Agriculture
in the Paraná Basin

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Contents

Research Plan
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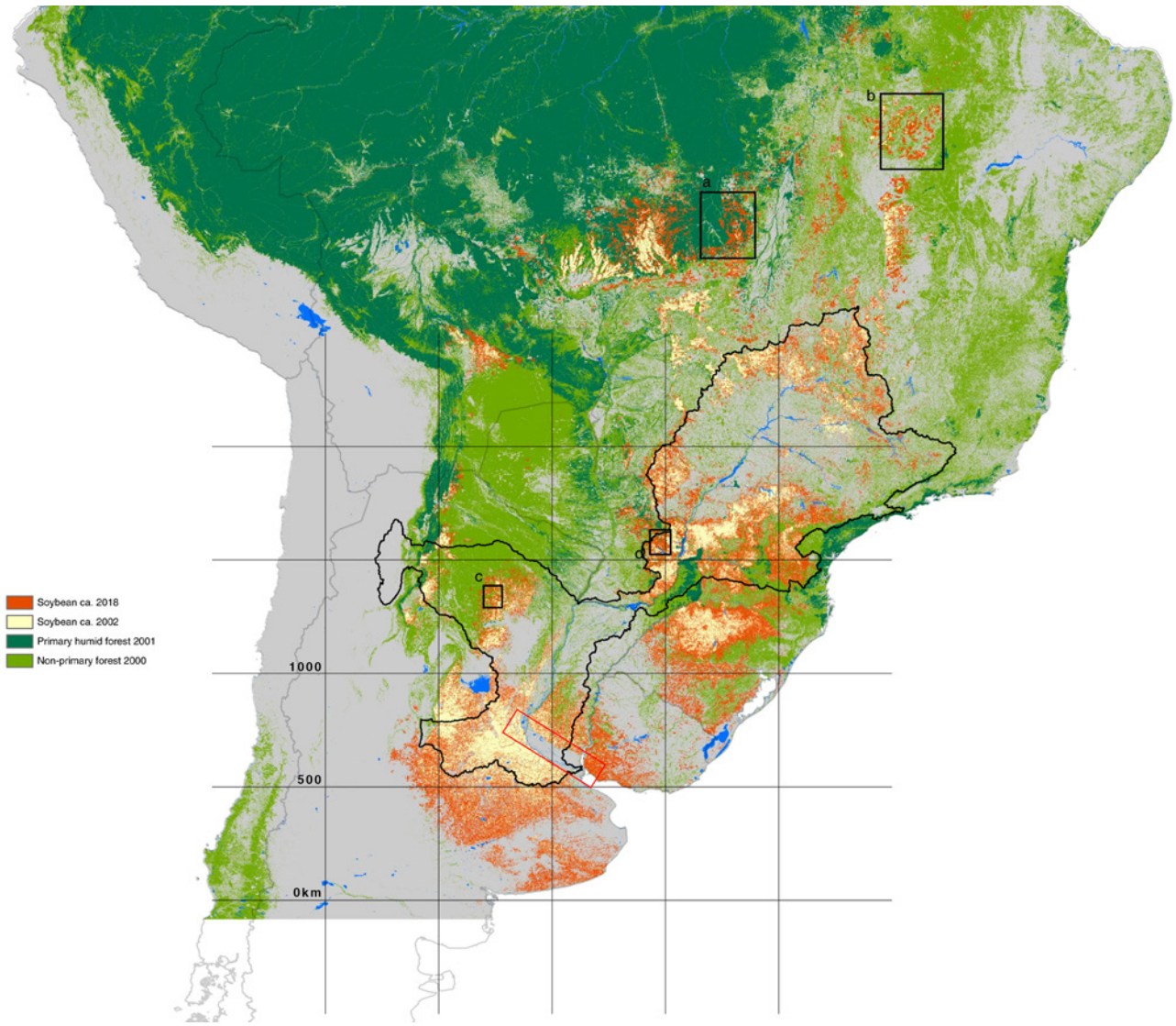


Figure 1

Soybean expansion in Brazil and Argentina between 2002 and 2018. Parana basin outlined in black, delta region in red rectangle. Song et al., 2021

#agroforestry #biodiversity #carbonsink #climatechangeadaptation #compost #interstitial space #localfoodsecurity #regeneration #resilience

This graduation plan and the forthcoming research will be in close contact with the Delta Futures Lab (DFL) project for the Parana delta, of which I am a research member. While related and within the same context, the research within this individual project is completely independent from that of the group work developed by the DFL. Appendix I is an excerpt from the most recent DFL report, which details the overall framework and vision more comprehensively.

Problem Statement

Agriculture in Argentina accounts for more than thirty percent of total greenhouse gas emissions in the country (OWID, 2020). In the Pampas, where most of the agricultural production occurs, land that is not built is almost exclusively soybean and maize monocultures (Figure 1)(Song et al., 2021). This has led to a huge decrease in biodiversity and soil health, increased water and air pollution, habitat loss, ecosystem degradation and runaway emissions (Chiummiento, 2022). Farther north, in the Gran Chaco forest, cattle ranches continue to expand at alarming rates, accelerating an area already threatened with deforestation (Aizen, 2021). Both the Gran Chaco and the Pampas lie within the hydrological basin of the Parana river, an area of approximately 1.5 million km2 that spans across Brazil, Paraguay, Uruguay and Argentina. Since 2020, the entire region has been experiencing severe drought, exacerbated by climate and land use change in southern Brazil and northern Argentina (Turcot, 2022). The drought has negatively impacted shipping throughout the region, which relies on the Parana river as the main thoroughfare to get agricultural products, among others, to markets abroad (Hiba, 2021). At the moment, it remains unclear if the drought will persist as a reality of the New Climatic Regime (Latour, 2017), or whether precipitation and water levels will eventually return to historical norms. Regardless of the river's flow, sea level rise will impact low-lying areas in Buenos Aires and as far north as San Pedro. While agriculture impacts the entire Parana basin, this report will focus on the Pampas region between Rosario and La Plata where over forty percent of the country's population lives. The urban-agricultural interface in this region (referred to occasionally as 'the continent') is a turbocharged anthropocentric landscape directly adjacent to the Parana delta, a 15,000km2 area of wetlands and floodplains, that is increasingly threatened by the unregulated expansionism on the continent.

At the same time, waste in Argentina accounts for more than five percent of total emissions. The majority of waste in the country, fifty percent of which is organic (NEA, 2021), accrues in its most populous areas,

namely Rosario and Buenos Aires. Approximately 96% of waste in Buenos Aires, an immense urban agglomeration of more than 22 million human inhabitants, is directed to the Norte III landfill. This means, on average, more than 7,000 tons of organic waste enters this landfill daily (ibid.). As a result, the landfill is responsible for more than half of the city's total methane emissions (Maasakkers et al., 2022), which are 25 times more potent than those of carbon dioxide. CEAMSE, the agency that manages the Norte III landfill, is attempting to capture these emissions and utilize them to generate energy for several thousand homes in the vicinity; however it is possible to capture at most no more than forty percent of these emissions (Gilbert, 2021). While the government understands that composting represents a mutually beneficial and pragmatic strategy for managing organic waste, few large scale programs exist. Furthermore, as the pollutive methods of the current agricultural system become more apparent, new modes of agricultural production are urgently necessary. Compost is an obvious source of vital nutrients for plant life, much of which is lacking in farms across the country. It can also replenish depleted soils and close the loop of this otherwise linear process.

Food production and waste management must be analyzed as two parts of the same system; it's all agriculture. With such an approach, we can identify areas of strategic intervention; however, reforming the current model will not be easy. The agriculture sector is dominated by multinational agribusiness corporations that rely on heavily subsidized petrochemicals and is thus subject to the typical inertia of such gargantuan, capital-intensive systems. It does not help that meat consumption in Argentina per capita is among the highest in the world (OECD, 2022) and remains entrenched within social and cultural values, complicating any transition to a more regenerative food system. Somehow, the transition must happen, and quickly: the IPCC, among others, continues to publish evidence that in order to prevent more than 1.5C of warming, emissions must peak by 2025, decrease by at least 43% by 2030 and reach net-zero globally by 2050 (IPCC, 2022).

Within the context of Argentina, like so many other places around the world, top-down government initiatives can be slow and ineffective. Furthermore the profit incentive of both the agriculture and waste management industries typically prevents collaboration between these otherwise siloed and segregated entities. Small-scale community-based interventions could represent an opportunity to implement sustainable land use practices that promote local food sovereignty, circumventing an otherwise incapable or unwilling government. By decentralizing the network and giving agency to urban inhabitants, more comprehensive change could accelerate. With little government input, new areas in the city can become the sites of community exchange. This is not to say a larger transition at the municipal or federal level cannot or will not happen. Indeed, the desire is that these institutions begin to implement such systems in earnest. While various paths are possible and remain undefined, it remains urgent to reduce our dependence on linear, centralized infrastructure developed within

Figure 2

Future flood projection in white dashed line (NASA, 2022) along the Riachuelo-Matanza river. The two warehouse distribution centers of the UTT are located within this zone.

twentieth century frameworks that are simply not sufficient in the Anthropocene.

Fortunately, there are already farming communities that work with sustainable practices through traditional agroforestry and non-tillage methods, and without the use of pesticides. Most prominently, the Union de Trabajadores de la Tierra (UTT) is a group of more than 22,000 family farms spread across twenty provinces in Argentina. The union operates its own distribution network that allows farmers unmitigated, direct access to the consumer, increasing their overall agency in the marketplace and offering a higher percentage of total wages earned. This in turn offers lower income communities access to affordable, sustainable and local food. At present, the UTT has two warehouse distribution centers in the Greater Buenos Aires metro region that also host markets for nearby residents. Located to the southeast of the city in the barrio Avellaneda, outside the administrative boundaries of the Capital Federal proper, the two buildings are within the future flood projection zone of the Riachuelo-Matanza river basin, a very dense and typically low income section of the city (Figure 2).

Flood mitigation in the region is complicated due to the region's urban and hydrological complexities, two systems which have remained largely irreconcilable to date. The hydrological (sub) basin has typically been ignored in the planning of past and present growth of urban areas in Argentina. This has resulted in streams that have been converted to canalized storm drains and paved over like the Maldonado that runs directly through the center of Buenos Aires, and some of the most polluted rivers in the country like the Riachuelo-Matanza and Reconquista-Lujan which frame the city on its northern and southern edge. Sprawl continues anyway, unabated, into low-lying flood-prone areas. As we progress further into the climate crisis, these waterways will function as important vectors along which either more deterioration or amelioration of the urban-ecological interface will occur. It is up to us which pathway prevails.

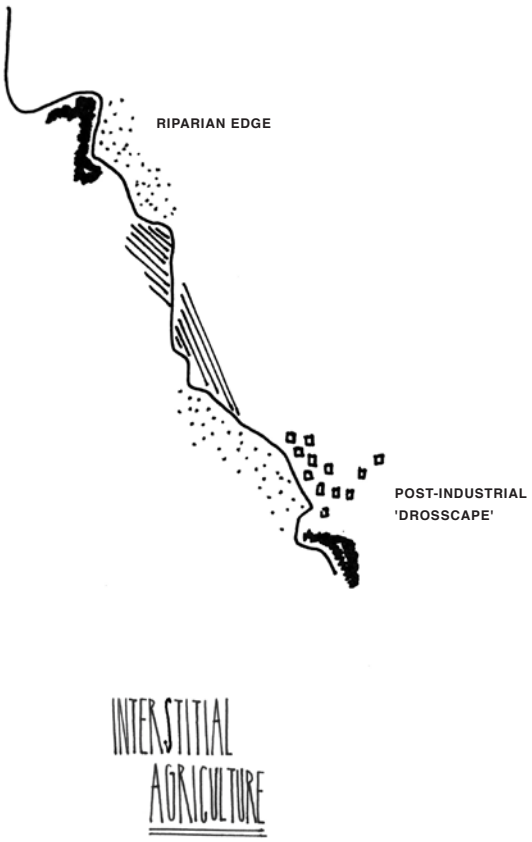
Objective

The existing network of farmers and markets of the UTT is an optimal case study onto which the methodology of this research can be applied. Farmers need soil and consumers need food. This represents a natural opportunity of exchange that does not currently exist at a meaningful scale in Argentina. Through a comprehensive decentralized network, local actions can have regional impact. Organic waste managed at the building, block or district level – depending on the density and needs of a locale – can be converted on site into compost. Such sites could also serve as new marketplaces for farmers of the UTT to sell their goods. Together, these curtail emissions and develop opportunities for new forms of public space and human ritual. The application of a waste-to-nutrient circular process can eventually catalyze a transformation of the entire agriculture and waste sectors across the country. These sites, or nodes, can go farther by hosting other forms of green infrastructure that enhance the region's resilience and adaptability to climate change through responding

to the hydrological, geomorphological and ecological conditions of the place. Systems that all too often have remained until now invisible to humans will be made visible.*

Design Intention

Nodes inhabit landscape patches that feature engineering and nature-based interventions from the DFL report and will likely be influenced by their presence depending on the specific site conditions of a locale. The existing warehouse distribution centers and markets will serve as the first two nodes of the network. Other sites will be identified across the region where strategic interventions can occur. A core principle of this research is the idea of 'interstitial space,' or all the odd, ugly fragments ubiquitous throughout urban centers today (see Appendix I for a detailed explanation). Nodes embed within interstitial space; they integrate into the existing context of a place, displace no one and work with the complexities of the site, using these to their advantage. If a structure is already there, it will be used. Likewise, materials from waste streams are incorporated as much as possible; where new materials are needed, locally grown bio-based materials, part of the regenera-



*The UTT can expand their mandate to increase the visibility and efficacy of the regenerative food model throughout Buenos Aires, which will increase demand for high quality, fair trade food, expand the network and accelerate the larger transition. While their current focus is on warehouses and adjoining markets as the interface between farmers and the public, expanded community facilities could extend their reach. Perhaps out of necessity, the UTT has located their centers within existing warehouses. This is to our benefit in terms of research purposes – eighty percent of buildings in 2050 already exist today, meaning the focus of much of the architectural field must be on adaptive reuse and retrofits of existing structures. Given the formidable building stock in Buenos Aires, new construction can be limited and possibly avoided altogether. It is likely this study will focus solely on adaptive reuse of existing structures.

tive agriculture scheme for the region, are applied.*

The network will expand as more nodes appear over time. Four main time horizons detail the steps and intervals of the development of the network, which corresponds to the IPCC guidelines to reach net zero emissions by 2050.

2023 UTT begins to adapt their existing building stock to become more adaptable, flexible and capable to accommodate change, both climatically and programmatically.
Increase points of sale for the UTT network. Some existing nodes become permanent sites for markets, etc. Compost towers are inserted into nodes. Locations to be identified.
UTT works with other organizations on combined facilities to include: arts programs and educational opportunities in local agriculture, sustainability, etc

2030 Argentine government has begun subsidizing key industries as part of the Agricultural Alternativa scheme: precision fermentation, lab grown meat, hydroponics, aquaponics, plant "factory", greenhouse, food forest, aquaculture, etc.
Interstitial farming throughout the hydrological sub basins along the Parana River between La Plata and Rosario are incorporated into the larger network. Some urban, some rural; multiple locations.
Rural locations serve as farmer outreach and engagement for adopting regenerative, climate adaptive farming techniques.
Full integration of compost towers across the region.
Biomaterials compose a larger percentage of the overall agricultural sector.

2040
Post cow: no more farm factories; meat is grown in labs.
Food forests and native prairie occupy most of the agricultural land across the Pampas.

2050
Post-carbon society. An integrated and comprehensive network of nodes and patches along the hydrological sub basins in the Pampas form the basis of a new regenerative urban metabolism.

*As the agricultural transition proceeds, new patch typologies will inhabit the landscape. These currently include the riparian edge, prairie strip and community garden. Each begins as a marginal patch, integrating itself where feasible and appropriate. The riparian edge can be used along urban and rural waterways as a phyto-remedial device, cleansing soils polluted by agriculture and industry. They filter chemicals from groundwater runoff before they enter streams and rivers, serving as a buffer zone between anthropocentric and anthro(de)centric patches. The prairie strip appears around the perimeter of monoculture crops like soybean and maize. These strips host native grasses and vegetation that support native fauna of the region. Community gardens are perhaps the most urban of the patches, which appear as micro parks (or forests) throughout the city. Parking lots, old railways and underpasses can be transformed into urban gardens to further support biodiversity. Once fragmented patches of poorly managed land, emerge as connected, resilient ecosystems.

Nodes can proliferate across the network within different interstitial spaces. Throughout Buenos Aires, a high concentration of empty lots where former buildings have been torn down remain unused. Some are quickly turned into the construction sites of new buildings, an unfortunate pattern common across the city, which contributes to the loss of embodied carbon of the former structure and promotes a tabula rasa approach to new development. Some lots, however have clearly been left vacant for years. In the photo above, tall grasses overtake a derelict concrete structure in the Recoleta neighborhood in the city center. In other lots, trees have taken root. All of these lots are boarded up, inaccessible to residents and passersby. This represents a lost opportunity for the city that could be sponsoring these spaces as temporary pop-up parks or even converting them into permanent open space for the public. Within these sites, nodes that include compost towers and other ammenities could transform an overlooked corner into a vibrant community garden, educational space or recreation area.

Thematic Research Focus

The research conducted between November 2022 and January 2023 will focus on the local management of organic waste by composting in Buenos Aires. Compost is often a land-intensive process; this research will investigate if such a process can be managed vertically in order to function within dense urban areas. Flow analysis of materials entering into the system will inform how the vertical management of food waste improves the city's relationship with agriculture and ecology more broadly. As a metaphor, the compost tower encompasses many of the woes of urbanization, distilled into its most essential architectural component(s): waste management, food production, soil quality, biodiversity, and how to integrate all of these into built environments that typically are inhospitable to other-than-human life forms.

As a literal entity and system of interrelated processes, the tower will allow for a systems analysis of the agricultural sector of Argentina where linear product-to-waste models can transform into closed-loop, circular systems where food waste becomes nutrients (or resources) for more food (or more resources). The end of one cycle is the beginning of another.

Observation:
What is happening in a standard home and commercial composting system?
Stacking exercise or is it a new process?
Mix processes to optimize results?

Methods:
Vermicomposting
Bokashi
Aerated windrow
In-vessel composting

Emergy:
Can energy be generated from compost?
Gasses emitted? Chemical composition?
Can generated heat be used in buildings or elsewhere?

Material:
Can it be used as building material?

Origin:
Where is food waste coming from, by sector
How much does one person generate?
One house? building? block? district?
How dense is the area where the waste is being collected?
What else is going in as the construction industry shifts to bio-based materials?

Biodiversity:
Which species naturally live in compost?
Which species can be added to assist?
Which species prevent potentially harmful pathogens?
Which plant species can be grown with compost?
Other forms of symbiosis?

Interface:
What is the interface of the compost?
Are there various scales? Building, block, city, region?
What is its form?
How is it easily dropped off, removed from house or commercial space?
How can the system become integrated into the built environment?

Application:
How is it processed?
How is it transported to agricultural sites?
Transport?
What if compost were as valued as oil?
Resulting distribution network

Limitations:
Private companies are typically not transparent
Government data is sometimes unreliable, scattered, not up to date

Methodologies

At the start of July 2022, I arrived in Buenos Aires for a period of two months in order to establish initial contact with various researchers across the fields of architecture, urbanism and agriculture, among others. In the field site visits and workshops that took place in July and August by means of individual engagement and within the group project of the DFL will continue to serve as important references throughout the research and design phases.

Extensive mapping exercises will be used in order to determine appropriate site(s) throughout the research and design phases. Analytical mapping can help to understand existing relationships, both positive and negative, between sites and (potential) actors.

Literature will help inform the theoretical outlook of the project (see bibliography). Writing in the form of a travelog details important events within the research and design phases. Graphic novels or other literary forms can help generate ideas for future scenarios and speculative forecasting. Perhaps these result in a final, meandering essay, or series of essays that form part of the structure of the final report issued in the P5, or they could remain as individual research tools to be located in the appendices.

Model making will be utilized to explore the architectural qualities and pragmatic requirements of a functioning compost tower and its possible integration into existing and newly built forms.

Finally, interviews and community engagement will be instrumental as primary and supplementary information to fill in the likely gaps in my own knowledge as an outsider who only spent a brief time in Argentina. Potential interviews will be sought from the following list, which could expand or contract depending on the availability and responsiveness of each contact:
UTT: Agustín Suárez, spokesperson
INTA: Daniel Somma and Martin Diano, delta farming
WUR: Maarten van der Zee, composting
TU: Andrew Jenkins, urban agriculture; Ben Bronsema, EWF; Davide Wuthrich, hydraulic engineering
FARN: María Marta Di Paola, director

Relevance

Built space occupies 1.5-3% of land surface globally. Agriculture occupies more than 38% (FAO, 2020). In its current, most prominent iteration, agriculture's destructive footprint means that while these areas register as green swaths in satellite imagery, they may as well be paved in asphalt. Agriculture is merely the unbuilt areas of the anthropocentric landscape; we should be classifying this land use typology as a part of the process of urbanization and sprawl. This research advocates for a complete reconceptualization of the linear food and waste systems that contribute to runaway emissions and mass extinction. The compost tower specifically will allow communities and municipalities regardless of location or socioeconomic status to manage organic waste locally and efficiently, and grow food locally and sustainably, in turn reducing emissions and restoring equilibrium to the ecosystem.

Planning

2022

November

P1

Integrate feedback from P1

Outreach compost related researchers

Engage with actual waste processes

Site(s) selection and programming

December

Research through drawings, experimentation with food waste systems

Continued interviews from experts

Initial building tech interviews

2023

January

Finalize findings

Finalize drawings and graphics

Finalize Research Paper

Presentation preparation

P2

February

In-field research in Argentina.

Meetings with Flavio Janches, Daniel Somma, Martin Diano

Shadowing UTT members at warehouse

Farm visit of UTT member

Workshop with community members

March

Finalized building concept

Finalized programming

Development of theory essay(s)

BT development

April

Drawing, modeling, preparation of presentation

P3

May

Modifications based on feedback from P3

Fully detailed BT systems

Fully detailed structural analysis

P4

June

Modify and prepare for final presentation

P5

Glossary

Agroforesty: a land use practice that implements holistic, regenerative models of agriculture and ecosystem conservation.

Anthropocentric (land use): a mode of land use that prioritizes the human species and their affiliated systems to the exclusion of everything else.

Basin: sometimes called *watershed.*

Biodiversity (loss): decline in biological diversity of species.

Blue-green infrastructure: approaches that use nature and natural processes for delivering infrastructure, services, and integrative solutions to meet the rising challenge of urban resilience. Sometimes called *Nature Based Solutions* (NBS), they can provide multiple benefits to cities and address different societal challenges, including reducing disaster risk and building climate resilience, while also contributing to restore biodiversity, creating opportunities for recreation, improving human health, water and food security, and supporting community wellbeing and livelihoods.

Casco concept: a framework design model with focus on the development of long-term and coherent landscape networks of landscape structures to support spatial development, safeguard resources and spatial coherence and create conditions for local developments. Usually, this approach focuses on open-space planning (the inverse of the existing urban tissue). Examples include the Boston Metropolitan Park System (US), the Emscher Park (Ruhr area, Germany).

Detention (basin): contrary to retention basins, detention basins are not permanently wet, they are sometimes called "dry ponds". Both detention and retention ponds delay runoff and contribute to the treatment of stormwater through different passive treatment processes such as filtration, sedimentation, absorption and biological processes.
The temporary storage of stormwater runoff in underground vaults, ponds, or depressed areas to allow for metered discharge that reduce peak flow rates.

Drosscape: from Berger, wastescape.

Ecology: typically referred to as *nature*.

Food forest: or forest garden, a typology within agroforestry that attempts to mimic ecological patterns

Flow regime: fluctuations in a river's discharge.

Grey infrastructure: Built structures and mechanical equipment, such as reservoirs, embankments, pipes, pumps, water treatment plants, and canals.
These engineered solutions are embedded within watersheds or coastal ecosystems whose hydrological and environmental attributes profoundly affect the performance of the gray infrastructure.

Hybrid solutions: *hybrid* is defined as something that is formed by combining two or more things.
A *hybrid solution* would be the result of associating green (nature-based) and gray (engineering-based) solutions when dealing with a certain urban challenge.

Infiltration: the vertical movement

of stormwater runoff through soil, recharging groundwater.

Interstitial: the space(s) in between.

Landscape-based urbanism: approach that takes the physical landscape structure and associated natural processes as a foundation to generate favourable conditions for future development and to guide and shape spatial transformations. Therefore, it offers a model for urban development and transformation, the preservation of biodiversity, water resource management, improved leisure facilities, community building, stronger cultural identity, and economic development (cf. Neuman 2000) while taking the landscape as the basis.

Network: the overall framework encompassing basins, patches and nodes.

Node: an architectural typology; one of the three scales in the network, lower than a patch and basin.

Patch: spatiotemporal section of a landscape; one of the three scales, higher than a node, lower than a basin.

Resilience: the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.

Retention (basin): pond-like features with vegetation around their perimeters. They have a permanent pool of water and the water level is allowed to vary as a results of rain events. Water is released slowly from the retention basin into another body of water on the surface or partially infiltrates into groundwater. The storage of stormwater runoff on site to allow for sedimentation of suspended solids.

Riparian edge: the zone at the interface between river and land.

Sponge capacity: cities that are structured and designed to capture rain water and utilize it to reduce floods. They utilize various techniques green infrastructure retrofits such as permeable pavements, green rooftops, bioswales and constructed wetlands at a variety of scales to reduce the intensity of rainwater runoff by enhancing and distributing absorption capacities more evenly across targeted areas. The resulting groundwater replenishment increases availability of water for various uses and serves to not only reduces flooding but also enhances water supply security.

Sprawl: the rapid expansion of the geographic extent of cities and towns, often characterized by low-density residential housing, single-use zoning, and increased reliance on the private automobile for transportation.

Strategic: critical, site-specific interventions

Urbanization: the increase in the proportion of people living in towns and cities. Urbanisation occurs because people move from rural areas (countryside) to urban areas (towns and cities). This usually occurs when a country is still developing.

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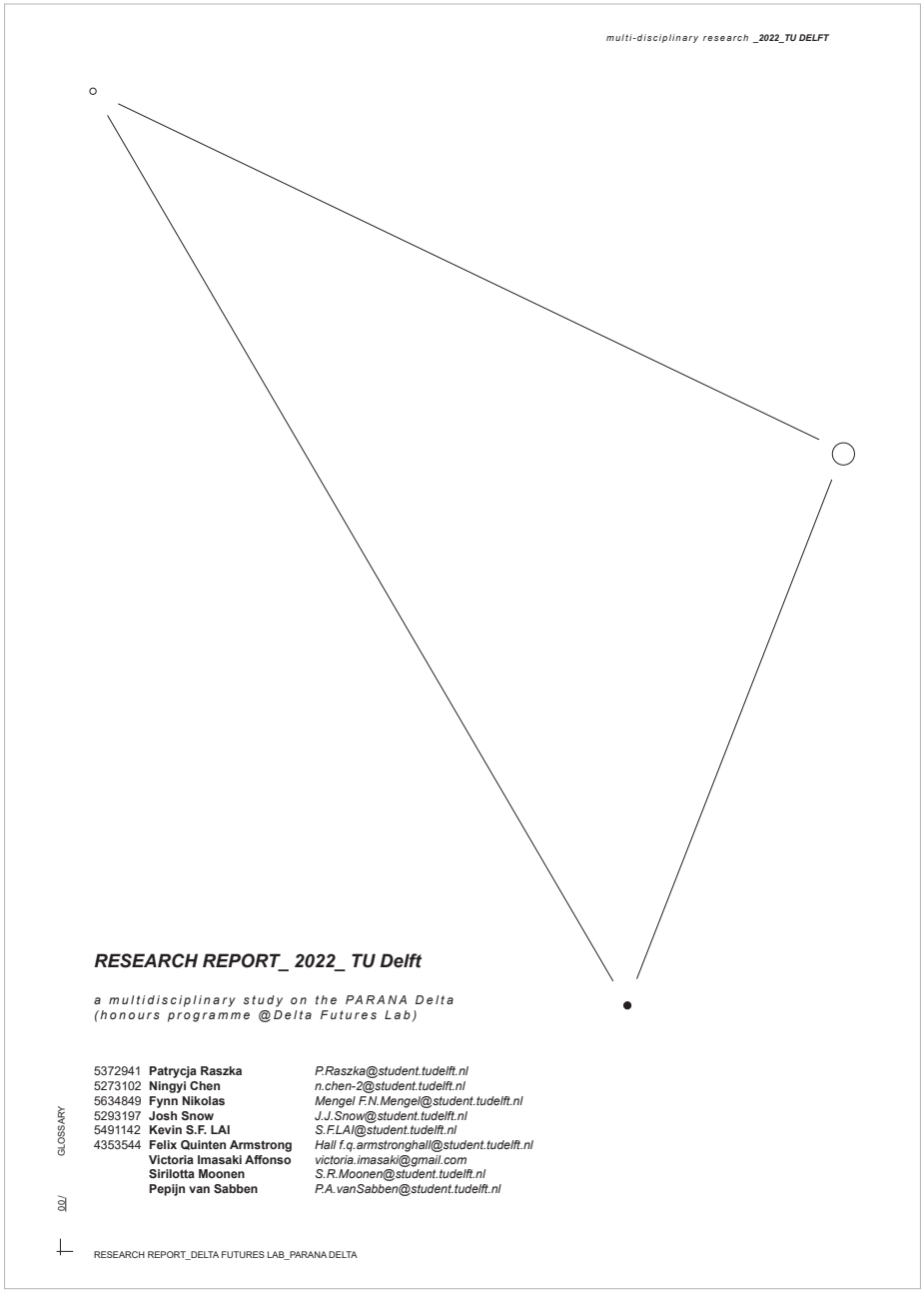
Appendix I

This is an excerpt from the Delta Futures Lab Final Report issued 1 November, 2022.



03

/VISION

3.0 INTRO

Our analysis of Zarate and Tigre demonstrates the overwhelmingly negative impact that anthropogenic processes are having on the delta. In order to curb these while simultaneously preserving and strengthening existing natural processes, we intend to offer a scalable methodology that ameliorates local conditions in each study area and that can also be applied more broadly across the various hydrological basins in the delta region from La Plata to Rosario and beyond.

diagram_three scales: basin-patch-node

Given the enormity of the delta, we suggest three working scales of the basin, patch, node based on local hydrological conditions to more easily guide proposed solution. The hydrological (sub) basin constitutes the first and largest scale. Within each basin a series of patches are identified where interventions are most needed. A patch, a term adapted from landscape ecology, is an area or habitat unique to its surroundings. It is typically the smallest scale within a landscape or regional analysis and will serve as the operative scale at which our interventions are proposed in this report. A patch typology can be a wetland, a forest, grassland or cropland; in an urban setting, it can be a parking lot, a housing complex, essentially any land use pattern. In order to critically identify patches where the most can be achieved with the least, we are using the lens of ‘interstitial space’ to strategically locate our proposed interventions. Within each interstitial patch, various hybrid infrastructures are proposed according to the needs of the context. Finally, the smallest scale is the node, typically an architectural intervention that will be detailed in the next report by the Honours Students at BK to be issued in April 2023, as part of the continuation of their programme.

3.1 INTERSTITIAL SPACE

Land burdened by decades of adherence to the fallacy of a market logic based on exponential growth on a finite planet has resulted in fragmentation, isolation, incongruity and mass extinction. Throughout the delta region empty lots, abandoned rails, car parks, awkward strips between box

stores along highways, neglected streams, polluted rivers and the streets themselves present ample opportunity to foster the complexity of life within (un)built form. These are the interstices, the spaces between one destination and another, overlooked, undervalued, ripe for transformation.

The interstice is where life happens. It's where the sediment accrues in the corners; it's the goop, the smelly processes that permit the evolution of life forms in all their messy entangled, interwoven ways. If modernity was the attempt to control the various ecological processes, design in the 'New Climatic Regime' (Latour, 2017) is about surrendering to them, observing, and harnessing the nonlinearity of their various covert and not-immediately-comprehensible processes. It's about embracing the process rather than the end result. There is no end, only continuation, change, evolution. An ecosystem is never finished, our built environment should take such clues.

While Koolhaas derides these spaces as the undesirable junk of modernity (Koolhaas, 2002), Berger gets it right: "In the urbanized world, the In-between landscape should be valued because it provides a threshold, or platform, for liminal cultural phenomena to play out" (Berger, 2006).

Utilizing interstitial space is a critical lens by which we must design future urbanism. Its objective: densify and diversify; its antithesis: destruction and displacement. Interstitial space integrates objects and processes into the existing context, making use of what is already there, locating potential connections and prioritizing symbiotic relationships over exploitative ones. This is the post-car city, the post-cow agriculture.

Perpendicular to the main axis of the Parana River, urban streams serve as intervals of urbanization. As urban agglomerations grow into one continuous megaregion, hydrology sets the pace and defines the positive. If buildings are the black of a figure ground, hydrology is the white of everything in between. We design the Not City, the buffer zones where life happens, unobstructed by human processes. Like urban acupuncture, the interstitial corridors transfer nutrients and sediment, penetrating the city, creating porosity in plan and infiltration in section.

evidence of interstitial space_underpass (photograph by authors)

evidence of interstitial space_abandoned lot(photograph by authors)

3.2 HYBRID RESILIENCE

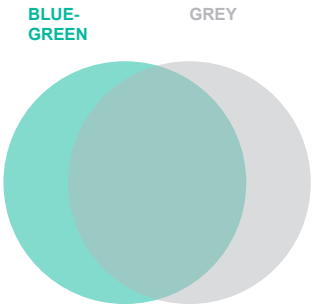
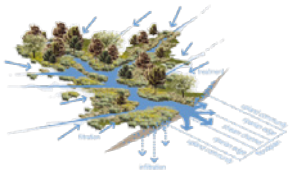


diagram of hybrid resilience

Because the conditions of the delta are unpredictable and prone to extreme hydrological events, further changes in the climate will exacerbate already difficult scenarios. In essence, the region must be prepared to accommodate periods of flood and drought, simultaneously. To cope with such varied extremes, our group has devised a series of strategies that implements resilience measures within a hybrid approach.

Hybrid engineering systems will provide redundancy and enhance overall resilience across the region. Rather than rely solely on traditional (grey) infrastructure, our strategy aims to combine these more common solutions with nature-based systems (“green-blue” infrastructure) through a series of context specific interventions that will ensure proper management of the hydrological issues within the delta, while positively reinforcing ecologies that are currently under threat from the dominance of anthropocentric models currently in place. Together these form part of a Strategic Infrastructure Network that can be integrated into existing interstitial space in and around the Parana delta and its connected hydrological basins.



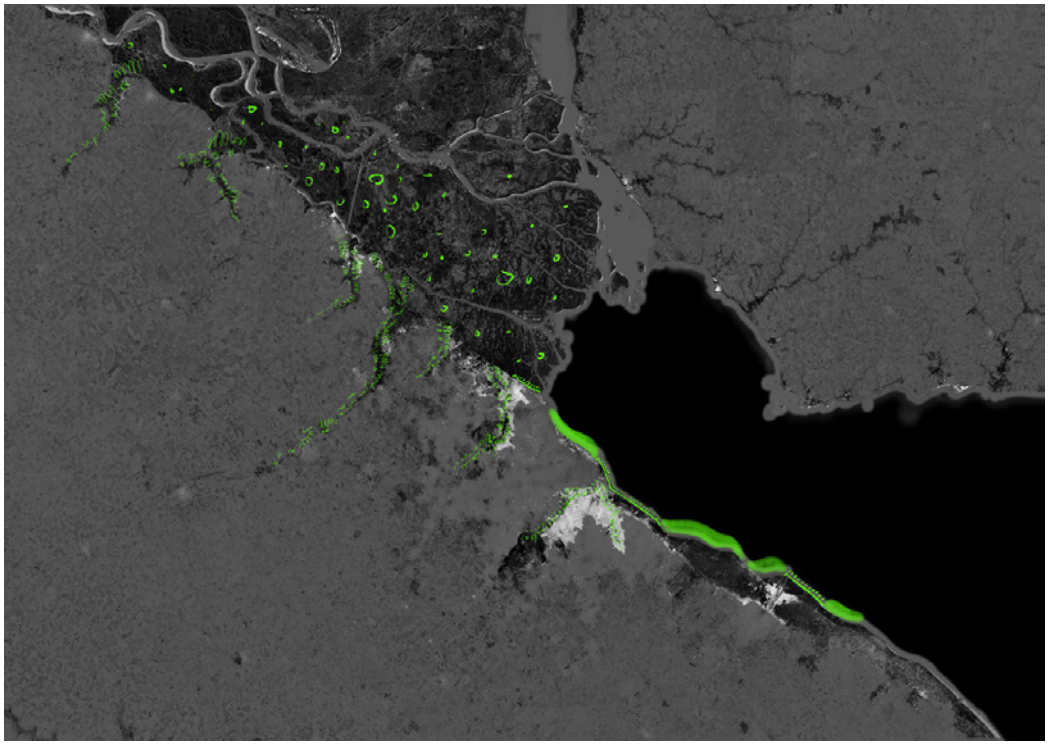
blue-green infrastructure

Due to its current canalized configuration, the drainage system within the city of Buenos Aires increases the chance for flash floods during high precipitation events. Because the city relies primarily on grey infrastructure methods, retention rates of this water remain low, exacerbating floods. At the same time, low water retention contributes to the risk of drought. By introducing blue-green infrastructures to work in tandem with the existing grey infrastructure, overall ‘sponge capacity’ of the territory would increase, consequently improving resilience to flood and drought.

By 2150, the mean sea level in the Rio de la Plata will have increased by between two and three meters. Combined with a drastic sudestada event, many parts of the city will be underwater. In time, the need to protect these areas will become increasingly urgent. Improving coastal defense along the coast from Tigre to San Fernando and La Boca to Sarandi, blue-green and grey infrastructure can work in tandem to prevent catastrophe.

3.3 STRATEGIC INFRASTRUCTURE NETWORK

To preserve the delta, we have to begin on the continent. From the continent arrives the varied negative anthropic land use patterns that are now beginning to proliferate within the delta. To reform the continent is to preserve the delta. As the Anthropocene progresses and the climate de-

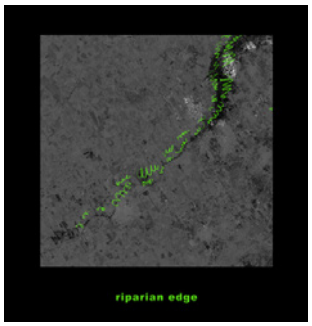


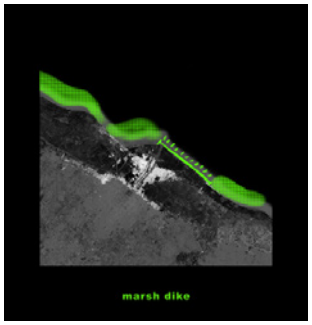
vision map of Strategic Infrastructure Network in the study area in the Parana Delta

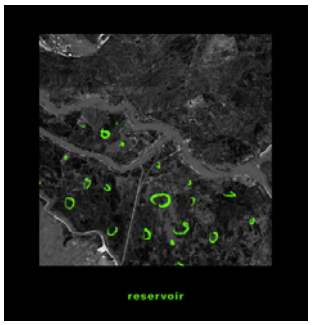
stabilizes, it is clear that infrastructure developed in the nineteenth and twentieth centuries will not suffice in the twenty-first. Thus, the Strategic Infrastructure Network is proposed.

Strategic infrastructure distributes land use patterns and architectural typologies across a decentralized network in order to localize management of urban and non urban systems. It takes into account the myriad flows - of nutrients, sediment, wind, rain, nonhuman organisms and all their affiliated functions - that impact and contribute to a healthy ecosystem. It then attempts to reconcile the anthropogenic processes unfurled by humans onto landscapes that all too often dominate and overwhelm natural ecologies. We are not restoring Nature; we are adapting ecologies that have operated under extractive modalities, or agrilogistics, as preferred by Morton, to modes that support symbiosis and regeneration (2016).

Future urbanization is subject to policies and market realities that we can not predict. For this reason, we do not plan the future of the city, rather we plan where the city is not. Integrating strategic infrastructures into ugly, unwanted spots can transform them into vibrant, flourishing ecosystems. The perceived patchiness at the beginning will eventually yield to a robust mosaic of interwoven, eco- and hydrologically designed network of systems. This is a territorial approach that encourages redundancies, as opposed to traditional linear systems. It takes clues from its context; it displaces no one.







A: Existing polders within the delta are to be transformed into water reservoirs which become a main protection from the drought around Zarate and other poldered areas. As much as possible, the delta's ecosystem integrity is to be preserved; human interventions with negative effects are to be undone.

B: Riparian edges are planted in underutilized spaces along waterways like the Reconquista-Lujan and Riachuelo-Matanza. Streams like the Maldonado, Viga, and Ugarteche all run under existing streets, and must be uncovered in critical locations. This will in turn catalyze a larger transformation of street use within the city, transitioning Buenos Aires from a car-centric, congested metropolis to one that favors the pedestrian. Streets become the green corridors, streams, the blue, each functioning as crosstown conduits for species migration on wheels, feet, wings or fins. At the intersections of these meandering corridors, nodes appear as communal hubs.

C: At the mouth of each stream and river, depending on the topography of the location, the waters will flow into the marsh-dike where sediment from the Parana and its tributaries build out resilient ecosystems for birds, amphibians and fish, overtime creating effective flood defense for the future rising seas. Not all areas will be immune to flooding: we strategically designate protected areas behind a dike from those that will be given over to marshland. Dredged materials from the main shipping channel in the Parana can be applied to the marsh-dike to accelerate sedimentation along the coast.

D: In the lower patches, reservoirs serve as both detention and retention basins,depending on a flood or drought event. These technical solutions are detailed in the following chapter.

It must be said the Casco concept (Sijmons, 1991) has been very influential in terms of the theoretical development of this vision. Also of import is that the network and its connected basins, patches and nodes can be deployed across scale to form a resilient megaregion, adequately prepared to adapt to climate change over the coming decades. However, it can also function at a micro scale, along one river or even a section of that river. As the connected patches and nodes proliferate, enhanced resilience follows.

Agriculture
in the Paraná Basin