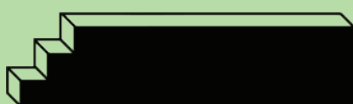


SUSTAINABLE COSTUMES



Final Impact Report

Written by Urs Dierker



**NEXT
STAGE**
GRANTS RECIPIENT 2022

The Next Stage Initiative is led by FEDORA and Opera Europa



ÍSLENSKA ÓPERAN

**OPER
LEIPZIG**

Sustainable Costumes Impact Report 2024

A NEXT STAGE 2022 project funded by FEDORA and Opera Europa

Coverphoto: ©Urs Dierker (2023) Costume workshop at the Oper Leipzig

www.sustainablecostumes.com | info@circularcostumedesign.com



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Introduction

This publication is the second part of the mandatory impact report for the FEDORA *Next Stage Grant* 2022 awarded project *Sustainable Costumes*. The project is led by Oper Leipzig, Germany, represented by the Artistic Director Tobias Wolff. The second partner is the Icelandic Opera based in Reykjavik, Iceland lead by Executive and Artistic Director Steinunn Ragnarsdóttir. The research lead is Urs Dierker. *Sustainable Costumes* is based on doctoral research by Urs Dierker on “Futuring Costume Work: A Critical Approach for Sustainable Innovation in Performance” at Northumbria University in the United Kingdom. The project examines environmental and social aspects of sustainability by thoroughly investigating current processes in three opera productions. The FEDORA-funded project started in 2023 and concluded in July 2024.

The driving question, cited from the initial funding application to FEDORA, was: How can circular economy practices mitigate environmental impacts and ensure long-term sustainability transformations within the value chains and networks of costume design for opera production?

Sustainable Costumes explored the costume design phases of three opera productions at the two participating opera houses. The interest of this study was to examine current circular practices in contemporary opera through material mapping during the design phase. The focus on the design phase aligns with the perspective that approximately 80% of a product’s environmental impact is influenced by decisions made during that phase.

Thanks & Acknowledgements

Sustainable Costumes would not have succeeded without the dedication and interest of the costume departments at the Oper Leipzig and the Icelandic opera. Their input and knowledge about their work and what it means to find a new balance with our planet are at the core of *Sustainable Costumes*. I especially want to thank the two costume directors, Helga Ludvigsdottir and Silke Wey, for their unwavering support and input. My thanks also extend to Roy Böser (head of costume production), Katja Schmidt (head of hat department), Jennifer Knothe (costume assistant), and the workshop heads and costume makers in both operas. Thank you also to Lucas Zimmermann and Mrs. Josephine Rozlach for lending their organizational skills to the project.

Sustainable Costumes began when the new artistic director of the Oper Leipzig, Tobias Wolff, became interested in my research and asked me to join him in applying for the FEDORA Next Stage Grant.

I am beyond thankful that Tobias Wolff invited me to join the project, and that Steinunn Ragnarsdóttir, Executive and Artistic Director of the Icelandic Opera, also became part of it.

Thank you Tobias Wolff and Steinunn Ragnarsdóttir for your vision and support of *Sustainable Costumes*, it opened many avenues to explore the untapped value of costume in opera.

Sustainable Costumes was made possible by the generous support and efforts of the FEDORA team, headed by Edilia Gänz, and Diandra de Lima, and Eléonore Benedetti. Thank you for believing in this project.

Now this fabulous project is coming to an end, but *Sustainable Costumes* is just the beginning. Let's keep working on it.



Steinunn Birna Ragnarsdóttir, CEO and Artistic Director of the Icelandic Opera, with the General Director of the Leipzig Opera, Tobias Wolff, at the presentation of the *Next Stage Grants* on June 17, 2022, in Prague. Photo Credit: ©luciekrejzlova ©Oper Leipzig

Sustainability Guidelines

One key recommendation from the costume department at Oper Leipzig was to create clear guidelines for costume designers on how to integrate sustainable practices into their work. Through conversations with designers and makers, it became evident that existing work processes often hinder new approaches to design and production that could minimize harm to both humans and the environment.

Costume designers, while having substantial influence over costume creation, are often restricted by production schedules, budget limitations, and their understanding of the costume department's resources. On the other hand, the costume departments typically act as service providers during the design phase, working to bring the designer's vision to life. Their role and influence grow after the premiere, as the costumes enter regular use.

The Sustainability Guidelines aim to facilitate a dialogue between designers and the costume department, allowing both parties to collaborate on sustainable solutions. These guidelines serve as a starting point for designers to incorporate eco-friendly methods into their creative process. The current version of the guidelines, available in both German and English, can be downloaded from the Oper Leipzig website.

The biggest success of the Sustainable Costume Project was the development of [Sustainability Guidelines for Costume Designers](#).



**OPER
LEIPZIG**

NACHHALTIGKEITSLAITLINIEN FÜR KOSTÜMSCHAFFENDE

Sustainability Guidelines for Costume Designers

Liebe Kostümschaffende,

wir freuen uns, Sie hier in der Kostümabteilung der Oper Leipzig zu begrüßen und Sie mit unseren Nachhaltigkeitsleitlinien vertraut zu machen. Die Leitlinien sind Teil des Ansatzes der Kostümabteilung zur nachhaltigen Transformation der Oper Leipzig. Die Leitlinien basieren auf einer Bewertung unserer eigenen Prozesse in der Kostümabteilung während des Sustainable Costumes Projekts.

Für uns, die Kostümabteilung der Oper Leipzig, sowie die Oper Leipzig selbst, bedeutet Nachhaltigkeit unsere Bedürfnisse bei der Kostümherstellung so zu gestalten, dass wir negative Auswirkungen auf lokale und globale Umwelt- und Sozialsysteme, die wir direkt und indirekt nutzen und beeinflussen, aktiv zu reduzieren.

Wir freuen uns, dass Sie mit uns zusammenarbeiten. Wir lieben es, Kostüme herzustellen, und die Kostümanfertigung ist ein Handwerk, das hier in Leipzig seit langer Zeit stolz praktiziert wird. Das erste Leipziger Opernhaus, die Oper am Brühl wurde 1693 gegründet. Heute verfügt die Kostümabteilung der Oper Leipzig über mehr als 100 talentierte und erfahrene Kostümschaffende mit einem reichen Kostümwissen in unseren 5 Gewerken – eine Damen- und eine Herrenschniderei, die Hut- und Putzabteilung, die Schuhmacherei, die Mal- und Spritzabteilung und in den Theaterwerkstätten die Rüstmeisterei, welche auch der Kostümabteilung zuarbeitet. Wir sind stolz darauf, dass wir ein großes und gut organisiertes Kostüm- und Materiallager anbieten können. Wir betreuen vier verschiedene Theaterhäuser in der Stadt Leipzig, jedes Haus mit seinen eigenen spezifischen Anforderungen und Vorgaben.

Wie an den meisten Theaterhäusern, ist Kreislaufwirtschaft in Bezug auf die Arbeit mit dem Kostümfundus, schon lange Teil der Arbeitsweise. Unser Kostümfundus hat ca. 20.000 Kostümteile, welche zur Wieder- und Weiterverwendung verfügbar stehen. Wir freuen uns darüber hinaus, neue nachhaltige Ideen zu Materialien, Herstellung und Zusammenarbeit auszuprobieren. Es interessiert uns sehr, mehr über Ihre Erfahrungen mit nachhaltigen Produktionsmethoden sowie Ihre Ideen und Entwürfe für umweltfreundlichere Kostüme zu erfahren.

Die Kostümabteilung der Oper Leipzig



¹ Sustainable Costumes ist ein Next Stage Grant Projekt, das von Fedora und Opera Europa finanziert und von der Oper Leipzig geleitet wird. Sustainable Costumes wurde von der Arbeit und Forschung von Urs Dierker zur nachhaltigen Transition im Bereich Kostümbild inspiriert. Dierker ist Gründer der Plattform Circular Costume Design.

Key Findings

The *Sustainable Costumes* project is pioneering a shift towards ecological and social sustainability within the opera industry, using costumes as a focal point. This initiative involved over 100 costume professionals from both Oper Leipzig and the Icelandic Opera, examining their work to explore sustainable transitions in costume design. The project included over 50 interviews, material mapping of 15 costumes, and 3 participatory online workshops for costume professionals in Europe. The project highlights the use of advanced tailoring techniques, resource efficiency, and innovative material sourcing. Three case studies of the productions of *Madame Butterfly*, *Peter Grimes* and *Mary, Queen of Scots* showcase the effective use of existing stock and a balanced approach to resource management. The long-term goal is to create a lasting positive impact on both the costume community and the planet.

Sustainable Costumes showed two things in relation to sustainable change in costume.

1. The current obstacles to sustainable change are interwoven among various stakeholders, from conceptual decisions (artistic director), artistic interpretations (artistic team, including the costume designers), performances (actors, singers), and production and maintenance of

costumes (costume department). These intersections create a complex network of interests, requirements, decisions, and responsibilities. Costumes are deeply intertwined with traditions and institutional processes, which makes it slow to adapt to sustainable change.

2. Sustainability in costume is most commonly interpreted as focusing on addressing environmental impacts through circular costume models (e.g., reuse and recycling). The *Sustainable Costumes* project showed that social aspects of work relations and well being must also be included when finding environmentally positive solutions and new pathways.

Key recommendations:

1. Knowledge transfer in a new, co-creative way between opera institutions, creative teams, designers and costume departments in a flat hierarchy is key to innovation

Missing: Collaborative life-cycle costume design and production practises

Solution: Co-design initiatives starting in the concept phase of a production

2. Rethink the procurement of materials and consumable (materials purchased by costume workshops for the construction of costumes, such as notions, haberdashery, linings and interfacing)

Missing: Innovative green materials and sustainable consumables

- Costume is a small, but crucial part in the sustainable transformation of opera with its power being sartorial storytelling and the ability to reconnect audiences with mindful fashion consumption

- Costume can help us to question our own relationship with clothing in the context of sustainability

- The costume department is an ideal candidate to become a hub for sustainable innovation

What needs to change

Climate change is a significant shift that impacts us all, albeit unequally. While techno

logical and procedural changes will aid in this effort, the transformation is fundamentally a social endeavor and requires a change in attitude towards what we call nature.

Sustainable Costumes showed that the creation of costumes is a complex process. The design and craft of making costume is a pivotal moment when tradition must be combined with the urgent need to push into unknown futures.

Change for the costume workshop

- Name one person per workshop as your innovation officer.

- Define together which traditional and innovative craft techniques and technologies are relevant to you (example: natural dyes).

- Communicate this in a written document: Explore alternative sources for material procurement and rigorous testing of these materials by the costume department to build confidence and acceptance of sustainable alternatives

3. Create innovative circular costume solutions, including technological processes, and including novel natural and synthetic material solutions

Missing: Efficient way to reuse greater quantities of costumes and materials, and processes that integrate biomaterials and other innovations currently in development

Solution: Co-create ideas between costume designers and costume departments to extend the life-cycle of materials and update processes to enhance a circular costume economy.

Opera houses and costume departments have a responsibility to act as role models, using their craft knowledge and authority to reevaluate the value of costumes in response to the climate crisis.

Recommendations

Costume is an interesting field for sustainable innovation in the performing arts, as it is connected to the idea of dress and with that, the social, cultural and economic worlds of clothing, fashion and textile production. The value of a costume also lies in its materials, usage, and maintenance practices as a sartorial response to the current climate crisis.

Moreover, costume is deeply intertwined with the human need for storytelling. In the case of opera, costume tells stories within a beautiful and rich tradition of music, voice and performance. Performers in costumes connect to the audience's own realms of dress. This makes costume a valuable but often underestimated part of performance. The value of costumes extends beyond their stage presence – opera houses are sitting on a gold mine of untapped value in the form of costumes in storage.

A question is how to innovate costumes within new life cycle thinking? Tobias Wolff has proposed digitizing costume and material stocks and is even considering collaborations with local material suppliers (<https://www.material-mafia.net/>) with the future vision that costumes could be, like books today, rented for a period of time through the local city libraries. Innovating in craft, maintenance, and reuse techniques serves as an exceptional means to position opera houses and its costume department as a leading example of a sartorial response to the current climate crisis that can be shared with the public.

- Costumes represent the vast knowledge of the designers and makers
- Though costume is not a mass-produced item, it participates in the consumption of mass-produced materials and clothing
- Costume department management and the artistic director (example: which dyes, which processes are needed, and idea of costs)
- Highlight which relevant storytelling and sustainable values your recommendation have (example: finding a local dye plant)
- Sketch out your ideal solution (example: an Oper Leipzig plant dye garden)

Change for the costume management

- The wellbeing of costume workers is directly related to their agency to work with more envi-

ronmentally friendly methods.

- Rethinking essential collaborations between costume designers, the creative team, and the opera institution to establish innovative life cycle thinking methods
- Communicate with the creative team and the costume designers about the creative possibilities the costume department can offer in terms of innovative material solutions and storytelling
- Communicate the extra time needed to fulfill these experiments and cross-pollination innovation with other departments

For the artistic directors

- Communicate in the concept meeting the urge and beauty of life cycle design thinking that goes beyond one production
- Communicate the willingness to support innovative and creative materials and material storytelling solutions
- Communicate the capability of the costume workshops to work with innovative materials and co-create and co-design together material and storytelling samples in the concept phase and beyond

For funders

- Encourage innovative and radical new thinking through the support of exemplary projects.
- Bring together designers and makers from different institutions and backgrounds
- Bring together science, industry and creative partners to cross-pollinate sustainable materials ideas with life cycle thinking

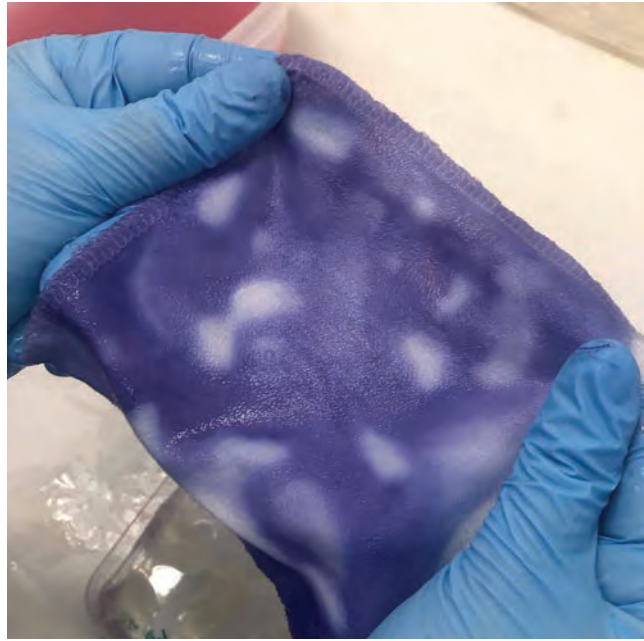
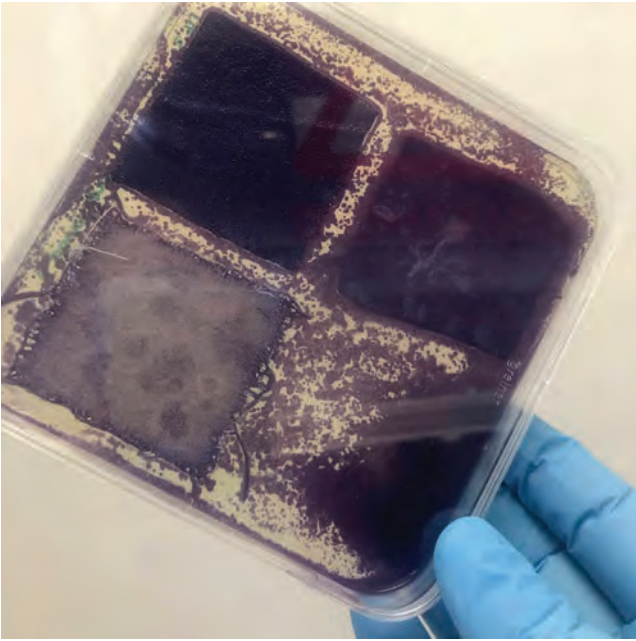


Image 1-3: ©Urs Dierker (2020) *Janthinobacterium lividum* grown on textiles.
Naturally Dramatic, Aalto University

Experimental materials

Experimental materials refer to the next generation of materials relevant to costume. There are many new biomaterials in development that will change our view on making costumes. One example is bacterial dyes. Unlike plant-based dyes, where plants must first be grown to produce plant matter that contains colorants, bacteria can directly produce colorants on textiles under certain conditions. Bacteria's ability to produce colorants more directly can save resources.

The beauty of working with living biomaterials, like the *Janthinobacterium lividum* bacteria, is that the live path of the bacteria becomes visible through the colors they produce. The biography of a bacteria is written on the textile through the purple dye the bacteria secretes during its lifetime. Astonishing experiments with new materials in opera have been undertaken, for example, the *Freischütz für Kinder* included an interactive tree costume made from bacterial cellulose by the Leipzig-based company ScobyTec for Oper Leipzig in 2015 at the *Musikalische Komödie*.



Methods

Sustainable Costumes aims to explore, in a participatory setting with costume professionals, a new balance between tradition and innovation for opera productions. The primary focus is identifying leverage points for sustainable transformation in costume design and crafting processes. Three main methods were employed.

Interviews with Stakeholders: These included individual and group semi-structured interviews with people participating in costume production processes within the opera houses. The main aim was to get a better understanding of current costume production processes.

Material Mapping: Materials from 5 costumes per production, 15 costumes in total, were mapped. All new and reused materials used to create the costume were accounted for. The material mapping was performed by the costume department with detailed instructions from the researcher.

Participatory Public Online Workshops: Three workshops were held. The first focused on Sustainable Guidelines for Costume Designers, while the last two centered on Sustainable Procurement. Each workshop included breakout sessions where participants discussed assigned topics in small groups. The findings from these

discussions were then presented in feedback rounds.

Ethical Considerations: The study followed ethical guidelines, ensuring informed consent from all participants, maintaining confidentiality, and obtaining necessary approvals.

By employing these methods, the study aimed to provide a comprehensive understanding of the current practices in costume production and to identify potential areas for sustainable transformation.

Framing

The results of the 2023 Act Green survey show that 77% of audiences think cultural organizations have a responsibility to influence society to make radical change in response to the climate emergency.

Sustainability and costume

Sustainability has become a prominent issue in the cultural industries in Europe. *Sustainable Costumes* is timely with its focus on regenerative innovation in costume, design and storytelling. What can sustainable action mean beyond reducing, reusing, and recycling in costumes? Thinking sustainably extends beyond the short period of production. A costume is, materially speaking, more than its presence on stage. Costume is changing in terms of manufacturing and audience. These changes occur not only on a technological level (digital) but also in terms of the perception of costumes. The audience wants costumes that visually and substantively engage with questions about our future, regardless of whether they are historical, contemporary, or futuristic designs. Costume designers and costume departments are jointly called upon to look to the future. Together they can shape their influence on artistic, craft, procedural, and material decisions in a contemporary way, without losing the rich tradition of costume making.

The costume departments of the Oper Leipzig and Icelandic Opera have been making strides towards sustainability by reusing costumes and carefully selecting fabrics. The costume departments are committed to integrating eco-friendly practices. While contemporary costumes are more easily repurposed than historical ones, the costume teams in both operas also prioritize using leftover fabrics and reusing accessories, shoes, and undergarments. Efforts to maintain costumes include using eco-friendly cleaning products and ozone cabins for sanitizing. Additionally, the costume teams are focusing on sustainable fabric choices, although challenges remain, such as finding alternatives to nylon for tutus. Raising awareness among designers is essential for their sustainability goals. To this end, the Oper Leipzig developed comprehensive sustainability guidelines for costume designers.

CO₂ footprint calculation

While *Sustainable Costume* did not use CO₂ footprint calculation as a method, one of its case studies *Mary, Queen of Scots* was calculated. The evaluations of the CO₂ footprint of the materials used in to make costumes showed that the costume department has only a minor negative impact, 1,6%, on the overall CO₂ budget of a production. The emissions



from the costume materials amount to approximately 950 kg. This constitutes about 13% of all emissions from the materials used (7.5 tons) and approximately 1.6% of the total production emissions.

Supplementary Information

The UN Sustainable Development Goals are an interesting framework for governmental, local and cultural institutions alike. The city of Leipzig, the main funder of the Oper Leipzig, and the Icelandic Government, the main funder of the Icelandic Opera, have invested in helping their cultural institutions to become change makers in their respective communities. For the Sustainability Guidelines for Costume Designers, seven goals were chosen that represent a wider framework for sustainable transformation of costume. Opera can play a role in the following:

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Goal 5: Achieve gender equality and empower all women and girls

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation

Goal 10: Reduce inequality within and among countries

Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable

Goal 12: Ensure sustainable consumption and

production patterns

Goal 13: Take urgent action to combat climate change and its impacts

The Icelandic Opera is supported by the Icelandic Government and located within Harpa, a concert hall and conference center, in Reykjavik. Harpa's sustainability efforts began in 2015 with goals to reduce greenhouse gas emissions and achieve carbon neutrality by 2030. Committed to the Paris Agreement, Harpa released a Climate and Environmental Policy in 2021, setting itself as a role model in Iceland in environmental issues. The climate action plan for 2022-2024, published a year later, outlines targets for systematically reducing the organisation's emissions.

The Oper Leipzig is a communal institution reporting to the City of Leipzig. The City has declared a climate emergency and is aiming for climate neutrality by 2050. This resolution prioritizes climate protection in all city decisions, accelerating existing programs and updating measures. The city has implemented a 2020 immediate action program with 24 measures, including making city administration climate-neutral by 2035, which involves municipal events and cultural institutions. The Oper Leipzig acted upon this and created different strategies to support the City of Leipzig in reaching its sustainability goals



Graphics: ©United Nations. (2016). Sustainable Development Goals.

Sustainable Costumes is one of three projects the Oper Leipzig is currently employing to attain its climate goals. With support from Fonds Zero the Oper Leipzig created its first sustainable Opera Production *Mary, Queen of Scots* in 2023. And Oper Leipzig is the first German theater to achieve DIN ISO 20121 certification for its sustainability management. Various independent and state-funded organizations are actively involved in supporting theaters and theater makers to address sustainability (Kearney (2021, 2023), Fedora (2019, 2023), Kulturstiftung des Bundes, 2023, 2024; Theatre Green Book, 2022, 2024). The cultural industries have recognised their responsibility and have established active networks of government, industry, and non-profit organizations working to limit environmental impact. They have largely concentrated on reducing energy consumption, recycling, managing waste and measuring carbon footprints. Recent developments in Germany focus on developing online material databases and material hubs (Kulturstiftung des Bundes, 2023), and on training theater makers about circular production (Julie’s Bicycle, 2023). From the perspective of the institution, current approaches center on energy and waste management, including the use of carbon calculators to assess negative impacts of material consumption and processes. From the worker and maker perspective, tactics include self organization (e.g., Nachhaltigkeits AGs, or “sustainability

working groups”), developing solutions within departments (e.g., use of green materials), and personal initiatives (e.g., collecting fabric scraps, buying organic soap). Several notable sustainability projects in the German-speaking region are StuFF, Performing for Future and Wiki zu Nachhaltigkeit und Theater (Performing for Future, 2023; SK Freie Szene, 2023; Stuff, 2023).

The interest in sustainability is reflected in a variety of gray and academic literature. Publications targeted to industry include the Theatre Green Book, which provides theater makers, including the costume department, with environmentally friendly practices to adapt green standards to theater buildings and operations (Theatre Green Book, 2024). Findings of the Sustainable Costume project informed the new Theatre Green Book Costume tooling. *Sustainable Costumes* is case study on the Theatre Green Book website.

¹Raines, Katy et al. (2023) Act Green 2023. Benchmark Report. Indigo Shore. Indigo Ltd.



Graphics: ©Urs Dierker

Focus of study

Design phase

The design phase, defined as the phase between the costume designer's initial concept and the premiere, is relatively short in comparison to the whole costume life cycle. During the design phase, costume concepts—developed through illustrations and detailed discussions between designers and costume makers—are transformed into wearable objects tailored to specific performers. The different steps from the initial concept by the costume designer to the finished costumes contain many decisions which define the resulting costume and have lasting impact on its multiple uses and ultimately disposal. Each step and decision nudges the costume toward its final design.

The conception of a performance has a great impact on a costume's lifecycle. How long a costume is in use and is reused involves multiple factors. The costume department has a central role in this entanglement; it is the place where the costume stays for most of its 'life'. The costume department's expertise in materials, making, and maintenance is crucial for future development in costume and sustainability.

One of the most frequently expressed needs by costume makers for sustainable transforma-

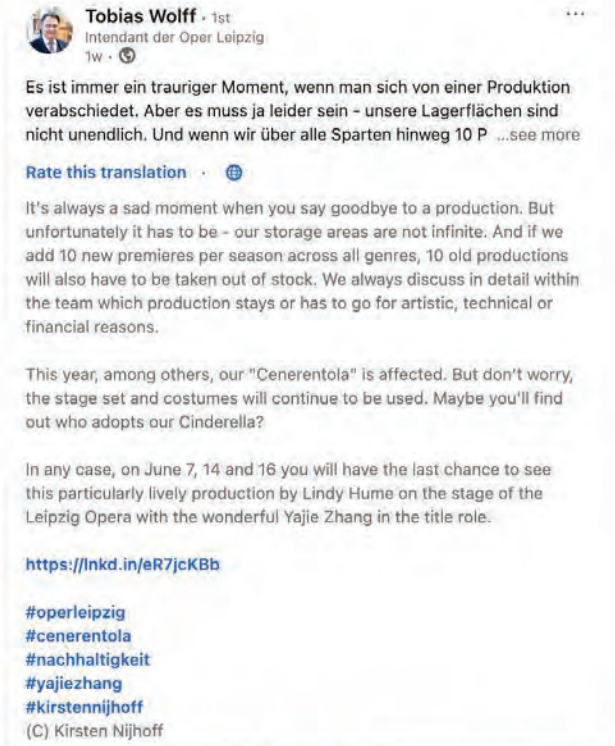
tion was time—the time to think about, act on, and create change in costume production.

Achieving sustainability requires extensive research and development, including iteration, testing, and refining processes. As there is no easy, ready-made solution for sustainability, institutions must invest in the necessary time and effort to costume makers to discover and implement effective practices.

Opera holds a unique position by combining heritage knowledge, which has vanished in the fast-paced clothing production industry, with innovative craft processes tailored to custom-fitted garments used for storytelling. While technical innovation is an important change maker, technology alone will not solve the environmental difficulties we are facing. It will be a combination of behavioral change, focused on social and cultural alterations, and technological advancements.

Circular economies

The reuse of material and costume was the main approach to sustainability in all three productions, followed by sourcing certified green materials. *Sustainable Costumes* showed that there are two main strategies for reuse. Costumes are coming either from internal



costume collections (like in Peter Grimes and Mary Queen of Scots) or are rented and lent from external costume stocks (as done for the Madame Butterfly production). *Sustainable Costumes* showed that the majority of materials do not come from reused sources. *Sustainable Costumes* also showed that most of the new materials used have synthetic, not biodegradable, fibers and will most likely end up shredded or in landfill. Current approaches to costume life cycle thinking are limited and disconnected. It is common to downcycle when reusing costumes. For example, costumes that were originally used as main cast costumes might end up as background costumes.

Imagine if costume materials had a voice; they would have many different stories to tell. Costumes are “repeatedly transformed, both

DEFINITION OF SUSTAINABILITY *****

Sustainability in costume focuses, in conjunction with other endeavors within the entertainment industry, on restoring the balance between humans and the planet. Sustainable transformation in costume involves widening our current approaches to costume work and performance to include life cycle thinking. Life cycle thinking explores the loops in a costume’s life, from concept to disposal. Sustainability requires that we question our work conditions and processes, how we choose and employ materials to create and use costumes, and the effects our actions have on humans and the Earth’s ecosystems.

materially and symbolically” in their use cycles. Extending their material biographies means not only to reuse them, but also to define the core value of what costumes are, and how they can make a difference beyond their initial use and maybe the stage. Costumes have many unexplored potentials, so as the Artistic director of the Oper Leipzig claims in a recent post, “don’t worry, the stage set and costumes will continue to be used. Maybe you’ll find out who adopts our Cinderella?”.

Project Team Adjustment

The *Sustainable Costumes* project, a collaboration between Oper Leipzig and the Icelandic Opera, encountered challenges when the Icelandic Opera faced funding difficulties. Preliminary plans are in the works to establish a National Opera in Iceland in the future. Steinunn Birna emphasized that the Icelandic Opera, with its rich history, international network, and extensive portfolio, provides a solid foundation for a national opera. The Icelandic Opera did not participate in the three workshops and the final Intermezzo.



White net veil
flowers decoration

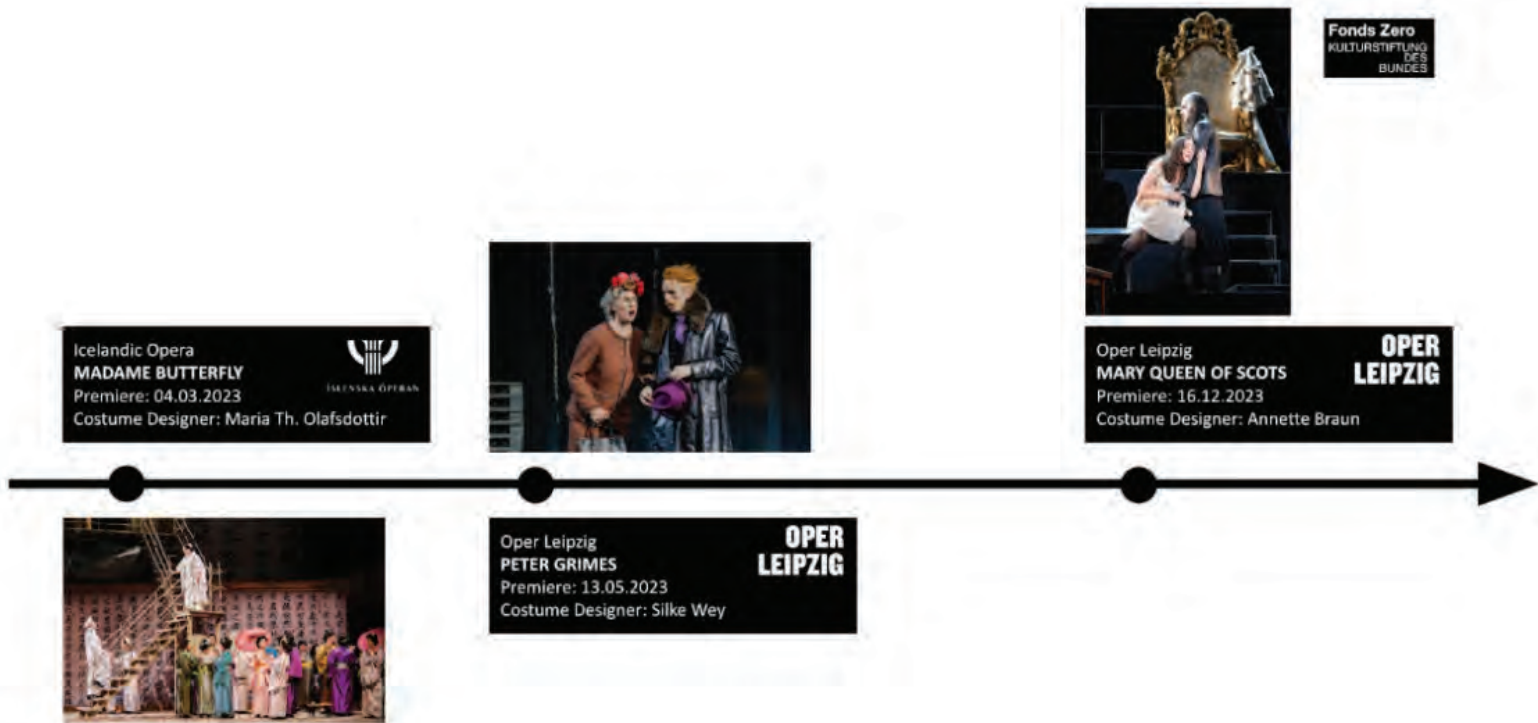
Thick silk brocade
as top layer of
4 coats

1 meter
train

Fringe from 3rd
coat that is
sheer w/
butterfly motive

white silk brocade
under dress, narrow

Illustration: © María Th. Ólafsdóttir - Badame Butterfly Icelandic Opera (2023)



Case Studies

Three case studies were chosen: Peter Grimes and Madame Butterfly, two productions with traditional production methods, and Mary, Queen of Scots, the first production at Oper Leipzig to strive for carbon neutrality. For this production, Oper Leipzig received the Zero Fund grant from the Kulturstiftung des Bundes.

All three productions followed the established steps of employing a costume designer who developed the concept in close relation with the artistic team and the costume department's management. After creating the initial designs, the costume designers shared them with the costume department about 6 to 9 months before the premier (initial costume). This started the process of refining the costume budget, finding materials, making samples and creating the final work plan for the workshops. The production started about 3 to 6 months before the premiere. With the start of the rehearsal period, about 6 to 8 weeks before the premiere, costumes were introduced on set (costume rehearsals), and altered and refined until the premiere. Around this time the costumers become responsible for the costume.

Costumers have the most important position when it comes to continuity and maintenance.

Costumers dress the performer, making sure they wear the right costume for each change, and maintain the costumes between performances. The costumer in Opera main responsibility is to prolong the usability of costume until their final disposal. Costumers are the unsung heroes of sustainability in the costume department.

Fig. 5: © Case studies. Graphics: ©Urs Dierker Photos Credits: Oper Leipzig ©Tom Schulze and ©Icelandic Opera

Material mapping

We focused on five costumes per production, fifteen costumes in total.

Purpose: Understanding the origins of new and used materials for the costume production.

Interviews

50+ individual and group interviews with 60+ costume professionals.

Purpose: Understanding work relations during the design and making phase of the costumes.

Data

Icelandic Opera, Iceland

Madame Butterfly

Interviews

8 Interviews

3 Participants

Material Mapping

- 5 Costumes

Oper Leipzig, Germany

2 Opera productions

Peter Grimes

Mary, Queen of Scots

Interviews

43 Interviews

62 Participants

Material Mapping

- 5 Costumes per opera

Material mapping

Five costumes per production, 15 costumes in total, were studied. The aim of the material mapping was to collect data on the number of materials used in one costume. The mapping collected all the materials used (fabric, thread, buttons etc.) used for a costume. The material mapping gives an indication of how current costume productions acquire and handle materials. Data on materials used for samples and mockups were not collected. We were especially interested in understanding more about how many ‘used’ materials were used, as no previous data was collected on the amount of “reused” costumes and materials used in a costume production. The mapping was done by the costume department in excel sheets provided by the lead researcher.

The costumes chosen represent different levels of performances, from main cast to choir to

costumes for extras (non-singing roles). The different materials ranged from costumes with predominantly new materials (mainly main cast costumes) to costumes with predominantly reused materials (often choir and extra costumes).

For the purpose of the material mapping, we divided the tracked materials in four groups: Specific Materials (New), Consumables (New), Costume Stock (Reuse), Material stock (Reuse). Specific Materials represent new purchased materials chosen by the designer. Consumables represent new materials chosen by the costume workshops. Costume Stock is a repository for used costumes. Material Stock consists of materials from previous productions now available for use. Specific Materials are the visible materials the designers especially purchase for the production to create the silhouette and



Fig. 6: Costume Milliners in the costume department. ©Photos Credits: Urs Dierker

style needed. Consumables are mostly hidden materials like interfacing of lining, used by the costume workshops to create the costumes. Consumables often are materials not bound to a specific production. They are bought in bulk by the department for all productions to use. The reused materials are divided into Costume Stock and Material stock.

Once material is assigned to a specific production; it cannot be used for other productions. The exceptions are consumables, standard, mostly hidden materials used by the workshops. These assigned materials, when not fully used, stay with the production in case costumes need to be altered or newly made. In many opera productions it is common to share large singing roles. As costumes are custom fit in size, this means that most often two of the same costumes need to be created if performers share a character. Once a production is released (discontinued) the costumes and left over materials become part of the common costume

stock or are recycled or disposed of. Currently, most costume stocks are not accessible to the public. To expand the reuse of costumes, it is necessary to rethink current practices. The two most common recent developments in reuse of costume materials are digitalisation of costume stock and making content available publicly.

Legend

Costume stock: the costume collection from which items were reused.

Material stock: materials not purchased but available for reuse.

Consumables: newly purchased materials from the material stock.

Specific Materials: new materials specifically purchased to create the costumes in question.



時無功
之秋羣雄林
君我厚
稱也然則帝
莫可至
而即不去則天
歸正統奸
象同心治
當



ÍSLENSKA ÓPERAN

Madame Butterfly

Giacomo Puccini (1858-1924) Composer
Luigi Illica and Giuseppe Giacosa Libretto
March 4th 2023 Premiere (5 performances)
Italian Language | 135 min. Length | 3 Acts

Madame Butterfly used a total of 108 different materials, of which 10.2% were reused materials. The majority, 89.8%, were newly purchased materials.

Reused materials: 10.2%

Costume Stock: 7.4%

Material Stock: 2.8%

Newly purchased materials: 89.8%

Consumables: 49.1%

Specific Materials: 40.7%.

Madame Butterfly

Total materials used in the production of the five case study costumes



● Costume stock (Reuse) 7.4%

● Material stock (Reuse) 2.8%

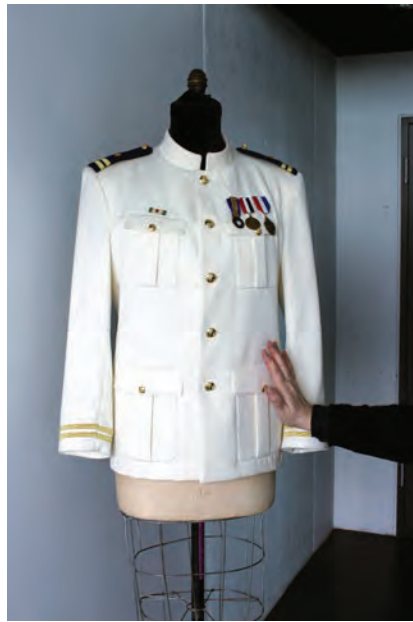
● Consumables (New) 49.1%

● Specific Materials (New) 40.7%

Madame Butterfly	
Total of materials used for costume production of the five case study costumes	
Costume stock (Reuse) 7.4%	8
Material stock (Reuse) 2.8%	3
Consumables (New) 49.1%	53
Specific Materials (New) 40.7%	44
Material used	108



Bonzo
Viðar Gunnarsson



B. F. Pinkerton
Egill Árni Pálsson



Cio-Cio San
Hye-Youn Lee



Geisha
Choir



Kate Pinkerton
Karin Björg
Torbjörnsdóttir







Peter Grimes

Benjamin Britten (1913-1976) Composer
Montagu Slater, based on the narrative poem
“The Borough” by George Crabbe Libretto
May 13th 2023 Premiere (5 performances)
English Language | 180 min. Length | Prologue
and three Acts

Peter Grimes used in total 89 different materials, of which 17.9% were reused materials. The majority, 82.1%, were newly purchased materials.

Reused materials: 17.9%

Costume Stock: 15.7%

Material Stock: 2.2%

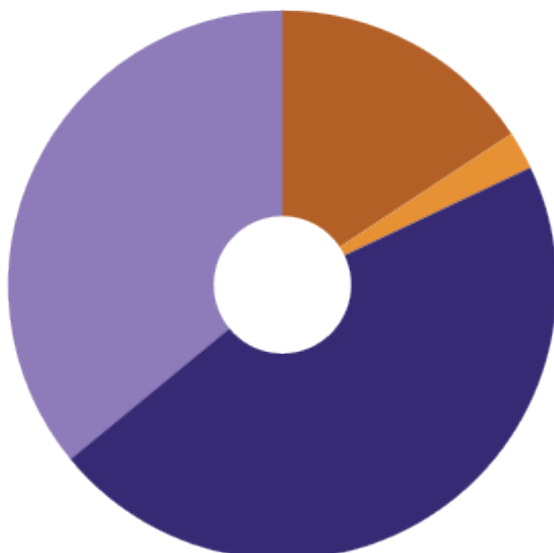
Newly purchased materials: 82.1%

Consumables: 46.1%

Specific Materials: 36%

Peter Grimes

Total materials used in the production of the five case study costumes



● Costume stock (Reuse) 15.7%

● Material stock (Reuse) 2.2%

● Consumables (New) 46.1%

● Specific Materials (New) 36%

Peter Grimes	
Total of materials used for costume production of the five case study costumes	
Costume stock (Reuse) 15.7%	14
Material stock (Reuse) 2.2%	2
Consumables (New) 46.1%	41
Specific Materials (New) 36%	32
Material used	89



Mrs. Sedley
Kathrin Göring



Auntie
Karin Lovelius



Ned Keen
Jonathan Michie



The boy
Jonathan Walldorf /
Oskar Wangemann Choir



Chor
Victor Gaviola



Photo Credits: © Urs Dierker (2023) Case studies: Madame Butterfly costume





Mary, Queen of Scots

Giacomo Puccini (1858-1924) Composer
Luigi Illica and Giuseppe Giacosa Libretto
March 4th 2023 Premiere (5 performances)
Italian Language | 135 min. Length | 3 Acts

Mary Queen of Scots was the first climate-neutral opera production at the Oper Leipzig. Mary, Queen of Scots used in total 100 different materials, of which 22% were reused materials. The majority, 78%, were newly purchased materials.

Reused materials: 22%

Costume Stock: 13%

Material Stock: 9%

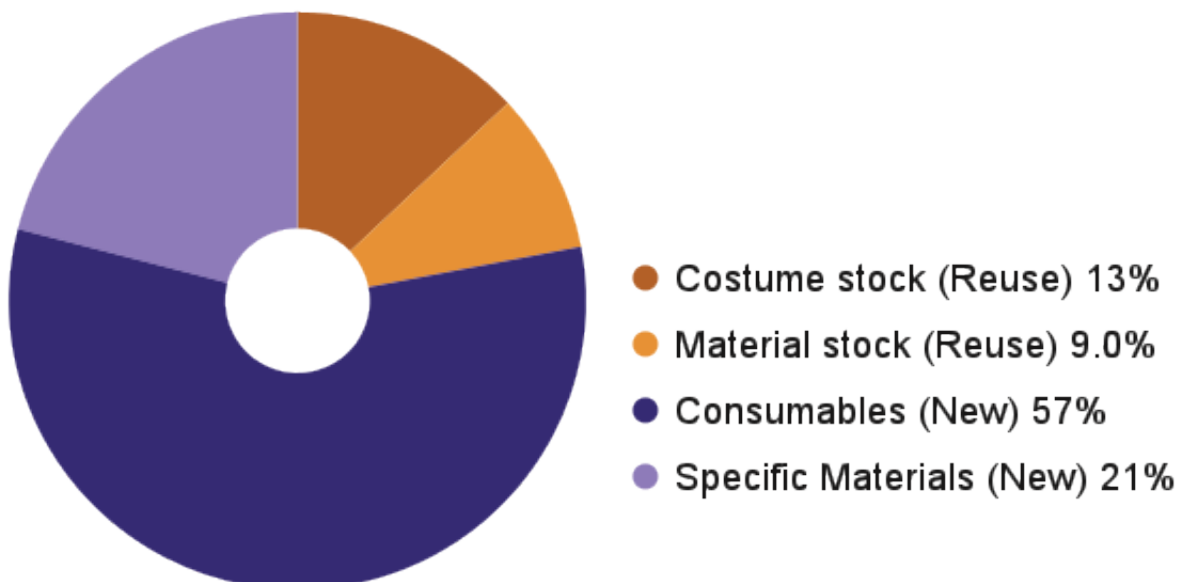
Newly purchased materials: 78%

Consumables: 57%

Specific Materials: 21%

Mary, Queen of Scots

Total materials used in the production of the five case study costumes



Mary, Queen of Scots	
Total of materials used for ostume production of the five case study costumes (estimate)	
Costume stock (Reuse) 13%	13
Material stock (Reuse) 9%	9
Consumables (New) 57%	57
Specific Materials (New) 21%	21
Material used	100



Mary Livingston
Katharina von Hassel



Lord Darnley Rupert
Charlesworth



Earl of Morton
Richard Morrison



Volk
Kamila Dziadko



Mary, Queen of Scots Nicole
Chevalier



Photo Credits: © Urs Dierker (2023) Case studies: Madame Butterfly costume





Photo Credit: © Oper Leipzig (2024) Mary, Queen of Scots

FOKUS

The costume of Earl of Morton

The costume for the Earl of Morton showcases a conscious effort toward sustainable costume design. A notable 33.3% of the materials used were sourced from existing stocks, while the remaining 66.7% were newly purchased. — This thoughtful combination of reused and new materials highlights the costume department's commitment to balancing creativity with sustainability, ensuring that high-quality design is achieved while minimizing environmental impact.

Earl of Morton | Richard Morrison

Twelve materials utilized for Earl of Morton's costume

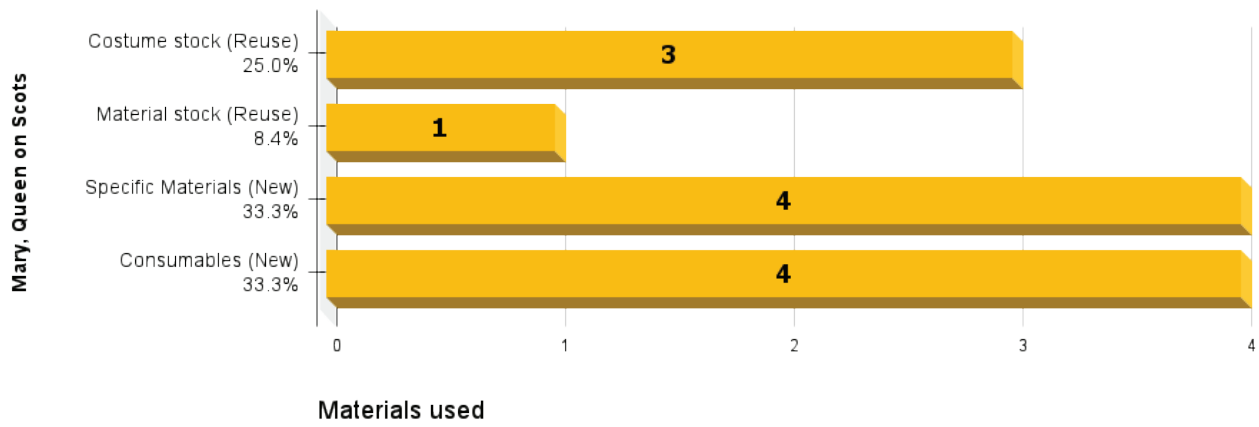


Photo Credit: © Oper Leipzig (2024) Mary, Queen of Scots. Illustration: Annette Braun



Materials

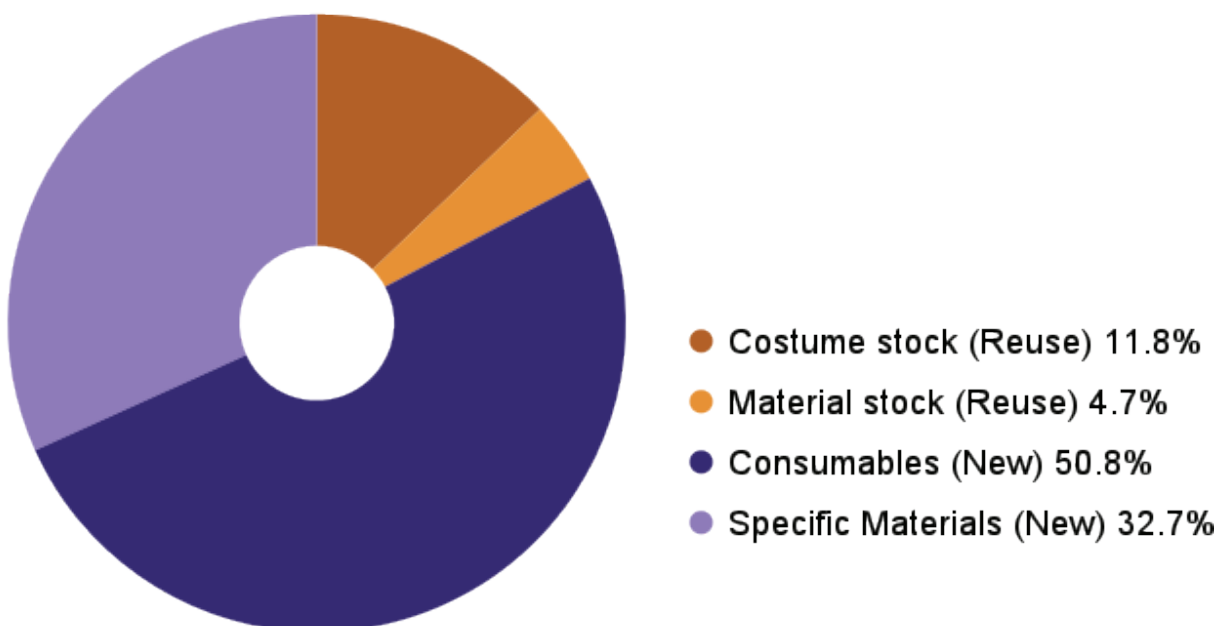
The pie charts display the total materials used in the three case study costume productions at Oper Leipzig and the Icelandic Opera. In total, 296 materials were utilized to create the fifteen costumes for these case studies. These materials include ready-made items like shoes and high-street fashion, as well as fabrics, and notions such as threads, buttons, and zippers. The scope of the material mapping was defined

to encompass primary suppliers, including external firms, and the internal costume and material inventories of the two opera houses.

Consumable and Specific Materials

All productions reused costumes and materials. However, in all three case studies, a smaller percentage of materials were reused compared to the larger share of newly purchased materials. A benefit of having two case-studies in one institution is being able

Altogether, 296 materials were used in the production of the five case study costumes



All three case study productions	
Total of materials used for costume production of the	
Costume stock (Reuse) 11.8%	38
Material stock (Reuse) 4.7%	13
Consumables (New) 50.8%	151
Specific Materials (New) 32.7%	94
Material used	296

to compare how stakeholders in the costume department at Oper Leipzig gradually refined their sustainability strategies. The learning of the Oper Leipzig costume department between making costumes for *Peter Grimes* and *Mary, Queen of Scots* was gradual but steady. One key takeaway from the project was the development of an internal sustainable material database and guidelines for costume designers, which will be shared with designers on future productions.

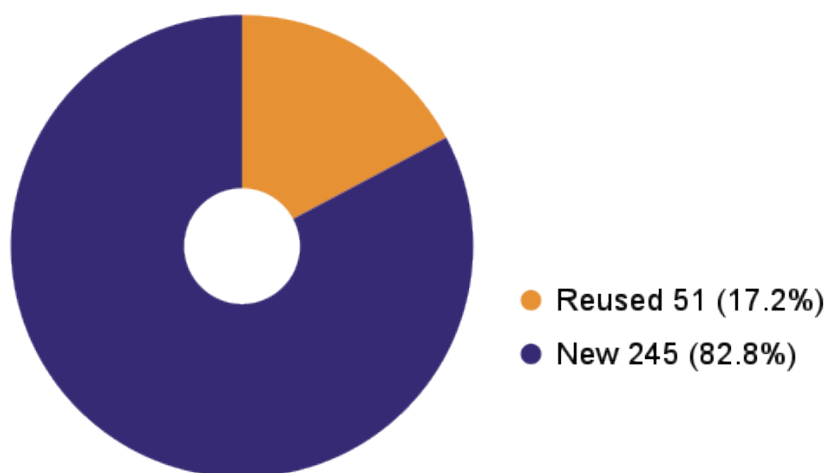
The last case study production, *Mary, Queen of Scots*, was also the first 'sustainable' production of the Oper Leipzig, funded by Zero Fonds of the Kulturstiftung des Bundes (Germany) which allowed them to create a carbon footprint calculator of the whole production. The results showed that less than 2% of the overall carbon footprint of the *Mary, Queen of Scots* production is attributed to the costume

department. The materials selected for the calculation were those purchased in the largest quantities for costume creation.

Findings Material Mapping

The material mapping results revealed that all three productions reused materials. However, the majority of materials used for the 15 costumes in each production were newly purchased. Both opera houses have large used costume and material collections which both operas claim to use to different degrees in almost every production. María Ólafsdóttir and Helga Lúðvíksdóttir, the costume designer and director of *Madame Butterfly*, borrowed some of the costumes from the two neighboring theaters. Silke Wey, the costume designer for *Peter Grimes*, mentioned that she used as many reclaimed (used) materials as possible for that production, inspired by our initial discussions about sustainability at the start of the

Materials combined of all 15 case study



Sustainable Costumes project. Annette Braun, the costume designer of *Mary, Queen of Scots*, integrated an entire set of choir costumes from a previous show which had been canceled due to the pandemic.

Conclusion Materials Mapping

The material mapping results conclude that 82.8% of the materials used were newly purchased, while only 17.2% were reused, indicating a strong reliance on new materials in costume production. Although materials are being reused, there is clear room for further improvement in increasing the use of reclaimed materials.

Of these new materials, the largest amount, over 50%, comes from consumables, which are materials purchased by the costume department. Most of the reused materials come from the costume stock (12.8%), followed by materials from the material stock (4.4%).

The specific materials that define the color range and silhouettes of costumes, predominantly chosen by the costume designer, account for 31.8%. The costume designer also selects most of the reused materials, such as stock costumes and materials (17.2%).

Therefore, it can be argued that the costume designer and the workshops are roughly equal

in their material choices (49,0% / 51.0%), with the costume designer opting for slightly fewer new materials (31.8%) compared to the workshops (51.0%).

As the interviews in the next section will show, there are plausible reasons for the limited use of reused materials, for example related to the limited time that costume designers and costume departments can allocate to material research.



Photo Credit: © Urs Dierker (2023) Oper Leipzig



Interviews and Online Workshop Feedback

The *Sustainable Costumes* project gave the opportunity to talk to many costume professionals. Individual and group interviews were conducted with stakeholders in the costume departments of both operas. In total, over 50 interviews were conducted: eight at the Icelandic Opera and forty-three at Oper Leipzig, involving about 65 participants. Based on the findings in the interviews we prepared three online workshops sessions.

The interviews and workshop feedback revealed two main trends. There is a great interest in the topic of sustainability, but uncertainty about what this word means and how sustainable transformation can be achieved either as a costume designer or in the individual workshops where costumes are created and maintained.

Interview findings

Twenty-eight primary keywords were identified by analyzing the most frequently mentioned subjects in the interviews using an AI data analysis tool (Sonix.ai). The keywords were then manually grouped in three topics – Work (organizational and practical); Stakeholders; and Concept, Systems and Networks.

1. WORK

The topic of work time was interpreted as the lack of time achieving, thinking about or acting upon issues for sustainable transition in the costume workshop and costume design. The lack of time in the context of the costume department and workshop was subject to the dependencies of designers and artistic team, and the artistic direction. Especially, the seemingly common practice of last minute changes close to the final rehearsals and the premiere seems to be an issue, that left costume professionals in a passive role, reacting to change (remake of costumes, finding new costumes for performer replacements) and not proactively planning. The issue of work can be summarized in the question: **How to innovate when there is only time to react?**



Fig. 6: Sustainable Costumes invitation 1-4. © Credits: Urs Dierker

Sample quotes from the workshop feedback session and interviews with the costume department:

“When we constantly find ourselves in stressful situations and produce at the last minute, we don’t have the time to research sustainable products.”

Feedback Session

“Instead of decreasing, it became more [productions]. The problem for us is that we always just react.”

Costume management

Keywords: Work (organizational)

Responsibility

Collaboration

Networking

Planning

Material procurement

Budget

Digitalization

Timeline

Sustainability certifications

Costume stock

Maintenance

Material management

Work (organizational) encompasses various aspects critical for effective management and production. This includes defining responsibilities and planning how the work is divided, which is first done by the head of costumes and later by the head of the individual workshops. Organizing work also involves material procurement, budgeting, and adhering to timelines. Additionally, managing costume stock, maintenance, and overall material management are key components in maintaining organizational efficiency and resource sustainability.

Keywords Work (practical)

Working conditions

Recycling

Flexibility

Fabric

Work-life balance

Resource optimization

Work (practical) involves ensuring good and safe working conditions, implementing recreational breaks, and maintaining flexibility in work arrangements to allow for a well balanced work-life balance. It also involves providing employees with time and resources for professional development, allowing them to acquire new skill sets related to sustainable transitions and obtain the necessary qualifications and certifications in this field.

The way the artistic director and costume management allocate time for development is a complex issue. Providing clear guidelines for costume makers on how to request extra time for experiments, along with straightforward instructions from management on deadlines and budgets, will help resolve current uncertainties.

2. STAKEHOLDERS

Especially costume designers in the feedback round emphasized their dependency on costume departments for innovation. This was an interesting twist in the conversation. Giving the costume department more agency, could strengthen their role as service providers by becoming leaders in sustainable transformation and educating costume designers. This enhanced position could allow the costume department to become more active in the design phase of costume productions. The issue of stakeholders can be summarized in the question: **Who is driving innovation in the sustainable transformation of opera?**

Quotes from the workshop feedback session and interviews with the costume department:

Keywords Stakeholders

Designers Team

Stakeholders were included in thinking about new collaborative design and production methods using life cycle thinking methods. Co-design methodologies can help to bridge the design phase with the use and reuse cycle of costumes. Designers and makers collectively contribute to costume lifecycle success through their expertise, collaboration, and shared responsibilities.

The costume department can become the driving innovative force when given the right resources and agency to act.

“[A good idea would be] creating a position in the costume department that is solely responsible for researching materials and sustainability, as well as long-term sustainability.”

Feedback Session

“Practically, [the costume designers] see us as service providers.” *Costume maker*

3. NETWORKS

When under pressure, leaving common ground seems unsafe and an unwise solution. Changing to new understandings of sustainable transitions needs a sheltered place and time for costume professionals to explore and also fail, basically to experiment with new materials, processes and life cycle ideas. Opera costumes are one of the lasting values of opera productions. Costumes are desired by the audience as the annual public costume sales show. For most of their 'life,' costumes are stored away, their value is not used. The model function that opera houses have as state or communal entities could allow them to unearth the hidden value of costumes and rethink other avenues of sartorial storytelling. Opera houses, and with it the costume departments, serve as role models by showcasing innovative sartorial solutions in response to the climate crisis. The issue of stakeholders can be summarized in the question: Is the costume department missing its opportunity to become an innovation leader in sustainability?

Sample quotes from the workshop feedback session and interviews with the costume department:

“We cannot afford to experiment with biomaterial that then breaks again because we do not have the time. We do not have the time to repair it afterwards.” *Feedback Session*

“We see ourselves as a state-run operation. With an educational mission and role model function.” *Costume management*

Keyword Concept

Sustainability

Concept. The concept of sustainability involves adopting practices that meet present needs without compromising the ability of future generations to meet theirs. It encompasses environmental stewardship, resource efficiency, and long-term ecological balance.

Keywords Systems and network

System boundaries

Workshop

Supply chain

Systems and networks encompass managing costume workshops and overseeing the costume supply chain. This includes production processes, storage solutions, and the handling of materials, all of which are essential for efficient operations and resource management.

Finally the request by costume designers and costume professionals for “more time”, can be seen by opera and costume management and outside funders as a welcome opportunity to create win-win situations for sustainable transformation. Costume departments can highlight

their unique heritage and skills in preserving the art of costume, promoting sustainable

sartorial storytelling.

Production

Storage

Materials

Conclusion Interviews

While the costume department as a service-based model is functional, it doesn't give costume makers much agency to change unsustainable processes. The costume designers and the people in the costume department have limited power to induce change. They are entangled in the rigorous process of costume production and reliant on other stakeholders in the opera who may slow down or obstruct initiatives for change.

Currently, the value of costumes is not being utilized to its full extent. Given the public role of opera in education, costumes have the potential to become a valuable tool in demonstrating sartorial responses to the climate crisis.



Photo Credit: © Urs Dierker (2023) Oper Leipzig

“Sehr gut, leider viel zu kurz”

Public Online Workshops

Online Workshop 1: Sustainability Guidelines for Costume Designers (25.04. 2024)

Online Workshop 2: Sustainability Procurement (02.05.2024)

Online Workshop 3: Sustainability Procurement (09.05.2024)

Final Event Intermezzo: Sustainable Costumes (16.05.2024)



Fig. 13 © Oper Leipzig (2024)
Online Intermezzo 16.05.2024

The *Sustainable Costumes* project invited costume professionals to four online events: three participatory workshops and the final Intermezzo. The first participatory workshop (WS1 24.05.) explored the idea of Sustainability Guidelines for Costume Designers, the two following workshops (WS2 02.05. And WS3 09.05)

focused on sustainable material procurement. The final Intermezzo event reported about the project and invited the project funder FEDORA and the bio colorant experts Axel Waehling (NIG Natural Dyes, Germany) and Friederike Hoberg (MycColors, Germany) to give presentations about natural textile dyes.

Over 50 costume professionals participated in the three workshops. In total, the Sustainable Costume online events reached 90 costume professionals from 9 countries from South Africa to Norway. The feedback from participants was positive and expressed the wish for more and longer participatory events.

Feedback from Anonymous Survey of Workshop Participants:

“Very good. It was good to hear and see colleagues from costume outside England and how they are dealing with similar challenges regarding sustainability.”

“Ich fand den Austausch mit anderen Kostümschaffenden aus anderen Häusern sehr gut.”

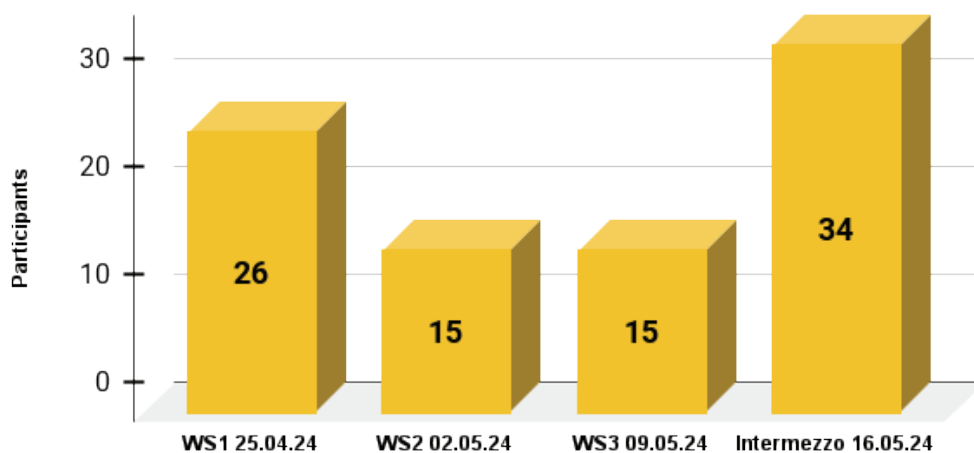
Except for the third workshop (WS3 09.05), all workshops were organized as bilingual events in English and German. The third workshop was held in German. Most participants at all four events spoke German (over 60%), followed by participants from the United Kingdom (19.1%). Participants represented all professional roles in costume. The majority are professionals working in costume departments (Costume Management 22.6% and Costume makers 28.7%), followed by costume designers (45.2%).

From the 170 people who RSVP'd for all four events, 90 participated. This is an average participation rate of over 50%, with the highest attending rate (66,67%) at the final Intermezzo event.

WS1 25.04.24	26
WS2 02.05.24	15
WS3 09.05.24	15
Intermezzo 16.05.24	34
Total participants	90

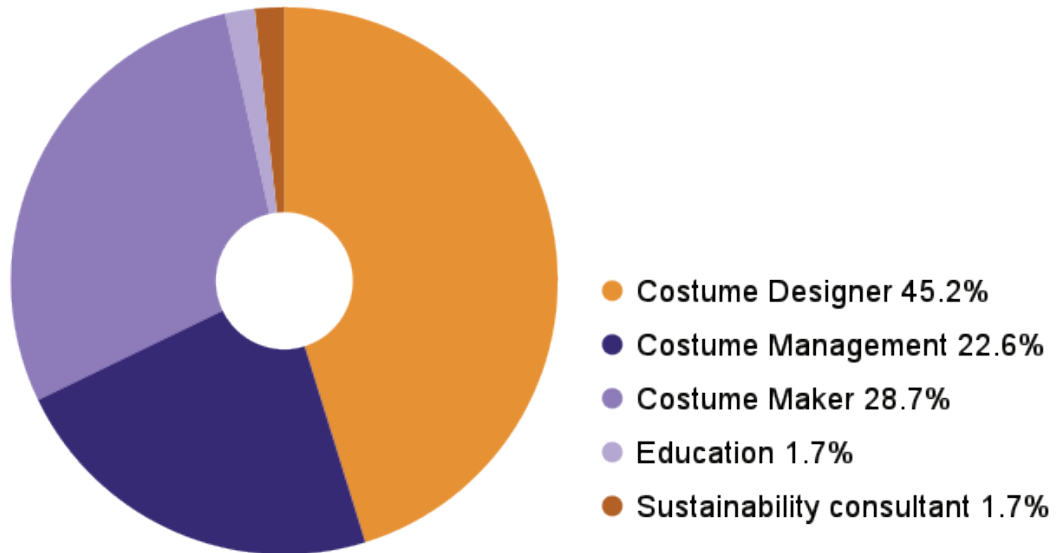
WS 1-3 and Intermezzo

90 participant are presents during the four events

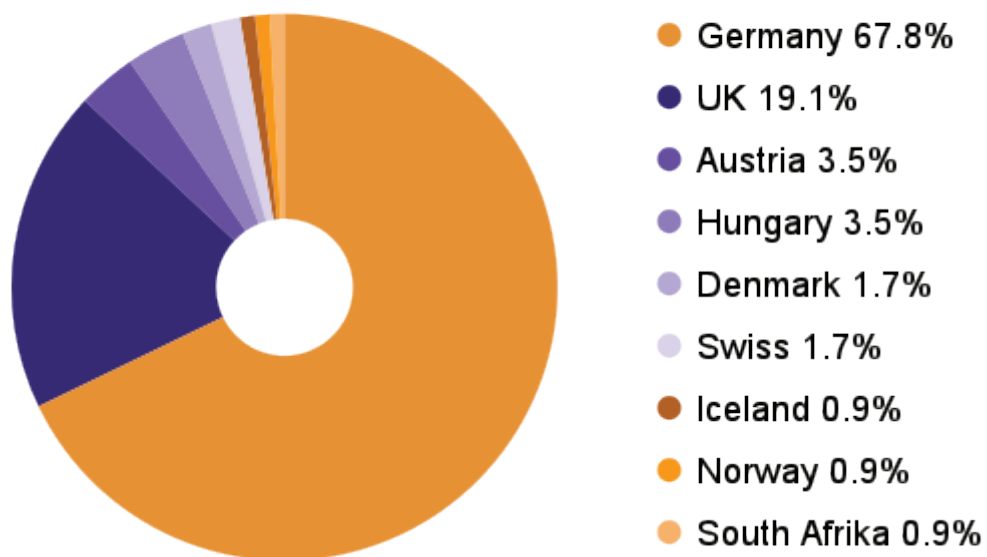


Count of online workshop and Intermezzo participants

Participants' Professional Roles



WS 1-3 | Countries of origins Participants



Online Workshop 1: Sustainability Guidelines for Costume Designers (25.04. 2024)

The first online workshop focused on Sustainability Guidelines for Costume Designers, had in total 26 participants from seven countries and almost equal ratios between costume design professions (44.0%) and costume professionals (56.0%) working in costume departments. The first part of the workshop presented findings from the costume material mapping of three opera productions, highlighting that while all productions reused costumes and materials, the majority were newly purchased items. The presentations emphasized the design phase of costume production, where costume designers and the costume department have the most influence in making sustainable decisions. The study showed that the production steps followed during the design phase are similar in both large (Oper Leipzig) and small (Icelandic Opera) costume workshops. Silke Wey, the costume director of Oper Leipzig, then introduced the Sustainability Guidelines for costume designers. The 90-minute workshop continued with discussion of three questions in breakout rooms to explore new understandings in the collaboration between costume designers and the costume department and concluded with a final feedback session.

Question for WS1

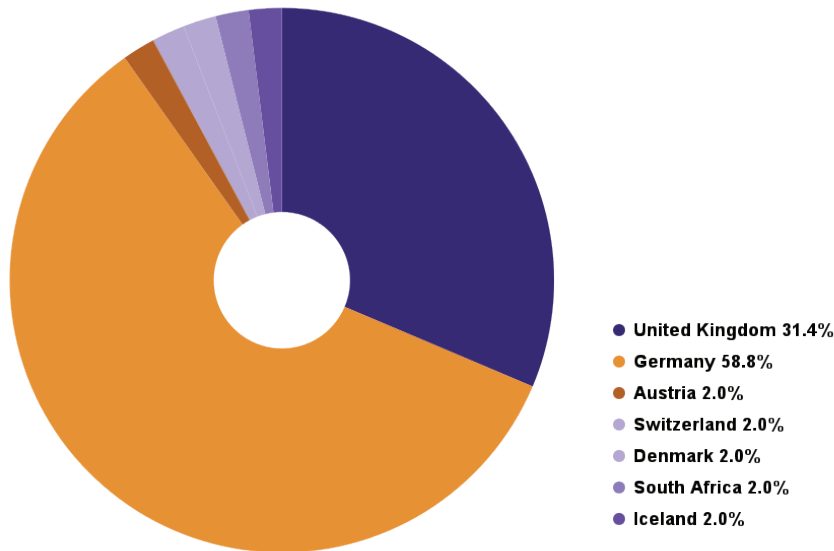
The discussion on sustainable costume design highlighted friction points between costume designers and departments that hinder sustainable practices. While designers may have significant potential to drive sustainable change, they face constraints such as limited resources and institutional resistance. Additionally, the field of costume design is evolving due to both technological advancements and renewed interest in traditional crafts and experimental biomaterials, offering new opportunities and challenges for sustainability in costume production.

Feedback

In the discussion, the importance of time, materials, and budgets was highlighted. Various groups exchanged experiences and ideas on how to implement sustainability in practice, such as using natural dyes and introducing a CO₂ budget. It was emphasized that all parties involved, including costume designers and theater management, need to change their mindset to work more sustainably. The challenges and opportunities of both new and traditional materials were discussed, as well as the importance of communication and collaboration between different stakeholders. The role of costume designers in promoting sustainable practices, along with the importance of early planning and sufficient time for implementing sustainable concepts, were

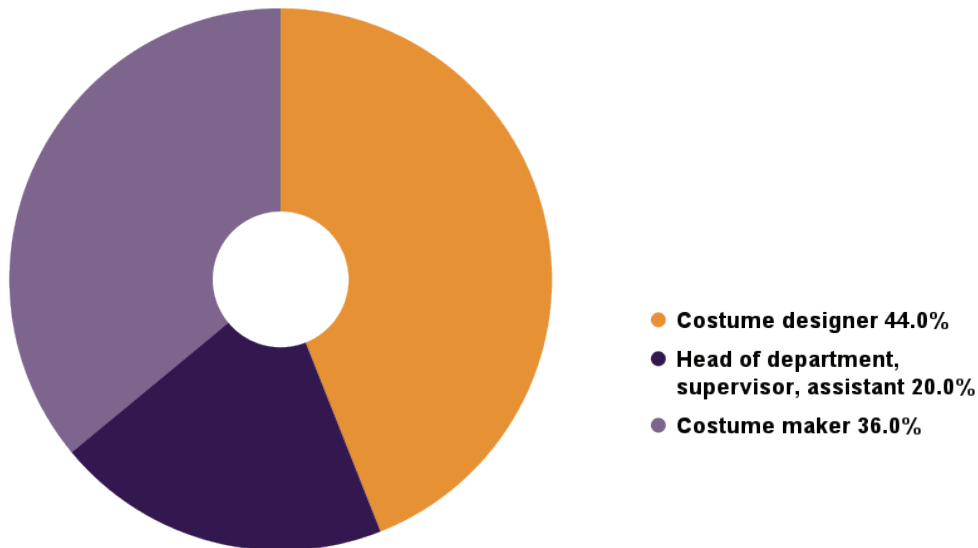
WS1 | Participants

Sustainable Practice Guidelines for Costume Designers



WS1 | Professions

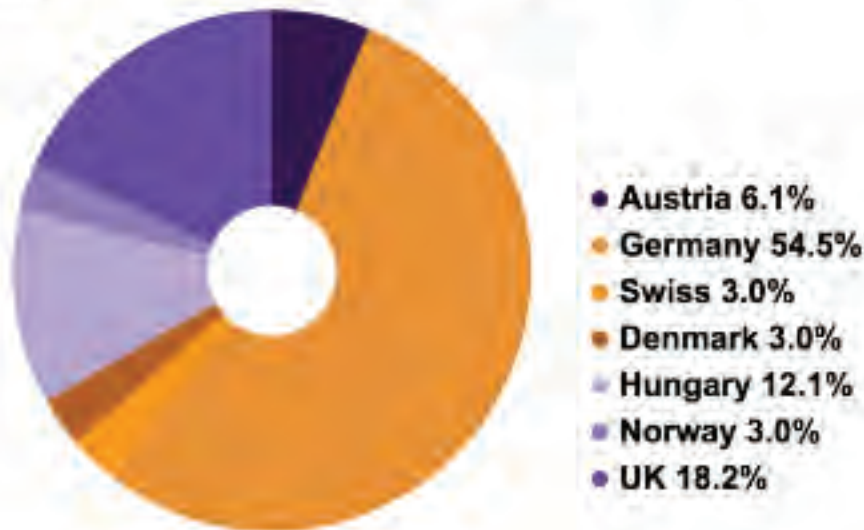
Participants' Professional Roles



underscored. The discussion illustrated that sustainability is a multifaceted issue requiring creative solutions and cooperation from all involved. Participants also spoke about the need to make existing initiatives and networks for sustainable costume design more visible and supported. Future ideas included creating centralized, nationwide repositories accessible to all theaters to promote costume reuse. The importance of education and training in sustainable costume design was also emphasized. Finally, there was hope that such discussions would continue and lead to concrete changes in costume design practices.

WS2 | Sustainable Material Procurement for Costume

Participants



Online Workshop 2:

Sustainability Procurement (02.05.2024)

The second online workshop focused on Sustainable Procurement. To accommodate the high demand and maintain a good level of discussion in the breakout rooms, the workshop was divided into two events. The first had 15 active participants from seven countries with a higher number of participants working in education and sustainability consulting (both 5.3%). The largest group were again costume professionals working in costume departments (55.3%), followed by the group of costume designers (34.2%). The presentations began with an overview of workflows and material flows in the three case study productions and concluded with a proposal for new design and production methods, incorporating life-cycle thinking, illustrated by experiments with bio-based materials. Roy Boesner, the production manager of the costume department at the Oper Leipzig, followed with a comprehensive overview of the department's experiences and solutions for sustainable procurement during the productions of Peter Grimes and Mary, Queen of Scots. The breakout session of the 90-minute workshop discussed the topics of sustainable procurement transitions, followed by an enlightening feedback session.

Questions for WS2 and WS3

When do limitations turn into opportunities? The discussion emphasized turning procurement limitations into opportunities by reusing materials and adopting a cautious approach to purchasing. It called for redefining team responsibilities to enhance collaboration in sourcing sustainable materials and highlighted the potential of using biodegradable materials to innovate and reduce environmental impact in costume design, despite challenges in durability. Overall, creative solutions and teamwork are essential for advancing sustainability in costume design.

Feedback

The importance of sharing materials and information between large opera houses and smaller productions was highlighted, emphasizing that sustainable practices need to start at the conception stage of performances. Time was a critical factor, as larger theaters with fixed repertoires are less able to use experimental materials due to their lack of durability and slower repair or replacement times. Costume departments of larger opera houses seem to have less time for research and developing alternative production processes.

An interesting point was the idea that costume designers could drive sustainable changes more effectively if this consideration is integrated

WS2 | Participants' Professional Roles

Professions



- **Costume Designer 34.2%**
- **Head of Costume / Assistant 23.7%**
- **Costume Supervisor 10.5%**
- **Costume maker 21.1%**
- **Sustainable consultant 5.3%**
- **Education 5.3%**

from the start of a project. It was suggested that creating a new role in the costume department dedicated to researching and sourcing sustainable materials could be beneficial for larger theaters to facilitate the transition to more sustainable production methods. Participants also discussed the challenges of sourcing certified materials and the important role that small productions and off-scenes play in exploring new, sustainable practices. Small productions and independent theater productions are more flexible in adjusting processes and “trying out new things,” though sufficient funding is a frequent challenge. There might be a possibility for new alliances between costume productions of different scales to exchange knowledge on sustainable materials and practices.

The concept of biomaterials was introduced, along with the challenges they pose in terms of maintenance and longevity within existing theater production workflows. Finally, the importance of networking and exchange within the theater community was emphasized to collectively pursue more sustainable paths in theater production.

The workshops closed with a preview of the collaborations with two material research groups and two natural colorants suppliers. The planned collaboration would be with a research group at the Technical University

Berlin on mycelium-based textile dyes and a research group based at Northumbria University in Newcastle focused on using bacteria for shape-shifting textiles surfaces. There are collaborations with two German-based companies, Kremer Pigmente and NIG Natural Dyes, who created sample boxes of natural colorants for simple experiments that can be purchased by theater professionals.

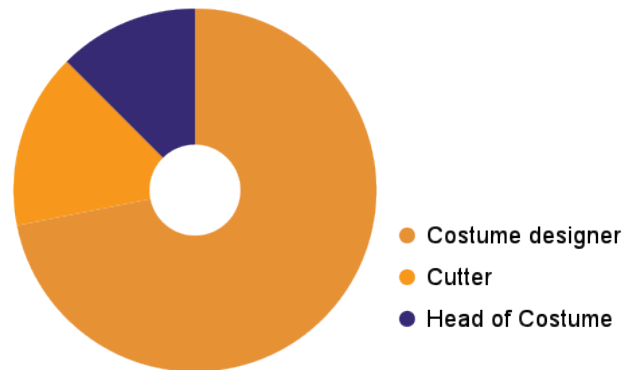
WS3 | Sustainable Material Procurement for Costume

Participants



WS3 | Participants' Professional Roles

Professions



Online Workshop 3:

Sustainability Procurement (09.05.2024)

The third workshop was a repeat of 02.05. and was made possible through the generous support of the German Szenografie Bund, personified through the technical support by Mathilde Grebot. The third workshop became a necessity because of the large RSVP numbers and interest in the topic of sustainable procurement for costume. The workshop was held in German. For a description of the workshop content see WS2 above.

Feedback

The discussion in the third workshop's breakout rooms session revealed a keen interest in digital technology. In a discussion on theater and digitalization, the importance of leadership-driven change was emphasized. There was consensus that costume designers alone are not enough to implement sustainable practices. Group discussions highlighted technical challenges and the value of constraints as a creative opportunity. The idea of reusing materials and exploring networking possibilities was proposed as a solution to challenges. The responsibility in procurement and the impacts of time and financial constraints were also discussed. Experimentation with new materials and collaboration with universities for innovation were seen as potential paths forward. The difficulties in finding sufficient time for creative processes

and the need to start projects earlier to allow for flexibility and acceptance of mistakes were also addressed. Finally, the possibilities of linking research and practice to test new materials, and the importance of networking and information exchange between different theaters and institutions, were emphasized.

Final Event Intermezzo:

Sustainable Costumes (16.05.2024)

The final event started with a warm welcome by the director of the Oper Leipzig, Tobias Wolff, and the Head of Costume, Silke Wey. Diandra Ferreira de Lima, Funding Programme Manager at FEDORA followed with a presentation on the NEXT STAGE Grant 2022 project, of which Sustainable Costumes is a part.

The presentation by Urs Dierker shared key findings of the Sustainable Costume project, beginning with the finding that more new materials are bought and used in all three productions than reused materials. The new purchased materials could be divided into two categories, attributed to decisions made by the costume designer and the costume workshop. The costume designer and their team, including costume assistants and buyers, are responsible for the visible materials that create the silhouette and color variations in the costumes. The

The Online Intermezzo on May 16, 2024, featured talks by Axel Wähling from *NIG Natural Dyes* and Friderike Hoberg from TU Berlin, who presented *Myco Colors*, her research on sustainable fungal-based dyes. Both talks focused on innovative approaches to sustainable textile dyeing and natural dyes in the fashion and textile industries.



**Axel Wähling (CEO),
NIG Natural Dyes**

Photo Credits: ©NIG Natural Dyes



**Friderike Hoberg, M.Sc.
und Birke Weber, Designer
Technische Universität Berlin**

Photo Credits: ©MYCOCOLORS



costume professionals in the workshop are responsible for the procurement of the hidden materials used for the costume construction. Findings showed that the latter represents the larger part of materials purchased in productions, more new hidden materials are used than new visible materials.

Findings from the extensive interviews with costume designers and makers were also shared. An argument by costume professionals, heard in almost each workshop on sustainability and costume, is the need for more time to think and act on what sustainable transformation for costume can mean. How to innovate costume when there is only time to react? Ideas were presented on how the costume department could become the hub for sustainable knowledge development and empowerment. Costume designers, even while leading artistic development, need services to help them find the best sustainable solutions. One leading question was if the costume department is missing its opportunity to become an innovation leader in sustainability and what this transformation would mean.

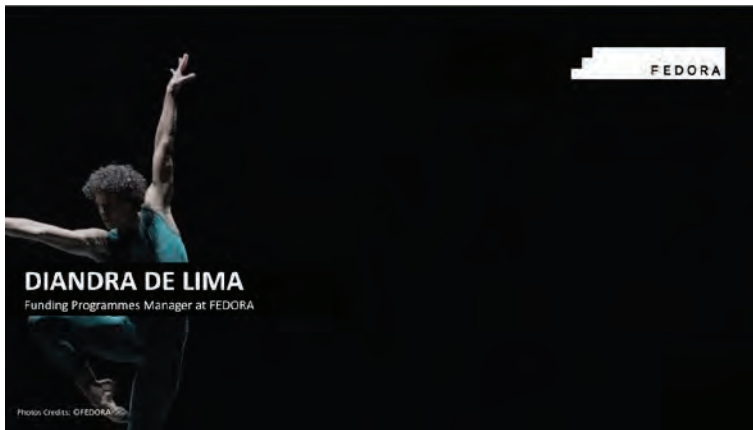
The *Sustainable Costumes* project made one tendency clear. The costume designer is only present for a short time to lead the creation of costumes before moving on to the next engagement. The designer's main influence

on costume is during the concept, design and making phases. The costume designer's responsibility for costumes stops with the premiere of the performance, leaving the costume department to manage the costumes until the end of their life cycle. The costume department holds the primary responsibility for costumes, from creation to disposal.

The presentation examined current technological innovations that are changing and will continue to impact the costume department and create a cross over to biomaterial developments. Costume departments have the chance to become innovation hubs, and the costume department of the Oper Leipzig's 2015 bacterial cellulose tree costume was a good example of what this might look like.

Workshop survey

We asked participants in an online survey three questions on their prior involvement in sustainable productions. The survey revealed that 54% have been involved in a costume production that prioritized environmental and/or social considerations. Only 20.5% of the costume designers who signed up (44 respondents) have been provided with specific guidelines from the hiring institution outlining what constitutes sustainable practices for a production. And only 13.6% of the costume makers who signed up (44 responses) have received specific requests from



© Urs Dierker Images from Online Intermezzo presentation 16.05.2024

costume designers to work in an environmentally and socially conscious manner. This indicates that although there is a trend towards more environmentally and socially sustainable costume productions, costume designers and makers have not received specific guidelines from their employers or costume designers about what constitutes sustainable practices.

Have you been involved in a costume production that prioritized environmental and/or social considerations? (50 responses)

As a **costume designer**, have you ever been provided with specific guidelines outlining what constitutes sustainable practices for a production you worked on?



As a **costume maker**, have you ever received specific requests from costume designers to work in an environmentally and socially conscious manner?





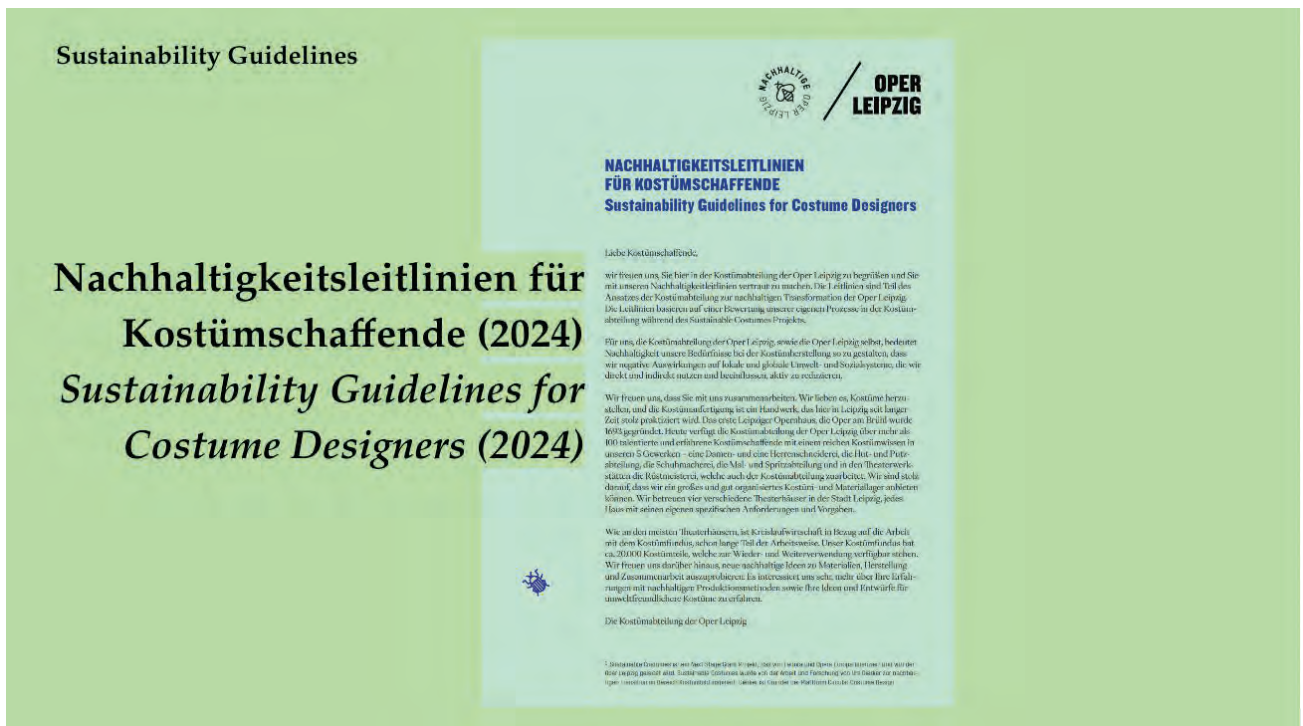


Fig. 16 © Oper Leipzig (2024) Sustainable Guidelines for Costume Designers

Sustainability Guidelines

One of the outcomes suggested by the costume department of the Oper Leipzig was guidelines for costume designers on how to organize sustainable work. Discussions with costume designers and makers revealed that current processes and work organization often hinder efforts to promote new understanding on work, designs, and processes that reduce the negative effects on humans and the Earth’s ecosystems.

Costume designers have significant influence in creating costumes but are limited by the production timeline, budget constraints, and their knowledge of the costume department’s specific capabilities. In contrast, costume departments often see themselves as service providers during the design phase as they help the designer to create their designs. The costume department’s agency increases after the premiere, when the costume starts to be used.

The Sustainability Guidelines for Costume Designers are a tool to start a conversation giving the costume designer the chance to share their own ideas on sustainable work with

the costume department. The current version of the Sustainability Guidelines for Costume Designers (German / English) can be downloaded on the Oper Leipzig website.



Fig. 17: © oopperabaletti (2022) Opera Beyond At the crossroads of new technology and performing arts. Beyond Conference 13-14 September 2022. FEDORA’s Director, Edilia Gänz moderated the panel “Green is the only Color: Considering the Planet in Art & Entertainment Production” with an introduction by Paddy Dillon (Theatre Green Book and Next Stage Grants Jury Member), panelists Valentina Bressan (Next Stage Grants Jury Member), Urs Dierker, and Anne Puolanne (Audiovisual Producers Finland APFI).

Impacts

Opera Beyond, Helsinki, September 2022

The Opera Beyond Conference in Helsinki, held on September 13-14, 2022, was an international event hosted by the Finnish National Opera and Ballet. This conference focused on integrating new technologies in opera and ballet, covering topics such as AI, volumetric video, motion capture (mocap), spatial sound, 3D projections, and the Metaverse as a creative space.

The event featured keynote presentations, demonstrations, networking opportunities, and case studies presented by artists and experts from around the world. One of the significant panel discussions, “Green is the only Color: Considering the Planet in Art & Entertainment Production,” was moderated by Edilia Gänz, FEDORA’s Director. The panel included notable speakers such as Paddy Dillon, Valentina Bressan, Urs Dierker, and Anne Puolanne, who discussed sustainable practices in the arts.



Fig. 18: © Oper Leipzig (8. September 2022) Ist das Kunst oder kann das weg!? Vernetzungsstrukturen der Kreislaufwirtschaft, Workshop Sustainable Costumes with Katja Schmidt and Urs Dierker at the Oper Leipzig

Nachhaltigkeit und Theater, Leipzig September 2022

On September 8, 2022, the city of Leipzig, Oper Leipzig, and the German Bühnenverein hosted a day dedicated to sustainability in the arts. Various events, including panel discussions and workshops, explored the opportunities and challenges of implementing sustainable practices in cultural institutions. Part of the event was a *Sustainable Costumes* workshop event held at the Oper Leipzig by Katja Schmidt, the Sustainable Manager of the Costume Department of the Oper Leipzig, and Urs Dierker.

The day concluded with a public soir ee at the Opera Leipzig, where new director Tobias Wolff and his team discussed their sustainability projects and plans. The event featured performances by soprano Samantha Gaul, tenor Alvaro Zambrano, and baritone Franz-Xaver Schlecht, accompanied by Ugo d’Orazio on piano, emphasizing the integral role of sustainability in the cultural sector. The Sustainable Costume project was presented by Katja Schmidt and Urs Dierker.



Fig. 19: © Oper Leipzig (8. September 2022) Gr unen Soir ee at the Oper Leipzig. Introduction of the Sustainable Costumes project



Fig. 19: © Oper Leipzig

Video 1: Sustainable Costume September 2022

Katja Schmidt, head of the hat department at Oper Leipzig, outlines the opera's sustainability efforts in costume production in a recent video. The initiative involves maximizing the use of existing stock, recycling large leftover materials, and facing the challenge of sourcing sustainable materials due to a decline in suppliers. The project emphasizes the importance of craftsmanship, with a focus on preserving traditional handcrafting skills, and adapting to material shortages through improvisation. Despite the difficulties of modern textiles' short lifespan, the project aims to maintain high standards of sustainability and resourcefulness in the costume department. For more details, watch the video on Oper Leipzig's YouTube channel.



Fig. 19: © Oper Leipzig

Video 2: Sustainable Costume February 2024

A second video about the *Sustainable Costumes* project was published as part of the Oper Leipzig Visibility Campaign. This promotional video funded by Opera Europe and FEDORA funded explains the vision of the project for the public.

For more details, you can watch the video on Oper Leipzig's YouTube channel.



Fig. 19: © Oper Leipzig

3. Green Culture Konferenz, Oper Leipzig November / December 2023

The “Green Culture” conference at Oper Leipzig focused on integrating sustainability into theater and orchestra operations. The event underscored the importance of ecological and social responsibility in cultural productions. Katja Schmidt highlighted the collaborative efforts of costume professionals to adopt sustainable practices, such as reusing materials and sourcing eco-friendly supplies. The conference, held in cooperation with the Federal Commissioner for Culture and Media, aimed to foster knowledge exchange, develop new competencies, and define tools and strategies for achieving sustainability in the arts. The event emphasized the need for cultural institutions to address sustainability proactively, ensuring that future cultural practices are both environmentally and socially responsible.

The “Workshop 2 Nachhaltiges Produzieren,” led by Wesko Rohde (DTHG) and featuring experts like Carolin Löffler (Theater Kampnagel) and Urs Dierker (Northumbria University, Project *Sustainable Costumes*), focused on the integration of sustainability into theater operations. The event addressed key questions such as how initial incentives can evolve into

binding commitments for sustainable production by 2030 and how socio-ecological production conditions can be considered for service providers and suppliers. The workshop with 27 theater professionals from various fields discussed the current state of theaters and identified strategies for enhancing sustainable practices. These strategies include active involvement and leadership of theater professionals in processes, access to expert knowledge organized in a team-oriented manner, support from theater management, increased digitalization, and funding structures that include time and personnel for sustainability efforts.

Fig. 22: © Oper Leipzig (2024) 3. GREEN CULTURE KONFERENZ »Mehr Kultur für die Zukunft? Theater und Orchester im Zeichen der Nachhaltigkeit« 30.11. to 01.12.2023 at the Oper Leipzig, Germany. Workshop 2 Nachhaltiges Produzieren.



Fig. 19: © Oper Leipzig

4. The Festival, Brussels April 2024

The *Sustainable Costumes* project was featured at The Festival in Brussels, part of the New European Bauhaus Festival 2024. An exhibition about the project was organized by Diandra de Lima and Eléonore Benedetti from FEDORA. It emphasized the importance of sustainable transformation and experimentation in costume production, aiming to create a lasting positive impact on the environment and the cultural sector.

Director Edilia Gänz of FEDORA presented this initiative to prominent figures, including the President of the European Commission Ursula von der Leyen, Belgian Prime Minister Alexander De Croo, European Commissioner for Cohesion and Reforms Elisa Ferreira, European Commissioner for Innovation, Research, Culture, Education, and Youth Iliana Ivanova, and Belgian State Secretary for Economic Recovery and Strategic Investments Thomas Dermine.

President of the European Commission, Ursula von der Leyen, spoke about the *Sustainable Costumes* project in her opening speech for the The Festival, telling the audience of distinguished guests that:

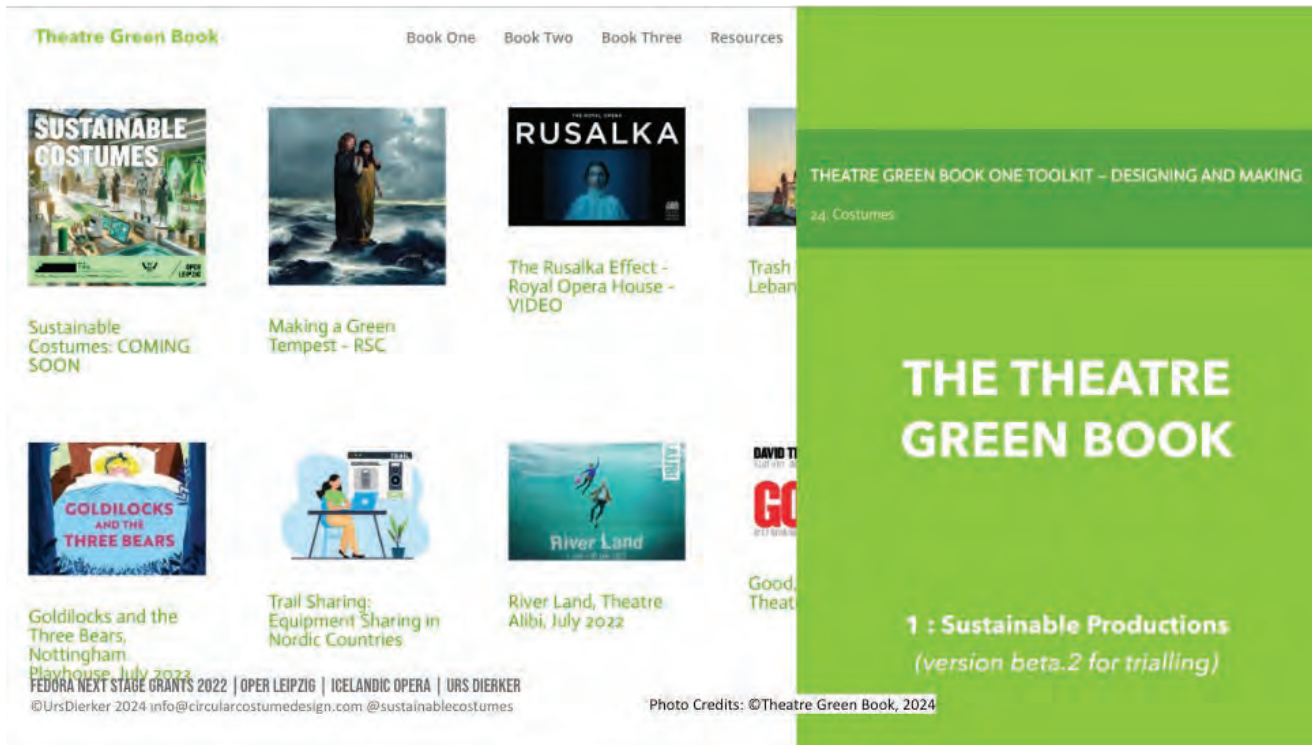
»The *Sustainable Costumes* project, which unites opera companies in Iceland and Germany. They will set new standards to make the costume creation process more sustainable and inclusive across the entire value chain.«

Opening speech by the President of the European Commission, Ursula von der Leyen at the second New European Bauhaus Festival, 9 April 2024

Fig. 23: © New European Bauhaus Festival (2024) Opening ceremony of THE FESTIVAL in Brussels with a speech by the President of the European Commission, Ursula von der Leyen



Fig. 22 © FEDORA (2024) The FEDORA funded project Sustainable Costumes was featured at The Festival in Brussels, part of the New European Bauhaus Festival 2024. Director Edilia Gänz of FEDORA presented Sustainable Costumes to President of the European Commission Ursula von der Leyen.



5. Sustainable Costumes as Case Study in the Theater Green Book

June 2024

The Theater Greenbook is an internationally recognized publication for sustainable change in the performing arts. It was first published in 2021 and an updated version was published in June 2024 featuring a case study of the Sustainable Costumes project and using findings from this research to inform the latest version of the costume toolkit.

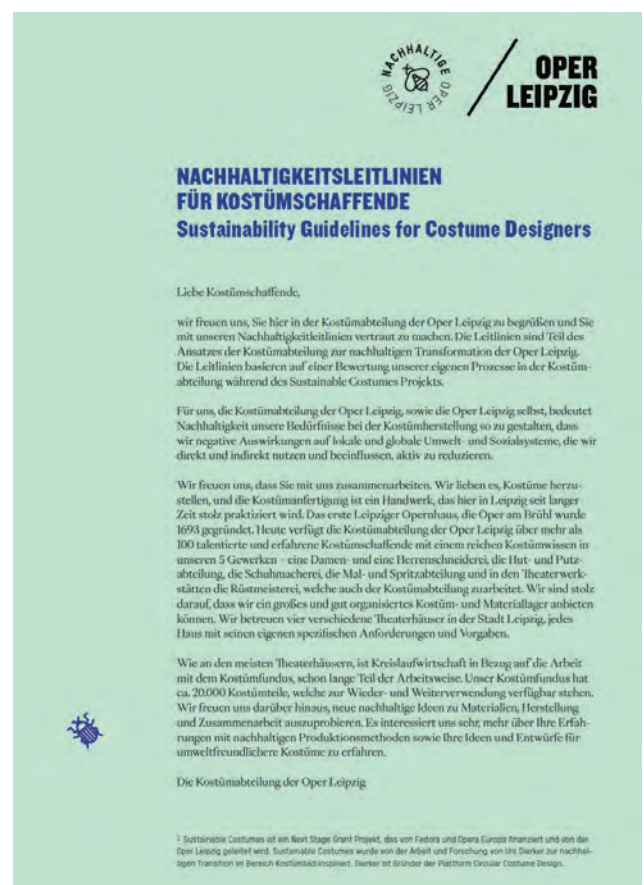
6. Guidelines for Costume Designers

June 2024

The Sustainability Guidelines for Costume Designers were inspired by discussions within the costume department and an online workshop. These conversations aimed to foster a new understanding between the costume department and designers, promoting work, designs, and processes that reduce the negative effects of our actions on humans and the Earth's ecosystems.

Fig. 24: © Theatre Green Book (2024) Reveal of the 2nd edition of the Theatre Green Book with an updated costume toolkit

Fig. 25: © Oper Leipzig (2024) Sustainable Guidelines for Costume Designers



GLOSSARY *****

Reuse

The act of using something again for the same or different purpose, instead of discarding it. This can involve using an item multiple times, repairing it, or repurposing it to extend its life and reduce waste.

Rentals

The practice of borrowing costumes for a specified period, typically for events such as parties, theater performances, or film productions, rather than purchasing them. This service allows individuals and organizations to access a variety of costumes without the need for permanent storage or ownership. Rental services usually offer a wide range of costumes, including historical outfits, themed costumes, and character costumes, often providing accessories and fitting services as well.

Costume creation process (Design phase)

The costume creation process involves several stages: starting with concept and design, where the vision is developed through sketches and collaboration. Next is material selection, choosing suitable fabrics and accessories. This is followed by pattern making, creating templates for cutting the fabric, and fabric cutting itself, ensuring precision. Sewing and assembly come next, constructing the costume and fitting it to the performer. Fittings allow for adjustments to ensure a perfect fit, followed by adding finishing touches like embellishments. Finally, a quality check ensures the costume meets the required standards before it is ready for use.

Circular economy practices (Value chain)

These are strategies and actions aimed at creating a sustainable economic system by minimizing waste and making the most of resources. The core idea is to keep products, materials, and resources in use for as long as possible through practices such as recycling, reuse, refurbishment, and remanufacturing. This contrasts with the traditional linear economy, which follows a “take-make-dispose” model. Circular economy practices include designing products for longer life, encouraging repair and maintenance, creating sharing platforms, and developing industrial processes that utilize waste as a resource. The goal is to reduce environmental impact, conserve resources, and create economic opportunities.

Value chains

These are the full range of activities that businesses go through to bring a product or service from conception to delivery and beyond. A value chain encompasses the steps involved in producing goods and services, including design, production, marketing, distribution, and customer support. Each step adds value to the product or service, hence the name. Effective management of value chains can improve efficiency, reduce costs, and enhance product quality. Organizations often analyze their value chains to identify areas where they can gain a competitive advantage or increase profitability.

