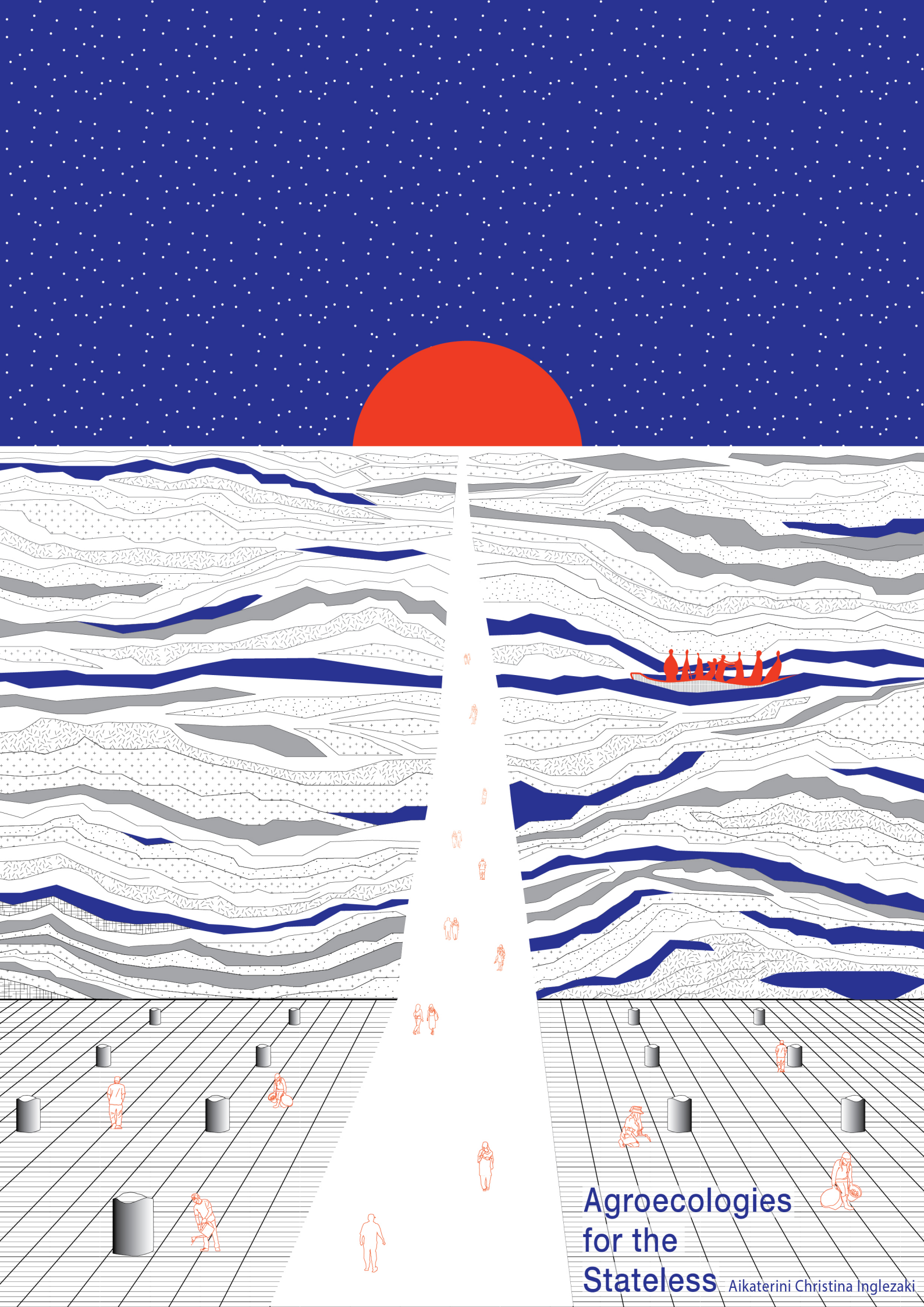

Agroecologies for the Stateless

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COLOFON

Master thesis P5 report

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Fig.1. Yannis Behrakis, Crossing the Aegean, Source: Reuters.

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The most difficult journey has come to an end, through two years when the whole world seemed uncertain,when I started being a foreigner myself, when I doubted and challenged myself multiple times. A few words of gratitude to the people who were there for me;

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No one leaves home unless
home is the mouth of a shark
you only run for the border
when you see the whole city running as well[...]

Home by Warsan Shire



Fig.2. Photo by author.

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Fig.3. Immigrants rescued and transferred to the port of Malaga. Source: EFE,DANIEL PÉREZ.

ABSTRACT

Murcia, one of Spain's autonomous communities, is located in south-eastern Spain. The region is a gigantic irrigation machine operated by farmers, cooperatives, and increasingly foreign-owned multinationals or large supermarkets that either cultivate their own land or lease from smaller plot owners. It comprises a sector that has managed to make south Spain the "orchard of Europe" with a profit margin of more than 900 million euros in the Segura river basin and over 100,000 direct jobs associated. The industry is dependent on the immense engineering works of the Tajo-Segura transfer, a major infrastructure that transports water from the North to the South.

Water is considered the most valuable resource in the region. There is a tremendous system of exploitation underneath the ground, formed by wells, pipes, and desalination plants, many of which are neither authorized nor monitored. This setting is damaging the Mar Menor lagoon, the largest hypersaline lagoon in Europe, and its natural ecosystems; groundwater is overexploited and polluted with nitrates, despite the fact that European regulations mandate its protection.

This intensive system of production is also dependent on an increasing migrant workforce that seeks a better level of liveability in the European context. The distribution of immigrants in the territory is unequal and is conditioned by the structure of the labor market and the primary sources of demand for immigrant labor. The poor conditions of habitability, overcrowding, and lack of privacy have obvious negative repercussions for immigrant communities. Tensions in daily neighborhood relationships inevitably arise.

The project Agroecologies for the Stateless is focused on the interrelation between intensive agro-industry systems and the exploitation of a flexible migrant workforce, located in a river basin environment. The thesis attempts to put a value on nature, reconsidering agricultural cultivations and the mechanisms that support it, and in parallel, seeking a new material basis for the coexistence of local communities, in search of a viable alternative for the restoration of the territory's imbalance.



Fig.4. Farm workers harvest melons in Los Alcazares in the region of El Campo de Cartagena which borders Mar Menor. Source: David Ramos, Getty Images.

0

FOUNDATIONS

Thesis positioning

The site

Context

Attitudes

Problem statement

Theoretical framework

Research framework

THESIS POSITIONING

Migration is a growing global phenomenon that concerns millions of humans annually. Most countries are simultaneously countries of origin, transit and destination for migrants. Poverty, food insecurity, political and social conflicts and climate change-related phenomena are a few of the root causes of migration. Migration has acquired an unprecedented dimension while the infrastructures that respond to climate displacement are inadequate. Prior to the pandemic we are now facing, projections indicated that the share if migrants in the global population would increase from 2.8% in 2010 (190 million people) to 3.5% in 2050 (334 million people)- nowadays projections are higher and will continue to grow. Research suggests that these displacements will increase up to 200 million additional people due to environmental factors. Rising sea levels, changes in rainfall patterns will affect coastal cities where 77% of the global at-risk population resides. In the years to come, a more vulnerable migration landscape will emerge, posing new challenges for destination cities.

Meanwhile, nature is being exploited in order to meet the demands for the material needs of humanity and to make profit. Vast non-city landscapes are being heavily altered to support urban life, in terms of food production or mineral extraction. This rapidly changing human-led environment-making is constantly in need of cheap labour supply in order to be sustained. In an era of accelerated urbanization and higher education levels in developed countries, the rural landscapes are shrinking and agro-food related jobs are less preferred. Thus, in the context of developed European countries these labour shortages are covered by migrant populations that seek a stepping stone into society before they are able to move to less demanding jobs, bearing the negative economic impacts of the sector.

The project Agroecologies for the Stateless is focused on the interrelation between intensive agro-industry systems and the exploitation of a flexible migrant workforce, located in a river basin environment. It is aligned with the Transitional Territories graduation studio which focuses on the relation between natural environment and politics, mainly concerning riverine environments. The role of an urbanist in such a setting is to challenge the spatial implications of geopolitical interests that shape the land and to be critical of the ways people are integrated (or rather segregated) into new societal structures of urban or peri-urban areas. The discourse concerning the insertion of migrants in new regions is usually concerned with temporary forms of emergency shelters, treating it as an ephemeral phenomenon and lacking a medium or long-term scheme on the social sustainability of such populations, benefiting the host communities at the same time.

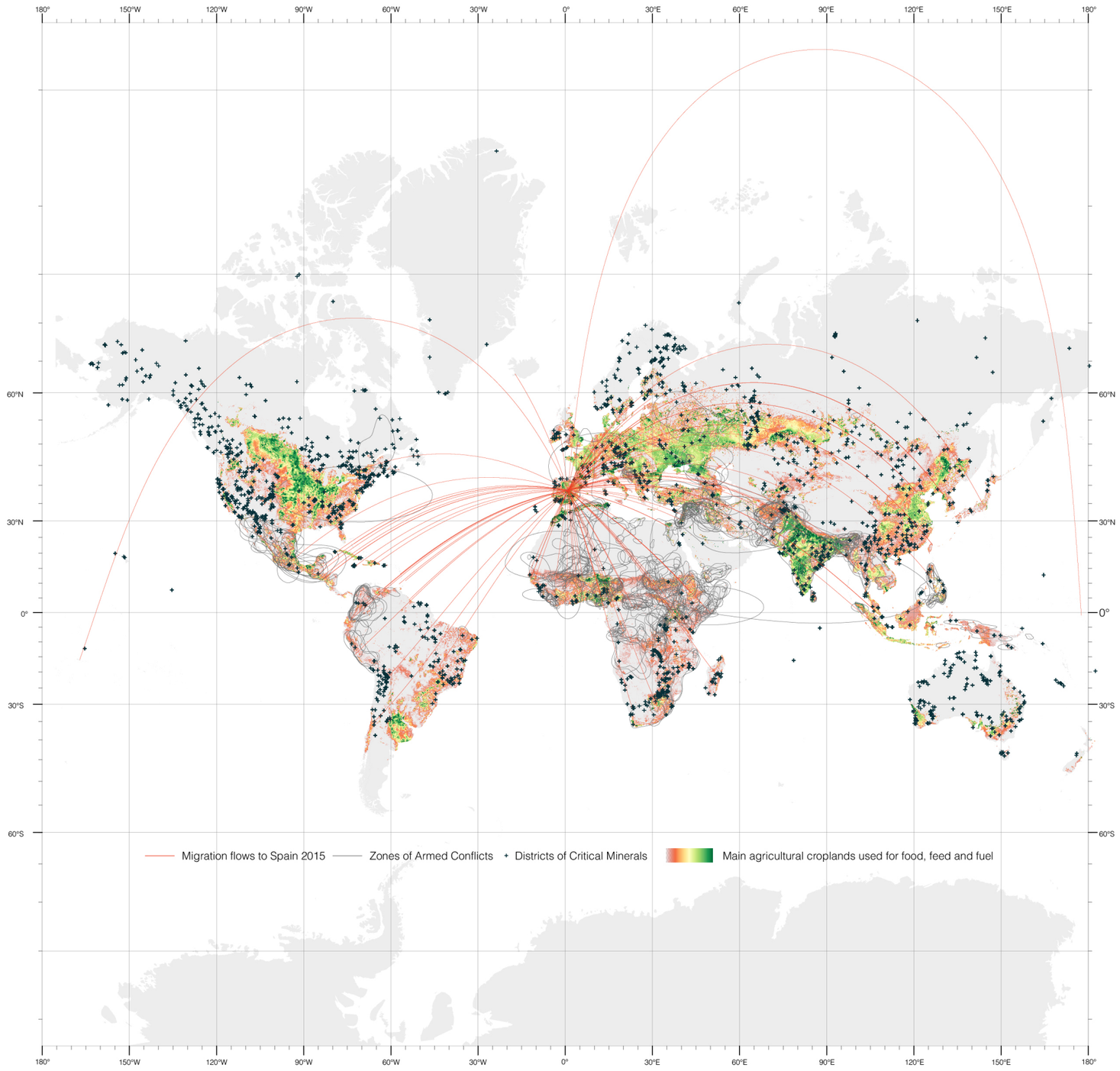


Fig.5. Operational Landscapes and global conflicts. The author, 2021.

THE SITE

Spain has been a global hotspot of agri-food systems due to its tremendous soil fertility, mild Mediterranean climate, changing production intensity, growing urbanization and market needs. Rapid transformations in land systems are common in Spain, involving both land use and the complementary socioeconomic, ecological and organizational dynamics. These transformations entail widespread intensification of land use and industrialisation of agricultural production (e.g. from annual crops to larger areas or greenhouse cultivation systems or livestock raising) in order to maintain an export-oriented model of economy. To sustain this model of national and export markets, an increased presence of immigrant workers in industrial agriculture was necessary. The percentage of immigrant workers in agriculture has increased substantially since 2000. This growth coincided Spain's entry to the euro and its subsequent economic deals. During this period, Spain became Europe's largest vegetable and fruit producer and fifth worldwide.

Spain and the Mediterranean showcase an interesting case study of immigrant farm workers as a source of cheap and flexible labour in agribusiness operations, packing, processing and export. They consist a important element of Spain's population, establishing new dynamic demographic enclaves. In Southern Spain, which is the primary research context for the project, the largest source of workers is Morocco, a fact that creates a particularly interesting socio-cultural context in the Mediterranean region. A great number of Moroccans and other immigrant populations, such as sub-Saharan Africans, Latin Americans and Eastern Europeans, are currently vulnerable to food insecurity and hazardous living conditions that are deteriorating due to socio-political crises and acute climate change-related weather phenomena.

The amount of the native population that sees immigration as a serious problem can not be negligible. The immigrant population, by itself, cannot be considered a hostile element for a number of reasons. Foreign populations enrich the destination society with a cultural plurality that tends to nourish society intellectually. The populations in question are individuals with high labour concerns that they have been able to overcome a very hard exile, normally not a voluntary one. provoking an injection of dynamism that, empirically, regenerates the host economy and makes it more sustainable. What is more, it is a young population, that regenerates the territory not only economically but also demographically, which, in combination, is a relief for the maintenance of the welfare state, and finally, the Spanish is a traditionally emigrant society that has a historical sensitivity towards human mobility.



Fig.7. Comparison of agriculture value per worker in Spain and the Netherlands. Source: World Bank.

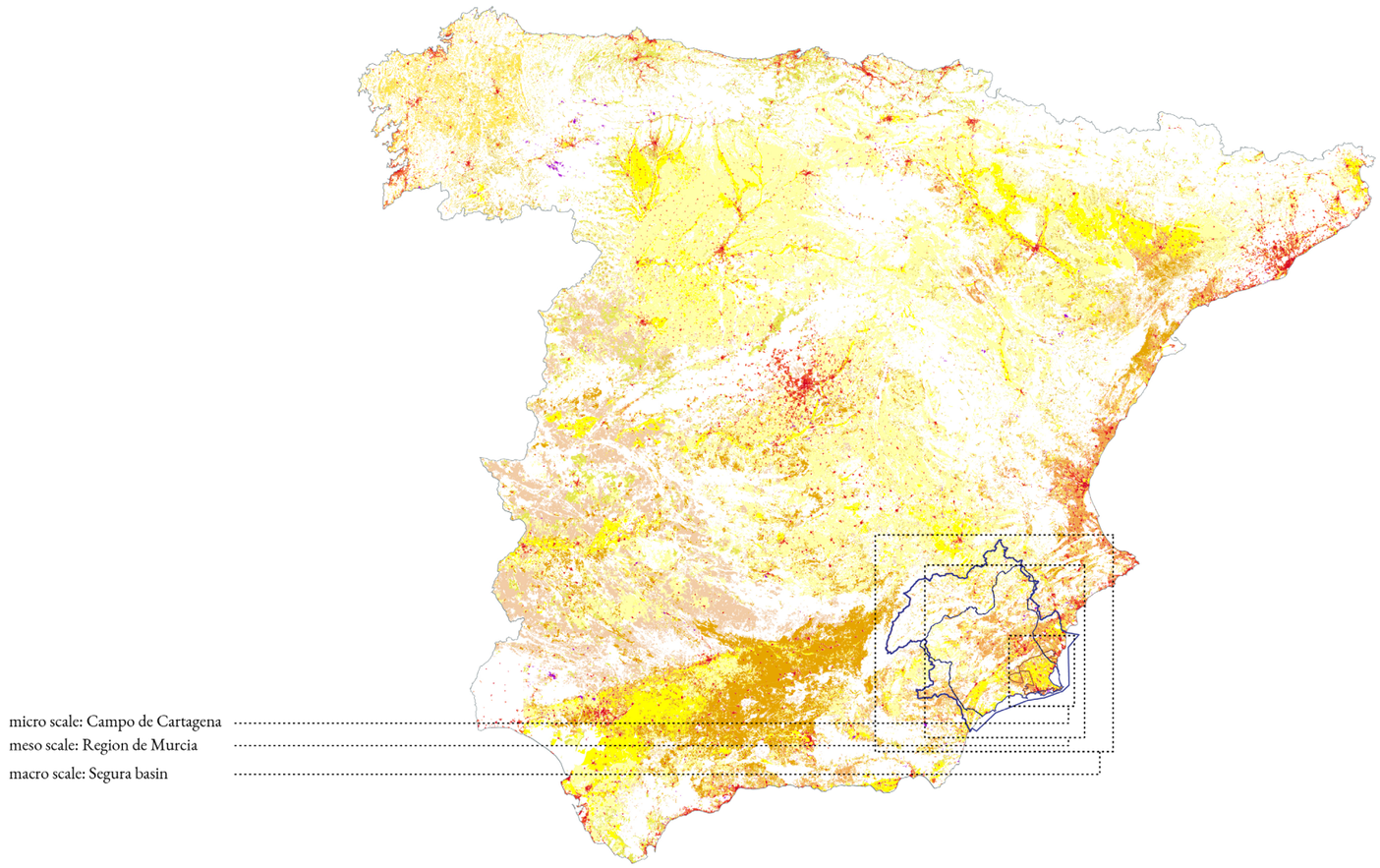


Fig.6. Main landuses of Spain. The author, 2021.Data by CORINE Land Cover.

Murcia, one of Spain's autonomous communities is located in south-eastern Spain. The region is a gigantic irrigation machine operated by farmers, cooperatives and increasingly foreign-owned multinationals or large supermarkets that either cultivate their own land or lease from smaller plot owners. It comprises a sector that has managed to make south Spain the "orchard of Europe" with a profit margin of more than 900 million euros in the Segura river basin and over 100,000 direct jobs associated. The industry is dependent on the immense engineering works of the Tajo-Segura transfer, a major infrastructure that transports water from the North to the South.

The first great idea to transfer water from other basins occurred in the 16th century when the Huescar canal was designed. Years later the towns of Murcia, Cartagena and Lorca began the works, but they were destroyed by a great flood.In the 18th century, the Real Compañía del Canal de Murcia was created, based on the old projects of Castril and Guardal, to have a 110 year concession, which was cancelled as the works did not get started within the scheduled term. The first shipment of water from the Tagus River to the Segura River basin took place on March 31, 1979. The water from the Tajo-Segura Transfer starts from the Entrepeñas and Buendía reservoirs, located in the Northeast of Castilla-La Mancha. The Transfer channel is open-air and has a length of 292 kilometers. This begins next to the Bolarque reservoir, located between the provinces of Cuenca and Guadalajara. From Bolarque, the water from the Transfer reaches the Bujeda dam (Cuenca). After overcoming a large unevenness, the Transfer goes to the Alarcón reservoir (Cuenca), completed in 1970, at the head of the Júcar river.

The water leaves the Alarcón reservoir in the direction of the Talave reservoir (Albacete), and goes through a 31.9 kilometer tunnel. This reservoir is located on the Mundo River, within the Segura Hydrographic Basin (CHS). The last stage of the Transfer consists of sending water from the Talave to the Azud de Ojós, in the province of Murcia.



Sábado, 14 de septiembre de 1968

La verdad

DIARIO REGIONAL DEL SURESTE

DIRECTOR: Venancio - Luis Ayuda Exposito

Precio: 2'00 Ptas.

ALICANTE

MURCIA

Kelvinator

DESDE 283

DISTRIBUIDOR OFICIAL NAVEDO

APROBADO EL TRASVASE

EN EL CONSEJO DE MINISTROS DE AYER, Y A PROPUESTA DEL SR. SILVA, SE APROBARON LAS OBRAS FUNDAMENTALES PARA EL APROVECHAMIENTO CONJUNTO TAJO-SEGURA, COMO PRIMER PASO PARA LA ORDENACION HIDRAULICA DE ESPAÑA

SUBVENCIONES A MURCIA Y ALICANTE POR LA SEQUIA

Rusia ha exigido que Checoslovaquia se convierta en República federal

EXPLOSION EN UN BARCO ESPAÑOL

Fig.8. Front page of the newspaper La Verdad that commemorates the approval of the Tajo-Segura transfer in 1968. Municipal Archive of Murcia.

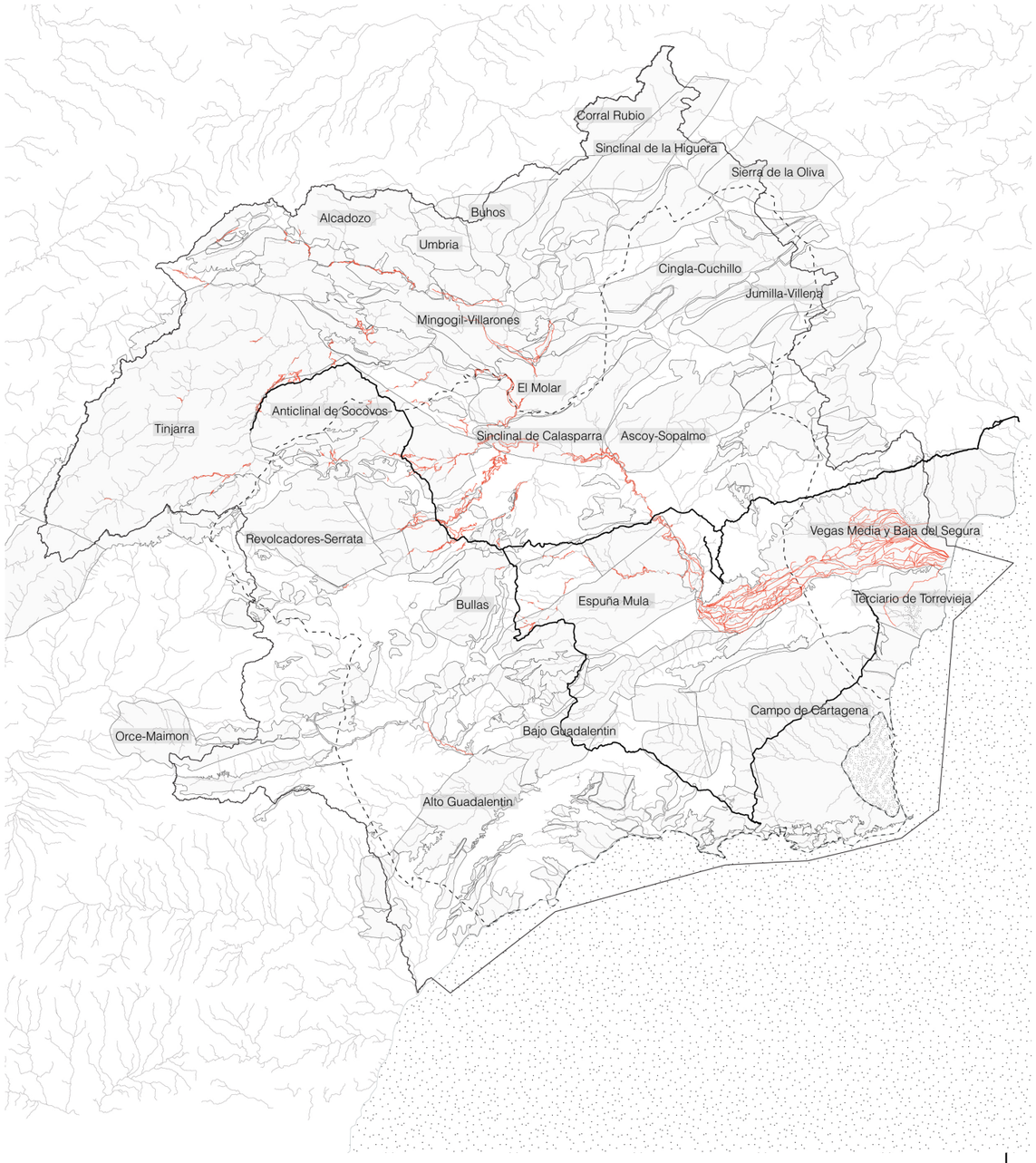


Fig.9. Segura river basin structure.

The fixation on promoting a water-based economic sector, dismissing the inadequacy of hydrologic conditions, in relation to the public administrations' non-compliance with their duties, has compromised the territory's ecological systems and given risen to an environmental disaster

Thousands of farmers from Alicante, Murcia and Andalusia gathered last May to protest against the latest decision of the national government to implement cuts in the water transfer from the river Tajo to Segura. The Sanchez government recently took the decision to to reduce the monthly transfer from 38 to 27 hm^3 when the main water reservoirs Entrepeñas and Buendía are in state of alarm (level 2). The Buendia reservoir contains 447 hm^3 (merely 26% of its total capacity) and Entrepeñas 384 hm^3 (47% capacity). In case both reservoirs reach less than 1300 hm^3 level 2 is enforced. The protesters claim that will inevitably lead to desertification and unemployment since the whole agro-sector depends on the water transfer. "Say goodbye to the orchard of Europe" was the message written on their banner during the protest.

However, conflicting interests are at stake in this case. The President of the regional government of Castilla-La Mancha where the water comes from supported the national decision. "This is not about transferring water from wet Spain to dry Spain, but about transferring water from dry Spain to dry Spain", he stated. Meanwhile, the President of the Region of Murcia declared that the cuts are an unacceptable measure.

Water is considered the most valuable resource in the region. Farmers and companies are constantly searching for it literally under stones, resorting in illegal actions in many cases. The Campo de Cartagena in particular, is the most exploited aquifer with devastating consequences for the nearby Mar Menor. There is a tremendous system of exploitation underneath the ground, formed by wells, pipes and desalination plants, many of which are neither authorized nor monitored. This setting is damaging the lagoon and the natural ecosystems; groundwater is overexploited and polluted with nitrates, despite the fact that European regulations mandate its protection, since groundwater is the future reserve from which communities will be supplied when climate change induces longer and more frequent drought periods.



Fig.10. Thousands of growers and farmers gathered in Madrid to protest against cuts in the water transfer from the river Tagus to the river Segura. Photo: Wikimedia Commons.

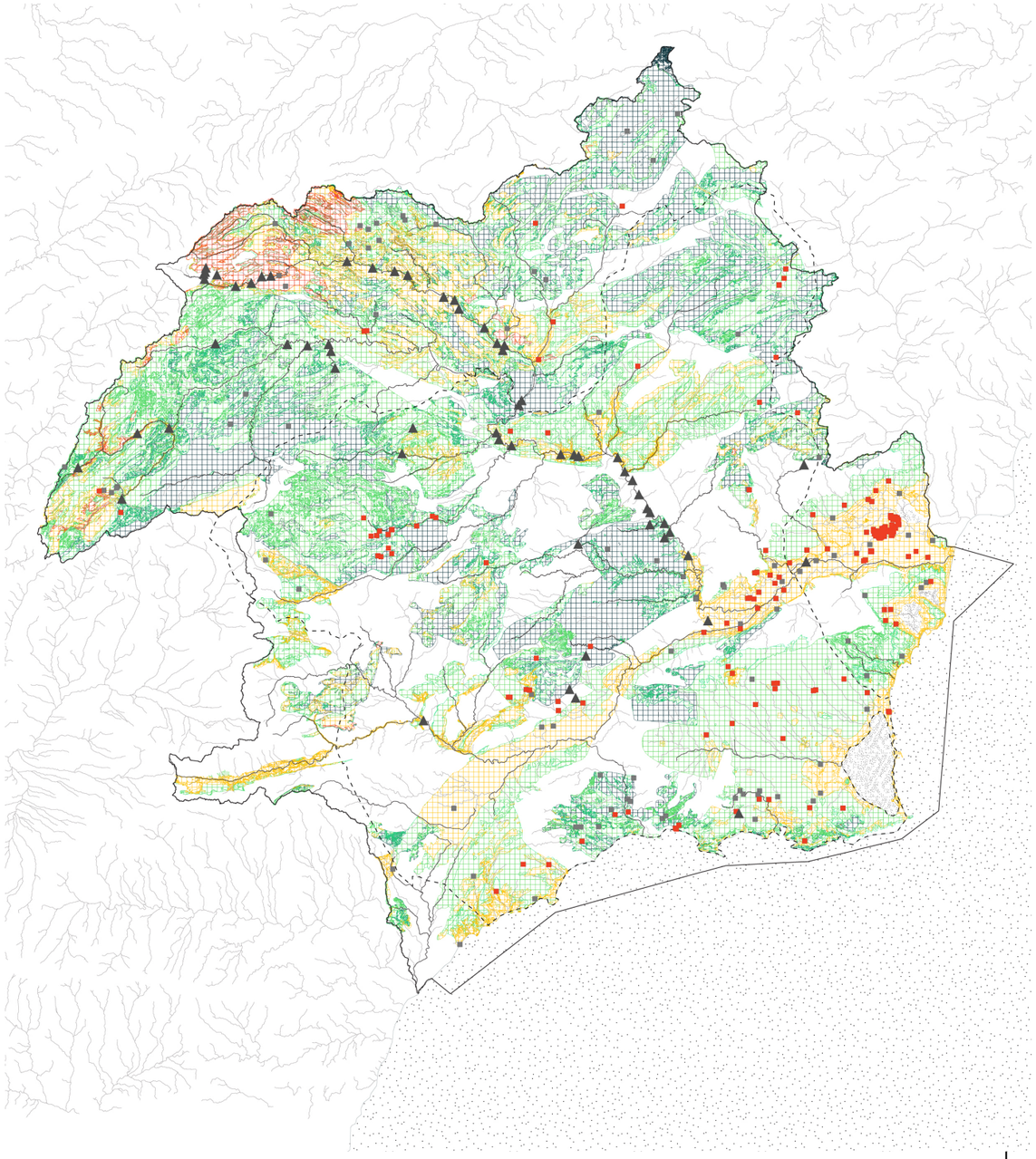


Fig.11. Aquifer vulnerability and waterbodies pressures.

ATTITUDES

Murcia gained notoriety after the event of twelve illegal immigrants dying after the *furgoneta* (van) in which they were travelling to work was crushed by a train near the town of Lorca. This incident shed light into the role of migrant workers in an intensive Mediterranean agro-industry and brought attention to the harsh working conditions and low-paids jobs that exist in a significant underground black economy that is mainly dependent on a foreign workforce.

Murcia has been a region of outward migration and was not a destination for migrants coming from the African coastline, since the migratory routes ran through the Strait of Gibraltar and to coast of Andalucia or to the Canary Islands. However, in recent years this has changed from the moment criminal gangs established illegal routes bringing mainly Moroccan and Algerian illegal immigrants into Spain, charginf for up to 2.500 euros per person for their “services”. The migrants are firstly detained for 72 hours and then led to a transit camp for deportation, but not all of them are deported since the prosecutors cannot trace the country they came from, so many of them are released, without being able to work legally in Spain. Consequently, they find themselves exploited in low-paid illegal jobs and living in shanty towns, or they continue their journey towards Northern European countries where they might have contacts or other family members. The problem in the case of Murcia is that there is a severe lack of infrastructures to temporarily house them while their cases are being examined by the authorities. While there are some facilities in the port of Santomera, the volume of individuals arriving is overwhelming and the facilities provided are at a basic level, thus, there have been a lot of escapes from the facilities. The recent refugee crisis in Syria and Afghanistan has significantly increased the inflow of people and has complicated the situation.

The Region has also made the news headlines because of the environmental crisis in Mar Menor, after the outburst of eutrophication in 2016, resulting in the so-called “green soup”. Researchers from environmental agencies have been investigating the area only to discover the existence of brine water coming from pipes all around the Campo de Cartagena, the product of multiple illegal desalination plants spread throughout farms. These first incidents triggered a series of investigations by local authorities and independent environmental organizations such as WWF, but also great political debates as to how to handle the responsibilities weighing down on agro companies and the local associations of irrigators. This debate has escalated in a case filed by the European Commission regarding the provisions of EU’s Nitrate Directive that Spain does not comply with, accusing the country of not controlling nitrogen fertilisers used in agriculture, causing extensive water contamination.

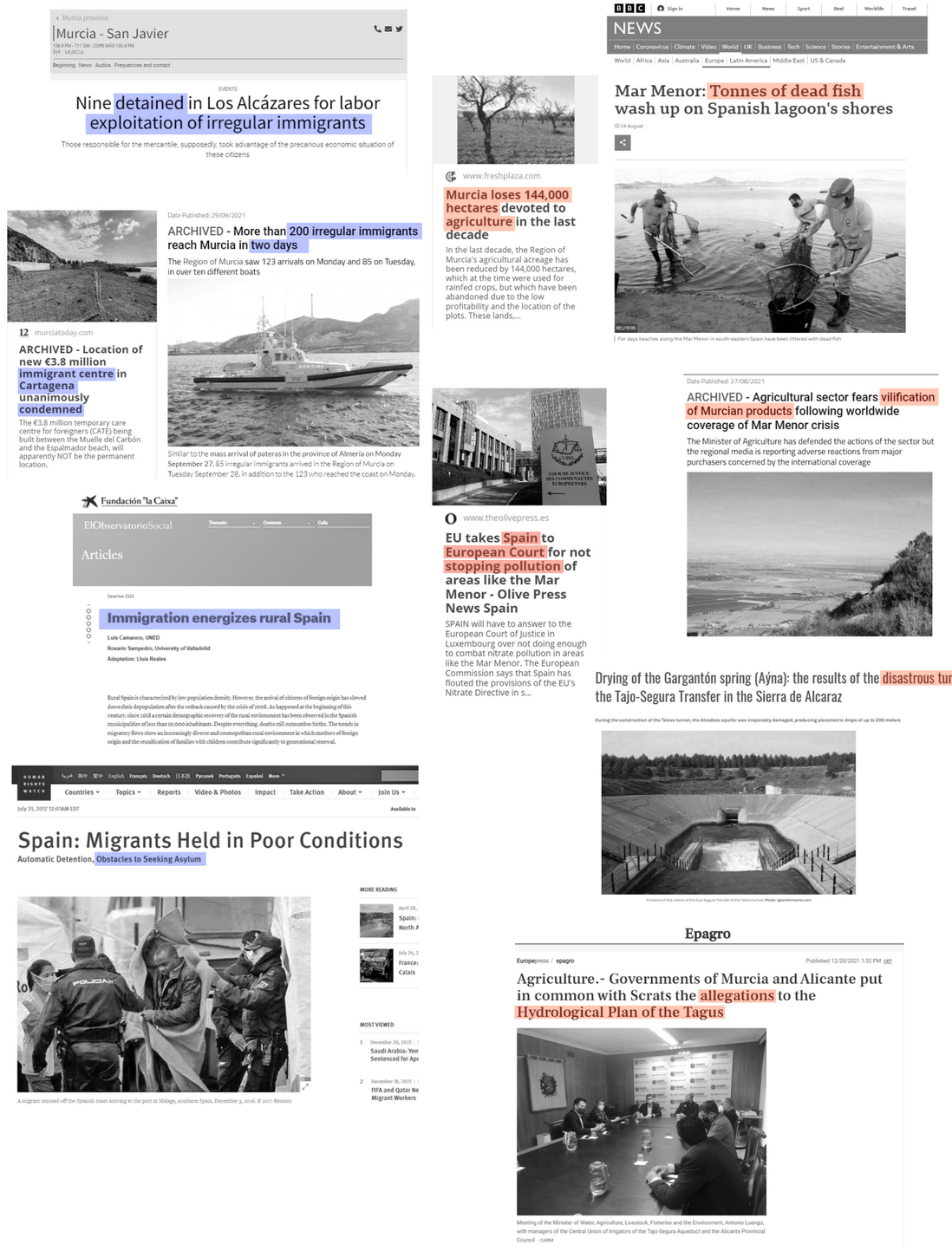


Fig.12. Recent news headlines for the region of Murcia.

The Spanish irrigation industry is largely exported and that has given it immense value for consecutive decades. Over the last century it has become a subject of public discussion closely related to many economic crises. The agro-sector has been a power vacuum in a country whose trade balance is being crushed by foreign energy dependence. After the Great Crash of 1929 politicians argued on the importance of establishing a National Hydrological Plan that would bring water where it was necessary, therefore enhancing irrigation and skyrocketing agricultural exports.

In the latest severe economic crisis of 2009 when exports of the as a whole contracted 15.5%, those of the agri-food sector made a slight 0.3% and since then they kept on growing, reaching 79.4% in 2017. On that same year Spain exported 50,039 million euros of agrifood products and imported 37,978 million, representing a positive balance of 12,060 million. The agrifood products regarded for 18.1% of foreign sales of the total economy with fruits having the highest positive balance of 5,525 million, vegetables a balance of 4,795 million and on the third place, citrus fruits, only behind olive oil and pig meat. Although this large-scale export model dates back to the last century, the most significant changes have happened in recent years when big portions of Spanish-owned land were bought off to foreign capital, primarily British and French multinationals.

In relation to the recent floods in the Mar de Cristal development, located in the south of Mar Menor, the prosecutor's brief in the preliminary hearing that is being held by the court of Cartagena is including the downslope ploughing as well as the disappearance of the terraces in the fields that are allegedly responsible for the nitrate runoff into the Mar Menor. Locally operating companies have agreed on executing a series of works consisting of constructing three channels built by the owners of the plots (...) one flows directly into the Mar Menor, next to the bathing area"; another, "deeper than the first and with a wider bed, collects rainwater that falls on cropland (...) channelling it to an open area on the Loma del Castillico beach" and finally, a third that runs parallel to the RM-12 highway and has "its exit directly towards Ingres street, in the Mar de Cristal" development, next to the houses.[1]

1. The irrigation machine
https://especiales.datadista.com/medioambiente/desastre-mar-menor/maquina-del-regadio/eng/



Fig.13. Samuel Aranda. New York Times.

LAND TRANSFORMATIONS

At the start of each season, rigorous contracts are being signed to ensure that there is a steady supply of fruits and vegetables daily in Spanish or British supermarkets. The large groups usually control the whole chain, from the stock of seeds, the production itself, to the packaging and marketing of the products. Inevitably, the pressure is on the landowners, most of which are in debt in their attempt to grow their businesses and acquire more land and equipment. In order for them to meet their supply contracts and fulfil their payments they need a guaranteed adequate supply of water. Land leasing has become the norm for many of them. According to the latest agrarian census published (INE, 2009) 12% of agricultural exploitations in the municipalities of the Campo de Cartagena were rented out from their owners. Evidence suggest the intensification of this model in recent years, for instance in the Southern part of the Campo de Cartagena that was originally supposed to be devoted to real estate developments and that were converted to irrigated agriculture plots after the recent financial crisis.

The Office of Environment and Socioeconomic Development of the Government of the Region of Murcia has gathered satellite images of the last 35 years in two reports, stating that there has been a global process aimed at “intensifying cultivation, increasing irrigation, homogenising space and installing new infrastructures” on land, and particularly in this case in the area around Mar Menor. Two key moments can be identified: firstly, 1997, when rainfed agriculture was largely replaced by irrigation, the sizes of the parcels were readjusted, eliminating terrace structures that retained water and enclosures became larger and more uniform; and 2011 when farm units became even larger and the remains of the terraces were completely removed, ploughing was done downslope and areas on which forest was previously growing started to be farmed.

Where water from the transfer is being allocated, it is used for irrigation if it arrives. When it does not arrive, groundwater is the main source. In those Units of Agrarian Demand (UDAS defined by the CHS under an unrecognized legal status) where no transfer water is allocated, groundwater has been the main source until it is possible to formalize a license to operate a seawater desalination plant. Irrigation happens no matter what.



Fig.14. Transformation of the plots located in front of the residential development Mar de Cristal. The terraced land, visible in the 1956 and 1977 images, is transformed into irrigated land in the 1900s. The terrace structure, which retained water, is lost. In 2011 a transformation to an even larger parcel structure can be observed. / IGN and especiales.datadista.com.

ENVIRONMENTAL IMPACT

The Mar Menor is the largest saltwater lagoon in Europe. Located on the coast of the Murcia region, it is a natural treasure enjoyed by the inhabitants of the area and the thousands of tourists who visit it every year.

Currently it is seriously threatened by an excess of nutrients in its waters (eutrophication) due to the impact of agricultural activity and urban pressure. In 2016, an extreme eutrophication – a massive growth of algae caused by a discharge of nutrients, mainly from agriculture – turned the water here green and killed 85% of the seagrass. Thousands of fish were beached on the shore, unable to breathe because of a lack of oxygen resulting from the degradation of excessive algae and changes to salinity.

Experts point the finger at the agriculture industry – exporting mostly vegetables to European countries such as the UK, Germany and France – as the main polluter. The problem is nitrates from the intensive irrigation of crops, as well as poor sewage systems in towns surrounding the lagoon, which have grown dramatically since the 1960s, and discharge from mining activities. According to the central government's environment ministry, 80 percent of the water contamination resulted from the unchecked growth of agriculture. Local restaurants no longer serve Mar Menor seafood and commercial fishing crews now trawl in the nearby Mediterranean instead.

In August, when another wave of dead fish washed up, scientists noted that the water temperature had climbed significantly. But in September, the Spanish Institute of Oceanography published a report that rejected the idea that excessive summer heat helped kill the fish. The impact of tourism - another giant contributor to the local economy - is another problem.

Regarding the complaint on the floods in the Mar de Cristal development, located to the south of the Mar Menor, whose preliminary processes are being carried out by a court in Cartagena, the prosecutor's brief includes not only the downslope ploughing and the disappearance of the terraces as alleged causes of fertilizer nitrate-loaded runoff into the Mar Menor. Companies operating in the area "agreed to carry out a series of works consisting primarily of three channels built by the owners of the plots (...) one flows directly into the Mar Menor, next to the bathing area"; another, "deeper than the first and with a wider bed, collects rainwater that falls on cropland (...) channelling it to an open area on the Loma del Castillico beach" and finally, a third that runs parallel to the RM-12 highway and has "its exit directly towards Ingres street, in the Mar de Cristal" development, next to the houses.



Fig.15. Dead fish are seen in the water near Cala del Pino beach in Murcia Mar Menor lagoon, Spain August 20, 2021. Reuters: Eva Manez.

What used to be a popular tourist destination has now turned into an ecological disaster. Activist groups are pursuing to protect the Mar Menor by a change in legal status. In last August of 2021 there was yet another incident when thousands of fish died of lack of oxygen in the water, washing up on the beaches in tons, a phenomenon known as eutrophication. The heavy use of fertilizers is to blame according to environmental activists who are propelling the local authorities to impose restrictions on the intensive agriculture industry that is considered to have a damaging effect on the lagoon's habitat. The government from its side attributed the deaths of the fish to the summer's heatwave.

Last October 70.000 people rallied in Murcia, 50 kilometers from the lagoon, demanding action. At the same time multiple solidarity protests took place in Madrid, Valencia and Brussels. Despite the growing interest in ceasing the pollution sources of the Mar Menor, palpable actions have been hampered due to conflicts between the regional and the national governments over accountability for the issue. Ecologists are dismissing the lack of political incentive and have recently submitted a formal complaint to the EU over the "continued failure" of the Spanish authorities to protect Mar Menor. The activist group of ILPM Mar Menor initiated a campaign to raise 500,000 signatures for a petition calling for Mar Menor to be granted personal legal rights. The Spanish Congress of Deputies has voted, by overwhelming majority to give the green light to this legislative initiative in April 2022. This historic decision marks the first time that a region in Europe is classified as a legal person with all the ensuing rights and protections. This means that from now on the lagoon is represented by three groups: legal guardians, a monitoring committee of "protectors", and a scientific advisory board. In addition to that, any citizen will also have the right to file a lawsuit on behalf of the Mar Menor.

During 2021, the regional government of Murcia has reportedly spent only 12 million euros for protecting the Mar Menor, in addition to 300 million promised by Spain's national government between 2021 and 2023 that are yet to arrive. The Region of Murcia has promised a further 85 million to help recover the Mar Menor to its previous state, which is not expected to materialise since the government has a 26-year track record of not meeting 100% of their budget promises allocated to protect Mar Menor.



Fig.16. People take part in a demonstration in defense of the Mar Menor lagoon, in Murcia, Spain. Reuters: Eva Manez.

PROBLEM STATEMENT

The current paradigm of land exploitation that is dependent on commodity export is rapidly operationalizing the Segura river basin in Southern Spain. The immense infrastructure network of the Tajo-Segura transfer is draining groundwater in spite of the EU regulations that demand its protection since it constitutes the future supply for local population when the climate crisis worsens and droughts become increasingly long. The administration that controls the fate of the transfer's water through the associations of irrigators does not control the volume of water that is transferred nor the number of wells that are illegally opened to sustain agriculture, resulting in major nitrate concentration in the aquifers and ultimately, jeopardizing the sustainability of the water cycle.

This intensive system of production is also dependent on an increasing migrant workforce that seeks a better level of liveability in European context. The distribution of immigrants in the territory is unequal and is conditioned by the structure of the labour market and the main sources of demand for immigrant labour. The poor conditions of habitability, overcrowding and lack of privacy have obvious negative repercussions for immigrant communities. Tensions in the daily neighbourhood relationships inevitably arise.

Such a system of production creates a duality of exploitation of nature and exploitation of human labour, based on modernity's concept that views nature as a resource and allows geopolitical forces to control individuals. By attempting to put a value on nature through a process of deterritorialization that will reconsider landuse distribution and the mechanisms that support it, and in parallel, by seeking a new material basis for coexistence of local communities, a viable alternative is in need of exploration to restore the imbalance in the territory.

RESEARCH QUESTION

Main Research Question:

How to find more socially and ecologically equitable ways of human and natural work in the Region of Murcia?

Analysis Sub-Questions:

RQ1: What are the systems that pose criticalities in the region and what are their limitations?

RQ2: How is the land operationalised to sustain the regional economic model? What are the impacts of this process on the natural systems?

RQ3: What are the working and living conditions of the migrant workforce? How is the seasonality of production affecting the labour dynamics?

THEORETICAL FRAMEWORK

The theoretical framework illustrates the theories and concepts that guide the development of the project and attempts to show the ways they overlap and shape each other.



Fig.17. Theoretical framework scheme.

Agroecology

Agroecological landscapes are the ones that have a productive purpose and involve agriculture or forestry and are intensely managed or barely touched human-oriented ecosystems. The idea that agroecology rather than natural ecology is a more suitable perspective to comprehend and analyze human-oriented landscapes is embedded in this approach. Both natural ecology and agroecoloy are branches of ecology; however, they view natural processes from a different lens and have contrary end goals. That is mainly due to the fact that agriculture fundamentally expels natural flora and fauna with food crops to sustain human populations. This monopolization leads to a narrow spectrum of plantings and, more often, monocrops. Modern-day farming is essentially an industrial practice that transforms a landscape from a complex disorganized state to a simplified and controlled system. Many of the most common cash crops such as rice, wheat and tobacco are well-known for depleting soils and underground water level, and the impact of these monocrops was already recognized in the eighteenth century when scientific farmers began to seek for the connections between plant biology, nutrient and mineral cycles, and soil health. Mid-twentieth-century theories looked at the soil and addressed soil extraction, proposing forms of closed-loop agriculture.

Agroecology, the ecology of a productive rural land does not focus on the individual agro-ecosystems but on the interrelations between human-oriented,-managed ecosystems and the interrelations between those that produce useful yields and their adjacent natural non-producing ecosystems.

Rural landscapes can be divided into observable and measureable units based on agroecosystem age, management purposes, economic need or land use compatibility. Productive units are divided into plots and agroecosystems, which can be the same or vastly different. The plot is essentially a management unit and the agroecosystem contains sets of plants serving a certain purpose. Plots are areas clearly demarcated by either constructed boundaries (fences and hedges) or natural (streams, hills etc.). A plot can consist of a single agroecosystem or a group of agroecosystems that perform a commo function within the limits of the demarcated area. The agroecosystem is the central unit in any given landscape and is defined by its design role, since all component plants are used to achieve a set of objectives (production, water retention, erosion control etc.).

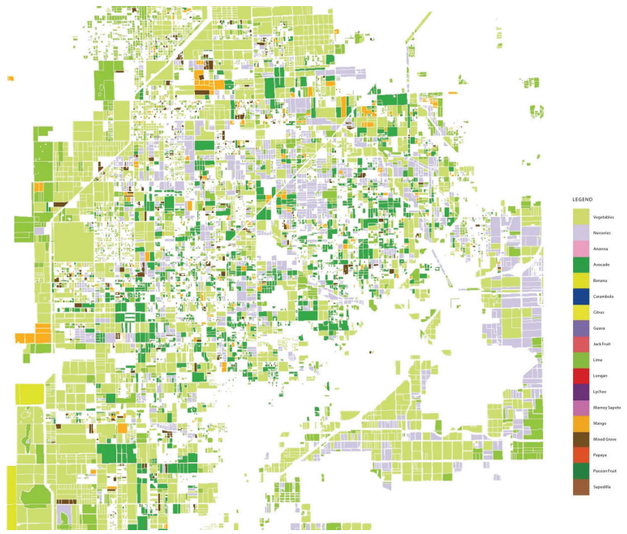


Fig.18. Valerie Imbruce, Agricultural Biodiversity Study, Florida, 2004.

As an approach, agroecology consists a holistic and integrated approach that aims at applying both ecological and social concepts to the design and management of sustainable food systems. A system's optimization cannot be viable without taking into account the need of socially equitable conditions within which people can choose what they cultivate, how much and how it is produced. Agroecology is at the same time a science, a social movement, and a set of practices that expands the focus from farms and fields to the entirety of agriculture and production chains. In recent decades it grew into a transdisciplinary field that includes the ecological socio-cultural, economic and political dimensions of agro-systems, from production to the very consumption.

Systems-thinking through holistic approaches is needed to address the complex inderdependencies that derive from human activities on natural terrestrial ecosystems. The intrinsic relationship between people and the planet is at the basis of the 2030 Agenda for Sustainable Development. Providing food security and ending poverty while responsibly managing the available natural resources can only be feasible through holistic approaches that comply with human rights.

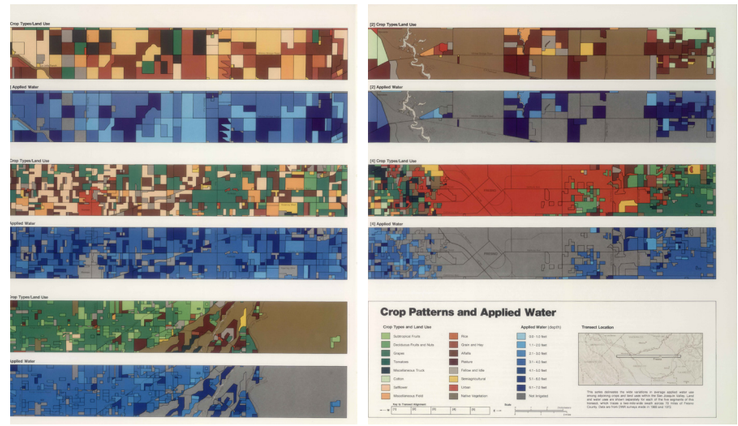


Fig.19. The California Water Atlas, Edited by William L. Kahrl, State of California , Publication Section (1978).



Fig.20. Sustainable Development Goals, United Nations Assembly.

The concepts of agrarian and urban are usually interpreted as distinct across disciplines and times. In the context of times of war, environmental crises, and industrial turbulence, designers have grown an environmental consciousness as opposed to the disastrous environmental impact of large-scale agro-businesses, drawing links between agricultural production and cities. Various authors and scholars have been proposing new models of sustainable practices associated with systems of local agricultural production, reduced carbon footprint, energy sufficiency combined with enhanced biodiversity. Contemporary discourse on food production has resulted in a number of urban planning projects that attempted to impose the idea of agrarian urbanism, providing an antithesis to the dense metropolises that grew after mass internal migrations from farm villages to industrialized cities in the 19th and 20th centuries.

In the rear or Great Depression, urbanists conceptualized agrarianism as a cross over between the mere rural practices of food production and the progressively exposed workforce. Urban planners of the Modernism movement conceived a mixture of industry and agriculture in a rotational labor system in which workers shifted from factory jobs to collective farming.



Fig.21. Broadacre City, Frank Lloyd Wright.



Fig.22. Broadacre City, Frank Lloyd Wright.

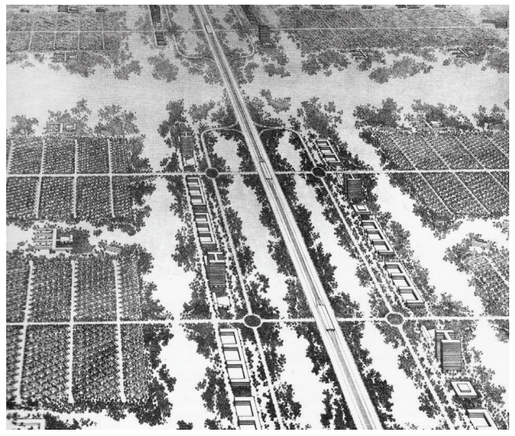


Fig.23. The new regional pattern, Ludwig Hilberseimer.

These conceptual trends were expressed in many unbuilt projects that envisioned decentralized agrarian urbanism. Frank Lloyd Wright's "Broadacre City" (1934–35), Ludwig Hilberseimer's "New Regional Pattern" (1945–49), Ebenezer Howard's "The Garden City"(1920) and Andrea Branzi's "Agronica" (1993–94), and its further development, "Territory for the New Economy" (1999). Each of these projects proposed a reconceptualization of the city, a decentralization of the urban into a productive landscape.

Broadacre City- Frank Lloyd Wright

Broadacre City manifested Wright's critique of the modern industrial city, positioning an organic model for a settlement across an immense cultivated landscape. Broadacre proposed a network of transportation and communication infrastructures, having the Jeffersonian grid as its ordering system. By owning one acre of land per person as a birthright, the citizens of Broadacre would reside in modern houses situated amid abundant gardens and small-scale farms. A primary model of variously scaled housing and landscapes was mixed with light industry, commercial centers and markets, and last but not least, the ever-present highway.

Part of Wright's social critique was the questioning of private ownership and blatant consumption and accumulation of wealth associated with cities, in a time when bankrupt family farmers were fleeing their fields and migrating to California.

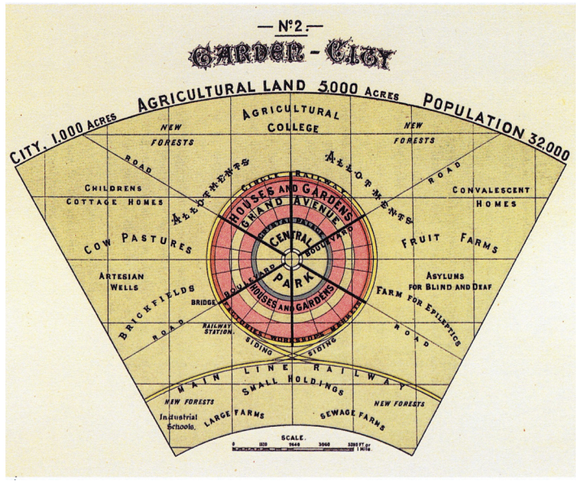


Fig.24. Ebenezer Howard- The Garden City.

The New Regional Pattern- Ludwig Hilberseimer

Hilberseimer developed the New Regional Pattern as a strategy for low-density urbanization on highways and natural environments and published his ideas in the 1949 The New Regional Pattern: Industries and Gardens, Workshops and Farms. Similar to Broadacre, it was organized around transportation networks that unified a horizontal, landscape-oriented settlement. The whole territory was filled with housing, farms, industry, commercial activities and public spaces However, the New Regional Pattern was not possessed by the rigidity of the grid but was rather formed by the natural environment, by topography, hydrology, vegetation etc. It combined infrastructures with built spaces and landscape elements in order to reconceive the American urban model.

Ebenezer Howard- The Garden City.

The Welwyn Garden City and the garden city movement originated in England and have often been discussed through the work of planner Ebenezer Howard for ”a town designed for healthy living”, blending the best aspects of urban and rural life into a utopian hybrid community that had agriculture as a buffer greenbelt around average-density towns. Agriculture was more than mere nature, it was ideological, tied to the economy and the ecology. Howard proposed two forms of agriculture in his diagrams: a greenbelt surrounding the city that would provide ecosystem services, subsidence farming, clean air, water and recreational areas; and allotment gardens that could potentially provide self-sufficiency for communities.

Howard designed a diagram for urban development with circular concentric rings of activities. The plan proposed the cellular division of the landscape into dense urban cores surrounded by agro-greenbelts obstructing urban sprawl and protecting the agricultural land. The center of the concentric city was placed within a garden ringed by public institutions, such as a library, town hall and museums.

The Garden City was a complete urban development plan that served as a form of utopian socialism, providing for all the social, economic and physical needs of the community.

Agronica / Territory for the New Economy

Branzi’s work followed the practice of using an urban project as a social or even cultural critique. that not only illustrates a vision for the future but also critically decompress contemporary social problems. His work is focused more on the political delineation of power structures and forces that are shaping urbanism. Branzi was influenced by the theories and the projects of Hilberseimer, and mostly from the New Regional Pattern. Both Branzi and Hilberseimer illustrated the city as a continuous system of interconnected forces and flows and not as a collection of objects, making their work relevant to contemporary discussions of ecological urbanism.

The project of Agronica illustrates the perpetually horizontal sprawl of capital across urban territories as a result of neo-liberal economics. Initially commissioned by Philips Electronics and created in collaboration with the Domus Academy — a research institute Branzi cofounded in the ’80, Agronica examines potential relationships between agriculture and energy production, new models of post-Fordist economies and their resulting consumerist cultures.

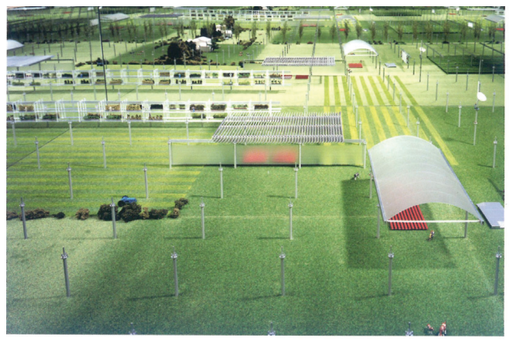


Fig.25. Andrea Branzi’s Agronica model.

Nature-based solutions for water management

The European Commission defines Nature-Based Solutions (NbS) as “solutions to challenges facing society that are inspired and supported by nature that are cost effective while providing environmental, social and economic benefits, and help build resilience. The frequency of extreme weather events keeps increasing, having an irreversible harm to humans, natural ecosystems and the built environment. The rapid growth of urban areas leads to higher demand of water resources, highlighting the need for sustainable and resilient water management. Urban planning and land use decisions directly affect the water supply and the operation of infrastructures. Nature-based solutions refer to green-blue infrastructures and natural measures in opposition to the traditional grey infrastructures that are found in urban settings and can reduce the total costs of water services both in cities and in rural areas.

In the context of increased risk susceptibility, Nature-based solutions function as important foundations for new models of economic growth that can achieve an optimization between economy and environment. Although the European water policy advocates the adoption of NbS, the large-scale implementation of these practices unfortunately remain limited. In most cases, they are implemented as pilot projects and are limited in size.

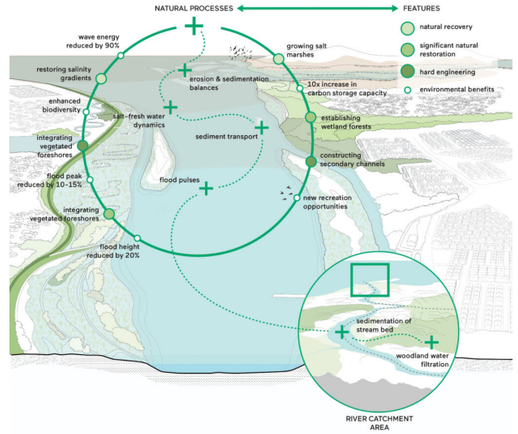


Fig.26. Building with nature approach on river environments principles, Building with Nature – Creating, implementing and upscaling Nature-based Solutions, NAi Boekverkopers, 2020.

At the heart of the “building with nature” approach” lies the principle that water infrastructures work together with nature rather than against it. Design projects that follow this approach consider the interventions as part of an evolving environment rather than a static one, meaning that physical material processes and their associated timeframes have to be taken into account when developing the design proposal. The project perspective entails proceeding having the whole system in mind and not particular interventions, the system meaning biotic and abiotic entities, as well as socio-economic and governance sub-systems.

The Black Mediterranean

Through its long historical journey the Mediterranean has been a territory of prosperity, cultural exchange, trade and conflict. The unpredictability of the climate and its fragmented topography create a series of different ecologies that force their inhabitants into trade with their neighbors to sustain their energy sources. This drive to trade is intensified by the connectivity to the sea, enabling coastal sailing, while magnifying the struggle of one nation to overrule over another.

As an analytical framework, the Black Mediterranean approaches the Mediterranean as a space of multiple mobilities, cut through man frontiers and borders and ranging colonial legacies and post-colonial claims. Historians and scholars of this field have recognized the Mediterranean as a unique region that has brought together three continents into direct contact and has accelerated multiple networks of cross-cultural exchange and commerce since ancient times. However, this romanticization of the Mediterranean as a field of exchange is dismissing the long history of racial subordination and resistance.

The representational crisis over the Mediterranean is once again relevant. Its physical geographies are influenced by various perspectives that share an implicit cartographic narrative of a single, unitary epistemological framing and political management (Chambers 2008; Giaccara and Minca 2010).

In light of the worst refugee crisis on European grounds after the Second World War, the Mediterranean coast functions as a passage to a land of opportunity from the perspective of the African and Middle-East populations. From Europe's point of view, the South acts a pool of cheap labor that can easily be deployed whenever necessary. The main object in this narrative is the Black African migrant. Floating on its waters to reach the stability of continental Europe, Black migrants have become a symbol of insecurity of this space. Two vastly different lines of thought are shaping the dominant stereotypes: one that pictures the migrant as a victim of stronger forces beyond his level of control, and a second one that pictures the same entity as violent invader, a potential criminal threat. While being positioned within diametrically different ideologies, both stereotypes share the same white gaze. By propagating voiceless subjects, this gaze concurrently propagates he ground conditions for their exclusion from the discourse of human rights, political asylum and citizenship claims. However oxymoron as it may sound, this theory states that the current narratives over the Mediterranean crisis is founded upon a predominantly European male gaze, one that views others as either "charitable subjects" or "uninvited guests".

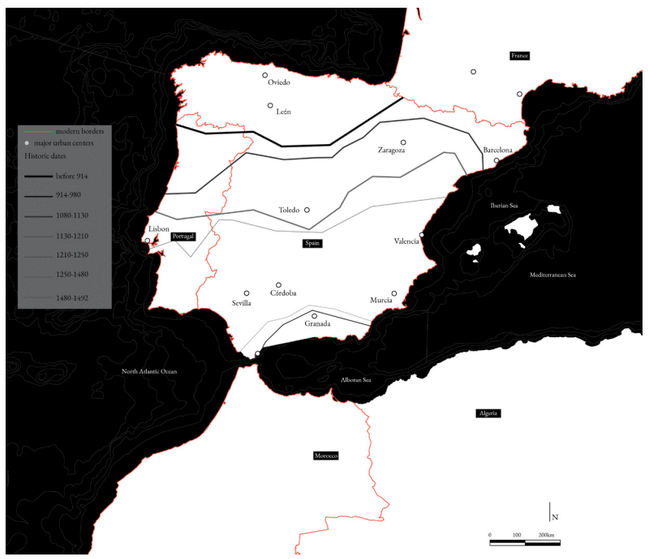


Fig.27. Territorial claims throughout the Reconquista wars, figure by author, produced during the Projecting Urban Landscapes intensive Q1 course.

What is the Mediterranean today: a solid sea or a liquid frontier, a bridge or a barrier?

Iain Chambers, Maritime Criticism and Theoretical Shipwrecks

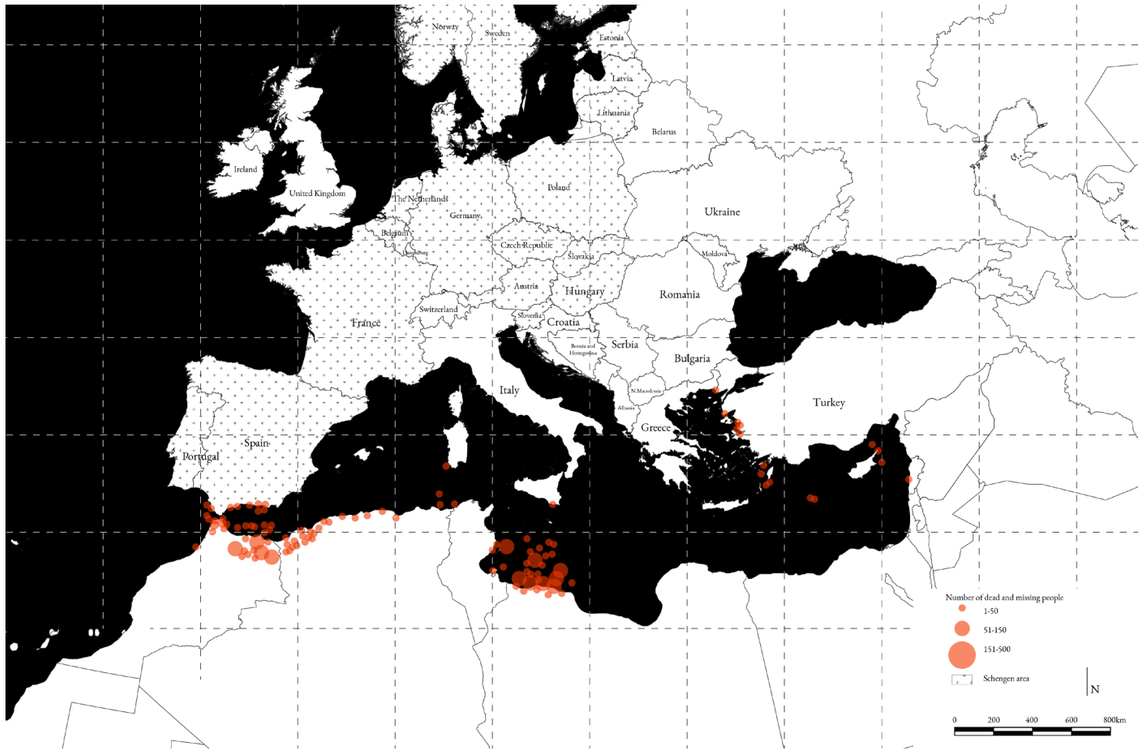
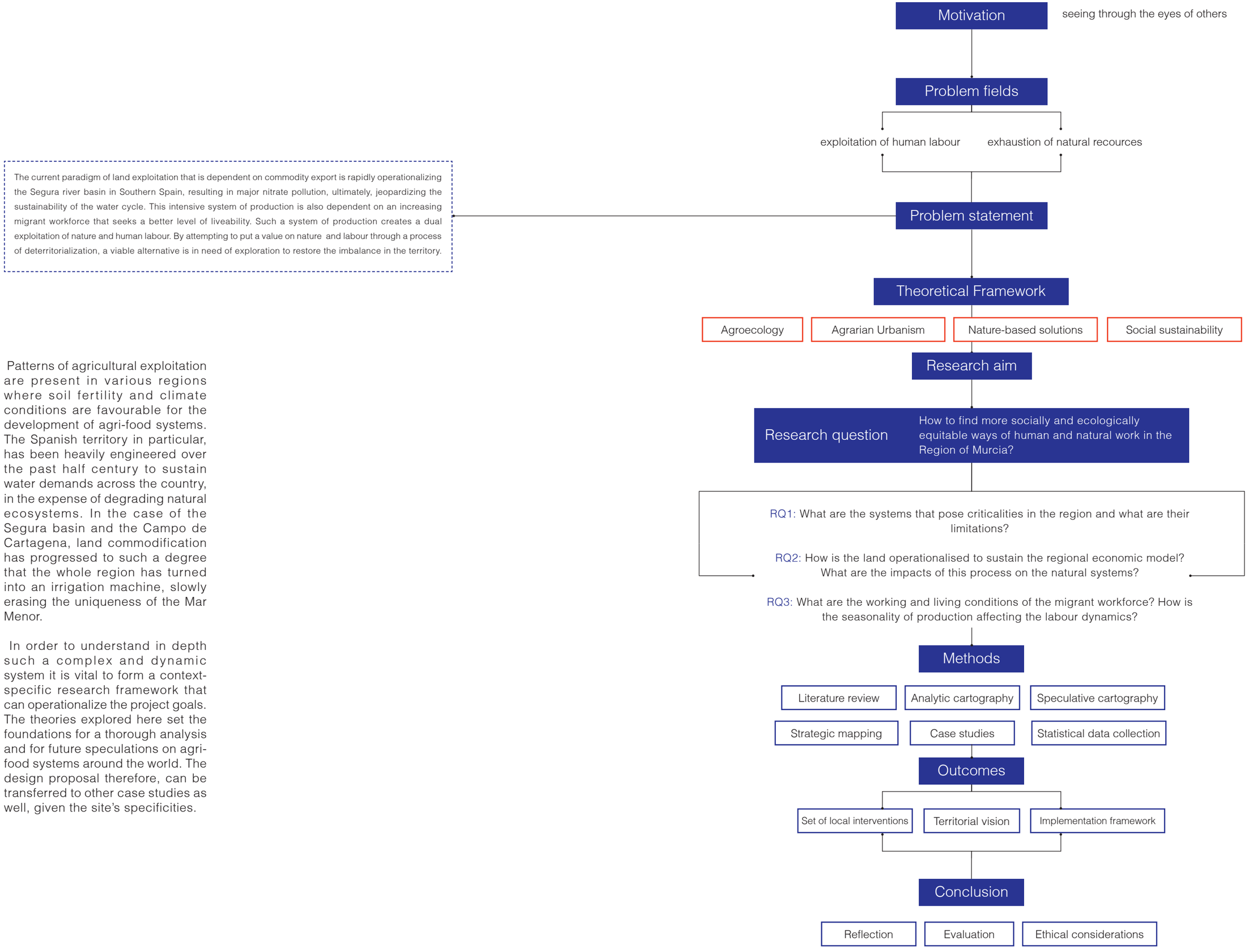


Fig.28. Data from Flow Monitoring Europe, figure by author, produced during the Projecting Urban Landscapes intensive Q1 course.

RESEARCH FRAMEWORK

Patterns of agricultural exploitation are present in various regions where soil fertility and climate conditions are favourable for the development of agri-food systems. The Spanish territory in particular, has been heavily engineered over the past half century to sustain water demands across the country, in the expense of degrading natural ecosystems. In the case of the Segura basin and the Campo de Cartagena, land commodification has progressed to such a degree that the whole region has turned into an irrigation machine, slowly erasing the uniqueness of the Mar Menor.

In order to understand in depth such a complex and dynamic system it is vital to form a context-specific research framework that can operationalize the project goals. The theories explored here set the foundations for a thorough analysis and for future speculations on agri-food systems around the world. The design proposal therefore, can be transferred to other case studies as well, given the site's specificities.



1

ACCUMULATION

LINES OF INQUIRY:

Matter

Topos

Habitat

Geopolitics



Fig.29. The current state of Los Nietos beach in Mar Menor. Photography: Pedro Martinez Rodriguez

Composition

The Association of Naturalists of the Southeast presented in March 1999 a Complaint before the European Commission for the possible non-compliance in the Region of Murcia of the Nitrates Framework Directive (91/676 / CEE). Directive 91/676 / CEE, of December 12, relative to the Protection of Waters against pollution produced by nitrates of agricultural origin, was transposed into the Spanish legal system by Royal Decree 26/1996, of February 16. The Directive obliges member states to identify bodies of water affected, to designate areas vulnerable to contamination by nitrates of agricultural origin, to draw up a Code of Good Agricultural Practices, to draw up action programs to reduce nitrates and to the issuance of status reports based on the periodic monitoring of water quality. The Directive aims, as its ultimate goal, to reduce pollution caused by nitrates of agricultural origin, which are the main cause of diffuse pollution that affects the waters of the European Union.

As a result of the ANSE's complaint, the Ministry of Agriculture, Water and Environment designated as a zone highly vulnerable to contamination by nitrates from agricultural areas to the Quaternary and Pliocene aquifers in the area defined by the eastern irrigable zone of the Tajo-Segura Transfer and the coastal sector of the Mar Menor. The nitrate accumulated for decades in the aquifer must exceed 300,000 tons, an average value of 244 mg/l, far from the 50 mg/l set by the nitrates directive.

What is a UDA? A UDA is "an irrigation zone that shares common characteristics according to the fundamental criterion of constituting a differentiable management unit, either because of its source of resources, because of its administrative conditions, because of its irrigation typology, because of its hydrological similarity, or because of strictly territorial considerations." (CHS, 2015).

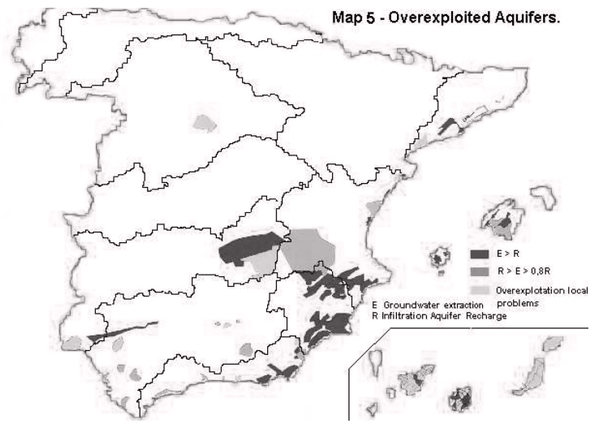


Fig.30. Overexploited aquifers in Spain. Source: Sumpsi and Varela-Ortega, 1999, retrieved from The Environmental Impacts of Irrigation in the European Union, Institure for Eurpean Environmental Policy, 2000.

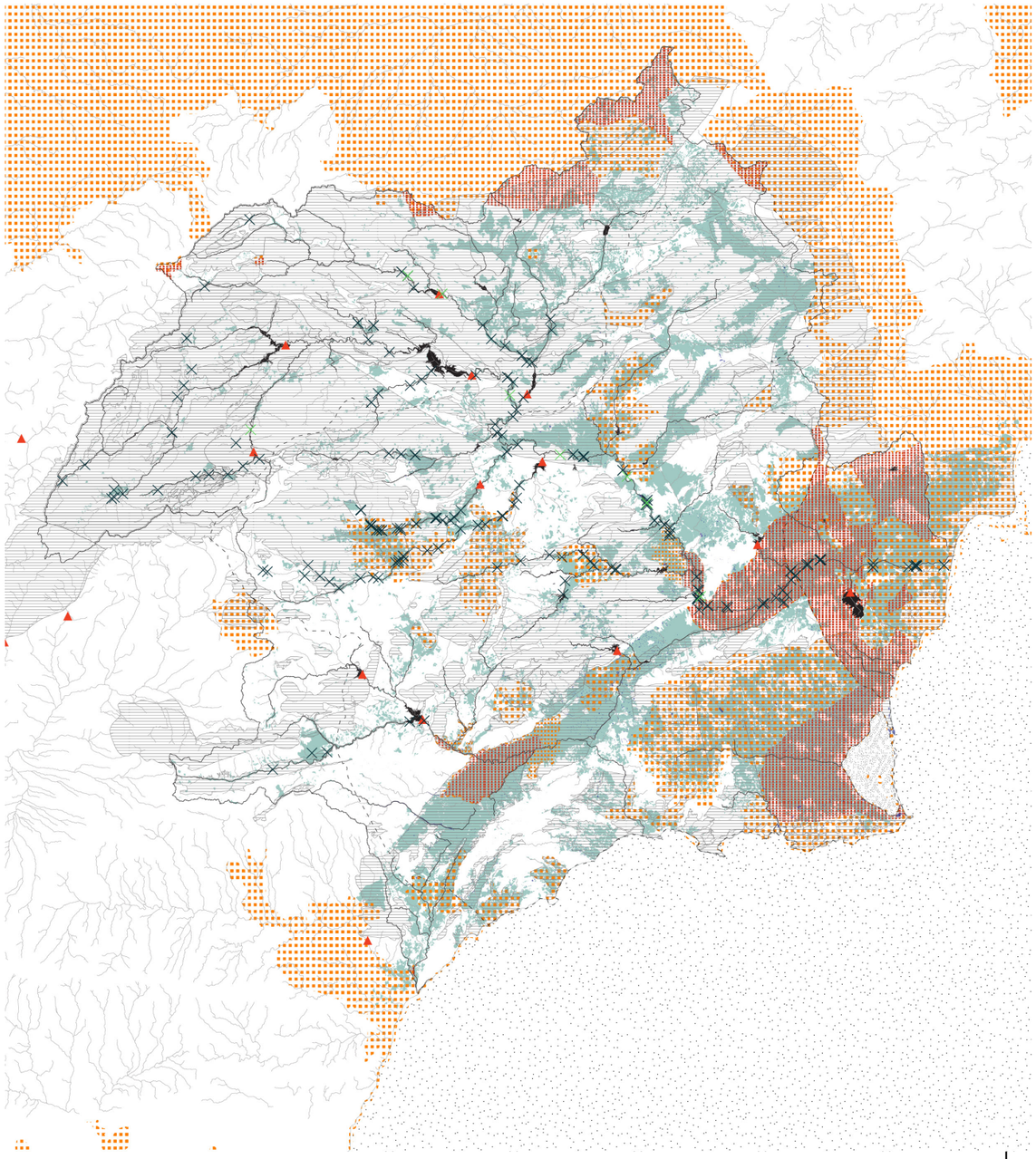


Fig.31. Nitrate pollution along the Segura river basin, main sources of contamination and hydrographic network.

Alteration

The issue with the Quaternary aquifer is that it is highly polluted by fertilizer nitrates which is a great threat to water masses since it literally fertilizes phytoplankton in such huge quantities that it no longer allows sunlight to shine through water. As a result, the water turns green as happened in the Mar Menor in 2016 and the seagrass beds, unable to photosynthesize, die.

Nitrates would be useful for irrigation but these Quaternary waters are also brackish since they come from filtrations of the Mar Menor to which the aquifer is connected, and so, they need to be mixed with others of lower salinity or processed in desalination plants to be suitable for irrigation. At the moment, the Quaternary aquifer is not the only polluted one according to documents by the Campo de Cartagena Association of Irrigators, where they request the reopening of drought wells closed in 2015, it is acknowledged that not only is the Quaternary aquifer polluted by nitrates because it is "under agricultural soil" but that the Pliocene aquifer is also already affected by nitrate pollution in some areas, "especially south of Torre Pacheco, in part due to the artificial connection of the two aquifers that is established through pumping wells. Wells were not properly drilled, piercing through the Quaternary without cementing the walls of the well, causing contaminated water to descend from the upper aquifer into the lower.

Eutrophication (nom. f.) Process by which nitrates fertilize algae and phytoplankton, causing their uncontrolled reproduction, preventing light from reaching the bottom of the lagoon. The water turns green and the seagrass dies.

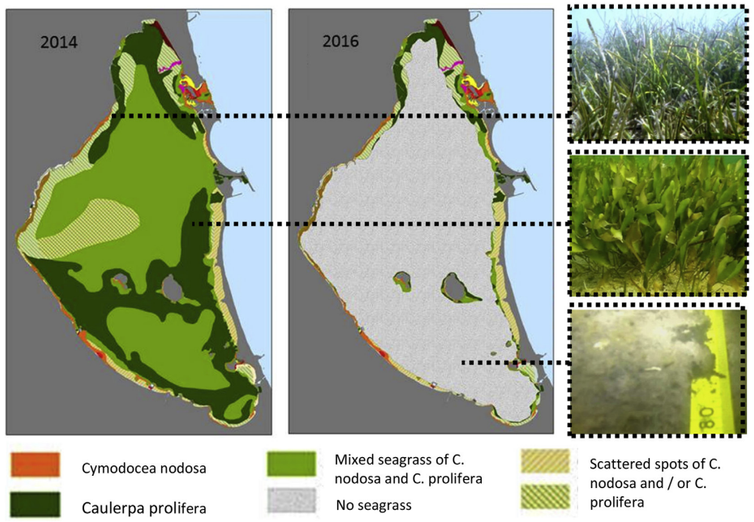


Fig.32. Seabed evolution of the Mar Menor from 2014 to 2016 and main seagrass species of the lagoon. Source: Spanish Institute of Oceanography (IEO) and ecologist association ANSE.

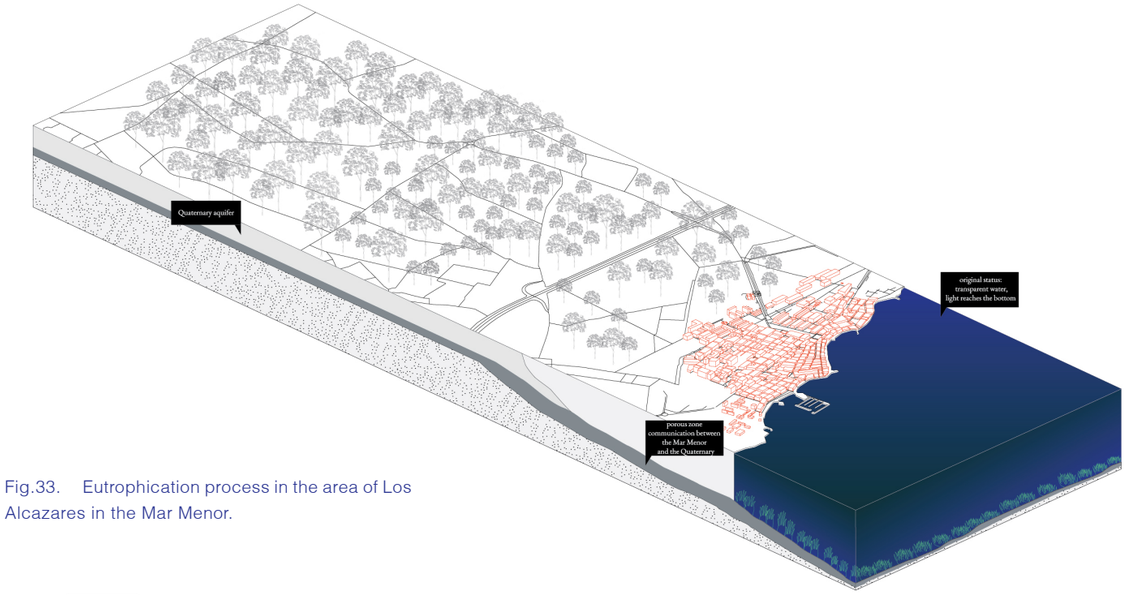
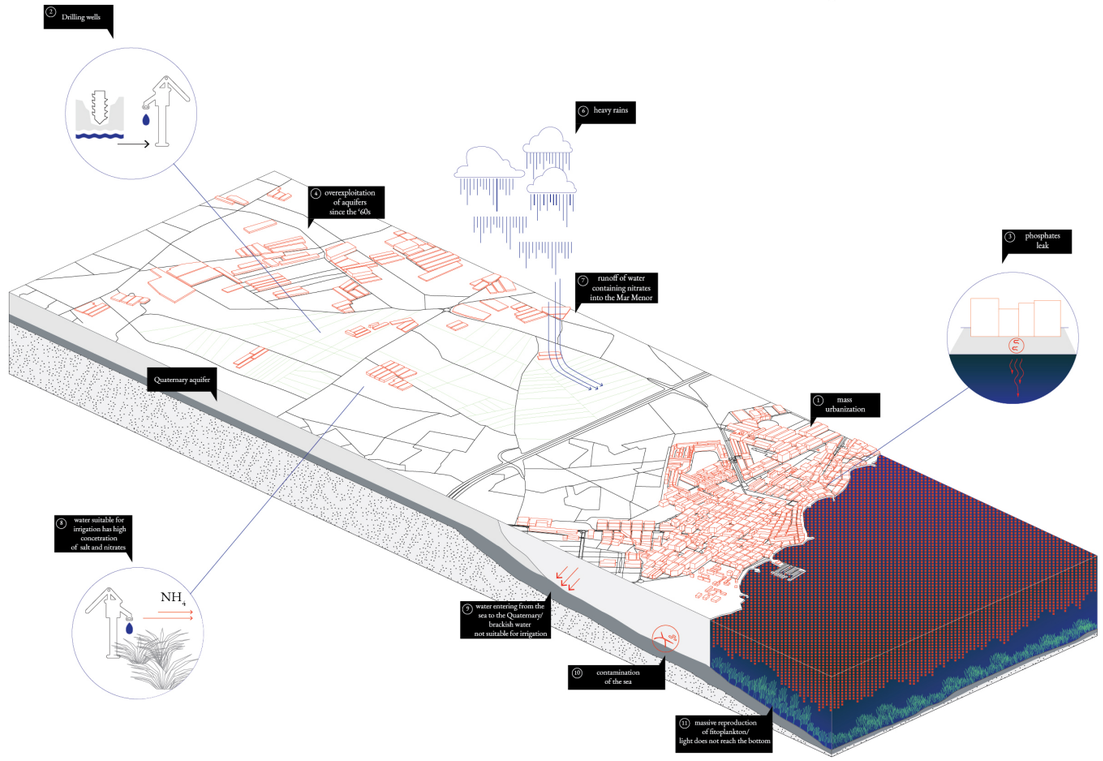


Fig.33. Eutrophication process in the area of Los Alcazares in the Mar Menor.



Limit

The Tajo-Segura aqueduct connects the Tajo and Segura basins, crossing the Guadiana and Júcar basins, in which it uses the Alarcón reservoir as a transit element. It transports the waters of the headwaters of the Tagus that have previously been regulated in the Entrepeñas and Buendía reservoirs.

The maximum volume that the Law allows to transfer is 600 hm³/year, which is used for supply and irrigation. The Law also authorizes the transfer of an additional amount to the Guadiana basin to supply water to the Tablas de Daimiel National Park and the populations of the upper basin.

Under normal conditions, the specific decision on the volumes and flows to be transferred in each semester corresponds to the Central Commission for the Exploitation of the Tajo-Segura Aqueduct, created in 1978 and made up of representatives of the management bodies of each of the basins involved. In exceptional hydrological circumstances, this decision is adopted by the Minister in charge of water matters, following a report from the Commission.

In accordance with the procedure approved by the Commission itself, the hydrographic confederations must prepare, before each meeting of the Commission, a status document that includes the relevant aspects for the common knowledge and exploitation of the Tajo-Segura Aqueduct so as to apply the exploitation rule.

> **-13000 hm³**
>
> Estimated reduction in groundwater reserves in the Segura Basin due to overexploitation.

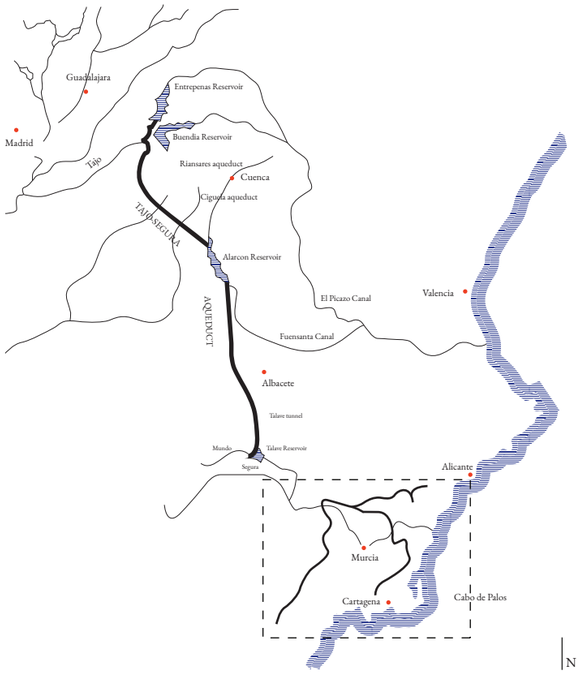


Fig.35. Diversion of water in the Tajo-Segura instructure network. Diagram by author based on map by CHS Segura.

Hyper-reservoir Entrepeñas & Buendia stock

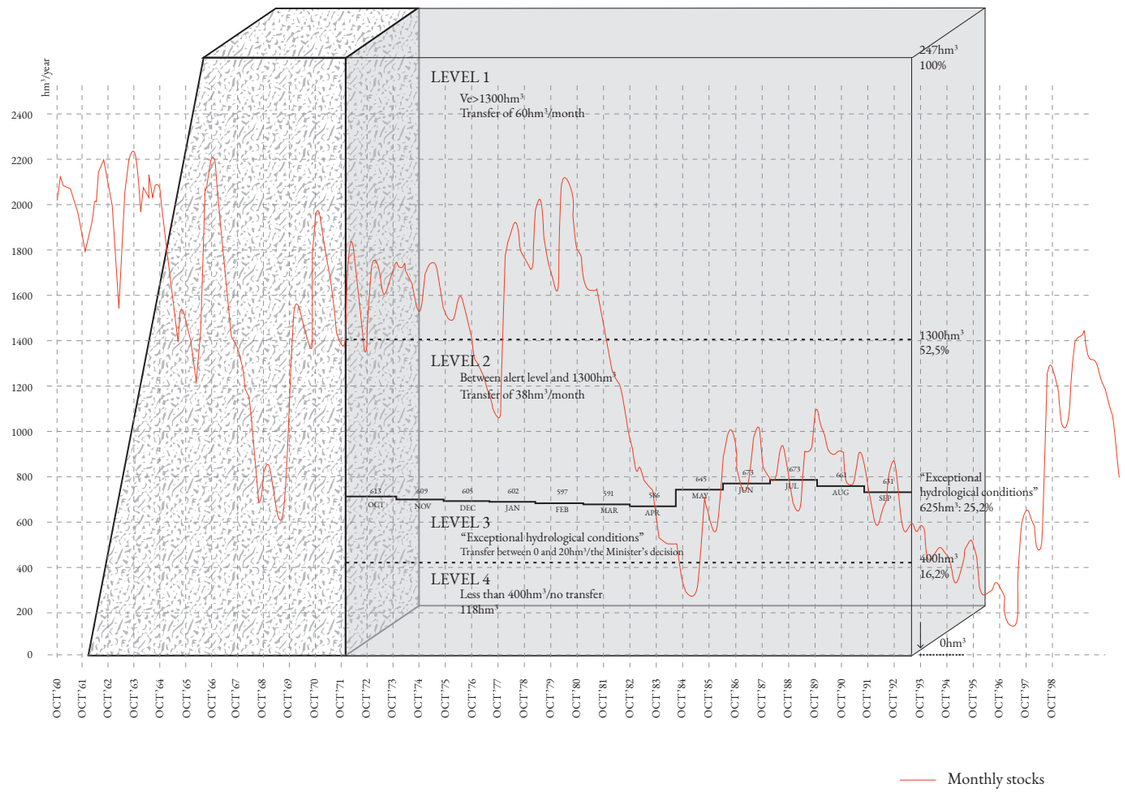


Fig.36. Exploitation rules of the Tajo-Segura transfer in the Entrepeñas and Buendía hyper-reservoir in relation to the monthly stocks of water from 1960 until 1998. Diagram by author based on data from the CHS.

TOPOS

Composition

The region called Campo de Cartagena is comprised of three main aquifers: the Carrascoy Triassic aquifer, the Victorias Triassic aquifer and the aquifer also called Campo de Cartagena. The latter, is an aquifer consisted from several layers that materialized during distinctive geological periods. Its deeper layers are facing a significant issue of overexploitation caused by farming activity that has been looking for water at plunging depths for decades through the construction of multiple wells. The upper layer on the contrary, the one formed during the Quaternary period, is the one connected to Mar Menor but does not have a similar issue of water availability but is facing a different situation. Seawater intrusion and the discharge of filtered irrigation water that has increased ever since the Tajo-Segura transfer, on top of intense torrential rains, have increased the water table to the point that water emerges on to the ground at times.

The hydrogeological functioning of the aquifers that make up the Campo de Cartagena aquifer is complex due to its geometry and high degree of anthropization. The sedimentary fill of the aquifer is mainly composed of detrital sediments (marl) with intercalations of highly conductive material (limestones, sandstones and conglomerates), which were deposited in the period between the Tortonian and the Quaternary. The sands and conglomerates of the Tortonian, the limestone of the Messinian and the sandstones of the Pliocene make up the deep aquifers, while the detrital sediments of the Quaternary constitute the surface aquifer. The regional hydrogeological system is a multilayer system composed of (Aragón et al., 2009; ITGE, 1993, 1991; Rodríguez Estrella, 1995):

- the shallow aquifer of Quaternary age, composed mainly of sands, conglomerates and sandstone with intercalations of silts and clays,

- the intermediate confined aquifer of Pliocene age, called Loma Tercia, composed mainly of sandstones,

- the deep confined aquifer of Messinian age, called Venta la Virgen, also composed of sandstones, and

- the deep confined aquifer of Tortonian age, composed of sands and conglomerates.

The aforementioned main aquifers are separated by low or very low conductivity aquifers: the Quaternary and Pliocene aquifers are separated by marls and evaporites. As can be seen in the section on p.41, the Quaternary aquifer is separated from the Pliocene aquifer by a low conductivity aquifer more than 40 m thick. The thickness of the aquitard decreases towards the edges of the basin, especially towards its southern edge, which could give rise to hydraulic communication between the free Quaternary aquifer and the confined Pliocene.

For the number of wells the study by Intecsa-Inarsa SA (Estudio Específico de Afecciones sobre la Red Natura 2000 de la autorización de extracción de aguas subterráneas en la zona regable del Campo de Cartagena) was used, 253 in total. However, other sources state that there might be up to 1,600 wells and boreholes in the area.

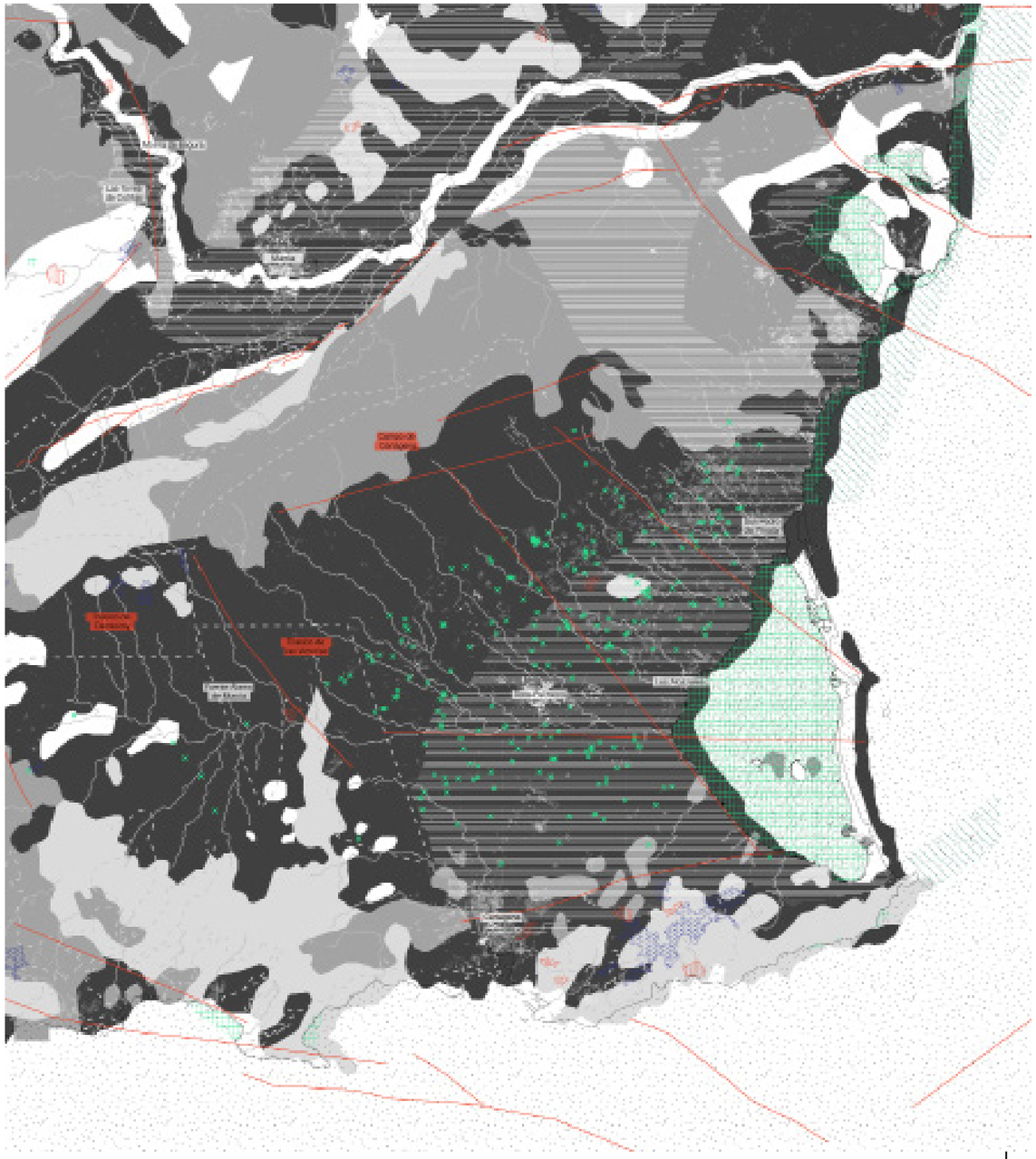


Fig.37. Geological and hydrological conditions in Campo de Cartagena.

Alteration

Groundwater in Spain is theoretically protected since the 1985 Water Law was passed, classifying such a resource as public property for the first time. However, in the Segura basin the reality is that more groundwater is exploited than nature can replenish, a fact that is known for decades. According to the definition given by Pulido (2001), overexploitation is produced when the quantity of water extracted from an aquifer is much greater (more than double) than its pluriannual recharge. The negative externalities on the physical and biotic environments refer to a notably long period (25 years 10 for South-Eastern Spain), so as to differentiate it from a period of drought (4 to 5 years). This continuous pressure makes it hardly possible to return to the original state of equilibrium. The fundamentally distinctive characteristic is a continuous fall in piezometric levesl (Rodriguez-Estrella, 2004).

The amount of water that is pumped out in the area is a question that cannot be answered with certainty, even the CHS is in position of answering it. There is currently no quantification of the direct meter numbers and not a digitization of all the current rights. The CHS currently recognizes it in incapable of managing what it does not know, claiming that vast majority of irrigable land rights applied before 2002, therefore, there is lack of information.

Years of drought led the CHS to authorize the extraction of brackish water, its desalination and use for irrigation in 1994. The Board decided to issue temporary authorizations stating that the titles should not exceed a period of five years. However, the CHS neither renewed those nor issued new ones, and inevitably, illegal actions took over for years. According to one of the water commissioners there might be up to 900 desalination plants in Campo de Cartagena. In 2009 there was an attempt to regularize these infrastructures and CHS hired the informatics company SETECO to create an inventory of all desalination plants and wells. Years after the inventory has not been made public nor did the legalization happen because of the pressure they received from the irrigators.

In the farms owned by G'S group, a British irrigation multinational, two desalination plants were found that expelled brine with nitrates into the brine pipeline and from there to the Albujón creek, with an estimated total discharge to the Mar Menor equivalent to 316 Olympic swimming pools. The discharge from INAGRUP S.L., 64 swimming pools, Ciky Oro, 555 swimming pools. Vanda Agropecuaria, 246 swimming pools. Most of those constructions had a high degree of sophistication in their concealment, from vehicle-installed desalination plants to large underground installations hidden by mobile ramps, to a plant that was powered by the battery of a buried tractor to hide any hints that external electrical cables could provide.

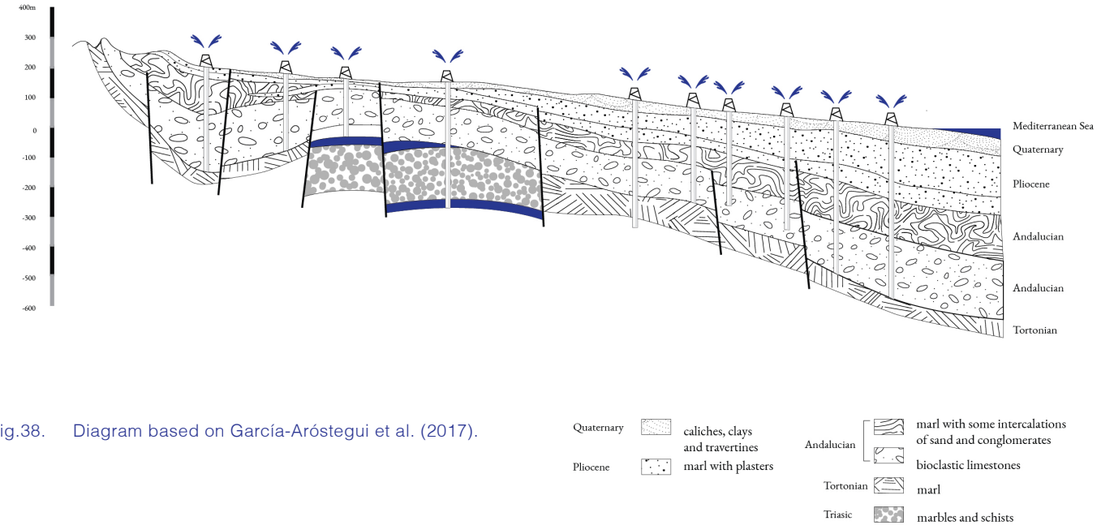


Fig.38. Diagram based on García-Aróstegui et al. (2017).

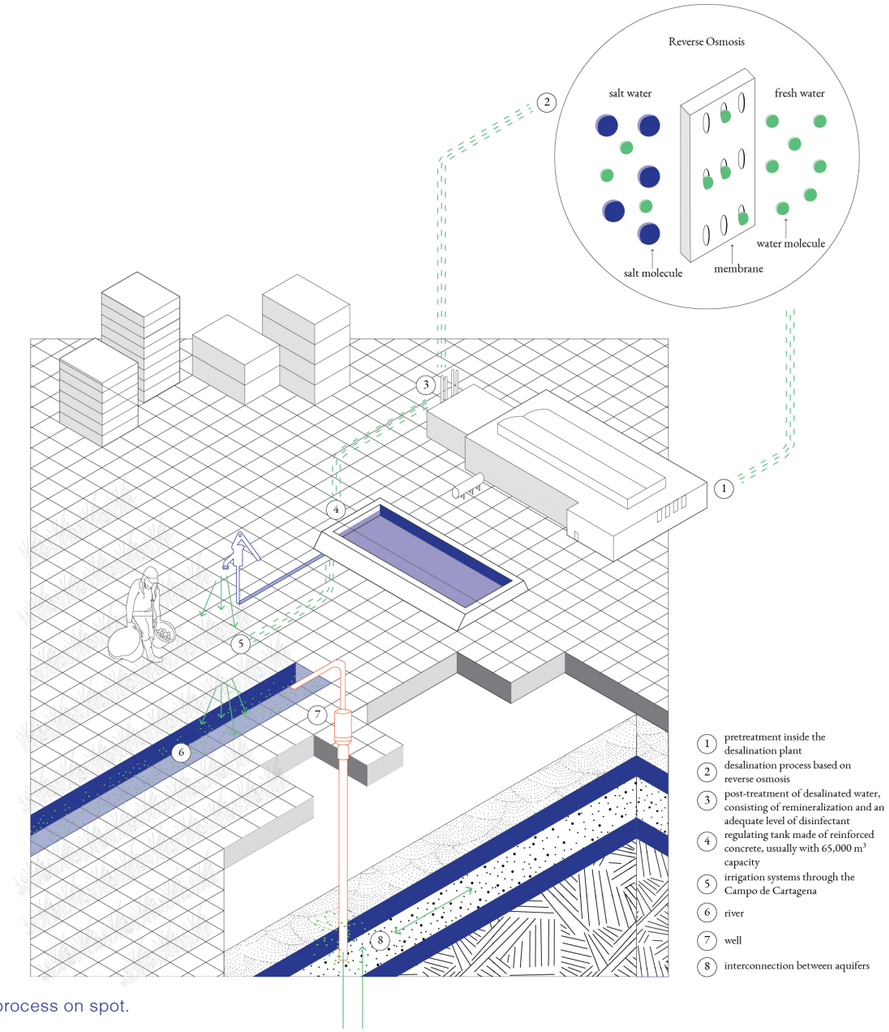


Fig.39. Desalination process on spot.

TOPOS

Limit

Residents in South-Eastern Spain faced a terrible catastrophe during the September of 2019. What is known as *gota fría* (cold front) resulted in the loss of eight people and about eight hundred people rescued from their flooded houses or vehicles. Crops were lost, streets turned into canals, waterfalls were coming out of houses, people clinging to trees to not be dragged by the force of the water.

Gota fría is the name given to a meteorological phenomenon which can cause severe flooding, manifesting particularly in the South-East of the country along the Mediterranean sea and usually occurs during September or October. It is a particularly violent storm in which huge columns of clouds rise to an altitude of up to ten kilometers before discharging their water in torrential downpours.

The warmer the water in the Mediterranean is the more likely it is for such a storm to happen. For it to unfold, unstable air is required at low altitudes in combination to cold masses in the troposphere at altitudes of 5 to 10 kilometers. Due to the warmth of the sea, a a large quantity of warm vapour is produced, and when that happens, it comes in contact with low pressure areas or cold fronts, and the instability in the atmosphere increases the higher it goes. The vapour then rises, carried by this upward airstream, and condenses when it hits the cold air, forming a cloud.

A *gota fría* is usually localised, affecting a small area while adjacent towns might not experience a single drop of rain. The damage caused by these rainfalls is not limited precisely to the area where it rains, and that is because of the nature of the landscape. The mountains in this region are steep and rocky rather than covered in soil, resulting in almost all of the water to transfer onto lower ground instead of being absorbed by the soil.

As water runs off the fields of Campo de Cartagena it carries with it large quantities of nitrate and phosphate contaminated soil, while the arrival of enormous amounts of fresh water into the lagoon decreases the salinity of the water. After the 2019 storm, an “anoxic” water layer was formed (lacking oxygen), resulting in tons of dead fish washing up on the shore of the Mar Menor.

Such phenomena underline the urgency to undertake measures that would protect the natural resources, tackling problems at their source, which is the unsustainable farming practices in the region and the overdevelopment of towns along the coast that have altered the landscape.

Ramblas: The meaning of the word in South-Eastern Spain is much different than in Catalunia. A rambla is considered a dry river-bed or floodwater channel. In some parts of Spain, municipalities have allowed individual to build houses next to ramblas, exposing themselves to danger in conditions of heavy rainfall.

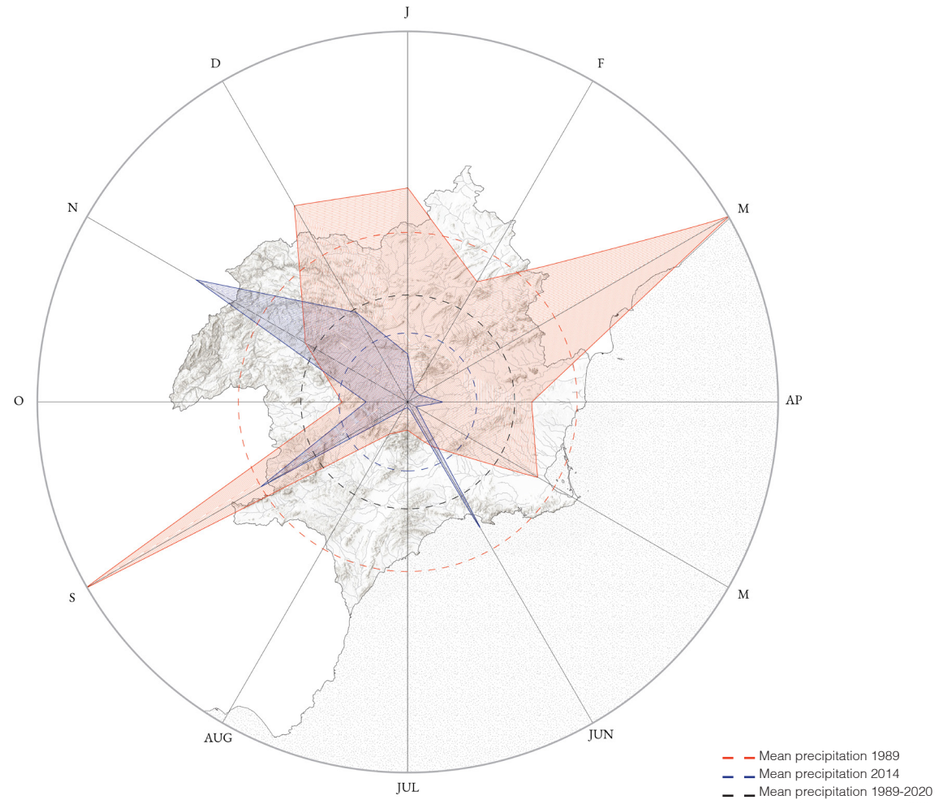


Fig.41. Precipitation values 1989-2014 and peaks.

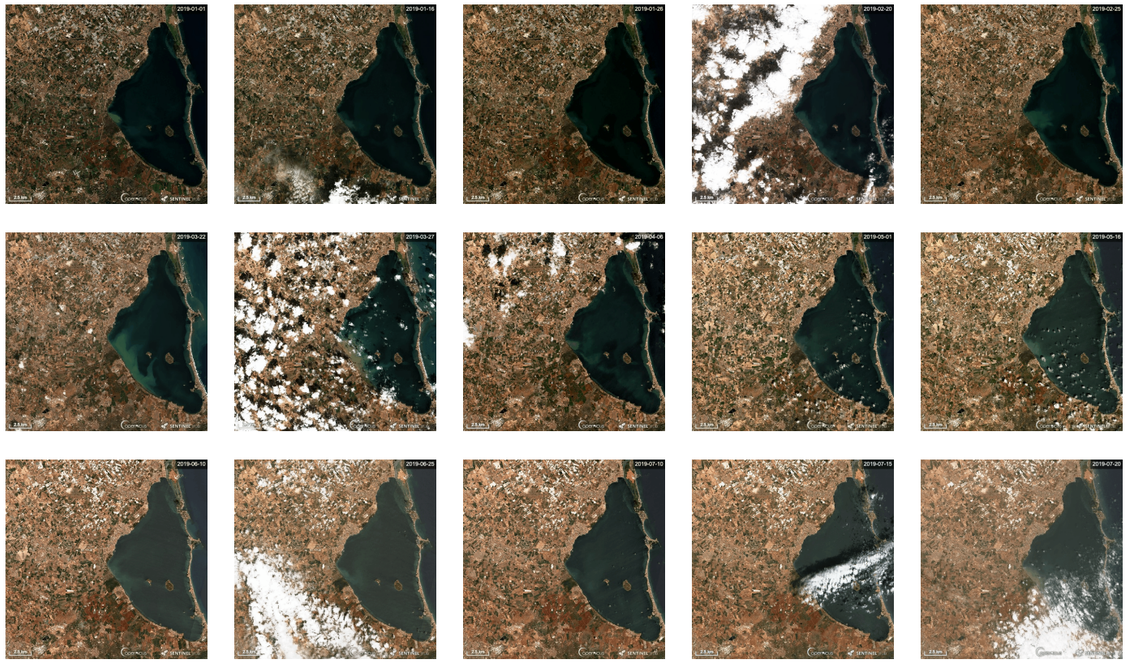


Fig.40. Timelapse showing the Mar Menor between January and September 2019. Continuous floods can be observed at the mouth of the Albujón creek. / Copernicus - Sentinel Hub

Composition

From the late ‘80s to the late ‘90s, immigrants, and mainly Moroccan men, started settling in the agro-exporting municipalities of Campo de Cartagena. At the beginning of 2000 the migratory flows diversified, with Ecuadorians making their entrance into the workforce, who unlike Moroccans, migrate both with men and women. Over the last 20 years, the area has been supplied with flexible labour through the implementation of a series of temporary migration programs (TMPs) which have been combined with the employment of irregular workers and, more recently, with the rise of “private” programs run by local companies. The presence of migrants throughout the region was increased given the growing diversification of migrant work that is no longer present solely in agriculture, but also in construction, and services.

In employment terms, the irregular workforce comprises domestic and hospitality workers, rural labourers, construction workers and the self-employed, mainly street vendors. The rapid growth of tourism in Murcia since the ‘90s along the coast at resorts such as La Manga has increased the demand for the foreign labour that currently consists the majority of the employees in the restaurants, cafes and bars. Employers often hire *sin papeles* (undocumented foreigners) due to the fact that experienced Spanish cooks, waiters and cleaners leave the region in search of higher wages elsewhere.

An important issue that is workers are facing is employment discrimination. During the varous stages of the labour-market process, most notably during the selection and recruitment, employees display their ethnic preferences that affect the wages structure. In the Spanish context, segmentation usually occurs by the type of work. Within the limited range of jobs that are available to them, each ethnic group has gravitated towards a particular sector or activity. North Africans, for instance, have a clearly defined niche as unskilled, manual agricultural labourer and construction, Ecuadorian women are primarily involved in domestic work and street-selling while the men work in farms, and Asians are usually preoccupied with commerce. Employers tend to prefer particular nationalities because they are perceived to be cheaper and more docile.

Mazarron is the municipality with the highest proportion of foreign neighborhoods, 42.67%, followed by Fuente Alamo, 31.24%, and Torre Pacheco, with 24.62%, where non-EU migration is the vast majority. Murcia and Cartagena, combining intensive agriculture and tourism, show a below-average but significant proportion of foreigners compared to the cases of agricultural municipalities such as Mazarron and San Javier.

On a municipality level, the evolution of the insertion of new residents can be synthesised as a process from the pedanías (districts), the first place of settlement, to the a greater presence in urban centers. This trend is evident in the agro-exporting municipalities and in the cities and towns with greater economic diversification.

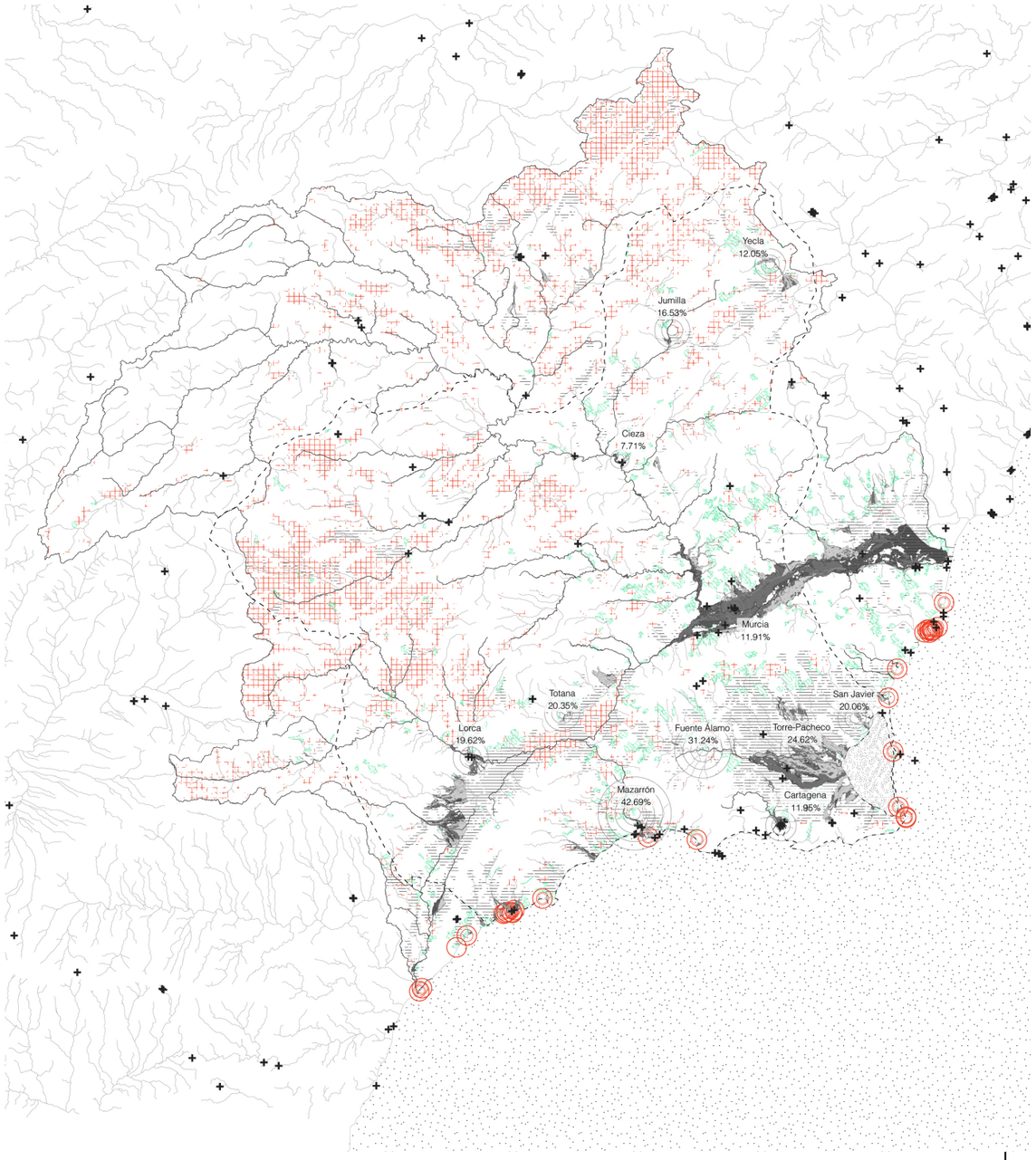
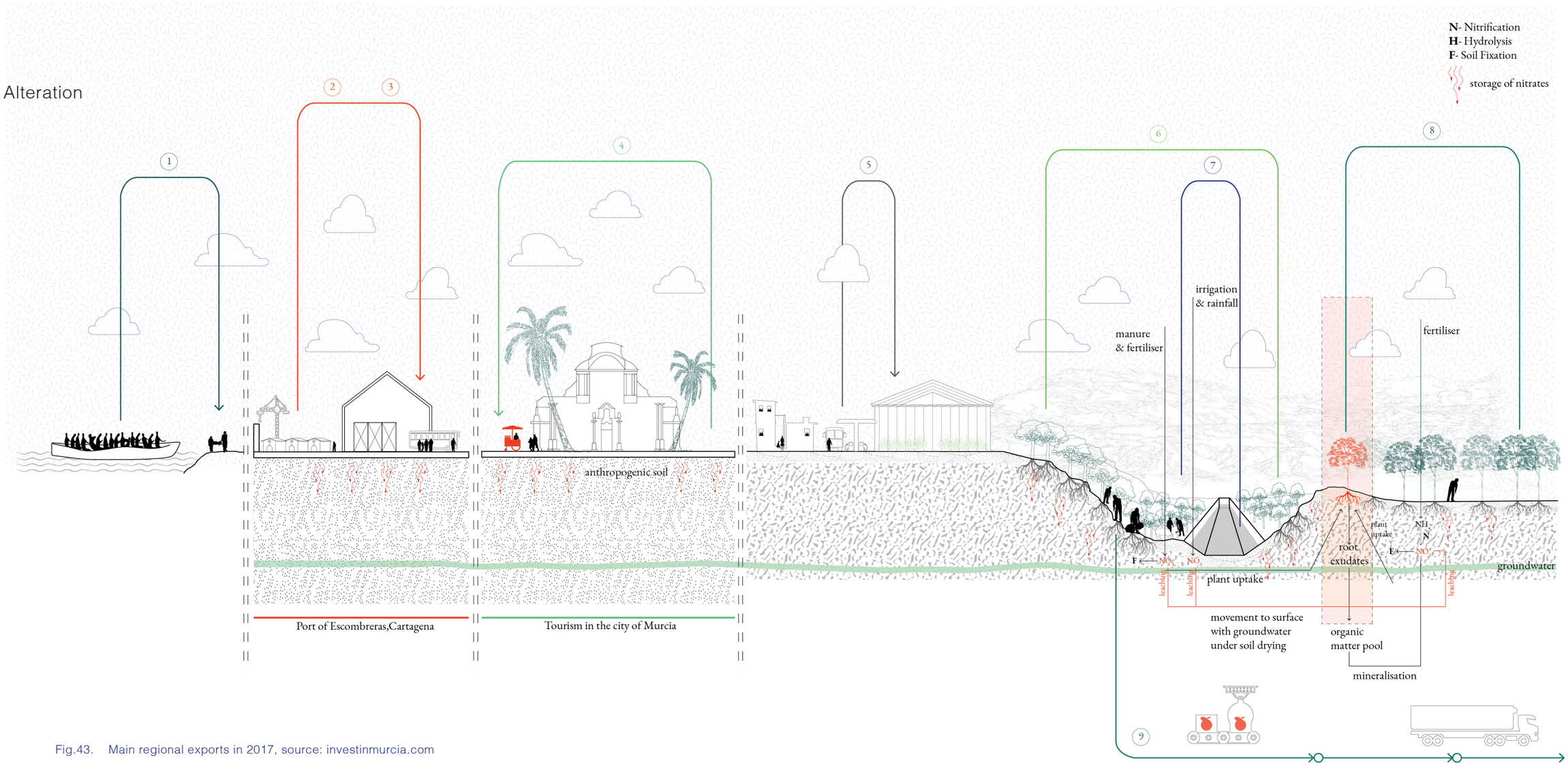


Fig.42. Habitation patterns and risk factors.

Fig.44. Metabolic section.



HABITAT

Fig.43. Main regional exports in 2017, source: investinmurcia.com

PRODUCT	Tonnes	%over worldwide total	%over total EU	%over total Spain
Apricot	11,972	4%	9%	37%
Cauliflwer & broccoli	192,727	17%	30%	66%
Lettuce & chicory	483,004	27%	44%	72%
Melons	172,252	8%	30%	46%
Grapes	76,386	2%	7%	54%
Lemons and limes	307,503	12%	42%	64%

1 Various NGOs provide humanitarian aid at the ports of the region where hundreds of people arrive daily.

2 Emergency shelters are provided at the Port of Escombreras for the reception of refugees and migrants. The regional government has started building a 3.8million€ Temporary Care Center for foreigners (CATE) in a high risk area next to the navantia shipping yards and an active military base, which will not a permanent solution either.

3 The port authorities and the Guardia Civil officers transport the immigrants by buses to potential homes provided by NGOs in the adjacent municipalities. Not everyone has the luck to be admitted in one of those.

4 Tourism is a major source of income for the region. Immigrants are employed in the catering industry, in hotels, cafes etc. but they also end up selling products as street vendors in many cases if they fail to acquire legal documentation.

5 Immigrant populations form their own communities in locations where housing is degraded but cheap. Overcrowding is a reality for many. Farm owners or companies orchestrate a system of pickup and transport of the workers to the greenhouses or the fields on a daily basis, usually with vans or buses, using gas stations and other sites as meeting points, just outside the outskirts of the city.

6 Traditional rainfed agriculture has largely been replaced by irrigated fields where work is being paid by the piece and not by the hour.

7 The aqueducts that transfer the water from the reservoirs to the fields are the highest-praised infrastructure for the region. Regulating the water flow is, in fact, a political issue that raises conflicts between different autonomous regions and authorities.

8 The fast pace that is needed for the production and distribution of agricultural products leads to an intensity that is making use of chemical fertilizers and machinery to sustain the production, with devastating impact on the environment.

9 After the harvest of the vegetables and fruits, the processing and packaging of products are done in nearby processing plants. Λogistics accounts for 4% of the regional GDP, 22.06% of employment and 4.2% of job generation.
The products are then transferred via refrigerated trucks to the port of Cartagena, the second highest growing port of Europe, where their distribution to the rest of Europe starts.

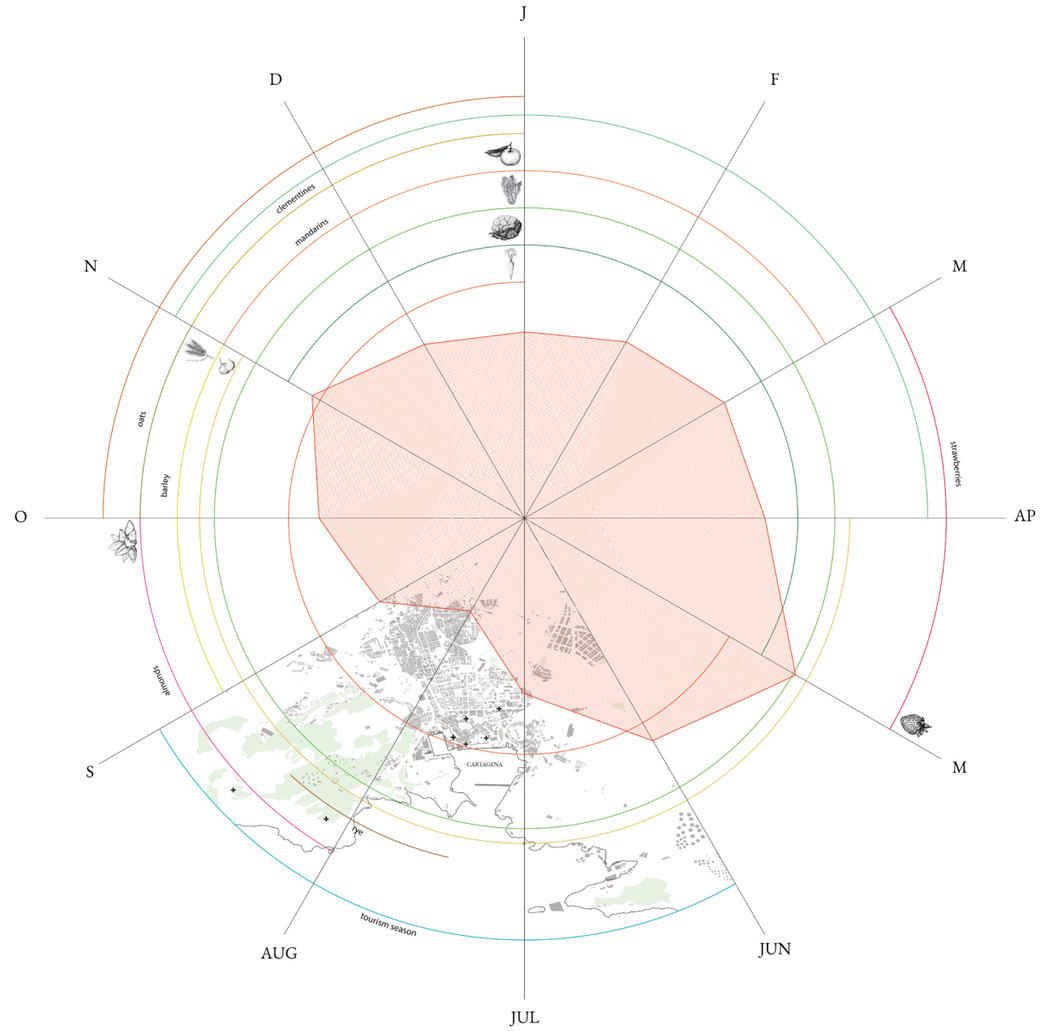
Limit

The Region of Murcia holds a tradition as an authentic orchard in which the most varied species of vegetables are cultivated. Lettuce, broad beans, peppers, tomatoes, aubergines etc., are products whose importance is not only economic, since their trade plays a fundamental role in the regional economic fabric, but also represents the cultural identity of the Murcian community. Most of the vegetables that we can find in the region have their origin in Asian regions, the Middle East, southern Europe and North Africa. The climate has favored their introduction in the region, as it is a zone with mild temperatures in winter and little or moderate rainfall that give these products a particular physiognomy and flavor.

In the last decades of the 20th century, crops in many areas changed from extensive rainfed agriculture to irrigated agriculture, while new intensive production in plastic greenhouses *(internaderos)* also spread, which led to an increase in the production of new products such as lemons, oranges, peaches, apricots, cotton etc. Modernization along technological innovations and new forms of production transformed the primary sector into what has been described as “post-Fordist agriculture” (Pedreño,2002). As a result, large scale agro-business, comprising three-fifths of Spain’s food processing industry, became a feature of the regional economy diruing the ‘90s.

Paradoxically, a number of agricultural employers manifest warnings about a surplus of workers ran parallel to the persistent complaints about seasonal labour shortages in hotels, transports, metals and construction. In the agricultural sector, once the workers are in possession of valid papers legalizing their residence in the country it is quite common for them to abandon the sector and leave the region for good.

High unemployment can in fact coexist with labour shortages given the uneven demand for labour caused by seasonality and weather dependency, demand can vary from month to month, as shown in the diagram p.51. In addition to the unpredictable flows of migrants seeking work, the situation is becoming extremely fluid. For this reason, employers express their preference for a system that would be able to respond to rapid fluctuations in demand.



Contracts of workers occupied in the agricultural sector in the Region of Murcia in 2020.

Fig.45. Agriculture employment contracts and seasonality of production.

Composition

The portion of the population that sees migration as a serious problem is reflected upon the vote during the last general elections held in 2019. The Region of Murcia has become the first community where Vox, Spain's far-right populist party, is the most voted force . The extreme right won three seats in this community with 10,000 votes more than PSOE or PP. Indeed, the difference between the results of the regional and municipal elections with the general ones is great, and the reason must be sought in the migrant vote, or rather the absence of it. Taking into account that the ideology of the extreme right finds in the rejection of immigration one of its great pillars, it could be said then that the more immigrants there are in a municipality, the more voting potential the extreme right has. This does not mean that the high percentage of votes for Vox is explained solely by immigration, but is also affected by a number of reasons, such as the deep rural cultural context, the disaffection with politics, the Spanish patriotism in response to sovereignty challenges, and so on.

In Torre Pacheco in particular, Vox obtained 38% of the votes, exceeding 45% in some schools, in contrast to the last local elections, where the Torre-Pacheco Independent Party (PITP) won, with Vox obtaining three councilors out of 21 and barely 1,600 votes, only 30 more than the PP, and that is because of the lack of voting rights for immigrants on a national level. "What this vote is saying is clearly that we want immigrants, but without citizenship rights, that is, we want a type of worker who does not make demands on us in terms of labor or social rights," according to Andrés Pedreño, professor of Sociology and deputy for Podemos.

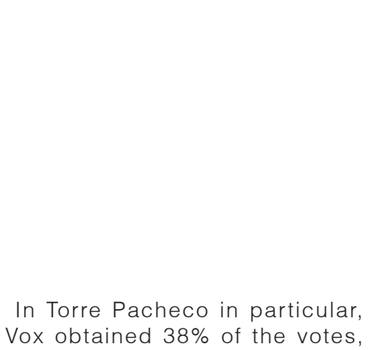


Fig.46. Graffitis at the entrance of Torre Pacheco.



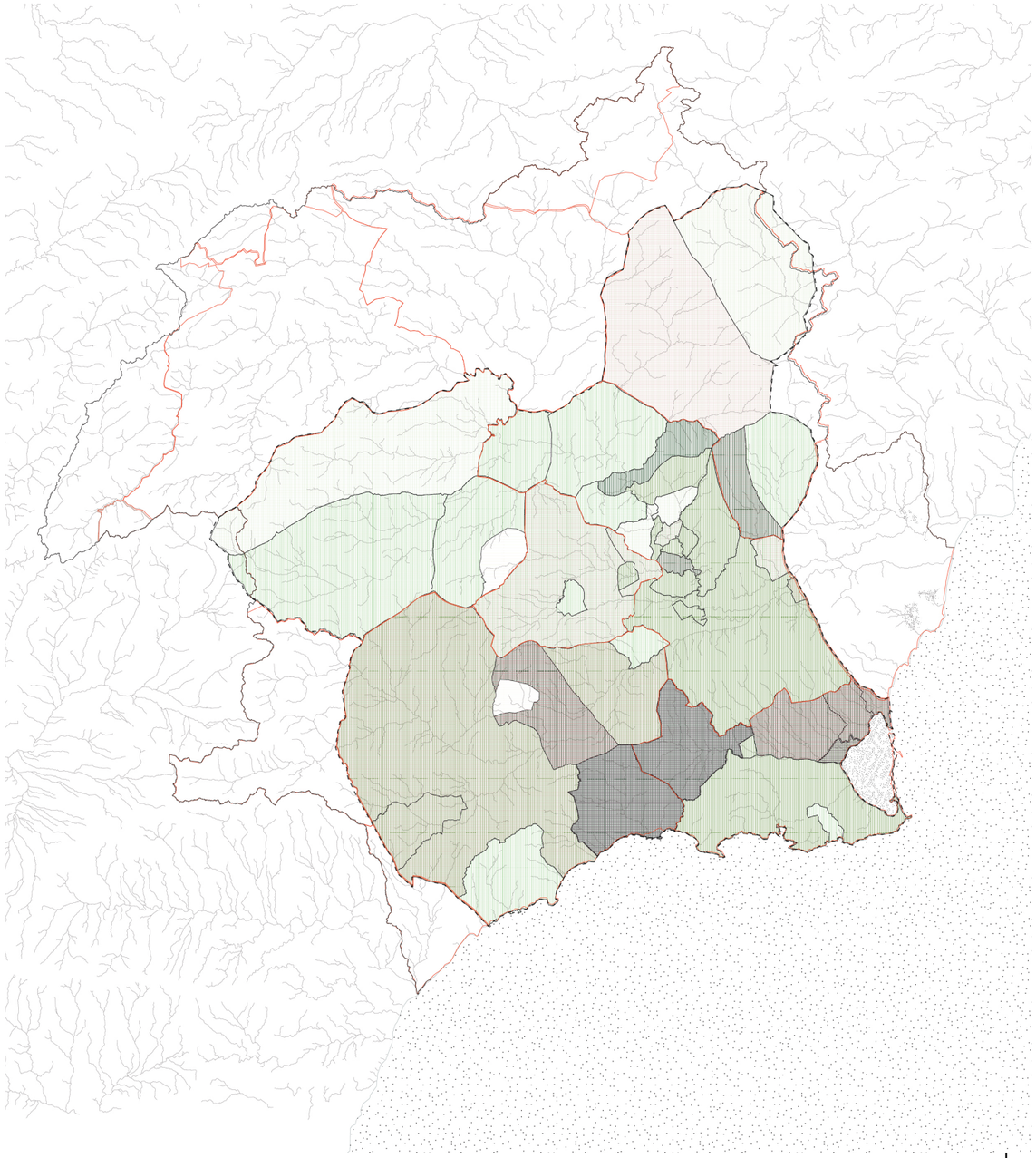


Fig.47. Immigration percentages and political vote in the region of Murcia.

Alteration

Murcia, with a 14% foreign population, has seasonal agriculture that provides work almost twelve months of the year; This makes many immigrants prefer to live in the region over other agricultural areas of the country. The days of farm workers usually consist of between 13 and 15 hours a day, including transportation, since day laborers often have to travel to destinations such as Albacete, Alicante or Granada. In addition, they work mostly by piecework, that is, they are paid by the number of pieces collected and not by the hour - a worker can collect up to 2,000 lettuces a day, for example, while the piece is paid at 0.046 euro cents.



Fig.48. Moroccan bakery in Torre Pacheco.

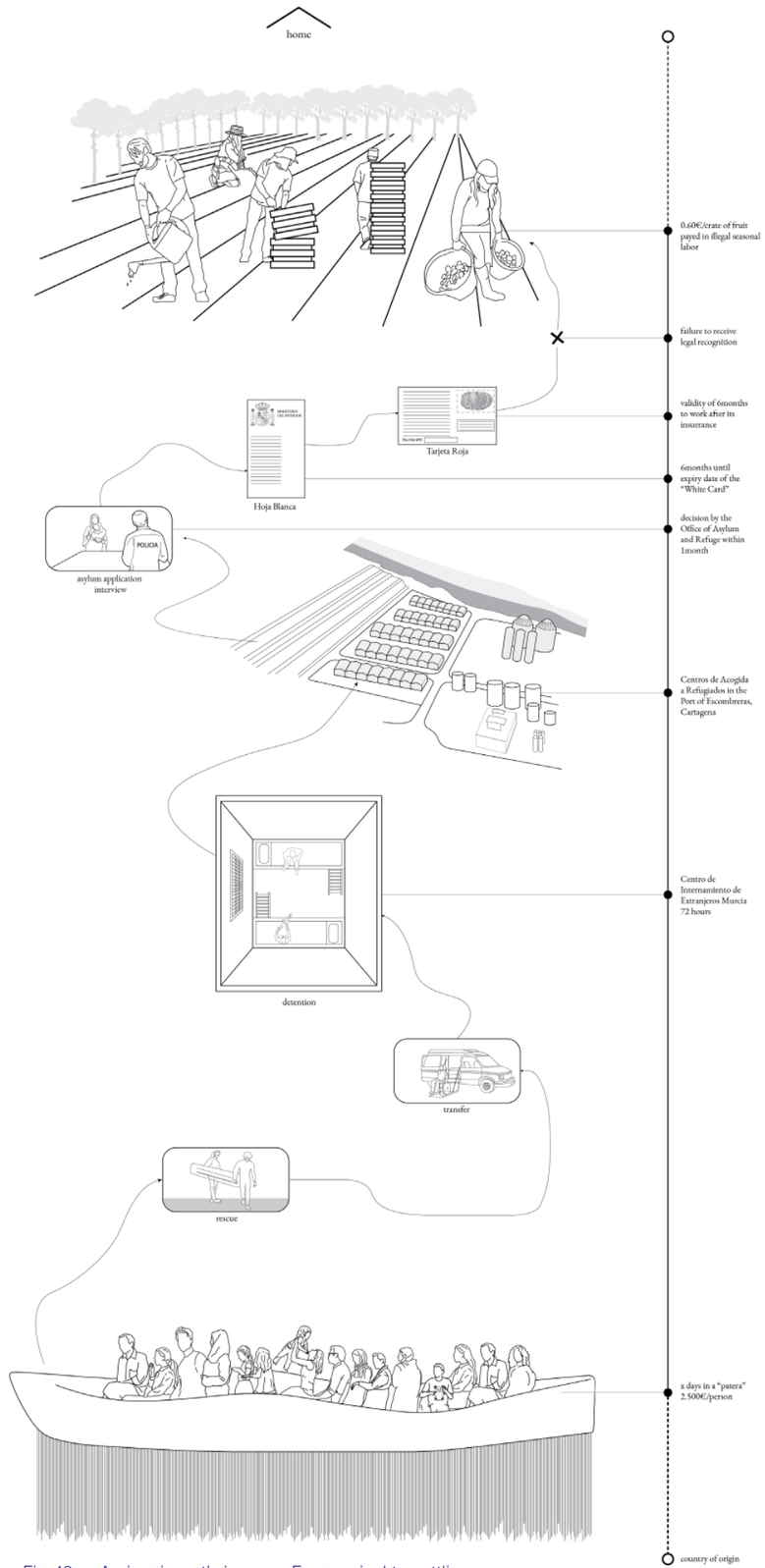


Fig.49. An immigrant's journey. From arrival to settling.

Furgonetero: literally, a person who drives a van, i.e. the recruiter/transporter.
Enganchadores: literally, the one who hooks, i.e. the recruiter.

Limit

As the demand for seasonal workers has increased over the years, employment agencies have played a central role in the restructuring of work practices and labour intermediation. In the Murcian agri-food industry there are two important periods in the organization of the labour regime: firstly, the '90s,which saw the expansion of the *furgonetero*; and secondly, the years after 2000 during which the temporary employment agencies (TEAs) have grown their influence. Traditionally, the *furgonetero* is the person responsible for recruiting and transporting the day workers and who often takes the role of supervising their work and paying them.

The *furgonetero* is a mode of intermediation that implies a great deal of control over the labour market and recruitment networks. They control the contact information with agricultural companies and they know the local workforce and their availability. They are generally migrant workers who have been working in agriculture for a longer period than others and who maintain good relationships with farm owners.

The TEAs were created in 1994, as part of a framework of institutional reforms that permitted the business sector to develop flexibilization strategies for the organization of work. In Murcia the speed at which tTEAs have played a role in the labour market reflects the fact that ehy have taken over the function that was previously provided by the *furgonetero,* and before that by the *enganchadores.* The TEAs are playing a fundamental role, not just in the ethnic segmentation of the agri-food labour force but also, in the increased use of temporary work and rotation of foreign workers, a phenomenon that was already highlighted by authors in the mid 2000s and which intensified during the recent financial crisis.

By specializing in the recruitment and mobilization of workers, TEAs based on Murcia not only supply labour to firms in the region but in other European countries as well. Terra Fecundis is the most important company, that not only hire temporary workers to farms or processing warehouses, but also maintains a large number of labourers on permanent part-time contracts, who can be moved around the Europeann countryside within hours, like boxes of fruit. The company also provides a number of services, like legal representation on migration matters, money transfer servicecs, even the selling of homes in countries of origin.

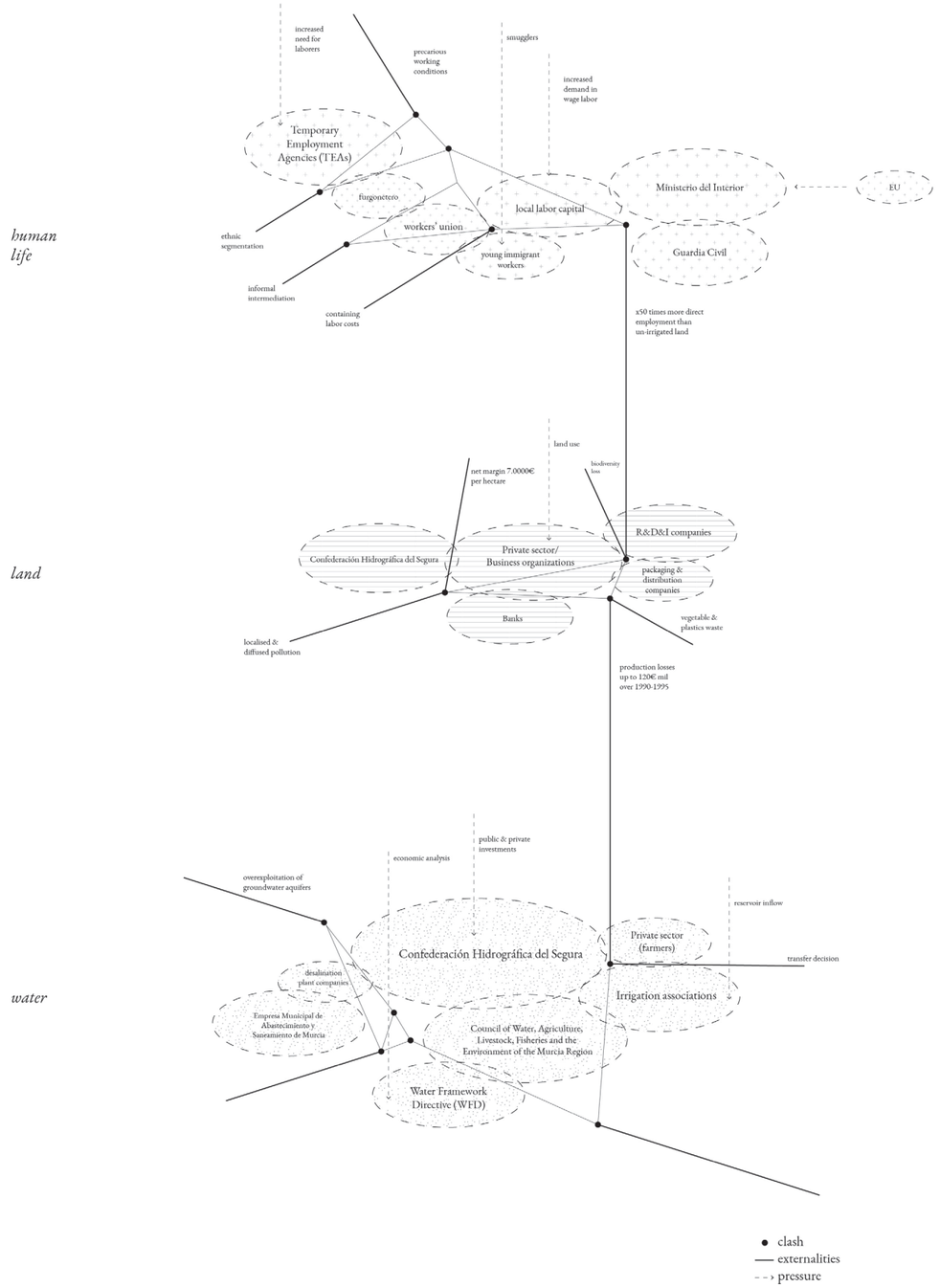


Fig.50. Employment processes and actors of power.

**furgonetero: literally a person driving a van, the recruiter/transporter that greatly controls the market and the recruitment networks*

2

CLEARANCE

LINES OF INQUIRY:

Matter

Topos

Habitat

Geopolitics

"Words are like empty balloons, inviting us to fill them up with associations. As they fill they begin to gain intrinsic force and at last to shape our perceptions and expectations. So with the word "ecology"..."

(Worster, 1994)



Fig.51. Aerial view of the Mar Menor. Source: inspain.news.

Alteration

MATTER



Fig.52. Initial design actions for “Matter” on the terrain model of the Campo de Cartagena

+ Monitoring stations
Hydrographic network
Sub-catchments of river basin
Zones vulnerable to nitrates
① Network of water retention ponds to improve connectivity and provide a range of ecosystem services
② Enhancing dune dynamics in Dunas de la Llana
③ Preserving the salt marsh of San Pedro del Pinatar
④ Creating a vegetated foreshore connected to the urban fabric
⑤ Creating riparian zones for the stream of Rambla del Albujón
⑥ Restoring seagrass meadows
⑦ Renaturalization of the Marina del Carmolí wetland

Alteration

TOPOS

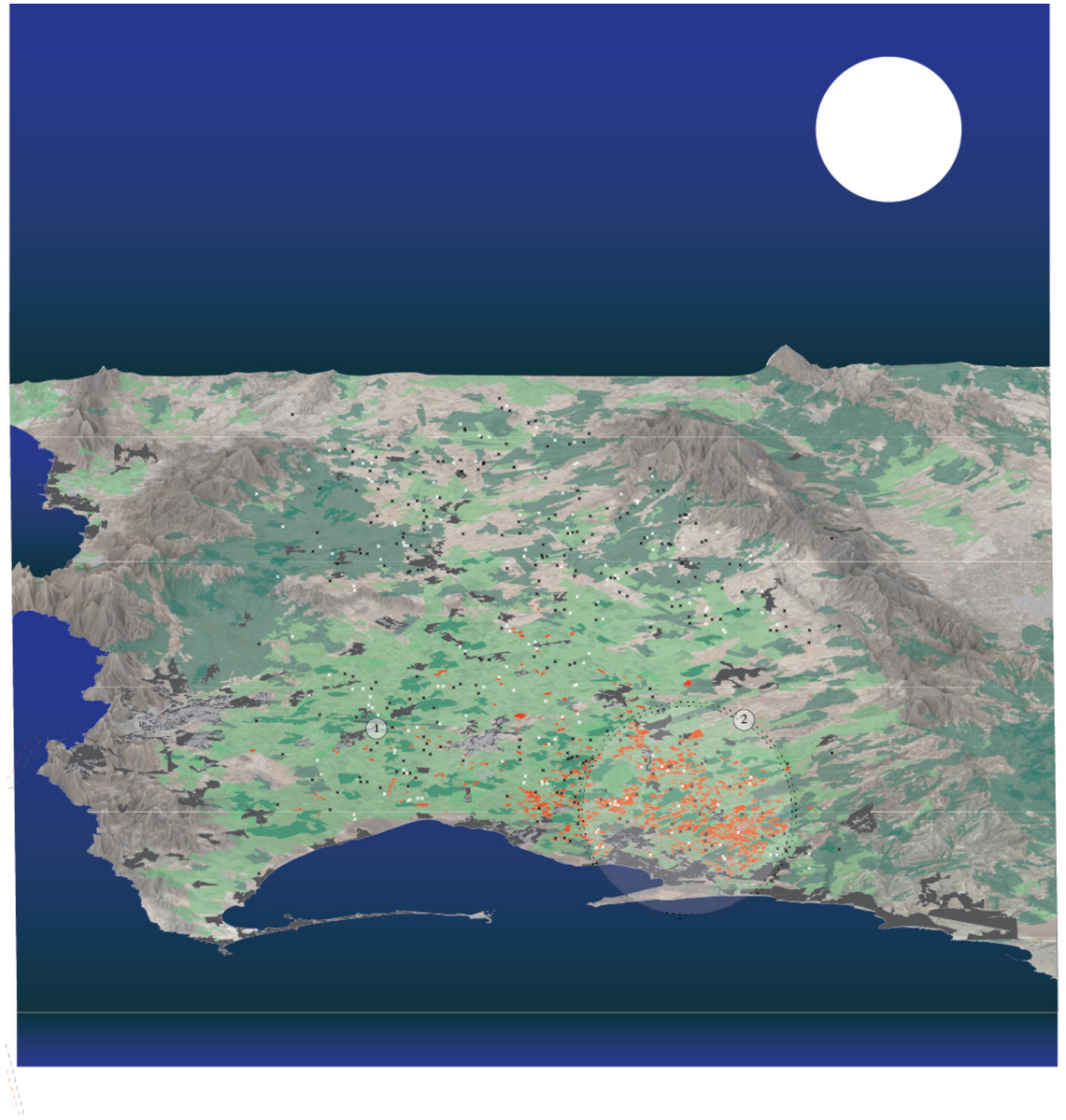


Fig.53. Initial design actions for “Topos” on the terrain model of the Campo de Cartagena.

Composition

HABITAT

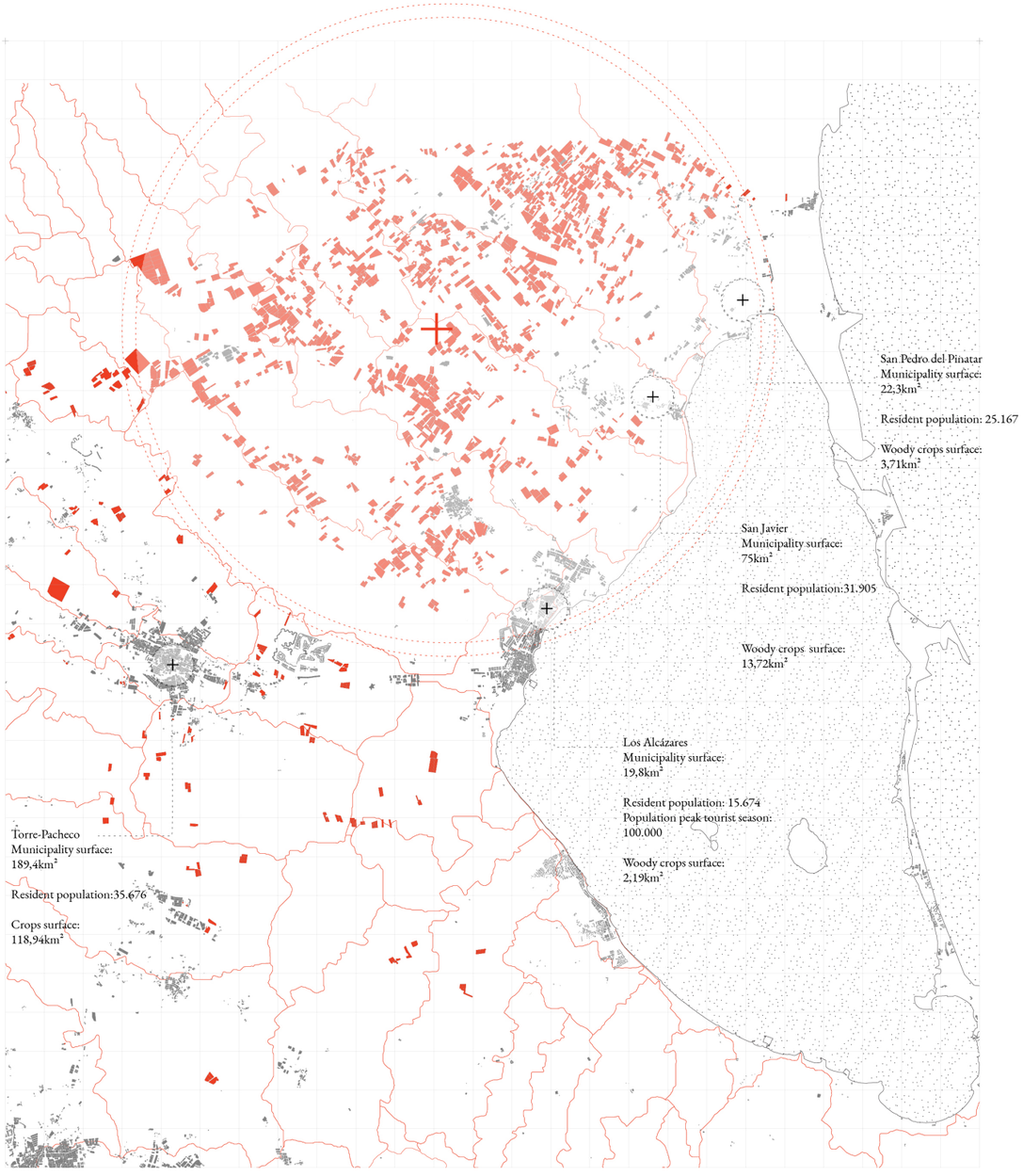


Fig.54. Production and habitation patterns in Campo de Cartagena.

Composition

The irrigated agricultural area in the Campo de Cartagena that drains into the Mar Menor has multiplied almost ten times since the arrival of the waters of the Tajo-Segura Transfer until 2017. According to the study done by ANSE and WWF, 49,488.17ha of irrigated land have been detected, of which only 37,322.99ha would be included in the water use rights. Therefore,12,165.18ha of irrigated land would be outside the limits established by the CHS. This means that almost 25% of the current surface area in the area does not have the proper irrigation permits or authorization to carry out its activity.

Despite the prohibitions and limitations included in the Segura Basin Hydrological Plans, the creation of new irrigated crops inside and outside the UDAs, and even within the protected natural areas of the Natura 2000 Network, has still continued without counting with municipal, regional or state authorizations.

All the actors involved in the area must respond to the critical current situation of deterioration of natural systems and act from their competence and responsibility.

Fig.55. The map of illegal irrigation, according to the ecologists report. ANSE / WWF .

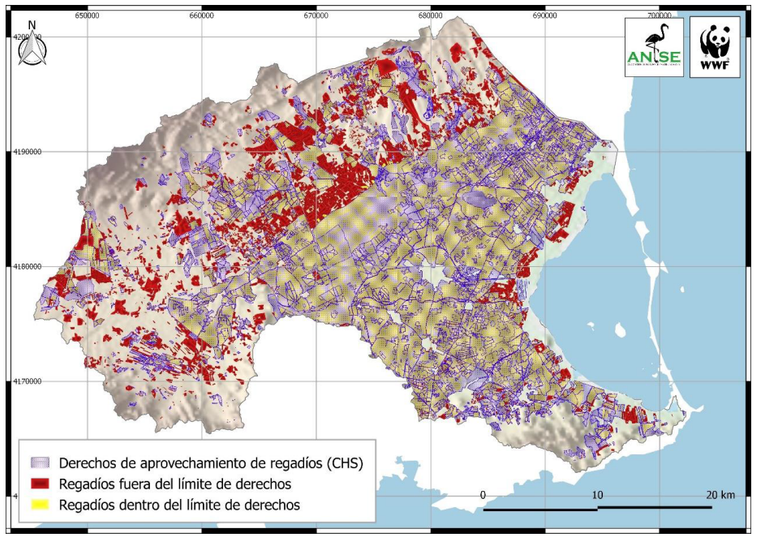


Fig.56. Irrigation zones and structures of exploitation.

Alteration

The emblematic estate called Finca La Loma in the municipality of Los Alcazares was considered the the ‘jewel in the crown’ of the businessman Juan Antonio Roca, who was an Urban Planning advisor to the Marbella town hall, and the mastermind of an urban mafia, settled for the last 15 years in Marbella. Its numerous properties, estates, carriage collections, livestock, and works of art were requisitioned by the State in 2017. The estate, with its wells, its desalination plants, and its discharges, were also requisitioned. Its administration, together with the rest of Roca’s assets, was entrusted to the Malaga lawyer’s office Idea Asesores, which was also to be in charge of organizing the auction of Roca’s assets. La Loma was the most valuable property of were to be sold to compensate the State for the crimes committed by the former urbanism managing director. It was valued at 27.5 million euros. The website on which Roca’s assets were displayed advertised La Loma’s reservoirs, wells, and desalination plants as part of its attractions.

Despite the order to stop all discharges to protect the Mar Menor, the desalination plants in La Loma were still working. In November 2017, La Loma, together with other properties grouped within the same package, was bought by Melones El Abuelo (Productores y Comercializadores de Melón S.L.) for 18.5 million euros, far from the 27.5 million that appear on the website advertising the auction of Roca’s goods and also far from the 24 million that another buyer was ready to pay. The Court was informed that the latter had withdrawn the offer because of the water problems in the region.

La Loma is only one example of the lack of control over the groundwater in Campo de Cartagena. Here, used as a case study, an attempt is made to reimagine the management of such a production unit as a way to showcase the potential of breaking the cycle of exploitation. Instead of buying and selling the land to another enterprise that would continue executing the same model, the regional government could give new incentives to locally-based companies to reconfigure their production by diversifying the crops used in the fields according to the principles of agroecology, to adapt the existing structures in order to facilitate the housing needs of its employees or add new flexible housing units on-site, and to regulate the consumption of water with appropriate purification systems.

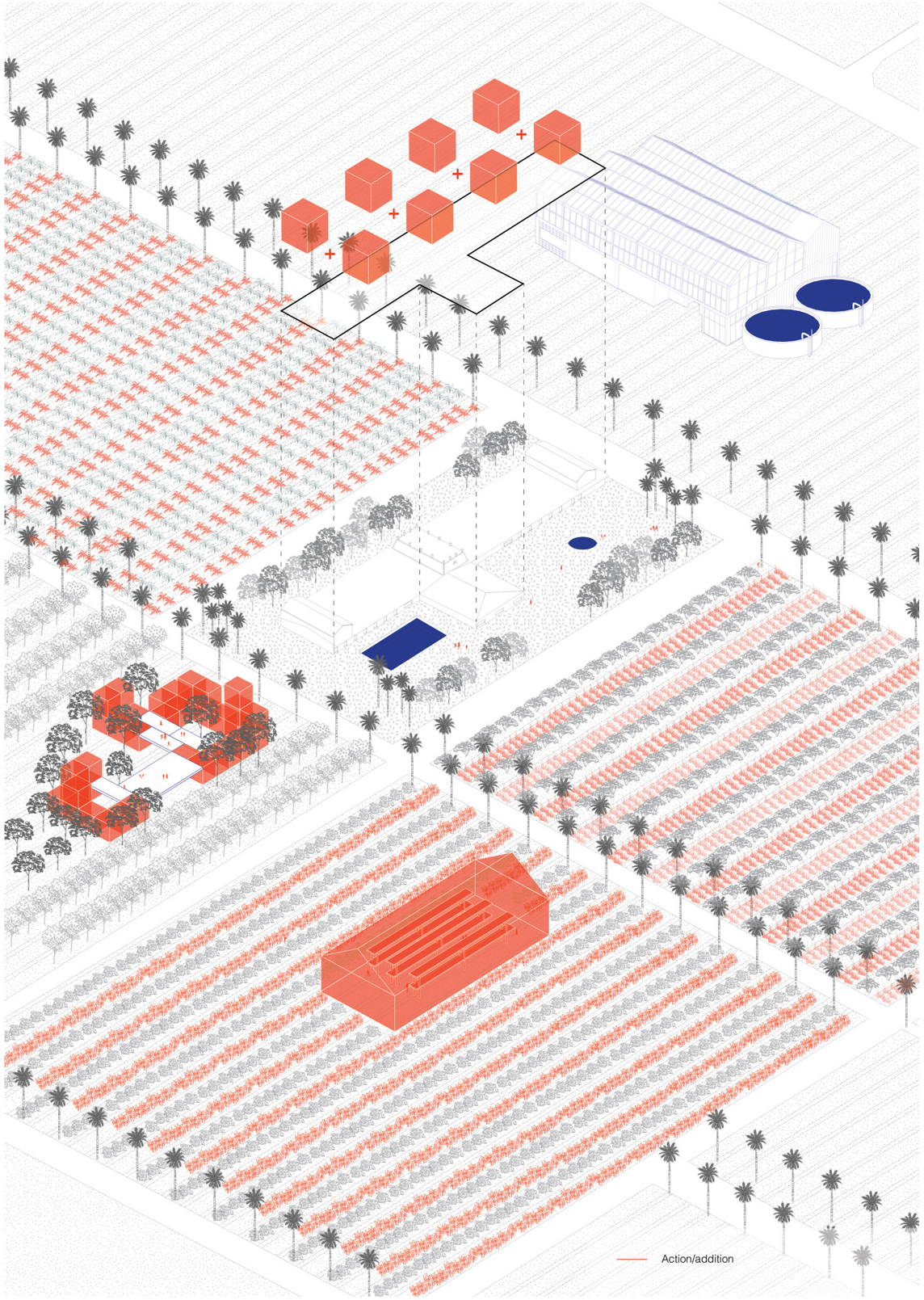


Fig.57. The Finca La Loma estate reimagined.

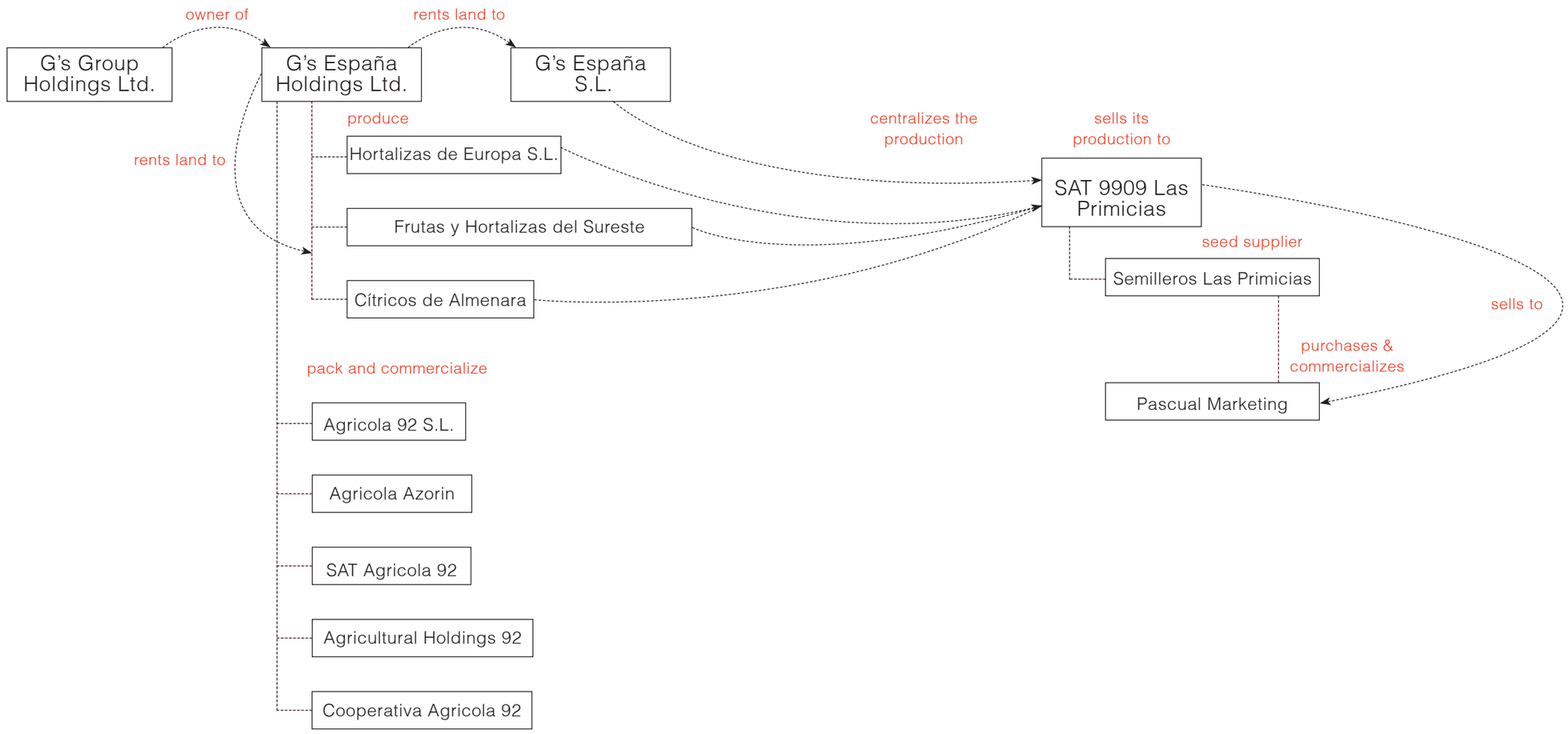
Limit

The export-oriented agricultural model began at the middle of the twentieth century, partly because of Franco's so-called "wet dream" that initiated the construction of dams, inter-river basins, large-scale irrigation with immense hydro-electric developments. However, the most important recent event has been the buyout of large parts of Spanish-owned land to foreign companies, mainly British, Dutch or French multinationals who based themselves in the sector.

One of the large-scale cases is Pascual Hermanos that has now been transferred to the hands of the British G'S group. Automated platforms harvest the lettuces and later pack them on the spot, then taken to warehouses, cooled and shipped to European supermarkets. "Spain-grown Broccoli from January to December", euphemises their website.

G'S España Holdings, the main land owner, rents it to the G'S group's companies that are specialists in all stages of production and storage. The remaining producing companies that fall under this group sell their produce to SAT 9909 Las Primicias that is also owned by G'S España Holdings. Following that, SAT sells 71% of the production to Pascual Marketing, another partner of the group that specializes in commercialization, and 18.5% is sold to the British parent company. Semilleros Las Primicias, the group's seed supplier. In total, more than 1.500 jobs rely upon G'S España, most of which are field labourers.

Simplified scheme of G's Group



G's Group Holdings Ltd. grows and distributes vegetables. The Company, through its subsidiaries, develops beetroot, celery, lettuce, baby leaf, radish, spring onions, leeks, potatoes, onions and garlic for supermarkets, wholesalers and processors. G's Group services customers throughtout Europe.

SAT 9909 Las Primicias was established as a transformation agrarian company in the municipality of Águilas (Murcia) on 1997. Its corporate purpose is made up of the following activity: promote the concentration of supply and price regulation in the production phase, proceeding to the commercialization of fruit and vegetable productions.

Semilleros Las Primicias' corporate purpose is the production and marketing of seedlings and seeds of all kinds of fruits, vegetables and other vegetables.

CULTIVATING THE FUTURE

3

Ecoregion structure

Aquifers and irrigation zones

Soil characteristics

Hydrography

REGION STRUCTURE AND SOIL CHARACTERISTICS

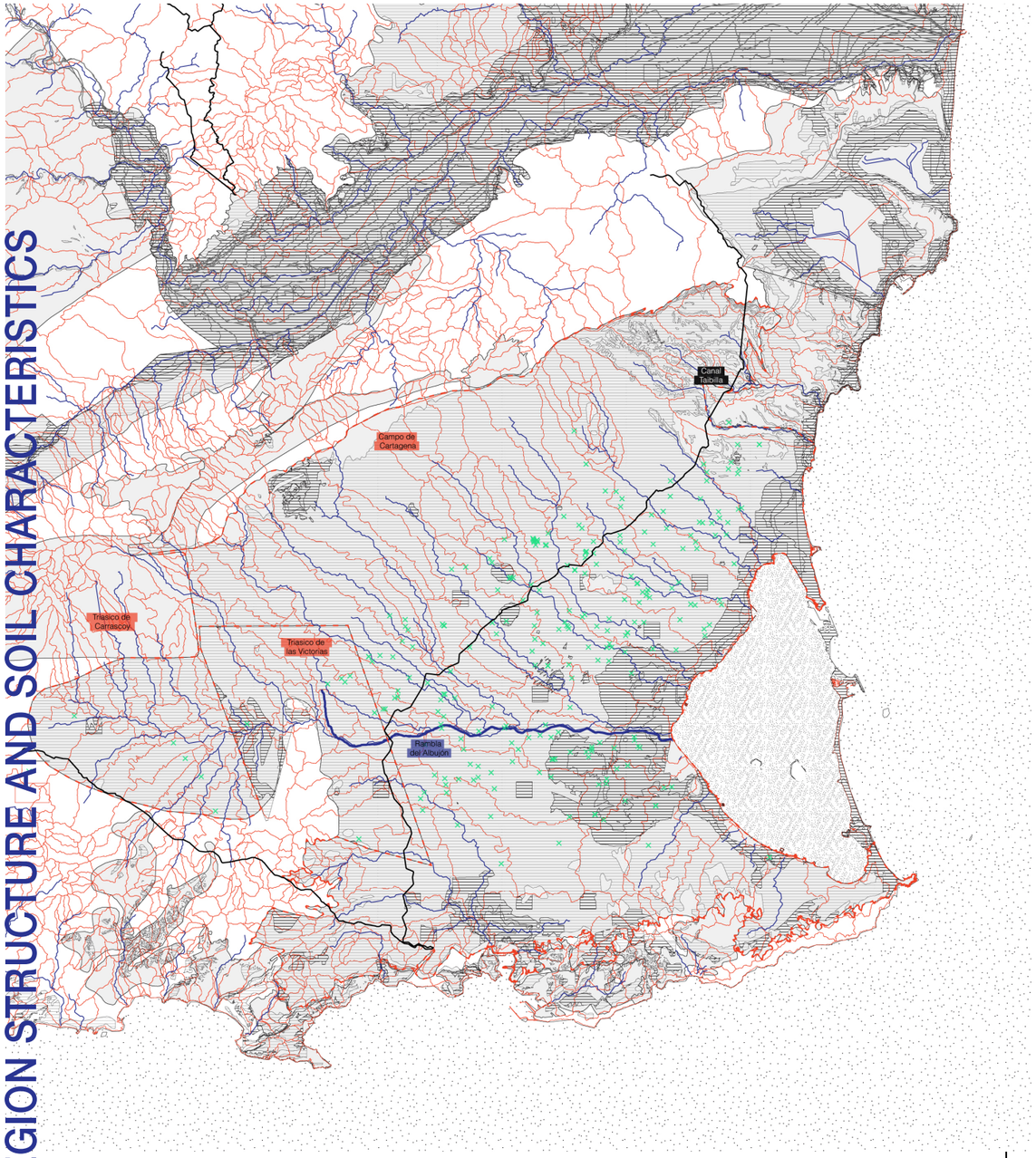


Fig.58. Visible and invisible infrastructures that make up the “irrigation machine” of Campo de Cartagena.

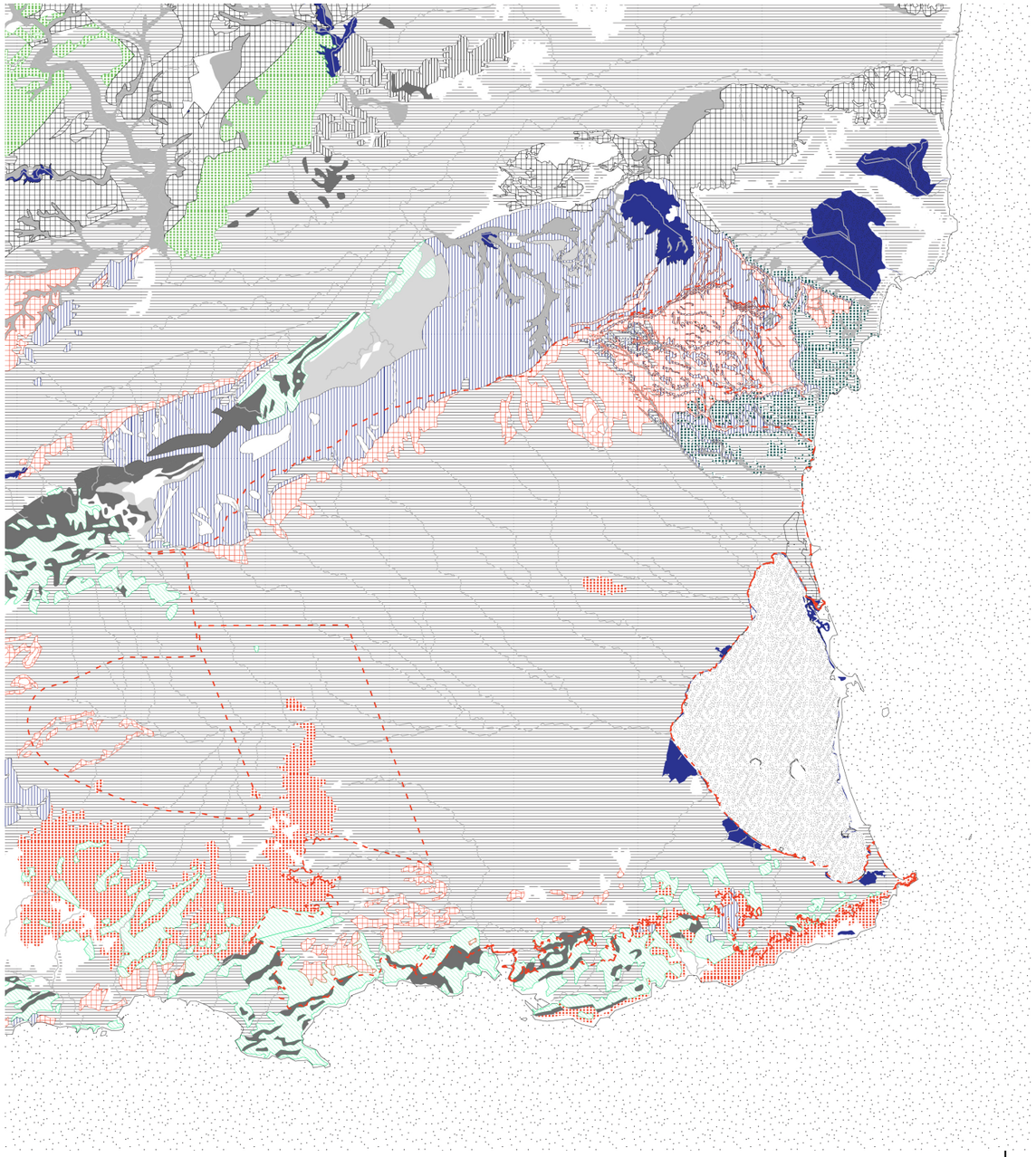


Fig.59. Soil permeability of the Campo de Cartagena.

AQUIFERS AND IRRIGATION ZONES

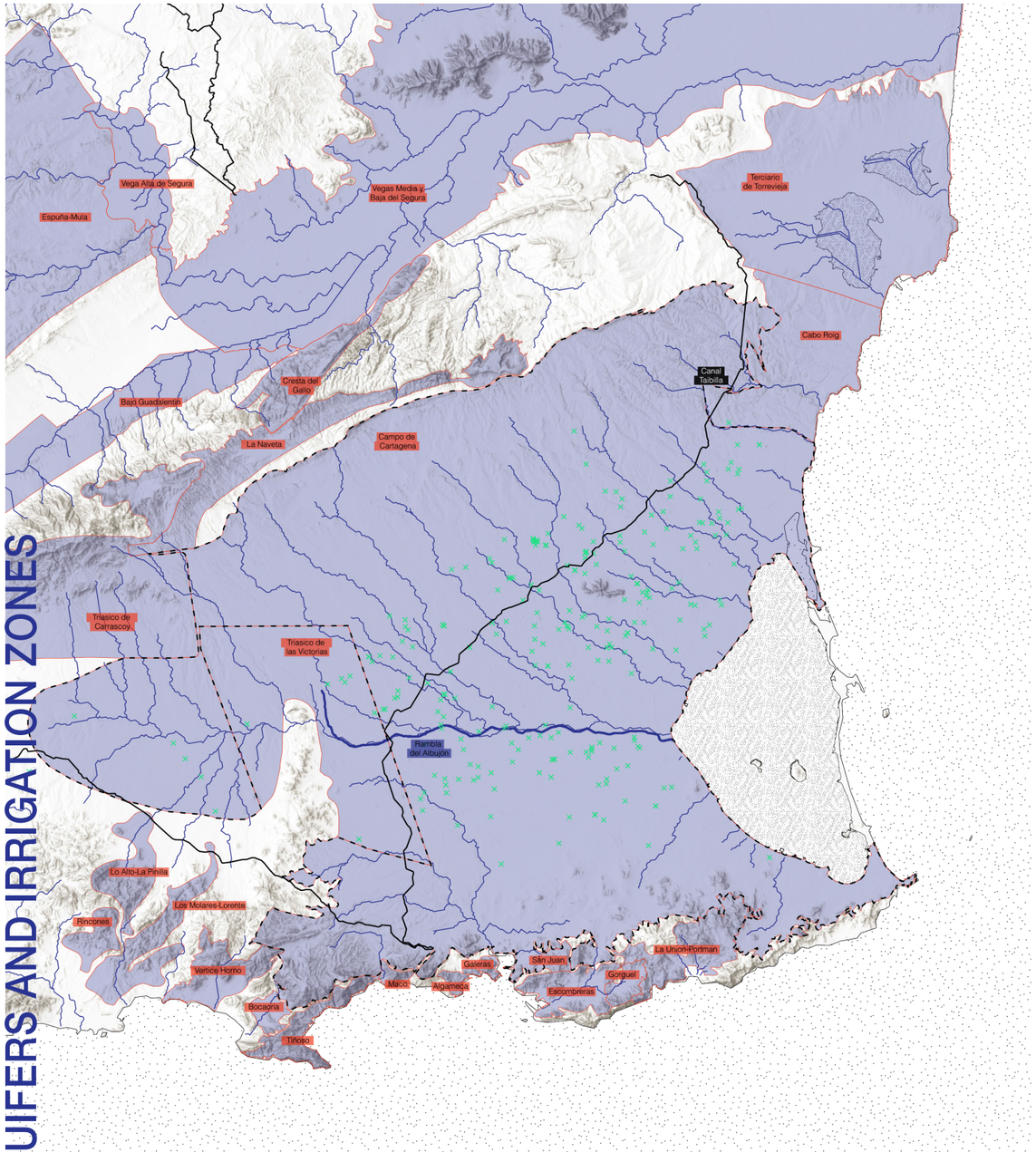


Fig.60. Aquifers zones and hydrography.

The hydrogeology of the Campo de Cartagena plain consists of a multi-layer complex aquifer with four sedimentary layers lay over the basement. The upper unconfined aquifer is the most relevant from the point of view of the study because it receives most of the return flows from irrigation. The upper aquifer extends over 1.135 km2 and comprises Quaternary detrital sediments (mainly sands and silts) (Jiménez-Martínez et al., 2012). Average thickness is around 50 m and the water table is 15 m in depth. At the present this aquifer is barely exploited because their waters are polluted by the agrochemicals supplied by the irrigation return flows (Jiménez-Martínez et al. 2010).

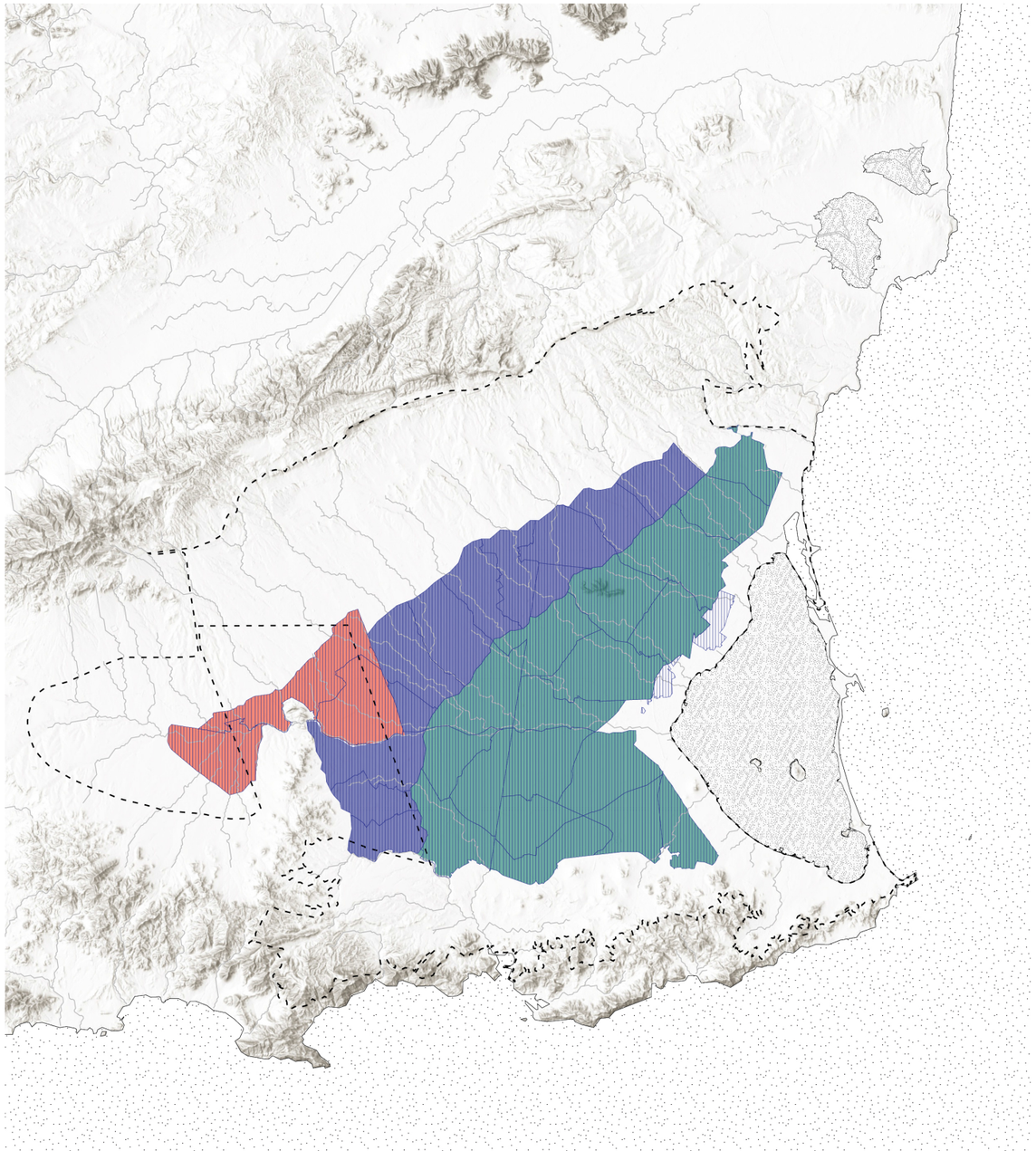
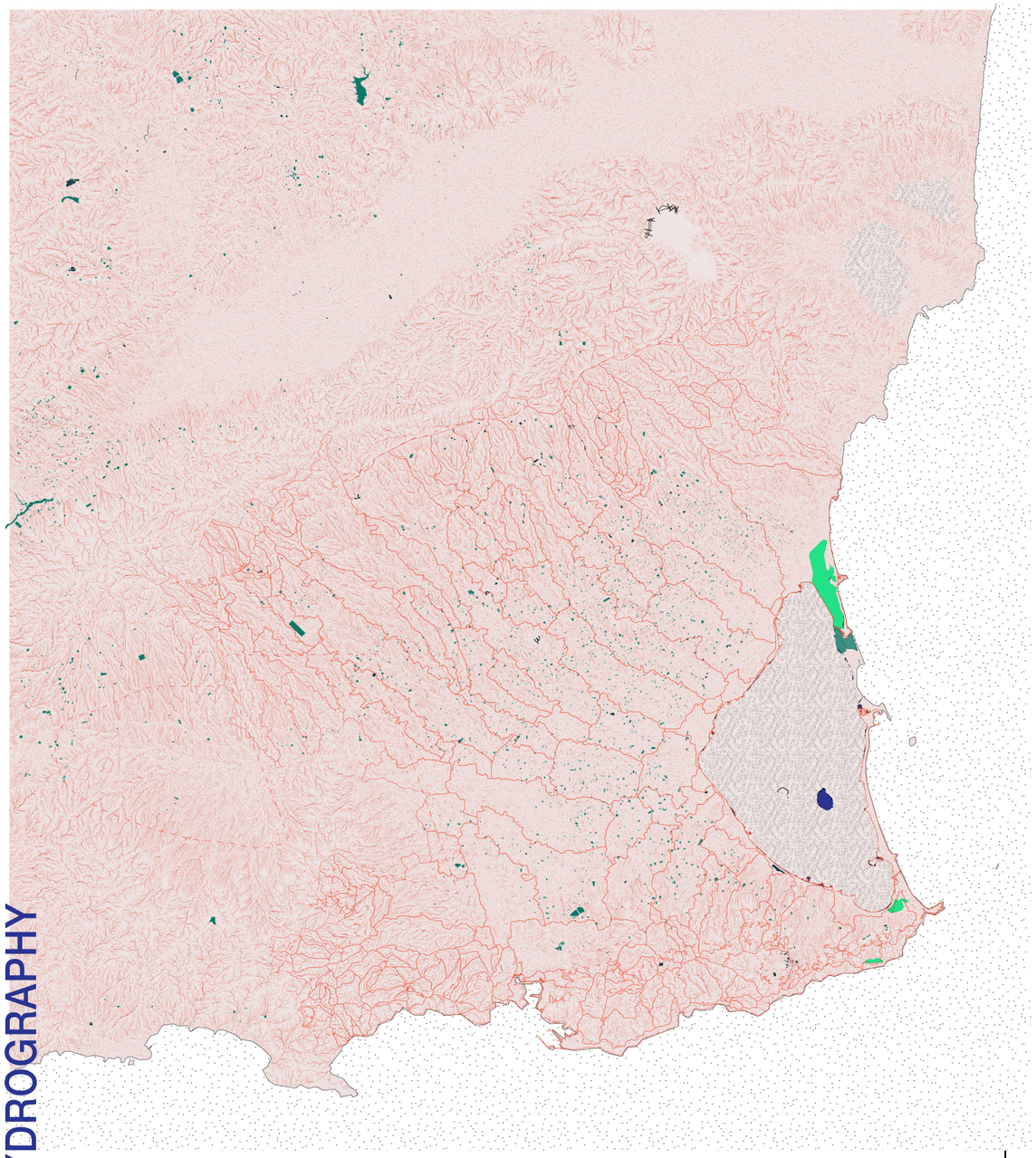


Fig.61. Irrigation zones.

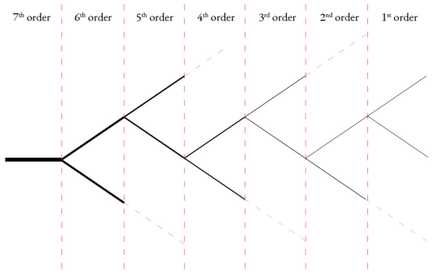
Irrigation in the basin is distributed in three zones, which are under the management of the Campo de Cartagena Irrigation Community (CCIC).

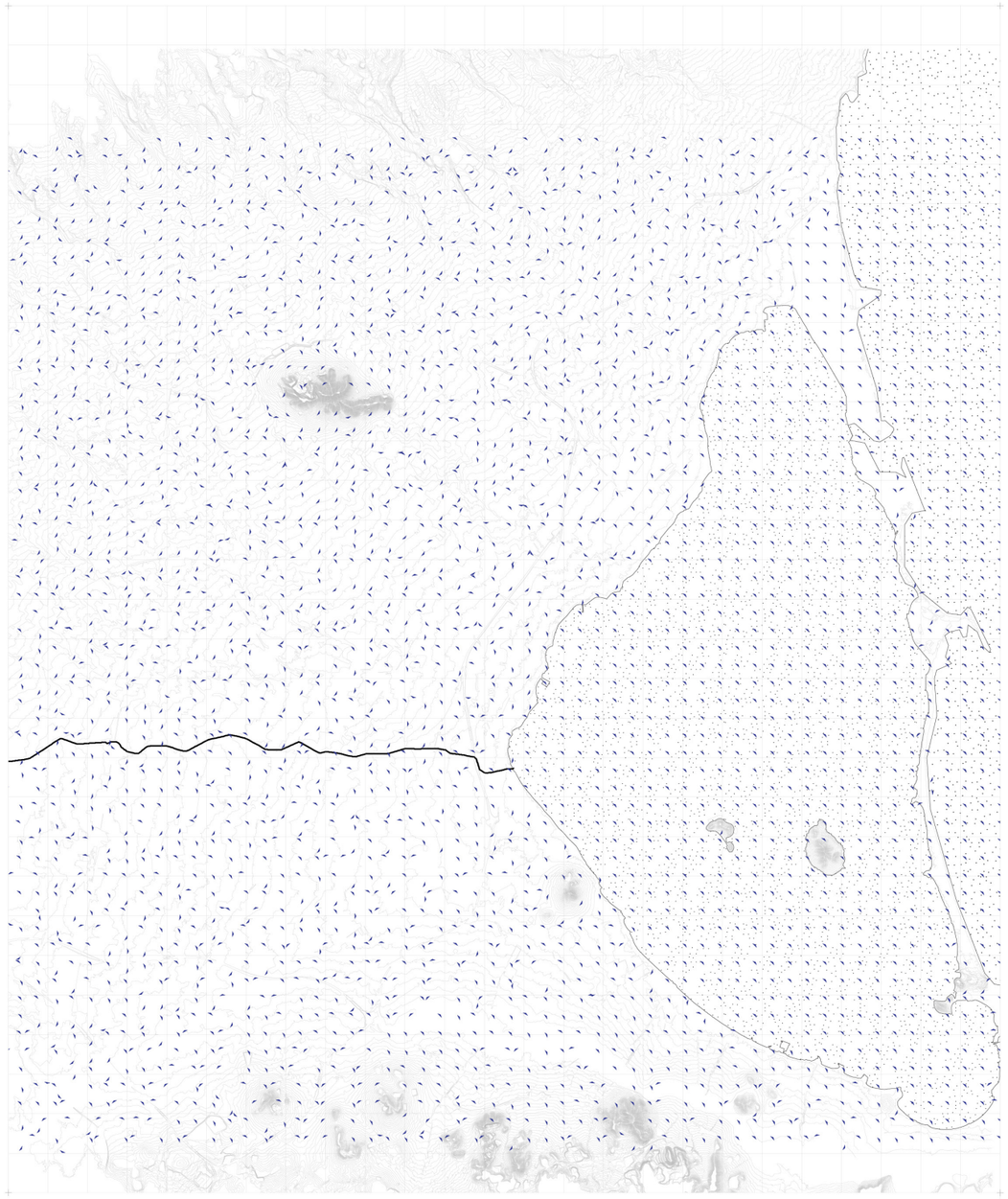
HYDROGRAPHY



Strahler order

Fig.62. Hydrography analysis based on the Strahler order method.





Flow direction

Fig.63. Flow direction of underground water bodies.

4

LANDING

Renaturalization of green corridors

Agro-settlement expansion

Crop diversification for flood & drought resilience

RENATURALIZATION OF RAMBLA DEL ALBUJÓN

The Rambla de Fuente Álamo is a rambla which crosses the city of Fuente Álamo de Murcia, where it gets its name from, and continues from Venta Redonda onwards being known as Rambla del Albujón. The basin of the Rambla del Albujón, with an extension of 77km2, is located at the southern end of the Segura Basin and covers almost the entire Campo de Cartagena region. It is characterized geomorphologically by being an extensive plain, slightly inclined towards the east, where some hills and peaks stand out, such as the Cabezo del Pericón (372 m.). The entire study area, like the rest of Campo de Cartagena, is covered by Quaternary materials that offer a great monotony barely interrupted by the small reliefs and by a micro-relief caused by the boulevards in the rainier seasons.

The Rambla del Albujón basin is characterized by its intensive agricultural character. This area is home to one of the areas with the highest agricultural production in the entire Segura hydrographic basin, and, therefore, irrigated agricultural activity is the main pressure on the riverbeds in this basin.

Climatology

Rainfall is scarce, below 250 mm, and unevenly distributed, with autumn and winter being the rainiest seasons followed by spring. Summer is a very dry season, representing very low rainfall values with respect to the total. The rain is usually torrential, being very localized in space and time. The maximum values of potential evapotranspiration are detected in Fuente Alamo with 960 mm/year and the minimum in the Carrascoy mountain range, with 800 mm/year, the average for the whole Campo de Cartagena being 900 mm/year. The high humidity of the air favors horizontal precipitation, with dew being a very frequent phenomenon, especially on the coast.

Hydrology

The surface hydrology of the Albujón basin is reduced to a few ravines that flow directly into the Mar Menor. This hydrographic poverty is related to the low elevation of its relief, the extreme aridity of the climate and the absence of allogenic watercourses.The hydrographic axis of Rambla del Albujón is the only large collector of the current basin of the Campo de Cartagena. It collects the waters of the Sierra de Carrascoy through the Rambla de la Murta and the western coastal mountains, through the subsidiary boulevard of Fuente Álamo. The Rambla del Albujón has one of the lowest longitudinal slopes in the Segura basin with only 0.37%. However, in the middle and lower sections of the stream, extraordinary floods are causing significant material losses and natural disasters in its mouth in the Mar Menor.

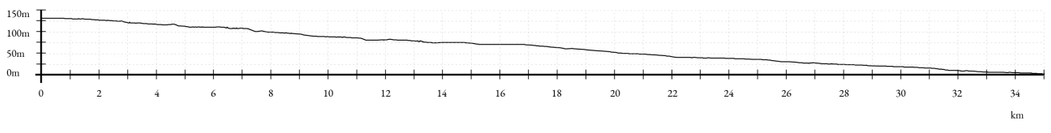


Fig.64. Longitudinal profile of the Rambla del Albujón based on the Digital Elevation Model.

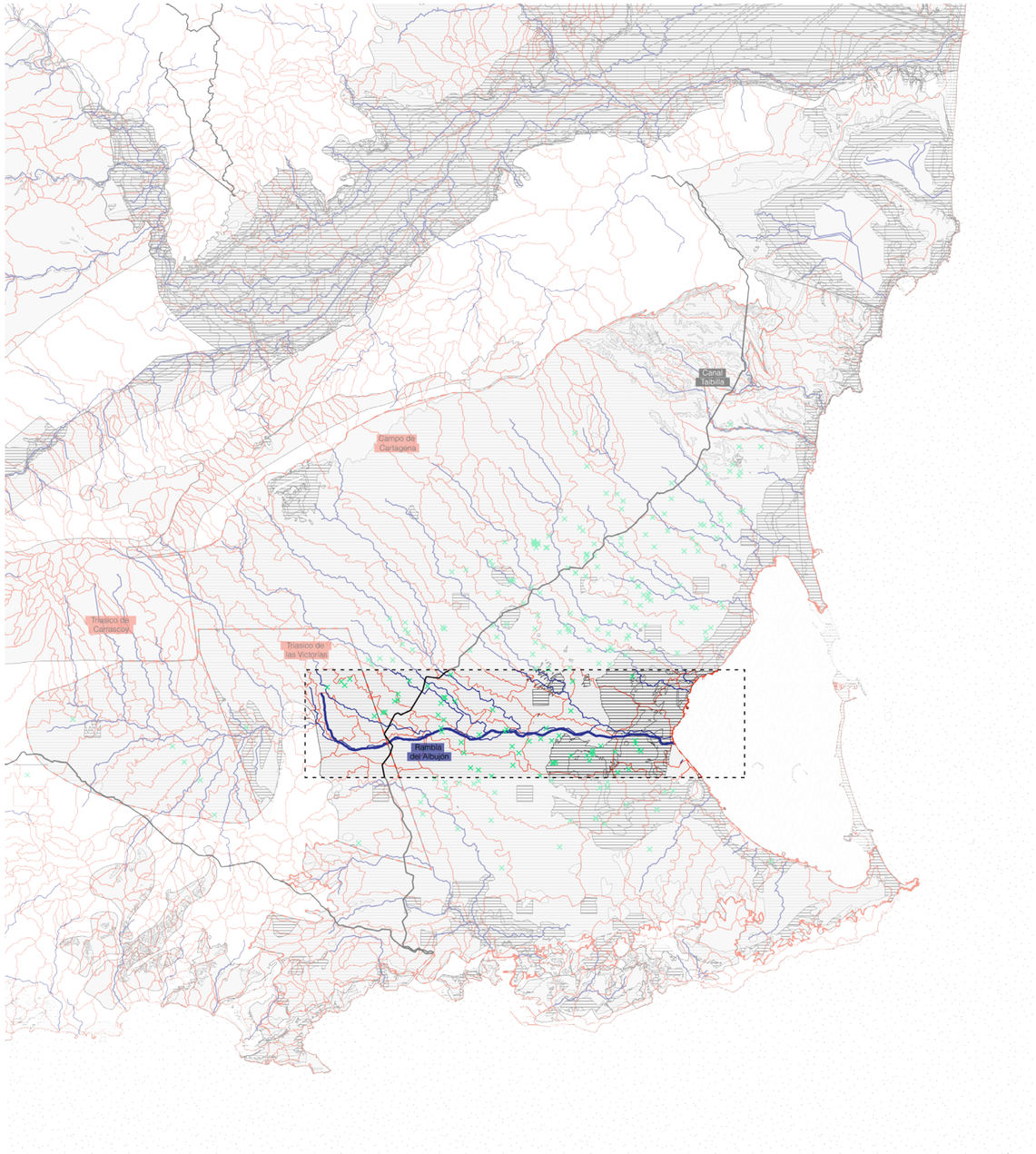


Fig.65. The Rambla del Albujón zone in relation to the whole Campo de Cartagena.









Impressions of the mouth of the stream.



Neighborhood protest in Bahía Bella on the Rambla del Albujón_ J.M. Rodriguez, AGM.



Los Urrutias on January 12, 2022.

Flora and fauna

Historically, the fertility of the soils of El Albujón allowed the entire area to be an orchard of forests, and cereal crops and fruit trees. Descriptions from the 18th century by botanists from Murcia, passing through the Campo de Cartagena, attest to this. However, there are two historical periods in which the vegetation of El Albujón was subjected to great damage by human beings, two periods in which the construction of ships and the appearance of large industries ruined centuries of native vegetation. of the Campo de Cartagena: Roman Period and the 18th and 19th Centuries.

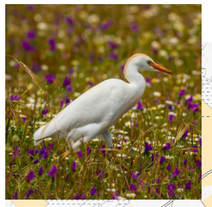
In medieval times, due to the depopulation of the area, the vegetation that was still native to the area was preserved and consisted of abundant scrubland, predominance of species such as Kermes oak, esparto grass, carob trees, reeds and blackthorns.

Species such as mastic, kermes oak, wild olive, juniper, holm oak and pine prevailed in the forests, but unfortunately the action of human beings weakened these species and they finally disappeared from the area.

In the proximitiy of the stream, baladres and tarais grow , and the meadows are occupied by collejones, daisies, corrihuela, vinagrillos, alaboles, dandelions, trigueras, borriquero thistles, etc. The Rambla del Albujón is an area of great importance for bird watching, specifically the most interesting area is concentrated in the mouth. The area is a very small space, where one can see both the Mar Menor lagoon and the mouth of the stream itself, thus leaving two ecosystems within the reach of the observer in this small space.

Among the avifauna species, it is worth highlighting the golden eagle of prey (Aquila chrysaetos), Royal Owl (bubo bubo), booted eagle (Hieraaetus pennatus), short-toed eagle (Circaetus gallicus) and peregrine falcon (Falco peregrinus).

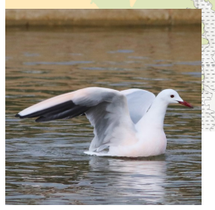
The last section of the basin from the town of Albujón onwards is included in the nitrate sensitive area of the eastern irrigation sector of the Tajo-Segura Transfer and the Mar Menor Coastal sector.



Cattle Egret (Bubulcus ibis)

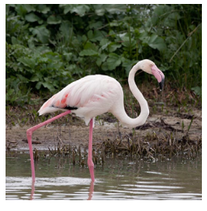


Yellow-legged Gull (Larus Michahellis)

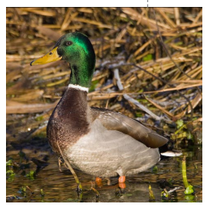


Slender-billed Gull (Chroicocephalus genei)

Fig.66. Urbanization and protected zones along the Rambla del Albujón.



Greater Flamingo (Phoenicopterus roseus)



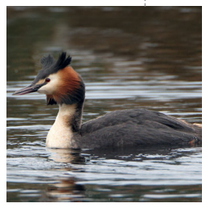
Mallard (Anas platyrhynchos)



Ruddy Turnstone (Arenaria interpres)



Reed Bunting (Emberiza schoeniclus)



Great Crested Grebe (Podiceps cristatus)



Great Cormorant (Phalacrocorax carbo)



Common Kingfisher (Alcedo atthis)

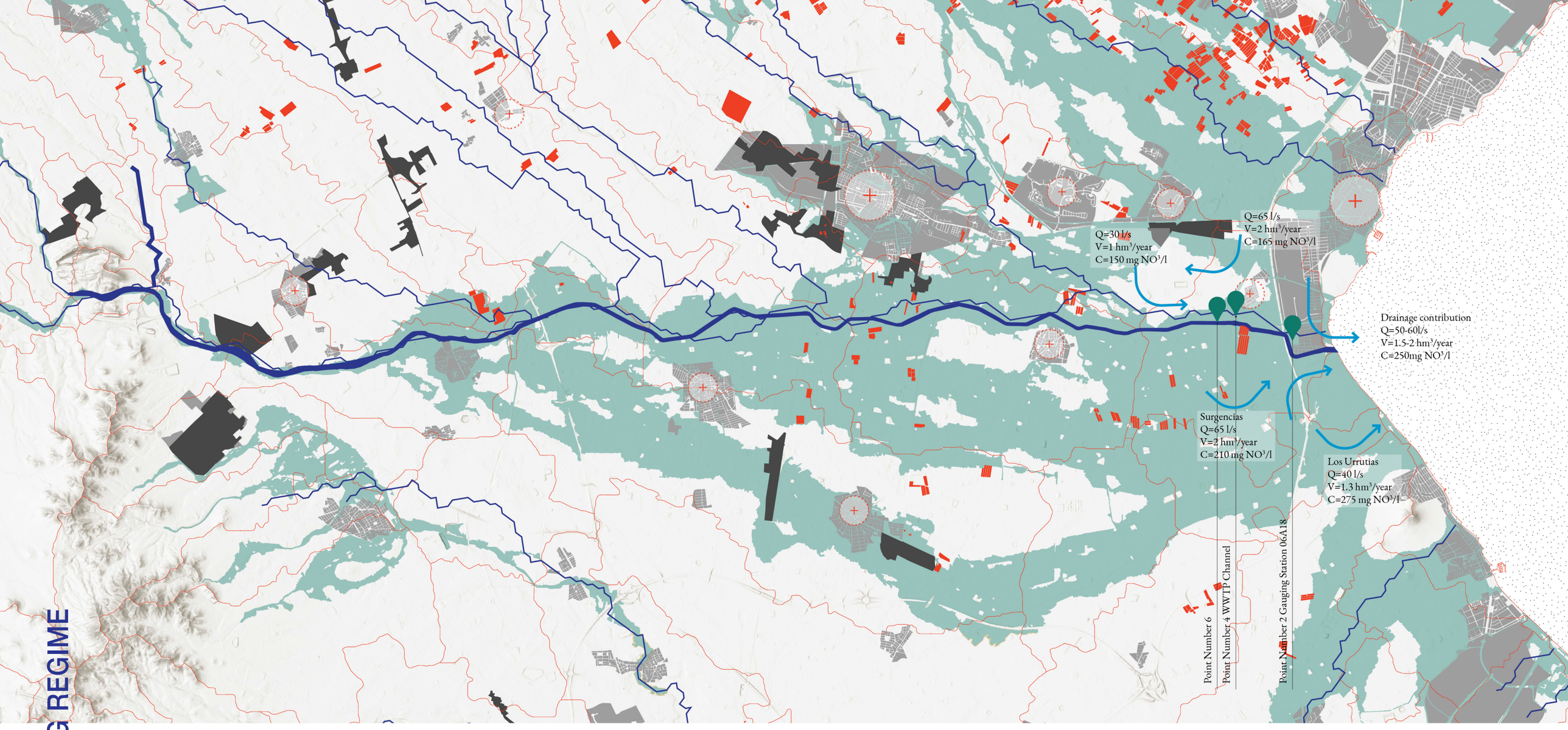


Fig.67. Hundred year floodplain and water leakage data along the Rambla del Albujón.

The water inflows along the Rambla del Albujón between Torre-Pacheco and La Puebla are characterized by an intermittent regime, with significant inflows only during precipitation events. The concentration obtained with the simulation model for the calculated surface contributions during these precipitation events, vary between 30 and 80 mgNO.3/l, with values between 60 and 80 mgNO3/l in the case of contributions up to 1 hm3/month and a concentration in the environment of 30 mgNO3/l in the case of contributions greater than 1 hm3/month. Data provided by the Segura Hydrographic Confederation indicate that nitrate concentrations during floods of the year 2021 of the Rambla del Albujón are estimated at 27 mgNO3/l (mouth of the Rambla del Albujón in March 2021).





Fig.68. The flooding of the El Albujón boulevard kept nearly ten thousand residents of the towns in the northern area of Cartagena on alert due to the possibility of an overflow in several of its sections. J.M. Rodriguez, 09/29/2012.

Data from Esamur (Sanitation and Wastewater Treatment Entity of the Region of Murcia), retrieved from Consulting services and technical assistance for the simulation under different scenarios and by means of a hydrological model, of the evolution of the nitrate content of the underground body of water Campo de Cartagena, Polytechnic University of Valencia, Institure of Water and Environmental Engineering.

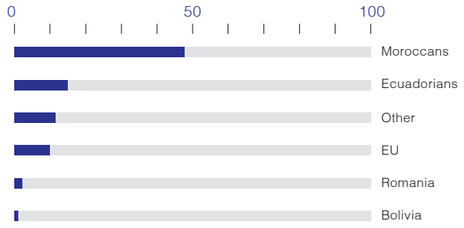
SOCIAL DYNAMICS

Using the case of Torre Pacheco as a case study we can observe certain patterns in the territorial distribution of migrants. The majority of individuals is distributed among the various districts of the municipality, some of which have high concentration indices such as Los Camachos, 53% immigrant neighbourhood and Hortichuela, 45.57% (seen on map right page). The vast majority of them are young Moroccan men and that is due to a number of factors, primarily because of enormous economic and social difficulties to find accommodation in the villages since many owners refuse to rent their properties to them and the prices are prohibitive for them. Additionally, the number of houses, shacks or warehouses accessible to the migrants was concentrated in those districts. Job instability is also a decisive factor, meaning the “nomadic” nature of these day labourers and their proximity to the workplace. Another important aspect is that this population comes from a rural area, the Eastern Moroccan Region, and settles in another rural area, creating the desire of a newcomer to be among “his own”.

On the other hand, Ecuadorian neighbourhoods provide bigger economic security to the owners since Ecuadorians besides working in agriculture were also employed in construction and services, earning higher salaries. What is more, the presence of families, in most cases, where women also work, is considered more appealing to the owners who believe that their property would be better taken care of by a couple or a family rather than a group of men.

Cultural beliefs also play a role in the selection of a home. Moroccans tend to prefer to live on a ground floor with a front yard or patio that would allow for greater intimacy in the case of a family reunification, for maintaining their religious customs and would overall make them feel closer to the rural habitat that they came from. Their homes are mostly located in the outskirts of urban centers of the large municipalities. On the contrary, Ecuadorians usually settle in flats that are more abundant in urban centers.

Regarding the housing tenure regime, the biggest percentage of migrants live in rents, a minority owns their own houses and another minority is using occupation or other forms of housing. The low proportion of immigrant owners is not surprising since the construction boom, the unreasonably high prices, the uncertainty that characterizes the first period of settlement and the social prejudices explain the situation.



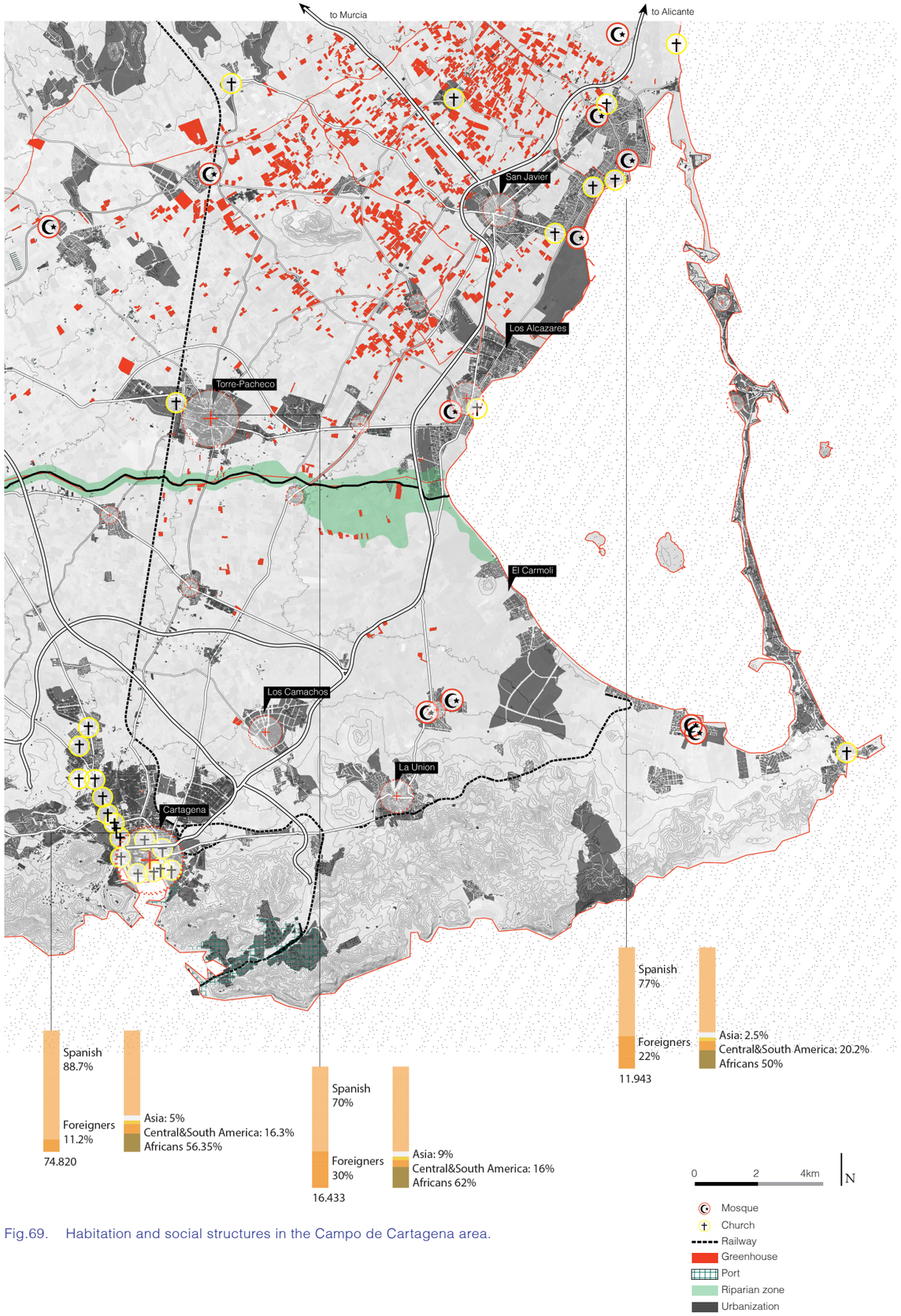
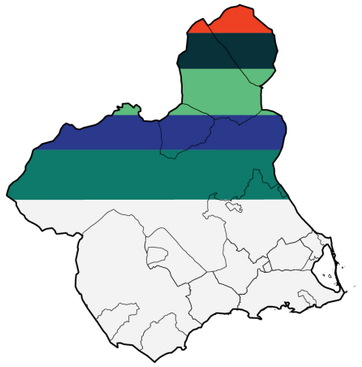


Fig.69. Habitation and social structures in the Campo de Cartagena area.

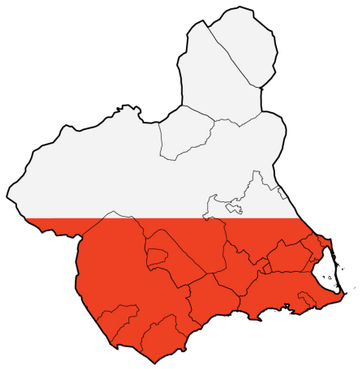
PRODUCTION DYNAMICS

Land use distribution in Campo de Cartagena is extremely heterogeneous. The study area is mainly occupied by a compound-moisaic cover class which integrates an irregular and heterogenous pattern of different land use classes. The second most important homogeneous classes are herbaceous (horticulture-row)crops and citrus orchards.

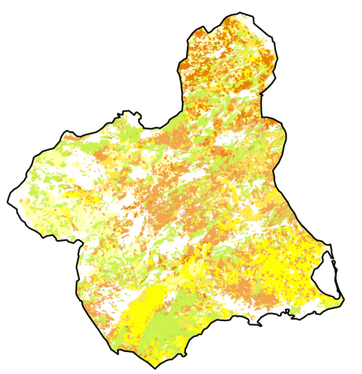
According the agro-statistics reported by the regional government, agriculture acreage in thebasin reached 32.366 ha. In 2011 horticulture-row crops were the main crop type in the farmland area (65% of coverage). Citrus orchards (lemon, orange, mandarine and grapefruits) covered more than 8.250 has. In plots dominated by row crops, rotation of autumn-winter (e.g. lettuce, artichoke) and spring-summer (e.g. melon) crops is a very common practice. Drip irrigation is the main irrigation system in the study region.



Agriculture, forestry & fishing
4.73%
Real estate activities
9.47%
Tourism sector
11.4%
Extraction & manufacturing industries
16.73%
Wholesail & retail
21.9%
% of total GVA



Arable farming
36%
% of total land cover



Cereals for grain
15.5%
100%
Vegetables
17%
100%
Tubers
1.5%
100%
Citrus fruits
12.7%
100%
Non-citrus fruits
34.5%
100%
Olive trees
7.4%
100%
Vineyards
9.3%
100%

Fig.70. Production values per sector GVA percentage.

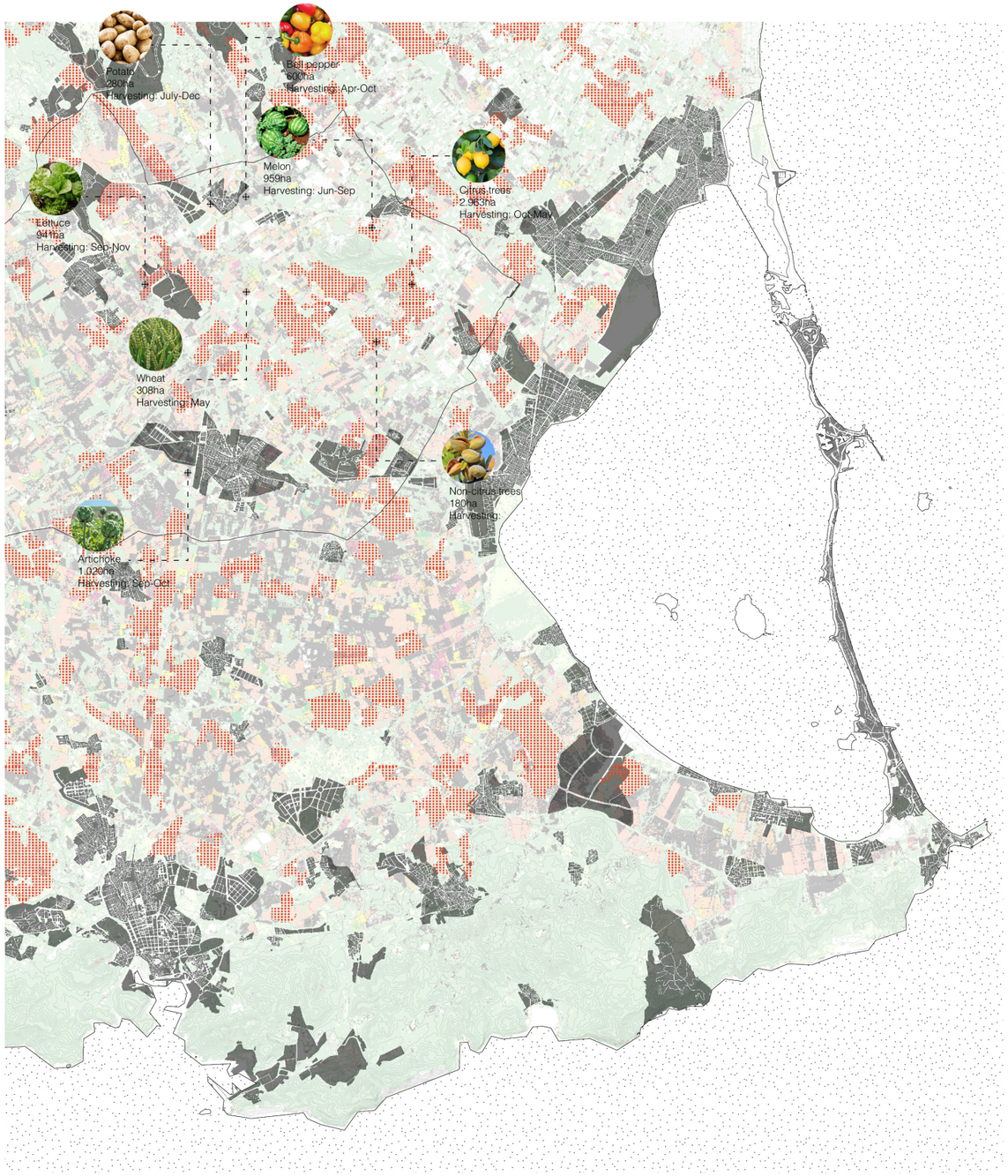


Fig.71. Production patterns and values.

"Okupas" is a major concern to those seeking to buy property in Spain. In recent years, socially-oriented Spain has created laws to protect the rights of house tenants that are undergoing difficult financial situations. Especially after the crisis 0f 2008, tenants were allowed to stay in their homes even without paying their rent and eviction has been possible only by court order.

Nowadays legal home owners cannot dispose their properties Court trials for eviction can carry on for years and in cases where there are children in the family of the squatters the owners are almost losing their rights to react. Action has to be taken within a 24-hour window to remove the squatters. In the case of Mar Menor where there is a plethora of European expats owning summer houses that leave them unattended over the winter, private security companies have taken the task of surveillance and protection of properties. In many municipalities in the whole region of Murcia there have been a number of criminal organizations occupying properties and then renting them illegally to immigrants. These groups are locating empty houses, forcing their doors open and connecting them to electricity and water supply when there is none. Their target profiles are usually undocumented Northern Africans with financial difficulties who are charged with 50 to 100 euros per month for a room in of these houses, having to deal with precarious overcrowding circumstances.

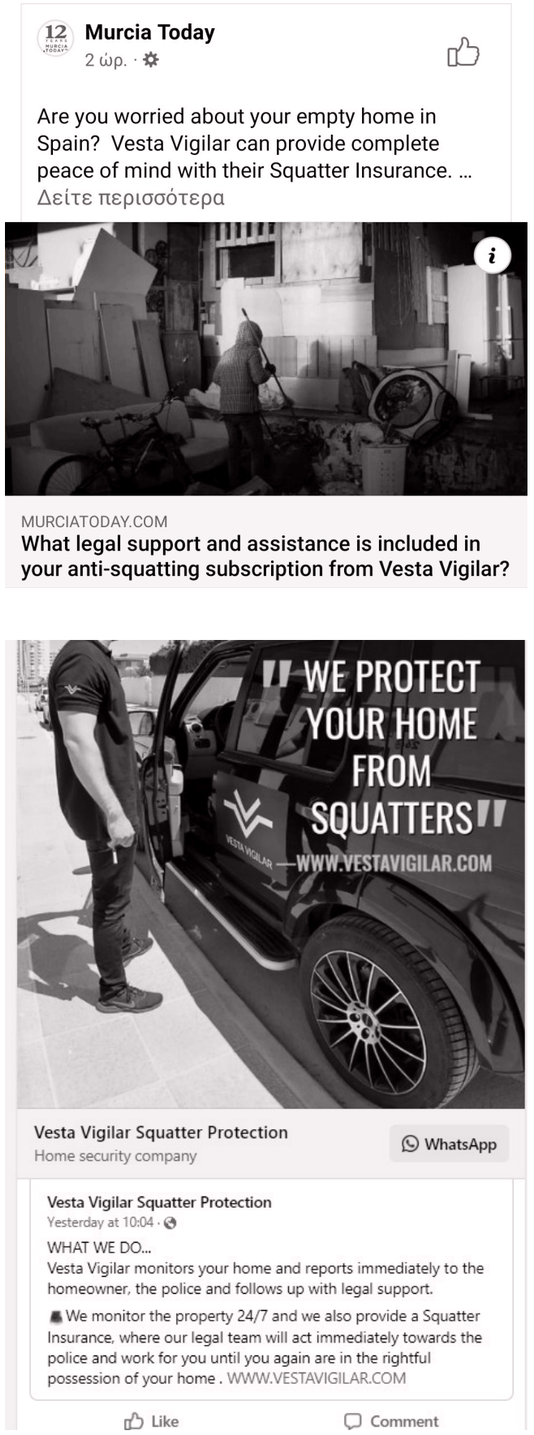


Fig.72. Advertisements of surveillance companies in local Facebook groups, promising to home owners to make sure they protect them from possible invadors.

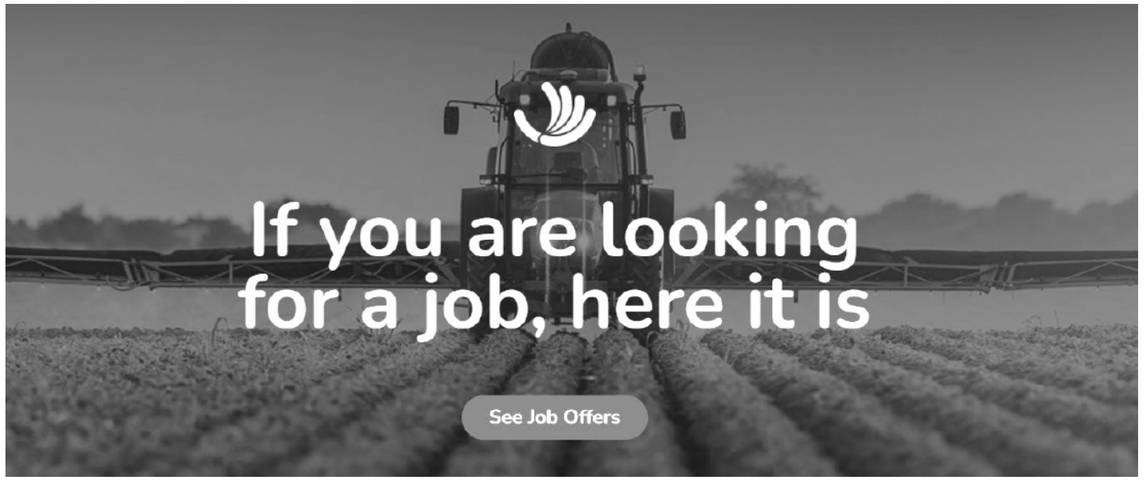


Fig.73. The main message on the Terra Fecundis website.



Fig.74. The adjacency of the extremes. Two views of the same street in the area of Torre Pacheco showing big water tanks in an agro-producing field and on the other side, one of the many summer complexes of the region. Taken from Google street view.



Fig.76. Housing conditons in Torre Pacheco. Google street view.



Fig.75. Advertisements in local Facebook groups seeking for workers.

DESIGN FRAMEWORK

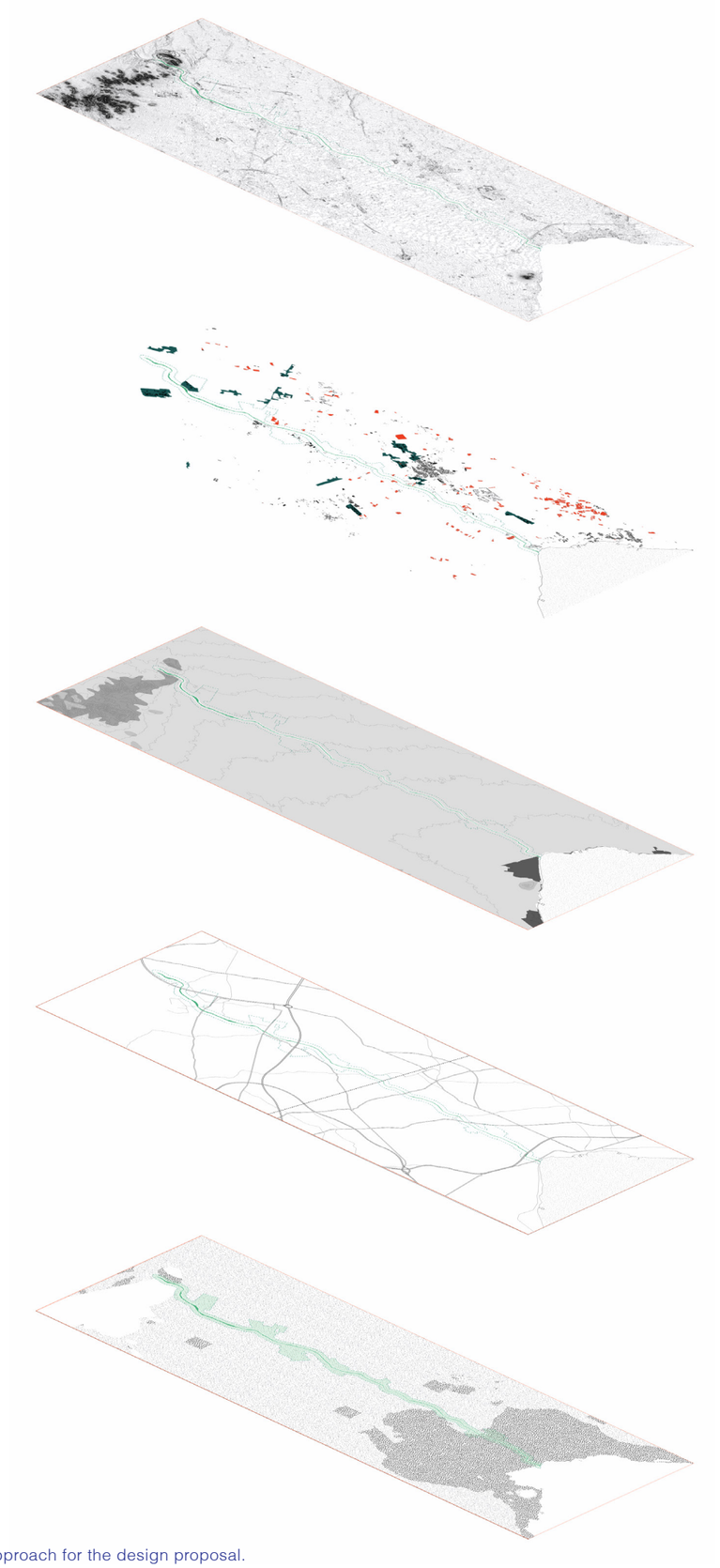


Fig.77. A layered approach for the design proposal.

The criticalities that put pressure on the Campo de Cartagena are mainly dismissing the temporal dimension of agriculture. The very nature of agriculture has distinct activities associated with the growth cycles of plants and animals, preferred sequences of events over time and feedback loops of cultivation.

There are two different notions of time related to agriculture according to the Ancient Greeks: chronos and kairos. Chronos is sequential, linear time, while Kairos, is numinous, circular time, the notion of a right time or moment for events to unfold. Agriculture engages in both forms of time. Seasons, weather cycles, sowing and harvest, growth, death and decay are all inherent to the productive landscape. Yet our understanding of this temporal engagement is ruptured by the global food market, which disconnects food from both place and time, “ensuring the year-round provision of fresh fruit and vegetables irrespective of their seasonality or the distance between their sites of production and consumption. Agriculture provides a site for us as designers to mend that rupture, to reconnect people with the place and time they live in.

The design proposal is also taking into account the topography itself, the existing settlement and industry patterns, the floodplain zone, the infrastructure networks and the contaminated zones in order to further develop strategies for the future (Fig. x).

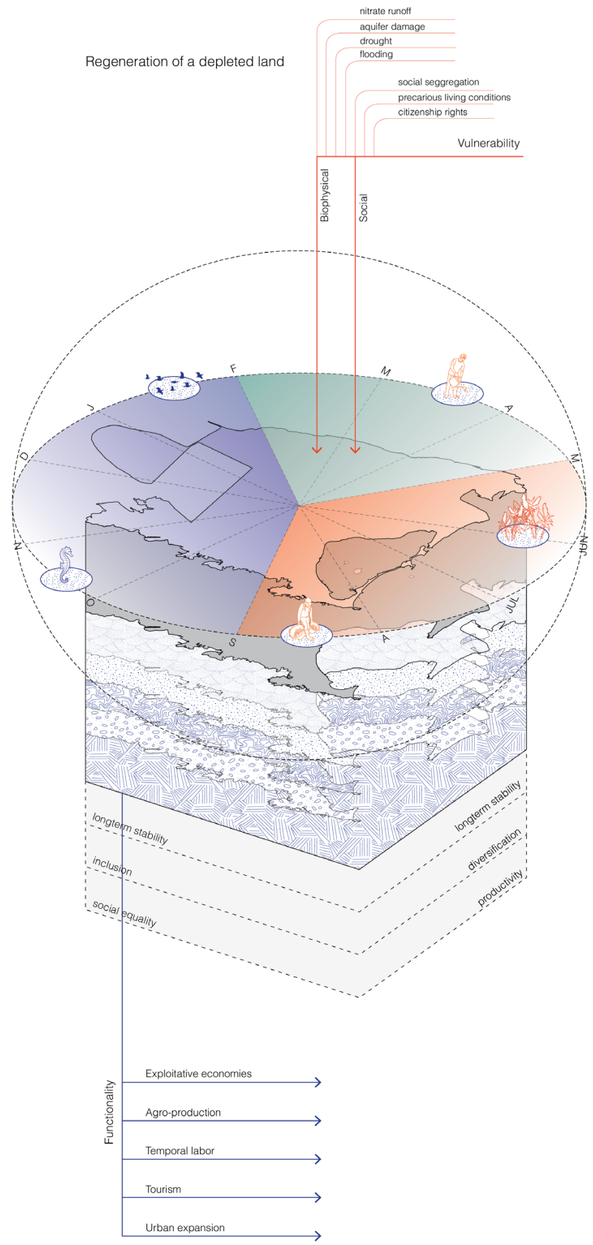
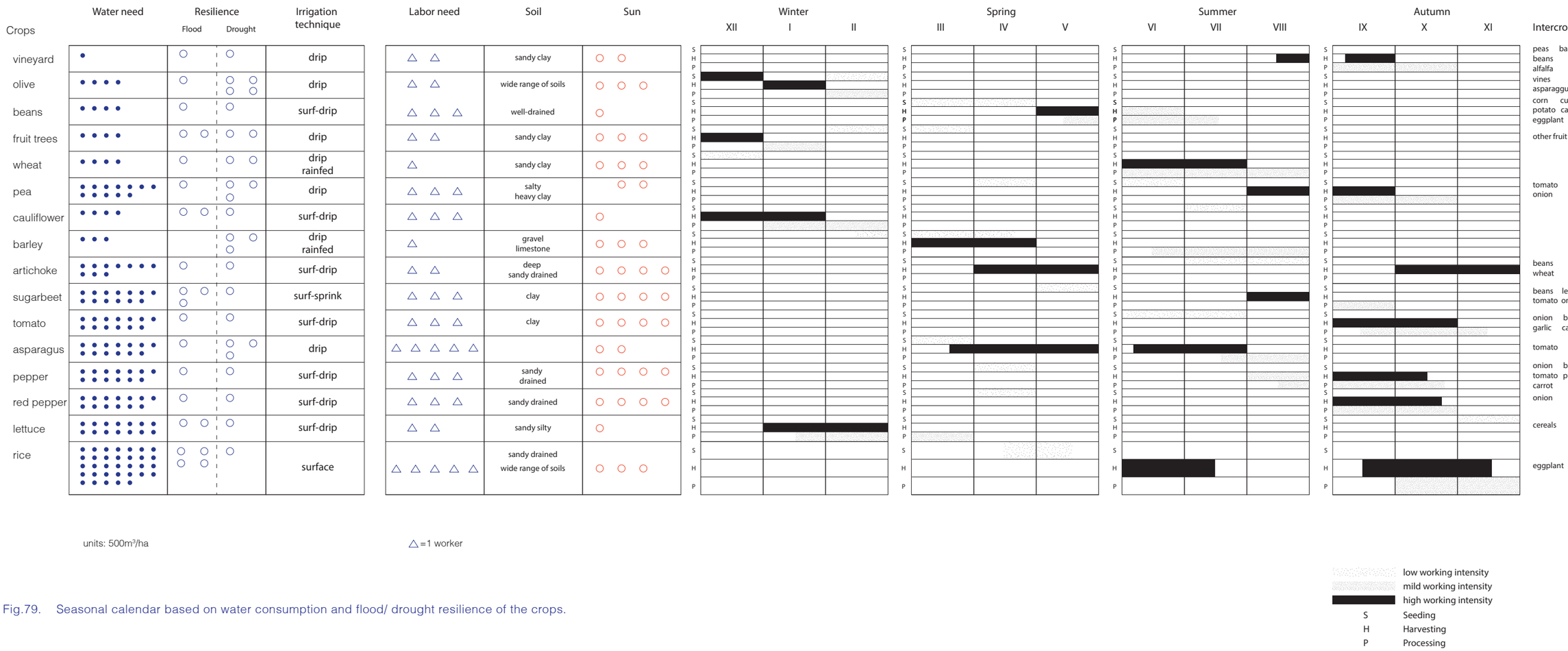


Fig.78. Design concept scheme.

SEASONAL CALENDAR



units: 500m³/ha

△=1 worker

Fig.79. Seasonal calendar based on water consumption and flood/ drought resilience of the crops.

The region is very rich in crops species since it is highly dependent on keeping a steady productivity to remain competitive in the global agro-market. Here, the crops are classified depending on their water consumption, flood and drought resilience and labour demand over the four seasons. It is obvious from the calendar that the major labour peaks occur during autumn and summer, then spring and finally winter.

Currently, Murcia marks as Europe's number one lettuce, cauliflower, lemon and melon marketer, a practice that has become highly unsustainable and calls for restructuring.

Existing monocultures

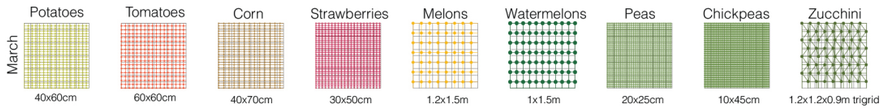


Fig.80. Existing cultivation patterns on plot scale.

Each of the crops has their own plantation frames and a yearly calendar needs to be implemented in crop rotation to let the soil rest for an adequate time. Some of the crops can be planted together in intercropping patterns due to similar water consumption, while others, for example crops who only need rainfall need more space between the crops.

Proposed crop rotation systems

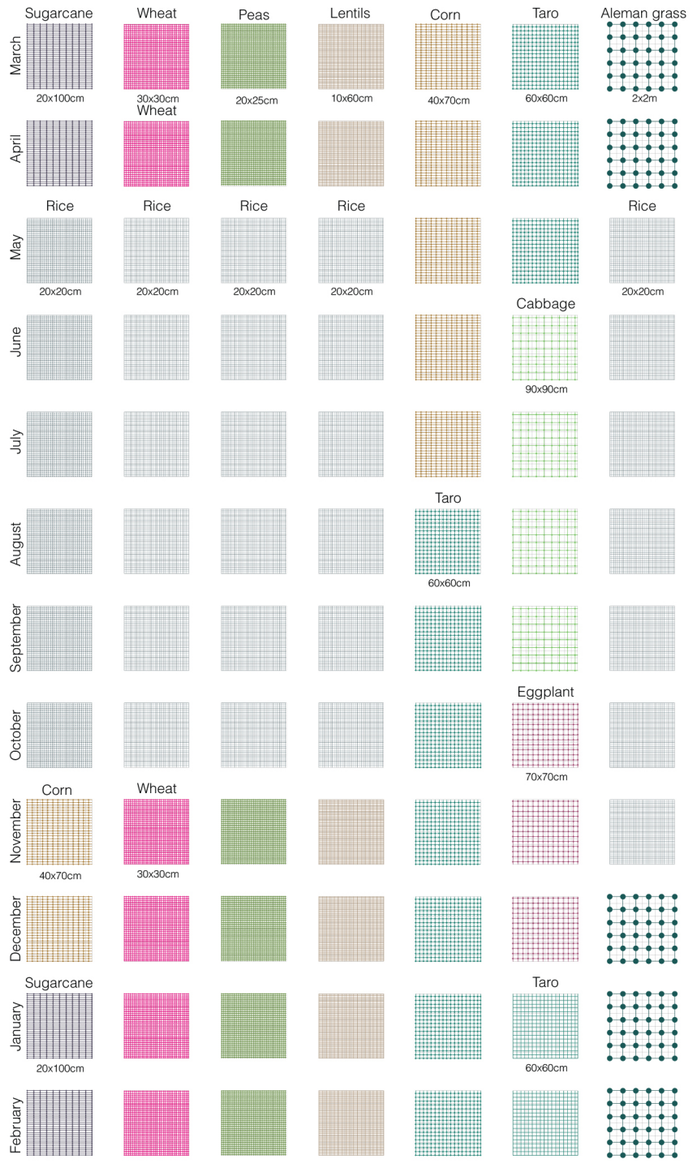


Fig.81. Proposed cultivation patterns on plot scale.

1. GREEN CORRIDORS

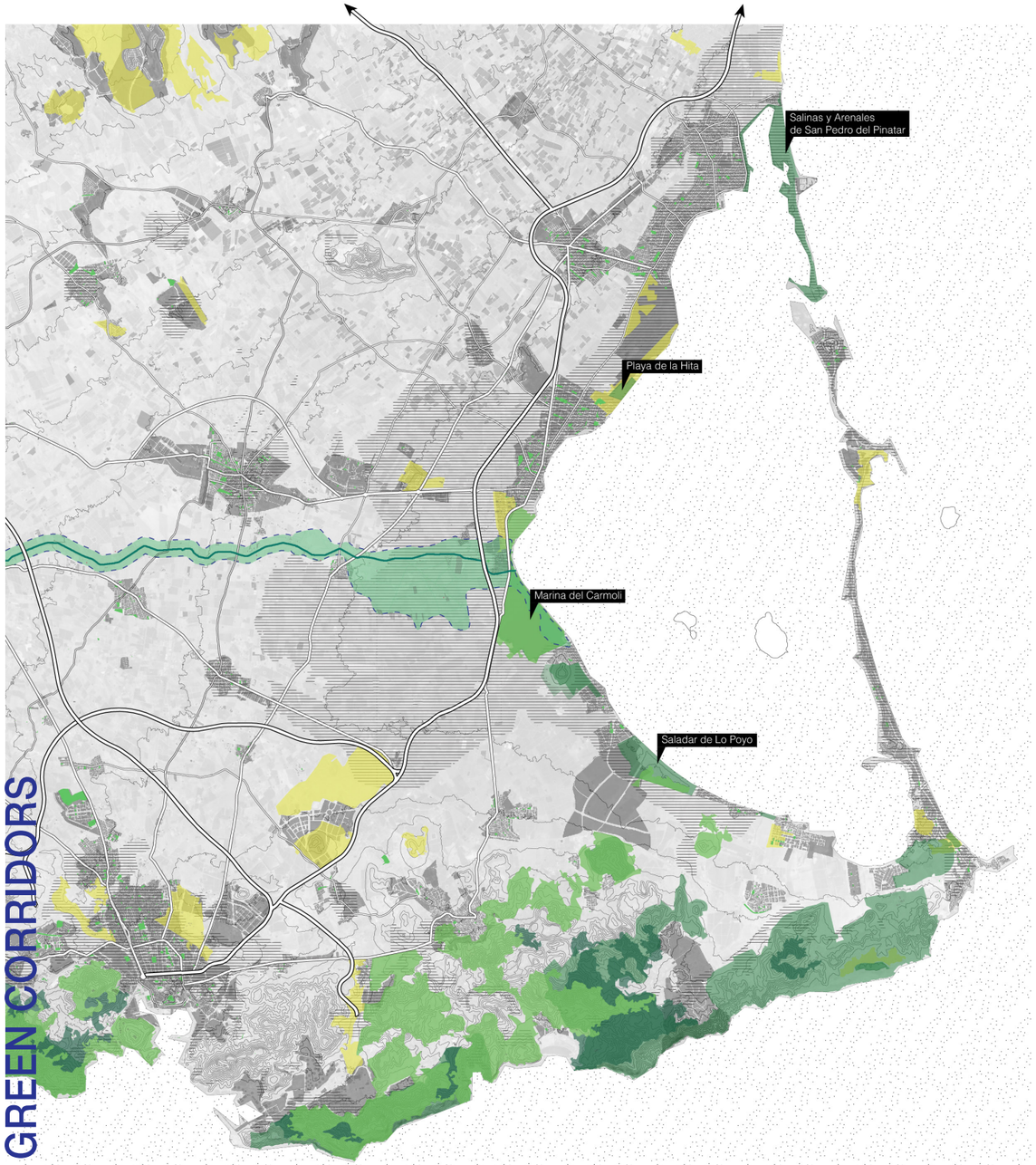


Fig.82. Existing green spaces

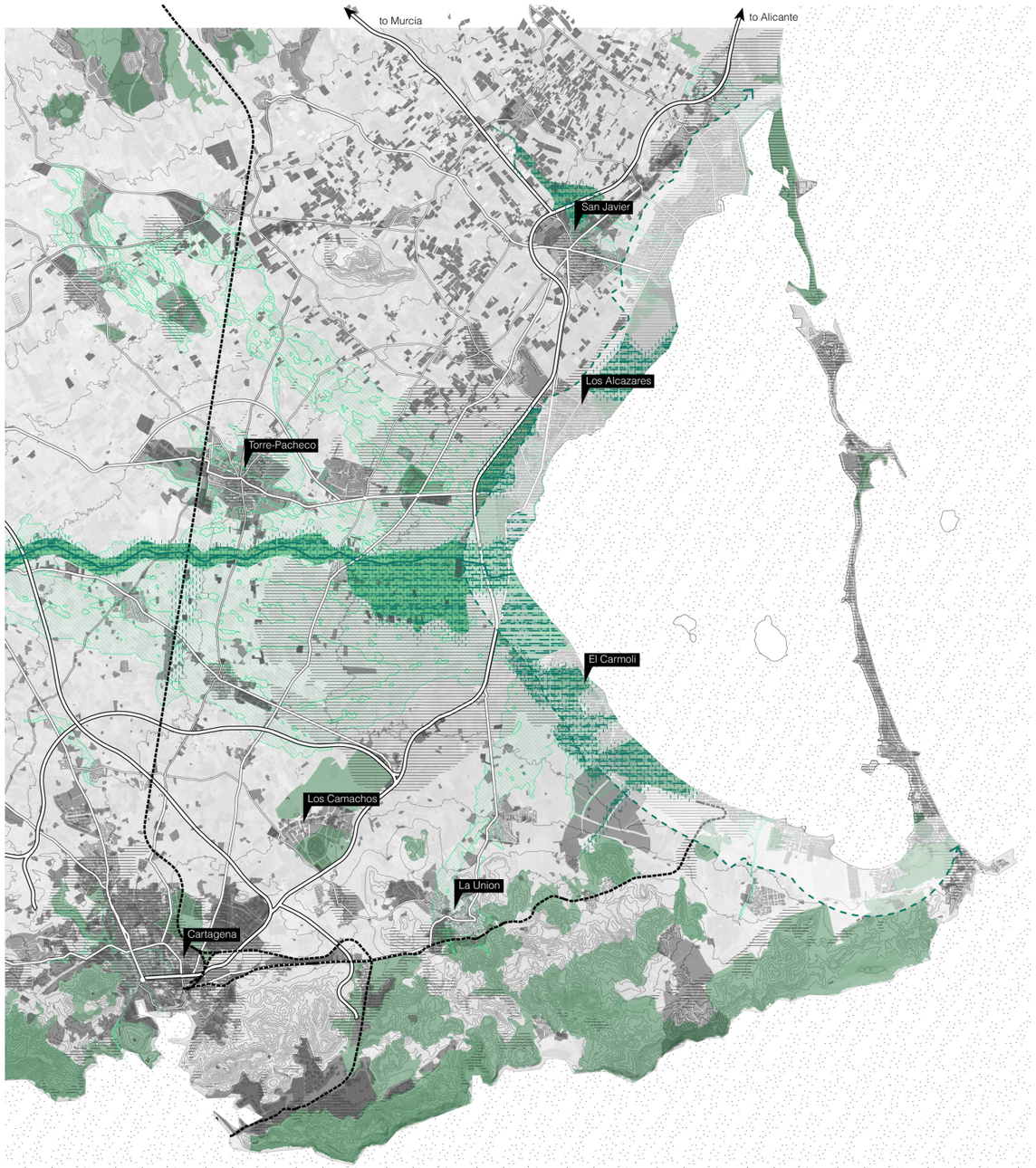


Fig.83. Proposed green corridors.

As part of the strategy for the environmental protection of the Mar Menor several green corridors are proposed in order to create natural green barriers to prevent fresh water from entering the saltwater lagoon. The strategy capitalizes on existing underutilized green or vacant spaces in the vicinity of the lagoon and along the spine of Rambla del Albujon.

Location	Tree characteristics	Examples
Inner 15m of buffer nearest water body	Must provide shade and organic matter to stream Must be flood tolerant Should be deciduous	Red maple River birch Sycamore
Outer 30m of buffer	Must be moderately flood tolerant Can be deciduous or coniferous	White oak White pine Black cherry Sugar maple

- Variation in the riparian landscapes of the Segura River Basin -

Table 1. Characteristics of the three site types, based on plant community composition.

Type	1	2	3
Thermo-climatic type Ombro-climatic type	Oromediterranean Subhumid, Humid	Mesomediterranean Semi-arid to Subhumid	Thermomediterranean Semi-arid
Water chemistry	Carbonated	Carbonated, Sulphated or high content in chloride	Sulphated, high content in chloride or equilibrium
Water-biotic quality	High	High/medium	Medium/low
Number of riparian taxa	662	562	384
Number of differential taxa	290	54	68
Percentage of exotic elements	1%	7%	14%
Percentage of Central-European elements	21%	12%	5%
Percentage of Mediterranean elements	41%	41%	39%
Temperate component (Querco-Fagetea)	5	4	0
North-African component (Nerio-Tamaricetea)	0	3	5

Fig.84. Variation in the Riparian Landscape of the Segura River Basin, SE Spain, F. Alcaraz, S. Ríos, C. Inocencio and A. Robledo, Journal of Vegetation Science, Vol. 8, No. 4 (Sep., 1997).

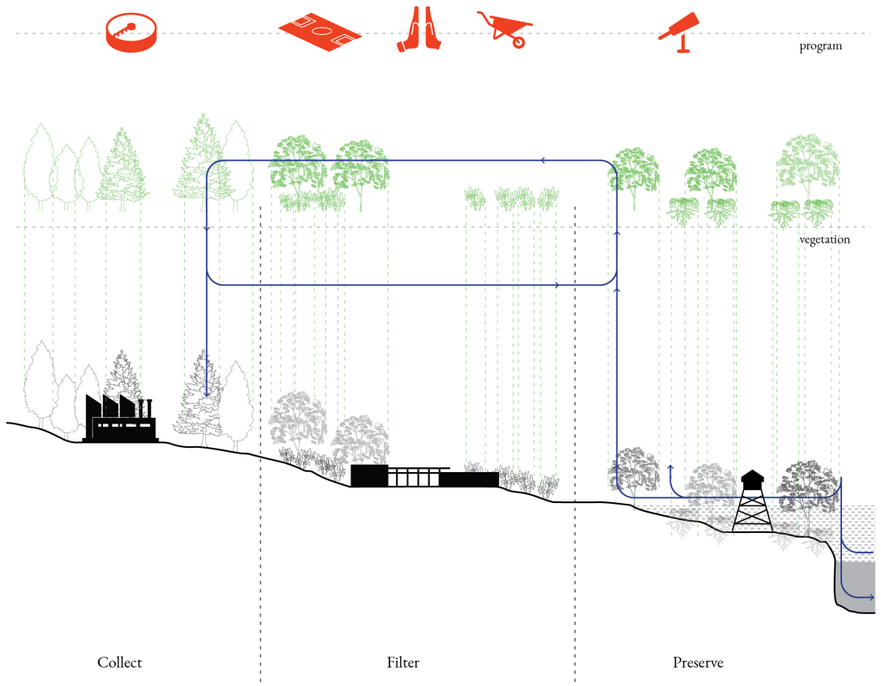
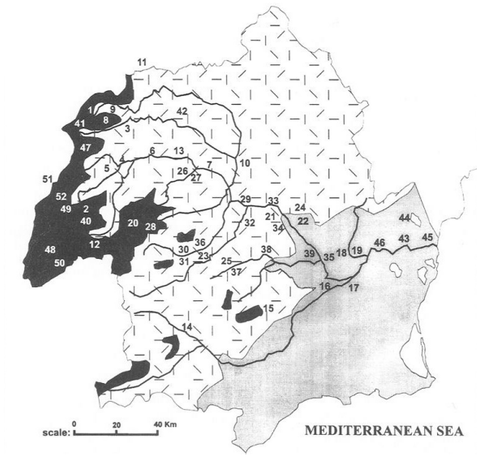


Fig.85. Systemic section of the design strategy.





Key map.

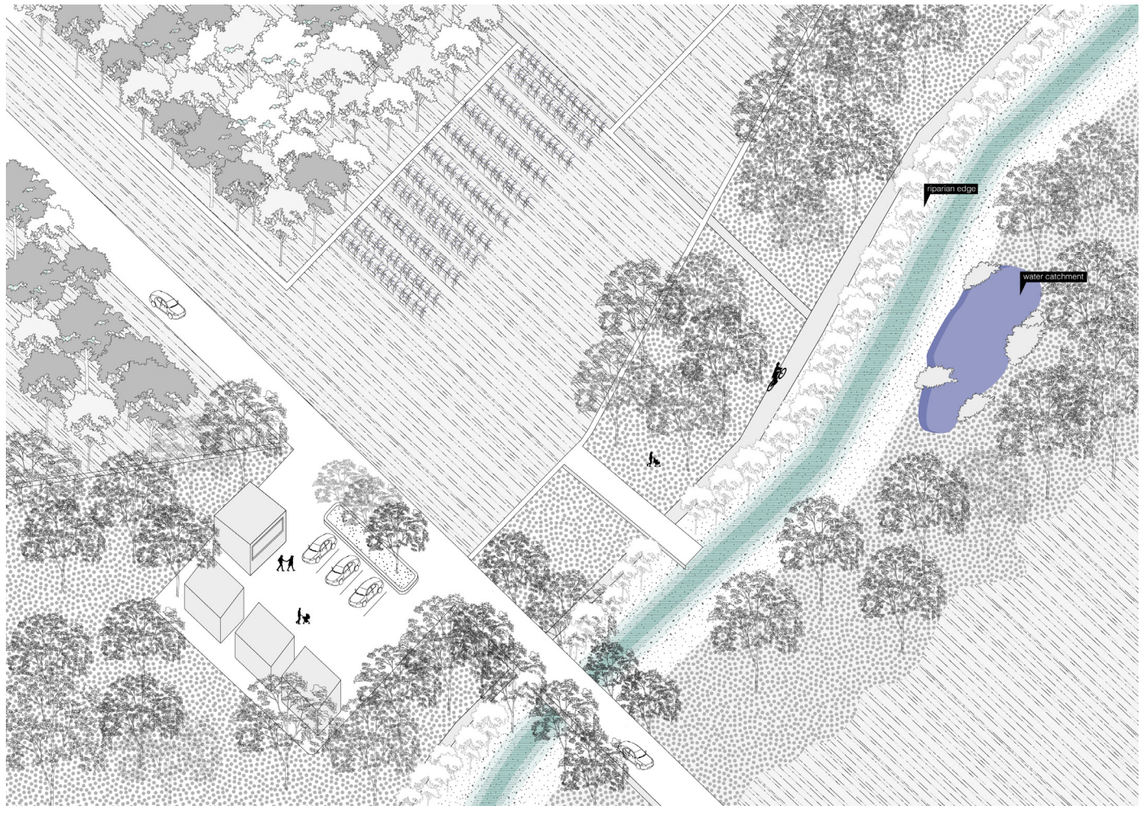


Fig.86. Reparative planting.

Explaining the design intensions for replanting the rambla's edge according to the principles of nature-based solutions.

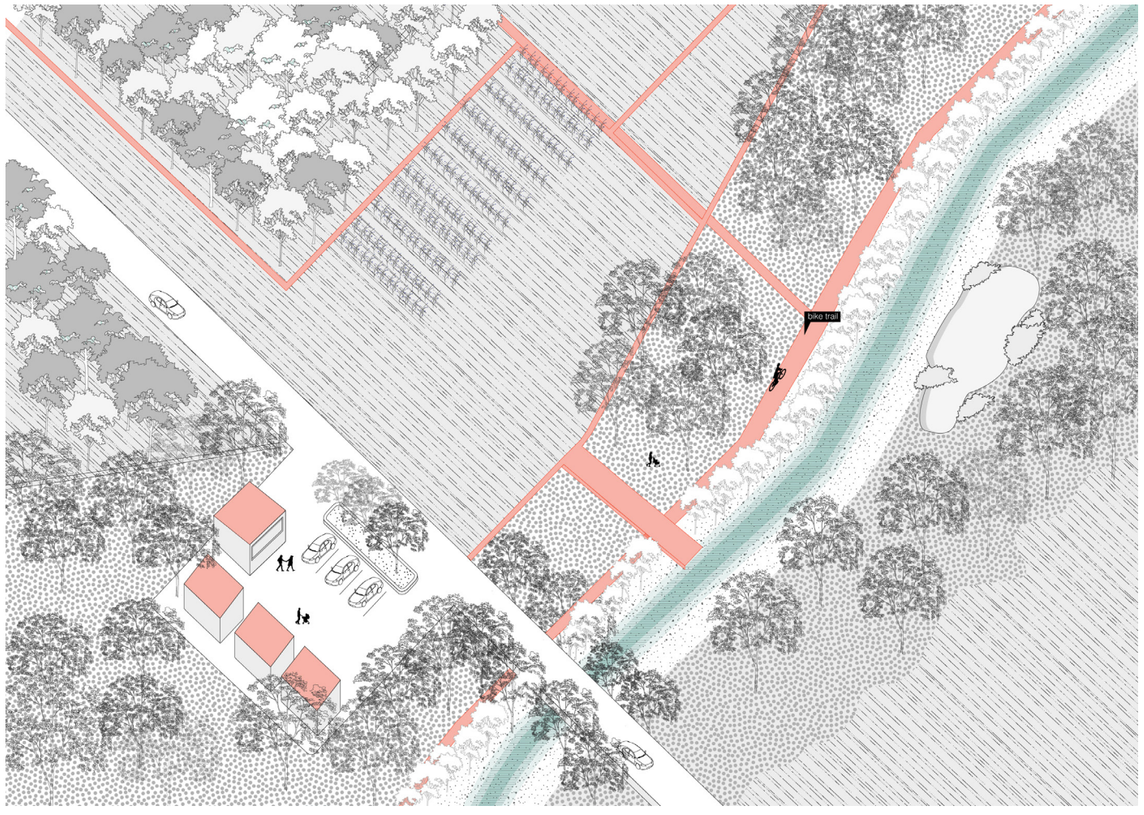


Fig.87. Social activators providing public spaces for locals.

Explaining the complementing program that will provide access to public spaces for local residents.

2. NEW SETTLEMENT EXPANSION

The choice of strategic locations for new settlement insertions has been made based on existing urbanization patterns and their transportation connections. The logic of the strategy aims at creating semi-autonomous settlements in close connection to existing urban areas so as to accomplish the social integration of the migrant communities and reverse the current segregated status quo.

Suitability map

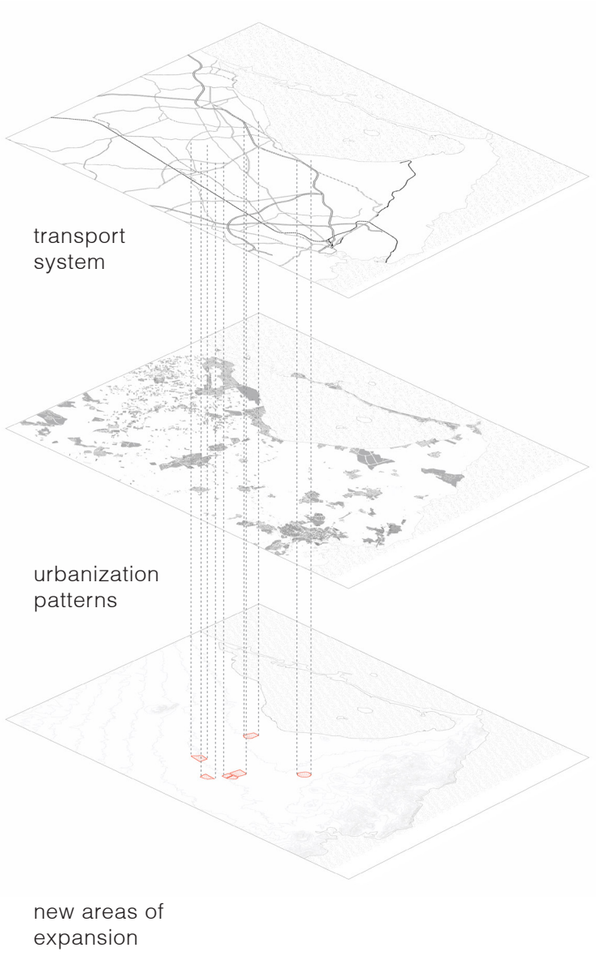


Fig.88. Layers of research for the settlement expansion.

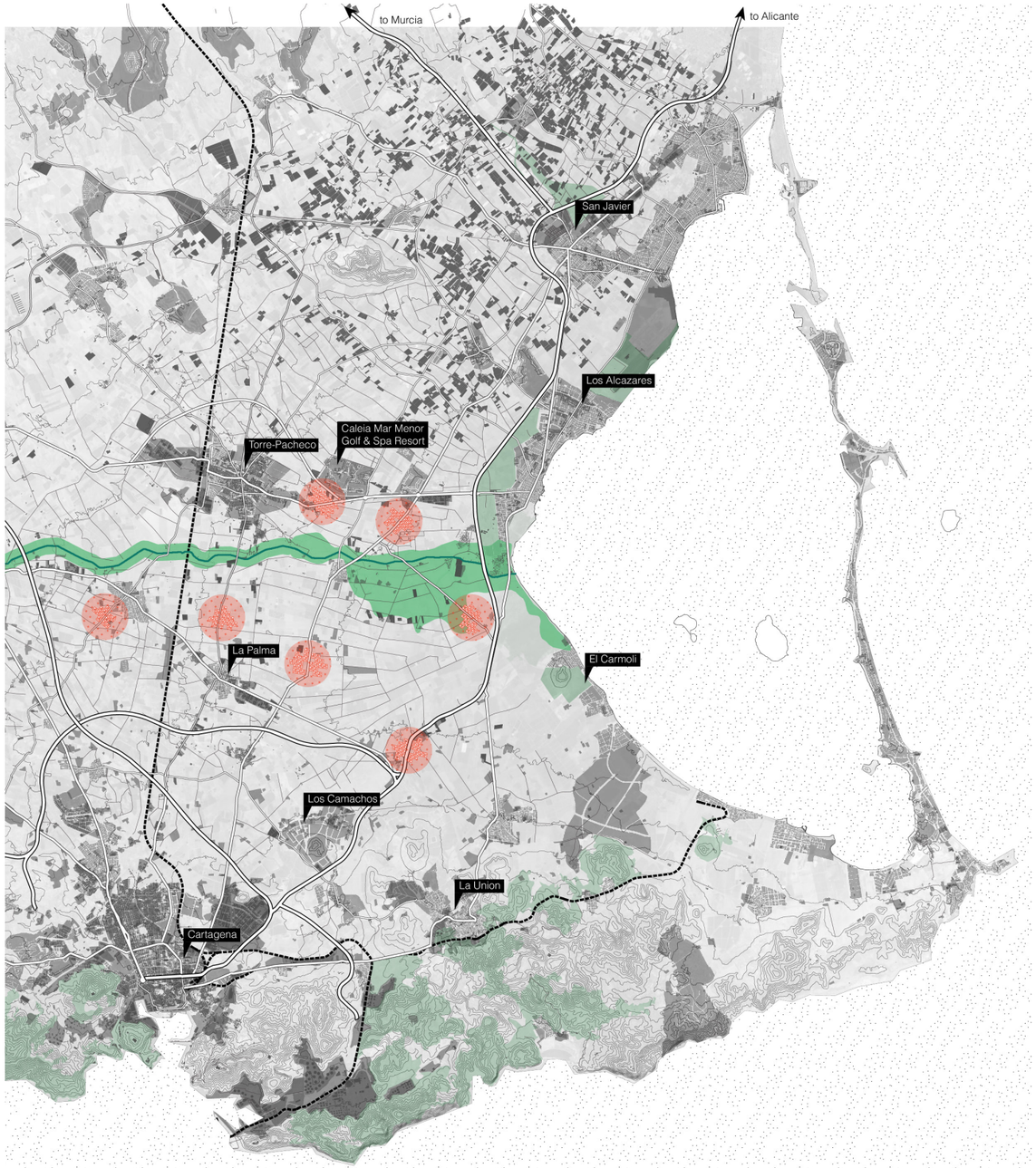


Fig.89. Strategic points of intervention.

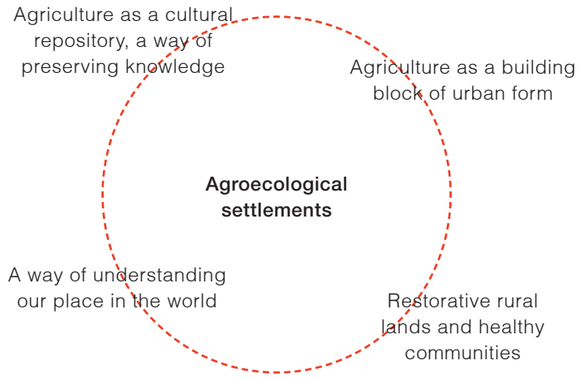
The agro-settlement functions as a building block of the urban form. It acts a cultural repository, a way of preserving knowledge and restoring the depleted rural lands in order to build healthy communities. Social interactions are cultivated in 3 different scales:

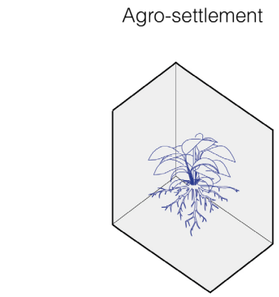
On the individual scale, residents cultivate their own plots to supply their own food.

On the household scale, groups of 8 households share the responsibility for the maintenance of a common productive land.

And on the neighborhood scale, communities come together to manage, harvest and process the crops.

Each new settlement develops along a main transportation axis between two existing urban areas. At the very core there is a main square with a commercial center, a place of worship, food markets etc. and around this center the various housing typologies unfold in relation to smaller public spaces, while at the edges of we can find manufacturing and processing facilities.





Three scales that facilitate different types of social interaction:

Individual scale
Residents cultivate their own plots in the community garden to supply their own food

Household scale
Groups of 8 households share the responsibility for the maintenance of a common productive land

Neighborhood scale
Communities come together to manage, harvest and process the crops

Fig.90. Scales of intervention for the agro-settlements.

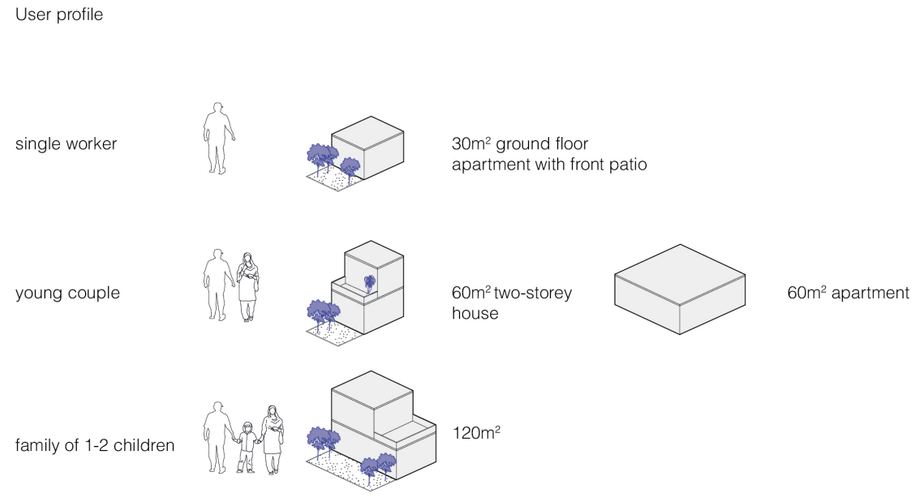


Fig.91. Housing and urban block typologies according to users' needs.

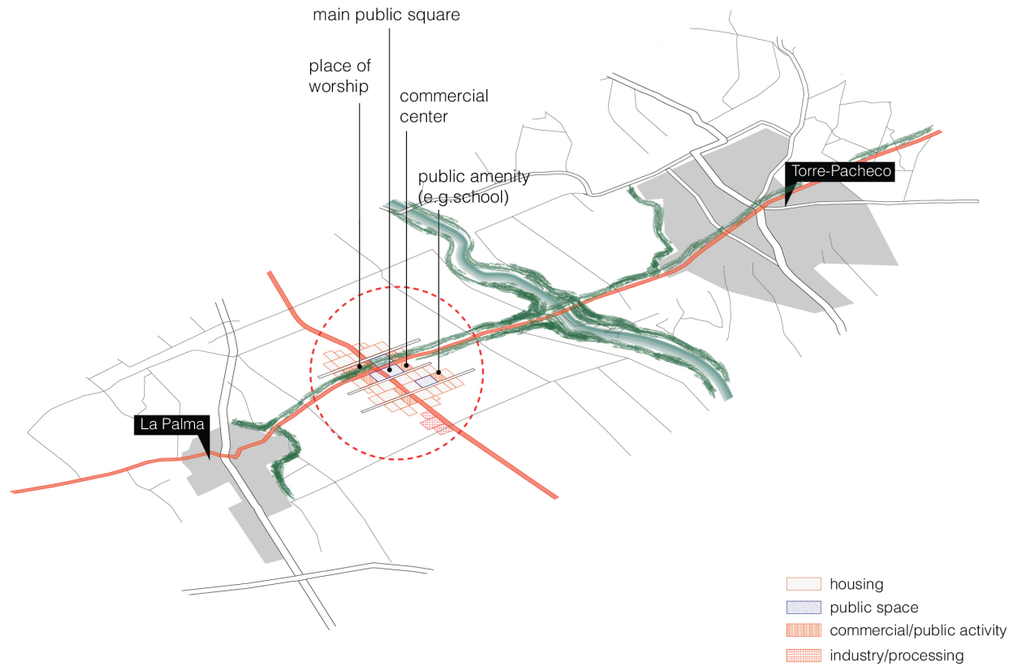
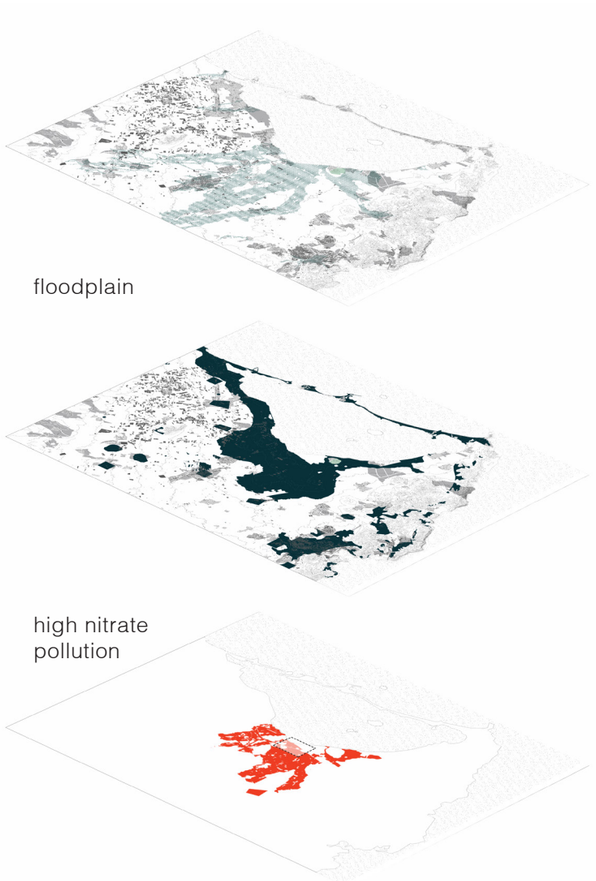


Fig.92. Concept sketch for the settlement's structure.

3. CROP DIVERSIFICATION FOR FLOOD & DROUGHT RESILIENCE

Since farming is a primary economic activity in the entirety of the region of Murcia and there is already a great investment interest in the land, the strategies presented here are working in line with this fact, attempting to restructure the kinds of cultivation and export as a means to moderate the existing intensive models and to pay respect to the natural systems they are based on.

In order to develop the design strategies, a number of factors have been used as a design framework, such as: the climatological classification of the region, the extend of the floodplain and its annual cycles, the zones of high nitrate concentration and the orchards that are mainly producing this pollution.



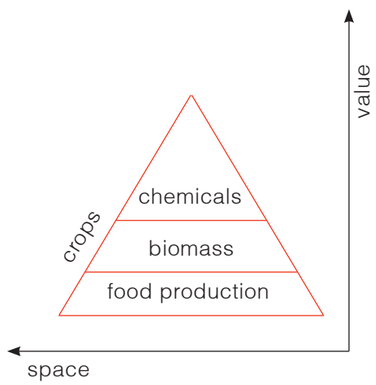


Fig.93. A layered approach on which the strategy is based on.

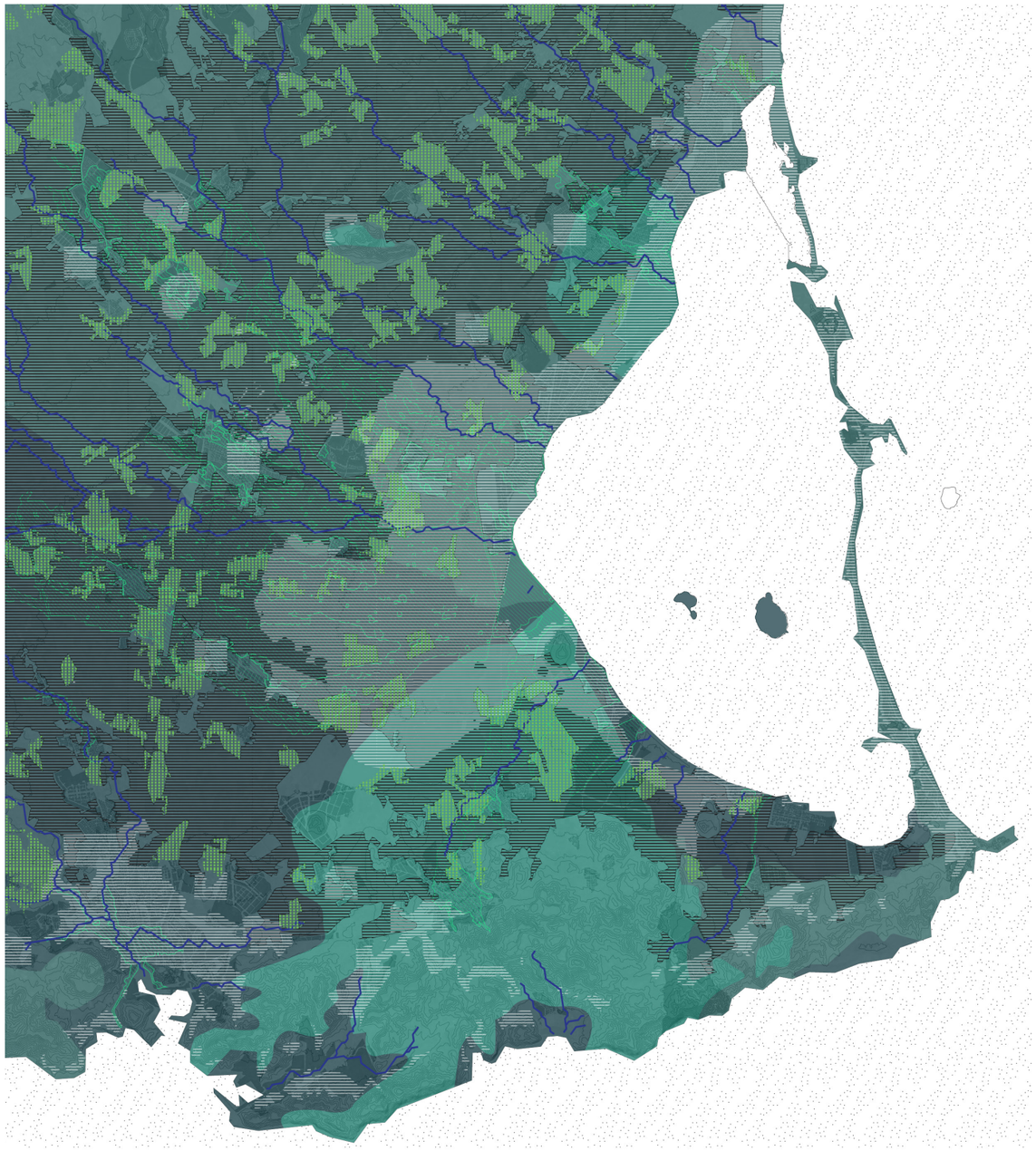


Fig.94.
Climate classification based on the Climate Atlas of the Region of Murcia prepared by the AEMET in 2013 according to the Köppen climate classification.

STRATEGY 2A- REFORESTATION WITH NITROGEN-FIXING TREES

Nitrogen is considered one of the most essential elements for the growth of plants and can greatly benefit agriculture. Nitrogen fertilizers are responsible for feeding approximately 48% of the global population but a large part of them is lost to the environment. Spanish agriculture is characterized by high inputs of fertilizers and high nutrient emissions to the environment. Agricultural activity is therefore responsible for groundwater pollution and eutrophication of aquatic ecosystems, posing a threat to water quality.

The use of organic and mineral fertilizers has proven successful in reducing N losses, improving N use efficiency (NUE) and reducing N surplus. N surplus is the difference between field N input and output. N surplus has been suggested as indicator of the potential loss of N to the environment (OECD, 2001). Besides N surplus, several crop and soil management practices can influence the N losses.

Various species of legumes have been observed to for their beneficial effects in agronomic systems. in intercropping systems where legumes are the main component, the main sources of nitrogen are the atmospheric nitrogen fixed by the legume, the nitrogen available from the soil either in organic or inorganic form and the nitrogen contained in applied fertilisers. Losses of nitrogen occur through harvested material, principally seed, and through denitrification, leaching and volatilisation. While in some circumstances, intercropping with a legume may not contribute significantly to the total nitrogen economy, the loss of nitrogen from a comparable non-legume stand will be much greater. By and large, intercropping with a legume will maintain the system in a positive nitrogen balance and if there has been good growth of the legume, the nitrogen contribution can be significant

Intercropping is defined as the cultivation of two or more crop species in the same field for the whole or a part of their growing period (Li, Zhang, & Zhang, 2013; Li, Zhang, Ma, et al., 2013). It contributes to high yields and high land use efficiency due to complementarity in resource requirements between plant species (Franco, King, & Volder, 2018; Yu, Stomph, Makowski, Zhang, & Werf, 2016)

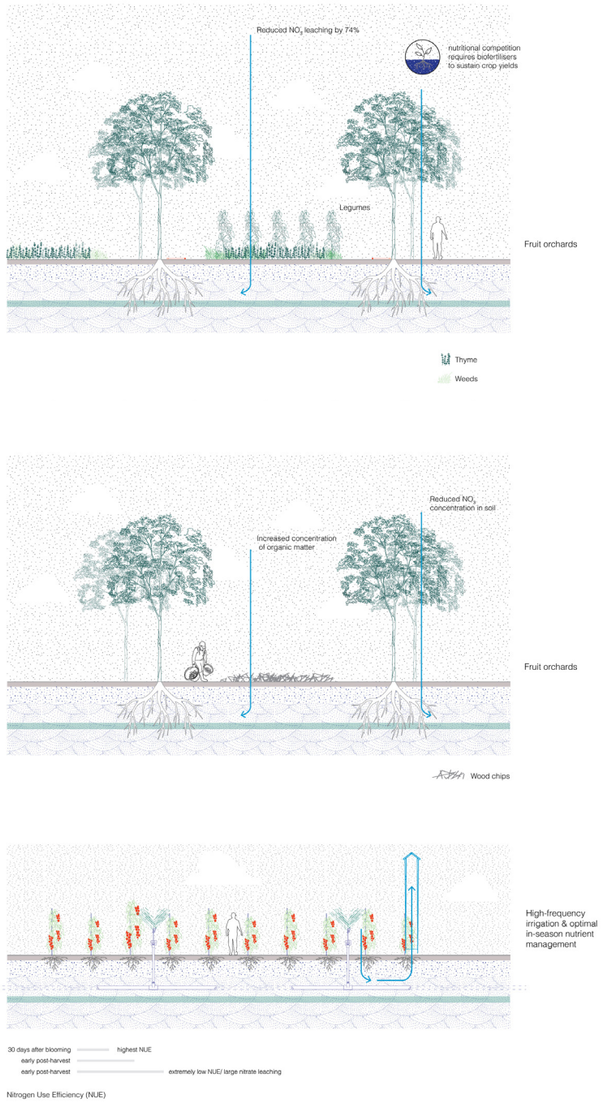


Fig.95. Agricultural practices for nitrogen recuperation.

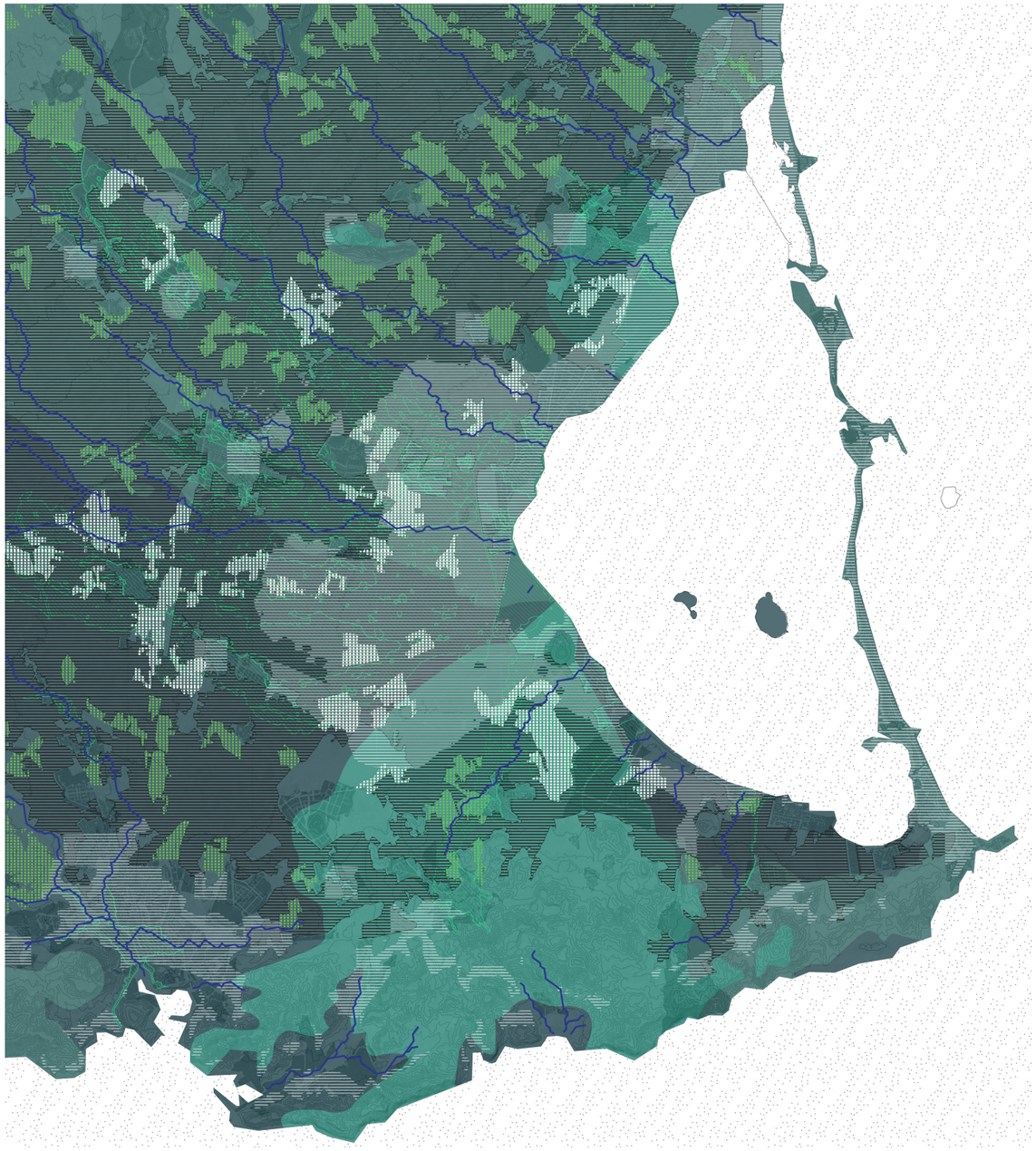


Fig.96. Orchard reforestation strategy.

STRATEGY 2B- MIXED DRYLAND/WETLAND FARMING

Strategy 1- mixed dryland/wetland farming

The increasing occurrence of extreme flooding and drought in the region that is exarcebated by climate change calls for the adaptation of the agricultural sector. The strategy is based on the hypothesis that wetland species could help upland species under flood conditions.

Various grain food crops adapted to environments with different water availability are used worldwide to provide food for humans (and animals). For example, pearl millet and sorghum have been used since ancient times because they are dryland-adapted food crops with high yield potential even under limited rainfall conditions They are the most widely cultivated grain crops in the semi-arid regions of Asia and Africa. More specifically, they are the major food crops in the Sahel of Africa, which account for more than 70% of all cereals grown in that region. Although pearl millet is one of the most drought-resistant food crops, it is extremely susceptible to conditions caused by waterlogged soil.

Major grain crops are occasionally mix-cropped with other species for risk management (Wolfe, 2000, Brooker et al., 2014). Mixed cropping of cereals and legumes is a commonly practiced cultivation technique worldwide because of the complementary effects for cereals, which benefit from utilizing the nitrogen that is biologically fixed by the legumes. Mixed cropping of wet- and dryland-adapted species may overcome the limitations imposed by both flood and drought conditions.

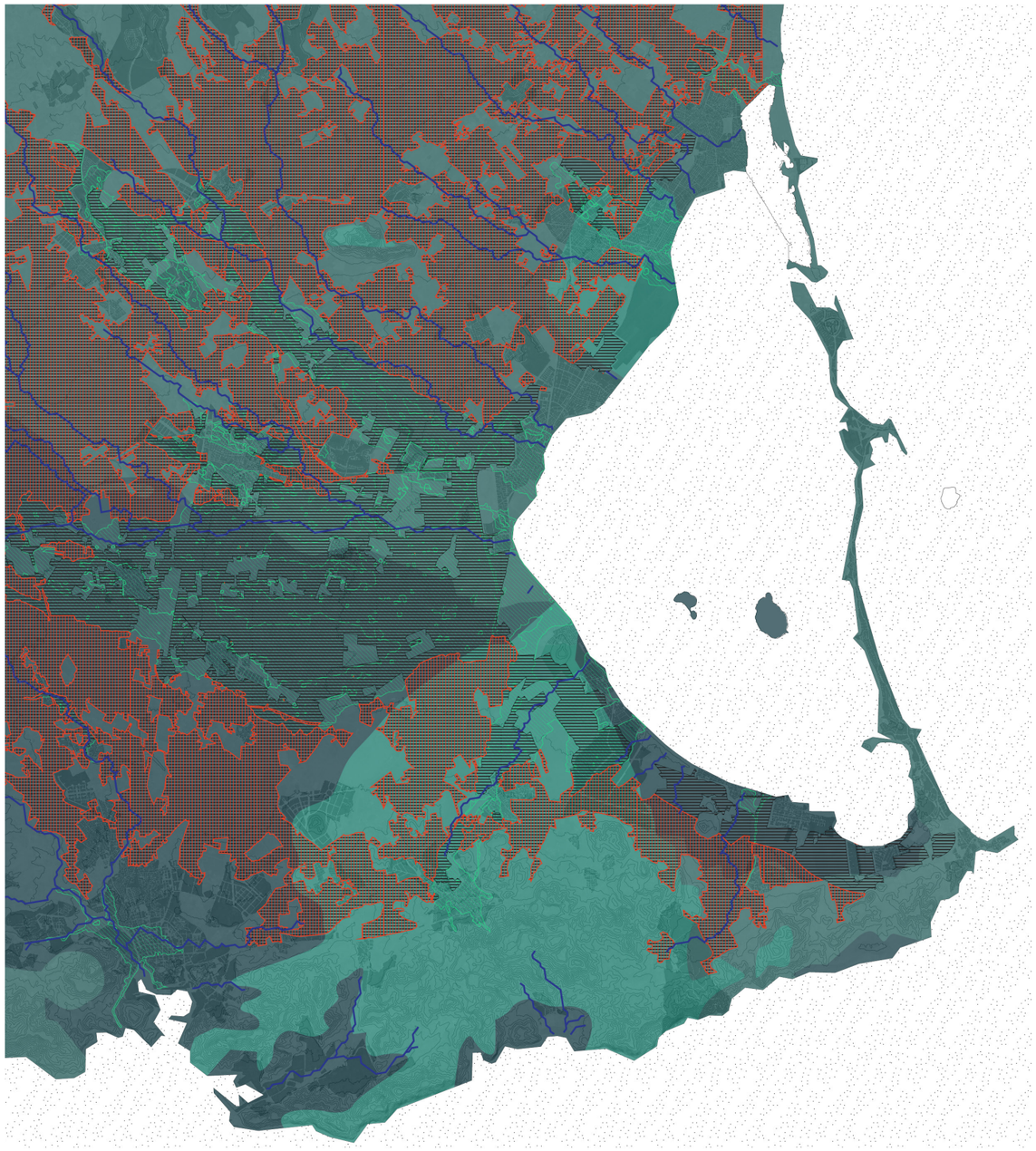


Fig.97. Mixed dryland-wetland farming strategy

STRATEGY 2C- FLOOD-TOLERANT ENERGY CROPS

Strategy 2- Flood-tolerant energy crops

The objective of this strategy is to introduce potential crops for production in flood-risk areas. The main crops suggested here are comprised by a tuber (taro), grasses (aleman grass, flood-tolerant sugarcane and rice). Flooded biomass crops have a potential for production for large areas and can be distributed in large markets throughout Europe, given the proper economic conditions.

The crops that are proposed here vary widely in yield and nutrient uptake. Rice, for example, can only thrive in conditions of low phosporus, whereas aleman grass may require additional phosphorus mineralization. Crops that thrive in oligotrophic conditions and those requiring large amounts of nutrients can be significantly useful in water quality management. Aleman grass can be effective in reducing the phosphorus content from the fields that were previously cultivated with crops that left behind large concentrations of chemicals (such as vegetables and fruits). Rice is also proven to further decrease the chemical contents to levels of natural conditions. What is also important here is the low operating cost of such cultivations since periodic flooding helps with pest control (Snyder, 1987).

Energy Value of Flood-Tolerant Crops

Alemangrass, because of its greater biomass yield per hectare, has far greater energy potential than the other crops of the proposal. However, sugarcane and taro havehigher rates of biomass conversion than alemangrass

The energy value of a crop of alemangrass is estimated to be 350 MJ ha-1 of total yield, and 70 Mg ha-1 yield from two harvests per year). The energy value of taro tops is estimated to be 145 MJ ha-l of total yield, and 1’45 Mg ha-1 yield from three harvests per year). Methane production of flood tolerant sugarcane range from 22 to 330 MJ ha-1 (Deren1991).

Water and nutrient demands of flood-tolerant crops

Timing of water demand and supply is a rapidly emerging necessity for agricultural production in Southern Spain.

Biomass production logistics.

Biomass production	>	Feedstock Logistics	>	Conversion	>	Distribution Logistics
Cultivation silviculture		Harvest & collection Processing Transportation Storage		Heat & Power Liquid fuels Char products		Packaging Transportation Storage

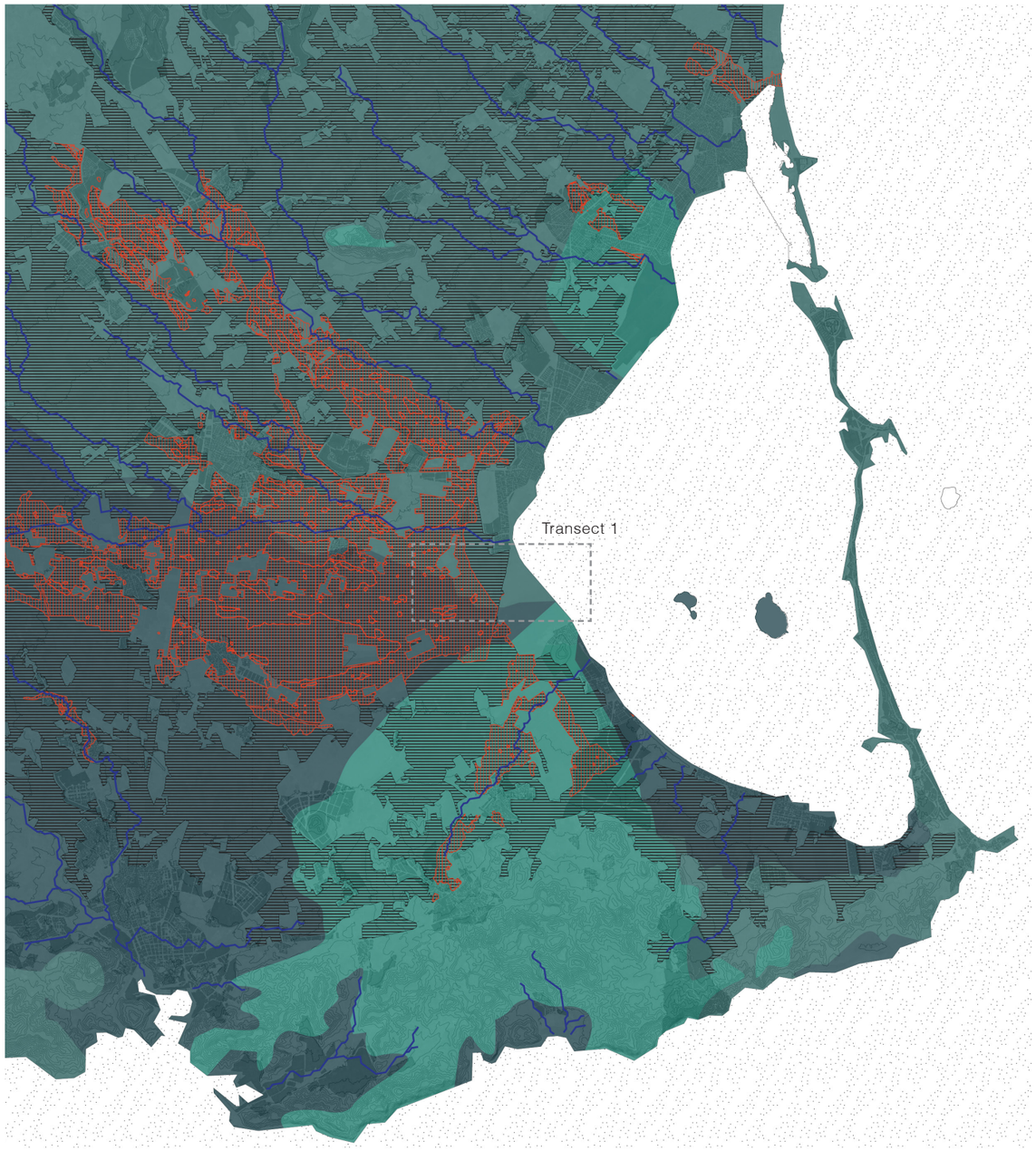


Fig.98. [

Transect 1

Existing conditions of urbanization [Local scale]

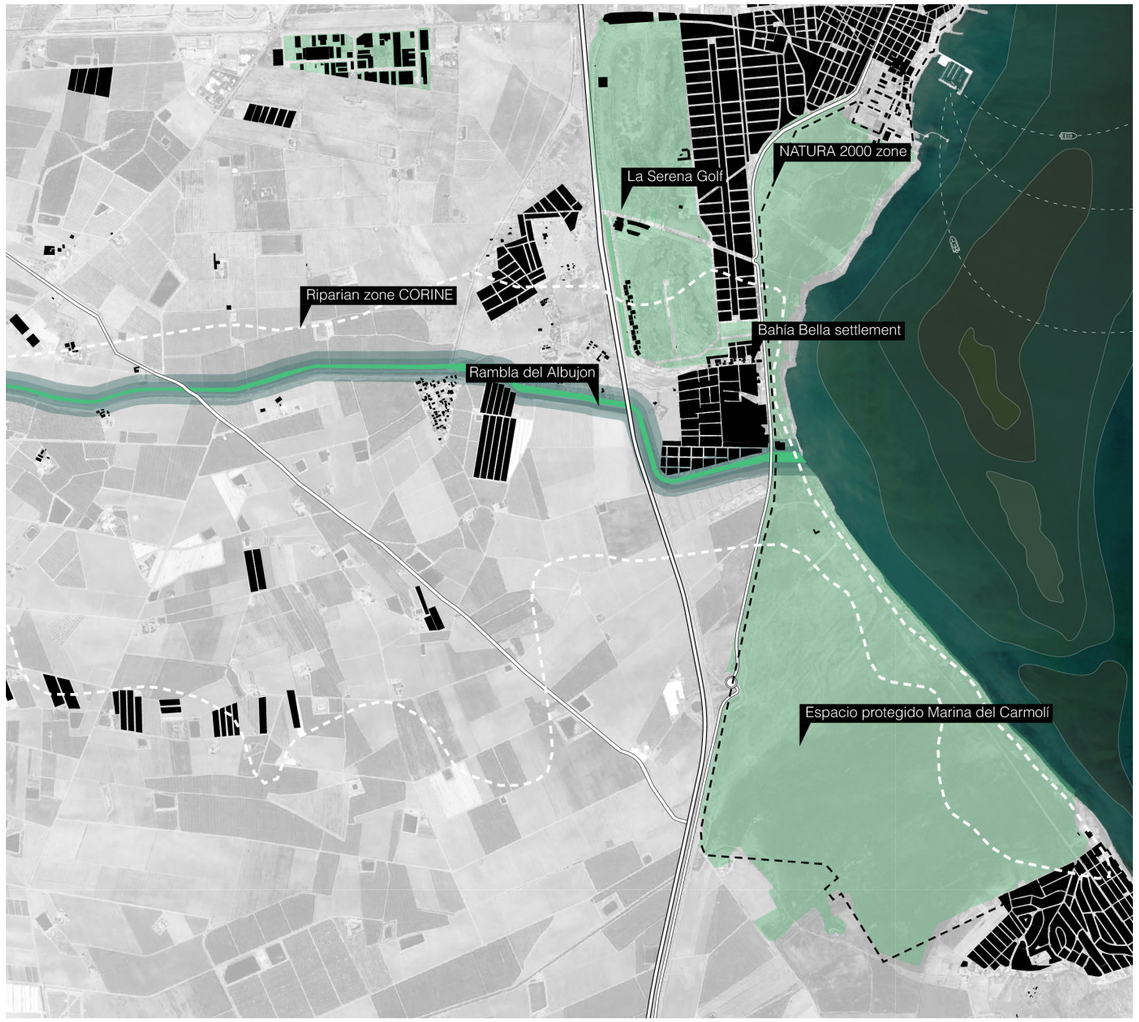


Fig.99. Map of existing urbanization and protected areas.

The lower transect of the mouth of the river is perhaps the most problematic part of the whole rambla. Large greenhouse structures,expanded settlement on the very edge, highways and bridges are putting pressure on the width of the river, dismissing its riparian zone. The natural wetland in El Carmolí (310ha) is completely neglected, covered in accumulated seaweed and other detritus from its former seaplane hangar state, even though it is considered as a protected zone.

Existing conditions of cultivation [Local scale]

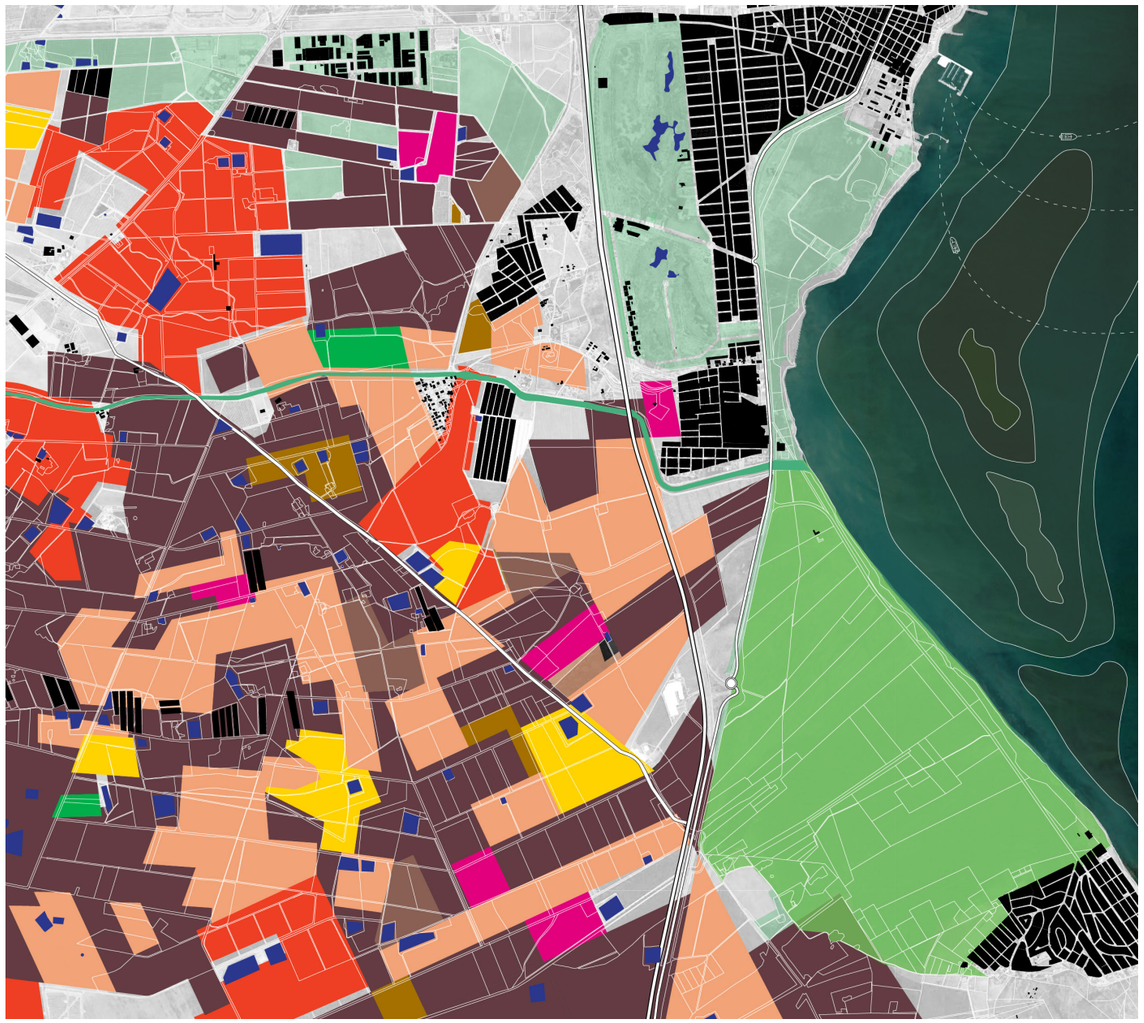
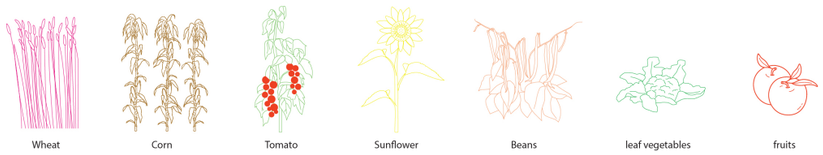


Fig.100. Map of existing cultivations.



Nitrogen excess*

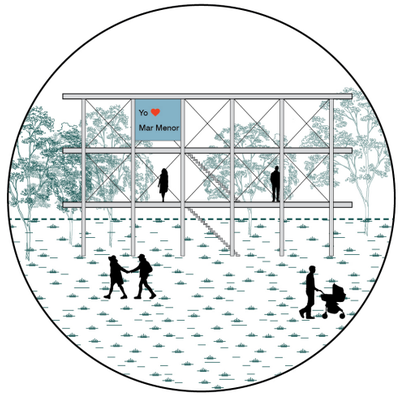
Vegetables	Citrus trees	Non-Citrus fruit trees
45%	28%	28%

*Data from Universitat Polytecnica de Valencia.

Design scenario

This portion of the intervention is the most crucial since it is the direct connection to the Mar Menor.







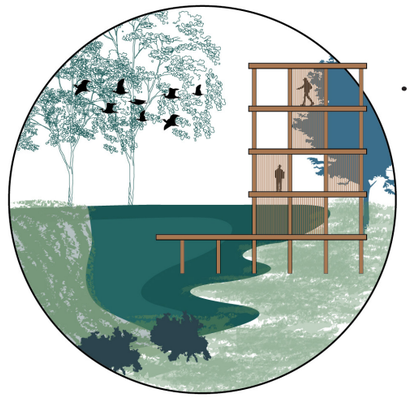


Fig.101. NBs design interventions on a local scale.

Phase 1- Proposed renaturalization of neglected protected zones

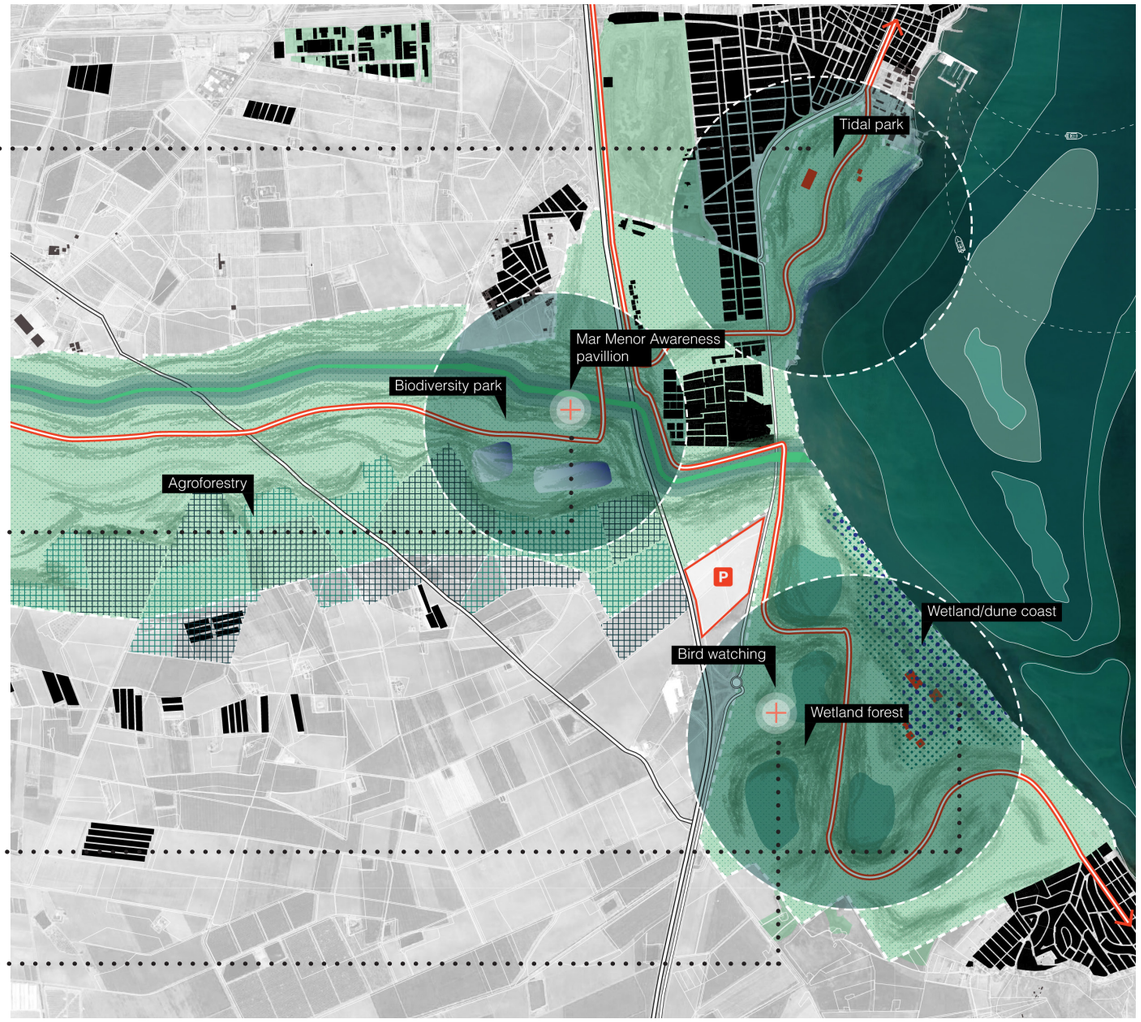


Fig.102. Areas of interest for creating green recreational zones.

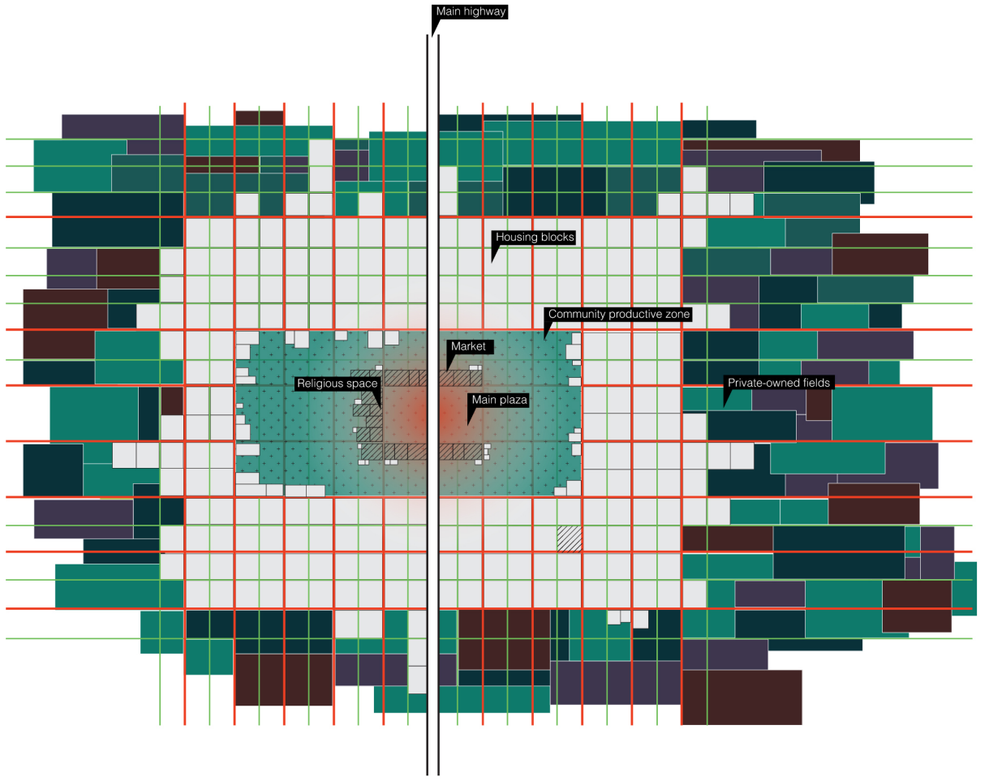


Fig.103. Settement typology diagram.

1. Reduced speed limit to 30/h in local streets.
2. Reduced speed limit to 15km/h in inner city streets / work towards shared space.
3. Build wide and accessible sidewalks.
4. Provide safe pedestrian crossings.

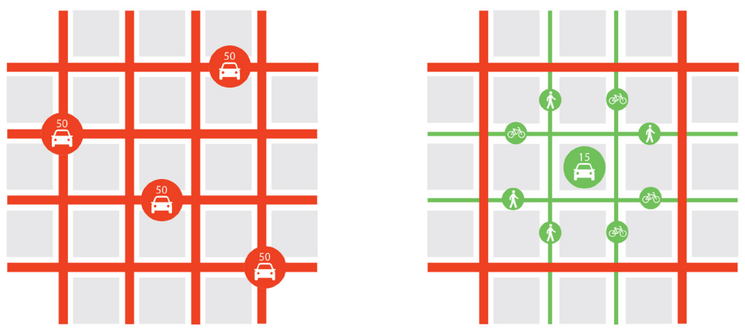


Fig.104. Slow mobility principles.

Phase 2- Construction of new settlement

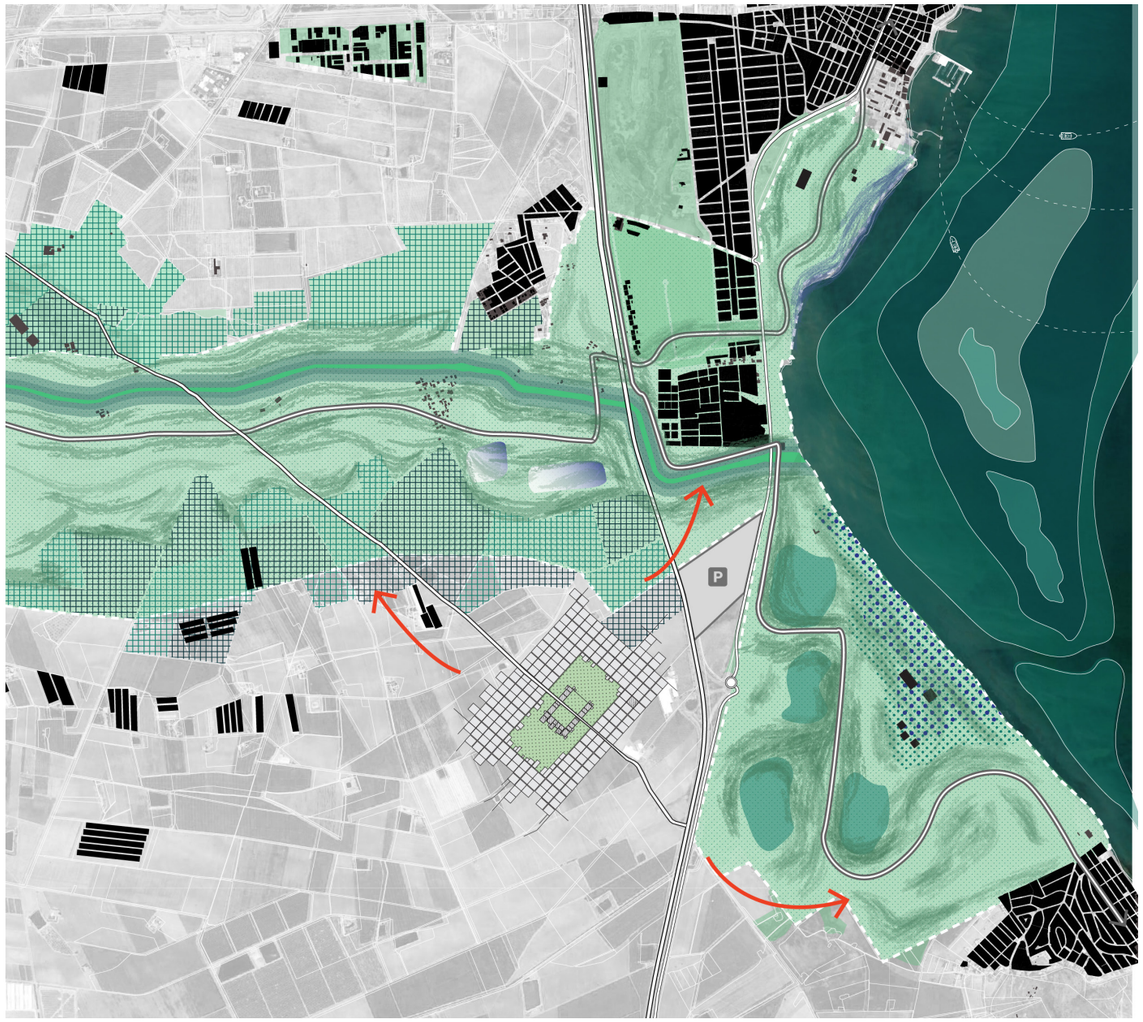


Fig.105. New settlement construction.

Recultivation strategy

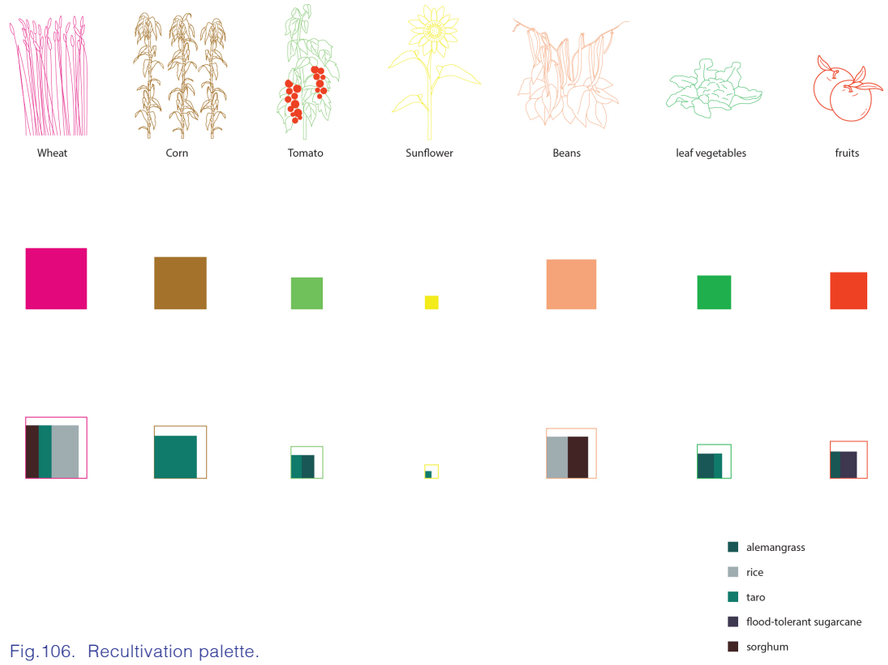


Fig.106. Recultivation palette.

Flood-Tolerant Sugarcane

Sugarcane (Sacchantm spp. and related genera) are grasses which yield large amounts of biomass. In addition, their high sucrose content may facilitate a more rapid and economical conversion of biomass to other forms of fuel. Several accessions of the Saccharurn complex are well adapted to a riparian habitat.

Aleman grass

Aleman grass is an aquatic perennial which is used for grazing, silage, and hay, mainly in South America. It is adapted to infertile soil, but responds well to nitrogen. It is a deep-water plant, tolerating floods up to 1 m in depth for short periods (Wilden, 1988) Indications are that two or three harvests per year result in greater yields than a single harvest at season's end.

Taro

Taro is a commercially important root crop in many parts of the world, including Egypt, the Philippines, the South Pacific and Hawaii, which grows well under flooded conditions. One of the major expenses of taro production is weed control, which can account for as much as 47% of total production costs. Lowland cultivars would presumably have fewer weed and insect problems because of flooding (Snyder, 1987).

Phase 3-Proposed system of production [Local scale]

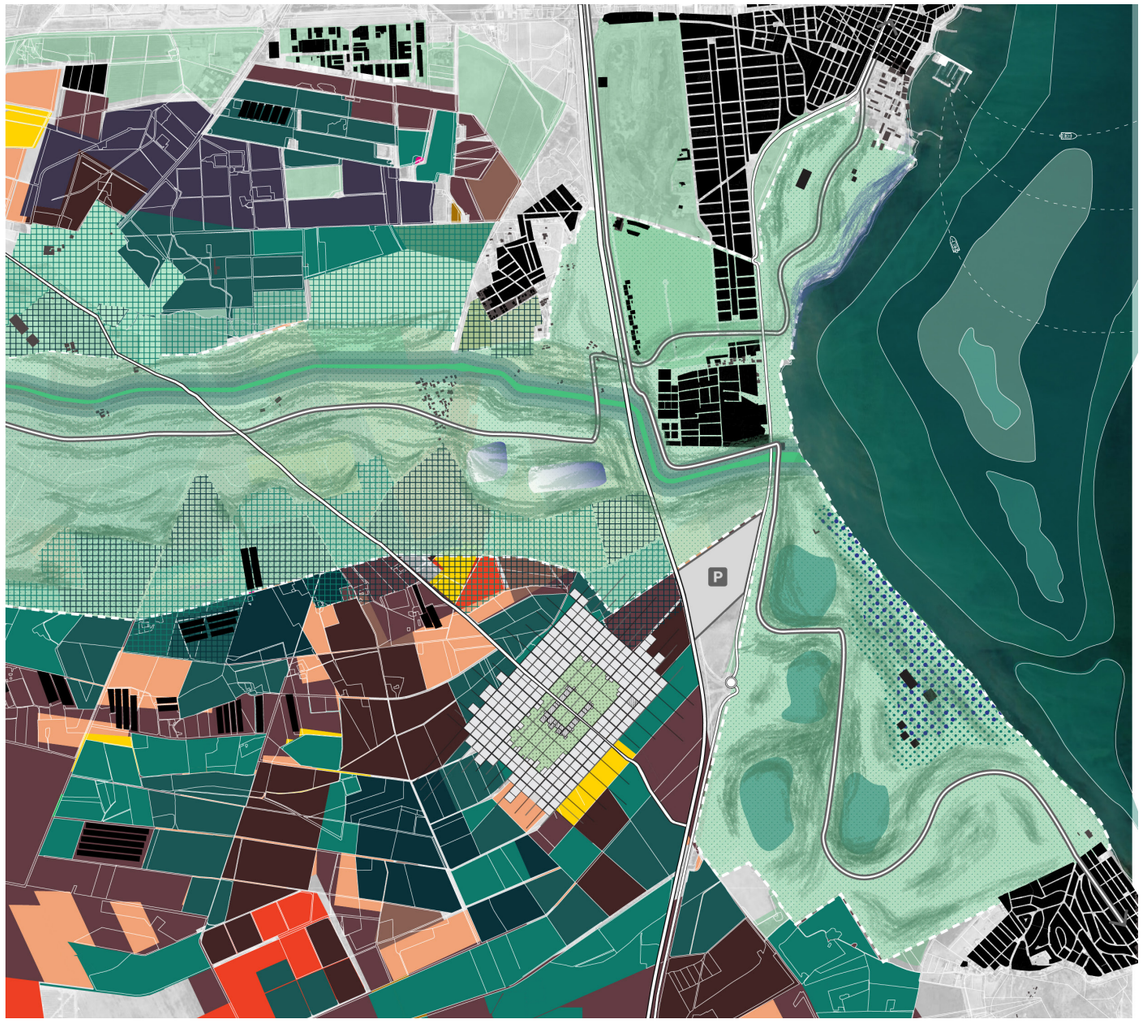


Fig.107. Final stage of the new settlement and its cultivated and protected zones around.

Rice

Rice is an important crop worldwide. Rice production benefits the soil by reducing the rate of soil loss, and may improve yields and water quality when grown in rotation with other crops. In addition, the demand for water by rice planted in the spring coincides more closely with the rainy season than that of other crops in the region. It has also been suggested that rice grown in rotation with vegetables may improve the water quality of drainage from vegetables (Jones, 1987).

CROP-LABOR BALANCE

Labor force transformation

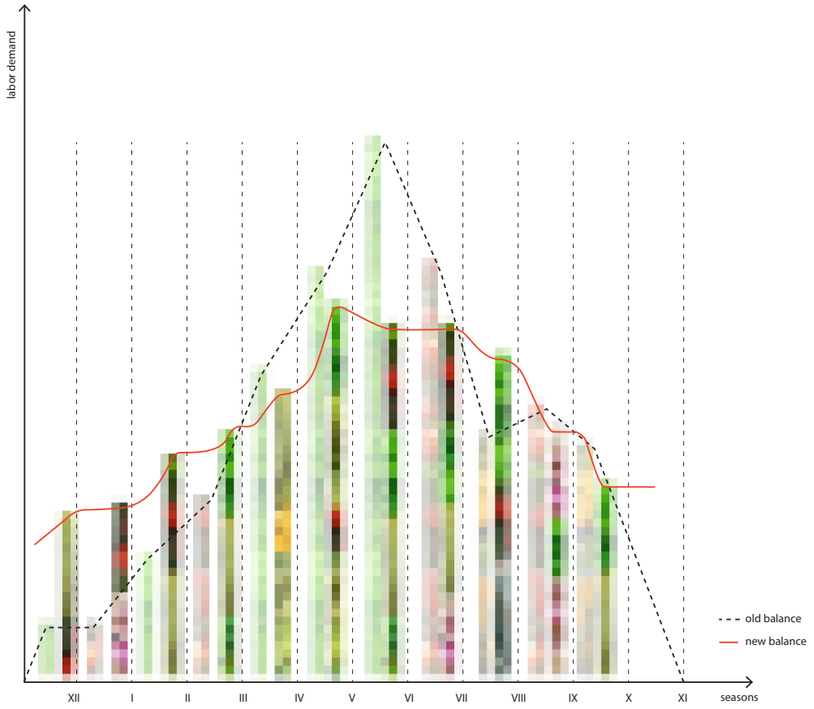


Fig.108. Labor demand scheme over the year.

One of the fundamental goals of the project is to transform the landscape into a more resilient one, not only in ecological terms but also in productive terms. The territory will be altered according to the flood and drought resilience of the crops and a new labour balance has to be achieved. An equal balance can definitely not happen so some peaks will inevetably still happen in summer.



Fig.109. Impression of the new settlement's everyday market. Production is getting closer to consumption by introducing industrial typologies that integrate retail markets on the ground floor, providing social interactions and gathering spaces for the residents.

TERRITORIAL VISION

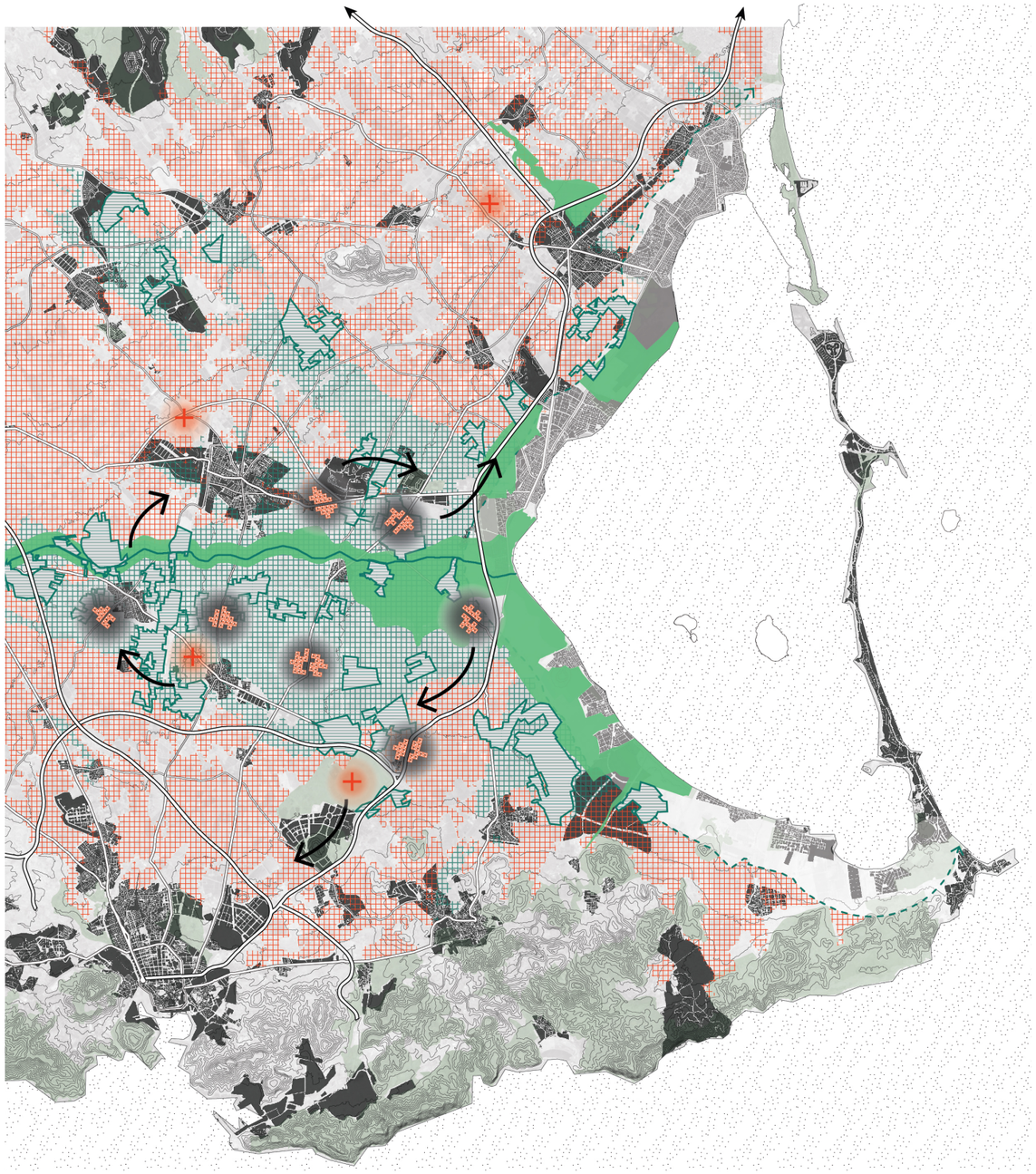


Fig.110. Vision map for the territory of Campo de Cartagena.

Implentation process- Timeline

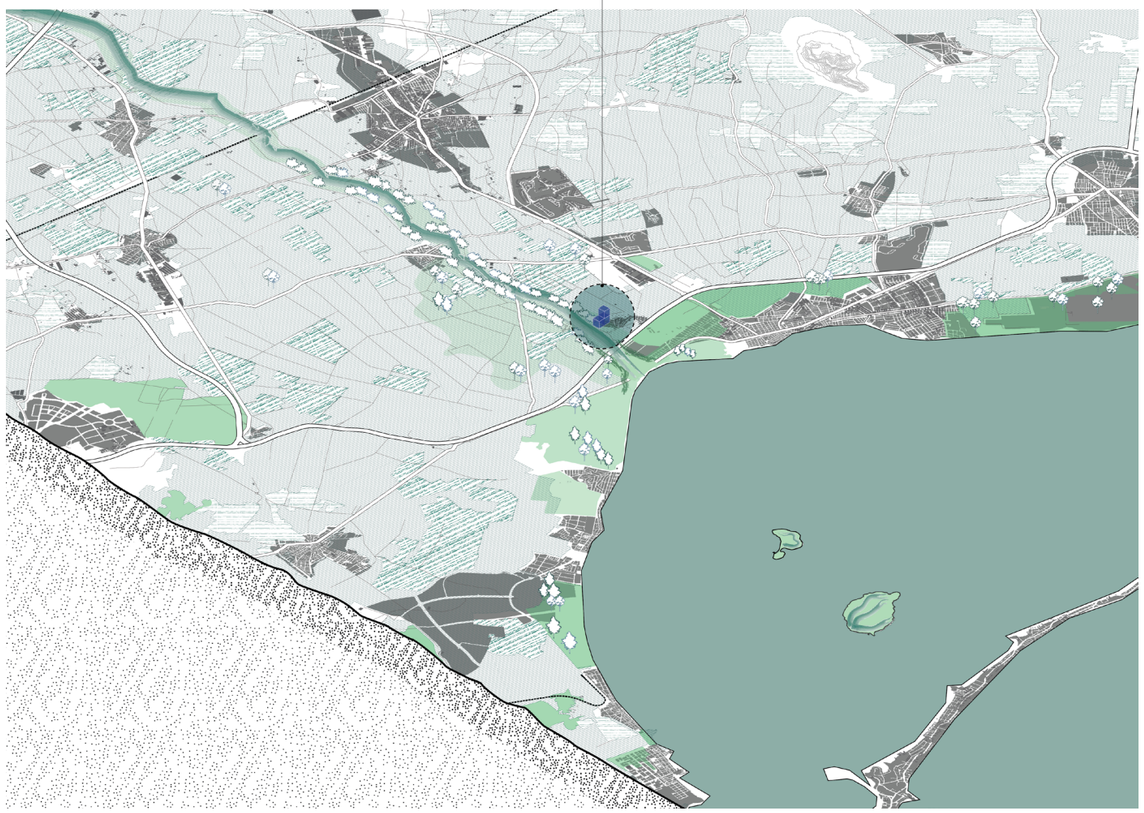


Fig.111. Phase 1-Construction of a new pumping station at the mouth of Rambla del Albujon.

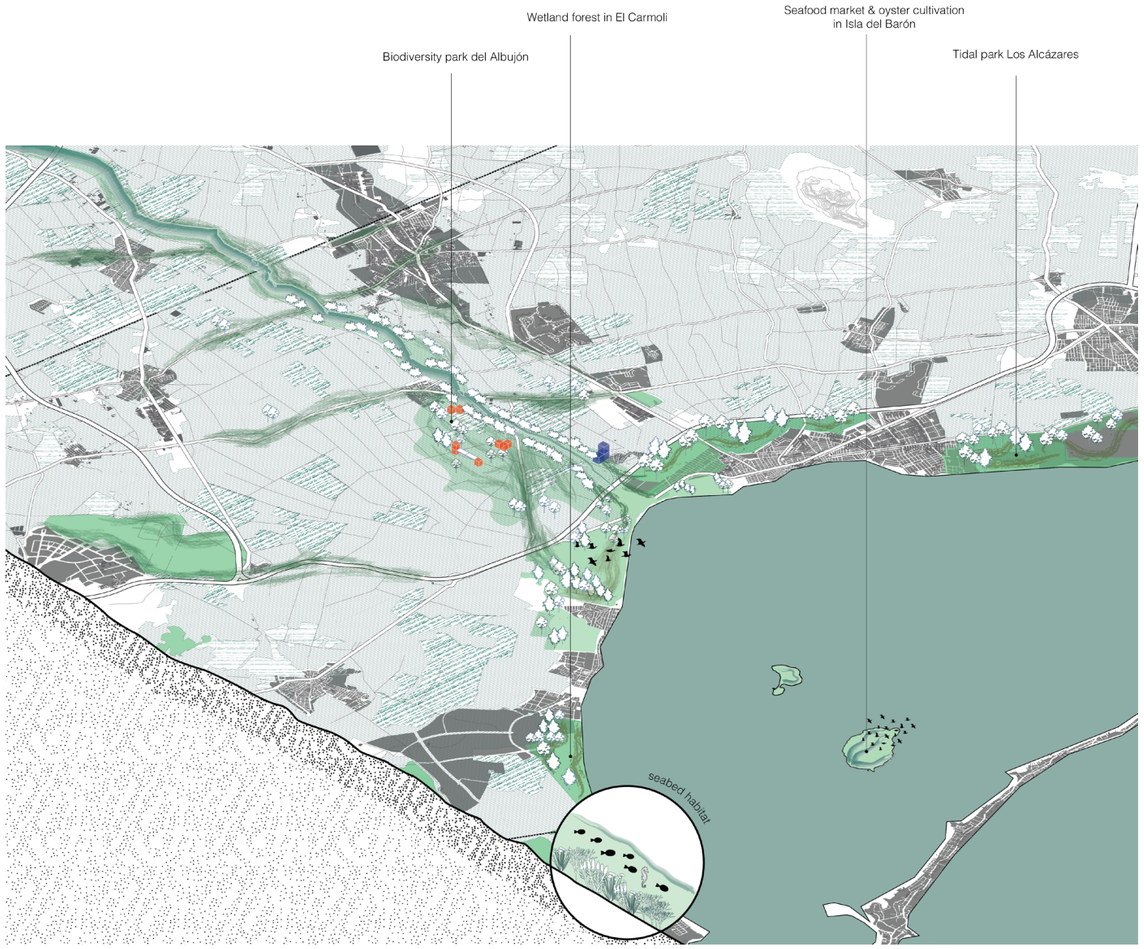


Fig.112. Phase 2-Planning, design and construction of the green naturalized zones.



Fig.113. Phase 3- Social housing projects are initiated.

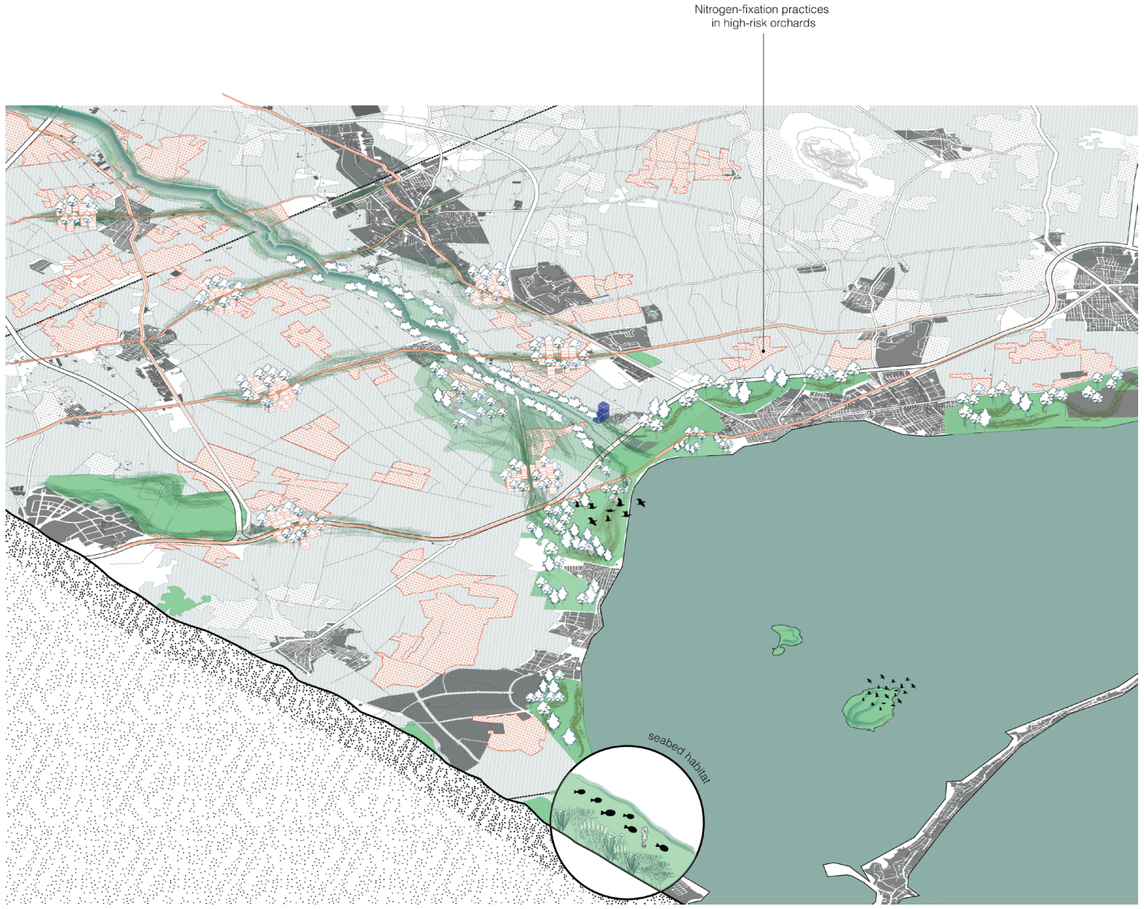


Fig.114. Phase 4-Selected orchards in high-risk areas are reforestated.

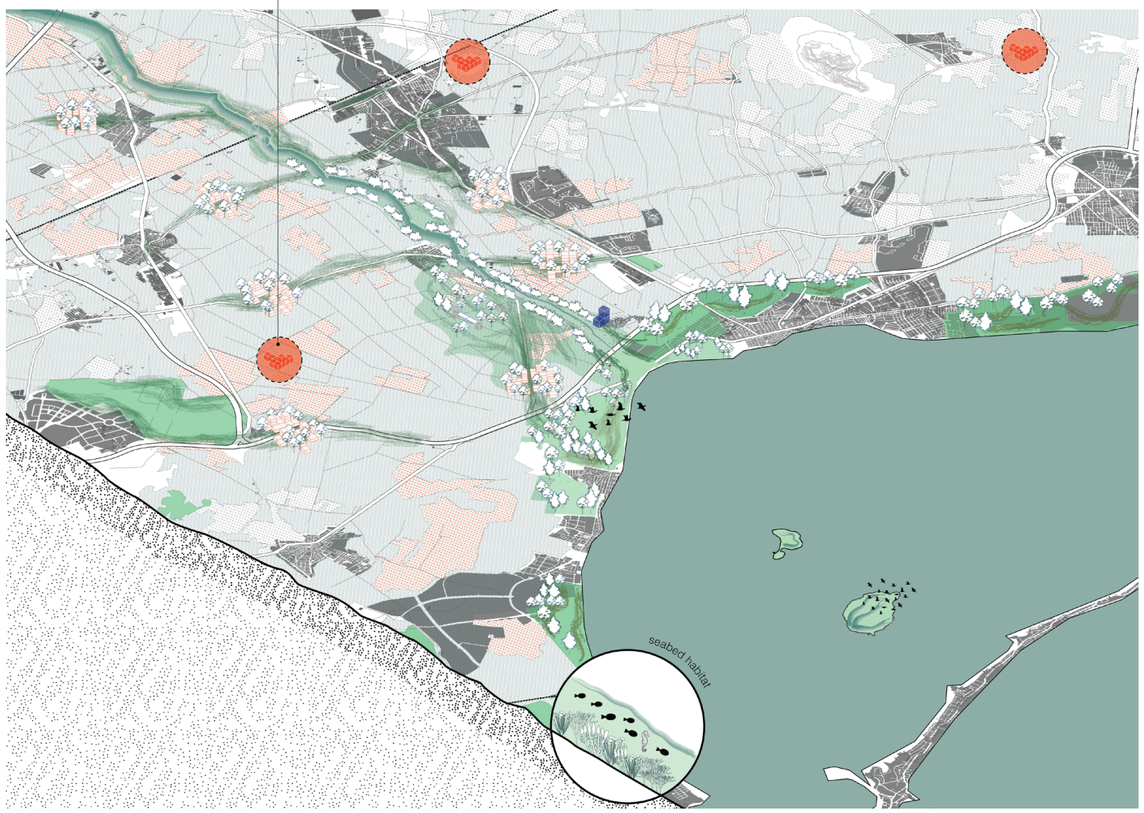


Fig.115. Phase 5- Biomass companies begin establishing their facilities in the region.



Fig.116. Phase 6-Agricultural zones transform according to the regional strategy for each zone's specifities.

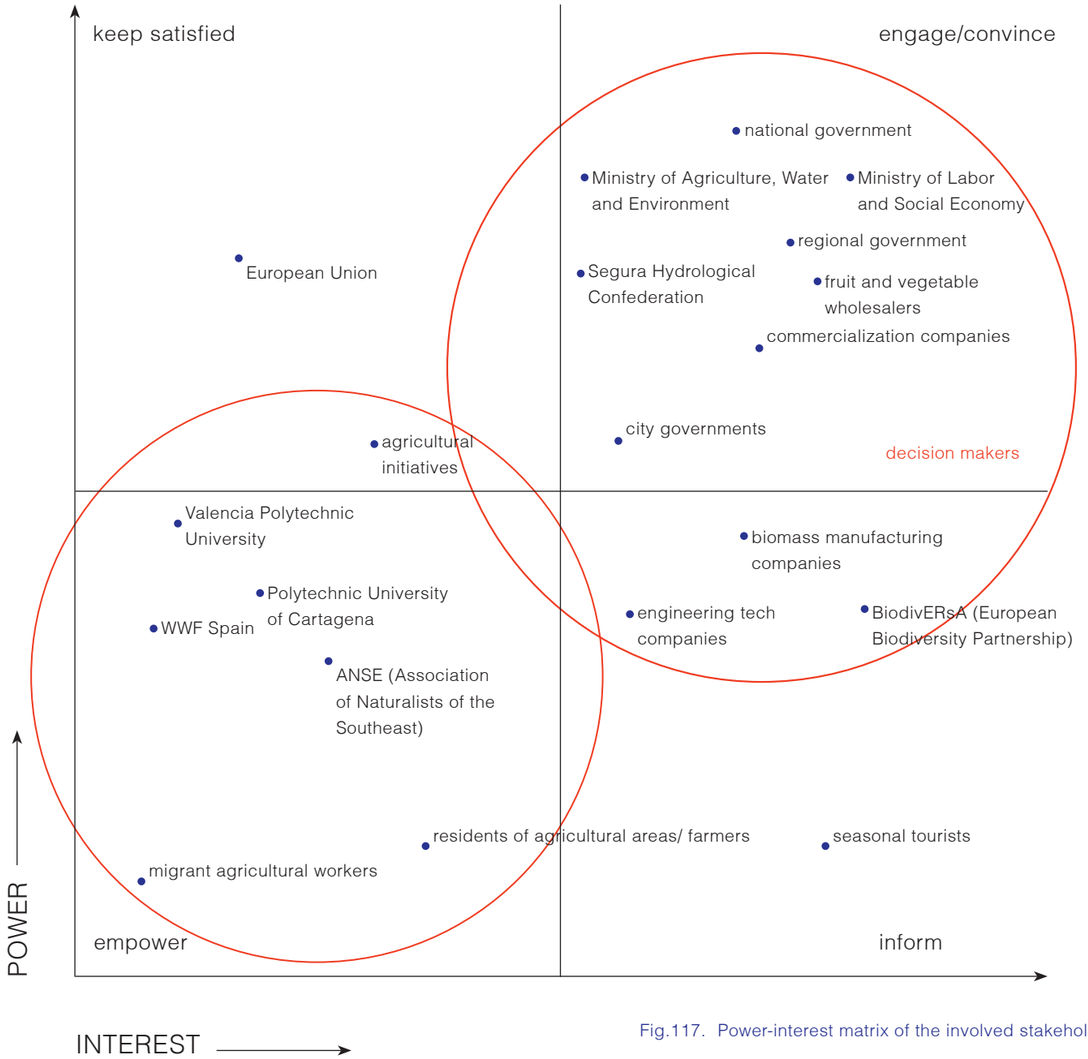


Fig.117. Power-interest matrix of the involved stakeholders.

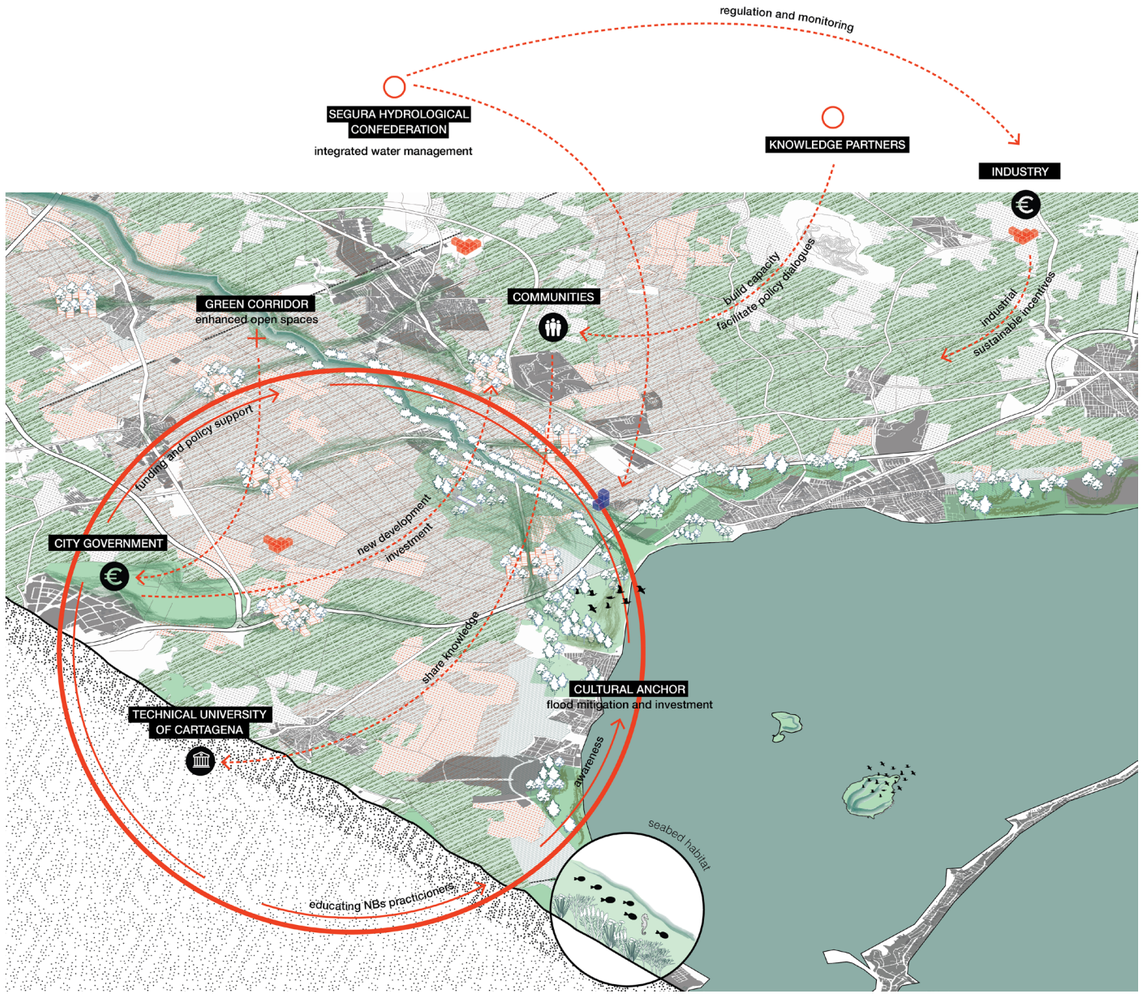


Fig.118. Stakeholders involved in the transformation of the territory.

""I'm jus' pain covered with skin."
-John Steinbeck, The Grapes of Wrath

5

CONCLUSIONS

CONCLUSIONS

The thesis puts forward an integral view regarding the heavy underground water pollution that arises from intense agri-food models of production. Instead of proposing short-term engineering solutions to tackle the water pollution and the water depletion, like the current research in place does, the project looks deeply at the source of the problem, diving into the specificities of agronomic systems in an attempt to propose an alternative form of production that is in line with a particular context and its limitations.

In the specific case of the Spanish Campo de Cartagena, a riverine territory with multi-level complexities, the project highlights the necessity to reconsider our approach towards industrial agri-food territories situated on fertile floodplains and in close proximity to invaluable ecosystems The intensified export-oriented model of production that is replicated around the world creates a deep physical and cultural separation between people and place; local climate conditions are dismissed, topography is engineered, people are mobilized throughout countries to get employed in big production lines.

The value of the project lies at the intersection of a biophysical strategy for the regeneration of a depleted land and a socio-cultural approach to give vocational voice to vulnerable communities.

The main design outcome of the thesis is a transformative vision for the territory comprising of strategies that seek to upscale Nature-based solutions and trigger a symbiotic relationship between ecology and habitation.

Grapes must be crushed to make wine.

Diamonds form under pressure.

Olives are pressed to release oil.

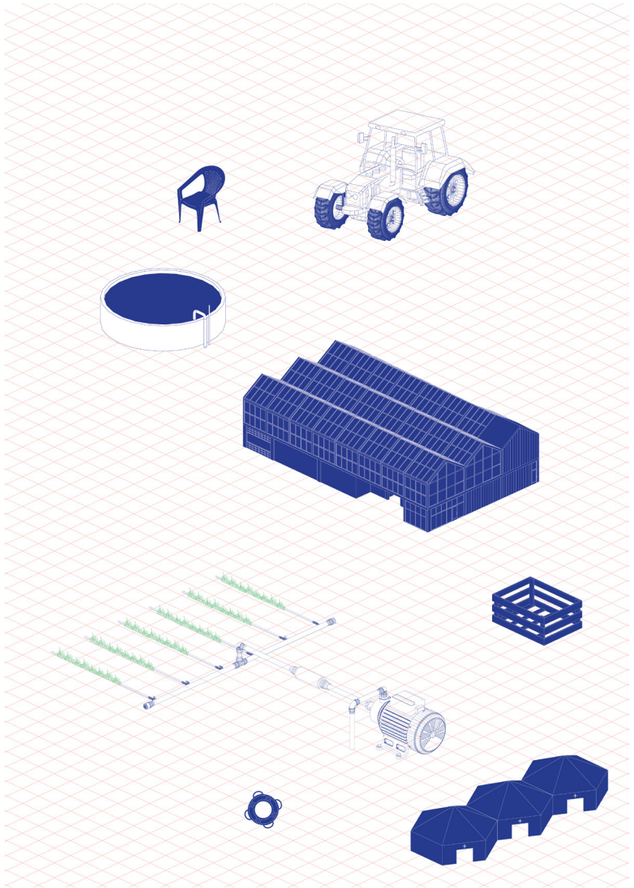


Fig.119. Bodies of exploitation, figure by author.

Relationship between research and design

The graduation project is developed through a research by design approach, meaning that data acquisition and analysis are being processed and represented with design elements, a method that sets the ground for new conclusions to be drawn and new investigations to be achieved. Design is used as a tool to make complex problems visual and spatial, to first investigate and then explore future possibilities. The project works under the framework of the Lines of Inquiry, where four thematic lines (Matter, Topos, Habitat, Geopolitics) are the departure point for the research of biotic and abiotic conditions, values and political frameworks.

The lines previously mentioned are then dissected through a triptych of cartographic methods following a transcalar approach:

- A composite map (top view plan)
- A relational section (vertical dimension)
- A spatio-temporal diagram (spatial dimension)

This method of representation offers a complete overview of the complexities and the specificities of the sub-systems involved, from the river basin scale to the agroecosystem and to the living organism scale (plant-to-plant agroecology).

Coming from the initial phase of the collective studio research and intensive courses of the 1st quarter, it allowed me to build consistency and coherence as I moved to the individual phase of my project and I began to encounter multiple problems on how to represent the complexities of the system I have been studying.

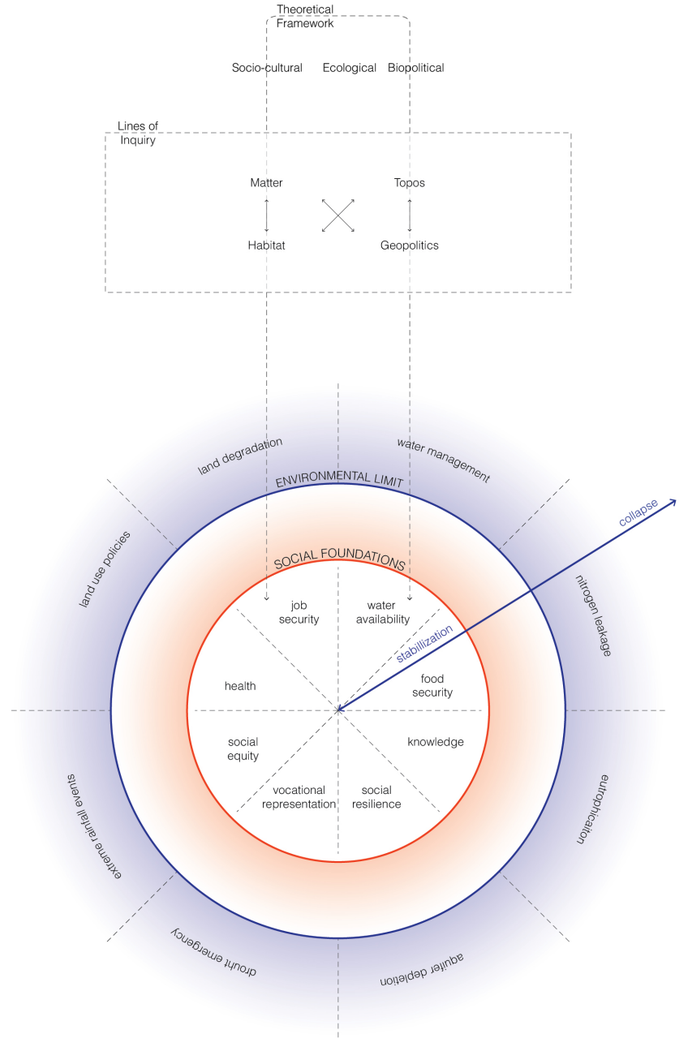


Fig.120. Approach of the project.

REFLECTION

Relationship between graduation topic,studio topic, master track and programme

The line of the new three years cycle of the Transitional Territories Studio is the de- / re-territorialization of places, structures and cultures between land and sea under the title “Inland-Seaward”. The studio looks at territories at risk between land and water (maritime, riverine, delta landscapes) and the relation between nature and urbanization. As a collective research group we are working with the notions of Accumulation and Clearance that function as a lens through which we decompress the complexities of contemporary urban environments and the material, ecological, socio-political and economic forces that shape them.

The project Agroecologies for the Stateless is focused on the interrelation between intensive agro-industry systems and the exploitation of a flexible migrant workforce. The topic falls within the studio premise that is related to territorialisation processes in transitional contexts. Regarding the studio topic in particular, the project is located on the Segura river basin, falling under the influence of the Tajo-Segura hydraulic network which capitalizes on the water resources of the region, in line with the studio’s research interest on riverine environments. The expanding agrobusiness model of the “orchard of Europe’ is causing the depletion of the region’s natural resources, directly affecting the ecosystems of the Mar Menor. Such systems are typically depended on transnational migrant labourers that are caught in a web of institutional assemblages that reshape their rights and claims, creating a vicious cycle of a collapsing system that vainly struggles to stay in place to sustain a certain economic performance.

The graduation project is positioned within the Urbanism master track by attempting to bridge the gap between the urban and the rural, shifting our understanding of agrarian landscapes under the theory of operationalized landscapes (Brenner & Schmid 2012), one that suggests that the world is entirely urban serving directly or indirectly the production and reproduction of urbanity through the accumulation of capital and material resources.

“In urban areas, we have landscaped our homes and towns with unproductive plants because we thought we had plenty of land to grow food elsewhere, plenty of water to irrigate it, plenty of energy for machine cultivation and long-distance hauling, and the ability to maintain ecologically unsound mechanized farming with large quantities of ecologically unsound pecticides and artificial fertilizers.”

Michael N.Corbett, Judy Corbett, and John Klein, A Better Place to Live:New Designs for Tomorrow’s Communities.

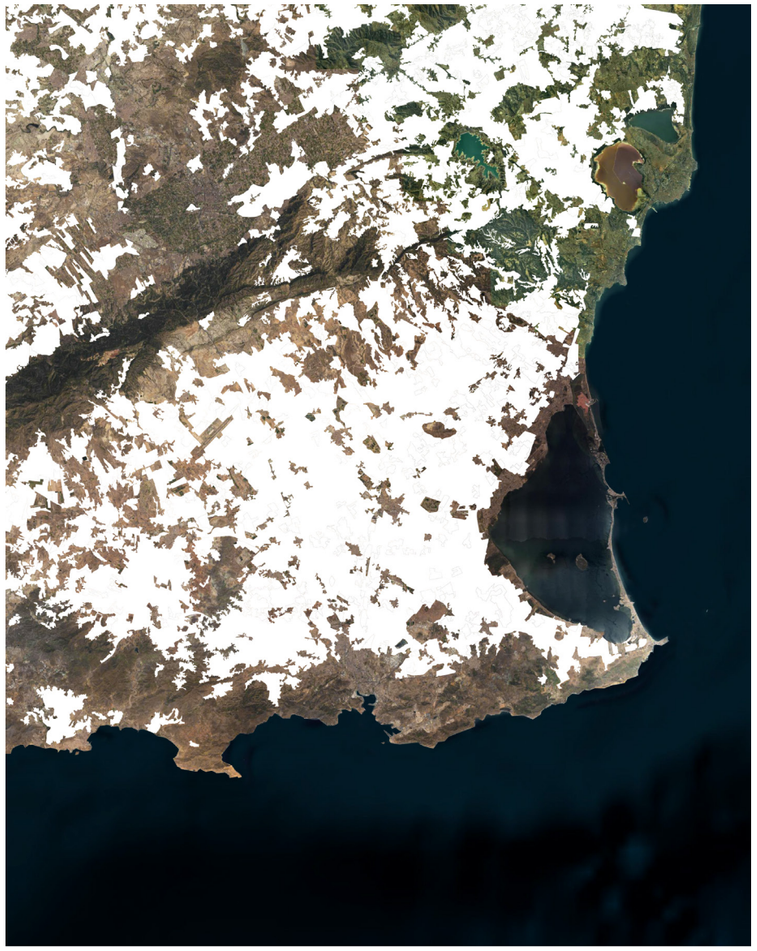


Fig.121. Design exercise: The territory of Campo de Cartagena without the irrigated land.

REFLECTION

Societal and scientific relevance

At the heart of the project lies the dual urgency to regenerate a deeply disturbed system from a socio-cultural and an ecological perspective.

The scientific relevance of the project comes from its clear call for a paradigm shift, one that reframes urbanization from an act of extractivism and operationalization, to an act of re-territorialization, where land systems are affiliated with a more symbiotic relation with nature and not only a reciprocating one.

The thesis questions the established water management practices that attempt to fix water seasonality through reservoir and canal infrastructures to ensure a constant supply for agriculture, dismissing nature's inability to replenish the amounts of water that are being extracted. The large-scale monocultural agriculture patterns of the region, independent from seasonality, are optimizing production efficiency and cost minimization but at the same time, cause land degradation through the immense use of fertilizers and eradicates biodiversity. More crucially, it entails labour peaks that are supplied by precarious, and in some cases, illegal labour, a recurrent social problem. The project's research goal lies at the intersection of an ecosystems approach and a socio-cultural approach Reflecting back on the agency of the urbanist, as a profession it materializes political decisions and, in that sense, we must position ourselves in the wider political framework that either adapts a resources' approach that commodifies rivers as sources for irrigation or an ecosystems approach, a rather recent trend, that seeks to make space for rivers and assign legal rights to ecosystems as in the recent case of the Mar Menor bill.

"Not a drop of water should reach the ocean without paying its obligatory tribute to the earth"

Cortes Generales (Spanish parliament), 1912, Retrieved from Swyngedouw, Liquid power: Contested hydromodernities in twentieth century Spain, 2015

Transferability of the project results

A large part of agricultural labour today is performed by a drifting migrant workforce, from both within and outside the EU, a paradigm that regulates commodity networks. Only in Spain "every single one of the ten mainland river basins is fully engineered, monitored and manicured [...] often to the last drop (Swyngedouw, 2015), a fact that reproduces a resource engineering perspective with severe labour implications. The project challenges these approaches by exploring a systems' thinking approach that adresses the overlapping complexities of the region, embracing the seasonality of production, in respect with labour and water demands, flood and drought tolerance and harvesting cycles. Such a method can be replicated and produce equally fruitful results in various regions of the world where such systems are at place, under the precondition of adapting to the local geographical, climatological and socio-political contexts.

The project objective also opens a dialogue around the application of nature-based solutions beyond their current small-scale and mainly technologically focused devices on a territorial scale.



Fig.123. Squatters in a building in San Pío X, Murcia. Source: laverdad.es



Fig.122. The Yacht Club of Los Alcázares, on the Mar Menor, Source: Alfonso Duran

Ethical considerations

i. Ethical issues arisen during research.

Throughout the development of the thesis I found myself facing uncertainties regarding my propositions since I have been involved with knowledge fields beyond my academic expertise, such as agriculture, water management, ecology and social studies. Instead of proposing concrete and definite solutions in order to tackle each challenge, the project aims to investigate a holistic approach that examines the interrelations of the subsystems in question.

What is more, since this region is highly controlled by multinational companies operating locally, one must be critical over the reliability of the material and the data provided by administrative authorities or research institutions that often undertake commissioned studies. Regarding the use of qualititative data it was important for me to make a thorough attempt to cross reference sources and since argumentations vary regarding the calculations of nitrate discharge, the extent of (illegal) irrigation in the Campo de Cartagena and the actions taken by the Hydrographic Confederation. The actual numbers of the wells and desalination plants remain an open question considering that the CHS keeps the files inaccessible to the public.

ii. Ethical issues arisen while elaborating the design.

During the design phase, several decisions had to be made concerning the regional vision and the choice criteria for land use transformations. These discussions raise ethical questions in relation with the practical implementation of the vision and the various actors which are involved, such as the required collaboration from the farmers' side and their willingness to adapt and expand their specilization.

iii. Ethical issues arising from the potential application of the results in practice.

During the development of this research I have come to realize how difficult it has been to attempt to view the world through the eyes of others and to be critical over our own ways of social reproduction and consumerism culture. To develop such a project that directly questions the modern day balance of supply and demand in food systems implies our individual consciousness over the impact of certain choices on a big scale. In a potential future research I foresee ethical issues regarding the cultural understanding of food systems and, of course, the measurement of our reconnection with nature in terms of investment cost.



Fig.124. Archive image of the El Albujón boulevard flooded after a storm. J.M. Rodriguez, AGM.

A. APPENDIX

Additional drawings/ schemes

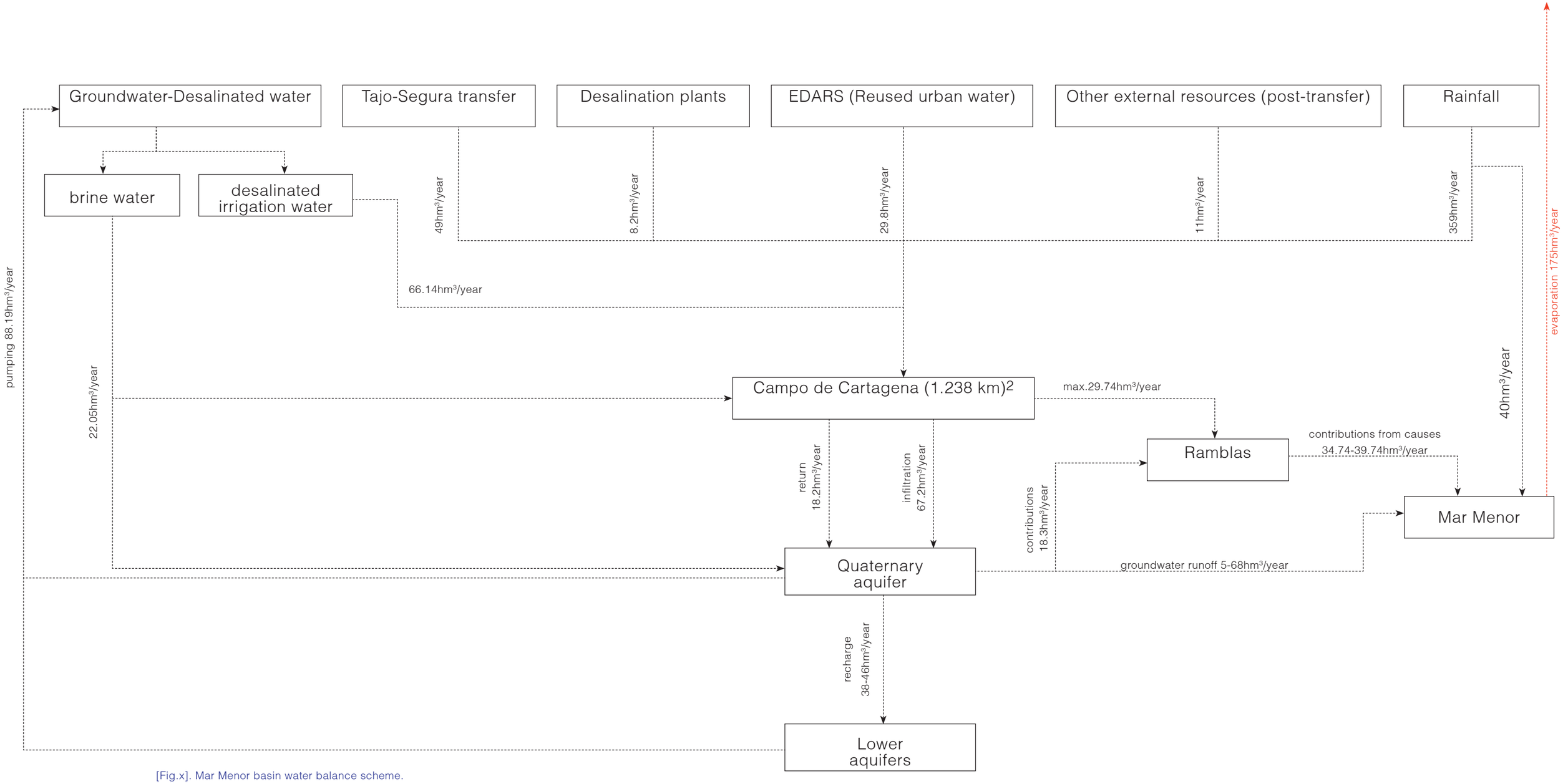
Bibliography

"The truth is corrupted by both lies and silence"

-Cicero



Fig.125. Photography by Carlos Trenor.



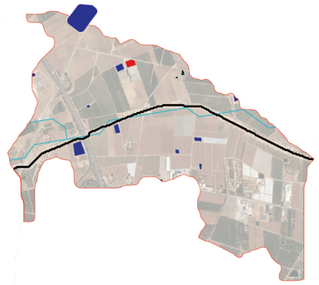
[Fig.x]. Mar Menor basin water balance scheme.



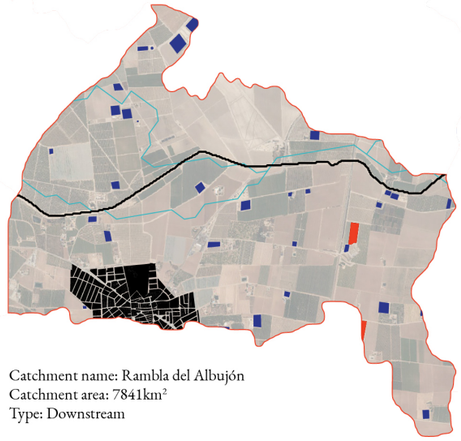
Catchment name: Sin Nombre
Catchment area: 4.281,6km²
Type: Downstream



Catchment name: Rambla del Albujón
Catchment area: 8.508,7km²
Type: Downstream



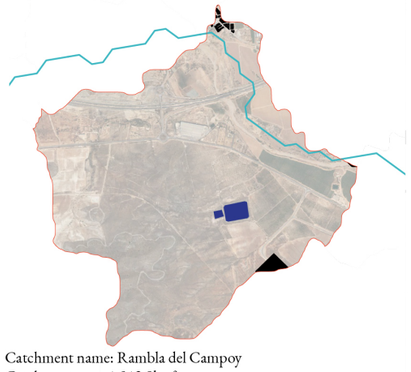
Catchment name: Rambla del Albujón
Catchment area: 315.73km²
Type: Downstream



Catchment name: Rambla del Albujón
Catchment area: 7841km²
Type: Downstream



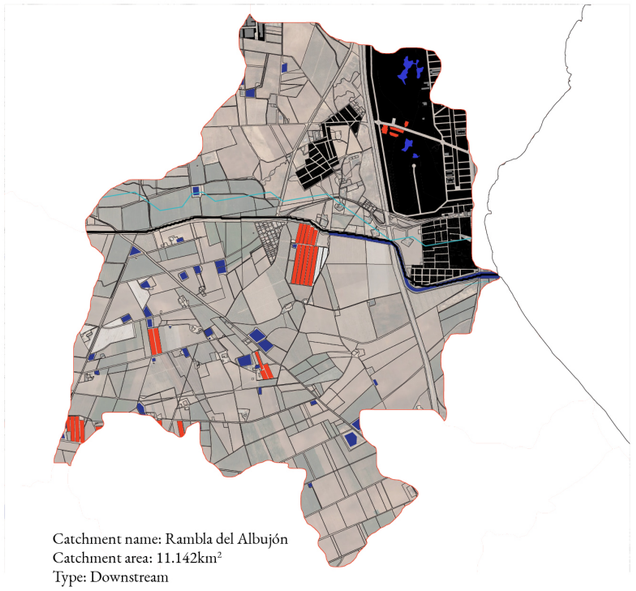
Catchment name:
Catchment area: km²
Type: Downstream



Catchment name: Rambla del Campoy
Catchment area: 1.013,8km²
Type: Downstream

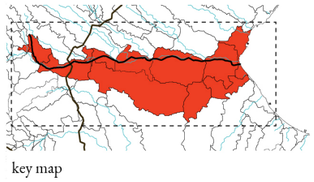


Catchment name: Sin Nombre
Catchment area: 29.520km²
Type: Downstream

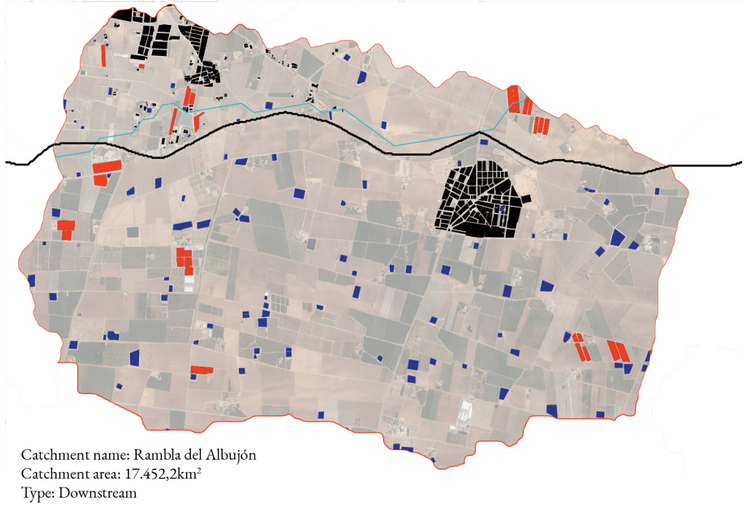


Catchment name: Rambla del Albujón
Catchment area: 11.142km²
Type: Downstream

greenhouse
building
water tank
groundwater hydrography
Rambla/Canal



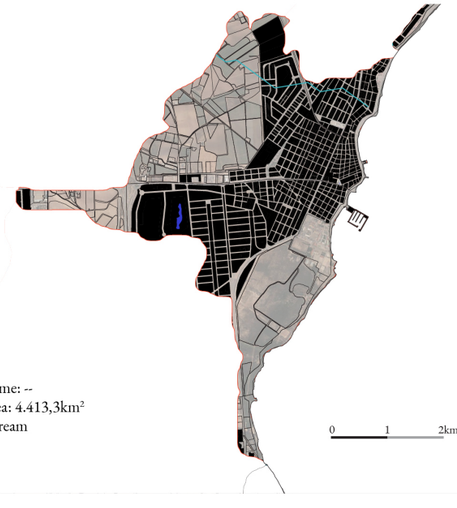
key map



Catchment name: Rambla del Albujón
Catchment area: 17.452,2km²
Type: Downstream



Catchment name: Rambla de los Rebollos
Catchment area: 2.162,5km²
Type: Downstream



Catchment name: --
Catchment area: 4.413,3km²
Type: Downstream

Fig.126. Catalog of sub-basins in the Rambla del Albujon transect.

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