PROJECT

# PEMEX Urban Park: Water as a Vision for the Future

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This study aims to raise a discourse on the unfolding future of a PEMEX vacant oil refinery and a natural lagoon located in the city of Reynosa, Tamaulipas. Reynosa is part of a larger geographical border defined by Mexico and the United States. The Rio Grande River is the geo-political border between both nations, and it's the primary source of water in the region. Its landscape is composed of several bodies of water featuring the Rio Grande, human-made canals, and a natural lagoon. Reynosa's water landscapes are interconnected as water flows from the canals to the lagoon into the Rio Grande to the Gulf of Mexico.

PEMEX is a nationalized Mexican Petroleum company founded in 1938. The 65-hectare PEMEX oil refinery in Reynosa was inaugurated in 1955 and had the capacity of 10,000 oil barrels. It produced hydrocarbons for 67 years until its shutdown in 2004.[1] Before the establishment of the oil refinery, military barracks occupied this site, originally farmlands – the ejidos of the villa de Reynosa.[2] The presence of the oil refinery generated a new economy and a modern city around it. In 2017, the 65-hectares vacant oil refinery site was donated by PEMEX to the state of Tamaulipas and became public property.[3] However, dystopic conditions were developed in the presence of the oil refinery to the surrounding neighborhoods, with high levels of air, water pollution, and lack of walkable and public spaces. Air pollutants, such as Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, etc.[4] generated by PEMEX, were flowing across polluting both sides of the border. Although dystopic conditions generated residential neighborhoods' development around PEMEX, paradoxically, the mixed-income character of such areas makes the oil refinery worth of transformation- through remediation and reclamation. A public park - Pemex Urban Park – would be a catalyst to evolve into new social forms towards a civic society. The park could play the role of 'social condenser,'[5] equitable for all users. A

Figure 1. Tank Playground . Image credit. Jose Antonio Herrera and Genesis Eng .

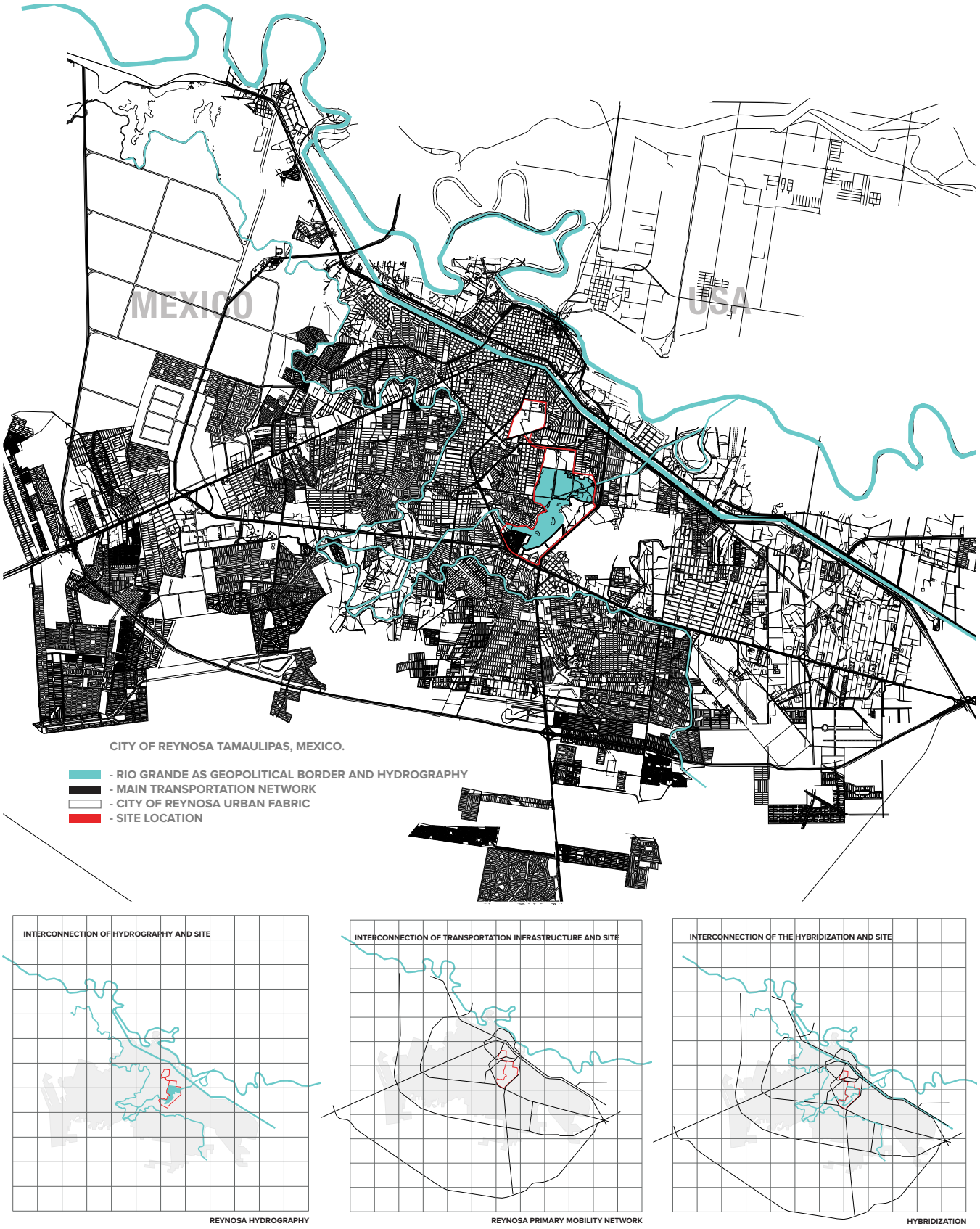


Figure 2. Site Location, context, and landscape. Image credit. Jose Antonio Herrera and Genesis Eng.


Figure 3. Existing Conditions. Image credit. Parque Refineria Reynosa Tamp.

new urban-ecological paradigm will emerge from the desire to revive, re-use, and reintegrate nature into the industrial site to support an evolving civic society. Adjacent to PEMEX, the natural lagoon, Laguna "La Escondida" a 152-hectare body of water, contaminated by toxic metals and chemicals produced by the refinery and the uncontrolled rapid growth of the city. The lagoon, however, is a strategic resource for many local floras and migrating species of fauna. The radical nature of the new urban- ecological paradigm shall include the lagoon's water. Not only ameliorating contaminated land and transforming it to serve the public. But also, bioremediating the water to return it to its role of life source. The population demographics of the residents of Reynosa are mainly classified as low-income socio-economic standing. The current population is 666,261, in which 231,903 of those residents are in poverty. The basic sectors are commerce and service, at 50.2% and manufacturing at 45.4% making up its economy. [6] Reynosa's economic structure is an industrial base, housing 14 industrial parks totaling 173 manufacturing facilities in the city.[7]

The strategies proposed for the new Pemex Urban Park are based on a conceptual framework: **HISTORY.** Elements of the industrial apparatus are retained, seeking to give voice to the site's history, framing them as ruins and place-maker. The industrialized physical context will be re-used and remain present while reinterpreting it into new social-ecological scenarios. **NATURE.** The use of botanical bio-remediation addresses the contaminated land of the oil refinery and the water of the lagoon. Phytoremediation and Rhizofiltration consist of a set of technologies, exploiting the ability of some plants to absorb, accumulate, metabolize, and volatilize contaminants.[8] Phytoremediation involves the use of plants to decontaminate soils, water, and – consequentially - air. Also, it stabilizes pollutants that are present in the soil, air, water, and sediments such as heavy metals, radioactive metals, organic compounds, and compounds derived from petroleum. Rhizofiltration is the process in which plants' roots absorbs the contaminants from the surrounding polluted waters.[9] **CULTURE.** The remediated landscape will turn -partially – into contemporary 'ejidos,' farmlands for urban community farming. The contemporary farmlands will function as a holistic ecological discourse, serving not only for food production. But also, for reconnecting young generations to the environmental and sustainable food chain and regional food cultural traditions.

History, Culture, and Nature are sub-systems and micro-mechanisms that work together as a hybrid infrastructure through an educational experience. The educational experience is interconnected and dependent on the new spatial organization of the site: The Urban strategy.

Figure 5. Oil Refinery and Lagoon existing conditions . Image credit. Jose Antonio Herrera and Genesis Eng.


Figure 6. Phytoremediation Processes. Image credit. Jose Antonio Herrera and Genesis Eng.

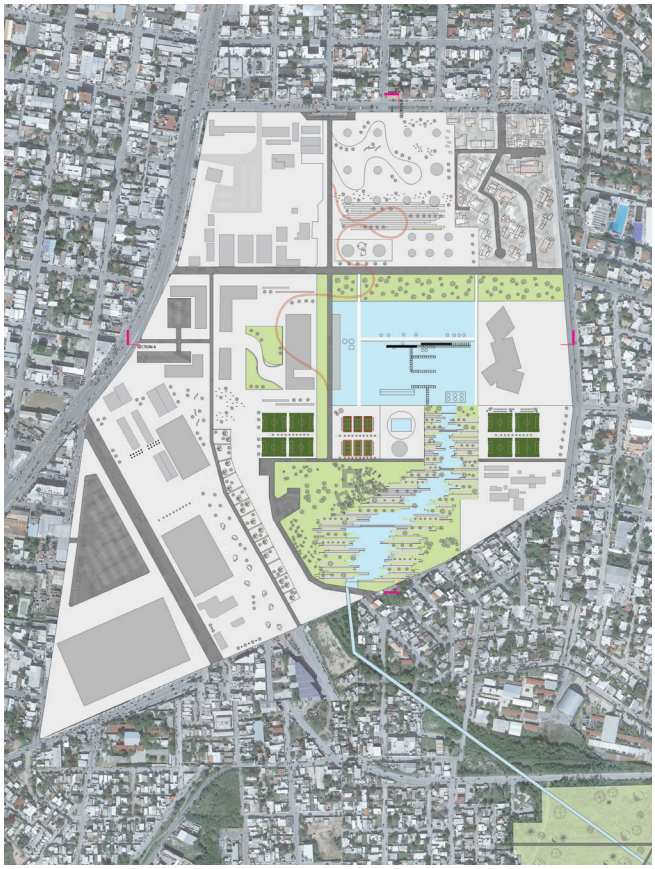

Figure 7.PEMEX Urban Park Master Plan (Oil refinery.) Image credit. Jose Antonio Herrera and Genesis Eng.

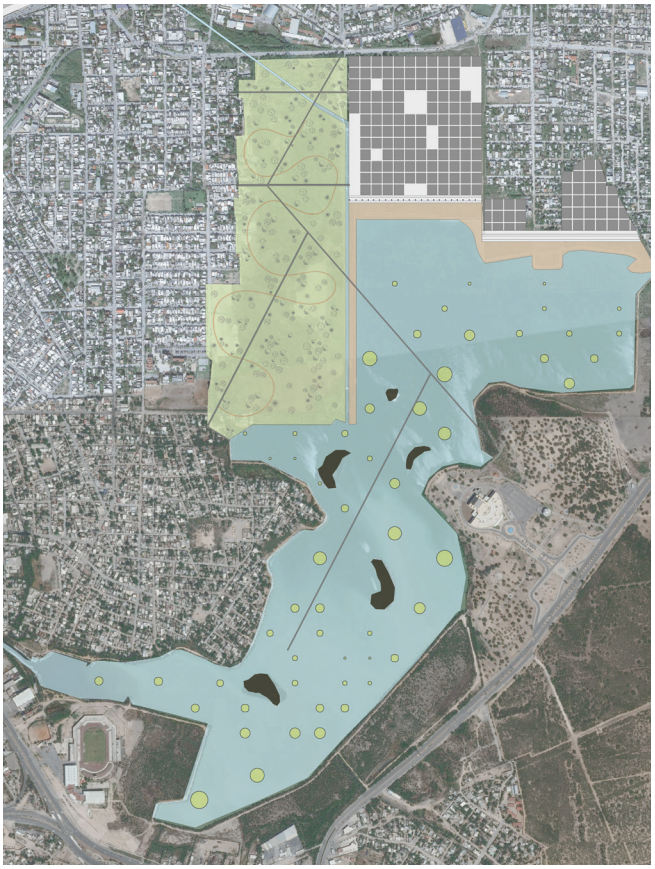

Figure 8. PEMEX Urban Park Master Plan (Lagoon.) Image credit. Jose Antonio Herrera and Genesis Eng.

## URBAN STRATEGY

The new spatial organization, based on the micro-mechanism of the 'strip sequence,' will shape the site of the oil refinery, with indeterminate programming in its vast area. It will provide a sequence of events to encourage the dynamic coexistence and collectivization of activities based on the new urban-ecological paradigm. The sequence of events will work as social catalysts for the new Pemex Urban Park as a "social condenser."[5]

## PAST AND FUTURE RESEARCH

Applying botanical bio-remediation strategies requires an extensive analysis of the site to identify the contaminants and their quantities. For further development, multidisciplinary collaboration is in progress to develop detailed steps for remediating the site utilizing the appropriate species for soil and water. Previous research has proven that using mesquite trees allows metabolizing heavy metals. In the mentioned study, the plants hyper accumulate 4,100 mg/kg of Aluminum (Al), 14,000 mg/kg of Iron (Fe), 1,600 mg/kg Titanium (Ti), and 2,500 mg/kg of Zinc (Zn) over two months.[10] This study can be utilized as a precedent to calculate a tentative timeline for the botanical bio-remediation applied in PEMEX Urban Park.

PEMEX Urban Park is envisioned through the development of a conceptual framework: History, Culture, and Nature and the applied urban strategy will be activated by the social and environmental grounding metabolism.[11] It consists of the physical configuration of human occupation "on the ground" to operate as a holistic system, channeling the activity of the social condenser and educational experience. The conceptual framework of Pemex Urban Park is based on the radical nature of the new urban- ecological paradigm. It will impulse the processing for the evolution of the civic society.

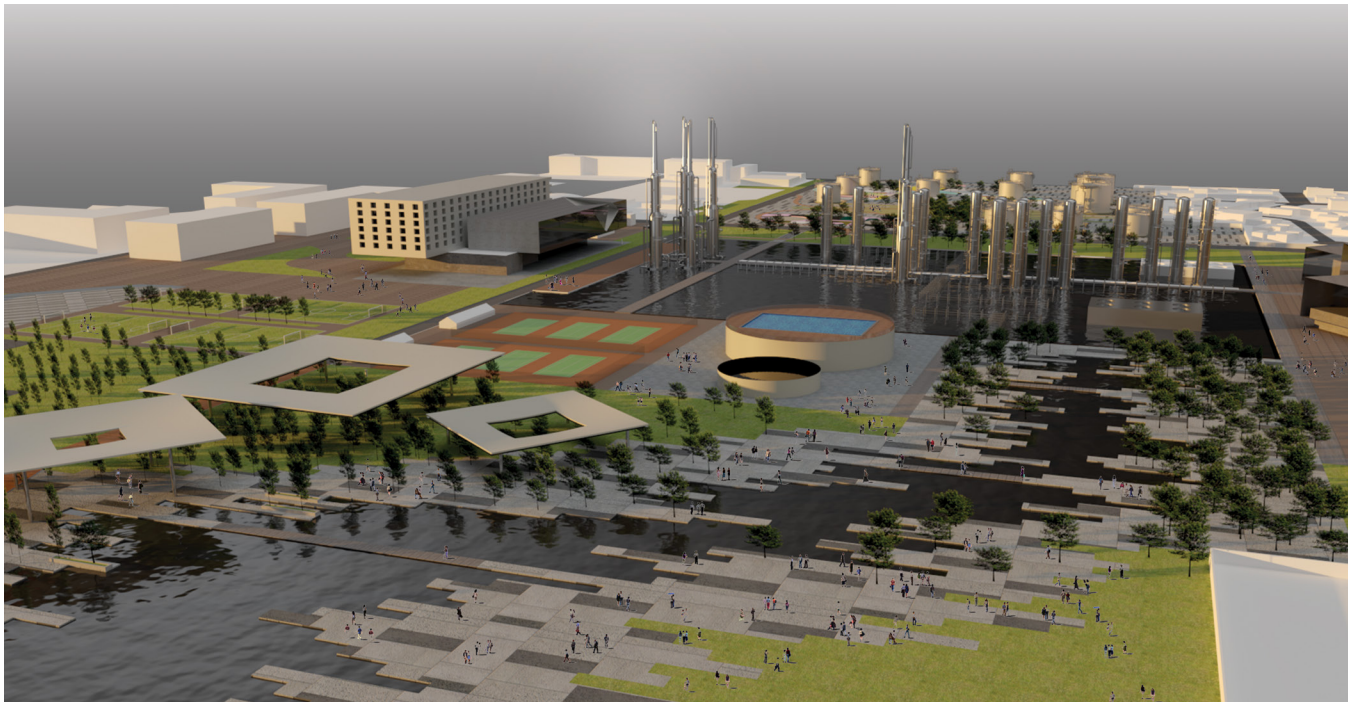

Figure 9. Aerial Vision of PEMEX Urban Park. Image credit. Jose Antonio Herrera and Genesis Eng.

Figure 10. In Between Existing Refinery Infrastructure. (Ojo de Agua) Image credit. Jose Antonio Herrera and Genesis Eng.

**ENDNOTES**


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