

SUSTAINABLE WATER RESOURCES MANAGEMENT LAKE CHAD



Project Activities - Report N° 1 April 2008



Lake Chad Basin Commission
Rond Point de l'Etoile,
N'Djamena



Federal Institut for Geosciences and
Natural Resources
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ACRONYMS

BGR: Bundesanstalt für Geowissenschaften und Rohstoffe – Federal Institute for Geosciences and Natural Resources

BMZ: Bundesministerium für Zusammenarbeit und Entwicklung – Federal Ministry for Economical Cooperation and Development

BRGM: Bureau de Recherches Géologiques et Minières

CAR: Central African Republic

DREM: Direction de Ressources en Eau et Météorologie

GEF: Global Environmental Facility

LCBC: Lake Chad Basin Commission

SAP: Strategic Action Plan

SRTM90: USGS Shuttle Radar Topography Mission

UNESCO: United Nations Educational, Scientific and Cultural Organization

1 Introduction

The project “Sustainable Water Resources Management – Lake Chad” is financed by the Federal Ministry for Economic Cooperation and Development, Germany. The project partners are on one side the Federal Institute for Geosciences and Natural Resources (BGR), Germany, and on the other the Lake Chad Basin Commission (LCBC), Chad.

The project intends to strengthen the LCBC so that it is able to coordinate the exchange of groundwater data between the member states, integrate them in a management system and elaborate water resources strategies of sustainable character.

Among the planned activities, there are:

- Collecting and quality analysis of available data.
- Training of experts on collection, diagnostic and analysis of groundwater data.
- Developing a database for groundwater information.
- Compiling a hydrogeological map for the Chad Basin Basin.
- Establishing a unit responsible for evaluating and analysing data within the LCBC. The unit will be in charge of developing strategies of integrated water management within the Basin area.

The importance of the LCBC-BGR project is reflected in the Strategic Action Plan (SAP) newly submitted to the LCBC by an external consultancy work under the umbrella of the Lake Chad Basin GEF Project. In this report, under the Ecosystem Quality Objective 1 – *Improved quantity and quality of water in the Lake Chad Basin* –, Target 2 deals with the development of strategies to manage groundwater and enumerates activities that should be taken into account. These activities coincide completely with those included in our project. Further, in Target 3, the necessity of groundwater protection is described, for which field measurements are needed (water levels to define the groundwater flow direction, land use to determine possible pollutants, water chemistry to establish the presence of contaminants, etc. The LCBC-BGR project comprises field work that will certainly include water level measurement and water chemistry analyses.

2 Project development

The project activities started on the 17th of September 2007 with the arrival in N'Djaména of the project leader from BGR, Dr. Sara Vassolo. Her stage had been originally planned for 7.5 months, from Mid-September to the end of April 2008.

2.1 Collecting and quality analysis of available data

This activity involves analysis of available data in the LCBC as well as collection of new data in the field.

Available groundwater data in the LCBC included:

- Database in digital form created by the Project N° 98/C88/ITE (R35985) - Monitoring and Management of Groundwater Resources in the Lake Chad, which was finalised in August, 1993. The project was financed by the Fonds d'Aide et de Coopération de la République Française and was run by BRGM, France.
- Database in digital form created by the Project 507/RAF/45 - Management of Ground Water Resources for the Sustainable Development of the Lake Chad Basin. The project was financed by UNESCO and BMZ and performed by a consultancy from Spain.
- Additional borehole data available as hard copy from numerous reports and publications, which were input in the database. These data involve mainly the Central African Republic (CAR) Chad, and Niger.

Meteorological data was also collected, especially precipitation data. These figures were contained in the old hydrological database. Unfortunately, the database crashed and most of them got lost. Records were re-collected, quality analyzed and, as far as possible, actualised. These activities included records from a total of 112 stations – 17 in CAR, 9 in Cameroon, 57 in Chad, 16 in Niger and 13 in Nigeria.

Field work includes mainly measurements of water levels and sampling of groundwater for chemical analyses and isotopy. These activities have not yet started due to many unforeseen as listed below:

- Arrival of working material with retard: the working material arrived in N'Djaména on the 16th of December.
- Arrival of project vehicle with retard: the project vehicle was purchased via Toyota/Motor Europe NV/SA, Gibraltar. It arrived in N'Djaména mid-January. Customs formalities were finalised by the 29th of January.
- War events: Due to the imminent insecurity in town (arrival of rebels), the Chadian Government decided to declare the 31st of January as a public holiday. Further, it recommended government staff not to assist to work as long as the security was not re-established. Unfortunately the situation worsened with time so the expatriates had to be evacuated. The team leader was evacuated on the 3rd of February to Paris via Libreville, Gabon. The German Government allowed the return to Chad on the 14th of March. The team leader returned on the 30th of March.
- Non-availability of LCBC counterparts: Field work should have started in April. Unfortunately, in April the whole staff of the LCBC Water Department was involved in the rewriting of the Terms of Reference for the Water Transfer so that no counterpart was available to accompany the project leader to the field.

2.2 Training of experts

The training of experts from the LCBC takes place on the day-to-day work. The staff involved does not work fulltime for the project, as they have to proceed with their own activities inherent to their appointment with the LCBC. Up to now, the project partners are:

- Dimbélé-Kombe, Michel, Director of Department of Water and Environment

- Ahmed Sedik, hydrologist, from the Department of Water and Environment
- Bukar Wakil, hydrogeologist, from Department of Water and Environment (started working for the LCBC at the beginning of March)
- Mohamed Bila, hydrologist, also counterpart for the Lake Chad Basin GEF Project
- Sambo Garba, GIS expert, also counterpart for the Lake Chad Basin GEF Project

2.3 Developing a database for groundwater information

The original groundwater database from 1993 (RESOPIEZ) included, among others, data on location, altitude, borehole construction, rest water level, lithology encountered, aquifer characteristics, recommended extraction rate, and chemistry for a total of 403 boreholes (Figure 2.1). This database has been expanded with the input of additional data. Actually it contains 14,097 boreholes, but input of data from CAR is still missing (Figure 2.2).



Figure 2.1. Location of boreholes included in the original database RESOPIEZ.

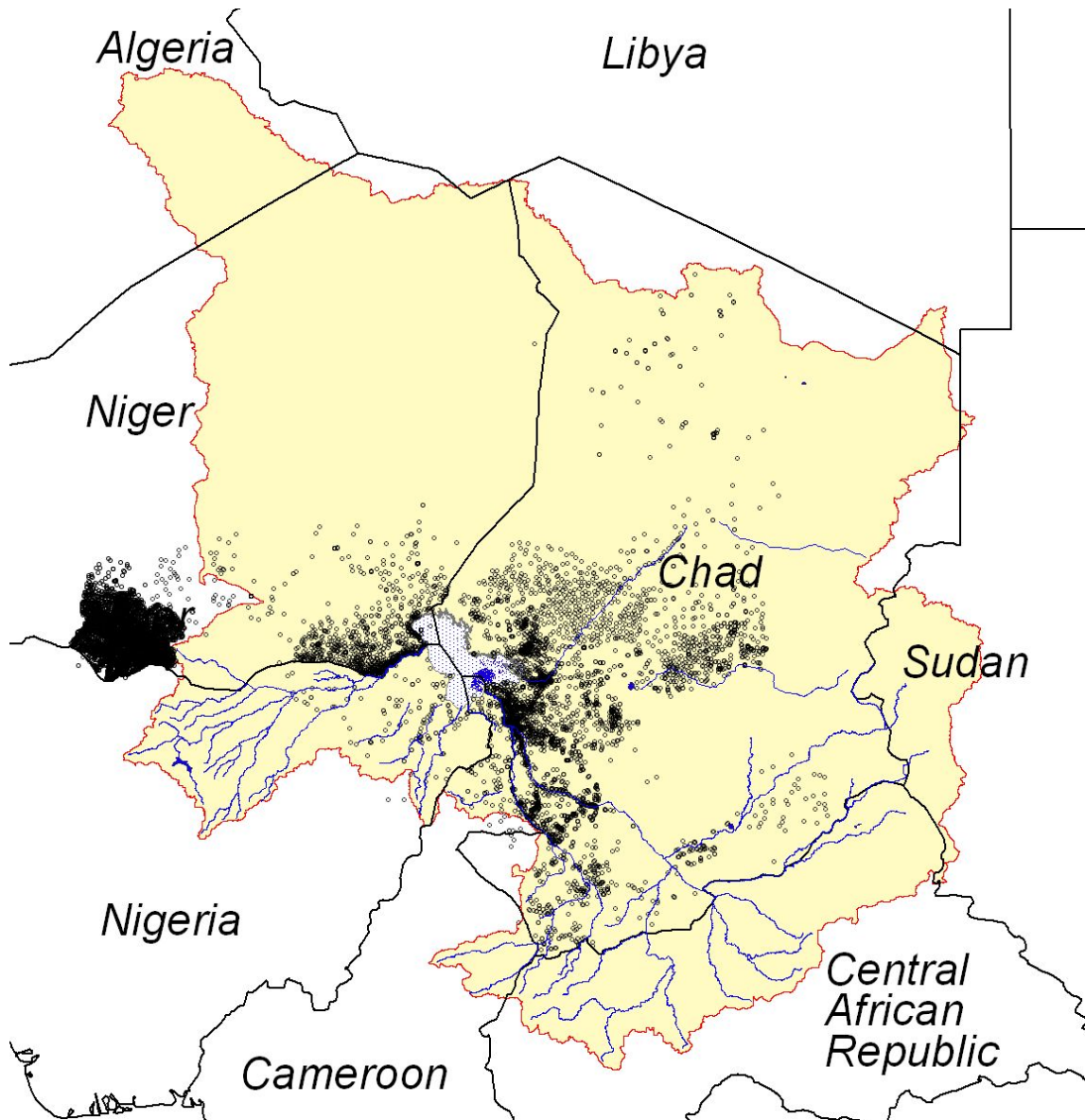


Figure 2.2. Location of boreholes included in the updated database.

A second database (SUIVPIEZ) was also developed in 1993. It contains 133 monitoring data or, in other words, time-series of chemical analyses and water level. This database was not actualised because no measurement has been taken yet.

2.4 Compiling a hydrogeological map for the Lake Chad Basin

Regarding this activity, all available GIS data was collected for quality analysis. The geology map of the region has been already digitized from the available geological map (Figure 2.3). AHT for GTZ has calculated the riverbeds taking into account the results from the digital elevation model of SRTM90 (USGS product containing world-wide elevations for a grid of 90 m x 90 m). In the same way river basins and sub-basins have been estimated. Populated centres are also available.

However, roads are available only as hard copy or scanned geo-referenced pictures. Therefore, digitizing work will have to be done to be able to produce GIS data.

All GIS activities from our project will commence in September with the arrival of a short-term specialist from the BGR.

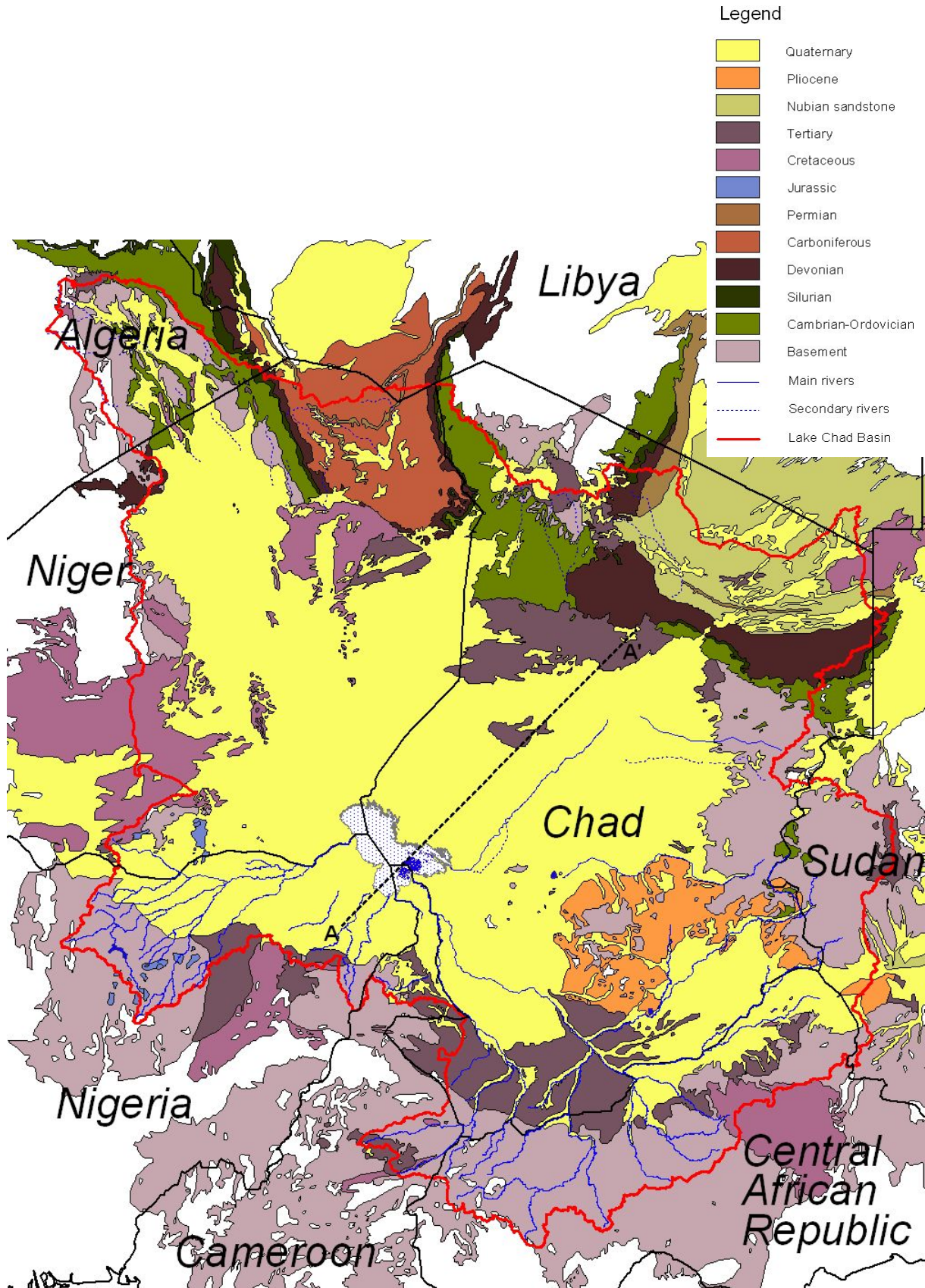


Figure 2.3. Geology of the basin area. The red line indicates the limits of the Lake Chad hydrological basin. The black dotted line shows the location of the cross-section of Figure 2.4.

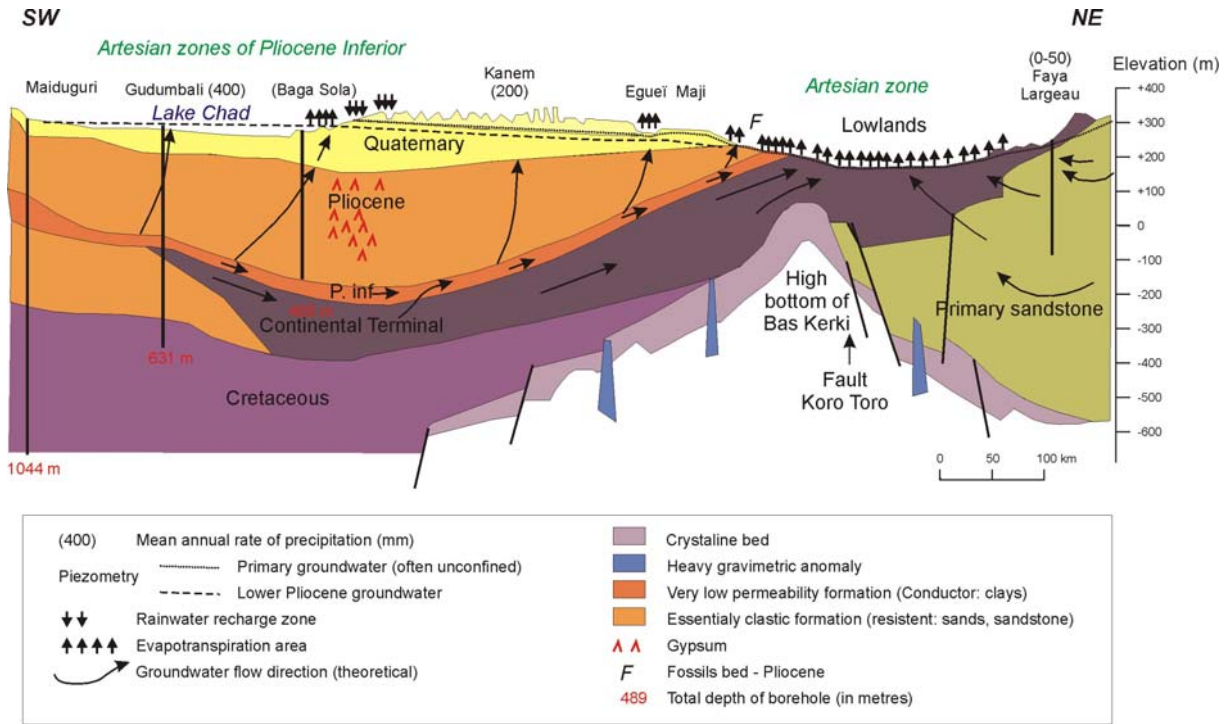


Figure 2.4. Cross-section A-A' of Figure 2.3 showing the possible hydrogeological behaviour of the various aquifers in the Lake Chad Basin (redraw from Schneider, 1989).

Using the actualised database, groundwater pressure lines were drawn. The following figures show the results for the Quaternary, the Pliocene and the Continental Terminal. However, the pressure lines for both dipper aquifers (Pliocene and Continental Terminal) are weak, as measurements do not cover the whole area.

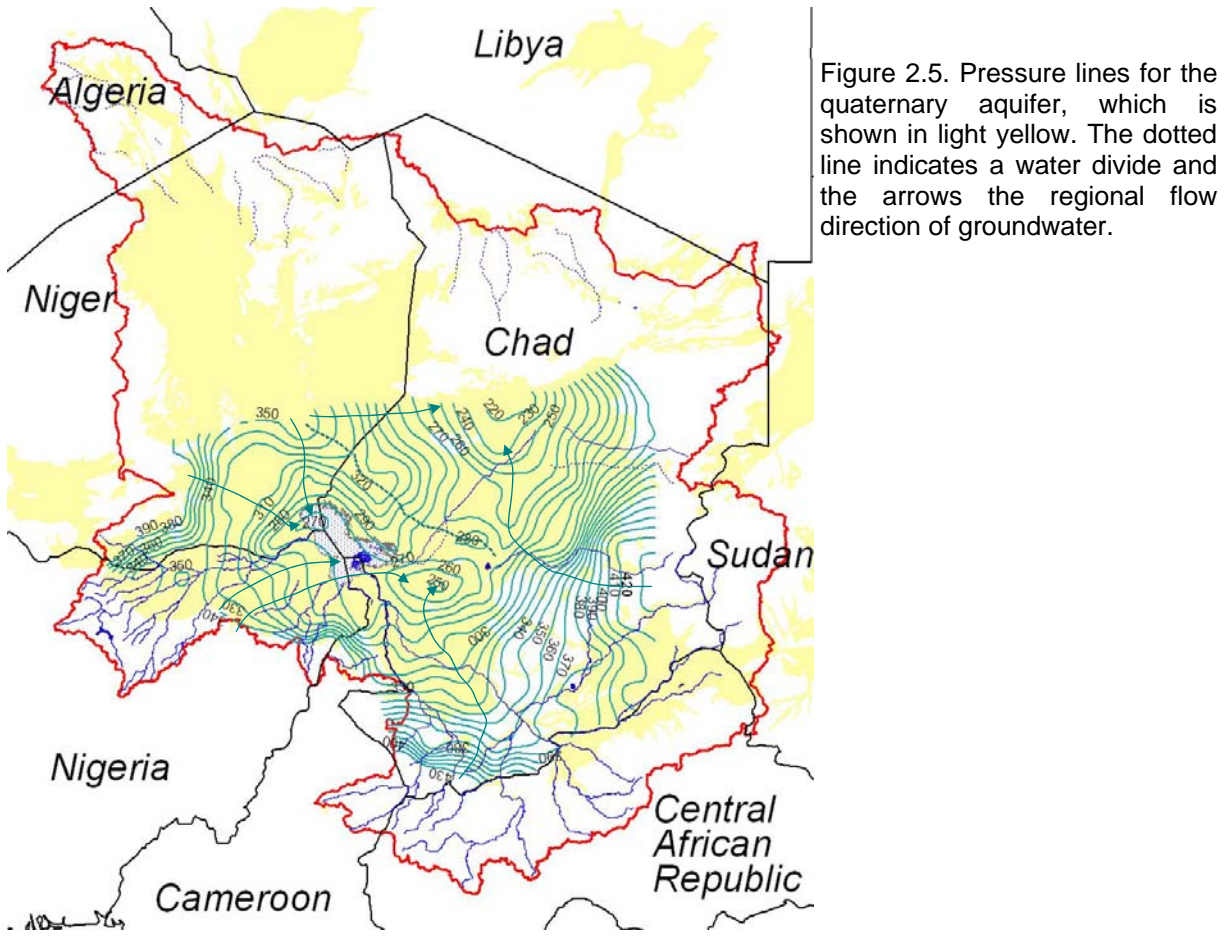


Figure 2.5. Pressure lines for the quaternary aquifer, which is shown in light yellow. The dotted line indicates a water divide and the arrows the regional flow direction of groundwater.



Figure 2.6. Pressure lines for the Pliocene aquifer. The arrows indicate the regional groundwater flows towards the east of the basin. However, data are very scarce and results must be confirmed.

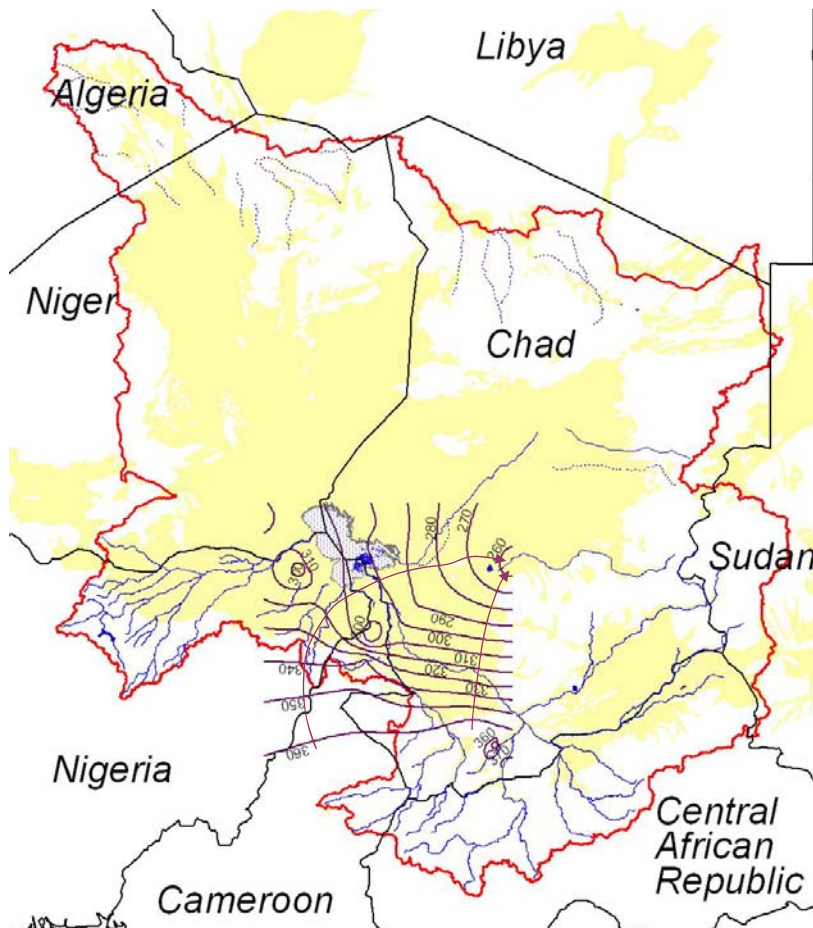


Figure 2.7. Pressure lines for the Continental Terminal aquifer. The arrows show that the regional groundwater flows from the south towards the NE of the basin. However, data are very scarce and results must be confirmed.

2.5 Establishing a unit responsible for evaluating and analysing data within the LCBC

The unit will be in charge of developing strategies of integrated water management within the Basin area. This activity has not started yet.

2.6 Other activities

2.6.1 Contact with the Direction de Ressources en Eau et Météorologie (DREM) in N'Djamena

Contact was established with the Department of Meteorology and the Department of Hydrology (Mr. Walbadet Aina Appolos, chief of Division) to ask for actualized data.

The Department of Meteorology has problems with the database and data cannot be downloaded at the moment. If the problem can be solved, digital data of precipitation and air temperature will be provided. If not, the data will be available as hard copy that will have to be inputted.

The Department of Hydrology will provide digital data of all stations in Chad. However, caution should be taken whenever working with discharge data, as the discharge sections have not been properly estimated.

2.6.2 Participation in the preparation of the 54th Council of Minister Session

The 54th Council of Ministers Session and the 12th Summit of Heads of State and Governments took place in Abuja on the 25th and 27th of March, respectively. A preparation for these meetings took place before with the participation of experts from the LCBC, country members and consultants.

The project leader assisted to this preparation workshop, where she had the opportunity to present the project.

3 Planed activities for the next stage

The next stage of the project leader is planed to start from September 2008. In the folowwing paragraphs, the main activities are listed and described.

3.1 Rehabilitation of the monitoring net established during the UNESCO/BMZ project

In the framework of the UNESCO/BMZ project in the Chari-Logone area, a monitoring net was set for which water level measurement campaigns took place: in May-August 1998 (humid period), January-May 1999 (dry period), and two others at the end of 1999 and the beginning of 2000. Unfortunately, no further measurement has been done since then.

This monitoring net needs to be rehabilitated to be able to analyse the groundwater evolution not only from the water level point of view, but also from the chemical side. During the next stage a field campaign for measurements corresponding to the wet season will be performed.

3.2 Land use mapping at the lake shores

A trip to Nigeria and Niger for evaluation of land use changes along the lake shores is planed. According to the available information, intensive agriculture takes place along the Nigerian shore, while in the Niger part the shores are pristine. Sampling of boreholes located in these areas is necessary to establish the effects of these changes on the groundwater quality.

3.3 Contact to Universities located within the Chad Basin

Due to the enormous extension of the basin, it will be almost impossible to perform measurement campaign including the whole area. Thus, cooperation works with the regional universities are sought. The idea is to promote thesis works that include measurements, which is consistent with the capacity building activities planed in our project. The results obtained should flow into the LCBC.

Contacts should be established at least with the Universities of Maiduguri and N'Djamena. Both of them have faculties of geology.

3.4 Contact to governmental institutions

Groundwater measurements and data storage takes place mainly in governmental institutions (mainly ministries). Contact to regional ministries in CAR, Chad, Niger, and Nigeria are required.

The Jigawa State Water Board (Nigeria) has already indicated interest. According to oral information from the Managing Director, Mr. Abba Hassan, data on boreholes as well as a digital hydrogeological map of the area is available.

4 References

Schneider, J.L., 1989: Géologie et hydrogéologie de la République du Tchad. Thesis presented at the University of Avignon, France, 3 vol.