Cardboard Unboxed

Runxin Zheng
MA Graphic Communication Design
Central Saint Martins

1 Complexity

While recycling is widely seen as a sustainable solution to waste management, its complexities – starting with the recycling symbol – make it confusing and often misleading. Since its creation, the ‘universal’ symbol has remained free in the public domain, resulting in many variations across consumer packaging, waste containers and other waste management infrastructure. While symbols are an essential visual aid in graphic design, they do not inherently make information or the system more accessible (Pater, 2016). As Fugelsang (1982, cited in Pater, 2016) notes, visual literacy is an acquired skill, and interpreting recycling symbols can be challenging, even for those well-versed in visual media.

Crow (2010) discusses the difference between official and unofficial visual languages, a distinction that also presents itself in waste management symbols. Official symbols, like the recycling symbol or general waste icons, offer authorised messages, while residents’ personalised bin markings attempt to clarify where the official voices fall short. Observing this tension between the two voices highlights public perceptions of the waste management system and reveals gaps and misunderstandings in communication.

2 Ambiguity

The recycling symbol’s simplicity – three folded, chasing arrows – has made it adaptable across materials and contexts. However, this abstraction leaves it open to varied interpretations and appropriations by both consumers and industries. As Douglas argues, ambiguous symbols function like poetry and mythologies, providing room for enriched meanings (cited in Liboiron and Lepawsky, 2022). This ambiguity enables industries to leverage the symbol for marketing, fostering a perception of sustainability that may not reflect reality. For instance, resin identification codes incorporated into the recycling arrows often mislead consumers into believing all plastics bearing these codes are recyclable when, in reality, only two resin types are widely accepted by recycling facilities (Delgado, 2023).

Similarly, cardboard is marketed as environmentally friendly due to its recyclability, yet it is primarily used as disposable packaging in a world of overconsumption. This branding aligns cardboard with sustainable practices, even though its overuse contributes to excessive waste. The evolving associations with the recycling symbol invite reflection on whether consumers could “unlearn” these meanings and uncover the reality behind the recycling system.

3 Iterations

Top: one iteration from first set of 100 iterations

To probe the recycling symbol's layered meanings, I made 100 visual iterations, each adding a layer of complexity and re-contextualising the abstract symbol. I incorporated images of elements within the recycling systems, including variations of symbols, packaging materials, on-pack disposal instructions, dustbins, wheelie bins, and refuse trucks. Through these visual experiments, the recycling symbol came to seem decorative – overused on various packaging – rather than a genuine representation of sustainable practices.

Blauvelt (1994) argues that graphic design's history must be considered within its social context, including production, distribution, and consumption. Following the first Earth Day in 1970, the Container Corporation of America commissioned Gary Anderson's design to represent recycling as a sustainable practice (Liboiron, 2012). However, it has since been appropriated to position recycling as a one-size-fits-all solution to the environmental crises. This narrative persists despite widespread acknowledgement of recycling's limitations. The symbol's public domain status has contributed to its overuse and inconsistent application, which, in turn, contributes to confusion and undermines its effectiveness as a communication tool.


PLEASE
TRASH
Enter your own text
THESE BINS ARE FOR RESIDENTS USE ONLY!
PLACE RUBBISH IN THE BINS
GREEN WASTE ONLY
Dog Waste Bin
Dog waste bin
WASTE MANAGEMENT
GARDEN WASTE ONLY
food waste
general waste
mixed paper & card
mixed glass bottles & jars
paper
food tins & drink cans
cans
plastics
mixed recycling
FOOD WASTE


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4 Reinterpretation

Could graphic communication design reinterpret the meaning of an overused symbol?

Kozole's (2021) documentation of 400 variations of the Triglav mountain symbol in Slovenia demonstrates that even widely used symbols can convey new, distinct narratives about their communities and cultural values. In Kozole's book, each logo is presented with a unique story of the community behind it, and collectively, these logos contextualised each other and pieced together an untold history and a contemporary image of the nation. Xu (2015) similarly created visual poems from a collection of clothing labels, each reflecting a facet of modern Chinese cultures and aspirations.

Both practices show that new meanings can emerge from the original materials when curated and contextualised with intentions.

In my second set of visual experiments, I explored the underlying structure of the waste management system by gathering images of recycling symbols, labels, and other graphic mediums, such as delivery packages and bins. I decoded and arranged the design devices – colour, shape, icon, and text – to depict the recycling process visually. This iterative approach mirrors techniques used by Kozole and Xu, demonstrating that even abstract symbols, when re-imagined, can offer fresh interpretations of system processes.

With enough preliminary visual research and experiments, I realised that need to learn about what systems are and how systems work before I could claim the recycling symbol from ambiguity and send a clear message.

Left: one iteration from the second set of iterations

Bottom left: Kozole, E. (2021) A book documenting all Slovenian logos that feature the national symbol of the country.

Bottom right: Xu, B. (2015) The Seven-Character Poetry Collection of Small Enterprises [Clothing labels and programming writing].

5 Theory

Voss (2024) defines systems as “relationships between things and relationships among those relationships,” often governed by embedded power structure. Systems, especially complex ones like recycling, are rarely linear or easily understood (Voss, 2024).

The term “system” itself is so expansive that it becomes applicable to nearly any area, positioning diverse processes as subjects for study and control (Voss, 2024). Applied to recycling, this systematic approach has generated entire industries dedicated to waste management, ultimately aiming to ensure an uninterrupted flow of production (Liboiron and Lepawsky, 2022). However, as Voss (2024) points out, even robust systems admit failures, just as litter always overflows its container, exposing the recycling system’s limitations (Moore, 2012, cited in Liboiron and Lepawsky, 2024).

Liboiron and Lepawsky (2022) argue that recycling has become a form of “discarding” that builds “a green reputation”, rationalising the production of disposables. The recycling symbol institutionalises recycling, making it part of the waste management system and, thus, perpetuating the production of disposable products. Additionally, industries offload their recycling responsibility to consumers, oversimplifying the process while obscuring the environmental impact of production.

6 Miscalar

To make these theories tangible, I focused on aluminium using a Sprite can. Aluminium is often celebrated as a ‘miracle’ or ‘green’ metal due to its recyclability, which has earned it multiple dedicated symbols, branding it as a sustainable material. However, according to the International Energy Agency (2023), aluminium production is highly energy-intensive, emitting significant carbon dioxide and producing toxic red mud. The bauxite mining for aluminium has caused environmental degradation and social displacement in regions Odisha, India, where companies like the Aditya Birla Group – a supplier of the Coca-Cola company – have displaced millions of people (Jena, 2016). Recycling diverts attention from these issues, tasking consumers with waste sorting without addressing production’s environmental toll (Liboiron and Lepawsky, 2022).

While consumer products like beverage cans make up only a fraction of aluminium applications, the majority of primary aluminium is consumed by transportation, construction, and renewable energy sectors (European Aluminium, 2024). For example, a Boeing 747 requires 66,000 kg of aluminium, compared to 0.015 kg for a standard soda can. Companies like Aditya Birla’s Novelis, which supplies Boeing and Toyota, illustrate what Liboiron and Lepawsky call a “scalar mismatch”: the high recycling rate of cans does not offset the growing demand for aluminium in industries with significant environmental and human costs. Thus, recycling ultimately legitimises resource extraction rather than preserving the natural resources.

Displacement
It is estimated that some 3–5 million people have been displaced since 1950 in Odisha on account of various development projects, of which more than 50 percent are tribals (Haan and Dubey, 2005, cited in, Jaysawal, N. and Saha, S, 2018)

Bayers process and red mud
The alumina refining process, called the Bayers process, produces a residue slurry, often called "red mud", which plants can't grow in when it's untreated. Globally, around 4 billion tonnes of red mud sit in ponds or dams, with more added every year. (Rio Tinto, 2023)

A drought led to a slower growth rate
Being the world's largest aluminium producer, China's primary aluminium output hit a record of 44.43 million metric tons in 2023. The growth rate slowed amid a drought in Yunnan, the country's fourth-biggest aluminium-producing region, led to insufficient hydropower supply and local smelters were asked to cut production. (Reuters, 2024)

7 Embodiment

To examine how graphic communication design can illuminate the recycling system's complexity, contradictions and failures, I created a traditional booklet showcasing my visual research on the aluminium industry, including collages juxtaposing leading aluminium producers' logos with images of environmental crises they have contributed to, like red mud pollution and droughts.

Happyland by Uj (2024) is a popsicle-shaped zine depicting the well-known dystopia neighbourhood in Bangkok, Thailand. The zine's vivid colours and playful form capture the district's atmosphere, creating a striking contrast with the area's infamous history as a once-closed theme park. Its wooden handle transforms the traditional zine format into a three-dimensional object, inviting readers to experience the theme park settings as if savouring a popsicle while unfolding each page. This raises questions about the impact of format on perception: How might a similar approach affect our understanding of the aluminium industry if publication were reimagined as a beverage can and as a Boeing 747? How does transforming a publication into an object shape the reader's interpretation and engagement with its content?

Left: Publication on Aluminium Industry #1

Bottom: Uj, T. (2024) Happyland.


Sprite
LEMON-LIME
THE Coca-Cola COMPANY
Novelis

Deakin and Dyer (2022) advocate for a more “embodied” graphic experience, calling it a “graphic event”. Unlike static images, a graphic event invites participation, allowing designers to challenge traditional graphic design experiences. I explored the publication’s affordance by producing a physical, folded network of objects representing the aluminium industry’s underlying structure. This ‘publication’ cannot be flipped page-by-page. Instead, readers must follow threads, untangling the objects individually.

Once unfolded, the objects “trail” out of the green cover, which Patti Smith would describe as a “kinetically trailing” experience, amplifying familiar objects (cited in Deakin and Dyer, 2022).

This graphic event invites viewers to experience the challenge of navigating systems, information and power structures, making the complexity of recycling and production tangible.

Left: Publication on Aluminium Industry #2

8 Form

Through my conversation with Matthew Stuart, I realised my interest lies in exploring the microcosms within systems: how things are made, distributed, circulated, used, discarded, and, sometimes, reused. This methodology, which I initially applied to aluminium, can extend to any material. One insight that emerged during our conversation is my desire to re-enact these systems through a tangible, sensory experience in the form of a physical publication.

“Visceral, embodied interactions and paying attention to the weird ways in which systems puncture the world are incredibly important but need to be coupled with awareness of the power relations that course through them.” (Voss, 2024)

The materiality of such a publication can engage the audience’s senses – sight, touch and smell – allowing them to experience the complexities, not just intellectually but viscerally. This realisation has shifted my focus to cardboard.

Cardboard, like aluminium, is part of a complex system of resource extraction, production, and post-consumer processing. Though celebrated as a sustainable, recyclable material, the extensive use of cardboard in packaging raises questions about its true environmental impact. As mentioned earlier, the recycling symbol was originally commissioned by a cardboard manufacturer, the Container Corporation of America. Since then, large volumes of cardboard have been produced and consumed, profiting from its reputation for being highly recyclable. This paradox underlines cardboard’s unique role in our growth-driven society, making it an ideal material for examining issues of consumption, waste, and sustainability.

So, how could I generate alternative ways of understanding cardboard through ‘sensory experience’? Matthew and I also discussed the need to align my production method with the values and ethics of my research. How could I embody cardboard’s materiality, packaging function, production system and recycling system in a publication?

This led me to explore artists who have embedded the system they critique in the form of their work.

For instance, in *FedEx Glass Works*, Beshty (2017) uses the fragility of glass boxes to document the shipping system. Scheeren (2013), whose photography book *Cut Shaving*, integrates mailer into the design of its book cover, so when readers receive Scheeren's book, they can spot traces of the journey this book has made on its cover. In her photo series *Airportals*, Brown (2019) intentionally passed rolls of film through airport X-ray scanners, capturing the liminal, ghostly, otherwise unseen frictions in the border control systems.

Top left: Scheeren, J. (2013) Jaap Scheeren Cut Shaving. Amsterdam: Fw: Books.

Bottom left: Brown, P. (2019) Airportals.

Right: Beshty, W. (2017) FedEx® Large Kraft Box ©2004

These practices remind me that the publication's design must reflect the system it critiques.

9 Discards

While Matthew's insights emphasised the production methods of my research, my conversation with Josh Lepawsky, the co-author of the book Discard Studies: Wasting, Systems, and Power, further advanced my enquiry by highlighting the misconceptions around discarding. We often mistake individual experiences of waste for the overall practice of discarding, while most waste is generated upstream in resource extraction and manufacturing. This has led me to explore the production system more critically. What is discarded in the process? Where does this 'waste' go? And who are the end-of-market users?

Understanding who my audience is became another focal point of my conversation with Josh. Depending on whether my work engages general readers, designers, or industry representatives, the impact and accessibility of the insights will vary. I aim to make the knowledge and insights more accessible for end users, especially younger consumers who may not yet consider the systems behind everyday materials like paper and cardboard. Josh's perspective has encouraged me to think about how to translate these complex systems into a language these groups can easily engage with.

Josh has also challenged me to think about the limitations of graphic design in creating systematic change. While design can offer new ways of experiencing and thinking about cardboard, it alone is not enough to shift individual behaviour or significantly impact the industry. We discuss concepts like per-unit efficiency and the rebound effect within the circular economy. Even if individuals reduce cardboard consumption, the industry's growth-driven nature often offsets these gains by increasing overall production volume. Ultimately, it is the system we need to address, not the symptoms (Liboiron and Lepawsky, 2022). While our power as designers and individual players is limited, Josh emphasised that history shows change is possible. Systems that seem fixed today were once different. For instance, before mass production and global distribution, people shopped locally without shipping or extensive packaging. With globalisation, businesses began sourcing materials from less costly regions and manufacturing goods in countries with lower labour costs, leading to an increasing demand for international shipping and cheap, disposable packaging like cardboard.

Neither Josh nor I dismiss the idea of societal growth; however, we must look for alternative ways to grow outside the dominant Eurocentric system. Similarly, the traditional form of publication is not inherently wrong but rather inadequate. Throughout Unit 2, I always want to provide at least two methods of engaging with the material in focus.

10 Cardboard Paper

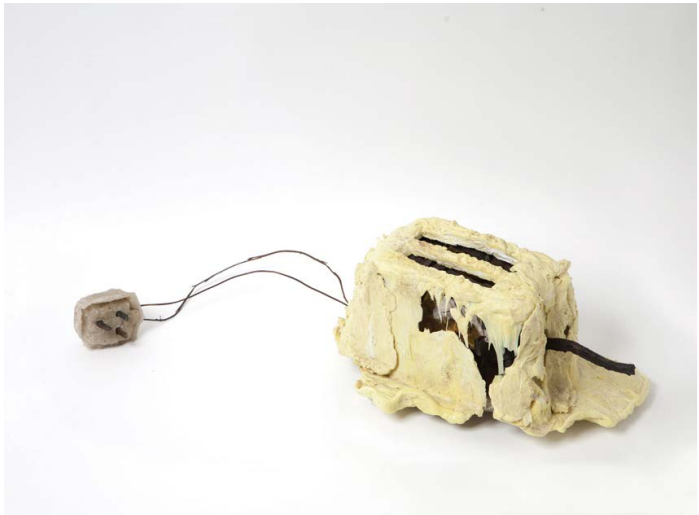
To establish a more direct connection between cardboard and publication, and to experience the recycling system on a sensory level, I decided to recycle and transform cardboard into paper sheets for printing and binding. As I experimented with making paper from cardboard at home, without using chemicals, the process proved laborious.

I manually shredded the cardboard boxes into small pieces, soaked them overnight in my biggest salad bowl full of water, used a domestic blender to turn these soaked cardboard pieces into pulps, and paused the blender every 10-15 seconds to prevent overheating. These pulps were then resoaked in a plastic container full of water, filtered with a mesh screen, pressed on a ragged cloth to remove excessive water, and finally left to dry on a cloth rack overnight

At this point, The Toaster Project by Thomas Thwaites has become a key reference for me. Thwaites (2011) deconstructed an electric toaster from Argos and attempted to replicate it by making all its constituent parts from scratch, revealing its underlying systems. Thwaites's efforts – from travelling to the most remote mines in the UK to extracting metals in a backyard – highlighted the difficulty of recreating such a seemingly simple product alone, making clear how even mundane items can offer deep societal insights (Barthes, 1972, cited in Dyer, Deakin, and Williams, 2022). Each step in The Toaster Project reveals the interconnected systems we take for granted, from transportation and materials to manufacturing and distribution.

Bottom left: Ballon, N. The Toaster Project, T, Thwaites.

Bottom right: Alexander, D. The Toaster Project, T, Thwaites.



11 Material

Like Thwaites, I am also intrigued by the hidden complexity of everyday objects and materials. However, my project engages more with the post-consumption cycle – how cardboard, once manufactured, is consumed, (sometimes) recycled and eventually discarded. Thwaites chose a toaster for its symbolic value as a superfluous, inexpensive, and disposable product. (2011) I chose cardboard for its close connection to consumption and recycling, questioning whether its recyclability has normalised overpackaging and overconsumption. Designed to be discarded after use, cardboard constitutes a large part of municipal solid waste, often ending up in landfills, especially in countries like the United States. (Milbrandt et al., 2024, pp. 21-28)

12 Scale

As Voss (2024) observes, our encounters with systems are rarely linear or complete; instead, we only experience parts of systems on a particular scale and receive partial information through multiple layers of filters. Consider Thwaite's Toaster Project: while a regular Argos customer sees an electric toaster encased in a clean, white plastic cover, 404 small parts lie within, each part embodying a system in its own right. As an individual consumer, my exposure to recycling is equally limited. As an individual consumer, my role ends with flattening cardboard boxes and placing them in a recycling bin, leaving the subsequent processes – how recyclables are processed, the waste generated in recycling, and its externalities – largely unknown.

My experiments with remaking cardboard into paper underscored how the labour-intensive nature of recycling. While my individual-scale recycling uses only water, electricity and manual effort, industrial cardboard recycling consumes significant energy, water and chemicals. Furthermore, cardboard can only be recycled a finite number of times before it is ultimately landfilled. Meanwhile, the production volume of cardboard has steadily increased, raising questions about recycling's role:

is it simply a reputation-building mechanism that justifies ongoing production? How problematic is cardboard compared to plastic, and are there alternatives to endless recycling, discarding and producing it?

Thwaites and I both attempted to achieve something usually done on an industrial scale through personal efforts. In the end, Thwaites failed to make a functional toaster, and I am still far from fully grasping the recycling and production systems despite being able to create some rough paper from cardboard. In contrast, industries of manufacturing have become increasingly productive and equipped with advanced technology, resources, knowledge, and access, which supports Voss's argument that scale is a process to justify an unequal distribution of power and resources. (2024)

13 Methods

Science of the Secondary: Rubbish, a visual study by Atelier HOKO (2022), examines the daily practice of discarding through photography and collage, capturing each step from preparation for disposal to the act itself and alternative responses, such as hoarding or gifting. This publication presents discarding at a micro-scale, framing it as both a cultural and collective practice facilitated by official infrastructures, like bins, as well as unofficial spaces where waste can be hidden or stored. Inspired by Atelier HOKO's (2022) approach, I adopted a similar approach to document cardboard's post-consumption lifecycle, seeking to expose often overlooked stages in its disposal.

In the papermaking process, I documented each stage of cardboard's transformation, capturing its visual changes and photographing byproducts such as contaminated water, sediment, and loose fibres. Like Atelier HOKO's (2022) work, which frames each moment in the journey of discarded items as an inquiry into cultural practice, I digitally cropped photographs to capture the material's texture, presenting a more sensory experience of cardboard's journey.

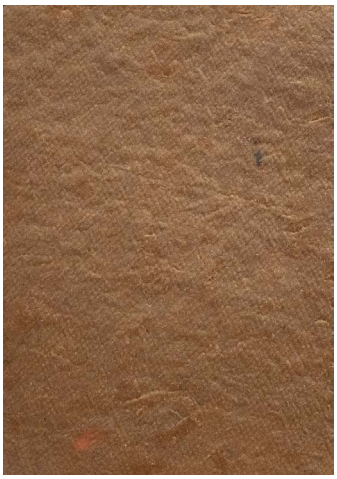
This approach led me to question cardboard's production, consumption and disposal, paralleling Science of the Secondary, which integrates visual storytelling with critical inquiry. After producing publications in the aluminium industry, I realised that presenting research findings, statistics, and answers isn't necessarily the most compelling communication method.

Right: documentation of my paper-making process at home

Bottom left: Atelier HOKO. (2022) Science of the Secondary #13 Rubbish.









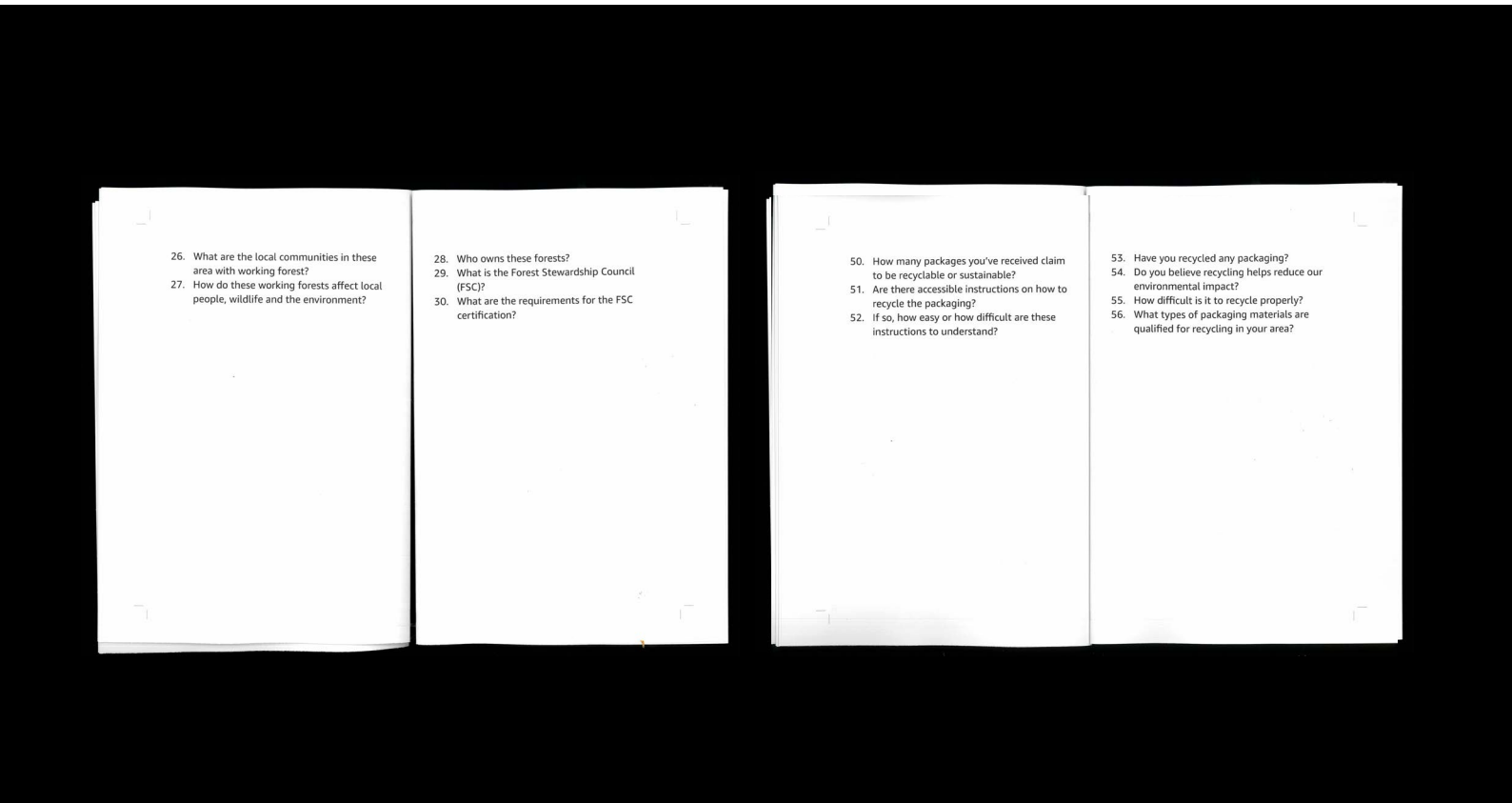
To prompt deeper reflection on cardboard's role and impact, I present these visuals with 101 iterative questions addressing cardboard's post-consumer lifecycle and its impacts. Through these questions, I encourage my audience to engage more critically with the material before them, recognising that questioning itself could be a powerful means of narrating and experiencing systems.

Rather than explaining how things work technically in detail, Thwaites shared his experiences navigating systems, from disassembling the toaster to attempting to extract raw materials and consulting specialists, even facing rejection from BP representatives. With openness and a sense of humour, Thwaites broke down every technical or political challenge into digestible stories, accompanied by his email transcripts, photographs, sketches, maps, diagrams and book pages. He made his findings accessible to his audience without overwhelming them with metallurgy or BP's operation structure as a multinational oil and gas company.

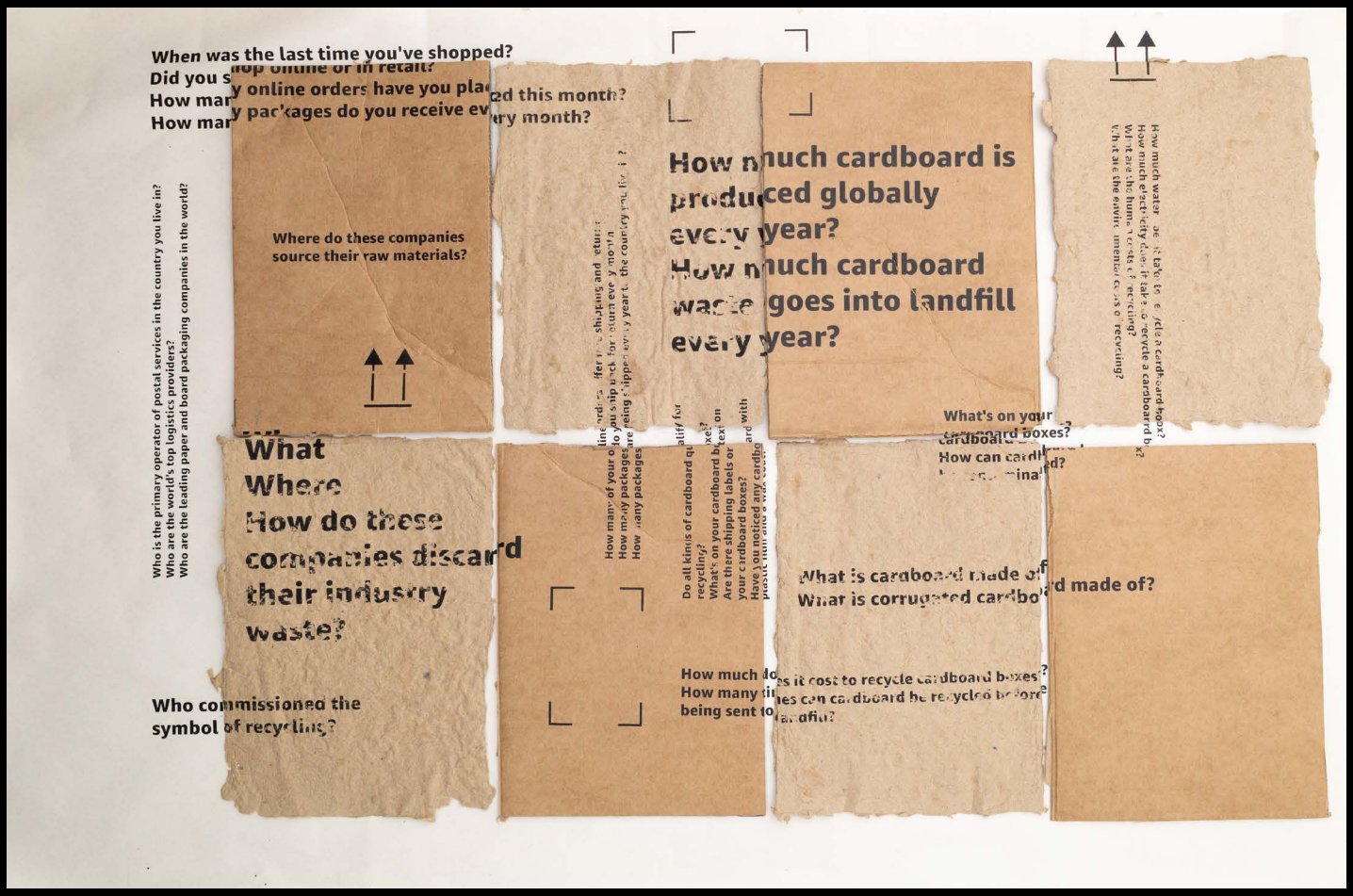
Neither the Toaster Project nor my project has provided solid answers to our questions about the production system. However, both projects offer a framework for examining and engaging with these systems from a tangible perspective, making abstract processes more relatable and encouraging a critical view of everyday materials and their lifecycle.

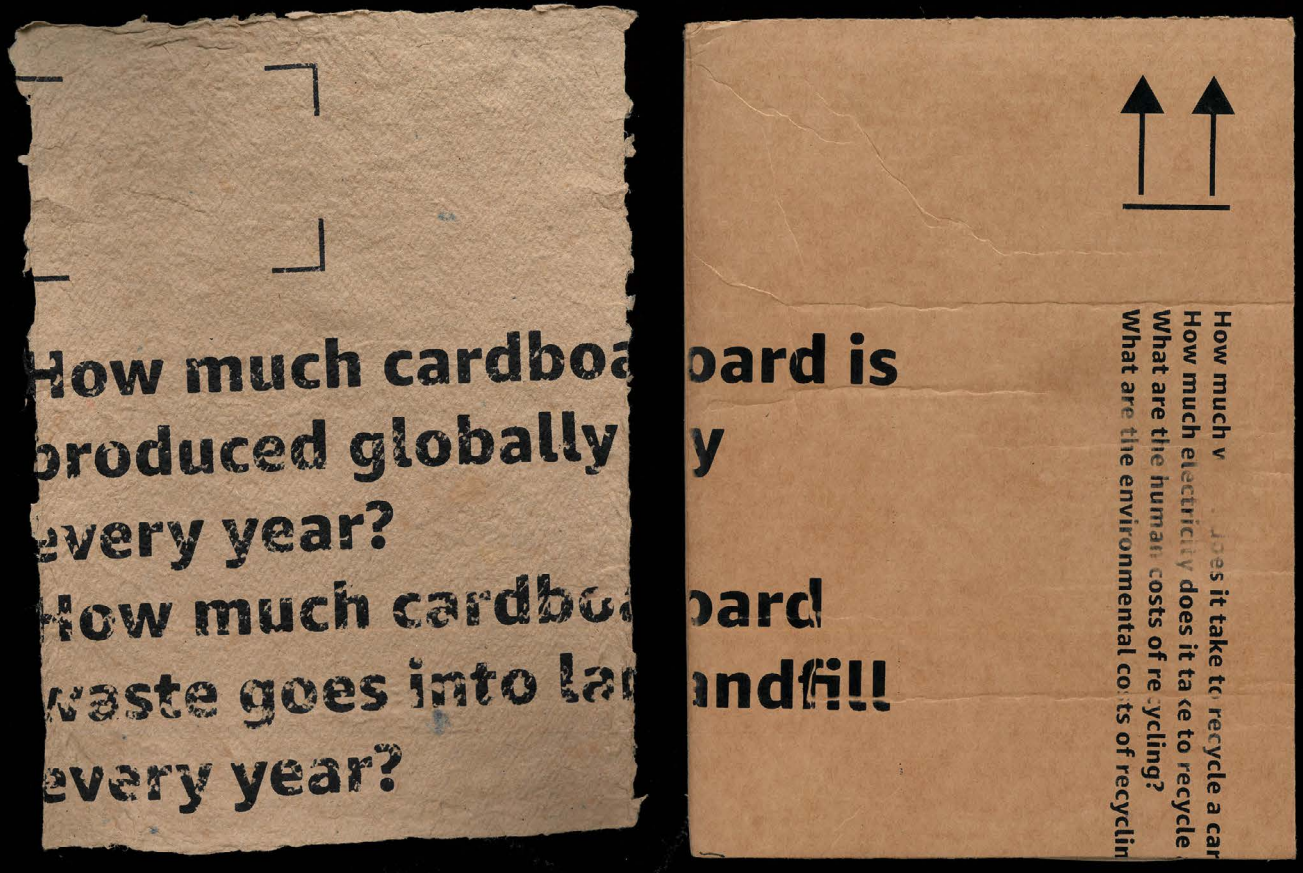
Bottom: unbounded, work-in-progress publication of the 101 Questions

Right: 101 questions on cardboard



1. When was the last time you've shopped?
2. Did you shop online or in retail?
3. How many online orders have you placed this month?
4. How many packages did you receive this month?
5. What is the average package size that you've received?
6. How many products come with more than one layer of packaging?
7. How many of your purchases are packaged in cardboard or corrugated cardboard?
8. How many of your online orders offer free shipping and returns?
9. How many packages did you ship back for return or exchange this month?
10. How many packages are being shipped annually to the country you live in?
11. Who is the primary postal operator in the country you live in?
12. How many packages does Amazon ship every year globally?
13. Who are the world's top logistics providers?
14. Where do these service providers source their cardboard boxes?
15. Who are the leading paper and cardboard packaging companies worldwide?
16. What is cardboard made of?
17. What is corrugated cardboard made of?
18. What are the environmental consequences of the adhesives used in cardboard?
19. Where do cardboard companies source their virgin materials?
20. Do they source virgin materials domestically or globally?
21. What are "working forests"?
22. How much land is dedicated to working forests?
23. What is planted in these forests?
24. What has been removed from these forests to make way for virgin materials?
25. How many trees are cut down annually to meet the demand for cardboard?
26. What are the local communities in these area with working forest?
27. How do these working forests affect local people, wildlife and the environment?
28. Who owns these forests?
29. What is the Forest Stewardship Council (FSC)?
30. What are the requirements for the FSC certification?
31. Where is cardboard being manufactured?
32. Does the manufacturing process vary by region or country?
33. What infrastructure is needed for cardboard production?
34. Where are the cardboard mills located?
35. Who works in these mills?
36. What chemicals does the paper industry use to produce cardboard?
37. What health hazards exist in the paper and cardboard industry?
38. What does the paper industry discard as industry waste?
39. Where do these companies discard their industry waste?
40. How do these companies discard their industry waste?
41. What pollutants are released during the cardboard-making process?
42. What are the microfibres, and how are they produced?
43. How does cardboard production affect the local communities, wildlife and environment?
44. Do you favour cardboard over plastic?
45. Do you consider cardboard environmentally friendly?
46. Do you associate cardboard with recycling?
47. Do you associate recycling with sustainability?
48. When was the symbol of recycling first created?
49. Who commissioned the design of the recycling symbol?
50. How many packages you've received claim to be recyclable or sustainable?
51. Are there accessible instructions on how to recycle the packaging?
52. If so, how easy or how difficult are these instructions to understand?
53. Have you recycled any packaging?
54. Do you believe recycling helps reduce our environmental impact?
55. How difficult is it to recycle properly?
56. What types of packaging materials are qualified for recycling in your area?
57. Have you recycled cardboard boxes?
58. Do all kinds of cardboard qualify for recycling?
59. What's attached to or printed on your cardboard boxes?
60. How many of the cardboard packages you've received are brown vs. coloured?
61. Are there shipping labels, tapes, printed text or graphics on your cardboard boxes?
62. Have you noticed any cardboard with plastic film and a wax coat?
63. How can cardboard be contaminated?
64. Have you recycled contaminated cardboard?
65. Where is cardboard recycled after collection from households and businesses?
66. How much of recycled cardboard is processed locally?
67. How much of recycled cardboard is exported?
68. What chemicals does the industry use to recycle cardboard?
69. What pollutants are released during the cardboard-recycling process?
70. What are the human costs of recycling?
71. What are the environmental costs of recycling?
72. How much water does it take to recycle a cardboard box?
73. How much electricity does it take to recycle a cardboard box?
74. What is the recycling rate of cardboard boxes?
75. How does the quality of recycled cardboard compare to virgin cardboard?
76. What percentage of virgin materials are used in manufacturing recycled cardboard?
77. How many times can cardboard be recycled before it's no longer viable and being sent to landfill?
78. How much cardboard waste goes into landfill every year?
79. How long does it take for cardboard waste to decompose?
80. What is released when cardboard decomposes?
81. How does cardboard impact air pollution during production, recycling and decomposing?
82. Is our recycling system currently working?
83. What is the size of the international market for cardboard packaging?
84. How much cardboard is being produced globally each year?
85. How has the demand for cardboard packaging changed during-and-post-COVID-19?
86. How does the rise of e-commerce impact cardboard demand?
87. Is the demand for cardboard still increasing?
88. Do you think cardboard has a favourable reputation as a packaging material?
89. How does the paper industry benefit from cardboard?
90. How do companies benefit from using cardboard as packaging?
91. What roles does cardboard play in the "throwaway culture"?
92. What alternatives exist to cardboard?
93. Are there any emerging technologies to make cardboard production and recycling more sustainable?
94. Are these technologies distributed evenly across the globe?
95. What's the purpose of card packaging and packaging in general?
96. What's our relationship with cardboard packaging?
97. What is the Cardboard Box Index?
98. Is it possible for industries to package less?
99. Is it possible for industries to produce less?
100. Is it possible for us to consume less?
101. What do you think about cardboard now?


When was the last time you've shopped?
Where do these companies source their raw materials?
How much cardboard is produced globally every year?
How much cardboard waste goes into landfill every year?
What's on your cardboard boxes?
What
Where
How do these companies discard their industry waste?
Who commissioned the symbol of recycling?
What is cardboard made of?
What is corrugated cardboard made of?
How much water does it take to recycle a cardboard box?
How much electricity does it take to recycle a cardboard box?
What are the human costs of recycling?
What are the environmental costs of recycling?
Who is the primary operator of postal services in the country you live in?
Who are the world's top logistics providers?
Who are the leading paper and board packaging companies in the world?


How much cardboa
produced globally
every year?
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How much v
How much electricity does it ta e to recycle
What are the human costs of re ycling?
What are the environmental co ts of recyclin

14 Method

The production method must mirror the system in critique.

By researching both individual and industrial practices of recycling cardboard and other recyclables, I found that individuals often cut or fold cardboard boxes into smaller pieces, while industries squash them into cubes through a process called baling. To echo this, I cut my recycled cardboard sheets in A5 size, aligning their scale with my recycled paper sheets.

To deepen my understanding of cardboard's materiality, I examined its properties, including labels, text, layout, and printing techniques, many of which use silkscreen printing. While commercial cardboard is often printed with industrial screen-printing as part of an automated manufacturing process, my access was limited to a workshop equipped only with manual screen-printing tools. In the next step, I screen-printed selected questions onto both recycled paper and corrugated cardboard sheets, distributing the text across multiple pages, each carrying part of the message.

This production method has mirrored the scale of our encounters with systems as individuals, which is always partial, never in its entirety.

The audience may need to piece the paper together like a puzzle to decipher the complete questions. Yet the full message might never be recovered as letters are omitted in the gaps between sheets of paper during printing. I considered these missing letters a metaphor for spillage, unseen costs, byproducts, or any externalities not accounted for in the recycling process and system of production. At an individual level, we rarely see the full scope of these impacts.

Practising recycling cardboard has also encouraged me to rethink how materials are commercially branded and culturally and socially perceived. Systems, after all, are networks of relationships (Voss, 2024), all of which are culturally and socially formed, including the ones we have with materials like cardboard.

Left: screen prints on A5 recycled paper sheets and cardboard

15 Externalities

Comparing original cardboard with recycled paper made from cardboard gives me a different perspective on the costs of the materials and recycling. Personal efforts, electricity, water, sediments, and loose fibres all entail hidden externalities. Liboiron, Lepawsky (2022), and Cummings (2018) all mention externalities, a concept originating in economics. Externalities are costs or benefits that occur outside the original intended transaction. Waste, pollution, and their health effects on humans, wildlife, and the environment are treated as negative externalities and are not accounted for in the recycling system.

Liboiron and Lepawsky (2022) argue that externalities create a "centre," calculating gains and losses beforehand within "peripheries" to accommodate externalities; however, waste and pollution cannot be defined as accidents or by-products. They are integral to industrial systems.

In the recycling system, contamination often occurs. While metals and adhesives can be removed from cardboard, contamination from oil and grease frequently denies its recyclability and sends it directly to landfills. These contaminations aren't considered in the design and recycling of cardboard.

As consumers, we are trained and used to take things at their face value and for granted. Yet, each consumer good, even cheaply priced ones, comes with significant human, environmental, and economic costs. Furthermore, despite our different lines of work, most of us participate in the labour that maintains mass production, even indirectly. Thwaites' nine-month-long efforts and £1187.54 to make a toaster revealed the true cost of an Argos toast far exceeds its £3.94 price tag. Though manufacturers can produce it cheaply due to economies of scale, we must consider the externalities enabling such low prices.

Right: 4 bottles storing the exteranlities of recycling cardboard, including loose fibre, first flush of water, excessive pulps, waste water with sediments

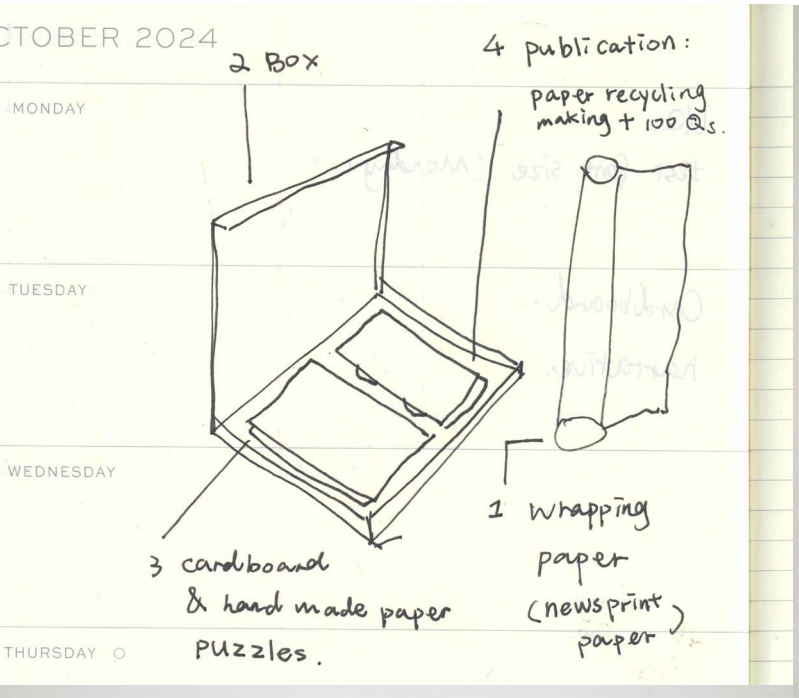
16 Unbox

To bring everything together, I packaged the pile of screen-printed A5 recycled paper and cardboard sheets and the book with visual documentation of the paper-making process and 100 questions into an A4 cardboard box. Lastly, I wrapped the box with newsprints I used to test screen printing at the print shop. This will force the audience to rip apart the packaging, open the box and unbox – these actions of consuming are something we've become oblivious to. This symbolic action reflects the system I aim to critique.

Bottom top left: sketch of the final package

Bottom bottom left: package wrapped in used newsprint

Buttom right: a A4 box with a pile of A4 recycled paper and cardboard, with questions sceen printed on them



17 Forward

My research started with the phrase “recycling =” taken from one of the Coca-Cola Company’s greenwashing campaigns, Recycled Records. I’m interested in how graphic communication design has simplified and hidden complicated and sometimes contradictory systems, such as recycling. Through 148 iterations of the recycling symbol, I realised it failed as a communication tool.

After reading *Discard Studies: Wasting, Systems, and Power* by Liboiron and Lepawsky, I’ve discovered that recycling’s main function is maintaining the dominant production system rather than reducing environmental impact. My visual research of the aluminium industry also proves Liboiron and Lepawsky’s argument. Though being praised for its recyclability, the aluminium industry turned out to be very exploitive, and the major users of the primary aluminium are the transportation, construction and energy sectors rather than the recyclable beverage can.

DiSalvo (2014) considered inquiry a process of producing a shape or a material form for otherwise vague and confusing situations. To further develop and substantiate this theory, I shifted my focus to cardboard, a material deeply embedded in consumer society and the recycling system. I practised recycling by making cardboard boxes into paper on a domestic scale, which was laborious. In contrast, recycling on an industrial scale is more productive as industries are equipped with more knowledge, resources and access. However, the industrial process requires significant electricity and water and involves more uncalculated costs, waste and pollution.

To embed the systems in question in the form of my work, I experimented with recreating the cardboard recycling process at home, producing recycled paper sheets manually. This laborious process highlighted the disparity between individual and industrial recycling, emphasising how resource-intensive the process can be when scaled. Additionally, the handmade nature of my practice contrasted sharply with the streamlined efficiency of industrial recycling, which involves extensive electricity, water, and chemical inputs, often generating unaccounted-for waste and pollution.

Inspired by artists like Thomas Thwaites, whose Toaster Project revealed the hidden complexities of everyday objects, I aimed to explore and communicate the unseen costs and externalities in recycling systems. I took an iterative, hands-on approach by transforming cardboard into recycled paper sheets and experimenting with screen printing, reinforcing cardboard’s materiality and layered meanings in consumer

culture. Through this tactile engagement, I found that graphic design could make the recycling process's contradictions and limitations more tangible, bridging the gap between theoretical knowledge and sensory experience.

Ultimately, this project has challenged me to consider how graphic communication can engage audiences more deeply, questioning the simplified narratives of sustainability presented by corporations and highlighting the systems of extraction, production, and disposal behind everyday materials. My approach aligns with DiSalvo's (2014) concept of inquiry, shaping new ways of understanding and questioning recycling's role in sustaining consumer society rather than the environment. This work invites viewers to rethink their relationship with waste, materials, and the hidden complexities within the recycling system, challenging us to see beyond the surface and engage critically with the systems shaping our world.

As this project advances, I'd like to further my relationships with cardboard from feminist and ecofeminist angles by examining the invisible labour associated with cardboard and its production, application and recycling. In many countries, female workers often undertake informal recycling by bearing the physical work of sorting and reprocessing materials like cardboard, which is another example of an unequal distribution of power and labour within the waste management system.

Secondly, cardboard metaphorically shares many "feminine" characteristics – undervalued and taken for granted regarding care and sustainability. Cardboard's role as a protective, utilitarian material also echoes the social expectations of women to "contain" or "preserve" without recognition (Kristeva, 1982).

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