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Life Cycle Assessment for Sidewalk Pavement Types, Case Study: Extension of New Borg El-Arab City

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Abstract

The sustainable city concept has become an important approach globally to reduce carbon emissions and adverse impacts to the environment. Life Cycle Assessment (LCA) is considered an effective approach to support decision-making for sustainable urban development. The 2035 strategic plan for the New Borg El-Arab City (NBC) suggests adding 20 km² as an extension area to the existing built area of the city. As a result, the infrastructure of the extended area is expected to have significant environmental impacts because of the large amount of material and energy required.

This paper compares the different types of sidewalk pavement material to provide information for decision makers about the environmental impacts of each type of material. It is hoped that this will help for the selection of materials that have the minimum environmental impact. This study used SimaPro software to conduct life cycle assessments for each sidewalk pavement material type and applied the IMPACT 2002+ method. It also focused on the manufacturing and installation phases. The materials chosen for comparison were mosaic tile, interlocking concrete tile and stamped concrete. The results of the LCA for each pavement type indicated that the interlocking concrete tile has the minimum diverse impact on the environment. Consequently, it is recommended for application in the extension of the NBC for sidewalk pavement.

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1. Introduction

Regarding the global concern and action to mitigate GHG emissions, national-level policies are increasingly being supplemented with city-scale actions to mitigate climate change. Urban growth and development causes huge amounts of pollution and waste generation worldwide [1]. There is a need for more sustainable design at the city scale. Consequently, the public spaces in cities are an exceptional location for implementing sustainable strategies because "the potential for direct environmental benefits is enormous and at the same time provides close example of urban environmental management to citizens" [1].

The 2035 strategic plan for the New Borg El-Arab City (NBC) proposes to add 20km² of extension area to the existing area [2] as shown in figure 1.

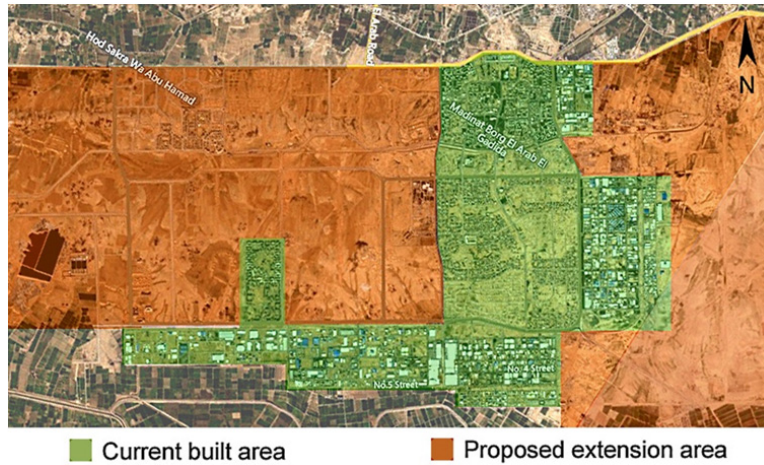


Fig. 1. Satellite image shows the existing and proposed built areas New Borg El-Arab City source : (www.wikimapia.org), [2]

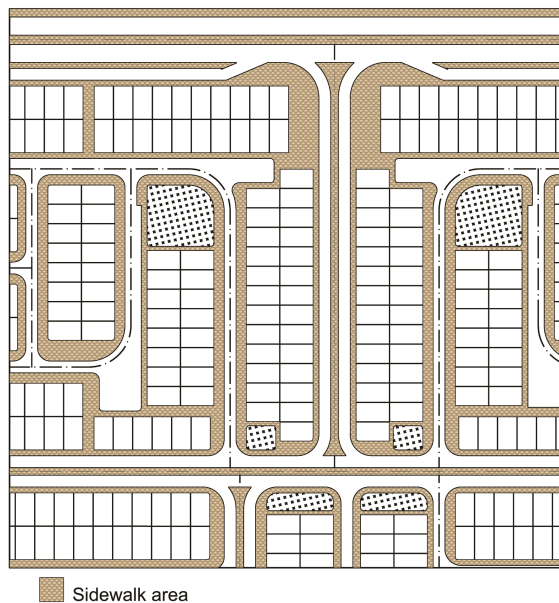


Fig. 2. The functional unit: area of 100000 m² from the NBC proposed extension of NBC, the ninth district [2]

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