BEACH LOSS, SEAWALL CONSTRUCTION, AND LAND-USE PATTERNS AT ODDS WITH COASTAL ZONE POLICY – EAST O'AHU, HAWAI'I 1928-2015

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For my parents, sister, dog, and friends. Thank you so much for all your guidance and support throughout this journey.

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ABSTRACT

Protecting and preserving beaches is critically important to the economy, ecosystem, culture, and lifestyle of the Hawaiian Islands. However, within the last century, beaches on O'ahu have narrowed and are increasingly vanishing altogether. In response to federal incentives, a desire to better manage population growth and development along the shoreline, a need to protest coastal resources, and locally significant erosion problems, the State of Hawai'i enacted a Coastal Zone Management (CZM) program in 1977 as part of the policy framework created under the U.S. Congress' Coastal Zone Management Act of 1972. Under the Hawaii Costal Zone Management program (HCZMP), the State has delegated the authority to regulate shorelines to the Counties. Over the intervening decades, the four counties have adopted different types of construction setback laws: Maui and Kaua'i have erosion rate-based setbacks, and Hawai'i and the City & County of Honolulu (C&C) use a fixed distance of 20-60 feet depending on specific parcel conditions. The stated purpose of C&C setback policy is primarily for preservation and protection of the natural shoreline, public access, and open space. Maintaining wide healthy beaches are critical to achieving all three of these goals. Despite this, across O'ahu, structures continue to be built close to the shoreline, seawalls continue to be constructed, and beaches continue to disappear. We present data from the east-facing shores of O'ahu between 1928 to 2015 that document changing shoreline positions and beach widths concurrent with expanding coastal development that is at odds with the goals of presiding coastal policy. Over the study timeframe of 1928 to 2015 seawall and revetment construction increased by 54%, concurrent to net shoreline change shifting from quasi-stable to erosional along 74% of the coast. Before the enactment of CZM policy in 1975, the shoreline was quasi-stable with headland regions eroding at an average change rate of -0.05 ± 0.09 m/yr and embayed regions

accreting at an average rate of 0.14 ± 0.05 m/yr. Following 1975, the average headland and embayed region shoreline change rate became erosional at -0.08 ± 0.06 m/yr and -0.21 ± 0.09 m/yr, respectively. We reveal that historical seawall and revetment construction to protect eroding lands has caused a narrowing and loss of beach from 1928 to 2015 even while both the Hawai'i CZM program and C&C policy have been in force with laws specifically designed to protect the coastline, ensure open space, and enhance public access.