



Ki Culture

WASTE & MATERIALS

**Collections Care: Packing,
Storage & Transport**

A Step-By-Step Guide for
Sustainable Action

Volume I

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Waste & Materials Ki Book, Volume I

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INTRODUCTION

This guide is intended to provide sustainability information to make the best possible decisions for your needs working with cultural heritage, whether you are a preparator, conservator, registrar, curator, gallerist or artist. The scope of this research is broad to include many roles and responsibilities within organizations and businesses. We are hoping the concise information included in these pages inspires you to do your own research and find ways to cultivate your own green materials and practices to become more efficient, ethical, and sustainable.

It's difficult to encompass a global disposal system in a quick guide such as this, and the availability and regulations of the materials referenced are heavily based on your location and unique waste streams. Nonetheless, finding ways to reduce your waste is possible everywhere! Transport of goods accounts for 24% of global CO₂ emissions (2016) and we encourage purchasing materials as locally as possible for your company or institution.

Additionally, it should be understood that we are in no way promoting specific products. Rather, we hope this guide will serve to inform your decision-making and disposal practices, and help connect you with resources. We encourage you to share your experiences of using alternative materials and techniques. We look forward to working with you on your sustainability journey!

KI BOOK LEGEND

We've created this legend to help you navigate through the information you'll find in the book.



KI TIP

tips and advice



KI FACT

interesting facts



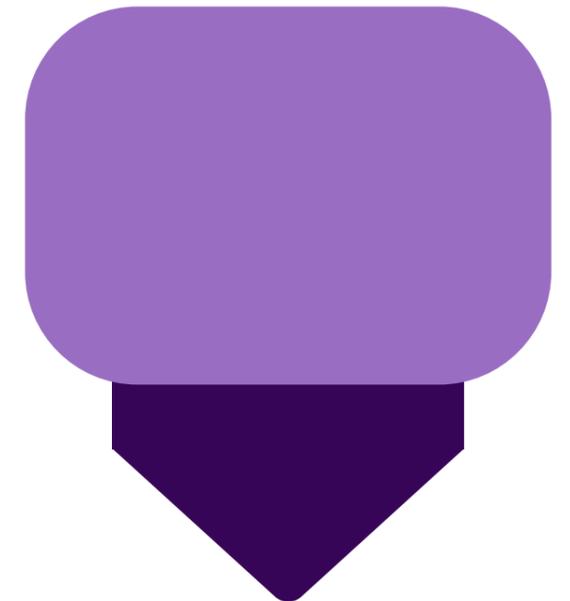
KI VISION

envisioned futures



KI STUDY

case studies



KI ACTION

*actionable items for
sustainability*

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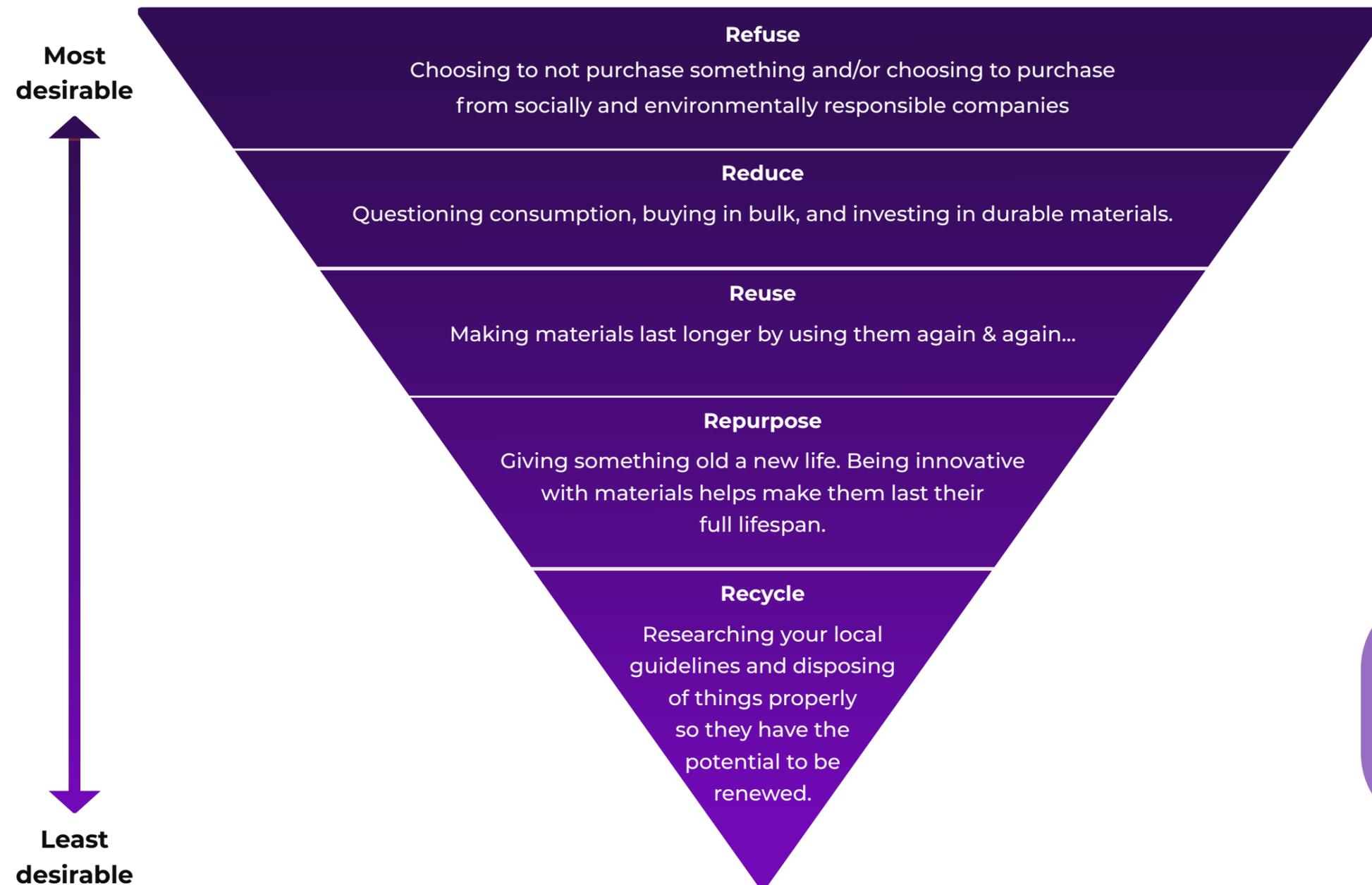
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THE 5 Rs

You may be familiar with the 3 Rs: Reduce, Reuse, Recycle and that nice little triangle. Well nowadays, many more Rs have been added. Some refer to 3, 5, 7, 9... it could be endless! But the most important thing to remember with any of these systems is to follow the Rs and do them **in order**. At Ki Culture, we use the 5 Rs: Refuse, Reduce, Reuse, Repurpose and Recycle.

This methodology will help minimize the amount of landfill waste produced by us in our work and in our daily lives.

WASTE HIERARCHY



KI VISION

Rethink and Redesign are key to the incorporation of inherently sustainable materials.

We would like to see more work on the part of manufacturers and product designers to incorporate these important principles (psst... those are the 6th and 7th Rs!)

KI ACTION

Don't know where to start?

Consider focusing on one "R" a week and put them into practice at work!

CIRCULAR ECONOMY

A Circular Economy is based on the principles of designing out waste and pollution, keeping products and materials in use for as long as possible and regenerating natural systems.¹ But the circular economy isn't just for the finance world - it is actually a concept that can be applied to everything that we do. From the materials we use to the exhibitions we design, from how we conserve our art to how we ship it - there are circular solutions for us all!

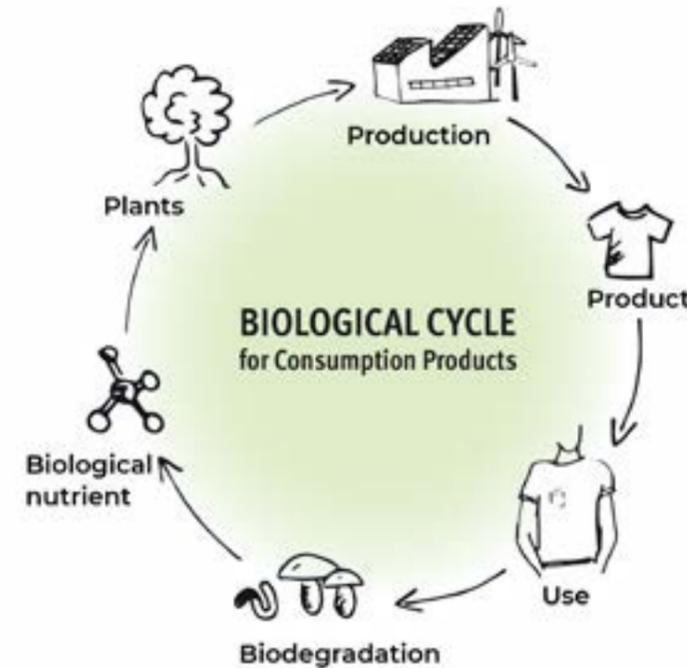
Circularity is the future and we hope to show you how to get a jump on promoting and engaging with this super sustainable concept by encouraging circular thinking in our material choices and use.

THE CIRCULAR ECONOMY

BIOLOGICAL CYCLE

Some of the materials discussed in this manual, such as biodegradable packing materials are biologically-based biodegradable raw materials obtained from nature, and therefore fall into this category. The biological cycle deals with these types of natural materials and how they can be regenerated, recycled, and eventually returned to nature.² Additionally, gases produced from this cycle are biogases and can be used for energy production!

Materials circulating in a biological cycle and can safely be used as “nutrients” for a new product instead of turning into waste.



THE ELLEN MACARTHUR FOUNDATION

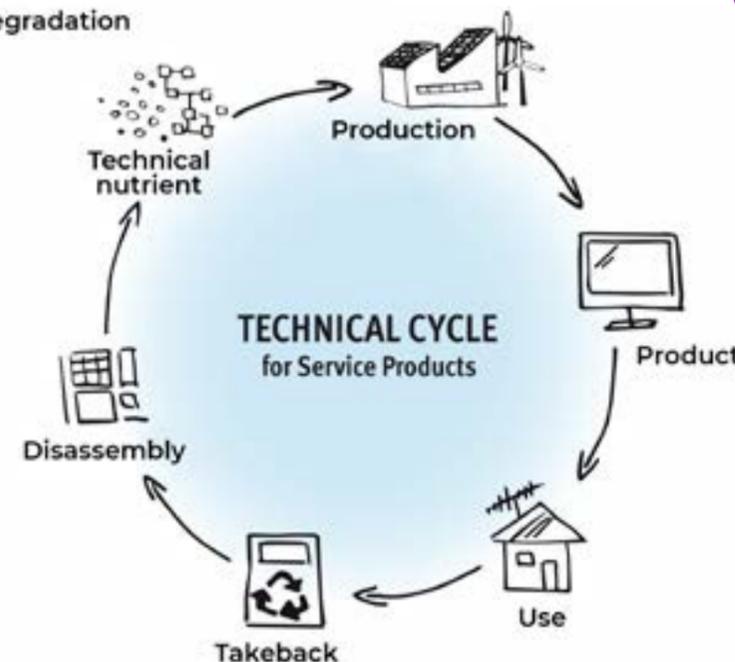
The Ellen MacArthur Foundation is the leading global authority on circular economy. Visit their website to learn more about circularity and find out how to use it in your daily practice!

More on the Ellen MacArthur Foundation here

TECHNICAL CYCLE

Products in this cycle are man-made materials and can be hazardous or contain rare metals. These materials, while taken from nature, have been altered so that they can no longer be returned to nature.

Materials circulating in the technical cycle are already optimized during the design and manufacturing process for their next life as new products.³ Some components can be switched out and reintroduced to a technical cycle, preventing downcycling.



GLOVES

At Ki Culture, one of the most frequent questions we encounter is what to do with all the gloves! Hand protection is a necessity for cultural heritage practitioners, but the majority of nitrile and latex gloves we throw away typically end up in landfills, incinerated, or worse- as pollutants in our environment! Reducing our consumption of disposable gloves by repurposing the gloves we use, replacing disposable gloves with reusable alternatives, or recycling can reduce the amount of waste you and your institution generate.

Not sure if these alternatives are suitable for your particular handling needs?
Let's examine our options and ask ourselves if gloves are always necessary.

GLOVES

Types, Tips & Recycling Programs

Click on the heading to skip ahead
to the information you need!

Reusable Gloves

Biodegradable Gloves

Compostable Gloves

TIPS on TIPS

Recycling Programs

COTTON GLOVES

Although they may not have the widest range of use due to their less than favorable tactile qualities, cotton gloves are washable and can be reused multiple times - unlike single use disposable gloves.

Sustainability Pros

- Biodegradable at end of life cycle
- Cotton biodegrades in compost within 5 months

Sustainability Cons

- Cotton crops require large amounts of water, pesticides and fertilizer. Purchasing organic cotton ensures no pesticides are used!⁴

WASHING INSTRUCTIONS

- Wash with warm water and mild detergent
- Air dry
- Wash regularly or when dirty



KI TIP

Washing hands thoroughly before using reusable gloves minimizes the transfer of dirt and oils to the gloves.

KI ACTION

Does your institution not have access to a washing machine?

- Organize a washing team!
- Take turns washing gloves at home or at a laundromat
- Learn how to inspire your colleagues to join you as a Ki Champion!



REUSABLE GLOVES

BAMBOO VISCOSE GLOVES

Bamboo viscose (also known as rayon) gloves are similar to cotton gloves, but are made with a thin, semi-synthetic cellulose-based fabric that is stretchy and better fitting than cotton.

Sustainability Pros

- Biodegradable at end of life cycle and inhome compost within one year
- Bamboo is a renewable resource that can reach maturity in 1-5 years
- Bamboo does not require chemicals, pesticides, or fertilizer to grow⁵

Sustainability Cons

- The production of bamboo viscose involves toxic chemicals and generates greenhouse gas emissions

WASHING INSTRUCTIONS

- 60°C water and mild detergent
- Air dry
- Wash gloves regularly or when dirty



KI VISIONS

Keep an eye out for gloves made from bamboo lyocell or TENCEL, which are eco-friendlier versions of standard bamboo viscose. Avoid bamboo gloves with zinc additives!

[Learn more about Bamboo here](#)

KI ACTION

Have you tried bamboo viscose gloves?
Many of us haven't!

[Share your experiences here](#)



REUSABLE GLOVES

NIRTILE COATED NYLON

Nitrile coated nylon gloves are for when you don't need a great deal of manual dexterity. They are chemically inert, have the same chemical resistance as nitrile gloves, and can still be useful for cultural heritage. Using these reusable gloves reduces a ton of waste compared to single use gloves.

Sustainability Pros

- Reusable

Sustainability Cons

- Not biodegradable at the end of its life cycle
- Not recyclable - made with two different polymers
- Introduces more virgin plastic into the waste stream
- Manufacturing process requires fossil fuels, energy, and releases greenhouse gases

WASHING INSTRUCTIONS

- 40°C water and mild detergent
- Air dry
- Wash gloves regularly or when dirty



KI FACT

An estimated 100 billion pairs of gloves are thrown away each year. That's enough to stretch to the moon and back 30 times!⁶

KI ACTION

Encourage your colleagues to write their names on each of their reusable gloves. Organize a storage container to keep gloves from wandering off.

[View Nirtile Coated Gloves Here](#)



REUSABLE GLOVES

SHOWA® “GREEN-DEX” NITRILE GLOVES

Showa® offers a nitrile glove with added degradation accelerators (Eco Best Technology) that speed up the degradation rate of nitrile in biologically active landfills using anaerobic digesters.⁶ Basically this means that in order for the glove to degrade, it needs to be in the right conditions - a landfill or compost. Showa® EBT gloves otherwise have the same properties as standard nitrile gloves with a thickness of 0.10 mm, ensuring excellent manual dexterity.

Sustainability Pros

- Biodegradable in biologically active landfills using anaerobic digesters within 1-5 years

Sustainability Cons

- Will not biodegrade nearly as quickly if they end up in landfill without anaerobic digesters
- Manufacturing requires fossil fuels and produces CO₂ emissions



KI FACT

Regular nitrile without EBT takes more than 100 years to break down in a landfill.⁷

Will your discarded gloves end up in a biologically active landfill using anaerobic digesters?

KI ACTION

WARNING!

Showa® gloves contaminated with resin or paint are not biodegradable.⁸

1. Try cutting the contaminated area from the glove.
2. Discard the contaminated area with hazardous waste.
3. Dispose the remaining glove in the proper place (compost or trash bin).

Showa® gloves have a shelf life of 48 months if stored away from UV, high temperature, and heat.⁹



BIODEGRADABLE GLOVES

PLA GLOVES

A variety of PLA gloves have appeared on the market over the past few years. These gloves are intended for use in the food industry, but why not try to integrate them into the cultural heritage sector? Made from renewable resources, such as starch, and considered a biobased plastic, these gloves are somewhat loose fitting, which slightly limits their application in cultural heritage.

Sustainability Pros

- PLA will compost in under 12 weeks, but only under the specific conditions of industrial composting!

Sustainability Cons

- PLA is often mistakenly placed in plastic recycling bins, which then contaminates the plastic recycling streams
- PLA is theoretically recyclable, but because the volumes of PLA are currently so low, there is little incentive for recycling programs¹⁰

[View PLA Gloves here](#)



KI FACT

Many compostable plastics - if not disposed of properly - behave similarly to fossil fuel derived plastics when they end up in landfills or the natural environment.¹¹ It is imperative that PLA products end up at industrial composting facilities!



KI STUDY

Will your discarded PLA gloves end up in an industrial compost?

Check out the map below to find local

[US PLA Compost facility map](#)

Not in the US? Ask your Ki Coach for help!

[Subscribe to Ki Futures](#)



**COMPOSTABLE
GLOVES**

TIPS ON TIPS



Cleanliness is key in cultural heritage, so we get it - sometimes there is no way around using disposable gloves. So what do we do with used disposable gloves that cannot be reused with objects? Here are a few tips to prolong the lifespan of single use gloves before they are discarded.

REDUCE

Instead of double gloving, use finger cots to protect the finger tips of the underlying gloves and prolong the use of the glove.

Or simply use the finger cots when only the finger tips require protection.

REUSE

Take used, intact gloves home for use in the garden or cleaning around the house. Give them to friends and neighbors!

REPURPOSE

- If the base of a glove is no longer in acceptable condition - from sweat or tearing - cut the finger tips off and use as extra protection against solvents
- Or, cut the finger tips off of gloves and reuse the base of the glove for something such as inpainting
- Use the cut off tips to keep brushes from drying out during short pauses in work. You could also use the elastic wrist band from the gloves and repurpose as rubber bands, to seal around your new paint brush covers, for example!



THE RIGHTCYCLE™ PROGRAM

The RightCycle™ Program from Kimberly Clark provides bulk bags for your institution to fill with discarded KimTech™ nitrile gloves. Send the full bag of gloves back and they will be recycled into new products.

[Learn more here](#)

[Sign up to RightCycle™ here](#)



KI FACT

Recycling plastic requires up to 88% less energy and less fossil fuel consumption than producing virgin plastic from scratch.¹²

Don't generate a large enough volume of disposable gloves at your institution? Collaborate with other institutions in your area!

Which recycling programs makes the most sense for your institution?



KI STUDY

The Dallas Zoo teamed up with RightCycle™ to recycle disposable gloves.

[Read more about it here](#)

KI ACTION

While RightCycle™ will accept gloves with resins or paints, it's always best to remove these contaminants if possible to streamline the recycling process.

1. Cut the contaminated area from the glove.
2. Discard the contaminated area with hazardous waste.
3. Dispose the remaining glove in the RightCycle™ container.



GLOVE RECYCLING PROGRAMS

TERRACYCLE - ZERO WASTE BOX™

TerraCycle is known for offering recycling solutions for hard to recycle materials including disposable gloves.

Nitrile, latex, vinyl and plastic gloves of any brand can be collected in a Zero Waste Box™ and then sent back to TerraCycle, where they will be turned into new awesome things like patio furniture and construction materials.

[Learn more here](#)



KI FACT

According to the Environmental Protection Agency, USA, recycling offers numerous environmental and economic advantages.¹³

Recycling:

- Reduces the amount of waste sent to landfills and incinerators
- Conserves natural resources such as timber, water and minerals
- Prevents pollution by reducing the need to collect new raw materials
- Increases economic security by tapping a domestic source of materials
- Saves energy

KI ACTION

Gloves contaminated with resin or paint are not recyclable.

1. Cut the contaminated area from the glove.
2. Discard the contaminated area with hazardous waste.
3. Dispose the remaining glove in the Zero Waste Box.™

Don't generate a large enough volume of disposable gloves? Collaborate with other institutions in your area!

Which recycling programs makes the most sense for your institution?

[Collaborate with other institutions through Ki Futures](#)

GLOVE RECYCLING PROGRAMS

SYNTHETIC WASTE

One of the biggest sources of waste is from synthetic materials. This includes packing/storage foams, Tyvek®, and plastic films. We may save what we don't use, but sometimes off-cuts can just pile up and don't always get used or properly discarded. How do we solve this? Well - let's get creative! One of our best tools is coming up with innovative ways to reduce plastic consumption!. We can also explore sustainable alternatives.

Thinking in terms of the 5 Rs - not only saving the planet - but money too! Efficient material use means less material goes in your shopping cart which means less money spent.

SYNTHETIC WASTE

Materials, Recycling & Identification

Click on the heading to skip ahead to the information you need!

Tyvek®

Polyethylene Foam

(Ethafoam®)

Polyethylene & Vinyl Acetate Foams

(Plastazote®/Evazote®)

Polystyrene

(Styrofoam™)

Plastic Films

(Mylar®, Melinex®, Hostaphan®)

Bubble Wrap

Stretch Wrap

Packing Tapes

Acrylic / PMMA

(ACRYLITE®, PLEXIGLAS®)

Recycling & Plastic Identification



TYVEK®

Tyvek®, made from spunbonded, high-density polyethylene fibers, has many applications in museums, such as lining shelves, covering textiles and garments, frame backing, and as a protective barrier for storage and transport.

Tyvek® is an inert and malleable material, capable of being sewn, welded, and printed on. With this versatility, the possibilities are endless for its reuse.



KI FACT

Tyvek® can be made from recycled materials including milk and water containers! And additionally, is easily recyclable. Collected Tyvek® can be recycled into wood alternatives, cable protection, automotive parts, and packaging.¹⁴

In order to be recycled, Tyvek® must be free of adhesives or labels. Keep an eye on how Tyvek® is discarded in your workplace.¹⁵

KI ACTION

Tyvek® can be washed!¹⁶

Lightly wash with a damp cloth or for heavier washing use the following Ki tips:

- 1. Handwash using mild soap. Do not use bleach.**
- 2. Use a cold cycle drip dry to retain stiffness.**
- 3. Or - dry using no or a low heat to preserve stiffness.**
- 4. Its not recommended to iron or dry clean.**

Tell us about some of the creative solutions you've come up with for Tyvek® reuse!

**Connect with the
Ki Futures Network**



TYVEK®

UPCYCLING

We've found some ways to use your Tyvek® offcuts from that carefully measured custom mount. Check out these storage and padding designs to save one of our most versatile materials from landfill.



KI STUDY

Studio Olafur Eliasson used Tyvek® slings to transport over 400 architectural models and prototypes belonging to the Wunderkammer inspired Model room, 2003.

Check out a similar strategy from the rehousing project by Philadelphia Museum of Art.¹⁷

[How to make Tyvek® slings here](#)



KI FACT

Trash to Treasure

Your recycled Tyvek® could be transformed into anything from shoes to park benches. However, this is considered downcycling, as the components are used to form a less valuable product.

KI ACTION

Turn your Tyvek® scraps into padding supports. Sew Tyvek® leftovers into a customized bag of any size and shape and fill with pellets, rice, or Ethafoam cutoffs. Sustainable - and a cheaper alternative than store-bought beanbags!¹⁸



TYVEK®

RECYCLING TYVEK®

While Tyvek® is not currently recyclable in curbside bins, there are programs available to divert usable Tyvek® scraps from the waste stream and give them a second life

DuPont will provide a recycling pouch for your Tyvek® scraps and you pay the shipping to return to the manufacturer.

Coming soon: Tyvek® recycling through TerraCycle!

[Learn more about Zero Waste Boxes™](#)



KI FACT

According to DuPont, when Tyvek® is incinerated, it releases water and carbon dioxide.¹⁹ More research should be conducted on this product to ensure no toxins are also emitted!

Finding ways to reuse or repurpose Tyvek® scraps can reduce processing costs and energy consumption. Consider the cost of recycling vs. release of gases in the incineration process.

KI ACTION

Talk with your regional recycling centers to see if they offer special Tyvek® recycling services. Encouraging these practices locally can save on the carbon footprint of collection and transport.

Need help? Ask your Ki Coach!

[Subscribe to Ki Futures](#)



TYVEK®

ALTERNATIVE OPTIONS

Reusable barriers made of washable organic cotton or bamboo linen are a great alternative to Tyvek® for dust covers.

NYLON 6

Nylon 6 is a material that is infinitely recyclable in a closed loop circular economy. If nylon recycling is available near you, textiles made from nylon 6 could be implemented as a dust cover or barrier material.

[Learn more about Nylon 6 here](#)



KI STUDY

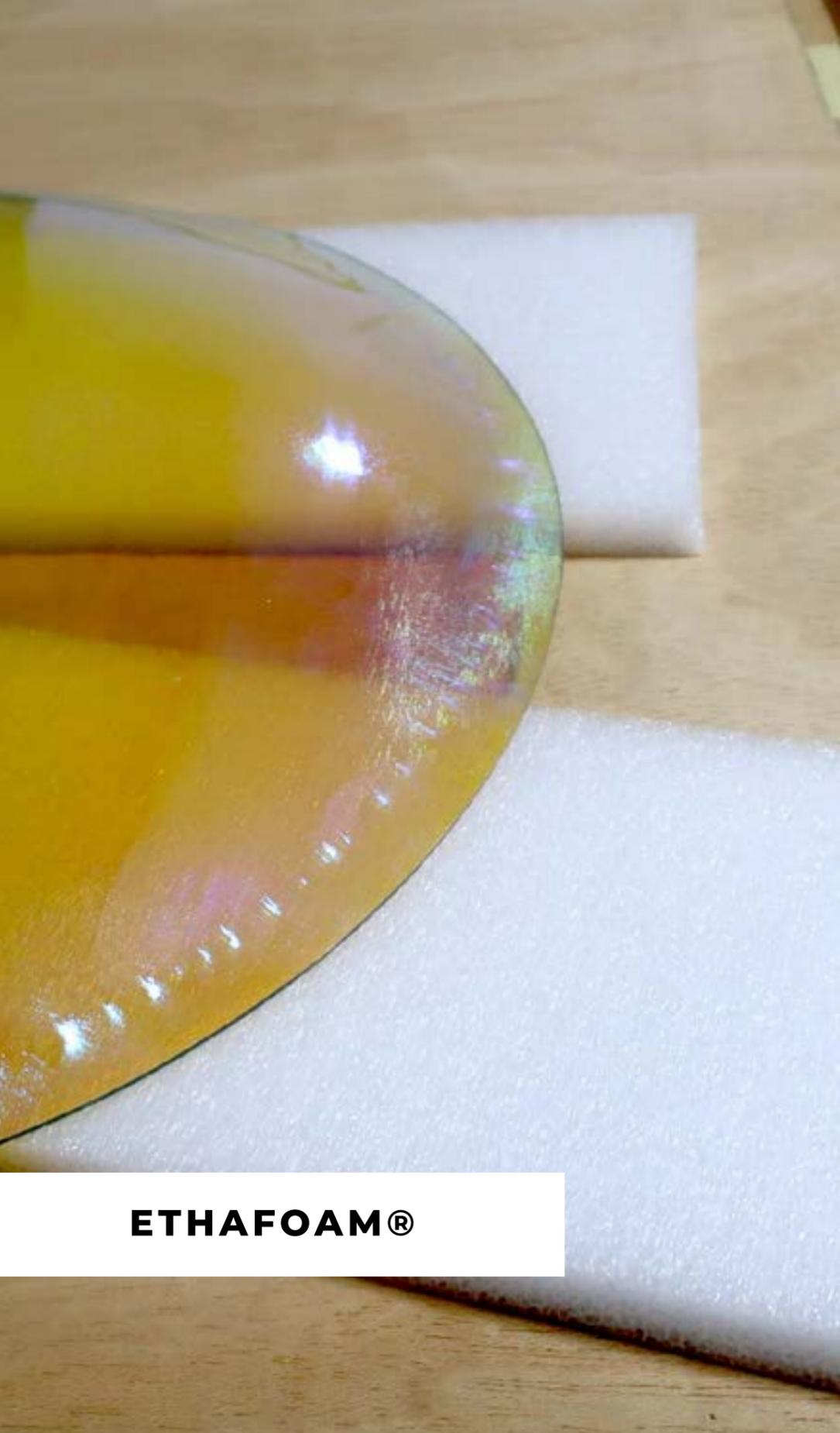
Healthy Seas initiative with Ghost Fishing volunteers recovered 4000 kg of discarded fishing nets made from Nylon 6, which were then recycled into fabric for fashion labels by the textile manufacturer Aquafil.

[Learn more here](#)

Not sure if nylon recycling is available in your area? Ask your Ki Coach or check the Ki Port!

Try this alternative for Tyvek® and tell us what you think!

[Share with us by subscribing to Ki Futures](#)



ETHAFOAM®

POLYTHEYLENE FOAM

Low density polyethylene (LDPE) foams, such as Ethafoam®, are closed-cell, non-crosslinked, and petroleum-based. This type of foam is known for being lightweight and inert with a smooth surface, making it both easy to fabricate and resilient to chemicals. It is sold in the form of planks and sheeting for packing and archival storage of cultural heritage artifacts.

While many of these properties make the material itself sustainable, the fact that it cannot be recycled and that it is petroleum-based means that we are still looking for ways to green our Ethafoam® use.

REUSE

- Upcycle used Ethafoam® by cutting and adhering clean Ethafoam® scraps together with hot glue
- Cover the surface of dirty Ethafoam® with a barrier material, such as Tyvek®, Mylar® or even reusable, sustainable textile and keep using



KI FACT

Sealed Air's Closed-Loop Recycling System

Sealed Air, a packaging solutions company, promotes a non-crosslinked foam, which means it is theoretically endlessly recyclable!²⁰

With Sealed Air's Closed-Loop Recycling program, they reprocess 35 million lbs of recycled PE globally per year! That saves 27 million pounds of CO₂, (=12.247 metric tonnes!) which is the equivalent of 2,646 passenger vehicles driven for one year!²¹

KI ACTION

Tyvek® Pillow

Create your own support cushion. Sew together used Tyvek® or fill an old pillowcase with foam cutoffs to create customized shapes and sizes.

[Learn how to make your own here](#)



POLYTHEYLENE FOAM

SUSTAINABLE CHOICES

Although LDPE recycling isn't as commonplace as we'd like, we can reduce the amount of virgin plastic entering our waste streams by purchasing polyethylene foam with recycled content. Ethafoam® HRC (High Recycled Content), for example, is produced with a minimum of 65% recycled content.²²

We're hoping biobased polyethylene foams become available on the market soon! Biobased LDPE foam, which retains the same physical properties as standard LDPE foam, is manufactured with ethanol derived from renewable resources (known as feedstock), such as sugar cane or beet root.²³



KI VISION

Find polyethylene foam products that are readily available in your area. Transporting these products over long distances contributes to greenhouse gas emissions!

ALTERNATIVE OPTIONS

Alternative materials with similar physical properties to PE foam are available, but may not be archival or appropriate for use in cultural heritage.



KI FACT

The renewable feedstocks (sugar cane, beet root) used in the production of biobased plastics are not without drawbacks. Agricultural land necessary for these crops utilize pesticides and may contribute to deforestation.²⁴

ETHAFOAM®



PLASTAZOTE® / EVAZOTE®

POLYETHYLENE AND VINYL ACETATE FOAMS

Plastazote®, a closed-cell, low density polyethylene foam, is used in collections care for display, transportation and archival storage. Closed-cell usually means non-renewable – which means that there are no circular options for making new foam out of it.

Downcycling of these foams is theoretically possible. Schmitz B.V. offers recycling of closed cell cross-linked polyethylene (located in the Netherlands and the United States).

KI VISION

Evazote® is a softer, tougher and more resilient alternative. It comes in High VA (vinyl acetate) content or Low VA content. By using more durable products, we produce less waste than when we use materials we have to frequently replace.



KI FACT

The durability of Plastazote® reduces the demand for new packaging, however the process of re-melting and re-forming crosslinked polymers is energy intensive. Shredding or pellet production are more efficient recycling measures.

KI ACTION

Check out our Alternative Materials pages for more ideas on sustainable packing options!

[Alternative Materials](#)



STYROFOAM™

POLYSTYRENE

No matter how bad of a rep polystyrene has, this lightweight, petroleum-based extruded plastic continually finds its way into our institutions. So what can we do with polystyrene after its use?

ALTERNATIVE OPTIONS

The packaging and food industries have begun introducing environmentally friendly packaging alternatives to the market, such as air cushions and biodegradable materials. Some brands of insulated box liners may serve as a sustainable alternatives, but require further testing for artwork safety.²⁵

Try using paper honeycomb for stronger corner protection. This can potentially replace polystyrene, foam and corrugated materials!

[More about paper honeycomb here](#)



KI FACT

The decomposition rate of Styrofoam is unknown, with some estimates of 500 years!²⁶ When heated or exposed to sunlight, Styrofoam releases toxic chemicals and contaminants that are hazardous to health. It is one of the worst types of waste to impact our ecological system!²⁷

[Learn more here](#)



KI VISION

Some businesses collect Styrofoam for reuse and recycling. Check with local packaging stores in your area, such as UPS and FedEx. Most will accept Styrofoam pellets for reuse. This map may help you find facilities in your area.

[View the map here](#)



**MYLAR® / MELINEX®
/ HOSTAPHAN®**

PLASTIC FILMS

Beloved in cultural heritage because of their high tensile strength, low gas permeability and moisture resistance, these thin transparent films made from polyester (BoPET) are not recyclable because they cause damage to sorting machinery at recycling facilities.

Until these materials can be recycled, our only course of action is to try and reduce our use of BoPET films. Here are some alternatives and options!

ALTERNATIVE OPTIONS

- Bio-based plastic films such as Natureflex™, are thermoplastic clear films made from cellulose and are compostable both at home and industrial composts.²⁸
- PLA films are also clear and thermoplastic, but require industrial composting to decompose.²⁹

[Learn more about Natureflex here](#)

[Learn more about PLA films here](#)



KI VISION

Bio-based pastics, including PLA films, have not yet been thoroughly tested for all applications in cultural heritage. Research opportunity here!



KI FACT

Share your tips on reducing the use of plastic films with the Ki Community and connect with other institutions minimizing their synthetic waste in your area through Ki Futures!

[Subscribe to Ki Futures](#)



BUBBLE WRAP

Chances are you've come across bubble wrap at some point in a museum or depot. Made with LDPE film, bubble wrap isn't typically curbside recyclable for the same reason as plastic films - it can damage the machinery in the recycling facility.

Luckily there are a few alternatives to bubble wrap that we can use! And in cases where LDPE bubble wrap is unavoidable, there are greener versions made with recycled content.

ALTERNATIVE OPTIONS

- Recycled content bubble wrap is offered by many manufacturers at up to 90% RC
- Sealed Air offers a take back program for bubble wrap. Information on viable recycling centers for all of their products is available on their website
- Air pillows are great alternatives - find methods and instructions on how to make your own
- Switch out your plastic for paper! You can use shredded cardboard or heavy paper to cushion your objects while in transit



KI TIP

Packing materials are now being made from all kinds of alternative materials and byproducts such as paper and cornstarch. Plant based options including fungus³⁰ and even seaweed!³¹

Don't pop those bubbles!! Bubble wrap was intended for multiple uses, so reuse or repurpose bubble wrap as many times as possible!



KI VISION

Do you already collect discarded plastic bags for recycling? Bubble wrap can be collected along with plastic bags and dropped off at plastic bag recycling centers.

[Learn more on Sealed Air website](#)

[Learn more about air pillows here](#)



STRETCH WRAP

We typically find stretch wrap around pallets, packages, crates, and occasionally wrapped around already encased objects. Made from either low-density polyethylene or polyvinyl chloride, this plastic film isn't curbside recyclable.

Reusing stretch wrap is a challenge, but what about **refusing** stretch wrap? Ask yourself: what are you using it for? Do you really need it?

ALTERNATIVE OPTIONS

Reusable tension belts can reduce the need for stretch wrap for transport purposes. Reusable plastic sheeting for protection against the elements can also help reduce the amount of stretch wrap that ends up as waste. This reusable pallet wrap could replace stretch wrap for transport.

Bioplastic PLA stretch wrap could also be a great alternative - just make sure it is properly disposed of so it goes to industrial composting!



KI FACT

Implementing reusable alternatives or forgoing stretch wrap entirely minimizes the single use plastic items that easily end up in the ocean, where they can have devastating effects on animals and ecosystems through entanglement and ingestion.³²

Think of the turtles next time and ask yourself again if you really need to use that plastic wrap.

[View reusable palette wrap here](#)

We want to hear from you! Share how you are refusing or reducing your stretch wrap usage!

[Subscribe to Ki Futures here](#)



PACKING TAPE

We use synthetic packing tapes, comprising either polyester or polypropylene backing with pressure sensitive adhesive (typically acrylic), in conjunction with dissimilar packing materials.

Mixed polymers tapes may not be accepted by your local recycling center - ask your Ki Coach to find out if it is or not!

ALTERNATIVE OPTIONS

Use packing tapes with natural paper backing and biodegradable adhesives to reduce synthetic packing tape waste. Or, consider switching to cloth strapping or tension belts that can be safely secured with buckles.

- Packing tape with natural paper backing and biodegradable/ natural adhesives
- Water activated tapes (gummed tape) with paper backing starch adhesive



KI FACT

Products consisting of two or more different types of plastics are not typically recyclable because the differing materials will contaminate the plastic recycling streams, which are intended for singular types of plastic.³³

KI ACTION

Rethink!

Can you replace tape with reusable ties or clips?

Packing tape with paper backing

Water Activated Tape

ACRYLIC/PMMA

Acrylic (PMMA or poly(methyl methacrylate)) is a thermoplastic known by many names, but is most commonly referred to as ACRYLITE® or PLEXIGLAS® and is most often encountered as a replacement for glass in vitrines and framed works, as well as for object stands and mounts.

Whether or not acrylic is sustainable is controversial. While it's petroleum-based and prone to scratching, it serves as a shatter-proof and lighter weight option to glass. PMMA is 100% recyclable, however, it is not commonly collected for recycling as it requires a special recycling program.

REDUCING WASTE

Acrylic glazing and sheeting is highly susceptible to scratching and ghosting. To prevent these damages, consider storing excess acrylic in painting racks with protective barriers (interleaving)!

Additionally, see if any local institutions would benefit from borrowing your custom vitrines.



KI VISION

Consultation with experts reveals that acrylic is an easy material to remold and extrude from recycled content. This makes it an excellent candidate for circular and zero waste efforts.

Given the current increased need for acrylic as a protective barrier, we see a market incentive on the horizon for recycling the material!

KI ACTION

Acrylic sheeting is great for helping evenly distribute weights across a flat surface. If you have sheets lying around, consider using them as a flat press to weight recently conserved artworks.

Share your creative solutions with us!

PLEXIGLAS® / ACRYLITE®

RECYCLING PLASTICS

Symbol	Polymer	Uses in Collection Care	Properties	Recyclable
	Polyethelene Terephthalate	MYLAR®	Clear, strong, lightweight	Yes, widely recycled, but films are not.
	High-Density Polyethylene	MYLAR®	Stiff and hardwearing	Not curbside. Look into recycling programs!
	Polyvinyl Chloride	Bubble Wrap	Can be rigid or soft	Often not recyclable due to chemical properties. Check with local recycling.
	Low-Density Polyethylene	Ethafoam®, Bubble Wrap, Packing Tape	Lightweight, low cost, versitle, fails under mechanical and thermal stress	Not curbside. Look into recycling programs!
	Polyproplene	Bottle Lids, Containers, Packing Tape	Tough and resistant. Effective barrier against water and chemicals	Often not recyclable. Avalible in some locations, check local recycling.
	Polystyrene	Styrofoam™	Lightweight, structurally weak, easily dispersed	Rarely recycled, but check with your local recycling first.
	Other plastics	PLEXIGLAS®	Clear, tough, scratch-prone	Not commonly recycled

RECYCLING

The numbers and symbols on plastic identify the type of plastic, and can also give us an indication if the material is recyclable or not. However, these regulations vary not only from country to country, and sometimes from city to city! So make sure to check with your Ki Coach on what can be recycled in your area!

Recycling is a last resort in the hierarchy of sustainable actions. But, because our use of synthetic materials is often unavoidable in cultural heritage, recycling is still important to reduce our overall impact.

[Subscribe to Ki Futures here](#)



KI FACT

Greenpeace released a comprehensive report in February 2020 entitled “Circular Claims Fall Flat” that found that PET #1 and HDPE #2 are likely to be recycled, PP #5 is rarely recycled, #3, #4, #6, #7 are effectively not recycled in the U.S.³⁴

MIXED WASTE

Many of these mixed waste materials seem like they should be recycled, but if we visit the 5 Rs - we know that first we should see if we can refuse, reduce, reuse or repurpose them! There are many exciting sustainable alternatives for mixed waste materials and plenty of options for reuse - from display to storage, not to mention these flat materials can be used over and over as extra support. And when you are done, see if you can donate the materials to other members of your community who have use for them!

Many mixed waste materials are composite materials - meaning that they contain more than one material. Foam board and plywood, for example, are made of sandwiched materials, some of which are harmful to the environment. If you must discard them, make sure you know their content so you can do so appropriately. For example, since adhesives aren't biodegradable, plywood cannot be composted.

But don't worry - we have some great sustainable ideas for all of these materials!

MIXED WASTE

Packaging, Storage & Transport

Click on the heading to skip ahead
to the information you need!

Foam Board

Composite Woods

Paper

Cardboard

FOAM BOARD

Most often used for mounting purposes, foam board is polyethylene foam sandwiched between two pieces of paper.

Because foam board combines two different materials, it cannot be recycled with either paper or LDPE and will likely end up incinerated or in the landfill.

ALTERNATIVE MATERIALS

Could you switch out foamboard for acid-free paperboard?

If paperboard isn't sturdy enough, try Falconboard! Check out the link below for more information.

[Find out more here](#)

Do you have other ideas for alternative materials? Let us know!

[Share your creative solutions with us!](#)



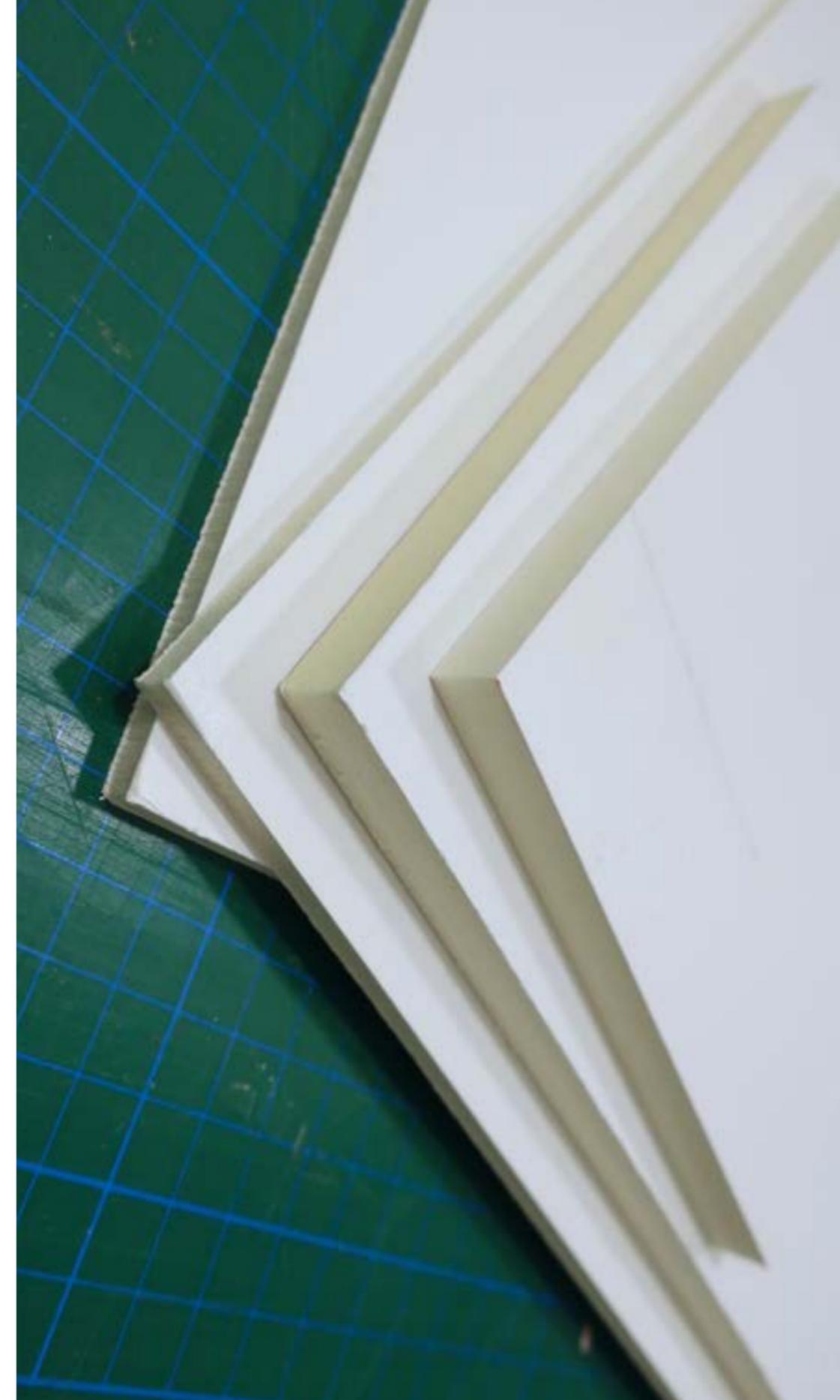
KI VISION

If possible, use products that are made from only one recyclable material, such as cardboard, to increase the likelihood of the material being recycled.



KI FACT

Products that combine two dissimilar materials are not recyclable because they contaminate recycling streams.



MDF / PLYWOOD / PARTICLE BOARD

Composite woods such as MDF (medium-density fiberboard), plywood, and particle board are usually made with synthetic binders and adhesives that not only emit VOCs, but also render the composite wood non-biodegradable.

ALTERNATIVE OPTIONS

Look for formaldehyde-free composite woods made with natural, biodegradable adhesives and binders or try to use plywood with soy-based adhesive. Particle board made from hemp and rice straw (which are renewable, and grow faster than wood) is making its way onto the market. Click on the headings to view these products.

Formaldehyde-free Composite Wood

Soy-based Adhesive Wood

Hemp Particle Board

Rice Straw Particle Board



KI FACT

Composite woods are often made with scrap wood and sawdust, which would otherwise go to waste. Donate discarded wood composite to local schools or community centers. Want to connect locally? Ask your Ki Coach for help in getting started!



KI TIP

When purchasing new wood is a must, try to buy wood with a third party forest certification, such as Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC), which ensures sustainable forest management.



KI VISION

While not curbside recyclable, Plywood (with natural adhesives) can be broken down with a shredding machine, which can then be implemented as mulch for landscaping and animal bedding.



PAPER

Paper is everywhere in our lives and our work and although it is often the easiest material to recycle, there is a limit to how many times paper can be recycled.

REUSING

Reusing and repurposing paper, potentially as a packing material, prolongs the life-cycle of the paper and reduces the energy consumption necessary for the recycling process.

RECYCLING

Paper can also become part of the circular economy! When paper reaches its limits in recycling (6-8 cycles) and if it is free from contaminants, such as toxic inks or coatings, the paper slurry can be repurposed in agriculture as a nutrient for crops.



KI VISION

Choosing paper without coatings and natural inks reduces the contaminants in the paper recycling stream.



KI FACT

Every ton of paper recycled saves 17 trees, 60,000 gallons of water, 225 kilowatt hours of electricity, 350 pounds of limestone, 275 pounds of sulphur, 9,000 pounds of steam, and 3.3 cubic yards of landfill airspace.³⁵

KI ACTION

Removing plastic tapes and labels from paper before tossing it in the recycling bin ensures that the paper will be properly sorted into the paper recycling stream.

[More about sustainable printing](#)



CARDBOARD

Cardboard is a straightforward material to curbside recycle as long as it's free from synthetic laminate, wax coatings, films, and tape, which contaminate the recycling stream.

But before tossing cardboard into the mixed paper recycling bin, could you potentially repurpose it as a packing material?

ALTERNATIVE OPTIONS

Turn your cardboard into packaging material by shredding it. Or reshape it using a perforator to create new boxes or storage containers!

Investing in a cardboard shredding and/or perforating machine will reduce cardboard waste at your institution while repurposing cardboard into packing materials, saving costs on both fronts!

[View products here](#)



KI FACT

Producing 1 ton of virgin cardboard requires 3 tons of trees.³⁶ Try to reuse and repurpose cardboard as much as possible to save trees!

Do you have a compost?

Uncontaminated cardboard can also be home composted.

[Find out about composting here](#)

KI ACTION

Cardboard is not very strong on its own but consider reusing cardboard in hybrid containers for transport. This method introduces wooden strips combined with cardboard walls to build a sturdy structure.

[Find out more here](#)



ALTERNATIVE MATERIALS

Artworks, artifacts and their accompanying components are often on the go in traveling exhibitions or as loans. Traditional packing materials such as fossil fuel derived foams and plastics can take hundreds of years to decompose. One way of reducing our consumption of synthetic materials in cultural heritage is thinking creatively and replacing these materials with biodegradable or compostable alternatives (if the circumstances allow, of course).

Some of these alternative materials are not archival and may not be suitable for use with cultural heritage objects or artifacts because of their hygroscopic nature, VOCs emissions, acidity, or susceptibility to attack from fungal molds and insects. But let's see what our options are!

ALTERNATIVE MATERIALS

Click on the heading to skip ahead to the information you need!

Types, Tips & Recycling Programs

**Corn Starch &
Paper Foam**

**Mycelium &
Bagasse**

**Paper &
Composite Natural
Fibers**

Wool Felt & Cork

PLA & PHA

CORN STARCH FOAM

You've probably come across this material as an eco-friendly version of packing peanuts. Corn starch foams are similar to extruded polystyrene, but are completely biodegradable within 60 days in moist soil. This lightweight material is extremely hygroscopic and has low compressive resilience, but can still find utility as a packing material.

Green Cell Foam offers corn starch foams in sheet form with PE films as a moisture barrier. While the PE films are not ideal, it's a good compromise to reduce the amount of eventual waste.



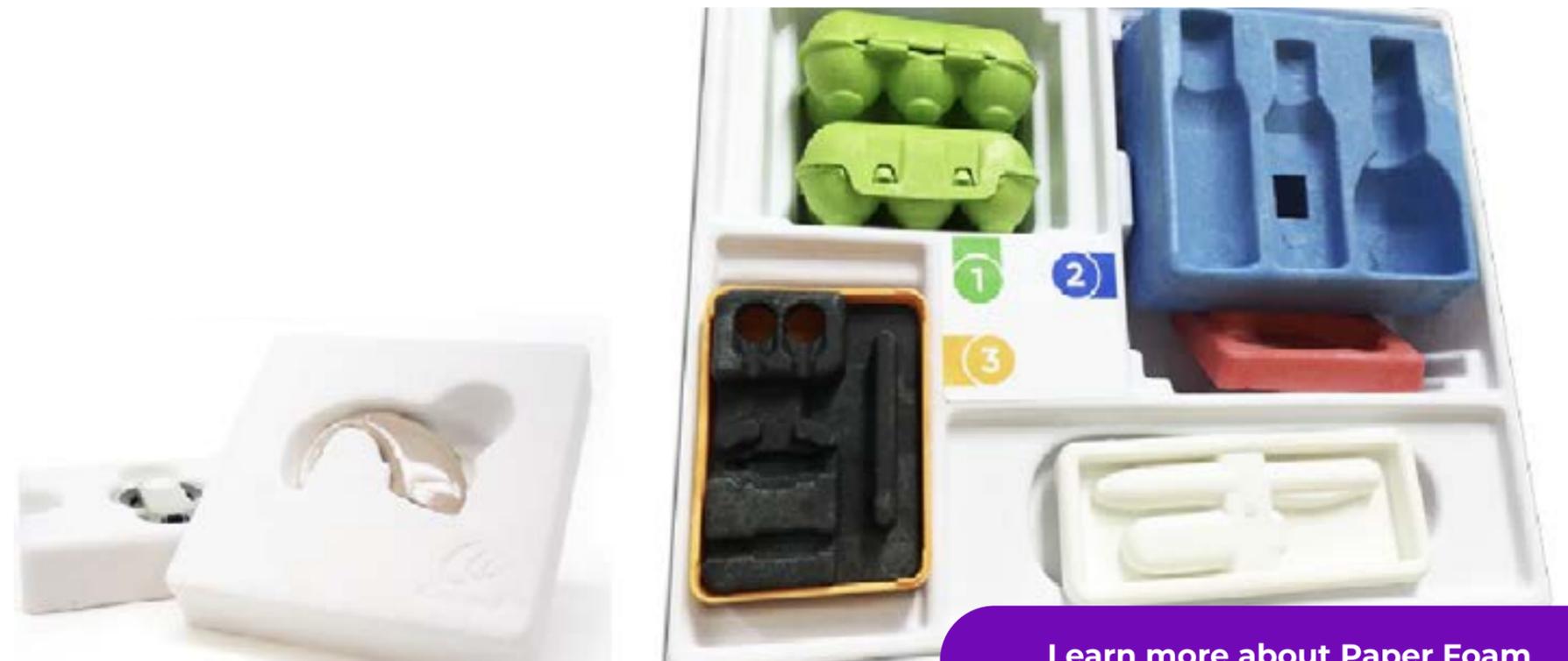
[Learn more about Green Cell Foam](#)

PAPERFOAM®

PaperFoam® is a unique thermoplastic starch foam made from renewable starch, cellulose fibers, natural binders, and water.

Manufactured with a low carbon footprint, PaperFoam® decomposes in weeks in both home or industrial composting or can be recycled with paper.

This lightweight material can be injection molded for customized forms and is impervious to humidity.



[Learn more about Paper Foam](#)

MYCELIUM

Mycelium, the fibrous component of fungi, can be grown in a controlled environment into a customized, durable packing material with high shock absorption. At the end of its life-cycle, mycelium is completely biodegradable in soil and water within 90 days and is additionally home and commercially compostable. You can even grow your own!

Mycelium is hygroscopic and will begin to degrade when exposed to moisture, however, there is a biobased waterproof coating in the works!



[Learn more about Mycelium here](#)

BAGASSE

A by-product of sugar cane, bagasse is a paper-like biodegradable and compostable non-flexible material that is very sturdy, and water repellent. In an industrial compost, Bagasse will compost in 45-60 days.

Bagasse is most often used for eco-friendly food containers, but perhaps we can find an application in our cultural heritage institutions? Great research topic idea!



[Learn more about Bagasse here](#)

PAPER

Although paper emits peroxides and acids, which can potentially damage objects, and is additionally hygroscopic, paper as a packing material has potential applications in short-term transport and temporary storage.

Perforated paper, paper bags filled with shredded scrap paper or standard craft paper and cardstock can be utilized in crates for short-term transport for objects and artifacts resistant to moisture and acidity. As always, try to use acid-free and uncoated paper with natural inks!



COMPOSITE NATURAL FIBERS

Cotton insulation is made from renewable and recycled resources and is biodegradable within months in a landfill. Similar to paper products, cotton is hygroscopic and should not come into prolonged contact with moisture sensitive materials.

Cotton insulation is typically marketed for eco-friendly construction. Check locally for composite cotton insulation in your region or ask your Ki Coach for help!



Subscribe to Ki Futures here

WOOL FELT

100% wool felt is a natural, renewable, and biodegradable material that has potential for use in short-term applications. Wool is hygroscopic and will release sulfur as it ages, making it potentially harmful to objects and artifacts.

KI ACTION

Use felt or cork instead of foam or Tyvek® to cover wooden slats used in exhibition installation and in-house transport of objects



CORK

Cork is a renewable, natural, biodegradable material that is hydrophobic and resistant to biological attack. But because cork contains lignin, it will emit VOCs as it ages and should be used with caution around susceptible cultural heritage objects and artifacts.



KI FACT

Much of the composite cork on the market is manufactured with synthetic adhesives or binders. Look for natural cork that is manufactured without synthetic adhesives or binders.



PLA

Poly(lactic acid) (PLA) is a biobased plastic derived either from plant starch or lactic acid monomers. Similar to polystyrene, expanded PLA foam is lightweight, retains its shape, provides high shock absorption and is resistant to moisture and biological attack.³⁷ PLA films have similar mechanical properties to PET.

PLA is marketed as compostable, but requires industrial composting or anaerobic digestion in order to break down into water, CO₂, and non-toxic by-products.

PHA

PHA (polyhydroxyalkanoates), a polyester derived from fermented sugar, is making its way to the forefront of biodegradable biobased plastics.³⁸

Expanded PHA is similar to polystyrene and has higher moisture barrier than other biodegradable foams. PHA will break down in both soil and aquatic environments, and is compostable in both home and industrial composting.

[Learn more about PHA here](#)



KI FACT

Because PLA so closely resembles petroleum-based plastics, it is often either mistakenly discarded into a plastic recycling stream, where it contaminates the recyclable plastics, or ends up in a landfill where it can't properly decompose.

Make sure an industrial compost that accepts PLA is available in your area before purchasing PLA products! Ask your Ki Coach for help finding a proper facility!

[Get help by subscribing to Ki Futures](#)



PACKING & TRANSPORT

The safety of art and artifacts is of utmost importance during storage and transport, but there is always potential to go more circular and design waste out of our crates. Rethinking and redesigning how we pack and transport art and artifacts can reduce the necessity for single-use synthetic packing materials and mitigate the amount of discarded waste we generate from transport.

As always, industry standards for packing artworks, objects, and artifacts should be considered.

PACKING & TRANSPORT

Crating, Solutions & Storage

Click on the heading to skip ahead
to the information you need!

Circular Crating

**Creative Packing
Solutions**

CIRCULAR CRATING

Using durable, reusable crates for fine art transport is a great circular solution to minimize the amount of wood waste generated from discarded crates. Fortunately, there are options on the market for sustainable crates which have a life-span of 25+ years and replaceable components!

KI VISION

When ordering wood crates is a must, make sure the wood is locally sourced and free from synthetic adhesives and coatings.

If you don't have room to store these crates for reuse, do you have a game plan for what you will do with them after? Can you donate them to a school? Are there companies in your area reusing wooden crates? Green Crates based in New York, for example, resells used fine art transport crates.

[Find out more about Green Crates](#)

[Find out more about ROKBOX](#)

[Find out more about Turtle](#)

ROKBOX

ROKBOX is a durable and reusable crate made from medium density polyethylene with medical grade silicone foam interior, offered in two sizes and available for purchase or rent worldwide.

All ROKBOX purchases are carbon neutral at delivery and ROKBOX will recycle all recyclable components of a ROKBOX crate at the end of its lifecycle. A reusable crate in lieu of wooden crates over the course of 15 years can save your institution up to 60,000 euros!



Photo by Rokbox, 2020, <https://rok-box.com>

TURTLE®

Turtle® is a durable and reusable climate crate. Made from impact-resistant polyester, Turtle Boxes come in two sizes and can either be purchased or rented from locations around the world.

Turtle® crates last at least two decades and the interior PU and Plastzote foam padding is replaceable to extend the life of the outer shell of the crate even further. In its lifetime the Turtle® crate can save up to 40 trees from being cut down!

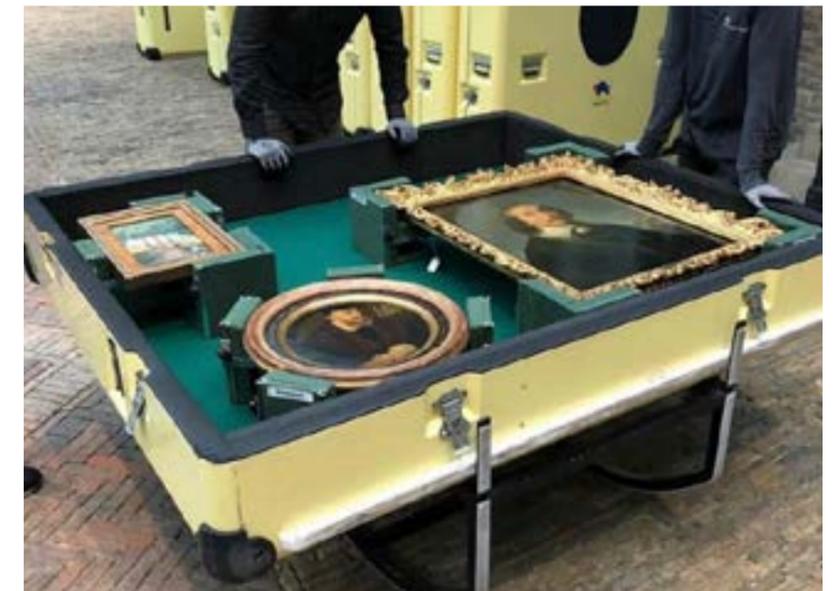


Photo by Turtlebox press kit, 2020, <https://turtlebox.com>

CREATIVE PACKING SOLUTIONS

Mechanically securing objects and buffering vibration and shock with reusable dampers and metal springs instead of encasing objects with packing foam reduces our consumption of these often single use, disposable materials.



KI STUDY

In packing of over 400 individual objects comprising Olafur Eliasson's Model room for both transport and long-term storage, Moderne Museet in Stockholm Sweden employed the use of hinged archival paperboard to secure the objects inside archival cartons.

Mechanically securing objects with reusable tension straps can reduce the amount of synthetic packing materials in transport and storage.



KI TIP

Only use crates that can be completely disassembled to reduce storage space and increase the likelihood of reuse.

Can your institution standardize various crate sizes with interchangeable crate walls?



HOW-TO GUIDES

Our How-To Guides walk you through the process of leading the charge in achieving sustainability goals in your workplace. Interested in figuring out the amount of waste your institution is generating? Check out our guide on conducting a Waste Audit. How about encouraging thoughtful sustainability practices and inspiring others to help reduce waste and start recycling? Then our Communicating Sustainability Guide is the tool for you. And make sure to join Ki Futures to share your results and successes with the Ki Community!

HOW-TO GUIDES

Click on the heading to skip ahead
to the information you need!

Reporting, Auditing & Communicating

Waste Audit

Auditing

**Analysing the
Results**

Waste Reporting

**Communicating
Sustainability**



WASTE AUDIT

Waste audits are a good starting point for understanding your waste issues. Monitoring and measuring what your organization is disposing can be done by sorting through your waste to classify, record and analyze the composition of materials that are commonly thrown away in order to improve recycling options or encourage reuse.

WASTE BENEFIT ANALYSIS

You can't monitor what you don't measure!
Here are some benefits of doing a waste audit:

- Identify the main waste streams your organization produces
- Highlight locations where particular materials are used
- Identify items for reuse/recycle
- Creating a baseline for recycling targets helps your bottom line
- Reduce use of raw materials



KI STUDY

National Galleries of Scotland

Over the course of 2 months, the museum performed a waste audit and communications campaign.

The result was a 48% reduction of carbon emissions from waste from the previous year. A major contributor was introducing dedicated food waste bins. Way to go, NGS!

KI ACTION

Safety first!

Prepare a Health & Safety Risk Assessment. This should include wearing PPE (personal protective equipment), a space to lay out waste, identifying any heavy lifting involved, and methods for removing waste from bins.

WASTE AUDIT

WHO'S INVOLVED?

Getting all staff involved is important, but here some of the key players:

- Facilities managers - to help understand your waste management policies
- Waste Management Company - may offer a waste audit
- Cleaners - discuss a schedule about emptying bins during audit
- Health and Safety Officer- for risk assessment planning
- Helpers - this is a great chance to build up your team and recruit new Ki Champions!

LAY SOME GROUNDWORK

- Identify most-used bins for auditing
- Set a schedule! Monthly or quarterly?
- Be sneaky! Don't tell your colleagues which day you're doing this, so habits are consistent with regular waste flow
- Choose a type of Waste Audit
- Design a template for data collection based on number or weight of items

TYPES OF WASTE AUDIT

Decide what kind of audit is right for your organization

Type of Audit	Pros:	Cons:
Procurement Audit	Financial benefit	Focus on specific items instead of overall waste
Light Touch	Easy to do, with no preparation	No quantifiable evidence to set goals and targets
Recycling Audit	Improve recycling rates and reduce general waste	Doesn't eliminate landfill waste
Deep Dive	Measures full quantity to work toward reduction	Messy and time consuming



AUDITING

WHAT'S IN YOUR TOOLBOX?

- Tarpaulin
- Paper/Pen/Clipboard
- Measuring scale or weighing device
- Gloves - Use reusable gloves such as Nitrile Coated Nylon
- Paper Towels
- Camera



KI STUDY

The Children's Discovery Museum partnered with the City of San Jose, CA (USA) to work on a Zero Waste toolkit.

This goes to show you don't need to be a big museum to make a big impact and form local partnerships!

[Learn more here](#)

STEP-BY-STEP

1. Collect trash bins from various areas of the building
2. Weigh total amount of waste in each bin for each location
3. Separate out each bin into different items e.g. cardboard, paper, tin cans, plastic containers, etc.
4. Record the weight or quantity of each type of waste in the bin
5. Take pictures for record keeping
6. Clean up and properly dispose of waste
7. Log all results on a spreadsheet so that you can continue analysis at your next scheduled audit date



KI FACT

While recycling is thought to be a great solution for keeping plastics out of landfill, in reality only 9% of plastics are recycled!



ANALYZING THE RESULTS

QUESTIONS TO ASK YOURSELF

- What items were most common?
- What items could be reused? Are there reusable or more sustainable alternatives available?
- Does the location of the bins play a role?
- Are there signs posted or other communications to improve and encourage proper disposal and good waste habits?
- Depending on these results - set small incremental targets for your organization to start being greener today!

KI VISION

Most cultural professionals are not aware of Waste Management Policies at work - or if there are any. But this is a great way to prioritize sustainability practice and proper material disposal... in writing!

Consider creating or reviewing this document to set standards for a sustainable workplace.

COMMUNICATIONS

Who are you communicating with?

All staff, department, visitors?

What are you trying to communicate?

And how are you communicating? Are you using targets and goals or more narrative?

Where are you communicating?

E-mail, in-person, staff briefings, posters with graphics?

Are there barriers?

Consider cultural, economic, and physical obstacles. For more ideas on effective communication strategies, check out our guides in the Ki Toolkit on the Ki Port!

[Subscribe for access to our Toolkit!](#)



KI FACT

About one-third of an average landfill's waste is made up of packaging material.

Do your part to reduce this by monitoring your waste and choosing more sustainable alternatives. Every little bit counts - together we can all make a big difference!



WASTE REPORTING

SCOPE OUT THE PROBLEM

Carbon emissions are broken down into three areas:

SCOPE 1 Direct GHG Emissions

e.g. Fuel combustion, company vehicles, fugitive emissions (accidental gas or vapor emissions, usually from leaks or industry)

SCOPE 2 Indirect GHG Emissions

e.g. Purchased electricity, heat and steam

SCOPE 3 Indirect GHG Emissions from Organizational Activities

e.g. Waste disposal, purchased goods and services, business travel, employee commuting, use of sold products, transportation and distribution (up- and downstream), investments, leased assets and franchises³⁹

KNOW YOUR CARBON FOOTPRINT

Many businesses are required to report the amount of greenhouse gas (GHG) emissions created by their waste. Check to see if this applies to you by looking at local and national requirements.

The Greenhouse Gas Protocol set the standards for measuring and managing GHG emissions. This standardized framework is used globally and covers all carbon emissions, including waste.⁴⁰

Check out our Energy Ki Book for more information about carbon footprint and emission reductions!

[View the Energy Ki Book Here](#)

COMMUNICATING SUSTAINABILITY



Proper waste disposal can be difficult and confusing. How do you know which bin to put what in!? And how do we properly dispose of toxic materials like solvents and paints? Is it ever ok to just pour them down the drain?

Education on material disposal and hazardous waste is crucial to ensure sustainable practice. A great way to communicate the importance of waste management and reduction with our colleagues is through signage, verbal reminders, and involving them in sustainable initiatives.

SIGNAGE

Online resources are helpful, but even an more effective way of engaging our coworkers is to be direct - talk about it constantly! Gentle reminders and fun facts keep sustainability a hot topic of conversation. This is especially important when new colleagues join the team who may be unaware of your institutions policies and local disposal regulations.

Effective signage could include statistics about waste or tips about proper disposal. Asserting being green as a social norm can be a beneficial way to promote change! Check out the Ki Toolbox for Ki signage you can use in your institution!

[Subscribe for access to our Toolkit!](#)



KI STUDY

At Ki Culture, we are working to create **duplicable exhibitions about various sustainability topics that can be freely used by museums across the globe. It is our goal that in 5 years, every cultural organization has an exhibit about sustainability for their audiences to enjoy!**

In 2018 the V&A hosted an exhibition titled "Fashioned From Nature" about innovative and sustainable fashion. Making sustainable exhibits about sustainability can have a positive social impact and spark dialogue.⁴¹



KI VISION

To date, there are many different cultural heritage material databases. However, they need to be merged in order for us to all get on the same page. CAMEO is currently working on this.

[Check out their progress here](#)

WHAT'S NEXT?

Thank you for joining us in making culture sustainable! We hope that you found the first edition of **Waste & Materials - Collections Care: Packing, Storage, and Transport** helpful! We will continue to update this Ki Book with new ideas, information and all the latest so you can always be up to date and find new actions. Stay tuned for our next volume focusing on front of house solutions - cafeteria, museum shop, office, and consumer waste and materials.

If you are interested in finding out more ways you can improve your sustainable practices, check out our **Social Sustainability** and **Energy** Ki Books!

And if you are looking for additional support, tools and resources, as well as a global network, take another step forward in your sustainability journey by joining our **Ki Futures** Program!

GLOSSARY

Biobased: Products and materials that are composed, in whole or in significant part, of biological materials, including renewable agricultural or forestry materials.

Bioplastics: Plastics made from renewable materials such as corn starch, recycled food waste and biopolymers. Biodegradable plastics, on the other hand, refer to petroleum-based plastics that are combined with an additive that makes them break down quickly.

Biodegradable: a material's ability to break down and decompose over time. Many plastics are "biodegradable," but require hundreds of years. They can still be considered biodegradable!

Biological Attack: When a material is compromised by either fungal/plant growth or animal/insect infestation.

Biologically Active Landfills using Anaerobic Digesters: A biologically active landfill (aka - bioreactor landfill) using anaerobic digesters is a municipal solid waste landfill in which liquids are added to help bacteria break down the waste. In an anaerobic bioreactor landfill, biodegradation occurs in the absence of oxygen (anaerobically) and produces landfill gas. Landfill gas - primarily methane - can be captured to minimize greenhouse gas emissions and can be used for energy projects.

Biopolymer: Polymers produced by living organisms in nature and are chemically synthesized into

materials. Examples include Polylactic acid (PLA) and Polyhydroxyalkanoates (PHA) used to make bioplastics.

BoPET (biaxially-oriented polyethylene terephthalate): A polyester film made from polyethylene terephthalate (PETE). This film is often referred to by its brand names, including Mylar®, Melinex® and Hotsaphan®.

Circular Economy: A system designed to eliminate waste and the consumption of resources. It is based on the principles of designing out waste and pollution, keeping products and materials in use for as long as possible and regenerating natural systems. This system is in contrast to the traditional Linear Economy, which emphasizes the production, sale and eventual disposal of as many products as possible.

Composting: The decomposition of organic materials. This process takes place in homes and industrial composting plants, where controlled conditions (e.g. temperature, humidity, aeration) are given. Microbes, including bacteria or fungi and their enzymes, "eat" the compostable material as a source of nutrition. The resulting end products are water, carbon dioxide, CO₂ and biomass. It is important to note that while all compostable materials are biodegradable, not all biodegradable materials are compostable.

Compostable: Organic materials (food, paper-based, or wood-based) that decompose naturally

under either aerobic or anaerobic conditions. Other materials that are certified compostable require specific conditions to decompose, which is why you can't simply throw them in your backyard compost.

- **Aerobic Composting:** Aerobic composting refers to the decomposition of organic materials through the use of microorganisms that require oxygen. This process results in the production of carbon dioxide, ammonia, water, heat, and organic matter (compost).
- **Anaerobic Composting:** Anaerobic composting refers to the decomposition of organic materials through the use of organisms that do not require oxygen. This process results in the production of methane gas, strong odours, and a small amount of heat. This process typically takes longer than aerobic composting, due to the lack of heat produced.
- **Certified Compostable Products and BPI Certified Compostable:** Standards developed by ASTM International and the Biodegradable Products Institute to prove that a material decomposes without the production of synthetic residues.
- **Industrial composting:** Industrial composting, also referred to as commercial composting, is a controlled, biotechnological process for transforming biodegradable waste of biological origin into stable, sanitized products to be used in agriculture. Industrial composting

facilities assure optimal process conditions, fast degradation, good emission control and good compost quality.

Home Composting: Home composting involves small-scale composting of household organic waste inside of people's backyards or houses:

- **Compost Bin:** Composting bins enable people to compost their household organic waste. These bins are designed to allow plenty of air circulation, facilitating the aerobic composting process.
- **Compost Pit:** Compost pits are used by people to compost their household organic waste. After organic waste is buried in these outdoor pits, anaerobic microorganisms will gradually decompose the organic material over the course of a few months.
- **Vermicomposting:** This composting process refers to the use of earthworms to convert organic waste into organic matter (vermicompost). This process is typically faster than other composting methods, and has become popular with individuals and industrial composting facilities.

Ethylene Vinyl Acetate Foam (EVA): A closed cell foam often used in packing and transport of artworks and commercially used to make exercise mats and other sports equipment.

Greenhouse Gas: Greenhouse Gas (GHG) are gases in the Earth's atmosphere that prevent heat from escaping and are the leading cause of climate change.

High-Density Polyethylene (HDPE): A rigid and resilient thermoplastic polymer produced from the monomer ethylene, typically used to make consumer products like milk jugs, as well as spunbond to make Tyvek®.

Hygroscopic: A material's ability to absorb moisture from the surrounding environment.

Landfill: An area of land designated for the disposal of solid or hazardous waste. Once waste enters a landfill, different chemical, biological and physical processes take place that enable the waste to degrade. When plastics (including biodegradable plastics) are sent to landfill, they release methane gas, a pollutant many times more harmful than carbon dioxide gas.

- **Construction and Demolition Waste Landfill:** Landfills that receive debris generated during construction, renovation and demolition activities. These landfills often work as material recovery facilities, as this type of material can often be sorted and reused.
- **Hazardous Waste Landfill:** Landfills designed specifically for the disposal of hazardous waste. These landfills prevent hazardous materials from escaping into the atmosphere or seeping into the soil or water.
- **Industrial Waste Landfill:** Any non-municipal landfill used to dispose of non-hazardous industrial and commercial waste.
- **Incinerated:** A high-temperature waste treatment process that involves the combustion of waste materials which converts them to ash, gas and heat.
- **Landfill leachate:** Leachate is a liquid with suspended solids that is formed through the degradation of organic and inorganic materials. It can contain both organic and inorganic pollutants, including pesticides and heavy metals, which are extremely toxic to humans and the environment.
- **Municipal Solid Waste (MSW) Landfill:** Landfills that receive and process household garbage. These landfills are constricted with flexible composite liners and compacted clay soil to

reduce water and soil pollution. Some household materials (including paints, cleaners, and batteries) cannot be disposed of in MSW landfills.

- **Sanitary landfill:** Landfills that isolate waste from the environment until it has decomposed into biologically and chemically inert materials. Sanitary landfills prevent potentially hazardous substances, gas, and leachate from leaching into the environment.

Life Cycle Assessment (LCA): A technique to assess the entire carbon footprint of a product's life in all stages - from raw material extraction through recycling and disposal.

Low-density polyethylene (LDPE): A lightweight, flexible, and chemically inert thermoplastic that is closed-cell, non-crosslinked, and petroleum-based. Common products made from LDPE include Ethafoam®, bubble wrap, shrink wrap and some plastic bags. LDPE is often difficult to recycle and is not generally accepted by city/municipal recycling programs.

Marine Degradable: Materials that are designed to biodegrade under marine environmental conditions within four to six months, without producing any toxic substances.

Methane Gas: Methane is a colorless, odorless gas that occurs in nature. It is also a natural byproduct of the decomposition of organic materials in landfills. Once anaerobic conditions are established, methane producing bacteria will begin to decompose the waste, generating methane gas through the process of methanogenesis.

- **Collection of Methane Gas from Landfill:** Methane is a potent greenhouse gas that can negatively impact the Earth's environment, contributing to global warming and climate change. In order to combat this, landfills can collect their methane and convert it into a renewable energy source.

Polystyrene: A synthetic hydrocarbon polymer. It is one of the most commonly used plastics, and is often used to create protective packaging materials including packing peanuts, as well as foam cups and disposable cutlery.

Recycling: Converting waste into reusable material. Recyclable materials are treated using a variety of industrial processes and are then reused in different capacities. This means that energy is consumed and carbon is produced in the process of forming new products, so it is a last resort method of disposal.

- **Contaminated:** When the recycling capabilities of a homogenous material are compromised by a dissimilar material.
- **Curbside Recyclable:** Curbside collection is a municipal service provided to many households in urban and suburban areas with the purpose of collecting and disposing household garbage, recycling, and compost. Many municipalities have strict rules regarding what materials are and are not curbside recyclable. Some of the materials that are not accepted include styrofoam, bubble wrap, grocery bags, batteries and cleaning products. It is important to refer to your municipalities' guidelines as many products do not qualify for curbside recycling collection, even if they're made from recyclable materials.
- **Downcycling:** This process helps eliminate the consumption of new resources and production of new products by extending the life of the original material through recycling, however, the recycled material is of lower quality than the original. This is typically what happens to plastics. This process is in contrast to Upcycling, where materials are transformed into a new product of higher value.
- **Recycled Content (RC):** Refers to materials that are manufactured with a certain percentage of recycled material, which is diverted from other waste streams.

Renewable Feedstock: Chemicals and raw materials which are made from renewable (ie. plant-based) sources, rather than other, equivalent chemicals originating from petrochemical sources.

Thermoplastic: A polymer that becomes pliable or moldable at a certain elevated temperature and solidifies upon cooling.

Tyvek®: A synthetic material made from high-density, spunbond polyethylene fibers. It is lightweight, durable and breathable, yet resistant to water and abrasion.

Volatile Organic Compounds (VOCs): VOCs are organic compounds that have a high vapor pressure and a low boiling point. They are called "volatile" because these characteristics cause many molecules to evaporate from the compound and enter the surrounding air. Some VOCs can be quite harmful to certain materials, animal, and plant life.

Waste Audit: Sorting through waste in order to classify, record, and analyse the materials that are most disposed of in order to encourage reuse or improve recycling options.

- **Procurement Audit:** This uses an organization's purchase orders on particular items (e.g. single use plastics) to collate information on amounts (both quantity and price) being purchased over an annual timeframe. Collections and Finance departments can collaborate to identify recurring purchases which could be swapped for more reusable or sustainable options.
- **Light Touch:** A weekly visual inspection of the bins can give a quick indication of the most commonly seen items and which areas of the organisation are using them. This could be for an easy 'awareness' campaign to remind people to not print as much or to use reusable water bottles.

- **Recycling Audit:** If you are already recycling, this may be an option. Either ask your recycling company for a breakdown of the quantities/weights of recycling, or if you do the waste audit yourself, it will help identify items which could be swapped out for reusable ones.
- **Deep Dive:** This is a full audit of recycling and general waste bins in order to identify the main materials that might be going to landfill as well as the common recyclable items which could be swapped for reusable options. This involves collecting, sorting, and recording your organization's waste.

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