



Lightweight Structures for a resilient urban environment

Sigrid Adriaenssens

Form Finding Lab

Department of Civil and Environmental Engineering

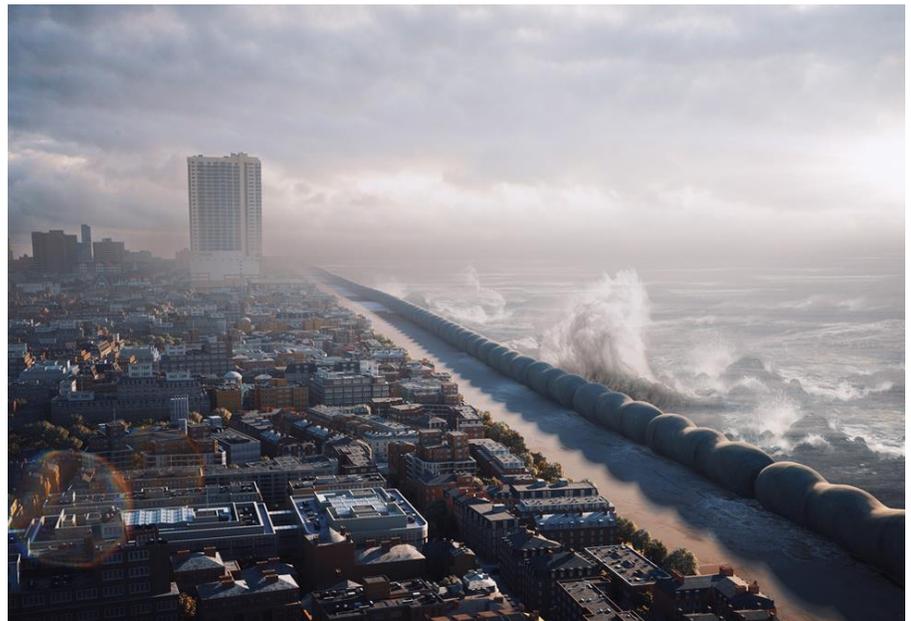
Princeton University

Abstract:

By 2050, 70% of the world's population will live in cities. Civil engineers envision, design and construct structures that those city dwellers depend on daily. The construction industry is one of most resource-intensive sectors, and yet our urban infrastructure continues to be built in the massive tradition in which strength is pursued through material mass. In contrast, I have focused my research on structural systems that derive their performance from their curved shape, dictated by the flow of forces. As a result, these structures can be extremely thin, cost-effective, and have a smaller carbon footprint. My core research question is 'What is the relationship between form and efficiency in civil-scale structures?' I will focus on the form finding and structural performance of rigid and compliant shells, and flexible net and rod networks with applications for a resilient urban environment. The applications include large-scale storm surge barriers, long-span buildings, adaptive building shading devices and submerged barriers. Some of these systems are inspired by structures that have evolved in biology, art or craft.

Bio:

Dr. Adriaenssens's research focuses on lightweight surface systems and how they can be optimized and realised to interact with extreme structural or environmental loading. This includes research on flexible and rigid shells and plates, submerged flexible membranes and nets, and metamaterials with applications for a resilient urban environment. Dr. Adriaenssens' research spans analytical approaches to study non-linear mechanics, seeking new numerical form finding, optimization and machine-learning approaches and fluid-interaction models as well as experimental aspects based on prototyping of small and medium scale systems using CAD/CAM and robotic construction.



Pressurized storm surge barrier (Credit Form Finding Lab)

Monday, February 24th, 2020 4:00 – 5:00 p.m.

1310 Yeh Student Center