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PROGRAM

SHELTER:

FROM BUILT TO MADE ADEQUATE HOUSING WITH
THE AID OF ADDITIVE MANUFACTURING.

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ABSTRACT

The shelter crisis: a significant part of the global population lacks access to adequate, safe housing that is affordable for them to live in. There is a huge demand for an effective solution to overcome the shelter crisis. This demand challenges architects, engineers, and researchers to develop diverse solutions to resolve the exigency, which results in the development of different technology-based, material-based, and practice based solutions. Did those solutions turn out to be efficient, sufficient, and economical as prophesied? But for the time being, various research claims that mainstream construction practises around the world cause more than half of the world's overall waste and nearly half of the overall global carbon emissions. Since it is not an effective solution to use conventional systems in the era of climate change, it led to the thought of trying out the application of one of the modern methods of construction [MMC] - **additive manufacturing**. In this research, I limit my scope of study to one housing typology: **single-family houses**. Can additive manufacturing in construction provide an appropriate ecological, social, and economic solution and find a realm for the circular economy in the field of adequate housing?

I am focusing my studies on 3 types of additive manufacturing in construction: **3D concrete printing, 3D clay printing, and 4D printing**. The empirical research uses the data from the case studies of the single-family housing projects and prototypes that have been developed using these three methods of construction and the interviews with the professionals in the specific field to act as an understanding of the pros and cons of the technology on the themes: **faster construction, affordability, and sustainability**, derived from widely discussed parameters that impact the construction, which are time, cost, and environmental impact. Situating my research in an Indian context, where additive manufacturing in construction is in its infancy stage, this thesis looks at the possibilities and opportunities of using additive manufacturing technology to develop adequate housing solutions in India.

Keywords: Shelter crisis, modern methods of construction, additive manufacturing, faster construction, sustainability, affordability, 3D concrete printing, 3D clay printing, 4D printing.