



## Short communication

# Marine plastic pollution and affordable housing challenge: Shredded waste plastic stabilized soil for producing compressed earth bricks



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## ABSTRACT

This research work was aimed at investigating the suitability of making compressed earth bricks (CEB) with a mixture of soil and varying percentages (0, 1, 3, and 7%) of shredded waste plastic. Specific gravity, particle size distribution, Atterberg limits and compaction tests were carried out on the soil to determine the engineering properties of the soil. The compressive strengths and erosion rates of the CEB made with the soil and the mixture of soil and varying proportions of shredded waste plastic of two size-categories (<6.3 mm and >9.6 mm) were determined. The soil was classified as clayey sand (SC). The highest compressive strength was obtained for the CEB containing 1% waste plastic of sizes <6.3 mm and its compressive strength amounted to a 244.4% increase. Of the CEB samples stabilized with shredded waste plastic, the sample containing 1% waste plastic of sizes <6.3 mm also had the least erosion rate. Provided the exterior surfaces of walls produced using the CEB are protected from erosion, the use of 1% shredded waste plastic with particle sizes <6.3 mm was recommended. The use of waste plastic that would have constituted an environmental nuisance has the potential to produce stronger and affordable bricks for providing affordable housing.

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## 1. Introduction

There has been a general increase in housing prices worldwide and in many countries, the range of housing prices has also continued to widen. The average property prices in many countries have increased. The average property price increase across all capital cities in Australia was said to be by nearly 30% from 2008 to 2018 [1]. Glaeser et al. [2] reported a 72% increase in average housing prices and a 247% increase in the standard deviation of prices in the United States of America, after comparing housing data of the year 1970 with those of 30 years after. Housing rent, which has been described as a better indicator of housing affordability than property prices [1], has also increased over the years. Martin and Troy [3] stated that housing can be said to be unaffordable if an individual's or household's median rent is greater than 30% of its income. According to Carliner and Marya [4], an average of 32.3%, 31.1% and 30.1% of the income of persons renting houses in Spain, the United States and the United Kingdom, respectively, is spent on rent. In the report of Szekely [5] that ranked 30 cities, considered to present the best deal of opportunities to its residents, based on their rent-to-income ratio, it was found that cities with >30% rent-to-income ratio include Tokyo, Japan (31%), Hong Kong, Hong Kong (32%), Madrid, Spain (32%),

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