5. Sustainability challenges of exhibition systems

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5.1 Current and urgent matters around sustainability in temporary exhibition systems

The core of this essay revolves around the concept of *sustainable culture*. In particular, it looks at sustainable exhibit systems for temporary cultural events in terms of both the process and specific artefacts. Its intention is to change attitudes as regards the whole process of organizing temporary events.

Nowadays it is necessary for the whole system of creative and cultural industries to respond to sustainability issues. According to the 2022 definition of *museum* by ICOM, «The museum is open to the audience, accessible and inclusive, and museums promote diversity and sustainability». This mission includes exhibit systems in terms of both process and product. Therefore, the role of museums is changing: they are becoming new activators of inclusive and accessible cultural experiences; but to do this in a way that aligns with the ICOM defini-

tion, they have to include sustainable features and adhere to certain requirements in their cultural, economic and environmental approach. This *new* attitude involves stepping away from the previous linear model and applying a sort of *circularity* to the heritage field: renting devices and equipment, using recyclable materials, and reusing the same exhibit system for several exhibitions. This last point leads to a delicate issue, because one has to take into account the designer's rights: how can the methods of transfer be included in the contract terms? Does the author have to have a licence for reusing/recycling?

How can one manage the constants and variables of a design exhibit system if one wants to reuse it for a different topic and context?

Where does one store the set of exhibit artifacts? If they cannot be reused, the alternatives are disposal and licence to third parties. If the materials are no longer usable in the museum, one can go ahead and dispose of them, but this solution creates a vicious circle which the professionals who work in this field have a responsibility to break. Above all, in the case of temporary exhibitions, another aspect to factor in is the impact of transporting the exhibit system to different places. Sometimes it is possible to use a system multiple times, but after that reuse and/or disposal currently look like the only options.

There is another important variable to consider: how the *customization factor* affects the exhibit systems recirculated for reuse. In this case the exhibit designer – in agreement with the communication team – has to work on a system based on constants (reusable on several occasions) and variables (designed for a specific topic).

A recent study carried out by ICOM (2023-2024) collected interesting data including percentages on a couple of crucial points: the elements of the exhibit systems already reused, and the life of the exhibit system after the event. On the first issue, pieces of furniture and display cases are often reused in different contexts; graphic artifacts and scenography installations are sometimes reused, as are indoor direction signs, outdoor communication signage and the lighting system; finally, shelves and mannequins are rarely reused.

On the second issue, the data reveal: 51% disposal; 36% stored internally; 7% stored externally for a fee; 4% stored externally for free or given away. The whole *professional chain* of the exhibit sector should address all these issues in order to regulate good practices and shift

attitudes in handling these kinds of project. This topic is not new; there are several Master's-level designs of exhibition systems whose default approach integrates consideration of such problems (albeit with different boundary conditions). In the following paragraph we will mention a *virtuous* case related to a historical palace, developed when sustainability themes were not perceived as urgent and were less present in the design debate.

5.2 From the *unique piece* to the flexible exhibition system

The question of reusing elements of exhibition systems arose in the context of an important museum/historical palace, at a time when reuse for sustainability was not coming to the fore so urgently and had little presence in the design debate. In particular, since the 1980s, Fruttiere di Palazzo Te in Mantua focused on this topic, with the primary aim of curbing the cost of the planned series of exhibitions (Sartori, 2009). Between the 1980 and 1990, Poltronieri hypothesized an *exhibit machine* able to offer flexibility in staging every kind of exhibition in a short time and at low cost. The theoretical machine is multifunctional and able to create a variable exhibit path according to different needs and topics, and it assumes different configurations: flowing, rotating, moving. In this way, horizontal, vertical and sloped surfaces – as well as display cases and wings – are part of a variable *grammar* of flexible elements. Unfortunately, this project never saw the light. Along similar lines, in 1991 for the book *Wiligelmo e Matilde. L'officina romanica*, the author Quintavalle – embracing the same approach – designed an autonomous piece of equipment able to show boards and drawings illuminated every time according to different features, thanks to devices provided with joint booms. It is a sort of wooden framed *gate* on wheels, with two textile panels. This system changes and evolves over time according to the heterogeneity of the collection on display and the functionality, but the main concept based on mobility, flexibility, durability and customization persists, and guarantees a coherent and sustainable system. Indeed, in *Leon Battista Alberti* (1994) some changes

reconfigure the system: the flat surface on which the boards and the system of fabrics are placed diffuses the light in myriad ways.

After five years this system (used in all Fruttiere exhibitions) was showing a great deal of wear, so much so that in *Domenico Fetti* (1996) the semi-transparency of the fabric was replaced by antique beige and pink wooden panels.

In 2004-2005 Studio Benedini was tasked with designing a new solution, based on mobile flexible walls that could show different kinds of artwork. In this case the pliability of the panels does not lie in their mobility on wheels, but in a lighter system where the panels are suspended among the architectural pillars. A tilting light system with a variable angle of incidence is installed on the panels.
This new structure – neutral and versatile – is easily integrated with temporary exhibitions, and can be used not only as a display system, but also as a dividing wall.

In this essay, the case described represents a paradigmatic design attitude to dealing with the service life of an exhibition system, and the evolution of attitudes and awareness – by a historical institution like Fruttiere di Palazzo Te – regarding the need to invest in reuse and sustainability. The dissertation will go on to examine another cultural institution – *Venice Biennale* – that, almost twenty years later, in 2023, is tackling this issue in a very interesting, engaging and unconventional way.

5.3 A virtuous synergy between art and architecture to activate new forms of participatory reuse

At the *2023 Venice Architecture Biennale* – an international event devoted to topics of care, repair and maintenance – German Pavilion took advantage of its participation to interpret and take a stand on the important issue of the sustainability of temporary exhibition systems. *Open for Maintenance* is not a real exhibition, but rather an action framework for a building culture, beyond the prevailing model that hinges on the exploitation of resources and humans (Femmer *et al*., 2023).

The focus is on previously used materials that were gathered from over 40 national pavilions and exhibitions at the *2022 Art Biennale*, with a view to making visible certain processes that are usually kept hidden, relating to the care and upkeep of social spaces and facilities.

In this way, the *Art and Architecture Biennales* collaborate to give shape to a new concept of a cultural message, born out of a rich and intertwined partnership.

The German Pavilion takes shape as an active infrastructure – a laboratory, serving to collect, catalogue, provision and process used materials from the *Biennale* – that has an impact beyond the boundaries of the institution. The *Maintenance* workshop programme features interventions within the Pavilion as well as in the urban space of Venice, where university students and craft apprentices assist several groups from civil society in maintaining, repairing and caring for social infrastructures across Venice.

This design attitude transforms the monumental German Pavilion into a living place of (re)production. As an action framework for a building culture beyond the prevailing model hinging on the exploitation of resources and humans, it sheds light on the social, material and urban dimension of maintenance, demonstrating that ecological sustainability is inextricably linked to the social question.

The pavilion assumes the role of a productive infrastructure, promoting principles of reuse and circular construction in accordance with the social responsibility of the architecture.

The interior layout follows the paradigm of the flat: each part of the space corresponds to a specific room of a house and suggests sustainable ways to solve the functions. In addition, a specific *workshop room* is devised as a dynamic place where students (in architecture, art and design) create specific installations to be placed in the Venetian Lagoon in order to communicate the soul of this process.

Every year, the *Biennale* grounds in Venice host a new exhibition. Hidden from the visitors' eyes, heaps of materials are transported to the city and then ferried to the various national pavilions by boat and handcart. Six months later, most of them end up being discarded. Since 2008 the Venetian organization Rebiennale/R3B has been dis-

mantling exhibition architectures and artworks every year after the
end of each *Biennale* and using the materials for new projects
(Greb, 2023, p. 2).

The project underlines that ecological sustainability is indissolubly
linked with the social issue, and itself represents a virtuous model
of collaboration between art and architecture in a circular model.

5.4 Towards an expanded notion of sustainability

Moving beyond the anthropocentric focus of the Brundtland Report's
definition of sustainability, studies indicate that our conceptual grasp
of this term has transitioned from considering it a fixed objective to
recognizing it as a fluid and evolving goal, adapting to our deepening
comprehension of the intricate interconnections between social and
ecological systems. Attaining sustainability necessitates adopting
a process-oriented, multi-scale and systemic approach to sustain-
able design, driven by a vision rather than relying only on traditional
goal-based optimization methods. This expanded notion conceives
sustainability as a system property rather than a property of individual
elements of systems (Ceschin and Gaziulusoy, 2016).

From this perspective, Design for Sustainability integrates sus-
tainability practices into current objects and processes.
This paragraph analyzes through this evolving definition of *Sustain-
ability*, on some points linked to futuring theories, the intersection
in the existing context between Design for Sustainability (DfS)
approaches and Exhibition Design.

Because the climate crisis is irreversible, the necessity to question
what «sustains the Unsustainable» (Fry, 2009) has evolved rapidly
in the past decades, and accelerated in the past ten years in the
exhibition design field. It is creating a vigorous debate about tran-
sient exhibition systems for cultural events, and demands particular
attention as regards managing and designing the production and the
end-of-life chain of temporary solutions. DfS strategies have devel-
oped in many design fields and have undergone several evolutions

(Ceschin and Gaziulusoy, 2019). DfS has since evolved from green to eco-design into a more holistic notion that includes social justice and environmental responsibility. Sustainability-oriented strategies can consist of life cycle thinking (Hauschild *et al*., 2018) and related industrial ecology strategies (McDonough and Braungart, 2002), recycling design, design for disassembly, and product-service systems (Vezzoli and Manzini, 2008).

Nevertheless, while in other design disciplines – for example, in architecture through Green Building Rating Systems such as the recognized BREEAM (UK) or LEED (USA) – research has long been working towards sustainably innovating paradigms, from concept to construction. Exhibition design is slowly combining these aspects into its creation and management structures. This criticality crosses the museum sector and the cultural and temporary events sectors because the issues associated with practical exhibitions are similar. The legislative framework reflects these critical aspects. Despite efforts such as establishing the Gallery Climate Coalition in 2020, and initiatives by organizations such as the Federal Cultural Foundation in Germany, and ICOM Lombardy in Italy, to promote sustainability in the fields of exhibition design and museums, official regulations and policies for ecological transitions are lacking. The first legislation on sustainable events only emerged in 2012, with Expo 2015 being one of the first large-scale events to apply it. Recent developments in ministerial policies – such as the approval of Minimum Environmental Criteria (CAM per Eventi, 2022) by the Italian Ministry of Ecological Transition, and the National Recovery and Resilience Plan (PNRR) – aim to support the cultural sector's sustainability-oriented transitions (Crippa *et al*., 2023). In spite of exhibition design being recognized as a critical player in helping the ecological transition in the cultural sector, strategic monitoring of its environmental impacts, at both macro and micro scale, remains a long way off.

5.5 Futuring in exhibition design: reading an evolving context through sustainable strategies and tactics

In exhibit systems, the emerging panorama of sustainability-oriented methods is evolving, coming from different research approaches; among them, futuring stands out, suggesting a strengthening of the link between theory and practice. Scholars from varied design fields, such as product, service, fashion, and speculative design, are inquiring as to how futuring uses a systematic process for thinking about and planning future scenarios (Dunne and Raby, 2013; Berardi, 2017) and pictures possible outcomes by interrogating, observing, sourcing and examining sustainable practices (Barucco *et al*., 2021; Payne, 2021). In exhibition design, futuring sits at the intersection of museum futures analysis (Bechtler and Imhof, 2014, 2021) and sustainability-oriented tools. The latter range from eco-efficiency tests developed by museums or cultural institutions, alongside the definition of sustainable guidelines (Abeyasekera and Matthews, 2007; Byers, 2008; Biedermann *et al*., 2021) to quantitative LCA-based evaluation systems, limited to specific exhibition setups and strategies (Muñoz-López *et al*., 2021; Toniolo *et al*., 2021). The definition of sustainable change as «actions and practices directed towards furthering justice for the human and non-human world alike» (Payne, 2021, p. 208) resides in this dimension, and the associated practices, understood as strategies or tactics, align with it. As a subdiscipline of its own, design strategy may be defined as a plan of action based on vision, defined objectives, and specific criteria for measuring its results (Payne, 2021). Conversely, tactics are decisions made by individuals with limited power who cannot fully foresee the outcomes of their actions. Through a selection of case studies, the study suggests that strategies and tactics are available to most professionals working within the exhibition design system.

The contribution examines several case studies analyzed in a progression that starts from strategies and tactics proposed by cultural institutions and then delves into the dimension of practice through cases involving both service system design and sustainable

management to reuse materials or components. The first two are guidelines developed in 2022 by the *27th Biennial of Design* (BIO27) in Ljubljana in collaboration with the Museum of Architecture and Design (MAO), and in 2023 by the Design Museum in London with the collective URGE. The first case (Kobal et al., 2022) arises from an explicit urgency on the part of BIO and MAO, based on the awareness that the implications of each exhibition production should be faced, and that it is essential to reduce the waste and environmental impact associated with cultural events and temporary exhibitions. The document is organized into categories: *museum, exhibition and exhibition design, graphic design/print, digital communication* and *design*. For each category, practical guidelines are proposed, organized by areas, and applicable both at the management and supply levels (e.g. for the *museum* category, guidelines include *Building renovation/Energy, Mobility – Low-carbon travel guidance, Administrative operations efficiency, Digital and electronics, Emails, Advertising, Water, Catering, Waste, Greenery/Biodiversity, Community building/Outreach and education*; for EXHIBITION*, Programme, Shipping/Transport, Materials, Construction/Deconstruction of the Exhibition, Electronics*). The document presents a selection of existing tools for the environmental impact assessment, ranging from a series of carbon footprint calculators to a life cycle assessment method for paper used in exhibitions to the B IMPACT ASSESSMENT. The latter is a digital tool that can help measure, manage and improve positive impact performance as the first step towards B Corp Certification. The choice of whether and which calculators to apply is left to the individual institution. The document's tactical nature lies in the fact that there are potentially applicable guidelines at multiple levels. Still, the possibility of evaluating their impact is fragmented and not tailored to the proposed guidelines. However, this does not diminish the power and strength of the document's ability to interrogate the biennale's practices and future, gain a deeper understanding of its environmental and social impact, design a roadmap setting decarbonization targets in the future, as well as demonstrate and communicate innovative approaches to sustainable cultural production.

From October 2021 to February 2022, the *Waste Age* exhibition at the Design Museum in London delved into the potential of design to

transcend the throwaway culture. With a commitment to minimizing the exhibition's carbon footprint, the organizers collaborated with architecture practice Material Cultures for spatial design, and engaged SPIN studio for the 2D experience, assigning both the task of devising strategies to eliminate waste in the exhibition's design and production processes. To ensure accuracy and gather actionable insights, the organizers enlisted URGE Collective to conduct an environmental audit, marking one of the pioneering Life Cycle Assessments for exhibitions in the UK. URGE Collective developed an Impact Model to track three key stages: pre-exhibition, live exhibition, and post-exhibition, shedding light on the primary sources of environmental impact. Through interviews and data collection, the curation, design, facilities, and production teams contributed to the audit process.

The model integrated data from various sources, including stakeholder interviews, desk research, energy procurement and usage, resource consumption analysis, waste generation assessment, transportation of materials and exhibits, and observation of the production process. This experience led to the creation of the guide published in March 2023 by the Design Museum and URGE, entitled *Exhibition design for our time. A guide to reducing the environmental impact of exhibitions* (Design Museum in London and URGE Collective, 2023). The report collects the key findings and their related strategies – some of which are summarized as follows: *Reducing impact starts with curatorial decisions, Chasing data, Choosing materials wisely, challenging convention, Working together, Counting digital carbon, Minimizing air travel, Building a network for sharing resources*.

The document proposes object and material decision trees to help stakeholders, sponsors, designers and suppliers in the exhibition design development process and commissioning. The guide's final focus is on measuring the impact and the presentation of the tool studied for this purpose. The Design Museum's Impact Model is an Excel-based tool (beta version) designed to estimate the carbon footprint of exhibitions. It assists exhibition, curatorial and project management teams in decision-making throughout an exhibition's development. The model covers stages such as *Project Development, Object Transport, Build / Setworks, Reused Resources, Museum Operations, Waste and Touring*. The exhibition project team can manage

it, encourage ongoing input, and offer a detailed user guide.
The open-source model is adaptable for broader use in museums, galleries, events and exhibition spaces, promoting continuous refinement and expansion.

The shared, long-term breadth of view, the key figures involved, and the effort to work on the assessment of the results underlines the strategic vision of the guide.

The following paragraphs describe other emblematic practices capable of providing innovative directions for the sustainability and circularity of the sector. They are close to the tactical approach; small firms often initiate them, and they act at a small scale or focus on reusing and recycling a single component. For most usable components/materials in exhibition design, the reuse options are varied, taking forms such as from-and-for-reuse systems or take-back schemes and sales. From this perspective, describing some practice examples of System Design for Sustainability (SDS) is essential.
By this, we mean the design of the Systems of Products and Services that are together able to fulfill a particular customer demand based on the design of innovative interactions among stakeholders, where the ownership of the product/s and its life cycle responsibilities/costs remain with the provider/s so that the provider/s continuously seek to make environmentally beneficial new solutions accessible (Vezzoli, 2010; Vezzoli *et al*., 2022).

Spazio META is a startup offering a fee-based service to collect, process and exhibit materials and structures used in sets, exhibitions, and installations. Notably, each year META recovers and redistributes over 16 tonnes of materials that would otherwise be wasted (Crippa *et al*., 2023). Product sales are confined to their Milan Bovisa location. They record volumes and quantities of recovered materials on the urban territory to provide annual reports regarding the practice of reuse. They have also created a database on the flow and consequent reuse of recycled materials, to monitor the efficiency of the recycling process and achieve higher impacts on waste reduction.
The aim is to connect stakeholders, who may be able to reuse recovered exhibit elements from different events.

Exhibition carpets are a vast area of leftover material, but today, the following recycled and recyclable options are changing the indus-

try and considerably reducing waste. Many manufacturers adhere to these processes, in order to meet increasing market demand in this direction. For example, a company called Tarkett investigates innovative solutions to turn used flooring into valuable, reusable materials. It proposes services to help customers take back and recycle flooring through its ReStart programme, and ensures that used flooring will be collected, recycled and introduced into the remanufacturing processes within the company.

Another example is Montecolino, in Italy. Since 2017, the company has been harnessing its experience in recycling internal waste, and has proposed a recovery system for used carpet. The company developed a management system for the exhibition industry that transforms old carpets into raw materials for new products. The deconstruction process pays attention to the destination of the non-resin-coated textile trimmings, which are part of the production cycle, and the resin-coated textile trimmings are separated according to their composition and destined for recovery outside the company.

These examples are systems aimed at *detailed* design, and constitute interesting experiments that can be scalable.

The originality values behind the selected cases are diverse. They propose new management and economic sustainability models, organizational structures, collaborations within the sector, and ways of engaging suppliers and decision-makers. They offer opportunities to reduce environmental impact and bolster economic sustainability, in order to sustain the development of this cultural sector from a future-facing perspective.

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