

Living and Sustainable Egyptian Shorelines A tool to mitigate natural hazards and sea-level rise

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Biography:

Rasha Sayed holds a Ph.D. Degree in environmental architecture design and urban planning, from Cairo University. Rasha obtained her undergraduate degree from Cairo University faculty of engineering and architecture department in 2004. She obtained her master's degree from Scuola Superiore di Catania, Italy in Landscape Design, and Environmental Planning (MSc) in 2009. She finished the program of Professional Trainer Board Member, from Missouri State in 2018. Rasha has been in international private practice as a licensed professional architecture consultant for several years. She has been a visiting scholar at MIT Massachusetts Institute of Technology, architecture school, urban planning department DUSP, in MIT-UTM sustainable cities program. Currently, Rasha works as a lecturer in Cairo university and MSA University. She is also the CEO in RM Design architectural firm.

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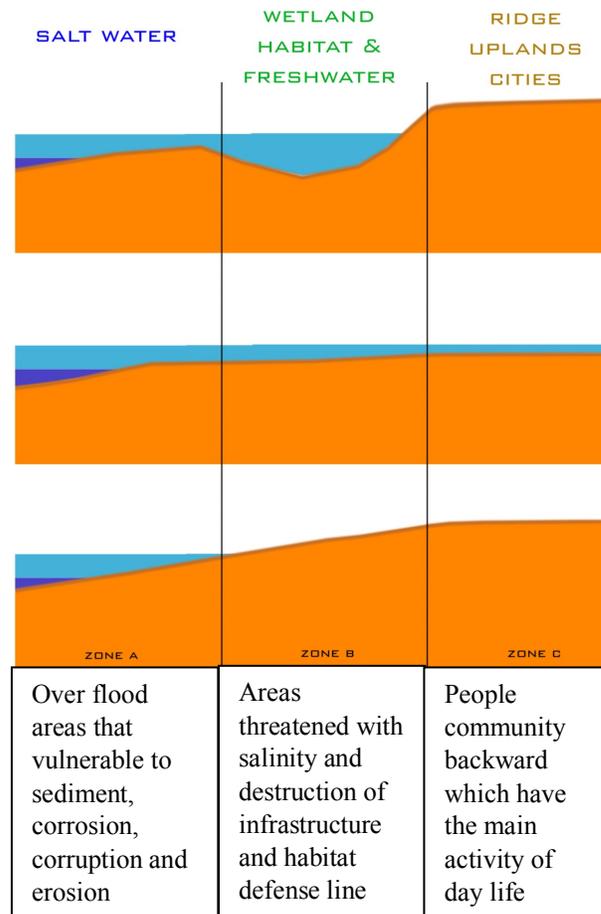
Over the last decades, the world has been facing a group of challenges and crisis. Problems like droughts, gradual loss of natural resources, land deformation and sea level rise, are pushing and stressing strongly on lands on the urban scale. In Egypt, as one of the most vulnerable countries to climate change impact, the Nile Delta soon will be threatened by the SEA LEVEL RISE Phenomenon.

Egypt, with its flat delta and its different red sea and Mediterranean shorelines in different climatic zones, reshape and reorient together the effect of global warming. Impacts and vulnerabilities on Egyptian landscape, especially shorelines, would cause severe changes on all social, economic, urban and environmental levels. Food resources, agriculture, land use, climatic conditions and economy would have dangerous and destructive effects. As urban planners and designers, we should be able to translate and introduce different solutions and mitigation plans and give other alternatives rather than immigration.



Potential direct impact of the Nile Delta to SLR, each 0.5 raise in Mediterranean (United Nations Development Program & Government of Egypt, 2009)

Division of zones on coastal shorelines enable urban planners to understand each factor threaten the flora and fauna in terms of urban planning and landscape architecture design principles. The most important aspects of this definition are dynamic, function, habitat, and processes. **Salt water (zone A)** That areas with excessive water, attached to offshore shelf and over flood areas that vulnerable to sediment, corrosion, corruption and erosion. This dynamic zone, in, which implies variable and changing. **Wetland habitat & freshwater (zone B)** In which areas threatened with salinity and destruction of infrastructure and habitat. Wetland here could present as the defense line. **Ridge, uplands, and cities (zone c)** Ridge and uplands are the most highly secured parts of cities, which have backward people community. In which have the main activity of day life, and most of the investments.



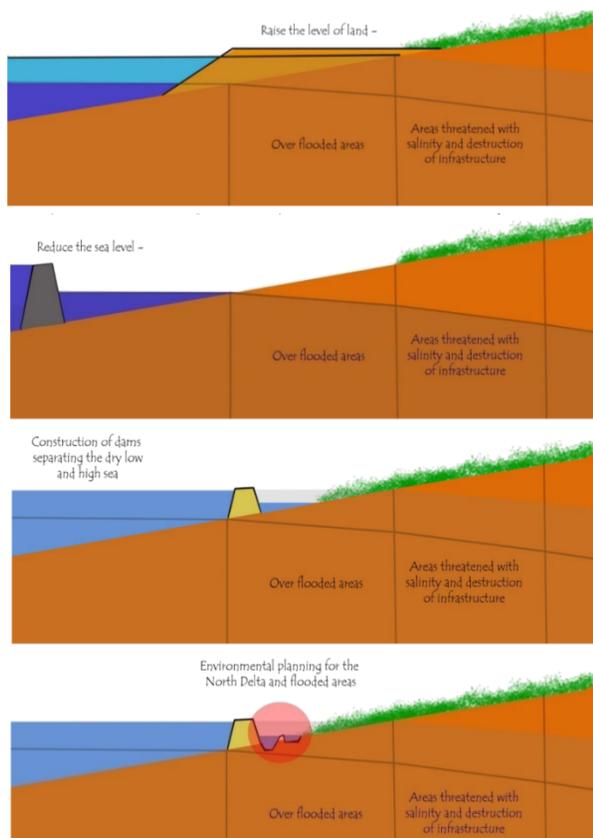
Different Division of zones on coastal shorelines.

City is a complex system that has many inner relations; therefore, the systematic design of spatial structure is the basic step for spatial sustainability. Creating rational relation between social, economic, and physical activities would lead to spatial sustainability. All these human activities are in the form of the strategic systematic elements, including urban zones, corridors, and nodes in urban spatial organization. It is important to consider these main elements to create sustainable composition of urban cities

- Zones (like residential, commercial and green spaces)
- Urban corridors (like transportation systems)
- Urban nodes (like city and neighborhood centers)

In Egypt, architecture on coastal lines has different categories, but more than 70% of these shorelines go to the touristic functions for the use of Mediterranean and red sea water. For delta shorelines, which close to seawater, most of them also have, the same functions but others could be used frequently as fishing national water. Therefore, in these areas the housing units are too near by the fishing boats, as these housing units have the same degree of danger that could damage complete villages.

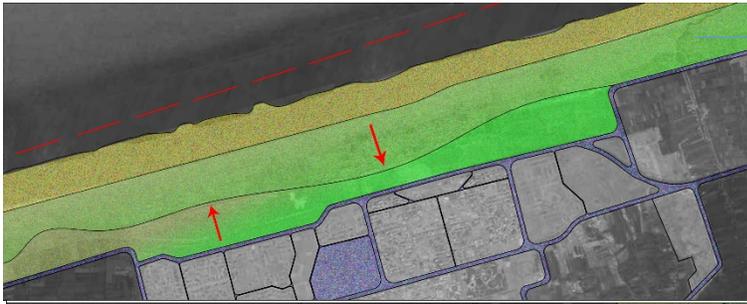
The density of land uses in the coastal urban corridors has an important role in sustainable development of these areas as for to mitigate with the impact of global changes. The main traffic corridors are responsible for main elements of linear urban spatial structures. On the other hand, in coastal cities, the main streets are the keys to clean the air by the suitable direction that causes the flow of coastal winds. Traffic and linear corridors are not just the indicators of sustainable urban design; there are other factors that affect directly and indirectly the ecological system. Then increase or decrease from global warming and climate change.



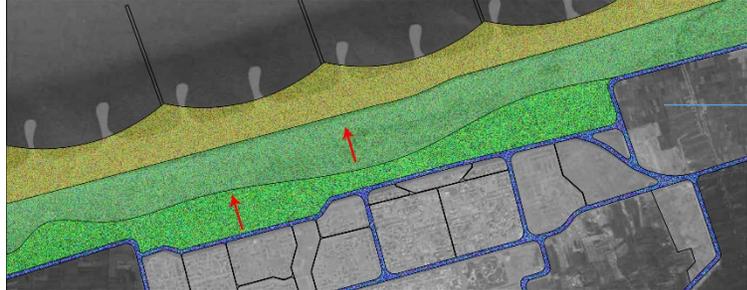
To create communities that could adapt or mitigate with the change, and at the same time to create sustainable development that could be the core for the investments to integrate socio-economic improvements on Egyptian northern coast, a frame work should be applied in order to create a strategic future development plan. First phase of the framework is the compilation and analysis of shorelines data and information in addition to natural processes and elements, the second phase is to assess exposure to risk management vulnerability assessment, the third phase is to design sustainable development plan based on the projected scenarios of Sea Level Rise. Finally, is discussing with public and national inhabitants together with all involved sectors the overall strategy of the solutions and technologies development mitigation and adaptation for the study area coast. Techniques of landscape architecture inventions could be applied in order to integrate current opportunities and future strategic plans for a sustainable development. Such techniques must be applied for the three zones of shoreline (Saltwater & wetland habitat freshwater & ridge Upland).

Sections that show the conceptual application for the different strategies of coastal shore lines.

These techniques will be applied using three main approaches, first, Raise the level of off shorelines lands using (Backfill using soil from same land or other lands -Riparian vegetation management - Stock control – re-vegetation – weed control - Tidal marsh enhancement - Tidal marsh creation - Sand dunes creation and beach nourishment). Second, Reduction of the sea level and wave strikes (Static reduction of specific part of sea - Control levels of natural lakes or natural water drainage – synthesis of artificial lakes - closed sea level control - Reduce the level of waves by building wave breakwaters (Vertical – horizontal – cumulus)). Third, Separate the integration line between the raise water and low dry (Bank grading Fiber logs - Marsh (toe revetment – sill – with groins) Off shore break water systems and spurs - Riprap revetment - Bulk heads - Positional dames - Sea dikes - Cumulus dames - Solid dames). At the end, redesigning the city gradually as vertical growth city, with public participation will give the opportunity to transform the impact for opportunity of investments and development.



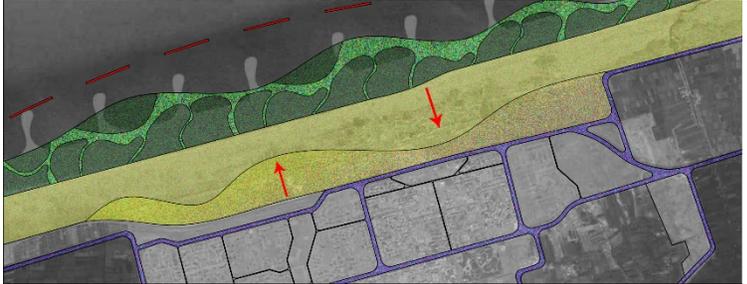
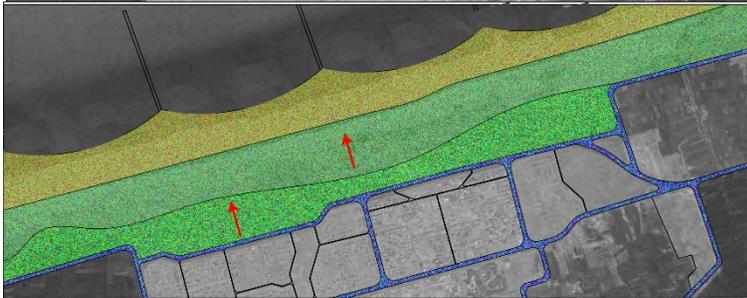
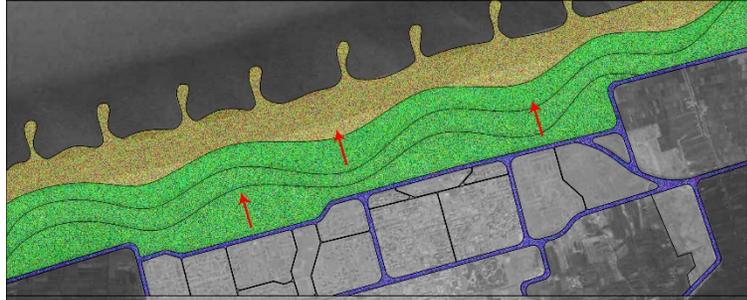
Different shapes of first line design as green sand dunes that enable the creation of new opportunities of investments as recreational parks or any other similar ideas



Network of complete channels that work as excessive water drainage for backwards lake or irrigation system for agricultural lands



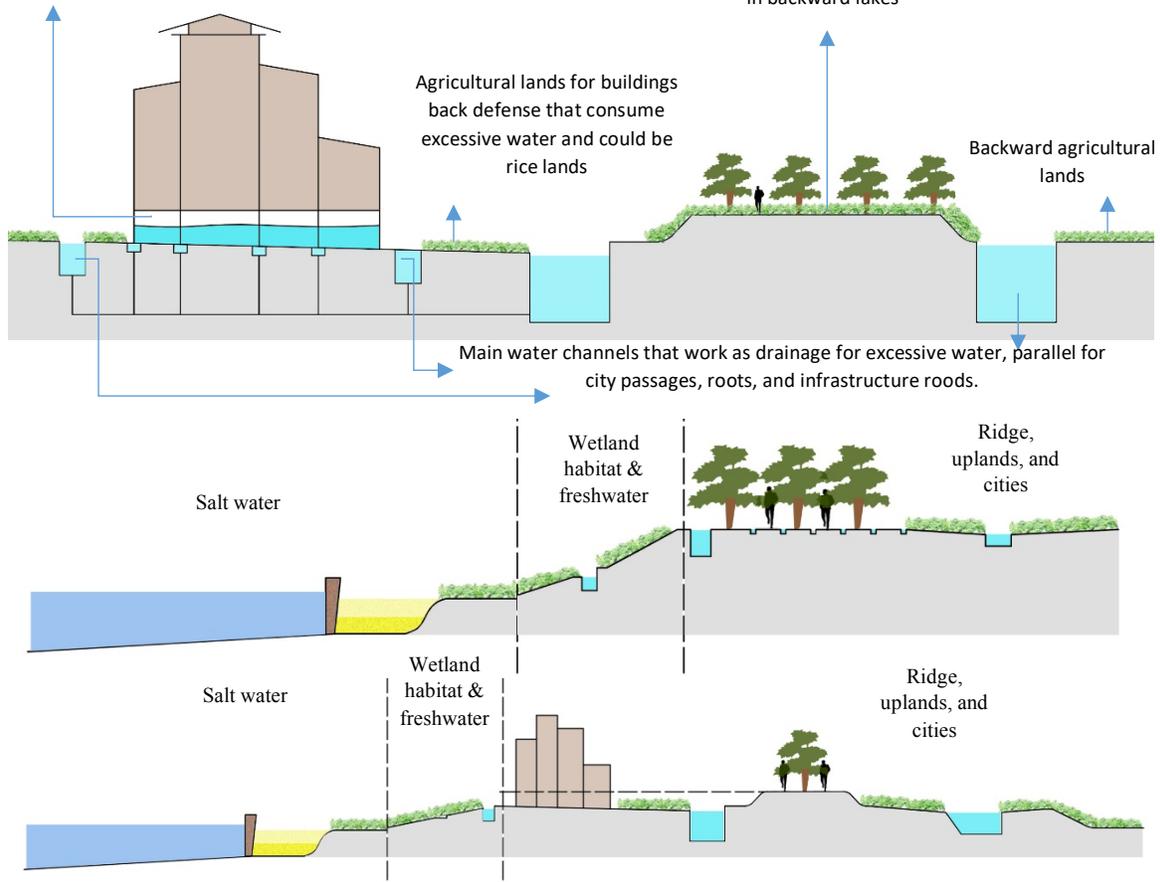
Different shapes of wave breakers that allow different zones creation for more investments or public sharing projects



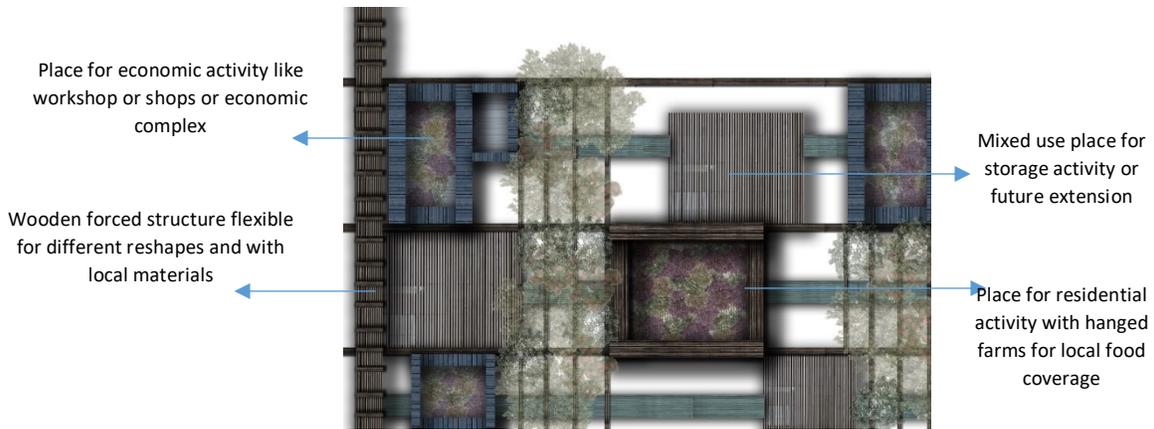
Case study of Damietta City, New Damietta section, one of the northern Delta Egypt cities that are vulnerable to Sea Level Rise impact. Maps show different techniques for redesign the shore line using different shapes of green sand dunes on three different zones (salt water, wetland habitat and freshwater, ridge upland cities) which will encourage and offer new opportunities for investments and people integration in sustainable development.

Ground floor of first floor in case of flood could be transformed into aquaculture or could be raised one floor with submerged it, .etc.

In case of raised water inside the ridge uplands settlements, these green dikes work as a dike with sided water channels to protect the lands behind, at the same time work as drainage channels for increased water and recycle this water in backward lakes



Case study of Damietta City, New Damietta section, one of the northern Delta Egypt cities that are vulnerable to Sea Level Rise impact. Sections show different techniques for redesign the shore line using different shapes of green sand dunes on three different zones (salt water, wetland habitat and freshwater, ridge upland cities) integrated with different shapes of lakes and water channels as drainage systems, with deformation in ground and first floor in the city as different functions that mitigate with excessive water, which will encourage and offer new opportunities for investments and people integration in sustainable development.



Conceptual layout for one cell of the redesign shapes for residential-socioeconomic space of urban settlement



Elevation show the conceptual studies for allocated urban settlement in case of drought with new light structure that gather residential and economic factors in one place and its permit for growing vertical in case of excessive water and floods. Landscape architecture could gather vertical gardens with other functions to make the city vertical growth for future strategic plans.

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