

RESOURCEFUL MATERIALS
A Critical Framework for Repurposing in Architecture – A
Method of Material Resourcefulness and Diverting Waste from
Landfills

by

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ABSTRACT

This thesis is an investigation into the use of unconventional materials in architecture – ones not typically used as building materials: repurposed items. A framework is established for how to select items for repurposing (in terms of recyclability, abundance, economy/culture and locality) and how to apply them (in terms of modification, labour, buildability, and elegance). This is accomplished by first examining the current practices of sustainability and ideas around how we interact with waste and efforts of diverting from the landfill. Repurposing offers a strategy of using unsustainable items that already exist, in a sustainable way so they do not continue to degrade our world and waste our resources. In a larger context, this thesis aims to change the conversation around waste and offer other ways to divert from landfills in all aspects our lives.

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CHAPTER 1: INTRODUCTION

There is no any one right answer of how to treat our world and its waste, but there are definitely wrong answers. There are also, right-for-right-now answers. Having different perspectives is valuable because it means there is possibility for different approaches of finding and creating good solutions for any situation. If people are given knowledge of the issues our planet and habitat are facing, it will generate a concern and understanding of what changes need to be made. Legislation can go a long way, but that only serves as a minimum standard. Focusing efforts on educating people *why* we need these legislations and changes can make a better impact. If there is allowance and encouragement to think outside the box, and to practice more sustainable living daily, we could come up with much more variety in terms of solutions for our world issues. Having different approaches will help us one day surpass the point of damaging our world, to one of contributing to it in a positive way.

Ideas about waste and how we deal with, and create materials and items are borrowed from McDonough and Braungart's *Cradle to Cradle* and *The Upcycle*, while Corson's *The Renovators Resource* provides examples of why and how we should choose to reuse over recycle. Ideas from Jarzabkowski and Pinch's *Sociomateriality is 'the New Black': accomplishing repurposing, reinscripting and repairing in context*, and Pinch and Bijker's *The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology might Benefit Each Other*, help to place us in beginning to understand the connections items have to the social realm. Material culture studies can be beneficial to the analytical process of an item too, from which a methodology has been provided by Prown's *Mind in Matter: An Introduction to Material Culture Theory and Method*. While there is an immense amount of literature, both in terms of sustainability of items and waste, and of the social role of items in daily life, this thesis just touches the tip of the iceberg for the sake of providing a preliminary structure for selecting and applying items to repurpose in architecture.

Relationship to Waste

Over production and over consumption has created a disposable culture mentality. Disposable culture generates massive amounts of waste through one-time use, 'disposable'

items. The overwhelming waste pool that continues to grow due to this culture is taking from our resources, while ruining our planet. For more information into disposable culture and waste contribution, refer to the appendix on page 89.

To regain control of our resources, we need to change our relationship with waste. Relearning the importance of reuse and acknowledging that our resources are not abundant is a step in the right direction. The next step is to expand the practice of reuse to that of repurposing. A life of resourcefulness (to use what you have, and to care for it like it is all we will have), will help change the nature of our waste problem. Learning to be inventive with our resources through repurposing will take that success even further by widening the possibilities of items and their application.

Sustainability

It is hard to doubt that the world is suffering from a climate crisis. Many human actions negatively contribute to climate change because of our carelessness with resources.¹ At our current rate “we produce millions of tons of solid residues that are burned or buried every day – with only a tiny percentage being recycled at present, despite all the serious environmental consequences.”²

Many of the environmental issues we are faced with today (rising water levels, acid rain, infertile soil, etc.) can be attributed to the nature of our human consumption.³ Our irresponsible methods of making and consuming, creates waste: solid waste, and off-gassing/pollution. These behaviours are creating (and have been for quite some time) climate change issues that are having compounding effects on our planet and its function:

This mindless consumption, this same thing that’s not making us happy, is also causing the degradation of our habitat. We can afford to have 350 parts per million of carbon dioxide in the atmosphere. We’re closing in on 400 parts per million. It’s caused by the burning of oil, by natural gas, of coal, of all the fuels that we use to power our consumer economy, to

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1. “The intertwined growth rate of our cities and industries and the depletion of our natural resources requires serious thought about how to sustainably develop the remaining stock of resources.” Jennifer Corson, *The Resourceful Renovator* (Toronto: Key Porter Books Limited, 2000), 47.
 2. Ibid.
 3. *Minimalism: A documentary about the important things*, Netflix, Directed by Matt D’Avella. 2016.

power the making of crap that we don't need.⁴

If this is not a reason to be more conscious of our impact, and consider the positive implications of reusing and repurposing the items we already have, then I do not know what is. There have been many views and approaches to sustainability in the past, in hopes to combat these rising numbers. Many of these strategies include the buzz word, 'green building.'

Green Building

There are different lines of thought when it comes to sustainability and green building. 'Green building' as a term has also acquired some of its own connotations. Some approach architecture in terms of materiality and others in term of energy. Looking at materiality, one could follow the line of thought that materials that are 'new' and advanced in technology will be more sustainable. This often results in composite materials, and if not used and conceived of responsibly they can be harmful to our environment too.

We're beginning to realize that "progress" has resulted in construction materials with high embodied energy, high maintenance requirements, short life spans, and which are often toxic and pollute the environment both during their production and during transport to building sites. The Rural Studio has led the way in the use of imaginative "earth-friendly" materials.⁵

Since we need to consider both materiality and energy (among many other things in design) we need to find a way for these things to work together. Creating 'new' materials could be problematic because if they might save in energy use in the building, but their production could be a harmful process, and the process of manufacturing could involve mixing raw materials, which makes that material difficult to recycle. Either way, the making of materials and items always means there is embodied energy involved.

'Green building' can be deceiving. It is easy to get caught up in new technology and how they can perform to save on things like energy, heating and water. Looking at the whole picture, one needs to consider how these new technologies, like everything else, effect the environment in their own production – rather than just looking at their

4. Ibid.

5. David Moos and Gail Trechsel, "Samuel Mockbee and the Rural Studio: Community Architecture," *Birmingham Museum of Art*, (Birmingham: Birmingham Museum of Art, 2003), 30.

performance after installation. Choosing buildings based on only how a new material performs during the life of the building neglects issues of embodied energy, which could dramatically outweigh any efficiencies during building life e.g. solar photovoltaic cells.⁶ Recyclability of these products can also pose an issue and need to be considered.

So there are many aspects of 'green' or sustainable building to take into account. Saving on embodied energy is definitely an advantage of reuse. "Green building" is commonly thought of as a noble venture in sustainable thinking for the built environment, but this approach requires many new materials, and results in much more waste of others – while reducing the production of waste seems to be a more impactful effort.⁷

Guy and Farmer distinguished different tendencies and approaches of "sustainable" architecture in their article *Reinterpreting Sustainable Architecture: The Place of Technology*. We should be aiming for a mix of these to achieve a more holistic approach that looks at all aspects that contribute to sustainability. Of course, you might not be able to achieve every piece of the sustainability puzzle every time, but understanding how each piece contributes is an important first step to making informed decisions in the efforts toward sustainable design.

Of the approaches Guy and Farmer outlined, the following constitute the most desirable aspects of each:⁸

Eco-technic: understanding material technical characteristics; its usage on a global scale.

Eco-centric: high priority of helping ecosystems blossom and working with them, not against.

Eco- aesthetic: creates in people the realization of their relationship to the world, nature and their waste.

6. Y. Sieffert, J.M. Huygen, and D. Daudon, "Sustainable Construction with Repurposed Materials in the Context of a Civil Engineering – Architecture Collaboration," *Journal of Cleaner Production* 67, no. 1 (2014): 126.

7. Ibid., 126.

8. Simon Guy and Graham Farmer, "Reinterpreting Sustainable Architecture: The Place of Technology," *Journal of Architectural Education* 54, no. 3 (2001): 141.

Eco-cultural: importance of cues from the climate for orientation strategies, and using tradition to inform design.

Eco-social: focus on the social through ideas of local and community independence.

Embodied Energy

One major advantage of choosing to reuse materials and items rather than recycling them is saving in embodied energy. Everything that has been made had to be processed in some way and this processing requires energy to be input; meaning all these things have “locked up energy.”⁹ Raw materials need to be harnessed and manipulated – possibly a number of times, in a number of ways – before an item is ready for its intended function. This means a lot of work, physical and/or mechanical, is invested into the making of things. Some things require more energy and effort than others. It all depends in the processes, materials, and labour teams involved. Considering the energy and resources that are contained in each item that already exists, it makes for a greater waste to not reuse the items we already have by throwing them into the landfill or recycling.¹⁰ This makes for an extra hidden value to reusing those items that one might not originally consider.¹¹ Choosing to recycle may be reusing the pieces or materials of the given item, but it is discounting the energy invested in its making, and requires extra energy to turn it into something new.¹² Embodied energy is an issue we need to think of when we are considering making items, buying items, and building spaces:

Sustainable architecture embraces far more than the energy efficiency of the building alone, encompassing the total relationship between a building and the process by which it is realized, including the manufacture and transportation of the building’s components, its consumption of energy, its form and siting, and finally, its ability to contribute to rather than destroy its environment over time.¹³

Meanings and Cycles

Reduce, reuse and recycle are common terms used in our culture in regards to how

9. Corson, *The Resourceful Renovator*, 3.

10. Ibid., 63.

11. Ibid., 4.

12. Ibid., 13.

13. Susan Piedmont-Palladino and Mark Alden Branch, *Devil’s Workshop: 25 years of Jersey Devil Architecture*, New York: Princeton Architectural Press, 1997, 12.

we should act responsibly towards our waste. These terms are used loosely and results in misleading many in believing there is not currently an issue with waste. Understanding these terms and their intentions will help place repurposing within the current practices. An example of how even natural cycles under stress can be harmful is provided in the appendix, on page 92.

Reduce: less consumption, less buying and therefore less waste.¹⁴

Reuse: using something over and over again for the same original intended function.¹⁵

Recycle: taking items and harnessing their raw materials to make into something new.¹⁶

The idea of downcycling put forth in *The Upcycle* is that of designing materials without a consideration about what its use will be after it is no longer needed and a critique of recycling processes. They speak about how society considers it “recycling” if the disposable plastic water bottle is turned into a carpet, or a sweater after its first use.¹⁷ The idea they are trying to get across is that it is not recycling but a downcycle. There was no positive original intent when the water bottle was empty that its next use will be a carpet. There was an issue of too many empty disposable water bottles, and someone found ‘another use’ for them by combining more materials with water bottles to create a carpet, for example. It is problematic because the chemicals used in the downcycle process are not safe and pollute our world further. It is also problematic because it inaccurately tells people that there is not a problem with their waste, because they can just ‘recycle’ it.

Upcycle: to put to use in a more substantial, longer lasting way than the original use

Repurposing is defined as using a waste material or one that is no longer used, and using it for something other than its intended use – reuse but for a new function.¹⁸

14. Sieffert, 127.

15. Ibid.

16. Ibid.

17. William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 58.

18. Sieffert, 127.

Misconceptions

With concern of climate change rising all the time, many are seeing the importance of recycling. Many of us know the phrase “reduce, reuse, recycle” as an attempt to instill in people an idea of how our relationship with waste should exist. The order to this phrase, “reduce, reuse, recycle,” is important to the idea: it is best to first avoid producing waste (reduce), but when it cannot be avoided it should be put to use again (reuse), and when it can no longer be used again, it should be recycled. This sounds like it makes sense, and it can begin to make people hold responsibility for the waste they create and feel better about having agency in disposing of it ‘properly.’ Knowledge that the things that are not reused or recycled are instead thrown into a landfill, and what this means for our environment, can become alarming. Throwing things into the landfill has been a ‘solution’ for waste for a long time. It seems obvious to us now that this does not make for a healthy environment, but it was not always known as a fact. When items are thrown into a landfill all together, organics cannot break down¹⁹ and non-organic items thrown into the landfill leach chemicals into the soil, air and water we count on as resources to survive and thrive.²⁰ Efforts to get people to ‘reduce, reuse, recycle’ are ones to divert waste from landfills.

Recycling Issues

As it turns out, not everything can be recycled, so it does not suffice as the last option for all items. There are issues with recycling that many do not understand, so their reliance on recycling as the last straw,²¹ is a false hope. To stop there and be satisfied with recycling as the last option to fall back on, and thinking that it is a good one might be a mistake. The idea of recycling in its current state needs some major improvements.²² There are many chemicals and glues that go into our items. Therefore, to recycle these items involves a chemical process in order to try to separate the materials in an effort to harness the raw elements that first went into the item.²³ This process of making and

19. McDonough, *Cradle to Cradle*, 55.

20. Jennifer Corson, *The Resourceful Renovator*, 37.

21. Hopefully there is a time where there be no more drinking-straws as they are a major waste of plastic.

22. McDonough, *Cradle to Cradle*, 56.

23. *Ibid.*, 57.

recycling with chemicals contaminates our environment because they are later dumped into our water.²⁴ Even if recycling did work for all items, is this what we want? We can do better.

McDonough and Braungart also have some conflicts with notions of simply reducing our waste and chemical use. They say, “even small amounts... over a longer period... [become] detrimental”²⁵ so we need to change what we are doing with our waste – change our processes – rather than how much waste we create. We need to know we can do more. Recycling could be an even better thing, if it were safe and well designed. Until then, our relationship with reuse should be expanded, since it is encouraged to be practiced before recycling anyway.

Although all efforts to avoid contributing to landfills are useful, they are not all equal. Reducing is good, but it is not possible in its entirety; if that were the case, we would all cease to exist. As pointed out previously, any small amounts of pollution and contamination to our environment is bad in the long run. We do not want to have to live a constant life of cutting back on all the things that make us happier and make our lives easier and worthwhile. Recycling in its current practice has many problems due to the chemicals used in items and the culture of disposableness. Reuse is a great option since the item already exists.

Point of View about Recycling and Intention for Resources

The caution that needs to be given in recycling is the motivation and intention behind the recycling act. Industries producing items from raw materials for mass consumption that are betting on the recycling process to pick up the waste made by these products may not be so noble. A mentality of, *it's okay because they will be recyclable*, might not be enough. The damages made by making these conglomerates, and taking these materials forever from our raw resources is a big price to pay. More responsibility should be held for the waste that is being made, and more effort should be spent ensuring they can make their business as sustainable as possible. An example of this might be the water bottle and soda pop bottle industry. *Cradle to Cradle* thinking would say that although these items

24. Ibid.

25. Ibid., 54.

are 'recyclable,' they represent items that are a *hybrid of materials* and take away from our usable resources.

A nobler venture is the efforts of those recognizing the problematic waste creation by these companies, and strategizing to make use of waste pool created by these companies' wrongdoing. Companies like TerraCycle and Girlfriend Collective are taking this different approach – a different perspective – on the resources we have to choose from as creative and making beings. Recognizing the huge amount of waste being created by those in the food and packaging industries, TerraCycle and Girlfriend Collective are taking another stance by utilizing waste materials for a greater endeavour. By recognizing the waste pool humans are constantly adding to, it is a more noble cause to innovate in how to use these items, and to work within the constraints we have made for ourselves. Refer to the appendix on page 93 for more on TerraCycle and Girlfriend Collective (Organizations that divert through recycling).

As consumers, it is important that we not only know what the products we buy and use are made of, but also how they were made. Was this item made from raw materials? Is the item recyclable? Was it made from raw materials that are now a conglomerate of materials, which downgrades the quality of the raw material? Does the item make use of downgraded materials, but in effort to add utility to the ever-expanding waste pool? This is an important thing to include in any purchase decision.

The difficult thing about using materials that are hybrids – using materials from waste pools to make new items – is accounting for the next use. Does the process of making the new item make for even more conglomerate materials that are even more difficult for us to deal with?

An example of a building material that uses hybrid materials in an unsustainable manner is rigid foam insulation. This is a material that makes a problematic recycling process due to the chemicals used.²⁶ So it is introducing more of our raw resources into the building material world to make a material that cannot be used again.

26. "How to Recycle Foam Insulation," *SFGate*, accessed April 9, 2016, <http://homeguides.sfgate.com/recycle-foam-insulation-30287.html>.

An example of a building material that uses items from the waste pool as its source of material is Tuff Roof.²⁷ This material is made of Tetra Pak cartons. Another example is using plastic bags to create the building material Recy Blocks.²⁸ The point of scrutiny here is not the materiality, *pre se*, but the intention for obtaining those resources. Ruining raw resources by making hybrid materials is irresponsible. Utilizing hybrid materials that are already made to make recycled products is resourceful. For the same reason that it is better to recycle from the waste pool, it is even better to utilize materials we already have for reuse and repurposing.

Ideal Materiality Versus Right-For-Right-Now

Cradle to Cradle thinking and designing is the ideal: working toward clean loops and intentioned nutrient cycles that are healthy.²⁹ This should take place for all new products being made, as soon as possible. This will require participation on many levels, and from many people: all of us. To get to that point will require a lot of awareness, education and commitment to new ways of thinking and action. *The Upcycle* is a fantastic read about how we could design from inception with the ability to do good and with more: “Human beings don’t have a pollution problem; they have a design problem... Good design would allow for abundance, endless reuse and pleasure.”³⁰

In the meantime, my question is what happens to the things that are already made? How do we deal with the items we now consider as waste after its (first) use? Approaches to solving this question appeals to the right-for-right-now kind of response. In an ideal world, we could undo all the waste and damage we have made to the environment and focus on making smart products from here on out. The reality is that we need to move forward from not only how to do better, but in dealing with the mess we have already made. The approach being proposed here is practicing repurposing: that is, reusing an item for a new function. Repurposing in architecture is an additional attempt to divert waste from the

27. Dirk E. Herbel, Marta H. Wisniew, and Felix Heisel, *Building from Waste: Recovered Materials in Architecture and Construction*, (Basel: Birkhauser, 2014), 66.

28. “9 building materials made entirely from waste products,” *City Metric*, accessed April 8, 2016, <http://www.citymetric.com/skylines/9-building-materials-made-entirely-waste-products-932>.

29. William McDonough and Michael Braungart, *The Upcycle: Beyond Sustainability – Designing for Abundance* (New York: North Point Press, 2013), 14.

30. McDonough, *The Upcycle*, 7.

landfill. Finding more ways to use materials we already is an important task to tackle as a right-for-right-now response, while we come to grips with the consequences of climate change.

Repurposing in architecture is not an original idea but “teaching and/or building with repurposed materials still remains a rare activity... only architectural institutions drive these pedagogical experiences.”³¹ School-led efforts such as Rural Studio are the main examples of repurposing that can be noted. Rural Studio is the most well known group that takes part in reuse and specifically repurposing as the studio believes “the profession should “challenge the status quo into making responsible environmental and social changes.”³²

While many might think using trash for something new is insignificant and degrading to culture, others would say “that the very idea of manipulating garbage – and moreover using ingenuity to turn it into something productive and beautiful – is extremely innovative.”³³ It is ironic that some think we should not repurpose trash because of its perceived uncleanliness, since in making this waste for our convenience and throwing it away, we are in fact making our planet dirty. We need to find a new strategy, or middle ground, where we can begin to see our waste as a product of how we have allowed our culture of use to evolve. We have become accustomed to a culture of disposableness and with that, we have lost respect for the resources our planet offers us. Challenging this mindset is the first step in changing our practices for the benefit of the environment, our health and our resources.

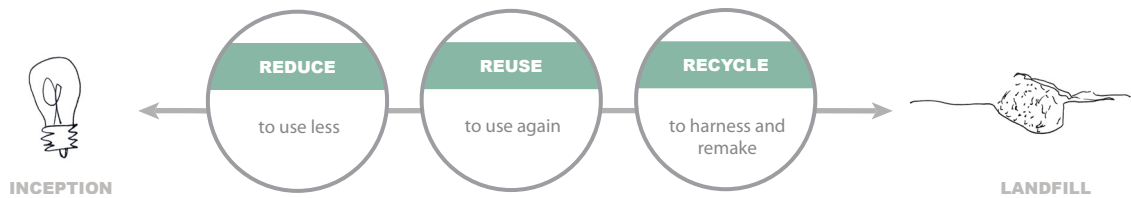
31. Sieffert, 127.

32. Andrea Oppenheimer Dean and Timothy Hursley, *Rural Studio: Samuel Mockbee and An Architecture of Decency* (New York: Princeton Architectural Press, 2002), 1.

33. Alejandro Bahamon and Maria Camila Sanjines, *Rematerial: From Waste to Architecture* (London: W. W. Norton & Company, 2010), 7.

LANDFILL AVOIDANCE APPROACHES

strategies and thoughtfulness
spectrum of material end-of-life



LANDFILL AVOIDANCE APPROACHES

placing repurposing within the
practice

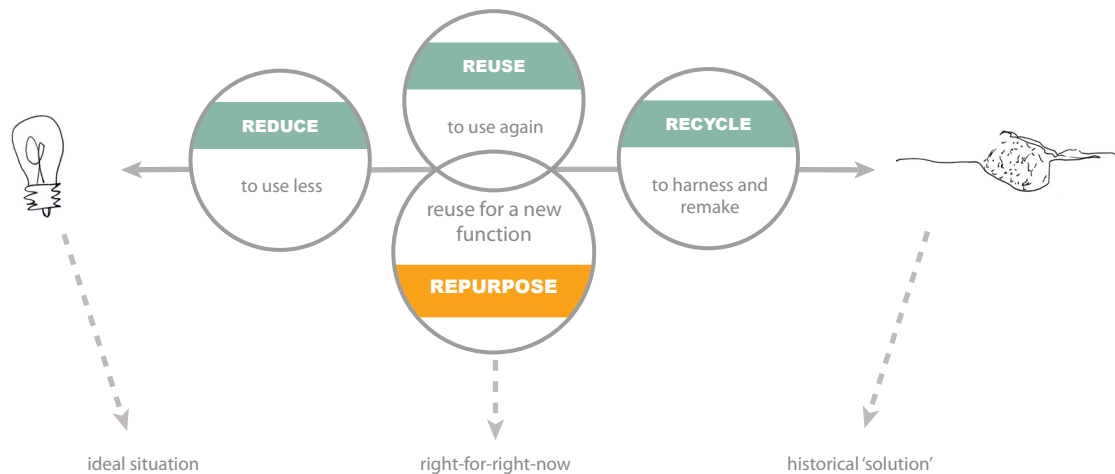


Figure 1. Landfill avoidance approaches and repurposing within the practice

Embedded Intelligence: Features We May Not Realize in Items

Items are designed with intention – many with more intention than we give them credit for. This is what we refer to as embedded intelligence. Whether they have been designed well or not, items have been designed for a certain purpose and have built in conveniences that we many not even realize are there. This can lead to us using them in our own way because we still see value in the product.

Articles can be found online that often aim to show people how they have been

using an item ‘wrong’ their whole lives, to reveal the embedded intelligence of these products. One example of such articles is this one from BuzzFeed: 18 Everyday Products You’ve Been Using Wrong.³⁴

Often people adopt technologies and use them how they see fit rather than in the intended manner by the designer. If we begin to understand items, the intentions for the design, and how people use them, we can use this to assess what needs to change in product design, but also, to understand useful qualities in an item to use in an repurposing instance.

34. “Aluminum foil boxes have punch-in tabs on each end so the roll stays in the box while pulling out a sheet

- Tic Tacs are suppose to be dispensed upside down, using the lid as a flip down trap for getting only one mint at a time
- Ketchup cups at restaurants are meant to fold out flat
- Chinese take-out containers are meant to fold out flat to be eaten off of like a plate
- Pop can tabs can be spun around and hold a straw in the can
- Juice boxes have tabs on the top edges that can be folded up for handles. This saves from messed being made from grabbing the container and unintentionally pushing juice up the straw.
- Toblerone chocolate is meant to be snapped back toward the chocolate bar by the tip of the piece, not away from the bar.
- Pot handles have a hole in them for a spoon rest
- Fountain pop lids double as coasters because the ridges in the lid are dimensioned to accommodate the bottom of the cup.”

Gabby Noone, “18 Everyday Products You’ve Been Using Wrong,” *BuzzFeed*.

CHAPTER 2: REUSE

Reuse Across Scales and Time

The approach given from McDonough and Braungart in *Cradle to Cradle* and *The Upcycle* is the ideal way we should proceed in new product design. But what happens to the things we already have? Reusing materials and items we already have seems like not only a responsible response, but the most obvious one. If we do not reuse them, they will be thrown into a landfill, or recycled. As illustrated in the previous section, landfills are not a good option – and should not be considered an option. Recycling, if made safe and less damaging to the environment, would be an option in the future, but there are important things to consider when it comes to reuse as an option.

Reuse can happen across many scales and over different time periods. Efforts to save things like plastic bags to use them again and again is in its simplest form an attempt to challenge the culture of instant use and disposableness one can see here in North America. A more responsible solution to the bags might be to use reusable bags and boxes from the get-go to avoid the plastic bags altogether. Refer to the appendix on page 94 for examples of organizations that divert through reuse efforts.

Moving up a scale, reusing building materials can help divert waste from the landfill. Individual building materials can last a long time, ranging from decades to centuries, if maintained properly, and depending on their function. Roofing and flooring would need to be repaired or replaced at different times, for example, based on the climate, quality of installation, and frequency of use.

At a very large scale, adaptive reuse and moving buildings are great examples of reuse.³⁵ The structure of a building and its façade could be reused time and time again, while adapting its function and interior. Depending on the scope of the project, adaptive reuse could entail puncturing through the façade or structure to add onto and manipulate the original project. Adaptive reuse could also include disassembling many pieces of a building and reusing them in a new configuration. There are so many possibilities with reuse, across scales and across time. There are definitely challenges to reuse as well,

35. Corson, *The Resourceful Renovator*, 21.

which will be examined in regards to the built environment at the end of this chapter.

History of Reuse

It seems we are in a strange middle period in terms of reuse of building materials and adaptive reuse.³⁶ These are not, by any means, new ideas. They are very old ideas: “Up until the nineteenth century, recycling elements from old buildings was practically the norm all over the world. Today it still takes place in developing countries, not as an environmental initiative but as a measure for relieving extreme poverty.”³⁷ Using what one had was the natural way of making and fixing things. Since the industrial revolution³⁸ everything began to be turned on its head. With the masses moving into the cities and abandoning the countryside, many also left behind their individual skills and means of livelihood for a new way of life. What this meant was leaving behind small-scale skill and resources for mass production. This created a shift. In the years to follow, many could afford many things they had not before. An ‘out with the old and in with the new’ mentality grew with the rapid production that was made possible with the industrial revolution and machine age. Depending on this new way of making also meant the loss of the “Jack of all trades” type, where each person had skills of various kinds. Working in factories meant assembly line work where people only had one task, all day long. Even today we see many professions requiring specialization: one person or company offers one service or product.

Over time, this has meant individuals are less well rounded in terms of their skills and ranges of experience with building, making and fixing things. Uncertainty around how things are made might make one uneasy in wanting to reuse things in a culture where new-things-all-the-time is common. What if the old compromises the performance? How can we mediate the popular dichotomy of building new and reuse? The Arts and Crafts

36. “Materials recovery activities have fluctuated over time depending on changes in economy, technology advances, codes and fashions, trends towards convenience, and the disposability of components.” Mark Gorgolewski, “Designing with reused building components: some challenges,” *Building Research & Information* 36, no. 2 (2008): 176.

37. Bahamon, *Rematerial*, 7.

38. Gorgolewski, “Designing with reused building components,” 176.

movement was a time of challenging some of these issues.³⁹

Reuse of Building Materials

The reuse of building materials is not a new practice but it would be beneficial to increase this practice, as construction waste accounts for a large percentage of the world's waste.⁴⁰ It is very common to reuse materials in a do-it-yourself renovation and some small-scale projects, but for many reasons it may seem difficult to reuse building materials in new builds and larger scale projects. Since previously used building materials are often not typically collected and available at the designers' disposal, sourcing the materials for reuse may pose as the first challenge. Used building materials are not "readily available from stock" like new, standard building materials are.⁴¹ Many clients want matching doors, matching hardware, etc., which could be difficult to achieve using reused building materials.

If architects were to begin a project by looking at the facilities available locally for resources, sourcing used items within a community could be possible. This is a matter of expanding the type of facility one looks to for materials. Starting with "an inventory of the available materials from salvage" is a different process than what happens most often.⁴² Instead of producing a design and then looking for materials to assign to the schedules, another process is to begin with the materials, and design with those particular pieces in mind.⁴³

In the case of architecture created from recycled materials, this market does not exist, and so the process is inverted: the design team must first identify the sources of materials suit-

39. "The goal of the Arts and Crafts movement was an integrated and designed environment in which clients became "homemakers" in the most literal sense – by learning basic crafts themselves. Machine-made objects, in spite of their greater availability, were contaminated by a sort of architectural original sin. Machine production, Morris felt, compromised the object by obliterating the signs of its making, and therefore devalued the efforts of the craftsman. Materials were to remain undisguised, their natural characteristics celebrated. Viewing industrial production as a threat to local traditions, the Arts and Crafts movement stressed the idea that architecture and design should be based on vernacular principles" Piedmont-Palladino, *Devil's Workshop*, 9.

40. Colin Jeffrey, "Construction and Demolition Waste Recycling: A Literature Review," *Dalhousie University's Office of Sustainability* (2011), 10.

41. Gorgolewski, "Designing with Reused Building Components," 179.

42. *Ibid.*, 180.

43. Jennifer Corson, interviewed by Emily Cassidy, November 17, 2016.

able for reutilization and then start to define the details.⁴⁴

This requires a kind of flexibility in the design that is not the same in the regular process.⁴⁵ The current practice of design and construction leads accounts for “huge volumes of waste being generated.”⁴⁶

Flexibility of this nature can be seen in the typical design-build process, which the design-bid-build process might be able to pull from. Design-build is more realistic for reuse of components in the design world, currently, because you could begin with a concept design and develop it further as one finds materials in the community from which to develop. Not every detail needs to be decided upon in the beginning:

This process of designing *in* building and *with* the situation involves a rethinking of the sequential relationship between designing and building, so it inevitably calls into question the relationship between the media of the design world the media of the construction world.⁴⁷

This does not mean the typical model of design-bid-build could learn from this and allot time for the sourcing of used materials in the design stage and construction document stages of development.

Now, with standard sizes in the North American building industry, it is easy to feel that changing the design process to account for more tedious building material sourcing is too much of a burden. Designers and builders usually have a systematic method in place when it comes to choosing materials. There is the exception though. Some designers make a special effort to reuse building materials and salvaged pieces, and some, even use the pieces they find to inform the design process. Jennifer Corson (of Solterre Design), in an interview, confirmed that it is better to have the salvaged piece beforehand, to have a better understanding of where the design can go and incorporate it in accordingly. This is important because there is added work to alter the piece that does not quite fit into the design afterward.⁴⁸

Once the material is obtained, there is a need to store the item during construction

44. Bahamon, *Rematerial*, 8.

45. Gorgolewski, “Designing with Reused Building Components,” 180.

46. *Ibid.*, 175.

47. Piedmont-Palladino, *Devil’s Workshop*, 4.

48. Jennifer Corson interview.

and that could be costly and could result in the item being damaged. Sourcing the item when it is ready to be installed, rather than before construction, poses an issue of availability. Items that might have been available earlier could then be unavailable by the time it needs to be installed. Buying and reserving salvaged materials while the project goes through design and bidding could cause cash flow issues.⁴⁹ Sometimes the reuse of building materials can cost more than buying new if there is a need for extensive re-fabrication and storing the item.⁵⁰ These are issues that should not lead for the avoidance of reusing building materials, but ones that need to be considered when sourcing and selecting material. As a result, timing is very important to the process.⁵¹ Searching for material in the beginning can intensify design time “to identify, locate, inspect” each piece, which therefore increases fees,⁵² but it often can be a fun part of the project.⁵³ This means that extra consideration for door, window, and hardware schedules might need to be paid; more time and effort might be necessary to coordinate reused building materials rather than working from a regular building materials depot with standard stock. Especially because, as mentioned before, the nature of reused materials means they will probably all be different.

Assessing building materials for reuse is also a challenge because “at the structural level, the conception cannot be helped by any building code to satisfy safety requirements,” and the project could benefit from a simplified design to avoid extra complications.⁵⁴

Deconstruction and Disassembly

In terms of taking down buildings, reuse needs to be considered as well. If we are to take part in the reuse of building materials, we cannot expect the reusable pieces to come from the odd replacement of a door when someone wants a new one (for example). There needs to be some consideration of how to handle materials during a demolition in order for them to be reused. Unfortunately, people are not participating in reuse projects because there is a “limited supply of reused components due to limited deconstruction...

49. Gorgolewski, “Designing with Reused Building Components,” 180.

50. Ibid., 184.

51. Ibid,

52. Ibid., 180.

53. Corson, *The Resourceful Renovator*, 5.

54. Sieffert, 128.

or lack of market demand to invert the situation.”⁵⁵ To correct this issue of supply and demand, the challenges of deconstruction need to be approached, in hopes that this can some instill confidence in the industry with utilizing used building materials.⁵⁶

Currently though, there is some resistance to deconstruction or disassembly method of taking down projects. Some of the reasoning here is due to the added time and therefore money it requires to take this route. The low cost of materials and high cost of labour makes it difficult for people to justify deconstruction over demolition.⁵⁷ Deconstruction can be more expensive but one “study concluded that deconstruction can be more cost-effective than demolition when considering the reduction in landfill disposal costs and the revenues from salvage.”⁵⁸

There are several strategies that can be implemented in design so when buildings are taken apart their pieces can be used. This kind of design is called Design for Deconstruction (DfD) and is practiced with the idea that materials will be reused, rather than landfilled.⁵⁹ The most important consideration for this kind of design is being mindful of how materials come together. Many times items are made and new building materials are manufactured so there are less pieces to connect together. This often occurs with many plastics and composite materials that are conglomerate items that merge materials from both the biosphere and technosphere together, which *The Upcycle* shows is an issue.⁶⁰ Designing with careful consideration for our resources means less mixing of materials and the creating of hybrids. To do this, there needs to be more investment in designing with pieces that can come apart: “Reversible joints such as screws and bolts are desirable, permanent fixings such as welding can make deconstruction difficult and components are more easily damaged.”⁶¹ Glues and nail guns are forms of connection which should be avoided as they are hazardous and make it difficult to separate materials for reuse.⁶²

55. Gorgolewski, “Designing with Reused Building Components,” 177.

56. Ibid., 186.

57. Ibid., 176.

58. Ibid., 177.

59. Ibid., 178.

60. McDonough, *The Upcycle*, 14.

61. Gorgolewski, “Designing with Reused Building Components,” 185.

62. Corson, *The Resourceful Renovator*, 39.

Working with bolts, Robertson head screws, and common and galvanized nails⁶³ means the materials are not amalgamated, but can be taken apart, so they can easily be put back into their respective material pools for reuse.

Another strategy includes considering how the systems are nestled together. For example, “segregating utilities from wood framing to allow for easier disassembly and to reduce holes in the framing” means there is more opportunity in the reuse of the stud for later projects as it is not damaged.⁶⁴ Many projects are purposefully designed as temporary buildings. If we used the same mentality with all our built work, it would be easier to disassemble buildings and design for deconstruction.⁶⁵

Organizations in Reuse of Building Materials

As mentioned previously, storing salvaged building materials for reuse can pose an issue. In the case that the building materials are not going to be reused in a new project replacing the building being taken down, then there could be an issue of where to take the old building materials instead of the dump. This is an opportunity that Jennifer Corson took advantage of, and she used this as a new business endeavour: Renovator’s Resource. I had the opportunity to interview Corson, where she showed me the ins and outs of Renovator’s Resource.

Renovators Resource is a warehouse in North End Halifax that is beneficial for both those looking to get rid of used building materials, and those looking for used building materials. Halifax is an old city with lots of historic buildings. During renovations of these old buildings, it is hard to find building materials such as doors and hardware to incorporate into the space. Renovators Resource fills this void.

Many of their items are wood items from the 1950s and earlier. They tend toward having items from this period because many things were made of solid wood and it makes them more valuable today. Many of the items fall into the Victorian, Arts and Crafts and Georgian styles.⁶⁶

63. Ibid., 53.

64. Gorgolewski, “Designing with Reused Building Components,” 178.

65. Ibid., 176.

66. Jennifer Corson, interview.

The main goal for Renovators Resource is salvaging pieces so they can be reused rather than thrown into the landfill. Their work is not limited to reuse in this way. Sometimes they take in items that are not in good condition and cannot be repaired for their original use. If the wood is good they sometimes use the wood to build something new and place it for sale in their warehouse. An example of this is using old solid wood doors to build cabinet doors or a bookcase. They encourage repurposing in this way and examples for how to repurpose the kind of items they have for sale can be found in Jennifer Corson's book, *The Resourceful Renovator*.

They do not take windows with cracked panes of glass because they are so labour intensive to repair – but there are repurposing things you can do with them if you were to remove the glass, but one needs to be aware that it weakens the frame.⁶⁷

Pink tubs are not valuable in normal circumstances so keeping space for them does not make financial sense. Since Renovators Resource is a business, every piece on the warehouse floor has to have enough value to 'deserve that space' in order to keep money flowing.⁶⁸ This is why solid wood pieces get much of the space – they are highly sought after. Local items are extremely important for Renovators Resource because materials have travelled a great distance contribute to transportation costs and pollution. Additionally, the locality of the material matters in this circumstance because renovators will want similar things to match the homes and buildings they are renovating – so it makes sense that the material come from here. An exception is Douglas fir. During the World Wars a lot of Douglas fir was brought from the west coast. After the war, there was an abundance of Douglas fir for building.⁶⁹ This is highly sought after at Renovators Resource because there is coming to be less and less available as the years pass.

Other items found at Renovators Resource range from hardware, marble door knobs, flooring, trim, rail spindles, sinks, radiators, whole doors, mantles, etc.

67. Ibid.

68. Ibid.

69. Ibid.

CHAPTER 3: REPURPOSE

Why Repurpose

It is worthwhile to get more specific than reuse of building materials and widening the scope. Building materials are not foreign to us as designers and builders: they are standardized and so are their methods for employing them. Although the practice of reusing building materials has its challenges, it can be done through careful design and consideration. There are many other items out there, though, beyond the typical 2x4 or plywood. Why not make use of those alternative materials in building too? Using these items is utilizing another pool of waste and therefore serves as another vehicle to diverting from landfills.

In order to expand the scope and successfulness of reusing items and cutting down on contributing waste to the landfill, the idea of reuse and the idea of building materials needs to be re-framed in another context. Reuse has its challenges, but maybe there just needs to be more options: more options in terms of sourcing and conventionality. What if we started to look at an item differently in order to find additional uses for it, and therefore, to expand its life? Introducing an item into a new context could open new possibilities for its use. What if we began to open our minds about where we source material? What I am alluding to is repurposing materials, not typically used in construction, from atypical sources as means of supply for architecture. Opening up this kind of unconventionality makes for another avenue to take, in efforts to avoid contributing to the landfill. Another reason for encouraging this change to be more widespread is it can open new opportunities for creativity.⁷⁰

Like reuse, repurposing is not a new phenomenon: ““Repurposing” materials was largely born in the eighties and some examples of repurposing materials in geotechnical

70. “Due to the nature of the materials used, this architecture may deviate from conventions, such as symbols used in religious buildings or the materials and methods traditionally used in local building. Variety is found in this deviation. Furthermore, the use of materials out of context and in unconventional ways invites experimentation and discovery, which also is a source of variety” Geoff Crosby, Church: Thesis project for Master of Architecture degree, 1988, (Halifax: Resource Center Publications, School of Architecture, Technical University of Nova Scotia, 1989). 12.

engineering can be found in the literature of the 1990s.”⁷¹ Repurposing is something we most likely have all done on the scale of the household item. Makeshift adjustments are made to all sorts of things on a daily basis.⁷² An example of this could be using tennis balls on the foot of a stool so to not mark-up one’s floors. This is changing the tennis ball from its use for sport to its use of soft, yet durable qualities; the function of the tennis ball is then completely different. It is also important to note that needing to physically manipulate the item for the new function could range from very little change, to a great change. In the case of the tennis ball, it only required a hole to be punctured in it – a task that does not require much intervention if one were to use a simple blade because of the sponginess of the ball.

Repurposing Everyday Objects for Convenience

Item	Quality	Repurposed function
Bottle cap	Container	Tea light
Bed frame	Comfort/ inhabitation	Outdoor hammock
Chair	Inhabitation	Swing
Cookie sheet	Magnetic	Magnet board
Cup towel	Thermal properties	Oven mit
Drawer knobs	Form	Hooks
Dryer lint	Thermal properties, soft	Bird nest filler
Garbage bag	Moisture protection	Rain poncho
Globe stand	Allows rotation in 1 axis	Paper towel dispenser
Jar	Container	Cup
Jar	Container	Plant pot
Jar	Translucent	Light shade
Ladder	Series of rungs	Drying rack
Lobster cage	Strong	Table base (Corson, p. 40)
Metal headboard	Frame	Garden gate
Milk jug	Container	Buoy
Milk jug	Container	Boat bailer
Penny	Form, size	Button
Pillow case	Covering, container	Bag
Pipe	Hollow	Lamp fixtures

71. Sieffert, “Sustainable Construction with Repurposed Materials,” 128.

72. Sometimes if a product is repeatedly altered by customers not to change the function but to improve the function, and this feedback gets back to the manufacturer, then this could lead to a product being changed.

Suitcase	Container	Table base storage (Corson, p. 40)
Tennis ball	Durable, soft	Chair feet
Tire	Durable	Tire swing
Tire	Durable, shock	Boat bumper
Tire	Tread grip	Stair tread topper
Toboggan	Form	Bench top
Vegetable/ milk crate	Container	Shelving
Washer drum	Metal container with holes	Fire pit
Window frame	Form, material	Picture frame
Wine bottle	Container	Vase
Wine bottle	Translucent	Light shade
Wine cork	Durable	Floor mat
Wine cork	Thermal properties	Coaster
Wine cork	Accepts punctures	Pin board

Repurposing Everyday Objects for Survival

Item	Quality	Repurposed function
Boxes	Flammable	Kindling
Gas jug	Container	Floatation device/ kayak (Richard Kroeker)
Water bottles	Container	Floatation/ life jacket (Richard Kroeker)

Many of the same challenges of reusing typical building materials applies to repurposing as well. Taking apart manufactured items, for instance (if that is where the item is coming from), also takes time and costs money. If there is a method of working in modular units where whole items are used, it could help with this situation by minimizing disconnecting pieces. There is additional issues of cleaning, assessing and testing⁷³ that goes along with using any material that is old and is going to be reused, or one that is unconventional to the task at hand in the case of repurposing. During adaptive reuse or reuse of major structural components there is a need to have the pieces tested in terms of their structural integrity. As a building gets older, or parts have been taken out to use elsewhere, it needs to be assured that the elements did not degrade with time, or that the quality of the piece was not compromised during dismantling. When it comes to repurposing, it might be a little more tedious to have this testing done, since they would

73. Gorgolewski, "Designing with Reused Building Components," 177.

not be typical building materials.⁷⁴

Repurposing Building Materials

Repurposing is using something for a new function. A building material could be both reused (for the same function) or repurposed (for a new function). The concept of repurposing is less about the type of item and where it originates and more about the function (original versus new). The act of changing the context in which the item is used is where the repurposing occurs.

An example of building material reuse is obtaining an old door and using it in a renovation. This might entail sanding and refinishing the door, for example. An example of building material repurposing is using an old door as a headboard. This might entail attaching it to the bed frame or mounting it onto the wall.

For some building materials it might be hard to think about repurposing in this mindset. Plywood, for example, does not have a function, but it is a material that performs multiple jobs. It does not have any one major function, as it is made and used for many purposes in construction – that *is* its function. For example, plywood is used as sheathing, subfloor, furniture, millwork, etc. Plywood can be considered both a material and a tool. As a tool, for example, plywood is often used as formwork. Such materials such as plywood that are used for their versatility are difficult to pin down with a major, prominent function. This makes it difficult to ‘repurpose.’ This is not to say it cannot be analysed by the criteria set out here for repurposing to see if it should be used, and how one might benefit from its embedded intelligence, but there is the difference: it is simply being used, not repurposed – and that is okay. That is what it is for.

74. “This is believed to be due to the absence of codes and technical guidelines for repurposed materials forcing architects and engineers to interact positively in order to innovate and build with these unconventional materials.” Sieffert, 136.

Repurposing Building Materials: *The Resourceful Renovator*

Item	Repurposed function	Source (Corson)
Ball-and-claw bathtub leg	Wall sconce	p. 56
Cast-iron doorknobs	Self-levelling feet	p. 29
Cast-iron heating grates	Table top	p. 57
Cast-iron radiators	Boat mooring	p. 55
Copper humidifier	Wall hanging	p. 58
Copper pipe	Racks and shelving	p. 58
Door	Bedframe	p. 30
Salvaged doors	Cabinets	p. 41
Salvaged doors	Frony base of a bar	p. 41
Old paneled door	Bench	p. 31
Solid-paneled door	Headboard	p. 31
Door hinge	Drawer pull	p. 30
Doorknob	Coatrack	p. 59
Faucet	Coatrack	p. 59
Fireplace mantel	Doorway lintel	p. 34
Fireplace mantel	Headboard	p. 34
Fireplace mantel	Store counter front	p. 34
Interior shutters	Shelf	p. 32
Wooden ladder	Pot and pan hanger	p. 32
Lath	Kindling	p. 127
Lath	Picture frame	p. 127
Molding trim	Mirror frame	p. 35
Molding trim	Picture frame	p. 35
Newel post	Counter top support	p. 41
Salvaged plank flooring	Cabinetry	p. 29
Rebar	Furniture	p. 58
Rabar	Hardware	p. 58
Window sash	Pot and pan hanger	p. 32
Old-fashioned security grill	Metal handrail	p. 56
Spindles and newel post	Legs for furniture	p. 33
Exterior trim work brackets	Shelf support	p. 35
Multipane window	Heat register	p. 126
Salvaged window	Cabinet door	p. 127
Salvaged wood beam	Milled into plank flooring	p. 25

CHAPTER 4: METHODOLOGIES IN REPURPOSING

The Resourceful Renovator

The Resourceful Renovator is a book by Solterre Design's Jennifer Corson. While her business, Renovator's Resource, is a warehouse for building materials for sale to be reused, her book opens the conversation about how to repurpose items like those found in her warehouse. The examples given in the book take the reuse business a step further, and demonstrates what can be done with items beyond just reuse. Some items might not be in the best condition for a typical reuse project, so using their pieces to make something new brings life back to the item rather than disposing of it. "ReFurnishings," as they call it, are made from materials that cannot be reused, such as "short spindles, old glass, and wide plank boards in the creation of armoires, tables, bookcases, shelves, and many other items," and are sold at Renovators Resource.⁷⁵

An example given in *The Renovators Resource* is that of a pub owner. He shows what he did when he was renovating his pub before opening and explained his approach. Knowing that reuse is cheaper than buying new, he knew this would make sense for him financially to get the bar on its feet. He salvaged much of the materials for the space, but decided to invest his money in something new where he thought it mattered the most: leather seating.

His reasoning here was that salvaging material should be practiced for things that are seen, and new purchases should be practiced for things that are touched.⁷⁶ This makes for an interesting strategy when one thinks about salvage. Many associate salvage with things that are old and past their time, therefore being out of style and uncomfortable. So, the approach of counteracting any potential uneasy feelings by investing in new things one will come in direct contact with, strikes the perfect balance. This ideology is in line with that of many designers you think there are certain things to 'splurge' on: things like fixtures, which you touch.

Many of the repurposing instances shown in the *The Resourceful Renovator* can

75. Corson, *The Resourceful Renovator*, 90.

76. Ibid., 42.

be seen in the table in the previous section. While *The Resourceful Renovator* looks at how one might reuse and repurpose old building materials, the scope of repurposing can be taken beyond building materials to unconventional items for building.

Solterre Design

Solterre Design revolves around an idea of an all-encompassing green architecture that includes working in respect to certifications such as Passive House and LEED.⁷⁷ Their projects often run on solar energy principles, as well as considering the impact of materials used in the project. At Solterre Design, they believe it is important to “aim to find a balance between design, ecology, and economy” in all of their projects.⁷⁸

The Concept House is a fantastic example of Solterre Design’s work that involves repurposing. This project has an eclectic approach where pieces used within the project come together from different sources and serve as different elements to the project. There are many instances of reuse and repurposing in the Concept House, including waste signage as shed doors and shower surround.⁷⁹ Many salvaged doors were reused which determined the height of the space.⁸⁰ This is a different approach which uses found pieces to influence the architecture. Rather than searching for materials after the design is resolved, it is important in to projects like Solterre’s to find the materials first in order to minimize the need for new materials.⁸¹

Figure 2.
Left: Concept House: waste signage shower surround; from *Solterre Design*.

Figure 3.
Right: Ecology Action Center: Bus stop wind-break; from *Solterre Design*.



77. “Solterre Design,” *Solterre Design*, 2014, <http://www.solterre.com/#/about/>.

78. Corson, *The Resourceful Renovator*, 5.

79. Corson, Jennifer. “Concept House Info 8 Pager,” 1.

80. *Ibid.*, 2.

81. Jennifer Corson, interview.

The Ecology Action Centre office had a renovation done by Solterre Design. The project is another great example of putting reuse and repurposing in practice. The interior cladding in the lobby/large meeting space on the main level is reused floorboards that existed previously in the space. The interior windows dividing the main level and the hall repurposes the wind-break elements of a former bus stop.

Rural Studio

Rural Studio was initiated by Samuel Mockbee as part of the architecture program at Auburn University in Alabama. Mockbee believed in an architecture for everyone and found there was a hole in how students are taught in architecture school.⁸² To fill this void he began the studio, which was based on providing good design to those who are less fortunate. To Mockbee, this meant local, sustainable design. Rural Studio often practices reuse and repurposing in their built work. Some examples of reuse in Rural Studio work is using old barn beams in a new project.

Rural Studio does this out of resourcefulness to achieve new projects for local residents. The use-what-you-have mentality has helped them achieve a lot for families who are less fortunate. Making use of things around the site and community that are not being used, exercises the creativity of Rural Studio and has enabled them to make a larger impact than they would have been able to by using funds to strictly buy new off-the-shelf materials. Opening to the possibility of repurposing in architecture in this way has meant creative problem solving and unforeseen improvements in the community's reach.

Much of the reason Rural Studio has been so successful in incorporating repurposing into their projects is because they receive "mostly salvaged or donated, often curious materials – beat-up railroad ties... baled corrugated cardboard, rubber tires worn thin, license plates, and road signs."⁸³ They are able to experiment with these items because they use free labour from students. This means that there is hope for repurposing in architecture because if students who are just learning can preform these tasks then professionals should be able to as well. Labour costs might be an issue in typical repurposing projects on contract until repurposing in architecture becomes a more

82. Dean, *Rural Studio*, 1.

83. *Ibid.*, 2.

normalized practice.

The first Rural Studio project set out some themes – a method – for each project to follow. Along with creating homes for the locals that caters to their needs, and offers a sense of “spirit to it,” the studio set out to use “inventive building methods and scavenged and unusual materials.”⁸⁴ But they also acknowledged that since they were trying to spread their budget to as many families as possible, that too much attention to aesthetics would mean limiting their reach.⁸⁵

Using what they had and working with an idea of “economy of design and construction” allowed them to strike a balance between aesthetics of a project and the realities of what people needed.⁸⁶ It is also more telling of what they could accomplish by beginning with the available resources.⁸⁷

Church

Geoff Crosby did his architectural thesis in 1988 on using found objects to design a community church for New Minas, Nova Scotia. He used a method of looking for available resources within the community before moving forward with a design.⁸⁸ Once he found the objects, he analysed them by sketching and measuring,⁸⁹ cataloguing,⁹⁰ and drawing each to scale.⁹¹ The cataloguing involved having a drawing number assigned to each object, an item name, its size, the quantity, and the location found.⁹² From here, Crosby documented the skills of each member of the community, whom he could utilize.⁹³

84. Ibid., 17.

85. Ibid.

86. Ibid., 142.

87. Ibid., 141.

88. Crosby, *Church*, 20.

89. Ibid., 22.

90. Ibid., 24.

91. Ibid., 26.

92. Ibid., 25.

93. Ibid., 28.

The design process from there was a heuristic, design build, kind of process⁹⁴ where he looked at the items he had and matched them to precedents⁹⁵ and the skills of those available in the community. Examples of the repurposed items in the design included telephone poles,⁹⁶ concrete culvert,⁹⁷ clay objects,⁹⁸ railway car undercarriage, rebar, and rail end-guards.⁹⁹

94. Ibid., 100.

95. Ibid., 57.

96. Ibid., 50.

97. Ibid., 70.

98. Ibid., 84.

99. Ibid., 97.

CHAPTER 5: ESTABLISHING CRITERIA: CONSIDERATIONS AND QUESTIONS TO ASK

Process



Figure 4. Sequence of item repurposing inquiry

Evaluation, Sourcing, Selection, Application

When planning to repurpose an item (use it for something other than its original function), there is a series of questions that need to be asked. Considerations fall under 3 different umbrella categories: sourcing, selection and application. Sourcing raises questions of the how the item was found and what it might mean to source an item from different origins. Selection raises questions around the recyclability, abundance, economics, culture, and locality. Application raises questions about modification of the item, labour required, available resources, buildability, and elegance of the installation.

Prior to these concerns, one needs to assess the item and the qualities it possess, and the qualities society reflects onto the item, to see how the item might be beneficial in a repurposing context.

Sustainable = Social = Local

The questions of importance in selecting and applying items for repurposing involve three important reoccurring themes: sustainable, social and local factors. Each question posed for consideration is tied to these 3 themes.

To be sustainable is to be respectful to the planet and our neighbours. This means we need to consider the social aspects of sustainability of things too. If we are to be truly sustainable, our practices must help us come together and support our needs. Locality is important because it gives a context for sustainability. Something that is sustainable in one place might not be sustainable in another. Local factors tie to the social through practices of the culture, and they tie to the sustainable by identifying resources.

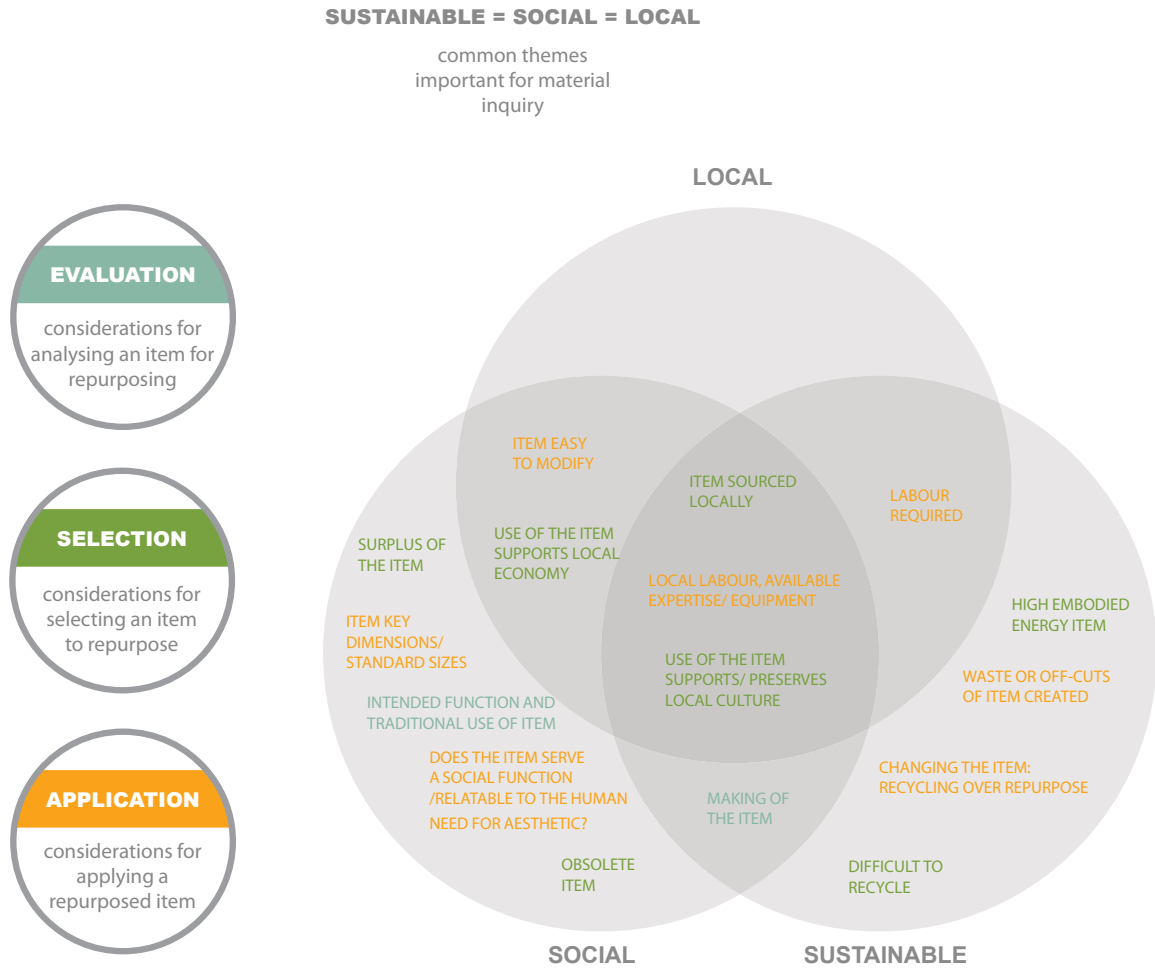


Figure 5. Points of item inquiry fitting within local, social and sustainable themes

Item Quality Evaluation Questions

How well does the repurposed item relate to a building system?

Repurposing in architecture requires the reality of construction to be considered. This means the first step to evaluating an item for repurposing in architecture is to find its qualities that relate to a building system. Without qualities that will be useful to a building system, too much time and effort could be spent trying to repurpose an item for a function where it just does not suffice. This is why first examining an item's qualities in relation to a building system is the first move and the most important one. Finding linkages between the two reveals potential for the item to be repurposed into an architectural project. Drawing on the qualities of the item is to examine its embedded intelligence – that is, the built-in,

designed-in qualities of them item. Using these designed characteristics of the item will take advantage of what the item was designed to do best – just in a new context.

An item that does not have qualities that are useful to a building system can still be repurposed – just not in architecture. Many repurposing projects have been successful outside of the architectural realm. Examples are shown in Chapter 4: Repurpose, many of which are furniture and home décor.

By looking at how building systems serve the user, one can begin to understand the roles each system plays and we can recognize these qualities in items beyond typical building materials.

Building Systems Hierarchy

Inhabitation systems help negotiate programmatic adjacencies and formalize zones – item dictates the gathering size and encourages pause, dwelling.

Duration: minutes, hours, days

Activity: sleep, wash, eat, gather

Space: intimate, open

Circulation systems moderate movement, encourage flow, and provide accessibility.

Horizontal: hall, breezeway, pedway, bridge

Vertical: stair, ramp, elevator (lift/shaft), escalator, ladder

Mechanical systems provide air, water and electrical power distribution through the space for the benefit and comfort of the occupants.

Air: heating/cooling/hvac, ventilation (ducts, vents)

Power: lighting (wires, conduit, fixtures), outlets and switches

Water: plumbing (shower, sink, toilet, laundry, fountains, fridge, sprinklers, pipe,

fixtures, water storage, drains), radiant heating/cooling

Structural systems support the building by resisting gravity and wind loads.

Configuration

Orientation: vertical (column, wall), horizontal (beam, slab), diagonal (bracing), arch, dome

Many small items: truss, space frame, gridshell, stick frame, etc

Few large items: post and beam, concrete

Forces

tension, compression, torsion, shear

Connections

Pin: nail, screw, bolt

Moment: weld, glue, multiple pin connections

Envelope systems protect the user from the elements. (thermal/temp, moisture/precipitation)

Exterior: cladding (shingles, architectural metal, vinyl, etc), rain screen, sheathing, shade, wind block

Interior wall assembly: thermal barrier, moisture barrier, fenestration (door, window, curtain wall, glazing)

Interior: finish (flooring, drywall, wallpaper, etc)

How well does the repurposed item relate to the building material it replaces?

This is less important than matching an item to a building system based on useful qualities, but it may still be a helpful question to ask if there is difficulty in seeing how it

could relate to a building system initially. Asking this question might help to find new uses in items by comparing them to a particular building material and analysing their qualities, as an extra hint or guide on what has been successful in construction, typically. However, this step is may not be necessary and skipping this step could allow for innovation and more out-of-the-box solutions by focusing on the system rather than individual building materials.

Beyond strictly looking at item properties, we need to understand how the item plays a role socially. Architecture is a social discipline, and items are made for human use. Considering these uses and functions becomes important for true success of the item's integration.

Social Questions – Origin of Item: Function and Making

How is the item used traditionally? What is its intended function?

Having some connection to the original function of the object might help forecast how it can be repurposed, but within a new context. What service does it provide to people? Maybe it can provide this same service, but in a new way. One example is the Rural Studio Glass Chapel. This project repurposed car windshields as cladding for the chapel; windshields provide protection from the elements within a car, while in this new context, they shelter community events from the rain. This relates to the idea of embedded intelligence which is key to repurposing in architecture.

Looking beyond embedded intelligence, one step further, this question evaluates the item in terms of, not the intelligence it was designed with, but how people use it (intended or not). As we have seen, not all items are used the way they are intended. So it is useful to examine the item out of context, just looking at its internal qualities, and in context, looking at how it was intended to function, but also how people decided to use it.

Jarzabkowki and Pinch, in their article *Sociomateriality is 'the New Black': accomplishing repurposing, reinscripting and repairing in context*, illustrate the idea of 'affordances.' The idea of 'affordances' offers a relation of how "humans interact with the



Figure 6.
Left: Examples of items in their original use with human interaction



Figure 7.
Right: Examples of items in repurposed form.

Top: Rural Studio Pods; from *Rural Studio*.
Middle: Rural Studio Smoke House;
from *Rural Studio*.
Bottom: Rural Studio Yancy Chapel;
from *Rural Studio*.

material world.”¹⁰⁰ Affordances extend beyond an object’s physical properties, like its materiality¹⁰¹ and they begin to look at how objects have more properties when the object is in use in a particular activity or context.¹⁰² It is in the social action that humans share with an object that the object acquires affordances.

Objects are often designed with affordances embedded into them.¹⁰³ This relates to the idea used here of embedded intelligence, but the object is not limited to these designed affordances: it is possible for them to be repurposed.¹⁰⁴ Is this so because by changing the relationship one has with the object, the function changes, without necessarily modifying the object itself.¹⁰⁵ The example they give in the article is of a chair. A chair is ‘afforded’ for sitting, but in a given situation, its function could change based on the relationship of its user; a person could use the chair as a step, a lock if placed under a door handle, or firewood.¹⁰⁶ So, it is the relationship with the user that changes the use of the object, not merely its material properties. This is what makes it so important to look at how people use something. Their actions can reinterpret the object, even before modifications are made. These studies can help indicate how to repurpose.

In Pinch and Bijker’s article, *The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology might Benefit Each Other*, they examine how society interprets objects. They show that truths pertaining to scientific knowledge does not necessarily mean that society accepts those truths in their actions and decisions.¹⁰⁷ What this means for us, is to make an impactful repurposing, and changes in people’s lives, we need to see how they interact with things, rather than just viewing items from a physical property standpoint.

100. Paula Jarzabkowski and Trevor Pinch, “Sociomateriality is ‘the New Black’: Accomplishing Repurposing, Reinscripting and Repairing in Context,” *Management* 16, no. 5 (2013): 4.

101. *Ibid.*, 3.

102. *Ibid.*, 4.

103. *Ibid.*

104. *Ibid.*

105. *Ibid.*

106. *Ibid.*

107. Trevor Pinch and Wiebe Bijker, “The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” *Social Studies of Science* 16, no. 2 (1984): 407.

It may be a daunting task to understand how every social group interprets an item, but it is not necessary to reach this level of understanding. It is more important to try to understand how the users of the building interpret that item and how it might be interpreted locally. Knowing the entire population cannot be understood in terms of one item is no reason to discount how people interact with it at all. Instead, however, it can be used to one's advantage for more creativity in solution finding.

How is the item made?

Analysing the item's process of creation might give some insight into how it might be useful for another function. Looking at how an item is made is another route to understanding the embedded intelligence of the item (potentially through the lens of some social factors). How people interact with the item during its making might tell a story about why it is formed the way it is formed. It could explain its joinery, or why it is made to the size it is. An item might be made a certain way for ease of use, but it could also be made a certain way for ease of creation. An item might be made a standardized item because it is needed to be that way in relation to the maker, or to the machine, or because it will be easier to use at that size for the intended user. Any of this information could be helpful in strategizing in how to use the item. Understanding the embedded intelligence behind the item allows for further innovation; using those designed utilities of the item to one's advantage in the repurposing.

Understanding the process of how an item is made will also help demonstrate how an item might have environmental issues. The process could be using hazardous materials, producing pollution or could be incorporating problematic materials to the composition (making it hard to recycle). This knowledge might help inform how it can be repurposed by looking at what other items undergo these processes and why. It is also helpful to understand these processes in terms of how these processes might need to change for the better.

Analysing an Unknown Object

Sometimes an object might be found without even knowing what it is. This is a special case where a thorough analysis of the item would be necessary to understand how

the item can be used and repurposed. The method by Prown can be very useful in not only this scenario, but in terms of understanding any item better.

The idea is to try to look at the item from a place of ignorance while one runs through the categories of analysis: description, deduction, speculation. It is important to try to refrain from jumping to conclusions and making any assumptions before reaching the step where you are asked to speculate. In each category of analysis, there are certain things to identify in the item. They are as follows:¹⁰⁸

Description

Substantial Analysis: physical dimensions, material, articulation of the object, fabrication, weight, general measure (proportion)

Formal Analysis: object form/configuration, visual character (2D then 3D, lines, color, light, texture)

Deduction

Sensory Engagement: touch for texture, lift for heft

Intellectual Engagement: what it does, how it does it

Emotional Response

Speculation

Theories and Hypothesis: what it does, how it does it

108. Jules David Prown, "Mind in Matter: An Introduction to Material Culture Theory and Method," *Winterthur Portfolio* 17, no. 1 (1982): 24.

CHAPTER 6: SOURCING: USING WHAT YOU HAVE

Scale of the Project

The methodology being developed here is for the use of many different people in different scenarios. It could be used by the homeowner, looking to use things they have in the yard to build a new shed, for example. It could be used by a group of members of the community looking to use items at their disposal within town or from the local salvage yard. It could be a builder or designer looking for materials for a commissioned project. All of these different cases could benefit from running the items within reach through the criteria offered here. Each is an exercise in responsibly using what we have on hand to perform a repurposing project – regardless of scale.

Using what one has and working it through the design is more responsible than always going for new, off-the-shelf materials.¹⁰⁹ It helps cut down on waste by creating a new use for the item.

Sourcing materials is an important step for any project – whether it is projects that are concerned with reuse or repurposing, or if it is a project made with entirely new materials – whether it takes place toward the beginning of the design process, or just prior to installation. The reality of building means finding material for each part of the project to make the plans come to life. It would make the most sense, both economically and socially, to look for those materials as close to the site as possible. Finding materials locally would save money on transportation costs and costs to the environment by polluting in transportation. Finding materials locally would be socially responsible because using materials from where they are made and used is a good representation of the culture and life of the people who live in a given place.

Not only those communities and populations who are poor should use the approach of using what you have before looking beyond for items. Resourcefulness is not to be viewed as a characteristic of those less fortunate, but as a virtue that all should strive to attain. Being resourceful is a skill and a responsible way to approach material culture: “The biggest challenge for the use of repurposed materials is the need for a mentality

109. Sieffert, 137.

shift... They will also contribute to change the negative perception of “waste” materials.”¹¹⁰ Acknowledging this, it is often communities in rural areas which are poor that “are wealthy in resources such as materials, labour, skills, traditions and time.”¹¹¹

Facility Types

What type of facility was the item sourced from?

Items could be sourced from a number of different locations. Corson demonstrates a number of places from which materials could be sourced for reuse and repurposing: around your house, yard sales, used building materials stores (like Renovators Resource), material exchange listings, and newspapers of second-hand buyers guide.¹¹² Adding to that list, Crosby recommends searching auto salvage, manufacturers public facilities such as waste collection sites, and construction and transportation sites.¹¹³ I would add that sourcing found objects and looking to local industries for unused items would be a good method of sourcing.

What kind of sources are available?

Depending on the scale of the project and sources that are available to the project at hand, one might be required to look to different places for sourcing material for repurposing. A home owner or client might already have material they are looking to use in the project. In cases of adaptive reuse, there might be elements of the project that are in good condition to be used for a new purpose. If none of these scenarios fit the case, one will have to look beyond their immediate reach. A next sourcing facility to scout out might be a local salvage/scrap yard. Repurposing items from these locations is environmentally responsible because it takes items that are not being used and have been discarded and brings them back with a new purpose. One might also look to local manufacturers. If they have old equipment or old product that no longer has a use, it could be obtained and repurposed for a project.

In an interview, Jennifer Corson gave some great insight about sourcing items

110. Ibid.

111. Crosby, *Church*, 10.

112. Corson, *The Resourceful Renovator*, 7.

113. Crosby, *Church*, 21.

from different facilities. She said that while metal salvage yards are great due to its variety of use, car salvage in particular can be difficult because pieces come from many different models.¹¹⁴

Point of Intervention

One thing to be wary of when sourcing a material is the point of intervention. Repurposing hard to recycle items is encouraged but the sourcing could be problematic. Where one intervenes in any sourcing endeavour makes a difference in the impact of diverting. If one were to source an item that is hard to recycle right from the manufacturer, this could create another use for that item, and therefore create more demand for its creation. This is something that needs to be avoided, because it only contributes to the problem of irresponsible manufacturing.

If one were to source that same item, further down the line, it would be better. For example, if the same item was no longer being used and was about to be disposed of, it could be obtained for repurposing without creating demand for more of the item to be produced. Another way to source that same item might be to visit the manufacturer and obtain any defect items, or any off-cuts and waste by-products. This is different, because the item is being produced anyway, but by picking up the waste, it is reducing the contribution to the landfill, without creating demand.

Material Pools

At what point does an item become 'waste'? At what point does an item become no longer useable? Society views items as having a linear life: raw materials are harnessed and processed into items, and once they have been used they become waste to be thrown away. This kind of thinking about our resources makes an assumption that our resources are unlimited. As we can see, this is not the case.

Traditionally, we have taken from raw materials to make new things. We are seeing the importance now, more and more, of reusing the things we already have. Now, we need tools to use those things we have already discounted as waste. Sourcing from unconventional places (waste pools) gives us an additional source of material to use – one

114. Jennifer Corson, interview.

we should be making much better use of. Repurposing adds to the amount of utility we can get from this extra material pool. This is because endless reuse might not be practical for items that are no longer relevant to people, socially. The status of 'previously used,' as an umbrella category, makes it more sustainable to use, rather than looking for new items and materials. So sourcing with this in mind, one could virtually get these items anywhere.

CHAPTER 7: SELECTION

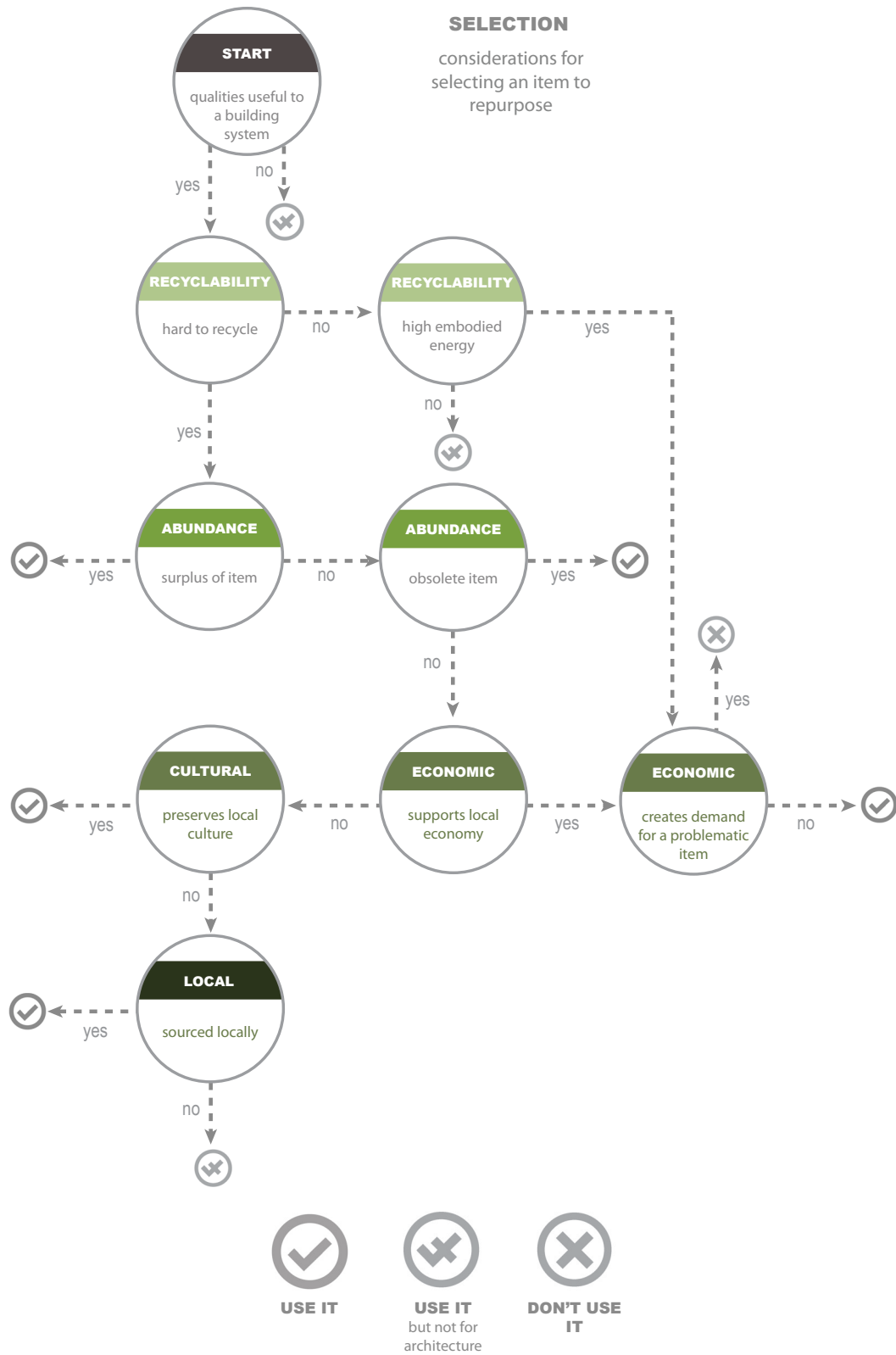


Figure 8. Selection flowchart: relationship between questions when selecting an item to repurpose

Sustainable Questions – Recyclability

Is the item difficult to recycle?

As discussed before, recycling is not always the best option. Many chemicals and pollutants are often used in the recycling process. We should avoid these processes as much as possible and work on improving them¹¹⁵. But what if a particular material is especially difficult or hazardous to recycle? This is a good reason to find a new use for the item rather than trying to recycle it or throwing it into the landfill.

[high amounts of energy, effort and chemicals required]

Many items that are a mix of the biosphere and technosphere make it difficult to harness the raw material to recycle. The biosphere includes things like wood whereas the technosphere includes things like metals.¹¹⁶ Mixing these spheres to make new materials makes it difficult to separate them after the fact. This is how we come to have more new materials: it is the mixing of different materials to make hybrids like plastics. Making new items that use materials from both the bio and technosphere is not the issue – it is how they are connected. Objects that are bolted or nailed together can be taken apart and the pieces of each (if they are pure) can be recycled safely without much issue.¹¹⁷ Items that are hard to recycle are ones that were not “designed for deconstruction,” and hence leave us with conglomerate items.

[mix of bio/technosphere]

So, if the item is more difficult to recycle, it would be more sustainable find a new function for it. Since it already exists, it might as well be used in a way that does not continue to harm the environment.

Does the item have a high embodied energy?

If an item has a high embodied energy, it would be better to find a new function for it, rather than it be seen as obsolete if it can no longer be reused, and end up in a landfill

115. McDonough, *Cradle to Cradle*, 57.

116. McDonough, *The Upcycle*, 14.

117. Ibid.

or being recycled. It has already required so much energy to get to its existence – might as well find a new use!

Abundance Questions

Is there a surplus of the item?

If there is a surplus of the item, there is obviously not enough demand for the item as there might have once been. This means it would be beneficial to find a new use for the item and for it to be used rather than being thrown away, or piled somewhere being unused. A surplus of items indicates the item might be socially irrelevant now, after a new, better product is made and takes its place. This makes it suitable for repurposing.

Is the item obsolete?

Regardless of an item having a surplus or not, it may be obsolete because its use is no longer needed or desired. If an item no longer serves a societal demand, it comes obsolete. These would make for good items to repurpose because they account for some of our resources that will just be going to waste.¹¹⁸

Economic/Cultural Questions

Does use of the item support local economy?

The item might support the local economy if it is made locally and its use adds to the demand of the item by giving it an additional use than the one it is produced for. This could be problematic if it is creating demand for an item that is harmful to the environment, so this question needs to be approached with caution. For example, there could be a suffering industry and it produces hard to recycle items. Hard to recycle items warrant repurposing over recycling but if the use is creating demand for a problematic item or material at the frontline then it should not be used, and sourcing should come from down the line (after the item is no longer needed to keep it from entering the landfill). It is all about point of intervention for diverting from the landfill and making sure not to contribute to problematic item/material creation.

118. "Sustainability seems more achievable by reusing or repurposing obsolete manufactured materials rather than investigating new "green" materials" Sieffert, 127.

On the other hand, maybe items can be sourced from a struggling industry, new or old, that produce great environmentally friendly items. Sourcing items from an industry in this case would add to the economy and strengthen their success and demand for the item by giving it a new function within the context of repurposing and architecture.

Does use of the item support/preserve local culture?

The item might not contribute to the support of the local economy or a local industry, but it might speak to the history of the place. Rural Studio's founder, Mockbee believed "the best way to make real architecture is by letting a building evolve out of the culture and place."¹¹⁹ Using the item because of its historical significance within the place gives the item more utility than it might have had before and gives it a place in the culture with a new function: "since the repurposed item conserves the memory of its previous function it becomes a cultural bridge between generations. Thus, to repurpose a material is totally different than to reuse or to recycle a material."¹²⁰

One might argue that repurposing trash and using items in this way could be damaging to, or misrepresent the culture the repurposed item is being implemented in. I would argue that is false and rather it is just the next step we need to take to evolve from our culture of disposableness, and this practice can represent that. Learning to use what we have and change our preconceptions about waste can be reflected in our built work.¹²¹ Practicing repurposing in architecture is a profound way to demonstrate to the public we intend to change our relationship to waste, and it will help foster conversation and growth in terms of product design and disposable product use. It makes a statement to say these are our resources and we need to be more serious about how we use them.¹²²

Material culture is important factor in the discussion of waste creation because in repurposing items we are shifting the current values and beliefs associated with a material

119. Dean, *Rural Studio*, 2.

120. Sieffert, 127.

121. "Essential structures... at the Rural Studio both reflect and transcend their cultural context," Moos, "Community Architecture," 7.

122. "Whatever the providence or heritage of the piece, it will become part of the story," and architecture is about telling stories – stories of culture and life, Corson, *The Resourceful Renovator*, 5.

that is traditionally something else.¹²³ Following this line of thought, choosing to recognize how we interact with our resources and create things we use, can demonstrate change in society. Our current material culture is that of a disposable mentality, but by building with 'waste' we can begin to challenge this.

Local Questions

Where was the item made?

Using an item made in a particular place is an investment in that place – in their values, in their resources, in their livelihood. If the item is to be appropriate for the application in architecture, it should be something the people are used to interacting with – something that means something to their culture, craft and way of life. Investing in the people who will use the architecture means to support their ways by using the things they surround themselves with. This is socially sustainable and relates to the preservation of culture that was mentioned previously.

Is the item sourced locally?

Using items that are sourced close to site is better than those brought from afar. Hopefully the item was also made in proximity to the site, but these are not necessarily one and the same. An item could have been made and shipped somewhere else to be put to use or an item could have travelled with someone when they moved. Sourcing an item locally, does not indicate it was made locally, but this is not always a bad thing. An important advantage about an item being sourced locally is the impact it has on reducing transportation distances. Transporting items costs money and costs the environment by releasing pollutants into the air. Reducing all transportation to a minimum would help save on these damages. The important idea here is to cut down on transportation for things that do not need it. If there is a project in the works, one should begin looking for materials locally. Using what is available locally rather than ordering materials from a way is more

123. "The underlying premise is that objects made or modified by man reflect, consciously or unconsciously, directly or indirectly, the beliefs of individuals who made, commissioned, purchased, or used them and by extension, the beliefs of the larger society to which they belonged," Prown, "Mind in Matter," 18.

responsible.¹²⁴ This is environmentally sustainable.

124. "Sending products to regions that cannot support them is similar to producing materials that our recycling systems cannot process. We need to close the loop on the production, use, and reuse of these materials, while not taxing our existing resources to manufacture, transport, and build them," Corson, *The Resourceful Renovator*, 46.

CHAPTER 8: APPLICATION

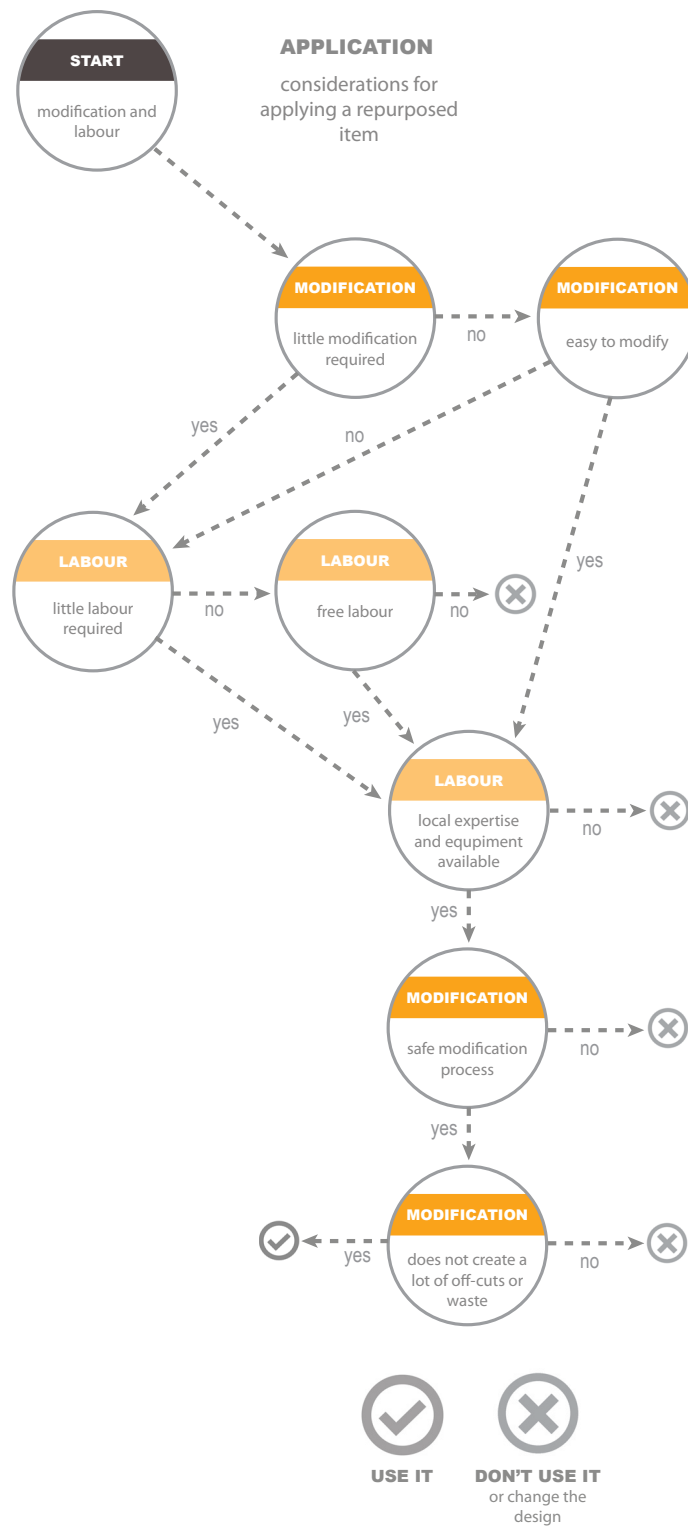


Figure 9. Application flowchart: relationship between questions when applying a repurposed item

Modification and labour

Modification Questions

Is there little modification required to repurpose the item?

If the item requires a lot of modification, it might not be the best item for the job. This might occur if the item does not map well onto a building system and make use of its embedded intelligence. A lot of modification might mean the item is being forced into a repurposing where another item might be more appropriate. Additionally, too much modification might not make sense financially.

Is the item easy to modify?

Maybe there are many modifications that need to be made to an item, but if these modifications are easy to make it might not cause too much hassle. For example, plastic bottles might be easy to modify by cutting, shredding or melting them. If a process can be established for modifying the item, then repurposing it should not be a problem.

Is the modification process safe?

This relates back to the same issues around recycling: many recycling processes involve toxic solutions.¹²⁵ If modification for a given item is unsafe then another item or method should be chosen. For example, the bottles that might be easy to modify through melting could be more harmful to those involved in making the modifications and to the environment. Cutting the bottle may be less harmful.

At what point of changing the item does it become recycling over repurpose?

The extent of modification or process of modification for a particular item may start to resemble a recycling process rather than a repurposing one. In terms of the extent of modification: an item could be taken apart (disassembled) and its pieces used in a new application. This is a great way to repurpose, even if it means the item is not recognizable in its original form. In terms of the process of modification: one might wonder if the process differentiates it too much, and makes it not safe to repurpose. This relates to the hazardous process question. When thinking about the plastic bottle example, the idea of melting it to make a new item resembles the process of recycling more than that of disassembly.

125. McDonough, *Cradle to Cradle*, 58.

This is something that should be taken into consideration with each individual repurposing project, because recycling should be avoided until there are no longer any possible uses.

Does the modification create a lot of waste or off-cuts that cannot be used? Does it use the whole item?

An ideal repurposing would utilize the whole item and not leave any waste. This cannot be expected to be possible in all scenarios though, as a new function probably means some modification and modification probably means not using the item in its entirety. Any cut-offs or waste should be accounted for, and made to be used elsewhere, or recycled if possible. If these are not options, then the design should be reconsidered and changed to make better use of the whole item.

Labour Questions

Is there little labour required in modifying and installing the item?

Extensive labour could be justified depending on the position. If there is a lot of labour required in repurposing the item, then it could become costly and might not lend itself to the budget. If extensive labour is creating needed jobs, then labour could be considered a good thing, and could potentially outweigh the downside of paying for extensive labour. This, obviously will depend on the item being repurposed, the particular project, and the client, but it is something that needs consideration. In situations where there is free labour (for example, volunteers or students), this might off set the time the labour will take.

Can the labour be done locally? Is the expertise/equipment available?

If labour is required is it best that it can be done locally. This would mean that it supports the local economy. Ensuring that the resources and equipment for the labour is available is important, especially in a repurposing project, where modifications to an item might be out of the ordinary. Expecting there to be expertise and equipment locally for the job at hand is unrealistic, while having work done out of town and shipped in could be costly (and add to transportation pollution). If the work cannot be done locally, design changes (or item changes) should be considered.

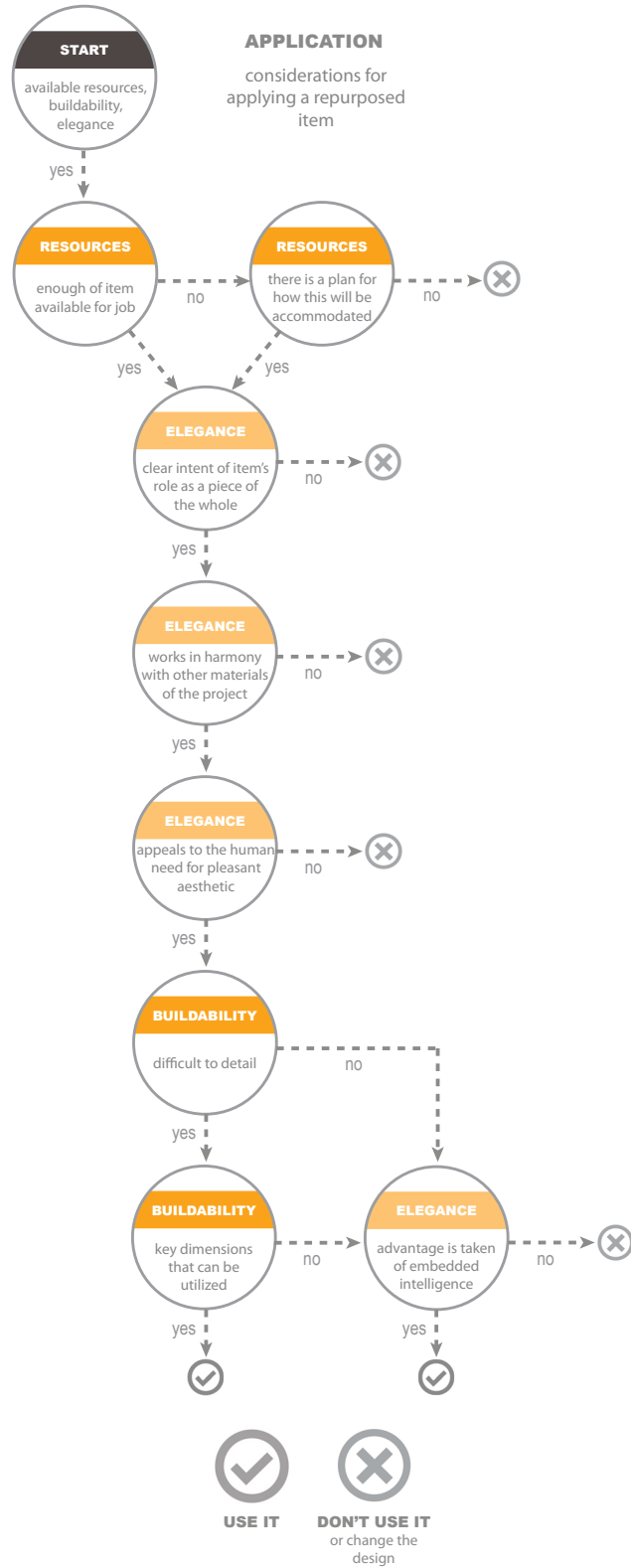


Figure 10. Application flowchart: relationship between questions when applying a repurposed item

Buildability and elegance

Available Resource Questions

Is there enough of the item available for the task?

There needs to be some consideration for how much of the item the project might require. This is an example of why it is useful to source items prior to design. Knowing the amount of items you have to work with can be useful in the design process.

If there isn't, is there a plan for how this will be accommodated?

Will it become a patch job or does this fall into line with the intent for the project? If there is a plan for mixing the use of the item along with another solution, one should ensure it does not confuse the concept for the project and leave much room for error.

Buildability Questions

Does the item have key dimensions/standard sizes that could be utilized?

The item could have standard sizing that could be treated as key dimensions in terms of designing with modularity or repetitive schemes. This is where understanding how an item is made in terms of its dimensions could shed some light on how it could be arranged in space and actually be used to benefit the construction process. Sourcing multiples of the same size item could be very beneficial in planning, depending on the design. Of course, this might not always be possible, but this makes it important to consider in the beginning, as dealing with many different sizes may or may not pose an issue.

Is the item difficult to use and/or detail?

In trying to decipher if an item might be difficult to detail, it will be beneficial to recall its qualities that are similar to the building system to which it is going to be assigned. How are materials typically detailed in this situation? Can the item be resolved in a similar way? Looking at typical building materials can serve as a useful guide, but one should not let it inhibit them from seeing an item's potential.

As illustrated in *The Resourceful Renovator*, knowledge of how an item is assembled can help with its safe disassembly.¹²⁶ Knowledge of these methods of installation and

126. Corson, *The Resourceful Renovator*, 27.

disassembly could be useful in formulating how it can be assembled in repurposing.

Elegance Questions

What does elegance mean in a repurposing project?

1. Clear intention of item's role as a piece of the whole within the project

If there is no clear intent and plan for how the item plays a role in the project as a whole then it will most likely become a conglomerate of pieces and will not be aesthetically pleasing. Applying items without intention leads mix-matched composition, which could cause problems beyond aesthetics.¹²⁷

Referencing Rural Studio's founder, Mockbee describes his method as "continually collaging together ideas and experiences" where "diverse components form a coherent whole."¹²⁸ Incorporating many pieces together does not mean it is problematic. Each piece needs to have its place though, and work together toward the whole project. To celebrate the item in its application shows there is a clear intent. Unless it is enclosed in part of a wall assembly, the item should be meaningful to the space and not cause disharmony with materials around it: "Here it describes a matured sense of production that informs and merges materiality with formal qualities."¹²⁹

2. A sense of resolve and order in bringing systems together: harmony.

It is important that there is no competing of items and materials within the project. An item should respect the other materials in the project by either complimenting it or contrasting it. There should be a sense of hierarchy in how the elements come together, with a sense of order: "Elegance leads architecture once again to emphasize a sensuous

127. "A second issue is the risk of creating chaotic and unaesthetic structures that are not mechanically stable. Significant attention should be paid to produce simple and logical shapes while preserving the ability to aesthetically seduce. This can be achieved by finding the correct assembly of repurposed materials, having a perfect resonance that can form a coherent whole of beauty and sense." Sieffert, 128.

128. Dean, *Rural Studio*, 71.

129. Joseph Rosa, "Fabricating Elegance: Digital Architecture's Coming of Age," *Architectural Design* 77, no. 1 (2007): 91.

role for a mediating machine.”¹³⁰

There is more to elegance “than the traditional theoretical heavyweight ‘beauty’.”¹³¹ Elegance is a strategy of beauty. It is deliberate thoughtful consideration, and articulation of bringing elements together “without descending into disorder.”¹³²

3. Social function and sense of comfort: human need for pleasant aesthetic.

Can people relate to and feel a sense of comfort in the application strategy of this item? This question relates back to the question about an item’s original use. Considering how an item is typically used can help forecast how people are used to interacting with the item. A sense of comfort should be approached by striving for a familiar aesthetic.

Responsible design does not have to sacrifice elegance, and it should not. Elegance has a great importance to human needs and it not something to be abandoned. It is natural for people to choose between things based on aesthetics. Since all humans rely on shelter, and shelter styles and aesthetics change from culture to culture “then there is reason to conclude that, for the purposes of material culture analysis, the aesthetic aspects of artefacts are more significant than the utilitarian.”¹³³ Goldblatt says there are emotional fields that apply to elegance, and when achieved, it has “a lifting of the spirits towards a mood of civilised life” which can explain this bias we have for beautiful things.¹³⁴

4. The item makes use of its embedded intelligence to its advantage in the application (relates to the intention if interpreted properly)

Matching the item’s qualities to its application ensures a first step in knowing the item’s role in the project. If the embedded intelligence is not being utilized, it is probably not a good application for the item and the intention might need to be reconsidered. From a material culture point of view, Prown says architecture is “a partnership of art and craft,

130. David Goldblatt, “Lightness and Fluidity: Remarks Concerning the Aesthetics of Elegance,” *Architectural Design* 77, no. 1 (2007): 11.

131. Patrik Schumacher, “Arguing for Elegance,” *Architectural Design* 77, no. 1 (2007): 30.

132. Ibid.

133. Prown, “Mind in Matter,” 17.

134. Goldblatt, “Lightness and Fluidity,” 12.

of aesthetic appeal and utility,” meaning there is importance to how we decide to bring materials together in our projects regardless of our attempts to be sustainable.¹³⁵

He continues to say, “it is the aesthetic or artistic dimensions of objects... that open the way to cultural understanding.”¹³⁶ We should recognize this when we decide to repurpose and use it to strengthen the movement to change how we view waste. It is important that the spaces we make do not look like trash. Yes, we need to re-evaluate our relationship to waste, but this does not mean we need to start living among garbage. This is where the aesthetics come into play. If repurposing items in architecture is ever going to compete with using new materials, aesthetics *needs* to play a role. Aesthetics play a major role in our lives, regardless of how much we might try to say that they do not. Value judgements in what is beautiful may change over time, but it is nevertheless important. How we incorporate repurposed items into architecture then becomes very important. As Buckminster Fuller said, “When I am working on a problem, I never think about beauty but when I have finished, if the solution is not beautiful, I know it is wrong.” So, although it is the last thing to consider, it is by no means the least important, and the project would not be complete and successful without this consideration of elegance and aesthetics. It is up to architects to make responsible choices and be creative in utilizing the waste pool for beautiful, elegant architecture. Great architects are able to overcome so many obstacles in design – labeling items as waste should not be discounted as a realm out of reach for great architecture.

Repurposing and Bad Aesthetics: Scrap House

To illustrate the importance of aesthetics to the success of a project, we will examine a project that has unsuccessfully engaged in repurposing a number of items. The Scrap House by Public Architecture and Jensen Architects makes use of many different items in attempt to demonstrate to the community that only using salvaged items for building is possible.¹³⁷ The project repurposes phonebooks, road signs, fire hose, keyboards, and more. The project also reuses a lot of building materials. It is not necessarily the number

135. Prown, “Mind in Matter,” 15.

136. Prown, “Mind in Matter,” 16.

137. “Scrap House,” *Jensen Architects*, Accessed March 22, 2017. http://jensen-architects.com/our_work/scrap_house

of items that are salvaged, reused and repurposed in the project, that causes the issue, but how they come together. As we will later see, there are examples of projects that are entirely made from salvaged materials and work out very successfully.

While the Scrap House might utilize many items, it does not use them elegantly. Looking at the project, it appears to be a mishmash of items, without any order of how they are arranged conceptually in space, and how they meet each other. The interior of the space feels the same way, but with different materials from the exterior. The Scrap House feels like a scrapbook: with layers of pieces tacked onto one another. This is not a good representation of how one could live, even among a space constructed of salvaged pieces. There does not appear to be an effort to make each element of the project work together in harmony, but it merely uses what they could find, fastened together. They should have had a consideration for how much material they had and formulized a plan for each item. How does each item play a role to the project as a whole? Does it act as the skin? Does it act to form a zone in the space? Does it provide structure? There are so many possibilities for fantastic outcomes with salvaged items, but the intention for the items need to be clear from the beginning.



Case study images of the Scrap House:
(clockwise, left to right)

- Figure 11. Exterior; from *Jensen Architects*.
- Figure 12. Interior, bedroom; from *Jensen Architects*.
- Figure 13. Interior, window corner detail; from *Jensen Architects*.
- Figure 14. Interior, stair; from *Jensen Architects*.
- Figure 15. Exterior, court; from *Jensen Architects*.
- Figure 16. Interior, phonebook wall; from *Jensen Architects*.

CHAPTER 9: CASE STUDIES: REPURPOSED ITEMS IN ARCHITECTURE

Objects Mapping Onto Building Systems

System	Assembly	Quality	Item	Designer	Project
Envelope	Cladding	Water resistant	Windshield	Rural Studio	Glass Chapel
Envelope	Cladding, sheathing	Structural	Road signs	Rural Studio	Smoke House
Envelope	Fenestration	Translucent	Glass bottle	Rural Studio	Smoke House
Envelope	Thermal barrier	Thermal properies	Carpet tile	Rural Studio	Lucy Carpet House
Envelope	Shade, wind break		Flag	Rural Studio	Music Man House
Envelope	Shade, wind break	Solid, water resistant	Road signs	Rural Studio	Music Man House
Envelope	Shade	Linear lengths	Oil pipe	Lake Flato	Chandler Ranch House
Envelope/ structure	Thermal	Heavy, solid	Phone books	Richard Kroeker	Ambient Material
Envelope	Cladding	Similar sizes, wooden	Rail road ties	Estudio Beldarrain	Azkoitia Municipal Library
Envelope	Niche	Strong	Vegetable crates	Juan Manuel Casillas Pintor	ITT Library
Envelope	Cladding	Metal	Crushed cars	Mansilla + Tunon Arquitectis	Museum of Automotion
Envelope	Fenestration	Translucent	Glass bottle	Deanery Project	The Sheiling
Envelope	Cladding	Metal	Metal cans	Lih, Roe and Galit	Bat-Yam Can Pavilion
Envelope	Interior finish	Shiny	Metal studs	Alejandro Aravena	Arsenale and Central Pavilion
Inhabitation/ structure/ circulation	Horizontal, buried	Tight space	Culvery	Rural Studio	HERO Playground
Inhabitation	Vertical	Intimate	Concrete pipe	Techne Architects	Prahran Hotel

Structure	Horizontal stacking	Durable	Tires	Rural Studio	Yancy Chapel
Structure	Vertical, compression	Strong	Culvert	Rural Studio	Lions Park Restroom
Structure/mechanical	Foundation	Modular, container	Water jugs	NLE	Makoko Floating School
Structure	Vertical, compression	Strong	Telephone pole	Rural Studio	Shiles House
Structure/inhabitation	Stacked	Modular	Galvanized drums	Rural Studio	Lions Park Playscape
Structure	Shell	Solid, durable	Chairs	E/B Office	SEAT Pavilion
Structure	Stacked vertical, compression	Strong, durable, flame resistant	Concrete manhole	Jersey Devil	Snail House
Structure	Post and beam	Strong, modular, inter-locking	Scaffolding	Helloevery-thinga and Selgas Cano	Louisiana Pavilion



Case study frequency of:

Figure 17. Left: repurposed items

Figure 18. Middle: program repurposed item applied in

Figure 19. Right: architectural element repurposed item used for

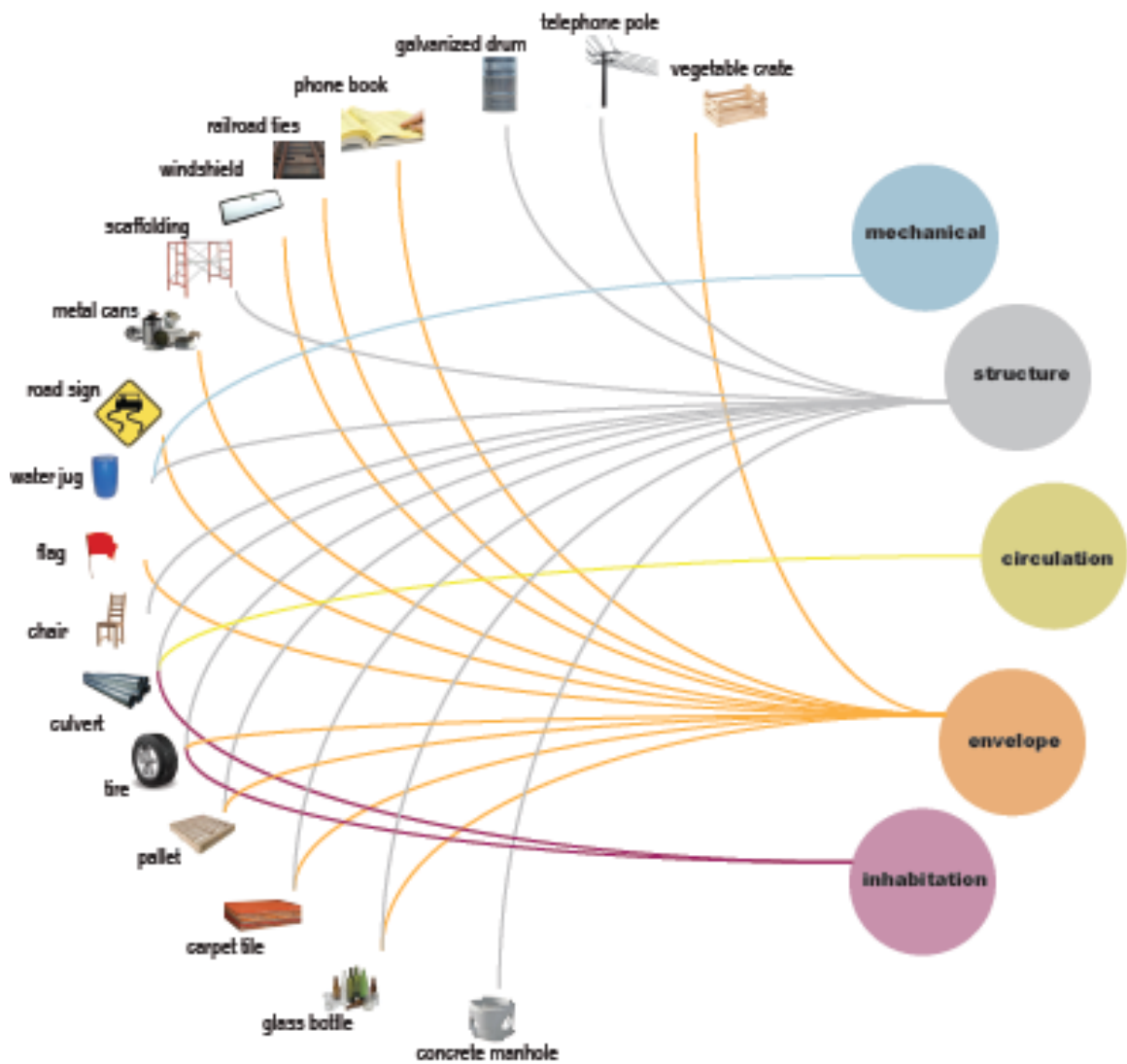


Figure 20. Case study items mapping onto building systems

Rural Studio's Glass Chapel as a Case Study



Figure 21. Rural Studio Glass Chapel (Mason Bend Community Center); from *Rural Studio*.

A great example of repurposing done by Rural Studio is the Mason Bend Community Center, also known as the Glass Chapel. Although this project seems to stick out in its environment, it makes wonderful use of many windshields from a scrap yard as cladding: “Since there was no budget for buying glass for the roof, they came up with the idea of recycling automobile windshields.”¹³⁸ A major downside to this project was the sourcing of this item. It was acquired from a salvage yard, but it came all the way from Illinois. This meant it needed to be trucked over 700 miles.

Evaluation

How well does the repurposed item relate to a building system?

Very well: the windshield acts as a piece of the envelope system of a car, by protecting inhabitants from the elements and allowing light and visibility through.

How well does the repurposed item relate to the building material it replaces?

Very well: it is strong and durable, resistant to water and wind, much like a window.

138. Dean, *Rural Studio*, 50.

How is the item used traditionally? What is its intended function?

The windshield is traditionally used to shelter people from rain, snow and wind within a car.

How is the item made?

The windshield is made as part of a manufacturing process. This involves the floating glass process, cutting and tempering, quenching, laminating and assembly.¹³⁹ The assembly includes glass encapsulation, in which molten plastic forms around holes in the glass and hardens.¹⁴⁰

139. "Automobile Windshield," *How Products are Made*, accessed April 9, 2016, <http://www.madehow.com/Volume-1/Automobile-Windshield.html>.

140. *Ibid.*

Selection

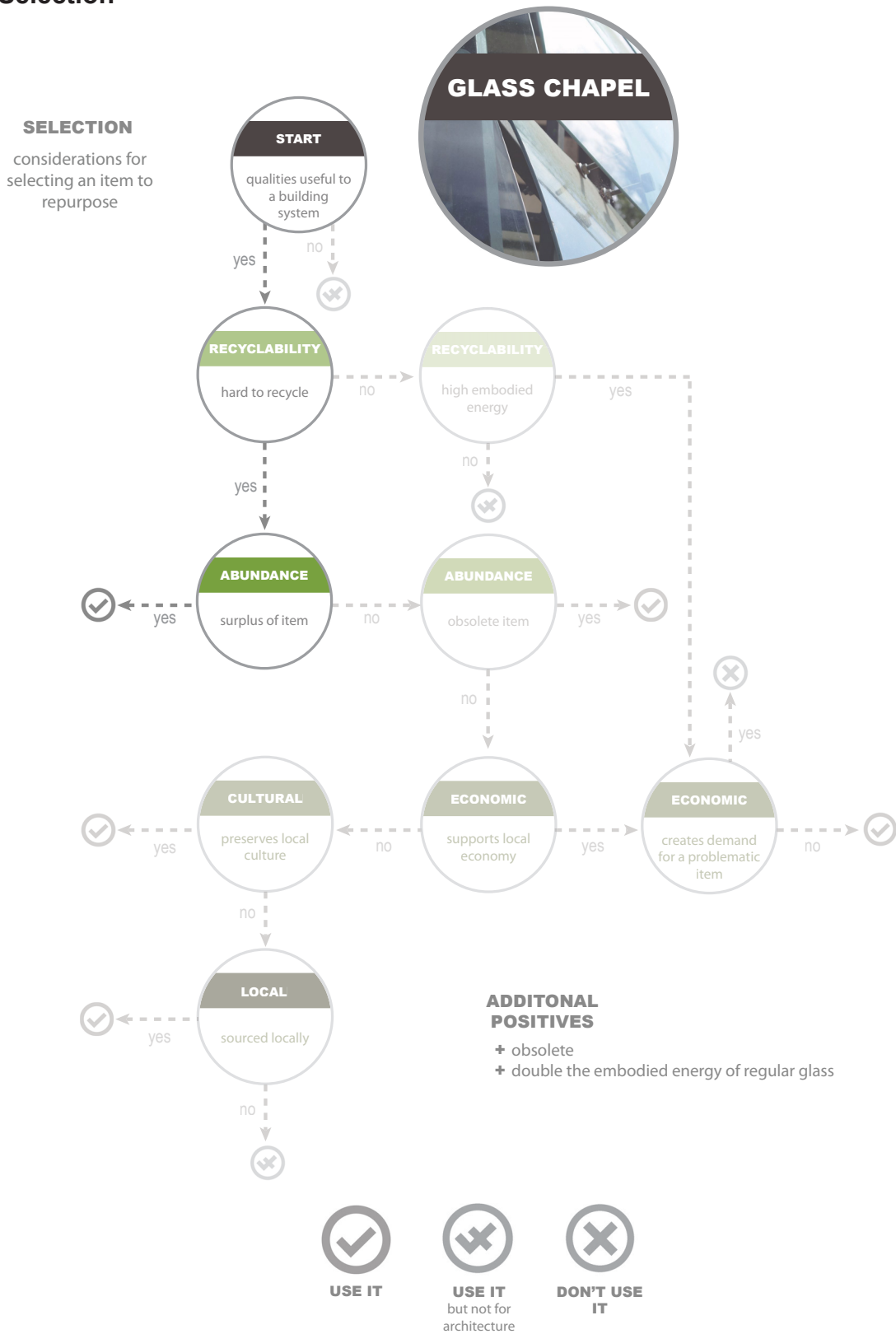


Figure 22. Selection flowchart: GLASS CHAPEL CASE STUDY; from Ted Cavanagh.

Is the item difficult to recycle?

Yes the item is hard to recycle, because there are not many facilities that recycle window assemblies.¹⁴¹ Due to windshield lamination,¹⁴² the recycling process is more difficult.

Does the item have a high embodied energy?

No: glass does not take a lot of energy to create it, compared to other materials,¹⁴³ but tempered glass is double the embodied energy of regular glass.¹⁴⁴

Is there a surplus of the item?

Yes, in this particular case, the windshields were sourced from a scrap yard that was full of them.¹⁴⁵

Is the item obsolete?

Windshields are a vital part of cars, which are still in high demand today, although models change all the time. So design changes in updated car models means particular form and size of windshields are no longer possible to reuse for new cars, making the particular model obsolete.

Does use of the item support local economy?

No.

Does use of the item support/preserve local culture?

No, but people can relate to the item, culturally on a global scale.

Is the item sourced locally?

No, they were trucked from Illinois. A negative for this project is the sourcing of the

141. Corson, *The Resourceful Renovator*, 131.

142. "Automobile Windshield," *How Products are Made*, accessed April 9, 2016.

143. Ibid., 161.

144. "Tempered glass has about double the embodied energy or regular annealed glass, 70,000 Btu/square foot" because tempered glass is made using annealed glass, but then required extra processing." Carl Bovill, *Sustainability in Architecture and Urban Design*, (New York: Routledge, 2015), 134.

145. Dean, *Rural Studio*, 50.

windshields: one of the thesis students got them for only \$120 from his hometown scrap yard in Chicago.¹⁴⁶ This means they needed to be trucked to Alabama, over 700 miles, which contributes to pollution. A more ideal case would have been if they could have sourced windshields from a closer location.

146. Ibid.

Application

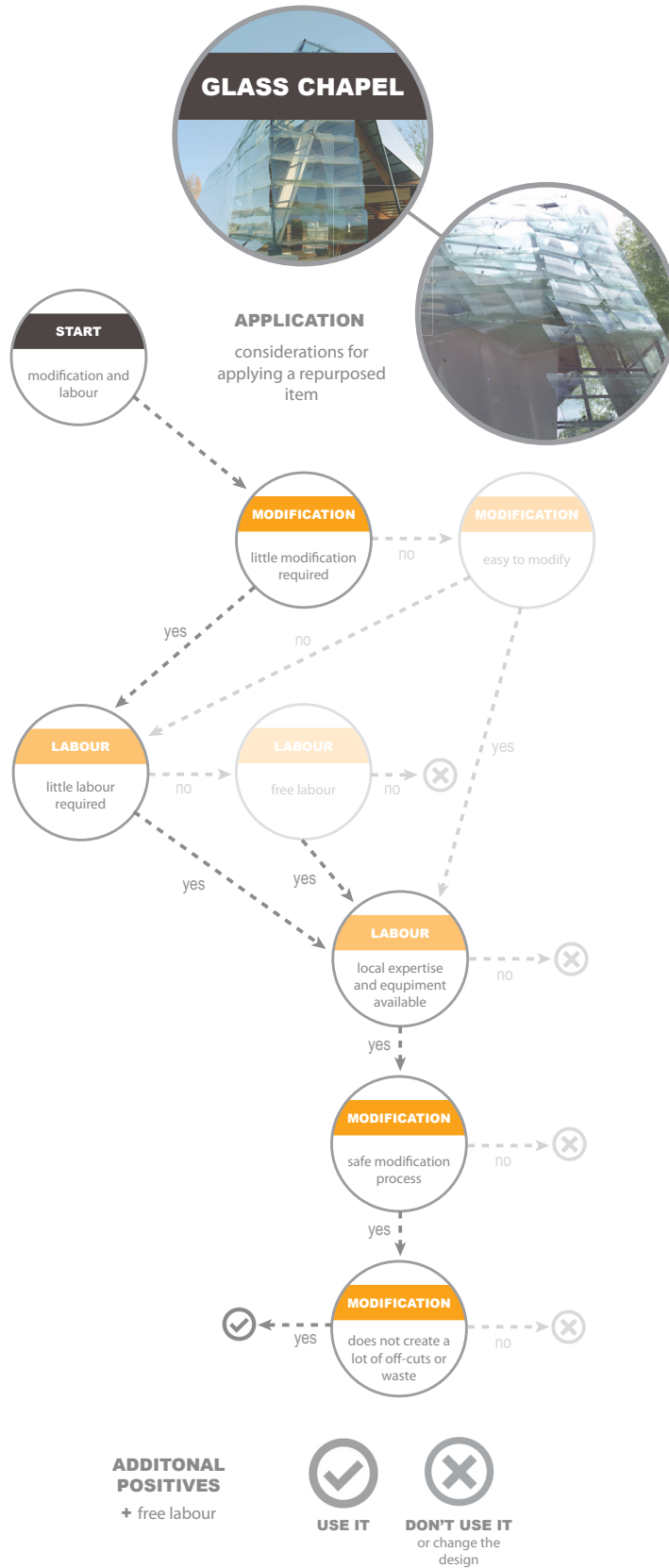


Figure 23. Modification and labour: GLASS CHAPEL CASE STUDY; from *Rural Studio* and Ted Cavanagh.

Is there little modification required to repurpose the item?

Yes. There was no modifications required as they designed using the shape and attachment points to their advantage.

Is the item easy to modify?

No modification was required for the item, as the full embedded intelligence was utilized: using the holes in the item as attachment points. It is worth noting though, that laminated glass can be “cut, drilled, and edge-worked, as necessary,”¹⁴⁷ so if the design required some modification, it would be possible.

Is the modification process safe?

Yes, because there were no modifications to be made.

At what point of changing the item does it become recycling over repurpose?

The design was using the item in its current form, with only needing attachment points. If they were to take the layers of the windshield apart, and melt its components down to create a new item, this would begin to resemble a recycling job. The lack of change to the item makes it an example of repurposing.

Does the modification create a lot of waste or off-cuts that cannot be used? Does it use the whole item?

No, the modification does not create a lot of waste, as the whole item is used.

Is there little labour required in modifying and installing the item?

No labour was required in modifying the item. This project was an open air pavilion, so the application of windshields in this way is more simplistic than having a whole envelope system. That being said, using windshields as a building material is much less conventional, and therefore might have required more problem solving to detail. As Rural Studio students constructed this project, though, the unconventionality of the cladding was not creating a higher labour cost, since students are free labour.

147. “Automobile Windshield,” *How Products are Made*, accessed April 9, 2016.

Can the labour be done locally? Is the expertise/equipment available?

All labour required to apply this item was done locally, as all the labour was done by Rural Studio students.

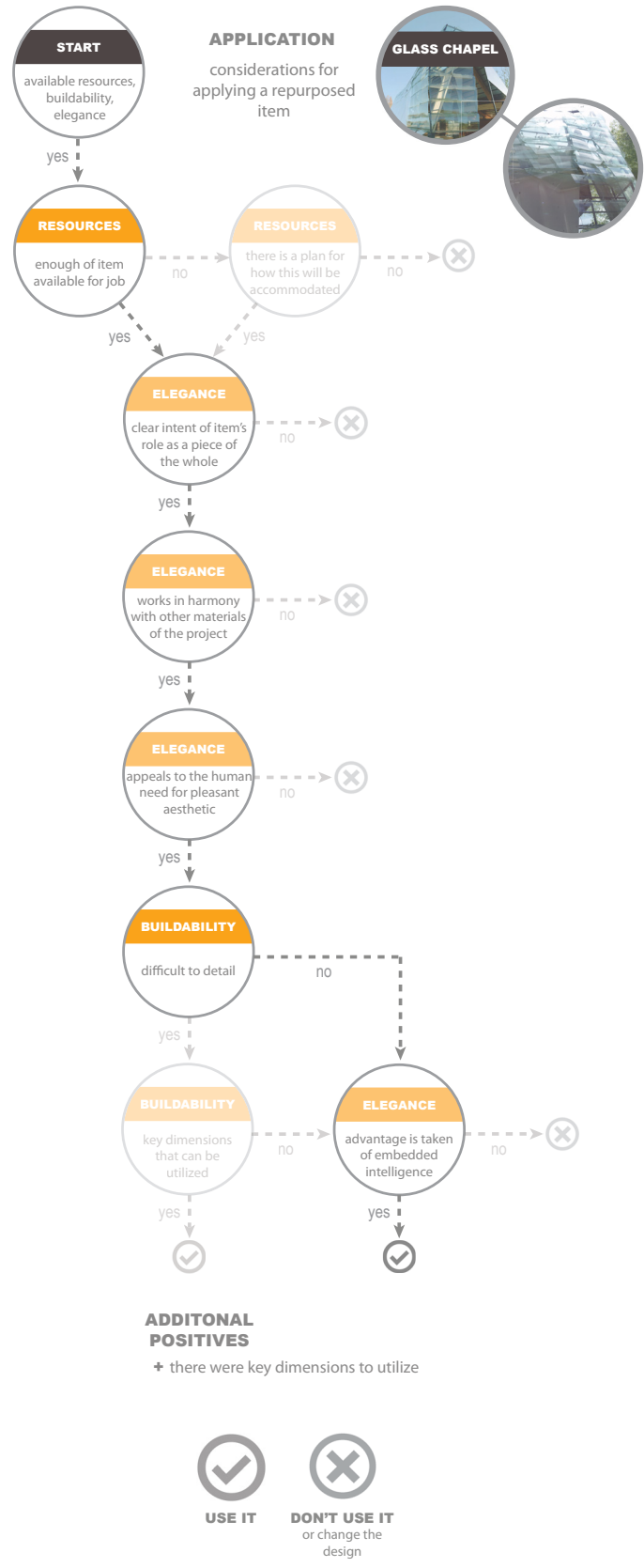


Figure 24. Buildability and elegance: GLASS CHAPEL CASE STUDY; from *Rural Studio* and Ted Cavanagh.

Is there enough of the item available for the task?

Yes. Of course if the same item in the number they need is not available then this would require a different design to compensate. Aside from that, having been able to find so many windshields of the similar model made this project more easily successful.

Does the item have key dimensions/standard sizes that could be utilized?

Yes, luckily the windshields were all similar in size. This helps in planning for application. They were able to obtain “eighty Chevy Caprice windshields,”¹⁴⁸ so having the same dimensions would be easier to plan the arrangement.

Is the item difficult to use and/or detail?

No: having a consistent dimension and curve could allow them to come up with a pattern for assembling the cladding. Having a program that was open air was an assistance in the application of this item. They had the flexibility of installing the windows as a cladding to keep most of the rain out without worrying about moisture in the interior, as it is a pavilion.

What does elegance mean in a repurposing project?

1. Clear intention of item's role as a piece of the whole within the project
2. Resolve/order/bringing systems together in harmony
3. Social function/sense of comfort: human need for pleasant aesthetic
4. The item makes use of its embedded intelligence to its advantage in the application (relates to the intention if interpreted properly)

Yes, this application of windshields was preformed elegantly. The purpose of both the windshield and cladding traditionally is to protect from the elements. This suits the item well. I think they were successful in the application of the cladding too. It appears they offset the windshields from the structure to let the windshields express themselves as separate element – it is celebrated and does not clash with the other elements of the space.

148. Dean, *Rural Studio*, 50.

Solterre Design's Bullshed as a Case study



Figure 25. Bullshed by Solterre Design; from Jennifer Corson.

The Bullshed, by Solterre Design, is an excellent case study of repurposing. The project is an example of how a project can successfully bring together many salvaged pieces and still achieve a “minimalist modern aesthetic.” The materials include salvaged insulation, windows, road signs, doors, lumber, and metal cladding. The material selection and application of the cladding is a clever demonstration of how to use a waste by-product, which will be examined here.

Evaluation

How well does the repurposed item relate to a building system?

Very well: the item is water resistant so it can help protect from the elements, as does an envelope system.

How well does the repurposed item relate to the building material it replaces?

Very well: the metal keeps out the elements and helps protect the insulation from damage, as a cladding would protect the interior wall assembly from damage. The item is very similar to metal siding, but it was harnessed as a waste by-product, so it was not intended for the same function, but can do the same job.

How is the item used traditionally? What is its intended function?

Traditionally, the item is part of an exterior door assembly.

How is the item made?

The item is a waste by-product as the result of the exterior French door manufacturing process at Peter Kohler Doors in Truro, Nova Scotia. The item is a result of doors that are produced as a solid door, and then have the center punched out for windows to be inserted.

Selection

SELECTION
 considerations for
 lecting an item to
 repurpose

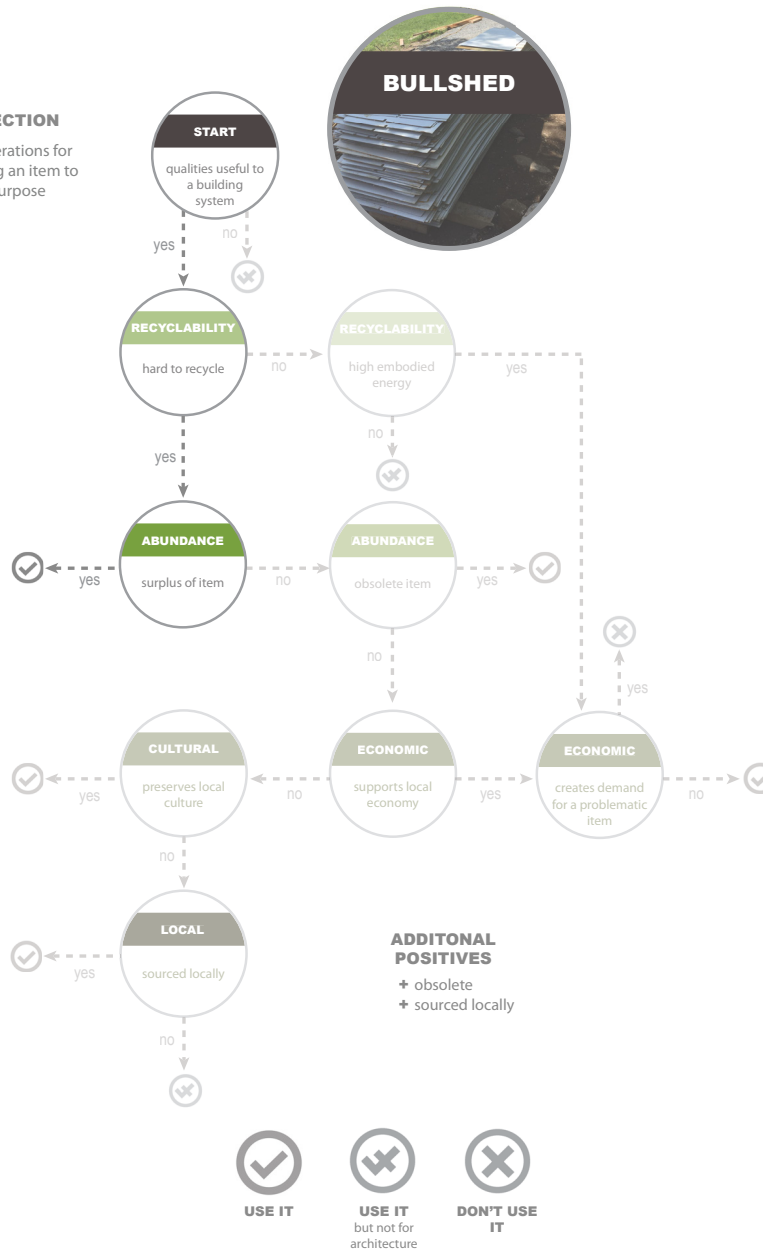


Figure 26. Selection flowchart: BULLSHED CASE STUDY; from Jennifer Corson.

Is the item difficult to recycle?

Yes: the waste by-product as a whole is difficult to recycle in its current form because it is a laminated assembly (metal sandwiching insulation). Broken into pieces by separating the metal from the insulation, the metal pieces could be recycled. So, on its own, no: metal is not difficult to recycle, as it is a common practice. Although it is a common practice, recycling metal it is still a dirty process, contributing to pollution, and wasting a lot of energy.¹⁴⁹ Recycling the insulation, on the other hand, is not in current practice.¹⁵⁰

Does the item have a high embodied energy?

Yes: metals have a tremendous amount of embodied energy from the extraction process, so already the item should be repurposed due to its metal content.¹⁵¹

Is there a surplus of the item?

Yes, there is a surplus of this item because many doors go through this process to have windows made in them, leaving a lot of waste.

Is the item obsolete?

Doors are not going to be obsolete any time soon, so there will be plenty of these off-cuts to come. The off-cuts themselves do not have a purpose and is just considered waste, so in that way they can be considered obsolete.

Does use of the item support local economy?

The item is made locally in Nova Scotia. Although, it does not add to the local economy and success of the door manufacturing industry, its use utilizes the waste this manufacturing process creates rather than it going to the landfill.

Does use of the item support/preserve local culture?

The use of the item does not add anything historically significant, but it fits within the cultural practice of cladding with metal.

149. Corson, *The Resourceful Renovator*, 63.

150. "How to Recycle Foam Insulation," *SFGate*, accessed April 9, 2016.

151. Corson, *The Resourceful Renovator*, 46.

Is the item sourced locally?

Yes the item was sourced within the province (less than one hour away), so its transportation was not a cost to the environment.

Application

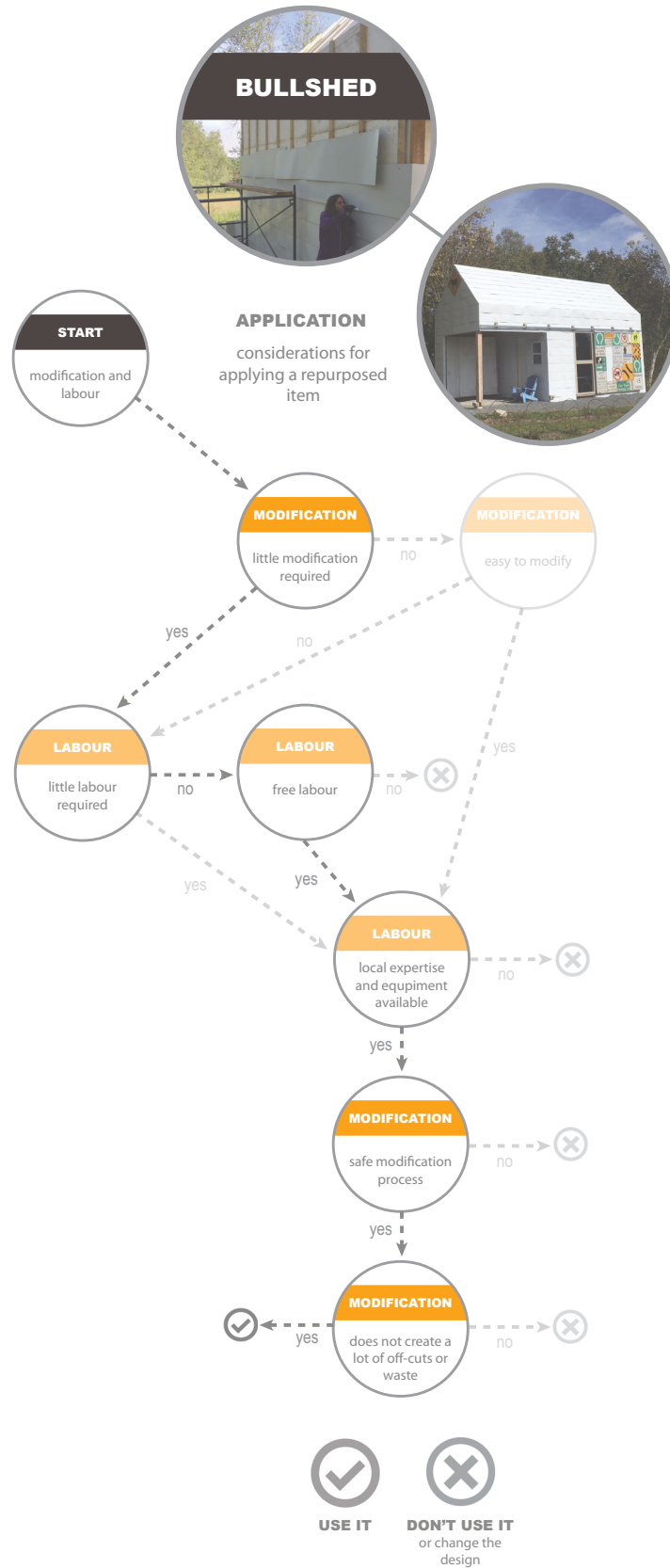


Figure 27. Modification and labour: BULLSHED CASE STUDY; from Jennifer Corson.

Is there little modification required to repurpose the item?

There is a modification that needs to be made for the item to be used. The metal needs to be stripped from the insulation in order for the metal to be used as cladding as per the design. This is not a big modification, as it is just pulling the two pieces apart.

Is the item easy to modify?

Stripping the metal from the insulation is a simple process, but requires a lot of work.

Is the modification process safe?

Pulling the metal panels off of the insulation is safe with the use of gloves as the edges can be sharp.

At what point of changing the item does it become recycling over repurpose?

The original waste by-product was stripped into its pieces and each of those pieces were reused for relatively new functions. The insulation component was used to insulate a crawl space in another project, rather than serving as the insulation in a door assembly as it was originally intended. The metal, upon being stripped from the insulation, was used as cladding, rather than a door finish material. Since each of the components of the door assembly were used in this way, it constitutes as a repurposing project. If the components had been reduced even further to their primary raw materials and were used for something else, it would begin to resemble a recycling process.

Does the modification create a lot of waste or off-cuts that cannot be used? Does it use the whole item?

Only the metal was used in this project once the components were stripped into its pieces. The insulation was not going to be used in this project, but it was set aside to be used in another project (to insulate a crawl space) so as not to be thrown into the landfill. Utilizing this waste by-product created so little waste, as a whole.

Is there little labour required in modifying and installing the item?

The stripping of the metal from the insulation created a lot labour. Although there was only the 3 pieces that needed to be separated from each other, there were many pieces so this

becomes labour intensive. To off set this inconvenience, though, the labour was free, as was the cost of material.

Compared to regular metal cladding, it was not too much more labour to install. The metal panels were thicker than regular metal cladding, so more hammering effort was required to create holes for nailing. Minor cutting was needed as most pieces were 5' x 2' in size.

Can the labour be done locally? Is the expertise/equipment available?

Yes, the stripping of the material was done by hand with the help of volunteers.

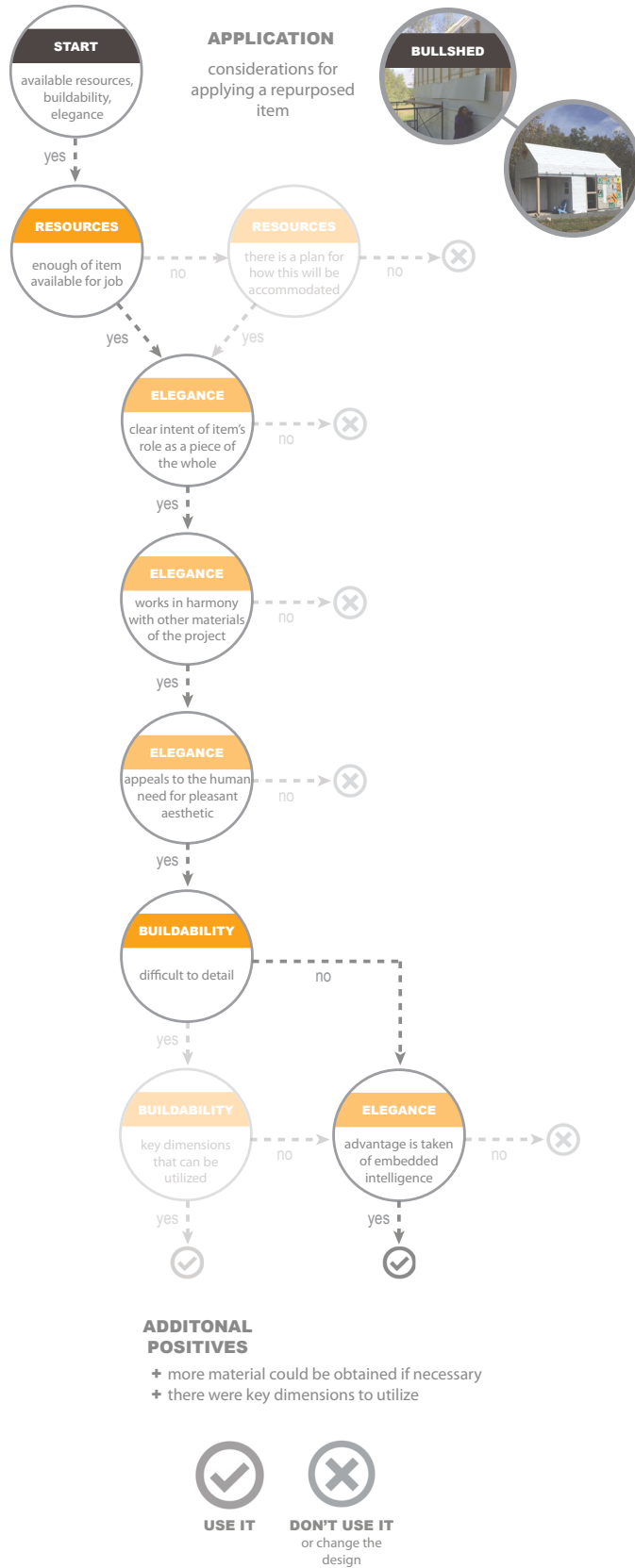


Figure 28. Buildability and elegance: BULLSHED CASE STUDY; from Jennifer Corson.

Is there enough of the item available for the task?

Yes: there was enough of the item to clad the entire project (over 400 panels, which meant 800 pieces of metal). The original plan was to only clad the walls with the salvaged metal, but they realized they had enough to do the whole project; so the available resources influenced the design. If they had run out, Solterre would have approached Kohler for more cut-outs to finish the job, but this was not necessary.

Does the item have key dimensions/standard sizes that could be utilized?

Yes: the strips were all of same or similar size (5' x 2') so this made it easy to use as a cladding system and to predict the layout.

Is the item difficult to use and/or detail?

No, detailing the metal portion of the waste by-product was straightforward upon its separation from the insulation. The labour of cladding with metal is a common practice; so the opportunity to obtain this waste by-product for repurposing made it easy to deal with.

What does elegance mean in a repurposing project?

1. Clear intention of item's role as a piece of the whole within the project
2. Resolve/order/bringing systems together in harmony
3. Social function/sense of comfort: human need for pleasant aesthetic
4. The item makes use of its embedded intelligence to its advantage in the application (relates to the intention if interpreted properly)

The item serving as the project's cladding is a very clear intent and lends well to the envelope building system. There was a good choice made here, making use of the item's use traditionally, because metal is often used as cladding and it was used for a similar purpose in the original item: exterior doors. People can very easily relate to metal as a cladding as this is a common practice and aesthetic.

CHAPTER 10: CONCLUSION

Critical Position

Many of these questions are not exclusive to repurposing items in architecture. These questions could be asked for any material selection and application, but it is the instances and circumstances around repurposing items that prove to have some obstacles to overcome. This is what makes these questions especially important to ask when repurposing in architecture so one can make an informed choice – choice being the key word. Fulfilling all of the considerations in a positive light is difficult in any given material choice, but one needs to weigh the factors and make a decision about what they are trying to achieve.

The mentality around waste has to change if we ever want to turn our environmental crisis around. Diverting from landfills and utilizing the waste pool is such a responsible way to make things. Sustainable efforts do not need to sacrifice elegance. Elegance is achieved in how we strategize to apply the items and materials we use as designers. Elegance does not come from using items that are seen as precious or rare or expensive. Many simple things are the most beautiful. Learning to design with the challenge of changing the mentality around waste can make for a lot of creativity.

Challenging how we interact with materials and items is important in *everything* we do in life: including our daily purchase decisions. The disposable culture is ruining our world. I think learning to live with less, and learning to waste less will bring us together and challenge us to get more out of life. A life of resourcefulness is the real underlying principle here: to use what you have.

Looking at the tools that have been established here, it is most important that we understand what the items we are purchasing and using are made of – and that we make responsible decisions based on that. Hard to recycle items cause a lot of issues with our abilities to re-harness materials. Understanding the social implications of items is critical for so many reasons. It can indicate how it can and should be repurposed; it can help add to a project by preserving heritage and culture, and it can contribute to the elegance of the project by appealing to the comfort and familiarity to the users. Locality is an important

principle in sustainability in general, and should be practiced whenever possible. Not only does using local resources support the place, culturally and economically, but it cuts down on unnecessary transportation costs.

In terms of architectural repurposing, of course, none of this will matter if first, the item is not evaluated in terms of utility towards a building system. Understanding the item on the level of its embedded intelligence and social role is the most important thing to satisfy on the road to repurposing for an architectural project successfully.

Acknowledging that different social groups within society as a whole can come to different interpretations about an object, means they each recognize different problems to have solved, in turn meaning there are again different approaches to solutions.¹⁵² I think this recognition means there is possibility to successfully encourage and increase the practice of repurposing, if we are able to change the mentality around items viewed as waste. Many people from different social groups working toward the same mission will find different problems, and therefore different solutions. Allowing for this flexibility in approach, while considering this guided values, will help us reach a higher level of sustainability.

An important question remains unanswered: how can we move forward with material and item repurposing without making items more difficult to reuse and repurpose in the future? Finding new ways to make use of waste pools is great but this is only useful if we are able to continue to use, reuse, and repurpose them again, continuously in the future. This brings back the importance of the idea of understanding how your item was made, and striving to use Design for Deconstruction from here on out.

152. Pinch, "The Social Construction," 417.

APPENDIX

Definitions

Dictionary.com

- Product
1. a thing produced by labor
 2. thing produced by or resulting from a process, as a natural, social, or historical one; result
 3. the totality of goods or services that a company makes available; output
 4. Chemistry. a substance obtained from another substance through chemical change.
- Substance
1. that of which a thing consists; physical matter or material
 2. a species of matter of definite chemical composition
 3. the actual matter of a thing, as opposed to the appearance or shadow; reality
- Material
1. the substance or substances of which a thing is made or composed
 2. anything that serves as crude or raw matter to be used or developed
 3. any constituent element
- Component
1. a constituent part; element; ingredient
 2. a part of a mechanical or electrical system
 3. Physical Chemistry. one of the set of the minimum number of chemical constituents by which every phase of a given system can be described

4. Adjective. being or serving as an element (in something larger);
composing; Constituent

Thing 1. a material object without life or consciousness; an inanimate object

Merchandise 1. goods, especially manufactured goods; commodities

Reduce 1. to bring down to a smaller extent, size, amount, number, etc.

2. to lower in degree, intensity, etc.

Recycle 1. to treat or process (used or waste materials) so as to make suitable for reuse

2. to alter or adapt for new use without changing the essential form or nature of

3. to use again in the original form or with minimal alteration

4. to cause to pass through a cycle again

Manufactured 1. to make or produce by hand or machinery, especially on a large scale

2. to produce in a mechanical way without inspiration or originality

Industry 1. the aggregate of manufacturing or technically productive enterprises in a particular field, often named after its principal product

2. any general business activity; commercial enterprise

3. trade or manufacture in general

Upcycle 1. to process (used goods or waste material) so as to produce something that is often better than the original

Material 1. the aggregate of physical objects or artifacts used by a society

culture

- Disposable 1. designed for or capable of being thrown away after being used or used up
2. something disposable after a single use, as a paper cup, plate, or napkin
- Heritage 1. something that is handed down from the past, as a tradition
- Unconventional 1. not conventional; not bound by or conforming to convention, rule, or precedent; free from conventionality
- Consumption 1. the act of consuming, as by use, decay, or destruction
2. the amount consumed
- Salvaged 1. the property so saved
2. the act of saving anything from fire, danger, etc
3. the property saved from danger
4. the value or proceeds upon sale of goods recovered from a fire

Disposable Culture and Waste Contribution

“Reduce, reuse, recycle” provides an important way to think about our relationship with waste. It helps internalize that maybe we do not need more, since the idea begins with the concept of reducing. Learning to live with less is better on the mind and it can be freeing. The constant need for more is straining on the individual and the environment.¹⁵³ Consumerism is a huge culprit in the waste issue we face. We make purchases all the time and many of the things we buy have extensive packaging for the sake of convenience and marketing. Plastic bags, take-out food containers and individually wrapped snacks unnecessarily add to the waste stream simply because we think our time is more precious than the environment. This mentality has made for the material culture one of

153. *Minimalism*, Directed by Matt D’Avella.

disposableness – a disposable culture, if you will. Prown defines material culture as “the study through artifacts of the beliefs – values, ideas, attitudes, and assumptions – of a particular community or society at a given time.”¹⁵⁴ Looking at how people interact with their items, one can see there is a seemingly strong need for acquiring new things all the time, but also treating them as if they are easily replaceable.¹⁵⁵

There is an idea about modern life that is associated with being fasted pace. People take on so many tasks in the run of the day, and many businesses have adapted their products to cater to this fast lifestyle. Time and time again, this has meant opting for ‘disposable’ items. Disposable items mean they do not need to be cleaned or returned: you just get a new one. This is how massive amounts of waste is produced. Having lived this way for so long, people assume being more environmentally friendly will come at the expense of their time and schedule. This does not have to be true.

We need to change our views about this culture of disposability that has been created. It does not help that there seems to be an obsession for the ‘clean.’ A lot of household waste can be attributed to cleaning products, ironically. Society views waste as dirty, but they also create a ton of waste by trying to keep clean. Many cleaning solutions are harmful to the environment, and on top of that, we take the disposable route for many cleaning tools. Paper towel, disinfectant wipes, napkins, cotton swaps, toilet paper, etc., are all used for cleaning but rapidly add to the waste stream. Many feel it is easier and cleaner for them to use things they can throw away for cleaning because it does not harbour the dirt. What they might not realize is to keep themselves and their homes clean in this way, it is making our world more ‘dirty’ with pollution. It is not only wasting the resources we have by irresponsibly spending it on many one-time-use items, but it is also ruining the chances of renewing and harvesting more resources from the planet as it suffers to thrive: “experts estimate that some of our virgin resources will disappear before the end of the twenty-first century.”¹⁵⁶ Just because you throw the ‘dirt’ ‘away,’ it does not mean it is gone.¹⁵⁷ The “out of sight, out of mind” mentality will not suffice here.

154. Prown, *Mind in Matter*, 18.

155. “We are too materialistic in the everyday sense of the word. And we are not at all materialistic enough in the true sense of the word. We need to be true materialists, like really care about the materiality of goods,” *Minimalism*, Directed by Matt D’Avella.

156. Corson, *The Resourceful Renovator*, 45.

157. *Ibid.*, 2.

The fashion industry is a huge contributor to waste because trends and very fast turn over periods make the consumer want the newest item of clothing. This leads to disposing of clothes more and more often. This was not as much of an issue in the past because there was only a two or four season rotation for clothing: you had clothing for warm weather and cold weather, or outfits for each season.¹⁵⁸ People would take better care of their clothes and they could last a lot longer. Now, the fashion industry runs on a 52 'season' cycle with new styles and shipments almost every week.¹⁵⁹ People end up throwing away clothing because it is not on-trend, even if it is still perfectly fine.¹⁶⁰

When clothing was valued more, during the 2-4 cycle season, they were cared for much more. If something had a tear or needed to be hemmed, one would fix it or take it to a tailor/seamstress. Hand-me-downs were also much more common – extending the life of clothing used by younger siblings, relatives and neighbours. There are efforts seen today to reuse clothing that people no longer wear, and it has become a business opportunity for many.

Thoughtful purchases, and thoughtful material selection can help combat the need for excess. Purposeful purchasing, and thinking about what it means to bring something into our homes, into our lives, can change the amount of things we end up throwing out. Before buying an item, if one thought to bring a bag with them, they would not need to request a plastic bag. Before buying an item, if one looked at the amount and type of packaging containing the item, one could then choose between items based on packaging, and anticipate how to deal with that waste later. Buying something with less packaging means less waste. There is an immense responsibility that comes with every purchase. This point is made very clearly by The Minimalists' view on consumerism:

The true cost of a thing goes well beyond the price on the price tag.

The cost of... storing the thing. Maintaining the thing. Cleaning the thing. Watering the thing. Feeding the thing. Charging the thing. Accessorizing the thing. Refuelling the thing. Changing the oil of the thing. Replacing the batteries of the thing. Fixing the thing. Re-painting the thing. Taking care of the thing. Thinking about the thing. Worrying about the thing. Protecting the thing. Replacing the thing.

158. *Minimalism*, Directed by Matt D'Avella.

159. Ibid.

160. "If you think about the concept of fashion, it embodies in it the idea that you can throw things away not when they are no longer useable, but when they no longer have that social value or they're no longer fashionable," Ibid.

When you add it all up, the actual cost of owning a thing is nearly immeasurable. So we better choose carefully what things we bring into our lives.¹⁶¹

Not only does this responsibility have the potential to overwhelm one's life during the 'life' of the item, but it extends to having responsibility to the environment in what happens to the item and packaging when you are through with it.

Stress on the Cycle: Food Waste

Just because a cycle might be natural, it does not mean that the cycle is not harmful by being wasteful and applying stress on the cycle. The frequency of turnover that might be required for a business to meet market demand can cause harm for even natural cycles. One example is the food industry. Tons of food is wasted each year for a few reasons. One reason is that people buy too much food – more food than they can consume before it goes bad. A big contributor to over buying is the wholesale/bulk business. Buying in bulk is advertised as a money saver, but it does not save you money if you end up throwing it out because you cannot eat it all before it goes bad. Another reason there is so much food waste is because the food industry runs on the appearance of food. Supermarkets have found that many will not buy food unless it looks next to perfect. Food that appears crooked will be rejected by many shoppers because they have a choice of nicer looking vegetables on the shelf. This results in farmers needing to meet a higher demand of growing vegetables to sell to supermarkets each year because the number of 'ugly' vegetables per field could vary.¹⁶² Over the years, farmers have learned to run their crops through a selection process and remove the vegetables that are not perfectly shaped. This collection of food becomes animal feed or is turned back to the earth. This seems like a harmless cycle of 'waste.' Why do we need to worry about wasting food if it can serve as animal feed or go back to the earth as organics?

There are environmental harms from stressing the cycle too much. For example, straining the fields by needing to produce more each year takes more nutrition from the soil, leaving them less fertile. Fields benefit from not being used every year to replenish. Additionally, more fields being worked and more harvesting means more equipment

161. "The Minimalists." *Instagram*. Jan 22, 2017.

162. Nina Corfu, "New group gets volunteers to recover unwanted veggies from farms," *CBC News*, June 30, 2016, <http://www.cbc.ca/news/canada/nova-scotia/found-vounteers-food-waste-farms-donate-food-banks-1.3658340>.

running, or equipment running for longer times. This contributes to pollution.

There are economic harms from stressing the cycle too much. Producing all that food that goes to waste still requires hard work on the farms. People need to be paid for their long hours.

There are societal harms as well. By allowing this cycle to spiral, so much food goes to waste. This food is perfectly fine, and could be gathered for homeless people and those less fortunate. One organization recognizes the issue in this cycle and is working to disrupt the misallocation of food due to imperfections and the appearance of food. FOUND works to gather food from farms and deliver it to food bank(s) in Halifax, Nova Scotia.¹⁶³

Organizations Diverting Through ‘Recycling’

TerraCycle is a company in the business of what they call ‘upcycling’. They run their business on waste people to send them. TerraCycle collects candy wrappers and drink pouch waste (hard-to-recycle products) with which they create products for sale.¹⁶⁴ This is a creative afterthought solution – one that I would call a right-for-right-now solution. The difference here is that this company uses the waste products that are collected and visibly incorporates the logos from the wrappers into the new item. This is a statement about our waste habits. This is more suitable/admirable because it confronts society by keeping the original wrapper visible. This is not the ideal – but a fair response for right now, and their efforts for keeping this waste out of the landfill should be commended. For TerraCycle, ‘upcycling’ means to take a waste product and make a more substantial use of it, which lasts longer than that of our disposable, one-time use culture.¹⁶⁵ This is similar to what McDonough and Braungart pose as a downcycle, since it follows similar processes of using working with problematic conglomerates. The idea is that because it uses these materials it means it is not sustainable, but it does in the sense that one finds a way to use our waste pools as a resource. From scratch, it would be unsustainable to continue to use raw materials to make these sort of items. I would say there is a better intent present with TerraCycle: the idea to bring people closer to their waste and to deal with the waste

163. “Found: Gathering + Sharing Forgotten Food,” Found. 2017, <http://foundns.com/>.

164. Lauren R. Hartman, “Talking trash: ‘Upcycle’ to recycle,” *Packaging Digest* 45, no. 9 (2008): 42.

165. Hartman, “Talking trash,” 50.

we have already made.

One start-up, Girlfriend Collective, has made it their mission to offer luxury leggings without guilt. Not only do they operate under fair-trade standards, but they also make their product from a waste material: water bottles.¹⁶⁶ Choosing to stick by their environmentally friendly values led to nine months of research into how to make the best leggings for their customers: ones that do not sacrifice the environment for comfort and performance. This is a great landfill diversion example for recycling. Rather than using raw materials and making conglomerates, they are taking a spin on how to use those materials in a justified way – using empty water bottles so they are not thrown away.

Organizations Diverting Through Reuse

Thrift stores such as Salvation Army are a good way to reuse items and contribute to reuse efforts. Salvation Army accepts clothing and other household donations to sell at their thrift stores. Their thrift stores are a 100 percent charity-based operation that support their many programs, for which they are “Canada’s largest non-governmental provider of social programs.”¹⁶⁷ Anything they cannot use due to being in rough shape is sold to cloth graders, which keeps them out of landfills and still generates money for them.¹⁶⁸

The Canadian Diabetes Association collects clothing through their Clothesline program. Their clothesline program is convenient because they will pick up the donations from your home, while there are also drop-off boxes among many communities.¹⁶⁹ Working with Value Village, the association raises money for diabetic research.¹⁷⁰ These are two very assessable examples of organizations that people can practice reuse through, and each have tremendous impacts in diverting from the landfill. The Canadian Diabetes Association in particular diverts more than 51 million kilograms of clothing from landfill sites across Canada” each year.¹⁷¹

166. “Girlfriend Collective,” *GirlfriendCollective*, 2017, <https://girlfriend.com/>.

167. “Salvation Army Thrift Store – FAQs,” *Salvation Army*, 2015. <https://thriftstore.ca/nova-scotia/salvation-army-thrift-store-faqs>.

168. *Ibid.*

169. “Clothesline FAQ,” *Canadian Diabetes Association*, 2017, <https://www.diabetes.ca/how-you-can-help/clothesline/clothesline-faq>.

170. *Ibid.*

171. *Ibid.*

There are profit-earning business opportunities through the reuse stream too. A New Brunswick business has recently become quite popular. Ella is a resale app and bricks-and-mortar store where people can sell their clothes to others. Many people buy clothes and only wear them a few times due to the large trend turnover in the fashion industry. This means many clothes are in perfect condition and others could get use out of them. Creating a culture of sharing in this way and normalizing reuse is a productive way to deal with the feeling of needing to update ones closet frequently, in a more sustainable way.¹⁷²

Bulk Barn has started a new program where patrons are invited to bring in their own containers and fill up on product instead of using plastic bags from the store.¹⁷³ This cuts down on the amount of plastic being used and thrown away. This is similar to grocery stores selling reusable bags for grocery shopping but it takes it a set further. In the case of the Bulk Barn, a patron can take as little or as much product as they need, as everything is sold by weight from bins. This eliminates the need for all products to be individually wrapped, and bringing a container means eliminating the need for bags. Jars can be purchased at the store as well. Why can't we acquire all of our purchases in this manner?



Figure 29. Bulk Barn container reuse program steps; from *Bulk Barn Limited*.

172. "Ella: Fashion Loved." *Ella*. <http://thisisella.com/>

173. "Reusable Container Program," *Bulk Barn Limited*, 2017, <http://www.bulkbarn.ca/en/Reusable-Container-Program>

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