2023 BALATON WORLD LAKE CONFERENCE

LAKE BALATON DEVELOPMENT COUNCIL

ILEC

19TH WORLD LAKE CONFERENCE

BALATONFÜRED, HUNGARY

NOVEMBER 7-9, 2023

CONFERENCE PROCEEDINGS

BOOK OF KEYNOTE PAPERS AND EXTENDED ABSTRACTS

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IMPRESS

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TABLE OF CONTENTS

FOREWORD

FROM THE LAKE BALATON DEVELOPMENT COUNCIL

It was honour for us to host the 19th World Lake Conference at Balatonfüred, Hungary, in cooperation with the International Lake Environment Committee Foundation (ILEC).

The conference was entitled "Beyond Lakes - Linking Science, Culture and Governance for their Sustainable Use", referring to the goal of the event, namely to go beyond presenting simply the latest scientific research findings. The Conference aimed to deal with lake management issues in a complex and integrated way by analysing the environmental problems of lakes and their catchments, and highlighting the socio-economic, cultural and governance challenges that lake areas are facing both in Hungary and abroad.

Lake Balaton and other large lakes in the world play outstanding role in the provision of freshwater sources of the world. The main importance of standing waters is their utilization as drinking water base. However, lake regions can also be of particular importance in respect of water transport, agriculture and tourism. However, besides their economic utilization, we must not forget about the role of lakes they play in the protection of biodiversity.

In the area of large lakes, therefore at Lake Balaton as well, the complex development and management of regions, and the coordination of sectoral and territorial policy interventions are difficult due to the administrative and institutional conditions, and their territorial fragmentation.

Since a significant number of lakes belong to several countries, regions or administrative units, which makes it difficult to manage these lakes in an integrated way using the same development concepts, the promotion of cross-border cooperation at both international and national-regional level was a priority objective of the WLC19. The strategic objective of the event was to successfully link policy-making procedures with the solutions offered by capital, knowledge and technology.

Lakes operate in a particularly complex environmental-economic-social system, which requires integrated management in line with the Sustainable Development Goals. The 19th World Lake Conference provided opportunity to review the alignment between the UN goals (in particular Goal 6 "Clean Water and Sanitation", Goal 13 "Climate Action" and the Goal 15 "Life on Land") and the recommendations of international policies and strategies for the management of lakes and the conservation of freshwater resources.

We are grateful that this Conference provided a good opportunity to take a step forward to achieve our goal.

Dr. István Bóka
Co-Chairman
Lake Balaton
Development Council

Judit Cunyiné dr. Bertalan
Co-Chairwoman
Lake Balaton
Development Council

FOREWORD

FROM THE INTERNATIONAL LAKE ENVIRONMENT COMMITTEE FOUNDATION

On behalf of the International Lake Environment Committee Foundation (ILEC), I would like to thank you all for participating in the 19th. World Lake Conference (WLC19) on the shore of Lake Balaton, which is blessed with one of the most beautiful sceneries in the world.

I would like to draw your attention to the fact that out of all the water on the earth, only 0.3% is fresh water in liquid form on the surface and that about 25% of such important resources exist in lakes, wetlands, and their basins. Lakes are also the most precious resources by providing us with a variety of ecosystem services. On the other hand, lakes are vulnerable to the impacts of climate change and human development activities, and therefore, lake management is required to cope with these challenges we face.

To address these challenges, the international community has moved forward in March 2022 to adopt a resolution on "sustainable lake management (SLM)" at the United Nations Environment Assembly (UNEA 5.2), calling upon UNEP and its Member States to take urgent actions toward realizing sustainable future of the world's lakes through the "SLM" approach. In addition, the "United Nations Water Conference - 2023" urged the Member States and relevant international organizations to accelerate their efforts to improve the environment of lakes and their basins worldwide. At the same time, the UN Conference called for establishing a "World Lake Day" as a symbolic movement to enhance awareness of the public in the world.

Given the emerging momentum on SLM, it was timely and meaningful that the WLC19 was organized with the theme "Beyond Lakes: Connecting Science, Culture, and Governance for Sustainable Use" to discuss our common agenda for realizing a sustainable society through SLM.

The WLC19 provided us with a unique opportunity to bring together a wide range of stakeholders from the governments, international organizations, academia, and civil societies around the world to discuss our challenges and to explore solutions through exchanging their rich knowledge and experiences on SLM.

I would like to take this opportunity to extend our sincere thanks to the host organization and those who engaged in organizing this important Conference in such a smooth manner. Let us continue to work together toward SLM and contribute to improving the environment of the world's lakes and their basins.

Kazuhiko Takemoto
President
International Lake Environment
Committee Foundation

1983
2023
BALATON
WORLD LAKE CONFERENCE

INTRODUCTION OF 19TH WORLD LAKE CONFERENCE

THE WORLD LAKE CONFERENCE

The History of the World Lake Conference (WLC) dates back to the Shiga Conference on Conservation and Management of World Lake Environment of 1984, known as LECS'84, which was held on the shore of Lake Biwa, Japan.

The aim of the LECS' 84, which was to contribute to promoting scientific approaches in the world lake basin management, has been inherited to the World Lake Conferences held in various parts of the world including Argentina, China, Denmark, Hungary, India, Indonesia, Italy, Japan, Kenya, and the USA.

Today, the Conference is globally recognized as a place for multi-sectoral participants (i.e. academia, government, citizens, NGOs and enterprises) to exchange their views and experiences on the sustainable management of lakes and their basins.

The 19th World Lake Conference was the first international conference since the adoption of UNEA 5.2 in 2022, focusing on Sustainable Lake Management (SLM).It represented an important milestone in the implementation of SLM.

ORGANISERS OF THE 19TH WORLD LAKE CONFERENCE

LAKE BALATON DEVELOPMENT COUNCIL

The Lake Balaton Development Council (LBDC) is a regional development council. The most important tasks of LBDC are to determine the development directions of the area, to coordinate spatial development activities affecting the region and to support the elaboration of development plans and projects in the area.
LBDC also embraces new innovative ideas and promotes the implementation of regional developments, investments and projects through the allocation of funds and the provision of grant programmes. Moreover, LBDC also cooperates with professional authorities and scientific research organizations in the region, such as the University of Pannonia, the Balaton Limnological Institute of the Hungarian Academy of Sciences, the Balaton Uplands National Park Directorate and the Central-Transdanubian Water Management Directorate.
The Council has responsibility for all areas within the Lake Balaton Resort Area. It was established pursuant to the provisions of the Act XXI of 1996 on Regional Development and Spatial Planning. The composition of the Council and the number of members with voting rights are determined by the act on regional development in force. Members with voting rights involve delegates from the central government and representatives of regional and local authorities.

LAKE BALATON DEVELOPMENT COORDINATION AGENCY

The Lake Balaton Development Coordination Agency (LBDCA) is a non-profit organisation. It was established in January 1, 2000 by the Lake Balaton Development Council. The Agency performs professional and operative duties promoting the development of the Lake Balaton region in relation to the activities of LBDC.
The main activities of the Agency include the participation in the preparation and implementation of regional development programmes and the management of applications for regional development funds appropriated by the central budget based on the Council's decisions. LBDCA has a professional Social Science Research Group, which performs planned research in the fields of economics and social sciences in order to help achieving the area's development objectives. LBDCA also dedicates high attention to support the elaboration and implementation of local project initiatives and to participate in international projects and cooperation.

INTERNATIONAL LAKE ENVIRONMENT COMMITTEE FOUNDATION

The International Lake Environment Committee Foundation (ILEC) was established in 1986, following the Shiga Conference on Conservation and Management of World Lake Environment of 1984, which was held on the shore of Lake Biwa. This initiative was spurred by a proposal from the Director-General of the United Nations Environment Programme (UNEP), Mr. M. K. Torba, advocating for the creation of an "International Shiga Committee."
Lakes, which contain about ninety percent of freshwater on the earth, is a vital water resource, constituting a rich and essential component of nature and providing various benefits to human beings. Despite their global importance, many lakes and other inland waters around the world are in critical condition. Global warming will severely affect them because of their lentic (static) nature as water systems. In coping with these situations, ILEC will contribute to the sustainable management and conservation of lakes and basins in the world through international research and human resource development.

GEOGRAPHICAL AREA & LOCATION OF THE CONFERENCE

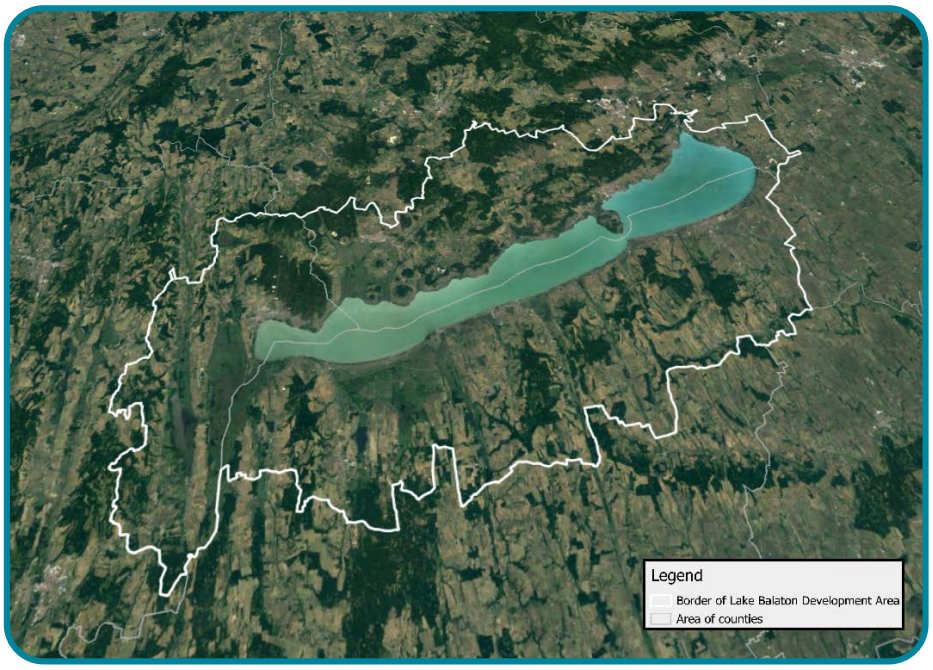
BALATONFÜRED

The 19th World Lake Conference took place in Balatonfüred. This small town, with a population of 13,500, is located on the northern shore of Lake Balaton. It is considered to be the oldest resort of Lake Balaton. The settlement has a historic atmosphere. It is visited by many tourists every year. The main attractions are the sandy beaches and charming coastal promenade, the medicinal springs and its cultural and historical assets.

Balatonfüred has a pleasant Mediterranean climate due to its favourable location: the surrounding mountains protect the settlement from the cold winds coming from the North. The town's clean, dust-free air is efficient to treat cardiovascular diseases. There are several springs in the settlement, providing special water that can be used for medicinal purposes (such as the famous "acidulous water"). The State Heart Hospital, which is the largest cardiac rehabilitation institution in the country, is also located in the settlement. In 1926, the famous Nobel Prize-winning poet Rabindranath Tagore recovered here. The promenade, located on the lakeshore, has been named after him.

The town is extremely rich in historical sites. In the 1800s, the town was a popular meeting place for progressive politicians, writers, actors and other artists. From these years, many villas and mansions have been preserved, which still determine the character and atmosphere of the town.

Region of Lake Balaton



LAKE BALATON

Lake Balaton is the largest freshwater lake in Central Europe and it represents one of the most significant natural treasures of Hungary. Located in the Transdanubian region of Western Hungary, it is a popular tourism destination due to the pleasant temperature of the lake, the favourable climatic conditions, the variety of beautiful landscapes and the diversity of cultural-historical assets. Tourism value of the Lake Balaton region is not only determined by the unique beauty of the natural and built environment, the long sandy beaches on the Southern coastline, the beautiful vineyards on the Northern shoreline and the widespread recreational services built on local traditions, but also by water quality and quantity of the lake.

With a surface area of 600 km^2, 78 km in length, 7.6 km average width and an average depth of 3.2 m, Lake Balaton is one of the shallowest large lakes in the world. The length of its coastline is 235 km. Its water volume is almost 2 billion m^3. The Lake Balaton watershed, including the lake itself, is 5775 km^2. River Zala is the most significant water-course flowing into the lake.

LAKE BALATON REGION

The Lake Balaton region covers the Lake Balaton Resort Area (LBRA), which comprises 180 municipalities belonging to three different counties (Somogy, Veszprém and Zala). Since 2000, the region has been disposing its own independent area development plan and regulations. Permanent population of LBRA exceeds 274,000 inhabitants, which is supplemented with an additional 250,000 holiday home owners staying in the area temporary. In connection with these figures, it should be noted that annually an additional 1.8 million paying guests are registered at accommodations around Lake Balaton.

Lake Balaton and the surrounding region is a national asset of European importance, which play significant role not only in terms of natural and cultural-historical values, but also has economic significance. The environment, economy and the local society form an organic unit in the region, which is uniquely sensitive to the changes in the natural conditions and to the impacts of human interventions. The increased vulnerability of the ecological and socio-economic system of the Lake Balaton region is due mainly to the combined effects of global climate change, and the changes in recreational habits, the changes in the regional economic structure and the changes in demographic conditions.

Some of the current environmental problems are rooted in the past, while others re-arise from day by day. Problems rooted from the past include the internal loading of phosphorus in sediments and the contamination of soil and groundwater caused by heavily polluting former industrial sites. Other problems include air pollution from increased vehicle traffic on congested main roads, and noise and light pollution during the tourist season.

Concerning the future of Lake Balaton, the key issue is to recognize the importance of environmental interest, since a lake is primarily a living water. The priority is to protect the ecosystem of Lake Balaton and stabilise the fragile natural balance of the lake in order to ensure economic activities associated with the lake over the long-term.

It is an important task to protect natural areas in a way that brings real benefits to the region, since the success of protecting the values in a long term is based on the interest of the local population and not on a system that is controlled only by legislation. Thus, smart management of the natural environment is required, in which only as much restrictions are applied that can guarantee the protection of the preserved values.

1983
2023
BALATON
WORLD LAKE CONFERENCE

WLC19 RESULTS & OUTCOMES

PLANNING OF THE WLC19

The planning of the Conference dates back to 2018, when the Lake Balaton Development Council first expressed its interest to host the 19th World Lake Conference at Lake Balaton. However, planning and organising the WLC19 is only one (but definitely) important step towards achieving the long term goal regarding the management of large lakes, even at Hungary and worldwide.

Actually, the Lake Balaton Development Council has been working for many years on exploring and finding answers how integrated management and developments could be implemented at lake areas. The goal of LBDC is to raise awareness of decision-makers to the specific development needs of lakes at both at national and international level and promote the elaboration of adequate tools and measures. The long-term goal is to promote the establishment of a lake development fund, to where regional actors representing large lakes could apply with integrated programmes.

Achieving this goal, the Council organises various events and presents at various platforms. As a first step, the Council organised an external conference on *"Sustainable Development in the European Lake Regions"* in June 28, 2018 together with the Commission for Environment, Climate Change and Energy (ENVE) of the European Committee of the Regions.

As the continuation of the work, LBDC organised a conference on *"Revealing Problems and Development Opportunities of European Lakes"* in May 13, 2019 in the framework of Science meets Regions programme co financed by the Joint Research Centre of the European Commission.

In addition, LBDC also convened a side event on the *"Progresses needed in integrated lake basin management to mitigate water crisis – Targeting a lake development fund"* at the Budapest Water Summit in October 15, 2019.

Applying for hosting the 19th World Lake Conference was part of this sequence of events. Originally, it was aimed that the WLC19 will be organised in 2022. However, due to the Covid-19 pandemic, it was delayed by a year. Fortunately, the event finally could be successfully organised in November 2023, with in-person participation.

The official announcement of the WLC19 venue was at the closing ceremony of WLC18, which was held online in November 9-11, 2021.

19TH WORLD LAKE CONFERENCE

LAKE BALATON DEVELOPMENT COUNCIL

06 NOVEMBER 2023

9:30-16:00 ILEC-UNEP International Colloquium (pre-event)

07 NOVEMBER 2023

8:30 Gate Opening
9:00-10:00 Registration
10:00-12:00 Opening Ceremony
12:00-13:00 Lunch
13:00-14:40 Plenary Keynote Presentations
14:40-15:00 Coffee Break
15:00-18:00 Technical Sessions

1. Integrated management of lakes and their basins (Case Report Session I)
2. Monitoring instrumentation, innovation, assessment issues and challenges
3. Lake-related sustainable development issues
4. Limnology, aquatic and microbnial sciences
5. Aquatic and Littoral Ecosystems

6.1 Living Lakes International / 6.2 Living Lakes European (ELLA)

12:00-13:00
Press Conference

08 NOVEMBER 2023

9:00-10:00 Registration
10:00-12:00 Plenary Keynote Presentations
12:00-13:00 Lunch
13:00-15:00 Technical Sessions

7. Integrated management of lakes and their basins (Case Report Session II)
8. Climate-change related issues, assessment, adaptations, and challenges
9. Lakes as functional development regions
10. Catchment land, resource values, impacts and mitigation
11. Lake-related water management, ground water, irrigation water
12. Lake and catchment technologies, traditions, innovations, and beyond

Special Session
10:00-11:30
Youth Power in Action

15:00-15:30 Coffee Break
15:30-18:00 Technical Sessions

13. Culture, herritage, society and education
14. National and local strategic plans, assessment, conceptual basis
15. Participatory planning, social engagement and mutual learning
16. Social and economic usages and valuing lake (ecocystem) services
17. Legal and institutional measures for lake basin management including DRR

Special Session
15:30-17:00
African Great Lakes

19:00-21:00 Gala Dinner & Cultural Event

09 NOVEMBER 2023

8:30-9:00 Registration
9:00-15:00 Study tour in the Lake Balaton Region
15:00-16:30 Closing Ceremony

Special Session
9:00-10:00
Highschool Student Session

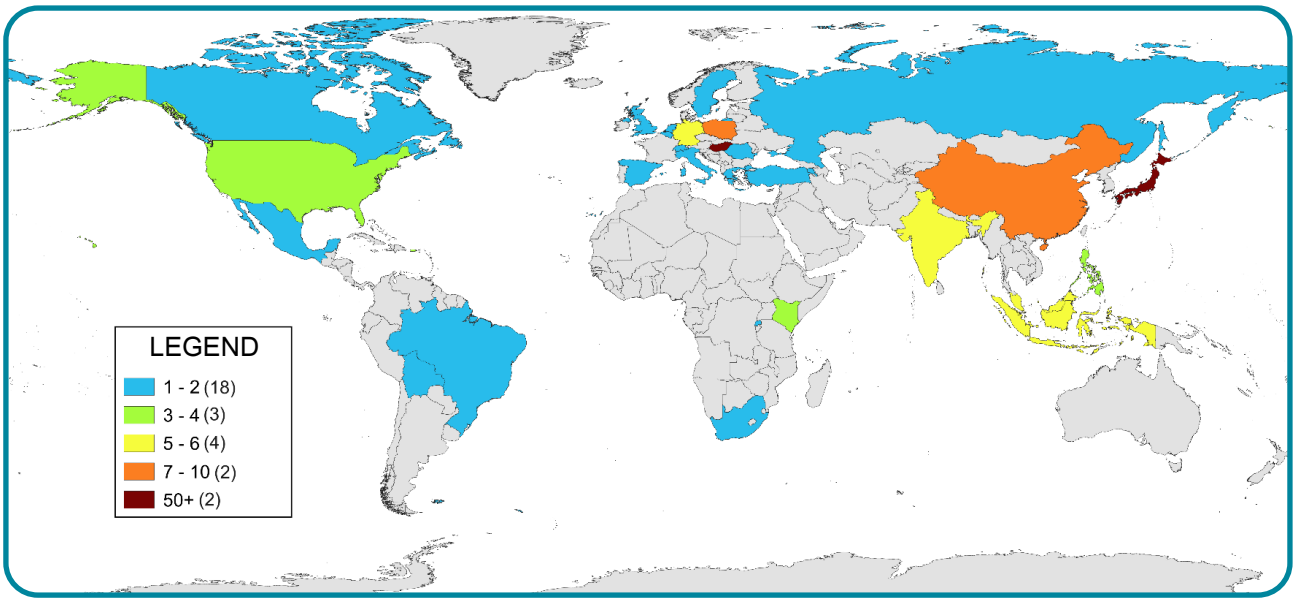
The exhibition and poster session can be visited during the entire duration of the conference.

The conference is co-financed by the Prime Minister's Office and the Lake Balaton Development Council.

CONFERENCE FACTS & FIGURES

The theme of the conference went beyond the ordinary lake management issues. The aim of the conference was to present the latest scientific research findings for lake professionals, politicians, regional decision-makers and civil society representatives in a practical and easily understandable way. Besides examining the environmental problems of lakes and their catchments, the conference also highlighted the socio-economic, cultural and governance challenges that lake regions are facing both in Hungary and at other parts of the world.
On the first two days of the Conference, participants attended plenary presentations and thematic sessions to learn more about the researches and project results implemented to foster the sustainable management of Lake Balaton and other large lakes in the world. On the closing day of the Conference, the participants went to a boat trip (as a study tour), where the regional partner organisations of the Lake Balaton Development Council presented their activities and projects: among others the Central Transdanubian Water Management Directorate introduced the reconstructed "Sió lock" and the measuring sensors of the online monitoring system, while the colleagues of the Lake Balaton Limnological Institute introduced their latest research findings.
All together there were 2 plenary sessions with 13 presentations and 17 thematic session with 96 presentations at the Conference. In addition, 3 special sessions were organised (as side events) and there was a poster session with 19 poster presentations.
The Conference was organised as an in-person event. However, some special sessions, such as the special session for secondary schools students, were organised in hybrid-format to make it easier for foreign, mainly Japanese, students to participate and share their experiences with the Hungarian students.
All in all, arriving from 27 countries, more than 120 foreign and more than 140 national participants attended the Conference. The majority of participants attended more than one day at the Conference. As an average, about 200 people attended the Conference each day and more than 120 participants attended the study tour.
Besides the Hungarian participants, many foreigners attended also the event too, who came from all over the world: mostly from Asia (mainly Japan, Indonesia, India, China) and Africa (mainly Kenya, Rwanda, South Africa). But many participants came also from Europe (mainly Brussels, Germany, Poland, Italy, UK), and from the United States, Canada, Mexico, Bolivia and Brazil.

Number of participants according to their sending country



INTERNATIONAL CONTEXT – UNEA RESOLUTION ON SUSTAINABLE LAKE MANAGEMENT

The 19th World Lake Conference represented an invaluable opportunity to highlight the critical challenges and goals inherent in the sustainable management of lakes and their basins, as the conference was the first global-scale lake-focused event convened since the adoption of the Resolution on Sustainable Lake Management (SLM) at the 5th Session of the United Nations Environment Assembly on 2 March 2022 (UNEP/EA.5/Res.4.).

RESOLUTION ADOPTED BY THE UNITED NATIONS ENVIRONMENT ASSEMBLY ON 2 MARCH 2022

5/4. SUSTAINABLE LAKE MANAGEMENT

- The United Nations Environment Assembly,
- Recalling the commitments made in the outcome document of the United Nations Conference on Sustainable Development, entitled "The future we want", [1]
- Acknowledging General Assembly resolution 70/1 of 25 September 2015, entitled "Transforming our world: the 2030 Agenda for Sustainable Development", in which it is noted that lakes are one of the water-related ecosystems that should be protected and restored, as set out in target 6.6 of the Sustainable Development Goals,
- Recognizing the complementarity between the objectives of the Convention on Wetlands of International Importance especially as Waterfowl Habitat, the 2030 Agenda for Sustainable Development and sustainable lake management,
- Acknowledging General Assembly resolution 75/212 of 21 December 2020 on the United Nations Conference on the Midterm Comprehensive Review of the Implementation of the Objectives of the International Decade for Action, "Water for Sustainable Development", 2018–2028,
- Looking forward to the convening of the United Nations Conference on the Midterm Comprehensive Review of the Implementation of the Objectives of the International Decade for Action, "Water for Sustainable Development", 2018–2028, to be held in New York from 22 to 24 March 2023, and calling for, among other things, acceleration of the achievement of internationally agreed water-related goals and targets, including those contained in the 2030 Agenda for Sustainable Development, including Sustainable Development Goal 6, on ensuring availability and sustainable management of water and sanitation for all, and promotion of the implementation of the objectives of the International Decade for Action,
- Recalling United Nations Environment Assembly resolution 3/10 on addressing water pollution to protect and restore water-related ecosystems,

[1] General Assembly resolution 66/288, annex.

- Noting with concern that, at the current rate of progress, the world is not on track to achieve the water-related targets of the Sustainable Development Goals at the global level by 2030, which will have a significant impact on human well-being and on the three dimensions of sustainable development, namely environmental, economic and social,
- Stressing the importance of the ecosystem approach for the integrated management of land, water and living resources and the need to increase efforts to tackle desertification, land degradation, erosion and drought, biodiversity loss and water scarcity, which are seen as major environmental, economic and social challenges for global sustainable development, and which affect lakes and necessitate sustainable lake management,
- Recognizing that natural and artificial lakes contain more than 90 per cent of the fresh water on the surface of the Earth and are major contributors to ensuring the availability and accessibility of water to protect lives and livelihoods and to the advancement of the 2030 Agenda for Sustainable Development,
- Realizing that lakes have unique characteristics, such as a long water-retention time, the integration of nature and a non-linear response to stresses, that make their sustainable management a continuing, long-term process,
- Realizing also that lakes provide a wide range of ecosystem services, including the provision of water for human consumption, health, food and energy; regulate services for the food cycle, water purification, climate and biodiversity; and enable the pursuit of recreational and traditional activities,
- Stressing the severe impact of climate change on the environment and recognizing that the sustainable management of lakes and other freshwater ecosystems can play a positive role as an adaptation measure for climate change and can serve as a reduction measure for water-related disasters resulting therefrom,
- Recognizing that the state of lake environments, notably in terms of water quality and quantity, is severely deteriorating around the world, threatening human health, biodiversity and the environment, and that this needs to be urgently addressed in a sustainable manner,
- Considering that lakes can have a close relationship with cultural, historical and societal values, which can play a central role in sustainable lake management, and that this makes engagement with local communities and environmental education and awareness vital,
- Recognizing the need for concerted efforts by all stakeholders, including through partnerships across both the public and private sectors, and involving local, national and global actors to support the implementation of sustainable lake management,
- Recognizing that transboundary lakes may be subject to relevant bilateral, international and multilateral agreements, in which case covered sustainable lake management efforts should be pursued under the respective agreements,
- Recalling and reaffirming target 6.5 of the Sustainable Development Goals to, by 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate,
- Reaffirming the importance of integrated, intersectoral, collaborative and coordinated approaches, at all levels, in the management and protection of lakes,

1. Requests all Member States and members of specialized agencies, and invites relevant international organizations, where applicable, to undertake and implement the following, individually and collectively, as appropriate:

   (a) To protect, conserve, restore and ensure the sustainable use of lakes, including aspects such as water quality, erosion, sedimentation and aquatic biodiversity, through integrated management at all levels, as set out in targets 6.5 and 6.6 of the Sustainable Development Goals, addressing the water body and the entire lake basin, supported by relevant regulation, institutional development, budget allocations, well-managed monitoring and data, integrated research, sustainable technology and international cooperation;

(b) To integrate lakes into national and regional development plans, including in climate adaptation, water resource management and conservation of biodiversity, to advance the attainment of Sustainable Development Goal 6, and of climate resilience and biodiversity conservation;

(c) To take into account their local culture and knowledge and their dependence and impact on lakes, ensuring engagement with and capacity-building for local communities and indigenous peoples, as appropriate, and in accordance with national circumstances;

(d) To involve all stakeholders, including university and research centres, private companies and non-governmental organizations, in a concerted effort to implement sustainable lake management;

(e) To take into account research and scientific guidance, with an emphasis on science-policy linkage;

(f) To develop international networking and collaboration for integrated sustainable and climate-resilient lake management and regularly exchange data and information between States that share a transboundary lake, as provided for in international agreements;

2. Requests the Executive Director of the United Nations Environment Programme to take action in the following three major areas:

(a) To support the advancement of sustainable lake management at all levels, in coordination with relevant conventions, as appropriate, including the Convention on Wetlands of International Importance;

(b) To facilitate collaboration among Member States and members of specialized agencies in research, capacity-building and the sharing of knowledge, information and best practices, including through North-South, South-South and triangular cooperation;

(c) To advance the mainstreaming of sustainable lake management in the global agenda and raise awareness of sustainable lake management at the global level to further highlight the important role played by lakes in supporting sustainable development and maintaining the well-being of ecosystems and humanity.

Source:
https://wedocs.unep.org/bitstream/handle/20.500.11822/39858/SUSTAINABLE%20LAKE%20MANAGEMENT.%20English.pdf?sequence=1&isAllowed=y

1983
2023
BALATON
WORLD LAKE CONFERENCE

BALATON DECLARATION

CLOSING DOCUMENT
OF THE 19TH WORLD LAKE CONFERENCE

PREAMBLE

Freshwater is our most important natural resource, being essential for human health, well-being, and socioeconomic development, as well as for facilitating biodiversity and the myriad of life-supporting ecosystem services upon which humanity depends. Only about 1% of all the freshwater on the Earth's surface exists in liquid form; however, more than 90% of this total is contained in lakes, wetlands and other standing bodies of water. At the same time, while our ability to develop and utilize water resources has advanced significantly globally over time, our ability to manage natural and artificial lakes, their basins, and their ecosystem services for sustainable use has lagged far behind, even as increasing freshwater demands are occurring alongside continuing exploitation and degradation of lakes. Many national approaches to freshwater policies, for example, are fragmented, with their goals not being achieved because of such factors as insufficient funding, slow implementation activities and insufficient integration of environmental objectives into sectoral policies. A sustainable freshwater management approach also has implications for achieving many Sustainable Development Goals (SDGs) and the 2030 Water Action Agenda, an example being SDG 6.6, which calls for the protection and restoration of water-related ecosystems.

National governments recognized this reality with their unanimous adoption of a Resolution on Sustainable Lake Management (SLM) at the 5th Session of the United Nations Environment Assembly on 2 March 2022, consistent with the global sustainability agenda. Furthermore, this 19th World Lake Conference, Beyond Lakes: Linking Science, Culture and Governance for Their Sustainable Use, was designed, among other reasons, to extend the range of lake degradation issues previously highlighted at the 3rd World Lake Conference in Keszthely, Hungary, including eutrophication, toxic substances, rehabilitation approaches and stakeholder roles, by presenting many valuable tools and concepts for maintaining the wide range of life-supporting ecosystem services provided by lakes and their basins, as well as other interconnected ecosystems. This 19th World Lake Conference also is the first global-scale lake-focused conference convened since the unanimous adoption of the SLM Resolution, thereby representing an invaluable opportunity to highlight the critical challenges and goals inherent in the sustainable management of lakes and their basins, including their linkages to climate change and the related extreme climatic events (droughts, floods) that have significantly impacted both aquatic and terrestrial ecosystems globally, highlighting the need for integrated climate planning in lake regions.

RECOMMENDATIONS

Accordingly, we, the participants at the 19th World Lake Conference, make the following recommendations to advance the sustainable management of lakes, their basins, and their ecosystem services for present and future generations, consistent with the goals outlined in the SLM Resolution.

SPECIFIC PROPOSAL

Accelerate and enhance support for the forerunner national governments and concerned national and international non-governmental organizations to realize the designation of a "World Lake Day" at the United Nations General Assembly. Designation of a "World Lake Day" will enormously contribute to bringing global attention to the crucial role of lakes in addressing human freshwater needs, and ecosystem integrity and biodiversity, at all levels.

GENERAL RECOMMENDATIONS

In addition, the participants agreed on the importance of striving to:

- Develop a cooperative global program of assessment dedicated to lakes and their basins, tentatively called the Global Lake Assessment Programme (GLAP), that provides a periodic global overview of their status, use and management that can complement existing global programs targeted to water as a whole, such as the World Water Assessment Programme (WWAP) and the World Water Quality Assessment (WWQA);
- Create and ensure implementation of tools to strengthen science-policy linkages in developing sustainable lake management efforts, including the involvement of policymakers, scientists, and communities, a noteworthy example being the Mother Lake Goals, inspired by the SDGs, for the conservation and sustainable management of the Lake Biwa basin, Japan; and
- Establish a long-term global lake coalition with measurable and achievable goals to unify and expand the synergy of the range of existing United Nations, governmental, non-governmental, research, and community lake-related organizations at the regional, national and local levels.

Additional considerations and actions to enhance the benefits to be realized from the implementation of the SLM Resolution can include the following:

- Consolidate and coordinate the authority and responsibility for lake basin management to the maximum extent in order to reduce the policy fragmentation currently hindering sustainable management of lakes and other lentic freshwater systems;
- Develop, harmonize and implement uniform guidelines and protocols for measuring both lake degradation and signs of improvement, including the scientific, institutional, policy, and cultural components;
- Emphasize on-the-ground adaptation of climate-water linkages by recognizing the increasing need to take Disaster Risk Reduction (DRR) concerns into account, highlighting the need for integrated climate planning in lake regions;
- Recognize that many lake-related hydrological extremes, such as lake water level changes, may occur as a result of external forces that require consideration within the development of sustainable lake basin management efforts;
- Because the more comprehensive ecological and social benefits of lake basin management are often not appropriately considered in national development plans and programs, recognize that sustainable lake management efforts to protect lakes and their essential ecosystem services, as well as to restore degraded ones, should be viewed as an investment both in the present and in the future, rather than as a cost;
- Because the SLM Resolution aligns well with ILEC's Integrated Lake Basin Management (ILBM) platform, emphasize its use as a powerful tool to facilitate achievement of the SLM Resolution goals, also noting the usefulness of a lake-focused Integrated Water Resources Management (IWRM) framework that features the gradual, incremental and long-term improvement of lake basin governance, as exemplified in the ILBM approach;
- Adopt communication strategies to facilitate effective outreach and communication at all levels, including social media, community engagement, and cross-disciplinary education, to inform sustainable lake management by policymakers and lake basin communities;

- Enhance proactive lake management by policymakers, the public, and all relevant lake stakeholders to address lake basin management challenges through the preparation of regular assessment reports on the status and needed actions of in understandable language used to address activities such as the implementation of the SLM Resolution at the regional, national and local levels;
- Promote and enhance the level of citizen science, as well as individual and community lake stakeholder involvement, to facilitate community ownership, including indigenous communities, of lake management efforts, ensuring their needs and considerations are incorporated into decision-making processes;
- Mobilize the enthusiasm, energy, and visions of the Youth in facilitating sustainable lake management at all levels, including planning, decision-making, implementation, evaluation and celebration;
- Ensure wide dissemination and training related to evidence-based solutions from successful case studies of sustainable lake basin management to all relevant stakeholders, including policymakers, scientists, NGOs, and lake communities, as a means to facilitate successful management efforts in other lake basins;
- Explore relevant principles and experiences of ongoing and anticipated EU water-related activities relevant to SLM implementation, such as the EU Blue, ESPON Thematic Area Plans and Water Management Functional Areas, and recommendations arising from the Budapest Water Summits;
- Provision of adequate funding at local, regional, national and regional levels to support implementation of the SLM Resolution and its aims, combining public investments with private and innovative financing, including development of a World Lake Fund;
- Place greater emphasis on the Payment for Ecosystem Services (PES) approach as a means for funding large-scale restoration and sustainable management of lakes and wetlands;
- Recognize glacial lake outburst floods (GLOF) as an emerging new challenge in addressing the sustainable management of high-altitude lakes.

As noted in the World Lake Vision, experiences around the world suggest that if we are able to use lakes, their basins and their wide range of ecosystem services in a sustainable and responsible manner, there is much hope we can meet the needs of the human and natural communities that depend on them for clean and sustainable freshwater resources, the key to life.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EXTENDED ABSTRACTS

SUBMITTED BY THE SPEAKERS AND PRESENTERS OF THE CONFERENCE

TITLE

EU BLUE DEAL

AUTHOR(S)

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AFFILIATION(S)

Consultative Commission on Industrial Change (CCMI), EU Blue Deal, European Economic and Social Committee (EESC)

PIn Europe, we have taken access to water for granted for a long time. But the world and our continent are facing increasing water-related challenges, such as droughts, poor water quality and pollution, or lack of access to safe drinking water. There is a lack of water efficiency in many areas of our society, including water supply infrastructures, production processes, agriculture and consumption. We are not on track to achieve the Sustainable Development Goals related to water.

The European Economic and Social Committee (EESC), an advisory body of the European Union representing organised civil society, strongly believes that there is **a need for a change of scale in European water policies:** An EU legislative framework exists; it is even one of the most developed in this area, but the overall approach is fragmented and not adequately addressing the challenges in our society. Many of the policy objectives set at European level have not been reached, largely due to lack of funding, slow implementation and insufficient integration of water in sectoral policies, and the water dimension is not sufficiently embedded in public and private decision making.

The crisis already exists and citizens, farmers and our ecosystems are feeling it. We need to take urgent action now. Without action, water challenges will impact ever larger parts of our society, with implications for economic, social, and political stability, also here in Europe. We need measures at EU level to safeguard clean water for people and our ecosystems, and to ensure a true transition to sustainable water use.

The EESC presented its call for an EU Blue Deal, a comprehensive water strategy for Europe, in October 2023. It addresses the social, economic, environmental and geopolitical aspects of water, water challenges in agriculture, industries and infrastructures as well as sustainable consumption. The EU Blue Deal Declaration puts forward 15 principles and 21 concrete actions to be adopted as a matter of urgency. **We call on the European Commission to make water a strategic standalone priority for the EU.**

Since the beginning of our work, we have been insisting that the Blue Deal be set up as an independent but complementary policy to the Green Deal. Up until now, the water dimension has been included within the Green Deal, whose main objective is to decarbonise our continent in order to become carbon neutral by 2050. We believe that, considering the vital nature of water and the magnitude of the challenges ahead, water cannot remain within the Green Deal but must be adopted as an independent policy, on an equal footing with it. **Water resilience and decarbonisation have to be addressed with the same determination, and the EU therefore needs two complementary policies on a par with each other.**

As recognised by the United Nations, access to water is a human right. However, in Europe, around 10 million people do not have access to safe drinking water, and globally the amount of available drinking water is not sufficient to meet the needs. We need to invest in our water infrastructures, knowing that in some EU countries, up to 50% of water is lost due to leakages. This also justifies dedicated social policies to ensure that the most vulnerable populations are not deprived of access to clean water and sanitation.

Furthermore, in the context of the EU Blue Deal, we see it as a necessity to help the most water-consuming industries to gradually adopt technologies to become more water-efficient and more

competitive. As we propose in the EU Blue Deal Declaration, this could be done through the revision of the industrial transition pathways at European level and through providing financial support and boosting research for technologies to ensure the success of these industrial changes. This approach will preserve jobs and create new career opportunities for workers, especially in clean technologies. **Like any industrial change, the Blue Deal will succeed only if it has the resources to implement it, both in terms of financing and human resources.**

The challenges with water are manyfold and go far beyond a purely environmental issue, but we need a coherent approach to all these challenges at EU level. **All EU policies need to include the water dimension. This will allow us to move towards a water-resilient society. If we join forces now and adopt water as an EU priority for the years to come, it is not too late to act. The cost of inaction is higher than the cost of acting now.**

We have involved stakeholders from the water sector, industries and civil society, as well as international organisations in the preparation of the EU Blue Deal. And we have seen an unprecedented amount of interest in this initiative. Stakeholders come to us proposing joint actions on this topic; they see the Blue Deal as a meaningful concept that can support their engagement on water. There seems to be this emerging hope that the EU Blue Deal will be a turning point in achieving long term water-resilience for Europe.

Since the start, we have worked closely also with the European Parliament, where many MEPs share our vision on the need to address water with a more strategic approach in order to ensure a water-secure future. Together with 36 MEPs, we have sent a joint letter to all EU Heads of State and government, calling on them to support and adopt an ambitious EU Blue Deal. We hope that the new Parliament will keep this commitment. This depends on our future choice, as EU citizens. We also urge the European Commission to continue its work on the Water Resilience Initiative and look forward to contributing to the process of defining Europe's water future.

We are determined and optimistic: many Member States are starting to wake up to the importance of the water crisis, although the issues affecting them might vary. Many have recently adopted national water strategies, which is an encouraging sign. We will continue to work closely with them to foster a coordinated approach at EU level; no country can tackle these challenges alone. We will also continue to engage with organised civil society, calling for a more ambitious and comprehensive strategy on water for Europe. Europe needs and deserves an ambitious EU Blue Deal.

TITLE

ADVANCING FUNCTIONAL AREA APPROACHES. INSIGHTS AND OPPORTUNITIES FOR THE LAKE BALATON REGION

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ABSTRACT

Functional area approaches are essential for addressing complex challenges faced by lake regions and promoting sustainable development across jurisdictional boundaries. This paper presents the key insights and opportunities identified in the Lake Balaton region within the *Functional Areas in the EU* project, highlighting the importance of effective governance mechanisms and coordinated action to improve transport and sustainable mobility, address climate challenges, and foster cultural ties. Strengthening coordination and promoting the positive results of the functional area approach will provide an opportunity to inform the design of future programmes and policies for lake areas and beyond.

Keywords: functional areas, interjurisdictional cooperation, lake regions

INTRODUCTION

Development dynamics rarely follow administrative borders. The question of identifying the most efficient scale for territorial development has increasingly preoccupied policymakers, researchers and practitioners around the world. This interest was fuelled by the quest for innovative approaches to achieving cohesion and increasing local ownership, bringing planning and decision-making as close as possible to the needs on the ground, and finally, the growing interdependencies that could no longer be adequately addressed by development approaches defined by administrative boundaries.

A functional area describes a space that encompasses interdependencies among places (OECD, 2020). While research efforts mostly concentrate on urban agglomerations, functional areas reflect a variety of links between different places, including natural characteristics. A functional area is defined by one or more specific territorial interdependencies, related to various economic, social, cultural, or geographical functions, which often overlap. A functional area may capture commuting flows, specific economic flows, natural characteristics, cultural links, or may reflect demographic commonalities (CEMAT, 2020). Reflecting this broader understanding, a definition encompassing the characteristics of all types of functional areas was formulated: *'the Functional Area (FA) is an area or region that operates as a single system in political and/or social and/or economic terms. In other words, the FA is defined by the internal system of interactions and relations and covers, in full or in part, the territory of several administrative units which cooperate and are linked together/united through economic, communications, transport and other activities'* (CEMAT, 2020).

The specific challenges and potential of functional areas defined by natural characteristics (such as mountain areas, island areas, coastal areas, river catchment areas, delta areas, or lake areas) are increasingly recognised at the global level. **Functional natural areas** are often confronted with shared barriers stemming from administrative fragmentation, climate-related challenges and environmental vulnerability, requiring coordination between local administrative units.

In the following, key opportunities for the Lake Balaton region in strengthening functional area approaches as part of the *Functional Areas in the EU* are presented, covering governance and capacity, sustainable mobility, addressing climate challenges, and cultural ties.

METHODS, FINDINGS AND DISCUSSION

As one of the areas participating in the **Functional Areas in the EU** project launched by the European Commission and the World Bank in 2022, the Lake Balaton region received support in addressing various challenges requiring joint action, and improving the strategic importance of lake regions at EU level. Analyses and recommendations resulting from the project supported both these challenges, and highlighted opportunities of strengthening the functional area approach in the region.

The case of Lake Balaton serves as an example for the importance of coordinated action in non-urban functional areas. As pointed out by OECD, expanding the functional area framework to encompass non-urban regions has the potential to improve spatially-targeted policies (OECD, 2020). Many OECD countries have predominantly concentrated their efforts on larger cities and their immediate economic influence zones through the concept of functional urban areas, but considered less the potential of supporting functional approaches in non-urban areas. However, non-urban areas around the world can strongly benefit from coordinated actions to tackle shared challenges beyond administrative boundaries.

A joint approach is critical in the case of functional natural areas, such as lake areas. Specific challenges requiring cross-jurisdictional planning and implementation include climate change, loss of biodiversity, balancing economic development and environmental protection, protecting water resources, and demographic decline.

Having in place an efficient **governance arrangement** can support the institutionalisation of territorial cooperation, improve joint strategic planning and optimise investments for the benefit of the entire functional area. A governance body can coordinate integrated planning at the functional area level and serve as a robust platform for collaboration among diverse stakeholders. In the case of Functional Urban Areas, the benefits of establishing governance bodies at the metropolitan level are well documented, particularly regarding their role in promoting integrated and sustainable development and limiting urban sprawl. While less documented, formalising cooperation in 'natural functional areas', such as lake regions, has the potential to balance economic development and environmental vulnerability and administrative fragmentation.

The governance structure of the Lake Balaton region is ensured by the Lake Balaton Development Council (LBDC), composed of ministry and county representatives, and its executive arm, the Lake Balaton Development and Coordination Agency. The Lake Balaton functional area's governance body (LBDC) enables the engagement of a variety of stakeholders from both urban and rural areas, including local administrations, regional organisations, non-governmental organisations, and businesses. Going forward, building the sub-national institutional and financial capacity is a prerequisite for advancing policymaking and promoting a more efficient use of resources.

To support the Lake Balaton governance body in achieving the area's development goals, several opportunities were identified or explored further as part of the *Functional Areas in the EU* project. Firstly, starting from the existing project to develop a **transport** coordination office for the Lake Balaton Region to ensure integration between different means of transport and oversee transport infrastructure development, several possible interventions for integrated transport were identified in a dedicated report. These included a unified ticketing system options for all sustainable transportation modes, including electric buses, trams, and regional trains, park and rides, differential parking tariffs, sustainable public transport hubs, or eco-friendly travel incentives.

Another key area of focus was improving the cycling infrastructure. The area boasts an impressive cycling network of over 200 km, which is a key asset for promoting **sustainable mobility** within a largely non-urban, touristic region. A separate practical report identified opportunities for the area to implement additional measures based on principles of world-class high-quality cycling infrastructure (safety, directness, cohesion, comfort, attractivity). Moreover, cycling tourism is a major opportunity for extending the tourism season, a major objective for the region.

A third topic addressed within the project was **addressing climate change** in the region. By ensuring coordination between urban planning, public health, environment, social inclusion measures across member municipalities, functional areas can create more resilient communities that are better equipped to handle the increasing challenges posed by climate change. While there are strong advancements in integrated shoreline management and water monitoring in the Lake Balaton area, a mapping of the urban heat island effect confirmed the importance of continuing to formulate joint regulations across the functional area. The analysis identified the areas in the region most affected by heat islands (this included surprising examples such as fallow agricultural lands), and developed several scenarios. Even in the milder scenarios, the heat islands may have a severe impact on the socio-economic performance of the region, livelihoods, water balance, and the natural hinterland. For example, the increased evaporation of water in Lake Balaton can affect the fish and algae population, can negatively impact the tourism sector and, by extension, can affect many other businesses.

In view of climate change forecasts and urban heat island effect, increased cooperation in tackling climate change is needed. Institutional measures such as building a climate change coalition of public and civic actors at the regional level, and mainstreaming climate action in sectoral planning and operations were proposed. Other potential measures include regulatory and financial incentives for cool building designs and materials, integrating green assets and climate-sensitive design into planning codes and public investments and enforcing joint regulations to protect the shoreline. Moreover, establishing an early warning communication regarding heatwaves, creating a network of community cool spaces (or „climate shelters"), partnering with unions and employers to ensure that occupational health practices are in place, and finally, creating more opportunities for citizen engagement around climate change are also recommended.

The *Functional Areas in the EU* project also supported the Lake Balaton region with identifying EU financing opportunities for water and public safety, particularly as extreme weather events become more frequent. In the context of Veszprém holding the European Capital of Culture (ECoC) title for 2023, the project also facilitated knowledge exchange through the TAIEX Regio Peer2Peer instrument in Wroclaw (2016 ECoC) on the topic of leveraging the title for integrated territorial development of the wider area, strengthening regional ties and a shared identity.

CONCLUSIONS AND RECOMMENDATIONS

As natural functional areas, lake regions face the challenge of balancing environmental vulnerability and socio-economic development, underscoring the need for stronger coordination between local administrative units and enhanced capacity and resources to implement collaborative projects. For instance, the analysis of the heat island effect in the Lake Balaton region highlights the importance of accelerating climate action and the need for coordinated measures. As water scarcity and droughts are increasingly frequent and widespread in the EU, strengthening coordination and promoting the positive results of the functional area approach will provide an opportunity to inform the design of future programmes and policies.

Considering the importance of lake areas, building adequate sub-national capacity for planning and financing investments and services across jurisdictional boundaries is necessary. Functional approaches require robust institutional capacities for the implementation of place-based, integrated policies, and adequate access to financial resources. Other important areas of advancing cooperation in the Lake Balaton functional area are transport coordination, promoting and improving its cycling network, developing all-year tourism opportunities and leveraging the ECoC cultural programme and experience to drive further integration at the territorial level.

ACKNOWLEDGEMENTS (WHEN APPROPRIATE)

The *Functional Areas in the EU* project aims to boost administrative capacity to improve cooperation, plan and finance across jurisdictional borders. For more information: www.functionalareas.eu

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TITLE

SUSTAINABLE USE OF LAKE BIWA AS A LOCAL RESIDENT

AUTHOR(S)

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ABSTRACT

Purpose: Developing children who can act independently as local residents towards realizing a sustainable Lake Biwa
attempt: Conduct experiential activities continuously and in a multifaceted manner.
As part of our sustainable use, we have been conducting experiential activities at Lake Biwa.
Elementary school students, middle school students, and high school students participated.
We will tell you what I experienced from elementary school to junior high school and high school, and what I thought from those experiences.
At Lake Biwa, you can secure food to survive, enjoy sightseeing and play, and learn about living things through observation.
I learned from experience that it can be used in many different ways.
Next, we thought about what we (junior high school, high school, and university students) can do today to make Lake Biwa sustainable.
1. Don't create or throw away trash.
2. Learn deeply and widely about Lake Biwa
3. Make friends. The keywords are transmission and interaction.

Keywords: experiential activity, continuation, interaction, thinking

1. INTRODUCTION

As part of our sustainable use, we have been conducting experiential activities at Lake Biwa..
The following are experiential activities that we have undertaken with a particular focus on continuity and seasonality.

1. Use a canoe to investigate the water quality of Lake Biwa.
2. Talk to people who are involved with the creatures of Lake Biwa.
3. We boarded a fisherman's boat and experienced fishing for Nigorobuna.
4. I boarded a Ministry of Land, Infrastructure, Transport and Tourism ship and we had some experiences.
5. We are observing living things in the rivers and rice fields leading to Lake Biwa, and investigating the plants on the riverbanks.

2. ABOUT FINDINGS

1. Use a canoe to investigate the water quality of Lake Biwa.
In this activity, we focused on three things: directly touching the water of Lake Biwa, feeling the vastness of the lake, and feeling the differences in the four seasons.

Children's impressions
In spring, many aquatic plants were growing in Lake Biwa, covering the surface of the water.
We were able to observe a lot of zooplankton in the summer. We saw many Daphnia and rotifers. We observed reeds growing around Lake Biwa.
When we got on the canoe and entered the reed belt, the feeling of exploring increased and it was exciting.
Many creatures lived in the reed zone. We heard reed warblers chirping and saw dragonflies flying. We observed the reeds from the land as well as from the lake.
In the spring, the reeds in the reed belt were as tall as my knees, but by summer they were taller than I was.

2. Talk to people who are involved with the creatures of Lake Biwa.
Many people are researching the living things and water quality of Lake Biwa.
We spoke mainly to people who have been conducting research for many years as part of their civic activities.

Children's impressions
The southernmost point where swans come to Lake Biwa is Shina in Kusatsu City. There is someone there who observes swans every year. That person has been observing for 16 years. What I learned from listening to the story is that the same swans come back for several years, but if the environment changes, they stop coming back.

3. We boarded a fisherman's boat and experienced fishing for Nigorobuna(Crucian carp .
"Learn about the occupations that use Lake Biwa" and "Think about the happiness and food of Lake Biwa." We did activities to learn about this. Nigorobuna is endemic to Lake Biwa. And since ancient times, it has been used as an ingredient in the "funazushi" of food.

Children's impressions
There are fishermen fishing in Lake Biwa. We were taken fishing and we saw them catch a Japanese carp. Then we cooked the fish we caught. We then ate it on the shore of Lake Biwa along with clam rice.

4. I boarded a Ministry of Land, Infrastructure, Transport and Tourism ship and we had some experiences.

5. We are observing living things in the rivers and rice fields leading to Lake Biwa, and investigating the plants on the riverbanks.

1. Researching Lake Biwa using a canoe.
2. Children listening to stories about swans coming to Lake Biwa.
3. Rice with shrimp caught in Lake Biwa and miso soup with clams.
4. Experienced an investigation on a national office ship.
5. Children looking for living things in the rice field.
6. Pick up trash at Lake Biwa.

AS A RESULT

Thoughts from continuing participants

1 Mana Kosugi 1st year student at Kyoto Sangyo University (10 years of experience)
Through these hands-on activities, I learned and thought about various things. One of them is the garbage problem.
Among these activities, the one that concerns us the most is the issue of garbage. We participated in cleaning Lake Biwa several times and picked up trash. There was a lot of garbage falling That had been thrown a way there. There were two types of garbage we picked up.
This garbage is thrown away by people visiting Lake Biwa. The first was garbage thrown away in Lake Biwa. This garbage is thrown away by people visiting Lake Biwa. They camp around Lake Biwa. It feels very good. However, many of them have a lot of garbage and leave the garbage on the spot. the second is garbage flowing to Lake Biwa. This garbage is thrown away by people living in Shiga Prefecture. Lake Biwa is surrounded by mountains, and many rivers flow in. Along with those river water, a lot of garbage is thrown into the river flowing into Lake Biwa. We, ourselves do not throw away trash on the river and Lake Biwa, and call for residents living around Lake Biwa and rivers, and those who visit Lake Biwa do not leave garbage.

1 Chinami Takemura 2nd year student, Shiga University (13 years of experience)
I have been doing this activity for over 10 years since I was an elementary school student.
And we thought about what we can do today to make Lake Biwa sustainable.
I thought it was important to create a sustainable local environment.
For that. We would like to do the following.
1. Do not make garbage, do not throw it away by the lake.
2. Learn deeply and broadly about Lake Biwa
3. Make friends. The important thing is communication and to exchange of idea.

Lastly
Our activities will continue.

ACKNOWLEDGMENTS

We would like to express our sincere gratitude to
O'PAL (Lake Biwa's Nature Experience and Learning Facility)which provided canoeing guidance for these hands-on activities. In addition, I would like to conclude by expressing my gratitude to Ms. Misako Yoshioka, who casually talked about her observation data over many years, and many other people, because I believe that these hands-on activities would not have been possible without the cooperation of many others.

TITLE

THE MULTIVERSE OF LAKE LANDSCAPE. THE CASE STUDY OF BOLSENA LAKE.

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ABSTRACT

The contribution explores the impact of water resource management on landscape quality in the Basin of Lake Bolsena, utilizing qualitative data obtained through on-site studies. The theoretical framework adopts the multifactorial and multi-actor approach where integrated lake landscape management requires an in-depth understanding of intricate territorial dynamics, particularly focusing on water management strategies (Biswas, 2004; Kikoyo et al., 2023; Lin HeBin et al., 2013). To analyse the features of lakescape (natural, cultural / social factors), we evaluate landscape and seascape characters used in the Nordic countries, reflecting on potential opportunities to comprehend the dynamics in the case study(Fairclough et al., 2018). The basin requires an integrated planning approach where water, landscape, and stakeholders collaborate to formulate innovative strategies, mitigating the impacts of climate change. Considering the Natural, Cultural and Social system, the Lake Basin can be viewed as a hydrosocial territory(Boelens et al., 2017), fostering a vision for potential development through a Lake Landscape project. This contribution proposes an initial framework for the hydrosocial basin assisting stakeholders in observing and governing the territory in a holistic approach.

Keywords: Landscape Character Assessment; Landscape; Governance; Lake Bolsena.

1. INTRODUCTION

Lakes are sensible ecosystems damaged by fast and strong anthropic factors, serving as basins for various species and services (Network Natura 2000). The complexity of a "lake" stems from intricate relationships within the landscape. Thus, this article introduces the term lakescape (O'Reilly et al., 2023; Potocka, 2013;) to describe the intricate landscape associated with lakes and social environments, representing the transformation of the water and human system in a specific area. The challenge of this contribution is to illustrate how to define landscape character with a water relation and underscore the effects of neglected governance about this relationship.
In the recognition of different lakescapes, we identified that each management lake basin plan often considers only one or two aspects in its strategy (Pinder, 2013). The monosectorial approach leads to discrepancies and gaps in understanding the diverse characters of lake basins. The most effective approaches vary, depending on the problems present in the territory, the types of stakeholders involved, and their vocations. The hydrographic basin is a space where humans and nonhumans co-exist. Therefore, the research theory is grounded in literature on environmental and hydrosocial aspects of the lake (Boelens et al., 2017) emphasizing the necessity for a sustainable development of the lake basin. The causes that called before are possible to reconduct at three aspects of lakescape: governance, environmental and immaterial aspects (Brillo, 2023). This cohesion permits one to work with a multi-level and multifunctional approach.

2. LAKESCAPE OF THE BOLSENA LAKE BASIN

The Lake of Bolsena is situated in a rural area in the middle of Italy, part of a region characterised by five volcanic lakes, with Bolsena being the largest. The presence of many volcanic lakes in the region is connected by geological and historical characteristics (Capelli et al., 2005; Regione Lazio & Rossi Marcello, 2006). The Bolsena Lake basin is linked to the main "Bolsena-Marta basin", where the lake connects to the Marta River, its only emissary. The Lake has seven town hall - Bolsena, Capodimonte, Gradoli, Grotte di Castro, Marta, Montefiascone, San Lorenzo Nuovo- with 27,400 inhabitants (ISTAT, 2021). The basin of the lake is 273 km^2 (CDF, 2018) and the lake has 43 km of perimeter and 114,5 km^2. The basin has two Habitat Directive Sites (SCA) and Bird Directive Sites (SPA) ("Monti Vulsini- IT6010008" and "Lago di Bolsena- IT6010007") where there are several important species of flora and fauna (Natura 2000 Network). Moreover, the historical layers built rich archaeological and artistic sites (from Etruscan times to the 19th century). The knowledge of the territory serves as starting point to structure the research analysis phase, emphasizing the need of updating, sharing data, update of water infrastructure, enhanced communication among actors, and increased monitoring activities for lake's environment and its basin. Despite different management layers, such as local plans, basins plan, plans for SCA areas, regional landscape plan, the agricultural directives and individual actions, an individualistic approach prevails, leading to unplanned development that look out environmental and lake safety. The lake often becomes a mere line in these plans, highlighting how a vision lacking water attention negatively impacts sustainable development.

1.1 Methodology

The case study is studied with a mixed approach, quantitative and qualitative data. Therefore, through a single case study, the research found a method of analysis that includes all aspects of the basin lake. The case study is revealing in its design, as we aim to discover and analyse new or unique phenomena related to landscape quality in water management. For the lake to be integrated into the dynamics of sustainable development, the territory will need to reclaim these landscape features.

The method used in the resource is connected to the process of Seascape Character Assessment (SCA)(Fairclough et al., 2018). SCA is a landscape approach where the methodological debate about the balance between qualitative and quantitative, objective, and subjective. In the specific case study, we conducted: collected data; overlapping quantitative and qualitative data; highlighted the same characteristics; gave new tools for the water management. The goals of the evaluation are to develop a tool involving operational actors. This approach helps bring out the value of landscape in the basin. In the case study, the lakescape framework is composed of landscape value and water (resource) management. This approach has been chosen because the case presents a complex network of problems and can offer a different perspective on water resource and landscape management. Conducting an analysis and an assessment of lakescape characters helps identify potential issues related to water management.

1.2 Discussion

The water research management in the waterscape is very complex with respect, for example, urban context. The history of settlements, the use of soil, the erosion, the rural uses add in the complex framework of WRM. In the lakescape. In this context, the lakescape's water management involves three spaces and elements of water: Coast, Lake environmental, groundwater.

- The coast of Bolsena Lake is important because it is a buffer zone where diverse ecosystems interact. The quality of this space significantly influences water quality and ecosystem health. In the last century, with the rapid unplanned development, the lake coast is threatened with anthropization. When the Special Area to Conservation was instituted in 2006, a SAC and SPA plan was defined, and the coast had 71,86% anthropic pressure (Piano di Gestione ZPS, 2006). Recent simulations indicate a growth to 85,95%. The transformation from riparian vegetation to increased beaches and berths has damaged the natural ecosystem, undermining the coast's ability to filter and preserve biodiversity and the lake's water quality.

- The lake environment is fragile. Each transformation in the territory caused a different mutation in the environment. The lake is a 300-year-old water exchange and, with anthropic pressure, it risks beginning eutrophic status. According to ARPA Lazio, the ecological state changed from 'good' in 2008 to 'moderate' in 2015. The causes could be using fertilize chemical products, introducing alien species of fish for sport fishing (report BDLB, 2019; Calvario et al., n.d.; Nostra, 1970); unplanned development near the lake there are informal withdrawing water and drain in the lake; the infrastructure of wastewater is old and inadequate.
- Groundwater in the past has been studied a lot, and the last studies are in 2010. In the desk and site studies, we understand how there exists a gap about groundwater knowledge and its infrastructure. Private wells, for example, are not monitored by water companies but by other actors, posing a short-term problem for public wells and a long-term threat to the aquifer's viability. Uncontrolled water usage over an extended period risks aquifer depletion and landscape alteration.

3. CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the examination of water resource management in the context of the Lake Bolsena Basin reveals a multifaceted and intricate landscape. Approaching the landscape by identifying the features of the landscape can lead to a discussion round table to enrich these features and define common actions. They can help in the character development phases and in incorporating the oral knowledge that cannot be found at present except by talking to technicians. The problems of lakescape are linked with knowledge, education and sharing. These aspects aren't implemented by the governance system, or "not good" dynamics were started, making the creation of good practices difficult. For this reason, the socio-hydrological cycle approach helps the governance system to individuate gaps and start a good process to engage the resource system and actors in the planning of development. In the international context, there are many approaches to water resource management or landscape management, some quantitative and some qualitative but the common problem is the difficulty of the relationship between actors who want sustainable development and other actors with different priorities, gaps in knowledge, and lack of coordination. The main challenge of lake management is to maintain the network and balance between nature and human interests to preserve and promote the hydrosocial value of these basins.

1.2.1 ACKNOWLEDGMENTS

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TITLE

COMPLEX SYSTEM OF CONDITIONS FOR SUCCESSFUL SUSTAINABILITY PROJECTS

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ABSTRACT

Based on our domestic and international experiences gained in connection with our sustainability projects at various (community, organizational, local, regional and macro) levels, we became convinced that the issue of autonomy at the given entities is closely connected with the implementation of sustainable development and competitiveness. And it is now becoming a priority. Sustainable development means responses to the complex challenges of economic-social-technical development and in accordance with local conditions. In doing so, far beyond economic capital, the role of social capital, human capital, natural capital, and the level of governance must take into account. The complex system of different forms and levels of autonomies, overlapping and building on each other, plays an increasingly important role in the projects. The simultaneous strengthening of individual and collective autonomies is essential, and this requires appropriate, intensive and complex social marketing. For this, the correct diagnosis of the situation of the existing decision and action autonomies at a given place and time serves as a starting point. Our objective was to reveal the significant relationship between the elements of individual and collective autonomy and the sustainable competitiveness using multivariate statistical analysis based on local databases. We are showing that the higher the level of local autonomy, the more competitive an entity is. This is closely relating to the quality of human and social capital, government performance, and local innovation potential. In the case of development projects aimed at sustainability, the available economic and natural capital can only serve as a starting point. But local human, social and innovation capital are indispensable for the implementation of these projects.

Keywords: sustainable competitiveness, human capital, social capital, autonomies

1. INTRODUCTION

During the last two decades, one of the important areas of our research work has been the methodological development of the strategic foundation of different level development programs, and the processing and feedback of the practical experiences of implementation. Since sustainability challenges are growing rapidly and are inextricably linked at the global-macro-regional-micro level, taking this into account during local developments is increasingly important. Knowing this process, it has become an important task to assess the foreseeable future: what changes in emphasis are needed in the field of different level developments in order to be able to provide adequate answers to complex challenges at these levels?
As a result of the research, the requirement for increased enforcement of several (previously background) aspects can be formulated. Thus, the realization of the maximum mobilization of

the local community, ensuring the continuous cooperation of those involved, and the intensive development of the adequate competences of the actors. Much more emphasis should be placed on the maximum strengthening of local decision-making and implementation autonomies (in contrast to their degradation process), and in connection with the programs, on building the ability to flexibly adapt to significant environmental changes. Knowledge of professional project planning and the implementation of a (technically) up-to-date evaluation and monitoring system are indispensable. It is essential to be aware that copying the "best practice" that can be used at all levels of entities does not work, instead, the development of local "best practices" is more effective. This, on the other hand, can be based only on a creative combination of several local (social - economic - environmental - technical) innovations.
Based on our more than 20 years experiences in projects aiming sustainability at international-macro-regional-micro-levels we found that sustainability is built from the bottom up not from the top down! Specialties of our micro-regional sustainability projects are:

- Collective and individual autonomy, role of community engagement
- Local planning and governance
- Micro-level environmental and economic sustainability
- Cultural and heritage preservation
- Local infrastructure and services
- Monitoring and evaluation

Responsible sustainability at different levels, including individual, micro-, meso-, and macro-levels, refers to the varying scopes of responsibility individuals and entities have in promoting ethical behaviour, contributing to the well-being of society, and addressing social issues. The short overview of responsible sustainability at each level is the following:

- Individual responsible sustainability:

It is focusing on actions and behaviours of individuals, and concerns on personal ethical choices, civic engagement, and contributions to the community. Some examples: volunteering, charitable donations, ethical consumer choices, practicing environmentally friendly habits, and engaging in acts of kindness.

- Micro-level responsible sustainability:

It is the level of small-scale groups, organizations, or communities, and concerns on responsibilities of smaller entities within a society. Examples are the corporate social responsibility (CSR) initiatives, community development projects, ethical business practices, and fostering a positive workplace culture.

- Meso-level responsible sustainability:

This case the main focus is on intermediate-scale organizations, communities, or groups. Responsibilities related to the functioning and impact of larger entities within society. Examples: collaboration between businesses and local communities, advocacy for fair labour practices, supporting educational initiatives, and promoting diversity and inclusion within organizations.

- Macro-level responsible sustainability:

At this level the focus is on societal and systemic issues at a large scale. Responsibilities related to broader social, economic, and political structures are of most importance. Examples: advocacy for human rights, addressing systemic inequalities, promoting environmental sustainability, and influencing policy changes to benefit society.
Responsible sustainability is interconnected across these levels, and actions at one level can have ripple effects on others. For example, individual ethical choices can contribute to a positive workplace culture (micro-level), which, in turn, may influence the organization's overall CSR initiatives (meso-level). Additionally, advocacy for policy changes (macro-level) can create a supportive environment for both micro- and meso-level social responsibility efforts. The effectiveness of social responsibility initiatives often stems from a coordinated approach that considers these different levels of impact.

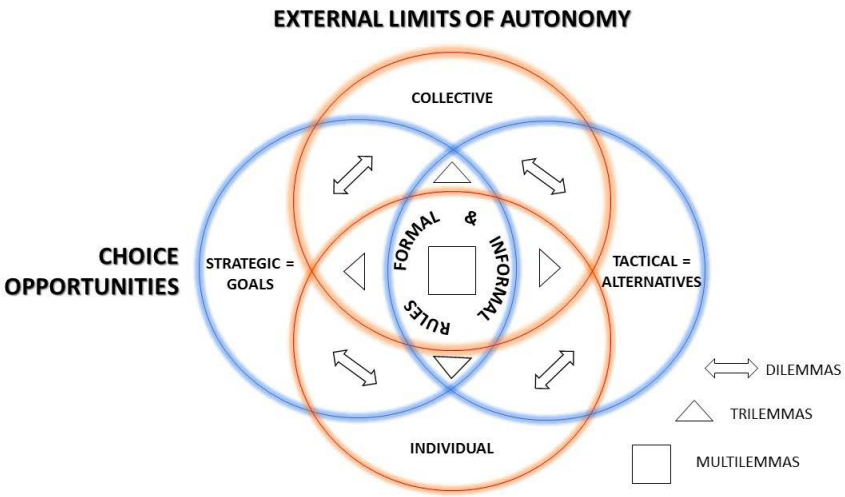
2. METHOD AND MODEL

In public opinion and public discourse, *autonomy*, *sovereignty*, *independence and many other terms* appear as related concepts, even though they have different meanings. *Autonomy* means a certain degree of freedom and self-determination of a group or individual. This means that they have the authority to make independent decisions and act within the limits set by external factors. For example, local governments may have autonomy within their own jurisdiction to make decisions about local affairs, but remain subject to the laws and regulations of higher levels of government. (Moraes – Wigell 2022)
The concept of *sovereignty* refers to supreme power and authority within a political entity, such as a nation-state. This means that the government has the right to operate without interference from outside actors and to exercise control over its own territory, citizens and resources. Sovereignty can be absolute, where a government has complete control and authority, or limited, where the government shares power with other entities. (Bihari 2014)
Independence refers to the state of not being dependent on or subject to an external entity in any way. For example, it can refer to political independence, where a nation-state is self-governing and not subject to external control. Or for personal independence, where the individual is free to make decisions. and live your life without depending on others. (Cantor 2014)
In summary, *autonomy means self-determination within given limits*, sovereignty means supreme power within a political entity, and independence means that a given actor is not subject to another entity. Therefore, we do not consider independence and sovereignty to be synonymous with autonomy: *autonomy* has external and internal limits, but independence means no limits. In the following, we specifically deal with autonomy, the types of which are distinguished according to Figure 1.

Based on our practical experiences, we significantly supplemented the original classification with the following:

- In practice, the four forms of autonomy (individual / collective and strategic / tactical) appear with a partial overlap, and the real freedom of movement (decisions) is a function of the meeting of the four sets (four types of freedom of movement).
- The external and internal (choice opportunities) limits of the four autonomies determine the real size of the autonomy in the case of every actors in the given situation.
- Limitations can be formal (legislative) and informal (values, culture). In society and the economy, both appear together and prevail together.
- The scope means a choice between alternative possibilities, where the dilemmas require the actors to resolve a conflict between two different forms of autonomy, in the case of a collision of three different scopes, this is called a trilemma, and the coordination of all scopes (i.e. the task occurring in real life) is called a multilemma.
  Taking the above into account, we will further analyse the situation of the necessary autonomies to smart sustainable competitiveness studying at the individual, local and global levels in the case of Hungary.

Figure 1. Types of autonomy



Source: own editing based on Moraes – Wigell 2022

3. ANALYSIS, FINDINGS AND DISCUSSION

In the course of our development projects, we were usually faced with the fact that the partners basically focused on financial resources as an almost exclusively important factor. How much money will be needed to implement a concept, from what sources can it be provided, and how quickly will the project result, how much money (or savings) can it bring? After a while ("as a zero step"), we found it necessary for the stakeholders (participants of the project "team") to go through a kind of socialization, if you like, a "harmonization of values". The purpose of this was to raise awareness of the importance of human (knowledge) capital, social capital (cooperation) and some other priorities (such as multi-level autonomy). Which go well beyond financial capital. We assumed that behind these hiatuses lies the value system formed as a result of individual and collective socialization, which we verified through multivariate statistical analyses based on an international database.

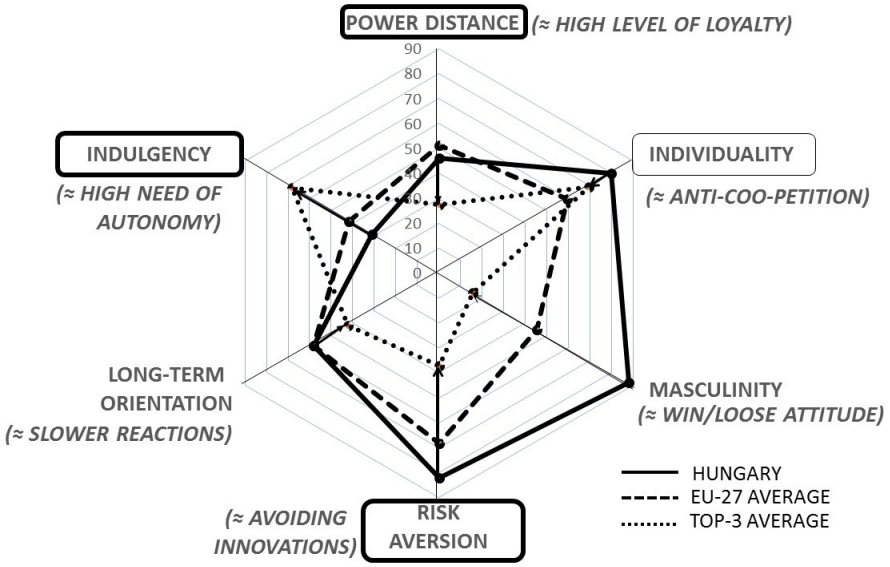
It is now widely accepted that the basis of sustainable competitiveness is the so-called "co-petition". "Co-opetition" is cooperating with competitors to achieve a common goal or get ahead. (Brandenburger - Nalebuff, 2021) And the role of the autonomy of the stakeholders, i.e. their decision-making space, is crucial in this. The basic level of that one is the individual autonomy, which is closely related to individual values, i.e. cultural socialization. From this point of view we have now highlighted some results related to autonomy at the individual level.

The classic of the comparative study of national cultures, Geert Hofstede, essentially started from individual values and reached defining the types of national and organisational cultures, and finally the development of global value maps. (Hofstede et al. 2022) Originally, he was looking for answers to the management challenges that managers at multicultural companies faced during their daily operations (crosscultural management). Today, the survey is carried out in about 140 countries, every three years, with representative questionnaire sampling. Over time, this was also linked to the measurement of countries' competitiveness, which is now analyzed globally. Because in the knowledge economy and knowledge society, society is

an inseparable part of competitiveness, and within this, the competitiveness of the national culture (value system). The point is, therefore, that the set of values (cultures) at the individual level represents the value system of a country, and that is closely related to the competitiveness of the given society (community).
Based on this, we examined the position of Hungary inside our own community, within the EU. (Figure 2) In a first approach, we are now analysing the position of Hungary in relation to the EU average calculated from the data of the other EU member states on the scale of six basic values of the national cultures (defined and measured by the Hofstede-team on the scale between 0…100 points). And we also examine the profile of Hungary compared to the average of the three most competitive EU countries (TOP-3: Sweden, Finland, Denmark) based on the Global Sustainable Competitiveness Index (GSCI, see later!)? To interpret this, a short explanation is needed for all six basic values, as well as what we mean by sustainable competitiveness:

- *"Power distance"* (loyalty): in the case of a higher point value, the given society acknowledges (accepts) inequalities (high loyalty that is low autonomy), with a lower value it is more egalitarian.
- *"Individualism":* where this score is high, the society is selfish (self-centered), while a lower score is characteristic of a collectivist (we-centered) society.
- *"Masculinity"* (Compulsion to win): where the value of this is higher, the society is socialized to compete. The problem with this is that the result of a "win/lose" ("macho") attitude can easily be a "lose/lose" outcome in our increasingly complex world.
- *"Risk aversion"* (uncertainty avoidance): societies where this value is higher are more afraid of changes. Unfortunately, it is afraid also of innovations, because it involves risks.
- *"Long-term orientation":* where this score is lower, the society is less future-oriented and focuses more on traditional short-term values.
- *"Indulgency"* (need of autonomy): the importance of solving problems independently. Where this is lower, paternalism (solutions expected from above) is preferred.

Figure 2: Autonomy in national culture of EU-member countries



Source: own editing based on data from Hofstede 2022

And by competitiveness (more precisely: Global Sustainable Competitiveness Index, GSCI) we mean (based on the overall picture of 131 unique indicators) how big is the competitiveness potential of a country that satisfies both economic, social and environmental requirements. (SolAbility 2022) This assessment has been completed every year since 2012 and covers around 180 countries. In addition to GDP and many other economic indicators, for example, indicators characterizing the level of governance, human and social capital also play an important role in it.

How closely social values and competitiveness are related was examined using a multivariate statistical analysis (factor analysis). (Table 1)

Table 1: Correlation between six indicators of social values and competitiveness (GSCI-2022) in the 27 EU member states

INDICATORS	Factors	
	F1	F2
Loyalty	**-,798**	-,020
Individuality	**,692**	,535
Masculinity	-,176	**,550**
Risk aversion	-,737	-,079
Long-term focus	-,197	**,779**
Need of autonomy	**,846**	-,252
GSCI-2022	**,931**	,040
INFORMATION %	**59,5**	**12,8**

Source: own editing

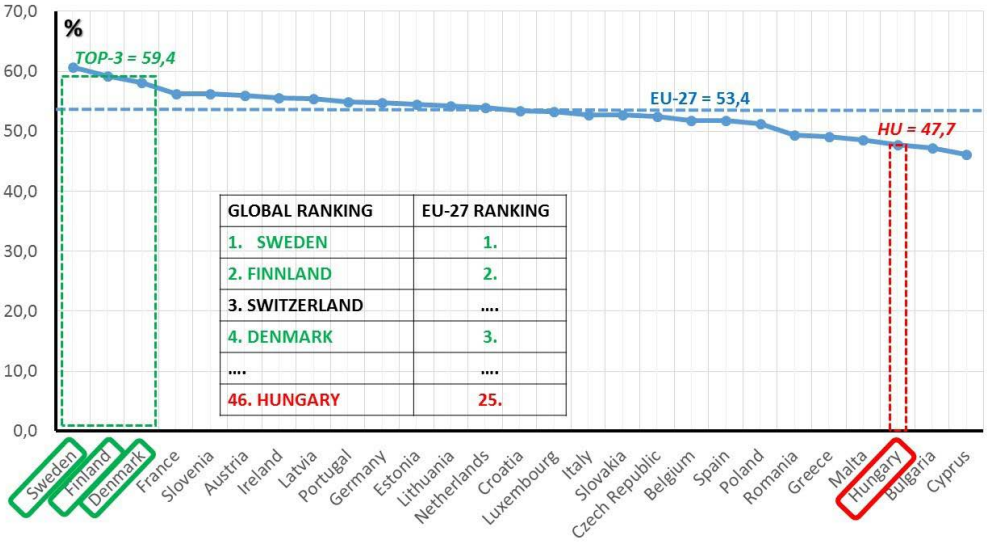
By performing this analysis on the cultural values and sustainable competitiveness databases of the 27 EU member states, we got a picture of how many independent groups (factors) the 6+1 examined indicators belong to, according to which indicators are statistically related to each other and which are not. The size of the factor weights in the table indicates which indicators have a significant relationship (that is they change related to each other) and which have a negligible relationship. The two indicator groups (factors) together compress approx. 73% of the total information, the first factor (F1, which is relevant to our focus) approx. 60% of it. This is enough to draw important conclusions. Competitiveness (GSCI) and four of the six basic cultural values (power distance, individuality, risk aversion, need for autonomy) are included in the same factor (F1), i.e. they are closely related. Interestingly, sustainable competitiveness changes independently of two basic values (masculinity and long-term focus). These two indicators are thus neutral from the point of view of the countries' sustainable competitiveness, so it is advisable to concentrate on the indicators included in the first factor. That is:

- It can be seen that the higher the need of autonomy and individualism in a society, and the lower the power distance (loyalty) and risk aversion, the higher is the level of sustainable competitiveness. For the latter, the sign of the factor weight is negative, so the strong correlation with competitiveness is in the opposite direction.

- But it also follows that "normally" (that is, statistically) in the country where individualism is greater, the demand for autonomy is also greater. With the exception of Hungary, that is, our country is an unusual case: our extreme individualism is combining with a much weaker need for autonomy (or in other words: much greater paternalism).

Values of the sustainable competitiveness index (GSCI) are in Hungary = 47.7, TOP-3 countries = 59.4, EU average = 53.4. Let's add that, with this value, Hungary is among the last three in the field of 27 EU members, in 25th place (slightly ahead of Bulgaria and Cyprus). (Figure 3)

Figure 3: Situation of responsible sustainable competitiveness (GSCI) in the EU-27 area in 2022



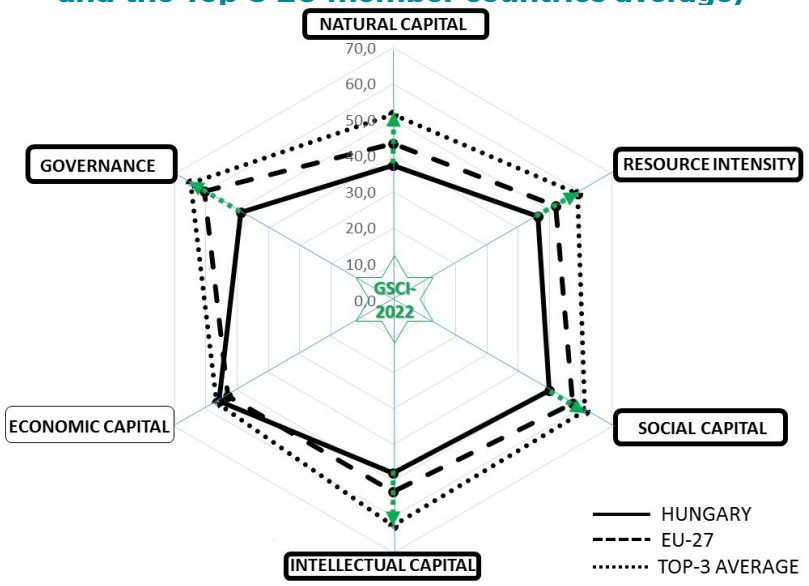
Source: own editing based on database of SolAbility, 2022

The conclusion is obvious: if Hungary wants to be much more sustainable competitive than it is at present, it has significant and untapped reserves in the shaping of social values. Primarily in terms of "boosting" the weak need for autonomy (in other words radical reduction of overly strong paternalism), "getting used to" risks (changes) as quickly as possible, and a much stronger fight against the acceptance of inequality (for example, a significant strengthening of the rule of law).
And for this, individuals must be mobilized, which is typically not the task of the government, but of local civil societies. However, the government can significantly help this in one way: to catalyse and does not hinder it...
After examining the situation of individual autonomy and the development of the global sustainable competitiveness index (GSCI) in the EU-27 member states, we subsequently analyzed how the different main dimensions (pillars) of the GSCI are looking out in these countries.

In order to outline the potential tasks of non-business marketing (in a narrower sense: social marketing) to strengthen the demand for autonomy at the individual level, we need to see what macro-level obstacles there are. As we have seen (Figure 3) before, the situation of the countries in terms of sustainable competitiveness in the EU-27 group to which Hungary belongs is not flattering. And this is a serious threat in the 21st century for those being behind. Hungary is not only behind the leaders, but also significantly behind the average of the group too. In order to assess the macro-level barriers, it is necessary to analyse further components of

sustainable competitiveness.
The complex indicator of sustainable competitiveness is calculating as the result of 188 individual indicators, which are classified into six main categories (so-called competitiveness pillars). (SolAbility, 2022) (Figure 4)

Figure 4: Values of the six pillars of smart competitiveness (EU-27 average, Hungary and the Top-3 EU member countries average)



Source: own editing based on database of SolAbility, 2022

Each pillar takes a value for all countries on a scale between 0...100 by averaging its individual indicators, and averaging the pillars in a similar way gives the final value of the GSCI. From the database of SolAbility available for 135 countries, we made a selection for the 27 member states of the EU and determined Hungary's position for all pillars, comparing it with the average of the EU-27 group, and within that also the average of the Top-3 EU members.

First of all, it is necessary to briefly define the content of the six pillars of competitiveness (for reasons of limited space, we omit the listing of all individual indicators):

- *Natural capital:* agriculture, biodiversity, supply of resources, state of the natural environment
- *Resource intensity:* efficiency of energy, water and raw material use relative to GDP
- *Intellectual capital:* education-training, research-development-innovation, high-tech enterprises
- *Social capital:* level of autonomy, healthcare, polarization - equal opportunities, public safety, satisfaction, civil communities
- *Economic capital:* economic indicators, financial markets, competitive economy, business environment
- *Government performance:* infrastructure, corruption, financial stability, public services, legal certainty and rule of law

Some pillars of sustainable competitiveness are more or less related to each other (an analysis of this is the topic of a separate research). The role of the level of economic capital, which is the main actor in the classic approach to competitiveness - but its role in sustainable competitiveness is peculiar. It can be seen that in this respect the group of the EU-members is

practically in the same position, and even Hungary's position is the same as the average of the Top-3. In other words, the role of economic capital is almost indifferent from the point of view of sustainable competitiveness, at least among the more developed countries.
The fact that the EU-27 group is strongly differentiated according to the GSCI complex indicator is explained by the other five factors (pillars):

- Natural capital can basically be considered a geographical feature, but the level of management of natural resource potential (resource efficiency) is no longer. Therefore, it is possible that the competitiveness of countries with relatively unfavourable natural endowments is better than that of "more fortunate" ones.
- Compared to the most competitive EU member states (Top-3 average), Hungary lags significantly in the other five pillars of sustainable competitiveness. Mostly in the area of government performance, resource efficiency and intellectual capital, but also social capital.
- The EU-27 average for these five pillars of sustainable competitiveness is between the Top-3 and Hungary's performance. Compared to the EU-27 average, Hungary's disadvantage in terms of government performance, social capital and intellectual capital is strikingly large.
- There are many closed connections between the level of intellectual capital and the level of government performance: the level of education and training, the level of health care, and not least the level of economic policy, which affects the emigration of marketable domestic labour, the marginalization of domestic SMEs, overall the low level of domestic intellectual capital.
- Social capital, i.e. autonomy, the quality of civil communities is also an important component of sustainable competitiveness at the macro level. And this is linked at many points to the indicators of government performance that influence it, such as the state of legal regulation and the rule of law, or the strengthening of paternalism.

4. CONCLUSIONS AND RECOMMENDATIONS

The analysing showed that the sustainable competitiveness of countries is closely related to different levels of autonomy. Greater autonomy goes hand in hand with greater competitiveness and vice versa. The level of individual autonomy is influenced by the individual (social) value range of the citizens of the given country: it is strengthened by their need for autonomy and individualism, and negatively influenced (reduced) by the individuals' loyalty to the government and their risk-avoiding attitude.
Hungary has been an EU member state for two decades, so it is advisable to realize the level of sustainable competitiveness that is becoming increasingly important in this group. We have shown that Hungary has a significant competitive disadvantage in each of these necessary competitiveness pillars. One of the main elements of this is the dominant social value system at individual level, and the other main element is the macro-level obstacles.
Since the highest possible level of autonomy is an important condition for sustainable competitiveness, the question arises: how can we expect autonomous communities with individuals who have no need for this? Autonomous communities can only be created from the bottom up - therefore, a multitude of social marketing programs organized at the level of local communities would be necessary. The ultimate goal of these programs would be to form the current social value system into one that supports competitiveness. Local development projects carried out with our own cooperation have confirmed this (cliche) statement in many cases.
At the same time, however, a macro-level coordinated social marketing program is also needed. Because government performance, social capital, intellectual capital and the poor

level of efficient utilization of resources that hinder sustainable competitiveness are obstacles to progress one after the other. In addition, they are obstacles to the organization and implementation of local programs aimed at the justified development of the autonomies.
A broad social awareness of these issues could be the starting step - or we should forget about sustainable competitiveness in Hungary.

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TITLE

VIA KALEVALA – VIA ROMANA. ANCIENT ROUTES, CONTEMPORARY EXPERIENCE

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ABSTRACT

The preservation of cultural diversity is a pre-condition of sustainable environment. Finland abounds in precious but vulnerable freshwater lakes, catchment areas. A project of cultural revitalization and environmental awareness in Finland can serve as a model at Lake Balaton with venues, suitable for similar activities.

Keywords: cultural heritage, environment, Eastern Finland, Badacsony-Hungary

1. INTRODUCTION

All nations have their iconic sites, venues of historical events, unique landscapes, buildings, special formations in nature. Nowadays traditional package tours, sight-seeing cultural trips are replaced by experience-oriented, ecological tourism. Nationality, age and gender are factors of motivation visiting heritage sites; "educational experiences are less important than escapism or entertainment". (Smith et al. 2022, Abstract) Rather, reducing stress, creativity and inspirational environments matter. (Smith – Ram, 2016, 5) Cultural landscape inventories are compiled, focusing on spiritual meaning, nature, creativity, aesthetic experience, human attachment, local culture, history and recreation (Smith-Ram, 2016, 3).

2.

Based on written and online sources, field-work in Badacsony, previous experience in Finnish cultural studies, a comparative approach revealed remarkable differences, yet good practices worth adopting.

2.1 The Kalevala-hike

Internationally renowned focal points of Finnish culture are pristine nature, lakes, endless forests, applied arts, national architecture, handcrafts, music festivals, high-tech industry in harmony with nature. Each element of this list reveals an interface with Kalevala, their national epos (19th c.) and with 'karelianism', its subsequent cultural-philosophical current, style, initiator of the national awakening – referring to areas of Karelia and the Karelian Isthmus. With the loss of most of Karelia (1944), the region has ingrained into the soul of Finns forever.

The *'Kalevala-hike 2016-2035'* or 'pilgrimage' (cf. Santiago de Compostela) as declared in 2015, is a specific initiative, the combination of an excursion and the support of Finnish identity. The project was launched by ELMA Matkat, a travel agency in 2016. The organiser of the 1st Kalevala-hike was dr. Antti Holopainen. The closing year will be the bicentenary of the publication of the so-called 'Old Kalevala'. Between 5th June – 7th August, 2016 a handful of devoted volunteers re-visited natural and cultural sites on a tour of nearly 1000 kms from the south-west across the Finnish-Russian border up to Northern Karelia. Participants were invited to follow in the footsteps of Elias Lönnrot, doctor and collector of ancient runo-songs and the compiler of Kalevala. The first tour, repeating his 1st field-trip (1828) was dedicated to him, then the project was extended to other territories of ecological-cultural interest. Each year participants follow a different trail to sites (where legendary 'runo'-singers lived, special lakeshores, landscapes, former industrial buildings). This is a mission "as the tale, compiled by Lönnrot into the epic, is connecting Finns and Karelians on the other side of the border." (kavelija.blogspot.2016/11)
In 2017, commemorating the 100th anniversary of Finland's independence, they visited the greatest battlefield of WW2 (Sortavala). The 2018 hike welcomed volunteers to former Inkeri-Finnish territories on the southern shores of the Gulf of Finland.
ELMA Matkat has published the diary of the 1st trip. The book analyses the environmental conditions and the opportunities in the cultural potential of the border region. (Holopainen, 2016). For Midsummer feasts in 2019 they visited Inkeri again, Viena and Northern Karelia. Then came the pandemic, closing societies off for long months. The last full project, 'Cycling for peace' in 2020 promoted mutual understanding in the region, still unaware of the coming warfare. Participants visited Finnish, Estonian and Russian (former Finnish) venues, emblematic cities like Vyborg (Viipuri). When things seemed to be back to normal, there came the war in the Ukraine. The project was halted, across-the-border trips were suspended. Since then, 'Via Kalevala' hikes are directed at the lake district of eastern Finland. Ancient cultural flow along Salpausselkä, an extensive moraine ridge, is revived, especially as the European Greenbelt following the borders of the former iron curtain from the Black Sea to the Barents Sea, unites valuable areas of national parks, biosphere reserves. Lakes are crucial parts of this chain for Finns.
The largest of the 39-40 so-called 'Saint lakes' (Pyhäjärvi) is shared by Finland and Russia with problems to be solved in cooperation.

2.2 The Romans in the Balaton region

The Roman province of Pannonia, organised in 9 A.D., the westernmost territory of the Empire had been an inhabited (Celtic, Gallic), fertile land long before the Romans. The Roman presence had distinctive phases of administration: Emperor Diocletian after 284 A.D. transferred his seat into Herculia, (earlier Gorsium). The towns of Gorsium, Aquincum, Brigetio, Savaria and Sopianae were next to or at the intersection of the most important international roads. The third main road of Pannonia, a section of merchants' Amber Road connected the Mediterranean and the Baltic areas. The Balaton Uplands, i.e. the northern shores and the zone stretching as far as the Bakony mountains represented a rural region with no significant town but with the largest number of known Roman villas. (B. Thomas, 1964, 13).
During the 3rd-4th centuries A.D. the Balaton Uplands was densely scattered with villas i.e. agricultural estate centres, usually located at an altitude lower than 175m, mostly on the sunny southern slopes of hills (Firnigl, 2012, 56, 101). Beside sunlit plots, water was the key factor in choosing locations for building homesteads (far enough from the changing levels of the lake, close enough to essential springs, wells). Archaeologists have found evidence of extensive fruit growing (grapes, apricots, almonds). New archaeological methods such as aerial remote sensing to detect former walls or foundations from the air, are not necessarily successful due to the dense "plot ratio", building density there (Szabó, 2020, 145).

As we all know, the Romans were masters of road building. By the time of Christ's birth, an amazing network of 80-100.000 km roads interwove the Empire (Firnigl, 2012, 59). On the northern side of Lake Balaton in a number of settlements, the main street is still called *Roman Road* (Római út). One location with a Roman road running around as its belt, is Mount Badacsony, an extinct volcano. It was in 1895 that on the territory of the present water supplier (Pap-rét) Roman walls were found, in 1898 Roman tombs and in 1879 bronze and stone objects were unearthed (Vajkai, 1991, 5). The Hungarian National Museum has a thorough database which confirms the first occurrence of Roman relics in 1895. In 2010 and 2011 newer excavations on this very site near the Roman Road revealed the remains of a late-Roman building and a 4th century villa with two bronze melting stoves (Sey, 2013, 44).
There is no trace in literature whether this Roman Road follows the same trail as the original road used by the Romans or road No.71 is the descendant of the original one. In any event, there is a new edifice, a Roman milestone erected a few months ago at an entrance point to Badacsonytomaj. Once the Romans, in our times winemakers invigorate ancient vines (Bakator and the endemic Kéknyelű wine), and visitors are welcomed in family vineries. In Badacsony you can enjoy scenic views, the atmosphere of ateliers, museums, local architecture, be it small chapels or the great two-towered church of basalt, observation points, a lookout tower, as well as the Research Institute for Viticulture and eco-wine making technologies. All this along Via Romana or within a stone's throw.

3. CONCLUSIONS

21st century people are starting to realise the importance of heritage and the interconnectedness of man, nature and traditions. "Roman Emperors and the Danube Wine Route" already exists (Council of Europe certificate, 2015). On a smaller scale, the Roman heritage of Lake Balaton and especially the Roman Road could become another itinerary of cultural tourism, similar to Via Kalevala.

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TITLE

BEYOND WATER - LAKE BASINS AS WINE AND FOOD TERROIRS

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ABSTRACT

Lakes have a significant moderating effect on local weather and climate. As such, lakes tend to be in the centre of regions with typical products tightly connected to their origin, particularly in the case of wines.
The concept of geographical indications (PDOs and PGIs) is based on the link between the quality and origin of a product. Our study assumes that lakes significantly influence products using a PDO or a PGI as, by definition, these products are linked to their place of origin. Our research questions aim to reveal the main quality factors that lakes affect and the differences in the effect between types of products (wine, food, spirits) or between PDOs and PGIs.
We take 27 PDOs and PGIs from Austria and Hungary (wines, food and beverages and spirit drinks - whose production area is situated in a lake basin within or bordering Hungary, including three major lakes: Lake Balaton, Lake Fertő (Neusidlersee) and Lake Velence) into account and provide a content analysis of their product specifications to detect the effect of the lakes on the products' quality.
The results are mixed, as in the case of spirit drinks and some larger wine PGIs, where the lakes' effect seems negligible or not even mentioned in the product specifications. However, in some cases, a lake within or near the production area is deemed to affect product quality substantially.

Keywords: Balaton wine region, Felső-Pannon wine region, geographical indications, wine terroir, food terroir, content analysis

1. INTRODUCTION

Lakes have a moderating effect on local weather and climate through mesoscale circulations of their surrounding region by reducing the maximum and increasing the minimum temperatures due to their large heat capacity and considerable albedo; they affect the formation of storms and lake breezes and the fluxes of heat and moisture. Thus, lakes influence the local water and energy cycles. Therefore, lakes tend to be in the centre of regions with typical products tightly connected to their origin, particularly pronounced in wines such as the Three Lakes region in Switzerland, the Finger Lakes in the US, or the Okanagan Valley in Canada.
This study presents the effects of lakes through geographical indications (GIs, for short) that bear the name of a lake or whose production area is situated in a lake basin within or bordering Hungary.
The concept of geographical indications is based on the link between the quality and origin of products. By theory, this link is loose in the case of protected geographical indications (PGIs) and tight in the case of protected designations of origin. Theoretically, GIs incorporate many factors (e.g. climate, soil, morphology, lakes and rivers, traditional consumer patterns, reputation of the name, community of the producers, quality level or the character of the products)

2. RESEARCH QUESTIONS AND METHOD

This section presents our study's research questions and methodology (including the data source).

2.1 Concept

Our research heavily relies on the concept of the geographical indications specified by EU regulations No 1152/2012, 1308/2013 and 2019/787. Therefore, in the case of this research, we assume that the theoretical basis of GIs is existing, therefore:

- there is a link between the quality and origin of products,
- the GI types differ like this link: the link is loose in the case of protected geographical indications (PGIs) and tight in the case of protected designations of origin (PDOs),
- the chapter describing and justifying this link of the product specifications is comprehensive and valid in all cases.

2.2 Research questions

In this study, we seek the answer to two research questions:

1. What are the main quality factors that lakes affect?
2. Are there differences in the effect between types of products (wine, food, spirits) or between PDOs and PGIs

2.3 Data and methodology

Our research included all geographical indications whose production area is in a lake basin within or bordering Hungary, including three major lakes: Lake Balaton, Lake Fertő (Neusidlersee) and Lake Velence. As Austria and Hungary share Lake Fertő territory, four Austrian names were also taken into account. The 27 names included in our research are listed in Table A1 of the Annex.

The EU regulations request that each GI have a product specification that defines the rules of using that GI and describes the link between the product's quality and its origin. We conducted a detailed content analysis of this chapter on the product specifications of these GIs. All product specifications were downloaded via the EU's eAmbrosia database.

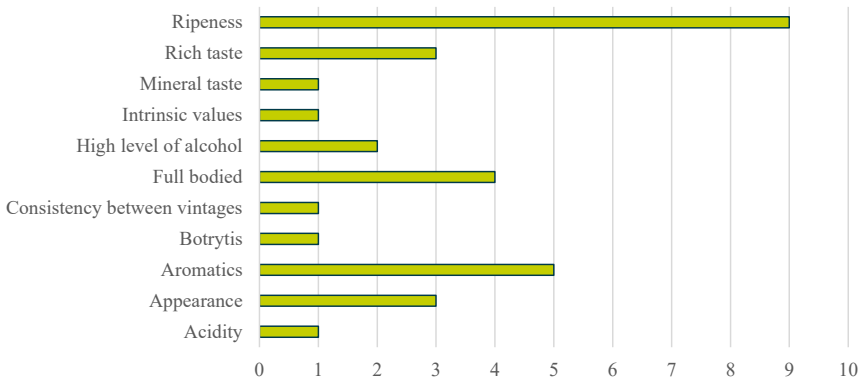
3. FINDINGS

The findings of our study are provided here.

3.1 First step

In the first step of the research, we identified the main quality factors that are at least partially attributed to lakes by the product specifications.

Figure 1: The quality factors attributed to lakes



Source: eAmbrosia (own composition)

As shown in Figure 1, ripeness is the most frequently mentioned item (9/28), followed by the aromatics (5/28) and the full-bodied taste (4/28).

Table 1: Rank of GIs by the dominance of the lake effect

Rank	PDO/PGI	Share of lake effects	Product type
1.	Badacsony	80%	wine
2.	Hegykői petrezselyemgyökér	57%	food
3.	Leithaberg	50%	wine
4.	Nivegy-völgy	50%	wine
5.	Sopron	50%	wine

Source: eAmbrosia (own composition)

From another aspect, we analysed the dominance of the lake effect. Table 1 lists the most lake-dominated GIs measured by the share of the quality factors influenced by lakes.

3.2 Second step

In the second step, the product groups were analysed based on how important the role that lakes play in the product quality.

Table 2: Crosstabulation (product type and the presence of the lake effect on quality)

	Lake not mentioned in the product specification	Lake mentioned in the product specification	Total
Food GIs	3	2	5
Spirit GIs	3	0	3
Wine GIs	4	15	19
Total	10	17	27

$X^2 = 8.3123$; $p = 0.016$
Source: eAmbrosia (own calculation)

First, the GIs were grouped by product category. As the crosstabulation in Table 2 shows, there is a significant difference (at a 5% level of significance) between the three product categories.

Table 3: Crosstabulation (GI category and the presence of the lake effect on quality)

	Lake not mentioned in the product specification	Lake mentioned in the product specification	Total
PDO	3	11	14
PGI	7	6	13
Total	10	17	27

$X^2 = 3.0377$; $p = 0.081$
Source: eAmbrosia (own calculation)

The situation changes when GIs are grouped by GI category (PDO or PGI). As the crosstabulation of Table 2 shows, PDO and PGI products do not differ significantly by GI category.

4. CONCLUSIONS AND RECOMMENDATIONS

Our study showed that lakes play an important role in GI products' quality factor. The most important effect attributed to them is the ripeness of the product. However, this effect is not present everywhere: in the case of spirits and some larger wine PGIs, the impact of lakes is negligible or not even mentioned. On the other hand, the impact of a lake is substantial in the case of some GIs, as the share of lakes among quality factors may reach 80%.

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ANNEX

Table A1: List of the GIs studied

GEOGRAPHICAL INDICATION	PDO/PGI	Product	COUNTRIES	LAKE BASIN(S) CONCERNED
Badacsony	PDO	wine	Hungary	Balaton
Balaton	PGI	wine	Hungary	Balaton
Balatonboglár	PDO	wine	Hungary	Balaton
Balaton-felvidék	PDO	wine	Hungary	Balaton
Balatonfüred-Csopak	PDO	wine	Hungary	Balaton
Balatoni hal	PGI	food (fish)	Hungary	Balaton
Balatonmelléki	PGI	wine	Hungary	Balaton
Burgenland	PDO	wine	Austria	Fertő-tó/Neusidlersee
Csopak	PDO	wine	Hungary	Balaton
Dunántúl	PGI	wine	Hungary	Balaton, Fertő-tó/ Neusidlersee, Velencei-tó
Etyek-Buda	PDO	wine	Hungary	Velencei-tó
Fertőd vidéki sárgarépa	PGI	food (vegetable)	Hungary	Fertő-tó/Neusidlersee
Füred	PDO	wine	Hungary	Balaton
GYMS csemegesajt	PGI	food (cheese)	Hungary	Fertő-tó/Neusidlersee
Hegykői petrezselyemgyökér	PGI	food (vegetable)	Hungary	Fertő-tó/Neusidlersee
Káli	PDO	wine	Hungary	Balaton
Lajta sajt	PGI	food (cheese)	Hungary	Fertő-tó/Neusidlersee
Leithaberg	PDO	wine	Austria	Fertő-tó/Neusidlersee
Neusidlersee	PDO	wine	Austria	Fertő-tó/Neusidlersee
Nivegy-völgy	PDO	wine	Hungary	Balaton
Pálinka	PGI*	spirit	Austria and Hungary	Balaton, Fertő-tó/ Neusidlersee, Velencei-tó
Sopron/Ödenburg	PDO	wine	Hungary	Fertő-tó/Neusidlersee
Tihany	PDO	wine	Hungary	Balaton
Törkölypálinka	PGI*	spirit	Hungary	Balaton, Fertő-tó/ Neusidlersee, Velencei-tó
Vasi vadkörte pálinka	PGI*	spirit	Hungary	Balaton
Weinland	PGI	wine	Austria	Fertő-tó/Neusidlersee
Zala	PDO	wine	Hungary	Balaton

Source: own composition

TITLE

UNLOCKING THE POTENTIAL OF LAKE SHKODRA: LAKE BASINS AS CATALYSTS FOR SUSTAINABLE DEVELOPMENT IN ALBANIA

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ABSTRACT

In a world where transboundary water management is becoming increasingly critical, Lake Shkodra stands as a potential catalyst for sustainable development. This research paper offers a comprehensive screening of the current situation, drawing from existing studies and documents, to assess the challenges and opportunities inherent in managing this invaluable transboundary resource. Lake Shkodra, a vital transboundary water resource, is being increasingly managed due to human activities such as population growth, urban development, and industrial practices. This paper examines the challenges and opportunities of managing this valuable resource. It advocates for the application of Integrated Lake Basin Management (ILBM) principles, which offer a holistic approach to water resource management in lake basins. ILBM aligns with the European Union Water Framework Directive (WFD), promoting collaboration, stakeholder engagement, data sharing, and a basin-wide approach. It also advocates for international cooperation to protect this valuable resource. The paper synthesises ILBM and Integrated Water Resource Management (IWRM) concepts and objectives, setting the stage for science-based management practices. It positions Lake Shkodra as a focal point for joint preservation of environmental and cultural assets, requiring concerted efforts from all stakeholders. This contributes to the sustainable development and protection of Lake Shkodra, highlighting the importance of scientific knowledge, monitoring data, and transboundary cooperation in managing shared waters. In conclusion, the paper emphasizes the importance of collaborative efforts for the sustainable development and preservation of Lake Shkodra, recognizing ILBM as a key methodology to achieve this goal and meet WFD requirements.

Keywords: Lake Potential, WFD, ILBM, Sustainable Management

1. INTRODUCTION

Lakes are crucial for fresh water and provide essential resources like fish and leisure time. However, human activities have altered water resources, leading to groundwater pollution and contamination. Transboundary water agreements can promote regional security, conflict prevention, and equitable water resource management. Lake management affects the environment, economy, and social life, and implementing legislation or dynamic guidelines is crucial. The Skadar/Shkodra Lake Basin, the largest lake on the Balkan Peninsula, is a key tourist destination with a population of 500,000. Transboundary collaboration between Albania and Montenegro is necessary for sustainable development.

2. POLICY FRAMEWORK AND KEY CHALLENGES IN TRANSBOUNDARY ASPECT

Albania and Montenegro are working on horizontal legislation to comply with the EU acquis, with Albania focusing on environmental protection and integrated water management. Montenegro follows the EU acquis with laws on EIAs, SEAs, access to information, and liability for environmental harm. Priorities include strengthening environmental management capacities, developing a legal framework, integrating environmental considerations into sector policies, improving environmental conditions in hot areas, promoting environmental awareness, and integrating sustainable development principles. However, Albania needs to improve its legislative alignment with the EU water quality acquis and administrative capacity for water management. Collaboration between the two countries is crucial for transboundary environmental management, and a regional framework promoting harmonisation of environmental legislation is essential. Public awareness and engagement are also crucial for a sustainable approach to environmental management.

2.1 Institutional Arrangement

Montenegro's institutional framework includes the Ministry of Ecology, Spatial Planning and Urbanism, Agriculture, Forestry and Water Management, and other ministries. Local governments play a crucial role in urban planning and regulating the use of areas adjacent to National Parks. The Public Enterprise National Parks manages four Montenegrin national parks, while the University of Montenegro and the Ministry of Education and Science focus on research and educational programs. Albania's environmental administration system is based on central and local institutions, with the National Water Council being the central decision-making body and the Water Resources Management Agency addressing responsibilities between central and local-level institutions for water resources management.

2.2 Legal framework in both countries

Montenegro's Skadar Lake management plan, developed in 2001, outlines activities and a five-year program for protection and development. The Law on National Parks regulates human-nature relations and provides management tools. Albania's environmental legislation has evolved since 1990, addressing land, seeds, forests, wildlife, hunting, horticulture, fishing, aquatic life, pastures, water reserves, wastewater management, environment protection, protected areas, marine environment, transboundary lakes, environmental impact assessment, and biodiversity. The National Strategy for Integrated Water Resources Management 2018-2027 aims to expand and enforce protected areas. However, the environmental management system of Shkodra Lake suffers from an inadequate legal framework, poor enforcement, insufficient capacity of relevant institutions, inadequate coordination, and insufficient funding for environmental protection.

2.3 Key challenge dealing with transboundary aspects

The Memorandum of Understanding (MoU) for the Protection and Sustainable Development of joint resources between Montenegro and Albania was formally signed in May 2003, committing to conserve the natural resources of Skadar/Shkodra Lake in a coordinated and integrated manner. Both countries are working towards integrating EU legislation into national laws to strengthen the institutional and legislative framework for lake conservation and transboundary collaboration.

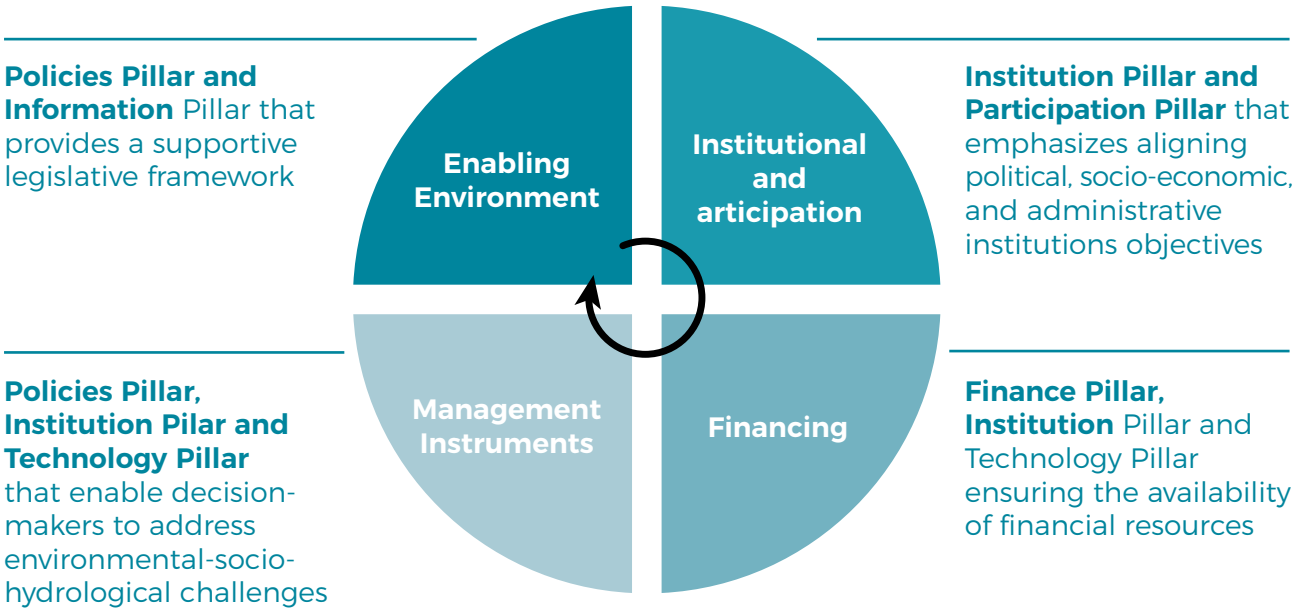
The Lake Shkodra Basin faces four key transboundary challenges: deterioration of water quality, natural and regulated hydrological variability, biodiversity degradation, and a common lake management between Albania and Montenegro. Climate variability and change are significant regional and global issues affecting these problems. The lake basin faces issues such as excess nutrients, biochemical oxygen demand, industrial, mining, and solid waste sources, and climate

variability and change. Nitrogen pollution is low compared to the Europe level, but high levels are observed in the tributaries of Lake Skadar/Shkodra and the Morača River. Coastal waters are at risk of receiving excess nutrients. Most pollutants for surface Skadar/Shkodra Lake's water, groundwater, soil, and air originate from Podgorica, situated on the Morača River terraces in the Zeta Plain and Crnojevića Rivers. The lake water appears reasonably good due to a high refreshment rate of 2-3 times per year.
A common transboundary approach for lake management is essential to ensure ecological health, and sustainable resource use, and prevent conflicts by establishing fair mechanisms for sharing water resources, fisheries, and other lake-related assets.

3. ENHANCING THE POTENTIAL FOR SUSTAINABLE DEVELOPMENT AND STRENGTHENING COMPONENTS OF TRANSBOUNDARY GOVERNANCE THROUGH ILBM

The Integrated Lake Basin Management (ILBM) technique is a comprehensive approach to managing water resources in lake basins, promoting international collaboration, stakeholder participation, and data exchange. It aligns with the Water Framework Directive (WFD) and aims to ensure sustainable development, allocation, and management of water resources across various sectors. IWRM focuses on maximizing economic and social welfare while preserving ecosystem sustainability, integrating domestic, agricultural, industrial, and environmental needs into water catchment management. It requires political will, capacity development, flexible legal frameworks, adequate investment, financial stability, and good knowledge of natural resources. River Basin Organizations (RBOs) help bring about IWRM and improve water governance in transboundary water basins.
Integrated Lake Basin Management (ILBM) is a comprehensive approach to managing water resources in lake basins, focusing on the unique behavioural features of lentic waters. It complements the principles of Integrated Water Resources Management (IWRM) and Integrated River Basin Management (IRBM), emphasizing the importance of strengthening basin governance. IWRM addresses water-resource-related issues such as water supply and sanitation, while IRBM addresses river basin management issues like flood control, drought management, hydropower, and water resource infrastructure operation.
The ILBM Platform Process is a gradual, incremental, and long-term basin governance improvement process necessary for managing a basin system consisting of one or more lakes. This benefit-sharing approach responds to the demand for practical and collaborative tools that lead to optimal sharing of water benefits. The conceptual framing follows a process of stakeholder engagement, assessments, and knowledge building to enhance cooperation within countries and across state borders for sustainable river basin management.
IWRM operates on three core principles: social equity, economic efficiency, and environmental sustainability. It is supported by four main areas: enabling environment, institutional and participation, management instruments, and financing. The enabling environment provides a supportive, institutional legislative framework, while participation emphasizes the alignment of political, socio-economic, and administrative institutions with ILBM objectives. Management tools of ILBM enable decision-making bodies to address environmental challenges through the Policies, Institutions, Participation, Technology and Information Pillars.
Funding for ILBM is essential to ensure the availability of financial resources. The ILBM methodology is applicable as an instrument not only complementary and necessary to IWRM but also in lake management, as lake systems are more complex than river systems and require special care.

Figure 1: Matrix relationship between Six Pillars of ILBM and Four main areas of IWRM application



In summary, ILBM aligns with IWRM principles, promoting a holistic and coordinated approach to water resource management. It emphasizes effective governance, stakeholder involvement, technological support, information availability, and sustainable financing to ensure equitable, efficient, and environmentally sustainable use of water resources.

4. CONCLUSIONS AND RECOMMENDATIONS

The Lake Skadar/Shkodra ecosystem is undergoing positive changes due to updated environmental policies and EU instruments. Institutions are better equipped to understand the impact of changing water conditions on environmental sustainability and economic development. A cooperative monitoring system should be established to ensure compliance with the EU Water Framework Directive and the Ramsar Convention. Initiatives include sustainable tourism development, zoning and resource management plans, and public education to improve socio-economic conditions while preserving ecological systems. Investments are directed towards water quality protection. Transboundary water cooperation is crucial for mitigating climate change and stimulating regional development. Integrated Lake Basin Management (ILBM) and Integrated Water Resource Management (IWRM) are distinct approaches to managing water resources. Decision-making and management should focus on three main areas to improve the situation on Lake Skadar/Shkodra: transboundary aspects, the functional shoreline at Skadar/Shkodra Lake, and municipalities' involvement.

I. Requirement from Framework agreement between Montenegro and Albania and MoU on Common Transboundary approach for lake management

The Memorandum of Understanding (MoU) and Framework agreement between Montenegro and Albania aim to promote cooperative and sustainable management of Lake Shkodra. The agreement includes provisions for a cooperative approach, data sharing, joint management

plans, environmental protection, transboundary water management, stakeholder engagement, monitoring, reporting, dispute resolution mechanisms, funding, resource allocation, compliance with international agreements, and periodic review.

Table 1: Ways how different ILBM pillars work in relationship with IWRM and support the implementation of agreements and establishment of a Common Transboundary approach for Lake Shkodra Management

ILBM Pillar/ Thematic field of improvements	Environmental Protection	Stakeholder Engagement	Transboundary Water Management	Institution Coordination	Monitoring and Reporting	Data and Information Sharing
Policies Pillar	+	+	+		+	
Institution Pillar	+	+		+		+
Technology Pillar	+		+		+	+
Finance Pillar	+		+	+		+

II. Functionality of the Shoreline at Skadar/Shkodra Lake as a catalyst for sustainable development

The recommendations for Montenegro and Albania focus on preserving the natural components of Lake Shkodra, such as reeds and white willow woods, in the northern and northwestern parts of the lake. Sustainable tourism development should be centred on local populations, focusing on small fishing villages, local architecture, and ecotourism facilities. The development should also address inadequate tourist infrastructure in other parts of the lake. Improving water quality, controlling the hydrological regime, and conserving biodiversity are also crucial. Water quality data collection methods, policies, wastewater collection systems, solid waste management, and agricultural measures are recommended. The hydrological regime should be controlled by a coordinated monitoring network, drought forecasting, flood risk modelling, flood preparedness, and multisector requirements for water resources. Biodiversity conservation and ecosystem services should focus on systematic research, a common vision, and community-based management.

Table 2: Ways how different ILBM pillars work in relationship with IWRM and support the functionality of the Lake Shkodra for sustainable development

ILBM Pillar/ Thematic field of improvements	Environmental Preservation regulatory framework	Sustainable Tourism Development	Education and Awareness	Restoration (of fishing villages) and Reforestation (of land protection)	Monitoring and Reporting
Policies Pillar	+	+	+	+	
Information Pillar		+	+	+	+

III. Municipalities' involvement as one of the main actors in lake management

Municipalities play a crucial role in water governance, but their effectiveness depends on institutional arrangements. Issues affecting their engagement include authority disconnect, collaboration challenges, and timescale misalignment. The overlap in administrative competencies and unclear distribution of competencies create coordination challenges. Different institutions regulate specific aspects of water resources, with municipalities responsible for service delivery and water management plans.

Table 3: Ways how different ILBM pillars work in relationship with IWRM and support the involvement of municipalities

ILBM Pillar/Thematic field of improvements	Clarification of Roles and Responsibilities	Coordination Mechanisms	Incentives for Collaboration
Institution Pillar	+	+	
Participation Pillar	+	+	
Finance Pillar			+
Technology Pillar	+	+	

Effective lake management is crucial for the environment, economy, and social life. Lake Shkodra is a vital transboundary water resource, increasingly managed due to population growth, urban development, and industrial practices. Integrated Lake Basin Management (ILBM) principles provide a comprehensive approach to water resource management in lake basins, aligning with the European Union Water Framework Directive. International cooperation is also needed to protect this valuable resource.

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TITLE

THE QUANTIFICATION AND MODELLING OF SEDIMENT PRODUCTION IN TIMAH TASOH LAKE BASIN, PERLIS, MALAYSIA

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ABSTRACT

Sedimentation is a common problem in lake and river basins especially having significant changes in land use activities. Timah Tasoh Lake has suffered from deterioration of quality and shallowness of water due to sedimentation processes and the imbalanced development around the basin. These crises cause changes and problems in a lake, such as floods, lake erosion, sedimentation processes, and anthropogenic interference, which contribute to problems for humans and specifically river basin ecosystems. The main objective of this research was to assess and evaluate the sources and identify environmental defense options for pollution, sedimentation, and erosion control in the lake basin. The integration of hydrology and GIS is quite a natural method for environmental research such as the integration of Sediment Load Analysis (SL) and GIS Spatial Model Analysis. Based on the numerical result based on integration, the sedimentation problems are more critical in the middle areas of the Timah Tasoh Lake Basin compared to the upstream and downstream areas. This sedimentation problem is due to unsustainable land use changes, cliff erosion problems, and active sand mining activities. This study suggests the sedimentation management methods including the application of existing integrated of river management methods based on Integrated River Basin Management (IRBM).

Keywords: Sedimentation; Sediment Production; Spatial Model; Geographic Information System; Timah Tasoh Lake Basin

1. INTRODUCTION

Sedimentation is a frequent crisis in the lake as it relates with land use activities in the catchment. Natural events can also precipitate sudden changes. Increasingly, however, the anthropogenic effects of human activities such as intensive agriculture, deforestation, urbanization, and tourism are causing specialized habitats to change, shrink and become fragmented to the extent that they may no longer be self-sustainable. These cause the changes and problems to a river of lake (flood, lake erosion, sedimentation process and anthropogenic interference contribute problems to human and specifically on lake basin ecosystems itself).
Timah Tasoh Lake can be polluted when human activities like residential development, agriculture, industry, and urbanization directly or indirectly alter its water composition. Recent

agricultural and development activities have increased overland and river flow, impacting the lake's equilibrium. Socio-economic considerations encompass both benefits, such as improved socio-economic conditions, and concerns like social conflicts, environmental pollution, and impacts on water resources and fisheries (Najib et al., 2017; Kamarudzaman et al., 2011).

2. METHODOLOGY

GIS and hydrology modeling are integral components of this study. GIS technology, capable of capturing, storing, analyzing, and visualizing georeferenced data, serves as a vital tool (Bakir & Zhang, 2008; Kusre et al., 2010). Hydrology, inherently spatial, benefits from distributed hydrologic models with significant data requirements, making the integration of hydrology and GIS a natural method for environmental research. This integration involves Sediment Load Analysis (SL) and GIS spatial model distribution.
The calculation of annual sediment load production (SL) is based on discharge value (Q) (m^3/s), Total Suspended Solids (TSS) value (mg/L), and the area of the sampling basin (km^2):

1. Discharge value (Q):
$Q = vA$
$Q = m^3sec^{-1}$
Where:
Q = Discharge value (m^3/s)
V = Velocity value (m^2/s)
A = Area (km^2)

2. To obtain the unit L day-1, the following formula is used:
$Q = m^3sec^{-1} \times 86400 \text{ sec day}^{-1} \times 1000 \text{ L m}^{-3}$
$= L\ day^{-1}$

3. Annual sediment load production (SL):
SL = (Q x TSS)/ Area of sampling basin
= (L/day x tonnes/day) / km^2

3. RESULT AND DISSCUSSION

3.1 Discharge Measurement (Q)

Figure 1: The Estimated of Water Discharge (Q) for the Pelarit & Jarum River from 2009 until 2020

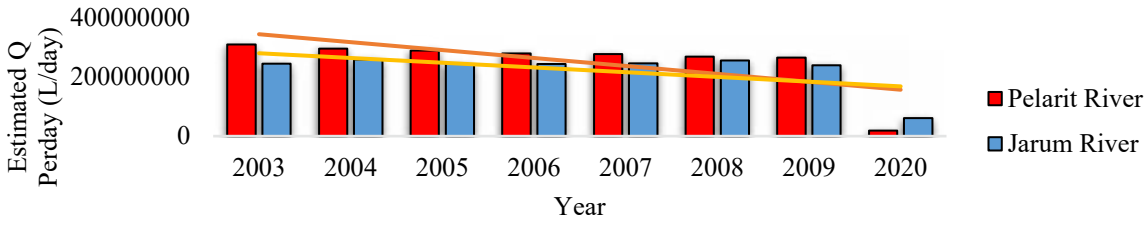
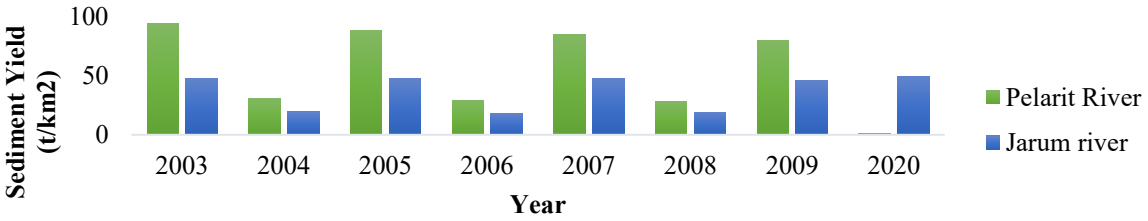


Figure 1 showed the estimated of water discharge (Q) for the Pelarit River and Jarum River from 2009 until 2020 based on the study of Rahaman & Ismail (2010) in "Spatial and temporal variations of sedimentation rate in the Timah Tasoh Water Reservoir, Perlis, Malaysia and data collected in 2020 by NAHRIM.

3.2 Annual Sediment Load (SL)

Figure 2 showed the estimated of sediment yield (tonnes/km²) for the Pelarit River and Jarum River from 2009 until 2020.

Figure 2: The Estimated of Sediment Yield (tonnes/km²) for the Pelarit & Jarum River from 2009 until 2020



There are not smooth trend lines of sediment production in Pelarit River and Jarum River because the main problems in Timah Tasoh Lake Basin is the unlimited development of the anthropogenic factors such as tourism, industrialization and residential resulted to be some of the main sedimentation problems and water damage problems.

3.3 GIS Spatial Model Analysis

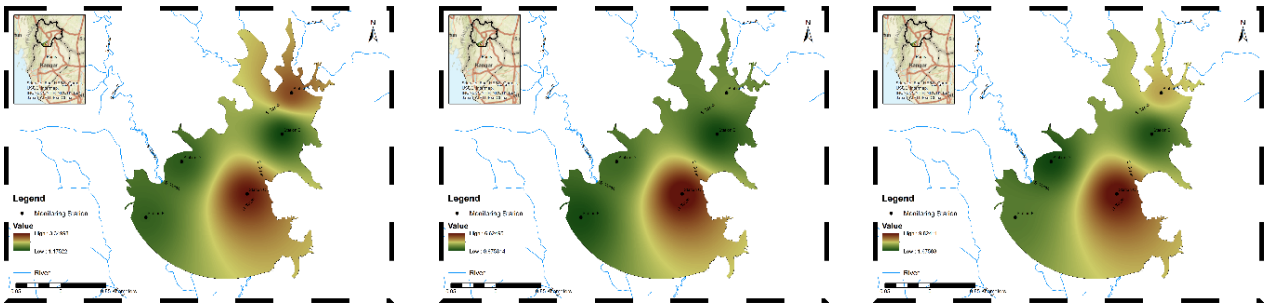
Table 1 showed the range values of sedimentation rate during normal, dry and wet season by Rahman and Ismail (2010). Based on the numerical result, the sedimentation problems are more critical in the middle areas of the Timah Tasoh Lake Basin compared to the upstream and downstream areas (Figure 3 (a – c). The river affected higher sedimentation problem resulted in soil degradation, interference to the soil physics-chemical characteristics, weathering process, climate changes, soil erosion and many other impacts that have contributed to the increase of sediment.

Table 1: The Average Sedimentation Rate on Wet Season, Dry Season and Normal Season in Timah Tasoh Lake

Station	A	B	C	D	E
Season	kg/m²	kg/m²	kg/m²	kg/m²	kg/m²
Dry	6.325	2.025	1.68	9.83	3.35
Normal	3	1.18	1.375	3.35	1.425
Wet	2.45	0.88	1.65	6.63	0.975
Average	3.925	1.358	1.567	6.6	1.917

Source: Rahaman and Ismail (2010) in article journal "Spatial and temporal variations of sedimentation rate in the Timah Tasoh Water Reservoir, Perlis, Malaysia".

Figure 3: Spatial Distribution Model of Sedimentation Rate Based Total Suspended Solid (TSS) and River Discharge(Q) Values for (a) Normal Season, (b) wet season & (c) dry Season in Timah Tasoh Lake



4. CONCLUSIONS

In conclusion, sedimentation in Timah Tasoh Lake is a complex issue influenced by both natural processes and human activities in its catchment area. Anthropogenic factors such as intensive agriculture, urbanization, and tourism exacerbate sedimentation, leading to ecological disruption and increased risks of flooding and erosion. Through GIS and hydrology modeling, the study reveals varying sedimentation levels across different rivers surrounding the lake. Sedimentation rates are particularly pronounced during wet seasons, emphasizing the urgency for comprehensive management strategies. Addressing these challenges requires a holistic approach integrating conservation efforts, sustainable development practices, and community engagement to ensure the long-term health and sustainability of the lake and its ecosystem.

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TITLE

A STUDY ON DECADAL CHANGES IN WATER QUALITY OF BHOJ WETLAND, THE CENTRAL INDIAN RAMSAR WITH RESPECT TO RAPID URBANIZATION

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ABSTRACT

Bhoj Wetland, one of the most important Central Indian Ramsar Sites is providing multiple services viz. drinking, fisheries, irrigation, ecotourism etc. to a population of about 2.5 million people living in Bhopal, the capital city of Madhya Pradesh. The wetland constructed in 10 century by famous King, Raja Bhoj is arguably the oldest existing manmade wetland in India. The wetland is enriched with more than 700 species of various categories of flora and fauna besides being an Important Bird Site (IBA) habitating more than 20000 avian species including residential and migratory visitors.

However, the inevitable process of urbanization especially in last four decades resulted in deterioration of overall water quality, subsequently posing a threat on ecological sustainability of this pristine wetland. Since this wetland is intimately related with the livelihood of the people of Bhopal city and is also an important water body due to its socio-economic, cultural and religioustic values, therefore a major conservation and management programme was implemented by the State government with the support of Government of India through external funding from JBIC, Japan. Various conservation measures like interception, diversion and treatment of sewage, solid waste management, catchment management through construction of check dams, plantation, fisheries development and other engineering interventions like de-silting, dredging etc were implemented during 1998-2004 for improving the water quality and biodiversity of the wetland. Implementation of the identified conservation measures resulted in significant improvement of water quality of the wetland in post project implementation phase i.e. during 2004 onwards (Annual Report, 2004, ERL, EPCO). Since this wetland is an important Ramsar site hence monitoring of water quality of the wetland is being continued since 1998. For this purpose water, soil and biological samples are being collected from 18 sampling stations at monthly interval and are being analysed for various physico-chemical and biological parameters.

The comprehensive study over 20 years has shown that the water quality of the wetland at present is fairly good as various indicating parameters like pH, BOD, COD are well within the permissible limits nevertheless variations in few parameters have been observed at instances at different stations due to temporal and seasonal influences and other natural variables. The details of 20 years study are presented in the paper.

Keywords: Ramsar Wetland, Urbanization, Decadal impact, Water Quality

1. INTRODUCTION

Reverence for water resources and their conservation is an age-old practice in India. Former rulers have contributed significantly by constructing large number of impoundments for providing drinking water to the people in their capitals and elsewhere. This was particularly necessary in arid, semi arid and other regions with highly erratic rainfall. The state of Madhya Pradesh is one such regions which is bestowed with large number of water bodies. Most of the water bodies in the state are manmade impoundments which suffice the needs of potable water, irrigation, fisheries, industrial and all the other daily needs of the residents of the state.

Bhopal, the capital city of Central Indian State Madhya Pradesh is also blessed with number of water bodies of multipurpose uses. Unfortunately with rapid urbanization and consequent changes in the demographic nature specially during second half of the last century all these water bodies have undergone severe degradation in their water quality due of inflow of sewage, dumping of solid wastes, inflow of silt, nutrient accumulation, flourishing growth of invasive aquatic plants and, depletion of bio-diversity and other anthropogenic activities.

At presen most of the water bodies in and around Bhopal are under great environmental stress due to pollution from point and non-point sources, flourishing aquatic vegetation, enrichment of nutrients and human encroachments. As a result, all the water bodies are gradually approaching towards eutrophication. Due to joining of untreated domestic sewage, washing activities etc., the water quality of these water bodies has deteriorated to a great extent thereby affecting the bio-diversity of the system.

The Upper Lake of Bhopal, also known as Bhoj Wetland is arguably the oldest among the large man-made lakes in the central part of India, falls in this category. This lake was created in the early-11th century by King Bhoj by construction of an earthen dam across the Kolans River, a rain-fed tributary of the Betwa River.
The Lake is a source of potable water and meets 40% of the drinking water demand (29 million gallons per day) for the city's growing population. Its fishing rights have been allocated on a long-term lease by the Bhopal Municipal Corporation (BMC) to a fishermen's cooperative, consisting of some 500 fishermen families.
The Lake has both rural and urban catchments. With a well-protected catchment, its water quality was of potable standard until recently (Singh and Anandh 1996). In the last few decades of the 20th century, however, many sections of the lake became surrounded by habitations as the city grew. These developments have generated anthropogenic pressures on the lake, thus accelerating its eutrophication.

The lake is very rich in biodiversity with the principal components being phytoplankton, zooplankton, macrophytes, aquatic insects and avifauna (both resident and migratory).
Considering the ecological importance of these lakes, the Government of India declared the the Upper lake along with Lower lake which is situated at the downstream as lakes of national importance, and efforts to improve their environmental status began in 1989. Later implementation of an integrated conservation and management plan for the lakes was started in 1995 with the financial support of JBIC. In recognition of its rich biodiversity (especially avifauna), and for adopting an integrated management plan, this wetland was declared a Ramsar site (a wetland of international importance) in 2002.

The project was coordinated with JBIC by a government- controlled society, called the Environmental Planning and Coordination Organization (EPCO), and implemented by the Bhopal Municipal Corporation (BMC), State Public Health Engineering Department (PHED),

Capital Project Administration (CPA) and MP Fisheries Development Corporation (MPFDC). EPCO is the executive and advisory arm of the Environment Department on statewide environmental issues.

The project envisaged tackling various conservation and management issues of the Upper and Lower Lakes of Bhopal in an integrated manner. Although the issues are interrelated and interlinked, for ease of operation and management, these issues were divided into various sub-projects, albeit with the understanding of the related issues and their interconnectivity with each other. The project initially envisaged 14 sub-projects under the major topics of:

- De-silting and Dredging (de-silting and dredging of the lakes; deepening and widening of the spill channel, and restoration of the island);
- Catchment Area Treatment (afforestation, creation of buffer zones, construction of check dams, silt traps, toe walls and cascading and garland drains);
- Prevention of Pollution (Sewerage schemes);
- Shoreline and Fringe Area Management (construction of link road from Retghat to Lalghati, solid waste management, prevention of pollution from Dhobi ghats); and,
- Improvement and Management of Water Quality (de-weeding, biological control of weeds through aquaculture, installation of floating fountains, water quality monitoring).

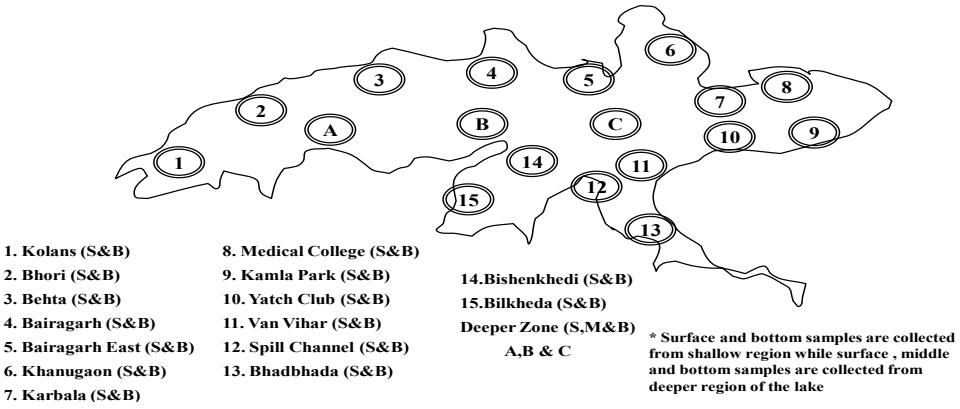
As part of the project actvities analysis of water quality, and monitoring of biodiversity of the two lakes, has been conducted since 1998 on a regular basis. Special studies were conducted to assess the impacts, if any, of anthropogenic activities, as well as developing project activities to facilitate corrective measures, if necessary, on the part of decision-makers. Since then monitoring of the water body is being continued till date to assess the cumulitative impact of both natural and anthropogenic variables on water quality and biodiversity of this Ramsar Wetland.

2. MATERIALS AND METHODS

Water samples were collected at monthly intervals from 18 sampling stations of Upper Lake (Fig-1). Samples were collected from limnetic (shallow) as well as littoral (deeper) regions of the lake which were finalized based on fringe area activities, anthropogenic impacts and catchment characteristics.

Sampling Technique

Figure 1: Sampling stations in upper lake



1. Kolans (S&B)
2. Bhori (S&B)
3. Behta (S&B)
4. Bairagarh (S&B)
5. Bairagarh East (S&B)
6. Khanugaon (S&B)
7. Karbala (S&B)
8. Medical College (S&B)
9. Kamla Park (S&B)
10. Yatch Club (S&B)
11. Van Vihar (S&B)
12. Spill Channel (S&B)
13. Bhadbhada (S&B)
14. Bishenkhedi (S&B)
15. Bilkheda (S&B)

Deeper Zone (S,M&B) A,B & C

* Surface and bottom samples are collected from shallow region while surface , middle and bottom samples are collected from deeper region of the lake

For water quality monitorin, monthly water samples are collected from 18 identified sampling stations (15 from shallow zone and 3 from deeper zone: A,B,C) (Fig-1). Water samples are collected in sterile glass bottles, jerry cans from each station following the standard methods (APHA, 2017).

After collection of the samples the bottles are tightly capped and immediately transported to the laboratory to avoid any unpredictable changes in the physico-chemical characteristics. Suitable preservation techniques are adopted as per the standard methods. The parameters like pH, TDS, conductivity, Dissolved Oxygen are analyzed on the field while rest of the parameters are analyzed in the laboratory as per the methods described in APHA (2017), Adoni (1985) and Golterman and Clymo, (1969).

For collection of Biological samples, macrophytes are collected by Quadrate Method while fish data are collected on the basis of information available from the fisherman in the area.

RESULT & DISCUSSION

Water pollution is a major problem especially in urban cities. This is the biggest problem that affects the health of human, animals and plants. In all known forms of life continuation, water is an essential substance of the natural sources. The aquatic ecosystem consists of several components which are directly or indirectly affected by pollution. The pollution of a particular water body can always be linked to an industry, sewage or agricultural runoff.

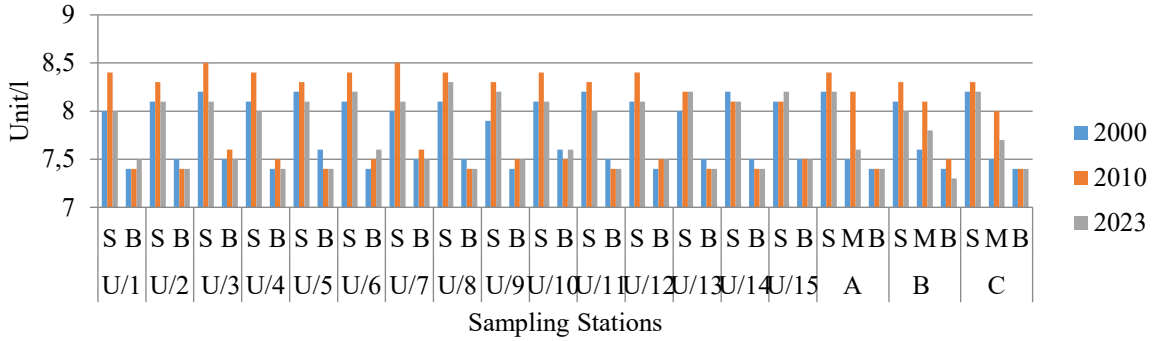
The significance of environmental factors to the health and well-being of human populations is increasingly apparent. Environment pollution is a worldwide problem and its potential to influence the health of human population is great. Therefore understanding the existing status of a water body through comprehensive and regular water quality paremeters has become the

need of the hour. Considering this the water quality monitoring of Upper Lake is being done from 1998 to till date to assess its present status with espect to its best uses. The outcome of the study based on indicative parameters is discussed below:

pH

Variation in pH at different stations of Upper Lake during 2000 to 2023 is depicted in Figure-2.

Figure-2 Variation in pH at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023

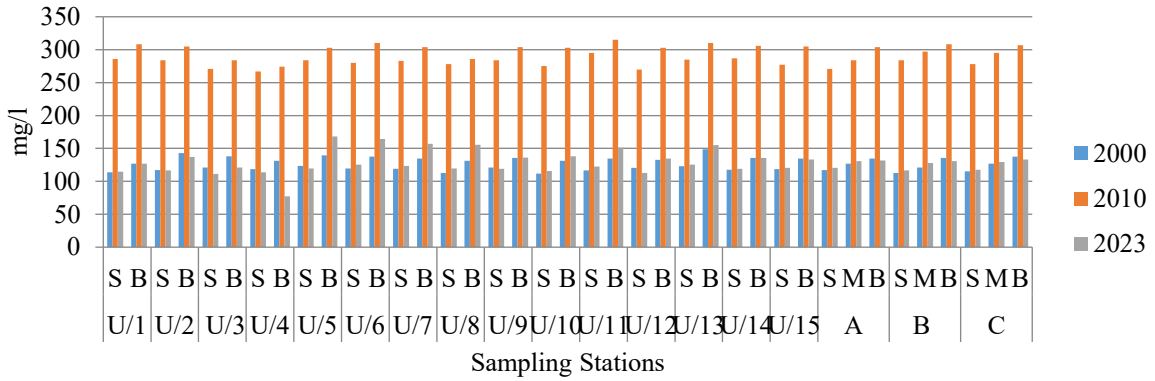


The pH in optimum range depicts good water quality. The pH was recorded slightly high during the period 2010. In subsequent years pH values shows a decreasing trend depicting sign of improvement in water quality. The surface water depicted slightly higher values than bottom waters. Most of the Indians lakes show pH normally between 6 and 9. The value of pH was recorded in the mild alkaline range in almost all the samples collected from various stations of Upper Lake. In a lentic ecosystem, the pH is influenced by the age of the water body and the chemicals discharged by the biotic communities and industries and geo-chemical characteristics of its catchment. Most of the water bodies are usually basic (alkaline) when they are first formed and become more acidic in course of time due to the build-up of organic materials. In Upper Lake the pH in general was slightly alkaline and shows comparatively better quality for sustainability of the biotic community in the water body during later stages of investigation.

Total Dissolved Solids (T.D.S)

Hydrogen ion activities in a water body also related to Total Dissolved Solids (TDS). Total dissolved solids information is used to determine the overall ionic effect in a water source. Total dissolved solids in natural water mainly composed of a large variety of salts and inorganic minerals i.e., dissolved solids such as chlorides, carbonates, bicarbonates, nitrate, phosphate etc. which impart particular taste to water at higher concentration. TDS when present in excess in the water may create an imbalance for aquatic life. Certain physiological effects on plants and animals are often affected by the number of available ions in the water. Variation in Total Dissolved Solids at different stations of Upper Lake during 2000 to 2023 is depicted in Figure-3.

Figure 3: Variation in TDS at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023



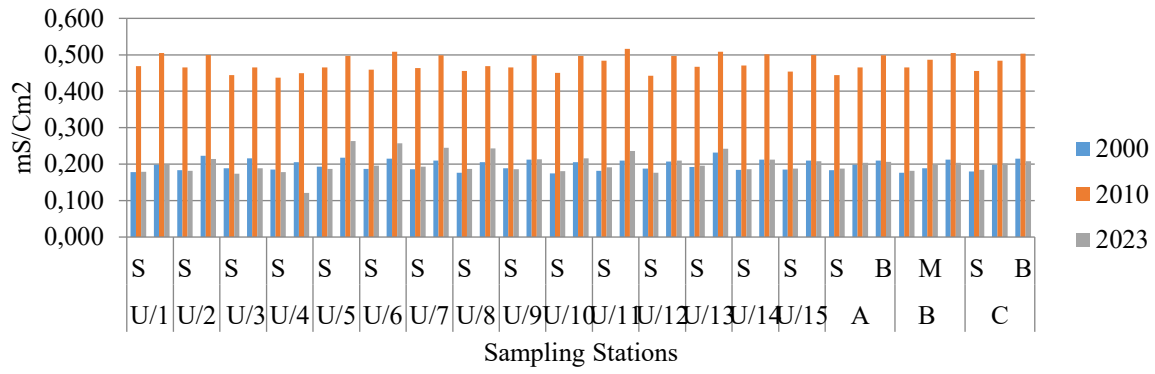
In Upper lake, slightly higher values of TDS were recorded during 2010 which may be because of inflow of sewage from the newly constructed unauthorzed regions as inflow of sewage increased even after construction of sewage treatment plants under Lake Bhopal Conservation project. TDS is an important parameter for productivity of the aquatic environment. Khan and Khan (1985) found higher values of TDS during rainy season. High values of TDS due to rains were also reported by Verma et. al. (2006). Similar observations were found by Pani et al (2024) wherein it TDS values in upper lake surface water was reported between 163mg/L to 216mg/L. The values obtained during present investigations (77mg/l to 315 mg/l) are inconformity of these workers.

Conductivity

Conductivity is a measurement used to determine a number of applications related to water quality like determining mineralization. Conductivity is a numerical expression of the ability of an aqueous solution to carry on electric current. This ability depends on the presence of ions, their total concentration and temperature variations. Conductivity depends on the ionic strength of the water. Inorganic salts, acids and bases show better conductance while organic compounds do not show much conductance.

Variation in Conductivity at different stations of Upper Lake during 2000 to 2023 is depicted in Figure-4. During this period, Conductivity was observed within the range of 0.12 mS/cm^2 to 0.52 mS/cm^2. The Conductivity was recorded on higher side as that of TDS during the period 2010.

Figure 4: Variation in Conductivity at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023

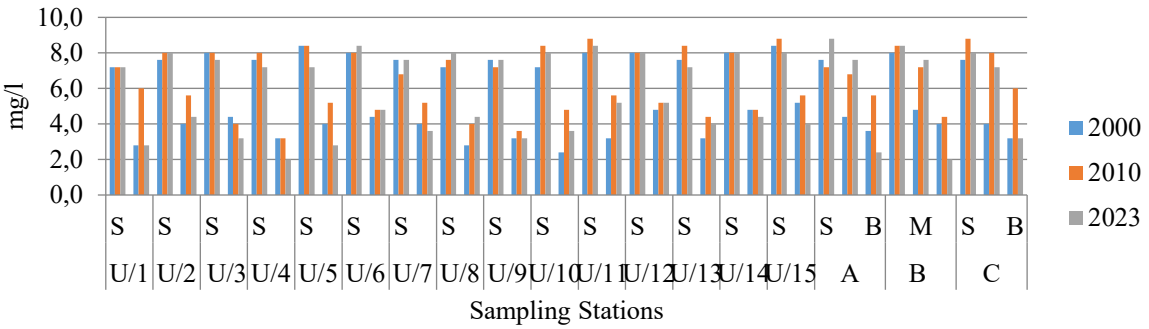


The conductivity in optimum range depicts good water quality. The lower values of conductivity after 2010 depict a sign of improvement in water quality. Chemically pure water has low electrical conductivity while high values of electrical conductance show presence of ionic solids in water. In Upper Lake a moderate range of conductivity values were observed. Similar observations were also recorded by Pani et. al.(1999). Jain (1995) reported conductivity of Inlets of Upper Lake sometimes high in surface water and as well as in bottom water also. Tiwari et. al., (2004) recorded the conductivity of the lake water samples in the range of 0.60 to 0.72 mS/cm2. Berg (1958) also used specific conductivity as a parameter for assessing trophic status and eutrophic trends. According to them the lake with low water renewal capacity has higher conductivity values and is considered to be at a higher trophic level. In Upper Lake due to large fluctuations in water flow and high renewal capacity due to increase in rainfall in subsequent years of 2010, the conductivity values were in general on lower side. Unni (1985) reported uniform conductivity of 237 and 121 mhos/cm in Gandhi Sagar and Tawa Dam. Conductivity of pure water is low. If conductivity value is high this means high ionic substances present in water (De, 2008).

Dissolved Oxygen

Dissolved Oxygen is an important parameter to understand the trophic status of a water body. Variation in Dissolved Oxygen at different in Upper Lake during different months of 2000 to 2023 is depicted in Figure-5. During this period, Dissolved Oxygen in Upper lake was observed within the range of 2.0 to 8.8 mg/liter. The value of Dissolved Oxygen in general was recorded higher at surface during the entire period of investigation.

Figure 5: Variation in Disolved Oxygen at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023



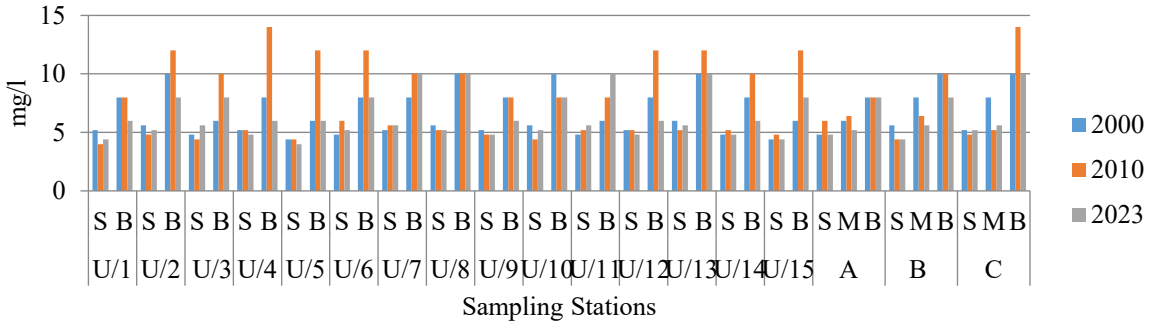
The concentration of DO recorded in moderate range during the period of investigation. Very high values of Dissolved Oxygen at the surface indicates higher trophic status of the Lake.
High dissolved oxygen concentration during summer months could be on account of high photosynthetic activity by the standing phytoplankton crop and macrophytic vegetation in presence of optimum light. Higher values of DO in the surface water also indicates intensive photosynthetic activity (Pani, 1993).
The low DO concentration persisting in the deeper water layer also represent a consequence of intensive hetrophitic activity following an accumulation of biodegradable organic substances. The DO of water goes down and suspended solids increase due to turbidity of water. Wanganeo et al (1994) also reported higher values of DO in surface water reported that higher values of DO content in water increase the corrosion in the raw water. In a water body where rate of respiration and organic decomposition are high, DO remain low, (Sharma Cooper 2010). Similar observations of reduction in DO concentration through bacterial activity were also reported by Varma et. al. (2006). However in bottom waters of Upper Lake a moderate range of Dissolved Oxygen concentration was observed.

It is of paramount importance to all living organisms and is considered to be the lone factor which to a greater extant can reveals the nature of the whole aquatic system at a glance, even when information on other chemical, physical and biological parameter is not available.

Biochemical Oxygen Demand

Variation in Bio-chemical Oxygen Demand at different in Upper Lake during different months of 2000 to 2023 is depicted in Figure-6. BOD during the period of investigation ranged from 4.0 to 14 mg/l.

Figure 6: Variation in Biochemical Oxygen Demand at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023

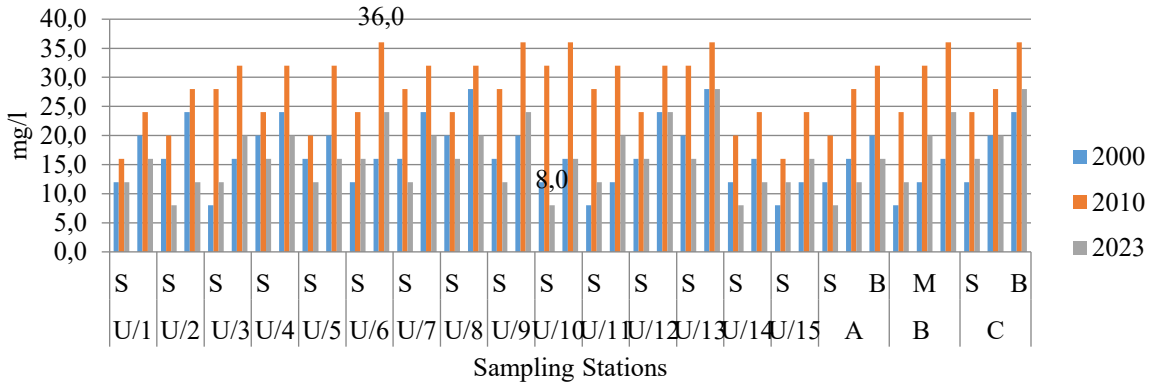


BOD is the most important pollution indicating parameter. The concentration of BOD has shown higher values during the period 2010 as compared to earlier years, depicting slight deterioration in water quality. The concentration of BOD has shown a trend of reduction in afterwards 2010, depicting slight improvement in the water quality as compared to previous years.

Chemical Oxygen Demand

Variation in Chemical Oxygen Demand at different in Upper Lake during different months of 2000 to 2023 is depicted in Figure-7. COD during the period of investigation ranged from 8.0 to 36 mg/l. The higher value was recorded during the period 2010.

Figure 7: Variation in Chemical Oxygen Demand at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023

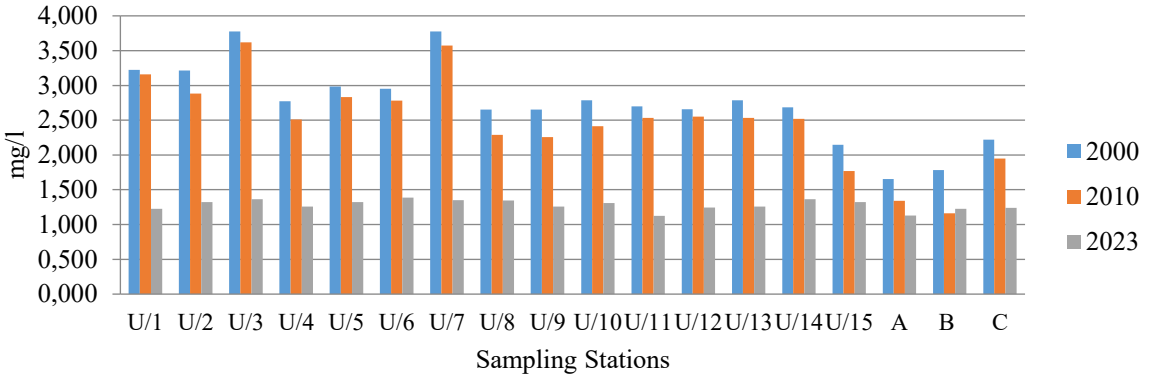


The reduction in concentration of COD afterwards 2010 depicted slight improvement in water quality.

Nitrate

Variation in Nitrate at different in Upper Lake during different months of 2000 to 2023 is depicted in Figure-8. Nitrate during the period of investigation ranged from 8.0 to 36 mg/l. The higher value was recorded during the period 2010.

Figure 8: Variation in Nitrate at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023

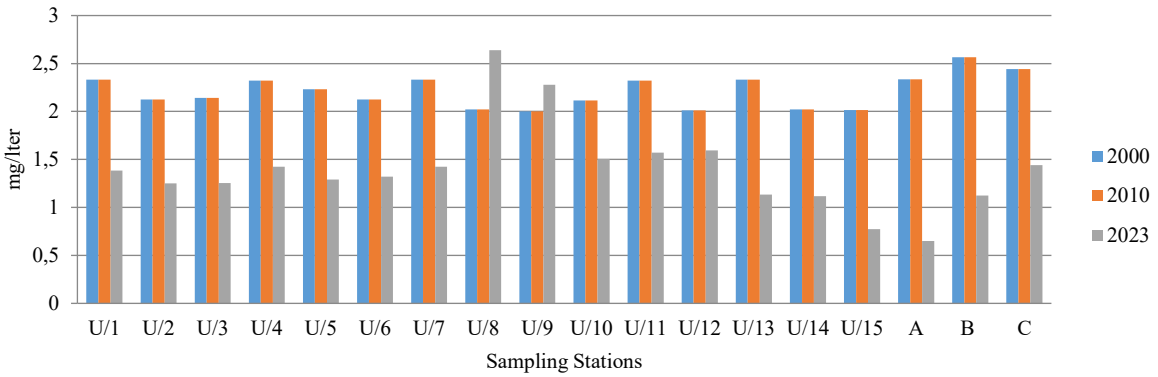


The concentration of Nitrate has recorded slight dip afterwards 2010 thereby depicting slight improvement in water quality.

Phosphate

Variation in Phosphate at different in Upper Lake during different months of 2000 to 2023 is depicted in Figure-9. Phosphate during the period of investigation ranged from 0.649 to 2.64 mg/l. The higher value was recorded during the period 2010 after wards a decrease in phosphate values were observed at all the stations except at station- 8.

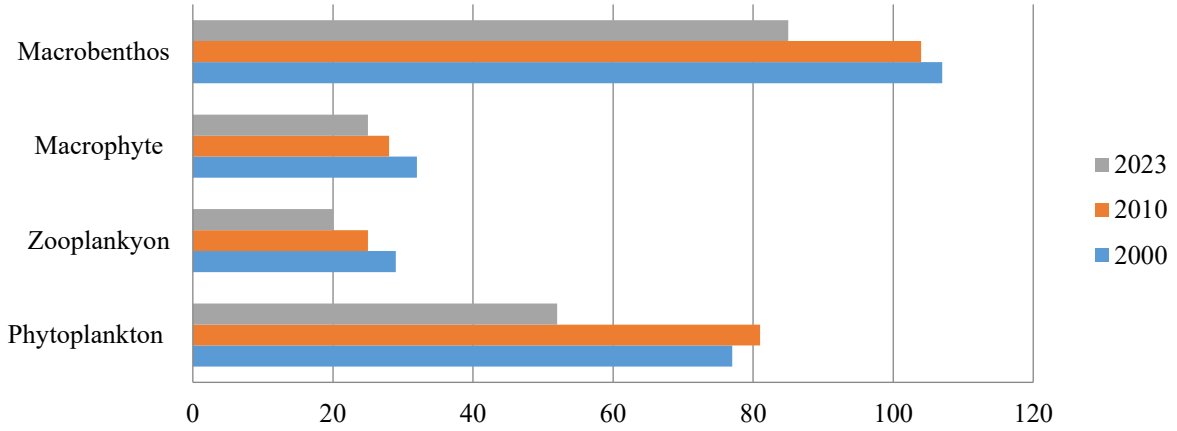
Figure 9: Variation in Phosphate at Surface and Bottom waters of Bhoj Wetland during different intervals from 2000 to 2023



Biological Parameters

Variation in total number of species of Biotic community in Upper Lake during the year during 2000-2010 is depicted in Fig-10. While going through the various categories of biological communities it was observed that number of species of phytoplankton, zooplankton, macrophyte and macrobenthos has reduced over the years.

Figure 10: Biotic community of Upper Lake



The lake is an important Ramsar Site due its rich flora and fauna. In past more than 700 species of various categories of flora and fauna has been reported from this lake (Bajpai et al, 1997). In course of time the number of phytoplankton species has reduced as reported by Bajpai et al1997.

The present investigation reveals that the water quality of of Upper Lake was observed to be slightly poor during the period 2010. A deterioration in water quality was also depicted at few palces which may be related to inflow of untreated seawge and dumping of solid wastes from unauthorized slum areas. The concentration of BOD, Phosphate, Nitrate-nitrogen and reveal high degree of organic pollution during the intermittent years , a possible reason may be inflow of raw sewage from the inlets of adjoining areas at periodical intervals. Thus, by detailed analysis of data it can be concluded that the quality of water in general with respect to most of the parameters were observed to be fairly good afterwards of 2010 and mostly falls within class – C of Central Pollution Control Board (CPCB, New Delhi) under designated best uses of water for irrigation and drinking water after conventional treatment.

CONCLUSION

The comprehensive study over 20 years has shown that the water quality of the wetland at present is fairly good as various indicating parameters like pH, BOD, COD are well within the permissible limits nevertheless variations in few parameters have been observed at instances at different stations due to temporal and seasonal influences and other natural variables.

However the study also indicates that there are lots of anthropogenic influences which resulted in environmental stress and degradation of water quality at few places and could be alarming in time to come.

Vast shoreline areas have been drained for agriculture, urban expansion and other purposes, which have reduced the water storage capacity.

Need to implement measures such as controlling domestic sewage/ effluents and wastes which are being dumped at few places in to this water body, construction of sewage treatment plant, control the destruction of plants in the nearby forest area and reduce agricultural activities in the fringe area.

1. The present investigation depicts that among 18 stations, few stations viz. Station U-5, U-6, U-8 and U-13 were more polluted in comparison to other stations.
2. Comparatively higher values of BOD, COD, TDS, and Conductivity were recorded at these stations.
3. These stations are the representatives of the areas where major inflow in the lake is witnessed either as storm water or as sewage water. Presence of few dominant macrophytes was also observed at these specific regions.
4. These species can be referred as bio-indicators and may well be considered as bio-remediators for up taking the nutrients including organic as well as organic nutrients.

RECOMMENDATIONS

During the present study it was observed that sampling stations which were away from the fringe area from habitation are comparatively less polluted. On the basis of the study following suggestions and recommendations are made

- Upper Lake is one of the life lines for the people of Bhopal. Therefore measures to be taken for ensuring maximum availability of water from its drainage during monsoon by widening and deepening the major inflow channels joining the lake. The illegal drawl of water should also be regulated.
- The discharge of waste water without proper treatment should be banned and alternate effluent treatment facility (Oxidation Pond) should be established to treat the sewage as per the prescribed standards of EPA/CPCB, to control the sewage pollution.
- Regular monitoring practices are needed for the control of pollution level and proper management of industrial and domestic waste water disposal.
- Periodical De-silting and De-weeding operation in the lake as well as feeding channels should be conducted to remove the silt and weeds.
- The bank and fringe areas of the lake should be protected from erosion by afforestation and land scrapping.
- Disposal of solid wastes and religioustic materials into the lake especially from the city areas should be strictly prohibited.
- Idol immersion is also taking place at some parts of the lake, so this should be diverted by providing alternative ghats.
- Organic farming should be promoted in the agricultural fields situated in the catchment area of the river.
- Animal intervention should be stopped to prevent the pollution from animal origin.
- Vehicle washing was also observed at some of the sampling stations which cause oil and grease pollution to the lake. So, this should be stopped.
- Washing and bathing activities should also be taken care of, to prevent the soap and detergent pollution.
- Unhealthy fishing practices should be avoided.
- Regular water quality monitoring and other measures should be taken care of, to assess the pollution level and sources of pollution in the lake.

On the basis of above suggestions and recommendations, better conservation and management plan can be formulated for the conservation of Upper Lake and other similar type of water resources which will help the policy makers to develop a self sustainable long run plans for the conservation plans of aquatic resources.

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TITLE

SYNERGISING LAKE MANAGEMENT WITHIN WST2040 OF MALAYSIA

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ABSTRACT

Malaysia has taken various initiatives since 2007 to sustainably manage lake governance. Current achievements of lake management in the country are adoption of the Strategic Plan for Sustainable development and management of lakes and reservoir and National Lake Water Quality Criteria and Standards. A guideline and research on Integrated Lake basin management plan were carried out for seven lakes in 11th Malaysian Plan. An updated inventory of lakes which include ex mining ponds, was undertaken in 2021. An additional of 11 lakes have had their lake briefs documented, compared to 28 lakes from 2009 to 2012. In connection to enhancing the country's water management, WST 2040 (Water Sector Transformation by 2040) study for Malaysia was was completed in December 2021 and endorsed to be implemented in April 2022, encompassing the whole water sector which therefore encompasses lake resources and subsequently their governance. The proposal and recommendations of the WST2040 study, have been uploaded into the internet public domain. The WST2040 implementations are expected to be carried out from 2021 to 2040. Overall, the aim of water sector transformation 2040 is to ensure the availability of clean and sustainable water resources for future generations, while addressing the challenges posed by population growth, urbanization, climate change, and other factors. This paper focuses on enhancing lake management, riding on the policies recommended under WST2040, including creating awareness and capacity building, recommending required new researches, development of new indigenous technologies, innovation, and commercialization of such technologies to help further improve lake management by all, including local communities.

Keywords: Lake, Governance, Malaysia, Water sector transformation

1. INTRODUCTION

Malaysia has adopted an integrated water resources management (IWRM) framework comprising Integrated River Basin Management, Integrated Coastal Zone Management, and Integrated Lake Basin Management since the approach was introduced in 1992. The most significant initiatives were the establishment of the National Water Resources Council in 2011. The council was transformed into the National Water Council in 2019 to oversee the entire water sector, including water resources and water services. This Council is the highest forum for addressing national water management issues and establishing nationwide policies, including overseeing national responsibilities in international treaties.

Lakes remain important elements of water resources as most of them are part of the river system and provide a source of livelihood. About 20% of the country's water supply is drawn directly from lakes and additional lakes are created as off-river storage ponds for raw water supply. Numerous reservoirs serve a variety of purposes, including drought and flood control, hydropower generation, freshwater fishing, recreation and tourism.

2. NATIONAL LAKE MANAGEMENT INITIATIVES

Integrated Lake Basin Management (ILBM) initiatives in Malaysia have been undertaken since 2005. The adoption of the Strategic Plan for Sustainable Lake and Reservoir Development and management in 2012 through the National Water Resources Council, provided the long-term strategies for implementation to meet its vision of sustainable use of lakes for their ecosystem services and economic values. The Policy Framework clearly stated the adoption of ILBM approach to protect, restore and sustain lakes and reservoirs (ASM & NAHRIM 2009).

2.1 Lake issues and challenge

Recent inventory by National Water Research Institute of Malaysia identified that there are additional 280 lentic waters that provide various ecosystem services in addition to 90 major lakes and reservoir in the country (Sharip et al. 2020). A recent study showed more than 64% of 94 studied lakes in the literature reported experiencing eutrophication while about few reservoirs having storage losses of more than 50% due to sedimentation (Jansen 2019, Sharip et al. 2020).

2.2 Research and development direction

To support lake management, the Blueprint for Lakes and Reservoir Research and Development, sets out the propose R&D activities based on integrated research at catchment scale (NAHRIM 2014). Among the research direction needed are (1) inter-disciplinary studies that link physical and social sciences, (2) improvement of pollution monitoring (3) carrying capacity of lentic-lotic waters (4) rehabilitation of degraded lakes.

2.3 Specific standards for lake water quality monitoring

Standards for ambient monitoring of lake water quality was adopted in 2017 to support decision making and management. The standard, which focuses on protecting human and ecosystem health, considers maintaining lake quality for various recreational purposes.

2.4 Guidelines, lake briefs and management plan

Development of lake briefs begun in 2009 and span over four series with a total of 39 lakes completed to date. These lake briefs provided an overview of the current state of the lake, their management and governance challenges. A specific guideline in preparing lake management plan has been introduced in 2018 to promote development of lake basin management plan by respective managers. A total of seven ILBM Plans were completed over the period of 2016 to 2020 namely Sembrong, Batang Ai, Durian Tunggal, Bukit Merah, Chenderoh, Timah Tasoh & Melati Lake.

2.5 Participatory ecosystem services shared value assessment

To enhance lake management initiatives at international level, collaborative research between National Water Research Institute of Malaysia and the International Lake Environment Committee to use the tool, developed by ILEC, known as Ecosystem Services Shared Value Assessment to enhance ILBM process. Research using this tool is being conducted at Chenderoh Lake and Bukit Merah Lake in Perak. The research hopes to increase public awareness and shared values among for participation in lake management initiatives.

3. WATER SECTOR TRANSFORMATION 2040

Integrated Water Resources Management (IWRM) was incorporate as a national policy for Malaysia, since the 8th Malaysia Plan, beginning in 2001.

In December 2021 the study on WST 2040 (Water Sector Transformation by 2040 -https://wst2040.my/) was completed, aiming at mainstreaming IWRM paradigm as a central policy towards achieving national sustainable development goals on water, in the light of various challenges faced, such as climate changes, population increase, rapid development and urbanisation. WST 2040, with 2 objectives, "water security & sustainability and water as an economic opportunity" was endorsed for implementation since April 2022.

WST2040 focuses on whole eco-system perspectives as well as whole social and management perspectives (government, private sectors, academia, NGOs and communities) with people as the main driver. The study encompasses integration of land and water management. Details of the study is uploaded on https://wst2040.my/ and is accessible to all.

While all aspects of water were studied, eight new game changes were included namely; Advocacy, Awareness, Capacity Building & Public Participatory Platforms (AACB), Integrated Water Sector Data Centre (IWSDC), IR4.0 in the Various Water Sector (IR4.0 WS), Water-Food-Energy Nexus (WFE Nexus), Virtual Water and Water Footprint (VW&WF), Climate Change Impact and Adaptation (CCIA), Alternative Water Financing (AWF) and Water as an Economic Sector (WES)

4. SYNERGISING LAKES IN WST 2040

To improve ILBM implementation, lake management initiatives will be based on the policies recommended under WST2040, including

4.1 Creating awareness and capacity building

Main effort to synergize lakes by strengthening the participation of all stakeholders in the lake basin, including the community, through advocacy, awareness and capacity building (AACB). AACB is considered a game changer, seeks to educate Malaysians about the concept of water management, including lake resources, and their respectives roles and responsibilities in supporting the change (EPU 2021). AACB on lake governance include promoting scientific and citizen science on lake monitoring and management, and public participation in lake care.

4.2 Recommending new researches and open data

Among research areas promoted to achieve WST 2040 are research and model development linking water sector with food (irrigation) and energy (hydropower) nexus to ensure that water resources with good water quality are available to meet the water needs up to 2040 and beyond. Other research needs promoted include water footprint, alternative water and the economics of the water sector including financing mechanism. The development of new indigenous technologies, innovation, and commercialization of such technologies based on Industrial Revolution technology such as drones, integrated models, artificial intelligence, and artificial wetlands to further improve lake management for all, including local communities.

There is also a need to establish a national integrated data centre knowns as IWSDC that supports open data sharing and enables all water sector stakeholders, including water managers, to make science-based decisions. An example of open data sharing is Digital NAHRIM, where research publications are stored.

4.3 Adaptation to future climate changes to enhance lake resilience
This includes improving prediction and forecasting of climate change and its impacts on lakes, adapting to changing impacts of drought and flooding, and mitigating extreme events by promoting nature-based solutions.

5. CONCLUSIONS

ILBM is an important management mechanism for lentic water resources in support of IWRM in Malaysia. IWRM paradigm as a central policy (20-year plan) for the commitment of countries to achieve the sustainable development goals in the water sector. Lake synergy in WST2040 includes improving capability in data-driven decision-making capabilities such as long-term programs including research and development to improve monitoring and restoration of lakes, stakeholder and community collaboration on governance, and adaptation to future climate change.

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TITLE

IMPLEMENTING PARTICIPATORY ECOSYSTEM SERVICES SHARED VALUE ASSESSMENT IN MALAYSIA

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ABSTRACT

Reservoirs, lakes, and ponds provide important ecosystem services for both human and natural life. Despite their importance, managing these lakes - both natural and man-made - remains a challenge due to the intrinsic nature of the lentic water bodies, anthropogenic pressures and climatic conditions. There is still no comprehensive integration of the shared value of lake ecosystem services to support sustainable management of the lake basin. Stakeholders' views on ecosystem services (ES) varied, making it difficult to successfully manage the lake basin and associated services. This paper provides an overview of the implementation of the Participatory Ecosystem Services Shared Value Assessment (PESSVA) in Malaysia. The work involves developing questionnaires, conducting social surveys, and confirming with stakeholders in workshops. The survey for Chenderoh Lake was carried out from January to March 2023 covering two districts namely Lenggong (upstream) and Kuala Kangsar (downstream). More than 300 respondents from ten sub-districts took part in the survey. The initial findings of the survey of the local communities and stakeholders in Chenderoh Lake basin revealed that more improvement was required to strengthen lake basin governance. Lack of knowledge and programs was perceived by community to may limit their involvement in lake basin management. PESSVA survey is currently being undertaken in Bukit Merah Lake Basin. A comparative analysis of the survey data from the two lakes will provide better understanding on the role of PESSVA in supporting the planning process, management actions and overall governance of lake basin in the two water bodies.

Keywords: Bukit Merah Reservoir, Chenderoh Reservoir, Ecosystem Services Shared Value Assessment, Lake Basin Management and Governance

1. INTRODUCTION

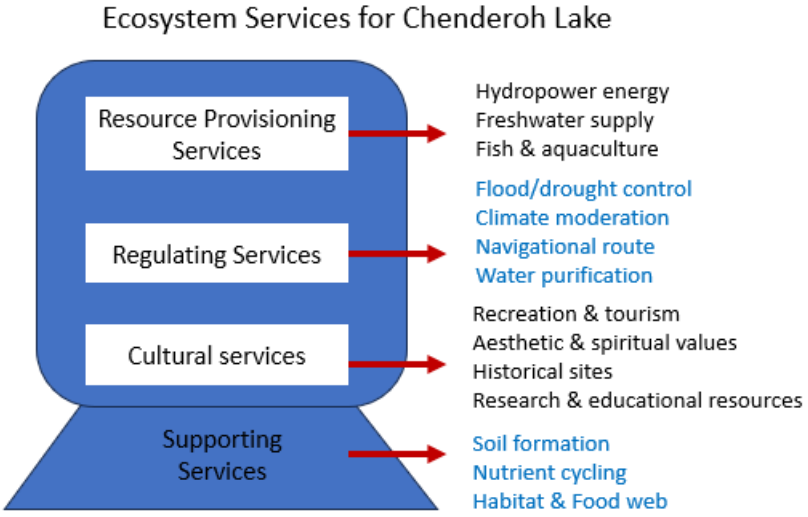
Lentic water bodies such as reservoirs, lakes, and ponds offer important ecosystem services for human and natural life. Yet, maintaining lake and ecosystem services - both natural and man-made - remains difficult due to various factors such as the nature of the Lentic water, human pressures and climatic conditions. Comprehensive integrations of the shared value of lake ecosystem services to support sustainable governance of lake basin is limited. Stakeholders' perspectives on ecosystem services (ES) varied depending on their knowledge and focus, making it difficult to successfully manage the lake basin and the services connected to it. Ecosystem Services Shared Value Assessment is a methodology used to incorporate the ES

concept into the lake basin management planning (Nakamura et al. 2022). The method has been successfully used in few African lakes to encourage people to take an active part in lake management (Nakamura et al. 2022). The concept of involving communities to develop shared values to improve the participatory process of basin management is still new in Malaysia.
This paper provides an overview of Malaysia's implementation of the participatory ecosystem services shared value assessment (PESSVA). The study is a collaborative project between the National Water Research Institute of Malaysia and International Lake Environment Committee on PESSVA starts with the Chenderoh Lake Basin followed by the Bukit Merah Lake Basin, both located in Perak, Malaysia.

2. METHODOLOGY AND FINDINGS

The work involves developing questionnaires, conducting social surveys, and confirming with stakeholders in workshops (NAHRIM & ILEC 2023). The questionnaire was adapted from the survey form developed for African lakes as illustrated in the newly published guideline (Nakamura & Muhandiki 2023) and modified to the Malaysian scenario. The details on the ecosystem services perceptional profiles is given in Table 1. Chenderoh Lake is the oldest hydropower reservoir in Malaysia. The dam was constructed in 1926 by damming the Perak River. The surface area of the reservoir is 21 km2 and while catchment area is 975 km2.
Resource provisioning services are the main ecosystem services for Chenderoh Lake (Figure 1). According to its main function, the most important provisioning service is energy production through hydroelectric power generation. The lake is also used to supply water for drinking and industrial purposes, with water being drawn from the Perak River at various points downstream of the lake.

Figure 1: Ecosystem services for Chenderoh Lake, Perak



The Chenderoh Reservoir also serves to control the impact of flooding on downstream areas such as the city of Kuala Kangsar. Cultural services are also important where the lake's scenic views make it a popular destination for recreation and ecotourism. Within the lake basin is the Lenggong Valley which is home to a UNESCO World Heritage Site. Important historical features of outstanding universal value includes the skeleton of the Perak Man, the oldest most complete human skeleton and four open-air and cave sites with Palaeolithic tool (UNESCO, 2021)

Table 1: Ecosystem services perceptional profiles

Question	Details	
Demographic information	Age Ethnic Occupation group Income levels	Gender Education level Period of residence
Resource Use and development activities, and the degree of stress	Agriculture Manufacturing Domestic water uses Tourism Transport	Livestock production Mining activities Fishing Hydropower
Impairment of the Nature's function	Biodiversity Pollution absorption Drought mitigation	Climate moderation Flood mitigation Erosion mitigation
Direct impact from sub-basin activities	Upstream	Downstream
Infrastructure and facilities	Effluents discharges Water treatment	Solid wastes Sanitation/hygiene
Status of Cultural services	Aesthetic/scenic values Historical significance Educational values	Traditions Religious value Natural heritage
Impact on human health	Family Basin community	Local Community
Impact on economy	Family Basin community	Local Community
Improvement of basin governance	Existing measures and action Possible Improvement	Responsibility and proactive role

Source: Nakamura et al. 2022; Nakamura & Muhandiki 2023, NAHRIM & ILEC 2023

The survey for Chenderoh Lake was conducted from January to March 2023 and covered two districts, namely Lenggong (upstream) and Kuala Kangsar (downstream). More than 300 respondents from ten sub-districts participated in the survey. The majority of respondents are men (> 60%), ethnic Malaysian (86%), married (76%), and have low incomes (70%) and primary to secondary education (52%).

The preliminary results of the survey among local communities and stakeholders in the Chenderoh Lake basin revealed that agriculture and mining, as activities that exert some stress or influence on the lake basin (NAHRIM & ILEC 2023). Further improvements to strengthen the management of the lake's catchment area is necessary to ensure ecosystem services and lake basin sustainability. Lack of knowledge and appropriate programs were viewed by the community as a possible barrier to their participation in lake basin management.

3. CONCLUSIONS AND RECOMMENDATIONS

A PESSVA survey is currently underway in the nearby Bukit Merah Lake Basin, Perak. A comparative analysis of the survey data of the two lakes will lead to a better understanding of the role of PESSVA in supporting the management planning process, action programs and overall basin governance of the two lakes. Some recommendations for the study include improving monitoring of alien fish releases and solid waste pollution, and as well as promoting awareness programs and encouraging participation. Strong financing mechanisms are needed to preserve the lake and river environment.

ACKNOWLEDGMENTS

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TITLE

THE LEGAL ASPECTS OF ECO-DRR IN ENVIRONMENTAL TREATIES AND ITS NATIONAL IMPLEMENTATION-TOWARD A SUSTAINABLE LAKE MANAGEMENT

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ABSTRACT

This study focuses on the legal system for social implementation of watershed flood control that combines the perspectives of sustainable community development and environmental conservation, particularly from the aspects of international environmental law and Japanese environmental law. The water-related disasters around the world have become serious year by year that there are urgent needs to prepare and to respond for such disasters. In recent years, the perspective of utilizing natural ecosystems in a way that has a synergistic effect with the response to climate change has been incorporated into resolutions by Contracting of the Parties of environmental treaties. The need for integrated management that takes advantage of the characteristics of lakes has been addressed in the UNFCCC, which requires Parties to prepare appropriate and comprehensive plans for the management of coastal areas and for the protection and restoration of areas affected by flooding. The Ramsar Convention also requires parties to consider the basic ecological functions of wetlands as water regulators. Therefore, it is essential that domestic implementation be carried out in accordance with the requirements of the international society for sustainable lake management. In addition, flood control has long been an important policy issue in Japan. This study also examined the response to Eco-DRR and its challenges in Kumagawa River in Kumamoto prefecture. As a result, this study clarilfy the necessity to ensure implementation of guidelines and effective linkage among environmental treaties for sustainable lake management.

Keywords: Environmental Treaties, Japanese Environmental Law, River Basin flood Control, Sustainable Lake Management, Eco-DRR

1. INTRODUCTION

The climate change and other factors are causing increasingly serious adverse impacts on the natural and living environments around the world due to hurricanes, tsunamis, and other natural and water-related disasters. Countries are being called upon to respond to these disasters, and also, there is a growing interest in establishing international legal frameworks and regulations for disaster prevention and mitigation. From the perspective of international law in general, discussions on natural disasters are not new, however, since all of them were mainly focused on the human security perspective, such as the Tampere Convention or draft articles on the Protection of Persons in Disasters by the International Law Commission. Therefore, the concept of disaster prevention, mitigation, and risk reduction using natural ecosystems will be

addressed on an individual environmental treaty basis. One of the responses to disaster which is one of the interests of the international community has been discussed in conjunction with the importance and use of Eco-DDR, especially wetland ecosystems.
The interest of international community for Eco-DRR can be shown, for example, in the concept of sustainable lake management as outlined in target 6 and 14 of SDGs. In addition, according to the resolution of sustainable lake management adopted by UNEA, still this resolution is not a legal binding obligation, though it is one of the key tools for the international community to align themselves. The resolution consists of two main pillars: implementation of sustainable lake management and support for international organizations. The former involves all stakeholders and calls for six actions to be taken into consideration. In the latter, three actions are requested of UNEP, the international organization.
In light of the resolutions related to sustainable lakes at various international conferences, this study will examine, (i) What kind of roles should treaties play in sustainable lake management? (ii) How should we think about sustainable lake management in relation to natural disasters?

2. TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW

2.1. Environmental Treaties related to lake and natural disaster

Focusing on especially, function of lake for flood control, the Framework Convention on Climate Change (UNFCCC) had already recognized that one of the responses to climate change is the management of lakes in Article4(e). Furthermore, the Convention on Biological Diversity (CBD) calls for integrated management of water systems in Aichi Target 10 and 11. The term "DRR" started to appear in decisions in CBD about 10 years ago[1]. The latest Conference of the Parties (COP) in Kunming and Montreal was held in 2022, the Parties are asked to ensure effective restoration of inland water including of the lake[2].
The most relevant environmental treaty for lake conservation and natural disaster is the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention). The convention states lake is one of the wetlands (Article 1.1) and also states that Contracting Parties consider wetlands to play a role in regulating the water cycle, and in so regulating (preamble, para2).
The theme of "natural disasters" began to appear in the late 1990s of COP and related resolutions have been frequently adopted until today[3]. Early resolutions were mostly about raising awareness of wetlands and disasters themselves, but since 2008, resolutions have been reaffirmed and updated, especially with the terminology of climate change.

2.2. Water management and natural disaster under Ramsar Convention

The Ramsar Convention had also adopted resolutions on water management and on natural disasters, such as "Resolution VI.23 Ramsar and Water", since 1996. At the COP held in 1999, some requirements were discussed since there were no clear guidance for water management systems or on how to integrate wetlands into river basin management under the Ramsar Convention (Resolution VII.18). Some updates in 2008 for promote awareness of the guidelines (Resolution X.19). Incidentally, this update introduces the Critical Path approach, a way to start where you can, even if there are barriers to implementing integrated water management according to the guidelines. Since COP12, the response to natural disasters has been considered not only in terms of management, but also in terms of recovery (Resolution XII.13).

[1] See, Decision XII/19 Ecosystem Conservation and restoration (2014), para 6.
[2] See, Global Biodiversity Framework (2022), Target 2 and Target 3.
[3] The resolutions responding to Natural Disasters are as follows; Recommendation6.9, Resolution VIII.35, Resolution XIII.25, Resolution VIII.3, ResolutionX.9, Resolution X.24, Resolution XIII.13, Resolution XIII.14 , Resolution XIII.16, Resolution XIII.19.

The most recent resolution urges parties to include ecosystem-based approaches within their respective countries (Resolution XIV.17). Although the term "natural disaster" does not appear in the resolution XIV.17, it was confirmed during the drafting stage of the resolution that nature-based solutions include flood risk management.

3. TRENDS IN JAPANESE ENVIRONMENTAL LAW AND "NATURE-BASED BASIN FLOOD MANAGEMENT"

Flood control has long been an important policy issue in Japan. In 2021, nine laws were revised in Japan under the Act on Countermeasures against Flood Damage of Specified Rivers Running Across Cities to try to ensure more effective policies. Local community have begun to think together about how to deal with floods, adopting not only concrete and other forms of revetment but also ecosystem-based methods where necessary. In detail, divided into four major sections, such as (i) Strengthen basin flood control plans and systems, (ii) Measures to prevent flooding as much as possible, (iii) Measures to reduce damage, (iv) Measures for damage reduction, early recovery, and reconstruction, the focus is on disaster mitigation rather than disaster prevention, on how quickly the living environment can be restored.

As a means of achieving this, a project called "Nature-Based Basin Flood Control Management" (MRC, *Midori no Ryuiki Chisui* in Japanese) is currently underway on the Kuma River in Kumamoto Prefecture[4]. This is not a government-based project, but it is one of a form of Eco-DRR implementation. The concepts are the measure to reduce flood damage by considering the entire river basin as a single basin and having its stakeholders work together to reduce flood damage.

There are four objectives of MRC; (i) Focus on the flood control function, (ii) Allow a certain level of flooding, (iii) Minimize damage (ex. saving lives), (iv) Restoration of natural environment and reconstruction of living environment. However, considering the Ramsar Convention resolutions discussed in the previous chapter, it is not a new concept. These objectives are by no means new concepts and are all included in the resolutions of the Ramsar Convention, as discussed in the previous chapter.

What is the significance of the MRC without a new concept? There are two expected effects. One is that Japan is a country which does not have a wetland conservation law, so this project will opportunity to prepare for and implement natural disasters in people's daily basis in advance by utilizing watershed flood control related laws and ensuring the implementation of green basin flood management. Another is Since the project is being implemented so that all people can participate, specific initiatives can be cited to ensure that people can continue to live in the area after reconstruction. This, in turn, will help ensure the implementation of environmental treaties.

The implementation of MRC is not only a way to prepare for natural disasters, but also a way to restore an area after a natural disaster and to ensure that future generations will continue to use the area.

[4] See, https://www.midori-lab.pu-kumamoto.ac.jp/

4. CONCLUSIONS

This study examined the roles of environmental treaties for sustainable lake management through UNFCCC, CBD and Ramsar Convention and relation between sustainable lake management and natural disasters from legal aspects.
It is claear that a number of resolutions and guidelines have already been adopted in environmental treaties. However, the issue is that adopted guidelines are not fully utilized. One of the idea for solve the issue is to ensure implementation of guidelines. Periodic and continuous review of wetland management at the site is also necessary. Due to solid implementation of wetland management in accordance with the guidelines, strengthening the role of NGOs and NPOs are also essential. Furthermore, the guideline should be used after localized. Re-revise the guidelines for locals suitable for their own area, the locals could understand and accept the content. If they are still difficult to implement the guideline if there are any inquiry of the content, then locals request to the government or specific branch based on the article6(3) of Ramsar Convention[5]. Based on legal grounds, locals can take proactive action.
Talking about the sustainable lake management in relation to natural disasters, the synergy relationship among treaties is necessary. Though, the importance of cooperation of environmental treaties has been repeatedly pointed out since 1990s, to achieve this point, the process leading up to the adoption of the resolution must also be taken into consideration, not just the content of the resolution adopted.

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[5] Article6(3) states that the Contracting Parties shall ensure that those responsible at all levels for wetlands management shall be informed of, and take into consideration.

TITLE

COLLABORATING FOR THE HEALTH OF THE AFRICAN GREAT LAKES: A SPECIAL SESSION AT THE WORLD LAKE CONFERENCE 2024

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Freshwater lakes are among our planet's most precious resources, providing sustenance, biodiversity, and livelihoods to millions worldwide. Yet, despite their immense value, lakes face a multitude of challenges that threaten their health and resilience. At the 2023 World Lake Conference (WLC) on Lake Balaton, the African Center for Aquatic Research and Education (ACARE) held a special session focused on the African Great Lakes, which comprise 25% of the world's surface freshwater. The African Great Lakes are Lakes Albert, Edward, Kivu, Malawi/Niassa/Nyasa, Tanganyika, Turkana and Victoria. The session highlighted the African Great Lakes and extended into a discussion about challenges and solutions held in common for global lakes.

During the discussion, attendees zeroed in on freshwater challenges, focusing particularly on the African Great Lakes and other large lakes globally. Discussions revealed common issues such as fishery health, harmful algal blooms, plastics pollution, and the imperative need for sustainable land management. Compounding these issues is a lack of collaboration on transboundary lakes. A proposed solution is to promote regional cooperation, launch joint research and monitoring initiatives and establish transboundary management agreements, including a Sustainable Lakes Management approach, The group recognized that identifying challenges is the tip of the iceberg. Real-world change will only occur by developing and implementing a shared strategy with solutions that can be shared and scaled across borders.

The urgency of these challenges demands a shift in our approach to solutions. Entities working toward healthy and vibrant lakes must join forces to establish shared goals and strategies. While solutions like communication, education, and policy are crucial, they are not enough on their own. To accelerate positive action, we need to forge a new path—a path of collaboration, shared knowledge, and coordinated efforts across global lakes.

The key lies in unifying scientists, communities, and decision-makers behind common goals. This means changing values, behaviors, and laws to drive measurable actions that benefit lakes worldwide. It requires the formation of a global lake coalition—a collective force dedicated to the preservation and restoration of our lakes.

During the conference, attendees proposed a range of innovative solutions to drive forward collaborative actions that could be advanced by a global lake coalition:

- **Shared Goals and Strategies:** Develop a global lake coalition with shared goals related to financing, policy, and healthy lakes and communities. Offer and facilitate training in planning and implementing collaborative governance for effective decision-making to achieve the goals.
- **Communication for the Win:** Identify "low-hanging fruit" projects that are quick wins to demonstrate the impact of collaborative action. Achieve the wins and broadcast in clear, compelling language and visual formats to reach new audiences.
- **Momentum Building:** Adopt shorter success timeframes to maintain motivation and take time to celebrate successes along the way. Report back on progress along the way.
- **Health as Focus:** When needed, keep politics separate from lake conservation efforts initially, focusing on the shared goal of lake health. Later freshwater solution stages can unify policymakers, as shown in some parts of the world.
- **Societal Value:** Recognize the economic potential of healthy lakes and explore "functional areas" as business opportunities. Emphasize the return on investment generated by projects that enhance the vibrancy of our global lakes.
- **Water/Climate Connection:** Integrate water strategies and projects with climate action plans, and acknowledge the interconnectedness of these issues.
- **Education and Engagement Matter:** Prioritize education and use global models to guide success to ensure that water literacy, citizen science, and action for healthy water become a fundamental part of school curricula and community conversations.
- **Water Workforce:** Embrace interdisciplinary approaches and ways to connect with water workforce efforts to foster skilled job seekers in fields related to lake management.

By implementing these solutions and fostering collaboration on a global scale, we can pave the way for a future where our lakes thrive, supporting both people and the planet. The time for action is now, and together, we can make a real difference in the health and vitality of our global lakes.

TITLE

YOUTH POWER IN ACTION: DRIVING CHANGE FOR OUR LAKES

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BACKGROUND

At the 19th World Lake Conference in Balatonfured, Hungary, youth delegates from Hungary, Japan, Kenya, Uganda, and the United States came together to address critical issues affecting our precious lakes. Through collaborative discussions and shared experiences, these passionate young leaders highlighted key challenges and proposed actionable solutions to safeguard our water resources for future generations. The youth participants met together multiple times in the four months leading up to the World Lake Conference to understand each other's large lake issues and solutions and to prepare for the session.

HIGHLIGHTS FROM THE YOUTH SESSION

1. Tourism, Education, and Environment: Youth representatives from each country shed light on the current state of their respective lakes, emphasizing the interplay between tourism, education, and environmental preservation. From Lake Biwa in Japan to Lake Victoria in Uganda, they shared insights into their communities' unique challenges.

2. Identifying Issues and Causes: Pollution, climate change, invasive species and inadequate infrastructure emerged as common themes across the regions. From plastic pollution to eutrophication, youth identified the root causes and their impacts on the environment and communities.

3. Youth-Led Solutions: Despite the challenges, youth delegates showcased innovative solutions to address these pressing issues. Through their ideas and examples which included beach cleanup programs, education programs, and advocating for policy changes, they demonstrated a commitment to driving positive change in their communities.

4. Recommendations for Action: The youth delegates outlined concrete action steps to tackle environmental degradation and promote sustainable practices. From enhancing research on microplastics to promoting eco-tourism, their recommendations spanned education, policy, and community engagement.

ACTION STEPS

- Continued Collaboration: Youth plan to continue to meet regularly, fostering collaboration and sharing updates on their progress. This includes possible involvement in global initiatives such as World Lake Day and the International Coastal Cleanup.

- Community Projects: Each country would like to spearhead one or two community projects addressing local water issues. These projects may range from educational projects and campaigns to policy advocacy, empowering youth to make a tangible impact in their communities.

- Preparation for the 20th World Lake Conference 2025: Youth aspire to play a central role in the planning and execution of the next World Lake Conference. They would like to advocate for greater youth inclusion in the event, and ensure that their voices are heard on the global stage.

In summary, the Youth Power in Action session at the 19th World Lake Conference exemplified the potential of young leaders to drive meaningful change. By working together across borders and generations, these passionate individuals are paving the way for a more sustainable future for our lakes and communities.

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- International Lake Environment Committee Foundation (ILEC): Dr. Masahisa Nakamura, Walter Rast, Rika Okaji, Kiyoko Takemoto, Junki Nakai.

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1983
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