# Time to Reflect

Eleven weeks later I am reflecting on the transformative journey through the Environmental Design Course, exploring how it reshaped my understanding of sustainable and ecological design practices. Before embarking on the Environmental Design course I thought recycling, choosing a sustainable material, or reducing waste was what created a sustainable approach to design. However, although those practices are an important part of ecologically responsible design they play a small role. If we are going to secure the future of the planet we must design with an inclusive, interconnected approach that considers and includes all human and non-human things throughout the design process.

Inspiration for this type of “environmental design practice” can be taken from settled cultures that live with a slow approach to life. This way of life is vastly different from our western society that is fast paced, excessive and thrives on consumption. Settled cultures take their time to achieve things, working mindfully, in touch with the land around them, using resources provided by the surrounding community. Orr mentions a few successful cases of this ecological design and highlights that it is possible for all designers to create ecological designs with this level of success if we draw on the history that is “evident in many places, times and cultures prior to our own”. This approach requires a deeper understanding of cultural practices that have harmonized with nature over centuries, enabling designers to draw on “intelligence that is deeply embedded in the culture”. (Orr, DW. 2002)

Designing with this mindset means shifting away from the fast-paced, consumption-driven habits of modern society and instead embracing practices that prioritize mindfulness, community,

and respect for the natural world. As Orr highlights, the solutions to our current ecological crises often lie in the practices of the past—cultures that demonstrated how to live and create in ways that sustain rather than deplete the world around them. By learning from history and remaining committed to an interconnected approach, we can collectively work towards a design ethos that truly supports the long-term well-being of our world.

Ecological Civilization (Lent, J. 2021)

The Environmental Design course has been a transformative experience, reshaping my understanding of what it truly means to design sustainably. I have learned that ecologically responsible design is not merely about individual actions like recycling but involves adopting a holistic and inclusive approach. This approach requires us to recognize the interconnectedness of all living and non-living things and to draw inspiration from the wisdom of cultures that have lived in harmony with nature for centuries.

Ultimately, this course has highlighted the importance of not only individual responsibility but also collective action in fostering a way of life that ensures a balance between human needs and the health of the planet. By incorporating these principles into future designs, we can contribute to a more balanced and ecologically sound world. Moving forward, I am inspired to integrate these lessons into my own practice, embracing the complexity and responsibility of designing for a sustainable future.

Bibliography:

Lent, J. 2021. What Does An ecological Civilisation Look Like: In Depth https://www.yesmagazine.org/issue/ecological-civilization/2021/02/16/what-does-ecological-civilization-look-like Accessed on 25/11/2024

Orr, DW 2002, Nature of Design: Ecology, Culture, and Human Intention, Oxford University Press, Cary. Available from: ProQuest eBook Central. (p7-12)

---

# To Condem or Not to Condem?

The theme for this week's debate was "future humans, looking back on our early-mid 21st Century design considerations and actions, will thank us rather than condemn". I believe that future humans will without doubt condemn us for our design considerations of the 21st century. Sure, we have made some

positive changes that point us in the right direction, like being more mindful about sustainability within the design field. But overall, the changes we have made have not been significant enough to regenerate the negative impacts our design decisions have already left on our natural environment.


Our Only Home (UN Climate Action, 2024)

The earth’s temperature is still rising at an uncontrollable rate, carbon emissions are extremely high, we are dependent on fossil fuels, plastic is taking over our oceans. All these things are still causing large scale impacts on the planet. According to UN Climate Action we are “losing species at a rate 1,000 times greater than at any other time in recorded human history”, risking the extinction of many species in the years to come. (UN Climate Action. 2024) We are facing a future with a loss of biodiversity, a lack of natural resources and extreme weather conditions. This does not leave a positive impression on future generations that we did all we

could to help solve the problem.

Berners-Lee talks about how our society has had decades of knowledge and warnings about the impacts of our behaviour on climate change yet “we have wasted that time through our denial, first of the problem itself and then of the nature of the solution that is required”. The only way for future designers not to be condemned is for us to completely re-think our approach to the whole design process. (Berners-Lee, M. 2019)


New Climate Story (UN Climate Action, 2024)

We still make design choices that are convenient, consuming products and materials at a rate that is completely unsustainable to our natural environment. Designers have the power to drastically change the future of the planet by educating ourselves on these problems and designing with a holistic, cradle-to-cradle approach. Understanding where the

products and materials we choose have come from, where they end up, and the agency they possess, is the only way to design responsibly and create significant changes. This approach to design makes it possible to reduce waste, reuse materials, and recycle objects throughout a project, creating a mindful and considered design practice. If we do not want to be condemned by future generations, we need to make these changes to the way we design now. We can no longer approach design with an uneducated naivety that doing the minimum will be ok, if we want to secure the future of our planet.

# Bibliography:

Berners-Lee, M. (2019) *There Is No Planet B: A Handbook for the Make-or-Break Years*. Cambridge: Cambridge University Press.

UN Climate Action. (2024). Causes and Effects of Climate Change https://www.un.org/en/climatechange/science/causes-effects-climate-change Accessed on 22/11/2024

---

# The Eden of Ecological Design

This week we are discovering the depths of Ecological Design. The author of this week's reading defines ecological design as "any form of design that minimizes environmentally destructive impacts by integrating itself with living processes". (Cowan, S & Vanderyn, S. 2007) This clearly defines the way we need to think about the design process to create ecologically responsible designs. For designers this means respecting all elements of nature and the environment throughout the design

development process. By taking into consideration the resources we are using and how they are replenished, as well as the impacts of manufacturing those resources. Through consideration of the natural environment in which we are building designers can minimise the impact of the natural species and habitats within those environments and develop design solutions that work in harmony with nature, integrating “human purpose with natures own flows, cycles, and patterns”. (Cowan, S & Vanderyn, S. 2007)

The topic of scale linking was another new concept to me, the theory that “everything influences everything around it”, be the scale small or large everything holistically interacts with its surrounding environment creating varying scales of impact. Scale linking is crucial for designers if we are going to consider and address the unique interconnectedness of ecological environments and the consequences our design choices make on those ecological systems. Scale linking enables designers to develop a sustainable approach that creates harmony between human and ecological well-being.

Eden Projects Biomes (Ackers, L. 2021)

A project that I personally love that embodies scale linking throughout its design is the Eden Project in Cornwall, UK. This is an excellent example of scale linking in the ways it connects local and global scales through its architecture,

ecological systems, and educational mission. The two giant biomes within the site replicate the mediterranean and rainforest ecosystems, this creates a localised link to global ecological systems. The renewable energy use and rainwater harvesting is a local response to global sustainability goals. The educational programs within the project highlight the interconnectedness of local actions to global impacts. (Ackers, L. 2021)

Inside the Biomes at the Eden Project (Ibrahim, N. 2021)

This project has successfully used its design to create a systems-thinking mindset that demonstrates how actions at one scale (local) affect another scale (global). This is why designers play such a huge role in the interconnectedness of these systems. Our design decisions made at small local scale contribute to the larger global scale and impact the larger ecological systems. This project proves that by designing with a holistic approach that engages the principles of ecological design we can fulfil our vital role in shaping a sustainable future that integrates humans with the living flow of nature. (Ibrahim, N. 2021)

**Bibliography:**

Ackers, L. 2021. Everything you need to know about The Eden Project, Cornwall. https://www.hpb.co.uk/blog/everything-you-need-to-know-about-the-eden-project-cornwall/ Accessed on 15/11/2024

Cowan, S & Vanderyn, S. 2007. Ecological design: with a new introduction by the authors. Island Press. Washington. 10th Edition

Ibrahim, N. 2021. The Eden Project in Cornwall, United Kingdom by Grimshaw. https://amazingarchitecture.com/exhibitions/the-eden-project-in-cornwall-united-kingdom-by-grimshawAccessed on 14/11/2024

---

# Plastic Fantastic

Plastic a material once seen as fantastic has now become a material with many negative connotations. We interact with so many types of plastics daily as humans but are we doing enough to stop the destruction plastic causes to our natural environment? Is it possible to reimagine the way we view plastic? According to SAS (surfers against sewage) “1 in 3 fish caught for human consumption now contains plastic”, so now as humans we are consuming plastic through fish due to our pollution habits. (SAS, 2024)

Image of fish in the ocean (EMF, 2019)

World War II was the beginning of a need for the expansion of plastic as a material, to “preserve scarce natural resources”. (SHI, 2024) By the end of the war production had increased by 300%, plastic was replacing many other materials. Humans designed this material to preserve our natural resources, when in fact the life cycle has now come full circle destroying our natural resources and ending up in the food we eat. This is a fantastic example of the importance of materials and the role they play. It highlights the need for material education throughout the design process. If designers are not choosing materials responsibly then we are not fully understanding future impacts of our design choices. This example should educate us on the importance of the life cycle of a material and the negative impacts it can create on the future of the planet and ourselves if not designed and used responsibly.

Often many design decisions we make have a linear approach, focusing on the finished aesthetic of a space instead of also thinking about the life span of the space. Designers need to modernise our approach to the way we design, focusing on a holistic approach that considers what happens after the space has become redundant. We need to consider where the materials

we have chosen will finish their life cycle? Will they be reused and recycled or will they end up in landfill. The Ellen Macarthur Foundation talks about it best when discussing a "circular economy" where "materials are designed to be used, not used up". In a circular economy plastic never becomes waste that causes pollution. (EMF, 2019)

The foundation also talks about the fact that it is now no longer possible to create a circular economy for plastic without the elimination of the material, we need to physically reduce the volume of the material produced to create a circular economy of the plastic already in circulation. There is a need for designers to develop creative ways of reusing plastic within design to change the impacts the material has on the environment. Achieving this could reframe the negative connotations we perceive around this mass-produced material and create a fresh and positive perspective of its uses. (EMF, 2019)

Bibliography:

Surfers Against Sewage, (SAS), 2024. Plastic Pollution, Facts & Figures.

https://www.sas.org.uk/plastic-pollution/plastic-pollution-facts-figures/

Accessed on 12/11/2024

Science History Institute, (SHI), 2024. History and Future of Plastics.

https://www.sciencehistory.org/education/classroom-activities/role-playing-games/case-of-plastics/history-and-future-of-plastics/#:~:text=In%201907%20Leo%20Baekeland%20invented,the%20rapidly%20electrifying%20United%20States.

Accessed on 12/11/2024

Ellen MacArthur Foundation, (EMF). 2019. Plastics and the Circular Economy – Deep Dive

https://www.ellenmacarthurfoundation.org/plastics-and-the-circular-economy-deep-dive

Accessed on 12/11/2024

---

# Our Vibrant Materials

This week's reading was a topic I found intriguing, the term "Vibrancy of Matter" was a completely new concept to me. My understanding is that this philosophical concept argues against traditional views that we as humans are above everything else, instead proposing that all matter both human and non-human contains agency or "vibrancy". The author proposes that this radical concept could alter the divide between humans and nature making us more interconnected with the natural world. (Bennet, J. 2010)

Essentially both human and non-human things are made up of an assemblage of "vibrant matter" that have multiple qualities and behaviours that impact our environment in ways we are not even aware of. An example of this is Electricity, while not a living entity it has many forms of "vibrancy" creating power for cities, homes & devices all things that we interact with daily, this in turn makes electricity an assemblage of "vibrant matter". (Bennet, J. 2010)

In design we use many different types of materials such as

stone, metal and wood, all of which have different properties and qualities. This concept challenges us as designers to view materials as an assemblage of “vibrant matter”, by doing this we develop a knowledgeable understanding of the history and life cycle of the material we are using. By understanding the vibrancy of the material matter designers are enabled to use them in a way that engages human connection with nature.

For example, if using wood, we can focus on the knots, cracks, patterns, smell and texture of the material throughout the design process. This is a way designers can embrace and highlight the natural characteristics of the material being used, giving us the knowledge to create a designed space where the material becomes part of the experience of the environment we have designed. This connects the user with a genuine relationship to nature through the material, establishing a deeper connection between humans and nature. Although the table below has been treated it is a great example of how viewing wood in its natural state really connects us with its life and where it has originated from.

Wooden Table Top (Barnard, S. 2024)

The use of these materials in its “vibrant form” encourages a genuine reflection of nature and the materials journey, rather than just viewing the material as part of a construction method. It changes our perception of the material from being something separate that has been treated, shaped and formed to build with to a material that connects us with its true self. This creates a more respectful understanding of the material, which puts human and non-human matter on an interconnected and equal level. Designers are then able to embrace the “vitality” of the material in a more responsive and organic manor that works in harmony with the natural environment, reducing the ecological damage to nature.

**Bibliography:**

Bennett, J. (2010) Vibrant matter: a political ecology of things. Durham, [N.C.], Duke University Press.

**Images:**

Barnard, S. (2024) Wood in Interiors: How to use natural wood in interior design, [Online image]. Available at: https://www.sarahbarnard.com/story/woodininteriors (Accessed on 30 October 2024).

---

# Working In Harmony With Nature

## Annotated Bibliography Reflecting

# On The Importance of Working With The Natural Environment

**Berleant, A. (1992) 'Environment as a Challenge to Aesthetics'** ***The Aesthetics of Environment*****. Philadelphia: Temple University Press. p2-13**

The chapter's argument is for a redesign of the way we view aesthetics and our natural environment. Intertwining the two disciplines engages our understanding of the natural world in a way that improves our relationship to the natural environment in a more holistic manor.

The author examines the connections between aesthetics and the environment thoroughly, providing a strong argument for interconnecting the two fields, whilst also challenging anthropocentric views that we as humans are separate from nature. This defines the importance of our role as designers not to exclude ourselves from nature and the environment but to include it throughout the design process.

Aesthetics are philosophically viewed as something beautiful, something we have designed to look good. By designing purely to be aesthetically pleasing we are often disassociating ourselves from the natural environment. Combining our thinking of the two fields enables designers to create an aesthetic concept that enriches our understanding of the environment.

**Orr, DW. (2004) 'The Problem of Ecological Design'** ***The Nature of Design: Ecology, Culture, and Human Intention.*** **Oxford: Oxford University Press, Incorporated. p1-32**

The chapter discusses the need for urgent change in the design process that integrates human activity and ecological systems. Enabling a shift from negative impacts, to designs that reinforce both human and ecological welfare that builds a

sustainable future.

The author highlights the need for change through a historical and cultural reflection of humanity's impact on the planet. Using examples of Amish and Balinese cultures to exemplify successful sustainable living. Designers have a responsibility to combat the ecological degradation of our environment through sustainable practices.

Shifting the design process away from technical solutions towards a holistic understanding of our role within the ecological system allows us to change our presence on Earth. Designers have a moral responsibility to build environments that live in harmony with nature, this is vital in tackling climate change and developing a sustainable future for the planet.

**Pannels, I. (2019) 'Glass-A Material Practice in the Anthropocene'** ***Arts*****. Vol 8:1, DOI:10.3390/arts8010007**

The article is about the "Material Journey" of an art project, looking specifically at the carbon footprint and environmental impacts of making art with glass. The author uses this project as an example to highlight the urgent need for us to shift towards a circular economy that understands the effects of material processes in the Anthropocene.

The article gives a clear understanding of "Material Journey" and its impacts on the environment. This highlights the importance of material choice within the Interior Design field. Understanding the entire lifecycle of materials creates an awareness around material selection making it possible for designers to make environmentally responsible decisions.

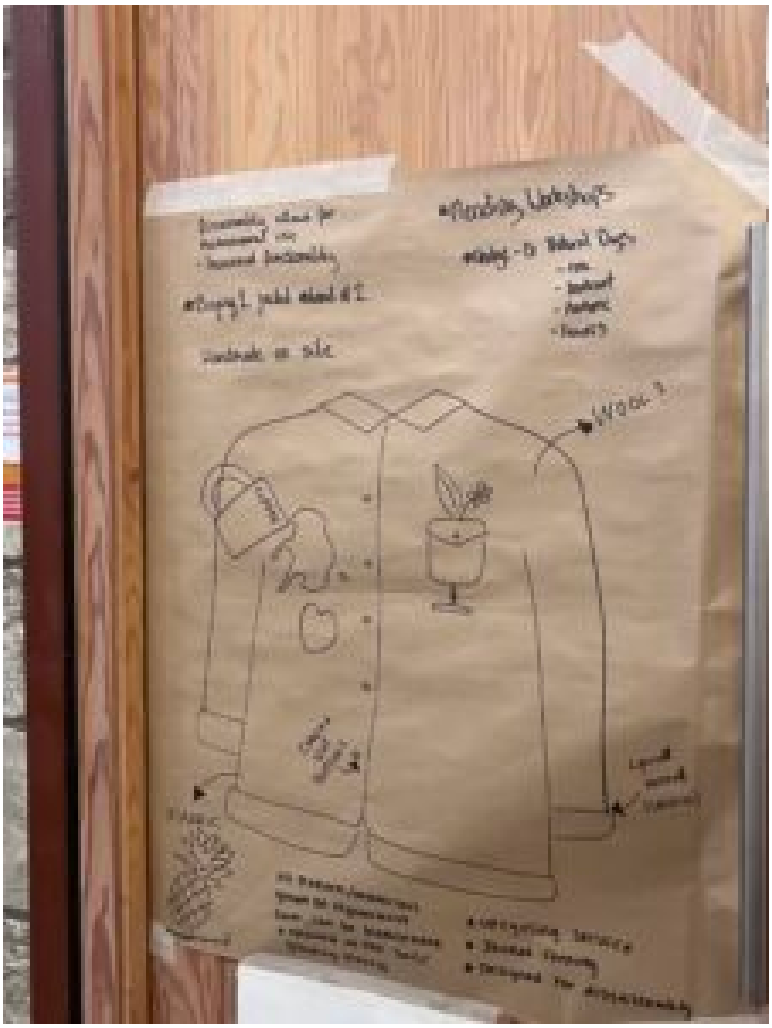
Understanding the carbon footprint of material production, will enable us a designer to shift towards a circular economy that engages with sustainable practices. We can make informed choices that promotes ecological responsible and sustains our natural environment.

# The Stories Of Our Things

The “stories of stuff” has been an interesting topic, I am not sure the stories of stuff are told enough, we have all these “things” or “objects” in our lives and how many of us truly understand or know their story.  Where did they come from? how were they made? who made them? Again, it all relates back to our lack of understanding as humans of the life cycle of products and things that we consume, surely learning the “stories of stuff” can enable us to design “stories” that have a full life cycle that benefits humans and nature.

(Understanding the full story/journey of a product)

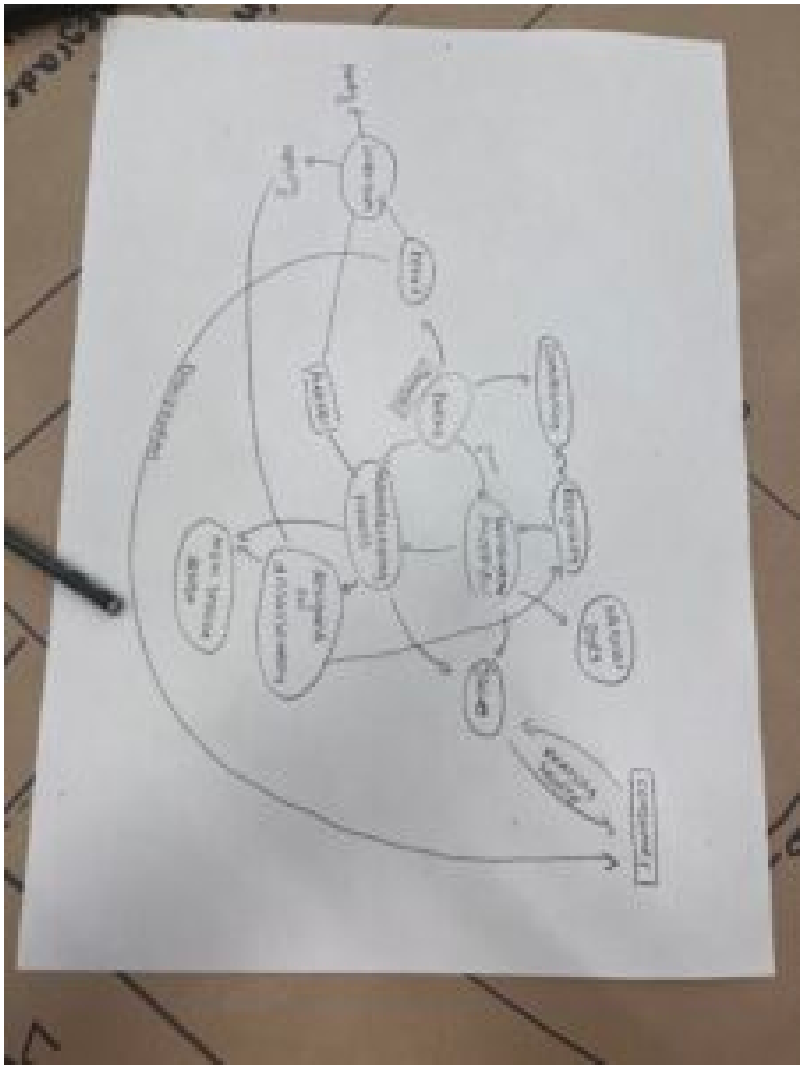
To follow this, theme our workshop task was to create a product with a full life cycle. We were given “clothing” and decided to design a jacket that was made of natural fibres all grown on a single farm. The fibres and materials were to be responsibly treated with natural dyes etc. The farm would then also manufacture the jackets, deliver, recycle and reuse creating a full life cycle for the product. Our vision was that if everything is produced on one site it makes it possible to ensure every element is sustainable and that we are creating a product that has a cradle-to-cradle life cycle.



(Process of designing a jacket with a full life cycle)

We delved deeper into all the factors that would be required to produce such a product and realised that there was such a large variety of skill sets needed to tend to every aspect of the production such as farming knowledge for the materials,

manufacturing, design and tailoring to name a few. How could it be possible to achieve all this responsibly from one place? Creating a product that had a complete life cycle that was sold on its story and journey was not something that was going to be easily achieved.



(Factors we need to think about to create a completed life cycle)

Looking at the details involved in a concept like this really got me thinking about how our society has such little knowledge about the “stories of stuff”. I now feel that it is our responsibility as designers to make the stories of what we are designing known. The story begins with the materials we choose, how they have been harvested, how the land has been cared for, how those materials are then used to create products or “stuff”, where that stuff goes after its use and

how that continues to aid new growth. The only way we can create social and environmental justice is by telling the whole story.

---

# Don’t Rock The Cradle

“Cradle-to-Cradle” was a term I personally had not heard of before, but a concept that I found extremely interesting upon reading. The amount of toxins coming out of our mass-produced items was shocking, and the negative impact that this is creating on our biological environment is devastating. There is so many products that are designed without the environment in mind creating a “cradle-to-grave” life cycle. It became clear that it is possible to create production systems that are designed with a “cradle-to-cradle” approach producing items that have a full life cycle and a positive impact on the natural biology of the environment.

One of the examples I thought was key in explaining why this concept is so important was the story about the sewage pipes. Originally designed so that sewage sludge could be reused as fertilizer, which was seen to be an intuitive way of using waste for good to create a complete life cycle “waste is food”. But in fact, because the pipes had not been designed with our biological environment in mind the whole concept became a dead end, a solution that is now polluting the natural biological environment instead of aiding it. (McDonough, W. 2009)

Sewage Pipe Pollution (Hawkes, D. 2023)

A product that has successfully been cradle-to-cradle certified is “Ice-Stone”, made from recycled glass and cement. The product is used for countertops within the design field and is created with a non-toxic pigment, 75% recycled materials and 0% petrochemicals or resins. This product highlights that it is possible to design responsibly using materials that are non-toxic creating a positive impact rather than a negative. (Icestone 2024)

Ice-Stone Countertops (Icestone 2024)

I believe that concepts like “Cradle-to-Cradle” are the future of the design industry and can only be achieved with further education and connections between environmental studies and

design history. We need to fully understand the processes in which the materials and products we choose have been treated and manufactured so we as designers can become part of the “cradle-to-cradle” life cycle and make positive design choices.

Having this kind of knowledge as a designer will allow us to make informed decisions on the built environments we are creating. By using this knowledge, we could design built environments that have a 100% biologically safe impact on nature. This is surely our responsibility as designers if we are going to create a positive impact on the climate crisis.

Bibliography:

Hawkes, D. 2023. How to fix the UK’s sewage overflow problem. https://www.ice.org.uk/news-insight/news-and-blogs/ice-blogs/the-infrastructure-blog/how-to-fix-uk-sewage-overflow-problem Accessed on 07/10/2024

Icestone USA, 2024. Get to Know Icestone. https://icestoneusa.com/get-to-know-icestone/ Accessed on 08/10/2024

McDonough, W. (2009) Cradle to cradle : remaking the way we make things /. London :, Vintage

---

# Our Entanglement Between Nature and Culture

As a society our relationship between nature and culture is deeply entangled. The many types of interactions between humans and the environment shape our perceptions and alter our

outlook towards nature. Culture, language and symbols are all constructs that influence our perception of what we perceive as “natural”. These constructs are shaped by our cultural practices and mediate the way we perceive nature. This is easily highlighted through a few interesting examples from this week’s workshop.

## Trade: Gravel

Gravel comes from a natural resource and is manmade in quarries by crushing the stones into gravel. This production of gravel is then distributed into our society.  Nature provides us with the “natural” resource while our culture dictates how the raw material will be utilized due to our cultural specifications. The movement or “trade” of these goods alters our natural landscapes, impacting our natural environment, this illustrates how “trade” as a cultural activity is entangled and shaped by nature.

Pile of Gravel (Lancaster, J. 2024)

## Home: Security

Home is a place that allows us to feel safe and secure. A home is a physical space and a cultural construct. A home in the physical sense is built in conjunction with natural landscapes and climates, constructed with raw materials provided by “nature”. While “culture” educates us on how the home is designed and the traditions in which a home is shaped. Culture educates us on what makes a home feel “secure”. Nature and culture intersect to create a home that joins us to the environment and society.

Keyholes/Security/Home (Lancaster, J. 2024)

## Water: Growth

Water unites all living creatures, the world is made up of water, we as humans are mostly made of water. Nature cannot grow without water, nature feeds us, water is vital for our survival and growth as humans. In this sense we are not separate from nature, but the way we interact with water is shaped by culture. Many rituals such as baptisms involve water, symbolic of life, growth and renewal. This is our cultural way of connecting to the natural world. Water flows through both nature and culture to create growth.

Living Things (Lancaster, J. 2024)

Our cultural practices shape the way we design, they determine the way in which we consume raw materials. Our perceptions of these raw materials are mediated through our culture. For example, we often associate natural materials as being sustainable because they come from nature. But is this just our cultural perception of nature being a renewable source? By educating ourselves as designers we will be able to make informed decisions on ways in which design culture can benefit nature. I believe this is the way forward for designers wanting to create a sustainable approach to their practice.

Bibliography:

Fallen, K & Jørgensen, F.A.  Histories of Design: Towards a New research Agenda. doi:10.1093/jdh/epx017. Journal of Design History. Vol. 30 No. 2
Accessed on  11/09/2018

Images:

Lancaster, J. 2024. Photos Around Campus

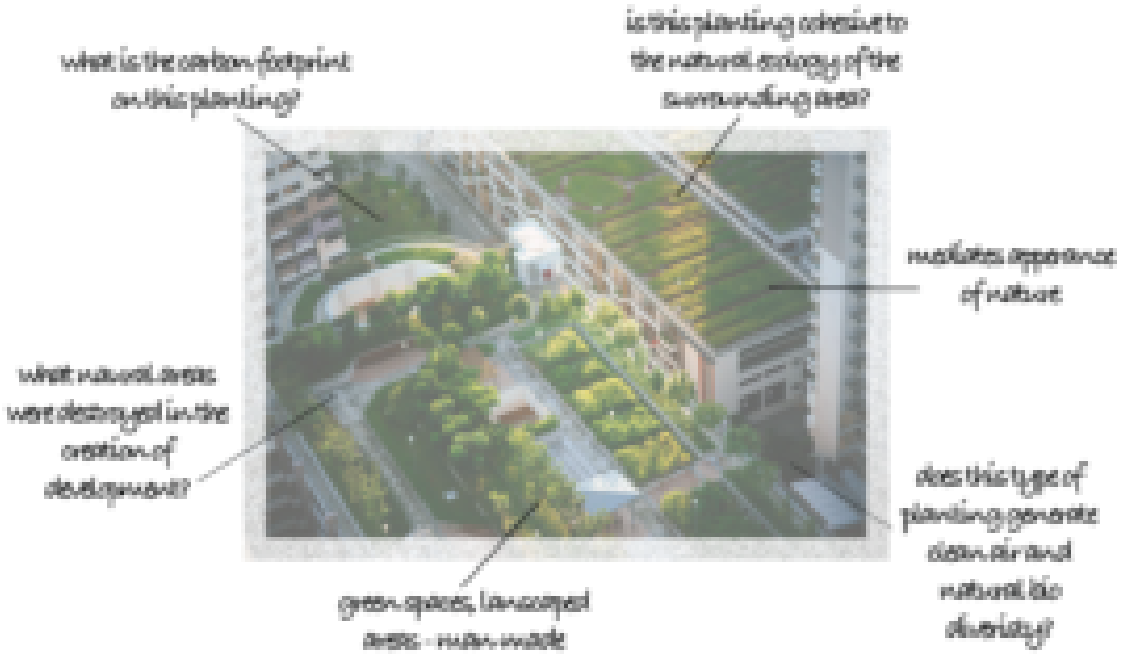
---

# Our Experience of the Environment

This week was focused on the reading by Fallen and Jørgensen, the article explores the need to interconnect the concerns about the environment with designers. Environmental history often doesn’t reflect the impact from human-made design, connecting the two fields could create a beneficial understanding of the problems within our natural environment that are fuelled from design choices. What ways does design connect us to nature, are these connections transparent? How is it even possible to define the true starting point of the Anthropocene when the effects on the environment span over a geological epoch.

Rollin’s reflection on the SUV makes an interesting point about the paradox between the SUV having a negative impact on the environment but being “marketed with nature imagery”. (Fallan.K & Jørgenson, F.A  2018) This imagery and marketing constructs a false cultural message for the consumer mediating the perception of the SUV’s effects on our natural environment.  An example of this which relates to the field or Design is the large-scale residential development’s popping up around the world with imagery of plants and nature. These developments promote an ideology that connects the consumer with nature but often these developments destroy many acres of forestation and natural ecosystems during the construction

process. In our more modern society this form of marketing/architecture is a form of “greenwashing” selling a false ideology. Having more knowledge on environmental histories would arm the design and architecture field with better solutions and a more transparent approach that doesn’t create a false dichotomy. (Ghisleni.C, 2022)



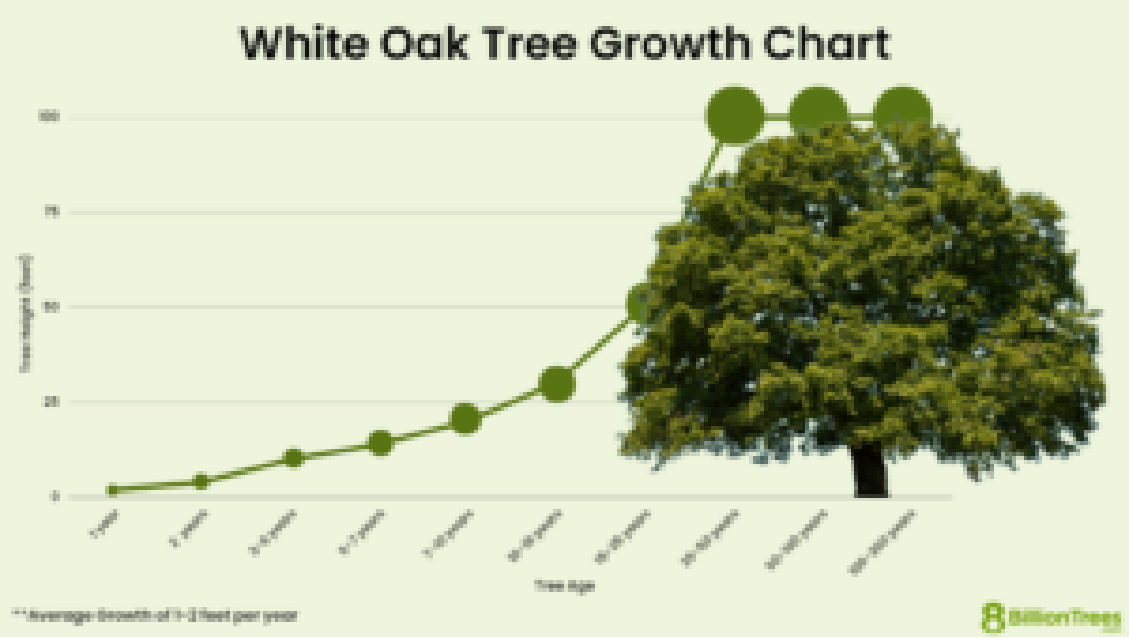

Residential Development Promoting Nature (Ghisleni, C 2022)

Annotation of Image (Lancaster, J 2024)

Having a proper understanding of how design can impact the environment is an extremely useful tool for future designers. More education about the effects of design history on the environment enables us as designers to think and act with a transparent, well-educated approach that leaves minimal impact on the natural world. Historically design as a discipline has negatively influenced the environment. Material choices that

follow “trends/fashions” often do not account for the use of natural resources and the pollution caused by manufacturing processes creating an unsustainable approach to design.

This can be exemplified through the material of Oak-Wood which is seen to be natural. Although the rate in which we use this material means that the natural product (oak tree) does not have time to regenerate at the rate it is being consumed making certain types of the material unsustainable to the natural environment. (Hoskins, R 2019)




Lifecycle of an Oak Tree to Fully Mature (Kilgore, G. 2024)

By educating ourselves on material choices and construction methods used in historic designs we as designers would have better perspective on how these choices and approaches to design impact the environment. Understanding the sustainable/unsustainable impact of historic design choices provides us as designers with the valuable knowledge needed to design responsibly in the future. I believe this knowledge allows us to be totally transparent about the environmental implications of our decisions. It gives us the knowledge to educate clients on sustainable practices that prevents

greenwashing, creates transparent ideologies and allows us to participate in a positive impact on the man-made world.

# Bibliography


Fallen, K & Jørgensen, F.A.  Histories of Design: Towards a New research Agenda. doi:10.1093/jdh/epx017. Journal of Design History. Vol. 30 No. 2
Accessed on  11/09/2018

Ghisleni.C, 2022. *Archdaily.* [Online]
Available at: https://www.archdaily.com/978874/50-shades-of-green-the-contradictions-of-greenwashing-in-architecture#:~:text=A%20classic%20example%20is%20the,use%20native%20plants%20in%20landscaping.

Hoskins, R. 2019. Life cycle of a tree: how trees grow. https://www.woodlandtrust.org.uk/blog/2019/06/tree-lifecycle/ Accessed on 28/09/2024

Kilgore, G. 2024. White Oak Tree: Leaves, White Bark, Swamp (Ultimate White Oak Guide) https://8billiontrees.com/trees/white-oak-tree/ Accessed On 26/09/2024