

Architecture & Urbanism in the Age of Planetary Crisis

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TABLE OF CONTENTS

CONFERENCE PROGRAM.....	6
CONFERENCE CALL FOR PAPERS.....	9
KEYNOTE SPEECHES.....	10
Towards Lightness and Freedom: Reimagining Architecture and Education.....	11
Unveiling Istanbul: Taksim Urban Design Competition for Prost's Espaces Libres.....	13
Reproducing Architecture and Urbanism in the Midst of a Pandemic Condition	15
Transition Design: An Approach for Addressing Complex "Wicked" Problems and Catalyzing Transitions toward More Sustainable Long-Term Futures	16
SESSION 1	17
1. The Urban Commons as a Possibility for the Socio-Spatial Justice in the Cities of the Global South: Rethinking the <i>Favelas</i> in the Metropolis of Rio de Janeiro	18
2. Creating Geographies for Capital Accumulation and the Reproduction of Crises	22
3. Post-Democracy and Governance in Refugee Camps: Unveiling the Socio-Spatial Conflicts of Refugee Crisis in Athens and Thessaloniki	25
4. Recovering the City, Citizen Empowerment towards a Tactical Urbanism.	33
5. What do we have to Be Careful about Public Space in the Age of Planetary Crisis?	40

6. The Contributions of Architects to Post-Conflict (Re)Construction: Social Processes towards Building Peace, Case Studies from Rwanda, Colombia and Iraq.....	49
SESSION 2.....	59
7. De-Urbanisation as Paradigm and Process: The Embedded Transdisciplinarity in De-Urbanisation	60
8. Towards Post-Pandemic Urban Change; Renaissance of Bicycle Networks.....	70
9. The Urbanization Processes of Northern Istanbul in the Anthropocene Era: The Yavuz Sultan Selim Bridge and the Northern Marmara Highway	76
10. Strategy and Planning From the Field: An Alternative Methodology	82
11. The Incentivization of Freedom and Its Future	90
12. An Analysis of Children's Perceptions on the Concept of <i>Neighbourhood</i> through Their Own Paintings.....	102
SESSION 3.....	107
13. Sustainability and Smartness during a Pandemic Scenario	108
14. A Reading on New Social Praxis and Its Possible Effects on Built Environment in the Post-Pandemic Era through the Brave New World Text	120
16. House Types, Settlement Patterns, Infrastructure and Physical Distancing Measures during the COVID-19 Pandemic	132
17. The Crisis of Place-Based Labour at the Crossroads of Planetary Gentrification and the COVID-19 Pandemic.....	149
18. How Evolution of Virtual Workplaces during Pandemic Affected Urban Planning and Zoning	156
19. Seeking Potentials in the New Cultural & Material Reality of the COVID-19 Pandemic: A Critical Appraisal from the Lenses of <i>New Babylon</i>	163

SESSION 4	174
20. How can Architects Serve the Climate Crisis? Presenting a Design-Led Solution to the Wicked Problem.....	175
21. Using Case Studies to Explore the Concept of Buildings-as-Energy-Service	180
22. Ti.hum: Tierra Húmeda Species Coexistence Urban Model for Vulnerable Basins, The case of Tierra Amarilla, Agro-Mining Town in Copiapó River Basin, Atacama Region, Chile.....	187
23. At Home in the Earth, Made without Hands.....	202
24. Redrawing Reconstruction: Defining a Mapping System for the Comprehension of Urban Metamorphosis Following Extreme Events	209
25. Transform to Transform Ourselves	224

25. Transform to Transform Ourselves

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Crisis and plastic consumption

The current sanitary crisis that we are globally facing has accelerated a wide range of issues and problems related to the reproduction of our consumption culture.

One of these problems takes our relation with industrial objects, especially plastic ones. In this sense, from the pandemic mitigation efforts, a large increase in the demand of plastic products has been detected to protect citizens, patients and health workers [1].

As can be seen in Fig.25.1, objects like masks, gloves, medical lab coats, glasses and facial masks faced an exponential growth in their demand and, according to that, the amount of plastic waste has been multiplied. On the other hand, it is also possible to find medical hardware like respirators and ventilators, polycarbonate syringes, etc., that also increased in demand, but they have longer useful life compared to the first group [2].

+ POLLUTION



COVID-19

Figure 25.1: Hospital plastic waste. Source: Elaborated by the authors from The conversation, journalistic flair.

Link: <https://theconversation.com/danos-colaterales-de-la-covid-19-el-resurgir-del-plastico-137803>

According to the prevention measures that have been adopted by the governments, like confinements and limit free walking, the use of disposable plastic has increased linked to the demand of delivery services packaging products to avoid personal contact.

What can we do with this plastic waste?

Definitely, this leads us to the ecological crisis reported in the last years related to the plastic waste in our planet and to the social, economical and environmental paradigm of single use industrial objects. The new industrial production paradigms based on ecodesign and circular economy methodologies have raised like a viable way between many production politics in the world, however, design and developing products and objects from recycling materials continues to be an urgent challenge.

From waste to the transformation

In this context, the plastic products post-use destiny (from health systems and general use), remains a feeble domain for institutions and citizens. In Chile, the regulatory framework for waste in health system buildings contemplate that 2,687,040 medical plastic waste are eliminated daily [3], an critical figure covered by a regulatory framework, which, although it contemplates the

differentiated use of waste containers and operating recommendations aimed at its recycling and reuse, does not specify any of these operations, promoting actions such as the collection of these or the incineration of waste or garbage dumps, which could generate emissions of carcinogenic compounds such as dioxins and furans [2].

According, recycling to transform, and limiting virgin raw materials as much as possible, is an aim that will allow us to revalue plastic waste as a secondary raw material open to the redesign of our material culture. Based on repair, modification and adaptation.

Re-thinking the plastic waste

From mechanical recycling to manufacturing, a technological community

Within the possibilities of exploring and understanding a recovery of plastic waste to the production cycle, our research is part of a design process for new architectural materials, taking as a first parameter the mechanical recycling process of different types of plastics obtained from the post-consumer, and the stabilization of new materials with additives that enhance certain properties of new products.

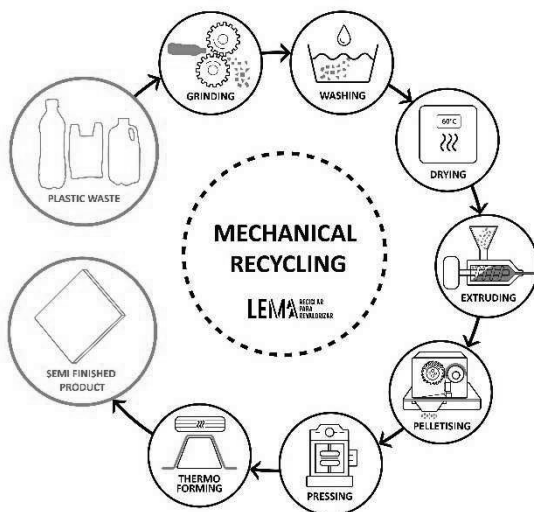


Figure 25.2: Mechanical recycling processes. Source: Elaborated by the authors from ISO 15270, 2008.

As shown in Fig.25.2, the transformation of these mechanical processes are enunciated within an interdisciplinary area, which involves new methodologies and techniques, to follow the line of revaluation of materials and products in search of a comprehensive transformation of the new product.

LEMAA is a Laboratory of Environmental Architectural Materials Exploration; in this laboratory, we give an opportunity to waste materials, incorporating Architecture, Design and Chemical Engineering, to create new forms and functions from the materialization of new products. We use the mechanical recycling process, such as crushing, washing, drying, extrusion, pelletizing, pressing, thermoforming and injecting to obtain a new functional and recycled product. Finally, we incorporated Ecodesign methodologies, to evaluate the environmental impact in the different stages of the product (Fig. 25.3).

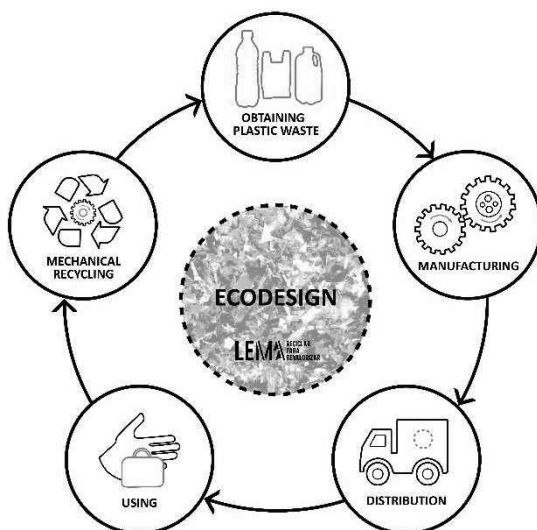


Figure 25.3: Ecodesign methodologies. Source: Elaborated by the authors, 2020.

Nanomaterials as an opportunity

By exploring and understanding the opportunity that plastic waste has for the production cycle, additives allow the enhancement of additional characteristics or properties to the new material, being able to grant a new environmental functionality to the architectural product as the degradation of polluting gases through Photocatalysis for example.

The iteration in this exploratory process of creating a new material, frames us to the possibility of researching the stabilization of the mixture together with catalytic nanoparticles, as can be seen in image of Fig.25.4. making a new nanomaterial with environmental functions.

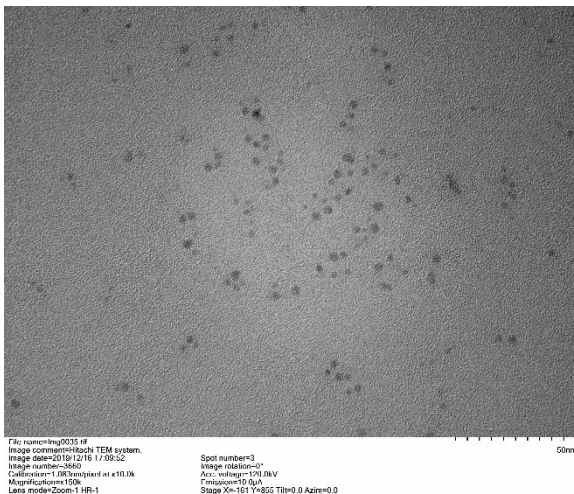


Figure 25.4: Catalytic nanoparticles in recycled plastic. Source: Elaborated by the authors from SEM (Scanning Electron Microscopy) test carried out by the USACH laboratory

The assessment of the incorporation of these additives in thermoplastics, the stabilization and the dosage percentage are taken into account to ensure a stability and minimum resistance compatible with the mechanical ranges [4]

Conclusion

Highlights of the critical consumption of plastics used on pandemic, invite us to transform ourselves, from an exploratory and iterative process of trial and error. This path allows us an opportunity for the environment that entails the change of the definition of plastic as a waste.

The incorporation of technologies, such as mechanical process, nanomaterials and ecodesign, allows to revalue plastic waste through the composition and materialization of new innovative products through interdisciplinary areas.

Plastic waste has a potential for toxicity, and added to the slow degradation, has been identified as a risk to human health and ecosystems [5]; according to the cycle of this material, it's a real challenge, transform the design methodology of new materials that will allow us to repair, modify and adapt what exists.

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