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Architecture, Waste, and  
the Circular Economy

# ENQ

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## Architecture, Waste, and the Circular Economy

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### Introduction

Waste is a modern global crisis. The world is drowning in an unprecedented amount of waste due to an increasing linear economy model that drive societies to consume more every day. It was reported that the average American citizen consume nearly 32 times more than the average Indian citizen. Companies, businesses, and corporates are continuously racing to deplete the planet's natural resources in an astonishing rate. The design and construction sector alone is responsible for 30-40% of total solid waste worldwide, yet as architects, designers, and planners the waste problem is almost absent from the current discourse, both in practice and academia. Beyond sustainability, and if ideas such as the Dutch "Circular-City" become more appealing to architects, designers, and clients, the architectural education must adopt a transformational shift in the design thinking process to prepare a more responsible future architect. A shift from goal-oriented design to means-oriented design requires a shift in the design education, and the studio pedagogy. A transformation is needed in education, practice, research, and the related professions to address the current and emerging economic challenges more so post crises and pandemics, and through the built environment lens. It is time to define the role of architecture and design in the circular economy paradigm shift.

The Circular Economy paradigm shift will likely impact three interconnect entities: Cities, Waste, and Commodity. The 2018 United Nations report stated that around 2.5 billion people will be living in cities by the

year 2050, placing unprecedented demands on both resources and services. Today, nearly 80% of Americans currently live in cities and the proportion is increasing. We use more than 100 billion tons of raw material every year, and most of it ends up as pollution in the environment. The building and construction activities account for nearly 35% of total solid waste. The US manufacturing industry alone generates approximately 7.6 billion tons of non-hazardous solid waste each year. Selling industrial waste as a commodity is already a \$57 billion industry in the United States but as foreign countries increasingly restrict imports of waste, US-based companies must deal with their own waste-flows and streams. A major automotive company such as General Motors reported in Forbes magazine, that they made nearly \$1 billion a year from recycling waste.

According to David Ness, the modern view of the circular economy differs from the past. It has started in the second half of the 20th Century and is a case for the simultaneous and uncorrelated emergence of an idea. In preparation for the call for articles, we have provided our prospective authors with a selection of literature on the circular economy, including those related to industrial ecology, urban metabolism and especially the built environment. The latter has tended to be overlooked, with most attention being focused on the manufacturing sector. In conversation with Walter R. Stahel, considered by many as the father of the modern term of Circular Economy, he said: "*Nature knows no waste, so all "waste" is man-made, which means our lack of ideas and "innovation" on*

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*how to prevent it in the first place, or how to reuse it once it is here. So let us be creative, but prevention first, please. Eat it up, wear it out, make it do or do without - "sufficiency" is often the most sustainable option.*" Although I agree with Walter in general, I had my reservations on the three ideas of Zero Waste, Innovation, and Sufficiency. First, Zero Waste is impossible. Waste is inevitable to human nature. Wait till you go to paradise, there will be no waste. Second, biomimicry is fake. Nature is GOD's creation, so we "humans" can't mimic nature. We can only learn from its mode of operation. And third, for sufficiency, imagine you have a sailboat, you also will likely need an auxiliary engine. When wind blows in your favor, use the sail. When you need to dock to the harbor, use the engine.

As the sole peer-reviewed journal of the Architectural Research Centers Consortium (ARCC), the editorial board have invited me to serve as the guest editor of the ENQ special edition for 2021. A difficult year post COVID-19, where there were and perhaps still questions more than answers. Seven years ago, I founded the Resource-Based Design Research Lab (RBDR/Lab) at Texas A&M University. The lab advocates for Circular Economy through adding value-by-design. The lab activates industrial symbiosis through research, design, and development of solutions for building components, building systems, and building products conceived from industrial solid waste-flow and manufacturers by-products. The title of our call for articles, Architecture, Waste, and the Circular Economy, attempted to attract scholars and researchers to examine the relationship among the three domains. While the topic has seen a recent interest from the architectural research community in Europe, the hope for this call for articles was to promote further interest for the US-based scholars and researchers. We have prompted our prospect authors with few questions such as *What is the role of the architect and architectural education in the waste problem? How can design thinking address the unavoidable crisis? Could the design studio be activated as a catalyst to provide holistic solutions to the problem? This call is intended to push the research agenda and to highlight the possibilities for scholars, designers, academics, and architects for research, teaching, and scholarship on the role of both the Higher Education and practice in the Circular Economy.* We invited submissions of manuscripts that address research questions that encompass the broad issues of the relationship between architecture, design, and the circular economy. Articles

addressing the broad topic in the built environment across different theoretical perspectives, epistemologies, and methodological approaches were encouraged. Scales addressed could be from the detail to the building to the city. We welcomed empirical research, literature reviews, theoretical arguments, and methodological outlines.

As we prepared the call for articles out, it was announced that Anne Lacaton and Jean-Philippe Vassal Received the 2021 Pritzker Architecture Prize. A prize considered by many as the Noble prize of Architecture. A testament that architects must take notes from the French duo and rethink the typical and conventional practice of architecture. To be able to advise a client not to build, and instead propose a conscious alternative solution is the ultimate selfless approach from the architect and a testimony to the noble role of the architect's duty towards societies. In Anne's words: *"Transformation is the opportunity of doing more and better with what is already existing. The demolishing is a decision of easiness and short term. It is a waste of many things—a waste of energy, a waste of material, and a waste of history. Moreover, it has a very negative social impact. For us, it is an act of violence."*

The ENQ special edition call has received contributions that reflected upon *Design thinking*: Redefining the architectural design framework and design process for a circular economy paradigm. How does architecture contribute by humanistic approaches adding the sublime and poetry, instead of basic pragmatic expectations? *Materiality*: Mapping and engagement in a resource-based project delivery system. How does architecture contribute to synergies between industries for circular economy material choices? *Design validation*: Adding value to waste streams from manufacturers and industries. Quantifying value by data analysis for material efficiency. Generating awareness for the potential of data driven design for a CE approach. *Interdisciplinary studies*: integrating ideas by collaborating across disciplines at early design stage. What are the possible disciplines the architect could partner with for CE design approach? *And Design efficacy*: Introducing methodologies to address untapped opportunity in design within a CE paradigm. Can architecture lead to new methodologies for sustainability? What new methods could arise from engaging architects in the circular economy paradigm?

The ENQ journal received 10 submissions to our call with an acceptance rate of 40%. The call for articles followed the first workshop conducted on the same topic at the EAAE-ARCC International Conference in Valencia, Spain in November 2020. The workshop titled; *Defining the role of Architecture in the Circular Economy Paradigm* included a panel discussion moderated by myself and included, Ilaria Valenti, Alisia Tognon, Marco Bovati, Emilia Corradi, Alessandro Raffa, Kevin Santus, Joan Romero, Anna Sanasaryan, and Patricia Kio. This panel session and workshop were intended to formulate a new research agenda that was focused on the role of architecture in the Circular Economy paradigm shift, and further identify the knowledge gaps for scholars, designers, academics, and architects for research, teaching, and scholarship collaborative opportunities.

To say the least, we still have a long way to go. Architects, educators, researchers, and students must engage in critical conversations on what makes the built environment. It starts with the education of the architect, and as known historically, economy is the least discussed issue in most architectural schools. Sustainability is no longer the topic of interest, much less identified. It is clear that the design education plays the most important role to change the way we build and to inspire the next generation of rethinking our natural resources instead of looking for an exit strategy on other planets after destroying our own.

I am grateful for the conversation that started this special edition with Oya Atalay Franck, Hazem Rashid-Ali, and Ilaria Valenti in Quebec, Canada. I especially thank Philip Plowright, the chief editor for inviting me to serve as the guest editor for this edition, and for his tremendous editorial help. I am also grateful for the outstanding service by our guest reviewers, David Ness, Alisia Tognon, Emilia Corradi, Clarissa Ferreira Albrecht da Silveira, and Thaleia Konstantinou.

In conclusion, we hope this special edition serves as the beginning for future scholarly contribution to the relationship between Architecture, waste, and the circular economy and to inspire design educators and researchers around the world to reconsider the design studio as a research laboratory that addresses one of the most global challenges of today.