

ANTHROPIC IMPACT MITIGATION THROUGH DESIGN STRATEGIES: INTERDUNAL WETLANDS SYSTEM ASSOCIATED TO THE COAST CASE STUDIES

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ABSTRACT

The lack of knowledge of the complexity from the natural systems within the city generates an irregular urban development because the cities grow without a coherent planning; those issues develop problems like the ecological fragmentation, the social and cultural decomposition, because these problems are being analyzed as an isolated element, without noticing the relation between them.

Architecture needs to rethink the role it plays in the environment in order to find a way to equilibrate the natural stage with the artificial environment, making people a crucial player in this process. The main objective of this research is to develop architectural design strategies that promote understanding of the complexity of the interdunal lagoon system associated with the coast, as a starting point to mitigate the anthropic impact that the fragmentation press in this and other natural systems, so we can make a way to generate habitability and a community responsibility.

The main components of the Interdunal lagoon system are wetlands, these are surrounded by sand dunes, those are connected with the coastal zone, this system is involved with many biological cycles, and they are important to give natural services and resources to populations, humanity is one of them, to make life affordable in the Sotavento zone, in the state of Veracruz, México.

In the city of Veracruz, where the ecosystems have been pressing because of the anthropic impact, we propose the development of a case study in a place where the urban area is pressing an uncatalogued ecological patch, from the landscaping design perspective. In this case and other ones that are being developed, we propose design elements to establish strategies that will serve as a starting point to mitigate the damage that this absence of knowledge of our environment has made, offering alternatives that allow the development of infrastructure without risking the life of the ecosystems and the community.

Keywords: Ecological design, Wetlands, Public space, Habitability, Social inclusion.

1.- The natural environment situation

The metropolitan area of Veracruz contains a huge and different amount of natural environments with straight relationship between them. The interdunal wetland system, located in Veracruz City, is composed of lakes, lagoons and surrounded of continental dunes, linked directly with the Veracruz reef system, mangroves and lagoons located in the lagoon system of Alvarado, those has relationship with other natural systems along the State of Veracruz and the region. The most important component of these systems is the coastal wetlands [1], those have a strong relationship between the seas through the sand dunes, which transport nutrients from a place to another, the wetlands allow to develop natural life and provide environmental service to the urban community.

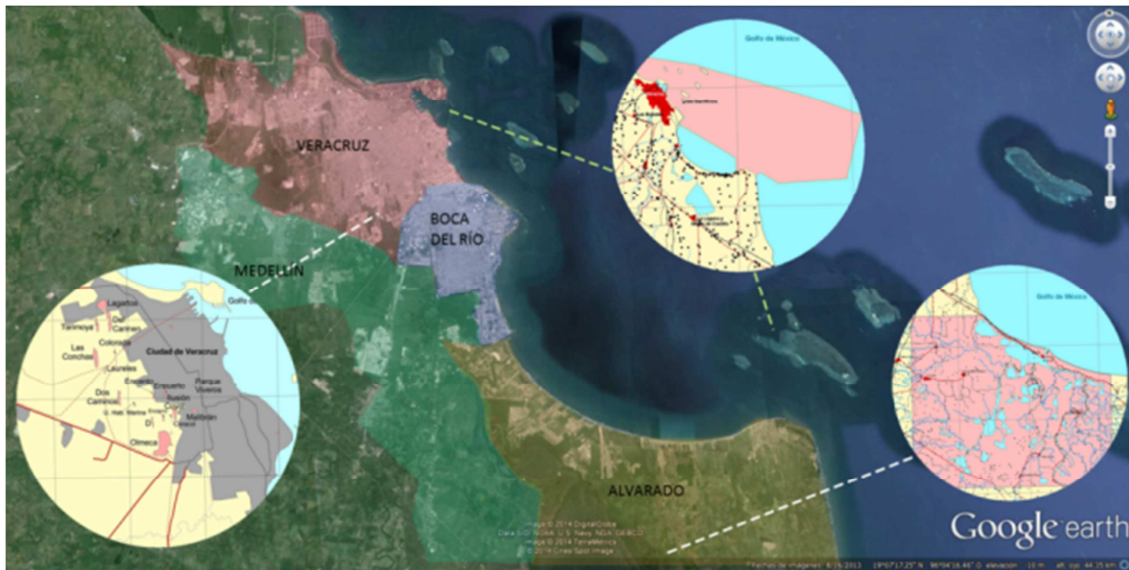


Fig. 1 "Location of the metropolitan area of Veracruz and the protected natural areas". Source: Own authorship.

Nevertheless, these places are under constant anthropic pressure because of the human settlements generated by the population growth, and because of the property speculation, in the best scenario it uses the wetlands as an commercial image to promote housing developments, in the worst one, these places are filled with to build on top of them; in the same way, wetlands are affected by the water extraction from the underground, lagoon and lakes dry out, soil erosion, driveways construction, bridges and pollution.

Is important to revalorize the relationship between the natural environment with architecture, the housing demand and the way to detect and handle today the impact to generate strategies to mitigate environmental impact and to generate habitability.

The unarticulated urban growth, the services demand and mostly the lack of awareness in the behavior of these natural systems, is being imposed a process of environmental fragmentation, it limits the water filtration and enters into a process of isolation of the natural places like the wetlands leaving unprotected urban and natural zones from climate change.

There is a crisis on different scales, the ecological, social and cultural scale, because of some issues which have increasingly limited the community activities; however, this is a crucial point to rethink our way to handle the crisis, generating alternatives where people can participate, of every sector, starting from elements as social inclusion and universal design.

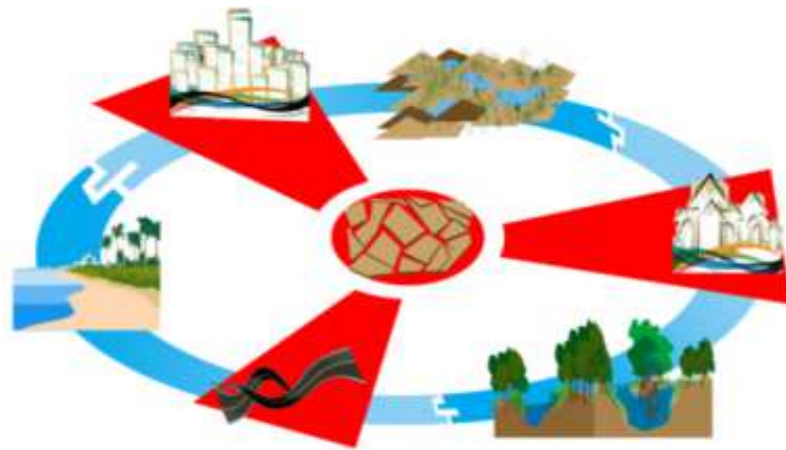


Fig. 2 “Ecosystem cycle fragmentation because of the anthropic impact”. Source: Own authorship.

It is urgent to change the mind of the actors who make decisions at the time to raise a point over the housing projects, the government and society, in order to understand all the context in which interventions will take place on ecosystems where the coastal wetlands exist, the roll of them and other natural places play on the urban and rural areas development, to be able to design architectural answers which integrate society to these natural places and to generate an resources exchange without risk; at the end, if this elements are taken to note, the benefits that the equilibrate environment are bigger and we can avoid contingency risk, saving money and, among everything, the ecosystem and the population integrity.

2.- Urban transformation

Is possible to chance the utilitarian vision in which the urban settlements are being established over the ecosystems and how we can generate urban and natural balance?

Lack of awareness of the complexity of the behavior of the ecological systems that find themselves into the city, specially the coastal wetlands, generate housing growth and urban infrastructure over the natural environment without a specific plan of integration which provokes ecological fragmentation, so that, if design strategies are established trying to understand the behavior of that complexity it can develop alternatives, integrating elements to recuperate, rehabilitate and conserve, in the vulnerable zones and it can gradually mitigate the anthropic impact that is pressuring the natural environment generating habitability and sense of belonging.

Usually, the fragmentation issues are being analyzed as an isolated problem, not just the environmental problems as wetland pollutions, economic and cultural situations as poverty, lack of basic services and low quality housing developments and the risk of the climate change. This fragmentation process is given when the ecosystems are divided or isolated within its components, because of field deforestation to make crops, urban zones, residential and commercial places, driveways infrastructure or water vegetation from rivers and lagoons is eliminated because of community or urban projects [2].

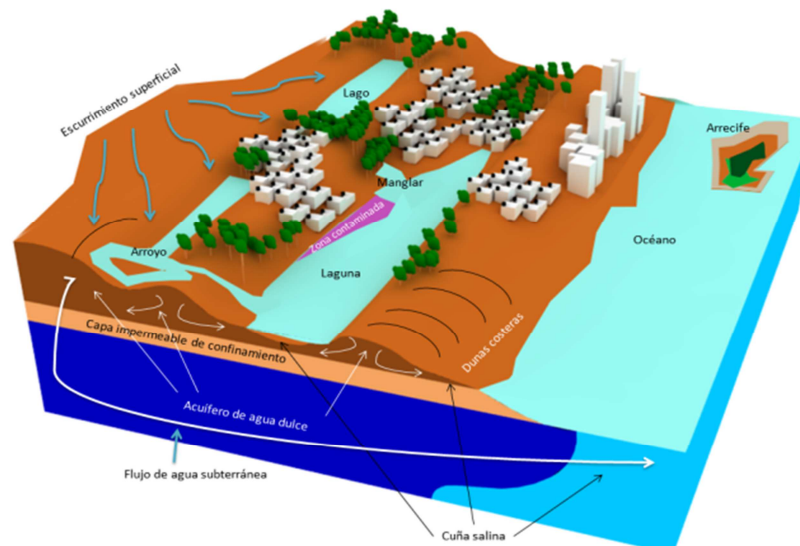


Fig. 3 “Coastal wetlands development and the relationship between the coast and the city”. Source: Own authorship.

The main objective from this research is to develop design strategies that promotes the understanding of the natural processes and cycles of coastal wetlands, just as their complexity, as an starting point to gradually mitigate the anthropic impact in the process of fragmentation that is being imposed over these and other systems that lies within the ecosystem; this understanding want to change the way to analyze the problems and try to resolve this in a more integrative way.

We should develop architectural schemes of design that allow us to:

- Describe the architectonical elements which integrate the anthropic activities without damaging de natural environment.
- Propose solutions according to the different potential areas to the architectonical, cultural, social and ecological development.

One of the factors that generate the urban and natural unbalance relationship is the urban transformation and the lack of identity in order to define the city. We can consider the city as an entity made of public space and community, that is influenced by the economic process and the planning whose basis is established by the capital accumulation product from an intense demand and speculation form the urban development [3], instead of the balance habitat development, privatizing, making limitations and isolating the community so the activities and liberties of the people and the way of life are being reduce just to be centered on specific issues as insecurity, working times, commerce, commercial image and consumerism [4].

Public space loses its capacity to connect architecture with the urbanity, the diversity of the activities of the community are being limited according to consumption strategies to specific groups of people, leaving the others behind, the public of the public is lost and so that public space become restricted space wih surveillance and security mechanisms [5].

3.- Design tools

The universal design and the social inclusion are mechanisms that allow people to interact with places, these are indicators that distinguish habitable cities from places that function according to what the market and capital establishes [6]. This is about including the general population, to design to everyone, all sectors of society not caring of the physical, economic or social condition, making people participate in the city's life will improve the quality of the settlements, instead of just making them a

distant witness of the decisions third parties made to their lives, is about of breaking the walls of community discrimination; in that way, is about retake the natural environment as the main axis of the city development, not just as a commercial scenario or an showcase, is to become an important component in order to generate cohesion between the urban and architectonic development with the nature.

Veracruz city, has suffered constant changes from its origin, from the wall urbanization, to the port and industrial city, in order to become the conurbated city and to develop the metropolitan area of Veracruz, industry and tourist commerce are the main economic activities and occupy a huge quantity of coastal soil that belongs to the ecological system; while the interdunal wetland system have lost many water fields and the lagoons are polluted or under pressure.

Because of the constant change of the city and the continuous urban growth to random places according to the housing demand and the speculation, the original cultural value from the city is disappearing, not just as an important industrial port city, it also is losing potential as a touristic spot, with cultural manifestations and its link with the interdunal wetland system which supply the city with environmental services.



Fig. 4 “Vergara Tarimoya lagoon, an example of an urban wetland into the Veracruz city”. Source: Notiver Newspaper.

Before the analysis to the specific site, we checked the site in a general level in a regional scale with geographic data through Landsat 8 pictures in the conurbated zone that compound the towns of Veracruz, Boca del Río, Medellín and Alvarado, these pictures were obtained from the U. S. Geographical Survey of the NASA, in order to understand the actual state of the site to develop interventions accordingly with the characteristics of the site, the methodology was proportionated form a special tele detection course where we were trained to the use and analysis of geographic information systems (GIS) with software like ArcGis and Global Mapper.

The landsat 8 pictures contains 2 sweeping instruments, spectral bands OLI (Operational Land Imager) whose has deep channels with visible blue color design to hydric resources and coastal zones researching and an infrared channel to detect cirrus clouds. On the other hand, it has an infrared thermic sensor called TIRS that carries wave lengths with 2 spectral bands. Landsat pictures are composed by 9 spectral bands with 30 meters of resolution to the bands 1 to 7 and 9. The 8 band resolution is panchromatic with 15 meters, where the size of the scene is from 170 km from north to south to 183 km from east to west [7].

We analyzed band combinations with ArcGis software to see which are the patch zones and the permeable and impermeable matrices, it can be helpful to understand the direction of the urban growth and because of what, to make possible to develop strategies that allow and structural urban growth with control.

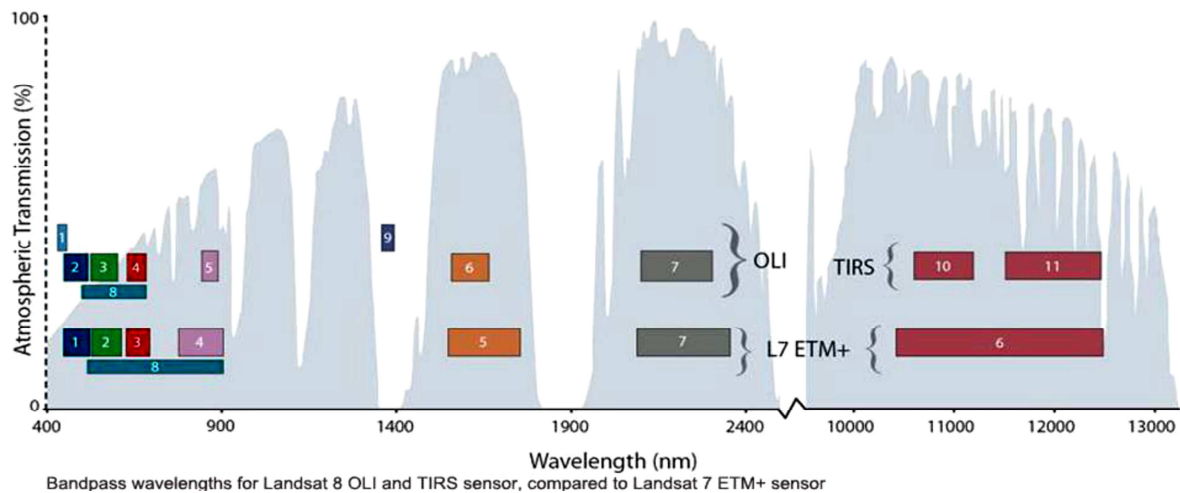


Fig. 5 “Sensors wideband OLI and TIRS on Landsat 8 and ETM+ on Landsat 7”.
Source: Ariza, 2013

According to the order of the bands on image 5, the vegetation (654), the real state of the site (321), heath vegetation (562), and mosaic structure (742) was analyzed. It concludes that the most pressured zone is distributed in 2 sections, one with high density over Veracruz and Medellin towns and another over Alvarado town, so that is important to consider actions to stablish development order into those areas.



Image 6 “Band combination, Conurbated zone of Veracruz analysis”. Source: Own authorship.

4.- Design proposals from case studies

To make a first approach in the making of design strategies, we proposed through an integration project connecting the landscaping design methodology with the ecological design principles, with site analysis, diagnosis, conceptual schemes and design proposals, in two case studies located in the metropolitan area of Veracruz where the constant issue is the high housing density and speculation which are affecting the natural places of the zone. Eco-tone was the main concept from the case studies; it can equilibrate the two environments, the natural and the human, making activities that promote ecological culture, social inclusion and complexity understanding of nature.

The first case study located in Veracruz city in the “Tembladeras” zone, closed to the Heriberto Jara Corona international airport, it is located where is stablish one of the oldest housing developments from the city, the “Geovillas”, the housing growth is restricted because of a driveway that connects the city of Veracruz and Xalapa and the airport zone, on the other part of the field there are uncatalogued flooded pastures that regulate the water rain from hurricanes and storms, on landsat pictures we observe that there is pressure over the zone from urban growth, with the risk of interventions over this place, risking the ecological patch.

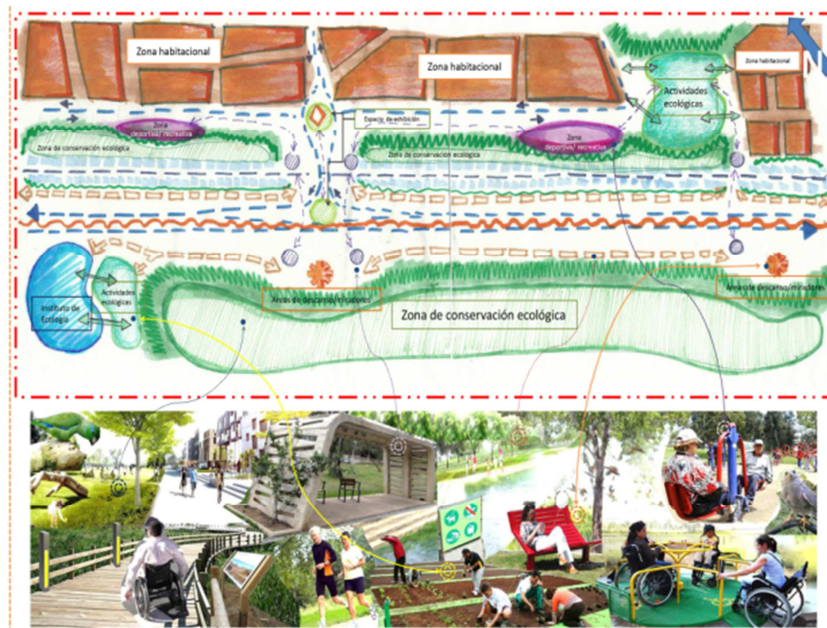


Image 7 “Case study concept proposal”. Source: Own authorship.

We are looking to integrate elements from universal design because of the importance of include the human and natural cycles, is important that the cities includes the community in all the modalities and capacities, not to be destined to standard adult people, it have to include children, teenagers, elder people and people with any motor, sensory, cultural, social disability [8]. To integrate this elements will allow to increase the percentage of citizen participation among the communities and will promote the sustainable development of the site, generating habitability and promoting this goals to other places.

These elements were generated in order to show that the integration and inclusion of human activities through design strategies on the natural sites can be benefic if those are created under the balance perspective, not just to destroy them.



Fig. 8 “Impact mitigation intervention through stages”. Source: Own authorship

Walking trails are proposed in order to make citizens witness of the remediation stages developing on the site to return to its natural values before housing growth. Today, housing developments are isolated but it can be helped with activities that connect the place with public space, diminishing the unsafe feeling from the site. The different design alternatives are looking to give options to the habitants so that it can include most of the community in the activities not caring their age or their physical and mental capacities.



Fig. 9 “Tembladeras zone project intervention plan in Veracruz city”. Source: Own authorship.

We want to include the community on the decisions of the projects from the beginning, from recreation and sports to parks and garden nurseries to promote ecological culture, it proposes the use of accessible urban furniture, this can work as a limit to protect the conservation zone that is actually without legal protection to stop urban growth pressure.

The next case study is located in the conurbation of Boca del Río and Alvarado towns, from metropolitan area of Veracruz, in this place is where the lagoon system of Alvarado and the Veracruz reef system exist, the case is over the Riviera Veracruzana zone, name that was given in order to allude an European Riviera, because of the residential developments over the zone, it is just an state driveway.

The project is looking to generate green corridors into the zone, specifically through the Punta Tiburón development, trying to permeate the site, because these housing settlements don't allow happening the natural cycles in which the air transport nutrients from dunes to wetlands, isolated them and generating fragmentation.

Originally, the fields from Riviera Veracruzana were rural soil, however, through a mediocre administration from government these fields were sold to private sector and it allowed to change the use of the soil from rural to urban without noticing the important of the natural ecosystem. The way of sell the fields is the same of the urban ones, the construction firms want money and profit so they urbanize all the field, filling lagoons with concrete and making impermeable a zone with natural value, not allowing to the environment to make the natural cycles, leaving with vulnerability the ecosystem to hurricanes and meteorological phenomena.

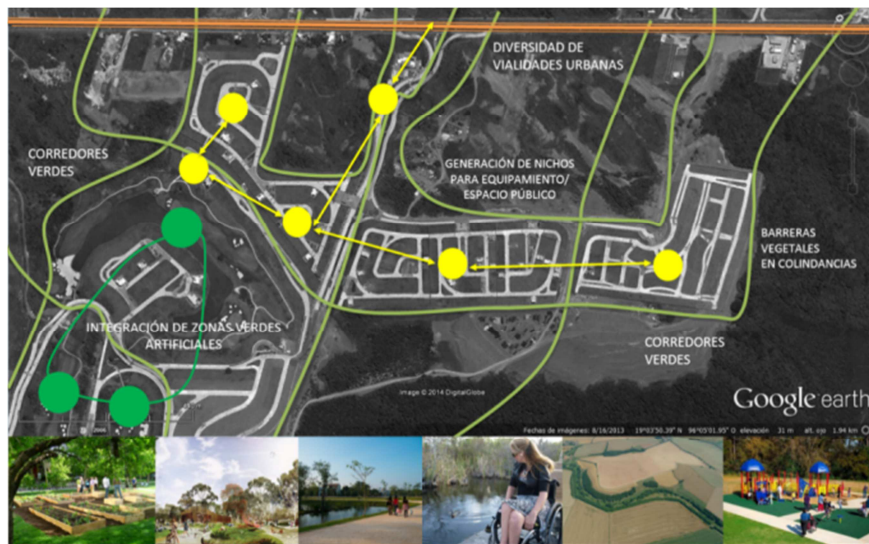


Fig. 10 “Case study concept proposal”. Source: Own authorship.

These housing projects are residential and social type, the only thing that separate them are security access, they lack of public space, reservation areas and green areas, urban infrastructure; they are built to the car way of life, not the walking people, but the streets are closed and limited by the security access, they are pushed to capacity the main roads with heavy traffic. The objective is to integrate green corridors in order to make permeable the area and the natural cycle from the lagoon and the reef systems can happen, if the community works with the government and the private sector these process can be remediated. The goal is to make these settlements to contain reservation fields according to the site not just as a bureaucratic requirement with straight relation with the green corridors.



Fig. 11 “Impact mitigation intervention through stages”. Source: Own authorship

Public space and urban equipment are urgent elements in the zone, the residential housing places are not used the whole year but the social ones are, so it is important to generate nodes and sites that allow the people to relate, to make them feel part of the place, not just with malls because the objective of public space is to generate spaces of cohabitation, not just malls as an axis.

In the matter of social inclusion, we have to diversify the mobility, not just of the car, it need to generate walking corridors, bike driveways, give accessibility to the zone, these settlements lack of sign information or elements that allow the include the people in the activities these places promotes, as the common day in order to move from a place to other without a car.



Fig. 12 “Riviera Veracruzana zone project intervention plan”. Source: Own authorship.

It is important to promote housing developments that respond to the site needs, generating habitability beyond profit and money as a main objective. Case studies make possible to show the way design strategies can improve the site and make better option to the actors which intervene on the process. It is about of show the profitability of generating habitable spaces without damaging the natural environment.

5.- Conclusions

The impact on the ecosystems due to the urban growth is constant and severe, however we can change the scenario if strategies from different disciplines are involved; from architecture perspective, its roll is important because it can measure the impact over the site before the construction. With this research we want to understand the complexity of the site and be able to develop strategies from the convergence of the methodology from ecological design and landscape architecture that allow us to intervene with respect and balance, trying to take benefit of the advantage the natural site is giving to us but from a naturalistic point of view, not to see ecosystems as a tool for humans, but to see it as an opportunity to integrate human life with natural life. The research project is under development, this stage is crucial to make a valuation of the objectives; incorporating different perspectives to improve the way we are handle the main subject.

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