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Bundesanstalt für Gewässerkunde  
Koblenz, Deutschland

Global Runoff Data Centre  
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Koblenz, Germany

**Report No. 13**

**GRDC - Status Report 1996**



**February 1997**

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# **GRDC STATUS-REPOPRT 1996**

## **1. General**

1.1 GRDC Status Reports are an important link between data providers, data users and collaborating Centres and institutions since the first of these reports was published in 1993. The rationale for the GRDC, its aims and objectives and major decisions relating to the operation of the GRDC, its data policy, linkages with other programmes and research aspects have been documented in these earlier reports and general information about the GRDC can be downloaded from the Homepage of the GRDC (see chapter 11.3 below).

1.2 In previous years, the establishment and consolidation of the GRDC has been the focal area of interest. The extension of the database, improvement of user services and active participation in research and advisory services are the emerging foci in the coming years.

## **2. Major issues in 1996 - Summary**

2.1 First priority remained the expansion and update of the database which includes the direct contact with data providers. Hydrological services of Latin America and the Caribbean were the priority of the year. Closer contact to Economic Commissions of Latin America (ECLAC) and the Economic and Social Commission of Asia and the Pacific (ESCAP), are geared to improve the access to hydrological information for socio-economic development.

2.2 Contributions to the Global Freshwater Assessment of the UN Commission for Sustainable Development (CSD) demonstrated the professional capacity of the GRDC to participate in global advisory service activities.

2.3 An operational linkage with UNESCO's programme Flow Regimes from International and Experimental Network Data (FRIEND) has been established for the Hindu Kush-Himalayan region.

2.4 In the fields: Science, research and development, the cooperation with the Global Energy and Water Cycle Experiment (GEWEX), the ex-officio membership in the GEWEX Hydrometeorological Panel (GHP), the membership in the Steering Committee of the Global Terrestrial Observing Programme (GTOS) and the contributions to the Arctic Climate System Study (ACSYS) have been highlights.

2.5 Based on GRDC observational data, a report about the freshwater fluxes from the continents into the oceans has been finalized. The GRDC Global Runoff Monitor which had been announced in the last report is now operational as well as the Plausibility Check tool of the GRDC.

2.6 Increasingly, the issue of access to hydrological and related data and the information policy of data providers, users and the GRDC becomes principal point of interest for all concerned parties. Details are discussed in chapter 7 below.

### **3. Database Development**

3.1 Two events contributed significantly to the expansion of the database in 1996:

3.1.1 The International Symposium on Water Resources Assessment in Latin America and the Caribbean in Costa Rica, which was attended by a large number of representatives of Latin American and Caribbean countries who demonstrated their support of the GRDC by sending hydrological data and country reports to the GRDC.

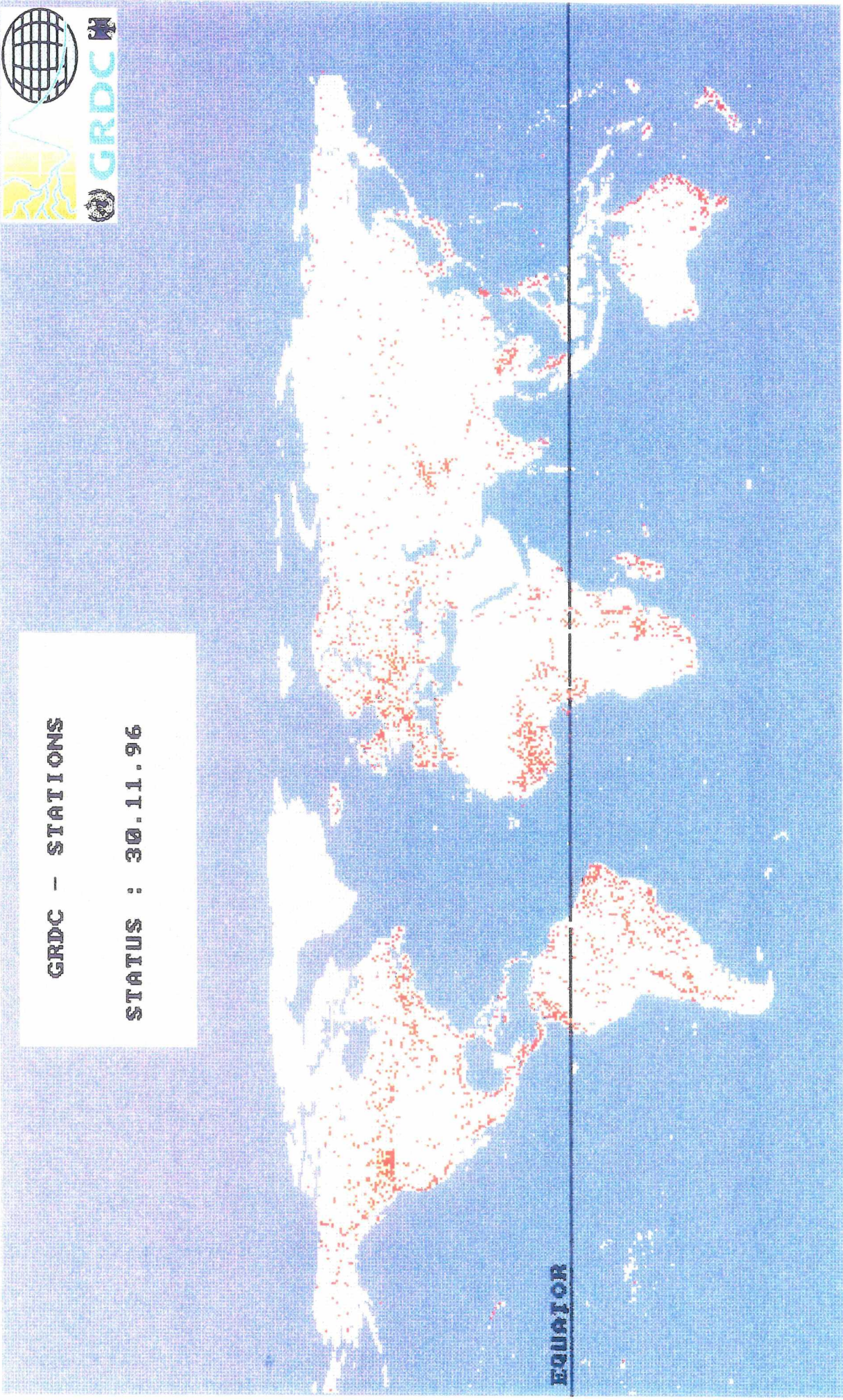
3.1.2 The Secretary-General of WMO sent a letter to the Hydrological Advisors of Members of WMO requesting the advisors for further support to the GRDC. A copy of this letter is attached as annex 5. The number of positive responses to this initiative of the Secretary-General has encouraging.

3.2 Mean daily and mean monthly discharge data from 493 gauging stations have been received from 15 countries. While 234 station records could be updated, 259 stations have been newly included into the database (Annex 1). Especially remarkable is the contribution from Brazil which now allows a much denser coverage and update of stations particularly of the Amazon basin.

3.3 The global distribution of GRDC gauging stations is displayed in figure 1 below. Figure 2 shows the availability of daily and monthly discharge data in the GRDC. At present, daily data sets are being converted into mean monthly values. It is evident from the figure that the data availability has shifted into the 1990's which is a considerable improvement of the situation just two years ago. It is however apparent, that the update process could be further improved if hydrological services could speed up the data transfer with a lag time of say, 1-2 years only which should be feasible for many hydrological services.



**GRDC - STATIONS**  
**STATUS : 30.11.96**



**Figure 1: Global distribution of GRDC gauging stations**

**AVAILABLE DATA IN THE GRDC DATABASE**  
- Stations from all Regions -

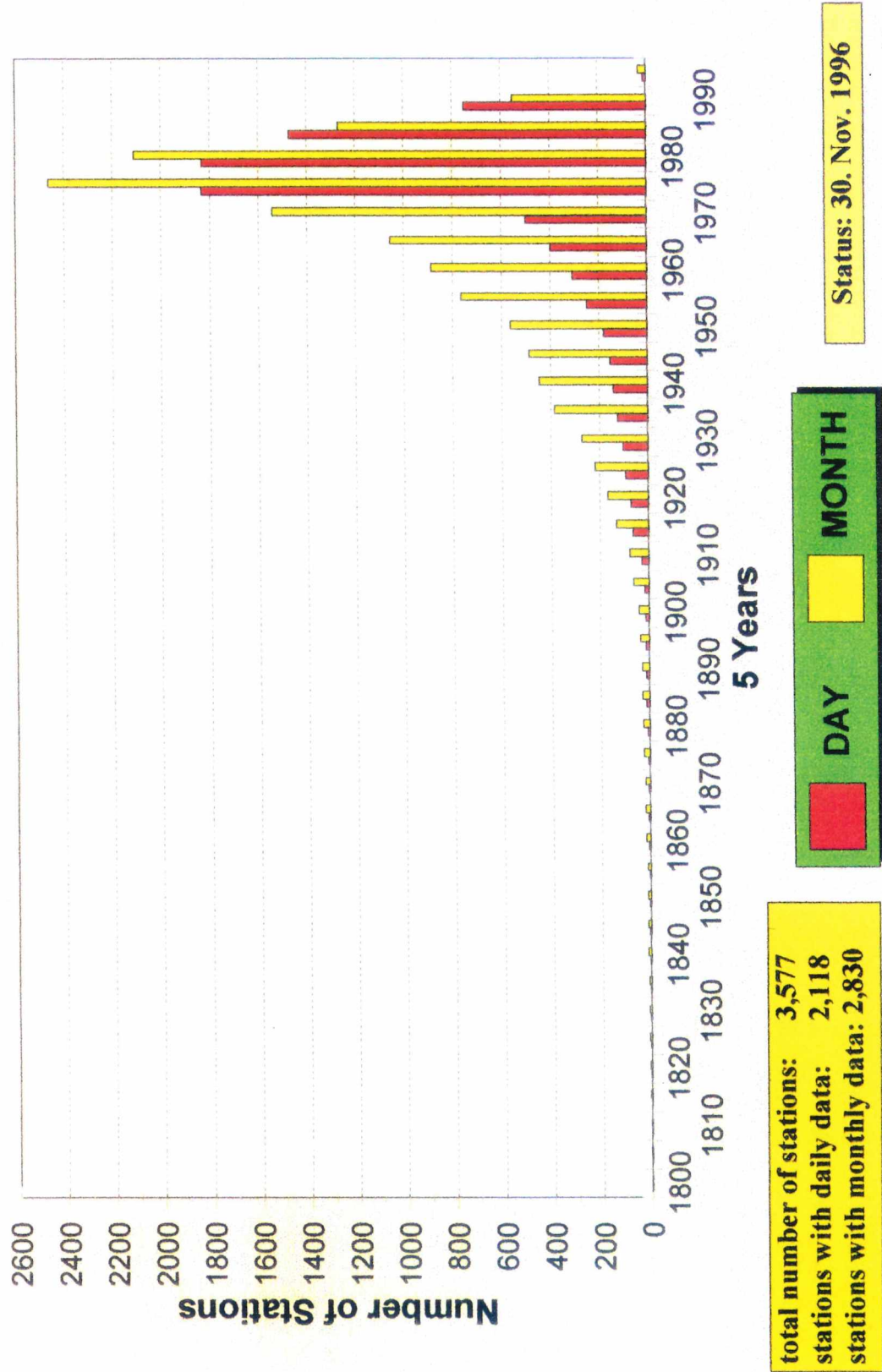


Figure 2: Daily and monthly discharge time-series in GRDC

Status 31. December 1996

3.4 With the evolving World Hydrological Cycle Observing System (WHYCOS) of WMO and the World Bank the situation is expected to improve on a regional basis and will ultimately lead to a global coverage of hydrological stations (see chapter 9.8 below).

3.5 The homogeneity of time-series for a larger number of rivers remains a problem: It is presently not possible to develop a dataset of major rivers of the world with the same reference period. This problem has to be addressed as a matter of priority. It can be solved only by active contributions from data providers who are requested to contribute the data needed in this respect.

## 4. User Services

4.1 A total of 93 requests have been handled at the GRDC; this does not include mere database contacts via Internet (see below). The user development is shown in table 1:

Year	Requests
1992	10
1993	24
1994	61
1995	66
1996	93

Table 1: Development of data requests

4.2 The user profil has been changing over the years. While in earlier years data requests for climate research had been in prominent, there is now a clear shift towards data requests for operational hydrology and regional and global hydrological research.

Topic	Requests received
Hydrometeorological modeling	1
Operational hydrology	22
Regional/global hydrological issues	20
Climate and ocean related research	31
Information/advisory requests	12
Others	5
<b>TOTAL</b>	<b>91</b>

Table 2: User profile of GRDC data 1996

4.3 A detailed listing of data and information requests is documented in annex 2. With the availability of the GRDC catalog on the WMO-server (see chapter 11.3 below), the number of contacts of the GRDC homepage cannot be established at present. The data catalog is now fitted with a new user-friendly surface and can be downloaded from the server.

## 5. Communication with Data Providers and Users

5.1 The listing of data users in annex 2 is important to close the feed-back loop between data providers, the GRDC and data users:

5.1.1 A closed feed-back loop has top priority in the work of the GRDC for three major reasons: First, the transparency of who is using GRDC data for what purpose is an important incentive for data providers to continue the transfer of data to the GRDC. It should be recognized that data transfer requires in many cases (scarce) financial and manpower resources of hydrological services especially in developing countries.

5.1.2 Second, communication between GRDC and data users enables the evolution of a research network with a synergistic effect in planned and on-going projects. Third, the feed-back loop enables data providers to enter in direct dialogue with data users.



5.2 Use of data and research/application networks will attain greater importance in the future and with an increasing number of hydrological services with e-mail and/or Internet access, the exchange of information and synergistic effects with benefits especially for researchers and hydrological services alike gains momentum.

## **6. Feedback on Data Use**

6.1 To obtain an overview of research undertaken with GRDC data, GRDC has launched a "Feed-back" activity, writing to all users who requested GRDC-data in the years 1993/94. The time lag of two years between data delivery and feed back request has been chosen because typically research projects are in the order of 24 months. 56 % of the contacted users responded to the request. A report citing the references of research publications and reprints of the abstracts of publications is currently being printed and will be published as GRDC report No. 14 (February 1997). This exercise will be continued in the future.

## **7. Data Acquisition and Dissemination - Emerging Issues**

7.1 Characteristic of the routine work of the GRDC is to deal with the sensitive issue of acquisition and transfer of hydrological data. In close cooperation with the WMO Secretariat, the GRDC has developed a policy guideline for the acquisition and dissemination of hydrological data which has been reprinted in the Status Report 1995 (GRDC Report No. 11).

7.2 The policy of the GRDC adequately considers the interests of both: Data providers and data users. The data holdings of the GRDC do not infringe on the ownership rights of data transmitted to the GRDC by data providers. In particular, the GRDC does not usually provide value-added and costed services to data users which fall in the domain of national hydrological services.

7.3 In view of the expanding requirements of hydrological data for regional and global research in far-reaching fields such as the changing environment and the impacts of regional and global changes of the hydrological cycle, the exchange of hydrological data must be re-assessed in a forward-looking way. In this respect, the World Weather Watch (WWW) programme of WMO is a good orientation for the global exchange of data and information.

7.4 The Commission of Hydrology (CHy) on its Tenth session (CHy-X, Koblenz, Germany, December 1996) decided to present the Executive Council of WMO and Congress with a draft resolution on the exchange of hydrological data, as a complement to resolution 40 (40-Cg-XII) adopted by Twelfth Congress with regard to the free and unrestricted exchange of meteorological and related data.

7.5 The draft resolution of the CHy-X will be discussed at the Fortyninth session of the Executive Council of WMO. Its decisions will influence the discussion about the policy guidelines for data acquisition and dissemination of the GRDC on its Third meeting of the Steering Committee in June 1997.

7.6 In the view of the GRDC, two major approaches to the exchange of hydrological data can be identified:

7.6.1 The concept that data acquired from public funds in a civil service structure should be freely accessible and unrestricted for the benefit not only to the national population (who paid indirectly for the data acquisition with their tax contribution), but also to the scientific community whose research results are regional or even global in nature so that a trans-national benefit can be achieved.

*Access to and exchange of information is also perceived as a confidence building measure between and across nations.*

7.6.2 The concept that hydrological data are crucial for the socio-economic development of a nation. Therefore it is perceived as politically important that data should be protected from improper use. This could be e.g. in the case of conflicting interests between riparian countries or in a situation where decision-makers suspect that the access to hydrological information would indirectly reveal internally sensitive issues such as power production, industrial development, agricultural production etc.

7.7 Between these contrasting concepts are a number of intermediate concepts. A widespread opinion is however, that a valid interest (such as a research proposal or regional assessment etc.) must be demonstrated which justifies the access to hydrological data.

7.8 The international dissemination of hydrological information does not have a long history and many nations are simply hesitating to allow access to data because potential gains and perceived losses cannot be judged with confidence.

The latter can be largely attributed to an insufficient exchange of national experiences in data exchange and the insufficient recognition of the positive national feed-backs when hydrological data is shared on a regional and global basis.

7.9 National hydrological services (which at present work in a rather isolated manner in most countries) should bear in mind, that international technical assistance and support of national meteorological services has been largely possible, because there is a long history and understanding of the need for the exchange of meteorological data. In parallel therefore, the exchange of hydrological data and information supports the understanding of funding agencies for the need of development and support of national hydrological services.

7.10 The issue of commercialisation of hydrological data with the purpose to earn revenue should not be mixed with the necessary principal consent of governments, that hydrological data should be accessible and exchangeable. The right of governments to choose the manner and extend of data accessibility and exchange is not questioned in this respect but should be transparent to potential data users.

7.11 Four basic models for the transfer of hydrological data may be identified:

7.11.1 Dissemination of data and products to identified users. This would mean a controlled access. From the experience of the GRDC this approach has helped a lot to network researchers who work in related fields and is able to make use of synergistic potentials in research which are less evident with an anonymous access to data and products. This approach also supports the information need of data providers who need feed-back as to who is using the data for which purposes and thus underlines the participatory approach of data providers in information processing. This approach requires "User rules" which regulate the dissemination of data.

- 7.11.2 Dissemination of the data through the Internet: This provides free, unrestricted, uncontrolled access except perhaps for commercial purposes. This model requires least administration efforts and follows the "Freedom of Information" - philosophy of the United States. It also allows the widest possible dissemination of the data and products. There is no need felt to monitor who is using the data in what context and for what purpose. The data providers do not have feed-back on the use of the data. The data may be used without reference of the source and update verification.
- 7.11.3 Dissemination of data for project participants only, until the project has proceeded to a stage where the project participants decide to make data and results public. This approach is close to the data transfer policy of UNESCO's regionally implemented programme Flow Regimes from International and Experimental Network Data (FRIEND). The assembly of global data sets and the principle of free and undiscriminatory access to data are difficult to achieve.
- 7.11.4 Case-to-case decision which datasets are open and which datasets should have a controlled access. This model takes into account that many datasets may already be public domain (e.g. data from historic archives etc.) and others are restricted for use only for defined purposes. The practical implementation of this model in a daily routine is problematic from an administrative point of view.

## **8. Research and Development**

### **8.1 Research and development of GRDC is focussed to:**

- Respond to user requirements and research needs of international programmes and
- Enhance the effectiveness of the database operation and the generation of basic data products for research programmes and other users.

Figure 3 shows the Database Environment in which research and development takes place.



# DATA FLOW AND DATA ACCESS IN THE GRDC DATABASE

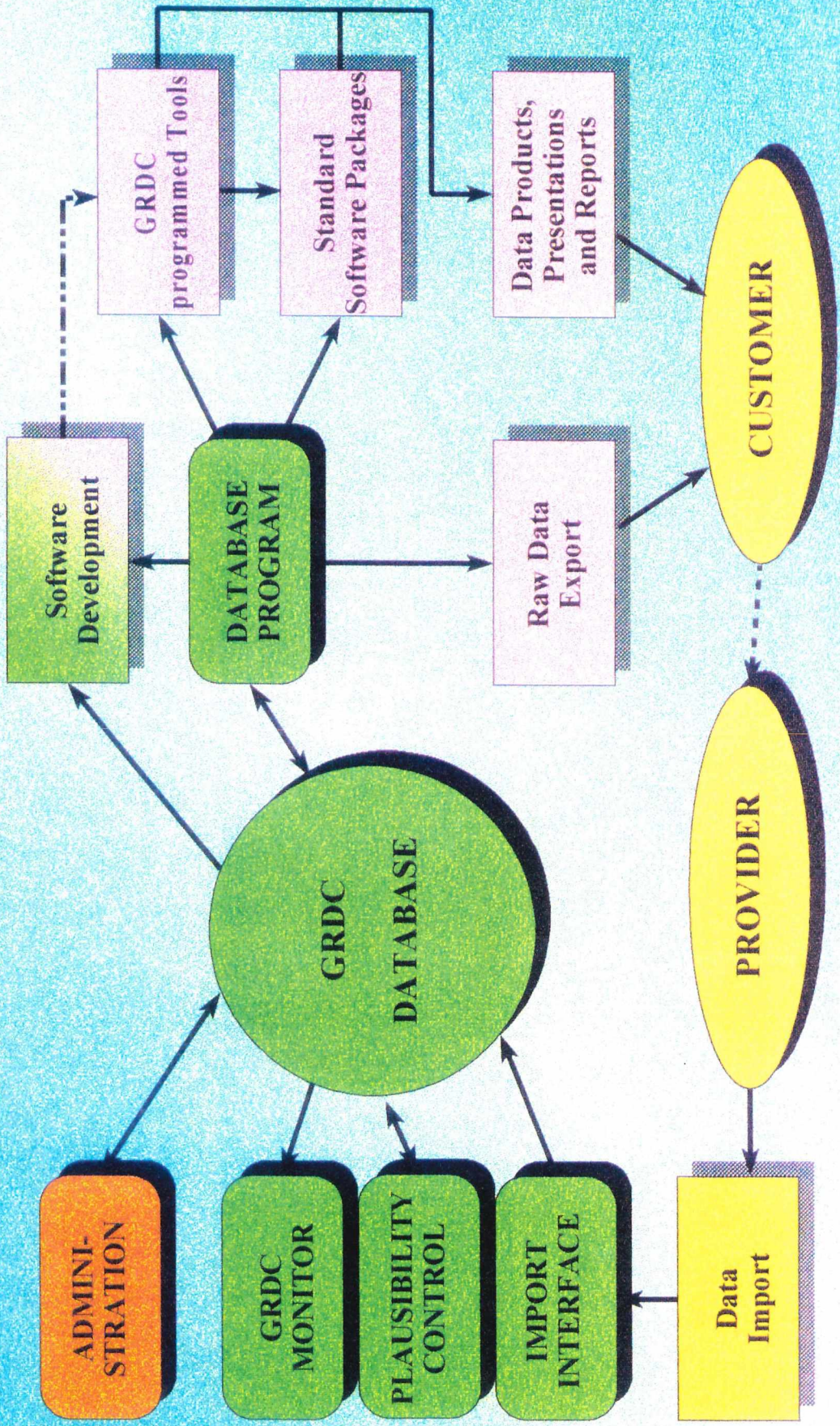


Figure 3: GRDC's database environment

**8.2 Demand for research products:** A continued demand for hydrological research and research products can be observed. For many of these research projects, the GRDC database is a principal source of information and data. From the staffing of the Centre it is evident that the Centre cannot respond fully to the growing demand. On several occasions therefore, the GRDC has solicited scientific support to the GRDC by third-party financed researchers who are invited to work as seconded experts with the GRDC in Koblenz. The concept of this approach is to identify an informal group of researchers with scientific ties to the work of the GRDC who can respond to research needs under the administrative umbrella and technical supervision of the GRDC. Preliminary plans have been made to implement this concept in 1997. *Interested persons or organizations are invited to contact the GRDC for further information.*

### **8.3 Calculation of freshwater fluxes into the oceans**

The calculation of surface water discharges from the continents into the oceans has been published as GRDC report No.10. Using observed discharges, fluxes to the oceans have been calculated for each continent. The fluxes were then differentiated to quantify freshwater fluxes in between latitude bands. The comparison of the computed fluxes with calculations from GCM's and water balance studies demonstrate that complete datasets of observed discharges are necessary to avoid large errors due to the incorrect quantification of the elements of the hydrological cycle.

### **8.4 Development of a grid-based water balance model**

8.4.1 Global gridded datasets of the individual components of the water cycle are needed as long term monthly means as well as monthly time series for the:

- Validation of General Circulation Models of the atmosphere and oceans (AGCM's)
- Assessment of water resources and their possible change of availability with regard to global warming

8.4.2 GRDC supports therefore a study undertaken at the Federal Institute of Hydrology:

*The Development of a GIS-supported Water Balance Model as a Tool for the Validation of Climate Models and Hydrometeorological Datasets.*

8.4.3 In the ongoing study, a grid-based water balance model is proposed following the THORNTHWAITE-MATHER-procedure to calculate long term mean monthly and monthly water balance components on a  $0.5^\circ \times 0.5^\circ$  grid. Discharge data are used in several steps for parameter estimation as well as validation and verification of the water balance components.

8.4.4 The water balance model has so far been applied for a  $0.5^\circ \times 0.5^\circ$  grid covering Central Europe. Model validation was carried out for the rivers Rhine, Weser, Ems, Elbe (Labe) and the German part of the River Danube for the period 1971 - 1980. This work is continued.

## **8.5 Development of the Global Runoff Monitor**

8.5.1 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 programme uses mean monthly discharge values, stored in the GRDC database. In this way it is possible to illustrate regional and global runoff variability e.g. as a slide show for each month of a given year, the comparison of a current year against the long-term mean runoff or the comparison of different time-series.

8.5.2 The tool serves to show regions with relative runoff surplus or deficit for a given comparison period and/or the long-term mean runoff. The tool is operational. The computed runoff relates to the grid size and not to the basin size. Therefore, the grid-oriented runoff information thus provided may not be confused with "gridded runoff" in a scientific sense which needs more input information than the approach used here for comparative purposes. Figure 4 gives an example of a Monitor output.

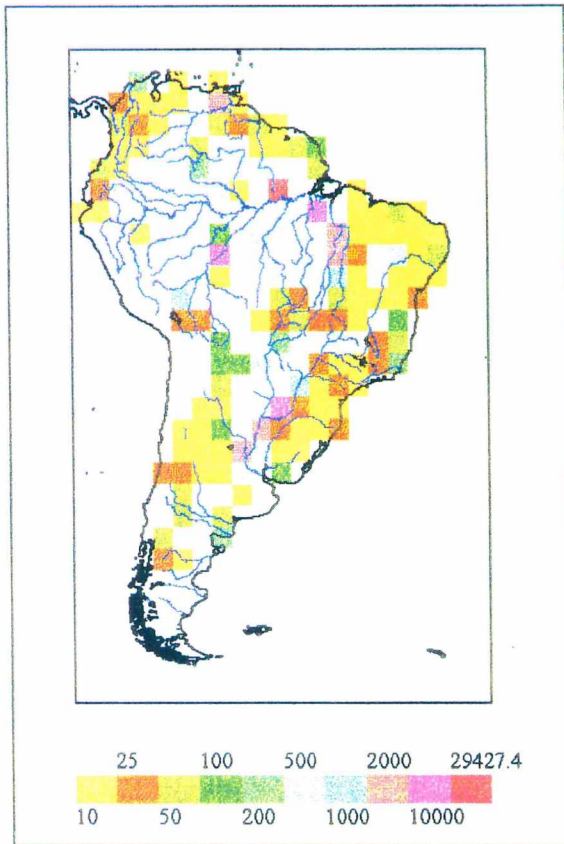
## **8.6 Plausibility check of hydrological data**

With the introduction of a plausibility software tool, GRDC has taken up steps to enhance its capability for quality control of daily and monthly hydrological data. The tool allows the visual and supervised check of hydrographs with overlay-capability to cross-check with hydrographs of selected reference stations. Values can be altered automatically or manually. Statistical routines are available to fill gaps in times series. An electronic protocol is maintained to document all changes made and the methods used. Corrected values are kept in separate tables to prevent the corruption of the original values of the database.

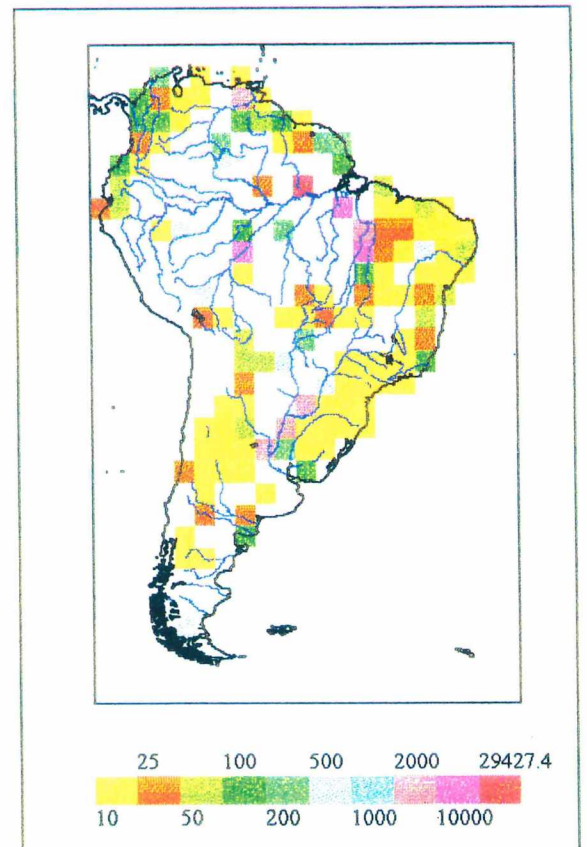
# VALUE OF RUNOFF FROM SOUTH AMERICA IN 1978 DEPENDING ON 435 STATIONS IN A 2.5° GRID



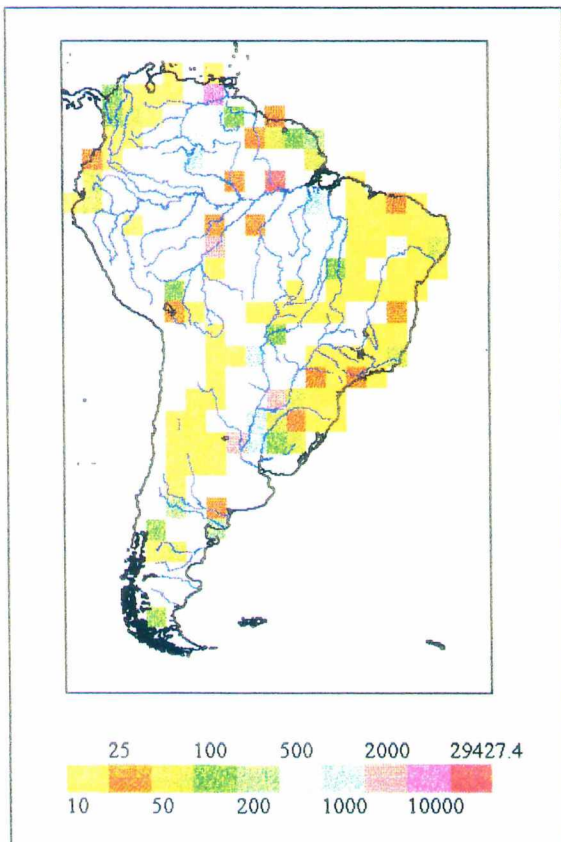
January



April



July



October

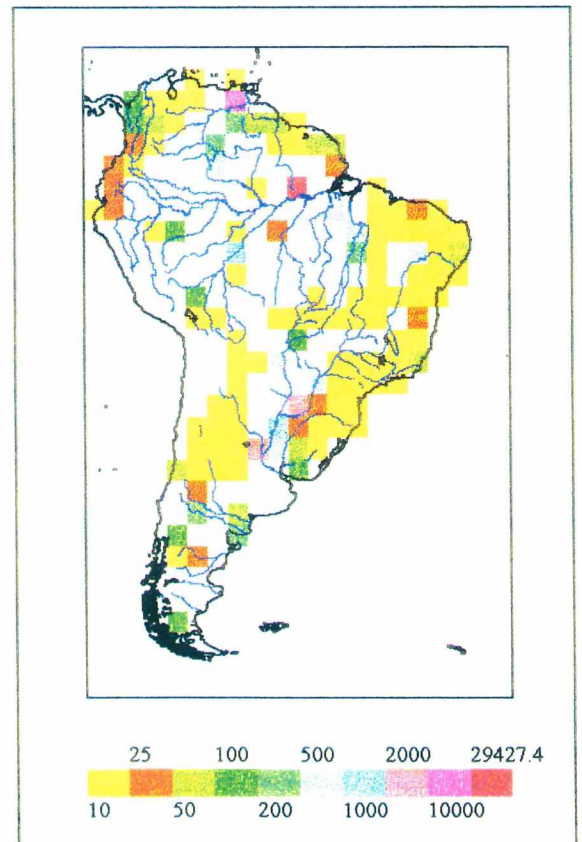
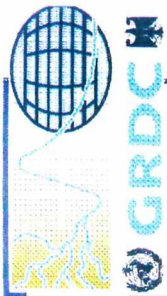


Figure 4: Variability of grid-based runoff over South America





Station: 1112300 Year: 1920 Threshold Value: 50

Station (GRDC No.): 1112300  
 Year to Check: 1920  
 Data Parameter Code: 1  
 Threshold Value (%): 50

Comparison Station (GRDC No.): 1112100  
 Comparison Period: from 1950 to 1980  
 Min. values per month (only for comparison): 1

Graphics:  Normal  Zoom  Adapt  3350.50

Buttons: Check, Curve, Regression, Quit

Generating graphics ... ready.

Station: 1112300 Year: 1920 Threshold Value: 50

Date	Data Value	Characteristics
01/01/1920	0	0
02/01/1920	0	0
03/01/1920	0	0
04/01/1920	0	0
05/01/1920	9.0	1
06/01/1920	112.0	0
07/01/1920	380.0	0
08/01/1920	2000.0	0
09/01/1920	3055.0	0
10/01/1920	1034.0	0
11/01/1920	315.0	0
12/01/1920	190.0	0

Buttons: Add. Curve 1, Add. Curve 2, Replace, Data Seq. 1, Data Seq. 2, Data Seq. 3, Data Seq. 4, Del.

Date: 04/01/1920 Data Value: 112.0

Correction Method:

Manual (no D.S.)  
 Time Interpolation (no D.S.)  
 Single Regression (1 D.S.)  
 Multiple Regression (1-6 D.S.)  
 Copy (1 D.S.)  
 Value Interpolation (2 D.S.)

Buttons: Compute, Update, Hide, Fill

Data Sequences:  stat1,  <none>,  <none>,  <none>,  <none>,  <none>

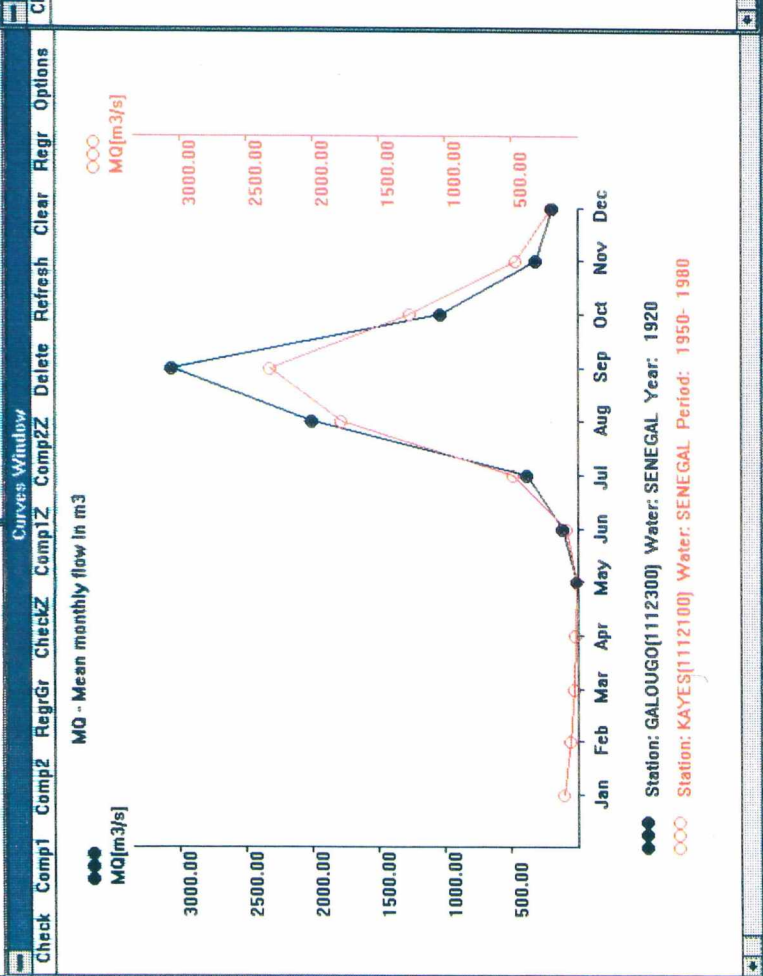
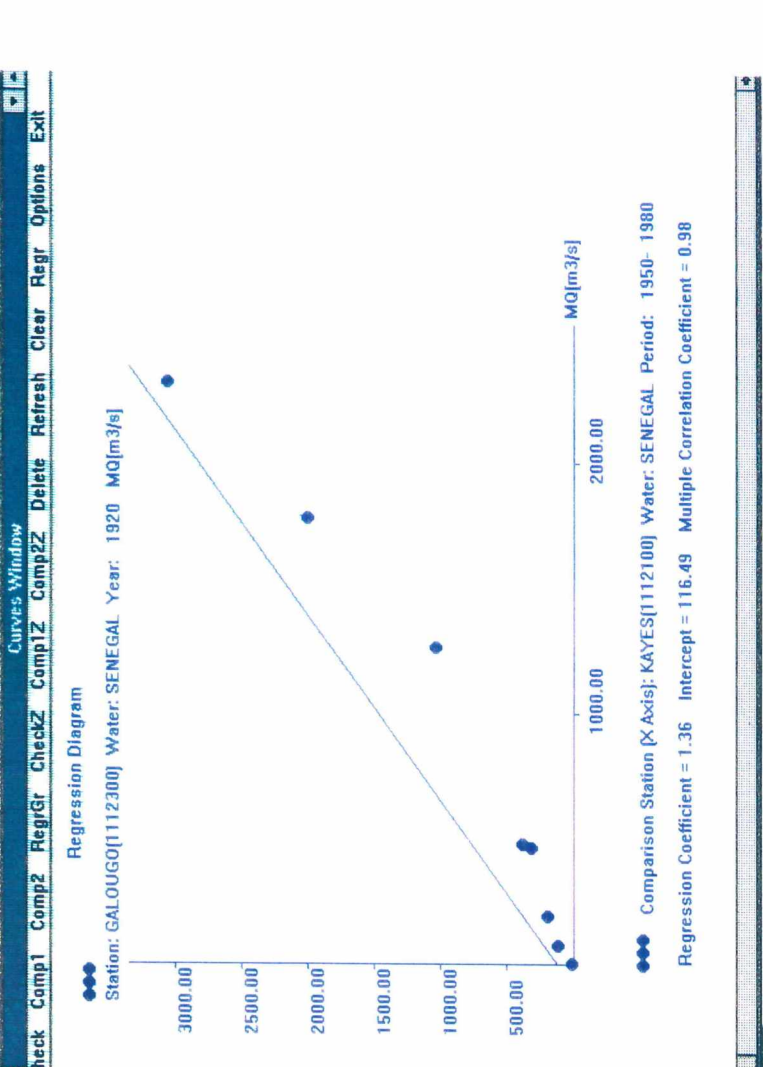
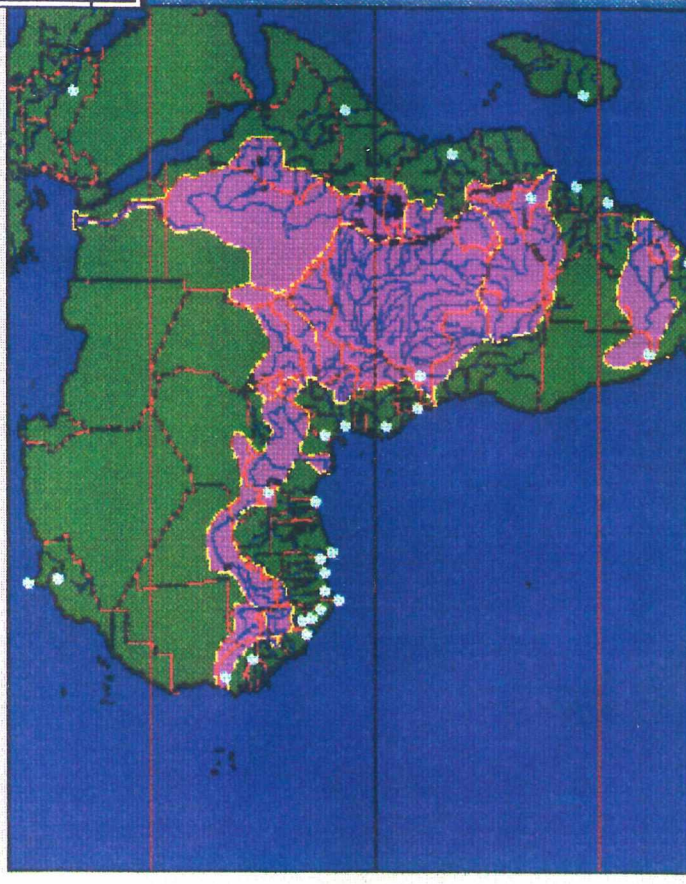


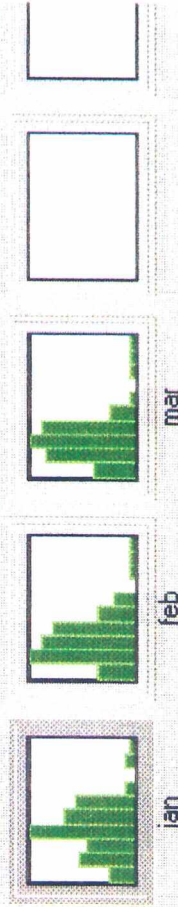
Figure 5: Plausibility check of hydrological data



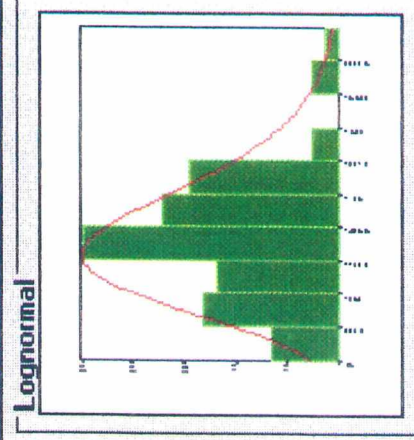
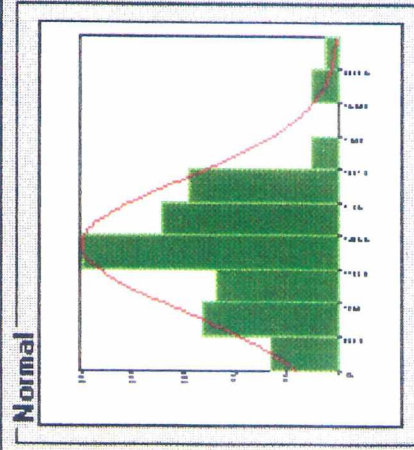
general



Database - C:\RMWIN\GENERAL\DATA.MDB [NILE D			
year	jan	feb	mar
1976	1400	1133	918
1977	1022	748	675
1978	1224	938	713
1979	1325	979	866
1980	863	623	604
1981	1008	774	686
1982	1008	938	706



Frequency Distributions - [jan



Normal Properties

# of pts: 72  
 Mean(p): 1289.653  
 SD(Q): 268.450  
 Skewness: 0.564  
 Kurtosis: 0.937

Max: 2146.000  
 90th: 1568.000  
 75th: 1437.000  
 Median: 1290.000  
 25th: 1131.000  
 10th: 955.000  
 Min: 784.000

Log Normal Pt  
 Log Mean: 7.  
 Log SD(Q): 0.

Close

Table: Nile Dongola

Figure 6: User surface of RAISON for WINDOWS

Users have the option to request the original data or the checked and statistically completed time series of discharge. Figure 5 demonstrates hydrographs for plausibility check.

## **8.7 Statistical tests and time-series analysis**

8.7.1 Statistical analysis for selected stations/data sets can be performed including time-series analysis. GRDC offers a range of statistical tests in line with the WMO WCAP-3 Project: "Analysis of long time series of hydrological data". The statistical programmes are based on the WMO-publication WMO/TD No.224 (1988) and have been updated to interface them with graphical display capabilities.

## **8.8 Geographical Information Systems**

8.8.1 GRDC is using now the updated version of RAISON for WINDOWS. This GIS-based tool is commonly used in UNEP's GEMS-Water programme and offers in its updated version a variety of useful statistical routines together with time-series analysis. Figure 6 shows an example of a RAISON screen popup. RAISON is tailored to the needs of water quality and quantitative hydrology. GRDC has configured RAISON to interface directly with the main database for the creation of data products e.g for the calculation and display of discharge variability.

# **9. Participation in major programmes and projects**

## **9.1 Arctic Climate System Study (ACSYS)**

9.1.1 The compilation of a comprehensive database for the ACSYS project allows the computation of surface water runoff into the Arctic Ocean. In particular, data contributions from the Former Soviet Union through the State Hydrological Institute in St. Petersburg have contributed largely to the development of the ACSYS hydrological database. The database catalog and computations have been published in GRDC report No. 12.

9.1.2 The GRDC has been tasked to continue its data quality check of ACSYS data and will do this first for 35 stations identified as being representative of the surface water flux into the Arctic Ocean.

9.1.3 ACSYS felt the need for the development of a data and management information plan. The GRDC is co-chairing the ACSYS panel on Data Management and Information (ACSYS-DMI) which is in its formation state.

## **9.2 Flow Regimes from International and Experimental Network Data (FRIEND)**

9.2.1 FRIEND operates under the umbrella of the International Hydrological Programme of UNESCO. The primary objective of FRIEND is to improve the understanding of hydrological variability and similarity across time and space to develop hydrological science and practical design methods.

9.2.2 As a result of the cooperation with FRIEND, the GRDC is entrusted with the database generation for the Hindukush Himalaya region. A first data catalog has been presented. Principal collaborators in this programme are the Department of Hydrology and Meteorology of His Majesty's Government of Nepal and the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu.

9.2.3 A planned mission to India and Myanmar in 1997 is expected to yield results inter alia also with respect to the extension of the database and cooperative efforts with respect to the cross-boundary transfer of regional hydrological information.

## **9.3 Global Environment Monitoring System - Water (GEMS/WATER)**

9.3.1 The calculation of freshwater fluxes to the oceans (see 8.3 above) is an important contribution to GEMS/WATER and is collateral to the efforts of the International Geosphere/Biosphere Project (IGBP)/ Land-Ocean Interaction in the Coastal Zones (LOICZ) which concentrates on smaller rivers with a high pollution transport into coastal zones and the research undertaken by Meybeck et al. in the GEMS/GLORI (Global River Input) project.

9.3.2 The GLORI database is static at present but contains valuable information about selected chemical parameters and sediment concentrations all of which makes the database an important link between the efforts of GEMS/WATER and the GRDC.

9.3.3 GRDC proposed a merger of the GLORI database with the GRDC which would ensure long-term professional and institutional support for the data brought into the system.

9.3.4 GRDC has agreed to actively participate in the GEMS/WATER Information Exchange System through the INTERNET. The objective of that system is to enhance the communication and information exchange between GEMS/WATER partners in an efficient, non-hierarchical way.

## **9.4 Global Observing Systems**

9.4.1 GRDC is a main source of hydrological information for Global Observing Systems like the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS).

The Centre therefore participated in an expert meeting on hydrological data needs for Global Observing Systems organized by WMO, April 1996.

9.4.2 GRDC has offered to Global Observing Systems to make available and maintain a global set of 160 gauging stations which have been identified as being representative for the surface freshwater flux from continents into the oceans. These stations are offered as a first modest step to build up a global hydrological monitoring system for global changes. In cooperation with WHYCOS (see chapter 9.8) the system could then be expanded to be useful on regional and sub-regional scale levels.

9.4.3 GRDC is represented in the Steering Committee of GTOS and participates in the working group "Earth Science". The purpose of this working group is to develop a strategy for dealing with land degradation issues.

## **9.5 Global Water Resources Assessment**

The UN Commission for Sustainable Development (CSD) has tasked WMO, UNESCO and UNEP inter alia to execute an assessment of the Global Water Resources. The Centre has participated in two planning sessions of the programme, participated in the strategic considerations to carry out the assessment and contributed data and information. The report has since been produced and submitted to the CSD.

## **9.6 Global Energy and Water Cycle Experiment (GEWEX)/ GEWEX Hydrometeorological Panel (GHP)**

9.6.1 As for GEMS/WATER, the calculation of freshwater fluxes to the oceans is an important contribution to GEWEX and the GEWEX Hydrometeorological Panel (GHP) where GRDC is an ex-officio member.

By monitoring the freshwater fluxes into the oceans GRDC expects that this information can be used for the quantification and validation of ocean-atmosphere exchange processes and the closure of the global hydrological cycle. Representative continental gauging stations have been identified for this purpose.

9.6.2 Through its collaborative activities, GHP has recognized that the GRDC is an important provider of global surface water budget information for the WCRP. However, GHP raised concern that the linkages between the Continental Scale Experiments (CSE's) and the GRDC are not functioning properly. Particularly, the data and information flow from the CSE's to the GRDC needs improvement. GHP agreed on a more formal cooperation between GHP, GRDC and GPCC. Areas of collaboration have been defined to:

- Undertake joint initiatives of mutual benefit,
- Coordinate contributions to the global observing systems (e.g. GCOS and GTOS),
- Develop a near real-time global monitoring network for surface water budget parameters.

More details and specific actions are documented in annex 3.

## **9.7 International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union (INTAS)**

9.7.1 In collaboration with the Institute of Hydrology in Wallingford, United Kingdom, the GRDC assists in the identification of suitable datasets, digitization and processing of the data as an INTAS reference database. The data is also stored in the GRDC database. GRDC in 1996 has provided an interim report on the project.

## **9.8. World Hydrological Cycle Observing System (WHYCOS)**

9.8.1 WHYCOS aims at improving cooperation at river basin, regional and global levels to support the establishment of consistent and reliable water data information systems. WHYCOS is implemented on the basis of regional Hydrological Cycle Observing System components (HYCOS).

9.8.2 Under the technical supervision of the WMO and with the assistance of the World Bank, the European Community and other donors, six HYCOS components are in various stages of planning, development and implementation.

9.8.3 The regional implementation of WHYCOS will make it probably the most important provider of near real-time data for the GRDC, where the GRDC is the principal link between regional HYCOS components to create a truly Global Hydrological Cycle Observing System.

9.8.4 GRDC has been involved in planning meetings as an observer. With the development of operational systems however, the links between WHYCOS and the GRDC are expected to become more intense in terms of advisory services the GRDC can render and the mode and ways of information transfer to the GRDC.

## **10. Regional activities**

Three regional events have been of major importance for the GRDC:

### **10.1 Regional Workshop on the Hydrology of the Hindu Kush-Himalaya (Kathmandu, Nepal, March 1996)**

10.1.1 Main purpose of this workshop has been to establish a FRIEND-type water information system for the eight countries which share the Hindu Kush-Himalaya.

10.1.2 The GRDC was tasked to undertake the data collection for the region and to assist in the establishment of a regional database in close collaboration with the participating countries, the International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal and the Department of Hydrology and Meteorology of Nepal. A first database had been demonstrated to the participants of the workshop.

### **10.2 Conference on Water Resources Assessment and Management in Latin America and the Caribbean (San José, Costa Rica, May 1996)**

10.2.1 The conference was designed to explore strategies to ensure that national water resources agencies play a full part in national and regional development.

GRDC provided a report "Assessment and Monitoring of Fresh Water Resources in South America - A View from the Global Runoff Data Centre (GRDC)" which includes a detailed overview of the availability of hydrological data in Latin America and the Caribbean.

10.2.2 A tangible result of the conference for the GRDC is the active contribution of many countries of the region to update and enlarge the GRDC database.

### **10.3 Regional Workshop on Sustainable Development in the ESCAP region (Bangkok, Thailand, July 1996)**

10.3.1 The meeting reviewed the water resources availability in the region and the demands by various users. Main focus has been the discussion and the agreement on the scope, nature and contents of guidelines on water and sustainable development to be prepared by the Economic and Social Commission for Asia and the Pacific (ESCAP).

10.3.2 GRDC contributed a report: "Sustainable Development of Water Resources in the ESCAP Region -A Discussion Paper by the GRDC". The report includes a detailed overview of the availability of hydrological data in the ESCAP region.

## **11. Reports and Public Relations**

11.1 The report about the Freshwater fluxes from the continents into the oceans (Report No. 10) and the report about the Hydrological Database for Arctic Climate System Study (Report No. 12) received due attention and studies on the subject will continue. A list of available reports is listed in annex 6. Due to the growing demand for these reports, some reports are currently being reprinted.

11.2 In public relation activities, the publication of a color brochure about the aims, objectives and services of the GRDC has been widely distributed. A sample is provided in annex 4. The translation of the brochure in languages other than English is planned. The GRDC can now be contacted by e-mail:

**GRDC@KOBLENZ.BFG.BUND400.DE**



11.3 Current information about the GRDC and linkages to other organizations can be viewed on the GRDC homepage which is serviced by the WMO-server. The GRDC homepage can be accessed under:

**<http://www.wmo.ch/web/homs/grdchome.html>**

Several other WebServers contain GRDC-information; amongst them the University of Kassel and the GEMS-Water Information System of UNEP.

## **12. Country missions and visits to the GRDC**

12.1 A mission to Nepal was executed in June 1996 with the objective to prepare and reach agreement on a Memorandum of Understanding to establish and implement a country component of the GEMS-Water Programme in Nepal and to review a data acquisition monitoring and quality control system which has been established earlier with GRDC's assistance in the Department of Hydrology and Meteorology in Kathmandu. The mission was used to identify a strategy to compile a regional hydrological database envisaged under the FRIEND-type Hindu Kush-Himalaya project mentioned above.

12.2 Japan is a key partner in terms of technology, regional cooperation and financial as well as technical assistance to countries in the region. In this capacity, Japan is represented in the Steering Committee of the GRDC. To become acquainted with the approaches, cooperative strategy and ways of implementation of bi- and multilateral technical and financial assistance, a mission to Japan was conducted in July 1996. One focus of the mission had been to become acquainted with the Japanese approach to regional and global cooperation in hydrology and water resources and the progress so far made in the Asian FRIEND project which is strongly promoted by Japan.

12.2.1 Likewise, the mission was used to inform the visited institutions about the aims, objectives and activities of the GRDC. The mission was concluded with a presentation of the scientific objectives of the GRDC at the prestigious Faculty of Industrial Sciences at the University of Tokyo.

12.3. On various occasions, the Centre welcomed visitors to its facilities. Amongst others, visitors were received from: Canada, Croatia, Germany, India, Japan, Nepal, Netherlands, Nigeria, Papua New-Guinea, Russia, South Africa, United Kingdom, Usbekistan, Zambia.

## **13. GRDC Outreach 1997**

In addition to the routine services of the GRDC some of its activities are highlighted for 1997:

### **13.1 Database technology**

13.1.1 Installation of the database system on a WINDOWS-NT Server. New functionalities will be implemented for database tools.

### **13.2 Database extension**

13.2.1 Intensified direct contacts with hydrological services. Regional priority in 1997 will be Asia. The acquisition of data for selected datasets e.g. the freshwater flux stations and ACSYS will also be prioritized. The objective of this activity is to obtain updated datasets for major rivers of the world with completely overlapping time-series for hydrological applications.

### **13.3 Data Quality checks:**

13.3.1 Plausibility control for data collected for ACSYS and stations identified as key stations for the computation of continental runoff into the oceans

### **13.4 Science and applications:**

13.4.1 Application of the Global Runoff Monitor for regional data sets in Africa, Latin America and Asia as part of GRDC's regional activities. Publications are expected in mid-1997.

13.4.2 Computation of the variability of freshwater fluxes into the oceans from GRDC data in continuation of report No.10 (see annex 6).

13.4.3 Statistical analysis for selected stations/data sets including time-series analysis. GRDC will execute statistical analysis in line with the WMO WCAP-3 Project: "Analysis of long time series of hydrological data" (WMO/TD-No.224 (1988)). Priority is laid on the 160 global flux stations.

13.4.4 Continued support and contributions to relevant programmes and projects as mentioned in chapter 9 above.

## **13.5 WHYCOS**

13.5.1 The operationalization of the information exchange with WHYCOS has a high priority. 1997 is the year where first operational transmission of relevant data will take place from the Mediterranean HYCOS system. Subsets of HYCOS data are expected to be transferred to the GRDC in a near real-time mode. The GRDC has updated its facilities to be in the position to receive, process and add WHYCOS data to its database. Direct links with regional WHYCOS partners are being explored.

## **13.6 Steering Committee**

13.6.1 The Third meeting of the Steering Committee of the GRDC will be held from 25 - 27 June 1997 in Koblenz, Germany. Invitations and a draft agenda have been sent out in October 1996.

## **Annex 1**

### **Station Update 1997**

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	NU	
Australia Northern Terr.	23.01.1996	5710060	Todd River	Wills Terrace	1972-1994	D	U	
	23.01.1996	5712090	Tennant Creek	Old Telegraph Station	1973-1993	D	U	
	23.01.1996	5708110	Victoria River	Coolibah Homestead	1967-1994	D	U	
	23.01.1996	5708130	Dry River	Manbulloo Boundary	1971-1994	D	N	
	23.01.1996	5708140	Green Ant Creek	Tipperary	1970-1994	D	U	
	23.01.1996	5708150	Elizabeth River	Stuart Highway	1990-1994	D	U	
	23.01.1996	5708155	Blackmore River	Tumbing Waters	1961-1993	D	U	
	23.01.1996	5708180	Mary River	El Sherana Road Cross.	1960-1994	D	U	
	23.01.1996	5708190	Upper Lairam River	U/S Eldo Road Cross.	1971-1994	D	N	
	23.01.1996	5709020	Angurugu River	U/S Grootte Eylandt Mission	1969-1994	D	U	
	Australia Tasmania	23.01.1996	5803020	Swanport River	U/S Tasman Highway	1971-1990	D	U
		23.01.1996	5803030	Ansons River	D/S Big Bogy Creek	1979-1994	D	N
		23.01.1996	5803200	Allans Rivulet	U/S Taranna	1983-1994	D	N
23.01.1996		5803520	Florentine River	Above Denwent River	1921-1994	D	N	
23.01.1996		5803040	Nive River	Gowan Brae	1964-1994	D	U	
23.01.1996		5803300	Pine Tree Rivulet	Lake Highway	1969-1994	D	N	
23.01.1996		5803600	Huon River	Above Frying Pan Creek	1948-1994	D	N	
23.01.1996		5803690	Mountain River	D/S Grundys Creek	1968-1994	D	N	
23.01.1996		5803700	Davey River	Below Crossing River	1964-1994	D	N	
23.01.1996		5803680	Peak Rivulet	U/S Esperance River	1975-1994	D	N	
23.01.1996		5803800	Franklin River	Mt. Fincham Track	1953-1995	D	N	
23.01.1996		5803310	Hellyer River	Guildford Junction	1922-1995	D	N	
23.01.1996		5803150	Black River	South Forest	1968-1994	D	N	
23.01.1996		5803140	Duck River	U/S Scotchtown Road	1966-1994	D	U	
23.01.1996		5803160	Flowerdale River	Moorleah	1966-1994	D	N	
23.01.1996		5803170	Seabrook River	U/S Bass Highway	1977-1994	D	N	
23.01.1996		5803190	Forth River	Above Lemonthyme	1962-1994	D	N	
23.01.1996		5803130	Arm River	Above Mersey	1972-1994	D	N	
23.01.1996	5803120	Rubicon River	Tidal Limit	1967-1994	D	N		
23.01.1996	5803180	South Esk River	Above Macquarie River	1956-1994	D	U		
23.01.1996	5803185	Meander River	Below Deloraine Weir	1968-1994	D	N		

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Australia Western Terr.	24.01.1996	5606020	Pallinup River	Bull Crossing	1973-1993	D	U	
	24.01.1996	5606090	Scott River	Brennans Ford	1969-1994	D	U	
	24.01.1996	5606120	Collie River East	James Crossing	1967-1993	D	U	
	24.01.1996	5606145	Serpentine River	Serpentine Falls	1958-1993	D	U	
	24.01.1996	5606140	Williams River	Saddleback Road Bridge	1966-1994	D	U	
	24.01.1996	5606160	Ellen Brook	Railway Parade	1965-1994	D	U	
	24.01.1996	5607010	Arrowsmith River	Robb Crossing	1972-1993	D	U	
	24.01.1996	5607080	Marillana River	Fiat Rock	1967-1993	D	U	
	24.01.1996	5607085	Portland River	Recorder Pool	1966-1991	D	U	
	24.01.1996	5608023	Fitzroy	Dimond Gorge	1962-1993	D	U	
	24.01.1996	5608020	Leopold River	Mount Winifred	1964-1993	D	U	
	24.01.1996	5608030	Fletcher River	Dromedary	1967-1993	D	U	
	24.01.1996	5608060	Morgan River	Moondaalnee	1971-1993	D	U	
	24.01.1996	5608090	Ord River	Coolibah Pocket	1955-1971	D	U	
	24.01.1996	5608095	Ord River	Old Ord Homestead	1970-1993	D	U	
	<b>Estonia</b>	08.02.1996	6972350	Narva	Narva (HEP)	1955-1991	D	N
	<b>Hungary</b>	07.02.1996	6444350	Bodva	Szendro	1991-1991	D	U
07.02.1996		6442450	Danube	Dunaalmas	1991-1991	D	U	
07.02.1996		6442500	Danube (Duna)	Nagymaros	1991-1992	D	U	
07.02.1996		6442600	Danube	Mohacs	1991-1992	D	U	
07.02.1996		6444400	Fehér-Körös	Gyula	1991-1991	D	U	
07.02.1996		6442300	Kapos	Kurd	1991-1991	D	U	
07.02.1996		6444500	Kraszna	Agerdomajor	1991-1991	D	U	
07.02.1996		6444110	Maros	Mako	1991-1991	D	U	
07.02.1996		6442050	Raba	Szentgotthard	1991-1991	D	U	
07.02.1996		6444380	Sajo	Felsoezscola	1991-1991	D	U	
07.02.1996		6444100	Tisza	Szeged	1991-1992	D	U	
07.02.1996		6444200	Tisza	Szolnok	1991-1991	D	U	
07.02.1996		6444310	Tisza	Tiszapalkonya	1991-1991	D	U	
07.02.1996	6444250	Zagyva	Jasztelek	1991-1991	D	U		

Table: 2

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Spain	02.02.1996	6211100	Mino	Orense	1914-1990	M	N
	02.02.1996	6211500	Sil	San Pedro	1914-1990	M	N
	02.02.1996	6212420	Duero	Puente Pino	1943-1991	M	N
	02.02.1996	6212510	Esla	Breto	1930-1991	M	N
	02.02.1996	6213700	Tajo	Talavera	1912-1988	M	N
	02.02.1996	6213600	Tajo	Alcantara	1915-1985	M	N
	02.02.1996	6216500	Guadiana	Puente de Palmas	1913-1992	M	N
	02.02.1996	6217110	Guadalquivir	Cantillana	1912-1992	M	N
	02.02.1996	6226300	Ebro	Castejon	1929-1984	M	N
	02.02.1996	6226600	Segre	Seros	1925-1984	M	N
	02.02.1996	6226650	Cinca	Fraga	1929-1984	M	N
	02.02.1996	6210100	Nervion	Echevarri	1978-1989	M	N
	02.02.1996	6213750	Jarama	Aranjuez (P. Largo)	1969-1992	M	N
	02.02.1996	6217120	Guadalquivir	Sevilla	1950-1964	M	N
	02.02.1996	6217130	Guadalquivir	La Presa	1912-1990	M	N
	02.02.1996	6227810	Llobregat	Sant Joan Despi	1968-1989	M	N
	02.02.1996	6227850	Besos	Sifon N.A.	1968-1989	M	N
Taiwan	08.02.1996	2385500	Yufeng	Dahan	1964-1989	M	N
	08.02.1996	2385600	Fushan	Baishi	1964-1989	M	N
	08.02.1996	2385650	Shanjiao	Nanaobai	1964-1989	M	N
	08.02.1996	2385300	Lushui	Liwu	1964-1989	M	N
	08.02.1996	2385750	Nanhu	Nanhu	1964-1989	M	N
	08.02.1996	2385700	Huanshanhe	Dajia	1964-1989	M	N
	08.02.1996	2385800	Sijilang	Sijilong	1964-1989	M	N
	08.02.1996	2385850	Qijawan	Yikawan	1964-1989	M	N
	08.02.1996	2385900	Tongtou	Qishui	1964-1989	M	N
	08.02.1996	2385950	Lishan	Fengping	1964-1989	M	N
	08.02.1996	2385550	Yutian	Houqu	1964-1989	M	N
	08.02.1996	2385200	Xinfadaqiao	Laonong	1964-1989	M	N
	08.02.1996	2385400	Sandimen	Ailiao	1964-1989	M	N
	16.07.1996	2385510	Tan-Shui	Yun-Feng	1957-1993	M	N
	16.07.1996	2385511	Tan-Shui	Fu-Shan	1953-1993	M	N
	16.07.1996	2385520	Tou-Chien	Nei-Wan	1971-1993	M	N
	16.07.1996	2385620	Nan-Ao	Shan-Chiao	1954-1993	M	N
16.07.1996	2385630	Lan Yang	Ku-Lu	1974-1993	M	N	

Table: 3

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Taiwan	16.07.1996	2385420	Li-Chia	Li-Chia	1962-1993	M	N
	16.07.1996	2385430	Pei-Nan Chi	Yen-Ping	1956-1993	M	N
	16.07.1996	2385960	Hsiu-Ku-Luan	Li-Shan	1959-1993	M	N
	16.07.1996	2385760	Li-Wu	Lu-Shui	1960-1993	M	N
	16.07.1996	2385350	Hou-Lung	Ta-Lu-Keng	1956-1993	M	N
	16.07.1996	2385360	Ta-An	Cho-Lan	1973-1993	M	N
	16.07.1996	2385765	Ta-Chia	Nan-Hu	1959-1993	M	N
	16.07.1996	2385766	Ta-Chia	Huan-Shan Junc.	1959-1993	M	N
	16.07.1996	2385767	Ta-Chia	Szu-Chi-Lang	1959-1993	M	N
	16.07.1996	2385768	Ta-Chia	Chi-Chia-Wan	1967-1993	M	N
	16.07.1996	2385150	Cho-Shui	Tung-Tou	1956-1993	M	N
	16.07.1996	2385151	Cho-Shui	Ying-Sheh	1959-1981	M	N
	16.07.1996	2385160	Po-Tzu	Niu-Chou-Chi Bridge	1973-1993	M	N
	16.07.1996	2385250	Pa-Chang	Chu-Kou	1967-1993	M	N
	16.07.1996	2385251	Pa-Chang	Chun-Huei	1970-1993	M	N
	16.07.1996	2385101	Chi-Shui	Shin-Ying	1961-1993	M	N
	16.07.1996	2385560	Tseng-Wen	Yu-Tien	1959-1993	M	N
16.07.1996	2385570	Yen-Shui	Hsin-Shih	1973-1993	M	N	
16.07.1996	2385210	Kao-Ping	Lao-Nung	1959-1993	M	N	
16.07.1996	2385460	Lin-Pien	Hsin-Pei	1962-1993	M	N	
French Guyana	01.07.1996	3512400	Maroni	Langa Tabiki	1951-1996	D	N
	01.07.1996	3514800	Oyopock	Maripa	1953-1996	D	U
New Zealand	10.07.1996	5864110	Whakatane	Whakatane	1973-1993	M	N
	10.07.1996	5865700	Hutt River	Kaitoke	1968-1994	M	U
	10.07.1996	5865701	Hutt River	Birchville	1971-1994	M	N
	10.07.1996	5864121	Rangitikei	Mangaweka	1970-1994	M	N
	10.07.1996	5865650	Mangawhero	Ore Ore	1963-1994	M	N
	10.07.1996	5865550	Onganue	Taringamutu	1963-1994	M	N
	10.07.1996	5865601	Wanganui	Te Porere	1967-1994	M	N
	10.07.1996	5865800	Punehu	Pihama	1970-1994	M	N
	10.07.1996	5865810	Manganui	SH3	1973-1994	M	N
	10.07.1996	5870100	Taylor	Borough Weir	1962-1984	M	N
	10.07.1996	5870110	Wairau	Tuamarina	1961-1983	M	N
	10.07.1996	5870200	Waihopai	Craiglochart	1961-1983	M	N
	10.07.1996	5870300	Branch	Recorder	1959-1979	M	N
	10.07.1996	5867600	Clarence	Jollies	1962-1994	M	N
	10.07.1996	5867100	Selwyn River	Whitecliffs	1965-1994	M	U
	10.07.1996	5868200	Ahuriri	STH Diadem	1964-1994	M	N
	10.07.1996	5868300	Mataura	Gore HBR	1961-1993	M	N
10.07.1996	5870700	Gowan	Lake Rotoroa	1935-1959	M	N	

Table: 4



**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Germany	14.08.1996	6335020	Rhein	Rees	1814-1995	D	U
	21.11.1996	6335060	Rhein	Koeln	1930-1992	D	U
	21.11.1996	6335200	Rhein	Maxau	1930-1992	D	N
	21.11.1996	6335400	Rhein	Rheinfelden	1930-1992	D	N
	21.11.1996	6335600	Neckar	Rockenau	1950-1992	D	N
	21.11.1996	6338100	Ems	Versen	1940-1993	D	U
	21.11.1996	6340110	Labe (Elbe)	Neu-Darchau	1925-1990	D	U
Nicaragua	11.09.1996	4769200	Coco	Guanas	1958-1995	D/M	U
	11.09.1996	4769250	Coco	Corriente Lira	1969-1981	D/M	U
	11.09.1996	4772040	Grande de Matagalpa	Dario	1952-1993	D/M	U
	11.09.1996	4772210	Grande de Matagalpa	Paiwas	1963-1974	D/M	U
	11.09.1996	4772050	Grande de Matagalpa	Sebaco	1969-1994	D/M	U
	11.09.1996	4772300	Grande de Matagalpa	San Pedro del Norte	1971-1982	D/M	U
	11.09.1996	4772250	Grande de Matagalpa	Copolar	1973-1984	D/M	U
	11.09.1996	4772140	Tuma	Yasica	1952-1994	D/M	U
	11.09.1996	4772150	Tuma	Masapa	1972-1983	D/M	U
	11.09.1996	4771050	Villanueva	Puente	1970-1985	D/M	U
	11.09.1996	4772610	Mico	Muelle de los Bueyes	1971-1988	D/M	U
	11.09.1996	4771210	Tamarindo	Tamarindo	1954-1996	D/M	U
	11.09.1996	4773800	San Juan	El Castillo	1985-1989	D/M	U
	11.09.1996	4773050	Viejo	La Lima	1962-1994	D/M	U
	11.09.1996	4771800	Brito	Miramar	1968-1995	D/M	U
Lithuania	12.09.1996	6974150	Neman	Smalininkai	1985-1993	M	U
Poland	12.09.1996	6441107	Rega	Trzebiatow	1988-1990	M	U
	12.09.1996	6457010	Odra	Gozdowice	1988-1994	M	U
	12.09.1996	6457707	Bobr	Zagan	1951-1990	M	U
	12.09.1996	6457800	Warta	Gorzow	1988-1994	M	U
	12.09.1996	6457956	Prosna	Boguslaw	1951-1990	M	U
	12.09.1996	6458010	Wisla	Tczew	1988-1994	M	U
	12.09.1996	6458203	Skawa	Wadowice	1951-1990	M	U
	12.09.1996	6458406	Dunajec	Nowy Sacz	1988-1990	M	U
	12.09.1996	6458450	Wisla	Szczucin	1987-1990	M	U
	12.09.1996	6458500	Wisla	Warszawa	1985-1990	M	U
	12.09.1996	6458713	Wieprz	Krasnystaw	1951-1990	M	U

Table: 5

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Poland	12.09.1996	6458753	Pilica	Przedborz	1951-1990	M	U	
	12.09.1996	6458805	Narew	Suraz	1951-1990	M	U	
	12.09.1996	6458863	Pisa	Ptaki	1951-1990	M	U	
	12.09.1996	6458924	Liwiec	Lochow	1951-1990	M	U	
	12.09.1996	6458810	Narew	Ostroleka	1951-1994	M	N	
	12.09.1996	6457200	Notec	Nowe Drezdenko	1951-1990	M	N	
	12.09.1996	6457100	Odra	Slubice	1951-1990	M	N	
United Kingdom	17.09.1996	6604610	Tay	Ballathie	1952-1996	D/M	U	
	17.09.1996	6604690	Tweed	Boleside	1961-1996	D/M	U	
	17.09.1996	6605510	Leven	Levenbridge	1959-1996	D/M	U	
	17.09.1996	6605540	Wharfe	Addingham	1974-1996	D/M	U	
	17.09.1996	6606300	Ise Brook	Harrowden Old Mill	1943-1996	D/M	U	
	17.09.1996	6607600	Thames	Eynsham	1951-1996	D/M	U	
	17.09.1996	6607800	Darent	Hawley	1963-1996	D/M	U	
	17.09.1996	6607500	Stour	Throop Mill	1973-1996	D/M	U	
	17.09.1996	6607200	Exe	Thorverton	1956-1996	D/M	U	
	17.09.1996	6608500	Wye	Ddol Farm	1937-1996	D/M	U	
	17.09.1996	6605200	Inwell	Adelphi Weir	1949-1996	D/M	U	
	17.09.1996	6604500	Annan	Brydekirk	1967-1995	D/M	U	
	17.09.1996	6604100	Ewe	Poolewe	1970-1996	D/M	U	
	17.09.1996	6603500	Lagan	Newforge	1972-1995	D/M	U	
	17.09.1996	6604605	Tummel	Pitlochry	1973-1995	D/M	N	
	17.09.1996	6607400	Mimram	Panshanger Park	1952-1996	D/M	N	
	Brazil	18.11.1996	3629000	Amazonas	Obidos	1968-1996	D	U
30.09.1996		3629000	Amazonas	Obidos	1928-1947	M	U	
30.09.1996		3623100	Amazonas (Solimoes)	Sao Paulo de Olivenca	1973-1993	M	N	
30.09.1996		3625100	Rio Acre	Brasileia	1982-1993	M	N	
30.09.1996		3625150	Rio Acre	Rio Branco	1967-1993	M	N	
30.09.1996		3627600	Rio Aripuana	Humboldt	1979-1984	M	U	
30.09.1996		3627610	Rio Aripuana	Bom Destino	1982-1985	M	N	
30.09.1996		3627650	Rio Aripuana	Prairinha (Velha)	1974-1984	M	N	
30.09.1996		3618500	Rio Branco	Caracari	1967-1992	M	N	
30.09.1996		3618711	Rio Cotingo	Maloca do Contao	1975-1992	M	N	
30.09.1996	3618710	Rio Cotingo	Fazenda Bandeira Branca	1970-1992	M	N		
30.09.1996	3630900	Rio Culluene	Passagem da BR-309	1980-1996	M	U		

Table: 6

GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Brazil	30.09.1996	3630219	Rio Curua	Cachoeira da Luz	1981-1986	M	N
	30.09.1996	3630215	Rio Curua	Boca do Inferno	1973-1993	M	N
	30.09.1996	3630210	Rio Curua	Cajueiro	1975-1995	M	N
	30.09.1996	3627810	Rio Guapore	Pedras Negras	1980-1988	M	N
	30.09.1996	3620100	Rio Ica	Ipiranga Velho	1979-1993	M	N
	30.09.1996	3630120	Rio Iriri	Pedra do O	1976-1995	M	N
	30.09.1996	3630150	Rio Iriri	Laranjeiras	1976-1989	M	N
	30.09.1996	3622800	Rio Itacuai	Ladario	1980-1993	M	U
	30.09.1996	3622801	Rio Itui	Seringal do Itui	1980-1992	M	N
	30.09.1996	3629205	Rio Jamanxim	Jardim do Ouro	1987-1990	M	N
	30.09.1996	3629204	Rio Jamanxim	Jamanxim	1986-1991	M	N
	30.09.1996	3629210	Rio Jamanxim	Novo Progresso	1987-1990	M	N
	30.09.1996	3621400	Rio Japura	Vila Bittencourt	1980-1993	M	N
	30.09.1996	3621200	Rio Japura	Acanai	1973-1993	M	N
	30.09.1996	3631100	Rio Jari	Sao Francisco	1968-1986	M	N
	30.09.1996	3622400	Rio Javari	Estirao do Repouso	1980-1993	M	N
	30.09.1996	3627410	Rio Jiparana	Sitio Bela Vista	1984-1988	M	N
	30.09.1996	3627402	Rio Jiparana	Tabajara	1977-1988	M	N
	30.09.1996	3627408	Rio Jiparana	Jiparana	1977-1991	M	N
	30.09.1996	3624180	Rio Jurua	Taumaturgo	1981-1993	M	N
	30.09.1996	3624190	Rio Jurua	Foz do Breu	1982-1993	M	N
	30.09.1996	3624120	Rio Jurua	Gaviao	1972-1993	M	N
	30.09.1996	3624160	Rio Jurua	Cruzeiro do Sul	1967-1993	M	N
	30.09.1996	3629380	Rio Juruena	Fontanilhas	1978-1995	M	N
	30.09.1996	3629390	Rio Juruena	Foz do Juruena	1986-1994	M	N
	30.09.1996	3627050	Rio Madeira	Porto Velho-Montante	1971-1974	M	U
	30.09.1996	3627030	Rio Madeira	Manicore	1967-1993	M	N
	30.09.1996	3627040	Rio Madeira	Porto Velho	1970-1985	M	N
	30.09.1996	3630300	Rio Maicuru	Arapari	1972-1995	M	N
	30.09.1996	3628500	Rio Mapuera	Estirao da Angelica	1970-1984	M	N
	30.09.1996	3624100	Rio Moa	Serra do Moa	1973-1993	M	U
	30.09.1996	3625500	Rio Mucumim	Cristo	1975-1991	M	U
	30.09.1996	3618090	Rio Negro	Cucui	1980-1992	M	N
	30.09.1996	3631215	Rio Paru de Este	Apalai	1980-1995	M	N
	30.09.1996	3631210	Rio Paru de Este	Fazenda Paquira	1973-1989	M	N
	30.09.1996	3625200	Rio Paulini	Fazenda Borangaba	1984-1993	M	N
	30.09.1996	3625340	Rio Purus	Labrea	1967-1993	M	N

Table: 7

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Brazil	30.09.1996	3625370	Rio Purus	Seingal da Caridade	1967-1993	M	N	
	30.09.1996	3625310	Rio Purus	Arumã-Jusante	1975-1993	M	N	
	30.09.1996	3625380	Rio Purus	Manceel Urbano	1981-1993	M	N	
	30.09.1996	3627550	Rio Roosevelt	Concisa	1976-1984	M	N	
	30.09.1996	3629790	Rio Sao Manoel	Tres Marias	1975-1995	M	N	
	30.09.1996	3627700	Rio Sucunduri	Santarem-Sucunduri	1973-1984	M	U	
	30.09.1996	3629150	Rio Tapajos	Fortaleza	1983-1995	M	N	
	30.09.1996	3629180	Rio Tapajos	Barra do Sao Manuel-Jusante	1975-1994	M	N	
	30.09.1996	3624300	Rio Tarauaca	Envira	1978-1993	M	U	
	30.09.1996	3629770	Rio Teles Pires	Santa Rosa	1982-1995	M	N	
	30.09.1996	3618950	Rio Uaupes	Uaracu	1977-1992	M	N	
	30.09.1996	3629700	Rio Verde	Lucas	1985-1994	M	U	
	30.09.1996	3629900	Rio do Sanguie	Fazenda Tombador	1984-1995	M	N	
	30.09.1996	3630050	Xingu	Altamira	1971-1995	M	U	
	Brazil	09.10.1996	3650525	Rio Acarau	Sobral	1973-1990	M	U
		09.10.1996	3650526	Rio Acarau	Fazenda Cajazeiras	1962-1993	M	N
		09.10.1996	3650010	Rio Amapari	Sierra do Navio	1972-1994	M	U
09.10.1996		3650710	Rio Apodi	Pedra de Abelhas	1964-1991	M	U	
09.10.1996		3650740	Rio Apodi	Pau dos Ferros	1964-1993	M	U	
09.10.1996		3650520	Rio Aracatiacu	Amontada	1970-1994	M	U	
09.10.1996		3650630	Rio Banabuiu	Senador Pompeu	1912-1993	M	U	
09.10.1996		3650634	Rio Banabuiu	Morada Nova II	1961-1992	M	N	
09.10.1996		3650640	Rio Basioes	Sitio Poco Dantas	1967-1981	M	U	
09.10.1996		3650925	Rio Capibaribe	Limoeira	1956-1982	M	U	
09.10.1996		3650928	Rio Capibaribe	Sao Lourenco da Mata	1956-1986	M	N	
09.10.1996		3650924	Rio Capibaribe	Salgadinho	1962-1977	M	N	
09.10.1996		3650920	Rio Capibaribe	Toritama	1966-1985	M	U	
09.10.1996		3650150	Rio Capim	Badajos	1971-1987	M	N	
09.10.1996		3650811	Rio Ceara-Mirim	Ceara-Mirim II	1969-1985	M	N	
09.10.1996		3650370	Rio Codozinho	Fazenda Sobral	1972-1988	M	U	
09.10.1996		3650340	Rio Corda	Rio Corda	1972-1979	M	U	
09.10.1996		3650341	Rio Corda	Rio Corda II	1984-1992	M	N	
09.10.1996		3650511	Rio Coreau	Granja II	1969-1993	M	N	
09.10.1996		3650360	Rio Correntes	Mendes	1970-1992	M	U	
09.10.1996	3650840	Rio Curimatau	Pedro Velho	1927-1985	M	U		
09.10.1996	3650540	Rio Curu	Santo Luiz do Curu	1966-1993	M	U		

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Brazil	09.10.1996	3650410	Rio das Balsas	Balsas	1965-1993	M	U
	09.10.1996	3650720	Rio do Carmo	Upanema	1975-1987	M	U
	09.10.1996	3650320	Rio Grajau	Grajau	1965-1982	M	U
	09.10.1996	3650321	Rio Grajau	Grajau II	1984-1992	M	N
	09.10.1996	3650530	Rio Groairas	Groairas	1968-1994	M	U
	09.10.1996	3650202	Rio Gurupi	Alto Bonito	1972-1986	M	N
	09.10.1996	3650205	Rio Gurupi	Fazenda Rural Zebu	1981-1985	M	N
	09.10.1996	3650930	Rio Ipojuca	Caruaru	1973-1985	M	U
	09.10.1996	3650460	Rio Itam	Santa Cruz do Piaui	1963-1992	M	U
	09.10.1996	3650350	Rio Itapecuru	Mirador	1968-1989	M	U
	09.10.1996	3650355	Rio Itapecuru	Caxias	1963-1991	M	N
	09.10.1996	3650359	Rio Itapecuru	Cantanhede	1968-1992	M	N
	09.10.1996	3650645	Rio Jaguaribe	Iguatu	1912-1992	M	U
	09.10.1996	3650649	Rio Jaguaribe	Peixe Gordo	1961-1983	M	N
	09.10.1996	3650610	Rio Jaguaribe	Arneiroz	1910-1981	M	U
	09.10.1996	3650475	Rio Longa	Esperantina	1963-1992	M	U
	09.10.1996	3650477	Rio Longa	Tinguis	1964-1992	M	N
	09.10.1996	3650860	Rio Marmanguape	Ponte de Leitao	1970-1985	M	U
	09.10.1996	3650335	Rio Mearim	Bacabal	1975-1992	M	N
	09.10.1996	3650330	Rio Mearim	Fazenda Remanso	1979-1992	M	U
	09.10.1996	3650970	Rio Mundau	Fazenda Boa Fortuna	1974-1984	M	U
	09.10.1996	3650380	Rio Munim	Munim	1972-1992	M	U
	09.10.1996	3650385	Rio Munim	Nina Rodrigues	1963-1992	M	N
	09.10.1996	3650885	Rio Paraiba	Ponte da Batalha	1970-1985	M	N
	09.10.1996	3650881	Rio Paraiba	Caraubas	1973-1985	M	N
	09.10.1996	3650488	Rio Paranaiba	Fazenda Paracati	1968-1993	M	N
	09.10.1996	3650480	Rio Parnaiba	Porto Formosa	1963-1981	M	U
	09.10.1996	3650481	Rio Parnaiba	Luzilandia	1982-1993	M	N
	09.10.1996	3650485	Rio Parnaiba	Floriano	1981-1983	M	N
	09.10.1996	3650730	Rio Pianco	Pianco	1963-1988	M	U
	09.10.1996	3650455	Rio Piaui	Sao Francisco do Piaui	1985-1993	M	N
	09.10.1996	3650280	Rio Pindare	Vale do Pindare	1981-1992	M	N
	09.10.1996	3650285	Rio Pindare	Pindare Mirim	1972-1992	M	N
	09.10.1996	3650755	Rio Piranhas	Varzea Grande	1962-1988	M	N
	09.10.1996	3650750	Rio Piranhas	Jardim de Piranhas	1962-1986	M	U
	09.10.1996	3650690	Rio Piranji	Cristais	1970-1994	M	U
	09.10.1996	3650220	Rio Piria	Sete Ilhas	1977-1986	M	U

Table: 9

GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Brazil	09.10.1996	3650221	Rio Piria	Taranua-Ponte	1975-1986	M	N	
	09.10.1996	3650820	Rio Potenji	Telha	1972-1985	M	U	
	09.10.1996	3650470	Rio Poti	Fazenda Cantinho	1963-1990	M	U	
	09.10.1996	3650471	Rio Poti	Fazenda Boa Esperanca	1984-1992	M	N	
	09.10.1996	3650745	Rio Salgado	Ico	1957-1992	M	N	
	09.10.1996	3650545	Rio Sao Goncalo	Sitios Novos	1962-1993	M	U	
	09.10.1996	3650875	Rio Taperoa	Poco de Pedras	1970-1985	M	U	
	09.10.1996	3650912	Rio Tracunhaem	Engenho Itapissirica	1973-1984	M	N	
	09.10.1996	3650910	Rio Tracunhaem	Nazare da Mata	1967-1984	M	U	
	09.10.1996	3650270	Rio Turiacu	Alto Turi	1972-1986	M	N	
	09.10.1996	3650940	Rio Una	Palmares	1973-1984	M	U	
	09.10.1996	3650941	Rio Una	Capivara	1977-1984	M	N	
	Brazil	10.10.1996	3649414	Rio Araguaia	Fazenda Telesforo	1969-1987	M	N
		10.10.1996	3649412	Rio Araguaia	Araguaiana	1970-1986	M	N
10.10.1996		3649416	Rio Araguaia	Conceicao do Araguaia	1969-1987	M	N	
10.10.1996		3649419	Rio Araguaia	Araguatins	1974-1987	M	N	
10.10.1996		3649418	Rio Araguaia	Xambioa	1969-1987	M	N	
10.10.1996		3649020	Rio Bagagem	Porto Rio Bagagem	1970-1984	M	U	
10.10.1996		3649430	Rio Barreiro	General Carneiro	1967-1980	M	U	
10.10.1996		3649450	Rio Caiapo	Sao Ferreira	1974-1987	M	N	
10.10.1996		3649459	Rio Caiapo	Peres	1971-1987	M	N	
10.10.1996		3649440	Rio Claro	Ivolandia	1975-1987	M	U	
10.10.1996		3649449	Rio Claro	Montes Claros de Goias	1971-1987	M	N	
10.10.1996		3649010	Rio das Almas	Jaragua	1964-1984	M	U	
10.10.1996		3649012	Rio das Almas	Ceres	1964-1984	M	N	
10.10.1996		3649014	Rio das Almas	Colonia dos Americanos	1973-1989	M	N	
10.10.1996		3649420	Rio das Garcas	Tesouro	1966-1987	M	U	
10.10.1996		3649610	Rio das Mortes	Rio das Mortes	1976-1986	M	U	
10.10.1996		3649619	Rio das Mortes	Santo Antonio do Leverger	1969-1986	M	N	
10.10.1996		3649614	Rio das Mortes	Toriqueje	1968-1986	M	N	
10.10.1996		3649850	Rio Lontra	Piraque	1974-1987	M	U	
10.10.1996		3649240	Rio Manuel Alves	Fazenda Lobeira	1969-1992	M	N	
10.10.1996	3649310	Rio Manuel Alves G.	Goiatins	1971-1984	M	U		
10.10.1996	3649311	Rio Manuel Alves P.	Itacaja	1973-1984	M	N		
10.10.1996	3649030	Rio Maranhao	Ponte Quebra Linha	1964-1984	M	N		
10.10.1996	3649211	Rio Santa Tereza	Jacinto	1971-1991	M	N		

Table: 10

GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Brazil	10.10.1996	3649210	Rio Santa Tereza	Colonha	1974-1984	M	U	
	10.10.1996	3649110	Rio Sao Vicente	Sao Vicente	1974-1984	M	U	
	10.10.1996	3649511	Rio Vermelho	Balneario Cachoeira Grande	1965-1987	M	N	
	10.10.1996	3649510	Rio Vermelho	Travessao	1974-1987	M	U	
	10.10.1996	3649900	Tocantins	Itupiranga	1969-1981	M	U	
	10.10.1996	3649255	Tocantins	Sao Salvador	1977-1984	M	N	
	10.10.1996	3649250	Tocantins	Porto Nacional	1949-1983	M	U	
	Brazil	14.10.1996	3651870	Riacho do Navio	Ilha Grande	1964-1993	M	U
		14.10.1996	3651530	Rio Carinhonha	Sao Goncalo	1946-1977	M	N
		14.10.1996	3651535	Rio Carinhonha	Juvenilia	1964-1978	M	N
14.10.1996		3651520	Rio Coxa	Capitanea	1950-1977	M	U	
14.10.1996		3651650	Rio das Femeas	Derocal	1977-1985	M	U	
14.10.1996		3651309	Rio das Velhas	Varzea da Palma	1938-1983	M	N	
14.10.1996		3651300	Rio das Velhas	Honorio Bicalho-Montante	1971-1972	M	N	
14.10.1996		3651660	Rio de Ondas	Fazenda Redencao	1977-1985	M	U	
14.10.1996		3651550	Rio Formoso	Colonia do Formoso	1977-1985	M	U	
14.10.1996		3651678	Rio Grande	Boqueirao	1933-1985	M	N	
14.10.1996		3651670	Rio Grande	Sitio Grande	1977-1985	M	N	
14.10.1996		3651860	Rio Pajeu	Flores	1967-1993	M	U	
14.10.1996		3651408	Rio Paracatu	Porto Alegre	1952-1975	M	N	
14.10.1996		3651400	Rio Paracatu	Ponte da BR-040	1965-1975	M	N	
14.10.1996		3651680	Rio Preto	Fazenda Porto Limpo	1977-1985	M	N	
14.10.1996		3651410	Rio Preto	Unai	1964-1975	M	N	
14.10.1996		3651720	Rio Verde	Fazenda Refrigerio Jusante	1977-1979	M	U	
14.10.1996		3651805	Sao Francisco	Manga	1932-1981	M	N	
14.10.1996		3651806	Sao Francisco	Bom Jesus da Lapa	1978-1985	M	N	
14.10.1996		3651807	Sao Francisco	Morpara	1945-1984	M	N	
14.10.1996	3651800	Sao Francisco	Juazeiro	1929-1994	M	U		
Brazil	15.10.1996	3652880	Paraiba do Sul	Sao Fidelis	1974-1992	M	N	
	15.10.1996	3652890	Paraiba do Sul	Campos-Ponte Municipal	1934-1991	M	U	
	15.10.1996	3652410	Rio Aracuai	Carbonita	1969-1982	M	U	
	15.10.1996	3652419	Rio Aracuai	Aracuai	1931-1983	M	N	
	15.10.1996	3652230	Rio Cachoeira	Contorno BR-101	1970-1979	M	U	
	15.10.1996	3652350	Rio Catole Grande	Itapetinga	1950-1978	M	U	
15.10.1996	3652610	Rio do Carmo	Avaiaca-Jusante	1940-1985	M	U		

Table: 11

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Brazil	15.10.1996	3652210	Rio Gaviao	Anage	1968-1980	M	U
	15.10.1996	3652030	Rio Itapicuru	Queimadas	1934-1984	M	U
	15.10.1996	3652039	Rio Itapicuru	Usina Altamira	1964-1979	M	N
	15.10.1996	3652068	Rio Jacuipe	Ponte Rio Branco	1929-1979	M	N
	15.10.1996	3652065	Rio Jacuipe	Franca	1965-1981	M	N
	15.10.1996	3652910	Rio Macabu	Macabuzinho	1930-1993	M	U
	15.10.1996	3652955	Rio Macacu	Parque Ribeira	1969-1993	M	N
	15.10.1996	3652950	Rio Macacu	Cachoeiras de Macacu	1935-1978	M	U
	15.10.1996	3652985	Rio Mambucaba	Fazenda Fortaleza	1935-1993	M	N
	15.10.1996	3652980	Rio Mambucaba	Fazenda das Garrafas	1978-1993	M	U
	15.10.1996	3652130	Rio Paraguacu	Fazenda Santa Fe	1966-1979	M	U
	15.10.1996	3652115	Rio Paraguacu	Andaraí	1940-1979	M	U
	15.10.1996	3652320	Rio Pardo	Mascote	1936-1979	M	N
	15.10.1996	3652089	Rio Pojuca	Tirrica	1961-1984	M	N
	15.10.1996	3652080	Rio Pojuca	Ponte BA-6	1965-1984	M	U
	15.10.1996	3652870	Rio Pomba	Cataguases	1934-1992	M	U
	15.10.1996	3652879	Rio Pomba	Santo Antonio de Padua	1935-1992	M	N
	15.10.1996	3652110	Rio Santo Antonio	Fertern	1947-1993	M	U
	15.10.1996	3652010	Rio Sergipe	Santa Rosa de Lima	1972-1975	M	U
	15.10.1996	3652120	Rio Una	Fazenda Iguacu	1940-1978	M	U
15.10.1996	3652050	Rio Vaza-Barris	Fazenda Belem	1971-1985	M	N	
Brazil	22.10.1996	3664804	Iguacu	Porto Capanema	1978-1995	M	N
	22.10.1996	3664160	Iguacu	Salto Cataratas	1942-1995	M	N
	22.10.1996	3664800	Iguacu	Porto Amazonas	1935-1996	M	U
	22.10.1996	3664802	Iguacu	Uniao da Vitoria	1930-1980	M	N
	22.10.1996	3667020	Paraguai	Porto Esperance	1964-1980	M	N
	22.10.1996	3666050	Paraguai	Caceiras	1965-1993	M	N
	22.10.1996	3667060	Paraguai	Porto Murinho	1965-1984	M	N
	22.10.1996	3662100	Parana	UHE Jupia-Jusante-JJU	1963-1992	M	N
	22.10.1996	3264500	Parana	Posadas	1901-1986	M	U
	22.10.1996	3662700	Rio Aguapei	Salto Carlos Botelho	1969-1978	M	U
	22.10.1996	3660900	Rio Auruoca	Fazenda Laranjeiras	1934-1988	M	U
	22.10.1996	3662300	Rio Anhandui	Deifino Costa	1976-1985	M	N
	22.10.1996	3667400	Rio Apa	Sao Carlos	1971-1978	M	N
	22.10.1996	3666300	Rio Bento Gomes	Perto de Pocone	1969-1978	M	U
	22.10.1996	3663550	Rio Cantu	Balsa do Cantu	1967-1991	M	U

Table: 12



**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U
Brazil	22.10.1996	3664102	Rio Chopim	Flor da Serra	1976-1980	M	N
	22.10.1996	3664100	Rio Chopim	Aguas do Vere	1956-1994	M	U
	22.10.1996	3663600	Rio Corumbatai	Barbosa Ferraz	1974-1991	M	U
	22.10.1996	3666400	Rio Cuiaba	Porto Alegre	1967-1978	M	U
	22.10.1996	3666401	Rio Cuiaba	Retiro Biguacal	1969-1978	M	N
	22.10.1996	3663800	Rio das Cinzas	Andira	1931-1991	M	U
	22.10.1996	3659500	Rio dos Bois	Abaixo Barra do Rio Verde	1964-1976	M	N
	22.10.1996	3663500	Rio Goio Bang	Ponte do Goio Bang	1967-1991	M	U
	22.10.1996	3661105	Rio Grande	Porto Felicio	1977-1985	M	N
	22.10.1996	3661109	Rio Grande	Itutinga	1946-1984	M	N
	22.10.1996	3666250	Rio Itiquira	Itiquira	1971-1977	M	N
	22.10.1996	3663650	Rio Ivai	Novo Porto Taquara	1974-1991	M	N
	22.10.1996	3663655	Rio Ivai	Porto Paraiso do Norte	1953-1995	M	N
	22.10.1996	3661700	Rio Jundiari	Itaici	1964-1978	M	U
	22.10.1996	3667200	Rio Miranda	Miranda	1965-1978	M	N
	22.10.1996	3660600	Rio Moji-Guacu	Moji-Guacu II	1977-1979	M	U
	22.10.1996	3660602	Rio Moji-Guacu	Padua Sales	1937-1991	M	N
	22.10.1996	3664905	Rio Negro	Rio Negro	1930-1996	M	N
	22.10.1996	3667100	Rio Negro	Fazenda Rio Negro	1968-1978	M	N
	22.10.1996	3659009	Rio Paranaiba	Fazenda Santa Fe	1960-1973	M	N
	22.10.1996	3660730	Rio Peixe	Chacara Santana	1935-1988	M	U
	22.10.1996	3666200	Rio Piquiri	Sao Jeronimo	1968-1978	M	N
	22.10.1996	3663200	Rio Piquiri	Balsa Santa Maria	1969-1995	M	N
	22.10.1996	3659100	Rio Sao Bartolomeu	DF-18	1978-1982	M	U
	22.10.1996	3659105	Rio Sao Bartolomeu	Ponte Sao Bartolomeu	1966-1983	M	N
	22.10.1996	3661100	Rio Sao Jose dos Dourados	General Salgado	1969-1984	M	U
	22.10.1996	3666500	Rio Sao Lourenco	Acima do Corrego Grande	1969-1978	M	N
	22.10.1996	3666505	Rio Sao Lourenco	Sao Jose do Borireu	1968-1978	M	N
	22.10.1996	3660700	Rio Sapucaí	Itajuba	1974-1988	M	U
	22.10.1996	3661601	Rio Sorocaba	Entre Rios-ENR	1969-1978	M	N
	22.10.1996	3667300	Rio Taquari	Coxim	1966-1978	M	N
	22.10.1996	3663700	Rio Tibaji	Jataizinho	1931-1995	M	N
	22.10.1996	3664600	Rio Timbo	Santa Cruz do Timbo	1976-1996	M	U

**GLOBAL RUNOFF DATA CENTRE (GRDC)  
STATION UPDATE**

Country	Updated	GRDC-No.	River	Station	from-to	D/M	N/U	
Brazil	22.10.1996	3669700	Uruguai	Marcelino Ramos	1939-1986	M	N	
	22.10.1996	3669600	Rio Ibicui	Passo Mariano Pinto	1955-1982	M	N	
Brazil	22.10.1996	3653710	Rio Camaqua	Passo do Cacao	1973-1985	M	U	
	22.10.1996	3653620	Rio Carreiro	Passo Carreiro	1939-1982	M	U	
	22.10.1996	3653352	Rio Itajai-Acu	Blumenau	1939-1989	M	N	
	22.10.1996	3653180	Rio Juquia	Barra do Acungui	1951-1986	M	U	
	22.10.1996	3653181	Rio Juquia	Juquia 1	1937-1979	M	U	
	22.10.1996	3653550	Rio Pardo	Passo Linha do Rio	1969-1983	M	U	
	22.10.1996	3653810	Rio Piratini	Passo do Ricardo	1961-1979	M	U	
	22.10.1996	3653110	Rio Ribeira do Iguape	Balsa do Cerro Azul	1930-1995	M	U	
	22.10.1996	3653450	Rio Tubarao	Rio do Puso	1939-1995	M	U	
	Russian Federation	29.10.1996	6970100	Onega	Porog	1989-1993	D	U
29.10.1996		6970150	Vonguda	Vonguda	1989-1993	D	U	
29.10.1996		6970120	Kodina	Kodina	1989-1993	D	N	
29.10.1996		6971750	Nenkosa	Nenkosa	1989-1992	D	U	
29.10.1996		6970250	Northern Dvina	Ust-Pinega	1989-1993	D	U	
29.10.1996		6970550	Kuloy	Kuloy	1989-1991	D	U	
29.10.1996		6970500	Mezen	Malonisogorskaya	1989-1993	D	U	
29.10.1996		6970560	Peza	Igunnovo	1989-1993	D	U	
29.10.1996		6970630	Pesha	Volokovaya	1989-1993	D	U	
29.10.1996		6970710	Pechora	Oksino	1989-1993	D	U	
29.10.1996		2912600	Ob	Salekhard	1989-1994	D	U	
29.10.1996		2999500	Pur	Samburg	1989-1990	D	U	
29.10.1996		2999250	Taz	Sidorovsk	1989-1994	D	U	
29.10.1996		2909150	Yenisei	Igarika	1989-1995	D	U	
29.10.1996		2903420	Lena	Kusur	1989-1994	D	U	
29.10.1996		2903430	Lena	Stolb	1989-1994	D	U	
29.10.1996		2999850	Khatanga	Khatanga	1989-1991	D	U	
29.10.1996		2903150	Anabar	Saskylakh	1989-1994	D	U	
29.10.1996		2999920	Olenek	Sukhana	1989-1994	D	U	
29.10.1996		2998110	Yana	Ubileynaya	1989-1994	D	U	
29.10.1996		2998400	Indigirka	Vorontsovo	1989-1994	D	U	
29.10.1996		2998450	Alazeja	Andrushkino	1989-1993	D	U	
29.10.1996		2998150	Omoloy	Namu	1989-1993	D	U	
29.10.1996		2998510	Kolyma	Kolymskaya	1989-1994	D	U	
29.10.1996		2998800	Pajjvaam	Pajjvaam	1989-1995	D	U	
Cote d'Ivoire		21.11.1996	1434820	Bagoe	Kouto Amont	1980-1986	D/M	U
		21.11.1968	1428400	Comoe	Aniassue	1980-1994	D/M	U

Table: 14

## **Annex 2**

### **Data Requests 1997**

## DATA REQUEST 1996

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Aarup, Th. 40 Holworthy Street Cambridge, MA 02138 USA	UK Rivers: Thames, Wasj, Humber, Tees, Tane and Forth; Rivers from the western part of Denmark	Dissertation on Regional Hydrology
Amt für Wehrgeophysik (Army Geophysical Survey), Traben- Trarbach, Germany	Nile at Karthoum (only MQ)	General regional information
Arestizabal, E. P. c/o. State Hydrometeorological Insitute St. Petersburg Russian Federation	Data of the station Greenville, Mississippi	Graduation project: Hydrological foundation of horizontal drilling methods for river crossing pipelines
Arnaud, D. Berthouville, France	GRDC - catalogue	Research on global water resources
Arora, V. Dept. of Civil and Environ. University of Melbourne Parkville, VIC, Australia	Discharge data for the Amazonas River basin	Regional hydrological studies
Ballisoy, N. Bodenkundliches Institut Bonn Bonn, Germany	Data for Rivers in West Turkey	Study on climate changes as a result of rain erosivity in West Turkey
Bauwens, W, Vrije Universiteit Brussel Laboratory of Hydrology Brussel, Belgium	GRDC catalogue	Thesis research in water resources of the Zambesi river basin
Becker, P. Battelle Marine Science Laboratory	Discharge data for the Yalu (Ammok) River GRDC catalogue	PhD thesis: The effect of arctic river hydrological cycles on arctic ocean circulation
Berg, van den J.H. Department of Physical Geography University Utrecht, Netherland	Data of the Allier river, France	Research project concerning the morphology and morphodynamics of the Allier river
Bezanson, D. Westlake Drive Austin, Texas, U.S.A.	GRDC catalogue GRDC report No. 5	Research on hydrological regimes of the world's largest river basins
Bhatia, R. International Irrigation Management Institute Colombo, Sri Lanka	GRDC information, GRDC - catalogue	Agricultural research, analysis of water resource systems, publication of world water dataset
Birkett, Ch. Mullard Space Science Laobratory Department of Space and Climate Physics University College London, U.K.	GRDC catalogue-extract General information	Satellite remote sensing measure- ments

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Bishop, G. Anteon Corps of the United States Environmental Protection Agency Corvallis, Oregon, U.S.A.	GRDC information	Test of runoff mapping methods for various areas of the world
Bouhia, H. Harvard University Division of Applied Sciences Cambridge, Mass., U.S.A.	GRDC information	Rainfall runoff analysis of major selected rivers
Bound, A.J. Mullard Space Science Laboratory Department of Space and Climate Physics University College London, U.K.	Streamflow data of Sudan, GRDC information, Flow data of the White Nile	Studies about the Sudan Marshes
Brandt, R. GKSS Research Center BALTEX Geesthacht, Germany	GRDC catalogue	General information
Brigham, L.W. Scott Polar Research Institute University of Cambridge, U.K.	Data for the Laptev Sea and the Lena River	Research on the sea ice conditions and ocean processes of the Laptev Sea
Calkins, D. Geological Science Division USACRREL Hanover, NH, U.S.A.	Sava River Basin, Croatia	US Army Cold Region project in Croatia
Charbonier, F. IMFIA - Hydrology Division J. Herrera y Reaño 564 Montevideo, Uruguay	GRDC catalogue	Interdecadal variability of the runoff and its relation with Pacific Ocean temperature
Cluis, D. Institut national de la recherche scientifique Université de Québec Québec, Canada	GRDC catalogue GRDC information	General information
Cullen, H. Columbia University Dpt. Geological Sciences Lamont Campus, U.S.A.	Runoff data of Tigris and Euphrates Rivers	General information
Demarée, G. Koninklijk Meteorologisch Instituut van België Brussel, Belge	Data of the station Rees at the Rhine river	Studies on dynamical climatology
Dettinger, M. U.S. Geological Survey San Diego CA, U.S.A.	GRDC information GRDC catalogue	General information

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Dibi, P. University of Oklahoma Dept. of Geography Norman, Oklahoma, U.S.A.	GRDC catalogue	Atmosphere/Surface parameter evolutions and interaction over Ivory Coast, West Africa
Diehl, A. Linden, Germany	Discharge data of the Yangtze Kiang river in China	PhD thesis about hydrological regime of the Yangtze River
Dixon, J.M. Institute of Hydrology Wallingford OX U.K.	Data of the rivers: Weser, Elbe, Maas, Vaenern-Goeta, Escault, Ems at Versen	FRIEND Project European Water Archive
Dobrovolsky, S. NASA Goddard Space Flight Center Greenbelt, MD, U.S.A.	GRDC - catalogue GRDC information	General information
Dokoubou, J.R. Institute of Hydrometeorology St. Petersburg	Data of rivers of Central Africa	Regional hydrological studies
Döll, P. Wissenschaftliches Zentrum für Umweltsystemforschung Kassel, Germany	Discharge data worldwide GRDC information GRDC report No. 10	Global model of water availability
Douville, H. CNRM/GMGEC/UDC Toulouse / France	Report No. 5	GEWEX Global Soil Wetness Project
Ducharne, A. Laboratoire de Méétéologie Dynamique École Normale Supérieure Paris, France	GRDC report No. 10 GRDC information, leaflet River discharge data of 58 stations	Forcing an hydrologic model with the continental water fluxes of an atmospheric general circulation model
Dümenil, L. Max Planck Institut für Meteorologie Hamburg, Germany	GRDC catalogue	General information
Eltahier, E. Massachusetts Institute of Technology Parsons Laboratory Cambridge, MA, U.S.A.	GRDC report No. 10	Information on global freshwater fluxes
Epstein, D. Battelle Pacific Northwest National Laboratory Richland, WA, U.S.A.	GRDC information	General information
Evans, J. Centre for Resource Environmental Studies Australien National University Canberra, Australia	Discharge data of rivers in the Ping basin, Upper Chao Phraya, Thailand	Project on integrated water resource assessment for sustainable management
Friederich Amt für Land- und Wasserwirtschaft Kiel, Germany	Data of 11 rivers flowing into the Baltic Sea	Study of the water pollution loads of the Baltic Sea

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Genta, J.L. Instituto de Mecanica de los Fluidos e Ingneria Ambiental (IMFIA) Montevideo, Uruguay	Discharge data for 13 rivers	Study of climate variability in Southeastern South America
Goosse, H. Université Catholique de Louvain Institut d'Astronomie et de Geophysiqze G, Lemaitre Louvain-la Neuve, Belgium	GRDC report No. 10 169 data in digitized form	Global coupled ice-ocean model
Hagemann, St. Max-Planck-Institut für Meteorologie Hamburg, Germany	Data for selected rivers of Africa, Asia, North and Central America, South West Pacific and Europe	Validation of global circulation models
Haller, W.T. University of Florida Institute of Food and Agricultural Sciences Gainesville, FL, U.S.A	Discharge data for the White and Blue Nile River and for stations of the Jebel Aulia Dam, Aswan Dam and Dongola	Prediction of aquatic plant interference with hydroelectric production
Helbig, A. Universität Trier FB VI Geographie/Geowissenschaften Germany	Discharge data of the rivers: Lena, Jana, Olenyok, Aldan	Study of ice conditions of the Laptev-Sea in relation to the discharge data of rivers flowing into the Laptev-Sea
Hietala, K. Scott Polar Research Institute University of Cambridge United Kingdom	First and second ACSYS interim report	PhD thesis about freshwater budget of the Arctic Ocean
Hoff, H. IGBP-BAHC Core Project Office Institut for Climate Impact Research Potsdam, Germany	Discharge data for the Amazone river basin GRDC catalogue	River basin study
Holland, D.M. Lamont-Dohery Earth Observatory of Columbia University Palisades, NY, U.S.A.	Two ACSYS Interim Reports, Runoff-data of the Arctic rivers	Investigation of the effect of rivers on the circulation of the Arctic Ocean and Sea ice using a regional coupled atmosphere-ice ocean numerical model
Horton, R. Center for Environmental Research and Conservation Columbia University in the City of New York, U.S.A.	GRDC catalogue of South-East Asian discharge data	Integrated assessment of ENSO- related effects in Indonesia
Isemer GKSS-Forschungszentrum Baltex-Sekretariat Geesthacht, Germany	GRDC catalogue	General information, contribution to BALTEX-project
Jacobs, N. University of Utrecht Faculty of Geographical Sciences Netherland	Data of the Elbe River stations	Hydrological model for the Elbe River

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Jakobsen, F. Danish Hydraulic Institute Horsholm, Denmark	Data of river discharges of the German Bight	DYNOCS Dynamic of connecting seas. A MAST II research project
James, R. Bureau of Meteorology Melbourne, Victoria, Australia	GRDC catalogue	General information
Jennerjahn, T. Universität Hamburg Institut für Biogeochemie und Meereschemie Hamburg, Germany	GRDC catalogue Discharge data of 28 selected rivers from Europe, North and Southeast Asia, North and Central America, Brazil, India and Asia	Biogeochemical research on rivers
Jiabin, Zh. Institute of Atmospheric Physics Chinese Academy of Sciences Beijing, China	Global Datasets of selected rivers	Study on the global change of runoff data
Jilk, H, Schwäbisch Hall, Germany	Discharge data of European rivers	General information
Kaczmarek, Zd. Institute of Geophysics Warsaw, Poland	Discharge data for rivers in China, Korea, Pakistan and India	Research project on impact of climate change in Southeast Asia
Kakuta, S. Ocean Research Department Japan Marine Science and Technology Center Yokosuka, Japan	Two ACSYS Interim Reports, Runoff-data of the Arctic rivers Mackenzie, Kolyma, Indigirka, Lena, Ktuy, Yenisei, Ob, Pechora and Sev. Dvina	Arctic ocean model study
Karim, A. Department of Geology University of Ottawa Ottawa ON, Canada	Discharge data for Indus River and its tributaries GRDC information	Major elements and stable isotopes: PhD thesis on the Indus River
Kassian, A.G. Cowes Isle of Wight, U.K.	GRDC information, GRDC Report No. 9	PhD. Thesis: A political history of the hydro-politics of the Euphrates-Tigris Rivers basin
Killingtveit, A, Centre for Environment and Development Dragvoll, Norway	GRDC information on the ACSYS project	Educational course in Arctic water management
Kleeschulte, St. G.I.M. - Geographic Information Management SQ Luxembourg	GRDC catalogue	General information
Kubota, J. Department of Forest Science Tokyo University of Agriculture and Technology	GRDC catalogue	General information



REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Lohmann, D. Institut for Atmospheric Physics Geesthacht, Germany	Discharge data of rivers, flowing into the Baltic Sea	Validation of atmospheric models of the BALTEX project
Maidment, D. R. Center for Research in Water Resources University of Texas Austin, U.S.A.	Discharge data for 161 stations	Fresh water fluxes into the Ocean
Mamaev Coastal Research Center Woods Hole Oceanographic Institution Woods Hole, MA, U.S.A.	Discharge data for rivers: Danube, Dniepr, Dniestr, Southern Bug, Don, Rioni, Sakaria, Kizil-Irmak, Kamchia	Research on the rising sea-level in the Black Sea
Marsh, T. Institute of Hydrology Wallingford, Oxfordshire, U.K.	Discharge data of the rivers: Blu Nile at Khartoum; Columbia River at Dalles, Oregon; Susquehanna at Harrisberg, Pa; St. Mary's River at Saulte St. Marie; Avoca River at Coonooer	Publication of the second edition of "Hydrometry - Principles and Practices"
Martin, S. University of Washington School Oceanography Seattle, WA, U.S.A.	Update of Arctic River information	Arctic research
Maruyama, M. Forest Resources Utilization Laboratory School of Agricultural Sciences Chikusa-ku, Nagoya, Japan	Discharge data from Brazilian rivers including Rodonia State	The impact of deforestation in Brazilian Amazonia: large-scale clearance in Rondonia State
Maus, S. Norsk Polarinstitut Oslo, Norway	GRDC Catalogue Discharge data from different rivers flowing into the Barents Sea	Transformation of water in the Barents Sea and the influence of the climatological variability
Maus, S. Havforskningsinstitutt Bergen, Norway	Discharge data of rivers draining into Arctic oceans	ACSYS -Project Water transformation and the variability of climate change in the Barents Sea region
Mcphail, N. Drainage Department of Abozzdford Vancouver, Canada	GRDC Catalogue GRDC information	Creation of a database for precipitation and discharge
Milliman, J. School of Marine Science The College of William and Mary Cloucester Point, VA, U.S.A.	Discharge data from several major rivers draining into the western Mediterranean	Studies of the late 20th century changes in the western Mediterranean oceanic climate due to decrease fluvial input

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Milly, P.C.D. Geophysical Fluid Dynamics Laboratory U.S. Department of Commerce/NOAA Princeton, NJ, U.S.A.	GRDC information GRDC catalogue Report No. 10 Update of earlier requested data Discharge data from 43 stations from various river basins	Observed and modeled variations of annual discharge from large river basins
Oki, T. Goddard Space Flight Center Greenbelt, MD 20771, U.S.A.	200 river discharge stations worldwide	Global modeling of the World Water Balance
Oki, T. Goddard Space Flight Centre Greenbelt, MD, U.S.A.	Data of about 180 stations of various river basins	Validation of ISLSCP global soil moisture project under GEWEX and the longterm variation of global runoff
Pasenau, H. PROJETO FEEMA - GTZ Controle Ambiental no Estado do Rio de Janeiro, Brazil	Discharge data of Rio Sao Francisco	Sedimentological and geophysical investigations on the continental margin off the Sao Francisco river
Pasenau, H. GTZ Feema BZ Brazil	Discharge data of the Paraiba do Sul River and others	Environmental monitoring
Paturel, J.E. ORSTOM Cidex Abidjan, Cote d'Ivoire	Discharge data of Rivers in West- and Central Africa	Study on climatic variability in West and Central Africa
Pelt GEC - Geneva Executive Center Chatelain, Geneva, Switzerland	GRDC catalogue, policy guidelines for data distribution	Update of the Meta-Data guide related to natural hazards
Plessis, S.C.du CORPORATE HYDRO & WATER CONSULTANT ESKOM Generation Department	Discharge data for rivers in Mosambique	Study of possibilities for drinking water supply in Mosambique
Portis, D. University of Illinois	35 ACSYS stations	Verification of P-E for atmospheric models
Potier, M. ORSTOM / HEA Montpellier cedex, France	GRDC information GRDC catalogue GRDC leaflet	Studies of pelagic fish populations of the Java Sea, Indonesia
Rodgers, Dr. K. Columbia University's Lamont Doherty Earth Observatory	GRDC information	Ocean circulation model
Sauerborn, P. Seminar für Geographie und ihre Didaktik Köln, Germany	River discharge data from Germany	Study on anthropogenic induced climate change

REQUEST MADE BY (NAME, COUNTRY)	COUNTRY OR RIVER, FOR WHICH DATA ARE REQUESTED	PURPOSE OF DATA USE
Sharma, A.A.L. Director of Research Studies M.V.P. Colony Visakhapatnam 530 017, India	GRDC information GRDC reports and brochures GRDC catalogue	Survey of literature on river flows into the World Oceans
Sipes, J.L. University of Oklahoma College of Architecture Norman, Oklahoma, U.S.A.	GRDC catalogue GRDC information, brochure	Article for Landscape Architecture magazine about use of computer technology in irrigation design and water management
Stansfield, K. University of Victoria School of Earth and Ocean Sciences Victoria, B.C., Canada	GRDC catalogue	Access to river runoff data for Thailand, Vietnam and Malaysia
Syvitski, J. Institute of Arctic and Alpine Research University of Colorado Boulder, Colorado, U.S.A.	Arctic Sea	Climate research in connection with the ten largest Arctic rivers
Vargiamidis, G. Thessaloniki, Greece	Catalogue information of Greek rivers	N.N.
Wendland, F. Forschungszentrum Jülich Jülich, Germany	General information	Kleinmaßstäbliche flächendifferenzierte Klassifizierung des Wasserhaushalts im Elbeinzugsgebiet
Wiley, A. U.S. Army Topographic Engineering Centre Alexandra, VA, U.S.A	All rivers of Ecuador	Water resources appraisal
Woerden, J. van Rijksinstituut voor Volksgezondheid en Milieuhygiene (RIVM) Bilthoven, Netherland	Discharge data of 37 stations	UNEP Global outlook project
Xiaoyang, Z. Department of Geography King's College London London, U.K.	GRDC information GRDC catalogue Status report	Modeling of soil erosion at a global scale
Xue, Y. Centre for Ocean-Land-Atmosphere Studies Calverton MD, U.S.A.	Discharge data of different African rivers	GCM modeling study on the ground water balance and use of observed large scale discharge data to validate the model
Zhang, H.-M FORD 0230 Scripps Institution of Oceanography University of California, San Diego La Jolla, CA, U.S.A	GRDC catalogue Mean runoff data of the rivers: Seween, Irrawaddy, Brahma-putra, Ganges, Brahmani, Mahanadi, Godavari	Fresh water budget for the Indian Ocean

## **Annex 3**

### **Proposed Agreement of Participation between GHP and GRDC/GPCC**

INTERNATIONAL  
COUNCIL OF  
SCIENTIFIC UNIONS

INTERGOVERNMENTAL  
OCEANOGRAPHIC  
COMMISSION

WORLD  
METEOROLOGICAL  
ORGANIZATION

## WORLD CLIMATE RESEARCH PROGRAMME

### REPORT OF THE SECOND SESSION OF THE WCRP/GEWEX HYDROMETEOROLOGY PANEL (GHP)

Toronto, Canada, 26-29 August 1996

# DRAFT

NOVEMBER 1996

WCRP informal report No.

#### 4.4 Global Runoff Data Centre (GRDC) and Global Precipitation Climatology Centre (GPCC)

The GRDC and GPCC provide essential contributions to the CSEs. The GHP therefore agreed that representatives of the GRDC and GPCC should become ex officio members of the GHP. Although there has been a general agreement for these centres to take action to assist the CSEs in the assembly of global runoff and precipitation datasets the GHP raised concern that the linkages between CSEs and the two global data centers were not functioning as efficiently as they could. As a result an agreement of participation was developed between the GHP and the GRDC and GPCC.

#### PROPOSED AGREEMENT OF PARTICIPATION BETWEEN GHP AND GRDC/GPCC

##### TITLE:

GEWEX/GHP - GRDC and GPCC Scientific Collaboration in Hydrological Dataset Development

##### INTRODUCTION:

It is necessary that GPCC and GRDC remain quasi-operational providers of global surface water budget information for the WCRP. The Centres are interested, however, in the research results, methodologies and regional data sets which the GHP controls through the CSEs. The GHP can in turn benefit from specialized analyses and, where appropriate, data sets to assist them in meeting their research objectives.

##### AREAS OF COLLABORATION:

Undertake some joint initiatives of mutual benefit.

Coordinate contributions to the global observing systems (e.g., GCOS and GTOS)

Development of a near real-time global monitoring network for surface water budget parameters.

##### RESPONSIBILITIES:

##### CSEs Will -

provide regional data sets or meta data on data sets (precipitation, runoff) to the Centers.

facilitate the acquisition of the data and the establishment of linkages with the regional/national data providers.

document cases where use of streamflow data has had an impact on regional water resources studies.

## GRDC and GPCC Will -

Will provide special analyses to the CSEs that relate to hydroclimatologies of the various CSEs, statistics showing the in-month variability of precipitation and runoff, and the application of gridded data sets.

## APPROACH:

Build on the informal linkages already established between GHP and the Centres to undertake joint projects of mutual interest such as

- the independent validation of GPCC/ GPCP products.
- the development of new methods for correcting precipitation (systematic measurement errors).
- the use of models to interpolate between stations thereby accounting for the effects of orography, etc.
- techniques for transferring hydrological models from one area to other more data-sparse land areas.
- techniques for using streamflow data to calibrate precipitation measurements.

## SPECIFIC ACTIONS:

CSEs will confirm that data flows from their countries to the Centers are working or take action by the end of 1996 to ensure that interactions are underway.

Individual CSEs will contact the Centres, by the end of 1996, with documented cases where use of streamflow data has had an impact on regional water resources studies.

## **Annex 4**

### **Public Relation**



## **Annex 5**

### **Letter of the Secretary-General of WMO**



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41, av. Giuseppe-Motta  
Case postale N° 2300  
CH - 1211 Genève 2

SECRETARIAT  
GENÈVE - Suisse

Our ref.: H/GRDC

GENEVA, 22 July 1996

Annexes: 2

Subject: Global Runoff Data Centre (GRDC)

Action required: Support to GRDC

Dear Sir/Madam,

In the early 1980s, WMO received from Member countries a set of runoff data for the years 1978-1980 as a contribution to the set of data being assembled for the First Global Experiment of the Global Atmospheric Research Programme. These data were compiled into a formal data-set at the University of Munich, Germany, and were transferred, in 1987, to the Federal Institute of Hydrology in Koblenz, where they formed the basis of the Global Runoff Data Centre (GRDC). Formally established under the auspices of WMO, the GRDC was officially opened on 14 November 1988.

A Steering Committee for the GRDC was established in 1993 to provide advice to the Centre and review its activities. Its composition includes senior German experts and representatives of WMO, UNEP, WHO, UNESCO, the World Bank and ICSU. Thus it recognizes the contribution that Germany makes to the running of the Centre, whilst at the same time ensures that the latter responds to the needs of the international community for hydrological data.

In June last year, Twelfth WMO Congress noted that the GRDC was being recognized increasingly as an important global source of data on river flow. It expressed its appreciation of the generous support provided to the GRDC by Germany and adopted Resolution 21 (Cg-XII) - Global Runoff Data Centre, a copy of which is attached for your information.

GRDC has recently issued the enclosed brochure, which is currently available in English only. I am enclosing two copies for your information and for onward transmission to other national and regional agencies which you consider might be interested in making use of the Centre and, in particular, working to support it. If you can make use of additional copies of the brochure, please write to the WMO Secretariat or directly to GRDC in Koblenz and we will try to arrange for you to receive the number you require.

To: Permanent Representatives (or Directors of Meteorological or Hydrometeorological Services) of Members of WMO (PR-5270)  
Hydrological Advisers to Permanent Representatives

cc: Members of the WMO Commission for Hydrology (for information)

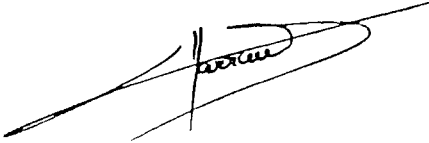
In this regard, it is relevant to note that the tenth session of the Commission for Hydrology will be held in Koblenz from 2 to 12 December 1996 and all delegates to the session will be able to obtain first-hand experience of the work of the Centre.

The value of the GRDC is directly dependent on the data that it holds and for that it relies on those national and regional agencies which collect and compile sets of runoff data to make them available to the Centre. GRDC regularly sends out requests for such data and, on occasion, I also issue such requests. To quote the words of Resolution 21 (Cg-XII), I would strongly "encourage Members to support the GRDC through the provision of the hydrological data and related information that it needs."

The Centre also relies on the resources that Germany has so generously provided, augmented by a limited amount of funds that WMO and WHO have been able to make available. It is clear that, with more staff and more resources in general, GRDC could greatly enhance the services that it provides. It is worth mentioning that the secondment of a staff member with supporting finance for a few months would also provide the person concerned with valuable experience. To quote Resolution 21 (Cg-XII) again, Members are encouraged "to consider also providing support to the Centre in the form of staff, funding, and other resources".

I would urge you to respond positively to this call by Congress for support to the Global Runoff Data Centre.

Yours faithfully,



(G.O.P. Obasi)  
Secretary-General

RESOLUTION 21 (Cg-XII)  
GLOBAL RUNOFF DATA CENTRE (GRDC)

THE CONGRESS,

**NOTING:**

- (1) That the GRDC has its origins in support to the WCRP and to studies of large-scale hydrological processes,
- (2) The generous support that has been provided by Germany over many years for the establishment and maintenance of the Centre,
- (3) That the GRDC is now widely-recognized as the principal source of global data on river flows, providing an effective service to an increasing range of users,
- (4) That the Centre already cooperates in a number of major international projects,
- (5) That through its Resolution 11 (EC-XLV) — Report of the ninth session of the Commission for Hydrology, the Executive Council had approved Recommendation 2 (CHy-IX) — Support to global data centres,

**CONSIDERING:**

- (1) That new and increased demands are now being put on the Centre, in particular in relation to the global assessment of the world's water resources requested by the second session of the United Nations Commission on Sustainable Development (1994), the need for a global data centre in relation to WHYCOS, and for various climate studies,

- (2) That the Centre will need considerably more resources if it is to meet these new demands effectively,

**RECOGNIZING** that the GRDC is a major component of WMO's IIWRP, serving also the WCRP and other programmes of the Organization,

**ENCOURAGES** Members:

- (1) To support the GRDC through the provision of the hydrological data and related information that it needs, including through the regional components of WHYCOS;
- (2) To consider also providing support to the Centre in the form of staff, funding, and other resources;

**REQUESTS** the president of the Commission for Hydrology to ensure that the Commission provides the GRDC with the scientific and technical advice that it requires;

**REQUESTS** the Secretary-General:

- (1) To invite other international organizations to cooperate with the GRDC, to make use of the services that it offers and to contribute both data and other resources in support of its operations;
- (2) To provide all possible support to the GRDC from available resources and to seek additional resources for this purpose from external sources.

## **Annex 6**

### **List of GRDC Reports**



## Reference of GRDC Reports

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- 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 the GRDC: Documentation of existing algorithms for transformation of runoff data to grid cells) by 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 in 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, June 20 - 21, 1994.  
(December 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)
- Report No. 9**      Report of the Second Meeting of the GRDC Steering Committee, Koblenz, Germany, June 27 - 28.  
(August 1995)
- Report No. 10**     Freshwater Fluxes from Continents into the World Oceans based on Data of the Global Runoff Data Base.  
(March 1996)
- Report No. 11**     GRDC - Status Report 1995.  
(April 1996)
- Report No. 12**     Second Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS).  
(June 1996)
- Report No. 13**     GRDC Status Report 1996  
(Februray 1997)
- Report No. 14**     The use of GRDC - information  
(February 1997)     Review of data use 1993/1994. Status: January 1997