Fourth Meeting of the Steering Committee for the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE)

FINAL REPORT

St. Petersburg, Russian Federation, 24 – 26 September 2013

TABLE OF CONTENTS

Fourth Meeting of the Steering Committee for the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE)

St. Petersburg, Russian Federation, 24 – 26 September 2013

1. Welcome

On behalf of the Director of SHI, Dr Vladimir Georgievskiy, Prof. Valery Vuglinskiy welcomed the participants to the fourth session of the Steering Committee for HYDROLARE. In his welcome remarks he highlighted the close collaboration of HYDROLARE with global data centres under the auspices of WMO and the level of support provided so far.

The representative of Roshydromet, Head of the Department for hydrometeorology and technical development Dr Alexander Gusev, confirmed the interest of Roshydromet in the activity of HYDROLARE. He acknowledged the progress achieved by the Centre in the intersessional period and stressed the need to integrate HYDROLARE as a DCPC into the WMO Information System. Dr Gusev wished the participants productive and successful discussions.

The representative of World Meteorological Organization (WMO), Dr Wolfgang Grabs, thanked SHI for the kind invitation to this event and voiced expectation that the progress achieved in the past reporting period can be effectively communicated to the world such enhancing the visibility and service capability of HYDROLARE.

……..

1.1. Introduction of participants and adoption of the Agenda

Participants were introduced to each other and after a short discussion, the agenda was adopted. The agenda is provided in Annex 1 and the list of participants in Annex 2.

……..

2. Status Report of HYDROLARE

2.1. Progress Report July 2011-September 2013

The Director of HYDROLARE Prof. Valery Vuglinsky provided an in-depth report on the status of activities and achievements made in the period from July 2011 to September 2013. In his report Prof. Vuglinskiy noted that during the reporting period the Centre operated in accordance with the work plan adopted by Roshydromet and following the recommendations of the third Steering Committee meeting (5-7 July 2011, SHI, St. Petersburg). This report was highly appreciated by participants as it showed the significant progress made in the reporting period. Participants acknowledged the dedicated professional work of the staff of HYDROLARE in this regard.

Specific items of interest are documented below and are summarized in the table of achievements made throughout the reporting period.

Main directions of HYDROLARE activity after the third session of the Steering Committee:

- further development of the HYDROLARE database, collection of information and database maintenance;
- website maintenance;
- improvement of a technology for displaying regularly updated information about the database content on the HYDROLARE Website using Google maps;
- cooperation with Legos/CNES;
- review and correction of the GTN-L list of lakes; and
- preparation of second and third issues of annual newsletter.

Prof. Vuglinskiy made a short description of each activity, and underlined the success achieved in the development of the technology for monitoring database content of the HYDROLARE website.

Main achievements of HYDROLARE up to September 2013 based on the Milestones for HYDROLARE defined during the Steering Committee Meeting in July 2011

Action
Complete preparation and loading of historical observational data from Russia and former USSR countries into the HYDROLARE database
Upgrade of website (meeting report; about us, status of database, data submission forms, links to partner organizations)
Update the list of organizations that have observational data for hydrology of lakes and reservoirs
Develop measures to stimulate data collection from foreign countries
Development of a HYDROLARE Science and Applications plan, taking into account the latest official documents from WMO, GCOS, GTOS and TOPC in regard to hydrology
Discuss feasibility of workshop on lakes and reservoirs in 2012/2013
Prepare two lists of priority lakes and reservoirs on global scale: - for monitoring climate change under CGOS programme (natural water bodies) - for monitoring main characteristics of water and ice regime (natural and with anthropogenic activity water bodies)
Review list of priority lakes and reservoirs and add (transboundary) lakes and reservoirs where altimetry data is or in near future will be available
Prepare official report on HYDROLARE in 2011 and 2012 for WMO and Roshydromet
Visit of HYDROLARE technical staff to CNES/LEGOS

Develop and carry out demonstration project showcasing integration of in-situ and satellite data
Develop a HYDROLARE newsletter (second and third issues)
Prepare progress report on HYDROLARE for SC-IV
On website, data policy, refer to WMO-Cg Resolution 25 on the Exchange of Hydrological Data and Products
Review WMO Congress Resolutions re: GCOS, GFCS and add relevant text in request letters of HYDROLARE, on website and articles/publications, where appropriate

……..

2.2. Demonstration of the HYDROLARE Website

The largely re-designed website of HYDROLARE was presented by Ms Liudmila Barinova. Since 2013, the website has constantly been updated with information about the database content, which can be requested by users. The data is provided to users by means of search and an explore tool that enables direct search of water bodies by their names and visualization using Google Maps. The technological complex maintaining the operation of the search and explore tool includes the following (Fig.1):

- main database on the web-server of the Centre holding lakes and reservoirs level data (at gauging stations and averaged for water bodies);
- special database on the web-server holding metadata of the main database;
- a program which requests the main database and generates files uploaded to the special database by means of the DBMS; and
- a program which accesses the special database and retrieves and visualizes information about database content on the map (Fig.2).

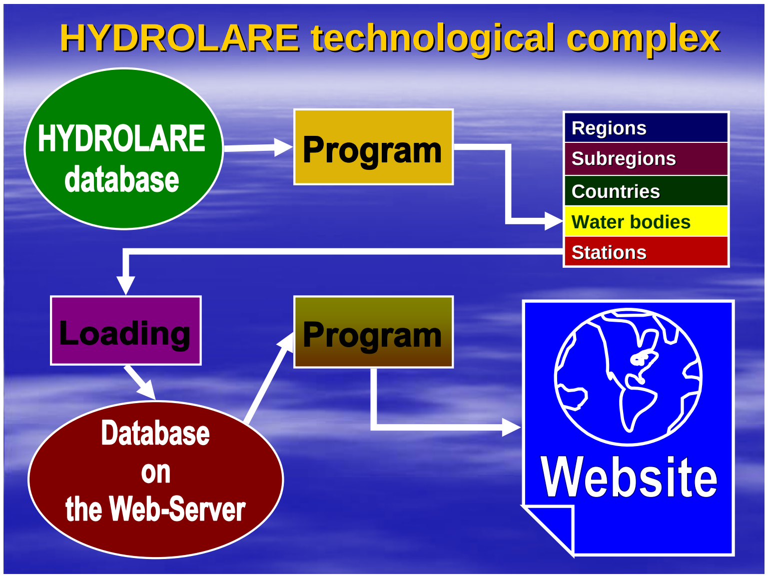

Figure 1 - Structure of the HYDROLARE technological complex

In the framework of cooperation with Legos, the possibility of direct access to the Hydroweb web pages on lake issues could be realized, and host both in-situ and remote sensing data.
The Centre has nearly completed the design of the new technological structure, including a database largely enhanced by remote sensing data, and furthermore started its implementation.

Figure 2 – a) Search results for Lake Ladoga; and b) Search results for Lake Baikal

……..

3. GCOS Programme and its Connections with HYDROLARE

The representative of GCOS, Ms Jessica Holterhof, who participated at the meeting on behalf of the Director of GCOS Dr Carolin Richter, outlined GCOS-related meetings and activities, and presented the recent work undertaken within the programme and its three scientific panels for atmospheric, oceanic, and terrestrial observations for climate (AOPC, TOPC and OOPC). GCOS is at present strengthening its efforts to stronger link the three panels through crosscutting issues, and furthering its engagement with the scientific climate research community. GCOS should be seen as a direct link between the science community and policy-makers, as it reports directly to UNFCCC.

Furthermore, Ms Holterhof mentioned that one of the central functions of GCOS is to identify gaps in the observing systems and to review its status of implementation. She outlined the upcoming steps in the GCOS cycle of continuous assessments on the status of observing systems and on progress against the current GCOS Implementation Plan (IP). Next steps are the preparation of a 'Third Adequacy Report' by early 2015, to be followed by a new IP to be published in 2016. Input is needed from both the HYDROLARE and GTN-L community for those reports regarding the Essential Climate Variable (ECV) Lakes, as actions in the current 2010 Update of the GCOS Implementation Plan are either ongoing, have already been completed, or have not been following a realistically set timeframe in the past. GCOS welcomed HYDROLARE to identify information gaps, assess the existing observation requirements, and comment on the networks progress, but also formulate of how GCOS can support HYDROLARE in the future to achieve a greater coverage of lake observations on a global scale.

……………………………………………………………………………………………………….

4. Activities of LEGOS/CNES and Possibilities of Monitoring Lakes and Reservoirs Using Remote Sensing

The representative of LEGOS/CNES, Dr Jean-François Crétaux, provided information on the activities of the Laboratory of Study of Geophysics and Oceanography from Space (LEGOS) at the International Centre for Space Studies (CNES), especially in regard to the work of HYDROLARE. Since 2011, LEGOS/CNES and SHI have an agreement to jointly work on issues regarding data management, data delivery, and database design.

Of main interest for members of the Steering Committee were the outcomes of the joint meetings of representatives from the two institutions that took place throughout 2012, which included an updated agreement on further actions, building on the list of actions agreed on at the third meeting of the HYDROLARE Steering Committee in 2011. In particular, an agreement was reached to jointly prepare two lists of lakes for monitoring main water and ice regime characteristics – lakes disturbed by human activities and natural lakes. Both lists can be found in Annex 4.

In addition, the representatives discussed the further development of a joint project on an integration of both the HYDROLARE and the Hydroweb websites. The Hydroweb database from LEGOS/CNES contains time series for water level observations of large rivers, lakes and wetlands all around the globe. The time series are mainly based on altimetry data, and are currently available for about 100 lakes. As users can visualize the water level time series, and can download their numerical values, the link to the Hydroweb website would be a useful asset for HYDROLARE. Additionally, Steering Committee members were informed of the development of an online version of a joint prototype database, which will be available from both websites. Dr Crétaux reminded participants of the meeting that Hydroweb and HYDROLARE have different data policies, as HYDROLARE works under WMO Resolution 25 (Cg-XIII) that defines the global exchange of hydrological data and products.

…………………………………………………………………

4.1. Progress in integration of terrestrial and satellite observations for HYDROLARE

Participants discussed progress made in the integration of terrestrial and satellite-based observations. Main emphasis of the discussion was set on the current capacities for the global measurement of the ECV lakes as a key variable to describe fresh water in a liquid phase. The volume of water in lakes and reservoirs reflects both atmospheric and hydrological conditions, and if climate conditions will change, the water bodies will reflect this promptly.

Terrestrial data forms a reference for the calibration of satellite-based altimetry observations. To further detect the causes of observed differences between terrestrial *in-situ* and satellite-derived data, LEGOS/CNES and HYDROLARE have conducted a comparison of *in-situ* and altimetry level data for two large Russian lake reservoirs (Bratskoye and Kuybyshevskoye) through their framework of cooperation. The comparison showed that there is a bad correspondence between *in-situ* and altimetry data, which can be attributed to the fact that their length is larger than their widths. In contrast, time correlation coefficients seem to be quite good due to high amplitude of water level variations well captured by altimetry. More detailed information on the comparison can be found in the annual newsletter (No. 3, 2013) of HYDROLARE.

………………………………………………………………………………………………………

5. Data Acquisition from WMO Member Countries – Progress and Issues to be Addressed

Ms Elena Kuprienok provided information on the status of data acquisition from national institutions and data centres. Participants commented on the efforts that had resulted in the acquisition of data and observations, including metadata from a number of countries. It was noted with concern that there were WMO Members who have reservations to sharing of observational data on lakes and reservoirs and others that have not yet obliged to the pledges made when contacted – some almost four years ago. While in some cases terrestrial observation data may not be obtained due to national reasons, the Steering Committee observed that it might be in part attributed to inadequate means of communication. Creating awareness of the necessity to share hydrological data on lakes and reservoirs is of critical importance to research in climate variability and change and its influence on changes in the freshwater resources in lakes and reservoirs. Participants agreed that the creation of awareness and outreach to holders of such data is a prime priority. Furthermore, the formulation of suitable adaptation strategies for the management of lakes and reservoirs needs to be based on robust observational data on national and transboundary scales.

Country	✉ request sent	✉ data received	Country	✉ request sent	✉ data received
Europe					
ARMENIA	✉		MOLDOVA	✉	✉
AUSTRIA	✉		ROMANIA	✉	
AZERBAIJAN	✉		SERBIA	✉	
BELARUS	✉	✉	SLOVENIA	✉	✉
CYPRUS	✉	✉	SPAIN	✉	
ESTONIA	✉		SWEDEN	✉	✉
FINLAND	✉	✉	SWITZERLAND	✉	✉
HUNGARY	✉		UKRAINE	✉	
ICELAND	✉				
Asia					
HONG KONG	✉	✉	MONGOLIA	✉	
INDIA	✉		TAJIKISTAN	✉	✉
KAZAKHSTAN	✉	✉	UZBEKISTAN	✉	
KYRGYZSTAN	✉	✉			
Africa					
MALI	✉		ZAMBIA	✉	
TANZANIA	✉				
North America, Central America and the Caribbean					
ANTIGUA AND BARBUDA	✉		DOMINICA	✉	
BELIZE	✉		MEXICO	✉	✉
CANADA	✉		USA	✉	✉
South America					
CHILE	✉		COLOMBIA	✉	
South-West Pacific					
AUSTRALIA	✉	✉			

✉ – **request sent** ✉ – **data received**

Figure 3 – Summary table of the current status of data acquisition

Ms Kuprienok informed the Committee that in 2012 and 2013 the Centre continued collection and preparation of data from WMO member countries, with priority given to water level data. To date, 14 countries provided their data to the Centre, including Australia, Moldova, Mexico, Cyprus, Switzerland, Finland and the USA that provided data during the last two years. In 2012/2013, data from Cyprus, Moldova, Switzerland, Finland (lakes of the Bothnian basin), the United States (Great Lakes), as well as data provided earlier by the former USSR states, were analyzed and uploaded to the HYDROLARE database (see Figure 3).

In conclusion, Ms Kuprienok noted with concern substantial problems impeding data collection. Only Cyprus and Finland sent their data in the recommended Excel templates provided on the website. Most of the countries have not provided data regardless of repeated requests circulated by HYDROLARE. Data from outside former USSR territory have been provided in variety of formats and national languages, which make it difficult to identify, analyze and prepare data for uploading to the database. The process is also aggravated by the fact that data providers do not indicate WMO sub regions in the datasets, which makes it difficult to encode water bodies and gauges.

……..

6. Liaison with National and International Providers of Data and Information

Members of the Steering Committee recognized that the traditional WMO approach to seek support through the Permanent Representatives of Members to WMO and Hydrological Advisors were insufficient to improve the data acquisition for HYDROLARE. Main reason for this is that traditional National Hydrological Services (NHS) are not in charge of the observation of lakes and reservoirs, with only a few exceptions. The Steering Committee therefore recommended using all possible means to indentify national data providers and encouraged an enhanced cooperation with national and international organizations that have expertise and are likely to be in possession of observational datasets and derived data products. This was seen as a matter of priority actions for HYDROLARE.

……………………………………………………………………………………………………..

7. Presentations from Collaborating Partners (GRDC, ILEC)

Information on technical aspects and institutional aspects of the operation of the GRDC database was provided by Dr Grabs on behalf of the Head of GRDC Dr Ulrich Looser on the status of the GRDC database and current developments. Participants welcomed the information provided as guidance for the operation of HYDROLARE. Participants urged GRDC to further provide relevant working experiences to HYDROLARE staff as “lessons learnt” to enhance service capabilities of HYDROLARE.

……………………………………………………………………………………………………..

The representative from the International Lake Environment Committee Foundation (ILEC), Prof. N. Aladin, provided information on the 15th World Lake Conference, which will take place from 1-5 September 2014 in Perugia, Italy. The theme of this years’ conference will be Lakes: The Mirrors of the Earth – Balancing Ecosystem Integrity and Human Wellbeing. The aim of the meeting is to bring together experts in the field of lake environments and habitats, with the underlying goal of establishing a basis for developing multidisciplinary solutions to multidisciplinary issues. Therefore, ILEC is not only addressing expert scientists, but also invites resource managers, politicians, lake basin stakeholders, and data users. The interactions between the representatives from different areas of expertise is expected to result in a wider discussion, with the goal to connect a top-down approach to a bottom-up perspective to solving complex lake basin issues.

It was furthermore decided that HYDROLARE will carry out a special session on hydrological monitoring of the world’s largest lakes and reservoirs. The WMO Climate and Water Department in principal is prepared to support such a session. GCOS assured its support for such a session. The session is aimed towards the exchange of international experience in hydrological monitoring of large lakes and reservoirs. As hydrological monitoring data is not available for many of those water bodies, and data sets available are mostly incomplete, there is a pressing need to address these challenging problems of obtaining, collection and dissemination of hydrological monitoring of lake data. The proposed themes for discussion will be:

- observations of hydrological characteristics of the world’s largest lakes and reservoirs, their content and measurement techniques;
- collection and processing of observation data on large lakes and reservoirs; long-term data achieving and database maintenance;
- development of international cooperation in the field of hydrological monitoring of large lakes and reservoirs; and
- improvement and development of international monitoring data exchange.

………

7.1. Information on the third Roshydromet-MFI Workshop in Moscow, April 2013

The representative of Roshydromet Dr Gusev provided information on the third Roshydromet-MFI Workshop that was held in Moscow, Russian Federation, in April 2013.

Major objectives of the meeting were to assess activities of the Russian segment of WIS (R-WIS) in 2013 and to provide information on development and implementation of the Global Information System Centre (GISC-Moscow) that had successfully held WMO Audit and is already operational as a component of the WMO Information System (http://portal.gisc-msk.wis.mecom.ru:8080/portal/). Participants were informed on the general WIS concepts and architecture, main technical specifications and requirements for WIS centres, activities and status of R-WIS in 2013 and the plans of Roshydromet on further large-scale implementation of R-WIS throughout Russia. It was emphasized that the next stage of WIS implementation in Russia envisages establishment of the network of special Data Collection or Production Centres (DCPCs).

It was noted with satisfaction that HYDROLARE is planned by Roshydromet as one of the DCPC centres of this network. Participants expressed support for this initiative and recommended to pursue activities on practical realization of this plan. The need was emphasized to further promote HYDROLARE activities. In particular, it was suggested to use resources such as Virtual Laboratory for Training and Education in Satellite Meteorology (http://meteovlab.meteorf.ru/ and http://tech.meteorf.ru/) for posting educational and information material about HYDROLARE.

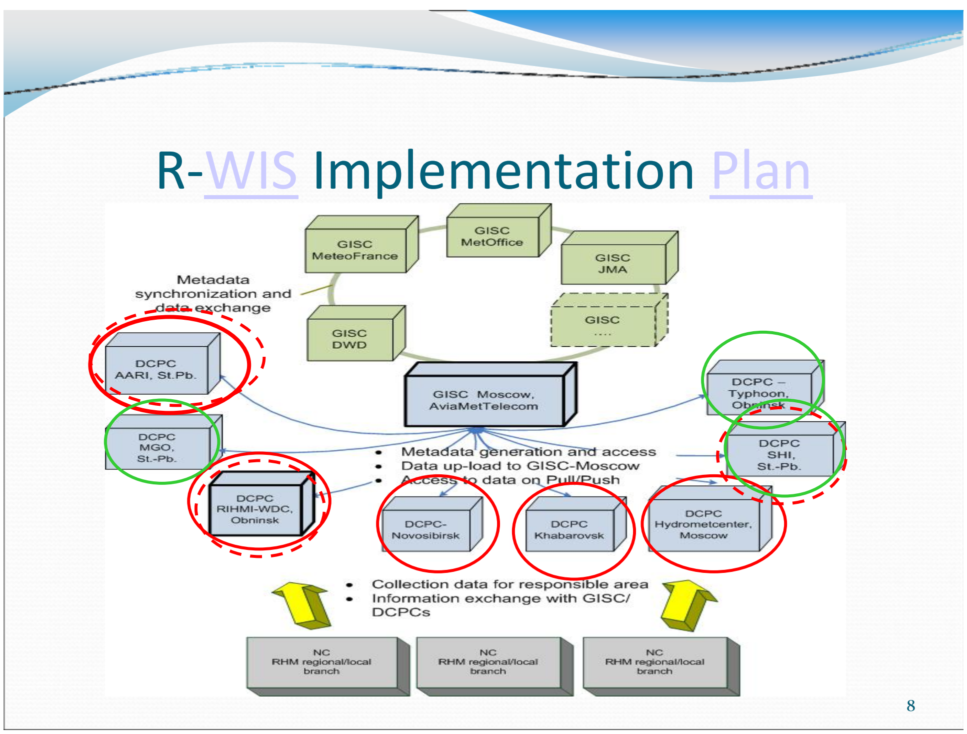

Figure 4 – Overview of the structure of the R-WIS Implementation Plan

………..

8. Lecture Sessions

Participants highly appreciated the lecture provided on the occasion: "Water-level changes in world's largest lakes in a changing climate." The lecture was presented by Ms Olga Golubeva and the main findings are summarized below:

The study was aimed at analysis of the world's largest lakes level measurements for the last 30 years comparing to the previous period. 16 largest lakes located in Russia (10 lakes), Kazakhstan (3 lakes) and the USA (3 lakes) were studied. Long-term observation series for the periods 1951-1980, 1981-2010 and the entire period 1951-2010 were analyzed. The series were tested for homogeneity using Student-Fisher criteria and analysis was made of the relevance of linear trends in long-term annual level series.

Main findings are as follows: a) positive trend in level variations is observed both in the past 30 years and for the study period 1951-2010 for most Russian lakes except for the lakes Lacha and Ubinskoye for which negative trend is observed ; b) for the US lakes (Erie, Ontario, Superior) the decrease in water level has been observed in the last 30 years; c) large lakes of Kazakhstan (Balkhash, Alakol, Markakol), on the contrary, demonstrate positive level dynamics in 1981-2010 comparing to the previous 30-year period.

………..

9. HYDROLARE Activities until July 2015

On-going Actions with Interim Milestones for HYDROLARE until July 2015

No	Action	Who (Lead)	Deadline	Checking
1	Continue preparation and loading of new portions of historical data from Russia and former USSR countries into HYDROLARE database	SHI	Ongoing	December 2014, 2015
2	Continue preparation and loading of new metadata and historical observation data from WMO member countries (outside former USSR) into HYDROLARE database	SHI	Ongoing	December 2014, 2015
3	Put data request form on the HYDROLARE website to enable data requests from users	SHI	October 2013	
4	Continue contact all institutions holding data on lakes and reservoirs of relevance for HYDROLARE	SHI, CNES/LEGOS, WMO	Ongoing	December 2014, 2015

5	Prepare requests to WMO member countries on: - submission of observation data to HYDROLARE - availability of observation data for lakes included into GTN-L lists, excluding the list of transboundary lakes	WMO,SHI	December 2013	
6	Prepare publications on HYDROLARE activity in scientific journals, newsletters etc.	SHI and partners	Ongoing	December 2014, 2015
7	Update HYDROLARE Science and Applications plan, take into account latest official documents of WMO, GCOS (TOPC) in hydrology, and evolving tasks	SHI, LEGOS/CNES,	Ongoing	December 2014, 2015
8	Update a list of organizations which have observation data for hydrology of lakes and reservoirs on the HYDROLARE website	SHI, CNES/LEGOS, WMO	Ongoing	December 2014, 2015

Actions and Milestones for HYDROLARE until July 2015

No	Action	Who (Lead)	Deadline
1	Explore the value of lake temperature database for former USSR countries as case examples for regional climate studies within this project	SHI and scientific partners	July 2015 (completion)
2	Prepare HYDROLARE newsletters (fourth and fifth issues)	SHI	Jan 2014, Jan 2015
3	Prepare official reports on HYDROLARE activity in 2013 and 2014 for WMO and ROSHYDROMET	SHI	Dec 2013 Dec 2014
4	Implement full query and data request functions for available stations and data in HYDROLARE	SHI	Oct 2013
5	Prepare list of priority transboundary lakes and reservoirs where altimetry data is or in near future will be available	LEGOS/ CNES	Dec 2013

6	Link SaLLe Database to HYDROLARE through web link	SHI, ZIN RAS	Oct 2013
7	Establish linkage between HYDROLARE and Hydroweb websites	SHI,CNES	Jan 2014
8	Update diagram of GTN-H configuration	WMO	Oct 2013
9	GRDC to provide list of matching gauging stations to HYDROLARE water bodies	GRDC,SHI	Jan 2014
10	Cross-reference water bodies with GEMS-Stat information	SHI,GEMS	On hold until new custodian for the GEMS-Stat database is known
11	Inform users of Hydroweb of the services of HYDROLARE	CNES	Dec 2013
12	Agree on common metadata standards and formats	SHI,CNES with support from WMO and GRDC	July 2014
13	At country level, visualize in interactive maps water bodies in the HYDROLARE database together with basic identification (i.e. name)	SHI	March 2014
14	Develop HYDROWEB into a fully operational Data Centre, complementary to HYDROLARE	CNES	Dec 2014
15	Provide automatically generated data products based on terrestrial and satellite-based observations	SHI,CNES	Dec 2014
16	Set in motion a process to apply HYDROLARE as DCPC with WIGOS/WIS	SHI, Roshydrom et	Dec 2014
17	HYDROLARE to provide inputs for next GCOS Implementation Plan and Adequacy Report	SHI	2014, 2015
18	Planning for HYDROLARE parallel workshop as part of the 15th World Lake Conference and inform the organizers	SHI, ILEC with support from WMO	Dec 2013
19	Provide information on standards to HYDROLARE	WMO	November 2013

10. Additional recommendations and conclusions

Reviewing its recommendations of the third session of the HYDROLARE International Steering Committee further recommended that SHI ensure in the further implementation of HYDROLARE the following:

- Standardization of all metadata information to available WMO and ISO standards, thereby ensuring consistent geo-referencing of lake shapes (using GOOGLE Earth and using HydroSHEDS, or equivalent) and station elevation;
- Provide reference of the source/origin of data;
- Document quality control procedures and methods used;
- Generation and display of volume changes of lakes in GTN-L using methods demonstrated by LEGOS/CNES;
- Compilation (twice per year) of time series of volume changes of selected lakes referenced in GTN-L on a monthly basis.

……..

11. Final Remarks

The representative of SHI thanked the members of the Steering Committee for their active participation, and recalled the importance of the guidance and support provided by the former to further the developments of HYDROLARE with a view to enhance its service capability to users.

The representative of WMO reiterated the full support of WMO within available means and using all opportunities to promote the operations and services of HYDROLARE, including efforts to accelerate data rescue as well as facilitating cooperation of WMO members to contribute data and observations for HYDROLARE on a regular basis. He also underlined the valuable complementarity of using both terrestrial and remotely sensed observations of lakes and reservoirs. He expressed his gratitude to the staff of HYDROLARE for their dedicated work and SHI as organizer of the meeting for its much appreciated hospitality and effectiveness of the conduct of the meeting.

……..

12. Closure of the Fourth Steering Committee of HYDROLARE

The meeting closed on Thursday, 26 September at 12.30 pm.

Annex 1
Final Agenda

Tuesday, 24 September

11.00 – 11.15 Welcome

11.15 – 11.30 Introduction of participants and adoption of the agenda

11.30 – 12.00 Status report of HYDROLARE – summary of activities and milestones (HYDROLARE)

12.00 – 12.30 Coffee Break

12.30 – 13.00 Collection of data from WMO Member States. Status: 2013 (HYDROLARE)

13.00 – 14.00 Lunch

14.00 – 14.30 Lecture "Changes in ice regimes of lakes and reservoirs of Russia under changing climate conditions" (SHI)

14.30 – 15.00 Development of HYDROLARE web-site (HYDROLARE)

15.00 – 15.30 Legos/CNES activities and possibilities of monitoring on lakes with use of satellite data (Legos, France)

15.30 – 16.00 Coffee Break

16.00 – 17.00 Initiative progress in integration of terrestrial and space-based observations (All participants)

Wednesday, 25 September

10.00 – 10.30 GCOS programme and its connection with HYDROLARE (GCOS Representative)

10.30 – 11.00 Presentations by collaborating partners (GRDC, ILEC)

11.00 – 11.30 Information about 3rd Roshydromet – MFI workshop in Moscow, April 2013 (HYDROLARE)

11.30 – 12.00 Coffee Break

12.00 – 12.30 Organization of an international lake monitoring workshop under the umbrella of the 15th World Lake Conference (ILEC)

12.30 – 13.00 Liaison with national and international providers of data and information (SHI and partners)

13.00 – 14.00 Lunch

14.00 – 16.00 Discussion on the future HYDROLARE activities (HYDROLARE, All participants)

16.00 – 16.30 Coffee Break

16.30 – 17.00 Summary of agreed actions (HYDROLARE, WMO)

Thursday, 26 September (morning session only)

10.00 – 11.00 Work plan and milestones 2013-2015, its adoption, recommendations and conclusions (All participants)

11.00 – 11.30 Coffee Break

11.30 – 12.00 Any other business (All participants)

12.00 – 12.10 Closure of the meeting

12.30 – 13.30 Lunch

Annex 2
List of Participants

Prof. Nikolay Aladin
(Representative of ILEC)
Laboratory of Brackish Water Hydrobiology
Zoological Institute of Russian Academy of Sciences
Universitetskaya nab. 1
199034 St. Petersburg
Russian Federation
Phone: +7 812 328 4609
Fax: +7 812 714 0444
E-mail: aral@zin.ru

Dr. Liudmila Barinova
Main Specialist
Centre of Water Cadastre
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: cntgwk@hydrology.ru

Ms Galina Barinova
Engineer HYDROLARE
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: idc@HYDROLARE.net

Ms Sophie Bazanova
Main Specialist HYDROLARE
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 11 03
Fax: +7 812 323 10 28
E-mail : ssbaz@mail.ru

Dr. Jean-François Crétaux
CNES/LEGOS 14, Av. Edouard Belin
31400 Toulouse France
Phone: +33 5 61 33 29 89
Fax: +33 5 61 25 32 05
E-mail: jean-francois.cretaux@cnes.fr

Ms Natalia Dolindo
Engineer
Centre of Water Cadastre
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28

Dr. Vladimir Georgievskiy
Director
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 35 18
Fax: +7 812 323 10 28
E-mail: onti@ggi.nw.ru

Ms Olga Golubeva
Engineer
Centre of Water Cadastre
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: cntgwk@hydrology.ru

Dr. Wolfgang Grabs
Chief, Water Resources Division
Hydrology & Water Resources Department
World Meteorological Organization
Case postale 2300
7bis, Avenue de la Paix
1211 Geneva 2
Switzerland
Phone: +41 22 730 8358
Fax : +41 22 730 8043
E-mail: wgrabs@wmo.int

Dr. Alexander Gusev
Head of Department Roshydromet
Phone: +7 495 605 48 13
Fax: +7 499 795 21 15
E-mail: gusev@mecom.ru

Dr. Sergei Gusev

Deputy Chief
Centre of Water Cadastre
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: idc@HYDROLARE.ru

Ms Jessica Holterhof
GCOS Secretariat
World Meteorological Organization (WMO)
P.O.Box 2300
7 bis, avenue de la Paix
1211 Geneva 2
Switzerland
E-mail: jholterhof@wmo.int

Elena Kuprienok
Main Specialist
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 32 80
Fax: +7 812 323 10 28
E-mail: idc@HYDROLARE.ru

Prof. Valery Vuglinskiy
Director HYDROLARE
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 34 58
Fax: +7 812 323 10 28
E-mail: vvuglins@vv4218.spb.edu

Annex 3
Existing and Potential Partners for HYDROLARE

International Joint Commission (USA & Canada): http://www.ijc.org/en/home/main_accueil.htm

Royal Geographical Society: http://www.rgs.org/HomePage.htm

National Geographic Society: www.nationalgeographic.com

LEGOS/CNES Hydroweb : http://www.legos.obs-mip.fr/en/soa/hydrologie/hydroweb/
Jean-François Cretaux (CNES, France): Tel: +33 (0)5 61 33 29 89, jean-francois.cretaux@cnes.fr
Philip P. Micklin (Professor emeritus at Western Michigan University): philip.micklin@wmich.edu
Dr Ian Boomer (School of Geography, Earth & Environmental Sciences, The University of Birmingham), Edgbaston, Birmingham B15 2TT, Location: GES 408, Tel: +44 (0)121 41 45536 (office) / -42866 (lab), Fax: -45528, i.boomer@bham.ac.uk
Global Runoff Data Centre http://grdc.bafg.de
Ulrich Looser (GRDC, Germany): Tel: +49 (0)261 1306 5224, Fax: -5722, looser@bafg.de

Finland's environmental administration: http://www.environment.fi/

Food and Agriculture Organization: http://www.fao.org/nr/water/aquastat/main/index.stm
LakeNet: www.worldlakes.org

International Commission on Large Dams (ICOLD): http://www.icold-cigb.net/

International Lake Environment Commitee (ILEC): http://www.ilec.or.jp/eg/index.html

International Association for Environmental Hydrology (IAEH): http://hydroweb.com/

International Association of Hydrological Sciences (IAHS): http://www.cig.ensmp.fr/~iahs/

International Geographical Union: (IGU): http://www.igu-net.org/uk/igu.html

US Army Corps of Engineers (USACE):
Hydraulics and Hydrology:
- http://www.lre.usace.army.mil/greatlakes/hh/
- http://www.lre.usace.army.mil/greatlakes/hh/contacts/

Great Lake Water Levels: http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/
Historic Great Lake Water Levels:
http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata/greatlakeshydrographs/

US Department of Agriculture, Foreign Agricultural Service: Global Reservoir and Lake Monitor (TOPEX/POSEIDON and Jason-1 Altimetry)
http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/

Charon Birkett (NASA Goddard Space Flight Centre, USA); Mailcode 923 Greenbelt, MD 20771, USA Tel: +1 301 614-6643; cmb@nemo.gsfc.nasa.gov

Northern Eurasian Earth Science Partnership Initiative (NEESPI) (http://neespi.org/)
Science Plan Overview http://neespi.org/science/ExecutiveSummary19W.pdf

Additional (new) data sources to be investigated:

- World Lakes Network http://www.worldlakes.org/index.asp
- GRanD (Global Reservoir and Dam database) available at http://www.gwsp.org/85.html (Digital Water Atlas at GWSP) or http://sedac.ciesin.columbia.edu/pfs/grand.html (SEDAC at CIESIN) - includes Greifswald dataset
- USDA/FAS Global Reservoir Monitor http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/PECADOnlineGlobalReservoirMonitorBackground.htm

Annex 4
Lists of GTN-L Lakes (Updated 2013)

Revised version of Global Terrestrial Network Lakes (GTN-L)
(Priority list of 79 lakes for sustained monitoring)
Status – May 2010

N	Name	Country	Lat	Long	Elev (m)	Area (km2)
1	Alakol	Kazahkstan	46:0NL	81:4EL	347	2650
2	Albert (Mobutu Sese Seko/Nyanza)	Zaire/Uganda	1:4NL	30:5EL	615	5300
3	Athabasca	Canada	59:6NL	108:4WL	213	7900
4	Baghrash (Bosten)	China	42:0NL	87:0EL	1038	1380
5	Baikal	Russia	53:4NLO	106:4EL	456	31500
6	Balkhash	Kazakhstan	45:4NL	76:2EL	341	18200
7	Beysehir	Turkey	37:4NL	31:4EL	1250	780
8	Bodensee-Constance	Germany/Switzerland/Austria	47:4NL	9:2EL	400	539
9	Caspian	Azerbaijan/Russia/Turkmenistan/Iran	42:0NL	50:0EL	-2.8	37400
10	Chad	Chad/Cameroon/Nigeria/Niger	13:2NL	14:1EL	280	1540
11	Champlain	Canada/USA	43:4NL	73:2WL	29	1130
12	Chany	Russia	54:5NL	77:4EL	106	2010
13	Chienghai (Koko Nor)	China	36:4NL	100:2EL	3196	4583
14	Chilwa	Malawi/Mozambique	15:2SL	35:4EL	622	1750
15	Colhue Huapi	Argentina	45:4SL	68:4WL	258	810
16	Dead Sea	Israel/Jordan	31:4NL	35:4EL	-405	810
17	Dongt ing Hu	China	29:2NL	112:2EL	33	2740
18	Ebi=Aibi	China	44:55NL	82:56EL	213	1070
19	Egridir	Turkey	37:5NL	30:5EL	920	590
20	Ennadai	Canada	60:0NL	100:5WL	311	668
21	Erie	Canada/USA	41:4NL	81:6WL	174	25821
22	Eyre	Australia	28:4SL	137:2E	-9.5	9690

				L		
23	George	Uganda		30:1EL	914	250
24	Great Bear	Canada	66:0NL	120:3WL	186	31153
25	Great Salt Lake	USA	41:1NL	112:4WL	1283	5000
26	Great Slave Lake	Canada	62:0NL	113:0WL	156	28568
27	Har Us	Mongolia	48:0NL	92:10EL	1153	1760
28	Hubsugul	Mongolia	51NL	102:2EL	1645	2770
29	Hukun Hu (Hulun Nur) Dalay Nor	China	48:5NL	117:2EL	543	1731
30	Huron	Canada/USA	44:4NL	82:2WL	176	59570
31	Hyargas Nuur (Khirgiz Nuur)	Mongolia	49:1NL	93:4EL	1029	1407
32	Ilmen	Russia	58:2NL	37:1EL	18	982
33	Issyk-Kul	Kirgizstan	42:5NL	77:1EL	1606	6236
34	Izabel	Guatemala	15:30NL	89:10WL	8	590
35	Kamilukuak	Canada	61:4NL	102:2WL	266	629
36	Kaminak	Canada	62:1NL	95:6WL	53	554
37	Khanka	China/Russia	44:5NL	132:2EL	69	4190
38	Kinneret (Sea of Galilee)	Israel	32:5NL	35:4EL	-209	170
39	Kyoga (Kioga)	Uganda	1:4NL	33:1EL	914	1720
40	Ladoga	Russia	60:5NL	31:2EL	5	18135
41	Leman (Geneva)	Switzerland/France	46:2NL	6:4EL	372	584
42	Lob Nor LOBNOR	China	40:30NL	90:30EL	2	3010
43	Maggiore	Italy/Switzerland	45:6NL	8:4EL	194	213
44	Managua	Nicaragua	12:31NL	86:21WL	37	1040
45	Manitoba	Canada	50:0NL	98:5WL	248	4610
46	Mar Chiquita	Argentina	30:4SL	30:4WL	69	1984
47	Maracaibo	Venezuela	9:40NL	71:30WL	1	13010
48	Michigan	USA	43:5NL	86:1WL	177	58016
49	Mono	USA	38:0NL	119:0WL	1945	180
50	Naivasha	Kenya	0:5SL	36:2EL	1890	160
51	Nicaragua	Nicaragua	11:30N	85:30W	32	8150

			L	L		
52	Nyasa (Malawi)	Mozambique/Malawi/Tanzania	1SL	34:5EL	5000	6400
53	Ohrid	Macedonia	41:0NL	13:0EL	89	358
54	Okanagan	Canada	49:5NL	119:3WL	342	351
55	Onega	Russia	61:5NL	35:2EL	35	9890
56	Ontario	Canada/USA	43:4NL	78:0WL	75	19009
57	Oulu	Finland	64:0NL	27:0EL	122	900
58	Patzcuaro	Mexico	19:32NL	101:32WL	2035	130
59	Peipu	Estonia/Russia	57:0NL	30:52EL	30	4300
60	Poyang Lake	China	29NL	116:1EL	16	3210
61	Pyramid	USA	40:0NL	119:4WL	1160	453
62	Rudolf Turkana	Ethiopia/Kenya	3:30NL	36:0EL	427	6400
63	Salton Sea	USA	33:12NL	115:51WL	-70	950
64	Sandy	Canada	52:0NL	93:4WL	276	508
65	Sasykkol	Kazahkstan	46:5NL	46:5EL	368	736
66	Scutari Skadar	Albania	42:0NL	19:0EL	121	600
67	Seneca	USA	42:5NL	76:5WL	126	175
68	Superior	Canada/USA	47:3NL	88:2WL	183	82367
69	Tahoe	USA	39:6NL	120:6WL	1897	499
70	Tanganyika	Tanzania/Zaire/Zambia/Burundi	6:0SL	30:1EL	773	3200
71	Titicaca	Peru/Bolivia	15:4SL	69:4WL	3812	8372
72	Torrens	Australia	31:00SL	137:50EL	30	5780
73	Tuz	Turkey	38:6NL	35:2EL	925	1500
74	Uvs Nuur	Mongolia	50:2NL	92:5EL	759	3350
75	Valencia	Venezuela	10:1NL	67:4WL	405	350
76	Van	Turkey	38:4NL	43:2EL	1646	3713
77	Victoria	Tanzania/Uganda/ Kenya	1:4SL	33:1EL	1134	68800
78	Winnipeg	Canada	52:6NL	97:5WL	217	23750
79	Winnipegosis	Canada	52:4NL	100:4WL	253	5150

List of priority unregulated and regulated lakes on global scale for monitoring main characteristics of water and ice regime (natural and with anthropogenic activity water bodies)

Unregulated lakes

N	**Name**	**Country**	**Lat**	**Long**	**Elev (m)**	**Area (km2)**
1	Alakol	Kazahkstan	46:0NL	81:4EL	347	2650
2	Albert (Mobutu Sese Seko/Nyanza)	Zaire/Uganda	1:4NL	30:5EL	615	5300
3	Athabasca	Canada	59:6NL	108:4W L	213	7900
4	Baghrash (Bosten)	China	42:0NL	87:0EL	1038	1380
5	Baikal	Russia	53:4NL O	106:4E L	456	31500
6	Balkhash	Kazakhstan	45:4NL	76:2EL	341	18200
7	Beysehir	Turkey	37:4NL	31:4EL	1250	780
8	Bodensee-Constance	Germany/Switzerland/Austria	47:4NL	9:2EL	400	539
9	Caspian	Azerbaijan/Russia/Turkmenistan/Iran	42:0NL	50:0EL	-2.8	37400
10	Chad	Chad/Cameroon/Nigeria/Niger	13:2NL	14:1EL	280	1540
11	Champlain	Canada/USA	43:4NL	73:2WL	29	1130
12	Chany	Russia	54:5NL	77:4EL	106	2010
13	Chienghai (Koko Nor)	China	36:4NL	100:2E L	3196	4583
14	Chilwa	Malawi/Mozambique	15:2SL	35:4EL	622	1750
15	Colhue Huapi	Argentina	45:4SL	68:4WL	258	810
16	Dead Sea	Israel/Jordan	31:4NL	35:4EL	-405	810
17	Dongt ing Hu	China	29:2NL	112:2E L	33	2740
18	Ebi=Aibi	China	44:55N L	82:56E L	213	1070
19	Egridir	Turkey	37:5NL	30:5EL	920	590
20	Ennadai	Canada	60:0NL	100:5W L	311	668
21	Erie	Canada/USA	41:4NL	81:6WL	174	25821
22	Eyre	Australia	28:4SL	137:2E L	-9.5	9690
23	George	Uganda		30:1EL	914	250
24	Great Bear	Canada	66:0NL	120:3W L	186	31153
25	Great Salt	USA	41:1NL	112:4W	1283	5000

	Lake			L		
26	Great Slave Lake	Canada	62:0NL	113:0W L	156	28568
27	Har Us	Mongolia	48:0NL	92:10E L	1153	1760
28	Hubsugul	Mongolia	51NL	102:2E L	1645	2770
29	Hukun Hu (Hulun Nur) Dalay Nor	China	48:5NL	117:2E L	543	1731
30	Huron	Canada/USA	44:4NL	82:2WL	176	59570
31	Hyargas Nuur (Khirgiz Nuur)	Mongolia	49:1NL	93:4EL	1029	1407
32	Ilmen	Russia	58:2NL	37:1EL	18	982
33	Issyk-Kul	Kirgizstan	42:5NL	77:1EL	1606	6236
34	Izabel	Guatemala	15:30N L	89:10W L	8	590
35	Kamilukuak	Canada	61:4NL	102:2W L	266	629
36	Kaminak	Canada	62:1NL	95:6WL	53	554
37	Khanka	China/Russia	44:5NL	132:2E L	69	4190
38	Kinneret (Sea of Galilee)	Israel	32:5NL	35:4EL	-209	170
39	Kyoga (Kioga)	Uganda	1:4NL	33:1EL	914	1720
40	Ladoga	Russia	60:5NL	31:2EL	5	18135
41	Leman (Geneva)	Switzerland/Franc e	46:2NL	6:4EL	372	584
42	Lob Nor LOBNOR	China	40:30N L	90:30E L	2	3010
43	Maggiore	Italy/Switzerland	45:6NL	8:4EL	194	213
44	Managua	Nicaragua	12:31N L	86:21W L	37	1040
45	Manitoba	Canada	50:0NL	98:5WL	248	4610
46	Mar Chiquita	Argentina	30:4SL	30:4WL	69	1984
47	Maracaibo	Venezuela	9:40NL	71:30W L	1	13010
48	Michigan	USA	43:5NL	86:1WL	177	58016
49	Mono	USA	38:0NL	119:0W L	1945	180
50	Naivasha	Kenya	0:5SL	36:2EL	1890	160
51	Nicaragua	Nicaragua	11:30N L	85:30W L	32	8150
52	Nyasa (Malawi)	Mozambique/Mal awi/Tanzania	1SL	34:5EL	5000	6400
53	Ohrid	Macedonia	41:0NL	13:0EL	89	358
54	Okanagan	Canada	49:5NL	119:3W L	342	351

55	Onega	Russia	61:5NL	35:2EL	35	9890
56	Ontario	Canada/USA	43:4NL	78:0WL	75	19009
57	Oulu	Finland	64:0NL	27:0EL	122	900
58	Patzcuaro	Mexico	19:32NL	101:32WL	2035	130
59	Peipu	Estonia/Russia	57:0NL	30:52EL	30	4300
60	Poyang Lake	China	29NL	116:1EL	16	3210
61	Pyramid	USA	40:0NL	119:4WL	1160	453
62	Rudolf Turkana	Ethiopia/Kenya	3:30NL	36:0EL	427	6400
63	Salton Sea	USA	33:12NL	115:51WL	-70	950
64	Sandy	Canada	52:0NL	93:4WL	276	508
65	Sasykkol	Kazahkstan	46:5NL	46:5EL	368	736
66	Scutari Skadar	Albania	42:0NL	19:0EL	121	600
67	Seneca	USA	42:5NL	76:5WL	126	175
68	Superior	Canada/USA	47:3NL	88:2WL	183	82367
69	Tahoe	USA	39:6NL	120:6WL	1897	499
70	Tanganyika	Tanzania/Zaire/Zambia/Burundi	6:0SL	30:1EL	773	3200
71	Titicaca	Peru/Bolivia	15:4SL	69:4WL	3812	8372
72	Torrens	Australia	31:00SL	137:50EL	30	5780
73	Tuz	Turkey	38:6NL	35:2EL	925	1500
74	Uvs Nuur	Mongolia	50:2NL	92:5EL	759	3350
75	Valencia	Venezuela	10:1NL	67:4WL	405	350
76	Van	Turkey	38:4NL	43:2EL	1646	3713
77	Victoria	Tanzania/Uganda/Kenya	1:4SL	33:1EL	1134	68800
78	Winnipeg	Canada	52:6NL	97:5WL	217	23750
79	Winnipegosis	Canada	52:4NL	100:4WL	253	5150

Regulated lakes

N	Name of lakes	Country	Lat	Long	Elev (m)	Nominal volume Km^3
1	Kariba	Zimbabwe	17:0 SL	28:0 EL	485	180,6
2	Nasser	Egypt	22:4 NL	31:8 EL	183	157
3	Volta	Ghana	6:5 NL	0:0 EL	85	150
4	Guri	Venezuela	7:8 NL	63:0 WL	162	135
5	Williston	Canada	55:0 NL	124:0 WL	671	74,3
6	Ataturk	Turkey	37:5 NL	38:3 EL	162	48,7
7	Los Barreles	Argentina	38:6 SL	68:9 WL	421	43,5
8	Mari Menuco	Argentina	38:5 SL	68:8 WL		43,0
9	Mead	United States	36:4 NL	114:7 WL	341	37,3
10	Powell	United States	37:0 NL	111:5 WL	1.0	35,5
11	Keban Dam	Turkey	38:8 NL	38:7 EL	207	31,5
12	Sakakawea	United States	47:5 NL	101:4 WL	554	30,2
13	Kossou	Ivory Coast	7:1 NL	5:5 WL		30,0
14	Oahe	United States	44:5 NL	100:4 WL	502	29,1
15	Lake Itaipu	Brazil and Paraguay	25:4 SL	54:6 WL	196	29,0