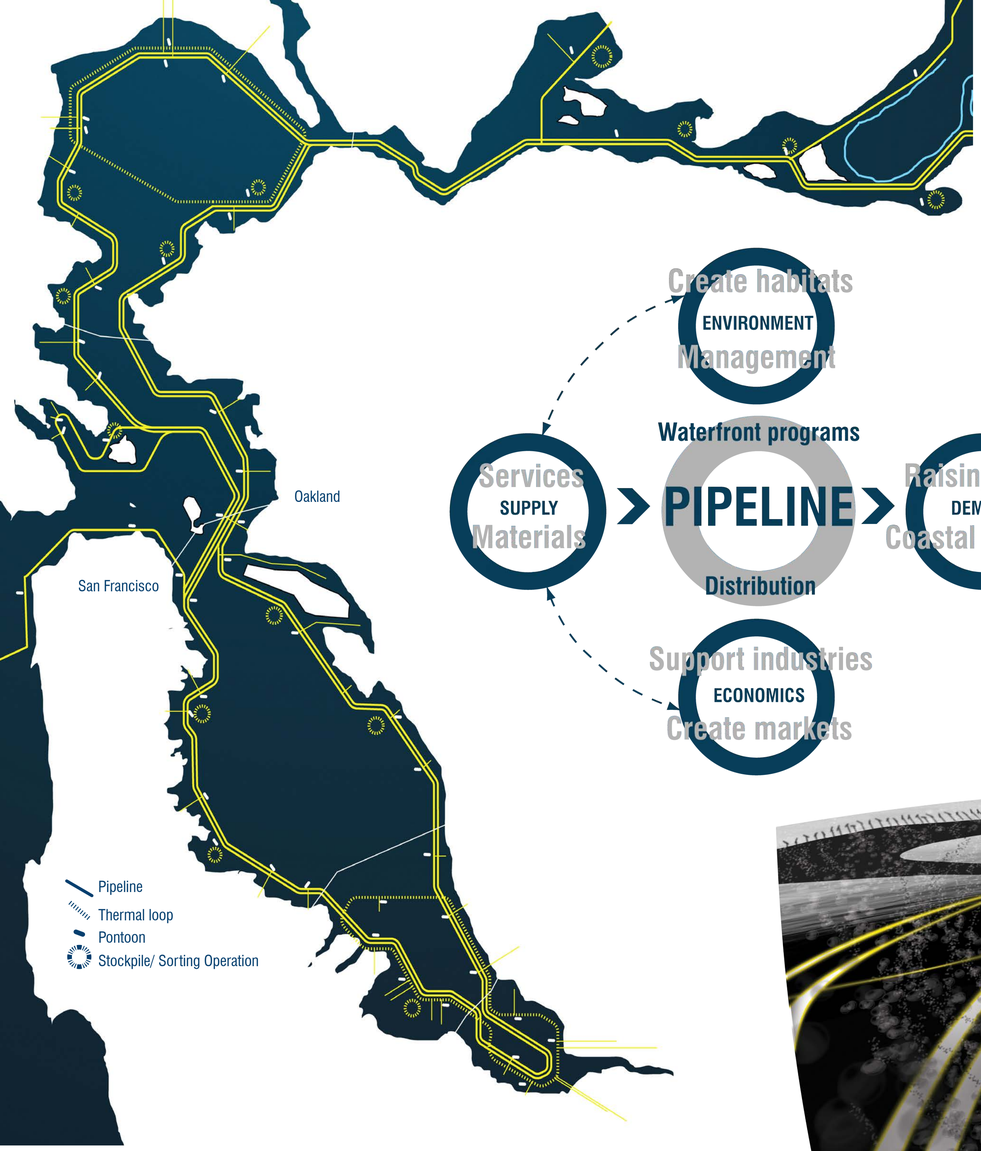
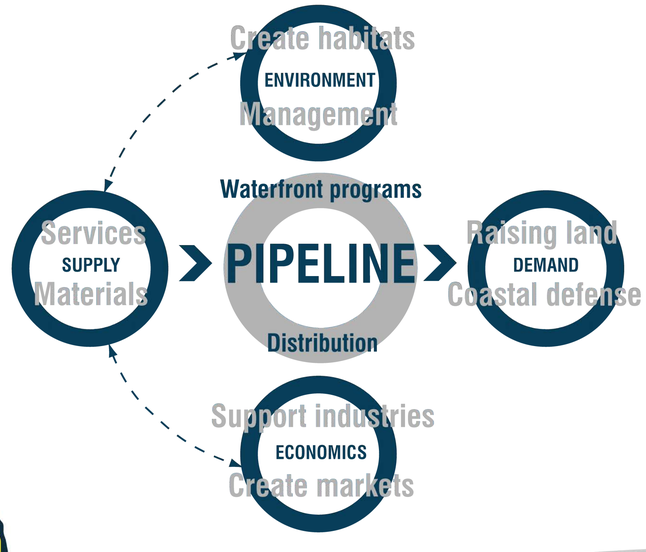
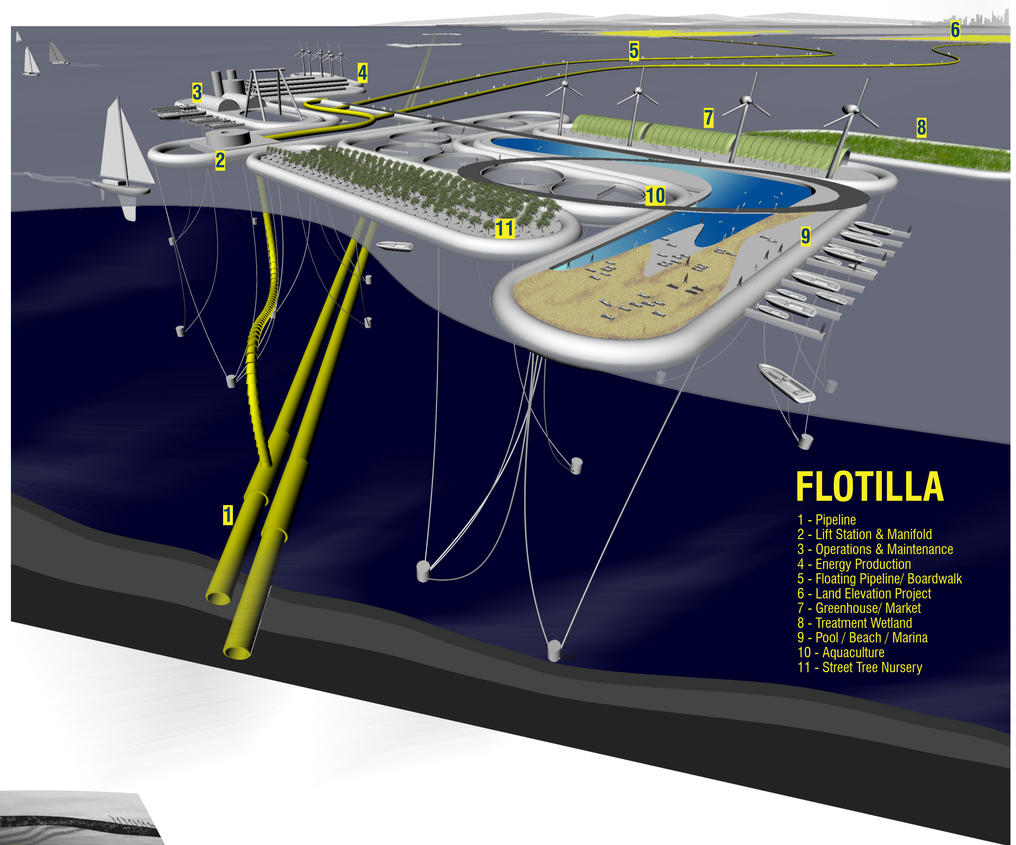




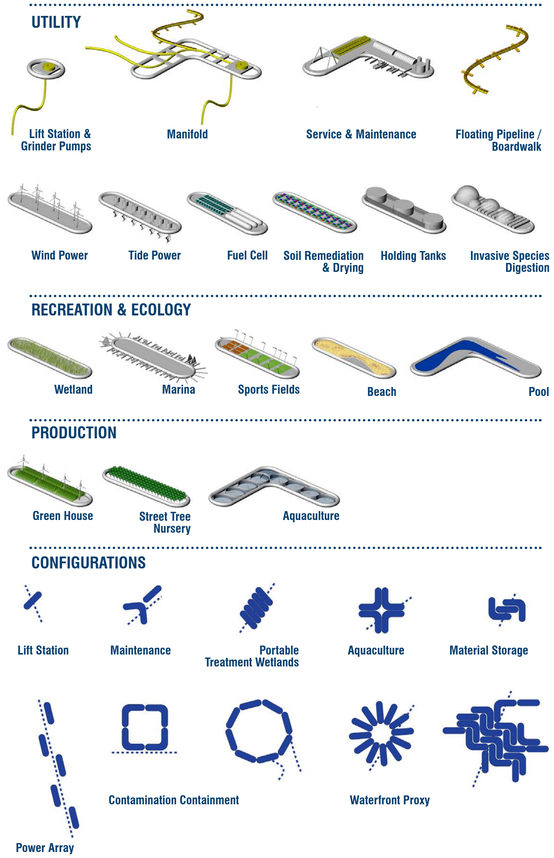


ESP // ESTUARY SERVICES PIPELINE

Estuary Services Pipeline (ESP) is a regional utility infrastructure designed to anticipate, adapt, respond, and leverage the changes presented by sea level rise in the San Francisco Bay estuary. This century sea levels are projected to rise 55", threatening our most productive economies, critical infrastructures, cultures, and coastal ecologies.

The sheer magnitude of the issue promises uncoordinated efforts among governments, agencies, and the private sector. Response is likely to be slow, late, and resource intensive. ESP is a coordinated large-scale force leveraging all available resources to offer efficiency, reduce disturbance, lower costs, and cope with known and unknown challenges that sea rise presents.

Financed by new markets for sediment materials management and transfer, ESP will facilitate a range of construction, infrastructure, and ecosystem management operations: construct coastal defenses, supply industries, raise land, create habitats, clean up contamination spills, manage invasive species, and provide waterfront civic spaces and programs.



FACTS

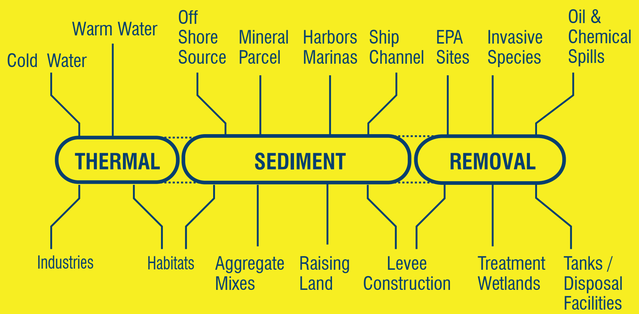
Every year **6 million cubic yards of sediment** is dredged from the San Francisco Bay—enough to fill the TransAmerica Building 27 times.

Hydraulic gold mining before the turn of the century deposited **8 times the volume of sand, rock, and gravel than was excavated from the Panama Canal** into the delta.

There have been more than **10 major oil spills** in the Bay since 1970. In 2008 Cosco Busan spill released 53,000 gallons of toxic bunker fuel.

There are over **70 sites** regulated by the Environmental Protection Agency at the Bay edge.

There are potentially **over 100,000 acres that could be restored** to tidal marsh, but costs, lack of sediments, and high salinity prevent progress.



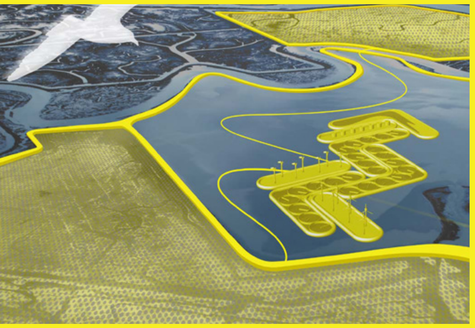
Four primary functions are employed to construct coastal defenses, supply industries, raise land, create habitats, clean up contamination spills, manage invasive species, and provide waterfront civic spaces and programs.

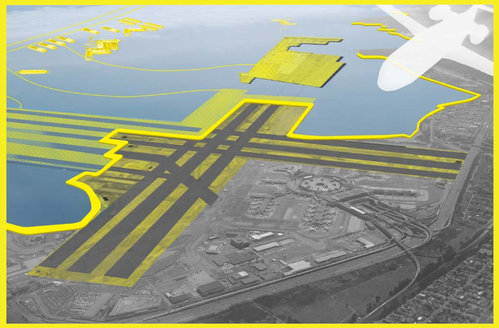
1st FUNCTION: SEDIMENT
Every year 400 million cubic yards of sediment is dredged from US Ports—enough to fill a four lane highway 20 feet deep from New York to Los Angeles. An ESP is designed to conduct sediments and other landscape materials from places where they are burdens (shipping lanes and ports) to places where they are needed for coastal defense, land elevation, and habitat creation. Any soft, loose, or liquid material can be conveyed including water, sediment, plant materials, and contaminated soils.

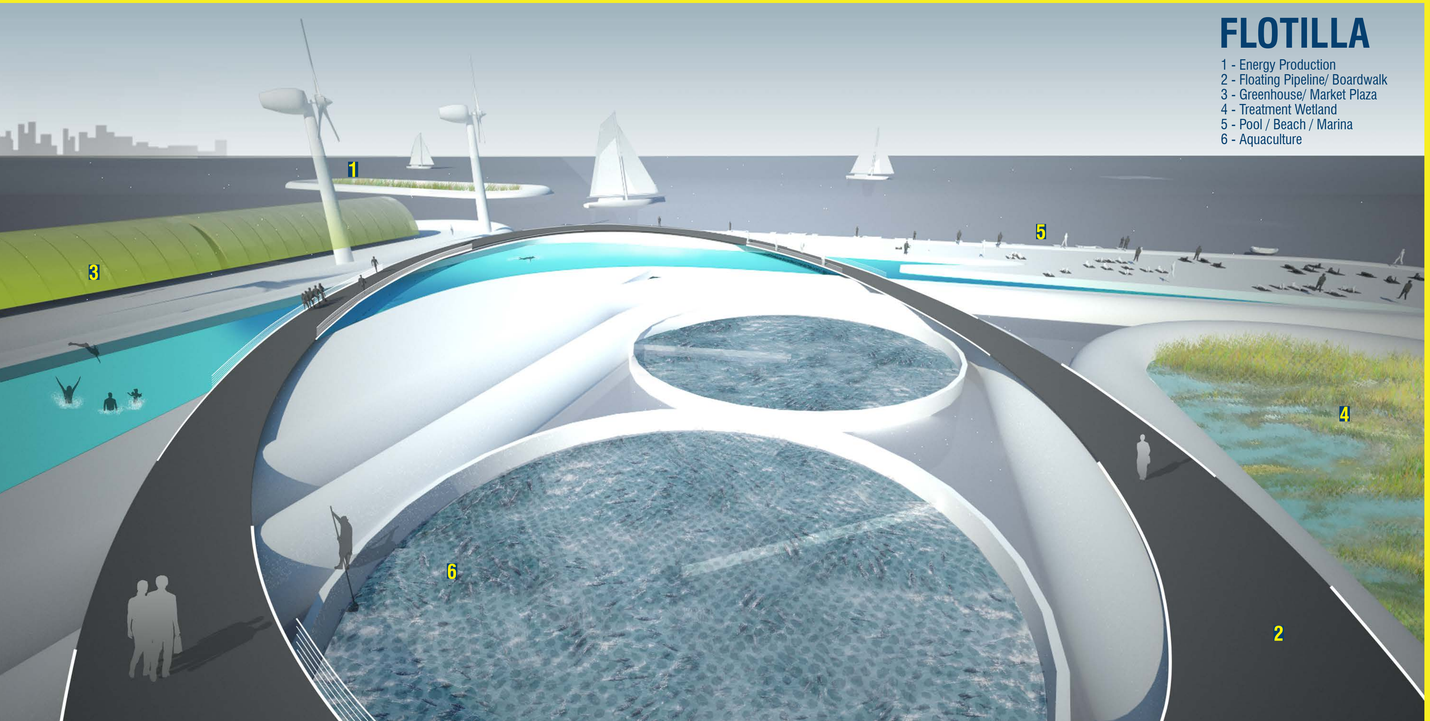
2nd FUNCTION: THERMAL
To cope with climate change influences, thermal exchange loops mediate water temperatures. Shallow areas support industrial ecologies including algal biofuels, aquaculture, remediation wetlands, and waste water treatment. Thermal loops supply the needs of these industries by exchanging warm water in shallow areas with cool water from deep trenches.

3rd FUNCTION: REMOVAL
An ESP and its utilities can maintain invasive species populations and others as they migrate into estuaries over time. In disaster times when large-scale quick response is needed, an ESP would function as a conduit for evacuating spills and moving contaminants to holding tanks and settling ponds.

4th FUNCTION: SUPPORT/PROXY
Support operations and other programs are stationed on a fleet of pontoons that serve as new programmatic realms during the adaptive replacement of waterfronts over the next 100+ years. Forms are intentionally simple to allow for periodic relocation, maximum stability, and modular configurations in flotillas. Along with support operations, pontoons host civic-scale programs and income-producing uses that are difficult to locate in urban areas such as marinas and food production. Pontoons provide a substitute for waterfront programs displaced by coastal projects of long construction periods.







FLOTILLA

1 - Energy Production
2 - Floating Pipeline/ Boardwalk
3 - Greenhouse/ Market Plaza
4 - Treatment Wetland
5 - Pool / Beach / Marina
6 - Aquaculture