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NEWSLETTER

INTERNATIONAL LAKE ENVIRONMENT COMMITTEE FOUNDATION

— For Better Lake Management —

This Newsletter is also available in Japanese.

"ROUND-TABLE" MEETING "HOW CAN WE SAVE THE ARAL SEA ?"

UNO Assistance Association of Kazakh SSR, Health Care Centre of Kazakh Ministry of Health and SovMAB UNESCO Head Centre on the problem "Human Response to Environmental Stress" held an international multidisciplinary task force "How Can We Save the Aral Sea ?". The task force took place in Kzil-Orda and Aralsk (Kazakh SSR) on 20-26 of April, 1990. Among participants which include ecologists, sociologists, physicians, demographists etc., Profs. H. Löffler and G. N. Golubev were ILEC members. Dr. M. Nakayama, Faculty of Agriculture, Utsunomiya University, represented ILEC Secretariat.

DECLARATION

We, the participants of the International "Round-Table" meeting "How to save the Aral sea", convened on April 20-24th, 1990 in the city of Aralsk, Kazakh SSR and which gathered together experts, scientists, state and public officials from Kazakhstan, Republics of Central Asia, Russian Federation as well as from France, Italy, Austria, Greece, Bulgaria, Mongolia and Japan express herewith our great concern over the fate of the Aral sea and the deteriorating ecological, social & economic situation in the region of the Aral sea.

During the last 30 years the level of the Aral sea has dropped by 14 metres, the volume of water has decreased by two-thirds, the area of water surfaceby one-third, content of salt in the water reached the figures characteristic for the ocean water. The Aral sea is retreating as a result of the decreasing of water flow from Amu-Daria and Syr-Daria. This resulted in a 20-times increase in morbidity of the local population and the child death rate has reached the highest indices in the USSR.

The "Round-Table" states that the Aral sea has become a symbol of unreasonable and short-sighted treatment of nature.

The shrinking of the Aral sea means not only a mere ecological catastrophe but indicates also a critical situation in the whole region of Central Asia and Kazakhstan. Therefore the restoration of the Aral sea can only be achieved through correct and prudent regulation and management of the whole Aral basin starting from the glaciers of Pamir and Tien Shan mountains down to the mouth of Syr-Daria and Amu-

BEREAVEMENT

The death of Mr. Hisao Sakimura, the UNEP Representative of Executive Director on Special Assignments in Japan is a great loss.

He died on 6 July 1990 from cancer. He was 57.

Mr. Sakimura, in his capacity as Advisor to ILEC, worked for coordination among ILEC, Japanese Government and UNEP as well as other UN organizations with great endeavor. He also assisted ILEC Secretariat for effective implementation of the joint projects with UNEP.

Daria.

We believe that the most urgent task for the nearest future must be the stabilization of the Aral sea at the present level and the main goal of future efforts must be the restoration of its condition as it was in the sixties.

The "Round-Table" supposes that for the restoration of the Aral region short and long-term measures should be taken. It is highly recommended to improve immediately the living conditions and health of the local population and above all to provide a sufficient supply of drinking water and food of quality that allows for the existence under extreme conditions such as the pollution of the atmosphere especially with dust and salt.

The foremost tasks should provide for the optimization of the water resourses by certain strategies such as the rejection of cotton and rice monocultures, the preservation of water and less water consuming technologies in all branches of economy.

It will be necessary to increase generally the water resourses within the water-shed of the Aral sea by means such as afforestation of mountain slqpes, redistribution of surface and underground waters, desalinization, etc.

The participants of the "Round-Table" stress that the stabilization of the Aral sea level within the ecologically acceptible limits demands a reorganization of the social and economic structures of the water-shed, transformation to the balance and stable development providing for efficient demographic policy and intensification of the national economy.

The critical situation in the Aral sea area requires the introduction of new methods of the regional management. It is reasonable to organize a special economic zone. In order to fulfil the programme of social and economic transformation of the Aral sea catchment area we propose to organize a Union-Republic Governmental Committee given special rights and powers.

For the restoration of the catastrophe area an Aral Foundation should be immediately established, financial resourses for it should be partly derived from payments for water use, penalties for excessive water use and water contamination.

The aggravation of the Aral sea crisis demands challenges to scientists. At present, the top priority task is the elaboration of a research programme which would be oriented towards the search for simple, reliable, efficient and cheap measures for restructuring the economy and the modernization of technology. We have to elaborate a well-structured concept of the sustainable development of the Aral Region and to organize a monitoring system which allows for a constant health control. It is also necessary to protect certain territories including the Aral Biosphere sanctuary.

To overcome the Aral sea crisis and to understand the reality of the region we need glasnost. Therefore we require the free release and use of ecological, sanitary, hygienic and other data.

In order to solve the Aral sea problems successfully their implementation into the programms of ILEC, SIL, UNEP, UNESCO, WHO, UNICEF, etc. is needed.

In particular, the "Round-Table" asks for earliest consideration and confirmation of the Kazakh programme "Prophylaxis" by UNESCO. This includes the Aral project component, proposed by the MAB experts earlier on an occasion. As it has been mentioned before the Aral sea crisis is a global ecological disaster and it can not be overcome by one single republic of the country.

We would like to draw the attention of the President of the USSR M. S. Gorbachev to the urgent need for the Aral region to be declared a zone of ecological disaster.

We appeal to the peoples and the governments of the Soviet Republics to help the Aral people to restore the dying Aral sea which is a natural unique treasure and phenomenon.

We appeal to the peoples and the governments, to the members of the world community, to the UN Secretary General Perez de Cuellier with a request of rendering urgent help to the world heritage of nature which is in the situation of an ecological disaster.

The participants of the International "Round-Table" meeting "How to save the Aral sea".

The Second BICER Meeting

Irkutsk, USSR, on April 2—5, 1990

The meeting was hosted by the Siberian Division of the Academy of Sciences of the USSR with the assistance of the Ministry of Foreign Affairs of the USSR. The meeting was attended by representatives from Belgium, France, Japan, the Netherlands, Peoples Republic of China, Spain, Switzerland, United Kingdom and United States of America. ILEC was represented by Dr. M. Aizaki of the National Institute for Environmental Studies, Japan.

The Director of the Limnological Institute of the Siberian Division of the Academy of Sciences of the USSR informed the participants of the Soviet initiative to establish the Baikal International Center for Ecological Research (BICER).

It is a research organization of USSR open for cooperated studies of Lake Baikal problems by scientists of USSR and scientists of all countries of the world.

The total capital stock and laboratory equipment is estimated to cost about 15 million roubles.

It is proposed that the main fields of research at BICER would be the following:

I) Interdisciplinary studies of Lake Baikal in comparison to other lake systems through hydrodynamical, hydrochemical, hydrobiological, climatological, remote sensing, limnological, computer and mathematical modelling methods to create mathematical and conceptual models of the ecological systems of Lake Baikal and other large lakes;

II) Studies of the mechanisms of speciation of the unique complex of Baikal endemic organisms and of the evolution of their nucleic acids and proteins;

III) Studies of Baikal as a "background" freshwater body aimed at understanding of the processes of global turnover of elements and global transfer of air-borne pollutants;

IV) Development and optimization of monitoring methods and equipment suitable for Baikal, for other large lake systems, and for the world's oceans;

V) Interdisciplinary geological, paleogeographic, geochemical studies of the history of the formation of the Baikal depression, with special emphasis on the problems of global climate changes and on the contribution of human activities to these changes, including the impact of the development of human cultures on the Baikal basin.

There was a general agreement that through BICER living quarters and research facilities should be constructed near Lake Baikal to better serve the program.

Participants were of the opinion that it is essential to establish a Steering Committee empowered to continue negotiations. on scientific, organizational, and financial matters related to BICER. It is understood that all the decisions of the Steering Committee will be reached at by consensus. The Steering Committee is open to the representatives of all the countries who formally indicated their interest in BICER.

The Soviet side may call to the first meeting of the Steering Committee when at least five countries have nominated their delegates to the Steering Committee.

The participants discussed further a draft agreement which was written by the participants of the October 1989 meeting. However, the preparation of the final version shall be left to the Steering Committee.

Lake Water-Quality Management Training Course

(January 8 — March 16, 1990)

ILEC Lake Water - Quality Management Training Course was held in Shiga from January 8 to March 16, 1990, under the substantial support of lacal and national governmental institutes and private firms in Shiga and other parts of Japan. ILEC invited five participants from China, Malaysia, Philippines, Ethiopia and Thailand. The purpose of this training course was to provide technical experts (mid-class managers) with the basic knowledge needed for lake water quality management as well as in-the-field water quality measurement techniques and expertise in the operation of measurement equipment. From 1991 onwards, this course is expected to be convened jointly with JICA and ILEC.

This was the first intensive technical course offered by ILEC, and emphasis was laid to 1) acquire a basic

COURSE SCHEDULE

Date	Subject	Lecturer
January		
8	Opening and orientation	Goda and Matsui
9	General introduction and presentation of country report	Goda
10	Problems & issues of lakes/reservoirs management	Kira
	Water pollution control in Japan	Matsui
11	Basic knowledge of water sampling & analysis	Tsuno
12	Eutrophication in Lake Biwa	Kawashima
	Inspection (Inspection of Lake Sciences)	Kawashima
15	Interaction between sediment & bottom water in Lake Biwa	Kawashima
	Chemistry of P & Mn in Lake Biwa	Kawashima
16	Basic knowledge of sediment analysis	Maeda
17	Basic knowledge of biological experiments	Kurata
18	Maintenance of laboratory facilities for water quality	Shimadzu Co.
19	Fundamentals of chemical/biological analysis of water/sediment maintenance	Shimadzu Co.
20	Inspection (Lake Biwa Work Office)	LBWO
22—24	Maintenance of laboratory facilities for water quality analysis	Shimadzu Co.
25	Guidance of water quality analysis & general description of the institute	IPHES
26	Field Survey of Lake Biwa on board	IPHES
29—31	Analysis of heavy metal in water	IPHES
31	Analysis of agricultural chemicals in water	IPHES
February		
1	Analysis of agricultural chemicals in water	IPHES
2	Observation of the planktons (Statistical analysis, discussion & evaluation)	IPHES
5—9	Appropriate Maintenance of Laboratory Facilities (pH, DO, K, TURB., COD, UV, TN, TP)	Horiba Ltd.
7	Inspection (Shiga Prefectural Fisheries Station)	SPFES
10	Inspection (Landsat, Personal Computer Network)	Koayu Net
12—17	Participation in: "ILEC/UNCRD/UNEP 3rd Expert Group Workshop on River/Lake Basin Approaches to Environmentally Sound Management of Water Resources" in Otsu	
19—22	Participation in: "ILEC/UNCRD/UNEP Training Seminar on River/Lake Basin Management: Focus on Water Quality" in Okazaki	
23	Visit (Environment Agency, Japan)	Takagi et. al.
26	Field Visit (Lake Kasumigaura)	Aizaki and Imai
27—28	Inspection (National Institure for Environmental Sciences)	Aizaki
March		
1	Inspection (DKK Co.)	DKK Co.
2	Inspection (TOA Electronics Ltd.)	TOA
5	Basic Knowledge of Statistical Analysis	Fukada
6—7	Computer simulation for Water quality management on Lakes/reservoirs	Fukada
8—9	Peport Writing	Matsui
12	Report Writing	Matsui
13	Discussion for Evaluation	Goda and Matsui
14	Closing	
15—16	Study tour (water-related Japanese culture)	

knowledge on lake water quality management, 2) learn basic technique for lake water quality analysis, 3) learn how to operate water quality measurement equipment, 4) acquire the basic knowledge relating to laboratory maintenance, 5) accumulate the knowledge needed to properly set lake water quality monitoring points, and 6) learn lake water quality simulation techniques.

SUPERVISORS OF THE COURSE

Takeshi Goda	Vice Director General, ILEC Professor, Setsunan University
Saburo Matsui	Regular Member, ILEC Scientific Committee Professor, Kyoto University

LECTURERS OF THE COURSE

Tatuo Kira	Chairperson, ILEC Scientific Committee Director, Lake Biwa Research Institute
Hiroshi Tsuno	Associate Professor, Kyoto University
Munetsugu Kawashima	Associate Professor, Shiga University
Akira Kurata	Head of Research Section, Lake Biwa Research Institute
Hiroto Maeda	Senior Researcher, Lake Biwa Research Institute
Fumiko Fukada	Head, Environmental Protection Section Public Health Center, Hikone

COOPERATE COMPANIES, INSTITUTES AND ORGANIZATIONS

Japan Environment Technology Association
Horiba Ltd.
Shimadzu Co.
Institute of Public Health and Environmental Science
Lake Biwa Research Institute
United Nations Centre for Regional Davelopment
Japan Environment Agency
National Institute for Environmental Studies
Office of Kusumigaura Regional Sewage Works, Ibaragi Prefecture
Japan International Cooperation Agency
DKK Co.
TOA Electronics Ltd.
Lake Biwa Work Office, Ministry of Construction
Shiga Prefecture Fisheries Experimental Station
Shiga Prefectural Sewage Works Corporation
Otsu Hydrobiological Station, Kyoto University
Laboratory for Control of Environmental Micropollutants, Kyoto University

Field trip to schools

On 24th February a part of ILEC members made an inspection trip to local schools in Northern Lake Biwa basin after the General Meeting. At Odani primary school and Kohoku junior high school which are cooperating in ILEC's pilot project for lake environmental education, ILEC members inspected lessons and experiments on acid rain. Prof. Jørgensen handed over school children letters from a Danish school, and the pupils in exchange presented ILEC members their drawings. After the inspection, ILEC members met with Japanese collaborating teachers in this project and educational board representatives and exchanged views on lake environmental education practices.

THE 3RD GENERAL MEETING OF THE ILEC SCIENTIFIC COMMITTEE

The 3rd General Meeting of ILEC Scientific Committee was held from 21 to 23 February 1990 at Lake Biwa Research Institute and Biwako Hotel in Otsu. Topics discussed at the plenary sessions and working party meetings included:

PROGRESS IN 1988/89:

Progress on the following ILEC projects were reviewed: Survey of the State of World Lakes; Workshop on Developing Training Materials and Modules; Training Course on Lake-Water Quality Analysis; Guideline Books; Cooperation in World Lake Conferences; Environmental Education, Lakes. Also, the content of a newly organized ILEC Lake Water Quality Management Training Course which was concurrently held in Otsu was outlined.

SCIENTIFIC COMMITTEE'S MEMBERSHIP AND TERM OF SERVICE:

According to the agreement of the previous meeting, membership of Dr. S. Evteev and Dr. J. P. Bruce was unanimously accepted. As a transition measures to increase the ILEC members term of service from the present two years to three years duration, it was agreed that the present members continue service for the term beginning April 1, 1990.

WORLD LAKE CONFERENCES:

ILEC's full support for the 4th World Lake Conference in China "Hangzhou '90" was confirmed. Prof. Liu explained the background to the organization and funding of the conference. ILEC's plan to organize a

session on citizen participation was explained. Convening of the 5th conference in Italy in 1992 or 1993 was positively discussed. It was also proposed to explore the possibility of holding the 6th in the USSR in 1994—5.

COLLABORATION WITH UNEP/GEMS:

ILEC's cooperation in GEMS/Water was sought. It was suggested that ILEC is in a good position to coordinate data collection programs in relation to the lake environment. Preparatory progress of a new joint project "Application of GIS's and remote sensing to Lake Management" between ILEC, UNEP/GRID and Geneva University was reported.

PROPOSALS FROM ILEC MEMBERS:

Proposals included: 1) training seminar on monitoring African river and lake basins, 2) training course on ecological background of lake conservation and management, 3) training course/workshop on management of reservoirs in La Plata river basin, 4) production of lake modelling software. 5) support for a textbook, 6) cooperation with SIL, 7) ILEC Award.

LAKE DATA COLLECTION WORKING PARTY:

Dr. Kurata reported the completion of 1989 report which included data for 54 lakes (in addition to already-printed 63 lakes), with 35 additional reports ready to be put into print. In addition, data on 40 Canadian lakes has been provided from CCIW. An interesting statistical analysis of the returned questionnaire's data was presented. Comparison was given according to 25 main data groups. The working group proposed to ILEC the publication of the Survey of World Lakes as a separate volume.

GUIDELINE WORKING PARTY:

Publication schedule of ILEC Guideline Book series (vols. 1—4) was reported. Translation of the books into other languages was considered. Topics for future guideline books (e.g. Integrated Approach to Lake Basin/Watershed Management of Reservoirs, and Acidification of Lake) were also considered.

TRAINING WORKING PARTY:

It was unanimously recognized that workshop provided excellent material for the proposed training textbook with nine studies and 20 or so resource papers. Production of the training manual together with a 3—4 volume case study collection, as well as video and computer software was discussed.

ENVIRONMENTAL EDUCATION WORKING PARTY:

The importance of rearing capable teachers with better environmental awareness and producing teaching aids for environmental education in primary schools was reconfirmed. Also, the value of the multi-disciplinary approach and the necessity to expand the project internationally and within the societal frame were pointed out.

Prof. Jørgensen described a multi-disciplinary approach in Denmark. This resulted from the interchange of ideas between the scientists and teacher which is educational for both parties. Prof. Tundisi gave details on the 3 year education project in Brazil which focuses on experimentation, observation and measurement approach to lake basin management. In Brazil the original aim had been to train teachers but that this had developed to encompass regional environmental problems and the involvement of the general public. Application of this project to other countries was explored.

ILEC INTERNATIONAL FORUM IN OSAKA: "THE WATER WE SHARE"

ILEC International Forum under the theme of "The Water We Share" was held on 20th February 1990 at Mido-Kaikan Hall in Osaka, Japan. This forum was intended to appeal the importance of environmentally sound management of fresh water resources to business world and administrations in Japan. ILEC Scientific Committee members served as panelists and explored the ways of sustainable utilization of freshwater resources with emphasis on the situation of developing countries and the roles of developed countries in this global issue.

In the morning session, Dr. S. Evteev (Assistant Executive Director of UNEP) in his keynote address entitled "Environmental Aspects of River Basin Development", overviewed such aspects as: world water resources situation, trend in the water demand, water pollution and wastewater treatment, flood and drought, erosion and sedimentation, and the EMINWA programme. In the statement of Dr. A. Ramachandran (Executive Director of the United Nations Centre for Human Settlements, HABITAT) which was read by Mr. K. Nakamura of UNIC/Tokyo, critical situation of water supply in the cities of the developing world was stressed in relation to the rapid urban growth and widespread poverty.

In the afternoon, a panel discussion was held under the theme of "For better relationshis between developing and developed countries - identification of water problems in developing countries and role of developed countries". Among topics of discussion were: human relocation and ecological problems by dam construction, rapid population growth as a base of environmental problems, eutrophication and acidification of lakes, shortage of drinking water supply, and difficulty of water

resources development with reference to rapid siltation in dam lakes.

Panelists:

M. Hashimoto (coordinator), T. Goda (Japan), N. B. Aibotele (GHANA), C. E. Bauer (ARGENTINA), S. Jørgensen (DENMARK), Liu H. (CHINA), C. H. D. Magadza (ZIMBABWE), J. Salanki (HUNGARY).

Co-sponsors of the forum:

United Nations Environment Programme (UNEP), United Nations Centre for Human Settlement (HABITAT), United Nations Centre for Regional Development (UNCRD), Environment Agency (Japan), Ministry of Foreign Affairs (Japan), Association for Promotion of Lake Conservation, Lake Biwa/Yodo River Environment Conference, Kyoto Prefecture, Osaka Prefecture, Hyogo Prefecture, Shiga Prefecture, Kyoto City, Osaka City, Kobe City, Kansai Economic Federation, Kansai Committee for Economic Development, Osaka Industrial Association, Kansai Association of Managers, and Kinki Federation of Chamber of Commerces.

Lake Environment Forums in Ibaragi and Nagano

Taking the opportunity of ILEC General Meeting, two forums were held on 19—20 February 1990 in Ibaragi and Nagano prefectures under the sponsorship of respective local governments. ILEC cooperated to them.

At Ibaragi Forum which took place at Hotel Sun-Lake-Tsuchiura, Prof. G. N. Golubev of Moscow University and Prof. J. G. Tundisi of Sao Paulo University represented ILEC. In their lectures, Prof. Golubev emphasized importance of environmental consideration in formulating development project, referring to the cases of shrinking Aral Sea due to improper irrigation scheme, water level fluctuation of Kaspi Sea, and eutrophication of Lake Laguna in the Philippines. Prof. J. G. Tundisi took up topics of lake environmental problems in developing countries with Brazilian examples. After discussion with participants including lake managers and researchers, the forum, inspection trip was made to NIES and Lake Kasumigaura, Japan's second largest lake suffering from severe eutrophication.

Nagano Forum which was held on 19th at Nokyo-Kaikan Hall in Nagano City, was represented by Prof. R. G. Wetzel of Alabama University and Prof. H. Löffler of Wienna University. After presentations on the state of US and European lakes, heated discussions were developed among 120 local administrators and researchers over management approaches on eutrophication, lakeshore conservation, and lake acidification. On 20th they visited eutrophicated Lake Suwa and Suwa Research Station of Shinshu University.

EVALUATING RISKS TO HUMAN HEALTH ASSOCIATED WITH EXPOSURE TO TOXIC CHEMICALS IN THE GREAT LAKES BASIN ECOSYSTEM

The Great Lakes Program of the State University of New York (SUNY) at Buffalo undertook to establish a binational project in 1988, consistent with the tenets of the then recently produced World Health Organization (WHO) philosophy on health promotion. SUNY sought to implement this approach at the regional level in response to inadequate actions to address toxic chemicals in the Great Lakes Basin Ecosystem. In October 1989 an International Working Conference was held to allow participants to share scientific and societal viewpoints and to seek a common ground of understanding on this subject.

Copies of the International Working Conference EXECUTIVE SUMMARY can be obtained from the Great Lakes Program, 207 Jarvis Hall, State University of New York, Buffalo, New York 14260 (USA).

Dr. Warren Flint
Great Lakes Program
State University of New York
Buffalo, New York 14260 USA

The Fifth International GAP Workshop

The V International Group for Aquatic Primary Productivity (GAP) Workshop took place from April 20th to 28th 1990 in Holland. Plenary lectures and workshop sessions were held in the somewhat incongruous Chinese-style setting of the "Motel Breukelen", replete with a traditional Dutch Windmill at its entrance! Experimental work was done at the Institute of Limnology, Nieuwersluis, at two nearby lakes (Loosdrecht and Maarsseveen) and at the laboratories of the Departments of Aquatic Ecology and Microbiology, University of Amsterdam.

The central topic of the workshop, "The Daily Growth Cycle of Phototrophic Microorganisms", was introduced by two Keynote Lecturers, B.B. Prezelin, ("Diel periodicity in Phytoplankton Production Patterns: Regulation and Ecological Considerations"), and W.F. Vincent ("The 24 hour dynamics of nitrogen based production").

The VI GAP International Workshop will be held in Saskatoon, Canada in 1993. The exact dates and workshop topic will be announced later.

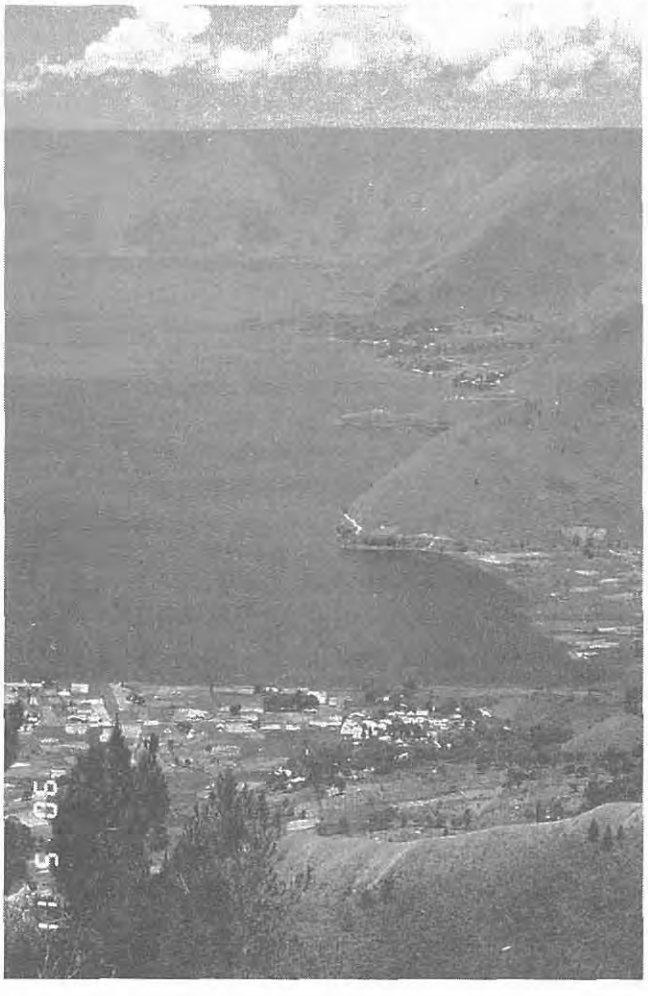
Professor Tom Berman
Chairman, GAP

LAKES OF THE WORLD

LAKE TOBA (DANAU TOBA)

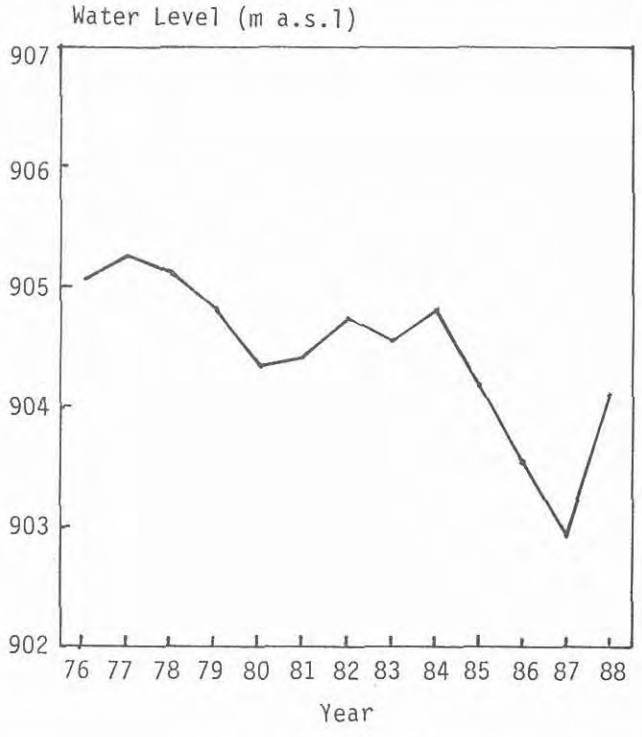
Lake Toba is located, near on the equator, in Sumatra Island, Indonesia,. The surrounding region is referred to as "Batak Highlands", well known that there were large-scale volcanic activities, and has been a subject of geological studies since the 1800's. Lake Toba trough is a giant caldera formed by ancient volcanic depression, surrounded by precipitous cliffs and plateaus above, and has a peculiar view. The water surface of the lake is 905 m above sea level. The total area of the lake, including the area of Samosir Island (640 ㎢), amounts to 1,780 ㎢. Lake Toba is one of the deepest lakes in the world, the maximum depth is 529 m, and has a transparency of greater than 10 m at the deep place. The lake is thus in oligotrophic condition.

Although the lake is situated in the tropics, the atmospheric temperature remains at approximately 20 ℃ and does not change much seasonally because of its high altitude. The water temperature of the lake is always greater than the atmospheric temperature and ranging from 24 to 26 ℃. This is one of the characteristics of tropical lakes. In April, based on the study of 1929, a weak thermal stratification was observed in the lake. The water temperature was 26 ℃ from the surface down to a depth of 25 m and 24 ℃ at a depth of greater than 70 m.



In January, based on the study of 1976, however, no thermal stratification was observed. The water temperature remained at 26 ℃ even at a depth of greater than 300 m. Although the thermal stratification was weak, about 2 ℃, the chemocline, e.g., of the concentration of dissolved oxygen (DO), was significant. In spite of the oligotrophic condition, a low DO zone was formed in the bottom layer of the lake. This is also a characteristic of tropical lakes and considered to be caused by high biodegradation rate due to high water temperature.

The catchment area of the lake is 3,440 ㎢ wide, in which the population is approximately 300,000. Slash-and-burn farming has been taken place and the forest has been cut down for ages. Those effects on the lake was significant. Analytical results of diatomaceous corpse in the sediment have illustrated the significant effects of erosion due to the forest cut down. According to the land-use survey in 1972, the occupied percentage of forest and plantation is only 25%, grassland and farmland occupied 51% and 11%, respectively. Under these circumstances, the efforts have been devoted to the recovery of the forest, and reforestation with *Pinus* has been promoted. As the results, the occupied percentage of grassland decreased to 8%, and that of forest and plantation recovered to be 58% in 1985. In addition, a pulp factory established in 1989 at the outlet of the Asahan river, outflowing river of Lake Toba, has been conducting reforestation with *Eucalyptus* to secure its pulp resources. Nevertheless, the occupied percentage of natural forest is less than 8%, even the forest including



WATER LEVEL OF TOBA LAKE

preserved one is still some 23%. Along the lake shore, there are small villages and rice fields at the limited area of gentle slopes whereas the large parts are untouched steep slopes. The area of grassland and forest in the slopes is small because of mountain fires due to the Slash-and-burn farming. The trace of mountain fires can be recognized anywhere even today.

Recently, the tourism of Lake Toba has been developed. Tour boats are frequently operated. Hotels and yacht harbors have been constructed at the lake shore. Especially, City of Prapat on the east lake shore has been heavily developed as a resort area. In this line, pollution problems of the lake is being aware although those are not serious yet. In fact, in Prapat, the deterioration of water quality can be visually noticeable, and a large number of *E. Coli* is measured. Oil pollution due to ships is also occurring, and thought to become serious environmental problem. There are some places where no shellfish can be found. This is considered to be caused by oil pollution. Since the number of tourists visiting Lake Toba is increasing certainly, some preventive actions of environmental conservation should be taken as soon as possible.

The records showed that the water level of Lake Toba was ranging 905±1 m in the 1950′. In 1980, however, a hydropower plant which provides electricity to a aluminum smelter was constructed, and excavations had been done at the Asahan outlet to secure some constant water quantity. As the results, the water level of the lake dropped to 903.7 m in 1980, and then recovered once, but dropped again to 902.7 m in 1986. The water level was supposed to be controlled at somewhere between 905.0 to 902.4 m in the original plan. However, that was the first time for Lake Toba, which water level became 2 m less than the average level. And since the effects of the water level drop are unpredictable, the government and the residents were very anxious about the future of the lake. In this context, Indonesia governmental organization, Agency for the Assessment and Application of Technology, convened "Lake Toba International Conference" in Jakarta, 1990, where the present and future state of Lake Toba were discussed. The conference lasted 2 days long with the energetic discussion of participants. However, the basic data was apparently short for further discussion.

To preserve lake environments, limnological and ecological studies are inevitable. The available data has been far short although Lake Toba is an interesting object of research and several researches had been conducted since Dr. Ruttner, a famous limnologist in the 1920′, made fundamental studies on the lake. Further comprehensive studies will be necessary to contribute to the environmental conservation of Lake Toba.

T. Nakajima
Lake Biwa Research Institute.

CALL FOR ARTICLES

Those who wish to contribute to ILEC Newsletter are invited to send manuscripts to the secretariat.

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