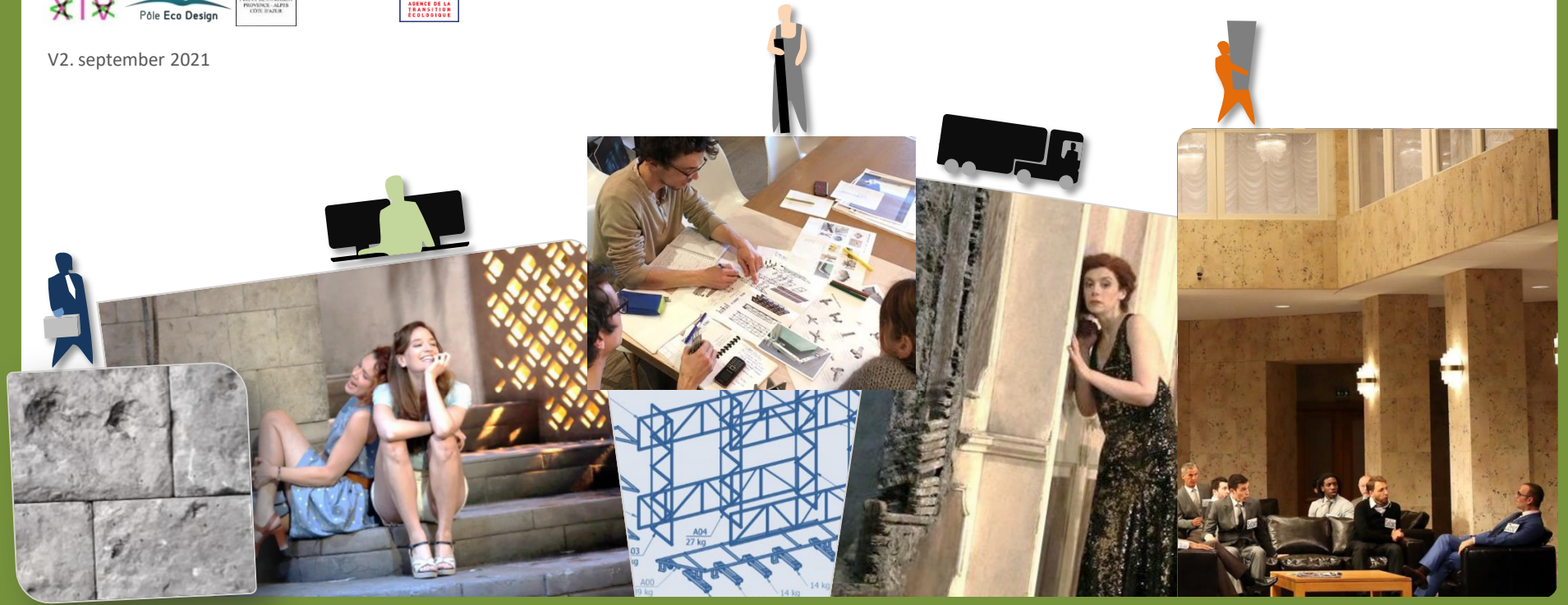
Ecodesign of an opera set and of a scenography.

The methodological Guide

V2. september 2021



The methodological Guide

Version 2.0. September 2021

Foreword.

This document is version 2 of the Methodological Guide published in October 2018. It is an update of the information, completed by new Procedure Information Files (PIF). It should be noted that although this guide was initially conceived for stage designs specific to opera, the issues, process strategies and some of the solutions tested can also be applied - directly or slightly transposed - to other disciplines of the performing arts, to events, to museography, etc. and to any other sectors of activity involving temporary, mobile or demountable structures. It should also be noted that between 2018 and the end of 2021, the culture sector mobilized itself very quickly around environmental issues, and has thus seen the emergence of numerous interested parties, community groups, and formal or informal groups that are reflecting upon and acting in favour of reducing the sector's environmental impacts. This version 2, available for free download, is part of this stimulating general mobilisation that aims to share the Festival d'Aix-en-Provence's experience in ecodesign.

This guide was developed by Yannick Le Guiner, a designer specialised in ecodesign and founder of the Ecodesign Pole, as part of the project to support the Festival d'Aix-en-Provence teams in ecodesign.
This project is supported by l'ADEME and the Région Sud, opération Filidéchet.

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The Methodological Guide

Introduction

In just a few years, the 'environmental issue' has seen its status transformed within the arts sector.

Whereas it seemed to be the concern of a few fanatical “greens” within the profession, it is now an unavoidable subject for an ever-increasing number of arts professionals, whatever their field of activity and the size of their structure.
The question is no longer "should I think about the environmental impact of my productions? but rather "how can I implement an ecodesign approach within my structure?" and "how can I invent a sustainable and resilient model for the production of live performances?

In order carry out such an approach, it is essential that each structure defines and displays a clear and legible environmental policy, with quantified, planned and realistic objectives. Indeed, the objective of zero net emissions by 2050 requires a commitment that is understood and shared by all interested parties. It is now urgent to take advantage of the energy and resources still available and financially accessible to invent and implement a new way of working in line with the objectives of reducing greenhouse gases (GHGs) and limiting global warming to 1.5°C (the objective defined by COP 21 in Paris).

To achieve such a result, it is essential that all the staff within an arts structure work in an inclusive and collaborative manner so that each person can, at his or her own level, make relevant and effective proposals and choices in environmental terms. The issues of training and information are essential so that everyone, by understanding the challenges, can take up these reflections and be a force for proposal throughout the life cycle of a particular project.

Indeed, if the initial question was the reduction of scenography production waste material, the reflection now concerns the entire life cycle of a production, and all of its environmental impacts. The question of greenhouse gas emissions, particularly due to the transport and travel of staff and audiences, is also becoming unavoidable. It is also essential to develop the logic of mutualisation, collaboration and sharing: how best to pool our knowledge, skills and processes between different structures.
To make concrete progress on all these issues, it is necessary to analyse the workforce - worktime and skills - and specific financial resources.

Let us not neglect the role of the performing arts, and opera in particular, as an emotional vector in favour of the ecological transition!

The Festival d'Aix-en-Provence

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The life of an opera set and of a scenography.

THE PROBLEMS AND ISSUES OF THE LIFE CYCLE.

Ecodesign is based on the 5 phases of the life cycle: each phase corresponds to different issues that are synonymous with financial and human issues and environmental impacts. The earlier these issues are considered, the more relevant and efficient the solutions will be.

PRELIMINARIES

Programming of a work by the co-producers takes place 3 years before the "First Night" Design in the festival design office takes place one year before the "First Night".

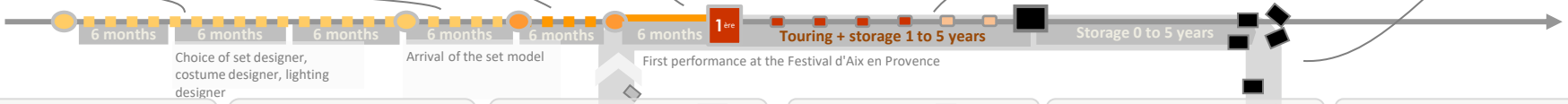
1 THE RAW MATERIALS
That will make up the sets

2 THE MANUFACTURING PROCESS
At the heart of the Festival Workshops

3 USE
Rehearsals, performances and maintenance of the sets

4 DISTRIBUTION
Packaging, Transport, Storage

5 THE END OF THE SET'S LIFE CYCLE



Prior to the production of the set, ...

Has the Festival shared its eco-design approach with its co-producers, directors and set designers?
Are the internal teams aware of the issues and have set objectives?
Has the design office been trained and its resources strengthened to deal with the extra workload?
Is the design office preparing to introduce carbon accounting (CO_2 equivalent) in addition to traditional financial accounting ?
Is the approach shared with peer structures?

The raw materials that make up the sets are themselves ...

From the use of standard reusable elements?

Of natural origin?

Renewable?

all or part of a recycling chain?

Easily recyclable at the end of their life cycle?

Toxic or impactful during production and/or processing?

Locally produced and environmentally friendly?

In the manufacturing phase, are the Workshops organised to...

Minimise production waste? Valorise production off-cuts?

Optimise utility flows (water, gas, etc.) to avoid wastage?

Minimise energy consumption (central vacuum cleaning system, powerful machines, etc.)?

Obtain renewable energy? Sort and/or recycle final waste (chips, consumables, paint, etc.)?

Limit heat loss from the building? Optimise health at work?

When the set is used, is ....

Its construction conceived to ensure a long service life with no need to return to the workshop ?

it subject to wear and are its parts easily replaceable?

Its Time and lighting technologies are optimised?

maintenance and cleaning required, with little fluid?

Using cleaning products that are bio-sourced, safe for humans and the environment?

For the whole tour it is anticipated that ...

The sets do not not require any form of special packaging?

The essential packaging is reusable or recyclable?

The journey is optimised without unnecessary return journeys to the starting point?

Is the load designed to minimise the volume required?

Is storage facilitated by a container solution?

Are there clear assembly and loading plans for stagehands?

When the production of the opera comes to an end ...

Is the set is easily dismantled with the aim of assembling the different families of materials ?

Are some elements reusable for other productions?

Will particular parts be donated or sold off?

"Mono-material grouping" facilitates sorting before dumping ?

"Decommissioned!" signboards makes the stage crew's work easier ?

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The life of an opera set and of a scenography.

Actors and Actions over time

The ecodesign of a set concerns all the staff of the Festival d'Aix-en-Provence and many other interested parties. Although the management and the design office play a decisive role in the preliminaries, everyone can intervene in accordance with their own means of influence, presented below in the form of Procedure Information Files (PIF).
Click on the cards to access them directly.

PRELIMINARIES

Programming of a work by the co-producers 3 years before the "First night".
The Festival d'Aix-en-Provence's Design Office comes into the project one year before the first night

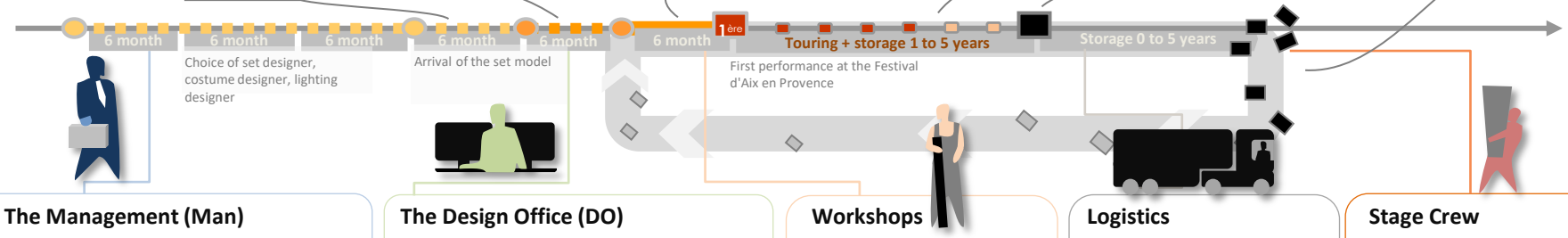
1 THE RAW MATERIALS
That will be use for the sets

2 THE MANUFACTURING PROCESS
At the heart of the Festival Workshops

3 USE
Rehearsals, performances and maintenance of the sets

4 DISTRIBUTION
Packaging, Transport, Storage

5 THE END OF THE SET'S LIFE CYCLE
The dismantling of the set



The Management (Man)

It is the Management that drives and supports the approach for all the in-house teams, and who raises the awareness and involves the external partners, both artistic and economic, in each production.

It highlights the benefits - in terms of savings and reduction of environmental impact - that the application of an ecodesign approach, followed and supported by all the participants, makes possible.

Being conscious of the scaling down effects, the Management must encourages a collaborative approach with other structures involved in the performing arts.

Method Guide Management 1. **Raising awareness among co-producers**

Method Guide Management 2. **Involve stage directors and set designers**

The Design Office (DO)

It is during the design phase that 80% of the impact of the set is determined.
The design office takes into account the entire life cycle of the set to be created and can make the least impacting design choices thanks to its overall vision of the project. The design office already interacts with a large number of protagonists and the integration of these new constraints will require additional study time at the start of the process.
This will be largely offset by the savings made over the entire life cycle.

Method Guide. **DO 1. Rethink MATERIAL SUPPLIES**

Method Guide. **DO 2. Design to Reuse**

Method Guide. **DO 3. optimise the end of life**

Method Guide. **DO 4. Relocating of resources**

Method Guide. **DO 5. Measure, inform, arbitrate**

Workshops

The workshops work in conjunction with the design office, in particular for the choice and validation of new materials and processes. Their feedback, positive or negative, on these tests helps to develop practices, to raise the awareness of the scenographers, and can also be shared with other structures.
They play a key role in optimising production flows..

Method Guide. Workshop 1. **Optimising Flow Management**

Method Guide. Workshop 2. **Raising awareness by involving suppliers**

Method Guide. Workshop 3. **Share skills and good practices**

Logistics

This also plays a very important role: the more a production is "on tour", the more the financial cost and environmental impact of the tour increases, until it becomes more important than the building of the set itself. First and foremost, the use of common standard elements makes it possible to limit the weight and volume transported and thus to limit emissions. By anticipating, with the co-producers, the optimisation of routes and the adoption of containers for transport and storage, logistics can generate significant savings (in € and CO2 emissions).

Method Guide. Logistics 1 **Optimising the Tour**

Method Guide. Logistics 2 **Transport and storage in containers**

Stage Crew

They are the "first users" of the set as they are responsible for loading/unloading, assembly/dismantling, alternations and dismantling at the end of the set's life cycle. It is therefore just as important to train them as it is to make a careful note of their feedback on the introduction of new processes that will have an impact on their professional practices (weight, time, comfort, etc.)

Method Guide. Stage Crew 1 **Raising awareness and training stage crews**

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Raising awareness among CO-PRODUCERS

Involve all the co-producers in order to have more influence on decisions and to multiply the results.

1. Draft a standard letter to raise awareness of the Festival's approach in order to inform and involve the co-producers.

2. Disseminate the Methodological Guide electronically, on paper, or during events between co-producers, to show concrete examples.

3. Define with them the priority areas of work for which they will have to mobilise their in-house teams, and start working together:
   - Anticipate the date of removal from storage of the sets to facilitate their re-use –
   - Draft common clauses for the contracts of the set designers or a set designer's charter –
   - Find secure temporary storage places (in containers) between two tours to avoid returning the sets to the construction workshops –
   - Produce common signage concerning the end-of-life scenarios of the sets (in the event that these sets are removed from storage by co-producers) –
   - Work on common repertory structures for the different theatres. Validate adherence to the principles of ecodesign and carbon accounting.

4. Define and implement a monitoring and evaluation method.

Objectives:
To mobilise all the co-producers to be able to act on important levers: the directors and set designers, and the organisation of the tour.

Strategy:
Collaborative

Evaluation:
Do the co-producers agree to include an ecodesign clause in the contracts?
Are they thinking about an optimised tour organisation?

THE PROTAGONISTS

Management.
It must integrate the approach and be involved in its dissemination to co-producers. The financial arguments must be put forward.

The design office (DO) provides information, particularly on the savings to be made.

THE CHALLENGES

Very Important
The co-producers together influence choices at the preliminary design stage, which will have significant impacts on the cost of a production.

Very Important
They are significant in terms of waste at the end of a set's life cycle, and CO2 emissions during the tour.

Important
The choices made in terms of set design can impact on production processes and set-up/dismantling.

During the different phases of the set's life cycle, co-producers have important roles and responsibilities that inevitably involve them in this ecodesign process:

- As co-constructors, they can **encourage set designers to commit and agree to eco-design their sets.**
- As co-financiers, **they may wish to better control costs**, including those related to transport during tours.
- As co-presenters they may **wish to better control and distribute the workloads of their teams** during set-up/dismantling, and to better take into account the health of their stage crews.
- As companies, **they may have to comply with local or national regulations on environmental protection** and waste management.
- As owners of an end-of-life set, **they may wish to reduce the volume and cost of their waste,** and encourage re-use themselves.

Focus on the importance of the role of co-producers.

Dear _____, dear partner, (and/or name)

As you may know, the Festival d'Aix-en-Provence has been committed for several years to a sustainable development approach in order to reduce the impact of its activities on the environment. .....

An example of an awareness-raising letter in Annexe p.31

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INVOLVING SCENOGRAPHERS AND STAGE DIRECTORS

They are key players. Their awareness and involvement at the preliminary stage will have a strong impact on the design choices for the sets.

1. Draft a standard letter to raise awareness of the Festival's approach in order to obtain the written consent of stage directors and set designers.

2. Disseminate the Methodological Guide electronically, on paper, and at events with stage directors and set designers. Disseminate also concrete examples from the eco-material bank.

3. Draft environmental clauses in contracts with stage directors and set designers (choice of materials, non-destruction and/or re-use clauses, etc.).

4. Have these clauses validated at management and co-producer level and integrate them into future contracts with stage directors and set designers.

Objectives:
To obtain the consent of directors and scenographers for the implementation of an ecodesign approach and the reduction of greenhouse gas emissions.

Strategy:
Collaborative. The aim is to encourage as many of the protagonists as possible in order to create a knock-on effect.

Evaluation:
Did the directors and set designers receive the awareness-raising letter? Were they receptive to the solutions proposed by the design office (DO) and the workshops (Wrksp)? Were they proactive, proposing solutions themselves?

Awareness on the move.
Extract from the Festival blog Ecological awareness is spreading throughout society, and the world of the performing arts is no exception to the rule. But how to reconcile creative excellence and sustainable development? Chloe Lamford, a young British scenographer who this year designed the set for Alcina, talks about her experience of "ecodesign" with the set building teams at the Festival d'Aix-en-Provence . A process that is in full swing, to build a "sustainable" future for the opera... [La suite Ici]

THE PROTAGONISTS

The Management.
It raises the awareness of its partners, the stage directors and set designers, by reassuring them and encouraging them to take part in the approach.

The design office (DO) and the workshops (Wrksp) propose ecodesigned solutions "with equivalent theatrical effects".

THE CHALLENGES

Important
The challenge is to design and produce an understated set design, in terms of materials and cost, without impoverishing the staging, the scenery or the production.

Very Important
80% of the impact of a production is decided at the design stage. The involvement and commitment of the set designer are essential

medium
Design choices can affect stage crews during handling

the portrait of the perfect eco-set designer !

Mr Green is a gem! He is the ideal scenographer partner for reducing the ecological impact of opera sets, theatre sets and scenography in any field.
He is aware of the climatic issues and the important impact that certain large-scale productions represent. He has integrated an ecodesign approach that he tries to follow to the absolute maximum:
He favours video exchanges with the design office and the workshop teams; he only travels if necessary and avoids air travel as much as possible, even if it means planning longer stays on site. He anticipates the creation of his project, presents the most complete work possible in the pre-project phase and remains available and reactive afterwards to work in close collaboration with the design office.
He designs a scenography in the interests of the work and the staging, based on sobriety, without overdoing the effects. If possible, he does not use a "superstructure" (storeys, stairs). And if the need is unavoidable, only with reusable construction elements (stock repertory elements), or failing that, using local and bio-sourced materials (timber frame for example).
He accepts modifications in order to reduce the impact of his creation.
He pays attention to the design office and the workshops for the choice of materials that have less ecological impact, from local and bio-sourced resources.
He avoids energy-consuming devices, for lighting, sound, projections, etc.
He understands the objective of having a scenography that can be dismantled into flat elements to facilitate transport and storage.
He accepts certain compromises in order to facilitate the use of stock repertoire elements common to several theatrical structures, so that they will not need be transported from one place to another.
He allows all the elements of the scenography to go onto a second life at the end of the tour, dismantled or in blocks, in a "free of rights" approach that is subject to careful management
With the design office, he measures the CO_2 impact of the scenography over the entire life cycle and decides on the best possible scenario.
He reports on his approach to the production team, defending his choices in order to promote them within the establishment's CSR policy.

Finally, he raises awareness among his peers and shares his good practices within the profession whenever possible !

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Rethink MATERIAL SUPPLIES

The availability of materials is no longer a foregone conclusion, and their rapidly rising cost is raising new questions.

1. Before choosing to use a particular material, answer all the following questions. **Make your choice by considering all the answers.**

2. **What function(s) should the material I intend to use perform?** (mechanical strength, appearance, durability etc.)
What other material(s) is/are likely to provide the same function?
Could a locally available second life material provide the same service at the same or a lower cost?

3. **With this material, can I intervene in the quantity of material to be used** (to hollow out the zones which are not engaged in any way and, reinforce the parts subject to strain...).
Do the technical skills exist in-house or locally?

4. **Does the material require a surface treatment** that impacts the building cost/time? Which makes it difficult to re-use at the end of its life cycle?

5. Does this material allow **easy assembly/dismantling with materials of different natures**, to facilitate re-use?

6. For equivalent functional qualities, which material has the least environmental impact?

OBJECTIVES:
To avoid possible shortages of materials and/or their additional cost.

STRATEGIES:
Circular economy, internal reuse, relocation of resources.

EVALUATION:
What percentage of reused, second life, bio-based and locally available materials are used in the composition of the next production? What savings does this generate?

THE PROTAGONISTS

THE DESIGN OFFICE (DO)
It is up to them to be on the lookout for new supply channels.

THE WORKSHOPS.
Introduction of up'cycling skills in the workshops.

THE CHALLENGES

€very Important
If the rise in the cost of building materials continues, the impact on the cost of production will be very significant, hence the need to anticipate

Very Important
Develop a disposition to be economical, it is important to build with reused and/or bio-sourced and/or locally available materials. So many negative consequences can be avoided.

Important
The supply of second life materials can lead to additional labour: collection and processing

New issues related to the subject.

What seemed obvious until now - being able to have the desired material available at any time - has become more complicated in 2021: a total shortage of certain materials or availability at prohibitive costs and delivery delays.
Is this a one-off phenomenon linked to the sanitary crisis or is it a trend that will continue year after year?
In the absence of a definite answer, it is advisable to anticipate and think about new supply strategies...

- Establish internal re-use as a priority, which will avoid any problems in the event of lack of availability.
- Relocate supplies, identify local production channels, to ensure greater availability of materials.
- Identify sources of second life materials (salvage) which, even if sometimes "less clean" or "less ready to use", will become increasingly competitive.

France Bleu Loire Atlantique, September 2021.
Excerpts. The article in full [here]

It's been going on for six months now. Six months that craftsmen and construction companies have had difficulty obtaining supplies of materials: wood, metal and electronic components. As a result, many building sites have already been delayed and prices are soaring. This is increasingly worrying the professionals.
"It's getting complicated to make a simple door."
"What happened was that production collapsed at the beginning of the Covid-19 epidemic.
Then, with the recovery, big nations like China and the US started buying raw materials in droves. "Because we are facing a price hike of 20, 30, even 50% because of this shortage! The price of timber, for example, has doubled.
The shortage may still have an impact in 2022 and 2023...

Maison Tecla in printed clay

And tomorrow, additive manufacturing ?
Even if its use is still experimental, 3D printing - or additive manufacturing - is developing in many fields: design, architecture, aeronautics, contemporary art, printing of biosourced materials, etc. It is worth keeping an eye out for relevant uses in scenography.

(By the way, the printing of a small 3D model has greatly facilitated the design of the COQ D'OR's scenography (The Golden Cockeral). See annexe here.)

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DESIGN TO RE-USE

Designing "repertoire" pieces, which will be re-used for several productions, or even shared between different structures.

Approach each new project according to 3 axes of reflection.

1 Think in terms of **"standard parts"**: which parts of this set could be re-used as they are in a future production? Establish a typology of parts frequently found in sets (staircases, trolleys, doors, etc.) Find the lowest common denominator for each of these parts (e.g. the whole part, its frame, its function, etc.)
Design the part according to this common denominator.

2 **Think about the "reversibility of assemblies"** on 3 levels: alternation, transport, dismantling. From the fastest and most practical to the most sustainable but always reversible.

3 **Thinking in terms of "mutualisation": what standard parts and assemblies do I use that could be of interest to other opera, theatre and live performance structures?** And vice versa, to benefit from the solutions devised by other design offices. Exchange and create a "shared pool" of standard parts and reversible assembly systems in the form of a collaborative platform.

OBJECTIVES:
To encourage the re-use of a maximum number of elements to reduce expenditure on materials, manufacturing and end-of-life treatment.

STRATEGIES:
Circular economy, functional economy, collaborative economy

EVALUATION:
What is the % of elements re-used in future productions? Does this % increase from year to year?

THE PROTAGONISTS

THE DESIGN OFFICE (DO)
Most of the design work is done by the design office.

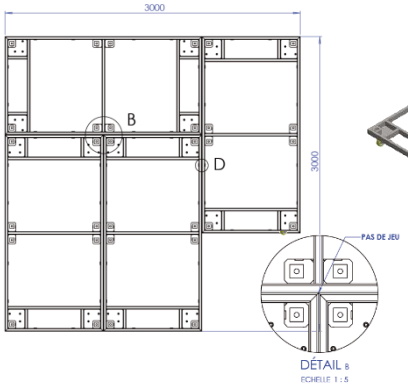
THE WORKSHOPS AND STAGE
crew will be a little more mobilised for the assembly phases

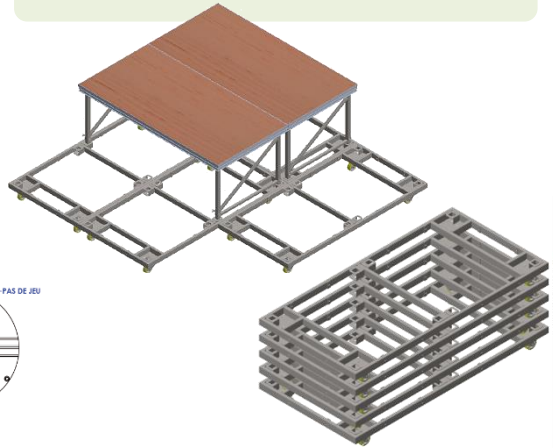
THE CHALLENGES

Important
Lower purchasing and manufacturing costs, independence from price fluctuations and availability of materials.

Very Important
Every re-used part saves material that has to be extracted, transported, processed and disposed of.
A total benefit.

means
The use of standard systems sometimes leads to a shift in workload: less manufacturing, more assembly.





This standard trolley system designed by the Festival is based on a metric grid. It can be combined in many ways to adapt to different surface shapes and heights.
It can be transported and stored by stacking.
It was used in 2021 for the productions, Le COQ D'OR (The Golden Cockeral) and the Le Nozze di Figaro (see appendix here and here).
At the end of the tour, all the trolleys, and part of the structures, will be reused for future sets.

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OPTIMISE THE END OF LIFE

Designing and anticipating the best end-of-life cycle scenario for the various elements of the set

1 **Make the scenographer aware** from the outset of the desire to avoid the production of final waste CIW (Common Industrial Waste) as much as possible.
Show him samples of solutions and provide him with a digital version of the eco-material bank.

2 Upon receipt of the model, identify the main families of materials that will make up the set. **Identify the most problematic ones in terms of end-of-life cycle**, likely to end up as CIW (Common Industrial Waste).

Take action by :

3
- Finding alternative materials that guarantee a better end of life.
- Asking the supplier about the possibility of taking back the material.
- Searching for the most appropriate treatment channels.
- Anticipating the end of life cycle by finding a "buyer" who will ensure a new use for the materials.
- Facilitating the separation of "problem" materials

Finally by
- Reducing the use of these materials as much as possible.

OBJECTIVES:
Aim for zero waste.

STRATEGIES:
Mono-material Design, Circular Economy, Functional Economy, Collaborative Economy...

EVALUATION :
Estimate the weight of CIW (Common Industrial Waste) for each production, and compare over several years.
Eco-material bank enriched with alternative materials.

THE PROTAGONISTS

The DO anticipates the end of the life cycle of each element that makes up the set

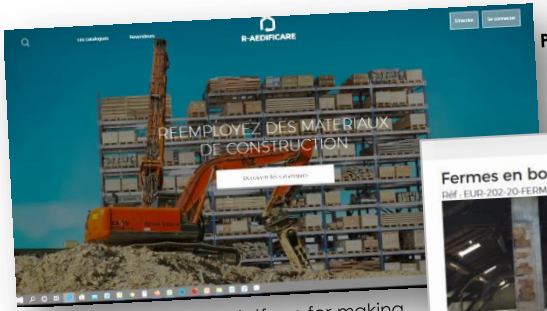
THE WORKSHOPS.
They test and then implement the solutions designed with the DO.

THE CHALLENGES

Important
As the cost of waste treatment continues to rise, not producing any more waste is a saving factor. This is particularly true in relation to the costs of CIW (Common Industrial Waste) skips.

Important
The problem of excess waste is at the origin of the circular economy.

Means
The stage crews are called upon more at the end of the set's life-cycle, to dismantle the set into reusable or recyclable sub-elements.



R-aedificare. A digital platform for making available / recovering materials and equipment before destruction. The Festival d'Aix-en-Provence is testing this system for its end-of-life cycle sets.

Permettre et faciliter le réemploi

Click to access the platform

Designing Mono materials

The entire decorative panel is made from wood and wood derivatives, (e.g. expanded cork for the Alcina wall. [here]. This allows a vent in the wood skip for the entire panel.
Wood fibre panels for Così Fan Tutte). At the end of its life cycle, all of it is recycled in the same wood bin. [here].

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RELOCATING RESOURCES

Be active in the economic development of your territory. Free yourself from the uncertainties associated with long-distance transport.

1. **Make an inventory of the materials most used by the building and trimming workshops**.
   Make an average annual estimate of needs.
2. **Identify the regional players** - or the heads of the sector - who could meet these needs.
3. Make contact with the key players in the sector, **specifying the expectations and constraints** specific to the scenography.
4. Place an initial "test" order, identifying possible grant aid within the framework of regional economic development.
5. Gradually replace a maximum of "remotely located" materials with local materials.
   Evaluate the benefits/losses with regard to the territory as a whole and the impact on the environment.
6. **Promote these "short circuit"** local economy operations in the direction of the general public, tutelary authorities and sponsors.

OBJECTIVES:
Relocate X% (percentage to be determined) of the materials in a production.

STRATEGIES:
Networking, testing, experimenting, "making do".

EVALUATION:
After some experimentation, what percentage of locally sourced materials are used in the composition of a set? How did this impact the design and/or the final result?

THE PROTAGONISTS

THE DESIGN OFFICE takes care of the research phase for local suppliers, initiates the tests and negotiates the order volumes.

THE WORKSHOPS;
If the local materials are not completely identical, carry out trials and tests in advance for validation

THE CHALLENGES

Important
In a context of the crisis and the shortage of materials, local procurement can become more secure and economically competitive

Very Important
A local, biobased material, resulting from sustainable resource management, can be the most virtuous solution in terms of impact

Means
Teams may need to adapt/expand their skills in the case of using previously unused materials.

Click to download the guide

Click to download the catalogue Or go directly to the professional directory [here]. [**ici**]

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CALCULATE FIRST – THEN ARBITRATE

Decision support calculators, for making relevant choices and enhancing the value of actions

1. Formulate the question and the expected answers in terms of **an alternative solution to a typical design hypothesis**. Measure the impact of the alternative solution by integrating the entire life cycle and working times.
(e.g. 1: for a given production, if I load 5 lorries instead of 6, what is the saving on transport costs for the planned round trip? and with an additional 15% loading time?)

2. In the design phase, **evaluate different designs in order to select the most virtuous one over the whole life cycle.**

3. At the end of the design process, in order to obtain a global vision and/or to justify all the choices made, complete the 6 pages for the entire production.

4. **Validate the results obtained** (savings and reduction of environmental impacts) with the management and all interested partners.

OBJECTIVES:
Obtain a global cost/impact vision to choose and justify a design/implementation mode

STRATEGIES:
Ecodesign global vision of the life cycle

EVALUATION:
What favourable trade-off has been made thanks to the Multi Criteria Decision Aid (MCDA) calculator ?

For what gains (and impacts)?

THE PROTAGONISTS

THE DESIGN OFFICE.
As the designer, it is the Design Office that has the final say on the various possible hypotheses. It is therefore up to the Design Office to put a figure on these hypotheses, and then, if necessary, to convince the production team on the basis of objective arguments.

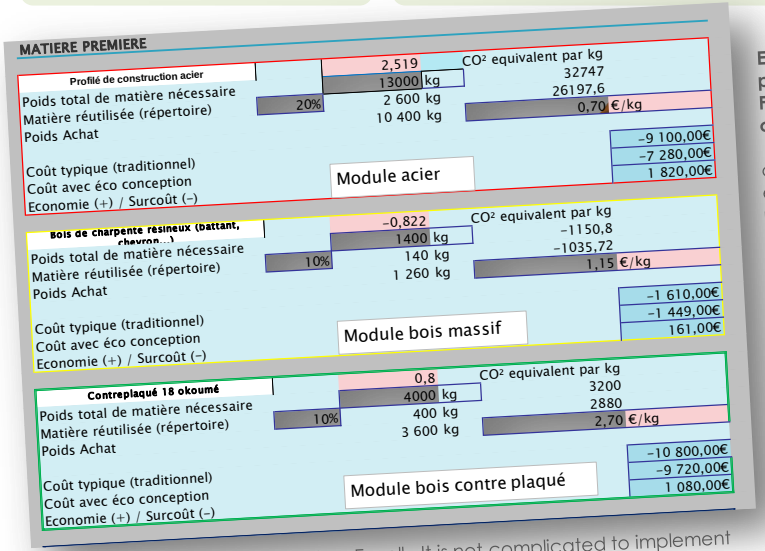
THE CHALLENGES

Very important
Ecodesign is generally a source of savings and not of additional cost.

It is important to highlight this to counter this often heard counter-argument.

Important
Any reduction in cost is often synonymous with a reduction in impact

Means
The calculation represents additional work time for the Design Office...



Extract from a page of the Festival calculator.
It shows the costs and CO2 emissions in parallel, and allows you to compare a "traditional design" hypothesis with an "ecodesign" hypothesis.

The Festival calculator is based on Excell. It is not complicated to implement but requires a little time to get used to. It is an awareness-raising tool that offers a global vision of the entire life cycle of a production.
After having analysed a few sets with this calculator, the Festival's DO has now acquired some experience and ecodesign reflexes.

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OPTIMISING FLOW MANAGEMENT

(materials, utilities; water, fluids, energy, consumables, etc.)

Consider the workshops as a large living metabolism... What do they consume? What do they expel?

1. Draw up an exhaustive a map as possible of all the inputs and outputs of the Festival Workshops. Estimate the volumes.
2. Identify the most important elements of flow management and/or the most critical situations (waste, toxic waste, etc.). Put in order the priorities.
3. Highlight courses of action on the most important issues. Prioritise according to the importance of the issues and the ease of implementing a solution.
4. Establish a short/medium/long term programme of action by appointing a specialist advisor for each action.
5. Schedule in-house meetings/exchanges to evaluate the implementation of actions and the results obtained.

OBJECTIVES:
achieve the most virtuous [sustainable] operation of the workshops possible.

STRATEGIES :
Biomimicry.
Circular economy

EVALUATION:
Global and shared vision of overall flow management?
Reduction in the volume of production waste ?
Reduction of entering input at the source ?

THE PROTAGONISTS

THE WORKSHOP STAFF, whether permanent or casual, they are the principal players in flow management in the workshop. It is up to them to implement the actions identified and to raise the awareness of all operatives.

THE MANAGEMENT supports these initiatives by investing in the necessary equipment.

THE CHALLENGES

Important
In addition to the recovery of material waste, the optimisation of energy, gas and fluid flows can represent up to a 20% reduction in a workshop's expenses.

Important
In terms of waste reduction, impact on water pollution, consumption of non-renewable energy

Important
The implementation of selective sorting sometimes requires a change in professional practices that must be supported by awareness-raising initiatives.

A brush and roller cleaning machine that recycles water
This rinsing and decanting tank recycles the water while leaving the paint residues on the brushes and rollers. Beware of fireproof paints of different densities..

Managing and reusing off-cuts
This off-cuts rack next to the panel saw is used to display the available panel "leftovers".

Sorting and recycling waste.
In the workshop, large, mobile and clearly identifiable bins are used to separate wood, cardboard and steel scraps.

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Raising awareness and involving SUPPLIERS

Raise awareness in advance (suppliers of materials and equipment) and afterwards consider recovery, waste treatment, etc. as part of the ecodesign approach.

1. Write a text to raise awareness of the Festival's approach to Suppliers by asking for references and/or samples.
2. Create a file with the contact details of all suppliers (protagonists + potential future ones)
3. Set up an Internet alert (newsletter, etc...) to detect the arrival of new materials.
4. Formalise a digital and physical eco-material bank and define the criteria (cost, nature, properties etc...)
5. Schedule sample tests
   Fill in the user notices on the file
6. Integrate into future programming
   Estimate positive impacts (costs, health, environment)

OBJECTIVES:
Identify new eco-materials, implicate suppliers for possible eventual revival.

STRATEGY:
Collaborative economy

EVALUATION:
How many new eco-materials were presented by suppliers?
How many were used for a set?

Note:
The presence of labels or initiatives to relocate resources is already an encouraging sign. (cf. Fibra Terra in the Région Sud) Increasingly strict environmental regulations also represent a strong "incentive" for suppliers. A letter to mobilise and raise awareness among suppliers;

THE PROTAGONISTS

THE DESIGN OFFICE. It is up to the Design Office to make suppliers aware of the situation when it is researching materials for the design of the set. It can also set up an observation cell.

THE WORKSHOPS are also important resource players for the discovery and testing of new materials

THE CHALLENGES

Important
So-called ecological materials sometimes represent an additional cost at the time of purchase. This must be weighed against the savings that will be made when the material is processed at the end of its life cycle..

Important
Replacing synthetic materials with natural ones avoids impacts at source, and often at the end of the life cycle

Important
Opting for bio-based and/or locally sourced materials has a positive impact on the economic activity of the region.

Dear Sir, Dear supplier partners, (nominative if possible)

For several years now, the Festival d'Aix en Provence has been committed to a sustainable development approach in order to reduce the impact of its activities on the environment.
This commitment continues and is strengthened each year, with the integration by our teams (including the Design Office and the Workshops) of an ecodesign methodology for the opera sets that are designed and built in our workshops in Venelles. [...]

Henceforth, and as a general rule, we shall pay more and more attention to the materials which will enter in the composition of the future sets, and will give our preference to the following materials:

Eco-labelled materials (PEFC or FSC label, European eco-label, the NF environment label, Bio-sourced materials (from renewable resources, produced naturally such as wood, textiles and materials from natural fibres, organic paint and dyes etc.)

See Annexe for the full letter

Proposal for a letter to suppliers and relay structures

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SHARING SKILLS AND GOOD PRACTICES

To be part of a collaborative logic, to share one's own research and skills, and to benefit from the experience of a wide range of protagonists.

1. Set up a collaborative digital platform open to all interested parties in the performing arts, culture and events sector.
2. Create a shared file with the contact details of all the suppliers of ecological materials.
3. Set up an Internet alert (newsletter, etc.) to detect the arrival of new materials and new processes
4. On the platform, validate specific areas for the eco-material bank, a manual of good professional practices, specific tools, innovation ... and mistakes to avoid, that is accessible to all.
5. Organise physical meetings in the form of workshops to test new materials and processes, and share skills through training/action

Objectives:
Enriching and drawing on expertise and knowledge from several performance structures.

Strategy:
Collaborative economy

Assessment:
What processes, systems, tools, etc. have been put in place in a collaborative manner? What did they allow in terms of eco-design?

What is an eco material?
This is a material that will have a lower environmental impact for the same use than other materials. The comparison must be made over the entire life cycle, taking into account durability and the end-of-life scenario.

A caricatural counter-example: a set made of recycled cardboard (therefore with a low initial impact), which will not last several performances and will not withstand transport, ultimately generating new production and numerous voyages for maintenance.

THE PROTAGONISTS

The Workshops and the Design Office to collect, reference and produce material samples to be validated (or invalidated).

The design offices to increment the digital platform, and share it with peer structures

THE CHALLENGES

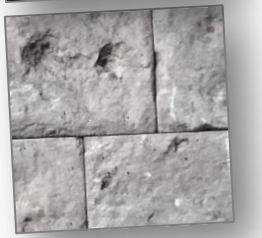
Very important

The sharing of issues and solutions between the different actors of the performing arts has a multiplying effect. All individual knowledge and experiences become collective. Solutions can be implemented on a national and/or international scale

Important

The process requires manpower and time. The return on investment is in terms of savings in the R&D budget and in the quality of life at work

Expanded cork for the concrete rendering effect



Wood fibre panels or cork slab for stone and marble blocks

At the Festival d'Aix, 10 good practices acquired, to be shared

- Standard elements
- Single material assemblies
- Reversible assemblies
- Favouring dismantlability and reparability
- An alternative to polystyrene: expanded cork
- 3D design and NC (Computer Numerical Control) cutting to generate volumes as close as possible to the final shape
- Optimising the structural design to save raw materials and reduce the weight of the sets
- The use of downgraded materials
- Optimising cuts and scrap
- Preferring bio-based and short circuit raw materials
- Favouring the use of reusable or recyclable materials

Organising collaborative working time
Thematic work shops, working meetings, 1 or 2 day seminars, working time on common issues

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OPTIMISING THE TOUR

Establish the shortest possible route by finding intermediate storage places, to avoid the "zig-zag" tour. Also optimise the loading of the lorries

1. **Contractualise the sharing of transport and storage** between the various co-producers.
2. Create a model and evaluate the cost of a typical tour - thanks to the ADMC decision support software -, (or of the tour forecast plan for a production). Ex: map opposite.
3. **Identify the longest and most unnecessary round trips between Aix and the production sites**.
   Evaluate the gains in the event of intermediate storage between 2 locations.
4. Make all co-producers aware of the **savings that can be made by pooling transport and storage costs.**
5. **Mobilise co-producers to reference potential intermediate storage locations between major cities.**
6. Create a model the optimised route with the new configuration and **assess the actual savings.**

OBJECTIVES:
Bring together the co-producers in order to anticipate planning the tour and to identify intermediate storage locations.

STRATEGIES:
Collaborative economy. The aim is to pool the cost of transport and storage. All savings will be shared between co-producers

EVALUATION
How many return trips to Aix were avoided?
What are the savings?

The need for trust between all co-producers.

The prerequisite for the implementation of an optimised tour is the trust that must be established between all the co-producers. Although significant savings can be made and shared, in the event of a "major upset" (damage to a set element during storage or transport, loss of an element, etc.) Mutual support must also come into play so that the costs incurred are also shared collectively.

THE PROTAGONISTS

The management has to drive the process with co-producers

Logistics, in charge of scheduling and monitoring the tour.

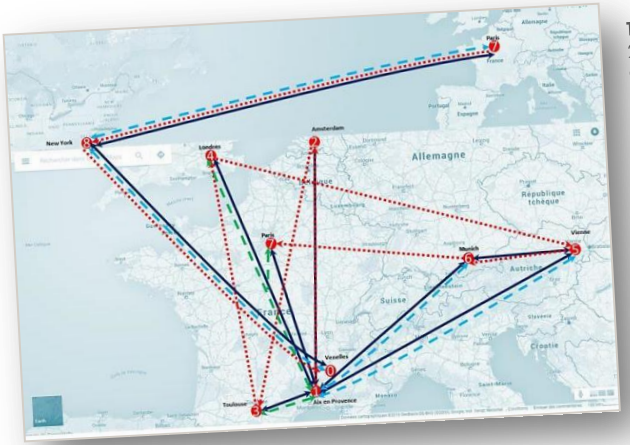
Design office to optimise the loading of lorries

THE CHALLENGES

Very Important
The cost of transport represents a significant part of the total cost of producing a work. It can be reduced by 20-40%!

Very Important
Optimised touring and lorry loading can cut CO2 emissions by half

Important
Optimised loading may result in slightly more work during assembly/dismantling



An optimised tour ?

The Written on Skin tour.
2006 > 2016 in figures
Cities crossed in chronological order (including return to Aix for intermediate storage):
Venelles, Aix, Amsterdam, Toulouse, London, Vienna, Munich, Paris, New York, Aix.
Number of HGVs: 7 .
Total km travelled excluding boats,
Total : 24780 km ;
CO2 emitted: 25 553 Kg.
Cost : 235 8212 €.

Hypothesis 1. Intermediate storage areas are found between 2 performance locations in order to avoid the systematic return of the set to Aix-en-Provence:
Total km travelled: CO2 emitted:
Cost in €: 161 900.
This represents a 31% saving on the initial scenario (€73,912)

Hypothesis 1 bis: by acting on the design of the set, we optimise the loading: we avoid a heavy goods vehicle (6 instead of 7)
Total km travelled: Co2: Cost in €: 138 771,
That is to say 41% savings on the initial scenario (€97,040)

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Transport and Storage IN CONTAINERS

Optimise packing, anticipate secure storage locations, limit handling operations

1. For each new production, consider touring based on projected locations and dates.
2. Using the ADMC software, calculate the potential savings by :
   Avoiding the need to return to Aix between 2 tour locations thanks to logistics platforms located between the 2 locations
   Avoiding intermediate loading and unloading operations by storing in containers
3. Arbitrate on the basis of economic relevance (and CO2 emissions avoided) / logistical complexity.
4. Pool efforts to find logistics platforms with all co-producers, highlighting the savings in transport/storage/handling.
5. Contact the Design Office to optimise the loading, and provide a loading plan/mode for the stagehands.

OBJECTIVES:
Arbitrate on the interest or not of organising transport and storage in containers, from an economic and ecological point of view.

STRATEGIES:
Ecodesign, global life cycle assessment with focus on the transport/storage phase.

EVALUATION:
Over several years, what savings have been achieved through the gradual introduction of this system? ?

THE PROTAGONISTS

The management must highlight the savings made for all co-producers

The Design Office must determine in advance whether the choice of a container meets the logistical constraints.

Logistics Find intermediate storage locations between 2 performance venues

THE CHALLENGES

Important
The container can allow for easier intermediate storage, thus avoiding the need to travel many kilometres. The container sometimes avoids 2 loading/unloading operations

Important
Every km avoided represents a gain in CO2 not emitted. (40 T euro 5 lorry : 85 g/T/km)

Important
Reduced loading/unloading operations can lead to a loss of activity for the stage crews.

A solution that has its limits...

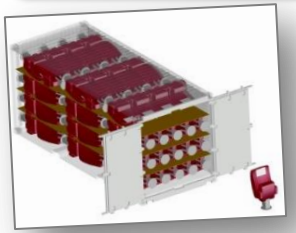
Frédéric, tour manager at the Festival d'Aix-en-Provence, shares his experiences with us by explaining the problems of storage and transport in containers encountered during the last tours.

Storage :

- Stored items are subject to extreme temperatures and condensation and can therefore be damaged.
- Container storage sites are often relocated in port areas (remoteness + regulated access).
- Depending on the storage and wind conditions it may not be possible to crane containers that are stored high up.

Transport :

- When loading, the container deck is higher than that of a lorry and the platforms are sometimes too low. In the absence of docks, lifting equipment is necessary (such as forklifts).
- As the container is the property of the establishment that stored the set, sending a container on tour requires finding a storage place on site or sending the empty containers back to the initial storage place.
- It is necessary to transfer the material stored in a container to a semi-trailer when the venue cannot or does not want to receive containers (double handling + cost of moving the container which cannot be unloaded in the port storage area for safety reasons).
- If an establishment accepts receiving a container, it is necessary to find a transporter who ensures this kind of service and is equipped with a loading/unloading platform.



A relevant example: The Trionfo del Tempo seats

A container specially allocated for the transport of the 108 Trionfo del Tempo seats. The seats were stored with their backs folded down on 2 levels with a removable intermediate floor. The volume of the container was 92% occupied.

Total savings of €45,000.

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RAISING AWARENESS AND TRAINING STAGE CREW

Optimising packing, anticipating secure storage locations, limiting handling operations: their role is decisive

1. Organise a time for a global presentation of the approach for all the stage crew; Focus on the actions implemented which have a direct impact on their professional practices. (assembly system, loading and transport methods, dismantling at the end of life cycle for recycling and re-use, etc.)

2. For these different phases, collect their feedback on what works, what doesn't work, and what they think could improve the systems in terms of ecodesign and quality of life at work. Integrate relevant feedback into set design and assembly/disassembly/transport/dismantling processes

3. Involve a representative of the stage crew in the Design Office meetings in order to collect and integrate their opinions from the design stage.

4. Co-design with the stage crew the most appropriate supports to make the choices of assembly, storage and dismantling at the end of the life cycle that are reader-friendly (PIFto gram on the set, note on the assembly plan, loading model, video ...)

OBJECTIVES:
Involve the stage crew in validating certain design choices concerning them.

STRATEGIES:
Collaborative

EVALUATION:
Are the organisation and dismantling choices concerning assembly, transport and storage adopted by the stage crew?

THE PROTAGONISTS

Stage crew: they are directly involved and impacted by the transport and end-of-life cycle choices made in the preliminary stages.

The DO must ensure, by involving the stage crew from the outset, what actually intends to be implemented.

THE CHALLENGES

Important	Important	Veryimportant
Additional costs at the end of life cycle are offset by savings over the whole life cycle	The volume of non-recycled waste can be reduced to zero through proper implementation of the identified actions	Stage crew and casual technical staff are impacted by changes in treatment at the end of life cycle: more work at the end of the life cycle. Support actions need to be put in place

-More work (the cost of which is partly offset) and less pollution.

The dismantling of certain parts of the scenery (here the Dune of Die Entführung auf dem Serail) is entrusted to the stage crew at the end of the scenery's life cycle. The additional labour costs can be offset by the resale of the "clean" material and by the savings made thanks to the avoided CIW (Common Industrial Waste) skips.

End of Life Signage ...

When a set reaches the end of its life cycle, information for the stage crew can take several forms:

- Special "end of life cycle" pages in the set's technical register.
- Signage on each of the set's elements specifying the end-of-life cycle scenario to be implemented,
- Briefing of the team before dismantling,
- or a combination of all three..?

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7 concrete examples of strategies implemented by the Festival d'Aix-en-Provence

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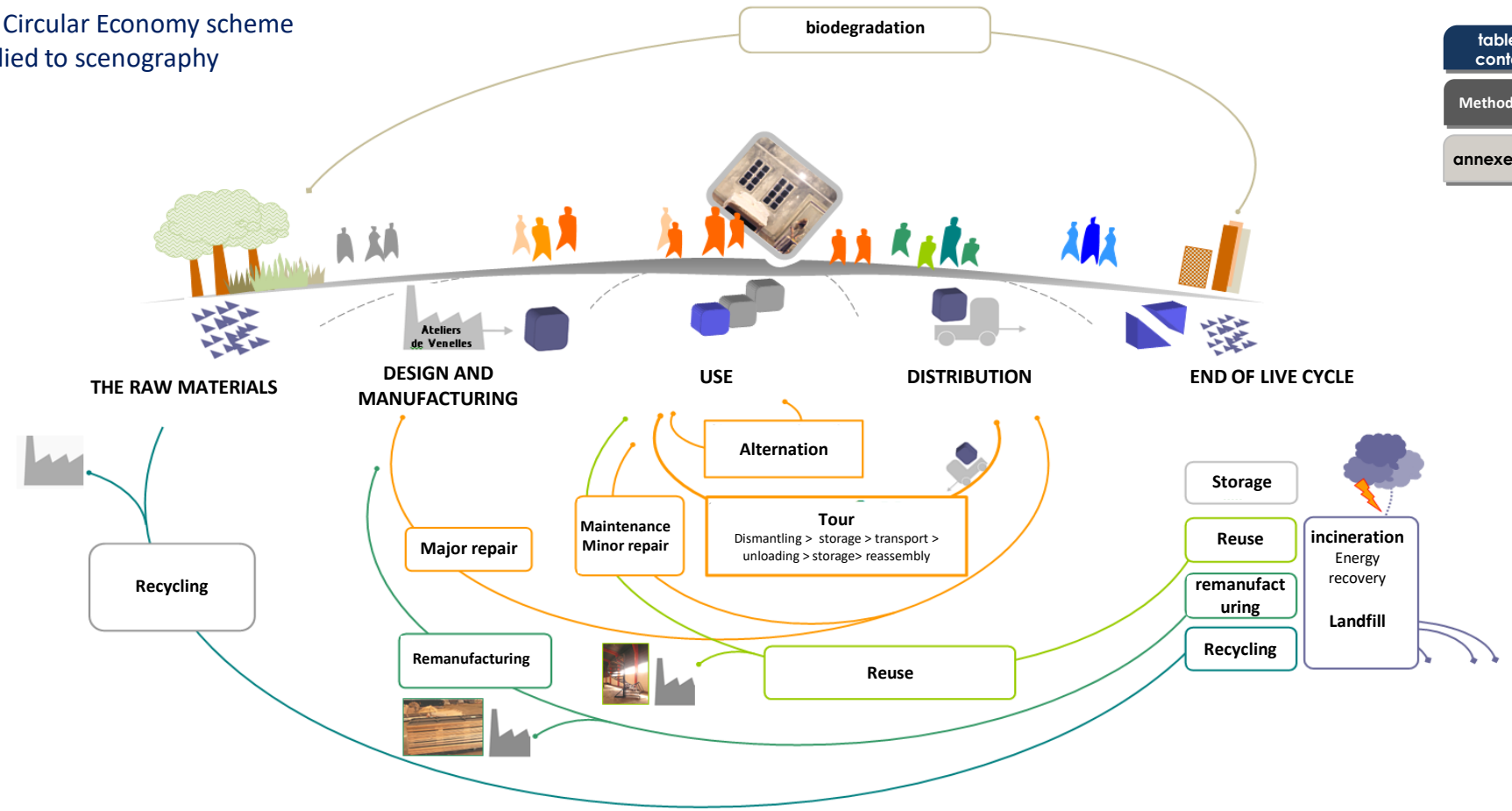
STAGE CREW

The Circular Economy scheme applied to scenography



Over the whole life cycle, each element of a set that goes back into a loop constitutes an environmental (and often financial) gain, which makes it possible to avoid burying and/or incineration. The shorter the loop (e.g. re-use), the lower the impact.

Recycling is also a loop that avoids burying, but it often requires a large number of operations that can be impactful. (e.g. collection, washing, transport, shredding, re-melting, re-processing, re-marketing, etc.). Biosourced materials that are not subject to chemical treatment can theoretically be "taken care of" by nature at the end of their life cycle.

Circular Economy

According to ADEME, the circular economy can be defined as an economic system of exchange and production which, at all stages of the life cycle of products (goods and services), aims to increase the efficiency of the use of resources and reduce the impact on the environment while developing the well-being of individuals

See diagram for the opera **HERE** et https://www.ademe.fr/expertises/economie-circulaire

https://www.futurerecycling.com.au/sustainability/circular-economy/

Sustainable procurement (sustainable extraction/exploitation and purchasing) concerns the mode of exploitation/extraction of resources aiming at an efficient exploitation of resources by limiting the exploitation waste and the impact on the environment, in particular in the exploitation of energy and mineral materials (mines and quarries) or in the exploitation of agriculture and forestry for both renewable and non-renewable materials/energy". This pillar covers elements relating to private and public (business and public authority) procurement.

Ecodesign, as early as the design of a process, of goods or a service aims to take into account the entire life cycle by minimising environmental impacts.

Industrial and territorial ecology, also known as industrial symbiosis, is a mode of organisation between companies through the exchange of flows or the pooling of needs.
The economy of functionality favours use over possession and tends to sell services linked to products rather than the products themselves.

Responsible consumption must lead the buyer, whether an economic actor (private or public) or a citizen-consumer, to make his choice by taking into account the environmental impacts at all stages of the product's life cycle (goods or services).

The extension of the period of use by the consumer leads to resorting to repair, second-hand sale or donation, or second-hand purchase in the context of re-use or re-cycling.

Recycling aims to use raw materials from waste materials.

Functional Unit

The functional unit represents a measurement of the function of a product. It is on the basis of this unit that it will be possible to compare product contexts that are a priori different. Like any unit, it must be precise, measurable and additive. Generally speaking, the functional unit should contain a functional component, a performance criterion and a duration.

The functional unit of an opera set can be defined as follows: For the same plastic quality, ensure N (number to be determined at the outset) performances of the Opera.

Biomimicry

Biomimicry is an R&D (Research and Development) approach that consists of drawing inspiration from the ingenuity of nature's mechanisms, properties and functions in order to innovate. More broadly, biomimicry, also called bio-inspiration, encompasses all engineering and science inspired by living organisms. In essence, biomimicry seeks to draw on the intelligence and sobriety of biological principles to design impactful and sustainable technologies.

More information on the Ceebios website (French) **https://ceebios.com/biomimetisme/**

Functional and Cooperative Economy .

The economy of functionality and cooperation consists in providing companies, individuals or territories with integrated solutions for services and goods based on the sale of a performance of use or a use and not on the simple sale of goods.

These solutions must allow for less consumption of natural resources in a circular economy perspective, an increase in the well-being of people and economic development**.**

https://www.ieefc.eu/activites-de-linstitut/centre-ressource-de-linstitut-new/

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- INNOCENCE 2021 -

The different strategies implemented throughout the life cycle of the set

- All the frames that make up the walls are made of single-material wood, sometimes with wallpaper (100% paper) applied.
- The material parts representing the concrete are made of wood and material in pulp and paint. Water-based paints, without chemical solvents or volatile organic compounds (VOCs).
- No irreversible assembly. Example: all the glazing (in polycarbonate) is removable and can be reused in the future. Recycling by material family is thus made possible.
- Reduction of the volume of transport (and therefore of the lorries) by a "flat" design of the steel supporting structures. all integrated lighting equipment is low consumption and reusable in future projects or by other users
- The PVC floor is not glued to the floor tiles and an agreement has been made with the supplier to recover and recycle these elements (200m²).
- The tour planned for all the numerous co-producers (more than 5) was organised with a single trip and storage near the recovery site with no return trip to Aix

The Advantages:

- Zero dumping of CIW (Common Industrial Waste)
- No more burying of waste
- Less treatment costs
- Less costs and CO2 emissions during transport

Constraints:

All these strategies need to be thought through at the design stage.

Applied strategy:

- Circular economy; Procedure Information File DO 3, "optimising the end of life"
- optimising the tour

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7 concrete examples implemented by the Festival d'Aix-en-Provence.

CARMEN- 2017

Different strategies implemented aiming for a Zero Waste set.

- 500 m² of "marble" cladding made from bio-sourced materials (of natural origin), thanks to sculpted cork slabs, scraped and painted with ecological paints. Recycling in the wood industry.
- Water-based paints, without chemical solvents or volatile organic compounds (VOCs)(Volatile Organic Compounds)
- No irreversible assembly. Example: Plexiglas windows are not glued to the wooden frame, but screwed; no wood/steel gluing. This makes it possible to recycle by material family.
- Reduction of the transport volume (and therefore of the lorry) by a "flat" design of the steel supporting structures.
- Re-use of some 'standard' structural modules, such as the stage access stairs.
- Set accessories (chandeliers) designed for possible second life use, such as sale to individuals.
- Reversible floor for use as a dance floor.

The Advantages:

- Zero dumping of CIW(Common Industrial Waste) :
- No more burying of waste material
- Less treatment costs
- Less cost and CO2 emissions during transport

Constraints:

All these strategies need to be thought through at the design stage.

Applied Strategy:

Circular economy; Method guide DO 3
"optimising the end of life cycle".

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COSI FAN TUTTE - 2016

Single-material walls, made from bio-based materials (of natural origin).

All the set panels are made from wood and wood derivatives.

On the right: Wooden lattice in wood fibre panels + 5 mm plywood. Stone wall in fibreboard panels "scraped" and matted with paper pulp.

Designed to be easily dismantled, the whole unit is recovered in the same wooden skip at the end of its life cycle.

The Advantages :

- Zero dumping of CIW (Common Industrial Waste)
- No more burying of waste Less treatment costs

Constraints:
Prolonged processing of fibreboard can cause itching thus need to protect the workplace

Applied Strategy:
Circular economy; Procedure Information File DO 3 "optimising the end of life cycle ".

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7 concrete examples implemented by the Festival d'Aix-en-Provence.

THE GOLDEN COCKERAL - 2020

Biobased or decommissioned materials, reusable standard trolleys, optimised design using 3D.

- A set creating the illusion of vegetation in a meadow made out of brooms using bio-based fibres.
- The entire base of the hill in standard reusable trolleys.
- The reliefs and undulations of the hill are entirely designed in 3D and made from re-used and digitally cut plywood panels to be as close as possible to the desired final shape and avoid the use of polystyrene sculpture.
- The only material input is cork, which will allow the floor level coffers to be recycled into the wood industry (single-material assemblies)
- A tree trunk made of "real wood" picked out of a river.

The Advantages :

- Zero dumping of CIW (Common Industrial Waste) :
- No more burying of waste material
- Less processing costs
- Reusable structural elements

Constraints :
All these strategies need to be considered as early as the design stage.

Applied Strategy:
Circular economy; Method guide DO 3 "optimising the end of life cycle".

7 concrete examples implemented by the Festival d'Aix-en-Provence.

LE NOZZE DI FIGARO - 2021

Reusable standard trolleys, reversible assemblies, 'flat' design

- Design and production of modules based on standard trolleys.
- All assemblies are mono-material or reversible.
- Water-based paints, without chemical solvents or volatile organic compounds (VOCs).
- No irreversible assembly. Example: all the glazing (in polycarbonate) is removable and can be reused in the future.
- Recycling by material family is thus made possible.
- Reduction in the volume of transport (and therefore of lorries) by a "flat" design of the steel supporting structures.
- All integrated lighting equipment is low consumption and reusable in future projects or by other users.

The Advantages :

Zero dumping Common Industrial Waste CIW :

- No more burying of waste
- Less processing costs
- Less costs and CO2 emissions during transport

Constraints :

All these strategies need to be considered as early as the design stage.

Applied Strategy:

Circular economy; Method guide DO 3 "optimising the end of life cycle ".

ALCINA - 2015

Detachable" polystyrene mouldings

When mono-material is not feasible, and rather than gluing the polystyrene moulding directly to the technical panel, it was glued to a 5 mm piece of plywood, then screwed to the technical panel. The main panel is recovered, only the moulding is treated as CIW (Common Industrial Waste).

A mono-material wall, made of bio-based materials

The entire set panel is made from wood and wood derivatives (e.g. wood, expanded cork, paper pulp for the Alcina wall).

At the end of its life cycle, everything is recycled in the same wood skip.

Strategy:
Circular economy "optimising the end of life cycle cycle ”

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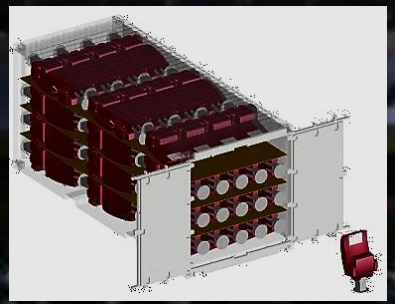
IL TRIONFO DEL TEMPO E DEL DISINGANNO – 2015



TRANSPORT AND STORAGE IN CONTAINERS

Elimination of wooden transport crates for the transport of seats (50 crates).
No more handling between two performance locations.

Cushioning with reusable intermediate plywood panels and straps in the container

No more handling between two performance locations.

The Advantages :

For a production at 10 venues with intermediate storage facilities,

- 47.52% of handling costs, i.e. €38,250.
- No material and manufacturing costs for the 50 wooden boxes.
- The intermediate plywood panels are in their original and reusable state.

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LETTER TO THE CO-PRODUCERS

Involve all the co-producers in order to have more influence on decisions and to multiply the results.

Sample letter to co-producers

Dear _____, dear partner, (and/or name)

As you may know, the *Festival d'Aix-en-Provence* has been committed for several years to a sustainable development approach in order to reduce the impact of its activities on the environment.

We are neither the first nor the only ones to follow this direction because, in addition to the signatories of the charter proposed by ***Opera Europa***, other festivals and opera houses have committed themselves to this approach, some of which are collaborating with us on this issue (The opera houses of Lyon, *Théâtre du Chatelet, Théâtre Royal de la Monnaie* in Brussels, *Opéra de Paris*) all as part of a collective.

In a nutshell, the methodology consists of analysing the entire life cycle of a set - the raw materials from which it is made, the construction and specific utilisation, transport to the various locations, storage and end of life cycle - in order to identify the main sources of pollution and energy consumption and to define a plan of action to reduce these impacts.

Our design office and workshops have already applied these principles to the 2017 programme: for example, 100% of the set for *Carmen* is reusable or recyclable, thus avoiding several tonnes of waste.

Since 2017, the eco-design approach has been generalised to all productions and we wish to involve all of our co-producing partners in this approach. To this end, we organise "collaborative labs" which are open to all live performance structures in France as well as to the audiovisual sector, with *France Télévisions* participating regularly in these.

You can be a key player with us in this new approach and act significantly with us on all the levers we have identified to reduce our impact on the environment.

Among the courses of action that we plan to implement progressively, we can mention:

- the inclusion of an "ecodesign" clause in contracts with directors and set designers from 2022. This clause will specify that ecodesigned solutions will be favoured in the creation of future sets. By then, they will already be made aware of this;
- The inclusion of a clause on "Recovery/re-use of sets". This clause will specify the modalities for reusing the sets, to avoid the scenario of burying and promote the circular economy.
- The implementation of a strategy to optimise the touring and storage of opera sets (transport by lorry over thousands of kilometres being a very important vector of CO2 emissions, as well as a very important budget item)

These concrete actions, and their results in terms of quantified reductions in environmental impact, will be promoted to all our partners and audiences.

I would also like to stress that, overall, this approach leads to financial savings which are sometimes significant, and do not lead to additional costs.

Mr/Ms (...), the Development Manager at the Festival d'Aix-en-Provence, coordinates all the actions we implement.
I have asked him/her to get in touch with your team to consider the best way of putting these courses of action into practice together.

We are also attentive to all the initiatives that you would consider implementing to perfect the approach.
I thank you in advance for meeting him/her.

Yours sincerely.

The Director of the Aix-en-Provence Festival

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LETTER TO STAGE DIRECTORS AND SCENOGRAPHERS

Involve all the co-producers in order to have more influence on decisions and to multiply the results.

Dear _____ , (to all Stage Directors and Scenographers already identified for future productions)

We are pleased to be working with you on the production of _____ which will be presented at the Aix-en-Provence Festival in XXXX

As you may already know, the Festival d'Aix-en-Provence has been committed for several years now to a sustainable development approach in order to reduce the impact of its activities on the environment.

We are neither the first nor the only ones to follow this direction because, in addition to the signatories of the charter proposed by *Opera Europa*, other festivals and opera houses have committed themselves to this approach, some of which are collaborating with us on this issue (Opera houses such as *Lyon, Théâtre du Chatelet, Théâtre Royal de la Monnaie* in Brussels, *Opéra de Paris*) as part of a collective.

In a nutshell, the methodology consists of analysing the entire life cycle of a set - the raw materials from which it is made, the construction and its utilisation, transport to the various locations, storage and end of life cycle - in order to identify the main sources of pollution and energy consumption and to define a plan of action to reduce these impacts.

Our design office and workshops have already applied these principles to the 2017 programme: for example, 100% of the set for Carmen is reusable or recyclable, thus avoiding several tonnes of waste.

As a stage director or set designer, you are a key player whom we wish to involve closely in our sustainable development approach. Indeed, although the ecodesign of the sets generally takes place "with an equivalent manmade effect", it may be that a new material, a new primer, a natural paint or another method of assembly, could provoke slight changes in appearance.

If this situation arises, we would very much like to hear from you, and hope that you will be open to the arguments of our design teams in favour of less environmentally damaging set elements.

We have also identified many other levers that can significantly reduce the environmental impact of a set over its entire life cycle. We hope to implement them progressively over the next few seasons, but if you would like to get involved with us in this approach, we are already at your disposal to explain it to you in more detail.

As travel is a major source of greenhouse gas emissions, we would ask you to limit it to what is necessary and to use public transport and train travel whenever possible. We will try to group together long journeys with different appointments and, if possible, meetings or projects in the vicinity in order to pool these journeys. We would like you to be a part of this process.

Thanking you very much for your attention to our approach, and remaining at your disposal for any questions,

Yours sincerely

The Director of the Aix-en-Provence Festival

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CLAUSES IN THE LYON OPERA CONTRACT

The clauses relating to ecodesign between the Lyon Opera and the Stage Directors and Scenographers.

In the commission & assignment contract and the contract of employment

The [stage director or set designer] further declares that he/she is aware that the Opera, as part of its sustainable development policy, has embarked on an ecodesign process for its productions aimed at reducing their environmental impact. This entails new constraints, in particular concerning the choice of materials, and the Opera reserves the right to refuse the use of certain materials because of their impact on the environment and/or human health. The Opera also favours the use of so-called "repertoire" materials, i.e. from other productions of the Opera, in compliance with intellectual property law. Finally, the Opera shall encourage the reuse and recycling of sets, in particular by selling, donating or reusing them for its own productions; in this respect, the Opera may enter into contracts with associations and/or organisations specialising in the recovery and enhancement of the said sets, without the [stage director or set designer] being able to object, subject to respect for his or her moral and economic rights

In the contract of employment

The [stage director or set designer], in the context of his or her duties, may be required to make occasional and exceptional journeys within Greater Lyon, the duration and destination of which he or she accepts in advance. The Opera gives preference to public transport for the organisation of these trips.

No journey will be undertaken without the written agreement of the Opera. Journeys requiring less than 5 hours from station to station are preferably made by train.

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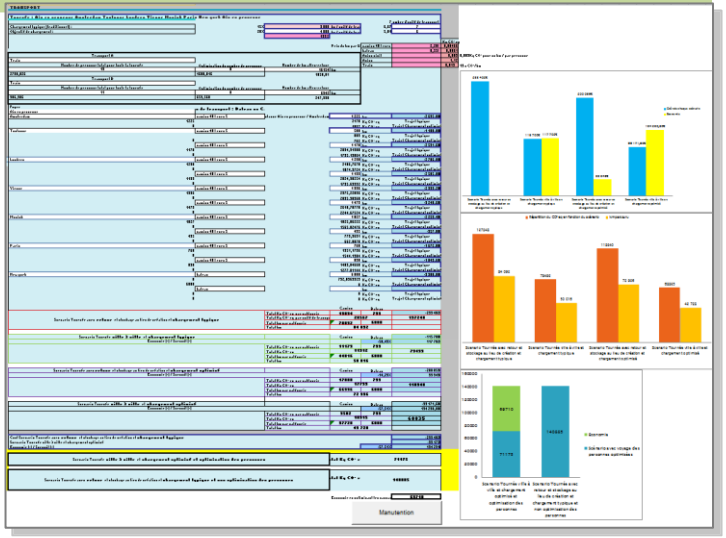
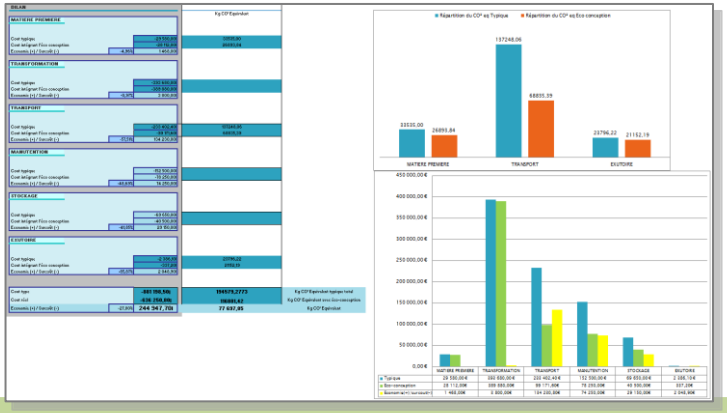
THE DECISION AID CALCULATOR: INSTRUCTIONS FOR USE

Pages:
life cycle
Materials -
manufacturing -
TRANSPORT -
handling -
storage - disposal



The review page



On the TRANSPORT page, you will find :

The tour of the set city by city
The different scenarios :

1. "Tour with return and storage at the place of creation and typical loading"
1. bis "City to city tour and typical loading"
2. "Tour with return and storage at the place of creation and optimised loading"
2. bis "City to city tour and optimised loading" ? "City-to-city tour and optimised loading" ?
This scenario is the ideal goal to achieve.

The type of transport
The type of transport for the staff The target to be achieved in terms of transport units.
The loading target corresponds to the target set by the user. "Here we want an increase of 133% (corresponding to 4000 kg / per transport unit)".
Finally, we obtain :
The cost of transporting a typical/ecodesigned set; The kilometres travelled for each scenario;
The kilometres are to be defined by the user depending on the tour. "Here, the values of the kilometres have been defined on Googlemap.
The possible savings to be made between the scenarios.
The Co^2 rate depending on the transport unit and the weight of the set.

The review page :

On this page you will find :
A summary of all previous phases

Finally, we obtain :
The cost of a typical set and that of an ecodesigned set, (The calculation includes the additional costs of the design office) The total CO2 rate of all the previous phases
For *Written on Skin*, the typical cost was estimated at **€881,198**
The cost with ecodesign (ideal scenario): **€636,250**

Savings achieved: **€244,947 (27%)**

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RAISE AWARENESS AMONG SUPPLIERS

PROPOSED LETTER TO SUPPLIERS AND TRANSFER/RELAY ORGANISATIONS

Dear supplier partners, (nominative if possible)

For several years now, the *Festival d'Aix en Provence* has been committed to a sustainable development approach in order to reduce the impact of its activities on the environment. This commitment continues and is strengthened year after year, with the integration by our teams (including the Design Office and the Workshops) of an ecodesign methodology for the opera sets that are designed and manufactured in our workshops in Venelles.

In a nutshell, it is about taking an overall look at the entire life cycle of a set (from the raw materials from which it is made, its construction, its utilisation, its distribution to the various tour locations, its storage and finally its end of life cycle), identifying the main sources of pollution and energy consumption, and defining a plan of action that will enable us to reduce these impacts.

Often large in size, the sets we produce each year can represent up to 25 tonnes of material per production, and the environmental impacts associated with the production of the materials are therefore significant, as well as, very often, their treatment at the end of their life cycle.

From now on, and generally speaking, we will be more and more attentive to the materials which will enter in the composition of the future sets, and will privilege, the following materials: Eco-labelled materials (PEFC or FSC label, European eco-label, the NF environment label, Bio-sourced materials (from renewable resources, produced in a natural way such as wood, textiles and materials from natural fibres, organic paint and dyes, etc.). Materials of close geographical origin (wood of regional or national origin, products manufactured in France, etc.) Recyclable materials, (for which the recycling channel exists and functions), including production offcuts. Materials and equipment taken back after use (under certain conditions, of course) and other possible solutions.

End 1. Usual suppliers We would be delighted if your establishment, with which we have been collaborating in confidence for several years, were likely to accompany us in this process by proposing solutions - materials, treatments, and equipment - along these lines, and Mrs/Mr. (principal buyer), will be attentive to all your proposals.

End 2. Potential suppliers We believe that your establishment is likely to supply us with such materials (especially _____). If so, please contact Ms/Mr. (Principal Buyer), who will tell you what we require, and will be interested in testing samples.

End 3. Relay organisations. Perhaps you have establishments within your network of members (or partners...) that could meet these needs? If so, we would be grateful if you could pass on our request to them, and give them the contact details of Mrs/Mr. (Principal Buyer), (e-mail and telephone number below) to enable us to move forward in the search for solutions.

NB. In concrete terms, we are currently looking for alternatives to PMMA (plexiglass), EPS (expanded polystyrene and reflective glass)

The Workshops Manager,

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AN OPTIMISED TOUR: RESULTS

TRANSPORT

Tournée : Aix en provence Amsterdam Toulouse Londres Vienne Munich Paris New york Aix en provence

Chargement typique (traditionnel) :		3 000 kg / unité de transp		6,81	7	Nombre d'unité de transport
Objectif de chargement :		4 000 kg / unité de transp		5,11	6	
		133%				
						Kg CO² eq
	Moyen de transport	Prix du km par UT	camion 40 t eu		2,20 €	0,08466
	Avion civil		bateau		0,55 €	0,0061
			Avion civil		3,00 €	0,083
Nombre de personne :	Optimisation du nombre de personne		Avion		3,00 €	1,12
			Train		3,00 €	2
7	4					
1162	Kg CO² eq	Trajet	2000	km		
664	Kg CO² eq					
Foyer						
Aix en provence						

Amsterdam	camion 40 t euro 5	istance Aix en provence / Amsterdam	1 225	km	-2 695,00€
			2177,8785	Kg CO² eq	Trajet typique
			1866,753	Kg CO² eq	Trajet Chargement optimisé
Toulouse	camion 40 t euro 5	distance Aix en provence / Toulouse	500	km	-1 100,00€
			888,93	Kg CO² eq	Trajet typique
			761,94	Kg CO² eq	Trajet Chargement optimisé
	camion 40 t euro 5	distance Amsterdam / Toulouse	1 178	km	-2 591,60€
			2094,31908	Kg CO² eq	Trajet typique
			1795,13064	Kg CO² eq	Trajet Chargement optimisé
Londres	camion 40 t euro 5	distance Aix en provence / Londres	1 230	km	-2 706,00€
			2186,7678	Kg CO² eq	Trajet typique
			1874,3724	Kg CO² eq	Trajet Chargement optimisé
	camion 40 t euro 5	distance Toulouse / Londres	1 139	km	-2 505,80€
			2024,98254	Kg CO² eq	Trajet typique
			1735,69932	Kg CO² eq	Trajet Chargement optimisé
Vienne	camion 40 t euro 5	distance Aix en provence / Vienne	1 336	km	-2 939,20€
			2375,22096	Kg CO² eq	Trajet typique
			2035,90368	Kg CO² eq	Trajet Chargement optimisé
	camion 40 t euro 5	distance Londres / Vienne	1 473	km	-3 240,60€
			2618,78778	Kg CO² eq	Trajet typique
			2244,67524	Kg CO² eq	Trajet Chargement optimisé
Munich	camion 40 t euro 5	distance Aix en provence / Munich	1 027	km	-2 259,40€
			1825,86222	Kg CO² eq	Trajet typique
			1565,02476	Kg CO² eq	Trajet Chargement optimisé
	camion 40 t euro 5	distance Vienne / Munich	435	km	-957,00€
			773,3691	Kg CO² eq	Trajet typique
			662,8878	Kg CO² eq	Trajet Chargement optimisé
Paris	camion 40 t euro 5	distance Aix en provence / Paris	760	km	-1 672,00€
			1351,1736	Kg CO² eq	Trajet typique
			1158,1488	Kg CO² eq	Trajet Chargement optimisé
	camion 40 t euro 5	distance Munich / Paris	838	km	-1 843,60€
			1489,84668	Kg CO² eq	Trajet typique
			1277,01144	Kg CO² eq	Trajet Chargement optimisé
New york	bateau	distance Aix en provence / New york	6 313	km	-3 472,15€
			808,8105155	Kg CO² eq	Trajet typique
			693,2661561	Kg CO² eq	Trajet Chargement optimisé
	bateau	distance Paris / New york	12 000	km	-6 600,00€
			1537,419006	Kg CO² eq	Trajet typique
			1317,78772	Kg CO² eq	Trajet Chargement optimisé

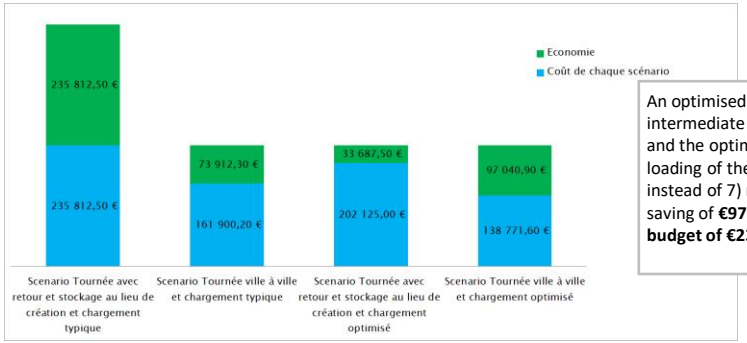
Scenario Tournée avec **retour** et stockage au lieu de création et **chargement typique**	Total Kg CO² eq :	25553,29	-235 812,50€
Total km : **341 474**			
Scenario Tournée **ville à ville** et **chargement typique**	Total Kg CO² eq :	13878,60	-161 900,20€
Economie (+) / Surcoût (-)		-31,34%	73 912,30€
Total km : **212 016**			
Scenario Tournée avec **retour** et stockage au lieu de création et **chargement optimisé**	Total Kg CO² eq :	21238,82	-202 125,00€
Economie (+) / Surcoût (-)		-14,29%	33 687,50€
Total km : **292 692**			
Scenario Tournée **ville à ville** et **chargement optimisé**	Total Kg CO² eq :	11563,95	-138 771,60€
Economie (+) / Surcoût (-)		-41,15%	97 040,90€
Total km : **109728**			

Cout Scenario Tournée avec **retour** et stockage au lieu de création et **chargement typique**		-235 812,50€
Scenario Tournée ville à ville et chargement optimisé		-138 771,60€
Economie (+) / Surcoût (-)	-41,15%	97 040,90€

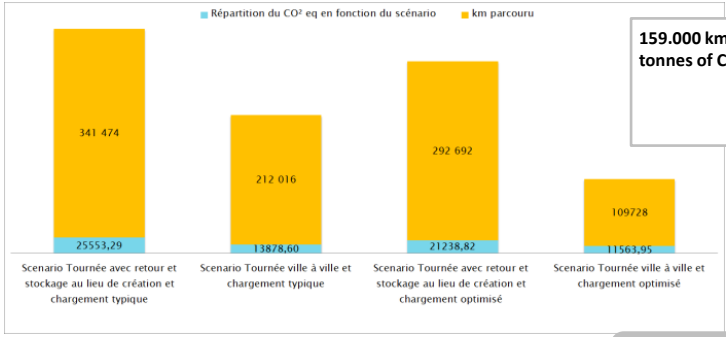
The TRANSPORT page of the Decision Support Calculator allows you to compare different tour scenarios:

1. A "typical" tour with no optimisation effort
1. bis. A "typical" tour, with an optimised HGV load rate in order to reduce their number ("load rate" box to be incremented)
2. An optimised tour in terms of travel, without a systematic return trip to Aix-en-Provence, with a classic load.
2 Bis. An optimised tour with an optimised load.

The potential savings are immediately apparent.



An optimised route with intermediate storage locations, and the optimisation of the loading of the lorries (6 lorries instead of 7) resulted in a saving of **€97,040 on an initial budget of €235,812 (or 41%).**



159.000 km and almost 14 tonnes of CO2 were avoided

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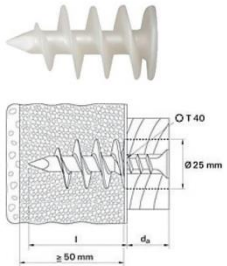
Where the stage crew are assessors and proponents in the dismantling phase



Conclusion of the trial

Disassembly requires little equipment or special skills, but it does take time.
This disassembly trial (test 1 and test 2) took one person one hour.
The two disassembled polystyrene blocks can then be recycled.
As far as the plywood panels are concerned, it must be determined whether the percentage of polystyrene remaining on the panels is low enough for the panels to be acceptable for recycling.

Method for the improvement of the disassembly :
Since small quantities of polystyrene have a tendency to stick to the plywood, it is prudent to carry out a test by first disassembling the plywood. In this way the polystyrene might be able to be peeled off more easily as the tarlatan will still hold it together.

Potential design enhancement :
It may be appropriate to test the screw connection to secure the polystyrene to the plywood. Special polystyrene Rawlplugs with a wide flange could be adapted. This design modification would allow the plywood sheets to be recycled and/or reused.

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