

Horizontes abiertos *Open horizons*

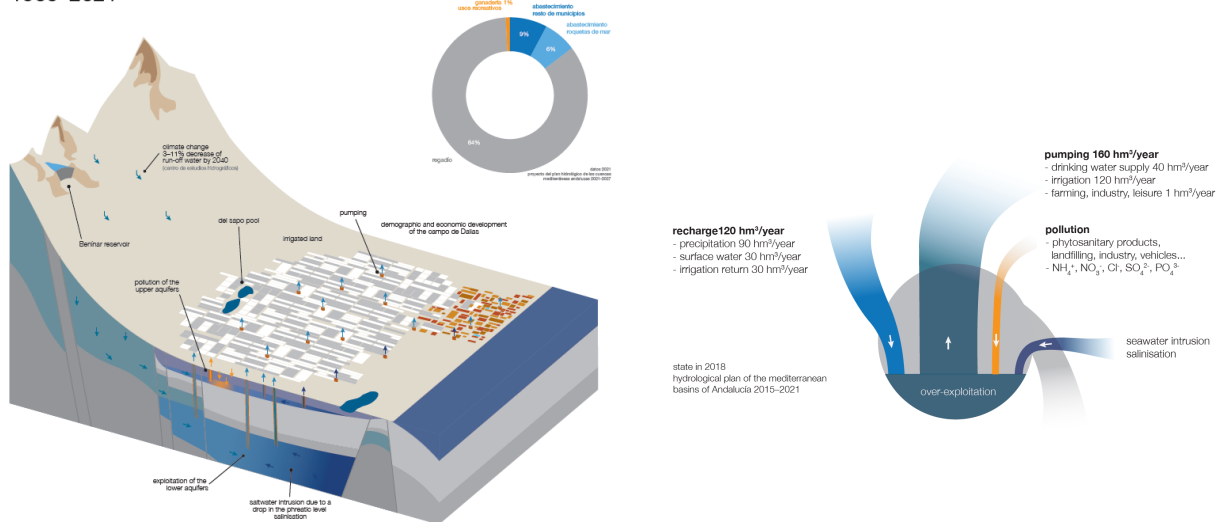
ROQUETAS DE MAR (ES)

Water, city and agriculture: the negotiation of a living interface

Water is a driving force and a limit

As surprising as it may be, one of the driest places in Europe, with barely 250 mm of rainfall a year, is the continent's leading exporter of fruit and vegetables. In 1950, the National Colonisation Institute initiated an economic and demographic revolution that transformed the Campo de Dalías - a semi-arid plain between the Sierra de Gádor and the Alborán Sea - into the "market garden of Europe". This agricultural development was based on the Campo de Dalías aquifer, a system of groundwater bodies that constitutes the region's main water source. The aquifer is currently overexploited. Aware that the quality of life and the economy of the region are linked to the aquifer, the inhabitants of Campo de Dalías have started to implement solutions to exploit the aquifer in a sustainable way: in 2018 the Aquifer Recovery Plan was approved and the draft Hydrological Plan for the Andalusian Mediterranean Basins 2021-2027 (PHCMA) foresees that by 2027 water from desalination plants and WWTPs will make up for the excess pumping and a state of sustainable exploitation will be reached.

over-exploitation
1960–2021



New flows come into play

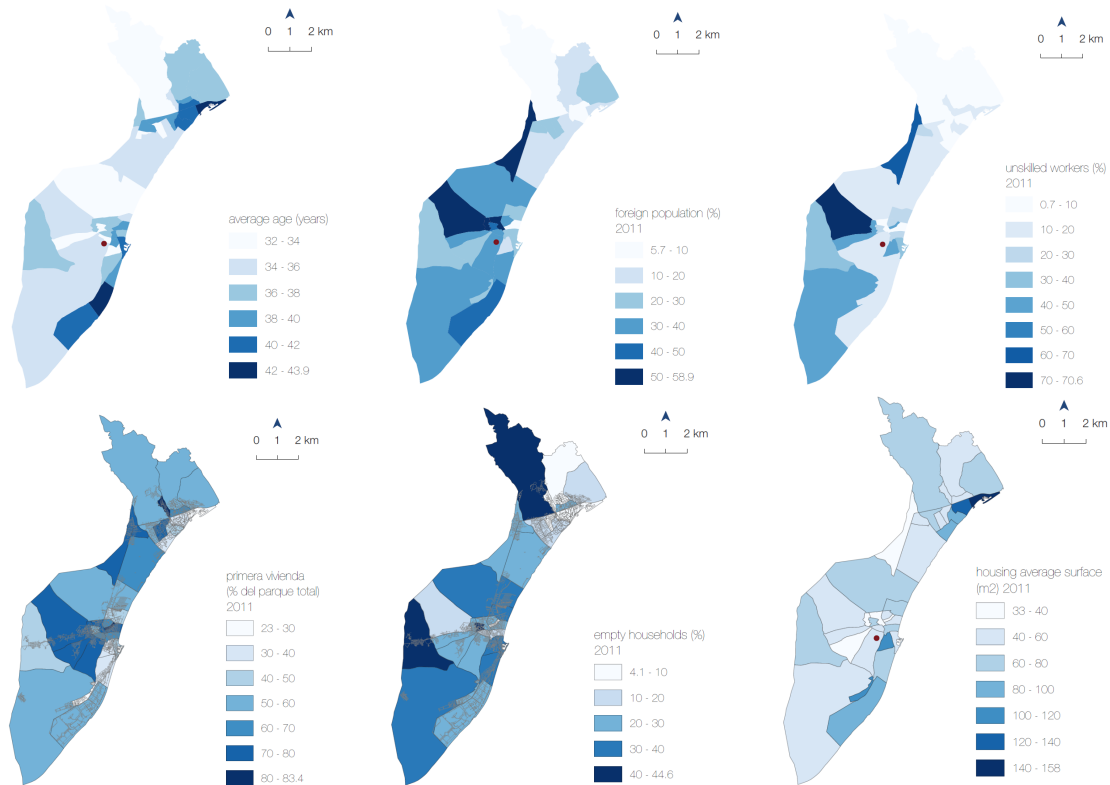
From the 1950s to the mid-2000s, the population of Roquetas de Mar experienced exponential growth, from around 3,760 to 71,740 in 2006¹. The 2006 General Urban Development Plan (PGOU) assumed that this trend would continue and predicted that in 2016 the population would reach 116 900 inhabitants. Perhaps due to the 2008 crisis, these forecasts have not materialised and in 2021 the population of Roquetas is 98,433 inhabitants¹. In recent projections, the Roquetas Town Council forecasts a population of 116 137 inhabitants by 2035. Work opportunities in agriculture, a mild climate, beaches, a good quality of life and a wide range of services have attracted a very young and multicultural population. The population of foreign origin in Roquetas de Mar is almost 30%. A population that Roquetas has been able to assimilate successfully: almost 80% feel somewhat, fairly or very well integrated and half of them plan to stay here indefinitely². Moreover, crime rates in most parts of the city are lower than the national average³. If such

¹ Instituto Nacional de Estadística - INE

² Estrategia de Desarrollo Sostenible Integrado Roquetas de Mar 2020

³ Atlas de Vulnerabilidad Urbana 2001

immigration rates pose real challenges in many other parts of Europe, Roquetas may well be regarded as a model of successful integration.



A negotiated homeostasis

Population growth and its need for infrastructure and housing has to be reconciled with the demand for agricultural land. City and countryside are two systems competing for resources and territory, whose changing interface is constantly re-negotiated. The pressure from the growth of the city is counterbalanced by the high value of agricultural land due to its high productivity. As in a living cell, the border between the urban and agricultural areas of Roquetas is a permeable membrane that ensures a homeostasis between these two realities, agriculture and services, work and housing, white and ochre, plastic and brick. Also as in a cell, this interface is crossed by multiple flows: the flow of underground water, people moving around, rural roads... We propose to revisit these interfaces in order to generate spaces where the two systems reconcile with each other.

Strategy

Horizon is the line where two realities converge: the sky and the earth, where the Iberian Peninsula touches the sea, where the city meets the countryside, where a culture meet others. In geology, horizons are the strata of the soil. Soil that supports, nourishes and quenches the thirst of the inhabitants - humans, plants and animals - of the Campo de Dalías and to which their future is inextricably bonded. Horizon also means new possibilities and perspectives: on how the inhabitants of Roquetas interact with each other, with the agricultural land, the dynamics of the aquifer, the richness of the geology, the local flora and fauna...

It's an open horizon!

We propose to open up these horizons. Firstly, to generate interstitial spaces that vitalise the interface between the city and the countryside. They will serve to release tension from the city-countryside interface, creating places where this line becomes blurry. In Roquetas there are a large number of urban voids near this boundary, which can lend themselves to this. As will be seen, the park strategy also aims to foster a dialogue of urban spaces with what is happening underground, through the management of surface water flows and urban recharge of the aquifer. Thirdly, these spaces serve to generate new ways of relating to

each other and to the habitat, bringing together educational buildings to create a continuum where residence, learning, work, leisure and nature meet.

Freeing up space in a compact network

The proposal seeks to densify the city and decompress in areas of interest to the territory, especially in areas where there are hydrological resources and in the contact between the city and agricultural land.

Parks allow a privileged dialogue between the city and water

Urban areas interact with the water cycle in very particular ways. They can alter the processes of evapotranspiration and precipitation and, contrary to popular belief, urban areas increase aquifer recharge⁴. In arid and semi-arid urban areas, as is the case here, urban recharge from irrigation returns and leaks from water supply and sewerage systems can make a greater contribution than natural recharge. Four urban recharge mechanisms have been identified⁵:

- Direct: percolation in unpaved areas
- Indirect: contribution through leaks from distribution and sewerage systems
- Localised: through faults and fractures in the ground
- Artificial: through water catchment and retention structures.

The characteristics of the park area allow us to benefit from all four. The park has been designed to maximise recharge capacity. The soil is freed of much of the tarmac, which improves the direct recharge capacity and creates spaces that, in the event of precipitation, serve to retain water and favour the infiltration of water into the subsoil. In addition, a settlement fault running through the park area may benefit recharge.

Pollutants from vehicles, waste, etc. can also seep into the aquifer and pose a major problem. This is why we must accompany urban recharge with a phytoremediation strategy. The community of Campo de Dalías is making great efforts to exploit the aquifer in a sustainable way and the reduction of consumption is one of the pillars. Therefore, it is a sine qua non condition that the plant species in the park area are typical of semi-arid climates, which do not require artificial irrigation. We have selected, in addition to plant species with phytoremediation potential^{6, 7}, those who are already present in the region: *Piptatherum miliaceum*, *Arthrocnemum macrostachyum*, *Sporobolus pungens*, *Brassica fruticulosa*, *Lygeum spartum*, *Lobularia maritima*, *Coronilla juncea*, *Globularia alypum*, *Coris monspeliensis*, *Biscutella laevigata*, *Silene vulgaris*, *Avena bromoides*, *Piptatherum coerulescens*, *Atriplex halimus*, *Medicago lupulina*. These shrubs will be accompanied by larger trees, also adapted to semi-arid areas: *Pinus halepensis* and *Ceratonia siliqua*.

A place for humans and for nature

The city is currently home to an accumulation of small parks, unconnected and with no apparent coherence. We have oriented our strategy towards the liberation of a large central space, directly linked to the schools and the college, in order to create a public space that will federate the social life of the district and demonstrate a new relationship with life in the broadest sense. On the one hand, this place will constitute a common asset with multiple possibilities; an interface where human relations can develop, a centre of conviviality, meetings and sharing for all the inhabitants. On the other hand, it will become a natural educational environment for everyone, a place for exploring new relationships with others and with the flora and fauna.

⁴ Lerner, David N. "Groundwater recharge in urban areas." *Atmospheric Environment. Part B. Urban Atmosphere* 24, no. 1 (1990): 29-33.

⁵ Garcia-Fresca, Beatriz, and John M. Sharp. "Hydrogeologic considerations of urban development: Urban-induced recharge." *Reviews in Engineering Geology* 16 (2005): 123-136.

⁶ Heckenroth, Alma, Jacques Rabier, Thierry Dutoit, Franck Torre, Pascale Prudent, and Isabelle Laffont-Schwob. "Selection of native plants with phytoremediation potential for highly contaminated Mediterranean soil restoration: Tools for a non-destructive and integrative approach." *Journal of environmental management* 183 (2016): 850-863.

⁷ García, Gregorio, Ángel Faz, and Héctor M. Conesa. "Selection of autochthonous plant species from SE Spain for soil lead phytoremediation purposes." *Water, Air and Soil Pollution: Focus* 3, no. 3 (2003): 243-250.

It seemed fundamental to us to include the schools in the park's global reflection perimeter. Indeed, the children will benefit directly from this large public space thanks to this proximity: projects could be born between the classroom and the agricultural experimentation sites, for example. The playgrounds will be integrated into the public space project. These everyday spaces for children will be freed from tarmac and pavement and made porous. This will create islands of freshness in the city; they will become fertile ground, sheltering a diverse fauna and flora, which the children will learn to take care of. In this way, children will be able to be not only privileged observers but also actors in this new relationship with life, actively raising their awareness of the challenges of the ecological transition. They will discover the richness of biodiversity while feeling a part of it. A sensitive link will be forged with this new environment, which they will then be more likely to want to preserve and protect. These green schoolyards will constitute common spaces and additional reservoirs of biodiversity and contribute to the recharge of the aquifer. They will no longer be used only during school time and will open onto the outside when the school doors are closed, in a logic of space sharing. In other words, boundaries will be revisited to make school courtyards accessible to the public (with the appropriate restrictions) during school holidays and weekends. Each courtyard would have a particular theme that would add a focus to the overall public space: sport and traditional games.