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Reducing lava flow impact in Auckland, New Zealand

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Throughout history cities have been impacted to varying degrees by volcanic eruptions. The frequency and cost of volcanic disruption is likely to increase as the areas around volcanoes become more populated. Little research has been conducted in urban environments inundated by lava flows due to the infrequency of such occurrences, and the fact that lava flows are not as life-threatening as other volcanic hazards. This project presents preliminary results of an ongoing study examining mitigation measures to protect the built environment from lava flows, focusing on Auckland, New Zealand. Auckland is home to a third of New Zealand's population and is the country's main economic hub. It is built on the monogenetic Auckland Volcanic Field (AVF). Spread over 336 km2, the AVF has been active over the past 190 kyr. It is composed of over 50 eruptive centres, with the most recent eruption occurring just 600 years ago. Most eruptions began with phreatomagmatism and, in cases of large magmatic volumes, were followed by an effusive stage. The eruptions in the past 40 kyr have exhibited a wider range of eruptive characteristics and included the largest volumes. Should this trend continue, considerable effusive activity will likely occur in a future eruption. This project integrates case studies of global historical urban lava flows, interviews, fieldwork examining lava flow-built environment interactions, geochemical and rheological constraints, small-scale laboratory experiments, and numeric simulations to determine the most effective lava flow mitigation measures for Auckland. Possible outcomes of this study include improved fragility and vulnerability functions for some built environment structures. These results may allow for lava flow hazard in Auckland to be evaluated as a non-binary impact since many factors, such as the lava's temperature and distance between the lava flow and structure, may determine if and how a structure will be impacted.