Review

Transition Interior Design: Reimagining Practice and Education for a Post-Carbon Society

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ABSTRACT

Interior design is a profession dependent on a high-technology design process, product manufacturing, and the constant movement of people and goods. While small contingents of interior designers, typically positioned within academia, pursue design for social and environmental justice, the profession is largely perceived as a luxury profession within a consumerist society. Interior design is implicated within the larger societal ambitions of sustainable development, but much evolution to interior design education, processes, and practices is needed to sharpen disciplinary contributions to global sustainable development goals (SDGs). This critical examination of the interior design discipline is inspired by scholarship that reimagines design practice and education through the lens of "transition design". Transition design provides a compelling portal to examine the ways in which practice and education will transition from current unsustainable levels of energy use to a new energy paradigm. This review is structured by logical argumentation that begins with the global environmental imperatives outlined by the United Nations. Transition design tools are then systematically adapted and applied to the interior design context. The result is a proposal for "Transition Interior Design" with vital future directions for interior design practitioners, students, and educators moving toward a future of energy uncertainty.

KEYWORDS: interior design; transition design; climate change; post-carbon society; localization; design process; design education

ABBREVIATIONS

CIDA, Council for Interior Design Accreditation; CIDQ, Council for Interior Design Qualification; DfS, design for service; DSI, design for social innovation; ID, interior design; SDGs, Sustainable Development Goals; TID, transition interior design; UN, United Nations

INTRODUCTION

The built environment is a major contributor to greenhouse gas emissions with building construction and operation summing to nearly 40% of total carbon dioxide emissions globally [1]. Given the prevalence of built environments in everyday life, architecture and urban design themes are woven throughout the United Nation's (UN's) 17 Sustainable Development Goals (SDGs) [2]. Key SDGs for built environment professionals include "Sustainable Cities and Communities" (SDG11), "Affordable and Clean Energy" (SDG7), "Industries, Innovation, and Infrastructure" (SDG9), "Responsible Consumption and Production" (SDG12), and "Climate Action" (SDG13). Sustainable design education aligns solidly with "Quality Education" (SDG4) aims. Beyond these goals, the built environment intersects with nearly every SDG around poverty, health, education, water, food, inequality, biodiversity, land management, policy, partnerships, and so on. It is thus surprising that education and licensing of architectural professionals only recently incorporates content aligned with SDGs in places such as Australia, the United Kingdom, and the United States [3]. The interior design profession lags even further behind with educational accreditation standards that merely footnote sustainability [4] and a professional qualification exam that does not require in-depth knowledge of sustainable interiors [5]. As an allied profession to architecture, interior design is implicated in the UN SDGs, but never explicitly mentioned within the larger ambitions toward sustainable development.

Building interiors, however, are a substantial piece of the total environmental impact of the built environment. The interior components of buildings, what Brand [6] calls the "services, space plan, and stuff", cycle in and out of buildings much faster than material changes to the structure and skin of buildings (Figure 1). When viewed holistically, the embodied energy in interior design process and projects is immense (Figure 2 collage). Interior design (ID), broadly defined, is the orchestration of interior furniture, finishes, materials, and equipment to support human comfort and wellbeing [7]. ID services scale from a single room in a home to multi-campus commercial and institutional projects. Interior designers specify products that are manufactured all over the world. ID products can be found in the aisles of big box retailers, boutique stores featuring luxury brands, manufacturer showrooms for commercial-scale products, and the list continues. The ID process is similarly energy-intense: interior designers often use sophisticated software for space planning and visualization, order product samples from around the world, collaborate on virtual teams, travel to project sites near and far, and re-design interiors rapidly as trends evolve. Many spaces created by professional interior designers—and the products that comprise these spaces—are driven by market forces and client desires (what Irwin [8] refers to as "Design for Service" (DfS)), and less often with consideration for the social and environmental impacts of the design processes and products. This

reality persists even when designers are personally inclined to promote sustainable alternatives [9].
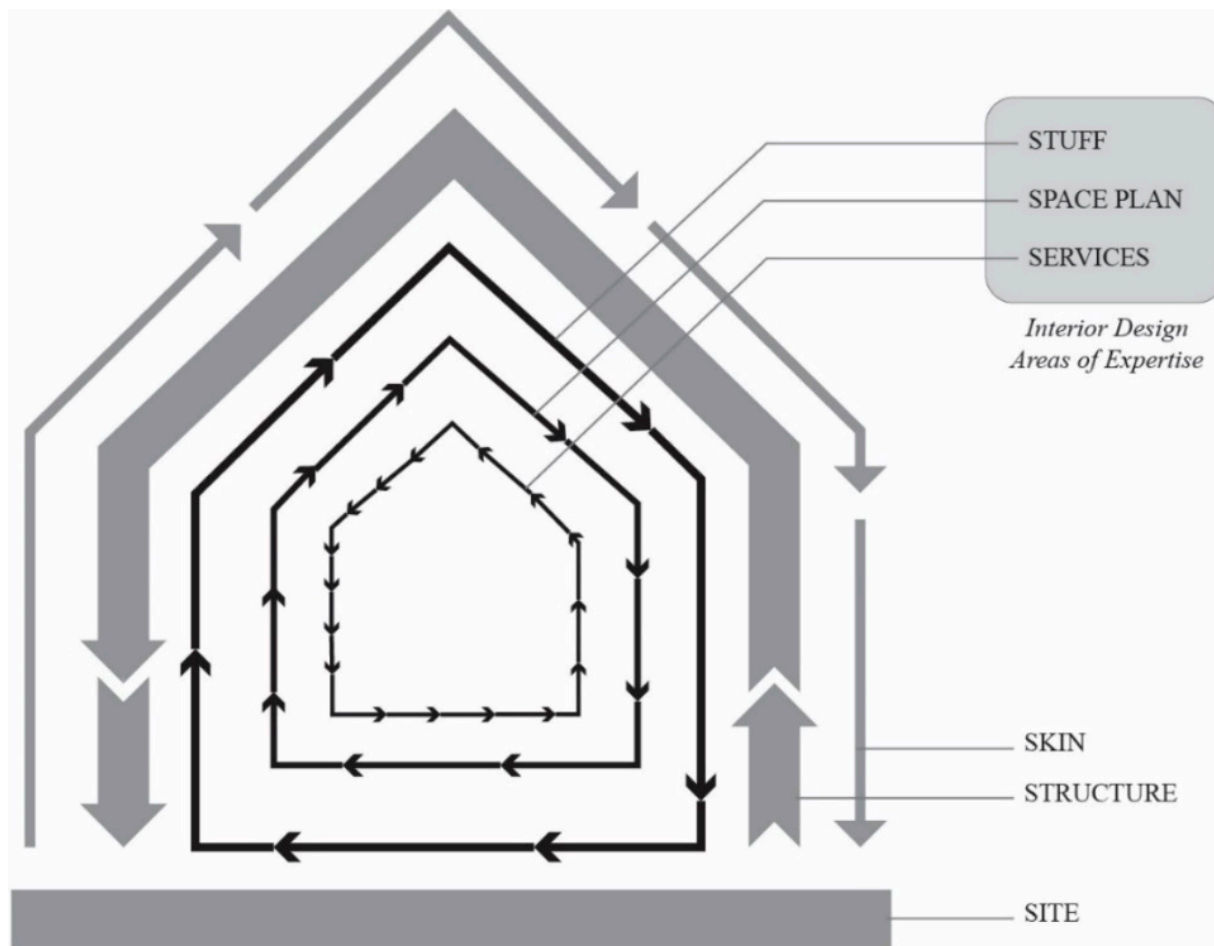
Figure 1. Interior design as the "stuff, space plan, and services" within a building (Brand [6]).

Interior design practice is orienting to more environmentally sustainable solutions with the advent of green building rating systems specifically for commercial interiors in the early 2000s [10] and the shifts in manufacturing practices that supply sustainable products for certified projects (e.g., [11,12]). An interior designer's key contributions to certified green interior projects include considerations of interior materials, provision of indoor environmental quality (IEQ) (e.g., daylight access and thermal comfort), and strategies for energy and water conservation, much of which requires that designers learn to question the status quo in interior planning and construction. However, interior design education in North America is arguably behind practice with few mentions of sustainable design practices in the interior design program accreditation standards [4]. While recent reporting shows the value Generation Z places on climate action [13], scholarship in the U.S. and abroad shows that student interest in and knowledge about sustainable interiors is moderate to low with areas for growth and improvement [14–17].

Figure 2. Fossil fuels in the interior design process (collage by Emily Chu).

Despite shifts in interior design practice and education toward higher integration of sustainability concepts, the pace is arguably slow and the current targets for "green interiors" may yet rely on a higher level of fossil fuel energy than society can afford. The considerable complexity that underlies the design process—of green and non-green interiors alike—will not change anytime soon. Interior design practitioners will continue to build Revit models on computers designed in the U.S., yet built and shipped from China. They will effortlessly plug myriad devices into the wall, drawing energy from invisible sources beyond, and travel to faraway job sites. Interiors will continue to contain products extracted from increasingly fragile eco-systems and manufactured at distant facilities. Interior materials will be discarded before the end of their useful life when trends change.

The critical action demanded by the UN's SDGs could catalyze deeper consideration of the interior designer's role in sustainable development. Interior designers have yet to ask difficult questions about the embodied energy in both our processes and design solutions. Failure to do so,

however, could turn the profession into a faded luxury of the oil age. It is an opportune moment to question conceptualizations of future design practice and imagine what "post-oil" interior design can be. While there are many ecological impacts in ID processes and solutions, the focus here is on the strong reliance of the discipline on polluting and nonrenewable energy sources. Thus, of the many SDGs that intersect with interior design, here we emphasize climate action (SDG13) and the design educator's role to deliver sustainability education (SDG4), and along the way define a key role for designers to promote clean energy (SDG7), reduced inequities (SDG10), and human health and wellbeing (SDG3).

The sections to follow first outline the energy predicaments that define the conversation and follow with a proposal aligning interior design within current movements toward "Transition Design" [18] where colleagues in allied disciplines advocate for an innovative approach to shifting the design professions away from fossil fuels and toward new paradigms. The current work outlines the potentially unique role of interior design in this paradigm shift.

OUR ENERGY PREDICAMENT: THE LONG VIEW

Two interrelated issues define the societal level energy predicament: peaking energy supplies and climate change. A look at the long history of energy use by humanity shows that modern society is at an unprecedented peak in energy use, a circumstance that is impossible to maintain for future generations [19,20]. Crude oil, an indispensable energy source in modernity, is the result of a geological process that takes millions of years. This gift of combustible fuels will never be experienced again by humanity, yet we treat this endowment as an endless resource [21]. However, peaking oil supplies may be less important than the current state of our atmosphere. McKibben [22] suggests that when we 'do the math' on available fossil fuels, we see that burning what is left in the ground puts our climate in certain peril. This is the type of data that underlies the UN SDG to "take urgent action to combat climate change and its impacts" (SDG13) while also striving to "ensure access to affordable, reliable, sustainable, and modern energy" (SDG7) [2]. We use the terms "post oil" and "post carbon" here to describe the energy context for a society that is substantially less dependent on fossil fuel energy.

The future of energy is uncertain. Crossing climate change with peaking resources, permaculturist David Holmgren [23] proposed a spectrum of future energy scenarios that range from stable "green technology" to more apocalyptic "lifeboats" scenarios, depending on the speed at which changes occur (Figure 3). For over a decade, the data have pointed to evidence that climate change is happening ahead of previous predictions [24]. Since 2012, when the Holmgren framework was created, the speed at which the planet is warming has come into sharper focus. Climate scientists now project that the Earth is rapidly approaching, within the current decade, the critical 2 °C global temperature increase, the threshold

beyond which ecological conditions on earth are in danger [25]. These data point to the need for a sharp decline in fossil fuel energy usage in the decades to come, a scenario which we will refer to as "rapid energy descent".
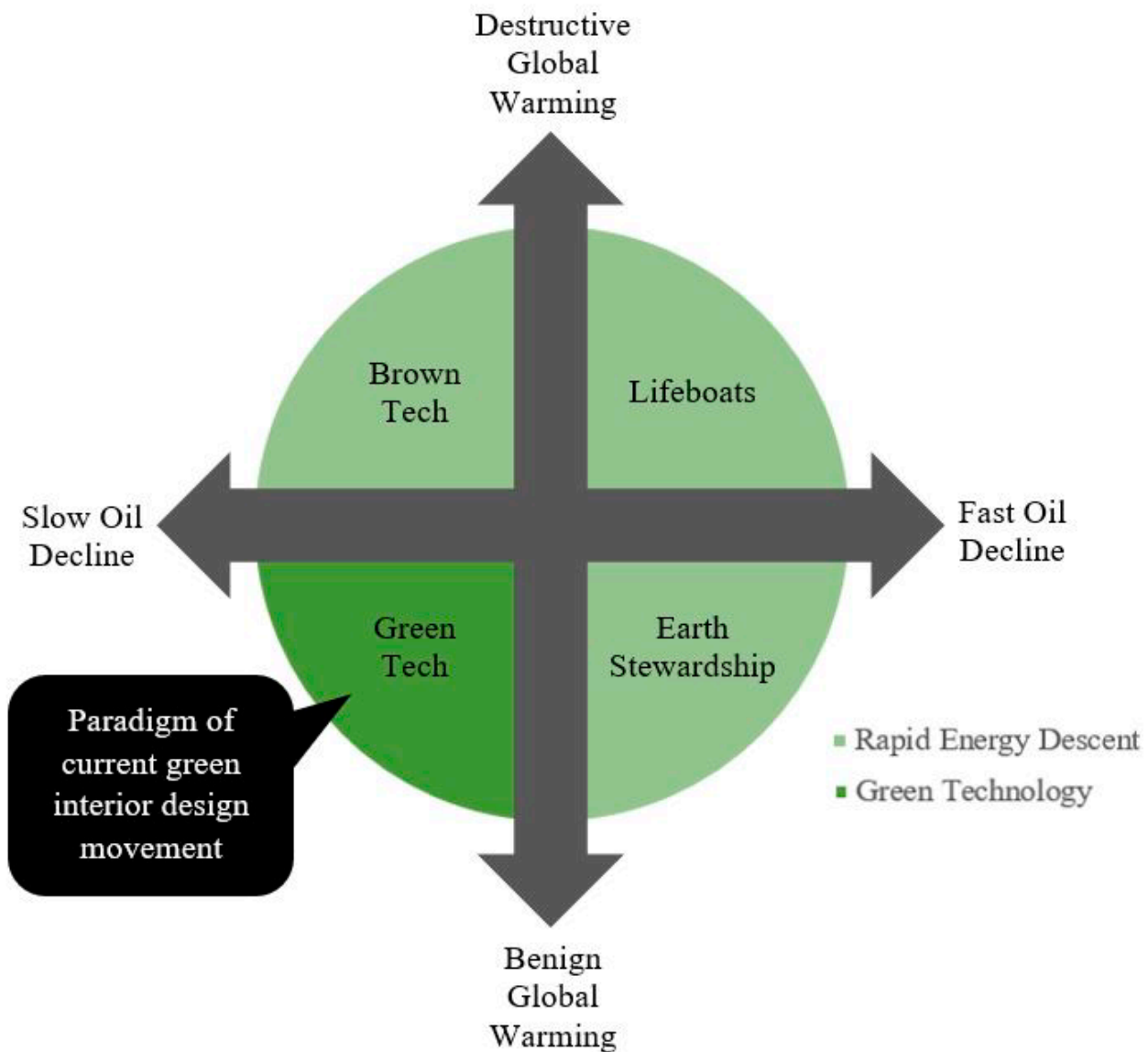
Figure 3. Future Scenarios (Holmgren [23]) and Green Interiors.

Dominant approaches to sustainable architecture and design (e.g., [10]) fall within the green technology quadrant of Holmgren's diagram (Figure 3), and according to this framework, rely on assumptions of slow warming and slow decline of nonrenewable energy source reserves. Current green building approaches, while making earnest efforts toward reducing greenhouse gases, continue to rely on high-technology solutions and substantial inputs of fossil fuel energy for the design, construction, and maintenance of buildings. These solutions often make green design palatable to consumers by implying that the changes are technological, not behavioral, and no human adaptation is necessary. Rapid energy descent,

however, will require substantial shifts toward "more sustainable use of natural energy resources and materials, personal proficiency, and community self-reliance" [26]. In the words of De Young [27]: "*Near the end of this century, day-to-day behavior patterns will need to consume nearly an order-of-magnitude less energy and materials than are currently used. The environmental movement has previously argued for major reductions in resource consumption but rarely have changes of this magnitude been envisioned*" [5].

Altogether, the need to downshift in societal-level energy usage—together with the potential for a challenging social and psychological transition—points to important contributions for interior designers.

The Role for Interior Designers in Energy Descent

For the foreseeable future, interior designers will continue to work for high-end clients using unsustainable processes and designing unsustainable interiors. The public brand as a luxury service is likely to persist; however, another brand image for interior design could emerge given the designer's potentially unique role in an energy-constrained future. Professionals with an interiors focus are instrumental in "retrofitting suburbia" [28] given the increasing likelihood of interior renovations versus resource-intense new construction. Designers set and follow fashion trends that lead to waste, which means they can also collectively redefine the pace at which interiors are landfilled. Interior designers are also responsible for multi-sensory aspects of building interiors—color, lighting, furniture, materials—that influence user experience. Their deep concentration on human health and wellbeing can contribute to the creation of healing interiors for a society in upheaval. The sections to follow make the case for a form of interior design practice that can play this role in the future, and the potential shifts needed in education to aid this transition.

TRANSITION INTERIOR DESIGN

"Transition Design" is a term coined by design scholars at Carnegie Mellon [8,18] and is an approach that extends previous work on permaculture ethics and theories of localization as means to achieve a post-carbon society [23,26]. The approach is radical in that it challenges the way that design fields are situated within current social-economic and political paradigms: "*It (transition design) is based upon and understanding of the interconnectedness and inter-dependency of social, economic, political and natural systems. Transition design focuses on the need for "cosmopolitan localism", a place-based lifestyle in which solutions to global problems are designed to be appropriate for local social and environmental conditions*" [8].

The approach aligns well with the Birkland [29] work situating design within complex social systems, and her more recent work critiquing the green building movement and advocating for sustainable and just "net-

positive" design. Scholars working in this area address urban and architectural environments, but this work has not been translated into the realm of interior design expertise.

The sections to follow adopt Irwin's [8] "Continuum of Design Approaches" as a guiding framework to examine the ways in which interior design practice and education might shift. This approach thus embeds interior design within broader frameworks for Transition Design, carving a niche area for "Transition Interior Design" (TID). Table 1 shows the concept of transition on a continuum from left to right. This work contains several key, underlying assumptions: (1) society will be transitioning to a new energy paradigm with significantly less fossil fuel energy use and (2) high-technology solutions alone will be insufficient to avert the climate crisis. This framework applies most readily to affluent places that have a currently high reliance on fossil fuel energy. This framework is also optimistic: it aligns with the De Young and Princen [26] conceptualization of "positive localization" (xviii) where society chooses cooperation and community care over conflict and violence.

Building on the intellectual tools created by Irwin [8] and Irwin et al. [18], Table 1 sketches ideas for interior design practice and education along this continuum. The word "continuum" signifies that many elements of the current paradigm (e.g., client service) will continue, even as they morph and evolve to align with the biophysical realities of climate change and resource scarcity. This conceptualization of TID contains elements of both "Design for Service" (DfS) and "Design for Social Innovation" (DSI) and increasingly responds to a future global energy crisis. All that follows is truly an exercise of imagination, a thought experiment, and a process of questioning the ability to align the profession of interior design with societal needs for rapid energy descent.

Table 1. A continuum of design approaches for interior design practice and education (Adapted from Irwin [8]).

Domain	Focus	Design for Service (DfS)	Design for Social Innovation (DSI)	Transition (Interior) Design (TID)
Irwin [8] definitions		Profitable and desirable services that are delivered within "the business arena and existing, dominant economic paradigm"	Design process for "emerging paradigms and alternative economic models, and leads to significant positive social change"	A "design-led societal transition toward more sustainable futures and the reconception of entire lifestyles…, (Transition Design) challenges existing paradigms, envisions new ones, and leads to radical, positive social and environmental change"
Energy & Climate Scenario		Abundant access to cheap fossil fuels; Impacts or restrictions caused by global climate change not yet tangible in many regions	Emerging impacts and restrictions due to global climate change and/or energy resource scarcity that encourages an approach that is increasingly place-based and community oriented	Substantial restrictions on energy consumption; Severe and tangible impacts of global climate change
Shifting Interior Design Practice	Design Processes	Fast-paced, high-technology processes in teams distributed across regions/countries; Frequent travel	Increasing focus on building connections in the community (e.g., public interest design) and localized interactions	Slower pace; Local clients; Less travel; Less computing; More design-build; Potential for designers to gain skills hand-crafting interior elements
	Design Solutions	High-cost services for clients who can afford to hire a designer; High embodied energy in furniture, fixtures, and interior materials; Designers can ignore social and environmental impacts if not profitable	Increasingly integrate broader social good into design solutions (e.g., projects for clients who typically cannot afford design services)	Low embodied energy design solutions (e.g., local sourcing, cradle-to-cradle, refurbish/reuse); Solutions support reduced consumption ("enoughism"), adaptability, sustainable lifestyles, and social/psychological needs during transition
Shifting Interior Design Education	Coursework Focus Areas [4]	Coursework prepares students with marketable skills to join national/international design industry; Professional practices; Design communication through computation; Human-centered design to support human health & wellbeing; Studio projects often focused on (fictitious) affluent residential/commercial clients	Coursework prepares students for community engagement; Cultural competency & awareness of global context; Service-learning projects such as studio projects with real and under-resourced clients; ID history courses would better prepare students to understand the structural systems that reproduce social injustices	Sustainable design woven deeply into design curricula; Students better prepared to deliver designs that succeed technically and socially in a society experiencing substantial energy restrictions and the impacts of climate change
Mindset and Posture of Designer		Designer-as-artist and technician [30]; Expert with proprietary knowledge; Focused on client relations and profitability; Quick to learn with a strong work ethic and demonstrated technology skills [31]	Transdisciplinary knowledge and collaboration [8]; Culturally competent; Socially conscious; Strong interpersonal skills and/or technical problem-solving skills relevant to community needs	Designer-as-cultivator [30] is committed to supporting "radical, positive social and environmental change" [8] within social systems that are adapting to a major downshift in energy use

Shifting Interior Design Practice

Given the current heavy reliance on petroleum products in the design process, energy descent—a significant downshift in the use of unsustainable fossil fuel energy—would necessitate a creative and radical shift toward low-energy interior design practice. The sections to follow outline several directions toward which interior design processes and solutions may transition or current practices that will evolve and expand. These are ways that interior design practice can contribute to SDG13 on climate action in a business-as-unusual scenario of rapid energy descent.

Design processes

While current design practice is competitive and fast-paced, a key feature of TID might be re-framing the notion of speed by adopting a philosophy of "slow design" [32]. Slow design sits amid parallel movements for slow food, slow money, and slow fashion. Slow design is a call for thoughtfulness and deep social and environmental sustainability in the design process. 'Slowness' has the additional benefit of allowing rich design solutions that leverage transdisciplinary perspectives to integrate complexities across social and ecological systems. In the current DfS paradigm, a slow-paced design process is rare, intentional, voluntary, and costly—and mostly likely to be seen in academia or with clients who value robust design processes.

Examining the long view of our energy predicament, however, leaves the designer to question what pace of practice would be possible in a societal-level energy crisis. Frequent travel and heavy design computing may become less common and increasingly complemented with localized interactions and low-energy design communications. Designers might elevate low-energy skills from our disciplinary past, such as sketching, hand drafting, and keeping libraries of hard copy books. Within the DSI paradigm, current practices of public interest design that use design-build processes may become more mainstream [33,34]. Client collaborations may be more localized, community-based, and participatory where designers maintain strong relationships with local builders, craftspeople, and suppliers. Perhaps future designers themselves will gain hand skills in areas such as woodworking, reupholstery, and fiber arts to craft post-oil interiors. Designs could be increasingly rooted in place and contribute to the 'cosmopolitan localism' envisioned by Kossoff [35] and Irwin [8].

Design solutions

Modern interior design solutions have high embodied energy with products manufactured all over the globe that are orchestrated and transported to a single job site. This status quo will be difficult to maintain in an energy descent scenario. Current design solutions additionally support high consumption and high technology lifestyles within cultures that emphasize unique individuals over community connections. Energy

descent, however, may require more sharing and collaboration among members of society. Below are some of the directions that may become more mainstream within ID practice in times of rapid energy descent.

Interior Design for Net Zero Energy Buildings: A major focus of green building design is energy performance, or considerations of energy sourcing and the reduction of greenhouse gas emissions. Despite differing green building definitions [36,37], all approaches to green building prioritize high-performance building design that approaches net zero [37,38]. These conversations are largely driven by the engineers and architects whose design decisions greatly affect the production and consumption of electrical energy on the building site. Many of these solutions fall into the "green tech" future scenario (Figure 3) and depend on technological innovation, and sometimes substantial up-front financial resources, to achieve (though scholars are increasingly demonstrating the cost benefits of net zero energy buildings over time [39]). Will these high-technology solutions be feasible to scale up in rapid energy descent? It is possible that energy descent will put an increasing focus on passive design strategies to meet net zero energy goals, which means less reliance on active building systems and increasing attention to building envelopes, window orientation, and natural ventilation [40]. What is the interior designer's role in these processes? In the current DfS paradigm, professional interior designers can better position themselves to support net zero energy and passive building design by considering the "stuff, space plan, and services" (Figure 1) that impact electrical demand in building interiors. We can additionally and continually expand our expertise in the realm of building materiality to specify products with low embodied energy, help to meet passive design strategies, and are designed with circularity in mind.

Interior Materials and the Circular Economy: Interior materials can make important contributions to passive design through considerations of how materiality impacts indoor conditions by absorbing/radiating heat and illuminating light. However, interior product sourcing, manufacturing, and supply chains for interior materials would dramatically shift with declines in fossil fuel energy. Interior designers can make strong contributions to the SDG goals around "Industries, Innovation, and Infrastructure" (SDG9), and "Responsible Consumption and Production" (SDG12). LEED promotes regional priority for sourcing [41], but the circle may become tighter and distance travelled will depend on innovations in green transit systems. Designers will increasingly look to align material sourcing with ideals of the circular economy [42], which means a deeper examination of waste and embodied energy in the lifecycle of interior materials. Energy descent—together with aspirations to reduce landfill waste—affects the sourcing of raw materials used in interior products and will likely push the industry toward cradle-to-cradle products [12,43], reused and refurbished goods, and goods made by local artisans with locally sourced raw materials and low-energy processes.

Vernacular design, the study of place-based traditional techniques, can offer insight to future low-energy designs [44] by offering precedent for thoughtful responses to climate, geography, and resource constraints. However, even the procurement of local raw materials must be done with care to avoid over-harvesting and negative impacts to local eco-systems, which calls into question how much "stuff" (Figure 1) is truly needed to support one's lifestyle.

Enoughism: Responsible consumption is one pillar of the UN SDGs (SDG 12). One study estimates that we would need five planets if everyone on Earth had the same consumption patterns as Americans [45], pointing to the unsustainability of the current American lifestyle. It also highlights the imperative, from a social justice perspective, for citizens to greatly reduce consumption patterns or find what Princen [46] calls the "logic of sufficiency" and Naish [47] calls "enoughism". If members of affluent societies radically rethink consumption patterns, and the social status related to having an abundance of space and possessions, the design of interior spaces plays a strong role. There are already hints of the ways in which ID supports voluntary simplicity [48] in the popularization of tiny home design, the capsule wardrobe, and the Marie Kondo philosophy of joy with fewer possessions [49].

Support low-energy lifestyles: Interior designers can support the "new behavioral context" [27] required by rapid energy descent by utilizing our talents with human-centered design to envision innovative solutions that support sustainable living. This is already happening to an extent in the current paradigm with smart thermostats and energy-efficient fixtures and appliances. However, TID will go further to support self-sufficiency at both personal and community levels. The kitchen designers of today could work with families to re-design kitchens around low-energy food practices of food growing, preservation, and storage. Residential interiors could evolve from the current emphasis on entertainment technologies to spaces that support human health and connection. An even more dramatic shift for residential homes would be a shift from single-family homes to multi-family units, cooperative housing, and/or intergenerational communities. Beyond the home interior, transition interior designers can support the rethinking of suburbs into retrofit cohousing solutions [50] to support higher levels of community connections and interdependency. Energy transitions in workplaces across sectors would require creative adaptation of the energy-intense structures inherited from previous generations.

Support Social and Psychological Needs During Transition: The rapid energy descent scenario described in this work would present a shock to social systems and the people within them. (e.g., [51]) Presently, climate-change related events (e.g., heat, drought, flooding, wildfires) are associated with negative mental health outcomes including psychological distress, post-traumatic stress, and increased mortality among people with pre-existing mental health conditions [52]. While ID will never be a

singular solution to human distress, it can play a powerful supporting role in psychological healing/wellness. Interior designers define the elements within buildings that relate strongly to user comfort, socialization, and aesthetic experience. (e.g., [53]). Designers use knowledge of biophilia [54], attention restoration theory [55] and mindfulness meditation [56] to inform stress-reducing interior design processes and solutions. Already, in the niche area of healthcare interior design, designers are adopting the philosophy of trauma-informed care (e.g., [53]) to ask how healthcare interiors can support individuals experiencing trauma. Design scholars such as Pable [57] have examined the importance of ID in resource-constrained contexts such as homeless shelters. Interior designers can leverage these sources of interdisciplinary knowledge and experiences designing diverse healing environments to create publicly accessible spaces that support psychological well-being. By creating and expanding the ID toolkit to support a society undergoing rapid energy descent, interior designers can play a unique role in supporting human health and wellbeing (SDG3) in an energy-constrained context.

Shifting Interior Design Education

The UN outlines the imperative for quality education (SDG4). Design education can better prepare emerging professionals to contribute broadly to sustainable development goals. Currently, interior design education dominantly focuses on preparing students for the DfS "business as usual" workplace (Table 1); critical reflection on future energy scenarios could help to better prepare students to be knowledgeable and adaptable in the decades ahead. On the question of design education in the 21st Century, Fleming [58] provocatively writes: *"In the time of upheaval and crisis, what is the point of design education? In nearly every school of architecture or design there is a central, unspoken rejoinder to this question: the point of design education is to condition each successive generation of students for a lifetime of unexploited labor that is detached from any critical relationship to the role that designers play in aestheticizing and instrumentalizing global capitalism"* (p. 192).

CIDA, the accrediting body for ID education in North America, recently published a report on the "future vision" for interior design education. They outline a move away from traditional "return on investment" outcomes to measurements that better reflect human health and wellbeing [59], a vision which nicely aligns with the Irwin [8] transition from DfS to DSI and the SDG goal for human wellbeing (SDG3). Despite ambitions to forecast the future, environmental issues are not emphasized in the CIDA report and existing unsustainable design paradigms remain largely unchallenged. Other recent work on the future of interiors has highlighted the important role of interior design for social justice [60], a body of scholarship that contributes important thinking to the DSI paradigm. Examining the practice of interior design in highly resource-constrained contexts, such as Pable's work on interior design for

homelessness [61,62], presents concepts that begin to bridge from DSI to the TID context. The next frontier is connecting design justice in outlying contexts (e.g., homeless shelters or refugee camps) with a more wide-spread societal experience of energy resource constraint.

If the profession of interior design survives in a deeply decarbonized world, it will need unconventioal interior designers who reimagine design processes and solutions for political and socio-economic paradigms that are not yet here. While several schools of architecture are running counter-cultural experiments, such as the Rural Studio at Auburn University [63], the Transition Design Institute at Carnegie Mellon [64], and the Green New Deal studio sequence at the University of Pennsylvania [58], we have not identified a parallel experiment in interior design education. However, in the realm of social innovation, the Center for Community-Engaged Design at the University of North Carolina Greensboro is the only U.S.-based public interest design group housed within an Interior Architecture department [65]. The preeminent network of interior design educators in North America, the Interior Design Educators Council (IDEC), publishes regional and national conference proceedings annually [66]. Abstracts addressing sustainability are thin and largely focused on "green tech" (Figure 3) innovations in the realm of interior furnishings and materials. Our discipline could benefit from having more pioneering interior design programs that boldly imagine how ID practice functions outside of conventional paradigms.

Interior design program accreditation and TID

The primary function of CIDA is not forecasting the future, but stewarding the professional accreditation standards that guide North American interior design education [4]. Before we consider these standards in depth, however, it is worth noting past critiques of the system as dominantly focusing on highly specific pedagogical content knowledge over the development of broader characteristics such as systems thinking, service learning, or team-based problem solving [67]. While the most recent standards begin to address these competencies [4], the heavy learning outcomes required across the standards leave little room within the traditional 4-year undergraduate degree for a strong liberal arts foundation that helps students to synthesize and cohere issues [67,68]. That is to say, the granular nature of CIDA standards may position interior design graduates to have a strong command of technical concepts but feel "lost in the weeds" in terms of how this knowledge fits into a bigger picture.

These standards, however, are of critical importance to the present and future of ID education. In the U.S., there are over 150 accredited ID programs and just under 20 programs outside the U.S [69]. Given the dominance of the CIDA framework guiding ID curricula, CIDA standards can be closely examined for adaptability to the TID context. Table 2 lists and defines the 13 CIDA standards related to ID knowledge acquisition and application. All 13 standards have the potential to be timeless and

enduring in rapid energy descent. However, some standards might change more dramatically than others. The Global Context standard (Standard 4) encourages designers to be system thinkers across social, cultural, economic and ecological contexts. This standard would elevate in importance in the TID context to become a core knowledge base of the transition interior designer. Collaboration (Standard 5), Human-centered design (Standard 7), and Communication (Standard 9) would maintain as critical knowledge domains to contribute to DSI. Business Practices and Professionalism (Standard 6) would follow the paradigmatic shifts in design practice and increasingly integrate new business models for DSI and TID (see Table 1).

While Design Elements and Principles (Standard 11) are not likely to change, and design thinking will remain the core of the Design Process standard (Standard 8), design production could move toward more low-energy processes. Studio projects may focus less on fictitious affluent clients and more on projects that provide service-learning opportunities with real clients in underserved communities (DSI). Moving toward the TID paradigm, these projects could additionally address the social, psychological and technological challenges of design for steep and rapid energy descent.

The History (Standard 10) sequence in design programs could shift in several radical directions to support DSI and TID. First, interior design history can recognize the designer's role over time in the "systemic forces that reproduce inequality and marginalization", which sets the stage to increasingly decolonize the discipline of interior design [70]. Authentic DSI that is place-based in the design students' own community would benefit from this kind of critical reflection. Second, history courses can increasingly emphasize materials and methods that are contextualized to place. Vernacular design is often missing from the traditional canon of design history; however, the study of traditional techniques and structures can offer myriad insights to future low-energy designs [44]. Interior design educators could take inspiration from Watson [71] who captures the philosophy and practice of "design by radical indigenism" for the deep sustainability of urban design. The companion work on indigenous interior design for modern living has not yet been created.

CIDA standards 12–16 are technical in nature and would require rethinking in a rapid energy descent context. Designers would apply Light and Color (Standard 12) expertise to low-energy interiors with a continued emphasis on human wellbeing. Radical changes to sourcing and application of Products and Materials (Standard 13) would be expected in the TID context as discussed in the sections above. Environmental Systems (Standard 14) would have continued importance with likely shifts from active, energy-intense environmental systems to the more passive, low-energy environmental systems seen in historic and vernacular designs. Within the Construction standard (Standard 15), there is potential for interior designers to be more actively involved in design-build, service-

learning interior construction projects. Teaching of Regulations and Guidelines (Standard 16) would evolve as regulations and guidelines shift to support an energy-constrained society.

Table 2. Council for interior design accreditation standards [4].

Standard #	CIDA accreditation standards for knowledge acquisition and application	CIDA definition of standard
4	Global Context	Interior designers have a global view and consider social, cultural, economic, and ecological contexts in all aspects of their work.
5	Collaboration	Interior designers collaborate and participate in interdisciplinary teams.
6	Business Practices and Professionalism	Interior designers understand the principles, processes, and responsibilities that define the profession and the value of interior design to society.
7	Human-centered Design	Interior designers apply knowledge of human experience and behavior to designing the built environment.
8	Design Process	Interior designers employ all aspects of the design process to creatively solve a design problem.
9	Communication	Interior designers are effective communicators.
10	History	Interior designers are knowledgeable about the history of interiors, architecture, decorative arts, and art.
11	Design Elements and Principles	Interior designers apply elements and principles of design.
12	Light and Color	Interior designers apply the principles and theories of light and color effectively in relation to environmental impact and human wellbeing.
13	Products and Materials	Interior designers complete design solutions that integrate furnishings, products, materials, and finishes.
14	Environmental Systems and Human Wellbeing	Interior designers use the principles of acoustics, thermal comfort, indoor air quality, and water and waste systems in relation to environmental impact and human wellbeing.
15	Construction	Interior designers understand interior construction and its interrelationship with base building construction and systems.
16	Regulations and Guidelines	Interior designers apply laws, codes, standards, and guidelines that impact human experience of interior spaces.

Mindset and Posture of the Designer

Within frameworks for Transition Design, the "mindset and posture" of the transition designer are important and complimentary considerations

[8,18]. While mindset refers to a person's worldview, posture refers to the attitudes and approaches one takes in their design work [8]. The posture of the designer is defined by the field's implicit and explicit values, setting the metrics for "good design" and by consequence, the role adopted by the designer in interacting with clients. Professional values are evident in curriculum and licensing, and visible in the work chosen for awards and heralded as ideal [30]. CIDQ [7] defines the role of the interior designer in part as being responsible for the "health, safety, and welfare" of occupants. The interior designer, within the current DfS paradigm, embodies two roles. The interior designer adopts the role of artist in actualizing the aesthetic preferences of the client, while simultaneously adopting the role of technician, who ensures that material specifications, fire code, accessibility, and egress meet technical requirements. Missing in the dichotomy between the roles of artist and technician is what Groat [30] terms the "designer-as-cultivator", who recognizes the needs of the larger community and ecological context.

TID will be supported by designers-as-cultivators who adopt participatory, interdisciplinary, and educational roles within their communities to move our society beyond preoccupation with meeting individual needs to the pursuit of cultural and ecological wholeness [30]. Preparing for a future defined by drastically reduced reliance on fossil fuels will involve reframing and re-imagining what constitutes a good life. As Irwin suggests, "most people in our modern society, and especially our large social institutions, subscribe to concepts of an outdated worldview, a perception of reality inadequate for dealing with our overpopulated, globally interconnected world" [8]. Transition interior designers will help to support an updated worldview that values socially just design that is consistent with the finite limits of our planet.

An expanded worldview leads to expanded design teams. Though interior designers already work in transdisciplinary teams composed of members from allied design disciplines to produce environments that serve client needs, interior designer's interdisciplinary scope could expand even further. Focusing less on interiors based on fleeting trends, the work of transition interior designers can grow increasingly interdisciplinary to create durable environments that are earth-connected and adaptive to changing social needs. Designers will quickly pivot as societal needs shift (as evidenced in design responses to the need for hospital beds during the COVID-19 pandemic [72]). In a future characterized by extreme and unpredictable effects of climate change, designers will continue to be nimble and flexible as we move fluidly across disciplinary boundaries.

The DSI paradigm requires interior designers who can step into role of cultivator to lead diverse communities through participatory design processes. Proficiency in this domain can be supported by engaging students in public interest design, systems thinking, and fostering interpersonal communication skills that center empathy and curiosity.

Optimistically, recent work by Gale et al. [31] suggests that "soft skills" were identified by interior design industry professionals as the most valuable skills exhibited by interior design interns influencing the firm's willingness to hire, perhaps indicating that the interior design profession is already shifting toward valuing skills that will aid DSI and TID.

Interior Design, International Frameworks, and Cosmopolitan Localism

The UN provides a broad, expansive framework with global ambitions for sustainable development [2]. Transition Interior Design is here conceptualized as a practice that can be deeply place-based where small experiments and adaptive muddling [73] may occur in hyper-local and decentralized ways. Between the two extremes—transnational frameworks to local implementations—are visions for modes of operation that move across scales. Kossof [35] is a leading thinker in this area, with work defining "cosmopolitan localism" as striking a balance between global communities (and the concept that we are globally interconnected) with need for action that is place-based at the local scale. Ritzer [74] contributes to this conversation by contrasting 'Grobalization' and 'Glocalization' concepts in the context of capitalist paradigms. TID resonates with the Ritzer [74] notion of the 'Glocalization of Something', where meaningful projects emerge in local contexts but contribute to larger shared goals. Our work thus acknowledges the multi-scalar dimensions of Transition Interior Design, where interventions can take place from isolated locations to networked regions to national/international alliances.

CONCLUSION

To engage intellectually with climate change and energy scarcity is to realize that "the future is not what it used to be" [75]. The pandemic, amid widespread political unrest, has already shocked social systems and caused hesitation about our shared future. It is an appropriate moment to question conceptualizations of future design practice and education. The definition of TID advanced here is a notion of interior design that weaves in and out of nearly all 17 UN SDGs and promotes a vision for a discipline that could be positioned to support both human and planetary well-being.

This work looked to the ecological future to question the givens of our high-technology profession. Most interior design students today belong to Generation Z (GenZ) [76] and soon Generation Alpha. These cohorts of learners are already being defined as a generation that will never know life without technology [77], but also as a group of people who could be hungry, uncomfortable, and continually battling global climate change, peaking energy resources, and related social turbulence.

With these challenges in mind, the current work seeks to push conversations of sustainable interior design well beyond the emphasis on green technology within a "design for service" (DfS) profession. We used

precedent work on Transition Design to sketch an evolution for interior design education and practice from the current DfS paradigm towards social innovation and, in the long run, transition interior design (TID). We identified current disciplinary strengths that can be leveraged and expanded in times of rapid energy descent. Finally, we explored opportunities for TID within existing frameworks for accredited ID education.

The work here leads to several clear implications for ID education and, ultimately, practice. The themes outlined in this paper point to both low-energy design processes (analog, human-centered, community-engaged, and place-based) and design projects (net zero, passive design and circular material loops, all informed by vernacular design). We emphasized the interior designer's role in supporting individuals and communities undergoing the stress of a changing climate. Our existing emphasis on healing and functional interior environments can be leveraged and applied to the TID context to support reductions in consumption and increasingly low-energy lifestyles. TID also opens up new avenues for design scholarship to expand current theoretical and empirical understandings of the human psychosocial outcomes of interacting with built and natural environments.

In sum, the current work boldly imagines a thriving future for the scholarship, education, and practice of interior design. Instead of disappearing with the oil age, interior design could become a profession that supports what it means to live well on a planet with finite resources. The path toward this vision begins with the recognition of sobering facts and continues with persistent hope, creativity, and experimentation. Myriad hidden energies underwrite the current success—and perhaps eventual decline—of the 21st Century designer. Advancing frameworks for Transition Interior Design provides a vision for what success could look like for designers, and life on Earth, by the end of this century.

DATA AVAILABILITY

No data were generated from the study.

AUTHOR CONTRIBUTIONS

This work was initially conceptualized by LBC, who took leadership on the organization and drafting of this review. EMH brought additional disciplinary expertise and perspective to support the conceptualization of themes and writing process. The final work is a co-conceptualized piece strengthened by the viewpoints of both authors.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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