

Social Hybrid Architecture for Water Regeneration in Rural Settlements: A Case Study in the Historic Landscape of La Vega del Guadalfeo, Spain

* M.A. Alegría Pacheco-Montero¹, Dr. Carlos Rosa-Jiménez²

¹ Higher Technical School of Architecture, University of Malaga, Malaga, Spain¹

² Institute for Habitat Territory and Digitalization, University of Malaga, Malaga, Spain²

E-mail¹: alegriapm@hotmail.es, E-mail²: cjrosa@uma.es

ABSTRACT

This article combines two problems such as the eutrophication of seas and oceans with the spontaneous appearance of rural settlements and the infrastructures that support them. According to Koolhaas, the rural world constitutes the new space for work and research. After a bibliographic review of the possible strategies, a social hybrid building is proposed between an ecological purification infrastructure and a social recomposing artefact. As a case study, the problem of dissemination in historic landscape of the Vega del Guadalfeo is analysed. The results show the design of an ecological treatment plant that can recycle wastewater from illegal rural settlements through worm filters and a system of artificial wetlands. This is part of a building that makes up for the lack of facilities that is typical of the scattered one with an exhibition hall and public meeting spaces. The paper proposes recommendations to institutions on the scope of this type of infrastructure in Mediterranean landscapes.

JOURNAL OF MEDITERRANEAN CITIES (2022), 2(1), 84-98

https://doi.org/10.38027/mediterranean-cities_vol2no1_6

ARTICLE INFO:

Article history:

Received: June 05 2022

Revised: July 10 2022

Accepted: July 29 2022

Available online: Aug 08 2022

Keywords:

Eutrophication; Rural Settlements; Quantum Growth; Worm Filters; Constructed Wetlands

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license



Journal of Mediterranean Cities stays neutral with regards to jurisdictional claims in published maps and institutional affiliations

www.mediterranean-cities.com

Copyright © 2022 by M.A. Alegría Pacheco-Montero and Dr. Carlos Rosa-Jiménez

1. Introduction

Koolhaas (Fernández-Galiano, 2016) highlights the almost total lack of attention to the rural settlements and its transformation processes. Changes are occurring at a speed even faster than in the urban world in multi-scale, social, technological, ecological, and digital issues. A situation that can be observed in Europe (Adam-Hernández & Harteisen, 2020), Western Asia (Kornilova et al., 2021), China (Cheng, 2021) or India (Jakobsen & Nielsen, 2020). The technological advances initiated since the 19th century have facilitated a process of hybridization between the rural and urban worlds with important physical, environmental, and cultural impacts. The rural landscape has evolved from a static and scenographic concept towards a close reality, in continuous change, interactive with the urban and generating a rupture in the established orders of traditional planning.

Corresponding Author:

M.A. Alegría Pacheco-Montero
University of Malaga, Higher Technical School of Architecture, Malaga, Spain
E-mail: alegriapm@hotmail.es

How to cite this article:

Pacheco-Montero, A., & Rosa-Jiménez, C. (2022). A Case Study in the Historic Landscape of La Vega del Guadalfeo, Spain. Journal of Mediterranean Cities, 2(1), 84-98. https://doi.org/10.38027/mediterranean-cities_vol2no1_6

In this regard, Frampton (1995) warned that the rules inherited from classical urban planning -conceived to combat the problems that the Industrial Revolution generated in cities -, could no longer cope with how and in what way our cities should or should not grow. Therefore, how to act in the face of these new scenarios? How to intervene in rural areas subject to the influence of the urban? While the literature made important advances in the analysis of urban phenomenology in rural and peri-urban settings (Vallance, 2014), there is a research gap in the development of infrastructures that allow, on the one hand, to recover the ecological balance due to the effect of hypoxia, and on the other hand, to provide social facilities for the phenomena of sprawl in these peri-urban areas. The use of micro-hybrid architectures is a necessary response to these challenges. The concept is a reduction of the hybrid building - conceived as a large mixed public-private building located in dense urban areas - so that the micro-hybrid concentrates social and environmental functions in low-density areas.

The objective of this research is to develop methodologies aimed at developing architectures focused on processes related to the landscape, which can face the multi-scale problems that may arise and to demonstrate flexibility in terms of design strategies and urban intervention. All this, understanding the place in all its economic, social, ecological, and cultural complexity. From this study, the empirical analysis of a case study allows us to establish a project framework for the intervention of a social hybrid architecture as a response to the phenomena that have transformed the contemporary agricultural framework. The Vega del Guadalfeo is located on the southern coast of Andalusia (Spain) and was characterized by its wealth of non-nitrified groundwater thanks to the large flow of water from the Sierra Nevada. However, this situation changed drastically with the construction of a dam and the development of an intensive greenhouse agriculture and numerous dwellings in the rural area of the municipality without implications for rural activity. The project results allow us to establish a debate on how this type of architecture can respond to the initial problems and improve the quality of life of the inhabitants in these highly transformed rural spaces.

2. State of the art

2.1. Rural-urban hybridization

Urban hybridization is developing in the postmodern urbanism (Patkar & Keskar, 2011). The appearance of hybrid figures between the rural and the urban (Sastoque, 2005) is the result of the technological advances developed since the mid-nineteenth century, both in the excessive growth of the urban, and in the environmental impacts of agricultural technologies. Until the 19th century, the limits between the city and the rural world were clearly defined in the physical dimension (Fariña Tojo, 2015) and the socio-political dimension (Ortega y Gasset, 1963, p. 408). The Industrial Revolution of the 19th century began the hybridization between the rural and the urban world as a consequence of the development of transport and telecommunications (Choay, 1994). New urban models and activities that are ecologically distant from the locality (Antrop, 2004) are implanted in the rural world (Kujundzic & Vuckovic, 2019): A generalized low-density urbanization and a loss of weight of the traditional historical nuclei named as diffuse city (Precedo Ledo, 2004), edge city (Teaford, 2020), ruralbanization (Ruiz Rivera & Delgado Campos, 2008) or suburbanization. At the international level, this urban phenomenon has had different degrees of intensity: maximum in the sprawl of the American continent, contained in Europe and reduced in Africa (Mokunfayo & Babatunde, 2018).

The suburbanization of Mediterranean coastal cities has followed a different process from that of Europe (Dura-Guimera, 2003:387). It began explosively in the 1980s in the context of a post-industrial and globalized capitalism. Their growth system does not respond to historical growth patterns (centrifugal, isotropic, ...) and, within their apparent anarchy, they seem to follow quantum patterns (Rosado, 2008). That is to say, superimposed on a millenary agricultural structure, and without being able to predict their appearance since they are separated or arbitrarily connected to nodes and transport infrastructures. This is consequence by the recent impact of information and communication technologies (ICTs). ICTs have multiplied information exchanges exponentially, facilitating ubiquity and levels of social and work

relations. Choay (1994, p.70) defined the urban as a new physical and social system based on material and immaterial networks. Especially in the hybrid territory of rural peri-urban environment of cities, which involves incorporating the net sphere into the natural and urban spheres. The need for new social and environmental infrastructures that support these transformation processes stands out in this new context.

Castells (1995) recalls the need to generate a significant generation of social infrastructures and public spaces especially in the disjointed peripheral areas. The urban generates places where the formal and functional homogenization of the territories and the hybridization of their objects generate generic landscapes (Pintos, 2014). It shares the process of loss of identity suffered by cities due to generic growth highlighted by Koolhaas (1994). It is characterized by *la anomie*, or liberation from the social structure, a deconstruction of identity analogous to the concept of genderless in fashion. According to Ascher (2009), the sociological space of the polis has evolved into a metapolis whose spatial expression is a distended, discontinuous, heterogeneous and polynuclear space. A hybrid structure built on the basis of varied spaces and ways of life. Thus, new social infrastructures have to strength a new hybrid space, built from the flows of communication and energy to reassemble, without exclusion, the three spheres formed by the farmer, the urbanite, and the tele-citizen (Perea, 2012).

In the ecological field, the discovery at the beginning of the 20th century of anthropogenic nitrogen revolutionized the agricultural world with the incorporation of artificial fertilizers to increase production. However, these fertilizers are carried by irrigation return flows from cultivated land to rivers and groundwater. Anthropogenic nitrogen produces a major imbalance in the marine and river ecosystem with the proliferation of microorganisms that cause eutrophication and hypoxia. This is a major global environmental problem (Chang et al., 2019), that has been aggravated by human activity due to population growth, urbanization, and industrial practices in rivers and riparian basins (Shao & Wang, 2020). Although the developed world has treated more than 90% of its urban water, it is not taking adequate measures to address this problem. It is currently estimated to be responsible for three-quarters of nitrogen emissions (Mekonnen & Hoekstra, 2015). This issue is added to the environmental problem of the human ecological footprint and the recent tipping point of human consumption/capacity of the Earth. This makes it necessary to transform our consumption into a circular metabolism (van Broekhoven & Vernay, 2018) and the development of infrastructures that facilitate this recycling process.

2.2. Hybrid Architecture

According to Rogers (1997), technology can create sustainable and civilizing environments if it is used and promoted in an ethical manner, that is, if it is used for the benefit of the community, over and above individual interest. Hybridization can be a relevant tool, not only at the urban but also at the rural level. From a positive perspective, urban hybridization constitutes a tool for transforming urban space (Zanni, 2012). On the one hand, hybridization, understood as a mixture that increases the complexity of a system, was used to improve the regeneration conditions of monofunctional European neighbourhoods such as Bijlmermeer (Aquilué Junyent & Roca Blanch, 2019). On the other hand, urban hybrids have great potential to increase both the relationship between the different urban fragments and urban connections, stimulating and attracting urban vitality (Herrera Napoleón, 2009).

Fenton, (1985) defines the hybrid building as a multifunctional structure both in terms of uses, incorporating architectural and urban elements, as well as public and private actors. A hybrid building is characterized by a mix of different programs, developers, management, and different user profiles: it can be as diverse as a neighbourhood or a city. But the development of hybrid architectures is also due to spontaneous generation processes in areas, such as Japan, where there are no regulations on uses but on densities (Kaijima et al., 2003). Kaijima et al. (2003) make a catalogue of urban hybrids where the lack of land makes it possible to establish combinations and stacking of uses and architectures. The authors define a hybrid as an "environmental unit" where three conditions are present: category

(character of the building as infrastructure, architecture, or landscape), structure (physical configuration) and use (or management of its activities and flows).

The approach from the genetics of hybridization, allows us to define the hybrid building as a combination of known parts of architectures whose union produces a functional superiority (McGinley et al., 2015). A concept closer to the symbiotic association where the parts that compose the building are visible and recognizable. Symbiosis in the animal world associates species from different kingdoms for mutual benefit. Morphogenetic design is based on adaptive micro and macro structural aspects and on the ecological relationship of the building with its environment. (Mestre Martínez, 2012). When these relationships consist in the reuse of residues from another building or from the environment where it is located, we speak of metabolic symbiosis (Šijaković & Perić, 2018). An association that in the framework of architecture is scarcely analysed (Parisi, 2009).

3. Methodology

Based on the processes of transformation of the rural world described by Koolhaas and the environmental problems generated using nitrogen in agricultural activity, a methodology is proposed (Figure 1) based on three phases. In the first phase, strategies, or alternatives to three problems of the rural world are established, based on a bibliographic review and a selection of case studies of different actions in the landscape that have been developed during the 20th century. Their comparison with the different realities of the rural world described by Koolhaas allows us to analyse his contributions in relation to the ecological, economic, social, cultural and/or architectural dimension. In a second part, an application of these measures is carried out in a real case study, where the different problems detected in the traditional agricultural space are analysed. Finally, a proposal for a hybrid building is developed as an example of the potential of this type of architecture in the improvement of the aforementioned problems.

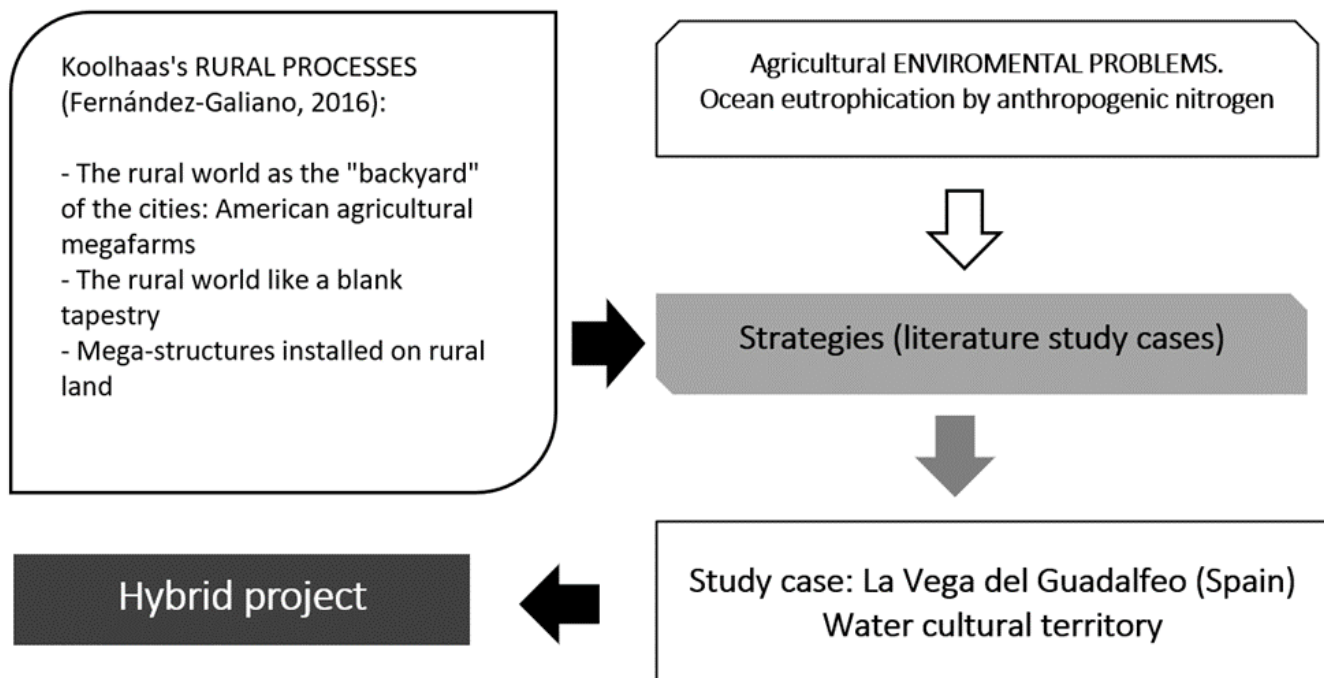


Figure 1. Structure of the study

4. Strategies to face the transformation processes in rural areas

4.1. Alternatives to the rural world as a "backyard" of the cities

The agricultural space contains the primary sectors (agriculture and livestock) that feed the city, but its technification implies the incorporation of productive processes closer to industry than to agriculture. An example is the use of greenhouses, where crops are grown even without soil, remotely controlled by the farmer via the Internet. In Europe, however, there is another productive tapestry, completely irregular in shape, chaotic, with a millenary irrigation system and inhabited in a scattered way. Secchi & Viganò (Viganò, 2001) describe the peri-urban landscape of the Territorial Coordination Plan of the Salento Region (Italy) as a continuous whole. A region in the south of Italy, whose traditional crop is olive trees and vineyards, and is visited by more than 2 million tourists per year, with a population of around 800,000 inhabitants. Both authors proposed as intervention strategies the conception of the territory as a great unique park and not so much as a protected landscape, but as a laboratory for habitat experimentation, always aimed at the ecological balance of the region. In contrast to the spatiality of the urban or rural space, Secchi & Viganò (Viganò, 2001) define peri-urban space as a third spatiality: "A space that could be inhabited by a society that aspires to a life in the open air, sharing the ecological and symbolic ideals of living in the countryside without leaving the city. An open society that seeks a collective dimension". And its main lines of intervention are:

- a) Ecological: Protection of its historical crops and development of proximity agriculture, incorporation of activities based on a circular metabolism and the reduction of the human footprint on the Earth.
- b) Economic: Maintain the agricultural area always productive, supported by tourism/agro tourism.
- c) Social: Focus on the local population, revitalization of depressed areas by promoting agro-tourism and life in the countryside with ecological ideals.
- d) Infrastructure: Connections between facilities, centres of interest and villages, which the region lacked.

In the peri-urban space, these strategies take precedence over any temptation of speculation and change in the local agricultural industry. It combines the solidity of an agricultural heritage with flexibility and a certain legal laxity when it comes to recognizing and integrating the urban development that has been settling in the countryside. All this without opposing the possibilities that a globalized world can bring and that is evidenced, in this case, through agrotourism.

4.2. The rural world like a blank tapestry

Agricultural policies like the Common Agricultural Policy of the European Union have been insensitive to the rural world's complex, multicultural and densely populated tapestry. A situation similar to the design of new capitals that emerged in the mid-twentieth century with principles far removed from the local reality, such as Brasilia or Chandigarh. The project The City of a Thousand Cities by Perea (2012) was winner of the New Multifunctional and Administrative City for 500,000 inhabitants' competition in Korea. It makes an interesting reflection on preserving a large central productive agricultural space, and building around it a ring of intermediate cities, where citizens can interact without the need for a motor vehicle, and count on the presence of the landscape. Perea (2012) affirms that the complex and intense sustainable city is not a consequence of zoning, but of "meshing in space, function and building matter" and where the net sphere must be superimposed on the natural and urban spheres.

4.3. Environmental micro-structures vs. mega-structures installed on rural land

Increasingly, the rural space is the area where mega-structures are implemented, such as Tesla's gigafactories located at Sparks (Nevada), Buffalo (New York) or Shanghai. They are a product of the

development of the fourth industrial revolution (Cooke, 2020), that is also taking place on the African continent with the development of megaprojects (Müller-Mahn et al., 2021). These processes of occupation of uses alien to the rural reality. Faced with this phenomenon, in the middle of the 20th century, the Agricultural City Plan of Kurokawa (1991) proposed a structure articulated by autonomous units. Their combination and growth allowed a progressive implantation on the rural landscape until generating a self-sufficient mechanism. Its flexibility allows intervention at different scales. So, it can be implanted in the rural environment according to the needs that are demanded.

Kurokawa's thinking therefore allows the development of microstructures or autonomous units that can help restore the ecological balance of water as a support to blue infrastructure (Wendling & Holt, 2020). It is about providing solutions to water problems, seeking agreements between the different interests of the actors and the scarce existing public resources (Sgobbo, 2018). In this regard, Oral et al. (2020) describes the case of The Gorla Maggiore water park, an urban wetland development with nature-based solutions where an area of 10% is intended for domestic water treatment, it reduces the nitrogen load by 0.4 t/yr and incorporates recreational areas with important social benefits.

5. The metamorphosis of the historical rural landscape in the case study of the Vega del Guadalhorce

The appearance, proliferation, and expansion of the urban sphere in the rural environment without administrative authorizations extends forming an infinite peri-urban zone. A process of occupation of the countryside with similarities to the Koolhaas (1994)'s Generic City in relation to four characteristics. First, it does not build a city a priori, but is generated in a quantum form. Second, the abandonment of obsolete agricultural structures (e.g., orchards, disused irrigation ditches, ...). Third, the anomie of all kinds of urban elements and uses. Fourth, a generalized process, which in the case of Europe inherits a specific morphology because of a tapestry formulated from the historical smallholding.

As an example of this type of process, La Vega del Guadalfeo has been selected as a case study. This historical agricultural area is located on the southern coast of Andalusia (Spain) and covers two areas: the western or Vega de Salobreña and the eastern or Vega de Motril. The metamorphosis suffered by the Vega de Motril during the 20th century transformed its continuous productive tapestry, structured by a millenary irrigation system, into a fragmented and sectorized system due to the construction of different infrastructures (Figure 2) and invaded by urban centres that grew in the form of industrial estates and the commercial port.

RUPTURE ELEMENTS THAT FRAGMENT AND SECTORIZE

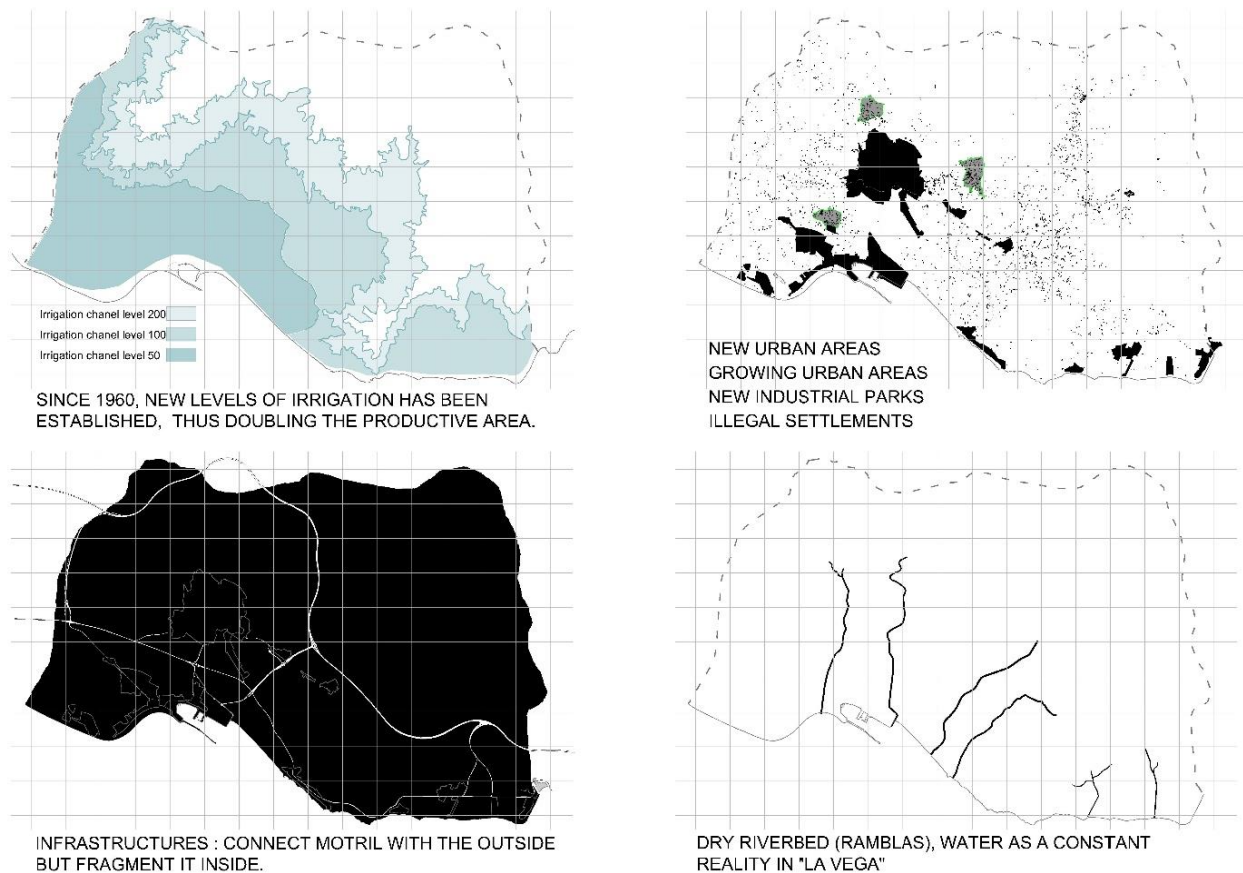


Figure 2. Articulating and transforming elements of La Vega del Guadalfeo in the municipality of Motril: irrigation canal, urban centres, highways, and wadis

In this way, a set of urban islands is generated, similar to the archipelago defined by Ungers (Hertweck & Marot, 2013), on a large non-urban productive green space with a productive agricultural character (Figure 3). The idea of a full urban space occupied by buildings versus a void or public space-landscape begins to be questioned due to the very complexity and active character of the void. The evolution of the peri-urban agricultural space is uneven, through illegal constructions that serve as leisure for the inhabitants of the nucleus, agro-industrial -especially with the hyper-development of intensive greenhouse agriculture, warehouses, small industries, but always subject to a historical plot structure, whose size and shape is conditioned by its agricultural production, and in turn by the capacity to be irrigated by the water from the irrigation ditches. The "marjal" is the agricultural measure that allowed an agricultural exploitation based on 24 furrows of ploughs, and that channelled the irrigation water, if it was guaranteed.

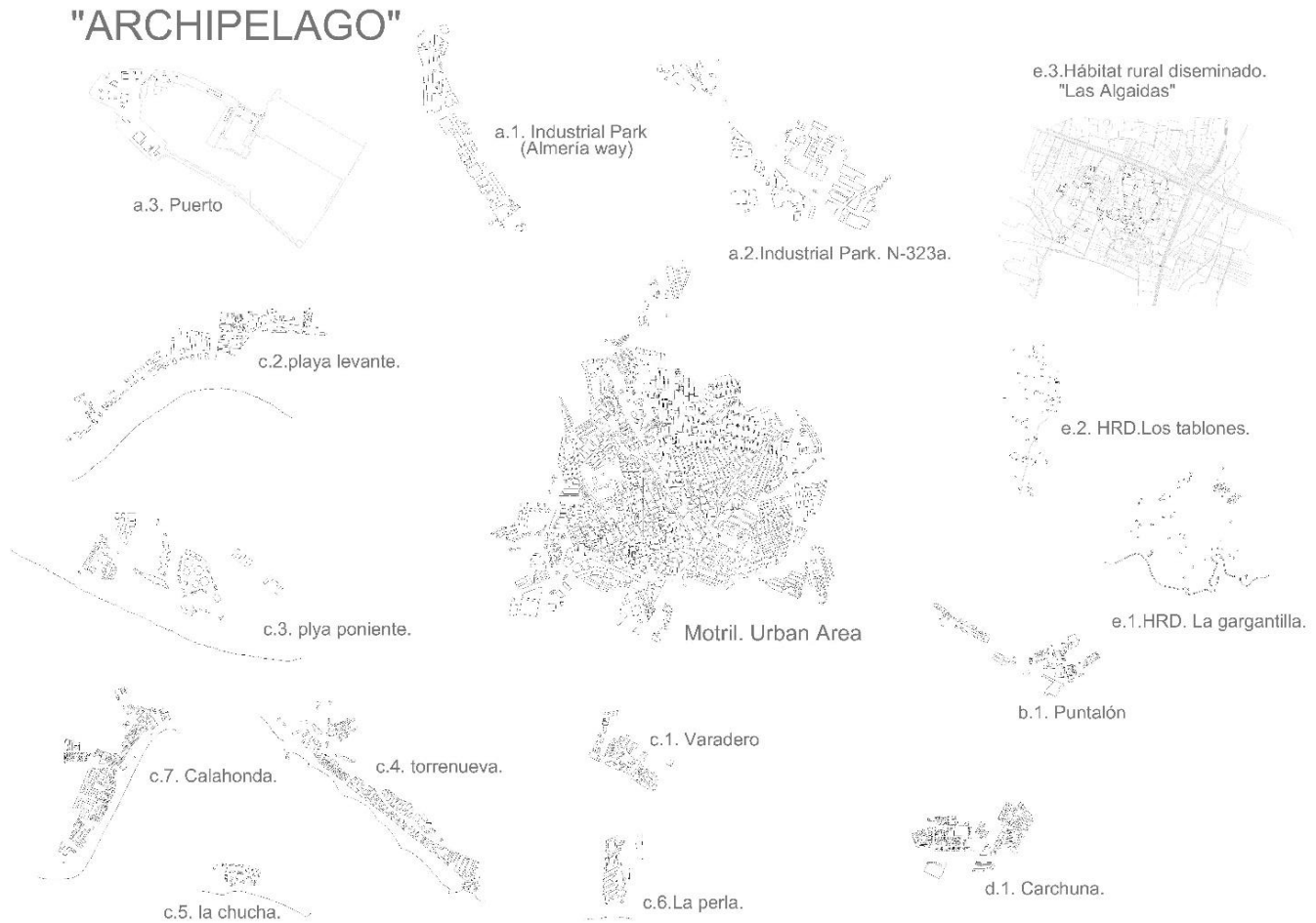


Figure 3. Archipelago of settlements in the municipality

The Vega is structured by a millenary system of irrigation ditches that is divided between a world that wants to maintain traditional cultivation (Figure 4, right), a system of intensive crops (plastics) and another semi-urbanized part with second homes (mostly illegal) and warehouses to support the nearby industrial park. All this chaotic variety is due to the irregular morphology of the plots and their small size (Figure 4, above). Water is the main element of identity in La Vega del Guadalfeo and is present in the irrigation ditches, in the wadis that cross the valley, and, in the aquifers, whose former abundance has been reduced by the construction of the dam.

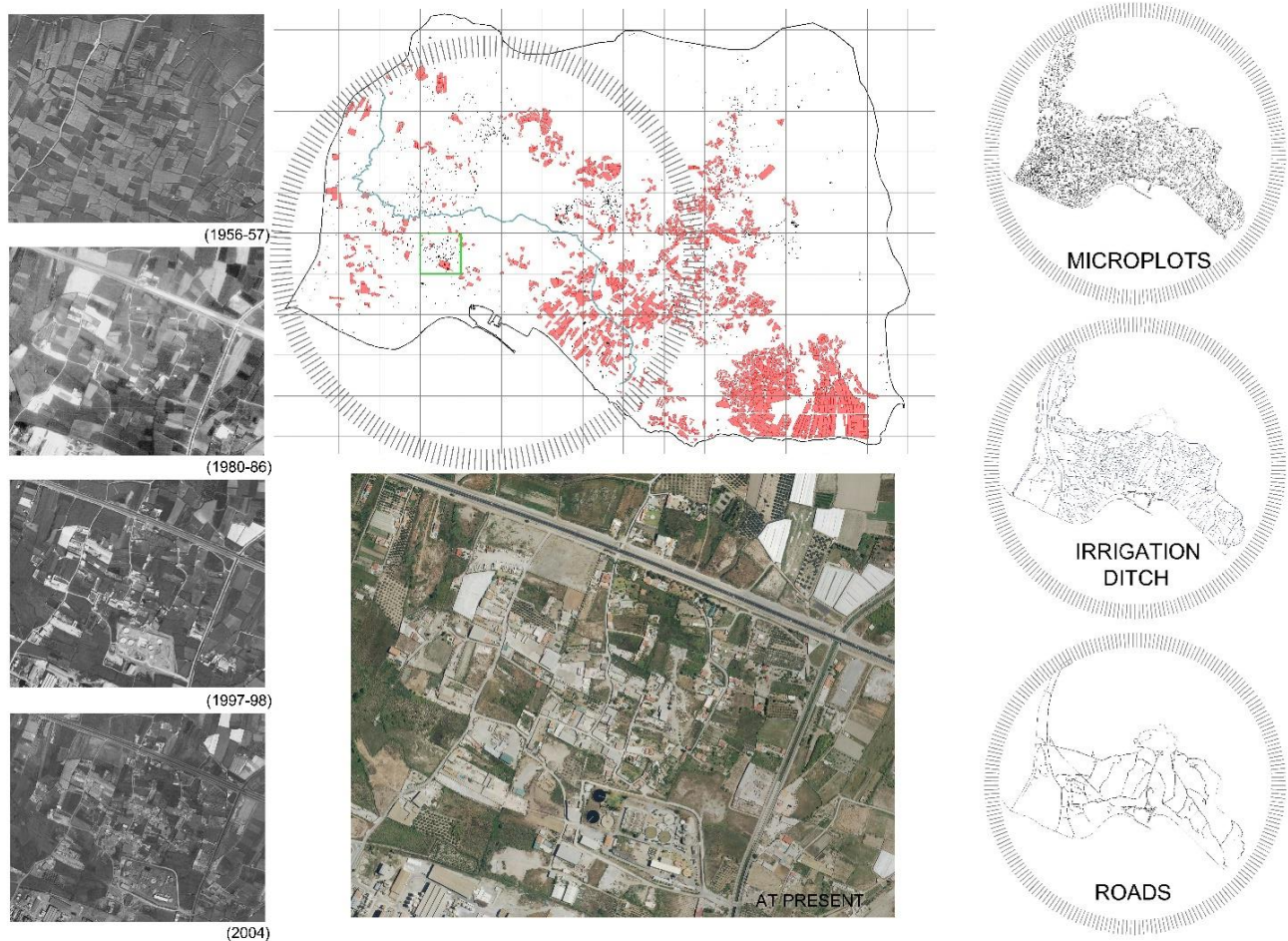


Figure 4. (Above) Transforming elements of the traditional agricultural landscape: Greenhouses (red) and illegal settlements (purple). (Left) Evolution of the study sector from its agricultural structure in 1956 to the current occupation of uses. (Right) Shaping elements of the traditional agricultural landscape: micro-plots, irrigation ditches and roads

The settlement of "Las Algaidas" is confined by a highway, the Rambla de las Brujas, an industrial park and a sewage treatment plant. It represents the spontaneous transformation, without previous guidelines, of a productive agricultural land to an urban reality lacking infrastructure, without facilities and infrastructures (Figure 4, left).

6. The micro-hybrid building as an environmental and social alternative

The construction of a hybrid building that houses an ecological purification infrastructure and a public facility makes it possible to respond to ecological and social problems through a relationship of metabolic symbiosis. As an infrastructure, the building treats wastewater from scattered settlements and manages the denitrification of irrigation return water that is discharged into rivers or wadis (delimited channels used by rainwater in torrential storms in the Mediterranean climate). Wastewater is collected through a vacuum sewage network designed to take advantage of the ditches of obsolete irrigation ditches and, after undergoing pretreatment, is treated by a dynamic aerobic biofilter system or lombifilters and a system of artificial wetlands. Crop water is treated only by artificial wetlands (Figure 5).

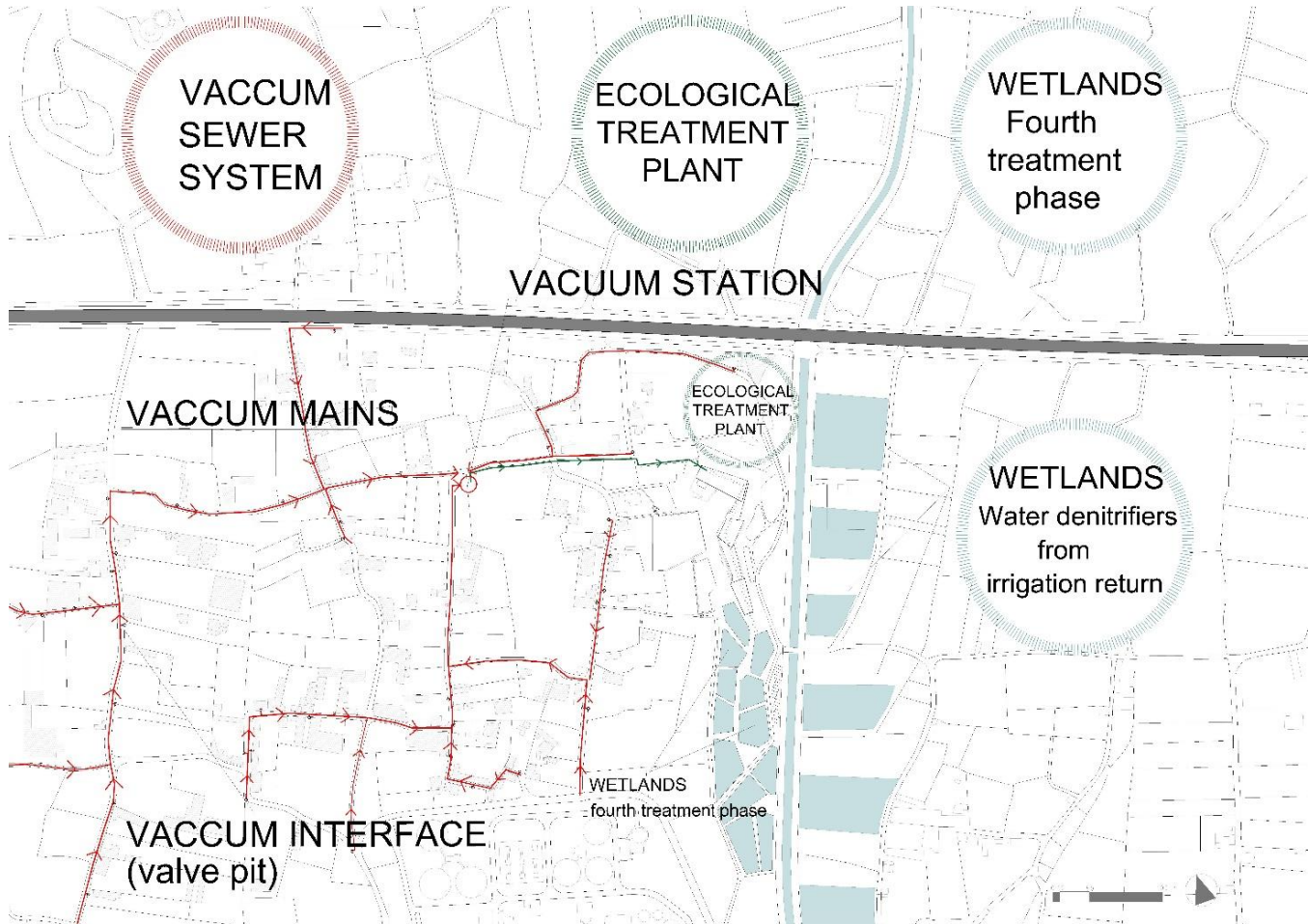


Figure 5. Sewage collection system and artificial wetlands for denitrification

From the Kaijima et al. (2003)'s approach, the hybrid building constitutes an environmental unit that manages two types of flows. On the one hand, the equipment solves the lack of endowment of the scattered areas by providing the settlement with a multipurpose space for the development of activities and social gatherings. On the other hand, the building manages an ecological water purification cycle. The ecological wastewater treatment plant treats wastewater through an initial pretreatment, a secondary treatment of lombifilters, and a tertiary treatment by artificial wetlands located in the southern part of the building. In its structure or physical dimension, the building is structured in a Research Centre and management of nitrified water in the central module, while the worm farm is located in the South module. The settlement's facilities are resolved with the North module, which houses an exhibition hall, a conference room and some classrooms-workshops, as well as two public spaces that are the west square of the complex and the large, elevated platform that connects the three modules. United by an elevated and common platform, which delimits and unites at the same time the two existing realities, the different pieces that make up the project are raised and oriented according to the scalar response (neighbourhood/municipality) in which they have been conceived and are united in a syntax that fits the environment, folding, forming ramps and slopes that link them together.

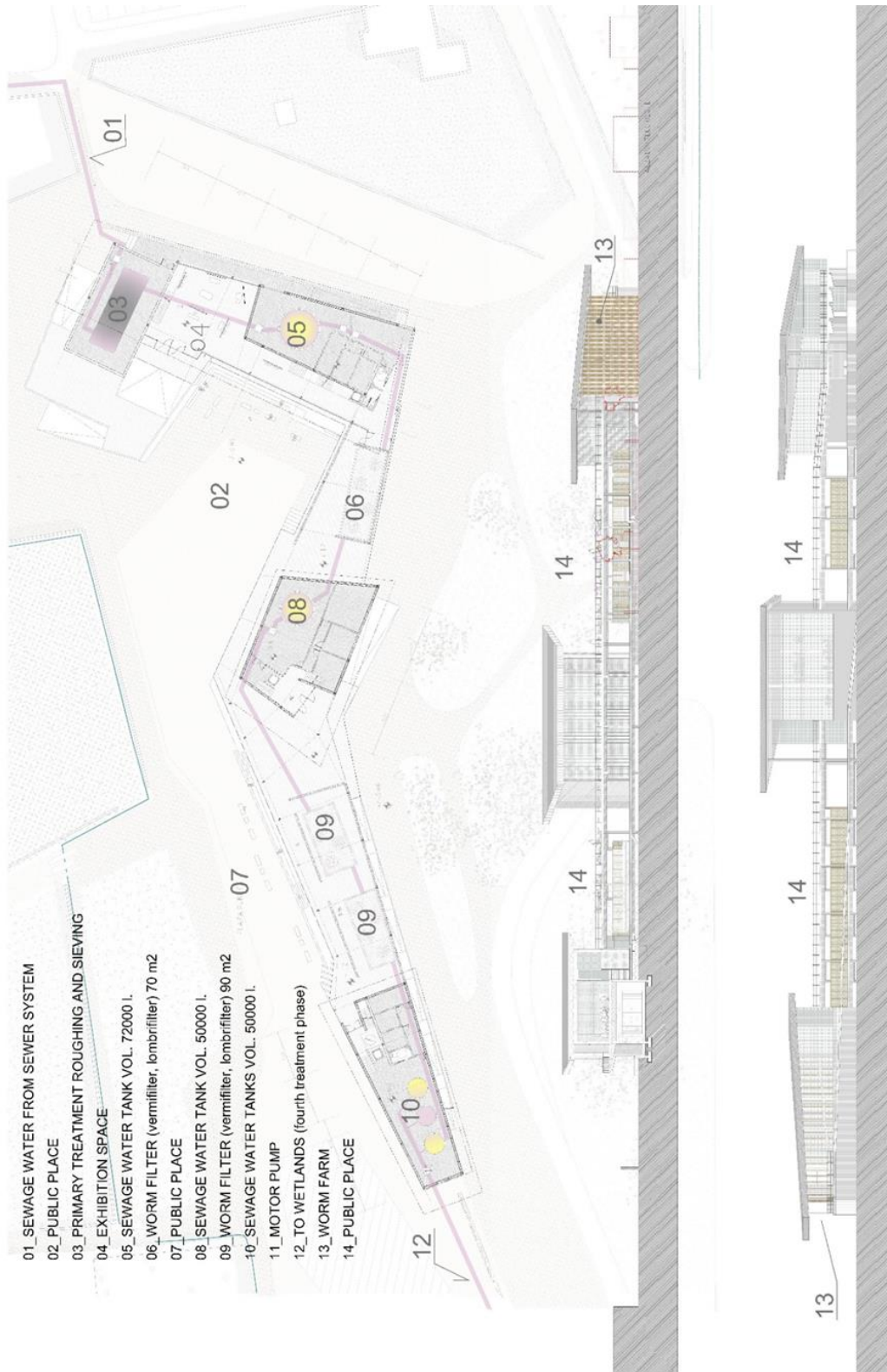


Figure 5. Plan, elevation, and section of the hybrid social architecture. The plan shows the water filtering infrastructure in the different components

Hybrid social architecture is opposed to the problems defined by Koolhaas for the rural world. As opposed to a concept of the "countryside as backyard", the hybrid building allows to support dispersed developments and allows to conceive them as experimental habitats in the environment of the urban periphery, as defined by Secchi & Viganò (Viganò, 2001). As opposed to urban infrastructures that segregate sanitation and purification facilities from social facilities, the hybrid infrastructure not only purifies the waste of dispersed settlements but also transforms them into elements of environmental purification of the territory. In this symbiotic relationship, the territory benefits from having these structures that improve the water cycle against the problems of eutrophication and hypoxia and the inhabitants of the third spatiality benefit from having both indoor and outdoor relationship spaces. In return, the residents must maintain the systems that support the purification flows, thus sharing the ecological ideals expressed by Secchi & Viganò (Viganò, 2001). Rural settlements need this infrastructure for environmental improvement; but, unlike the megastructures conceived by Kurokawa (1991) for his agricultural city. These hybrid architectures are dimensioned for the small scale, as the small is related to the rural dimension. Their architectural configuration avoids standardization and improves the rural habitat with a social program focused on the local inhabitant (Viganò, 2001).

7. Conclusion

Hybrid social architectures are micro-infrastructures specially designed to solve the problems of rural areas, insofar as they support their population and allow the ecological restitution of water cycles in order to avoid the problems of nitrification of the oceans. The architectures and infrastructures of the processes of dispersion in the rural world differ from the urban ones and must be directed to incorporate strategies of symbiosis in the territory.

The spatial example of the implementation of a social hybrid architecture for water regeneration allows visualizing the social and environmental benefits in European peri-urban areas with a historic landscape. As a social infrastructure, these are micro nodes that combine three vectors: (a) the creation of a public space for social relations, very necessary in enclaves where public space is normally limited to paths; (b) small public facilities supported by the ICT; and (c) spaces that can be rented to private initiative (sale of agricultural products) or to public centres that require it.

As an environmental infrastructure, it allows solving the problems of wastewater and nitrified water through ecological systems, covering small peri-urban sectors, where low density makes the implementation of traditional sanitation networks very expensive. On the other hand, the incorporation of solutions based on nature allows the creation of lagoons for water treatment with less impact on historical agricultural landscapes. Future research should analyse the validity of the model in other agricultural settings subject to environmental impacts.

Acknowledgements

A preliminary version of this paper was presented at 5th International Conference on Contemporary Affairs in Architecture and Urbanism in the form of an oral presentation. This research has been funded by the Ministerio de Ciencia e Investigación, Spain, research project "Saved landscapes/landscapes to be saved. Social mobilization and landscape protection in the Spanish Mediterranean coast (MOVxPAIMED)" [Grant number PID2020-116850RB-I00].

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statements

Studies involving animal subjects: No animal studies are presented in this manuscript.

Studies involving human subjects: No human studies are presented in this manuscript.

Inclusion of identifiable human data: No potentially identifiable human images or data is presented in this study.

Conflict of Interests

The author declares no conflict of interest.

References

- Adam-Hernández, A., & Harteisen, U. (2020). A proposed framework for rural resilience – How can peripheral village communities in Europe shape change? *Ager*, 2020(28), 7–42. <https://doi.org/10.4422/ager.2019.05>
- Antrop, M. (2004). Landscape change and the urbanization process in Europe. *Landscape and Urban Planning*, 67(1–4), 9–26. [https://doi.org/10.1016/S0169-2046\(03\)00026-4](https://doi.org/10.1016/S0169-2046(03)00026-4)
- Aquilué Junyent, I., & Roca Blanch, E. (2019). Bijlmermeer, cambio e hibridación en la ciudad del futuro. *ZARCH: Journal of Interdisciplinary Studies in Architecture and Urbanism*, 12, 210–223. https://doi.org/10.26754/ojs_zarch/zarch.2019123388
- Ascher, F. (2009). *Diario de un hipermoderno*. Madrid: Alianza Editorial
- Castells, M. (1995). *La ciudad informacional: Tecnologías de la información, reestructuración económica y el proceso urbano-regional*. Madrid: Alianza Editorial.
- Chang, J., Mei, J., Jia, W., Chen, J., Li, X., Ji, B., & Wu, H. (2019). Treatment of heavily polluted river water by tidal-operated biofilters with organic/inorganic media: Evaluation of performance and bacterial community. *Bioresource Technology*, 279(January), 34–42. <https://doi.org/10.1016/j.biortech.2019.01.060>
- Cheng, L. (2021). China's rural transformation under the Link Policy: A case study from Ezhou. *Land Use Policy*, 103(January), 105319. <https://doi.org/10.1016/j.landusepol.2021.105319>
- Choay, F. (1994). El reino de lo urbano y la muerte de la ciudad [The reign of the urban and the death of the city]. In Á. Martín Ramos (Ed.), *Lo urbano en 20 autores contemporáneos* [The urban in 20 contemporary authors] (pp. 61–72). Barcelona: Ediciones UPC
- Cooke, P. (2020). Gigafactory Logistics in Space and Time: Tesla's Fourth Gigafactory and Its Rivals. *Sustainability (Switzerland)*, 12, 2044. <https://doi.org/10.3390/su12052044>
- Dura-Guimera, A. (2003). Population deconcentration and social restructuring in Barcelona, a European Mediterranean city. *Cities*, 20(6), 387–394. <https://doi.org/10.1016/j.cities.2003.08.004>
- Fariña Tojo, J. (2015). Paisaje y Paisajes [Landscape & Landscapes]. <https://elblogdefarina.blogspot.com/2015/12/paisaje-y-paisajes.html>
- Fenton, J. (1985). *Hybrid Buildings*. 11. Princeton Architectural Press
- Fernández-Galiano, L. (Ed.). (2016). *Architecture: Change of climate*. Fundación Arquitectura y Sociedad. <https://doi.org/978-84-617-5331-4>
- Frampton, K. (1995). *Toward an urban landscape*. In B. Tschumi (Ed.), *Columbia Documents of Architecture and Theory*, CBA. Vol IV. Columbia University.
- Herrera Napoleón, C. (2009). De la genética a la ciudad. La espacialización de los híbridos urbanos [From genetics to the city. The spatialization of urban hybrids]. *Terra Nueva Etapa*, 25(37), 69–92.
- Hertweck, F., & Marot, S. (Eds.). (2013). *The City in the City: Berlin: A Green Archipelago*. Lars Muller; Bilingual, Critical edición
- Jakobsen, J., & Nielsen, K. B. (2020). Compounding aspirations: grounding hegemonic processes in India's rural transformations. *Canadian Journal of Development Studies*, 41(1), 144–160. <https://doi.org/10.1080/02255189.2019.1666706>
- Kajijima, M., Kuroda, J., & Tsukamoto, T. (2003). *Made in Tokyo* (98h ed.). Kajijima Institute Publishing, LTD

- Koolhaas, R. (1994). *La Ciudad genérica* [Generic City]. Gustavo Gili
- Kornilova, A. A., Khorovetskaya, Y. M., Abdrashitova, T. A., Smagulova, A. B., & Lapteva, I. V. (2021). Modern model of a rural settlement: Development of planning structure and reconstruction of villages. *Civil Engineering and Architecture*, 9(1), 214–224. <https://doi.org/10.13189/cea.2021.090118>
- Kujundzic, K., & Vuckovic, S. S. (2019). Cultural landscape devastation as a consequence of poor Sustainable Urban Development practice Case study: Kostanjica, Boka Bay, Montenegro. *Journal of Contemporary Urban Affairs*, 3(1), 121–131. <https://doi.org/10.25034/ijcua.2018.4689>
- Kurokawa, K. (1991). *Intercultural Architecture. The Philosophy of Symbiosis*. Academy Editions
- McGinley, T., Fotia, A., & Abroe, B. (2015). From hopeful monsters to morphogenetic prototypes. *Architectural Theory Review*, 20(3), 365–375. <https://doi.org/10.1080/13264826.2016.1177563>
- Mekonnen, M. M., & Hoekstra, A. Y. (2015). Global Gray Water Footprint and Water Pollution Levels Related to Anthropogenic Nitrogen Loads to Fresh Water. *Environmental Science and Technology*, 49(21), 12860–12868. https://doi.org/10.1021/ACS.EST.5B03191/SUPPL_FILE/ES5B03191_SI_001.PDF
- Mestre Martínez, N. (2012). Pacto energetico y nueva sintaxis del edificio híbrido Adyacencia y oportunidad. ambiental [Energy pact and new syntax of the hybrid building. Adjacency and environmental opportunity]. Conama 2012. <http://www.conama2012.conama.org/conama10/download/files/conama11/CT2010/1891517596.pdf>
- Mokunfayo, A. F., & Babatunde, A. (2018). The Impact of Peri-Urbanisation on Housing Development: Environmental Quality and Residents' Productivity in Ibeju-Lekki, Lagos. *Journal of Contemporary Urban Affairs*, 2(2), 60–70. <https://doi.org/10.25034/ijcua.2018.3671>
- Müller-Mahn, D., Mkutu, K., & Kioko, E. (2021). Megaprojects—mega failures? The politics of aspiration and the transformation of rural Kenya. *European Journal of Development Research*, 33(4), 1069–1090. <https://doi.org/10.1057/s41287-021-00397-x>
- Oral, H. V., Carvalho, P., Gajewska, M., Ursino, N., Masi, F., Hullebusch, E. D. V., Kazak, J. K., Exposito, A., Cipolletta, G., Andersen, T. R., Finger, D. C., Simperler, L., Regelsberger, M., Rous, V., Radinja, M., Buttiglieri, G., Krzeminski, P., Rizzo, A., Dehghanian, K., ... Zimmermann, M. (2020). A review of nature-based solutions for urban water management in European circular cities: A critical assessment based on case studies and literature. *Blue-Green Systems*, 2(1), 112–136. <https://doi.org/10.2166/bgs.2020.932>
- Ortega y Gasset, J. (1963). *Obras Completas*. Vol. II. *El Espectador: 1916-1934* [Complete Works. Vol II. *The Viewer: 1916-1934*]. *Revista de Occidente*.
- Parisi, L. (2009). Symbiotic architecture: Prehending digitality. *Theory, Culture and Society*, 26(2–3), 346–374. <https://doi.org/10.1177/0263276409103121>
- Patkar, M. R., & Keskar, Y. M. (2011). Hybridization as a New Paradigm of Urban Development in metropolitan city. *International Journal of Innovative Research in Science, Engineering and Technology*, 3(1), 22–73. www.ijirset.com
- Perea, A. (2012). *The City of the Thousand Cities*. <http://www.doyoucity.com/proyectos/entrada/728>
- Pintos, P. (2014). Paisajes que ya no serán. Acumulación por desposesión e hibridación pseudourbana de humedales en la cuenca baja del río Luján, Argentina [Landscapes that will no longer be. Accumulation by dispossession and pseudo-urban hybridization of wetlands in the lower basin of the Luján River, Argentina]. In S. B. Lobatón & J. Monroy Hernández (Eds.), *Perspectivas sobre el paisaje* [Perspectives on the landscape] (pp. 189–217). Universidad Nacional de Colombia

- Precedo Ledo, A. (2004). Nuevas realidades territoriales para el siglo XXI: Desarrollo local, identidad territorial y ciudad difusa [New territorial realities for the 21st century: Local development, territorial identity and diffuse city]. *Síntesis*
- Rogers, R. (1997). *Cities for a small planet*. Basic Books
- Rosado, C. (2008). Context determines content: Quantum physics as a framework for "wholeness" in urban transformation. *Urban Studies*, 45(10), 2075–2097. <https://doi.org/10.1177/0042098008094874>
- Ruiz Rivera, N., & Delgado Campos, J. (2008). Territorio y nuevas ruralidades: Un recorrido teórico sobre las transformaciones de la relación campo-ciudad [Territory and new ruralities: A theoretical journey on the transformations of the countryside-city relationship]. *Eure*, 34(102), 77–95. <https://doi.org/10.4067/s0250-71612008000200005>
- Sastoque, M. J. M. (2005). Contradicción, complementariedad e hibridación en las relaciones entre lo rural y lo urbano [Contradiction, complementarity and hybridization in the relations between the rural and the urban]. *MAD*, 13, 45–70. <https://doi.org/10.5354/rmad.v0i13.14675>
- Sgobbo, A. (2018). The Value of Water: an Opportunity for the Eco-Social Regeneration of Mediterranean Metropolitan Areas. In F. Calabrò, L. Della Spina, & C. Bevilacqua (Eds.), *International Symposium on New Metropolitan Perspectives* (pp. 505–512). Springer. https://doi.org/10.1007/978-3-319-92102-0_53
- Shao, T., & Wang, T. (2020). Effects of land use on the characteristics and composition of fluvial chromophoric dissolved organic matter (CDOM) in the Yiluo River watershed, China. *Ecological Indicators*, 114(March), 106332. <https://doi.org/10.1016/j.ecolind.2020.106332>
- Šijaković, M., & Perić, A. (2018). Symbiotic architecture: Redefinition of recycling design principles. *Frontiers of Architectural Research*, 7(1), 67–79. <https://doi.org/10.1016/j.foar.2017.12.002>
- Teaford, J. C. (2020). *Post-Suburbia: Government and Politics in the Edge Cities*. Johns Hopkins University Press.
- Vallance, S. (2014). Living on the Edge: Lessons from the Peri-urban Village. *International Journal of Urban and Regional Research*, 38(6), 1954–1969. <https://doi.org/10.1111/1468-2427.12036>
- van Broekhoven, S., & Vernay, A. L. (2018). Integrating functions for a sustainable urban system: A review of multifunctional land use and circular urban metabolism. *Sustainability (Switzerland)*, 10(6). <https://doi.org/10.3390/su10061875>
- Viganò, P. (2001). *Territories of a New Modernity*. Electa Nápoles.
- Wendling, L. A., & Holt, E. E. (2020). Integrating engineered and nature-based solutions for urban stormwater management. *Women in Water Quality*, 23–46. https://doi.org/10.1007/978-3-030-17819-2_2
- Zanni, F. (2012). *Urban hybridization*. Maggioli Editore.