



Shifting Horizons: Exploring the intersection of landscape & human experience in the evolving realm of sustainable glassmaking

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Introduction

A growing emphasis on sustainability over the past few decades has transformed the manufacturing sector, including the ceramic industry. Recycling of sludge waste in European factories producing tiles and sanitaryware are optimised to high standards (see e.g. Boschi et al., 2020), diverting large quantities of waste previously destined to landfill. Factories can operate on renewable energy and the efficiency of industrial kilns has reached very high standards (Silvestri et al., 2019). By comparison, craft ceramic studios are lagging in environmental standards, lacking the efficiencies and technological investments associated with larger-scale factories. Craft is often associated with a respect for nature and appreciation of raw materials but making handmade pottery – like most manufacturing – also damages the environment.

Clay can be dug and pots can be shaped by hand or with simple tools. Once dried in the sun, they can be decorated with other coloured clays, minerals and oxides crushed from local rocks. But then we would hit the wall: it is hard to fire ceramics without polluting or relying at least in part on fossil fuels. In fact, contemporary craft ceramic production is surely more impactful than this ideal scenario. Practitioners working individually or in small teams in post-industrial countries such as the UK (i.e. studio potters) follow an established production process that starts with purchasing materials, tools and machinery from suppliers who refine and package mined clays and rocks. Pots are formed by handbuilding, slipcasting or throwing on the potter's wheel, left to harden, trimmed (or 'turned' in the UK) and fired a first time, typically in electric kilns (bisque firing). Glaze materials are then mixed in water and applied to the 'bisque' pots, cleaned and fired again in electric, gas or woodfired kilns. Negative environmental impacts are associated with every stage in this process, from processing the raw materials at the source to working in the studio, firing the kilns and even heating, cooling and lighting the workshop space (Salani, 2024a; Železný et al., 2023; Lo Giudice et al., 2017).

The sustainability of craft ceramics is a more complex issue than it may initially appear. Potters may care for the environment and reject the wasteful consumerism of contemporary society for a more considered, thrifty use of resources. Rooted in the values of the Arts & Crafts and in the writings of Bernard Leach (1940/1978), the appreciation of handmade ceramics often contrasts with the throwaway culture that characterises much industrial output. But pottery making remains an energy intensive process that transforms virgin materials into products that once damaged will be hard to reuse or recycle. And yet, many materials, tools, machinery and methods used in the craft have seen limited innovation in terms of sustainability in the last few decades.

Life Cycle Analysis (LCA) is an established methodology for assessing the environmental impacts of manufacturing processes. LCA studies show wide-ranging emissions for ceramic production, from 1.2 kg CO₂ per kilo of industrial sanitaryware (Silvestri et al., 2019) and even lower for bricks (Almeida, 2010) to over 5 kg for handmade tableware (Makliuk, 2023). Assessments are greatly sensitive to exact methodologies and assumptions, and the emissions can vary based on each workshop's materials, processes, machinery and energy mix. Despite the significant attention given to industrial production, there are few scientific studies on handmade pottery processes, and discussions in specialist magazines and other grey literature lack scientific validity. (Salani, 2024b). Practitioners welcome useful tips for saving resources and improving the efficiency of making processes (NCECA, 2022; Harrison, 2013), from straightforward systems to reclaim clay and glaze materials from sinks (Schimik, 2010) to complex experiments with atmospheric firings (see Salani, 2024b for a review of sustainable

technologies). But quantitative assessments are rare and the environmental benefits of many solutions from a life cycle perspective remain untested.

Overall, this suggests a view of environmental stewardship that relies on the individual choices of makers who are conscious of the negative impacts their work may produce. This 'behaviour theory' view contrasts with 'practice theory' approaches which instead would target pottery making practices as the primary area of intervention (Shove et al, 2012).

This paper is informed by a systematic review of literature published in English on the topic of sustainability in craft ceramics since 2000 (Salani, 2024b), practice review and ethnographic research conducted at the Leach Pottery's production studio, in Cornwall, over the last 10 years. The analysis is centred on the UK context, but its findings apply to post-industrial societies more broadly. I offer reflections on key challenges in achieving sustainability in craft ceramics manufacturing. Inspired by practice theory, I analyse three recent case studies of best practices, suggesting recommendations for future research and initiatives to develop and evaluate eco-friendly solutions.

Challenges

Craft ceramics face some serious challenges in developing and implementing sustainability. The following paragraphs highlight a knowledge gap that hinders a clear definition of the issues involved - due to both lack of reliable data and sustainability education. Also, we suggest that by over-relying on the resourcefulness of their studios, makers end up neglecting more effective action.

Scarcity of scientific studies

In the UK and many other countries, craft ceramics as a sector lacks the legal or commercial requirement to conduct systematic LCA analysis and other environmental assessments. The scientific study of the sustainability of handmade processes has received relatively scarce attention despite a notable, general and growing interest in pottery, craft and sustainable manufacturing.

A recent peer-reviewed study compared 5 methods of tableware production, including ancient technology, wheel throwing and factory processes (Železný et al., 2023). The ancient method was found to be the most polluting "due to the particles released into the air during biomass combustion". Studio pottery was more sustainable, emitting 3.1 kg CO₂ eq. per kilo of pottery, compared to the 3.6 kg of factory production. A previous study showed that decorative hand-painted plates in Sicily were responsible for 1.26 kg CO₂ eq. (Lo Giudice et al. 2017), in line with the figures published for small tableware factories in Thailand (Chuenwong et al. 2017). For studio production, a recent study recorded 5.4 kg CO₂ eq. (Makliuk, 2024), while my analysis of the Leach Pottery (conducted with Prof. Xiaoyu Yan from Exeter University) measured 3.2 kg (Salani, 2024a).

Generally, tableware tends to have higher environmental impacts compared to other typologies, and craft processes are often associated with greater emissions than their industrial counterparts. Variation in making practices, technologies, ceramic typologies and energy mixes in the countries of operation may explain why these analyses of small-scale production present coherent but different results. The scientific literature currently available provides much needed insights on this issue but has not caught up with the resolution required by craft practitioners to make informed choices.

Poor understanding of sustainability

A widely accepted definition of environmental sustainability is “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). Achieving sustainability in craft ceramics requires specialized knowledge of environmental science, energy systems, and life cycle analysis—areas often outside the expertise of potters. Even if more scientific research were available on the topic, practitioners would not be able to reduce their impacts on the environment without a better grasp of its complexity, as low literacy can lead to ineffective or counterproductive actions.

An example from my ethnographic research illustrates this point. Many environmentally conscious potters are eliminating plastic from their packaging, particularly in the UK. Using a combination of cardboard boxes, honeycomb paper and starch-based peanuts is increasingly popular (Fig. 1). The peanuts are compostable and replace those made of polystyrene, often disposed in landfills after a single use. Makers (and likely their customers) often take the benefits of these materials for granted. A recent US study (Forfora et al., 2024) asks whether starch-based materials are more eco-friendly than fossil-based ones, noting that it depends on the impacts considered. While starch-based foams emit less carbon during production, growing the crops has greater negative effects on land and water. Carbon emissions range from 1.3-3.2 kg CO₂ eq. for starches and 0.7-6.7 kg for plastics, meaning plastics can be either less or more carbon intensive. Reusing either material would have no extra impacts, with polystyrene being more durable. Without clear environmental labelling, it is hard for potters to make informed choices. Our consumerist habits make us look for new “eco-friendly” materials to buy, whilst we could ‘reduce, reuse, and recycle’ the newspaper, cardboard boxes, and even plastic peanuts we already have. In the UK, a third of cardboard is not recycled and producing 1 kg of recycled cardboard emits 1-1.5 kg CO₂ eq. (Greenmatch, 2025), while reusing an old box does not. In our LCA study of studio pottery, packaging accounted for 18.6% of total emissions (Salani, 2024a). Makers with higher sustainability literacy would be better equipped to question the automatic adoption of seemingly green solutions, whilst better informed customers would be less impressed by the replacement of one polluting material with another.



Figure 1 - A machine used to wrap pottery in paper (left, credits: author) and starch peanuts used in packaging (right, credits: Wikipedia Commons)

Privileging a studio mindset

The transformation of clay and glaze materials into ceramics occurs within the confines of the ceramic studio. Authors and readers are eager to share tips and techniques aimed at increasing the efficiency of their processes, potentially saving them time, effort, energy, materials and money. Some actions can be implemented without interfering with the creative process and are widely shared: reclaiming used clay to make new pots (Levenstein, 2015), using a bucket system to collect glaze waste and avoid clogging the sink (Schimik, 2010), or maximising the number of pieces that can fit in the kiln in each firing. Other solutions require more advanced material testing and may alter the physical qualities of the ceramic pieces produced: lowering firing temperatures - typically from cone 10 to cone 6 (Field, 2007) or substituting virgin materials with recycled ones (Howard, 2020) requires a more proficient understanding of the pottery process and iterative attempts to reach the qualities desired.

Comfortable in their familiar spaces and empowered by the creative possibilities of studio operations, makers may fail to recognize the interconnectedness of their craft with multiple industries and stakeholders that lie outside of studio boundaries: mines and quarries that extract and refine raw materials, suppliers who gather resources from multiple industries, kiln manufacturers that dictate the efficiency of firings, tool and machine manufacturers, energy suppliers, storage and delivery companies and many others. LCA studies show that most of the carbon footprint associated with pottery making relates to the procurement of raw materials and energy consumption during firings (Salani, 2024a; Železný et al., 2023). However, the studio mindset privileges a focus on efficiency measures and savings that can be obtained with minimum disruptions to established procedures. This leads to a discourse on sustainable ceramics dominated by studio tips (e.g. NCECA, 2025; Levenstein, 2015). More radical approaches that can reconfigure ceramic practice beyond studio operations (such as the best practice discussed in the next section) are rare and, arguably, originate from makers with less established studio mindsets.

Slow technological and material innovation

Limited demand for, and investment in, sustainable solutions may be a key factor in their relatively slow advancement. For example, the practice of utilising waste vegetable oil (WVO) in atmospheric firings is a proven technology that is not yet available on the market. WVO has the double advantage of replacing non-renewable fuels (e.g. gas) while diverting waste from landfills. The technology has been demonstrated in various occasions but remains highly experimental to the point that practitioners exchange notes on making their own burners (NCECA, 2017). Similarly, reduction electric kilns are relatively common in Japan but not in the UK or the US. They could help achieve similar qualities to gas or wood firing but with a much-reduced impact on the environment (especially if powered by green electricity).

Scarce innovation in the production and consumption of ceramic materials has also hindered sustainability. For example, labelling the toxicity of glaze materials on the packaging is common practice today, but indicating geographical origins and carbon footprint remains unheard of.

Making handmade pottery requires that materials come to contact with human hands at various stages, and this limits the range of unorthodox materials that can be safely handled in studios. Projects incorporating waste from potentially polluted sources employ slipcasting in small factory settings rather than throwing or handbuilding in studios (e.g. Earth Tatva, 2025).

Finally, the comparatively high environmental impact of ceramic firings underscores the importance of improving kiln efficiency. However, it is still common among established UK workshops to build their own gas or wood-fired kilns, which, despite being less efficient and poorly insulated compared to the more advanced commercial models, are more affordable and easier to repair on-site without incurring additional technician fees.

In summary, the factors hindering sustainability innovation in craft ceramics are technical, financial, market-driven and cultural.

Steps forward

The best practice in this area of manufacturing can be exemplified by the three case studies described below. While some aspects of these projects are in line with other makers' initiatives to improve studio practices, what makes them remarkable is how they overshadow the focus on efficiency and 'green tips' for studio work by creating new regenerative platforms and innovative material practices around clay and ceramics.

Grandby Workshop

Circular exchange of materials between local businesses and industry can transform ceramic supply. Some of the most interesting recent projects are doing exactly that: challenging the traditional foundations of studio ceramic practice. The Granby Workshop is a collective of makers related to Assemble, the group of artists who received much attention since being awarded the Turner prize in 2015. The group is well-known for their architectural ceramics made by merging the creative freedom of studio pottery with industrial manufacturing processes such as press-casting. Involved in the redevelopment of a row of Victorian derelict houses in Liverpool (the Granby Four Streets project), they produced various architectural elements using clay, industrial ceramics and demolition material salvaged from the buildings. The project has been praised for embodying the revitalisation of the area through an original aesthetic inspired by ruins and demolition (Charles, 2018).

The project breaks the habitual processes of studio ceramics. Instead of simply producing attractive pieces for the newly renovated buildings, the skills of studio makers are put to the use of the construction team. Some of the output is straightforwardly studio pieces, such as terracotta lampshades and doorknobs wrapped in tin foil and 'pit fired' in a barbecue (Fig. 2, left). Others are custom products that merge the creative freedom of craft decoration (colourful decals) to the reliable standards of (cheap) blank industrial tiles. Another successful solution is the so-called Granby Rock, a series of terrazzo products that incorporate the rubble of demolition to create colourful attractive surfaces resembling conglomerate rock. Staying within the confines of studio practice, ceramic rubble could be handpicked and ground to fine particles to be used as 'grog' in clay bodies. However, this would require considerable resources and leave much concrete waste unutilised. A strong concrete material was instead produced from blocks of concrete, stones and ceramic waste. This was moulded, cut and formed into fireplaces, tables, kitchen tops and furniture. The project convincingly combined studio ceramic knowledge with experimentation with industrial machinery and construction waste, all delivered in a highly polished design aesthetic.

For another project, the collective produced tableware (Granbyware) entirely from industrial and post-consumer clay waste. Glaze was similarly created from the amalgamation of clay waste with other recycled materials such as crushed rocks, glass and bricks (Fig. 2, right). The

team pointed out that some of the most iconic ceramic products of the past, such as bone china and the London stock bricks, were themselves the results of experimentation with reusing recycled materials from other industries -i.e. burnt cow bones and chimney ash, respectively (Dezeen, 2019).

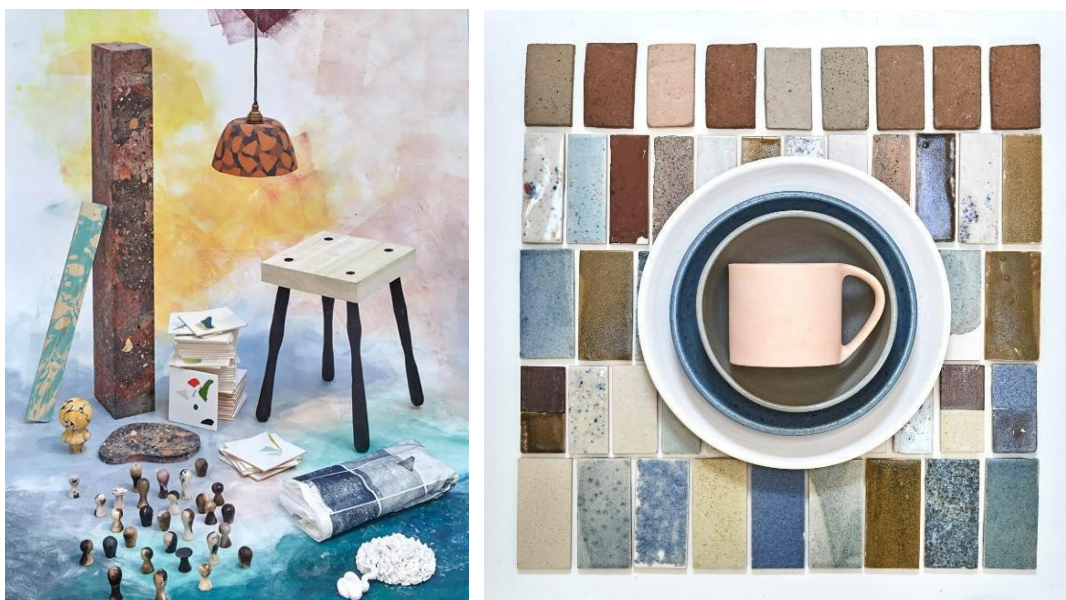


Figure 2 - Products from the first Granby Workshop catalogue, 2015 (left) and material tests for making the Granbyware (right), (credits: granbyworkshop.co.uk)

Circular Ceramics

After years of experimentation that started with her degree work at Central Saint Martins, Sara Howard's Circular Ceramics project (Fig. 3) is a "a fifteen-piece tableware collection, available in two colourways and made from 70% -100% secondary resources destined for landfill" (Howard, 2025). Following an approach shaped by regenerative design and the circular economy, Howard applied her ceramic knowledge to alleviating the negative impacts of mining and industrial waste as well as scarcity of resources (Howard, 2020). The tableware is produced through a process described as 'industrial symbiosis' with local businesses at the Kevala ceramic factory in Bali, bypassing conventional procurement of clay and glaze materials, diverting waste from landfills and reducing the environmental impacts of multiple businesses at once.

The formulation of the project originates in studio approaches and manual experiments, and the tableware range is hand-thrown by artisans in the factory. However, the procurement of the raw materials required the establishment of a local waste network and the industrial crushing and sieving equipment of the ceramic factory to obtain usable resources. The collection is made using glass waste collected from rivers in Bali, slurries from local marble and granite manufacturers and internal factory waste, "resulting in over 16 tonnes of waste diverted from landfill annually" (Howard, 2025). The clay body is entirely made of reclaim from factory wastewater, while one glaze is 100% residue from other lines' glazing process. As conceptual and innovative as the Granbyware described above, the Circular Ceramics collection is also a commercial product currently available for purchase.



Figure 3 - The Circular Ceramics collection by Sara Howard (credits: sarahowardstudio.com)

Golden Earth Studio

The team is a Wimbledon-based collective of local artists, ceramicists, students and communities pursuing circularity by replacing the common use of commercial bodies and quarried materials with clay from excavation waste that is otherwise destined to landfill. Through initiatives advertised on social media, they make clay from construction excavation in the London area available to makers interested in the sustainable sourcing of raw materials for creative expression. The clay is not sold but offered free of charge through their website. Working in partnership with construction and demolition companies, they aim to “make by-products from construction sites accessible” (Golden Earth Studio, 2025).

The alternative sourcing of raw materials for studio production follows a popular trend in ‘wild clay’ (Levy et al., 2022) and can be effective in promoting education in the chemistry and geology of ceramic materials. The studio claims to have diverted 1.6 tonnes of the 29 million tonnes of excavation material go to landfill every year. The initiative disrupts the common purchase of virgin materials from pottery suppliers and can potentially divert large quantities of construction waste from landfills. While the scale of the operations is small and localised, the project demonstrates that such an approach is possible and can pave the way for larger-scale implementations. In fact, the studio has recently announced a similar initiative in San Diego, California (Golden Earth Studio, 2025).



Figure 4 - Making ceramics from salvaged materials (credits: goldenearthstudio.co.uk)

Recommendations

The interpretation of the case studies through 'practice theory' (Shove et al., 2012) can help shed light on the issues discussed in this paper, addressing the challenges described above and informing some key recommendations for practical initiatives and future research.

Social practice theory as proposed by Elizabeth Shove at Lancaster University builds on Giddens' structuration theory and Bourdieu's concepts of habitus and field, which are influential in craft studies. Structuration theory highlights how the material practices that shape the work of potters and ceramic artists are socially constructed and perpetuated through performances. Shove points out the need to interfere with the "recurrent enactments" of contemporary studio ceramics and create "novel combinations of competence, materials and meanings" (Shove et al., 2012). This shifts the focus from individual potters making better choices to fundamentally reshaping the unsustainable systems of practice that hide behind current studio ceramics.

What lessons from these pioneering projects can help transform studio ceramics into more sustainable, regenerative and circular practices? The analysis of the case studies reveals the interconnected elements of materials, meanings and competencies.

MATERIALS. The sustainable sourcing of local and repurposed materials is a notable development in pottery practices that takes makers out of their studios and connects them with other industries. Whilst the environmental advantage of fetching wild clay demands scientific validation (e.g. through LCA studies), implementing industrial symbiosis in ceramics (Howard, 2020) has clear benefits (which should also be assessed). This 'system thinking' approach brings synergetic efficiency in the wider manufacturing sector, well beyond the confines of ceramic workshops (e.g. in the construction industry).

Beyond the measurable impact of each project, the case studies show that it is possible to establish new relationships between material supply and demand, transforming waste into a resource and disrupting established making methods and material flows while building on the skills and knowledge of studio ceramics. These projects demonstrate such innovation is possible and even available to individual makers, studios and collectives. Other manufacturers can take up on these methods and expand their benefits but a more radical, effective and in many ways easier approach would be for clay and glaze material suppliers to learn from them, take advantage of waste as a resource and utilise their established commercial and distribution chains to make it available to studio makers of any size. Environmental labelling can then help buyers make informed choices.

MEANINGS. Sustainability has the potential to shift studio ceramics from a value system focused on craftsmanship, tradition and design to one that prioritises ecological stewardship for future generations, addressing challenges such as resource limitations, water scarcity, pollution and contamination. The case studies show us how attractive products with refined design qualities can emerge from practices shaped around environmental and community regeneration. Creative expression can thrive in the technical challenge of achieving accomplished forms and refined craft aesthetics by utilising unconventional methods and resources. The complex interrelation of tradition and innovation in craft practices has often privileged narratives of conservation of skills and cultural heritage. However, scholars have noted the role craft plays in industrial innovation (Adamson, 2013) and the reliance of craft practice on other industries (Knott, 2015). Placing innovation for sustainability and regeneration at the core of studio ceramics would be aligned with contemporary readings of the history and theory of craft.

COMPETENCIES. Environmental education is crucial to raise sustainability literacy among makers and other stakeholders. New knowledge and understanding can help focus on regenerative practice and increase the demand for new material and technological innovation. Rethinking the cultures of making outside the confines of studio workshops offers creative potential and the chance to foster a more circular, fair, and sustainable society. In practice, efforts to bring more research and formal education in the field of craft ceramics should be prioritised if we want to reach a more informed, critical understanding of both issues and solutions. Education in sustainability science should not simply aim to instruct makers on the consequences of their individual actions but empower all stakeholders (and ideally all consumers of their products) with the knowledge required to reform current systems of production and consumption, finding alternative, sustainable routes for manufacturing goods and expressing creativity.

Conclusions

Informed by literature, practice and ethnographic experience of British pottery studios, this paper looked at the issue of sustainability in craft ceramics by identifying some key challenges to innovation. The lack of scientific research represents an important issue for practitioners willing to make informed choices. But even with more reliable data, developing and implementing solutions requires sufficient understanding of sustainability science. Literacy in this area is especially critical for manufacturers, whose processes not only contribute to environmental harm but also fail to adopt regenerative practices that could foster positive impact. Sustainability education should be an integral part of potters' training and not an afterthought confined to the self-teaching of a few individuals.

Practice theory can help identify and develop more radical approaches to achieve sustainability in craft ceramics. Maximising efficiency and reducing material waste and energy consumption should be encouraged in any studio process. But the new methods, materials and technologies required for a more fundamental shift in making practices can be achieved by working closely not only with ceramic suppliers, distributors and manufacturers, but with a wider local industrial and commercial ecology.

Pragmatically, efforts to educate both established and aspirant potters in sustainability science will be central to create a snowball effect towards more demand for research and innovation in the sector, to make more informed choices that can gradually reform current practice and, beyond that, to inspire the shift of paradigm that is required to adopt truly sustainable processes.

This positioning paper offers first reflections on the current state of the issue based on the analysis of three examples. Its originality lies in using practice theory to celebrate the lessons learned from the case studies not (only) to inspire other makers to follow in their steps but to show the importance of systemic thinking and collective actions to reform current practice and make ceramic manufacturing more environmentally sustainable.

A deeper dive into the nuances of practice theory would likely illuminate and clarify some of the initial points made here. Further LCA studies and reviews are needed to increase the resolution of the analysis of environmental impacts of craft ceramics, to help us identify priority actions and most effective solutions. More research is needed on how to create industrial ecosystems and local ecologies of waste in which studio ceramics can play a role in reducing waste streams while offering new creative opportunities to makers.

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