

Natural Shoreline Infrastructure: Adapting to the Future with Innovative Approaches to Shoreline Resiliency

Brett Vivyan, PE (brett.vivyan@ghd.com) and **Jeremy Svehla**, PE (GHD, Eureka, CA, USA)

Background/Objectives. The California Natural Resources Agency defines natural shoreline infrastructure (NSI) as “using natural ecological systems or processes to reduce vulnerability to climate change related hazards while increasing the long-term adaptive capacity of coastal areas by perpetuating or restoring ecosystem services” (Newkirk, 2018). The California Coastal Commission defines nature-based adaptation strategies (NBAS) as a resilient approach to climate adaptation that “incorporate ecological principles into shore protection strategies to support multiple benefits, including hazard adaptation and mitigation, natural resource resilience and enhancement, and recreation and scenic resource preservation (Vu, 2021). The Federal Highway Administration (2018) encourages nature-based solutions to prevent coastal highway flood damage and/or disruption by implementing approaches that mimic characteristics of natural features and protect or improve the build environment while maximizing the habitat value associated with the natural system. Similar terms include green infrastructure and living shorelines.

Approach/Activities. Although highly compelling conceptually and encouraged by public agencies, NSI projects are still considered innovative and relatively few projects have been implemented in California. The NSI approach faces challenges, limitations, and tradeoffs which must be addressed to identify feasible projects. Establishing feasibility encompasses multiple dimensions including technical feasibility (effectiveness at achieving goals and objectives), economic feasibility (capable of being funded), legal and regulatory feasibility (capable of receiving permits and approvals), and social feasibility (consistent with core community values). Each NSI project will have a unique design based on the geomorphic conditions, physical processes, and habitat types at a given site. One of the primary technical challenges is to understand the dynamics of natural systems at a specific location and how they have been disturbed by human intervention over time.

Results/Lessons Learned. This presentation will provide an overview of the modeled natural flood risk reduction properties of salt marsh, site characterization and preliminary designs for a project utilizing NSI techniques to demonstrate the use of natural ecological systems for sea level rise adaptation.