

Sustainable and Natural Techniques in Model Making and Other Industries


**Thesis
Noemi Fulop
2024**

Declaration of Originality

I, Noemi Fulop hereby declare that this thesis is the result of my own original research and does not contain the work of any other individual. All sources that I have consulted have been identified and acknowledged in the appropriate way.

I confirm that I have followed the ethical standards and guidelines for conducting research in my field. I have obtained all necessary permissions and consents from the participants or data providers involved in my study. I have also obtained approval from my supervisor and/or ethics committee before starting my research.

I understand that any violation of this declaration may result in serious consequences, such as rejection of my thesis, disciplinary action, or legal action.

Signature: 

Date: 15th of February 2024

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Abstract

This thesis explores the topic of sustainable model making, with a focus on event design, architecture, and the toy industries. It begins by introducing the traditional model making materials and methods and their natural sources; the wasteful ways and how they evolved to incorporate environmental considerations. It then presents the research objectives and rationale and provides examples of how sustainable materials can be applied in the model making industry and in the future of sustainable model making, including the potential of innovative and green solutions. The thesis concludes by emphasizing the importance of making practices sustainable for the future, and of creating products and designs that harmonize with nature and foster a more interconnected world.

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Introduction

“Imagine a world in which all the things we make, use, and consume provide nutrition for nature and industry—a world in which growth is good and human activity generates a delightful, restorative ecological footprint.”¹

This thesis dives into the studies of sustainability, as many areas of the modelmaking industry have shown that there’s plenty of waste, harm to our planet, and use of toxic materials. It will go through the historical methods and influences and explore the possibilities of sustainable alternatives in the field of modelmaking, specifically focusing on reducing waste, minimizing harm to the environment, and using non-toxic materials. The development and use of sustainable alternatives in the field of model making is crucial in order to address the current harms to the environment. The thesis will focus on examples like sustainable event development with decorations created with natural or recycled materials in mind, or product designs that have made a significant difference as they climbed through the chain of sustainability and reduced their environmental impact.

Model making is an essential skill for many creative fields, such as architecture, design, and art. However, in the era of digital technology and mass production, many model makers have lost touch with the environmental impact of their craft. We need to return to sustainable techniques that respect the natural resources and reduce waste and provide an overview of the traditional model making techniques and materials that were more sustainable and eco-friendly. Also, the historical and cultural background of the movements that advocated for sustainable thinking in model making will be traced and the current trends and motivations that are driving the adoption of sustainable and natural model making techniques in the contemporary scene will be discussed. It will focus on the toy industry, and examine the natural substitutes for toxic materials, the techniques and inspirations derived from nature, such as biomimicry and biophilic design, and the materials and technologies that are emerging, such as mycelium and augmented reality.

Some of the examples and the potential applications of various materials in the modelmaking industry will be highlighted, with a focus on event design and the thesis will also investigate some of the latest and upcoming innovations that aim to improve the environment and society.

¹ McDonough, William, and Michael Braungart. *Cradle to Cradle*. North Point Press, 1 Mar. 2002. P15

Chapter 1: Background, Current techniques & Materials

Traditionally, model making techniques were fully sustainable because they relied on natural, renewable, and biodegradable materials, such as wood, clay, and paper. These materials had a low environmental impact, as they did not require much energy or resources to produce, transport, or dispose of. However, as time went on, model making techniques became less and less sustainable, because they adopted synthetic, non-renewable, and non-biodegradable materials, such as plastic, resin, and foam. These materials have a high environmental impact, as they require a lot of energy and resources to produce, transport, and dispose of. These materials pose health and safety risks, as they can release toxic chemicals or fumes during the model making process or after the model's lifespan. Therefore, there is a need to rethink model making techniques and materials in order to make them more sustainable and eco-friendly.

Traditional model making techniques and materials have a rich history in various creative fields, from architecture and engineering to design and craftsmanship. "In many ways, model making is the first step in bringing any new product or idea to life."²

They employ a blend of precision tools and crafts to bring ideas and designs to life in physical form. These models serve as invaluable tools for visualization, communication, and evaluation in creative and construction processes, helping industries better understand and refine concepts before they are realized in full scale.

In ancient times, people used models as powerful tools for understanding, planning, and creating. These miniatures were like practical guides to their world. They would use natural materials like clay, wood, animal bones or precious stones and metals.



Figure 1 - The model of the Trypillian house, length 51cm, burnt clay. 4600-3900 BC. Historical Museum of Romania, Bucharest

² May, J. H. "What Do Model Makers Do? The World of Scale Model Making." JH May, 12 July 2022, www.jhmay.com/what-model-makers-do/. Accessed 19 Oct. 2023.



Figure 2 - Florence Cathedral Dome by Filippo Brunelleschi 15th century 1

Traditional techniques have a timeless charm and remain an integral part of design and construction practices and they are increasingly being reimagined through sustainable and eco-friendly lenses to align with contemporary environmental concerns and a desire for more responsible, natural, and sustainable model making.

For example there is this group called 'Healthy Materials Lab'³ whose mission is to create a healthier world by transforming the materials we use in our built environments. They do this by improving existing materials, promoting safer alternatives, empowering vulnerable communities, educating business owners, and collaborating with manufacturers, which I think is very inspiring.

It took some time and work for our society to get here though... The emergence of sustainable and natural model making techniques can be traced to a broader societal shift towards **environmental consciousness** and a reevaluation of the human impact on the planet. As awareness of climate change, resource scarcity, and environmental degradation has grown, industries and individuals alike have begun to rethink traditional approaches to design and manufacturing.

"Most forms of plastic are not biodegradable, so instead of turning to dust as so many things do, it sits, dirty and durable as ever, piling up and polluting countless ecosystems across the planet. The few types of plastic that do break down end up reverting back into toxic petrochemicals or transforming into ones that are different, but no less dangerous."⁴

There were several impacts of past events on the present and future as sustainable and natural model making techniques draw from a deep well of **historical influences**, including indigenous and traditional craftsmanship. Many indigenous cultures have long employed sustainable practices and utilized natural materials in their creations, setting a precedent for the contemporary sustainability movement. Additionally, the **Arts and Crafts Movement** of the late 19th and early 20th centuries emphasized the use of natural materials, handcraftsmanship, and a return to simpler, more sustainable design.

"Preserving and emphasizing the natural qualities of the materials used to make objects was one of the most important principles of Arts and Crafts style"⁵

And the transition from **Industrial Revolution to Sustainable Revolution**, agrarian and artisan-based economies to the industrialized world dramatically altered the landscape of production and

³ www.healthymaterialslab.org

⁴ Krososky, Andrew. "Plastic Toys Have a Greater Impact on the Environment and Human Health than We Thought." *Green Matters*, 11 Aug. 2021, www.greenmatters.com/p/environmental-impact-plastic-toys.

⁵ Pamela, Wiggings, "What Is the "Arts and Crafts" Movement?" *The Spruce Crafts*, 05/26/19, www.thesprucecrafts.com/the-arts-and-crafts-movement-148817. Accessed 17/10/23

consumption. The **Industrial Revolution** brought technological advancements and mass production, it also introduced resource-intensive and polluting practices. This transition eventually led to the growth of large-scale industries and factories that mass-produced goods and services. These industries and factories often exploited workers, who had to work long hours, in unsafe and unhealthy conditions, and for low wages. They also created a lot of waste and pollution, such as smoke, chemicals, and trash, that contaminated the land, water, and air which eventually raised concerns about environmental degradation, resource depletion, and waste.

The **Sustainable Revolution**, on the other hand, encouraged the development of small-scale and local businesses that produce goods and services in a more ethical and eco-friendly way. These businesses respect workers' rights, health, and safety, and pay them fair wages. They also reduce waste and pollution, by using recycled materials, biodegradable packaging, and organic methods.



Figure 3 - Eco friendly Toys, photo AdobeStock

The latter half of the 20th century witnessed the unfolding of environmental crises, which included issues like pollution, deforestation, habitat loss, and biodiversity decline. In **response to this ecological crisis**, movements for environmental protection and sustainability began to gain momentum. The 1970s marked significant environmental milestones such as the inception of Earth Day, the creation of the United States Environmental Protection Agency, and the release of "Silent Spring" by Rachel Carson, a book that shed light on the harmful impact of pesticides on our environment.

And then the 21st century has seen the emergence of a robust **sustainable design movement** that extends to various industries, including architecture, fashion, product design, and model making. The philosophy of "**Cradle to Cradle**" by William McDonough and Michael Braungart, which reimagines

products as endlessly recyclable and eco-positive, has significantly influenced the fields of sustainable design and industrial ecology. It has inspired designers, engineers, and businesses to rethink their approaches to product design and manufacturing with a focus on environmental sustainability and human health. Since its publication, the concepts presented in the book have continued to evolve and influence the discourse on sustainable practices in various industries.

“Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”⁶



Figure 4 - Local plastic toy producers - Photo: Noor-A-Alam

In this contemporary context, sustainable and natural model making techniques have taken center stage as an ethical imperative. The urgency to reduce our carbon footprint, conserve resources, and protect ecosystems has fueled the adoption of eco-friendly practices. Model makers, architects, designers, and educators are increasingly embracing sustainable and natural materials and methods, recognizing their role in mitigating environmental impacts and promoting a harmonious coexistence with the natural world.

⁶ Spilka, Dmytro. “The Rise of The Sustainable Design Movement.” Thrive Global, 28 June 2018, <https://community.thriveglobal.com/the-rise-of-the-sustainable-design-movement/>.

“We need to pay attention to the downsides of the plastic toy industry. Among the 419 chemicals found in plastic toys, about 126 are harmful to human health. It is high time we urge plastic-toy entrepreneurs to switch to environment-friendly toys produced from wood, clay, leather, paper, etc.”⁷



SOURCE: GETTY IMAGES

Figure 5 - Plastic Toys Have a Greater Impact on the Environment and Human Health Than We Thought

Now, many startups are leveraging the principles of the circular economy, which aims to eliminate waste and the continual use of resources. By using recycled materials like straw, sawdust, and plastic milk bottles, these companies are reducing their environmental footprint and challenging larger, more established players in the industry.



Figure 6 - Green Toys submarines. Photograph, Green Toys

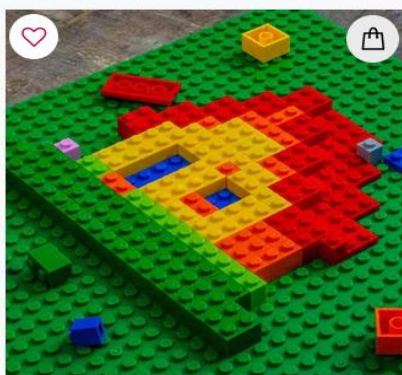
“Startups are embracing circular economy principles and taking on the big players by making safe, locally made toys from recycled straw, sawdust and plastic milk bottles”⁸

⁷ “We Need to Pay Attention to the Downsides of the Plastic Toy Industry.” *The Business Standard*, 16 Aug. 2023, www.tbsnews.net/thoughts/we-need-pay-attention-downsides-plastic-toy-industry-683354. Accessed 12 Dec. 2023.

⁸ McCullough, Debbi G. “Waste-To-Toys: The Growing Market for Eco-Friendly, High-Quality Toys.” *The Guardian*, The Guardian, 16 June 2014, www.theguardian.com/sustainable-business/2014/jun/16/eco-friendly-sustainable-toys-growing-market-waste-recycling. Accessed 23 Nov. 2019.

Others underscore the importance of safe and sustainable materials in toy production and demonstrate a commitment to both environmental sustainability and consumer safety. “HABA, a German company that’s more than 70 years old and employs 1,400-plus people. They use water-based stains, and their products are formaldehyde- and lead-free. All their wooden toys are made from certified, reforested timbers, and their fabric toys are made using organic materials.”⁹

Also, “Jiminy Eco Toys offers a refreshing alternative: Sustainable materials: Natural materials - not just wood but also innovative bio-plastics (100% from plants), recycled cardboard, and paper - or safe recycled plastics. Low toy-miles: Made in Europe - a maximum of 2,000km 'toy-miles' - 10 times fewer than China.”¹⁰



"Little LEGO" compatible baseplate made from plants for age 1.5 to 6 years
€12,95 €9,99 Sale

Figure 8 – Screenshot from Jiminy Eco Toys, Ireland web shop



Figure 7 - HABA Animal Upon Animal stacking toys game

These companies sell toys that are eco-friendly, non-toxic, and made from natural or recycled materials and aim to inspire a playfully sustainable world and reduce the environmental impact of the toy industry. They work towards being affordable as well so the impact can be even higher and they portray a powerful message that resonates with an increasing number of consumers who are concerned about the environmental impact of their purchasing decisions. It’s a testament to the power of innovation and sustainability in shaping the future of industries.

The Path Forward: Sustainable and natural model making techniques represent not only a response to ecological challenges

but also an exploration of innovative, environmentally responsible, and creative approaches to design. These techniques encourage a reconnection with nature and an appreciation of its wisdom, inspiring a more conscientious and harmonious relationship with our surroundings. As we delve into the world of sustainable and natural model making, we embark on a journey that seeks to reframe the narrative of human design and creativity in the context of the planet's well-being.

“A revolution that leads people to consider the environment and focus on doing more with less. The future will hinge on the world being able to rethink, reuse, recycle, regenerate, and share resources, as well as treat natural resources as precious commodities.”¹¹

9 Search, Brian Brassaw Brian formerly managed the Earth911 Recycling, et al. “Top Eco-Friendly Toy Brands for the Holidays.” *Earth 9 11*, 5 Dec. 2017, earth911.com/home-garden/eco-friendly-toy-brands/. Accessed 23 Jan. 2021.

10 “Jiminy Eco Friendly Toys, Ireland.” *Jiminy Eco-Toys*, jiminy.ie/.

11 Royal, Bhattar, “Industrial Revolution 5.0 – Driven by Sustainability.” *Industrial Revolution 5.0 – Driven by Sustainability | UPM.COM*, 2022, www.upm.com/articles/innovations/22/industrial-revolution-5.0-driven-by-sustainability/, Accessed 10/10/2023

Now, in an era marked by growing environmental awareness and a pressing need for sustainable practices, the field of model making is undergoing a profound transformation. Traditionally, model making has relied on a range of materials, some of which may have raised ecological concerns due to their environmental impact and long-term sustainability. However, a **new wave of innovation** is reshaping the way model makers approach their craft, introducing a paradigm shift that prioritizes sustainability and natural materials at the core of their processes. This shift reflects a broader global movement towards responsible, eco-friendly practices in architecture, design, and manufacturing. Sustainable and natural model making techniques are at the forefront of this movement, offering not only an environmentally conscious approach but also a reimagining of what is possible in the world of models.

“Designers and manufacturers can create products that are not only beautiful and functional, but also contribute to the health and well-being of humans and the environment. By using materials that are safe, renewable, and recyclable, they can avoid generating waste and pollution, and instead create cycles of use and reuse that mimic nature’s abundance and diversity.”¹²

In the ever-evolving landscape of model making, sustainability is the name of the game, and it's thrilling to see the emergence of eco-friendly materials leading the charge. **Bioplastics**, made from renewable resources like corn starch, have become a game-changer, offering a greener alternative to traditional plastics. Recycled and reclaimed wood is another standout, bringing a touch of nature to models while reducing the need for fresh timber. Composites created from reclaimed materials like **cardboard** and paper are gaining traction for their versatility and low environmental impact. But it doesn't stop there – **algae-based materials**, **bamboo**, and even **3D-printed biodegradables** are revolutionizing the industry. These sustainable materials aren't just great for the planet; they're also spurring creativity and innovation in the model making world.



*Figure 9 - Creative Bamboo Pavilion Model
Exhibition by Architecture student, photo
UNIVERSITI TUNKU ABDUL RAHMAN*

12 McDonough, William, and Michael Braungart. *Cradle to Cradle*. North Point Press, 1 Mar. 2002. P9

There are several great natural materials out there like paper materials sourced from recycled content that are widely used in architectural and product modeling. They are readily available, cost-effective, and biodegradable. Bamboo is a fast-growing and renewable resource that can be used for various model making applications, including structural components and surface finishes. It's known for its strength and versatility. And there is **cork**, a renewable material obtained from the bark of cork oak trees. It is lightweight, resilient, and often used for model landscapes and building facades. And of course, sustainably sourced wood, certified by organizations like the Forest Stewardship Council (FSC), can be used for architectural and structural models. **Timber** is renewable and can be recycled or repurposed. Or **natural fabrics** made from organic cotton, hemp, or other sustainable fibers can be used for textile elements in models, such as curtains, upholstery, or landscaping details. And for the more modern methods and materials there's **biodegradable plastics** that are made from renewable sources, such as cornstarch or sugarcane, they offer an eco-friendly alternative to traditional plastics for model making. **Bio-based composite materials**, such as those made from natural fibers (e.g., flax, jute) and biodegradable resins, offer strength and sustainability for structural model elements. Some eco-friendly casting materials, like **soy-based resins and plaster**, are suitable for creating detailed parts and prototypes, or "**alginate impression material** is a natural and eco-friendly option for making molds. This biodegradable material is derived from seaweed and boasts non-toxic and hypoallergenic properties. One of the advantages of using alginate impression material is that it sets quickly and captures fine details. This makes it an ideal choice for mold making in various creative projects, from sculptures to DIY home decor."¹³



Figure 10 - Eco friendly alginate impression material, www.artmolds.com

13 "Eco-Friendly Materials for Mold Making and Casting | ArtMolds." www.artmolds.com, www.artmolds.com/blog/eco-friendly-materials-for-mold-making-and-casting.html.

While plastics are generally not considered eco-friendly, using **recycled plastics** can reduce the environmental impact. Recycled PET and other plastics can be used for certain modeling applications. And for the 3D Printing Filaments we can use PLA (polylactic acid) and other **bio-derived 3D printing filaments** that are renewable and biodegradable options for creating intricate model components.

Figure 11 - "A 3D Printed Pavilion Made from Recycled Plastic Bottles." MaterialDistrict, 13 Jan. 2020 1



Locally sourced **natural stone** can be used for architectural models, providing an authentic look and sustainability when quarried responsibly, also **recycled glass** can be used for transparent or translucent elements in models and it's highly recyclable; the use of **living materials**, such as moss or succulents, can add an eco-friendly, dynamic element to models.

For paints and adhesives there are a number of Sustainable options like low-VOC (volatile organic compound) paints and finishes that reduce harmful emissions and contributes to a healthier indoor environment and the water-based and non-toxic adhesives that are the environmentally friendly choices for assembling model components. Furthermore, transitioning to digital modeling and virtual reality can reduce the need for physical model materials altogether, contributing to sustainability efforts. Sources 14, 15



Figure 12 – Elements Replica Botanical Designs - big cat moss map model, moss wall art

14 Eco-Friendly Building Materials | Sustainable Design. [www.youtube.com, https://www.youtube.com/watch?v=bsQBSVJoV04](https://www.youtube.com/watch?v=bsQBSVJoV04). Accessed 20 Oct. 2023.

15 Sustainable Materials: Is There a Concrete Solution? [www.youtube.com, https://www.youtube.com/watch?v=QnN4pZtf7aE](https://www.youtube.com/watch?v=QnN4pZtf7aE). Accessed 20 Oct. 2023.

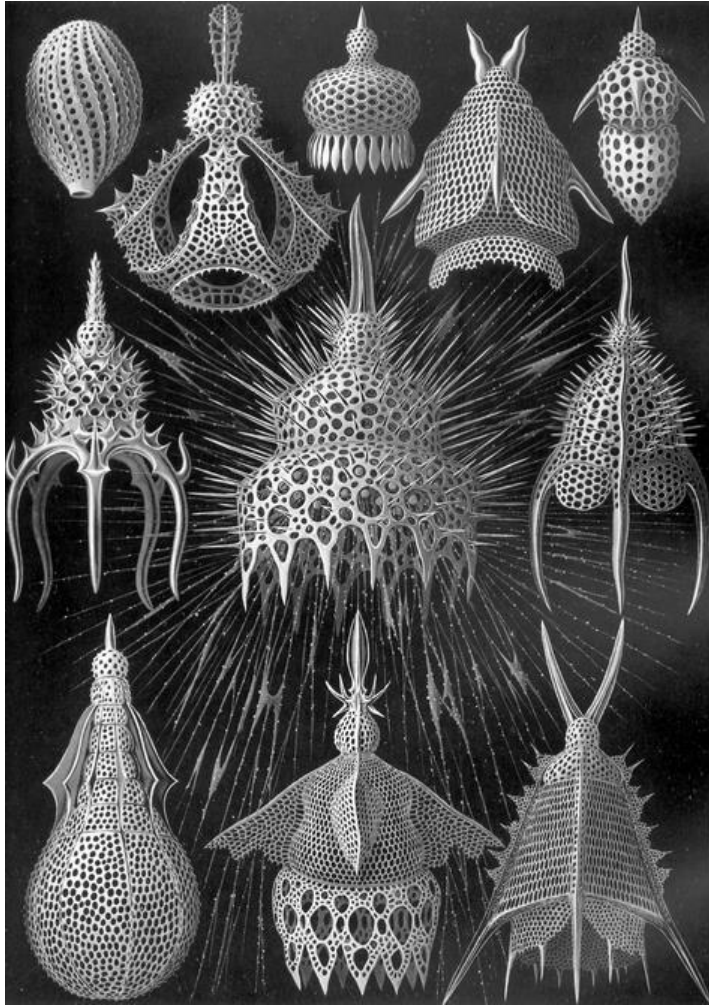


Figure 13 – Biomimicry
Cyrtosidea – Ernst Haeckel's illustration of *Clathrocanium reginae* and
Cyrtosidea Pterocanium trilobum Image via Wiki Commons

So “Why not challenge the notion that human industry must inevitably damage the natural world?

In fact, why not take nature itself as our model? A tree produces thousands of blossoms in order to create another tree, yet we do not consider its abundance wasteful but safe, beautiful, and highly effective; hence, “waste equals food”¹⁶ is the first principle that the book *Cradle to Cradle* sets forth. Products might be designed so that, after their useful life, they provide nourishment for something new - either as “biological nutrients” that safely re-enter the environment or as “technical nutrients” that circulate within closed-loop industrial cycles, without being “downcycled” into low-grade uses (as most “recyclables” now are).”¹⁷

When humans seek to create sustainable, efficient, and effective technologies, they can find valuable guidance in the principles and patterns observed in the natural world. It encourages the idea that mimicking or drawing inspiration from nature's solutions can lead to more innovative and ecologically responsible technological advancements. One

of these approaches is **biomimicry**. There’s many ways for architecture to mimic nature and build accordingly or create whole environments.

Biomimicry is like learning from nature to solve problems or make things better. It's when people look at animals, plants, and other natural things and ask, "How does nature do this, and can we do it that way, too?" For example, if we need a way to make strong materials, we might look at how a spider makes its web and try to copy that process. Biomimicry helps us come up with creative solutions inspired by the clever ways nature has already solved many challenges.

“Nature has the kind of intelligence that exists beyond and above intelligence, and it’s that wisdom that’s the best inspiration for technologies”¹⁸

¹⁶ McDonough, William, and Michael Braungart. *Cradle to Cradle*. North Point Press, 1 Mar. 2002. P92

¹⁷ “Cradle to Cradle: Remaking the Way We Make Things.” *Choice Reviews Online*, vol. 40, no. 02, Association of College and Research Libraries, Oct. 2002, pp. 40–0914. <https://doi.org/10.5860/choice.40-0914>.

¹⁸ “Neri Oxman: Biology, Art, and Science of Design & Engineering with Nature | Lex Fridman Podcast #394.” www.youtube.com, www.youtube.com/watch?v=XbPHoJL_61U.

Let's look at mycelium as an example, a type of fungus that can grow into a network of filaments and form a strong and lightweight material. Mycelium grown bio bricks are made from mycelium and other natural or recycled materials. The sustainable creation of these bricks involves only a few steps like growing and harvesting mycelium, mixing it with other materials such as coconut husk or saw dust and pressing it into a mold, the bricks are then cured to become durable and strong. These bio bricks have several advantages over conventional bricks as they are biodegradable and compostable, therefore they do not contribute to landfills or greenhouse gas emissions, also they are renewable and abundant, which means they do not depend on scarce or non-renewable resources. They are versatile and adaptable, so they can be used for various purposes and shapes. They are also resilient and fire-resistant, as a result they can withstand harsh conditions and reduce the risk of fire damage.¹⁹



Figure 14 - Mycelium-Grown Bio-Bricks / Evocative Design & The Living. Image Courtesy of The Living¹

The circular economy can really benefit from using mycelium grown bio bricks by reducing the environmental impact of brick production by using less energy, water, land, chemicals, and emissions and by increasing the value of brick products by adding functional properties such as insulation or water purification or aesthetic features, like color or texture. "Utilization of mycelium in the development of composites and bricks can be a better option for sustainable building industry."²⁰

The introduction of sustainable and natural model making techniques represents a commitment to a healthier, more sustainable future for both the industries and the planet. It encompasses a comprehensive approach that goes beyond mere material substitution. It encapsulates a holistic ethos that embraces the entire life cycle of a model or building, from material selection and production processes to the model's useful life and its ultimate fate. Moreover, it invites model makers and architects to rethink the boundaries of their creativity by harnessing the unique properties of sustainable materials and forging new frontiers in sustainable design.

¹⁹ Yadav, Madhura, and Mahek Agarwal. "Biobased Building Materials for Sustainable Future: An Overview." *Materials Today: Proceedings*, vol. 43, 2021, pp. 2895–2902, <https://doi.org/10.1016/j.matpr.2021.01.165>.

²⁰ Sharma, Rahul, and Rohan Sumbria. "Mycelium Bricks and Composites for Sustainable Construction Industry: A State-of-The-Art Review." *Innovative Infrastructure Solutions*, vol. 7 no. 5, 6 Aug. 2022, <https://doi.org/10.1007/s41062-022-00903-y>.

Chapter 2: Sustainable and Natural Model Making Techniques and Examples in Industries



Figure 15 - Video capture of Boom Festival, Portugal link: <https://boomfestival.org/boom2023/media/films/boom-web-tv/boom-environmental-program/>

In the world of architecture, design, and product development, the art of model making has long been a pivotal element of the creative process. Models serve as three-dimensional representations of ideas, designs, and concepts, aiding in visualization, communication, and evaluation. However, the traditional model making industry has been marked by a reliance on materials and processes that can have significant environmental and ecological impacts.

As the world confronts the ever-growing challenges of climate change, resource depletion, and pollution, there's an increasing urgency to transform the way we create models. This transformation is encapsulated by the embrace of sustainable and natural model making techniques. These innovative practices seek to reconcile the creative demands of model making with a deep commitment to environmental responsibility and sustainability.

Sustainable Model Making Techniques are based on the idea of reducing the environmental and health impacts of models throughout their life cycle. To achieve this, sustainable model makers follow several key principles, such as selecting materials with lower ecological footprints that can be recycled, biodegraded, or come from renewable sources; minimizing waste generation by using materials efficiently and applying recycling and repurposing strategies; embracing energy-efficient practices in production and operation to lower the carbon footprint of the model making process; and aligning with the circular economy principles by reusing, remanufacturing, or recycling materials to avoid the need for new resources.²¹ “Companies that embrace sustainable business model innovation²² can help transform entire value chains and ecosystems. They can, for example, introduce new circular business models to reshape the whole product usage cycle. And they can create new business models or make investments in ventures that address the looming scarcity of critical sustainability inputs²³. Consider recycled plastic. Some 45% of demand for recycled polyethylene terephthalate will be unmet by 2025, according to BCG analysis. Already, a number of companies are investing in innovation to address the gap, including through investments in R&D and recycling infrastructure.”²⁴

Natural Model Making Techniques are based on the idea of using organic and renewable materials to create models that draw inspiration from nature. These techniques often incorporate elements such as wood, plant-based fibers, and biodegradable components in their designs, which connect to natural forms and materials. Natural model making also considers the key aspects of biophilic design, sensitivity to local ecosystems, and health and well-being. By doing so, natural model makers foster a sense of well-being and sustainability, minimize transportation emissions, and support local economies, and promote healthier indoor environments.

Sustainable and natural model making techniques are not mutually exclusive; in fact, they often intersect. By incorporating eco-friendly materials, reducing waste, and embracing renewable resources, model makers can create models that are both sustainable and natural. These techniques reflect a commitment to environmental stewardship and echo the broader movement towards eco-conscious design and production.

In this era of unprecedented environmental challenges, sustainable and natural model making techniques are leading the way toward a greener and more responsible future. They are not only preserving the art of model making but redefining it, infusing it with a deep respect for the environment and the natural world. This transformation ensures that the models we create today are not just visions of the future but embodiments of a more sustainable and harmonious world.

²¹ Acaroglu, Leyla. “Quick Guide to Sustainable Design Strategies.” *Medium*, 27 May 2020, medium.com/disruptive-design/quick-guide-to-sustainable-design-strategies-641765a86fb8

²² Young, David, and Marine Gerard. “Four Steps to Sustainable Business Model Innovation.” *BCG Global*, 27 Apr. 2021, www.bcg.com/publications/2021/four-strategies-for-sustainable-business-model-innovation.

²³ Young, David, et al. “The Green Economy Has a Resource-Scarcity Problem.” *Harvard Business Review*, 8 July 2021, hbr.org/2021/07/the-green-economy-has-a-resource-scarcity-problem#:~:text=By%20anticipating%20bottlenecks%20in%20the. Accessed 31 Oct. 2023.

²⁴ “Six Steps to a Sustainability Transformation.” *BCG Global*, 5 Aug. 2021, www.bcg.com/publications/2021/steps-to-a-sustainability-transformation. Accessed 20 Dec. 2021.

In the event industries festival structures and decorations can be made from sustainable materials that have low environmental impact, are derived from renewable or recycled sources, and can be reused or disposed of safely. Using sustainable materials can reduce waste and pollution by avoiding single-use plastics and other harmful materials that end up in landfills or in the environment. It can also conserve resources and energy by using natural or recycled materials that require less processing and transportation than conventional materials. Moreover, it can enhance aesthetics and creativity by using unique and diverse materials that can create different textures, colors, and shapes. Some examples of sustainable materials for festival structures and decorations are bamboo, cardboard, and fabric.

Wonderfruit Festival in Thailand uses bamboo for most of its structures and decorations. “The festival launched a design contest with their collaborators Ab Rogers, a London-based design studio. The open call was for a “Super green, super lean, super clean” exhibition pavilion, won by the Woven House.”²⁵

All the structures are designed to be “sympathetic to their environment”. Techniques used by the studio were “inspired by local craft” and its chosen materials were “locally sourced and reversible”²⁶

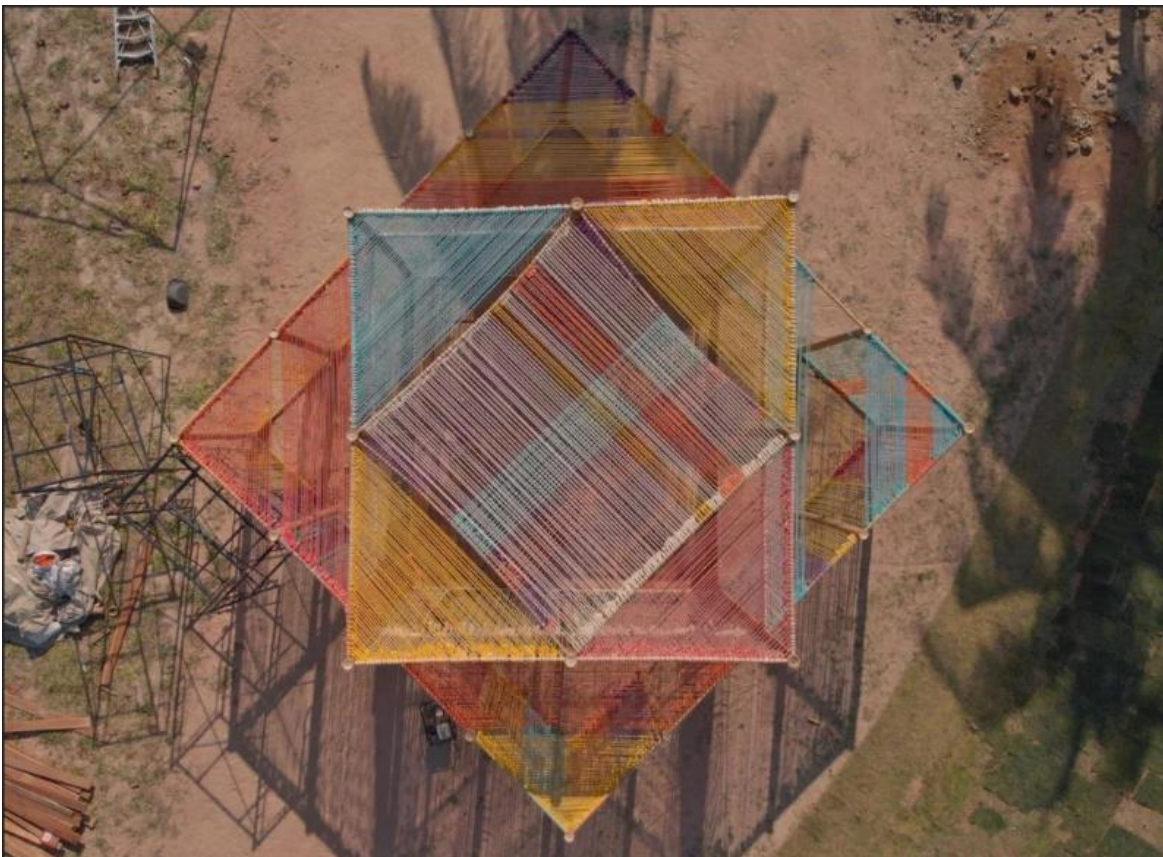


Figure 16 - The woven house at Wonderfruit Festival, Thailand 2019

25 lous. “Bamboo Pavilion the Woven House.” Trojans Collective, 30 Oct. 2019, trojanscollective.com/bamboo-pavilion-trojans-collective-wonderfruit-festival/. Accessed 31 Oct. 2023.

26 Bamford, Abbey. “Wonderfruit Cultural Festival Designed to “Minimise Environmental Impact.”” Design Week, 23 Aug. 2022, www.designweek.co.uk/issues/22-28-august-2022/wonderfruit-cultural-festival-designed-to-minimise-environmental-impact/. Accessed Nov 2023.

Cardboardia Festival in Russia uses cardboard for all of its structures and decorations. Cardboardia is a creative project that started in 2007 as a way to celebrate a unique wedding using cardboard as the main material.²⁷ Since then, it has grown into a community of artists, engineers, producers, and other professionals who create interactive public spaces and events using cardboard



Figure 17 - Defqon1 Hardstyle Cardstyle! – The Arts Board of Cardboard_files1

and other eco-friendly materials.²⁸ Cardboardia organizes workshops, carnivals, performances, parades, and exhibitions in various locations in Russia and abroad. The project aims to create a sustainable economy without territory and natural resources, based on the creative energy of people. Cardboardia also promotes cultural mobility and exchange, inviting participants from different countries and backgrounds to join their activities.

Burning Man Festival, USA uses fabric for many of its structures and decorations. The annual gathering in the Black Rock Desert of Nevada is not only known for its unique and temporary city but also for its commitment to sustainability and art. One of the ways Burning Man achieves this is through the use of fabric in its art installations. Fabric is a versatile material that can be used to create soft and colorful structures, such as curtains, canopies, and flags, as well as embroidered or printed with different patterns for decoration, it can be washed and reused or donated after use. It's used to create dynamic, fluid, and visually stunning pieces while also being more sustainable than some other materials. For instance, the "Living Knitwork Pavilion" at Burning Man seamlessly weaves textile art, culture, and technology. This project began as a desire to curate an experience and create a space for shading and gathering. The Pavilion's design features textiles that imbue the desert art landscape with fluidity, softness, and a dynamic quality. Textiles are integral to human expression and survival, yet they are often overlooked. The Pavilion highlights the complex materials, deep craftsmanship, and various elements that go into textile design and creation.²⁹

27 "Cardboard Town." cardboardtown.cardboardia.info, cardboardtown.cardboardia.info/en. Accessed 31 Oct. 2023.

28 "Cardboardia: Developing Cultural Mobility in and out of Russia | MAYYA LOBOVA | Interartive | Contemporary Art + Thought." interartive.org, interartive.org/2014/02/cardboardia/. Accessed 31 Oct. 2023

29 "Seamlessly Weaving Textile Art, Culture and Technology in the "Living Knitwork Pavilion."" *Burning Man Journal*, 24 Aug. 2023, journal.burningman.org/2023/08/burning-man-arts/brc-art/the-living-knitwork-pavilion/. Accessed 5 Sept. 2023.



Figure 20 - The structure consists of 12 petal fabrics, each designed with 90 textile reliefs



Figure 18 - Living Knitwork petals and detailed patterns, photo courtesy of Irmandy Wicaksono



Figure 19 - MIT Living Knitwork Pavilion
Burning Man, Western United States,
Designboom¹

Moreover, Burning Man encourages artists to consider alternatives to burning and to imagine a life for their work beyond a specific event. This approach is part of Burning Man's 2030 Environmental Sustainability Roadmap, which aims to mitigate emissions and be thoughtful about how, when, where, and why art is burned.³⁰

The use of fabric at Burning Man not only adds an artistic dimension but also aligns with the event's sustainability goals. By incorporating textiles into art installations, Burning Man fosters creativity while promoting environmental responsibility. Burning Man's temporary city becomes a canvas for sustainable art, with fabric playing a significant role in creating immersive and eco-friendly experiences. "Festivals are the perfect playgrounds for testing circular design, responsible upcycling and waste-free strategies."³¹

³⁰ Project, Burning Man. "Burning Man Project: 2030 Environmental Sustainability Roadmap." Medium, 22 July 2019, burningman.medium.com/burning-man-project-2030-environmental-sustainability-roadmap-c79657e18146. Accessed 22 Feb. 2021.

³¹ "Zero-Waste Festivals of the Future: A How-to Handbook." Metabolic, www.metabolic.nl/news/zero-waste-festivals-of-the-future-a-how-to-handbook/. Accessed 3 Nov. 2023.



Figure 21 - Olivia Guethling & Mar Ricketts — Superwhelm ¹

Events are often seen as temporary and ephemeral, but they can also be powerful platforms for experimenting with new models of sustainability. “By designing events with environmental and social concerns in mind, organizers can create prototypes of society” ³² that can inspire and inform wider changes. For example, events can explore different ways of managing mobility, health and safety, production, equipment, waste collection, and sanitation, and then share their learnings with cities or neighborhoods that face similar challenges. Events can also drive a lot of attention and awareness, and they can benefit from being a closed environment that is easier to control and monitor than a larger scale context. “Event greening should start at the inception of the project, and should involve all the key role players, such as clients, organisers, venues, sub-contractors and suppliers.”³³ However, sustainability is not obligatory for events, and many organizers may lack the motivation, resources, or knowledge to implement it. Therefore, government and other businesses could play a role in funding and supporting events to become more sustainable, and to disseminate their best practices and innovations. “the findings show that only 48% considers their organization sustainable, and more than half of respondent states that **the event industry isn’t doing enough to be sustainable** or effectively prioritizing sustainability” ³⁴, as they just want to complete their primary goal, such as a new product launch or a fundraising campaign. This suggests that there is a need for more education and incentives to encourage event organizers to adopt sustainable event management practices.

³² Poorkvliet, Lyke, host. “Scaling up sustainability at events with Lyke Poortvliet” Sustainable Events Podcast, episode 4, Spotify, November 2022, <https://open.spotify.com/episode/3Ykb1MlcJ8lhd9hmsGpY1?si=5e87e1b6132f456a>

³³ Wikipedia Contributors. “Sustainable Event Management.” Wikipedia, Wikimedia Foundation, 30 Sept. 2019, en.wikipedia.org/wiki/Sustainable_event_management.

³⁴ “Sustainable Events: Here’s How We Help Organizers Prioritize ESG Practices.” www.brella.io, www.brella.io/blog/esg-and-sustainability-for-event-organizers. Accessed 20 Dec. 2022.

Chapter 3: Environmental Impact, latest technologies, and Future Outlook

The future of sustainable and natural model making techniques is promising, as more and more people are becoming aware of the environmental issues and the need for green solutions. Many of the recent innovations and the cutting-edge methods used for creating models in various fields are often more environmentally friendly. This means that they use less energy and resources, produce less waste and emissions, and promote the conservation and protection of nature. For example, 3D printing of car parts and prototypes can reduce the cost and time of production, as well as the amount of material and fuel needed. Similarly, biophilic design of event spaces can improve the health and well-being of the attendees, as well as the sustainability and efficiency of the event management. These are some of the ways that the latest inventions and the most modern ways used for model making can contribute to a greener and cleaner future.

Some of the latest technology trends that are sustainable in the model making, theatre, event design, festival, furniture, auto and architecture industries can have positive impacts on the environment, society, and economy, as well as the quality and innovation of the products and services. However, these trends also pose some challenges and limitations, such as the cost, availability, and accessibility of the technologies, the ethical and legal issues of the data and privacy, and the social and cultural implications of the changes. Therefore, these trends require careful and critical evaluation and implementation, as well as continuous research and development, to ensure that they are beneficial and sustainable for the present and future generations.

Augmented reality and biophilic design are two of the latest sustainable technologies for events, design and decorations. They both aim to enhance the human experience and well-being by incorporating natural elements into the indoor environment, either virtually or physically.

“**Augmented reality (AR)** is an enhanced version of the real physical world that is achieved through the use of digital visual elements, sound, or other sensory stimuli and delivered via technology. It is a growing trend among companies involved in the metaverse in mobile computing and business applications in particular.”³⁵ AR can provide a realistic and immersive experience of nature, without the need for physical materials or space. AR can also be customized and interactive, allowing users to choose and manipulate the natural elements they want to see or hear. “To enrich exhibitions, concerts, festivals, or any socio-cultural event and offer a more immersive experience. For example, historical information or artistic details can be superimposed on works of art, sculptures, or landmarks, giving visitors a deeper and more contextual perspective. Another example would be to offer an immersive experience at concerts or festivals, from avatars to gamification games to enhance the experience and generate engagement.”³⁶



Figure 22 - Augmented Reality (AR) Instagram Art Mural At Event

³⁵ Hayes, Adam . “Augmented Reality (AR) Defined, with Examples and Uses.” Investopedia, 15 May 2023, www.investopedia.com/terms/a/augmented-reality.asp.

³⁶ Augmented Reality for Events and Fairs  Examples Updated. 1 Aug. 2023, www.onirix.com/augmented-reality-for-events/. Accessed 11 Sept. 2023.

³⁷ “Augmented Reality (AR) for Events: 5 Immersive Activation Concepts.” Postpopstudios.com, www.postpopstudios.com/post/augmented-reality-ar-for-events-5-immersive-activation-concepts. Accessed 24 Nov. 2023.

In one hand AR can “trigger cultural conflict and religious controversy”³⁸ and aesthetic conflicts, by imposing or influencing the values and preferences of users, without their input or feedback, for example, AR can create a homogenous and standardized experience for users, by neglecting or ignoring the diversity and uniqueness of the natural environment...

Take **Coachella** for example, a popular music and arts festival that takes place every year in Indio, California. This year, Coachella used AR to overlay digital instruments, lyrics, and effects on the real world, creating an immersive and interactive performance for the audience. However, this also meant that the festival did not take into account the cultural and historical significance of the instruments, lyrics, and effects that were used by different artists or genres. For example, some artists may use traditional or sacred instruments that have different meanings or values than those used by other artists. Some lyrics may also contain references or symbols that are specific to certain cultures or religions. By using AR to impose a uniform and standardized experience for users, Coachella may have lost its authenticity and diversity.



Figure 23 - Gorillaz unsurprisingly pushed boundaries at Coachella with a seemingly real-time AR installation that leveled up their live set for at-home viewers

38 Seddon, Robert. “Why Augmented Reality Is Triggering Cultural Conflict and Religious Controversy.” *The Conversation*, theconversation.com/why-augmented-reality-is-triggering-cultural-conflict-and-religious-controversy-77976. Accessed 6 Oct. 2021.

39 Dandurand, Darragh. “Gorillaz Debut AR YouTube Experience at Coachella.” *VRScout*, 1 May 2023, vrscout.com/news/gorillaz-debut-ar-youtube-experience-at-coachella/. Accessed 10 Dec. 2023.

But on the other hand, “One of the significant benefits of **using AR technology to preserve the environment** is it does not require physical presence.”

So, it contributes to environmental sustainability by reducing the consumption of natural resources, energy, and waste in not just events but education, tourism, entertainment, and other industries. For example, AR replaces physical objects or materials with virtual ones, reducing the need for transportation, installation, and disposal of resources. It can enhance the efficiency and performance of energy systems, such as smart grids, renewable energy sources, and energy management systems, by providing real-time information and feedback to users and operators. AR promotes environmental awareness and education, by simulating the effects of human activities on the environment, such as climate change, pollution, or deforestation, and by providing solutions and alternatives for environmental protection and conservation. “AR can also improve the health and well-being of users, by providing them with restorative and positive effects of nature, such as reducing stress, enhancing mood, and improving cognitive performance.”⁴⁰



Figure 24 - The Future of Cinema Involves New Augmented Reality Technology

40 Mollazadeh, Maryam . “Application of Virtual Environments for Biophilic Design: A Critical Review .” Buildings 2021, vol. 11(4), no. 148, 2 Apr. 2021, doi.org/10.3390/buildings11040148. Accessed 24 Nov. 2023.

41 Oosthuizen, Megan. “The Future of Cinema Involves New Augmented Reality Technology.” Fortress of Solitude, 5 Sept. 2022, www.fortressofsolitude.co.za/the-future-of-cinema-involves-new-augmented-reality-technology/.

In theatres too, one of the latest technology trends is the use of immersive and interactive technologies, such as virtual reality, and mixed reality, which can create more engaging and realistic experiences for the audience. Lighting and sound systems, which can reduce the energy consumption and carbon footprint of the performances. Some examples of these systems are LED lights, solar panels, and biofuel generators. “The evolution of theatrical lighting technology is already making moves to being more ecologically sustainable”⁴²

Furthermore the use of biometric and facial recognition technologies enhances the security, personalisation, and convenience of the events. These technologies can also reduce the use of paper and plastic tickets, badges, and wristbands, which can save resources and reduce waste. Another trend in event design is the use of digital platforms and tools, such as online registration, live streaming, and social media, which can increase the accessibility, reach, and engagement of the events. These platforms and tools can also reduce the travel and transportation costs and emissions of the attendees and organizers.

And then the use of **Biophilic design** integrates natural elements, such as plants, water, light, or materials, into the indoor environment, creating a connection between humans and nature. Biophilic design can be applied at different scales, from interior design, building design, to urban design. It can improve the sustainability of events, design, and decorations, by using biodegradable or recycled materials, enhancing natural ventilation, lighting, and promoting biodiversity. “Biophilic design can also improve the health and well-being of users, by providing them with physiological and psychological benefits of nature, such as lowering blood pressure, improving air quality, and increasing productivity.”

34



Figure 25 - The Sfer Ik arts centre at AZULIK Uh May in Mexico incorporates locally sourced, sustainable materials

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⁴² “The Ecological Sustainability of Theatrical Lighting.” The CSPA, 19 Oct. 2008, www.sustainablepractice.org/2008/10/19/the-ecological-sustainability-of-theatrical-lighting/.

⁴³ “Azulik Uh May Art Center / Roth-Architecture.” ArchDaily, 27 Oct. 2020, www.archdaily.com/906448/azulik-uh-may-jorge-eduardo-neira-sterkel. Accessed 16 May 2021

“Biophilic event design is an emerging event planning approach that prioritizes incorporating natural elements and patterns into the event space. Its primary goal is to create a sensory-rich experience that connects attendees with the natural world while also fostering feelings of well-being and tranquility. Biophilic design is not limited to large, open-air gatherings but can be applied to various event types, from corporate conferences and tradeshows to weddings and festivals.”⁴⁴

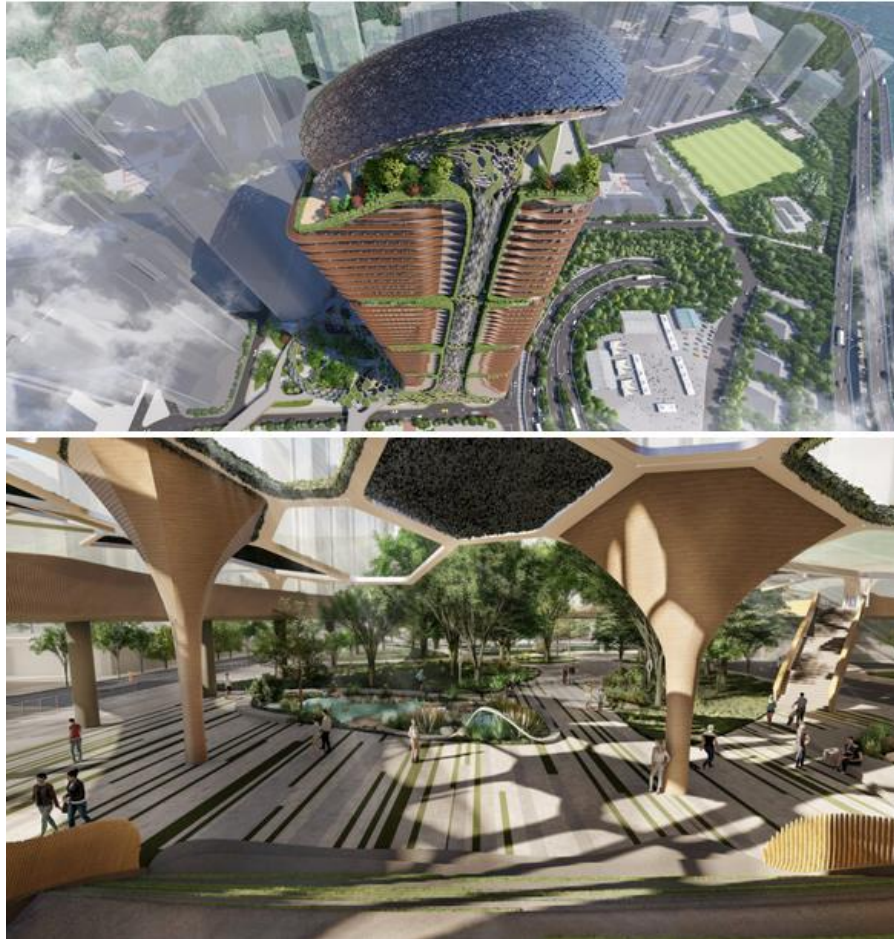


Figure 26 - The Treehouse high-rise office concept by Ronald Lu & Partners

These sustainable technologies have the potential to advance the field of events, design, and decorations, by offering new possibilities and opportunities for creativity and expression, as well as addressing the environmental and social issues that these activities face.

⁴⁴ CSEP, Corinne Kessel. “What Is Biophilic Event Design?” Corporate Meetings Network, 2 Nov. 2023, corporatemeetingsnetwork.ca/2023/11/02/what-is-biophilic-event-design/. Accessed 24 Nov. 2023

⁴⁵ “Azulik Uh May Art Center / Roth-Architecture.” ArchDaily, 27 Oct. 2020, www.archdaily.com/906448/azulik-uh-may-jorge-eduardo-neira-sterkel. Accessed 16 May 2021



Figure 27 - Jewel Changi Airport, Singapore; world's largest indoor waterfall HSBC Rain Vortex, 40m tall

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However, they also pose some challenges and limitations, such as the availability and accessibility of the devices and materials, the ethical and legal implications of the data and algorithms, and the cultural and aesthetic preferences of the users and audiences. Therefore, it is important to adopt a holistic and systemic approach to sustainable design, considering the social, economic, and environmental aspects of these technologies, and involving the communities in the design process.⁴⁷

In the fields of festivals one of the latest technology trends in festival is the use of smart and wearable technologies, such as RFID, GPS, and NFC, which can enhance the safety, communication, and enjoyment of the festival-goers. These technologies can also reduce the use of paper and plastic maps, guides, and coupons, which can save resources and reduce waste. Other trends in festivals are the use of green and renewable technologies, such as solar panels, wind turbines, and biodegradable materials. These are technologies that can harness natural resources or reduce environmental impact. They can reduce the energy consumption and environmental impact of the festivals, by providing alternative sources of power, lighting, and waste management. For example, solar-powered stages and wind-powered lights can generate electricity from the sun and the wind, while biodegradable materials can decompose naturally and avoid pollution. However, these technologies also have some limitations and challenges, such as the dependence on weather conditions, the high initial cost, and the lack of public awareness and acceptance. Therefore, it is important to evaluate the feasibility and

46 Nast, Condé. "Breathing Space: Biophilic Architecture." CN Traveller, 25 Oct. 2019, www.cntraveller.com/article/biophilic-architecture.

47 Lee, Eun Ji. "a Framework of Smart-Home Service for Elderly's Biophilic Experience ." Sustainability 2020, vol. 12(20), no. 8572, 16 Oct. 2020, doi.org/10.3390/su12208572.

Accessed 20 Nov. 2023.

effectiveness of these technologies, and to promote their adoption and integration in the festival industry.

Similarly in the fields of architecture the use of biophilic and biomimetic designs can create more human and nature-friendly buildings. These design principles can also improve the health, well-being, and productivity of the occupants. Some examples of these design principles are natural ventilation, daylighting, and green roofs. The use of modular and prefabricated construction can also create more flexible and efficient buildings.⁴⁸ These construction methods can also reduce the material and energy consumption, as well as the waste and pollution of the construction process.

“From a complete lifecycle assessment perspective, construction, operation, and demolition or reuse of buildings involve a chain of economic activities that provide the goods and services necessary to build, maintain, and eventually retire or convert the asset. Each of these activities carries an implicit "ecological footprint" of resource consumption and waste generation.”⁴⁹



Figure 28 - Biophilic design of the future -Space Refinery Magazine

⁴⁸ Muhammad Wasim, Paulo Vaz Serra & Tuan Duc Ngo (2022) Design for manufacturing and assembly for sustainable, quick and cost-effective prefabricated construction – a review, *International Journal of Construction Management*, 22:15, 3014-3022, DOI: 10.1080/15623599.2020.1837720

⁴⁹ The Environmental Benefits of Sustainable Design . www1.eere.energy.gov/femp/pdfs/buscase_section4.pdf.

Further research into the technologies of architecture uncovered some fascinating examples of how the built environment could be optimised from a biological perspective and by AI systems in the future. These are some of the innovative solutions that could transform our world for the better. Some architectural technologies would be like a self-healing concrete that uses bacteria to repair cracks and prevent corrosion⁵⁰; a biomimetic building that uses AI to adapt its shape, ventilation, and lighting to the changing weather and occupant needs⁵¹; a living wall that uses plants to purify the air, reduce noise, and enhance biodiversity⁵²; or a social housing project that uses AI to design and construct affordable and customized homes for low-income families⁵³; also a vertical farm that uses AI to monitor and control the optimal conditions for growing crops indoors.⁵⁴ These are an interesting outlook and one can only hope they will happen. These latest technologies are emerging across various industries are not only impressive and innovative, but also inspiring and hopeful for our planet. They demonstrate the potential and the possibility of creating solutions that are sustainable, efficient, and beneficial for both humans and nature. They also challenge us to rethink and reimagine our ways of living, working, and interacting with the world around us. However, these technologies also come with their own risks and limitations, such as ethical, social, and environmental implications. Therefore, we need to be aware, responsible, and critical when we adopt and use these technologies, as well as when we evaluate and improve them. By doing so, we can ensure that these technologies serve the common good and the future generations.

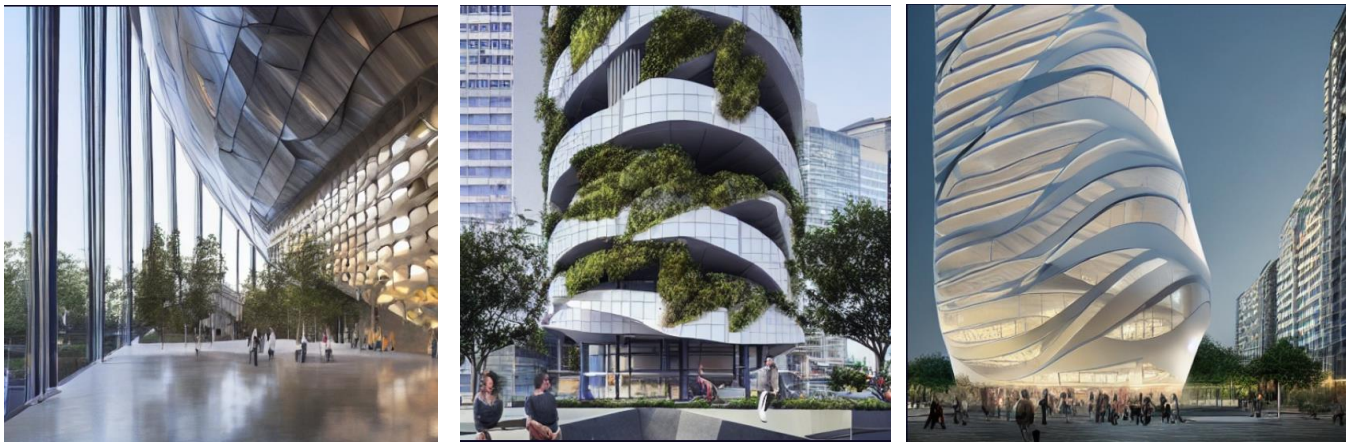


Figure 29 - Ai generated images, prompt by Noemi Fulop: a biomimetic building of the future that uses AI to adapt its shape, ventilation, and lighting to the changing weather and occupant needs.

50 "Self-Healing Concrete." GCCA, gccassociation.org/essential-concrete/self-healing-concrete/.

51 Sheikh, Wajiha Tariq, and Quratulain Asghar. "Adaptive Biomimetic Facades: Enhancing Energy Efficiency of Highly Glazed Buildings." *Frontiers of Architectural Research*, vol. 8, no. 3, Sept. 2019, pp. 319–331, www.sciencedirect.com/science/article/pii/S2095263519300470, <https://doi.org/10.1016/j.foar.2019.06.001>.

52 "The Living Wall - an Initiative That Brings Together Engineering and Art." *Engineers Ireland*, www.engineersireland.ie/Engineers-Journal/More/Sponsored/the-living-wall-an-initiative-that-brings-together-engineering-and-art. Accessed 24 Nov. 2023.

53 Overy, Rian. "What Are the Benefits of AI in Social Housing?" *Planning, Building & Construction Today*, 24 May 2023, www.pbctoday.co.uk/news/digital-construction/construction-technology-news/what-benefits-ai-social-housing/127036/. Accessed 24 Nov. 2023.

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Conclusion

It is important that we also focus on making practices sustainable for the future. This can be achieved through the use of eco-friendly materials, reducing waste, and adopting sustainable practices in the production process. We shall use the technologies to our advantage and embrace new technologies that can aid in the production of art and model making. By doing so, we can not only make these practices more efficient but also push the boundaries of what is possible. We must also strive to invent further by exploring new techniques and pushing the limits of our creativity.

The challenge now is to harness this creativity, technological prowess, and scientific understanding to design solutions that foster sustainability and ecological harmony, thereby healing the separation we have created over centuries. By doing so, we can become better stewards of the planet and work toward a future in which our products and designs no longer divide us from nature but unite us in a shared quest for a more sustainable and interconnected world.

Sustainability has emerged as a paramount consideration in the realm of model making, and it's intriguing to trace its journey. The driving force behind this transformation is the global awakening to environmental issues, ranging from climate change to resource scarcity. From my perspective as a model maker, it's been a remarkable evolution to witness. Our craft has shifted from an exclusive focus on precision and aesthetics to assuming a profound responsibility for environmental consciousness. Sustainable methods have taken center stage, altering the very essence of our work. We're now exploring eco-friendly materials, adopting energy-efficient processes, and carefully considering the entire life cycle of our models. Sustainability is no longer an optional feature; it has become integral to our practice. This shift has not only made us better model makers but also environmental stewards, contributing to a more sustainable and harmonious future for all.

Sustainability is not only a buzzword, but a necessity for industries. To achieve this, we need to use the latest techniques and technologies that are eco-friendly and efficient. However, there are also barriers and challenges that prevent us from fully embracing sustainability, such as cost, skill, regulation, and culture. To overcome these, we need to raise awareness, provide education and training, create incentives and policies, and foster collaboration and innovation. By doing so, we can build a better future for ourselves and the planet.

“The future is not predetermined. It is shaped by our choices and actions today. We have the power to create a more sustainable and equitable world for ourselves and future generations.”

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