROYA	CS	1990 1993	D	U
07.09.94	4873450	SARAPIQUI	PUERTO VIEJO	CS	1990 1993	D	U
07.09.94	4873410	SARAPIQUI	CARIBLANCO	CS	1990 1993	D	U
07.09.94	4873310	TORO	VERACRUZ	CS	1990 1993	D	U
07.09.94	4873230	SAN CARLOS	JABILLOS	CS	1990 1993	D	U
07.09.94	4873250	SAN CARLOS	TERRON COLORADO	CS	1990 1993	D	U
07.09.94	4873280	SAN CARLOS	BOCA TAPADA	CS	1990 1993	D	U
07.09.94	4873210	PENAS BLANCAS	PENAS BLANCAS	CS	1990 1993	D	U
07.09.94	4873100	FRIO	GUATUSO	CS	1990 1993	D	U
07.09.94	4874050	TEMPISQUE	GUARDIA	CS	1990 1993	D	U
07.09.94	4874080	COLORADO	COYOLAR	CS	1990 1993	D	U
07.09.94	4874120	CANAS	LIBANO	CS	1990 1993	D	U
07.09.94	4874100	TENORIO	RANCHO REY	CS	1990 1993	D	U
07.09.94	4874180	BARRANCA	GUAPINOL	CS	1990 1993	D	U
07.09.94	4874230	POAS	TACARES	CS	1990 1993	D	U
07.09.94	4874210	GRANDE DE TARCOLAS	BALSA	CS	1990 1993	D	U
07.09.94	4874200	GRANDE DE TARCOLAS	ALUMBRE	CS	1990 1993	D	U
07.09.94	4874310	GRANDE DE CANDELARIA	EL REY	CS	1990 1993	D	U
07.09.94	4874730	GRANDE DE TERRABA	PALMAR	CS	1990 1993	D	U

GRDC-IMPORT

COSTA RICA

Date	GRDC-Nr	River	Station	Landcode	Data	Monthly/ Daily data	Update/ New
					from	to	
07.09.94	4874410	NARANJO	LONDRES	CS	1990	1992	D U
07.09.94	4874450	SAVEGRE	PROVIDENCIA	CS	1990	1992	D U
07.09.94	4874770	COTO BRUS	CARACUCHO	CS	1990	1992	D U

GRDC-IMPORT

CYPRUS

Date	GRDC-Nr	River	Station	Landcode	Data from	to	Monthly/ Daily data	Update/ New
07.09.94	6196100	LMNITIS	SAW MILL	CY	1981	1993	D	U

IH - ENGLAND

GRDC-IMPORT

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
31.05.1994	6604650	Spey	Boat o Brig	UK	1952	1992	D	U
31.05.1994	6604610	Tay	Ballathie	UK	1952	1992	D	U
31.05.1994	6604750	Tweed	Norham	UK	1962	1992	D	U
31.05.1994	6605510	Leven	Leven Bridge	UK	1959	1993	D	U
31.05.1994	6605550	Wharfe	Flint Mill Weir	UK	1955	1992	D	U
31.05.1994	6606300	Ise Brook	Harrowden Old Mill	UK	1943	1992	D	U
31.05.1994	6606400	Bedford Ouse	Bedford	UK	1933	1992	D	U
31.05.1994	6606900	Waveney	Needham Mill	UK	1963	1992	D	U
31.05.1994	6607600	Thames	Eynsham	UK	1951	1993	D	U
31.05.1994	6607500	Stour	Throop Mill	UK	1973	1992	D	U
31.05.1994	6607150	Taw	Umberleigh	UK	1958	1993	D	U
31.05.1994	6609500	Severn	Bewdley	UK	1921	1993	D	U
31.05.1994	6604500	Annan	Brydekirk	UK	1967	1992	D	U

GRDC-IMPORT

GERMANY

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
18.10.94	6337100	WESER	VLOTHO	DL	1941	1994	D	U
18.10.94	6337200	WESER	INTSCHEDE	DL	1941	1994	D	U
18.10.94	6337400	WESER	HANN.MÜNDE	DL	1941	1994	D	N

GRDC-IMPORT

GUYANA

Date	GRDC-Nr	River	Station	Landcode	Data from	to	Monthly/ Daily data	Update/ New
21.12.94	3308300	MAZARUNI	APAICA FALLS	GY	1981	1986	D	U
21.12.94	3308400	CUYUNI	KAMERIA FALLS	GY	1974/1980	1975/1981	D	U
21.12.94	3308600	ESSEQUIBO	PLANTAIN ISLAND	GY	1974/1981	1975/1990	D	U
21.12.94	3309300	DEMERARA	GREAT FALLS	GY	1981	1990	D	U
21.12.94	3309400	BERBICE	ITABRU FALLS	GY	1981	1988	D	U
21.12.94	3309700	CANJE	REYNOLD'S BRIDGE	GY	1981	1985	D	U

GRDC-IMPORT

ICELAND

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
05.10.94	6401080	Hvita i Borgarfirdi	Kljafoss	IL	1951	1993	D/M	U
05.10.94	6401090	Oelfusa	Selfoss	IL	1950	1992	D/M	U
05.10.94	6401110	Bruara	Efstadalsbru	IL	1961	1991	D/M	U
05.10.94	6401120	Thjorsa	Urridafoss	IL	1947	1993	D/M	U
05.10.94	6401130	Joekulsa i Fijotsdal	Holl	IL	1962	1991	D/M	U
05.10.94	6401200	Joekulsa Vestari	Goddalabru	IL	1971	1991	D/M	U
05.10.94	6401500	Djupa	Bru	IL	1968	1992	D/M	U
05.10.94	6401600	Svarta	Ullarfoss	IL	1932	1992	D/M	N
05.10.94	6401700	Joekulsa a Fjoellum	Detifoss	IL	1939	1984	D/M	U
05.10.94	6401800	Lagarfjot	Lagarfoss	IL	1949	1993	D/M	U

GRDC-IMPORT

NIGER

Date	GRDC-Nr	River	Station	Landcode	Data	Monthly/ Daily data	Update/ New
					from	to	
14.09.94	1734500	NIGER	MALANVILLE	BJ	1981	1984	D U
14.09.94	1734410	ALIBORI	ROUT. KANDI-BANI	BJ	1981	1985	D U
14.09.94	1734300	MEKROU	KOMPONGOU	BJ	1981	1986	D U
14.09.94	1734600	SOTA	COUBERI	BJ	1981	1986	D U
14.09.94	1734550	SOTA	KANDI-SEGBANA	BJ	1984	1986	D U
14.09.94	1734480	IRANE	KOUTAKOUKROU	BJ	1978	1986	D U
14.09.94	1234090	NIGER	KANDADJI	NR	1981	1982	D U
14.09.94	1234190	DIAMANGOU	TAMOU	NR	1979	1981	D U
14.09.94	1234180	GOROUBI	DIONGORE AMONT	NR	1980	1981	D U
14.09.94	1234080	GOROUOL	ALCONUI	NR	1979	1982	D U
14.09.94	1234130	SIRBA	GARBE KOUROU	NR	1980	1982	D U

GRDC-IMPORT

SWEDEN

Date	GRDC-Nr	River	Station	Landcode	Data		Monthly/ Daily data	Update/ New
					from	to		
04.01.95	6229100	NEDRE BULLAREN	VASSBOTEN	SN	1981	1992	D/M	U
04.01.95	6229500	VAENERN-GOETA	VAENERSBORG	SN	1985	1992	D/M	U
04.01.95	6232100	TORNEAELV	NEDRE ABISKOJOKK	SN	1984	1992	D/M	U
04.01.95	6233100	VISKAN	ASBRO	SN	1978	1993	D/M	U
04.01.95	6233150	FYLLEAN	SIMLANGEN	SN	1981	1993	D/M	U
04.01.95	6233200	OESTERDALAELVEN	GROETSJOEN	SN	1981	1992	D/M	U
04.01.95	6233300	VELENAN	VELEN 2	SN	1981	1993	D/M	U
04.01.95	6233350	ALSTERAN	GETEBRO	SN	1981	1993	D/M	U
04.01.95	6233400	AMMERAN	FYRAS	SN	1981	1993	D/M	U
04.01.95	6233450	FAXAELVEN	ANKARVATTNET	SN	1981	1992	D/M	U
04.01.95	6233500	JOVATTENAN	NEDRE JOVATTNET	SN	1982	1992	D/M	U
04.01.95	6233550	KASSJOEAN	STORSILLRET	SN	1981	1992	D/M	U
04.01.95	6233600	VATTHOLMAAN	VATTHOLMA 2	SN	1981	1993	D/M	U
04.01.95	6233650	ANGERMAN	SOLLEFTEA	SN	1985	1992	D/M	U
04.01.95	6233680	VINDELAELVEN	SORSELE	SN	1989	1992	D/M	U
04.01.95	6233750	LULE	BODEN WATERWORKS	SN	1973	1992	D/M	U
04.01.95	6233780	RANEAELV	NIEMISEL	SN	1989	1992	D/M	U
04.01.95	6233800	LAPPTRAESKET	YTTERHOLMEN	SN	1984	1992	D/M	U

ANNEX 2

SUMMARY OF DATA REQUESTS FROM GRDC IN 1994

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Adams, D., National Remote Sensing Centre Limited, Hampshire, UK.	Rivers Bosna, Fojnicka, Neretva (50 km around Sarajevo)	GIS-Input for flood modelling
Alexiou, A.G. Intergovernmental Oceanographic Commission, UNESCO, France	River discharge into the Indian Ocean	Global ocean observing system
Aureli, A., UNESCO, IHP, France	Niger basin	GIS based assessment of water resources
Bainto, E.V., Climate Research Division, Scripps Institution of Oceanography, University of California, San Diego, U.S.A.	Major river inputs to North Pacific and Atlantic basins	Runoff computation into oceans
Barsoum, N., RITSEC - Regional Information Technology and Software Engineering Centre, Cairo, Egypt	Arab region and Europe	Regional information system update
Bergström, St., SMHI-Swedish Meteorological and Hydrological Institute, Sweden	Baltic region	BALTEX-Project
Braithwaite, D., University of Arizona, U.S.A.	Data of gauges in all regions	Earth Observation Project of NASA
Buchtele, W., Charles University, Prague, Czech Republic	Niger Basin	Water balances and rainfall-runoff modeling (Student-course)
Cayan, D., Scripps Institution of Oceanography University of California, San Diego, Climate Research Division, La Jolla, U.S.A.	Station in Canada, U.S.A., Europe with drainage area above 50 000 km ²	-
Chalise, S.R., International Centre for Integrated Mountain Development, Kathmandu, Nepal	Rivers in the Hindu Kush Himalayas	Hydrological studies in the Himalayan region
DeLiberty, T.L., Cooperative Institute for Meteorological Satellite Studies, Space and Engineering Centre University of Wisconsin-Madison, Madison, U.S.A.	Discharge data for rivers in Brasil; Amazon Basin	Research on moisture budget in the Amazon Basin

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Dethleff, T., Forschungszentrum für Marine Geowissenschaften, Christian-Albrechts-Universität, Kiel, Germany	Discharge data of Sibirien rivers flowing to the Arctic Ocean	Research on Arctic Shelf zones
Dinar, A., Water Resources Economist, The World Bank, Washington, U.S.A.	Indian and Brazilian rivers	Research on Global Warming effects in India and Brazil
Dümenil, L., Max Planck Institute for Meteorology, Hamburg, Germany	Metadata only	GRDC-Catalogue, Research on global climate change
Fernandez-Jauregui, C.A., UNESCO, Montevideo, Uruguay	GRDC diskette	LACHYCOS project South America
Flachs, F., Friedrich-Alexander- Univ. Erlangen-Nürnberg, Germany	River basins Kongo/Zaire, Nile, Mekong, Parana	Research on river discharge and flood plain ecology
Gelder, van A., Vakgroep Fysische Geografie, Univ. Utrecht, Netherland	Yellow River (Huanghe), China	Research on sediment transport
Georgiadi, A., IGAN. Moscow, Russia	Monthly flow of all rivers of GRDC	Information on rivers in former SU
Hamad, O., Freshwater Resources Management Program Centre for Environment & Development Arab Region and Europe, Oman, Giza, Egypt	GRDC catalogue	Establishing regional data base
Heller, H., Lehrstuhl für Geobotanik, Systematisch-Geobotanisches Institut, Göttingen, Germany	Discharge in Rivers Odra and Vistula	Vegetation Research
Hladny, J., Czech Hydrometeorological Institute, Praha, Czech Republic	Elbe-basin	WCP-Water Project B.3
Im mendorf, R., Geographisches Institut der Universität Köln, Germany	Rivers in Western Europe	Research Project: Floods in Western Europe
Iyama, S., River Bureau, Ministry of Construction, Tokyo, Japan	GRDC information	Catalogue of rivers in SE-Asia
Kasalski, K., Poznan, Poland	Rivers Thames and Lee	Analysis of long-term time series

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Kleeberg, H.-B., Institut für Wasserwesen, Universität der Bundeswehr München, Germany	GRDC information	Organisation of database and datastructure
Kwadijk, J., Geografisch Instituut, Vakgroep Fysische Geografie, Univ. Utrecht, Netherland	Rivers Ganges and Brahmaputra	Water balance with Rhine flow model for climate change research
Laval, K., Laboratoire de Météorologique Dynamique, Centre National de la Recherche Scientifique, Paris, France	Runoff and precipitation in river basins: Mississippi, Amazon, Europe, Sahel and Yenisey	Runoff simulation in Global Circulation Models
Lemmelä, R., National Board of Waters and the Environment, Hydrological Office, Helsinki, Finland	GRDC catalogue	Hydrological models for BALTEX project
Maidment, D.R. Centre for Research in Water Resources, University of Texas, Austin, U.S.A	GRDC catalogue. Streamflow data of the Niger and Benue basins	FAO/UNESCO Water Balance of Africa
Maier-Reimer, D., Hamburg, Germany	Runoff-data of rivers in Canada and Alaska. Runoff-data of rivers in France	Doctoral thesis on Hydrological Regimes
Malm, B., UNESCO, Division of Water Science, Paris, France	Station catalogue of rivers in Africa	Comparison of databases
Matsuoka, Y., Environmental and Sanitary Engineering, Univ. Kyoto, Japan	Runoff-data of 522 stations	Analysis of climatic change on East and South Asia
Matsuyama, H., Department of Geography, Tokyo Metropolitan University, Tokyo, Japan	Discharge data of 8 rivers, which drain into Lake Balkhas and of the Ili river	Studies on water budget around Lake Balkhash
McClimans, SINTEF NHL, Norwegian Hydrotechnical Laboratory, Trondheim, Norway	Data of Ob and Yenisei	-
Naff, Th., School of Arts and Science, Dept. of Asian and Middle Eastern Studies, Univ. of Pennsylvania, U.S.A.	GRDC information	Middle East water issues project

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Oki, T., Hydrology and Water Resources Engineering, Institute of Industrial Science, Tokyo, Japan	Selected global runoff data	Research on global soil wetness
Pelt, Ph., UNEP/GRID, Geneva, Switzerland	GRDC catalogue	User-guide for data base on natural hazards
Perlmutter, M.A., Texaco, Houston, Texas, U.S.A	GRDC information	Elevations and hypsometry of river drainage areas
Qu, W., Institut für Pflanzenökologie, Justus-Liebig Univ. Gießen, Germany	GRDC information	Water Cycle Model
Rohde, F., Lehrgebiet für Wasser-Energie Wirtschaft, RWTH Aachen, Germany	GRDC information	Structure of data and organisation of database
Sakho, M.A. Abidjan, Ivory Coast, Africa	Country catalogue, Catalogue of missing data	update of database
Schmitt-Heidrich, P., Institut für Hydrologie und Wasserwirtschaft, Univ. Karlsruhe, Germany	Gambia river	Irrigation projects (Salinization)
Singh, A., GRID-Sioux Falls, EROS Data Centre, Sioux Falls, U.S.A.	GRDC information	Digital elevation model
Sungwon, J., Korea Institute of Constuction Technology, Water Resources Eng. Div., Seoul, Korea	GRDC information (Korea)	Hydrologic data systems, update of regional database
The Hydrological Advisor to His Majesty's Government of Thailand	GRDC catalogue, catalogue of missing data	GRDC request for data: Comparison of databases
Tomé, A. R., Universidade da Beira, Covilha, Portugal	Spain: Ebro, Júcar, Liobregat, France: Rhône, Italy: Po, Arno, Tibre, Greece: Akhelóos, Axiós, Evros, Aliákman, Yugoslavia: Krka, Cetina, Neretva, Albania: Mat, Drin, Shkumbi, Devoli, Vigose, Lebanon: Litani, Egypt: Nile, Morocco: Moulouya, Tunesia: Medjerda, Algeria: Cheliff, Turkey: Cheyhan	PhD thesis intra and inter-annual variability in the Mediterranean region

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Try, P. International GEWEX Project Office, Washington, U.S.A.	GRDC information (8 stations)	Preparation of CD-ROM for GEWEX (ISLSCP)
Vandewiele, G.L. Vrije Universiteit Brussel, Belgium	31 rivers (globally)	PhD thesis; development of stochastic runoff models for engineering purposes
Wiese, B., Geographisches Institut, Universität zu Köln, Germany	Senegal river	Desertification in Senegal
Wilkinson, W.B., Institute of Hydrology, Wallingford, UK	GRDC catalogue	Comparison of databases
Yang, R., Climate and Radiation Branch, NASA/GSFC, Greenbelt, U.S.A.	Global river flow data; 42 rivers	Research on global climate change
Zober, St., IHP/OHP Secretariat, Koblenz, Germany	River Vistula	Floodplain pollution control

Reference of GRDC-Reports

- Report No. 1** Second Workshop on the Global Runoff Data Centre, Koblenz, Germany, 15 - 17 June 1992; May 1993
- Report No. 2** Dokumentation bestehender Algorithmen zur Übertragung von Abflußwerten auf Gitternetze. (Incl. abstract in English by GRDC: Documentation of existing algorithms for transformation of runoff data to grid cells). G. C. Wollenweber, May 1993
- Report No. 3** GRDC - Status Report 1992, June 1993
- Report No. 4** GRDC - Status Report 1993, June 1994
- Report No. 5** Hydrological Regimes of the Largest Rivers of the World - A Compilation of the GRDC Database, November 1994
- Report No. 6** Report of the first meeting of the GRDC Steering Committee, Koblenz, Germany, 20 - 21 June 1994
- Report No. 7** GRDC - Status Report 1994, June 1995
- Report No. 8** First Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS), July 1995