

LAKE GOVERNANCE DEVELOPMENTS IN LATVIA: LAKE LUBANS GOVERNING PROCESS STUDIES APPLYING GOVERNANCE SYSTEM FRAMING MODEL

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Abstract. The overall frame of this research was the governance process of surface water resources in Latvia, particularly, public lakes, to be studied by applying triple dimensional governance framing model of complementary dimensions of governance stakeholders, governance content and governance instruments. Studies were realized in the area of Lake Lubans, administratively located on the border areas between two municipalities of Madona and Rezekne in the eastern part of the country. Lake Lubans is the largest lake in Latvia, as well as the largest dammed lake in Europe, included in surrounding NATURA 2000 nature reserve territory as also nationally largest inland protected wetland complex (Lubana Wetland/Ramsar site, 2009). Case Study Research methodology was applied by approaching the study area not only as a nature protection area but especially as a socio-ecological territorial and human system, using in-depth semi-structured interviews in the surrounding areas/administrative territories with all main local-regional and also national stakeholder groups, as well as, applying document studies and territorial/objects' observations.

The National Nature Protection Agency's Latgale region branch as the legal administrator supervises all nature protection territories in the region and also the Lubana Wetland, which is still lacking statutory Nature Protection Plan for the area; and, due to very limited administrative capacities, Agency is to be oriented more towards cooperation with various other national and regional institutions from very different sectors, being organized under mainly two ministries involved – Environmental and Regional Development Ministry (nature, environmental, municipal and regional development sectors) and Agriculture Ministry (agriculture, forestry, fisheries, water infrastructure sectors), as well as, particularly, with many municipalities in the wetland area. But municipalities have to take into account also interests of local communities, the basic socio-economic development situation and possibilities, having also limited capacities, sometimes also approaches, which all is to be combined with strong nature protection requirements and limitations. This governance landscape requires co-relation of various and diverse interests and creates a rather fragmented and underdeveloped management of the lake. Lake water levels are fully regulated by the national Water infrastructure agency using dams and other hydro-technical systems, while water areas are used not only for highly popular angling, but also for active commercial fishing and various recreational activities, tourism, esp. bird watching etc., thus also keeping strong nature protection status in the same time, which all represent a unique challenge for to be developed multi-stakeholders and socio-ecological system (SES) approach for lake governance (assessment, planning, collaborative management, monitoring, and communication) developments in Latvia and alike.

Meanwhile, even having in general cooperative inter-institutional communication, the overall lake management puzzle has been neither participatory discussed and planned, nor envisaged, and, esp. local stakeholders have not been really involved in territories nature protection and lake development planning and management, disregarding also SES approach. In perspective, both municipalities have a quite developed local self-management and communication action approaches and experiences for the Lake Lubans area, particularly for tourism information/communication and management; however, Lake Lubans as a very capable socio-ecological local-international resource has been yet viewed quite superficially in municipal development planning and legislation due to strict nature protection regime. It was found, that particularly nature communication (as complementary information, education/training, participation, nature-friendly behaviour) and also nature tourism is to be seen as not only just still potential lake/nature governance sectors, but if pro-actively approached and to be collaboratively and complementary developed as effective lake governance instruments, keeping as preconditions, involvement and participation of local inhabitants/stakeholders with also normative-fiscal support frame by governmental agencies. This approach and application in the practice of triple

dimensional governance framing model shall facilitate structured lake governance system in order to both protect the lake and stimulate developments of local communities that have been historically dependent on it.

Keywords: Lake governance, Lake management, water management, protected areas, wetlands, sustainable development.

JEL code: Q01, Q25, Q56, R58

Introduction

Previous research done in this field in Latvia has focused mainly on nature/environmental protection, but little on governance as a whole system, and this research has highlighted that Latvia's environmental governance system is still very underdeveloped, with one of the most important areas of environmental governance – communications – being insufficiently studied and utilized, hampering the effectiveness of the entire system, especially the water governance sector, which is one of the least developed environmental governance sectors in Latvia. Research in lake environmental governance appears more consequently starting around 2010, more actively in 2015 when there appear more studies on the effectiveness of lake and river governance in the country, only further confirming the issue of underdeveloped environmental communications systems and insufficient support from the national government in environmental governance.

The authors have previously studied the topic of both, lake governance effectiveness in Latvia, and, methods used by the primary performers of environmental governance in the country – local municipalities, who, by Latvian law, are responsible for the governance of public waters. This, however, means the governance of only a small portion of all lakes of the country (roughly 220 out of more than 2300). Even so, municipalities have limited resources, specialists, or the management capacity to properly govern all public lakes within their boundaries, and they have no authority over private lakes (which are entirely the responsibility of their owners). This is further affected by the limited use of communications instruments by the municipalities, such as public media, in order to inform and educate their inhabitants about lakes and their governance. The municipalities, as a result of their limited resources and varied situations regarding their lakes, developed five different approaches for lake governance: a utility management approach, in which lakes are governed by municipal utility structures; an environmental/natural resources management approach; a water sector management approach, a non-governmental sector management approach, where lakes and public waters are managed by NGOs either established by the municipalities or the local inhabitants and a combined approach, which uses two or more previous approaches to govern their lakes. While the combined water resource sector approach was noted to be the most effective, all of the studied municipalities had considerable difficulties in managing their lakes, and have underdeveloped communications instruments to properly implement governance of their lakes and other public waters.

The overall framework of this research was the governance process of surface water resources in Latvia, particularly, public lakes, to be studied by applying **triple dimensional governance framing model** of complementary governance stakeholders, governance content, and governance instruments' dimensions. The goal of this research was to investigate Lake Lubans (nature protection territory based on regional up to international impact having public lake) governance system if any, and also, the possibility of using mentioned governance model as the Environmental Governance Outlook (Review) adapted for lake and public water management in order assess, overview and communicate Lake Lubans governance status to improve the effectiveness of municipal lake governance, by allowing municipalities to identify their available resources, to recognize what resources are in shortage, what are the main goals of lake governance and who are the main stakeholders for lake governance in their territory. These reviews would serve as a support instrument for municipalities for governing their lakes, as they would allow municipalities to more

clearly discover their strengths and weaknesses, allowing them to develop lake governance plans in accord to their actual abilities and resources (Ernsteins et al., 2017a).

Currently, Lake Lubans is the most altered lake in Latvia as a result of human activity, as the lake is completely dammed and its flow and runoff are fully controlled by locks and bypasses. Since its closure, the lake has shrunk considerably, and most of its former territory is covered by the Lubana wetland. Lake Lubans is the largest lake in the Republic of Latvia, as well as the largest dammed lake in the European Union. The area of the lake is 82.1 km² (80.70 km² without islands). The lake is located in the Lubana plain on the border of Rezekne and Madona counties. Lake Lubans belongs to the Daugava River water basin. Lake Lubans has a shallow shore, muddy bottom, clayey or rocky in places. The Rezekne and Malta rivers flow into Lake Lubans, the other former estuaries of the lake are diverted from the lake by a bypass canal. The lake's only outflow is the Aivieskte River but realized by locks and canals. Previously, the area of Lake Lubans basin was 6650 km². The flow of the source is 250 m³ / sec, as well as it regularly floods, covering most of the Lubana plains. The lake was formed around 15,000 years ago, and its territory has been inhabited since ancient times, as some of the first settlements in the Baltics were established in the Lubana region. The fertile lands of the plain of Lake Lubans, as well as the rich abundance of fish in the lake, have attracted the inhabitants since ancient times.

The lake is managed by several organizations, including Madona and Rezekne municipalities, the Department of Real Estate of the Ministry of Agriculture, which manages the hydraulic infrastructure; Nature conservation Agency as Natura 2000 territory main protection and management institution; The Regional Environmental Board, which is responsible for protected areas, as well as the State Forest Service, which is responsible for the regional forest board. These organizations manage their related issues and all shall work together to manage the lake. Although Lake Lubans is the largest lake in Latvia, the development of a management plan for it was started only in 2021 (as a part of the Lubana Wetland Complex planning). Given the complex, fragmented management of the lake, the natural values, and the unique role of the local communities, effective management of the lake is essential – it is important to assess the management of the lake as accurately in the complex socio-ecological system (SES) approach and from the perspective of both the local population and the all-professional interest groups. The investigation of the governance of Lake Lubans would also serve to improve the governance of the wetland complex as well, as it is the primary object of governance in the region. The complex itself was formed in 2009 by merging more than 12 smaller protected areas, including the Salas swamp and the Nagli and Idena ponds. The complex had protection rules and regulations, but did not have a unified governance plan, which has made it difficult to govern its territory, including Lake Lubans, which is part of the wetland complex. The regulations are strict enough that it has hampered economic activity and development of municipal territories, in addition to preventing important tasks such as sanitary felling in protected areas. Most of the issues with Lubana governance are caused also by the lack of a governance plan for the entire wetland complex.

The academic literature in Latvia related to this lake governance topic is very limited, as lake management in Latvia has been studied primarily from the perspective of natural environment protection, rather than as a socio-ecological system (Veidemane, 2020; Konkovs, Ernsteins 2020). Internationally, greater interest in this area is motivated by more serious environmental problems - agricultural pollution, the impact of industry on surface waters, the shortage of drinking water, the drying up of lakes, etc. (Blenckner et al. 2009). Given that the European Union has adopted a "Green Course", Latvia, like the other EU Member States, will increase its support for environmental management in order to achieve its goals, including improving the management of water bodies, which is Latvia has already gradually started to improve its surface water management, starting with the launch of the LIFEGoodWater project, which

has already yielded good results. Research on Lake Lubans management was started within the framework of this project (2021-2022).

Methodology - case study research frame

Lubana lake region was selected for this research, as it is the largest lake in Latvia and the largest dammed lake in Europe whose water levels are fully regulated using dams and other hydro technical systems, and lake is broadly used for commercial fishing and angling, various recreational activities, also bird watching and, overall nature protection as it is part of NATURA 2000 territory, that all represents a unique challenge for socio-ecological lake governance (assessment, planning, collaborative management, monitoring).

The tasks of this research were to recognize the main activities and interests of all administrative level and sector stakeholders, and to study the complex governance problem situation of the Lake Lubans, applying the SES approach and governance instruments based analysis frame (triple dimensions of the governance) and case study research methodology, in order to develop a **lake governance review framework** in order to have the comprehensive background to streamline and improve current lake governance fragmented system.

In particular, the study was designed around mentioned **triple dimensions of the governance**, starting with the usage of a lake **governance instruments dimension**, a framework consisting of six complementary types of instruments meant to be the mandatory bases for establishing and functioning of necessary governance system (Ernsteins et al., 2017a; Konkovs, Ernsteins, 2020), performing analysis of the instruments available for the lake governance at the various administrative levels in Latvia - policy and legislation instruments, planning, institutional and administrative, economic and financial, infrastructure and technology, and also communication and collaboration instruments. Besides this instrumental dimension, there were started to study also the other two governance process dimensions – the **governance content dimension**, being based on a socio-ecological systems (SES) approach, and the **governance stakeholders** (interest groups) **dimension** (Ernsteins et al., 2017a; Ernsteins et al., 2017b).

Representatives from five interest groups were interviewed - representatives of national level government institutions and their regional branches, local and county level municipal employees and decision makers, mediators (including NGOs, educators, local experts/scientists), local business sector/entrepreneurs, and, also selected number of 20 active representatives of the local population living at the shores of the lake. A total of 72 persons representing these groups were interviewed, actually, all those directly interested in the management of Lake Lubans, including all persons from professional interest groups (except national level) were questioned also as private persons, being part of the local/county population. Relatedly, also the main governance sectors were studied, according to local and lake region specific, including nature/environmental protection, socio-economic, regional/municipal development, fisheries, hydro infrastructure and aquaculture, agriculture, forestry, recreation, and tourism.

The study was developed by the University of Latvia, Environmental and sustainability governance research group in cooperation with Ilze Zvers, an expert from the Lubana Wetland Information Centre, and, the research was part of the EU LIFE project "Implementation of Latvian River Basin Management Plans for Achieving Good Surface Water Status". In the course of the study, realized as case study research, the document studies, deep semi-structured interviews with all main stakeholders' representatives as well as observation studies as site visits were performed.

Document studies. Both national and local government documents related to Lake Lubans were examined in the study. It included the public order regulations of Madona and Rezekne counties, the regulations for the operation of the lake's hydraulic infrastructure, the decrees of the national Cabinet of the Ministers, due to which the wetland nature reserve was established, as well as the lake management and nature protection as such. Territorial management plans, regional territorial planning, and documentation related to regional development were also examined. The governance plans of the protected wetland territories and the in-development wetland complex governance plan were also investigated, as well information from the previous research projects done in the area, including the so-called 'Japanese Project' which was carried out in the 2000s.

Observation studies, particularly, visited lake coast objects and territories. Within the framework of the research, the territory of the municipalities around Lake Lubans, tourist objects near the lake, as well as the accommodation nearest to the lake were surveyed. The tourist information centres and museums of Madona and Rezekne counties were also surveyed to find out more about the available information for locals and tourists on Lake Lubans and the wetland complex. Among the objects visited there were nature trails, the only lake beach managed by Rezekne municipality, as well as the Nagli fish farm- one of the biggest in the country, and the hydro technical infrastructure of the lake which is also considered, to have an important role in the maintenance of the lake.

Interviews. 45 Face-to-face interviews were conducted by visiting specific organizations and institutions in Rezekne and Madona counties, as well as, particularly in Nagli, Gaigalava, Barkava, and Osupe parishes. While conducting-face-to-face interviews, the research team visited a number of research-related sites. The research questionnaire was initially tested and the interview process was as follows. Pilot and framework interviews were initially conducted. Subsequent face-to-face interviews were conducted. After the face-to-face interview, 27 remote interviews were conducted, including short express interviews in time frame of 10-15 minutes. On-site interviews were conducted using the questionnaire, which consisted of 4 main thematic blocks: Introduction and personal profile as a representation of interest groups, where the lake is seen as a socio-ecological system and, subsequently, to interview individuals both as a target group for the population of the regions and as their professional target groups and all in all 5 main interest groups/clusters were covered; The values of Lake Lubans and the inhabitants of the surroundings/counties - an overall assessment of the situation based on the views and attitudes of the people towards the lake; Management problems of the Lake Lubans specifically, and, finally, Lake Lubans Management in general - for all six groups of governance instruments, also core governance thematic sectors and governance interest groups combined.

Research results and discussion

Lake governance, like other forms of governance involves the implication of three dimensions – governance content, interest groups and governance instruments (Ernststeins et al., 2017a). Content presents an outline of what is being governed and why. It includes information about the area and objects that are being governed, and what sectors are being involved in governance. The sectors of governance are the socio-ecological system areas that are involved in governance, such as water resources, education, and others. The sectors vary between the governable object and areas. Lakes and other bodies of water are a socio-ecological system, and as such, they are never purely a nature protection topic, but influence also economic and social areas as well. Interest groups include those who are involved or interested in the governance of the lake. These groups consist of local residents, municipalities and other groups that directly or indirectly would benefit or would be interested in lake governance. Governance instruments are used in

order to govern the area and they represent six major groups: political and legislative, institutional and administrative, policy development and territorial planning, economic and financial, infrastructure and technological, and, communication instruments. There are also complementary integrative collaboration instruments that are used to link and coordinate the other groups of instruments.

1. Lake governance content – SES frame for necessary cross-sectoral overview and cooperation

Environmental/lake governance content explains what is managed and why it is managed; and, in the case of Lake Lubans, the lake is the main object of administration and full scale and spectrum of governance, but its complex hydrological system, which has been strongly influenced by human activity, inevitably includes the governance of the territories and infrastructure attached to it. It is now necessary for lake managers to decide on the content of lake and surrounding areas governance, as not knowing what and why to manage the lake has significantly hampered the development of governance plans and everyday living and working practice, making current governance inefficient and chaotic, potentially deteriorating rather than improving the lake's environment. Much of this is caused by the lack of a unified wetland governance plan, which is only currently in development and is not going to be available until 2023.

Lake Lubans governance is a very complicated case compared to other lakes in Latvia, especially those with protected values or increased eutrophication. Lake Lubans is part of a NATURA 2000 wetland nature reserve and does not have a special governance plan. As a result, it is not clear what needs to be protected or why and this significantly hampers its governance. This factor is also facilitated by the fact that the lake and the areas adjacent to it are subject to a number of restrictions, which may have been unjustified since adopted before the protection plan was drawn up. Currently there is organized management of fish stocks and coastal areas in Lake Lubans, but they are severely degraded, due to overfishing and the deterioration of the lake's environment. For the time being, the content of Lake Lubans governance consists largely of three main basic elements or content clusters - tourism and recreation, other/main economic activity (primarily fishing and also agriculture), and nature protection, which are the dominant of the three.

However, socio-ecological systems (SES) governance shall include and balance many more sectors (Ernsteins et al., 2017a) in order to achieve the desired sustainability governance result. Subsequently, besides main nature protection sector as for mainly being NATURA 2000 territory, there shall be studied the whole spectrum of economic sector in general and particularly tourism sector, also its particular interrelation with recreation sector for both local inhabitants and guests, and at least also culture and social sectors in general, particularly, education, and the local/regional governance sector itself. These basic SES approach-based sectors are further subdivided, working particularly with those being important for the governance of this lake and, surely, also for local communities. The governance sectors involved in Lake Lubans governance are: The Governance sector, The Nature protection and natural resources sector, Economic sector, Fishing sector, Agricultural sector, The Forestry sector, The Aquaculture sector, the Tourism sector, Hunting sector, Angling sector, Education sector, Recreation sector, Bird watching sector, Culture sector, Waste management sector. These sectors are shortly described according to information gleaned from interviews. Each of these sectors are crucial for 3x governance systems to be effective.

The **Governance sector** includes all areas of governance and their performing organizations. It includes the municipal governments and their departments, national governance agencies, in addition to (in the case of Rezekne municipality) Citizens' Advisory Councils, that serve as intermediates between the municipalities and the local residents. There are also dedicated NGOs and investment groups created/involved in governing the lake, such as the Lubana Wetland Fund. This sector is the primary sector

regarding lake governance in the case of Lake Lubans, as it includes the municipalities and national institutions that govern the lake. This sector also includes municipal development projects and plans, but these are only indirectly related to governing the lake. This sector is largely dominated by municipalities, as funds and NGOs that were initially involved in this area have largely become dormant, their functions being taken over by municipalities.

The **Nature protection and natural resources sector** includes all protected nature values, and protected areas/objects, including the lake itself. This is currently the most important sector of lake governance, as the lake is currently managed directly from a nature conservation perspective, while other areas are less involved due most of the regions territory being part of the Lubana Wetland complex, and as such is subject to strict nature conservation regulations. According to interviews, the restrictions placed on the area have affected the local economics and were placed before there was a development/usage plan for the preserve. This sector faces the issue of lake overgrowth, which is particularly severe for the Madona side. And areas around the lake are subject to transformation into swamplands.

The main issues of this sector are water pollution in protected areas, which is largely caused pollution from the Rezekne river, lake overgrowth with reed, hogweed infestation, and flooding – while the lake damming has greatly reduced the frequency and severity of flooding, it still occurs, especially when the sluices of the dams are damaged during storms or similar events. Protection of endangered birds is also an important topic, as the wetland complex reservation was created for the purpose of protecting rare birds. This sector is represented by the Nature Conservation agency, but it also regulates fishing in Lake Lubans, a hunting logging in protected areas, which overlaps frequently with the State Environmental Services.

The **Environmental protection sector** is of the primary sectors of Lake Lubans governance. The environmental protection sector is responsible for governing natural resources and regulates fishing, hunting and angling, in addition to combating littering and illegal waste dumping, in addition to limiting water pollution from the Rezekne River. This sector plays a crucial role, as the lake is part of a nature reserve, and as such effective and careful usage of natural resources is very important. This is also the sector that causes most issues with local interest groups, such as farmers, as environmental protection regulations have severely limited economic activity in the region, and makes it difficult to develop local municipalities. This sector is primarily represented by the State Environmental Services, but their duties in protected areas overlap with those of the Nature Conservation agency. The Waste management sub-sector is important in Lake Lubans governance, as the lakes coastline is subject to littering, and some interviewers have noted the presence of illicit dumpsites in forests and near the lake. This is a serious problem, as the garbage can pose a threat to local wildlife and inhabitants due to contaminating fish in the lake with toxic substances and microplastic. This sector is not sufficiently investigated, represented or involved in lake governance issues. Local municipalities however regularly perform waste collection campaigns, and recycling bins are found near the Wetland Information centre, and in village centres. This sector is linked with the Environmental protection sector and the nature protection sector.

The following to mention after tourism sector is to be closely related **Recreation sector**, including all the ways and places where local residents and visitors to the lake can relax and enjoy nature and cultural values in different ways. This includes the beach (limited options due to the coastal specifics, just one official beach), nature trails, swimming, as well as berry picking, hunting, fishing, outdoor walks, etc. Locals and visitors to the region relax almost equally, only difference being that visitors are more likely to visit museums, guest houses, and nature trails, usually in the summer, where local residents do so all year, in addition to having their own swimming areas closer to their homes. This sector is closely linked to the nature protection sector, as most of the sites near the lake (and the wetland complex as such) are directly

related to natural values and their use, including bird watching. This sector is not well developed, because in general, both local residents and visitors to the lake do not have much to do at the lake, which is one of the main shortcomings. This problem is especially pronounced during the winter season when most of the sights and attractions are not available and one can relax mainly in the nearest towns. This sector is rather limited due to a lack of recreation places for both visitors and residents, as there are not many swimming areas, especially at Madona coast, there are not many nature trails and most possible recreation areas are not available during winter. Local residents often noted this problem, and the lack of recreation places also limits options for attracting tourists. Tourists have somewhat more options at guest houses, but most of these options are not available in winter, including bathhouses. The two most important subsectors of the recreation sector are the angling and hunting sectors, as these are two of the more popular forms of recreation for local residents.

The **Angling sector** is one of the most important sectors in Lake Lubans governance, as the lake is very popular with anglers, and a large number of local residents are anglers. Anglers are active in the region during the entire year, and fishing ponds near Nagli and Gaigalava are visited by anglers as well. Anglers however are not sufficiently represented or involved in governance planning. Anglers also have conflicts of interest with local fishermen, and many anglers that visit the region from other municipalities also litter the lake coastline with garbage, which is real problem. The **Hunting sector** is represented in Lubana lake governance, as the region is popular with hunters because of forests, wetlands and the regions sparse population. Wildlife is abundant in the region, and includes foxes, wolves and bears, in addition to deer and elk. Most of local hunters are part of hunting clubs, but hunters from other regions also visit the region. This sector is poorly represented in lake or wetland governance, and is not sufficiently involved in governance as well. This sector is also poorly regulated due to the lack of personnel. Local hunters hunt water birds in the region, but only seasonally due to restrictions, and this prevents hunters in helping farmers protect their crops from geese.

Subsequently, next sector to emphasize is the **Tourism sector** is as closely linked to the nature and recreation sectors, as it includes nature trails, recreation areas, as well as accommodation for their visitors. Although this sector is important, it suffers from a lack of facilities of any kind, as visitors to the lake can explore the area in one day, as a result tourist rarely stay at the lake for long periods. It is closely linked with the recreation sector and shares most of the same issues. During the interviews it was discovered that there is a limited number of accommodations near the lake area and that visitors are rather uncommon during winter – tourists visit the lake and the wetland only during summers when nature trails and the beach are available. Some resting places are not open during winters, such as the water tourism development centre "Baka", which is closed during winters. More developed recreation centres are not near the lake, but rather closer to the wetland or major population centres. The tourism sector is built around nature tourism, while other forms (cultural, culinary) are less noticeable in the region on the Rezekne side, while cultural and culinary tourism is more practiced on the Madona side.

The Bird Watching sector is important regarding Lake Lubans governance, as the Lubana wetland complex, which includes the lake, is home to various rare and endangered species of birds, including the Little Eagle and others. Migrating birds regularly use the wetland as a resting and feeding spot, and water birds such as geese live in the wetland complex during summers and springs. As a result, the wetland complex, including the lake, are popular places for bird watching, with bird watching towers (one in Madona, five in Rezekne municipality) being found in the wetland, and bird watching is popular among local residents, with Rezekne being the location of a branch of the Latvian Ornithological Society. However, birds often cause harm to farmland, destroy crops and deplete stocks of fish young in local fish farms. This group

is also is not properly represented or involved in regional governance, and frequently have conflicts of interest with local farmers due to bird-caused damage. Bird watching is linked to tourism, as many visiting birdwatchers are tourists. The wetland complex was originally created for the purpose of protecting endangered birds, and bird watchers have a dedicated 'base' in one of the guest houses in Nagli municipality, where there is a bird watching information centre.

The **general social sector** includes areas such as welfare, social support structures, education, and other societal issues, including culture. This includes also the involvement of youth organizations, and special interest groups related to social issues such as care for senior citizens. The Educational sector forms a part of this sector. This sector is only indirectly involved in lake governance, as it serves as an intermediate for other sectors. It also includes what homes the local residents are living. Most of the local residents live in private homes or farmhouses, as the area is sparsely populated, and most of the local settlements are villages with less than 500 inhabitants. Despite the limited population, the area has various public events, reasonably developed social infrastructure, and support for residents. The two most important subsectors of the social sector regarding Lake Lubans governance are the Culture and education sectors, as these are more involved in governing the lake and adjacent territories.

The **Culture sector** studies gave a necessary overview of the culture-historical environment and process, also particular human relations with Lake Lubans traditions/customs and experience content taking into account nowadays activities of culture and community centers/houses, local cultural events such as town/village, fisherman/river festivals and other activities, e.g. fish culinary, archeologic heritage (ancient settlements), also the village of Idena is to be mentioned as the only inland fishing village in the country with its unique lake area cultural significance, also mentioned being also part of tourism/recreation sector. Also, there were noted in the interviews various activities related to fishermen life, river Aiviekste role in people's lives, traditions related to local lake cuisine, fish drying or smoking, also wedding, that have been preserved from the times when the lake was not crucially human-influenced.

The **Education sector** includes a necessary overview of the education process and also content into its relation to the lake and region around it, taking into account the system of schools, museums, education clubs, and their programs, as well as related infrastructure and staff. This is an important sector for environmental education programs and for promoting environmentally friendly behaviour among children and young people. This sector was however only partly involved, as the lake itself was not a topic in local schools, and while there are two Eco-schools in the region, they are focusing on the environment as a whole, rather than placing focus on the lake. Interviews revealed that this sector is actively involved in nature-related activities, as schools organize field trips to the lake and wetland, and that almost all of them have nature and environment-related activity groups for students, in addition to the two eco-schools.

The **Economic sector** includes all economic activities, both private enterprises and public corporations, which are involved in the exploitation of the natural resources of the lake and its surrounding areas. These include agricultural enterprises, forestry enterprises, fish farms, commercial fishermen, tourism and leisure enterprises, and retail enterprises. This sector is important because it provides a large share of income to municipalities, and is one of the sectors most affected by lake governance. The economic sector is hamstrung by various regulations and restrictions placed on the lake and its surrounding area for the purpose of nature conservation. The area of Lake Lubans was, according to interviews, more economically active before the regulations, as they have greatly limited all forms of economic activities, including fisheries. There is also limitation of potential investments, as most local businesses have difficulties developing on their own resources. The primary subsectors of this area are fishing, agricultural, forestry and aquaculture sectors, as they represent the primary sources of income for local residents.

Particularly, the **Fishing sector** is to be analysed, including everything related to commercial fishing, in addition to fish farms. Traditionally this sector was the most important regarding Lake Lubans, but the damming of the lake, in addition to the various nature protection-related regulations, has greatly reduced its importance. Most people no longer have time or interest in fishing, and those who do are not capable to involve due to restrictions and quotes in this sector. As a result, Lake Lubans now has only a single fishing village, where decades ago it had many. Interviews confirmed that fishermen rent nets from the municipalities based on length, with the average fisherman having at least 500 meters of nets. In total, the available net length is 17 kilometres, and there are around fifty fishermen in the area. Anglers have fewer restrictions, but it needs to be considered that most of them are not locals. The **Aquaculture sector** is one of the most important governance sectors regarding the governance of the lake, as this sector includes two large fish farms that operate near Lubana lake – the Nagli fish farm, and the fish farms that are owned by Ltd. 'Vlakon'. Both of these are important for local municipalities as they provide jobs and income for local inhabitants. Most of fish farms are located in Nagli municipality, as this municipality was the site of a major Soviet-era fish farm, and the municipality grew around it. Currently, only a portion of fish ponds are in use, as some have overgrown, while others are now in protected areas, and are no longer in use. This sector is not sufficiently involved or represented in lake governance, and is not adequately supported by the government, and as such, has lost much of its former productivity. This is of several issues that are not sufficiently addressed in regional governance by local municipalities.

The **Agricultural sector** is one of the most important sectors in the management of Lake Lubans, as much of the land acquired by damming the lake is used for agriculture. This sector also generates part of the organic pollution that causes the lake to overgrow. Most agricultural land is owned by large-scale farms, but livestock farming and less traditional forms of farming (strawberry farming, sheep farming) are also practiced. Small farms also exist, but mainly on the Rezekne side. The Madona side is dominated by large farms. The agricultural sector is significantly affected by the flooding of the lake, which, although no longer regular, is devastating enough. The damage caused by birds and the spread of hogweed also pose significant problems, but farmers do not receive enough support or help from the government and are forced to deal with these problems on their own. There were more farms in the region than now, but since the floods of 2017, many farms have ceased operations. On the Rezekne side, more than 100 farms have gone bankrupt in the last five years.

The **Forestry sector** is another management sector in Lake Lubans. This sector is managed mainly by the Latvian State Forests, in co-operation with the State Forest Service as a supervisory body. There are also several private forestry companies in the area. This sector is relatively inactive, as a large part of forest land is located in protected areas, as a result of which it is not managed. Forests that are subject to regular development are located outside protected areas but are subject to 'gaps' in the clearing and are therefore either over-felled or under-felled. This sector is also responsible for part of the nature trails, including the Teirumnieki nature trail, and is involved in environmental education, but is not sufficiently taken into account in the management of the lake (or wetland). Part of the forest area near the lake is regularly flooded and turned into a bog, which is one of the causes of the lake's overgrowth.

As for the summarizing study results about the **first lake governance dimension** – main lake governance sectors – there shall be recognized, that the nature protection sector currently dominates, particularly, since 2009 when a complex wetland nature reserve was established connecting smaller nature protection territories in the area, while the economic and recreational sectors are less developed and involved. The tourism sector is as underused and underdeveloped as these sectors, due to being closely linked to them and having similar issues. The social sector was similarly underutilized and underdeveloped

and involved in lake governance very superficially. There are disagreements and conflicts in the content of the governance of the lake, as well as with the governance groups involved in its governance, about what would be more important in the case of Lake Lubans, and it is difficult to find unifying elements so that these parts of the content can be combined. The natural resources of the lake and the services provided are well known to its governing bodies, but there are some difficulties in finding efficient use - the overgrowth of the lake provides a large number of reeds, but it is not known where to use them. Potential uses would be biofuels and fertilizers, but there are no companies in the region that would be interested in using them. At the present, the content of the Lake Lubans governance is built around nature conservation, rather than anything else, as the absence of an actual governance plan prevents the development of the lake and its surrounding area, or develop the local municipalities and their economics. Other sectors are linked to the nature conservation and resources sector, as it influences all other areas of content. Because most of the area is a nature preserve, and as a result, the region is largely made of wetlands, forests, and farmland, the nature sector is the primary focus, while other sectors depend on it. The absence of a governance plan only further cements this, as it prevents developing or using the region's resources or territory in any meaningful way.

2. Lake governance interest groups – further necessary recognition and involvement

Governance interest groups are all the interest groups that would be involved, interested, or potentially interested/involved in the governance of the lake. Traditionally, we do recognize five major governance interest groups or segments (Ernsteins et. al., 2017a): state governance and local governance segments, corporate segment, mediators' segment (includes all the mass media representatives, formal/nonformal system teachers/educators, NGOs, information centres, cultural institutions, also libraries and museums etc.), and, particularly, the local residents/households. In the case of Lake Lubans and other nature protection territories, we definitively need to mention and consider also the segment of tourists/visitors, from regional to national and international interest as well. Each of these major governance segments needs to be seen in every detail and specific as representing often not only many and various subgroups, but those with contradictory interests etc.

The **state or national level governance segment** includes governmental institutions and organizations directly involved in nature and environmental governance, including the Nature Conservation Agency (NCA), responsible for the direct governance of the nature reserves of the lake and wetland complex, and, the State Environmental Service (SES), representing the Ministry of Environment and Regional Development, but it also includes the Real Estate Division of the Ministry of Agriculture, which manages the lake's water infrastructure and water flow, making it one of the key players in this governance group. During interviews, it was discovered that these structures are sharing the main responsibilities regarding lake governance, as other state structures are involved very indirectly, but all this could not be recognized as a joint lake governance system. The Agriculture Ministry is not actually involved in governing the lake itself, just the hydro-technical infrastructure. Other state structures are very indirectly involved, but take part in planning work. Other structures formally being part of the governance of the lake include the State Forest Service and the state-owned capital company "Latvian State Forests", Rural Support Service, and the Latvian Rural Advisory and Training Centre. Most of the state structures that manage the lake or are involved in it represent their regional structures, as the lake is located between Vidzeme and Latgale planning regions. These national level segment institutions are to be intended not only for communication but eventually for real cooperation with municipalities (local government groups) as municipalities have comparatively more resources and personnel, even still very limited, for practical

management activities. Regarding Lake Lubans governance, this segment is one of the most important, as actual governance of protected areas and lake hydro technical infrastructure is under the jurisdiction of national government structures.

Local level governments as local municipalities, having also territorial administrative units (former small municipalities before administrative reform) are responsible for the governance of coastal recreational infrastructure, as well as most of the land around the lake and wetland area. Municipalities are also responsible for most of the road infrastructure, as well as being the main ones maintaining the lake, restoring fish populations, and acting as intermediaries between national structures and local people/businesses. The municipalities are not responsible for the hydro-technic infrastructure of the lake, as it is managed by the Ministry of Agriculture. Interviews revealed that municipalities are one of the primary groups interested in governing the lake, as they manage the information centres, maintain the beaches, and roads and serve as intermediates between local residents and business owners regarding issues such as fishing quotas and economic activity within protected areas. Following the recent administrative reforms, the municipalities of Madona and Rezekne are reorganizing themselves to include environmental governance and planning structures, but this task is not yet complete. Municipalities have difficulties developing the area due to the lack of a lake governance and development plan, or governance plans for the wetland complex. As a result, municipalities do not know what to develop and where. Rezekne municipality is more involved in lake governance, due to having the lake beach, and villages near the lake, while Madona does not. This is one of the other crucial segments of Lake Lubans governance, as municipalities are the ones that govern local infrastructure, and serve as intermediates between local residents and governmental structures. Municipalities are also responsible for issuing angling and fishing licenses, and rent fishing nets to local fishermen, and use the income from these activities to maintain the lakes fish population.

The **Corporate segment** interest group includes local businesses operating within the municipality and is related and/or dependent on the lake - including fish farmers, tourism businesses and local retailers. Agricultural enterprises are an important part of this group because after the lake was dammed, a large part of the acquired land became agricultural land. And for local farmers, the governance of the lake is important, because their lands are threatened by floods, as well as the damage caused by birds in the wetland. The region has a single fish farm which is important for both the local economy and lake governance, as it is involved in the recovery of fish populations. This group is involved in matters regarding economics, recreation, and tourism, but is poorly represented or supported. It also was not sufficiently involved in developing the wetland governance plan, and only some companies (Ltd. "Vlakon") are more actively involved in lake and wetland governance, since the company owns a guest house, fish farm, and is involved in repairing roads.

Local residents' segment is to be seen as the most important governance interest group involved in the governance of the lake, however, in reality, is not fully so, even most entrepreneurs and municipal employees, a number of national level administrators, are residents of the villages near the lake. The lake is important for the local residents because it provides a livelihood, recreation, and the villages by the lake have historically been dependent on it. The lake was therefore an essential element of their local culture. This group was, despite its significance, poorly represented in lake governance, and was not sufficiently involved in development and planning issues. It was underrepresented in developing the wetland complex governance plan. This group was also the most diverse, as members of almost all other groups were local residents, but not represented in planning documents as local residents.

Tourists and visitors of all types, visiting lake area are also an important part of the lake's governance interest groups. Lake Lubans is the largest lake in Latvia, and its beach is similar to the sea beach, which makes it a popular destination for vacationers. The wetland and its nature trails attract nature tourism enthusiasts, especially from the rest of Europe. Inland tourists also include anglers and hunters who go to visit the lake and its territory. Members of this group were not possible to find during the research, as tourists normally visit the lake during summers, but owners of guest houses or workers of tourism information centres were interviewed. It was discovered that tourists visit the region more out of interest in local culture, food, or nature trails, rather than the lake itself, as the lake is poorly represented in tourism information, despite being the largest lake in the country.

The **Mediator segment** interest group includes all the mass media representatives, formal/non-formal system teachers/educators, NGOs, also local experts/researchers, as well as locally important municipal institutions as tourism information centres, cultural institutions, also libraries and museums etc., all being intermediates between local residents and governance agencies and other governance interest groups. This group is one of the more important governance interest groups regarding Lake Lubans, as some NGOs were directly involved in governing the lake, or were involved in operating tourist information centres. The mediator group was largely not linked to the lake (or environmental) governance, as most youth organizations or NGOs are focused on local culture, recreation, municipal development, or social issues, rather than anything related to nature. Interviews revealed the existence of hunting clubs, angler clubs, and local development funds, but these were rarely involved in lake governance or development in any capacity.

As for the summarizing study results about the **second lake governance dimension** – main lake governance interest groups – there shall be recognized that interest groups have frequent conflicts of interest, which have prevented them from finding a favourable scenario for the development of the lake, or a compromise between them. Cooperation is also limited due to serious communication problems and lack of information. Interest groups related to the local population (including entrepreneurs) are not sufficiently heard, but there is an excessive division of responsibilities between state bodies and municipalities - each institution does its job and mutual problem-solving is limited. This has hamstrung the development of a lake governance plan and prevents governance to be effective. The majority of these groups were also not sufficiently represented or involved in development plans, including the wetland complex governance plan that places more focus on municipal agencies and nature conservation agencies rather than local communities. Most of these interest groups are linked, due to their members being local residents. However, only the local governments and national institutions are properly involved or represented in governance and development issues. Other groups have not been represented sufficiently, and are minimally involved in governing the lake, despite their significance.

3. Lake governance instruments – the complementary set for further development

Governance instruments are designed and used for governance process realization (Ernsteins et. al., 2017a) related with Lake Lubans by all interest groups and in all governance sectors and their interlinkage, including cross-sectorial governance. This necessary set of governance instruments includes six groups of instruments: political and legislative(laws and regulations), Institutional and administrative(municipal councils, national organizations, law enforcement organizations), policy and territorial planning (planning structures and documents), economic and financial(taxes, fines, investment funds, projects), infrastructure and technological(roads, sluices, dams, recreational infrastructure), and, last but not least, communication instruments (information, education/training, participation and action/behaviour instruments), in addition

to complementary integrative collaboration instruments, being instruments meant for the purpose of fostering cooperation and coordination between other groups of instruments and promote environment-friendly behaviour in local residents. These collaboration instruments include NGO`s and nature-friendly behaviour initiatives such as garbage collection campaigns (Ernststeins et.al., 2017a).

Political and legislative instruments include national and local legislation, regulations, as well as international legislation related to environmental protection, as Lake Lubans is one of the sites of the Ramsar Convention and Natura 2000. The case of Lake Lubans includes the lake hydro-technical infrastructure exploitation rules, regulations regarding economic activities near the lake, nature protection regulations, and Local government public order regulations, as they also include permissible behaviour in the vicinity of lakes and other bodies of water. This is one of the primary instruments groups regarding lake governance in the region, but it is also a cause for some issues, as it includes the various restrictions and regulations that impair the local economics.

Institutional and administrative instruments are those bodies responsible for direct governance - municipal councils, national environmental protection agencies, and ministries involved in the governance of the lake, also other national and local administrative bodies, as well as representation forms of main other interest groups to be involved and self-organized participating. In the case of Lake Lubans, these instruments include the municipalities of the regional type of Rezekne and Madona, and, their subordinated local admin structures as Osupe, Barkava, Gaigalava, and Nagli parishes, Nature Conservation Agency, State Environmental Services, the Ministry of Agriculture and their regional departments of these national governance agencies. This instruments group is the one that is most directly involved in governing the lake and is the best-known among local residents.

Policy planning and territorial planning instruments includes spatial plans, development strategies, and plans, as well as specialists and structures that perform planning work. In the case of Lake Lubans, these instruments are largely represented by municipal planning organizations and specialists from the regional departments of national governance agencies. These instruments groups focus more on the entire wetland complex, rather than the lake itself, but it does not include a governance plan for the region, which limits both the developing the area and effectively governing the lake.

Economic and financial instruments include fines, fishing permits, natural resource taxes, and investments from international and national sources. In the case of Lake Lubans, these are various municipal taxes, fines, and income from fishing and angling licenses, as they are used for the restoration of fish populations and general municipal infrastructure maintenance. Investments and other forms of these instruments appear largely superficially and are used to govern the lake only due to being used for the support of areas that are tied with the lake – such as for repairing the hydro-technical infrastructure. This group of instruments is not sufficiently used regarding lake governance, as these instruments are primarily used in regional and regional governance, rather than the lake itself.

Infrastructure and technological instruments include the lake's hydraulic infrastructure, including dams and polders, road infrastructure, and everything else that is used or related to the lake's governance, including beach infrastructure and bird-watching towers. The most important part of these instrument groups is the hydro-technical system of the lake, as Lake Lubans is the largest embanked lake in Europe, and this infrastructure is critical for its further survival – it no longer has natural water flow. Recreational infrastructure needs repairs and overhauls, the road network is limited and worn out, and there is a serious shortage of swimming areas or recreational objects, according to interviews.

Communication instruments group include all four type of instruments and are recommended to be applied complementary – starting from all type lake **information** instruments (esp. both municipal lake

information centres etc.), lake **education/training** instruments (eco-schools, youth camps, etc.), lake governance **participation** instruments (esp. lake/recreation/tourism-based NGO's), and also lake-friendly or so-called **pro-lake/environmental behaviour** instruments. Generally, at the lake Lubans, communication instruments represent more or less well all of these forms, with various youth organizations being involved and, particularly, local municipalities having their own newspapers and internet websites. However, there is a lack of information regarding the lake, or nature in general, which makes it difficult to inform residents and visitors regarding various issues with the lake or involve them in its governance. It was also noted in interviews that information is hard to find, as there are few informative booklets or similar items available for tourists, or maps containing information about natural objects, swimming areas, and other objects of interest. Most residents did not know about the new wetland complex plan, as information about it was not well provided. Collaborative instruments are also underdeveloped. These instruments include NGO's, environment-friendly lifestyle activities and similar practices, but most of the ones currently noticeable in local governance, or mentioned by the interviewed are only indirectly related to nature (or lake) governance. There are almost no purely nature or environmental NGO's in the region (except "Pie Kraujas" in Madona municipality, which was commissioned by municipality to take care of the Wetland information centre), and most of pro-environment activities are related to birdwatching, rather than lakes or water resources.

As for the summarizing study results about the **third lake governance dimension** – lake governance instruments – there shall be recognized, that all groups of instruments are at least partially, but not yet in the full scale, used for the lake governance, except planning and communication instruments are used considerably less. There are almost none active NGOs directly connected to the lake (or nature) in the region, also community involvement instruments are not yet well developed, even Nagli and Gaigalava local municipal administration units do have inhabitants' councils established. There is a lack of information for both local residents and visitors to the region about nature. The information available is mainly related to tourism and is not easy to find. The planning instruments have only been recently involved in lake governance, such as Lubana wetland nature protection plan is being developed for the entire Lubana wetland complex, including the lake, but it is only past the initial stage of development, and is going to be ready after a year. Other instrument groups are only indirectly involved in governing the lake, with the exception of the hydro-technical infrastructure, as the lake is treated to be part of the municipal territory, rather as a separate object.

General discussion and conclusions

Summaries and initial conclusions drawn here shall be seen now as issues for discussions, further necessary detailed studies and developments.

- 1) **Governance instruments dimension.** Lake Lubans and the whole wetland's nature protected area governance developments are limited and structurally hindered, due to **insufficiently developed initial governance preconditions** – underdeveloped instruments of administration and information. First of all, there are seriously limited administration capacities (staff, other resources, instruments). Then, related but not exclusively, limitations to find existing and general lack of information (incl. information stands, booklets/guidelines, web pages etc. instruments, nor their interlinkage, as well as, all type of statutory information to be easy found/accessible) on both the lake and its natural values, nature protection, even recreation, tourism too, and, altogether on the lake governance process neither for local/regional different target groups, nor tourists and visitors.

Even less developed and non-regularly applied in the lake region are the next, to be complementary used, instruments of lake/environmental communication and besides information instruments they are – education/training, involvement and participation, lake/nature-friendly behaviour instruments. Subsequently, necessary **next governance preconditions** as mentioned **action-oriented communication and general collaboration are restricted**. The remaining groups of governance instruments as political and legal, planning, economic-financial are in various stages of the development, but also could be seen as **obstacles for the lake governance**. Considerably different is the situation with infrastructure and technological instruments as for the case of largest dammed lake in Europe, however all lake infrastructure belongs to the different ministry, giving another glimpse for the fragmented landscape of institutions and organizations having some impact on the lake governance practice.

2) Lake governance interest groups and **governance segments dimension**: (I) are not formally top-down recognized and also well self-organized, also have difficulties in communication and cooperating, also have various views over local and regional development; (II) excluding county governments and national institutions, are not sufficiently involved in management work, as well as development planning. Wetland complex nature protection planning process does not really involves all stakeholder groups, and does not sufficiently include also socio-economical aspects; (III) There is a lack of cooperation and agreement between the target groups, even though most of the them have common aspirations (preservation of the lake, development of tourism), there is no common vision on how to implement it, especially among farmers and bird watchers.

In the process of developing the new Nature Protection Plan, not all target groups are sufficiently involved, such as the heads of the local administrations of the municipalities adjacent to the lake, active people in the vicinity of Lake Lubans, and fishermen, large scale farmers, etc. The values of the lake and its governance should be seen as a socio-ecological system in which the role of a man should be emphasized, especially for those who inhabit this area of Lake Lubans and the wetland. A balance must be struck between nature protection and human needs.

3) **Governance sectors dimension**. SES approach has been barely followed and representatives of socio-economic sectors were not involved, besides tourism sector. Lake Lubans tourism sector was not particularly targeted until recently and is underdeveloped, lacks the infrastructure of all kinds, and lacks a selective planning niche that would use the lakes and wetland complex's values. At present, tourism near Lake Lubans and the wetland lacks purposeful organization, thus the territory is subject to unwanted, unorganized anthropogenic load, which damages nature and various ecosystems, including the protection of protected species. A new tourism niche is needed, which is organized in specially protected nature territories, incl. stressing on a certification system for tourism service providers, environmental guides, gentle tourism infrastructure etc.

4) There are clear requirements expressed by most of stakeholders to communicate and start really to cooperate in order to agree/design **joint multi-stakeholders supported lake governance planning** process towards eventually collaborative governance system. It is necessary to develop a dedicated lake governance plan, or, preferably, a regional governance plan that would focus on governance of the entire region, not just the wetland, and would focus on a socio-ecological system approach, as not have the governance from a purely nature or ecological governance perspective, but also governance or balanced economic growth and/or development of local municipalities. Without a governance plan that would follow the SES approach, lake or wetland governance would not be effective and would cause more problems, as it occurring at the present.

5) The **tested model of three-dimensional environmental governance framework**, being used in order to systemize and assess all lake Lubans governance resources (governance dimensions) and their qualitative development situation, appeared to be also effective applied to water resource governance, and could be further recommended for governance practice development for the lake Lubans (and/or Lubana Wetland area). Lake Lubans governance needs to be initially framed according to the triple governance dimensions' system, as there is a severe lack of detailed information regarding all governance sectors, interest groups and instruments in current planning and development documents, and only a small number of interest groups (municipalities and national organizations) are properly involved and represented, while others such as local residents are barely involved.

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