Theatre Scenography Between Sustainable Practices and Experimentation

DOI : 10.46522/S.2026.01.21

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Abstract: *This essay interrogates the evolving ontology of scenography at the friction point between ecological responsibility and artistic experimentation. It argues that frameworks like the "Theatre Green Book" function not as external restrictions but as generative parameters that reorganize design authorship, workflows, and aesthetics. Adopting the designer's perspective, the paper frames ecoscenography as a shift from linear models to circular practices of reversible making and afterlife planning. Here, sustainability is redefined as experimentation under constraint - encompassing modularity, bio-material testing, and a critical engagement with the digital paradox of energy-intensive AI tools. The study situates these shifts within the Romanian context, arguing that historical practices of reuse driven by scarcity must evolve into intentional, scalable circular systems. Ultimately, the essay posits that these regenerative strategies do not merely „green" the stage but also fundamentally reimagine the phenomenological possibilities of performance through a new ethics of material stewardship.*

Key words: *circular scenography; sustainable theatre; ecoscenography; production ecology.*

1. Introduction

Throughout the ages, theatre has advanced through a continuous process of material and visual experimentation — machines, architectural transformations, new lighting technologies, new dramaturgies of space, and new relations between performer and environment. Innovation is not new to scenography. Today, however, innovation is frequently demanded under conditions of compression: tighter schedules, small budgets, limited workshop capacity, touring demands, and heightened audience expectations shaped by screen culture and real-time media. Sustainability adds another layer of complexity: experimentation must now justify itself not only artistically but materially and energetically. Contemporary scenography is consequently being re-authored by three converging pressures: the climate emergency (and the cultural sector's responsibility within it), the accelerating development of AI-driven creative tools, and theatre's enduring imperative to innovate - formally, materially, technologically, and politically. For scenographers, these pressures do not arrive as separate topics. They collide in the daily pragmatics of making: what we specify, where we source, how we prototype, what we tour, what we strike, what we store, and what we leave behind.

While the intersection of the performing arts and the climate crisis is becoming a subject of global interest and extensive experimentation on stage, a purely thematic focus risks obscuring the material reality of the medium itself. Theatre remains an industrially resource-intensive practice, predicated on the rapid assembly, display, and subsequent disassembly of temporary worlds. As the global theatre sector moves from awareness to mitigation, the critical focus must shift from *what* the theatre says to *how* the theatre is made. Because scenography concentrates theatre's material extraction, fabrication, transport, and end-of-life impacts, it is the primary site where sustainability becomes concretely operational. Yet, for the designer, this responsibility presents a complex tension: how does one reconcile the ethical mandate to reduce with the artistic imperative to experiment and construct immersive, spectacular environments for the stage?

Over the preceding decade, the concept of sustainability has transitioned from a marginal *ecological supplement* to a primary production paradigm. For instance, the *Theatre Green Book* (Dillon 2021) conceptualizes sustainable creation through the logic of a circular economy, emphasizing the prioritization of reuse, recycling, and post-production planning for costumes, sets, props, and structural elements as fundamental design requirements rather than retrospective mitigation strategies.

At the same time, this new materiality faces a complex, almost dialectical tension with the rise of Artificial Intelligence (AI) in design - a tool that offers unprecedented efficiency yet embodies a hidden ecological cost that often contradicts the very principles of sustainable practice. AI is not environmentally neutral: its growth is entangled with the expansion of data centres, electricity demand, cooling water use, and the embodied carbon of hardware and infrastructure.

In terms of reimagining the future of performing arts scholars and artists, designers like Tanja Beer[1], Kaisa Illukka[2] or Tessa Rixon[3], posit that constraints - whether

[1]Dr. Tanja Beer is a pioneering ecological designer and academic credited with defining the field of Ecoscenography. Her work redefines stage design by integrating ecological principles into the creative process, advocating for „regenerative" theatre that benefits local environments and communities rather than just reducing waste. She is best known for her global project *The Living Stage*—which features edible, biodegradable sets—and her foundational book, *Ecoscenography: An Introduction to Ecological Design for Performance* (2021). Source : Beer 2021.

[2] Kaisa Illukka is a Finnish scenographer, artist, and educator known for expanding stage design into the realms of environmental activism and ecological pedagogy. Based in Helsinki, her work often abandons traditional theatre spaces to engage directly with the natural world, exploring "interspecies" relationships and the agency of non-human entities (such as pollinators and plants). She views scenography not merely as a visual craft, but as a method for shaping ecological worldviews, creating site-specific performances that function as quiet, durational activism against environmental degradation.Source: https://kaisaillukka.wixsite.com/portfolio/info.

[3]Dr. Tessa Rixon is an Australian academic and practitioner specializing in digital scenography and intermedial performance. Based at Queensland University of Technology (QUT), she explores the convergence of new technologies and sustainability, investigating how digital tools

budgetary, material, or ecological—function not as limitations on creativity, but as catalysts for a new experimental aesthetics. This approach defines a new trajectory for the discipline: one that navigates the tension between the „vibrant matter" of eco-materials and the „hallucinated architectures" of AI, finding within this friction a new language for the 21st-century stage.To understand the magnitude of the ecological challenge, one must first operationalize a broad definition of scenography. In this context, scenography encompasses the totality of the performance's material and spatial environment: the structural architecture, the „second skin" of costume, the atmospheric materiality of light and haze, and the props that circulate within the space. This essay argues that the key question is not whether scenography should be sustainable, innovative, or AI-literate, but rather how much freedom for experimentation remains when these imperatives intersect - and what kinds of experimentation become new possibilities (or new constraints) under an ecoscenographic horizon.

2. The Paradigm of Ecoscenography and the *Theatre Green Book* Framework

The response to this material responsibility is the emerging field of *Ecoscenography*. Coined by Tanja Beer around 2016, this term synthesizes *ecology* and *scenography* to define a practice that integrates ecological principles into every stage of design thinking, moving the discipline beyond mere mitigation - „doing less damage" - toward a regenerative ethos of „doing more good." This approach fundamentally challenges the traditional, linear production model, often described as „make-take-waste," where design is driven by artistic desire without regard for provenance, followed by fabrication with virgin materials, a temporary performance run, and an inevitable strike that sends the set to landfill. In contrast, ecoscenography advocates a circular framework in which materials are managed in closed loops through strategies such as design for disassembly - where components are conceived and constructed in ways that ensure they can be recovered and reused, rather than demolished and discarded.

If ecoscenography provides an expanded ethical horizon, frameworks like the *Theatre Green Book (TGB)*operationalize it through concrete standards, targets, and a shared professional language. Initiated during the COVID-19 lockdowns of 2020 by architect Paddy Dillon and executive Lisa Burger - founders of *Renew Culture*[4] - the project was technically co-authored by the engineering consultancy Buro Happold to ensure its standards were grounded in rigorous climate science. Supported by a steering group of major industry bodies, including the *ABTT*, *Theatres Trust*, and *SOLT/UK Theatre*, the *Theatre Green Book* articulates a *materials hierarchy* that begins by designing out the

can be used responsibly in theatre. She is a leader in the global design community, serving as Chair of the Research Commission for OISTAT and frequently collaborating with Tanja Beer on research into sustainable digital touring. Source : https://www.qut.edu.au/about/our-people/academic-profiles/tessa.rixon.

[4] https://renewculture.co.uk/

need for new resources, prioritizes reused or recycled sources (ideally local), and relegates virgin raw materials to the bottom of the pyramid. The book became a landmark, a sector-wide initiative designed to operationalize sustainability within the performing arts by providing a unified standard for climate-responsible practice. Its primary objective is to guide theatres toward a zero-carbon future through three distinct volumes: *Sustainable Productions*, which sets granular targets for material circularity and waste reduction in scenography; *Sustainable Buildings*, which addresses energy efficiency and infrastructure; and *Sustainable Operations*, covering logistics like catering and travel. By establishing clear, tiered benchmarks - Baseline, Intermediate, and Advanced - the *Theatre Green Book* aims to eliminate „greenwashing" and provide a shared language for sustainability, enabling organizations of all scales to embed ecological thinking directly into their creative and operational workflows. For example, the *Baseline Guidance* section specifies that 50% of all sets, props, and costumes must be sourced from reused or recycled materials.

Two points are crucial for understanding how such frameworks reshape experimentation.

First, the *Theatre Green Book* explicitly states that sustainability must be integrated from the outset. It argues that if sustainability is introduced later, it will appear restrictive; if embedded in the initial invitation to collaborators, it becomes part of creative thinking from the start.(Buro Happold and Renew Culture Ltd, 2024, 20) This is not a minor managerial detail. It reframes sustainability from a policing mechanism into a generative constraint - a set of parameters that can catalyse new formal solutions.

Second, the *Theatre Green Book* quietly alters the ontology of scenographic objects: sets are no longer made and then struck; they are designed to circulate. The education edition names two design approaches that make sustainability easier over time: modular design (so generic components can be reused across productions) and designing for disassembly (so that materials remain in whole sheets and can be recovered). This pushes scenography toward an infrastructural sensibility: designers begin to think not only in terms of a unique world-image but also in terms of shared component libraries, storage ecologies, and institutional memory.

While material limitations may restrict the sheer scale of the spectacular, they force a deeperengagement with the agency of matter. Genuine innovation emerges not when sustainability is treated as an administrative checklist - a performative „greening" of business as usual—but when it becomes the foundational logic of the creative act. However, this artistic evolution cannot occur in a vacuum; it requires a corresponding transformation in institutional infrastructure and policy. To operationalize ecoscenography, institutions must reform procurement strategies to prioritize access over ownership and invest in shared storage infrastructures that allow materials to hibernate and re-emerge. Ultimately, the future of experimental scenography depends on policy frameworks that incentivize co-productions and cooperative touring systems, valuing the longevity of resources over the novelty of consumption. Ecoscenography is

a reorientation of scenographic thinking toward interdependence: between bodies and environments, objects and infrastructures, aesthetics and extraction.

What matters here is not only a change in *materials* but a change in *epistemology*. Kaisa Illukka's reflection on sustainable performance design points to how theatre historically insulated itself from ecological accountability: meaning-making was assumed to compensate for physical emissions, and „artistic autonomy" could become an alibi for ignoring the socio-ecological reality. Ecoscenography challenges that insulation. It insists that scenographers - who often orchestrate the largest material flows in a production - cannot treat environmental cost as external to artistic choice (Illukka, 2023, 17).

This shift resonates with new materialist strands in scenography scholarship, which attend to the vitality of matter and the agency of objects. In a discussion of „scenographic stuff", Grace Hook connects ecoscenographic thinking to an attentiveness that finds scenographic potential in the *scrapheap* of unwanted remains - precisely the domain where reuse-based design discovers both constraint and poetic charge (Hook, 2024, 369). In other words: ecoscenography can be an ethics, a logistics, and an aesthetics. It asks us to see that the look of a world is inseparable from the worldliness of its making. Ecoscenography also expands the spatial boundaries of the discipline. Rachel Hann (2019) argues for „scenographics" - the orienting traits of staging that occur beyond the theatre building. This includes site-specific works where the scenography is the existing environment. By engaging with found spaces (urban ruins, parks, abandoned spaces), the designer reduces the need for new construction. The experiment here is one of *curation* rather than *creation*. The scenographer reveals the dramaturgy of the site itself, negotiating with the history and ecology of the location rather than imposing a fictional layer upon it. This aligns with the „aesthetics of atmosphere" (Böhme, 1993), where the primary material is not wood or canvas, but the tuning of a space through light, sound, and presence.

3. Sustainability as a Form of Experimentation

Throughout theatre history, scenography has played a central role in theatrical experimentation, serving as the primary mechanism through which the live event is physicalized, creating the visual shape for an engaging environment. In the postdramatic landscape, scenography evolves from mere background illustration into an active, dramaturgical agent (Lehmann, 2006; McKinney and Butterworth, 2009). Rather than simply providing a setting for a narrative, the spatial, visual, and auditory elements of the stage actively shape the audience's sensory experience. This paradigm shift aligns closely with the „material turn" in critical theory, particularly Jane Bennett's concept of *vibrant matter*. Bennett challenges the anthropocentric worldview, arguing that matter is neither inert nor passive; rather, it possesses a distinct „thing-power"—an intrinsic agency that interacts with and acts upon human bodies (Bennett, 2010, 3). When applied to performance design, Bennett's theory suggests that the physical materials of the stage are active co-creators of meaning. This non-human agency becomes evident when a heavy,

unyielding set physically „resists" a performer, forcing an unplanned adaptation in their movement, or when an encroaching atmosphere of dense fog fundamentally alters the audience's perception of scale, space, and time. In these moments, scenography ceases to be a static container for human action.

The central tension lies in the relationship between *sustainability* and *experimentation*. The concept of *experimentation* in scenography has historically been synonymous with the pursuit of the *never-before-seen*, often achieved through the lavish expenditure of resources and the technological conquest of space. From the hydraulics of the Baroque court theatre to the projection-mapped theatre performances of the 21st century, the experimental edge was defined by the ability to transcend material limits.However, inthe emerging paradigm of ecoscenography, the experimental frontier is no longer defined by expansion, but by contraction. It is an experimentation *under constraint*. This shift fundamentally redefines what counts as an experiment in theatre design, moving from a *teleology of product* (the final, perfect set) to an ontology of process (prototype, iteration, and adaptation). To understand experimentation under constraint, we must first destabilize the traditional production hierarchy. In the conventional model, the experiment occurs primarily in the mind of the designer or on the drafting table (or screen). Traditionally, the construction phase is merely the execution of a predetermined plan; ecoscenography disrupts this linearity by repositioning the experiment into the physical realm of fabrication and rehearsal. Here, a central tension emerges: Does this new paradigm curtail the freedom to experiment? Furthermore, how does it shift aesthetic values, and what becomes of the *spectacular dimension*? A critical question remains regarding the difficulty of achieving this dimension - and specifically, to what extent scenography can remain visually impressive and grand following the adoption of rigorous ecological practices.

Illukka's argument in her 2023 contribution to the volume *Sustainable Choices – Potentials and Practices in Performance Design* helps clarify the stakes: if theatre previously imagined itself „above climate change", then sustainability can feel like a loss—of autonomy, of speed, of indulgence, of excess. (Illukka 2023, 17). But ecoscenography reframes autonomy as responsibility: the scenographer is not less free; rather, freedom is redefined as the ability to invent forms that do not externalise their damage elsewhere (to forests, to waste streams, to carbon budgets, to labour conditions). In practice, the innovation imperative manifests as a complex negotiation among competing forms of value: the aesthetic effect of the staged world, the operational resilience of the build, the ecological necessity of circularity, and the digital advantages of rapid iteration. The designer's task is not to select a single priority but to choreograph these trade-offs, ensuring that ecological impact is never relegated to an afterthought. Once specifications for materials, construction methods, and transport volumes are established, the project's embodied carbon is largely irrevocable; while a production manager may mitigate waste downstream, they cannot undo the environmental cost inherent in the initial concept. Consequently, the designer's perspective is analytically necessary, as they possess the unique upstream agency to intervene before the carbon is spent. Every

material decision - such as the choice to use virgin polystyrene - is simultaneously an aesthetic and ecological proposition, turning the conscious exercise of this agency to disrupt the industry's linear flow of extraction and disposal into the true experiment of contemporary scenography.

Experimentation shaped by ecological thinking is already driving material innovation among designers. This is exemplified by costume designers such as the American designer Sarah Mosher[5] and the Romanian designer Cristina Milea, who tested bio-based materials including mycelium, kombucha „leather," and algae bioplastics. Unlike the relative permanence of plastics, these substances introduce a radical temporality: they transform the stage into a metabolic system, where artistic experimentation involves managing decay and adapting rehearsal processes to living - or once-living - matter. Alongside this bio-designlies a renewed emphasis on modularity in set construction. Sustainability encourages the development of reusable „kits of parts": standardised components that can be repeatedly reconfigured across productions. However, modular thinking is not new for Romanian designers, who have long developed sets in modular formats in response to touring requirements, transportation limits, and restricted storage capacity. The climate crisis introduces a further, non-negotiable set of parameters - carbon limits, material scarcity, and toxicity reduction - which increasingly compels designers to abandon the „easy" solutions of the petrochemical economy (e.g., polystyrene, synthetic foams, disposable plastics) and to invent alternative visual solutions.

As the discipline evolves, the central question for the designer shifts from „What do I want to create?" to „How can I negotiate my artistic vision with the resources available?" This represents a profound shift in methodology: it is not a compromise of artistic quality, but a demand for a deeper, more resilient form of craft. The transition toward a circular economy compels a radical rethinking of scenographic authorship, shifting the designer's ontology from the *ex nihilo* creator of new builds to a custodian of material flows. This necessitates a new evaluative triad: aesthetics–ethics–logistics. Must a scenography that is visually arresting but ecologically toxic be re-evaluated as a failed design?

Freedom for experimentation is often understood as liberation from boundaries. Within an ecoscenographic framework, however, freedom is redefined - not as the absence of rules, but as the capacity to invent forms that remain accountable to the material world. In this framework, the material dictates the form. This necessitates prototype thinking, where the designer begins with the materials at hand. Consequently, the experiment becomes the management of decay and rehearsal-driven adaptation. If a bioplastic prop melts or a natural dye fades, the production team must learn to cohabit with the instability of the matter. Failure, in this context, is not a disaster but a data point—a critical learning loop that transforms the theatre company from a factory of products into a laboratory of practices.

[5] https://www.sarahmosher.com/biodesign

From a designer's perspective, this is both liberating and unsettling. It liberates because it legitimises a longer temporal imagination: a staircase might be protected as bespoke intellectual property, while generic doors, flats, and textures circulate freely - creating an ecology of reusable building blocks. Nevertheless, it is unsettling because it challenges a deeply rooted theatre economy of novelty, where each production often assumes its right to new matter.

Experimenting with the convergence of sustainability and scenography represents a compromise that necessitates a fundamental transformation in working processes, extending well beyond the mere substitution of materials. This encompasses the redefinition of criteria for selecting appropriate materials for sustainable set design and costume construction, the rethinking of how scenic elements and built structures are assembled, and a careful negotiation of what should be regarded as intellectual property — as an artistic element that must remain unaltered — and what, by contrast, may be reused, shared, or repurposed across productions. It equally calls for a reconsideration of the collaborative dynamics between directors and scenographers, and a modification in the way productions are conceived and realised, ultimately reshaping the relationship between the scenographer and the final artistic outcome.

Such a shift demands a reconceptualisation of how one understands the very idea of spectacle, visual impact, and the criteria by which a scenography may be evaluated as an exemplary and innovative design. This is, by nature, a long-term experiment — one that invites critical reflection on what ought to be preserved from established practice, what should be reduced or reconsidered from inherited approaches, and what must ultimately be discarded in both the working and creative process. Importantly, this transition will have a direct and tangible impact on production budgets. Sustainability does not invariably equate to reduced expenditure; in many instances, it may require significant investment in research, alternative materials, and new methodologies. It will also demand a broader shift in perspective from directors, who will be called upon to rethink their creative assumptions and embrace a more ecologically conscious approach to the realisation of performance.

4. Circular Scenography in Context: From Pragmatism to Intention

In Romanian scenography, reusing sets and costumes is not a recent practice; however, it has rarely been articulated through the conceptual and ethical framework of ecoscenography. For decades, Romanian theatre designers - and students in academic training contexts - have routinely repurposed scenic elements, repainted and refurbished furniture, and adapted stock costumes. These practices were driven primarily by budgetary constraints and the scarcity of materials, rather than by an explicit ecological agenda. The key distinction is intentionality. Ecoscenography implies a deliberate, ethically grounded choice to design and sustain material ecologies across a production's life cycle, whereas traditional Romanian reuse often functioned as a survival strategy shaped by austerity and deficit.

In Romania, the shift toward sustainable scenographic practice is emerging less through uniform regulation and more through a mosaic of project-based initiatives, pedagogical laboratories, and venue-led experiments. This development is deeply shaped by the realities of a cultural sector where limited budgets and infrastructural fragility make reuse a pragmatic necessity. Consequently, public discourse frequently frames sustainability as a form of *resourcefulness* - working with what is available - rather than as a stabilized institutional system of carbon targets, reporting, and circular logistics. Nonetheless, several professional and educational platforms have begun to formalize this agenda through workshops, exhibitions, and training contexts. Notable examples include the sustainability-oriented initiatives of the *Bucharest Scenography Biennale* and university-based interdisciplinary projects that foreground recycling and focus on site-specific performances, such as *UNATC's Recycle Theatr*e workshop facilitated by Eugen Jebeleanu[6],Buzău Theatre Project: *E-waste E-motion*[7], coordinated by Marina Hanganu, et al. Looking ahead, these developments require amplification through transnational cultural programs that enable exchange on circular design, and through policy narratives that position culture as an active contributor to sustainable development.

The *Theatre Green Book* guidelines validate a practice already familiar to Romanian designers: modular thinking is not a recent innovation here, but a long-standing tradition. Practical constraints - variable stage dimensions, constrained construction schedules and limited time and space for setbuilding - have historically required sets to be conceived as adaptable, reconfigurable systems rather than as singular, site-specific constructions. Over time, this pragmatism has also evolved into an aesthetics in its own right. Modularity is no longer only a technical solution; it becomes a compositional method. Meaning can be generated onstage through repetition, rearrangement, and visible joints, where seams, hinges, and connections are not hidden but integrated into the visual language of the performance. A modular set often foregrounds transformation through reconfiguration in real time, aligning scenography with dramaturgies of change, fragmentation, and assemblage. In this sense, modularity offers a form of flexibility that supports both experimentation and sustainability - allowing designers to rehearse multiple spatial narratives with the same material inventory, while extending the life of components across productions. Comparable tendencies can therefore be observed in the pragmatic use of modular scenic components, even if "modularity" is not always explicitly articulated or theorised as a design method.

In the Romanian context, even when sustainability is not foregrounded, scenographers routinely draw from theatre warehouses, modify stock costumes, refurbish furniture, and repeatedly recontextualise props. These gestures are shaped by pragmatics, but also by aesthetic and affective motivations: the patina of lived materials, the memory embedded in objects, and the formal coherence produced by found textures.

[6] https://unatc.ro/devunatc/recycle-theatre-atelier-de-teatru-site-specific-colaborativ-autogenerator/
[7] https://www.teatrulgeorgeciprian.ro/e-waste-e-motion/

Here, constraints generate a distinct *aesthetics of scarcity*, where reuse is a structural necessity rather than an ethical choice. This results in a form of scenographic*bricolage* - creatingwith whatever is available - which produces, in some cases, a „ruin-like" quality defined by rough, layered, and visibly repaired textures. This aesthetics rejects the seamless polish of commercial theatre in favor of material honesty, becoming, thus, congruent with the aesthetics specific to experimental theatre (Pavis, 1998). For instance, a set built from discarded doors retains the „ghosts" of their previous lives. This allows the audience to read the material's history, adding a layer of meaning that is impossible to achieve with brand-new, freshly painted sets.

Prominent Romanian designers offerinstructive precedents for large-scale reuse. In documented reflections, scenographer Radu Boruzescu describes extensive practices of material repurposing across theatre and film, including the use of recovered objects and unconventional sources - for example, searching in Paris for discarded furniture and doors for his design for *La Princesse Turandot* (1974) at the *Théâtre National de Chaillot* or sourcing items from waste areas in Amsterdam for the movie *Sweet Movie* (1974) directed by Dušan Makavejev (Gherghescu, Ioniță and Boruzescu, 2024). These examples show that reuse is not confined to marginal or „poor" production contexts; it can underpin sophisticated aesthetic systems. However, without an explicit ecoscenographic framework, such practices remain difficult to assess, transfer, and institutionalise, tending to appear as individual ingenuity rather than transferable standards.

A robust circular approach requires shifting attention from the moment of production to the full arc of post-production logistics: storage, cataloguing, maintenance, reuse pathways, and responsible disposal. Here, the Romanian theatre ecosystem holds a significant - often underestimated - advantage: the continued presence of in-house workshops and skilled technical labour (carpentry, painting, upholstery, costume, dyeing), alongside warehouses and prop departments. These infrastructures can support sustainability not only by producing new work, but also by recovering value from existing holdings - repairing set elements, reconditioning costumes, and preparing objects for recirculation. Crucially, workshops enable periodic care coordinated with storage teams, allowing reuse to become reliable rather than improvised. In parallel, a stronger commitment to archiving scenography - both as material culture and as production knowledge - would support historical preservation and practical reuse, turning storage spaces into curated resources rather than sites of slow material degradation.

Sustainability in Romanian scenography, however, cannot be treated as an individual ethical choice or the responsibility of a single department. It is shaped by the relational field between director, scenographer, technical teams, administration, and procurement. Ecoscenography requires, therefore, a collaborative workflow in which artistic ambition is negotiated early in relation to material realities, reuse opportunities, and disassembly plans. It also requires *time:* time for sourcing, verification, testing, and the conversations that align concepts with sustainable methods. If theatres adopt structured frameworks such as the *Theatre Green Book,* they must recognise that circular workflows often demand

longer development schedules, particularly when reclaimed materials, reversible construction methods, and documentation protocols are prioritised.

Under these conditions, sustainability can become a driver of technical experimentation: designing for disassembly, expanding modular systems, avoiding irreversible bonding (for example, glue-intensive assemblies that prevent recovery), and using reversible fasteners that preserve material integrity for future cycles. Low-impact joining systems, demountable panels, repaintable surfaces, and standardised set modules provide a route to innovation that is compatible with circular ecology. Accordingly, the question „To build or not to build ?" becomes less binary and more procedural: what can be built so that it can be unbuilt, recovered, and reimagined?

At the same time, the fragility of the independent performing arts ecology - characterised by funding instability and the loss of spaces - remains a structural constraint on sustainability's scalability. Romanian scenographic sustainability therefore needs to be analysed simultaneously as an aesthetic practice, a labour condition, and an institutional capacity problem. Embracing ecoscenography and eco-creativity demands not only new materials and methods, but also reconfigured infrastructures of manufacturing, shared knowledge, and collaborative production cultures.

5. The Digital Paradox: The Environmental Reality of AI and Virtual Design

Seeking sustainability, the theatre sector has embraced digital tools like projection mapping and VR, seduced by the idea of „immaterial" scenography. Yet, the rise of AI and digital design introduces a paradox. Acommon strategy to reduce waste is the replacement of physical sets with projections - i. e. projecting a castle rather than building one. While this eliminates the need for wood and paint, it transfers the ecological cost to the digital realm through high energy consumption, hardware manufacturing, and electronic waste. Consequently, this digital „cure" risks becoming a new environmental poison.

AI's most visible entrance into scenography has been through rapid ideation: generating mood images, stylistic variations, prop concepts, and storyboard-like sequences. A common hope is that AI-enabled visualization will reduce physical waste by necessitating fewer physical models and discarded prototypes. AI tools allow scenographers to generate thousands of design iterations in seconds. This *rapid prototyping* in the latent space of a neural network seems like the ultimate tool for infinite experimentation. However, AI tends to hallucinate „impossible" architectures - structures that defy gravity, structural integrity, or material logic. These images are seductive, often depicting seamless, glowing, ethereal worlds. A certain friction arises when the designer attempts to translate this digital ideation into physical reality using sustainable materials; AI does not „know" that reclaimed timber warps or that cardboard cannot support a cantilever.

Furthermore, the assumption that digital scenography is inherently green is a fallacy. Various forms of cloud-based data storage rely on a physical infrastructure comprising server farms, cooling systems, and undersea cables, all of which consume vast amounts of elec-

tricity and water. Training a single large AI model can emit as much carbon as five cars in their lifetimes (Strubell et al., 2019). Therefore, the shift to digital and AI-driven scenography is not an escape from material consequences, but a *displacement* of these consequences. The true experiment is to navigate this hybrid space - using digital tools to optimize physical resources (e.g. using AI to calculate the most efficient cutting pattern for a sheet of plywood) rather than simply replacing the physical with the energy-intensive virtual.

This concern is supported by data. The International Energy Agency (IEA) reports that global data-center electricity consumption is projected to reach approximately 945 TWh by 2030 - close to 3% of global electricity consumption - with accelerated servers for AI workloads driving much of this growth (International Energy Agency [IEA], 2025)Similarly, MIT academics emphasize that the environmental consequences of generative AI include not only „operational carbon" (running GPUs) but also the often-overlooked „embodied carbon" inherent in building data centers and manufacturing hardware (Zewe, 2025) . In reality, we may simply be trading visible waste (skip bins, offcuts, solvent fumes) for less visible burdens (electricity demand, water use, embodied emissions). The ecoscenographic challenge, therefore, is to make these burdens eco-friendly - ensuring that innovation does not simply relocate harm.

6. Conclusion. Future Research Directions from a Designer's Perspective

Contemporary scenography is being redefined by the convergence of climate urgency, material scarcity, and technological acceleration. This shifts the scope and focus of the discipline from a binary choice between sustainability and experimentation to a synthesis where ecological limits become generative design parameters. Ecoscenography thus functions not as an optional ethical layer but as an epistemic shift, making aesthetic decisions inseparable from their ecological consequences.

The Romanian context highlights a distinct tension between a tacit, historical tradition of scarcity-driven reuse and the need for intentional ecoscenography. To scale beyond intermittent resourcefulness, this practice requires systemic documentation, shared inventories, and institutional support. Theatres with in-house workshops possess a strategic advantage, capable of functioning as engines of circularity. However, the fragility of the independent sector limits scalability, requiring transnational policy support. This ethos extends to architecture itself; given the unfeasibility of erecting new theatre buildings, the sustainable alternative lies in the adaptive reuse of existing spaces, exemplified by the *Fabrica de Cultură*[8]in Sibiu.

[8]*Fabrica de Cultură* is an alternative cultural center and monumental performance venue built within a repurposed communist-era industrial complex. It serves as an avant-garde artistic hub primarily managed by the Radu Stanca National Theatre and functions as a flagship location for the internationally renowned Sibiu International Theatre Festival (FITS). The site is famous for its massive scale and raw industrial atmosphere, which allows artists to stage experimental, boundary-pushing productions that conventional theatre buildings cannot structurally

The future research directions from a designer's perspective this study proposes converge into a lens that reveals how sustainability standards cease to be bureaucratic hurdles and become generative aesthetic propositions. Future research must move beyond theoretical advocacy to empirical testing across diverse production ecologies. Specifically, there is an urgent need for:

1. Cross-country comparisons analyzing how Romania's repertory systems interact with circular economy principles compared to Western European project-based models.
2. Labor studies investigating how the time-intensive nature of sustainable design (sourcing, repairing) impacts the already precarious contracting conditions of freelance designers.
3. Audience reception studies testing whether Romanian audiences perceive „reuse aesthetics" as a valid artistic choice or a symptom of underfunding.

Ultimately, sustainable scenography is not merely a matter of superior materials. It represents a collective reconfiguration of workflows, timelines, and institutional capacity, and equally demands a fundamental shift in the education of future scenographers and in the very understanding of what the role of a designer entails. If theatre is to remain an art of invention in an era of climate crisis, its experiments must move away from the conquest of matter toward an accountable cohabitation with it — designing worlds that can be unbuilt, recovered, remembered, and remade.

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