



Project area 20 x 20 km

A sustainable future for Lujan river middle basin

The Lujan river is one of the three main rivers flowing through the Metropolitan Area of Buenos Aires (AMBA). During the last fifty years, the AMBA has been experiencing a continuous expansion of its limits reducing the rural areas, a process that involves the substitution of rural lands into urbanized areas involving the construction of industries, closed neighborhoods and informal settlements. The lack of overseeing and planning efforts for the area lead to urban sprawl, and the distribution and location of the population without any consideration of the hydrological characteristics of the land.

The area also faces frequent flooding which has led to the proposal of expensive structural measures (e.g. enlargement of the river channel, construction of areas of temporary retention of surplus water.) The origin of floods in the river basin is directly related to a decrease in the floodplain area. The main causes are: a) The development of real estate projects protected with artificial waterproofing systems perpendicular to the river axis. (b). The embankments built along the flood plain surface to establish foundations above the local flood levels for housing development. (c). The embankments along the highways and railways. In addition, climate models predict for the medium and

long term a moderated increase of around 13% and 38% for daily precipitation and 24% to 29% for 5 days accumulated precipitations making flooding more probable.

The area is crossed by three major roads, Pilar and Campana highways, which are both radial and the Ruta 6 highway which is a ring road. Moreover, three railway lines cross the area, but all of them are in poor conditions and carry a low passenger capacity. The main transportation in the area is by car and in some cases it's the only one available. In addition, a very large industrial park is located in the area. It covers 920 ha, and around 20.000 people commute every day to work there.

Some other issues of the area are:

- Unplanned urban development and road infrastructure
- Land-use change: from agricultural and livestock activities to industrial and urban development
- New rural characteristics and urban centers
- Coexistence of rural productive activities and housing developments
- Deterioration of the wetland's ecosystem
- Sewage, industrial and agricultural effluents contamination
- Solid waste contamination

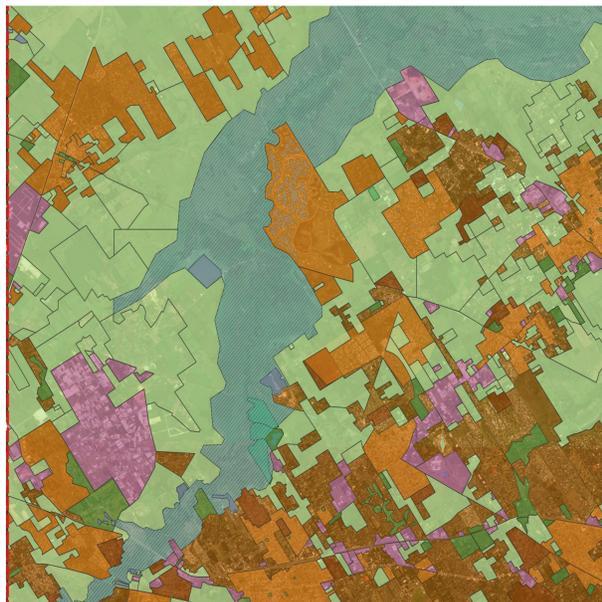
Requirements and Assumptions

- Taking into account the population growth additional 40.000 dwelling should be built in the area by 2050.
- The study area will have an increase in the frequency of extreme weather, so the floodplain and wetlands shouldn't be developed.
- Densification will occur in the already developed areas substituting old houses with denser forms of dwelling.
- Green infrastructure and remaining intensive and extensive agricultural land will face a lot more pressure for land use change.

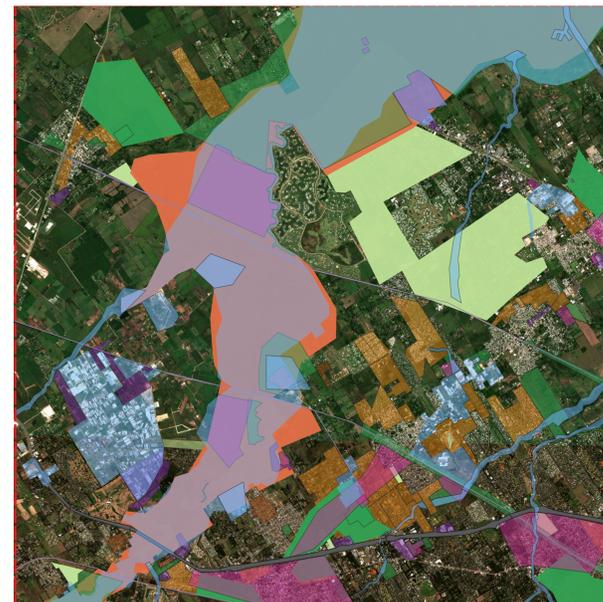
Major Innovations Employed

- GRN 2035 8 / GRN 2035 12 / GRN 2035 13 / GRN 2035 14
- WAT 2035/2050 2 / WAT 2035 8
- IND/COM 2035 2 / IND/COM 2035 8
- RES 2035 1 / RES 2035/2050 11
- MIX 2035 1 / MIX 2035 10 / MIX 2035 14
- ENE 2035/2050 1
- TRA 2035 4
- AGR 11 2035/2050 / AGR 7 2035

Lujan river middle basin



Existing 2020



Early Adopter 2035



Early Adopter 2050

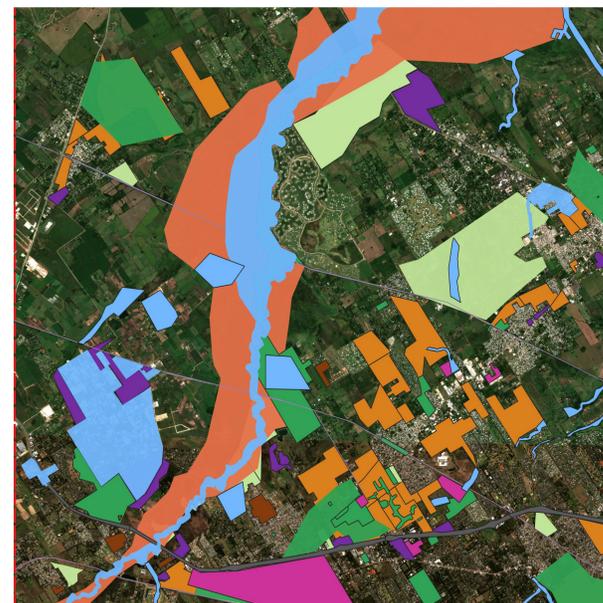
The early adopter scenario will consider first the protection of the floodplain of the river to stop the development of real state housing and industrial areas in order to keep the ecosystem services that the area naturally provides. Most of the rural activities will be preserved and modernization will take place in the farm's management.

It is expected that by 2050 most of the rural areas will be devoted to urban agriculture. Areas used today for stockbreeding will be replaced with horticulture farming that will cope with the changes occurring in the river's floodplain.

Urban sprawl will be controlled and densification of the low-density urban areas will take place. There will be a consolidation of the urban areas around the secondary main roads and by 2050 the urban areas will develop along the 25 route in the East and the 6 route in the west. Along the river floodplain, areas will be designated for the location of windmills for the generation of energy. The energy use efficiency will increase both in the industry and in the public and private sphere. Moreover, green corridors will be established along the railways and areas which are undeveloped will be considered as green infrastructure. Industry areas will not increase considerably, and only an area will be assigned next to the current industrial park for its expansion. The informal settlements will be urbanized and the one established near a flooding risk area will be moved.



Project Surroundings



Non and Late Adopter 2035



Late Adopter 2050

The late start of implementation makes using some nature-based solutions no longer achievable as much of the undeveloped land will change use. The currently allowed land uses continue without changes assuming that by 2035 all the land assigned for housing and industry uses will be consolidated, especially east of the Lujan river. The same will happen in rural areas with a fraction of them being used for low-density housing development due to population growth pressure.

The already urbanized areas will become consolidated along the main roads and some densification will occur in the more densely populated areas. A narrower area along the river Lujan will be protected to avoid changes in the topography of the flooding plain. After 2035 policies and projects promoting the protection of the water infrastructure and the remaining green infrastructure will be established.

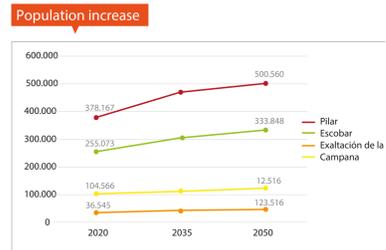
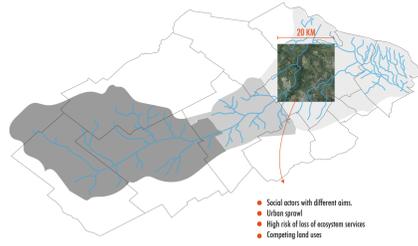
Linear parks along the railways will be possible, although they will be fragmented. A much larger area will be dedicated to industry and a smaller area to farming.

The areas on which the in-situ energy generation is possible will be smaller, although the process of energy consumption optimization will still be going on.

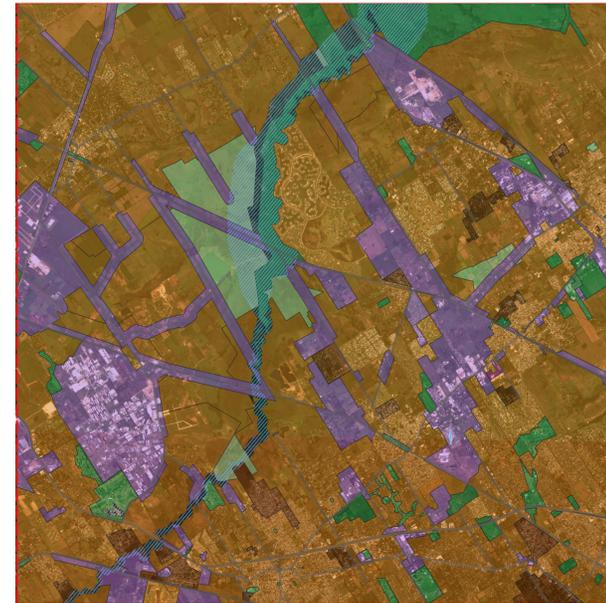
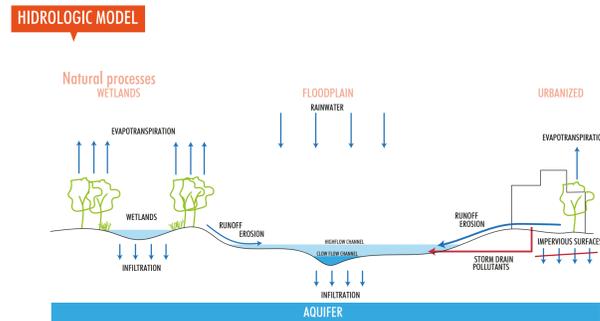
The trains will be renovated to transport more passengers and cycling routes will be established to cover some common commuting routes.

The study area lies in the upper part of the lower basin of the Lujan river. It comprises 5 municipalities and 7 localities (Matheu, Villa Rosa, Zelaya, Cardales, Loma Verde, La Lonja y Pilar.)

The expected population increase by 2050 requires the development of 40,000 new housing units. There are multiple ways to accommodate this new housing although the currently preferred one is letting the private sector develop closed neighborhoods



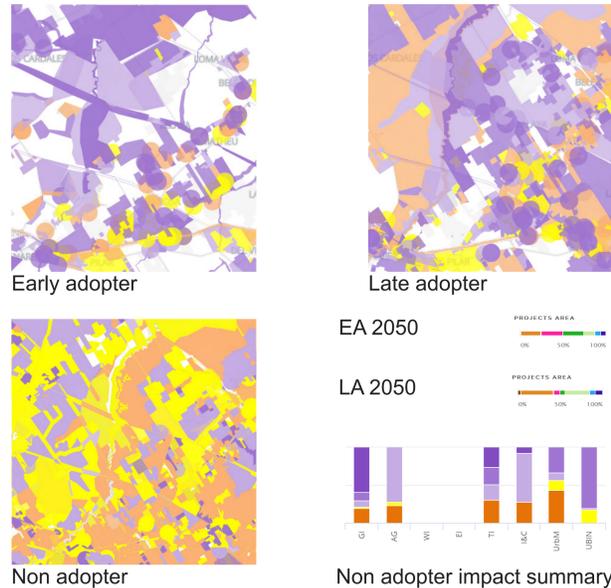
Controlled land-use change that affected the hydrological regime of the river



Non Adopter 2050

for mid to high-income population leading to urban sprawl and unsustainable urban areas. Property speculation and loose controls and construction permits have led to modifications in the topography and uncon-

Impact evaluation maps 2050



Sustainable Development Goals																
1: No Poverty																
2: Zero Hunger																
3: Good Health and Well-being																
4: Quality Education																
5: Gender Equality																
6: Clean Water and Sanitation																
7: Affordable and Clean Energy																
8: Decent Work and Economic Growth																
9: Industry, Innovation and Infrastructure																
10: Reduced Inequality																
11: Sustainable Cities and Communities																
12: Responsible Consumption and Production																
13: Climate Action																
14: Life Below Water																
15: Life on Land																
16: Peace and Justice Strong Institutions																
17: Partnerships to achieve the Goal																
	Most beneficial	Bene-ficial	Neutral	Detri-mental	Most detri-me											

SDG	Early adopter										Late adopter										Non-adopter														
	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex					
1	0	3	3	3	1	1	0	0	0	0	9	1	0	3	3	1	0	0	0	0	11	1	0	3	3	1	0	0	0	0	8				
2	0	3	1	1	3	1	0	0	3	0	12	2	0	3	1	1	3	0	0	1	0	12	2	0	3	3	1	1	1	0	8				
3	3	1	3	0	0	0	0	1	1	0	10	3	3	1	3	0	-1	0	0	1	0	8	3	3	1	3	0	0	-1	-1	-1	3			
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7	0	0	1	3	1	0	0	3	0	3	11	7	0	0	3	1	0	0	1	0	1	6	7	0	0	1	3	1	0	0	-1	0	-1	3	
8	-1	1	0	1	3	3	0	3	3	3	16	8	-1	0	1	1	3	3	0	0	3	11	8	-1	0	1	1	3	1	0	0	1	0	6	
9	1	1	0	3	3	3	1	3	0	0	15	9	1	1	0	3	3	3	0	1	1	13	9	1	0	0	3	1	1	0	-1	-1	0	4	
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12	0	1	1	1	0	0	0	3	0	3	9	12	0	1	1	1	0	0	0	1	1	6	12	0	1	1	1	0	0	0	1	0	1	5	
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15	1	1	3	1	-1	-1	3	-3	-1	-3	0	15	1	1	1	1	-3	-1	3	-1	0	1	15	1	1	3	1	-1	0	1	-1	-3	-1	1	0
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Early adopter scenario is clearly more beneficial regarding sustainability of cities and communities although this associate with benefits to economy, health and equality.

Although less beneficial, the late adopter scenario shares the same goals than early adopter.

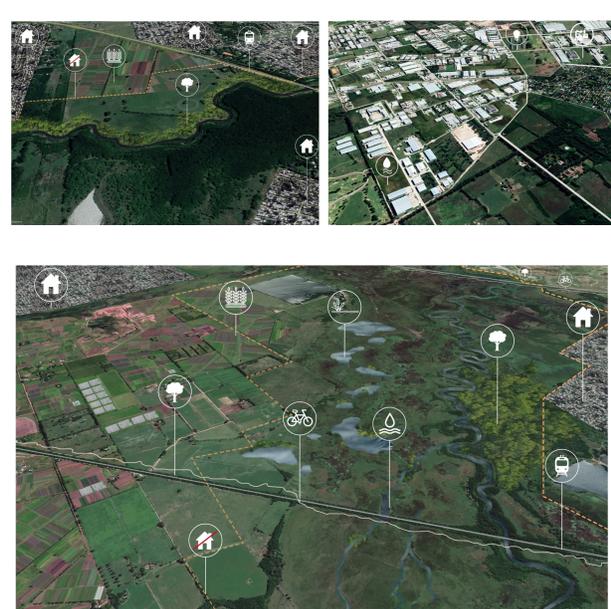
The non-adopter scenario is clearly the worst case in addressing the sustainability goals. The unrestricted sprawl over land has consequences on sustainability.

This scenario assumes the continuation of current patterns of decision-making. The ongoing housing development patterns continue replacing the current rural areas, including the areas west of the river, and becoming low-density housing development in the form of closed neighborhoods. Green infrastructure is composed of small, scattered spaces, although efforts to maintain the urban forest will surely have some success in keeping some ecosystem services. The water channel of the river is straightened and deepened (as others closer to Buenos Aires city have been) resulting in a vast impact over the life below water and on land. The floodplain will become very narrow and the embankments will be raised to avoid flooding in the housing areas. Informal settlements with substandard living conditions will increase in size occupying unsuitable land (flood-prone areas). Efforts to urbanize these areas will result in structural changes in the landscape. Industrial and commercial areas will increase following the new urban clusters resulting in more job opportunities but the levels of pollution will increase due to the use of polluting means of transport. Food production areas will be reduced to the minimum, and only very few and small farms will remain. The energy will continue to be brought from external sources (mostly hydraulic but also atomic) and local generation will only be done in demonstrative projects.

How do Scenarios address Sustainable Development Goals?

The results show that the Early Adopter scenario would provide the greatest positive outcomes, addressing sustainable development goals broadly than the other scenarios. The urban area will become more sustainable mainly by the reduction of urban sprawl and energy consumption. Mixed-use development and urban densification will also contribute. Local energy production on small wind farms and integrated solar power will address energy issues. There will not be a lot of innovation on transportation although sustainability will be increased by policies encouraging the increase in the quality and frequency of public transportation (roads and railways) and sustainable personal transportation (bicycle). Besides, in this scenario, rural land is available to produce more food to supply the area. As a result of protecting the river floodplain, the conditions for life on land and below water will improve.

The late adopter scenario uses the same strategies, but the land is already been used for other purposes limiting the size and effects of the projects especially regarding green infrastructure and agriculture.

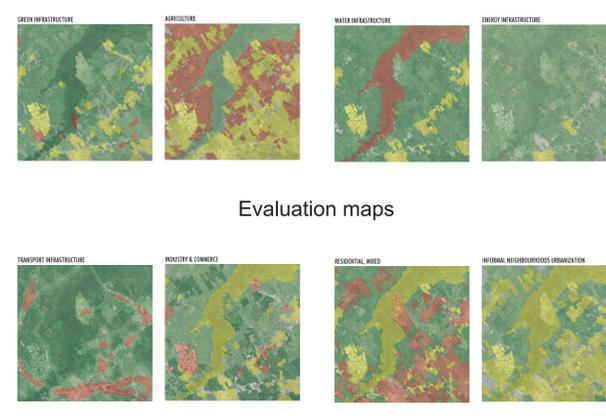


This study was done during a 2-month period of studio work by advanced students from the Landscape Planning and Design degree of the University. The teams were composed according to thematic focus (environmental, economic and social) negotiating a final design for EA-2050 scenario. Based on this scenario the EA 2035 was developed deciding on the innovations, projects and policies that should be introduced first. A restricted time frame and escarse human resources won't allow for the development of evaluation maps for 2035 scenario. Advanced innovations were difficult to include since some basic needs have still to be addressed in the area.

The late adopter scenario was developed independently, considering current permitted land uses. Some of the innovations and changes proposed for EA 2050 were introduced although the area was much smaller.

NA Scenario was developed taking into consideration foreseeable changes in policy and allowed land uses from the municipalities west from the river.

It was decided to address 7 systems not considering institutional as was deem not as important for the area. An additional system was selected (urbanization of informal settlements) due to the fact that they have to be relocalized to an area less prone to flooding.



Sources:
Background Imagery: Copernicus Sentinel data 2019
Local GIS Sources: ARBA / Instituto Geográfico Nacional / urbasig.minfra.gba.gov.ar/urbasig
Statistics INDEC (Instituto Nacional de Estadísticas y Censo)
Impact maps and graphics www.geodesignhub.com

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