

TOWARDS A RESTORATIVE DESIGN FRAMEWORK: INTEGRATING ENVIRONMENTAL SENSITIVITY AND HERITAGE CONTEXT IN SPA SETTLEMENTS

ABSTRACT

This paper proposes a restorative design framework for spa settlements by integrating environmental sensitivity, heritage context, and multisensory experience. Building on an interdisciplinary state-of-the-art review and the pedagogical platform of the SPATTERN project at the University of Belgrade – Faculty of Architecture, the study examines six design proposals developed across three master-level studios: Multisensory Architecture, Heritage Reprogramming, and Hybrid Naturalities. The research employs a dual methodological structure: (1) Design Stream 1, which generates three thematic restorative proposals for Radaljska Banja, Banja Koviljača, and Vranjska Banja; and (2) Design Stream 2, which applies three disciplinary approaches to a single case study - Niška Banja. Cross-case comparison reveals recurring restorative mechanisms (linear experiential routes, heritage reactivation sequences, and eco-hydrological integrations) while also highlighting how different disciplinary lenses generate distinct trajectories of restoration. Three overarching restorative scenarios emerge: sensory–atmospheric restoration, heritage continuity and adaptive memory, and eco-cultural regeneration. The findings demonstrate that spa settlements possess unique spatial, ecological, and cultural conditions that can be strategically leveraged through restorative design.

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KEY WORDS

RESTORATIVE DESIGN
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ADAPTIVE REUSE
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1. INTRODUCTION

1.1. Notion of Spascapes – Spa Settlements Challenges

Spa settlements represent one of Europe's most historically layered and morphologically distinctive urban environments, shaped through centuries of interaction between hydrothermal resources, therapeutic practices, landscape infrastructures, and evolving socio-cultural imaginaries. Far from being local curiosities, these settlements formed a transnational urban system whose influence exceeded their geographical scale and positioned them as significant stages of European sociability, architectural experimentation, and health culture. Research over the last two decades consistently demonstrates that spa settlements constitute a recognizable and comparative urban phenomenon - what could be framed as *spascapes* (Milovanović et al, 2025), spatial frameworks in which natural, architectural, and socio-therapeutic landscapes operate as an integrated whole.

Urban-historical studies situate spa settlements within a broader European trajectory of urban formation, emphasizing their role as early prototypes of leisure urbanism and cosmopolitan exchange. Syntheses of the UNESCO *Great Spa Towns of Europe* serial nomination establish spa towns as a coherent typology defined by the intertwining of therapeutic landscapes, green and blue infrastructures, and purpose-built public architecture (Kuča, 2022; UNESCO, 2021). This perspective aligns with earlier historical analyses that identified spa towns, such as Bath, as engines of 18th-century urban renaissance, where the built fabric (assembly rooms, crescents, colonnades) served as a physical apparatus for new forms of polite sociability and performative urban life (Borsay, 2016; Frost & Laing, 2016). Transnational cultural histories further highlight the mobility of architectural ideas across spa settlements, framing them as nodes of European exchange, where elites circulated, and where urban and architectural models migrated across national boundaries (Steward, 2015; Zeman, 2012).

Despite their cultural and architectural significance, spa settlements today face a set of complex challenges that arise from demographic shifts, economic restructuring, climate change, and heritage management pressures. Research on adaptive reuse identifies the growing difficulty of maintaining oversized thermal infrastructures built for historical treatment regimes whose

contemporary relevance is diminishing (Fabi, Vettori & Faroldi, 2021). Post-socialist transformations in Central and Eastern Europe introduced additional ruptures, as socialist-era expansions often conflicted with 19th-century urban fabrics. The result is a fragmented urban landscape where abandoned facilities, underutilized heritage complexes, and mismatched infrastructural layers coexist, complicating efforts toward sustainable development and identity preservation. Moreover, environmental and climate-related challenges are becoming especially urgent. Recent studies emphasize that spa settlements, dependent on specific hydrothermal conditions, are highly vulnerable to aquifer shifts, environmental stress, flooding, and changing hydrological regimes (Golędzinowska & Ganczarek, 2025). Landscape-based research points to the degradation of blue-green networks that historically structured the therapeutic experience, arguing for reintegration of forest paths, waterways, and ecological corridors as key to contemporary revitalization (Ványolós, 2025; Leca, 2025). Technical heritage research further underscores the fragility of historic masonry and interior microclimates in bathhouses, calling for continuous monitoring and conservation strategies adapted to new thermal realities (Gutierrez-Carrillo et al., 2021; Popovska-Vasilevska & Armenski, 2015).

Parallel to environmental and physical challenges, spa settlements are undergoing profound socio-economic transformations. The shift from subsidized medical tourism to global wellness and lifestyle tourism has altered patterns of demand, reshaped urban economies, and intensified pressures on local communities (Steward, 2012). Market segmentation studies reveal increasingly diverse visitor profiles - ranging from “healing-motivated” to leisure-seeking users - each with distinct spatial expectations and potential conflicts (Dryglas & Salamaga, 2017; Smith & Puczkó, 2014). Geographic analyses further show that many spa settlements exhibit “shrinking city” characteristics, where the decline of traditional treatment industries destabilizes urban services and accelerates depopulation (Weidinger & Kordel, 2015). Against this backdrop, spa settlements emerge as laboratories of contemporary urban and environmental challenges, where heritage conservation, climate adaptation, socio-economic restructuring, and restorative design imperatives intersect. The concept of *spascapes* offers a holistic lens through which these challenges can be understood - not as isolated heritage problems, but as multi-scale, landscape-embedded phenomena that require integrated and sensitive design frameworks. This study positions itself within this interdisciplinary landscape, arguing that the future of spa towns depends on the development of restorative design strategies capable of reconciling ecological sensitivity, heritage value, and contemporary social needs.

1.2 Restorative Design Strategies – State of the Art

Contemporary discourse on sustainable architecture and landscape-oriented urbanism increasingly converges toward the concept of restorative design, a paradigm that integrates ecological sensitivity, circularity, human well-being, and heritage-conscious intervention. Across a wide body of recent literature, restorative design is framed as a corrective shift from extractive, growth-driven models of urban development toward design practices that regenerate ecosystems, valorize existing built fabric, and enhance multisensory and psychological well-being. Such perspectives hold particular potential for spa settlements - *spascapes* - whose historical identity is deeply rooted in the interplay between natural resources, therapeutic landscapes, and culturally layered environments.

The rise of restorative strategies across architectural and planning research highlights several converging themes. First, restorative environmental design (RED) has evolved as a conceptual and methodological framework focused on mental restoration, ecological renewal, and multisensorial experience (Hartig, Bringslimark & Patil, 2008). Applications in coastal landscapes demonstrate how design can orchestrate zoning for recovery, nature-based solutions, and sustainable resource management while enhancing human well-being (Kirana & Sunarya, 2024). In parallel, studies in educational, workplace, and children's environments demonstrate how spatial features - materiality, greenery, permeability, sensory gradients - produce measurable psychological restorative effects (Weber & Trojan, 2018). These insights offer direct relevance for spa settlements, historically conceived as environments for physical and mental cure, yet now challenged to reinterpret this curative ethos for contemporary needs.

A second major trajectory concerns adaptability, deconstruction, and no-demolish design, central to prolonging building life cycles and minimizing resource depletion. Systematic reviews and industry guidelines propose design-for-adaptability (DfA) (Askar, Bragança & Gervásio, 2022) and design-for-deconstruction (DfD) (Kanters, 2018) strategies such as modular assemblies, reversible joints, traceable materials, and flexible structural grids. Architectural manifestos emphasizing “restraint”- choosing not to demolish, transforming instead of replacing- have reframed no-demolish practice as a radical yet pragmatic tool for urban sustainability (ArchDaily, 2025). Historic spa settlements, characterized by oversized thermal complexes, underused bathhouses, and vulnerable masonry, stand to benefit considerably from such approaches, which preserve heritage value while enabling new adaptive programs.

The third line of research emphasizes circular economy strategies in the construction and renovation sectors, where principles such as reduce, repair, reuse, refurbish, remanufacture, and recover form the backbone of long-term ecological and material stewardship. Systematic reviews reveal persistent barriers - technical, financial, regulatory - yet also outline successful models for embedding reuse into architectural practice (Bellini et al., 2024; Dragonetti et al., 2025). Research on alternative recovery strategies further differentiates when to prioritize direct reuse, cascading flows, or relinking, stressing the importance of design foresight and “design for X” methodologies (Franconi et al., 2023). For spa settlements with constrained resources and extensive heritage infrastructure, such circular approaches provide actionable methods for transforming abandoned or oversized facilities without erasing historical layers.

A fourth cluster relates to regenerative and biophilic design, positioning the built environment as an agent of ecological renewal rather than mere environmental mitigation. Regenerative frameworks argue for net-positive outcomes - restoring ecosystems, rewilding consciousness, and creating buildings that contribute ecological value. Biophilic and restorative architecture studies emphasize psychological and physiological benefits derived from sensory richness, natural materials, and ecological interfaces (Nota et al., 2017). These insights resonate strongly with the original ethos of spa settlements, whose curative landscapes historically integrated forests, promenades, watercourses, and climatic therapies to create a holistic healing environment. As *spascapes*, these settlements naturally lend themselves to regenerative design approaches that enhance ecological performance while reinforcing therapeutic identity. Finally, cross-cutting literature highlights vernacular knowledge, traditional construction, and low-impact cultural practices as valuable precedents for restorative strategies. Systematic studies on vernacular architecture demonstrate how climate responsiveness, passive systems, and material circularity are embedded in traditional built environments (Zong et al., 2024). Translating these principles into contemporary spa settlements offers opportunities to align restorative design with local identity and culturally embedded understandings of environmental stewardship.

Taken together, these diverse strands of research establish restorative design as a multi-dimensional, integrative framework capable of addressing the intertwined challenges of heritage preservation, environmental vulnerability, socio-cultural transformation, and well-being enhancement in spa settlements. The potential for *spascapes* lies precisely in their inherent hybridity: they are simultaneously ecological systems, therapeutic environments, architectural

ensembles, and cultural landscapes. Restorative design strategies offer a conceptual bridge capable of reconnecting these dimensions, guiding interventions that work *with* existing resources - natural, architectural, and cultural - rather than against them.

2. MATERIALS AND METHODS

2.1. Research Context

The research draws on three master-level design studios at the University of Belgrade – Faculty of Architecture, conducted within the SPATTERN pedagogical framework. Multisensory Architecture (1st semester, 1st year) examines the sensorial and phenomenological dimensions of space through multisensory mapping, experiential diagramming, and environmental prototyping, positioning spa settlements as inherently multisensory environments shaped by water, vegetation, microclimate, and therapeutic infrastructures. Heritage Reprogramming (2nd semester, 1st year) focuses on adaptive reuse and restorative transformation of cultural heritage, addressing bath complexes, underused public buildings, and obsolete treatment facilities as opportunities for contemporary restorative agendas. The diploma-level studio Hybrid Naturalities (2nd year) integrates ecological systems, landscape infrastructures, and architectural interventions across scales, analyzing hydrothermal ecologies, forest paths, climatic gradients, and blue-green networks as foundations for regenerative spatial strategies in spa settlements.

In terms of course structure, the Multisensory Architecture and Heritage Reprogramming studios are offered in a combined studio-and-seminar format, carrying 15 ECTS (studio) + 2 ECTS (seminar). These formats support iterative analytical and design processes, enabling students to generate research-based design insights that directly feed into the methodological scope of this study. By contrast, the Hybrid Naturalities diploma studio is part of the final master-level academic module, comprising the thematic research phase, master thesis, master project, processfolio, and final design presentation, collectively carrying 30 ECTS. This expanded format provides a comprehensive platform for developing advanced, research-driven design proposals that integrate analytical rigour, contextual understanding, and restorative design strategies. Together, these three pedagogical settings form a multi-scalar and multi-method research environment in which spa settlements serve as case studies for investigating restorative design potentials. The diversity of methodological approaches, ranging from multisensory analysis to heritage reactivation

and ecological infrastructure design, provides a rich empirical basis for the analytical and design phases presented in the following sections.

Studio / Academic Level	Thematic Focus	Individual Case Study	Shared Case Study	Analytical Contribution
Multisensory Architecture	Sensorial and phenomenological spatial experience	Radaljska Banja	Niška Banja	Multisensory mapping, atmospheric analysis
Heritage Reprogramming	Adaptive reuse, heritage activation, no-demolish strategies	Banja Koviljača	Niška Banja	Heritage typologies, reprogramming potentials
Hybrid Infrastructures	Ecological systems, hybrid landscapes, blue-green networks	Vranjska Banja	Niška Banja	Territorial ecologies, hydrothermal networks

TABLE 1. Overview of Case Studies Across the Three Studios

2.2. Analytical Phase

The analytical phase of the research consists of two methodological components: (1) the selection of case studies, and (2) the spatial analysis of the selected spa settlements. These steps were jointly developed across three design studios participating in the SPATTERN pedagogical framework. Case selection followed a dual logic aligned with the structure of the studios: (1) the first design stream - assigns a different spa settlement to each studio, ensuring that analytical outputs emerge from the specific thematic lens of each course, and (2) the second design stream - employs a single shared case study for all studios, enabling methodological alignment and the development of a unified restorative design framework. Selected spa settlements (Table 1) represent different morphological conditions, hydrothermal resources, landscape typologies, heritage structures, environmental pressures, and development trajectories - providing a diversified empirical basis for the analytical phase (Figure 1).

2.3. Design Phase

The Design Phase translates the analytical findings into spatial, programmatic, and ecological design strategies applicable to spa settlements. Building on the diagnostic insights developed for each case study, this phase operationalizes the principles of restorative design - adaptability, ecological sensitivity, multisensory experience, and heritage-responsive transformation - to articulate a set of design propositions that address both the specific conditions of individual settlements and the broader logic of *spascapes*.

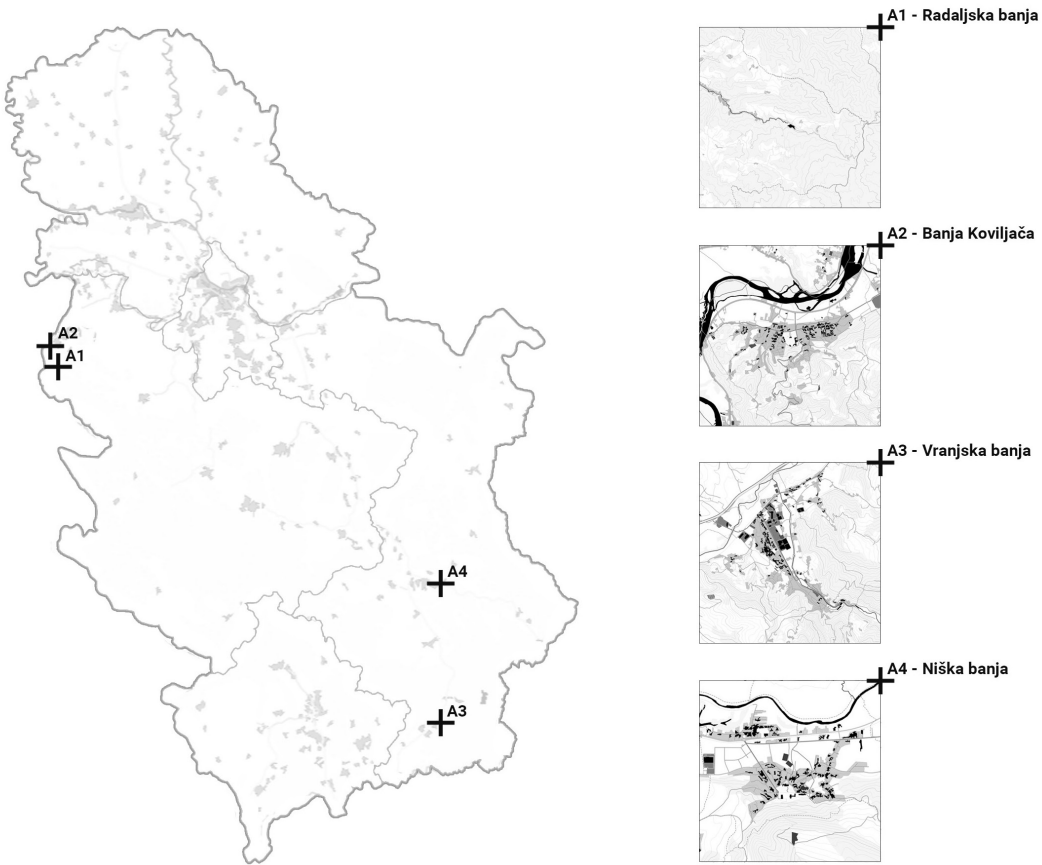


FIGURE 1. The Selected Case studies. Source: Authors

The design process is structured in two complementary streams. The first stream comprises studio-specific design development, in which each studio applies restorative principles to its assigned case study. This approach yields three distinct yet thematically aligned design outcomes: multisensory spatial intervention in Radaljska Banja, heritage reactivation strategy in Banja Koviljača, and ecological–infrastructural hybrid models in Vranjska Banja. The second stream represents a cross-studio integrative design process, wherein all three studios engage with Niška Banja as a shared case. This shared framework ensures methodological coherence and enables the synthesis of comparative design insights across scales, themes, and disciplinary approaches. Across both streams, the design methodology advances through three iterative components: (1) the definition of Restorative Spatial Strategies grounded in ecological recovery, heritage activation, multisensory enhancement, and landscape regeneration, (2) the articulation of Operational Design Principles,

detailing how such strategies translate into spatial organization, programmatic transformation, heritage-sensitive interventions, and environmental performance, and (3) the development of Design Prototypes, expressed through diagrams, spatial models, and interventions that visualize restorative potentials in concrete terms. By integrating multisensory, heritage-oriented, and ecological design approaches, the Design Phase generates a cohesive methodological foundation for proposing a restorative design framework for spa settlements. This framework forms the conceptual bridge between the analytical results and the broader conclusions of the study, demonstrating how restorative design can guide the sustainable and sensitive transformation of *spascapes*.

3. RESULTS

The results of this study are structured into two complementary design streams that reflect the methodological duality of the SPATTERN pedagogical framework. Design Stream 1 presents three thematic restorative design proposals, each addressing a different spa settlement through its specific disciplinary lens. Design Stream 2 introduces three unified restorative design applications for a single case study, Niška Banja, demonstrating how multisensory, heritage-responsive, and ecological approaches can converge within the same spatial context. Each of the six design proposals is presented through three analytical-design dimensions (1) Spatial–Morphological Dimension, (2) Programmatic–Functional Dimension, and (3) Environmental–Restorative Dimension. For each proposal, these dimensions are illustrated through three corresponding diagrams or visualizations. This triadic structure enables the projects to be examined comparatively, while also establishing a consistent analytical matrix that will be further explored in the Discussion section through a cross-project evaluation.

3.1. Design Stream 1

Multisensory Architecture – Radaljska banja

Within the valley-based geomorphological context of Radaljska banja, the design approach is based on a continuous linear trajectory that reads the terrain as a sequence of natural focal points. Conceived as a scenic route, it connects the spa core with key topographic and hydrological landmarks, responding to the valley's inherent linear movement logic. The concept draws on the site's therapeutic qualities – thermal healing water, forested environments, water surfaces, and microclimatic gradients, forming the basis for restorative

spatial experiences. The Radaljsko jezero zone is developed as a scene where landscape-therapeutic programs converge. These units, designed as minimal, landscape-sensitive interventions, function as resting areas, bathing platforms, and meditative spaces. Architectural configurations intentionally defer to nature, integrating with existing geomorphological and vegetative matrices. This approach positions Radaljska banja as a restorative landscape environment where geomorphology, sensory perception, and experiential movement intersect, producing a spatial narrative derived directly from the context.

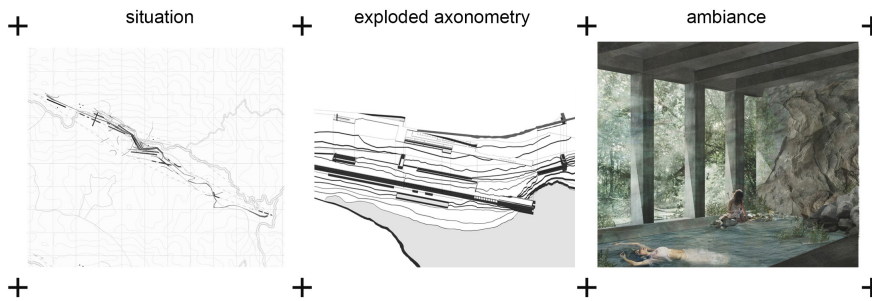


FIGURE 2. Design representation. (Studio M01 - Multisensory Architecture: Radaljska banja, class student Jelena Mihailovic, University of Belgrade - Faculty of Architecture, 2023)

Heritage Reprogramming – Banja Koviljača

The project focuses on reprogramming the ambient heritage of Banja Koviljača through the reinterpretation and integration of recognized architectural elements from protected structures and ambient zones of the royal period with natural protection areas. The intervention is organized linearly, along two orthogonal axes, aiming to traverse different levels of protection and critically reassess the degree of intervention. The main axis, connecting the central ambient zone with the Sanatorium, passes through three levels of spatial protection and is structured around thematic sequences (bathing, steaming, relaxation, meditation, fresh air) conveying the specific ambient characters developed over time. The minor axis, aligned with natural protection zones, symbolically forms a green barrier, marking the limit of further development. Constructive elements are derived by decoding architectural features from the protected context, recognizing their evocative potential. The approach critically examines architectural intervention within contemporary regulatory frameworks and fosters discussion on transmitting the memory of place within multi-layered protection zones.

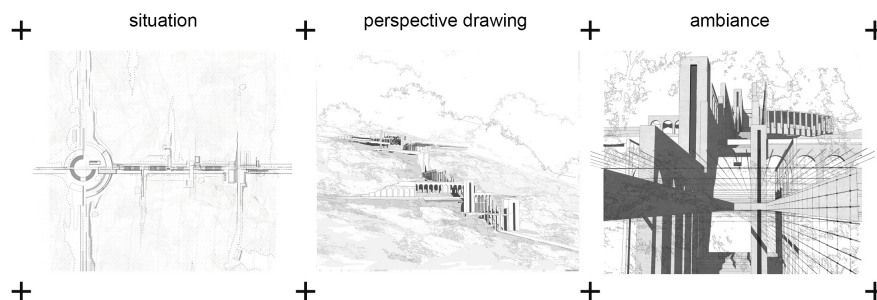


FIGURE 3. Design representation. (Studio M02 - Heritage Reprogramming: Banja koviljaca, class student Jelena Mihailovic, University of Belgrade - Faculty of Architecture, 2024)

Hybrid Naturalities – Vranjska banja

The design approach is based on recognizing the water-integrated landscape identity of Vranjska banja, exploring the role of water as a key element in shaping the narrative and ambient landscape. The intervention begins with an analysis of the spatial, social, and symbolic functions of water, which connect the historical layers of the spa with the contemporary practices of the local community. Water is employed as an integrator of natural processes and social narratives, interpreted through the analysis of historical postcards that reveal the spaces and practices of its use over time. The architectural gesture develops on two temporal levels: a permanent layer establishes a network of paths along the course of the Banjska river, incorporating public pools, springs, and fountains; a temporary layer consists of pavilion structures that highlight thermal-water sources and transmit knowledge of water-use technologies. The project aims to reinterpret complex landscape systems, establish a methodology for reading space, and reconsider the architectural role in preserving the identity of spa localities.

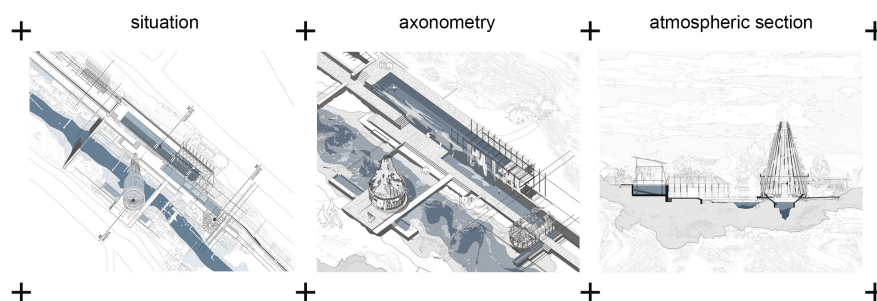


FIGURE 4. Design representation. (Diploma studio - Hybrid Infrastructures: Vranjska banja, class student Jelena Mihailovic, University of Belgrade - Faculty of Architecture, 2025)

3.2. Design Stream 2

Multisensory Architecture – Niška banja

The project investigates how the sensory heritage of Roman baths can be reinterpreted through contemporary multisensory architecture, using Niška banja as a case study. Although the spa was historically used in Roman times and is closely linked to Mediana, the remains of its baths remain undocumented, creating a gap between historical knowledge and spatial experience. By examining sensory qualities of Roman bathing (heat, humidity, acoustics, light, and movement) through examples such as the Baths of Caracalla and regional Moesia Superior sites, the research establishes a framework for translating these experiences into architectural form. The resulting design proposes a semi-submerged museum that integrates seamlessly with the surrounding landscape, emphasizing the notion of heritage that is present yet no longer visible. Conceived as an atmospheric and educational journey, the museum invites visitors to engage with history through embodied perception. Through spatial sequencing, gradients of temperature, sound, and materiality, the project evokes the cultural essence of Roman bathing and offers a new way of experiencing lost heritage within Niška banja.

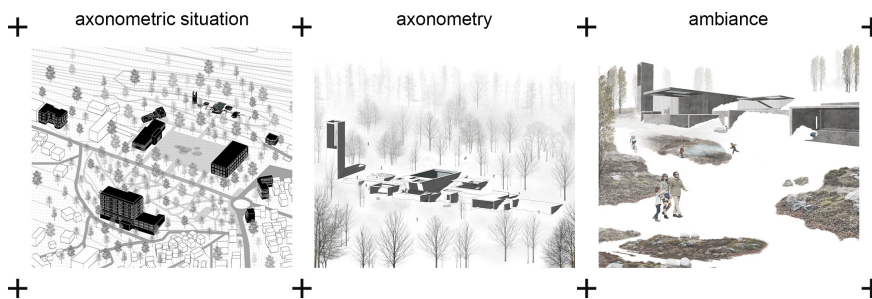


FIGURE 5. Design representation. (Studio M01 - Multisensory Architecture: Niška banja, class student Mila Mitrović, University of Belgrade - Faculty of Architecture, 2023)

Heritage Reprogramming – Niška banja

The sharp cultural and political shifts of the late 20th century led to the neglect and degradation of the interwar modernist heritage of Niška banja. The villa complex, originally designed by Russian and Yugoslav architects as an innovative expression of early modernism, gradually lost its spatial integrity and nature-filled atmosphere due to excessive urbanization. This project aims to reactivate the modernist ensemble by restoring lost vistas and reintroducing

spaces for relaxation within the natural landscape. Through new spatial, programmatic, and landscape elements, the villas become reconnected with each other and their surroundings, regaining cultural and functional relevance. Their aesthetic value, even in fragmented form, possesses strong evocative and emotional potential, forming a basis for enhancing collective memory. Archival research reveals lost visual axes, while analysis of architectural characteristics informs potential interventions. The resulting design introduces structures that reinterpret modernist fragments, integrate natural elements, and reweave the villas into a coherent network, revitalizing both the micro scale of each villa and the macro scale of the spa's urban fabric.

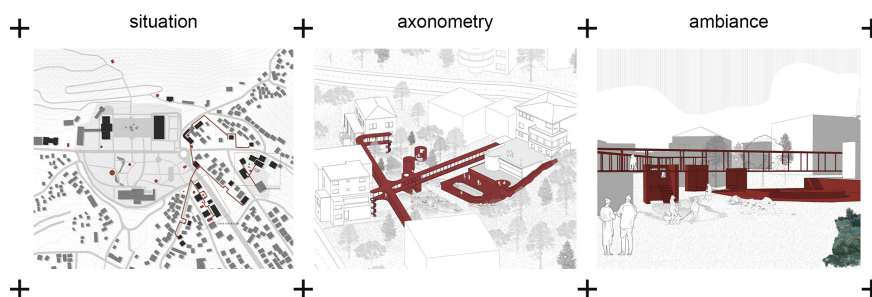


FIGURE 5. Design representation. (Studio M02 - Heritage Reprogramming: Niška banja, class student Mila Mitrović, University of Belgrade - Faculty of Architecture, 2024)

Hybrid Naturalities – Niška banja

The project interprets Niška banja as a temporal and spatial palimpsest, where the remains of Roman baths, the Ottoman hamam, and the modernist spa complex overlap within the same landscape. Over time, the loss of the earliest layers, especially the Roman *thermae*, has fragmented the identity of the site and weakened its cultural continuity. The design aims to restore this continuity by reactivating the “missing” layers through contemporary architectural expression. The new intervention is located where information is most lost, at the site of the Roman baths, reinterpreted as an underground multisensory museum and bathhouse that recalls the atmosphere of heat, water, and light rather than its original form. Smaller interventions engage the surrounding natural and urban fabric, connecting the modernist and Ottoman heritage into a coherent experiential sequence from the Republic Square to the Suva Banja spring, establishing a new balneological center that integrates history, landscape, and contemporary use.

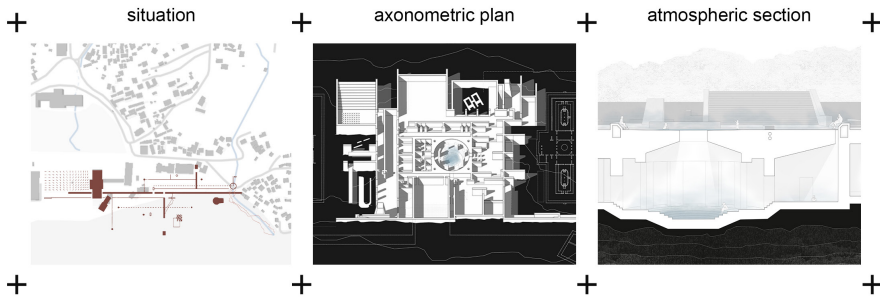


FIGURE 5. Design representation. (Diploma studio - Hybrid Infrastructures: Niška banja, class student Mila Mitrović, University of Belgrade - Faculty of Architecture, 2025)

4. DISCUSSION

4.1 Cross-Project Analysis Across Three Dimensions

The six design proposals - three thematic (Design Stream 1) and three unified (Design Stream 2) - were comparatively examined through the triadic analytical framework consisting of the Spatial–Morphological, Programmatic–Functional, and Environmental–Restorative dimensions (Table 2). This cross-project analysis reveals distinct patterns of convergence and divergence, suggesting that despite disciplinary differences, the proposals consistently articulate a shared restorative logic adaptable to varied spa settlement contexts.

4.1.1. Spatial–Morphological Dimension

Across all projects, spatial structuring demonstrates a strong affinity for linear, axial, or spine-based organizational systems, whether derived from topography (Radaljska banja), heritage protection frameworks (Banja Koviljača), ecological corridors (Vranjska banja), or historically shaped settlement morphologies (Niška banja). Thematic projects tend to anchor their spatial logic in contextual readings: (1) a topography-driven axis in Radaljska banja, (2) a biaxial orthogonal system tied to regulatory zones in Banja Koviljača, and (3) a clustered spine reflecting hydrological processes in Vranjska banja. By contrast, the unified Niška banja proposals show more typological variability, shifting from linearity (MA), to rhizomatic dispersion (HR), to linear–clustered hybrids (HN). This suggests that when working within a single urban and heritage framework, differences in disciplinary emphasis (sensory, heritage, ecological) become more pronounced morphologically. Overall, the morphological dimension indicates that linearities, whether experiential, ecological, or heritage-derived, serve as privileged restorative instruments, enabling the reweaving of fragmented spa landscapes.

Design Proposal	Spatial–Morphological	Programmatic–Functional	Environmental–Restorative
MA – Radaljska banja	Topography-driven linear / axial	<ul style="list-style-type: none"> • Linear program organization • Therapeutic–experiential sequence • Series of atmospheric spaces 	Landscape integration / Regenerative–Therapeutic
HR – Banja Koviljača	Hierarchical Biaxial / Orthogonal (urbanistic) Topography-driven linear (architecture)	<ul style="list-style-type: none"> • Regulatory sensitivity analysis • Reinterpreted ambient sequences • Clustered program organization 	Natural–Cultural integration / Regenerative–Therapeutic
HN – Vranjska banja	Clustered + linear spine	<ul style="list-style-type: none"> • Thematic pavilion network • Reinterpretation of water-use community knowledge • Layered intervention: permanent core & temporary pavilions 	Hydro–Cultural Reimagination
MA – Niška banja	Linear	<ul style="list-style-type: none"> • Linear program organization • Reinterpretation of the functional logic of Roman baths • Series of atmospheric spaces 	Landscape integration / Heritage Reimagination
HR – Niška banja	Rhizomatic / dispersed	<ul style="list-style-type: none"> • Reactivation of the villas through new programs • Establishing functional connections between the villas • Reorganization of public spaces (paths, terraces, viewpoints, resting areas) 	Heritage Revitalisation
HN – Niška banja	Linear (urbanistic) Clustered (architectural)	<ul style="list-style-type: none"> • Linear experiential route • Reactivation of lost historical layers • Creation of a new balneological center 	Heritage Revitalisation / Heritage Reimagination

TABLE 2. Cross-Project Analysis Across Three Dimensions

4.1.2. Programmatic–Functional Dimension

The programmatic layer shows the clearest disciplinary signatures. Proposals rooted in multisensory architecture (MA) emphasize sequentiality, atmospheric transitions, and spatial programming that enhances embodied perception. Both Radaljska and Niška banja MA proposals rely on linear experiential routes composed of atmospheric chambers - an alignment that confirms the robustness of multisensory programming across different contexts. Heritage reprogramming (HR) projects prioritize reactivation, reinterpretation, and reconnection. In both Banja Koviljača and Niška banja, programmatic strategies revolve around: (1) reactivating historic buildings or ensemble fragments, (2) re-establishing functional or visual connections,

and (3) creating sequences that mediate between degrees of protection and contemporary use. Hybrid Naturalities (HN) proposals foreground water systems and ecological logics. In Vranjska banja, programming emerges from water-use cultural practices, while in Niška banja it is structured around the creation of a new balneological center and the re-inscription of lost historical water narratives (Roman–Ottoman–modernist palimpsest). Comparatively, the programmatic–functional dimension confirms that restorative design in spa settlements is inherently narrative, relying on the structuring of movement, memory, and ecological processes into spatial experience.

4.1.3. Environmental–Restorative Dimension

Across all six proposals, the strongest unifying theme is the incorporation of restorative, heritage-responsive, and ecological mechanisms into the design logic. Three major tendencies emerge: (1) Landscape Integration and Regeneration – Radaljska and Niška banja MA proposals deploy restorative effects through sensory landscapes, microclimate modulation, and terrain-sensitive integration, (2) Natural–Cultural Reintegration – HR–Banja Kobiljača and HR–Niška banja reconnect natural and built heritage layers, emphasizing culturally embedded environmental restoration, (3) Hydro–Cultural Reimagination – HN proposals re-center water as a restorative and identity-defining medium, employing it simultaneously as ecological infrastructure and cultural narrative. This dimension demonstrates that restorative design in spa settlements is most effective when it operates at the intersection of material, sensory, ecological, and cultural systems.

4.2 Comparative Analysis Between the Two Design Streams

The distinction between Design Stream 1 (three different spa settlements) and Design Stream 2 (Niška banja as a constant) provides insight into how restorative design behaves under variable contextual conditions versus controlled comparative settings. Together, the two streams reveal that: (1) Design Stream 1 demonstrates situational adaptability, while (2) Design Stream 2 demonstrates methodological consistency. Both are essential for formulating a Restorative Design Framework for Spascapes, capable of working simultaneously across typological diversity and within specific, layered heritage environments.

4.2.1. Contextual Adaptation (Design Stream 1)

When each proposal responds to a different spa settlement, the designs exhibit strong contextual specificity:

(1) Radaljska banja - terrain-driven sensorial immersion, (2) Banja Koviljača - heritage sequencing across protection zones, and (3) Vranjska banja - ecological and hydrographic layering. These thematic projects demonstrate the elasticity of restorative frameworks, adapting to geomorphology, heritage complexity, or ecological infrastructure. Restorative design thus proves capable of registering and amplifying unique territorial identities.

4.2.2. *Controlled Divergence (Design Stream 2)*

In Niška banja, the same spatial context produces three disciplinary interpretations: (1) MA - sensory reinterpretation of Roman baths, (2) HR - reactivation of interwar modernist villas, and (3) HN - reintegration of Roman–Ottoman–modernist layers into a new balneological axis. What differs most is not morphology, but what each discipline chooses to restore: (1) MA restores sensory atmospheres, (2) HR restores architectural and cultural continuity, while (3) HN restores hydrological, ecological, and temporal depth. This confirms that restorative design is inherently plural, enabling multiple restorative readings even within a single site. Design Stream 2 thus validates that restorative methodologies do not rely on site change, but on the perspective and disciplinary lens applied.

5. CONCLUDING REMARKS: SCENARIO-BASED SYNTHESIS

To synthesize the broader contribution of this research, the three disciplinary approaches (Multisensory Architecture, Heritage Reprogramming, and Hybrid Naturalities) can be understood as restorative scenarios, each offering a distinct pathway for aligning spatial design with environmental sensitivity and heritage context.

Scenario 1: *Multisensory Architecture* – Restorative Atmospheres and Embodied Perception

This scenario positions restorative design as an experiential and atmospheric process. It enhances well-being through: (1) spatial sequences, (2) gradients of temperature, sound, moisture, light, and (3) material tactility and microclimatic modulation. Both MA projects (Radaljska and Niška banja) demonstrate that sensory restoration can reveal latent heritage (Roman bathing rituals) and amplify natural terrains (valley-oriented landscapes). This confirms that multisensory design is a powerful instrument for reconnecting visitors to ecological and cultural layers through embodied experience.

Scenario 2: *Heritage Reprogramming* – Restorative Continuity and Adaptive Memory

This scenario understands restoration as cultural and architectural reactivation. It emphasizes: (1) adaptive reuse of heritage ensembles, (2) reinterpretation of architectural fragments, (3) re-establishing spatial connections lost over time, and (4) navigating regulatory and conservation layers. HR proposals in Banja Koviljača and Niška banja illustrate that spa settlements benefit from approaches that stabilize cultural memory while enabling contemporary use, producing restorative effects by healing discontinuities between time periods. Heritage becomes not a constraint but a dynamic restorative resource.

Scenario 3: *Hybrid Naturalities* – Restorative Ecologies and Temporal Palimpsests

This scenario frames restorative design as an eco-cultural regeneration process. It is grounded in: (1) hydrothermal ecologies, (2) water-based narratives, (3) blue-green infrastructures, and (4) intertemporal layering (Roman–Ottoman–modernist). HN projects show that spa settlements hold extraordinary potential as eco-cultural palimpsests, where restoring water systems also restores identity, memory, and social practices. This approach generates restorative spaces by revealing and amplifying ecological processes operating across multiple scales.

Synthesis of the Three Scenarios

Together, these scenarios demonstrate that restorative design in spa settlements is: (1) multidimensional (sensory, cultural, ecological), (2) scalable (from object to territory), (3) historically grounded yet forward-oriented, and (4) capable of producing diverse, yet compatible restorative outcomes. They collectively form the conceptual foundation for the Restorative Design Framework, which emerges as the central contribution of this research.

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Conflicts of Interest

The Science Fund of the Republic of Serbia had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, as well as in the decision to publish the results.

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