SUSTAINABLE ALTERNATIVES TO CONCRETE APPLIED IN SOUTH AMERICA

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INTRODUCTION

The previous pilot study was about sustainable alternatives to concrete, specifically LC3 and Solidia cement, and their implementation in Peru. Based on their history, current studies about pollution and contamination from the building industry, and the growth in consciousness about sustainability; it is important to keep on researching, developing, and implementing alternatives for traditional building materials.
Particularly, it is important to find alternatives for traditional building materials like cement and concrete, which have more acceptance and a better seismic performance, and are also one of the most global and increasing demand materials that generate greenhouse gas emissions. (Kajaste, R., Hurme, M., 2016).

Seismic Hazard in Lima

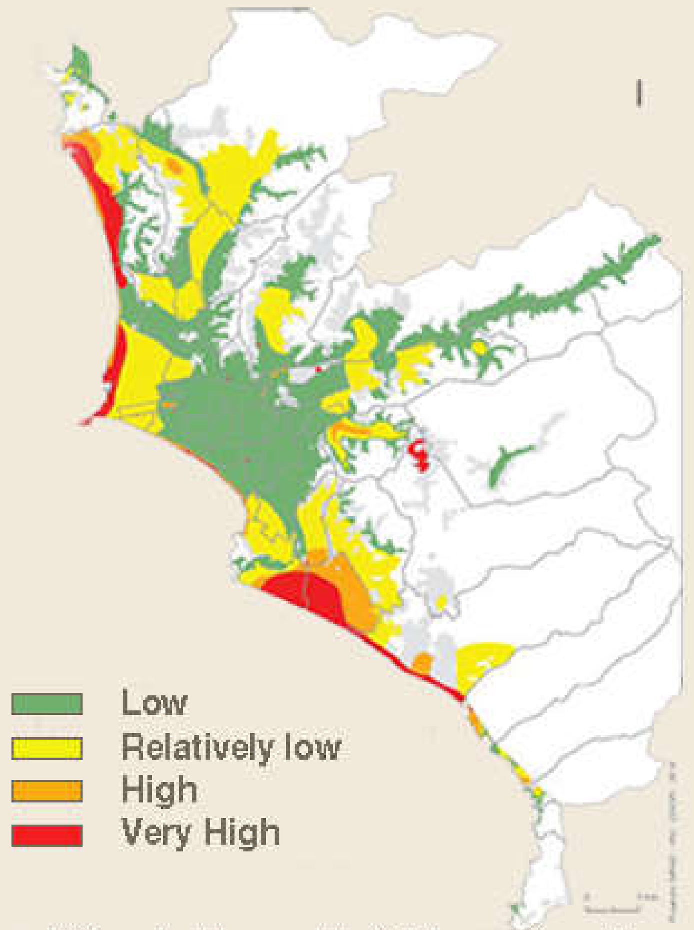


Fig. 1 Sismic Hazard in Metropolitan Lima Adapted from CISMID, 2005.

Fig. 2 Map of industries located in the area of study in San Juan de Lurigancho district in Lima, Peru. Adapted from Google Maps.

METHODOLOGY

The methodology used for this resarch consists of two surveys. The first one, made in 2020, "Green/alternative building materials and their implementation in Peru", directed to engineers, architects and/or professionals related to the construction industry with the intention of understanding the tendencies on merging to green alternatives to concrete in Peruvian culture.The second one, "Survey for neighbors of SJL", made in 2021, was focused on the reality and experience of the residents relating pollution and quality of public spaces. In addition to that, data from studies made in Latin America about the implementation of sustainable concrete and presentations about the Peruvian current special concrete alternatives was contrasted to finally produce a list of benefits and alternatives to Portland concrete, as well as a program proposal for a public space building in the area of study.

RESULTS AND DISCUSSION

Benefits of sustainable concrete versus Portland

Q9. Are you satisfied with the effect that concrete generates on the environment?

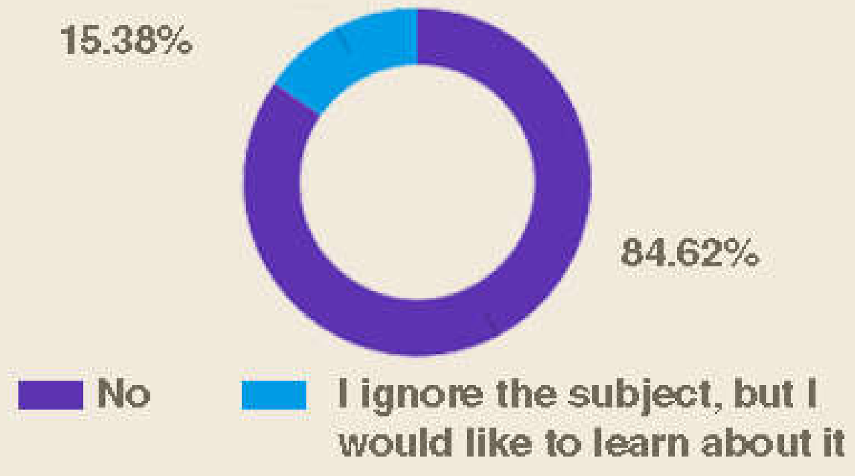


Fig 3. From the Survey: "Survey for neighbors of SJL", 2021

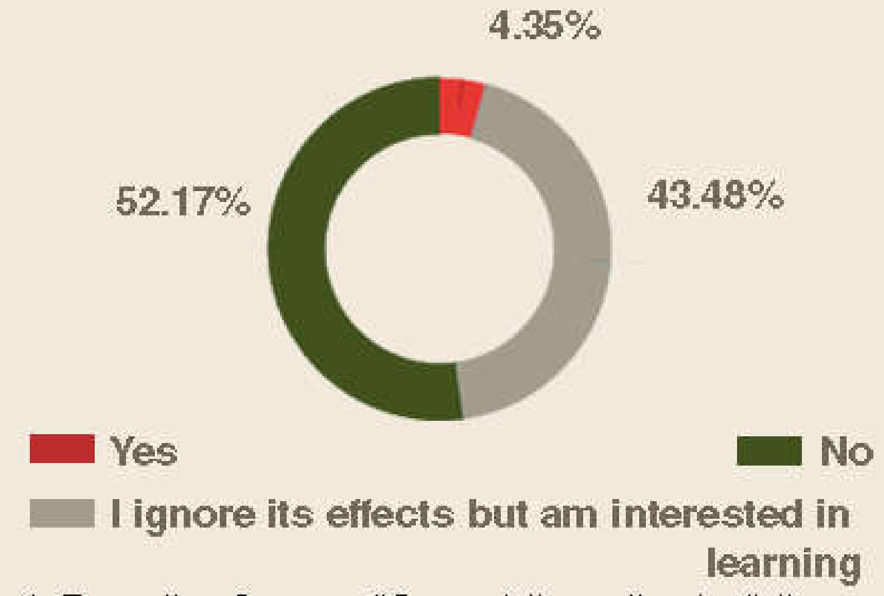
25% Savings of cost in production. (LC3)

40% Energy use reduction. (Sánchez-Barriel)

1 vs 28 Less than 1 day to achieve full strenght. (Solidia Cement)

40% Savings of Co2 emissions compared to Portland I cement.

Q2. Are you satisfied with the effect that concrete generates on the environment?



96% believe in implementing these alternatives in Peru

52,17% not satisfied with concrete negative impacts

Fig 4. From the Survey: "Green/alternative building materials and their implementation in Peru", 2020

CONCLUSIONS

Data showed the increasing and alarming levels of pollution in SJL district in Lima Peru, mainly from the industries located there. From the second survey, the main concern hat the neighbors had was the insecurity and need for adequate common spaces that can reinforce the community and their preservation.
The appliance of this design will mean great benefit for the communities of San Juan de Lurigancho. From air quality, sense of community, security and the generation of jobs, the design is not only a bookmark for sustainability but for public buildings.
Even thought the plants of production of this concrete alternatives is not yet availlable in South America, specifically for the case of Peru, there is presence of Kaolinitic clays, used for sustainable concrete, at the Llanacora district in Cajamarca. And the production of the material can be implemented in existing plants, generating local production, reducing transportation costs and emissions and generating industrialization possibilities for the green building industry.

SOURCES

Fig. 1 SIRAD Project Research 2010. Danger levels according to the Lima-Callao seismic zoning (CISMID 2005; IGP - SIRAD 2010)
Fig 2 Google Maps
Fig 3 "Survey for neighbors of San Juan de Lurigancho", 2021 https://uarizona.co1.qualtrics.com/jfe/form/SV_5uxlhnxWqNjQpfw
Fig 3 From "Green/alternative building materials and their implementation in Peru", 2020 https://uarizona.co1.qualtrics.com/jfe/form/SV_38ENL9SLJSyys6i

Kajaste, Raili, & Hurme, Markku. (2016). Cement industry greenhouse gas emissions - Management options and abatement cost. Journal of Cleaner Production, 112, 4041–4052. https://doi.org/10.1016/j.jclepro.2015.07.055; IGP - SIRAD 2010)