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FLOATING SPASCAPES: COMPARATIVE REFLECTIONS ON THERAPEUTIC WATERSCAPES AND THEIR POTENTIAL IN SERBIA

ABSTRACT

Floating therapeutic landscapes have emerged as spatial and architectural responses to the growing demand for wellness-oriented environments in both urban and natural waterscapes. This paper investigates the concept of floating spascapes through a comparative analysis of selected European examples that integrate health, recreation, and ecological sensitivity. While such typologies are gaining traction in Northern and Western Europe, their strategic potential remains largely underexplored in the context of Serbian rivers and lakes. The study applies an analytical and case-based methodology to examine five floating wellness facilities: KOK (Oslo, Norway), Trosten Sauna (Norway), Wyld Sauna (United Kingdom), Arctic Bath Hotel (Sweden), and the Floating Sauna (Czech Republic). Each case is assessed based on site typology, architectural adaptability, ecological integration, and social accessibility. The findings inform their relevance and adaptability to Serbian waterscapes such as Ada Ciganlija, Lido, and Srebrno jezero. The research underscores the potential of floating wellness infrastructure to reimagine underutilised waterfronts in Serbia as inclusive, health-oriented, and climate-adaptive spaces. It extends the notion of spascapes beyond traditional land-based facilities into mobile, resilient, and publicly engaging aquatic environments, and demonstrates how floating wellness facilities can inform sustainable spatial planning and public health strategies in Serbia, particularly in riverine and lacustrine contexts.

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KEY WORDS
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THERAPEUTIC LANDSCAPES
WELLNESS DESIGN
SPASCAPES
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1. INTRODUCTION

Waterfront environments have long served as spatial and cultural hubs for healing, recreation, and communal gathering. Historically shaped by natural springs, medical practices, and architectural responses to therapeutic landscapes, spa settlements have evolved as complex socio-spatial typologies rooted in health tourism and ecological symbiosis (Gesler, 1992; Bertram & Rehdanz, 2015; Conradson, 2005). In the 21st century, growing environmental awareness and the demand for accessible health infrastructure have revitalised interest in nature-based solutions and blue-green infrastructure as strategies for urban resilience (Völker & Kistemann, 2011; Kim & Bae, 2020).

Within this discourse, ***floating therapeutic landscapes*** — modular or mobile health-oriented units located on rivers and lakes—are emerging as alternative spatial typologies that integrate wellness, public access, and ecological regeneration (Baker & Coutts, 2016; Calcagni, 2025). While floating architecture has seen a proliferation across Europe, particularly in residential and leisure contexts, its application in therapeutic and health-related design remains underexplored (Jaroszynska & Wolanski, 2019; Lago & Czapiewska, 2020). Examples such as *KOK* (Oslo, Norway), *SeeSauna* (Konstanz, Germany), and *Thermen am See* (Burgenland, Austria), illustrate how wellness architecture, environmental immersion, and public health functions can intersect in waterborne spaces (Baker, 2015; Dezeen, 2020).

In Serbia, however, the architectural and regulatory discourse has yet to embrace such typologies, despite the existence of latent potential along its inland waters—such as Ada Ciganlija, Lido, and Srebrno jezero (Tilinger & Lalić, 2008; Urban Planning Institute of Belgrade, 2021). These sites, often underutilised or lacking strategic planning, represent a unique opportunity to rethink traditional spa settlements not as fixed territorial enclaves but as flexible, floating infrastructures capable of supporting public health, recreation, and environmental resilience in a climate-challenged era. This paper addresses the following research question:

How can floating therapeutic landscapes contribute to the sustainable revitalisation of Serbian river and lakefronts, and what lessons can be drawn from relevant European case studies?

Through an analytical–comparative framework, this paper evaluates selected European examples according to indicators including modularity, integration with natural systems, therapeutic programming, and infrastructural feasibility. The aim is to extract design principles applicable to the Serbian context, while contributing to the theoretical and practical discourse on ***floating spascapes*** — a hybrid category at the intersection of architecture, health infrastructure, and ecological urbanism (UN-Habitat, 2019; Li et al., 2021).

2. METHODOLOGY

The research adopts a qualitative, comparative case study approach, suitable for evaluating the spatial and functional attributes of floating therapeutic landscapes across different geographical and regulatory contexts. The method is structured to identify transferable spatial patterns and design strategies applicable to underutilised river and lakefronts in Serbia. The study is grounded in an analytical-synthetic paradigm, combining desk-based research and typological analysis. Case study selection is based on typological diversity, contextual integration, and wellness-oriented programming. This approach enables the study to synthesise insights from heterogeneous floating wellness facilities without aiming for generalisation, but for context-sensitive design translation. Methodologically, the study relies on:

- Typological and morphological analysis,
- Qualitative content review of architectural and regulatory documentation,
- Visual and spatial referencing using publicly available tools,
- Comparative synthesis through structured evaluation categories.

This approach provides a systematic, academically grounded foundation for proposing floating spascapes as part of nature-based, health-oriented urban development strategies in Serbia.

2.1 Methodological Framework

The analytical framework is built on five case studies that reflect varied spatial, cultural, and environmental contexts across Europe: *KOK* (Oslo, Norway), *Trosten Sauna* (Norway), *Wyld Sauna* (United Kingdom), *Arctic Bath Hotel* (Sweden), and the *Floating Sauna* (Czech Republic). These cases were chosen for their diversity in:

- Waterscape typology (urban, semi-natural, remote),
- Programmatic scope (private vs. public access, full-service vs. minimal facilities),
- Integration with ecological, social, and infrastructural systems.

The evaluation criteria were developed based on prior research in floating architecture, wellness infrastructure, and environmental health indicators—particularly drawing from Baker & Coutts (2016), Calcagni (2025), and studies on the health effects of blue-green infrastructure (Völker & Kistemann, 2011; Kim & Bae, 2020). The following five indicators were used to guide the comparative analysis:

Evaluation Category	Description
Site Typology	Classification based on environmental and spatial context: urban waterfronts, riverbanks, lakefronts, or isolated natural settings.
Architectural Modularity	Prefabrication, spatial flexibility, scalability
Ecological Integration	Energy systems, wastewater management, material sustainability
Therapeutic Programming	Wellness functions: sauna, thermal baths, relaxation areas, public access, and potential inclusion of health services.
Infrastructural Feasibility	Anchoring, energy/water supply, transport and land–water connectivity

TABLE 1. Evaluation indicators for the comparative analysis of floating therapeutic landscapes.

The data for each case is collected from a combination of: architectural project websites, architectural publications and tourism portals, academic literature and conference documentation. The results of the cross-case comparison are presented in Table 1, providing a clear overview of each project's performance across the selected indicators. This serves as the foundation for evaluating adaptive potential in selected Serbian locations, namely Ada Ciganlija, Lido, and Srebrno jezero.

3. CASE STUDIES

3.1 Overview of Selected Case Studies

The selection of five European floating spa facilities was guided by their spatial typology, architectural relevance, therapeutic programming, and representativeness within different ecological and cultural contexts. All examples fall within the broader category of floating spascapes—health-oriented architectural interventions located on inland or transitional water bodies. The chosen case studies span both urban and remote settings and reflect diverse approaches to floating wellness design.

Table II provides a comparative overview of selected floating wellness facilities across Europe, emphasising their geographic and typological diversity, primary wellness functions, and contextual integration. The selection is based on relevance for potential adaptation within the Serbian context and reflects diverse approaches to floating architecture in urban and semi-natural settings.

Case Study	Location	Year	Architect / Designer	Context Type	Capacity (persons)	Primary Wellness Function
KOK Oslo	Oslo, Norway	2021	Snøhetta (concept), KOK Team	Urban / River	Up to 10 people	Sauna, Social Wellness
Trosten Sauna	Norway (Remote)	2020	Estudio Herreros	Remote / River	Up to 24 people	Sauna, Immersive Nature Therapy
Wyld Sauna	London, UK	2022	Third Nature	Urban / River	Up to 30 people	Sauna, Public Access
Arctic Bath Hotel	Harads, Sweden	2020	Bertil Harström & Johan Kauppi	Lacustrine	20+ (6 cabins + spa)	Hotel, Spa, Wellness Retreat
Floating Sauna	Český Krumlov, CZ	2022	H3T Architekti	Semi-Natural	4–6	Sauna, Public Wellness Access

TABLE 2. Overview of Selected Floating Wellness Facilities

The comparative insight offered by the selected case studies reveals an evolving paradigm of floating wellness architecture that transcends mere touristic novelty. While cases such as *Arctic Bath* and *KOK* Oslo demonstrate high design resolution and infrastructural feasibility, others, such as the *Floating Sauna* in Český Krumlov, highlight minimal-intervention strategies suitable for low-tech adaptation. These examples collectively inform the potential for context-specific replication in Serbia, particularly along urban rivers or natural spas, provided that regulatory alignment and modular implementation strategies are ensured.

3.2 Individual Case Study Analyses

3.2.1 KOK Sauna, Oslo – Urban Floating Wellness Hub

Architectural Modularity - The sauna is a prefabricated wooden structure mounted on a pontoon equipped with an outboard motor. Its compact rectangular plan comprises a sauna cabin, changing area, and shower zone, enclosed with panoramic glazing that maximises visual connection with the fjord. This modular and mobile design allows for high adaptability to diverse waterfront conditions and reflects a plug-and-play logic suitable for replication (Baker & Coutts, 2016; KOK Oslo Official Website, 2024).

Ecological Integration - While not fully off-grid, *KOK* Oslo operates with minimal ecological impact. It uses electric heating rather than wood-burning stoves, significantly reducing smoke emissions. Sanitation is managed via a dry composting toilet or connection to nearby marina facilities. Building materials include thermally treated timber and recycled insulation. However, the system lacks integration of renewable energy sources, which limits its environmental autonomy (Jaroszynska & Wolanski, 2019).

Therapeutic Programming - The facility offers a traditional Finnish sauna experience with opportunities for cold-water dipping, contrast therapy, and collective relaxation. Both private and group sessions are available, targeting mental wellness, immune response stimulation, and stress reduction. The architectural design enhances sensory immersion through visual transparency, exposure to natural elements, and passive airflow (Conradson, 2005; KOK Oslo Official Website, 2024).

Infrastructural Feasibility - Its small scale and propulsion system allow KOK Oslo to dock at existing marinas and waterfront edges without requiring permanent anchoring or utility grid connections. This drastically reduces regulatory and infrastructural burdens. Its temporary nature and operational independence make it a promising model for pilot interventions along Serbian rivers such as the Sava or Danube (Calcagni, 2025) (Figure 1).

KOK Oslo exemplifies how minimalist, mobile wellness infrastructure can reclaim urban waterscapes for public use. Its low-cost, adaptable configuration makes it particularly relevant for experimental deployment in the Western Balkans. Despite limited therapeutic programming and ecological autonomy, its integration into the urban fabric positions it as a pragmatic starting point for developing floating wellness typologies in Serbian cities.

FIGURE 1a. KOK Oslo floating sauna.

FIGURE 1b. Additional exterior view of the urban micro-wellness unit.

3.2.2 Trosten Sauna, Norway – Floating Micro-Wellness in Natural Context

Site Typology - *Trosten Sauna* is located on the Bjørvika side of the Oslofjord, positioned near the island of Langøyene. Unlike urban typologies such as *KOK* Oslo, Trosten is anchored in a semi-natural fjord setting, creating a liminal zone between wilderness and city. Its setting offers immersion in pristine waters while remaining accessible by urban boat transport. This hybrid positioning enhances a sense of seclusion while maintaining access to infrastructure (Trosten Sauna Official Website, 2024).

Architectural Modularity - The structure consists of a compact wooden sauna mounted on a floating dock, using prefabricated components. Its rectangular design houses a sauna chamber, a small entrance platform, and retractable ladders. It lacks an engine but can be towed, making it easily redeployable. The small size and lightweight materials support seasonal relocation and rapid deployment without permanent interventions.

Ecological Integration - Trosten employs a wood-fired stove, which contributes to atmospheric and sensory authenticity. Although emissions are present, the structure minimises ecological impact through the use of untreated wood, recycled metal components, and rainwater use for basic functions. Solar lanterns are used for lighting, emphasising a low-tech but ecologically aware setup.

Therapeutic Programming - The program centres on the Finnish sauna tradition—combining heat exposure, cold fjord immersion, and contemplative rest. It is designed for individuals or small groups, focusing on psychological well-being, circulatory stimulation, and nature-based therapy. The open water plunge is not a separate facility but an integral spatial and therapeutic component.

Infrastructural Feasibility - Due to its scale and design, Trosten requires no connection to land-based utilities or infrastructure. It is seasonally anchored and accessible by small boats or kayaks. Its installation does not require complex permitting or foundation work, supporting a decentralised and affordable approach to wellness programming (Trosten Sauna Official Website, 2024) (Figure 2).

Trosten Sauna exemplifies a minimalist but high-impact approach to floating wellness infrastructure. Its simplicity, low cost, and seasonal mobility offer a pragmatic model for Serbia's smaller or underutilised water bodies

FIGURE 2a. Trosten Sauna – floating unit in a semi-natural fjordcontext.

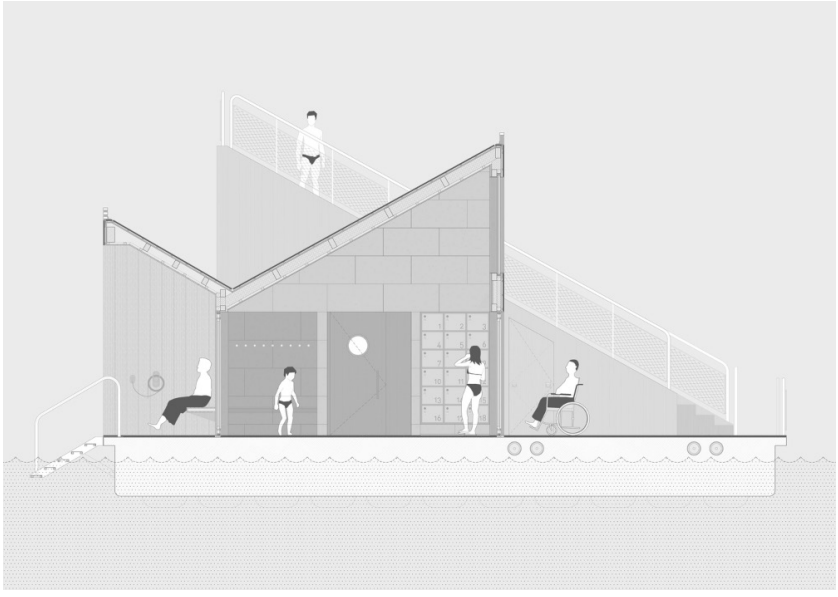

FIGURE 2b. Section of Trosten Sauna showing spatial layout

such as Srebrno jezero, Zasavica, or urban green–blue corridors. Unlike more complex examples, Trosten shows how therapeutic benefit can emerge from basic architectural interventions, provided they are sensitively placed and programmatically coherent. Its reliance on natural energy sources and low-tech materials align with eco-tourism and low-carbon development goals — though its use of wood-burning stoves introduces trade-offs that must be assessed in sensitive ecosystems. For Serbia, Trosten is a viable pilot model for municipalities seeking to experiment with floating wellness structures without the burden of heavy regulation or capital investment.

3.2.3 Wyld Sauna, United Kingdom – Regenerative Micro-Wellness on a Lacustrine Edge

Site Typology - *Wyld Sauna* is located on the banks of Loch Tay in Scotland, representing a lacustrine semi-natural context. Unlike urban saunas, this setting leverages the pristine environmental quality of the loch and surrounding hills to deliver nature-based therapy and mental restoration. The sauna's edge location allows for both visual immersion and direct access to cold water, embodying biophilic design principles (Wyld Sauna Official Website, 2024).

Architectural Modularity - The sauna unit is prefabricated and transportable, with a compact rectangular layout that includes a glazed façade facing the lake. Its lightweight timber construction and modular character allow for easy installation and disassembly, offering potential for replication across other natural water bodies in the UK and beyond. While not self-propelled, the unit can be trailer-mounted or floated into position (Baker & Coutts, 2016; Wyld Sauna Official Website, 2024).

Ecological Integration - *Wyld Sauna* demonstrates moderate ecological responsiveness through its use of sustainable timber, non-toxic insulation, and reliance on a wood-fired heater. Although it lacks integrated renewable systems, its operation minimises ecological disturbance. The unit uses dry sanitation and does not require connection to existing grid infrastructure, reducing its environmental footprint (Jaroszynska & Wolanski, 2019).

Therapeutic Programming - The sauna promotes thermal therapy in conjunction with wild swimming and mindfulness practices. Programming includes individual and group bookings, often integrated with yoga or guided relaxation sessions. The design emphasises intimate, sensory-rich experiences that appeal to health-conscious, ecotourism-oriented users (Conradson, 2005; Kim & Bae, 2020).

Infrastructural Feasibility - The sauna is manually positioned and anchored at the lake's edge without the need for permanent foundations. Access is via a small dock or gravel path, and utilities are minimised to essentials. The unit can operate off-grid, which makes it attractive for remote or seasonal deployment in Serbia's similar natural environments, such as Srebrno jezero or Vlasinsko jezero (Figure 3).

Wyld Sauna exemplifies how low-tech, high-impact design can redefine wellness infrastructure at the edge of nature. Its semi-mobile, off-grid, and nature-integrated model presents a viable template for replicability in Serbia's

ecotourism regions. However, the lack of integrated energy systems and limited year-round usability suggests the need for climate-adaptive modifications if transferred to other contexts. The project's greatest strength lies in its simplicity, ecological humility, and experiential depth.

FIGURE 3a. Wyld Sauna - modular floating sauna with urban integration and waterfront wellness programming.

FIGURE 3b. Wyld Sauna - interior with panoramic glazing.

3.2.4 Arctic Bath Hotel, Sweden – A Composite Lacustrine Wellness Facility

Site Typology - Situated on the Lule River in Swedish Lapland, *the Arctic Bath Hotel* represents a floating wellness complex in a remote, pristine environment. Its location enables immersive interaction with an untouched Arctic landscape, making it ideal for thermal tourism driven by natural stimuli such as snow, ice, and seasonal light phenomena (e.g., northern lights) (Arctic Bath Official Website, 2024).

Architectural Modularity - The complex consists of a central circular unit (spa and sauna hub), surrounded by six floating accommodation cabins. The cabins are prefabricated, modular, and easily transportable, made from locally sourced timber and insulated glass panels. The architectural configuration offers flexibility and adaptability across various lake and river environments (Dezeen, 2020).

Ecological Integration - The project is conceived with high ecological standards: it employs passive energy systems (solar gains, natural ventilation), low-impact anchoring mechanisms, and locally regenerative materials. Wastewater is treated on-site, and the overall footprint on the riverine ecosystem is minimal, offering a synergy between luxury and sustainability (Dezeen, 2020; ArcticCircle.se, 2024).

Therapeutic Programming - The wellness program includes traditional saunas, cold plunge pools, massage rooms, relaxation zones, and open areas for seasonal use. Emphasis is placed on contrast therapy (hot–cold), sensory recovery, and psychophysical balance through architectural design that frames the surrounding landscape. A multi-sensory therapeutic experience is emphasised—light, water, temperature, and silence (Arctic Bath Official Website, 2024).

Infrastructural Feasibility - The main spa unit is firmly anchored, while the accommodation cabins are buoyant and connected by floating walkways. The energy system integrates solar panels with conventional sources, and the facility includes autonomous water systems. Although more infrastructurally complex than smaller saunas, the project demonstrates that large-scale floating wellness structures can function effectively (Figure 4).

In contrast to smaller, mobile saunas, Arctic Bath Hotel exemplifies the potential of floating infrastructure for luxury health and eco-tourism. Its architectural approach enables not only physical relaxation but also emotional immersion into the Arctic landscape through seasonal phenomena and environmental silence. In the Serbian context, such a model could be envisioned on tourism-oriented lakes (e.g., Silver Lake), provided infrastructural adaptation and regulatory support are ensured.

FIGURE 4a. Arctic Bath - floating spa hub.

LEFT FIGURE. FIGURE 4b. Arctic Bath - modular floating cabins.

DOWN RIGHT FIGURE. FIGURE 4c. Arctic Bath - interior wellness space.

3.2.5 Floating Sauna, Sobáčov (Czech Republic) – Semi-Mobile Lacustrine Wellness Module

Site Typology - Located on a serene pond at *the Náš Sobáčov resort* in the Czech Republic, this floating sauna exemplifies a semi-natural, small-scale lacustrine typology. It balances controlled access with immersion in nature, offering wellness experiences in an intimate rural setting (Expats.cz, 2023).

Architectural Modularity - Designed by *Plovoucí sauny* in collaboration with Ateliér3M, the sauna is a prefabricated floating module built with steel pontoon foundations and thermowood timber slats. Its all-wood construction and trailer-movable design support rapid deployment, easy dismantling, and seasonal reuse—demonstrating modular functionality in rural wellness architecture (Expats.cz, 2023; plovoucisauny.cz).

Ecological Integration - The structure emphasises sustainability through locally sourced materials and passive building systems. A wood-burning stove provides heating, and its minimal spatial footprint reduces ecological disturbance. The design embodies a low-impact approach, though it does not incorporate renewable energy systems, instead relying on traditional yet sustainable construction methods (Hype & Hyper, 2023).

Therapeutic Programming - This module offers classic Finnish sauna rituals—heat followed by a plunge into open water—designed for private or small-group experiences. The simplicity of the program underscores sensory immersion, physical activation through cold exposure, and psychological rejuvenation rooted in traditional wellness practices (Expats.cz, 2023).

Infrastructural Feasibility - No fixed land utilities or permissions are required for installation. The unit operates autonomously and can be accessed by paddle boat or dock. This low-regulation, low-cost model allows for quick deployment, making it especially viable for rural or pilot wellness interventions (Figure 5).

The Sobáčov floating sauna embodies a pragmatic fusion of wellness tradition and rural sustainability. Its simple, transportable architecture and low infrastructural needs make it a prime candidate for rural or seasonal applications in Serbia—particularly around smaller lakes or caravan parks. While its lack of renewable energy systems limits environmental autonomy, its modular and mobile nature offers an agile template for grassroots wellness infrastructure that aligns well with community-driven, context-sensitive deployment.

LEFT FIGURE.FIGURE 5a. Floating Sauna CZ - exterior view.

RIGHt FIGURE. FIGURE 5b. Floating Sauna CZ - interior layout.

The following Table 3 presents a synthetic cross-case evaluation of five selected floating sauna projects in Europe, assessed through five context-specific indicators—site typology, architectural modularity, ecological integration, therapeutic programming, and infrastructural feasibility—with an additional column evaluating their replicability potential in Serbian waterscapes.

TABLE 3: Synthetic Evaluation of Representative Case Studies of Floating Architecture in Europe Based on Key Indicators

Case Study	Site Typology	Architectural Modularity	Ecological Integration	Therapeutic Programming	Infrastructural Feasibility	Replicability in Serbia *(Author's Note)*
KOK Sauna, Oslo	☑☑☑	☑☑☑	☑☑	☑☑☑	☑☑☑	Ada Ciganlija, Novi Sad, seasonal activation
Trosten Sauna, Norway	☑☑	☑☑☑	☑☑	☑☑☑	☑☑	Danube/East Serbia, youth tourism node
Wyld Sauna, Copenhagen	☑☑	☑☑	☑☑	☑☑☑	☑☑☑	Belgrade 25. maj, urban reconnection
Arctic Bath, Sweden	☑☑☑	☑☑☑	☑☑☑	☑☑☑	☑☑	Silver Lake (Srebrno jezero), wellness resort
Floating Sauna, CZ	☑	☑☑	☑	☑☑	☑☑	Rural spa node, testing pilot model

☑ – minimal

☑☑ – moderate

☑☑☑ – high

This cross-case synthesis confirms that floating sauna typologies—despite their scale and programmatic modesty—embody significant spatial, social, and ecological potential when strategically deployed. Projects like KOK Oslo and Wyld Sauna exemplify how minimal infrastructure can catalyse public engagement and health-oriented urban revitalisation, while Arctic Bath demonstrates the viability of more complex wellness-driven ecosystems in remote contexts. The adaptability of prefabricated structures, low-impact anchoring systems, and multi-sensory programming emerge as key enablers for successful transfer. However, for integration into Serbian contexts, legal recognition, modular production capacity, and marina-grade utilities remain critical prerequisites. As temporary or semi-permanent interventions, floating saunas offer a pragmatic testbed for broader policies on waterborne architecture and riverfront activation.

4. EVALUATION OF SERBIAN WATERSCAPES FOR FLOATING WELLNESS IMPLEMENTATION

4.1. Introduction and Methodological Rationale

The synthesis of European case studies has demonstrated that floating wellness infrastructure constitutes a viable and adaptable typology across urban, peri-urban, and natural contexts—provided that regulatory, ecological, and infrastructural preconditions are met (Calcagni, 2025; Bertram, 2010). Building on these insights, this chapter critically examines the transferability of such models to selected Serbian waterscapes, aiming to identify spatial opportunities and contextual limitations for local implementation. To ensure typological and geographical diversity, three sites were selected: *Ada Ciganlija* (an urban recreational zone), *Lido – Great War Island* (a protected fluvial landscape), and *Srebrno jezero* (a regional leisure lake). The selection was based on spatial criteria such as accessibility, infrastructural readiness, ecological sensitivity, and integration within regional tourism or development plans.

4.2. Geospatial Visualisation and Site Identification

Figure 6 presents a dual spatial analysis of two relevant geographical contexts in Serbia: the Belgrade riverfront (including *Ada Ciganlija* and *the Great War Island*) and the Veliko Gradište municipality (focusing on *Srebrno jezero*). These maps identify optimal sites for the implementation of floating wellness infrastructure, selected through a composite methodology involving field observations, review of regulatory frameworks, and overlay analysis using general and sectoral spatial documentation.

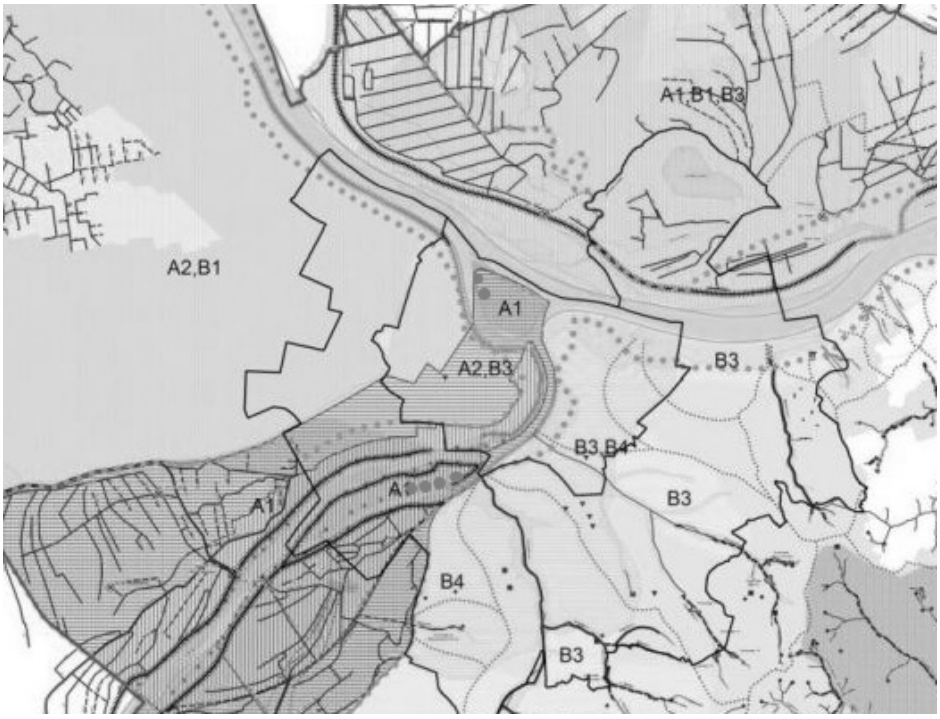

FIGURE 6a. Spatial analysis map - Belgrade waterfront.

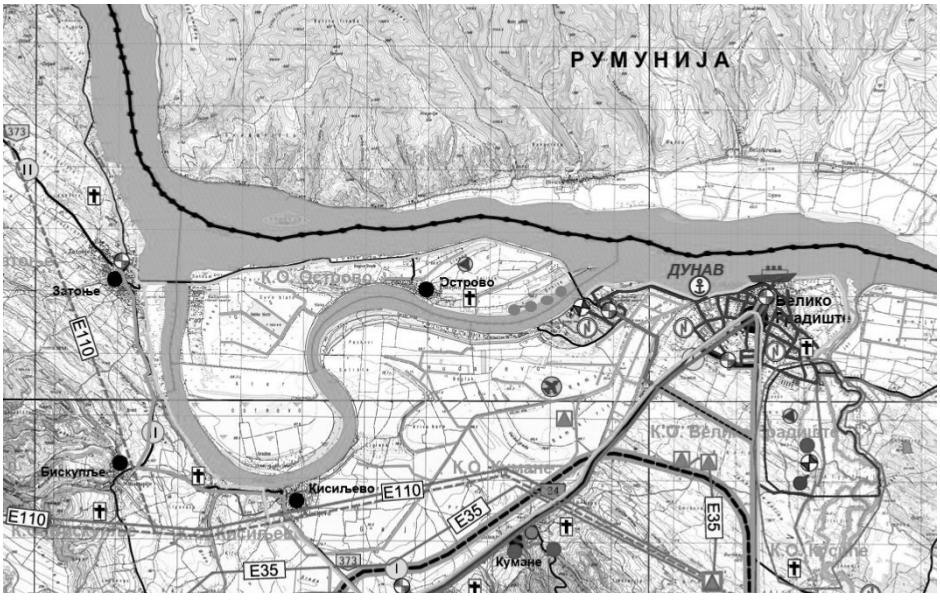

FIGURE 6b. Spatial analysis map - Srebrno jezero waterfront.

The left map illustrates selected zones along the *Sava River* in Belgrade. Three primary locations around *Ada Ciganlija* are indicated: The western shore of *the Ada Ciganlija Lake*, adjacent to sports and beach facilities—suitable for modular sauna units due to high accessibility and existing recreational infrastructure; The southern bank near *the Golf Club*, which offers seclusion for silent or nature-integrated wellness programs; The northern point near the *Jezero* restaurant and marina, benefiting from utility access and service logistics. Additionally, two sites on *Lido beach* and the western vegetated zone of *the Great War Island* (Veliko ratno ostrvo) are marked as eco-sensitive, seasonal intervention zones, where lightweight and reversible structures could align with conservation regulations. The right map displays the *Srebrno jezero* zone, located in the municipality of *Veliko Gradište*. High-potential locations are found along the southern bay and the urbanised eastern interface, where floating resorts, wellness capsules, or therapeutic clusters inspired by *Arctic Bath*–type models could be accommodated. These sites benefit from existing tourism infrastructure, controlled water access, and branding potential for spa-based tourism.

Taken together, these visualisations synthesise geospatial suitability, urban and touristic proximity, ecological sensitivity, and programmatic infrastructure. They serve as a foundational input for further spatial planning and pilot project formulation related to floating wellness architecture in Serbia.

Waterscape	Type	Potential Use Level	Strengths	Challenges	Transferability Potential
Ada Ciganlija	Urban peninsula with an artificial lake	Extremely High	Developed infrastructure, sports/spa zones, utilities	Legal harmonisation needed, EIA requirements	High – ideal for low-impact modular spa units
Lido – GWI	Protected natural zone, river island	Moderate to High	Pristine setting, close to the city, nature immersion	Strict protection regime, seasonal access, limited utilities	Moderate – seasonal, reversible wellness modules
Srebrno jezero	Artificial lake, tourism focus	High	Wellness brand, spatial flexibility, tourism visibility	Infrastructure support needed, EIA needed for floating units	High – resort-style spa and therapeutic modules

TABLE 4 - Spatial Assessment of Selected Serbian Waterscapes for Floating Wellness Facilities

4.3. Comparative Spatial Assessment

To evaluate the feasibility of floating wellness infrastructure in Serbia, a structured comparative matrix was developed across three typologically distinct waterscapes: *Ada Ciganlija, Lido (Great War Island),* and *Srebrno jezero*. The assessment integrates multiple criteria, including spatial typology, infrastructure availability, ecological sensitivity, regulatory limitations, and programmatic alignment with European precedents.

These three waterscapes collectively represent a typological continuum—from urban waterfronts and ecologically protected zones to regionally branded recreational lakes. This diversity offers a robust framework for evaluating the local adaptability of floating wellness typologies. Notably, *Ada Ciganlija* presents the most immediate opportunity for implementation due to its urban integration and recreational infrastructure. *Lido*, despite its natural allure and proximity to the city centre, requires carefully calibrated interventions in line with ecological preservation mandates. *Srebrno jezero,* as a semi-controlled recreational and touristic environment, emerges as a promising site for upscale, resort-style wellness concepts.

The comparative matrix in Table 4 serves as a baseline for integration with architectural, technological, and governance models derived from European case studies. This approach enables a place-sensitive strategy for pilot implementations, aligning spatial potential with regulatory and ecological feasibility.

4.4. Legal and Regulatory Context

The comparative spatial and regulatory evaluation indicates that *Ada Ciganlija* and *Srebrno jezero* offer the most favourable conditions for early-stage pilot projects involving floating wellness architecture. *Ada Ciganlija* benefits from robust urban infrastructure, year-round accessibility, and established recreational zoning. These characteristics make it a prime candidate for implementing modular sauna units or therapeutic docks with minimal legal barriers and high public visibility. *Srebrno jezero*, with its established identity as a tourism destination and branding aligned with wellness and leisure, presents significant potential for floating resorts and spa modules. Its spatial flexibility, coupled with moderate regulatory complexity, allows for the integration of larger, resort-scale wellness concepts—especially those drawing on Scandinavian typologies such as the Arctic Bath Hotel. However, the integration of such modules requires tailored infrastructural support and alignment with seasonal visitation patterns. In contrast, Lido (Great War

Island), despite its symbolic urban location and rich natural value, is subject to strict environmental regulations that restrict permanent construction. Nevertheless, its unique ecological character offers opportunities for seasonal, reversible wellness infrastructure—such as floating hammams, mobile thermal pods, or nature-based wellness barges. These interventions could function as educational or therapeutic nodes, emphasising low-impact and temporary use while respecting conservation protocols. To ensure the success of such initiatives, several implementation priorities have been identified:

- Legal harmonisation across municipal and national levels for regulating floating structures and clarifying water-use rights;
- Pilot testing of modular, off-grid, and reversible wellness facilities in controlled zones;
- Ecological compliance through integration of renewable energy (e.g., solar thermal), closed-loop waste systems (e.g., dry toilets), and floating wetlands;
- Participatory planning, involving local stakeholders, community organisations, and environmental agencies in decision-making processes.

These strategies align with international best practices in climate-resilient urban transformation and adaptive reuse of waterscapes (de Graaf, 2012; Calcagni, 2025). Floating wellness architecture emerges as a typology that bridges ecological sensitivity with public health innovation, offering scalable and modular solutions adaptable to both urban and natural settings.

The synthesis of this research suggests that Serbia's underutilised aquatic landscapes possess latent capacity for innovation through floating wellness interventions. *Ada Ciganlija* offers high infrastructural readiness and legal feasibility, while *Srebrno jezero* supports upscaled wellness tourism models. *Lido*, although constrained, may serve as a site for seasonal, symbolic, or demonstrative eco-interventions. Importantly, the issue of regulatory ambiguity—particularly concerning ownership, licensing, and ecological compliance in public waters—remains a critical bottleneck. Addressing this requires integrative spatial planning that includes floating structures within formal urban and environmental plans, supported by legislative updates and inter-agency collaboration.

5. DISCUSSION

The integration of floating wellness architecture into Serbia's aquatic landscapes represents more than a spatial or typological innovation; it signifies a paradigm shift in how post-socialist cities engage with their hydrological assets. The case studies and spatial analyses demonstrate that modular, climate-resilient wellness structures—such as floating saunas, spas, and therapy units—can act as catalysts for new socio-environmental relationships between urban populations and blue infrastructures (Baker & Coutts, 2016).

Crucially, the adaptability of floating wellness infrastructure depends on a triad of conditions: regulatory alignment, ecological compatibility, and infrastructural feasibility. For instance, Ada Ciganlija benefits from an already activated waterfront culture, which supports both regulatory simplification and public receptivity. Lido, on the other hand, exemplifies the tension between conservation imperatives and soft activation strategies, pointing to the value of reversible and seasonally adaptive solutions (Bertram, 2010; de Graaf, 2012). Srebrno jezero, by virtue of its wellness branding and flexible zoning, serves as a hybrid model—a testing ground for upscale therapeutic configurations that remain publicly accessible.

Another important dimension is the socio-cultural narrative that floating wellness projects can support. Unlike speculative waterfront development, these interventions are small-scale, public-oriented, and ecologically reflexive. As such, they offer spatial justice benefits—enabling broader public access to therapeutic landscapes without the exclusionary effects of privatised riversides.

Moreover, the emphasis on off-grid technologies (e.g., solar thermal energy, dry sanitation, rainwater harvesting) aligns with broader decarbonisation and sustainability goals. This opens new pathways for EU-aligned funding, intermunicipal cooperation, and cross-border knowledge exchange, especially with countries like the Netherlands, Germany, and the Nordic states. Incorporating environmental performance metrics into design and permitting phases is key to accessing EU cohesion or LIFE programme funding for nature-based wellness infrastructure.

Ultimately, floating wellness architecture is not merely a design experiment but a multiscalar solution—capable of operating at the intersection of public health, ecological stewardship, and inclusive urban regeneration (UN-Habitat, 2019; Li et al., 2021).

5.1. Potential Environmental Risks and Mitigation Strategies

While floating wellness infrastructures offer opportunities for ecological regeneration and climate adaptation, their deployment also carries potential environmental risks that must be critically assessed. Key concerns include disruption of aquatic ecosystems due to shading, which can reduce light penetration and photosynthetic activity in submerged vegetation, as well as altered water circulation and oxygenation caused by fixed pontoons or dense module clustering (Pedroso de Lima et al., 2022). Empirical studies have shown that floating urbanisation can lead to thermal stratification, reduced dissolved oxygen levels, and microhabitat fragmentation in shallow lake or river systems (Pedroso de Lima et al., 2022). Moreover, if not properly managed, the operation of floating saunas may lead to the leakage of greywater, organic waste, or even fuel residues (in self-propelled units), resulting in localised eutrophication and ecosystem imbalance (Baker & Coutts, 2016). Noise, artificial lighting, and increased human presence can further stress aquatic fauna, particularly in protected areas such as Lido or semi-natural lacustrine sites.

To mitigate these impacts, best practices from European precedents suggest integrating floating wetlands, vegetated buffer zones, and permeable pontoon systems that allow water and light to flow (Calheiros et al., 2020). Research on Floating Wetland Islands (FWIs) implemented in marinas demonstrates their ability to increase biodiversity and water filtration potential by supporting microbial and invertebrate communities (Calheiros et al., 2020). Additionally, the environmental performance of FWIs has been shown to improve nutrient removal and reduce algae bloom risks (Takavakoglou et al., 2021).

Renewable energy integration (e.g., solar thermal collectors) and closed-loop sanitation systems (e.g., dry composting toilets, greywater filtration) are essential for maintaining ecological balance and meeting EIA requirements (Takavakoglou et al., 2021; Pandey et al., 2018). Life-cycle analysis of such systems confirms their feasibility and sustainability for mid-scale deployment (Takavakoglou et al., 2021).

It is therefore recommended that all floating wellness interventions in Serbia be subject to Environmental Impact Assessment (EIA), with performance indicators including light transparency, oxygen levels, biodiversity monitoring, and nutrient output control. Long-term ecological monitoring—particularly in sensitive or protected waterscapes—should be institutionalised to ensure that these structures enhance, rather than degrade, aquatic habitats.

6. CONCLUSION

This study has explored the potential for implementing floating wellness infrastructure in selected Serbian waterscapes—Ada Ciganlija, Lido (Great War Island), and Srebrno jezero—through an analytical-synthetic framework informed by European best practices. The findings confirm that floating wellness typologies are both architecturally adaptable and contextually relevant, provided adequate regulatory instruments and ecological sensitivity support them.

Key contributions of this research include:

1. A comparative framework for assessing waterscape readiness,
2. Identification of three pilot-ready locations in Serbia,
3. Policy recommendations for regulatory harmonisation,
4. Emphasis on modular, reversible, and eco-friendly design principles.

Floating wellness architecture emerges as a scalable, inclusive, and climate-adaptive solution that can contribute to Serbia's green transition, post-pandemic recovery, and spatial reimagination of public health infrastructure. Rather than being residual or peripheral, rivers and lakes are recast as commons of care—sites where healing, education, and ecological awareness converge.

Future work should focus on pilot implementation, involving cross-sectoral partnerships, public engagement, and performance monitoring. Additionally, legislative amendments are urgently needed to incorporate floating structures into Serbia's spatial planning and environmental legislation. By doing so, Serbia has the opportunity to position itself as a regional innovator in blue-green infrastructure and regenerative urbanism.

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