Interregional lake basin management: the case of Lake Tahoe

I A Dets
Sochava Institute of Geography SB RAS, Irkutsk, Russia
E-mail: igordets@ya.ru

Abstract. The article provides an overview of the environmental conservation development in the lake Tahoe basin, located on the border of two US States. The geographical feature of the location made the process of managing economic activities on the lake more complex. The article highlights the role of local environmental organizations that contributed to public debate on lake pollution issues, which resulted in the formation of a unique Agency managing regional planning in the lake's catchment area. The historical overview of the main events related to the activities of the Agency and environmental organizations in the region is also presented. The analysis shows that the organization of a single governing body has not brought rapid results in environmental protection; the contradictions between economic growth and environmental protection remain. Regulatory experience in the Lake Tahoe Basin shows that many restrictive measures can be challenged in litigation under the rule of law. The results also show that the achievement of the set environmental indicators, even if the Agency is established, is problematic; and the measures taken can lead to a significant reduction in the number of permanent local population and stagnation in certain sectors of the local economy.

1. Introduction
The need for sustainable development has become clear to all humanity, especially with the acceleration of global warming. Solving the accumulated environmental problems on a global scale requires the most complex coordination of the efforts of many parties, which makes it impossible to achieve success in the near future. The complexity of solving global problems also lies in the difficulty of understanding them, because often the consequences of human activity are not obvious or their effect can be detected at a remote distance (as in the case of pollution of the world's oceans with plastic waste). In such situation, regional ecosystems that are more or less limited in space seem to be an excellent "training ground" for processing possible joint measures to solve problems that hinder sustainable development. It may seem that a smaller territorial coverage allows us to quickly understand the cause of disastrous changes in the state of the environment (as well as to faster see the economic consequences of inaction or erroneous decisions), and a smaller number of actors allows us to make decisions without excessively long discussions. However, it can be stated with great regret that the most obvious examples of such relatively closed ecosystems do not allow us to talk about the ease of solving their environmental problems [1].

For Russia, the environmental problems of the lake Baikal basin, one of the largest on the planet, remain particularly important [2]. The catchment area of Lake Baikal is located in three regions of the Russian Federation, as well as on the territory of Mongolia. For several years now, discussions have been ongoing on the plans of the Government of Mongolia to build a hydroelectric power stations on the tributaries of the lake, which are predictably opposed in Russia. At the same time, with the growth
of tourist flows, the existing environmental problems of the coast have significantly aggravated: uncontrolled development, lack of treatment facilities in settlements, undeveloped social infrastructure, etc. [3]. Besides, the problem of eliminating accumulated waste from the activities of the Baikal Pulp and Paper Mill, which in the event of mudflows from nearby mountain slopes could lead to an environmental disaster, has not been resolved. However, even a sharp deterioration of the situation, clearly expressed in the clogging of coastal waters with algae that was not characteristic of the lake (which in some places not only changed the color of the waters but also led to the appearance of a sharp unpleasant odor), did not become a reason for increased coordination of at least the two coastal regions. The Federal Government is trying to solve the accumulated problems through tightening control and a new initiative to introduce direct federal management of the territory, which may lead to at least a long-term delay related to organizational issues.

At the same time, a unique model for managing a lake divided by internal administrative borders of regions within a single state has been operating in the world for more than 50 years. Created in the wake of opposition to the plans for a radical transformation of the natural environment around Lake Tahoe (which involved the construction of a large city on the coast and girdling the entire lake with highways), the interstate agreement gave rise to an era of rational and coordinated development of the unique territory. The Lake Tahoe basin management model demonstrates the sustainability and consistency in pursuing the interests of the local population, business and government at all levels, which is illustrated by the results that are difficult to achieve without building a similar management system.

2. Lake Tahoe and surrounding area: basic facts
Lake Tahoe is located on the border of two states – California and Nevada – in the western United States (see figure 1). Surrounded by high mountains (Freel Peak – 3320 m, Mt. Rose – 3285 m), the lake is the second deepest in the country – more than 500 meters. The width of the lake is only 19.3 km, the length is 35.4 km, which makes the perimeter of the lake not so large, which is about 497 km².

However, the huge volume of water (more than 150 thousand m³) of this unique lake more than 2 million years old allowed to designate Tahoe as an Outstanding National Resource Water under the Federal Clean Water Act.

The 122 km of coast currently accounts for only about 55,000 permanent residents (many property owners come to the lake only for short vacation periods), while more than 10 million cars annually bring more than 15 million tourists¹. The environmental impact from such a number of visitors certainly cannot remain without a trace for the lake catchment area not exceeding 1300 km²[4]. However, the impact indicators could have been much higher if the development plans presented to the public in 1964 had been implemented (see table 1).

3. Environmental movement and interregional agreement in the lake Tahoe basin
Economic development in the Tahoe region in the 1950s and 1960s was not sufficiently constrained by environmental or other regulations and was largely controlled by local authorities. Rapid development began to lead to negative consequences for the environment and some of the real estate owners decided to organize a public organization. The original goal of the Tahoe Improvement and Conservation Association was to support the establishment of state nature parks and oversee regional development².

¹Lake Tahoe Fast Facts (2020) Tahoe Regional Planning Agency official website. Income accessed online on 30.08.2020 via https://www.trpa.org/tahoe-facts/
²League to Save Lake Tahoe turns 50: The environmental organization celebrates five decades of keeping Tahoe blue (2007) Tahoe Daily Tribune. Income accessed online on 23.08.2020 via https://www.tahoedailytribune.com/news/league-to-save-lake-tahoe-turns-50-the-environmental-organization-celebrates-five-decades-of-keeping-tahoe-blue/
Nevertheless, environmental principles did not immediately dominate the construction industry in the region. One of the landmark development projects of the early 1960s on the lake is the construction of the sprawling Tahoe Keys district of 1,500 residences with artificial marina in place of a drained swamp. Without bog filtration, the water quality deteriorated significantly, and subsequently the quick spread of invasive species took place on the territory.

A much larger change was envisioned by “1980 Plan”, presented by the Tahoe Regional Planning Commission in 1964. The ambitious plan, including the construction of a city comparable in size to San Francisco, could turn the region into a rapidly developing territory, but NGOs were able to radically change the public opinion of the planned changes. League to Save Lake Tahoe together with the Lake Tahoe Area Council and other organizations not only tried to raise awareness at the regional and national levels, but also advocated the creation of a bistate Agency and a Lake-wide sewer system. As a result, the active public was able to convince the governors of the States of California and Nevada, as well as President Nixon (who did not pay much attention to the environment) that lake Tahoe, as a national treasure, needs a special development management structure that takes into account the interests of both States, but is not subordinate to local authorities. The 1969 agreement between the two states was the first to be approved by the US Congress. It allowed the creation of a unified structure that sets standards and rules in the Tahoe Basin, as well as regulates general development plans for the territories. This achievement was an important milestone in the history of lake protection, but in fact it only created the necessary tool for the management of the region.

3Tahoe Keys Weeds (2020) Sierra Club. Income accessed online on 18.08.2020 via https://www.sierraclub.org/mother-lode/tahoe/weeds#text=History,%2C%20birds%2C%20and%20other%20wildlife.
4League founding officer brings early history of organization to light (2014) League to Save Lake Tahoe. Income accessed online on 22.08.2020 via https://www.keeptahoeblue.org/news/league-news/League-founding-officer-brings-early-history-of-organization-to-light
Table 1. Main stages of interregional cooperation on environmental protection in the lake Tahoe basin.

| Year | Action                                                                 | Result                                                                                                                                                                                                 |
|------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1957 | “Tahoe Improvement and Conservation Association” was founded.          | One of the main NGOs operating in the region has started its work. The organization changed its name to “League to Save Lake Tahoe” in 1965.                                                              |
| 1964 | Tahoe Regional Planning Commission created the “1980 plan”.            | The plan envisaged an increase in the population and tourists by 3 times, new clusters of casinos by the lake, and most importantly – a four-lane highway around the entire lake, including a bridge over the famous Emerald Bay. |
| 1969 | “Tahoe Regional Planning Compact” was signed.                          | The Bi-State Compact adopted by California and Nevada, then ratified by Congress, formed today’s Tahoe Regional Planning Association (now Agency) – TRPA.                                                     |
|      | “Keep Tahoe Blue” slogan was suggested.                                | The famous slogan has become a rallying point for many generations of lake defenders.                                                                                                               |
| 1980 | “Santini-Burton Act” was signed.                                       | the USDA Forest Service was authorized to acquire environmentally sensitive lands and to grant local governments funds for erosion control and restoration projects.                                      |
| 1982 | Environmental threshold carrying capacities were approved             | TRPA approved the main thresholds, which made it possible to fully control the environmental situation on the lake, which deteriorated significantly due to the increase in the region’s population by 73% between 1960 and 1980. |
| 1987 | “Regional Plan” was adopted                                           | TRPA, after litigation with League to Save Lake Tahoe and other activists, has adopted a revised 20-year development plan for the region.                                                              |
| 1999 | Carbureted two-stroke motors were banned                              | After a campaign organized by the League TRPA prohibits the use of this type of motor due to a significant increase in fuel-based water pollution.                                                          |
| 2008 | Water clarity loss has slowed down                                     | According to the results of scientific research, the process has slowed down, but the decrease in the transparency of the lake’s waters has not stopped.                                                 |
| 2010 | New Strategic Plan was endorsed.                                       | TRPA adopted a new development plan for the region. According to the results of the population census, the number of year-round residents has decreased by 10,000 over 10 years.                          |
| 2012 and later | Regional Plan Update was approved                                       | Necessary adjustments are made to the Regional Plan based, among other things, on scientific research. Area plans are accepted for different territories around the lake: South Shore Area Plan, Douglas County (2013); Tourist Core Area Plan, City of South Lake Tahoe (2013); Tahoe Valley Area Plan, City of South Lake Tahoe (2015); Placer County Tahoe Basin Area Plan and Implementing Regulations (2017); Meyers Area Plan, El Dorado County (2018). |
4. Continuous search for balance as a path to sustainable development

The creation of the planning Agency allowed for a more systematic view of development, but TRPA did not immediately recognize the need for more austere restrictions for various economic activities. In the early decades, the Agency focused on the regulation of residential development, assuming that accelerated economic growth could help preserve the environment. Disagreeing with this, League to Save Lake Tahoe even filed a lawsuit in the mid-1980s, challenging the development plan proposed by TRPA. The result of the trial in court was a complete ban on any development on the coast, including reconstruction and repairs. The ban, which lasted for several years, was extremely negatively received by the Tahoe Lakefront Property Owners Association, which argued that the ban was disruptive to the local economy [5].

Reduced requirements in the updated and approved version of the 1987 TRPA Plan allowed the ban on certain activities to be lifted, but many contractors left the territory, which significantly affected local communities. TRPA later shifted its focus to regional planning and restoration in order to try to take a more integrated approach to territory development than the point restrictions allowed. Nevertheless, such restrictions were introduced in the future. A notable example was the complete ban on carbureted two-stroke motors, introduced after another successful company of local NGOs in 1999[6]. Most of the measures taken were actively supported by local environmental organizations, which continue to be opposed by business associations. Ongoing disputes, including lawsuits, sometimes slow down the implementation of restrictions, which, according to scientists, have led to a slowdown in the loss of transparency of the lake's waters. This indicator still continues to deteriorate and has already reached less than 21 meters (at more than 30 meters in 1968), which is caused by active eutrophication and pollution by suspended particles due to human activities (including transport emissions)\(^5\). The recently adopted Regional Transportation Plan, which includes measures to encourage the use of public transport, bicycles, and walking activities, is designed to solve this problem\(^6\).

5. Conclusions

The results of the last census in 2010 showed another consequence of many years of work to regulate development in the lake Tahoe region – the permanent local population decreased by 10,000 in a decade (with the population of California and Nevada growing). Not all local residents are prepared for the restrictions imposed by stricter environmental standards [7], [8]. At the same time, quite a large number of local residents continue to support environmental organizations, including through donations and volunteering.

Neither TRPA nor environmental organizations have yet been able to achieve all the goals set, which is due to many reasons, including the negative impact of global warming. It is impossible to predict the success of the plans adopted in recent years, but it is safe to say that without the interregional cooperation enshrined in the creation of the TRPA, any progress in the conservation of the lake would be unlikely [9]. Only by coordinating the joint efforts of different levels of government is it possible to come closer to solving the complex problems of preserving such large and valuable natural objects.

Acknowledgements

This work was supported by the RFBR, project number 20-010-00990 ‘A Problem-driven Approach to the Intensification of Interregional Interactions’ and by the Institute of Geography SB RAS (state assignment’s registration number AAAA-A19-119122490007-4).

\(^5\)Water Quality Threshold (2020) League to Save Lake Tahoe. Income accessed online on 22.08.2020 via https://www.keeptahoeblue.org/protect/water#:~:text=Consistent%20scientific%20measurements%20of%20water.%20Foot\%20of\%20clarity%20per\%20year.

\(^6\)Regional Transportation Plan (2020) Tahoe Regional Planning Agency official website. Income accessed online on 30.08.2020 via http://www.trpa.org/wp-content/uploads/2017-RTP-FactSheet.pdf
References

[1] Born S and Rumery C 1989 Institutional aspects of lake management Environ. Manage. 13(1) 1–13 DOI: 10.1007/BF01867582.

[2] Zabotseva T 2018 Environmental safety and the “green” economy in the context of the Baikalocentric model of territorial development IOP Conf. Ser. Earth Environ. Sci. 190 012020 DOI: 10.1088/1755-1315/190/1/012020.

[3] Sysoeva N and Sysoeva O 2016 Problems of entrepreneurship development in the coastal zone of Baikal Geogr. Nat. Resour. 5 144-50 DOI: 10.21782/GiPR0206-1619-2016-5(144-150).

[4] Makley M 2014 Saving Lake Tahoe: an Environmental History of a National Treasure ( Reno: University of Nevada Press).

[5] Sabatier P and Pelkey N 1990 Land Development at Lake Tahoe, 1960–84: The effects of Environmental Controls and Economic Conditions on Housing Construction (Fort Lauderdale: FAU/FIU Joint Center for Environmental and Urban Problems).

[6] Jassby A, Goldman C, Reuter J, Richards R and Heyvaert A 2001 Lake Tahoe: diagnosis and rehabilitation of a mountain lake The Great Lakes of the World (GLOW): Food-web, Health and Integrity, ed M Munawar and R Hecky ( Leiden: Backhuys Publishers) pp 431–54.

[7] Weible C 2007 Stakeholder Perceptions of Scientists: Lake Tahoe Environmental Policy from 1984 to 2001 Environ. Manage. 40(6) 853–65 DOI: 10.1007/s00267-007-9005-2.

[8] Koebele E, Bultema S and Weible C 2020 Modeling Environmental Governance in the Lake Tahoe Basin: A Multiplex Network Approach Networks in Water Governance, ed M Fischer and K Ingold ( Cham: Springer International Publishing) pp 173–202.

[9] Imperial M and Kauneckis D 2003 Moving from Conflict to Collaboration: Watershed Governance in Lake Tahoe Nat. Resour. J. 43(4) 1009–55.