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Co-productive Energy Landscape Project: Borgo Monteruga

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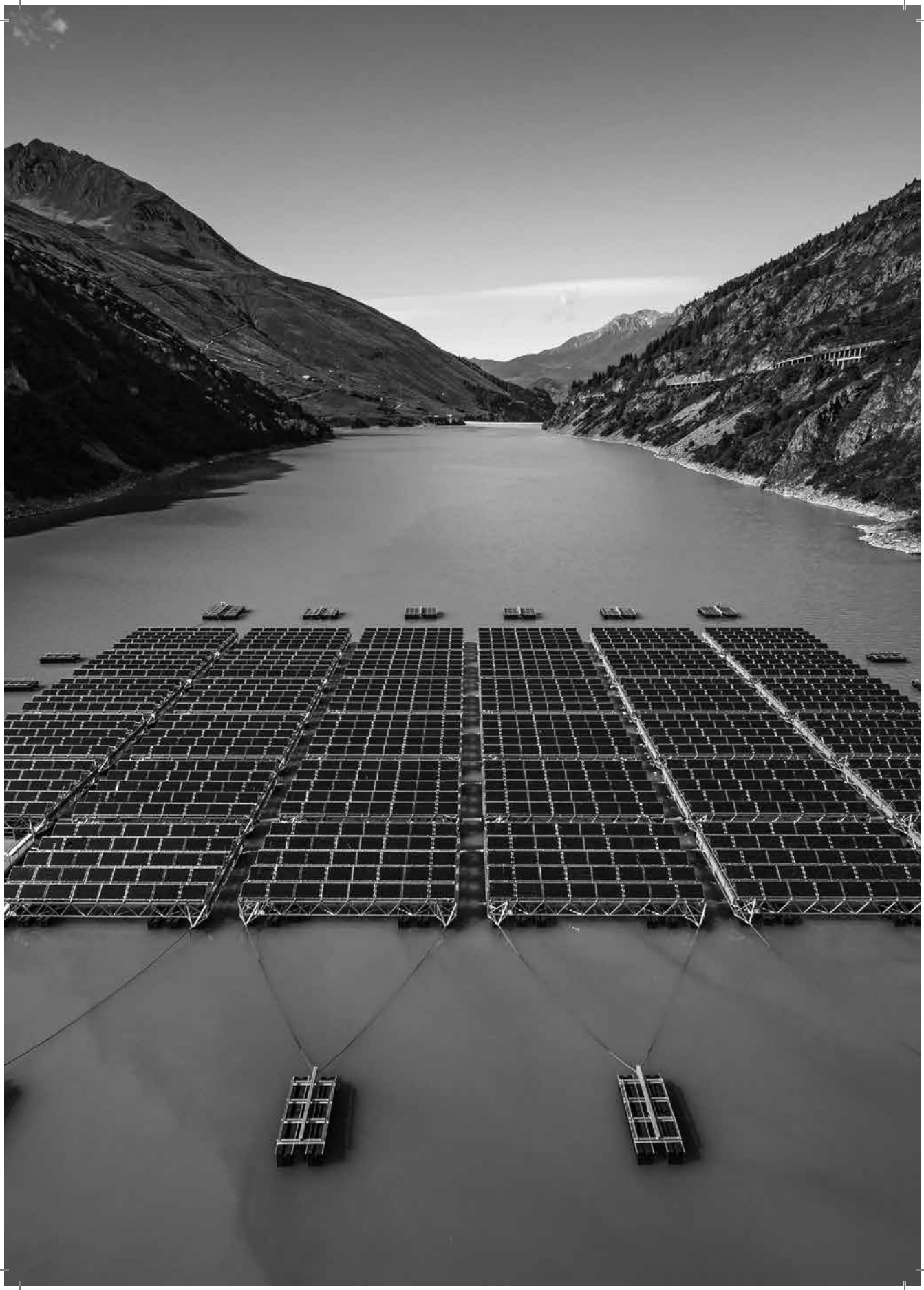
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Cover image
Romande Energie's demonstration floating solar park on Lac des Toules.
© Romande Energie

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Landscape
Field
Immanence
Perspective
Cluster/Network

diachronic reading • solar land-scape • energy transition

Co-productive Energy Landscape Project: Borgo Monteruga

Elena Vigliocco (1), Paolo Mellano (2), Elena Guidetti (3), Riccardo Ronzani (4)

Abstract

Assuming that an agricultural landscape is an energetic solar landscape, the article describes the premises and the strategy for the regeneration of Borgo Monteruga in Salento, a region known in ancient times for producing lamp oil. After becoming an agricultural site dedicated exclusively to oil production for food purposes, it is now wholly unproductive due to the spread of Xylella Fastidiosa. The absence of unequivocal legislation on agrivoltaics and the need to identify a productive layout that could reactivate and renew the site led the owner to appoint a third-party research institution to determine the most appropriate strategy for the economic regeneration of this non-productive landscape. The method proposed for pursuing the design of a new multifunctional landscape is grounded in the historical reading of the landscape. The visual essay consists of a timeline divided into four sections corresponding to four landscapes. Each section describes how the changing demand for energy, local and supralocal, has modified the actions imprinted on this solar landscape. The last section presents the project scenario reconciling two energy landscapes perceived as inconsistent into a co-productive energy landscape, assuming the historical analysis as design support.

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ARDETH #13

Introduction

In 2004, fossil fuels supplied 86.5% of the global energy consumption, which amounted to 15,000 TWh (Jefferson, 2005). In 2019, global energy consumption increased by 16% in fifteen years (Degl'Innocenti, 2020). The latest report from the International Energy Agency (2021) estimates that energy consumption will rise again by around 20% in 2020-2050[1]. The increase in consumption would not be a problem if it were not the leading cause of global warming. To achieve net zero emissions by 2050,1 the widespread use of available technologies that use renewable sources is necessary to implement the energy transition.

Among renewable sources, solar radiation is the primary energy source for life through photosynthesis (Smil, 2022). If in acquiring societies, the food, the energy that man needs in terms of caloric needs, was collected, and obtained from wild nature, the introduction of agriculture opens up new demographic opportunities. Agriculture is the first form of extensive domestication of nature, which aims to increase the production of food – energy – for human beings. An agricultural landscape is, therefore, by definition, an energy landscape.

Assuming the landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and human factors" (Council of Europe, 2000), disclosing the story of a landscape means unveiling the story of economies that produced that landscape and how those economies have modified it over time.

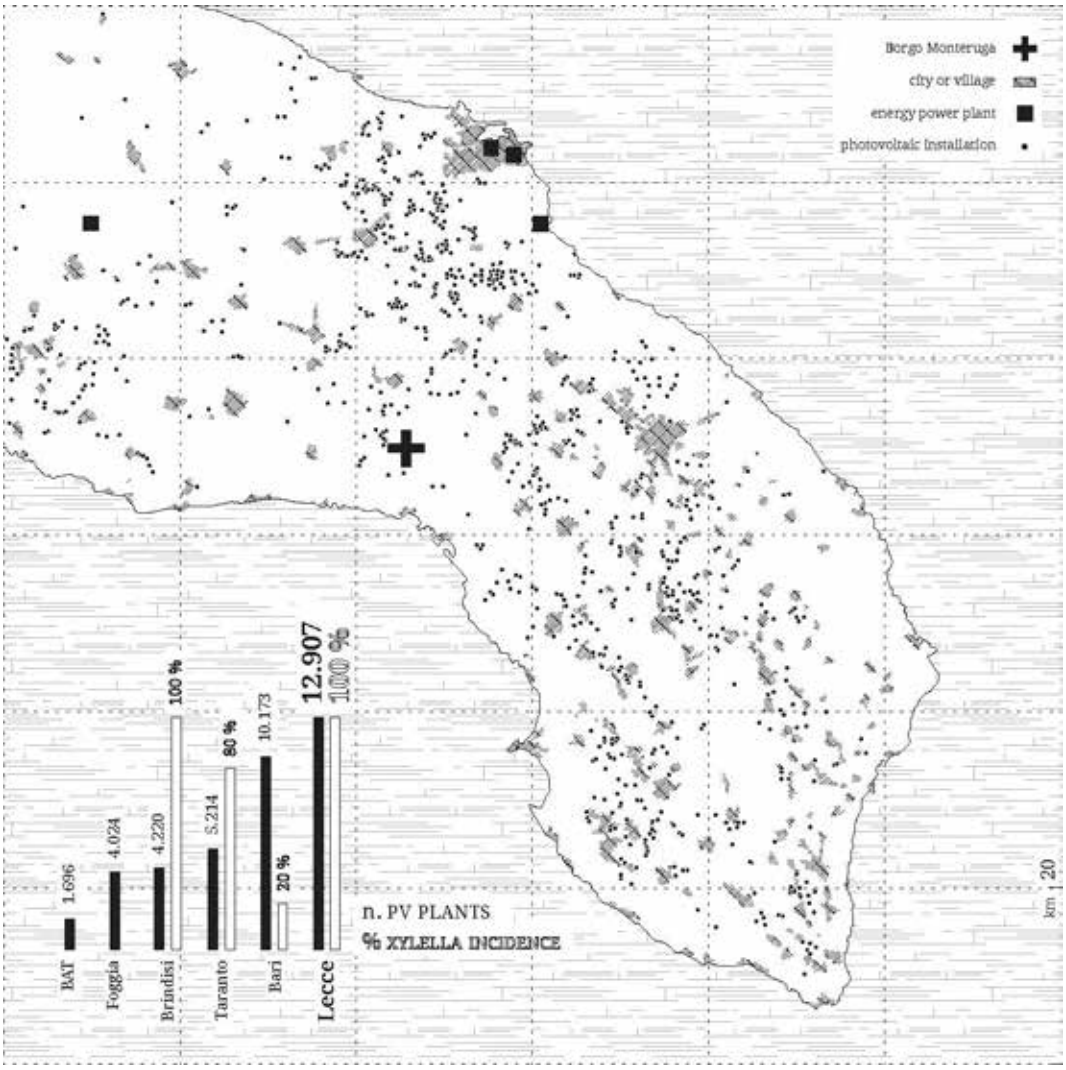
Conflicting solar landscapes

"Not In My Backyard" (NIMBY) indicates the slogan that is often used in protests against works considered to have a negative and relevant impact to be carried out in an area that is perceived as close to the daily interests of those protesting (Carley et al., 2020). In Italy, these complaints involve the debate on large ground-mounted solar parks (Roccato, Mannarini, 2012). The main criticism against these plants is that, by replacing agricultural production with devices for electricity production, the historicides image of the Italian agricultural landscape (Sereni, 1961) would be corrupted. The effect of this ideological resistance determined that in 2022, only 1% of large ground-mounted photovoltaic systems were authorized (Legambiente, 2023).

Who plans the planning?

In 2021, a private agricultural company specializing in the production of olive oil purchased the Monteruga property in Salento, a region where lamp oil was produced in ancient times. The intention is to reactivate the economy of this area whose agricultural production has stalled due to Xylella Fastidiosa. The need to plant more than 100,000 olive trees, which will only come into production after five to eight years, makes it necessary to introduce a second production capable of making the operation economically sustainable. Thus, the agricultural company imagines combining olive growing with the production of electricity from solar sources. Identifying a productive layout that could revive the site, without distorting it, led the company to turn to the Politecnico di Torino. The

1 – Starting from the European Green Deal, the European Climate Law presented by the European Commission in 2020 assumes the NZE as the primary goal (European Commission, 2019).



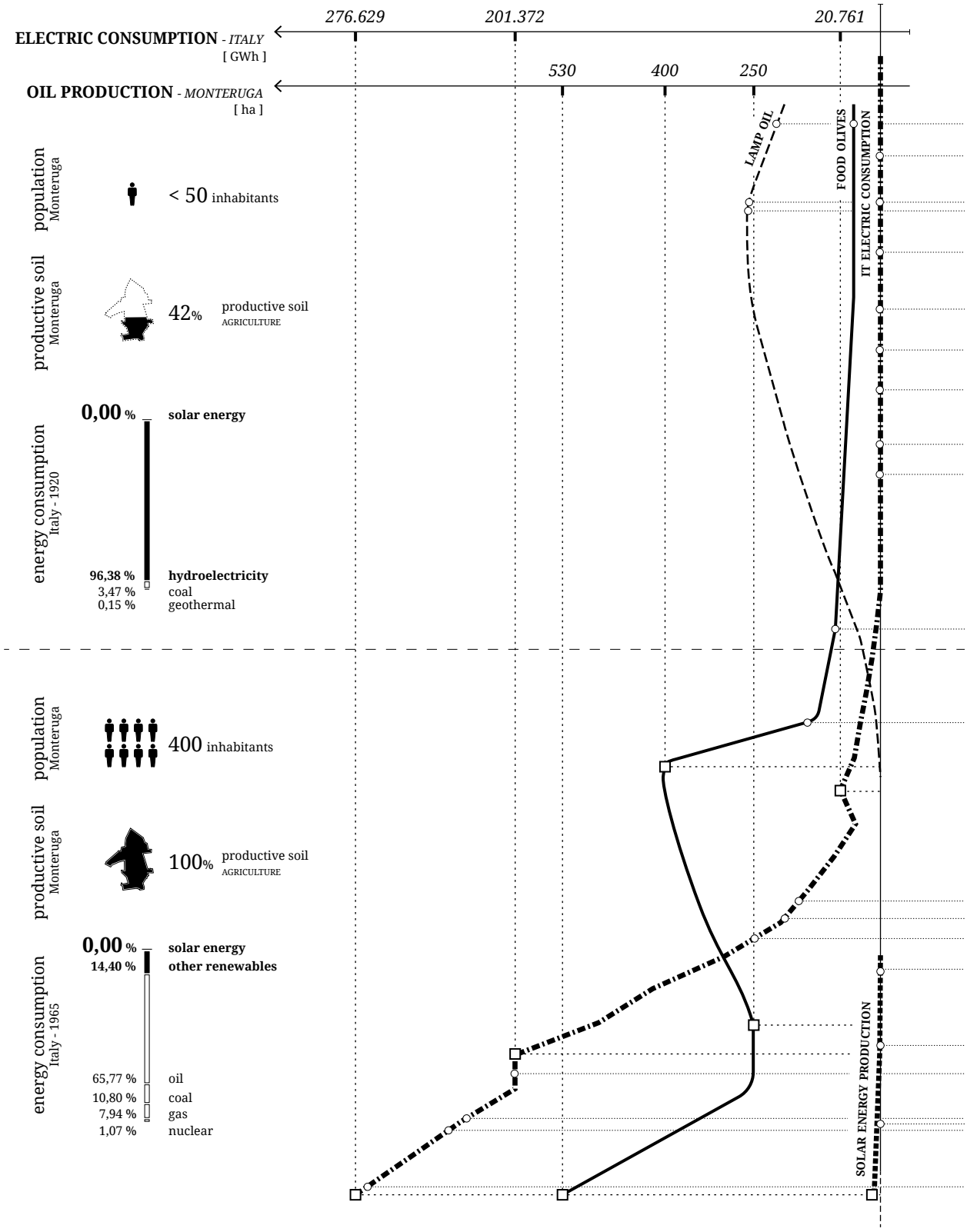
historical reading of the landscape, which highlighted the material and immaterial components and put in evidence the site's characters, made it possible to design a co-productive energy landscape that alternates food and electricity production at variable densities.

Reading notes

The paper presents the logical construction of the installation strategy of the new agrivoltaic system in Monteruga. The project aims to build a unique alliance between two kinds of energy derived from the sun. The outcome is a new energy solar landscape. The process is based on examining the transformations carried out on this solar landscape by the generations that have succeeded one another and have modified it opportunistically. Four historical sections organize the reading thanks to the maps repository listed at the chapter's end.

Fig. 1 - Location of Monteruga within the Salento context (Apulia Region, Italy).

Fig. 2 - Timeline describing the interaction between events, changes in energy demand, and energy production from solar renewable sources at the local and supra-local scales (1800-2000) [Following pages].


ELECTRIC CONSUMPTION - ITALY
[GWh]
276.629
201.372
20.761
OIL PRODUCTION - MONTERUGA
[ha]
530
400
250
population Monteruga
< 50 inhabitants
productive soil Monteruga
42% productive soil AGRICULTURE
energy consumption Italy - 1920
0,00 % solar energy
96,38 % hydroelectricity
3,47 % coal
0,15 % geothermal
population Monteruga
400 inhabitants
productive soil Monteruga
100% productive soil AGRICULTURE
energy consumption Italy - 1965
0,00 % solar energy
14,40 % other renewables
65,77 % oil
10,80 % coal
7,94 % gas
1,07 % nuclear
LAMP OIL
FOOD OLIVES
IT ELECTRIC CONSUMPTION
SOLAR ENERGY PRODUCTION

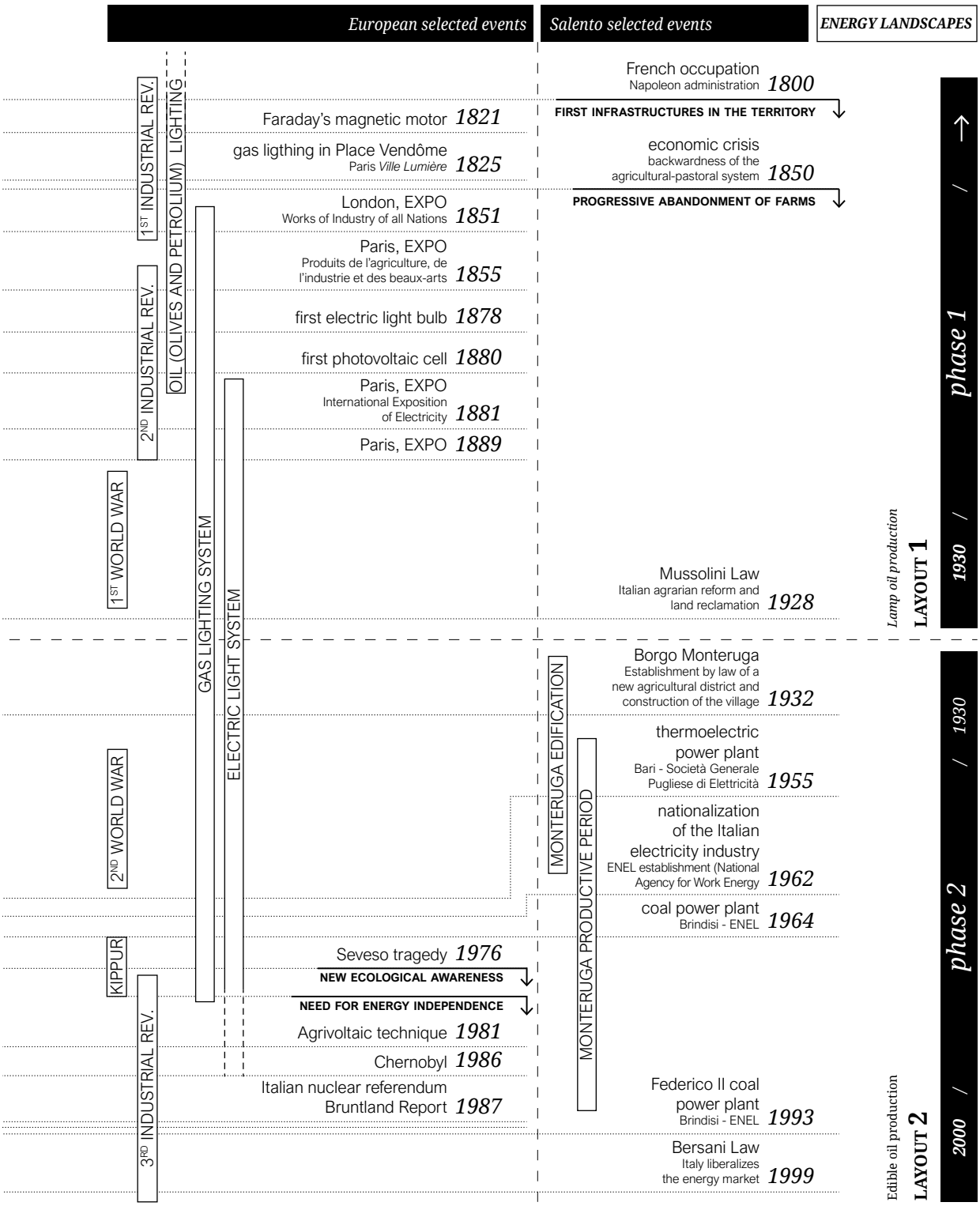
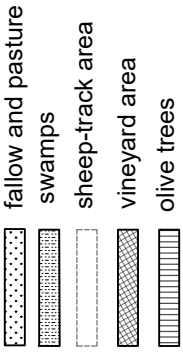

European selected events
Salento selected events
ENERGY LANDSCAPES
1ST INDUSTRIAL REV.
2ND INDUSTRIAL REV.
OIL (OLIVES AND PETROLIUM) LIGHTING
GAS LIGHTING SYSTEM
ELECTRIC LIGHT SYSTEM
1ST WORLD WAR
2ND WORLD WAR
KIPPUR
3RD INDUSTRIAL REV.
MONTERUGA EDIFICATION
MONTERUGA PRODUCTIVE PERIOD
French occupation
Napoleon administration 1800
FIRST INFRASTRUCTURES IN THE TERRITORY
Faraday's magnetic motor 1821
gas ligthing in Place Vendôme
Paris Ville Lumière 1825
economic crisis
backwardness of the agricultural-pastoral system 1850
PROGRESSIVE ABANDONMENT OF FARMS
London, EXPO
Works of Industry of all Nations 1851
Paris, EXPO
Produits de l'agriculture, de l'industrie et des beaux-arts 1855
first electric light bulb 1878
first photovoltaic cell 1880
Paris, EXPO
International Exposition of Electricity 1881
Paris, EXPO 1889
Mussolini Law
Italian agrarian reform and land reclamation 1928
Lamp oil production
LAYOUT 1
1930 / → / phase 1
Borgo Monteruga
Establishment by law of a new agricultural district and construction of the village 1932
thermoelectric power plant
Bari - Società Generale Pugliese di Elettricità 1955
nationalization of the Italian electricity industry
ENEL establishment (National Agency for Work Energy 1962
coal power plant
Brindisi - ENEL 1964
Seveso tragedy 1976
NEW ECOLOGICAL AWARENESS
NEED FOR ENERGY INDEPENDENCE
Agrivoltaic technique 1981
Chernobyl 1986
Italian nuclear referendum
Bruntland Report 1987
Federico II coal power plant
Brindisi - ENEL 1993
Bersani Law
Italy liberalizes the energy market 1999
Edible oil production
LAYOUT 2
2000 / 1930 / phase 2

Fig. 3 - Monteruga region before the 1928's agrarian reform.





LAYOUT 1: Solar landscape 1 - Lamp oil production
The territory is predominantly calcareous characterized by bushy pastures, scrubland, and swamps. There are extensive marshy areas, which make the place unattractive to human settlement. There are four agricultural farms. Economic activities are linked to agriculture and pastoralism. The olive groves produce olives whose refining produces poor quality oil used as fuel for lighting oil lamps. According to Giovanni Presta (D'Astore, 2001), already in the 18th century, 90% of the oil exported from Puglia was lamp oil purchased especially from foreign states for lighting, wool processing, and making soap. The other 10% was exported to other Italian states for food.

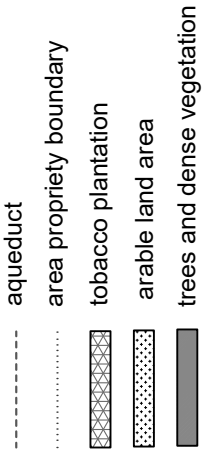


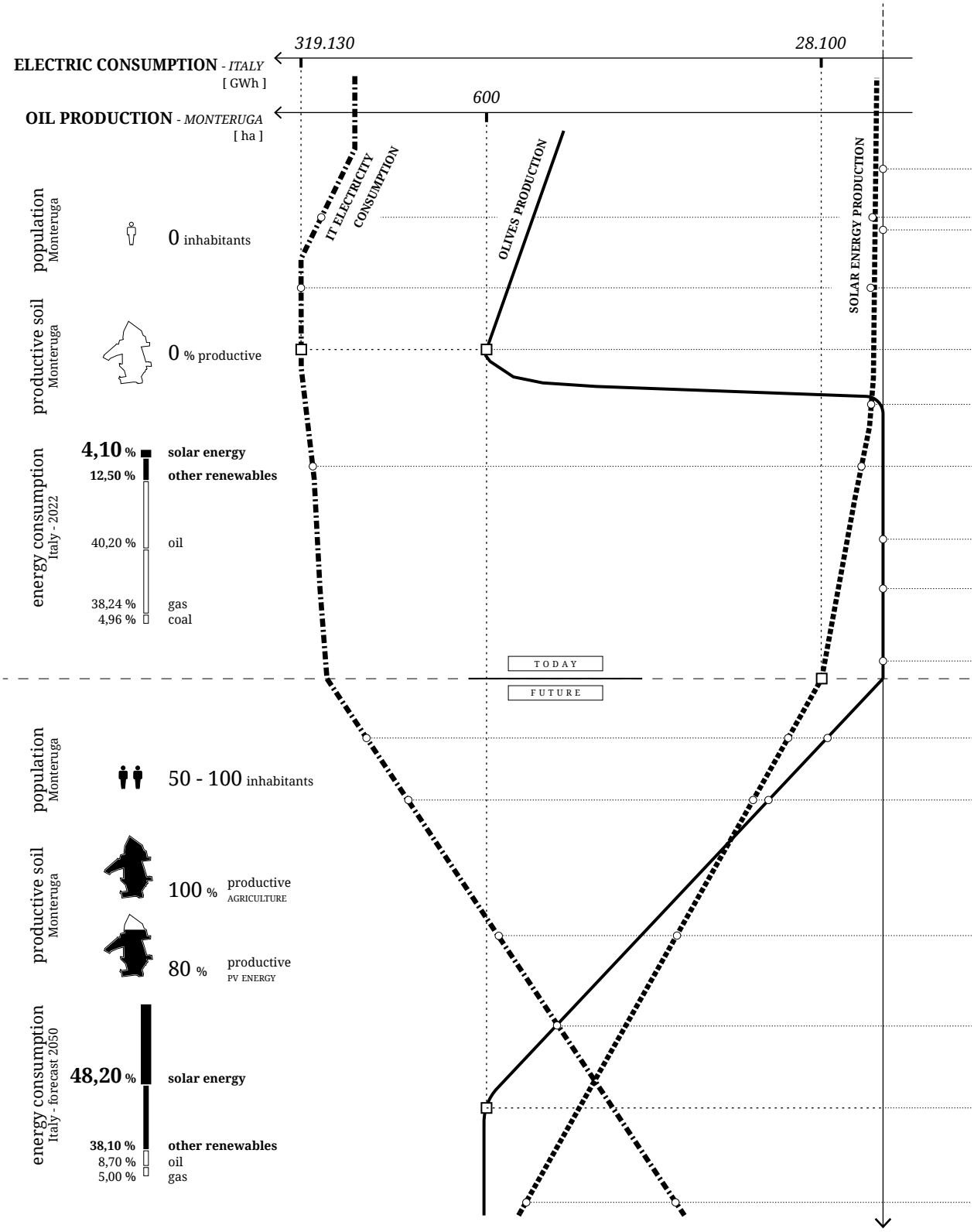
Fig. 4 - Monteruga region after the agrarian reform.

Fig. 5 - Timeline describing the interaction between events, changes in energy demand, and energy production from solar renewable sources at the local and supra-local scales (2000-2050) [Following pages].

LAYOUT 2: Solar landscape 2 - Edible oil production

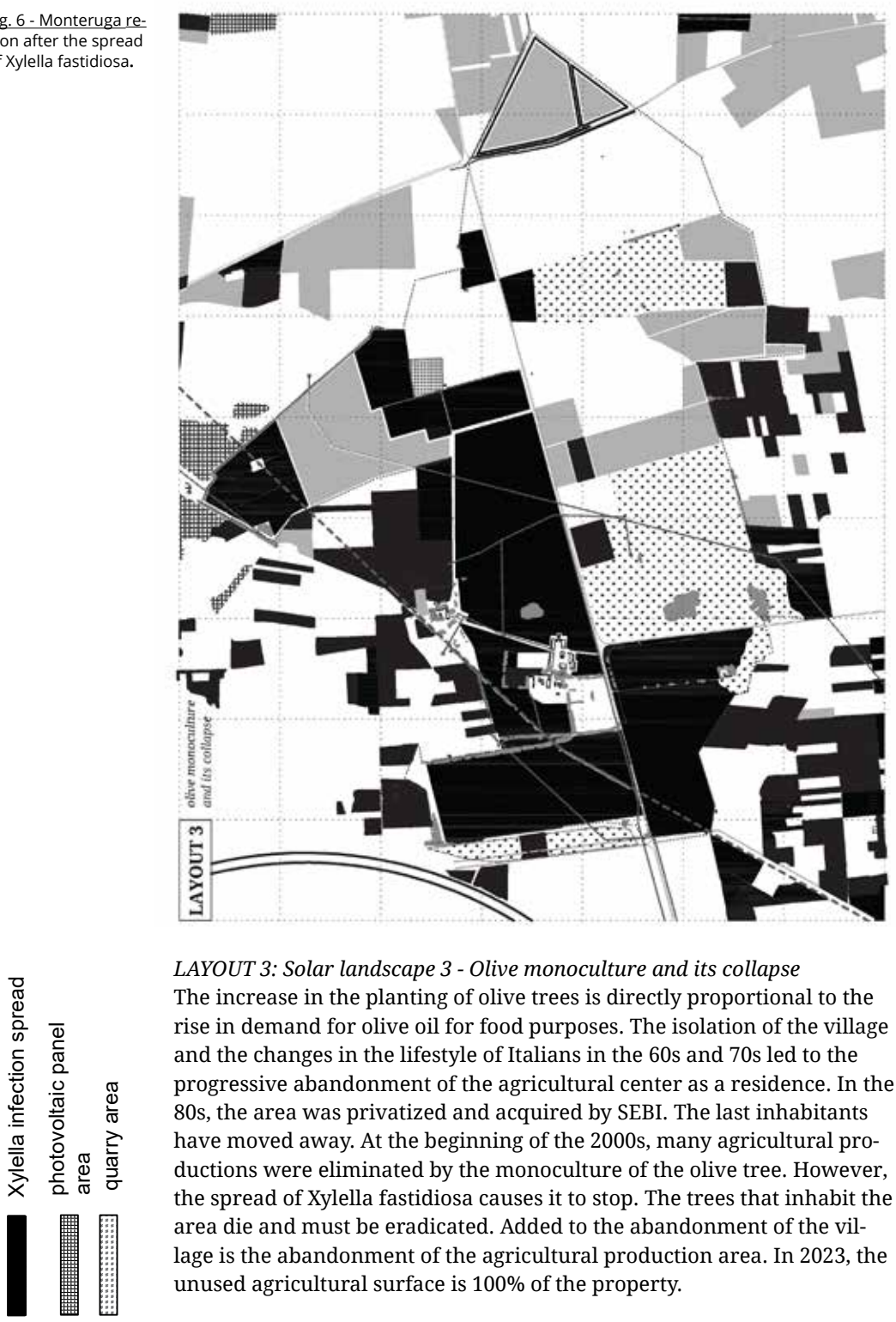
Starting from the end of the 19th century, the new Italian government gave a new impetus to public works by commissioning investigations on marshy and unhealthy territories. Subsequently, the fascist era recognized land reclamation as crucial in encouraging agricultural production as a strategic asset for Italy. The fascist regime encouraged land reclamation and reorganization and, with the agrarian reform, expropriated the large estates. Fourteen rural villages have been created in Puglia. Borgo Monteruga is one of them and is made of approximately 900 hectares of farmland. The farm located in the lower half is expanded by building new infrastructures and farmhouses. At the same time, land reclamation increases the quality of olive oil production, and the reconversion begins: progressive electrification requires adapting to new market demands.




319.130
28.100
ELECTRIC CONSUMPTION - ITALY
[GWh]
600
OIL PRODUCTION - MONTERUGA
[ha]
IT ELECTRICITY CONSUMPTION
OLIVES PRODUCTION
SOLAR ENERGY PRODUCTION
population Monteruga
0 inhabitants
productive soil Monteruga
0 % productive
energy consumption Italy - 2022
4,10 % solar energy
12,50 % other renewables
40,20 % oil
38,24 % gas
4,96 % coal
TODAY
FUTURE
population Monteruga
50 - 100 inhabitants
productive soil Monteruga
100 % productive AGRICULTURE
80 % productive PV ENERGY
energy consumption Italy - forecast 2050
48,20 % solar energy
38,10 % other renewables
8,70 % oil
5,00 % gas

European selected events
Salento selected events
ENERGY LANDSCAPES
European Landscape Convention 2000
Hannover, EXPO Humankind - Nature - Technology 2000
Italy approves the Cultural Heritage Code 2004
Bersani-bis Law Italy liberalizes the energy production market 2007
Xylella Fastidiosa Beginning of the spread of the infection 2008
Milan, EXPO Feeding the Planet, Energy for Life 2015
European Green Deal project and launch 2019
modification of Art. 9 of the Constitution the environment protection is equated to the heritage and landscape preservation 2022
EMERGENCE OF ENERGY INDEPENDENCE
European Nature Restoration Law 2022
Borgo Monteruga as cultural heritage recognition of the Borgo Monteruga public interest 2023
RUSSIA-UKRAINE WAR
4TH INDUSTRIAL REV.
OIL LANDSCAPE COLLAPSE
NEW OLIVE SPECIES
NET - ZERO EMISSION STRATEGIES APPLICATION
PV panel installation and olive trees planting 2024
Osaka, EXPO Designing future society for our lives 2025
ONU Agenda 2030 main goals 2030
PV panel removal and simultaneous planting of new olive trees 2044
MONTERUGA AGRIVOLTAIC PARK
Salento landscape restoration
European Green Deal main goals 2050
Olive monoculture and its collaps
LAYOUT 3 - state of the art
2023 / phase 3 / 2000
Co-productive energy landscape
LAYOUT 4 - project
← / phase 4 / 2023

Fig. 6 - Monteruga region after the spread of Xylella fastidiosa.



LAYOUT 3: Solar landscape 3 - Olive monoculture and its collapse
The increase in the planting of olive trees is directly proportional to the rise in demand for olive oil for food purposes. The isolation of the village and the changes in the lifestyle of Italians in the 60s and 70s led to the progressive abandonment of the agricultural center as a residence. In the 80s, the area was privatized and acquired by SEBI. The last inhabitants have moved away. At the beginning of the 2000s, many agricultural productions were eliminated by the monoculture of the olive tree. However, the spread of Xylella fastidiosa causes it to stop. The trees that inhabit the area die and must be eradicated. Added to the abandonment of the village is the abandonment of the agricultural production area. In 2023, the unused agricultural surface is 100% of the property.

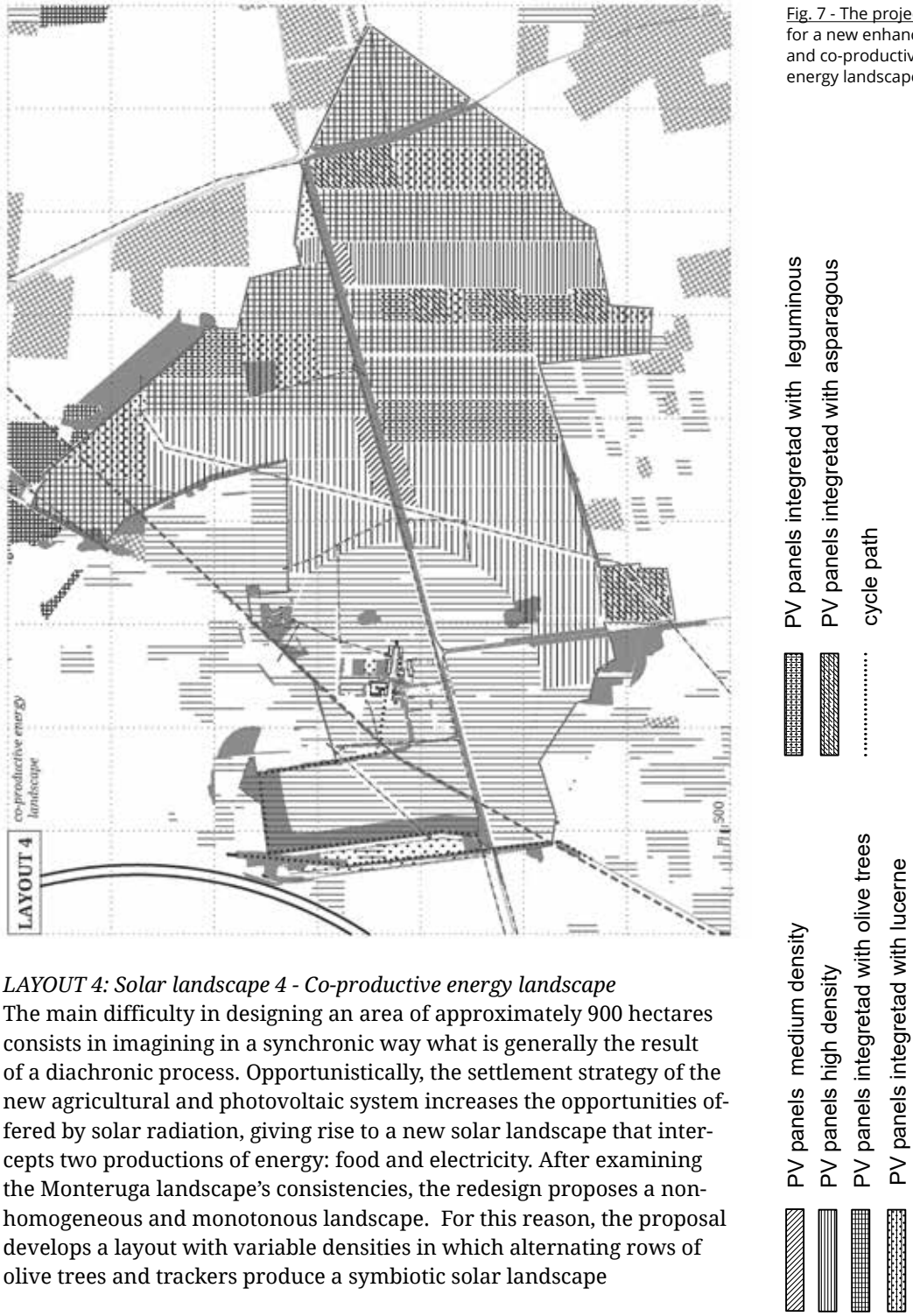


Fig. 7 - The project for a new enhanced and co-productive energy landscape.

LAYOUT 4: Solar landscape 4 - Co-productive energy landscape
The main difficulty in designing an area of approximately 900 hectares consists in imagining in a synchronic way what is generally the result of a diachronic process. Opportunistically, the settlement strategy of the new agricultural and photovoltaic system increases the opportunities offered by solar radiation, giving rise to a new solar landscape that intercepts two productions of energy: food and electricity. After examining the Monteruga landscape's consistencies, the redesign proposes a non-homogeneous and monotonous landscape. For this reason, the proposal develops a layout with variable densities in which alternating rows of olive trees and trackers produce a symbiotic solar landscape

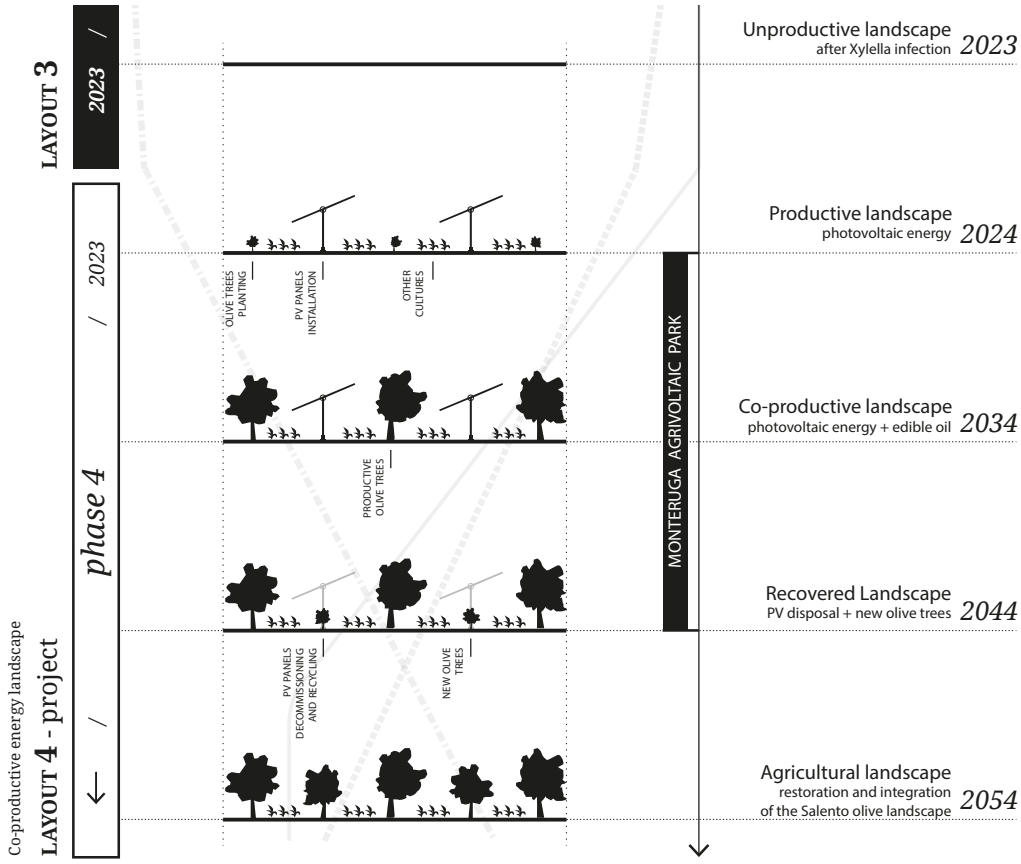
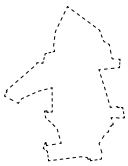


Fig. 8 - Restoring process of the Salento agricultural landscape through a phase of co-productive energy landscape. The dismantling of photovoltaic panels at the end of their life corresponds with the planting of new olive trees.

Conclusion

Despite the definition (Europe Council, 2000), the landscape has always been the victim of hard-to-die simplifications. In practice, the landscape project is reduced to *landscaping* (Folléa, 2019), corresponding to beautifying technological infrastructures you do not want to see by planting trees. Today, faced with an indispensable energy transition, we must imagine new project strategies for energy landscapes that have a specific impact, but which allow us, in a medium-long time (equal to almost the two decades it took from Xylella to annihilate the economy), to restore life, economy, image and meaning to this critical portion of Salento. Starting from a landscape diachronic analysis, the study unveils unexpected characteristics and not exploited potentialities of the site on which grounding the design of a new solar landscape. Because the landscape is not a static concept, this experience assumes that the historical evolution of the landscape must be at the center of every energy transition project. Only by achieving a correct awareness of the landscape under examination can the design strategies find the point of balance between preservation and innovation requests.



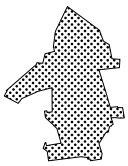
LAYOUT 1

1 - *Provincia di terra d'Otranto già delineata da Magini e nuovamente ampliata in ogni sua parte secondo lo stato presente. Data in luce da Domenico De Rossi,* 1714. Archivio I.G.M. Firenze, 21. B-6, n. 517.

2 - *Oria, Lecce, Otranto del cartografo Giovanni Antonio Bartolomeo Rizzi Zannoni*, 1808. Map published in https://www.davidrumsey.com/.

3 - "*La Descrizione del Regno delle Due Sicilie" – di Benedetto MARZOLLA (Napoli 1851),* 1851. Map published in https://belsalento.altervista.org/

4 - *Benedetto Marzolla, Carta dei prodotti alimentarii delle Provincie Continentali del Regno delle Due Sicilie"*, 1856. Map published in https://belsalento.altervista.org/.



LAYOUT 2

1 - *Planimetria Bonifica di Arneo 1:100.000* (1930). ASL Lecce, Genio Civile, folder 145, dossier 817.

2 - *Masseria Monteruga. Mappa catastale 1:4000,* 1927. Map published in Mainardi, M. (1997), *La modernizzazione rurale a Veglie e in Arnèo negli anni Venti e Trenta*, Manduria, p.40.

3 - *Progetto costruzione strada Monteruga-Cerfeta per Veglie del 7 maggio 1932 redatto da ing. C. Castrignanò. Scala 1:2000.* Archivio di Stato di Lecce, Genio Civile, Titolo XIII, folder 145, dossier 817.

4 - *Planimetria del 1934 con descrizione delle zone con ristagni di acque.* Archivio di Stato di Bari. Ministero dell'Agricoltura e delle Foreste, Ispettorato Compartimentale Agrario, folder 215, dossier 11.

5 - *Plan attached* to the 1940 report with description of the land purchased by SEBI. Archivio di Stato di Bari. Ministero dell'Agricoltura e delle Foreste, Ispettorato Compartimentale Agrario, folder 215, dossier 14.

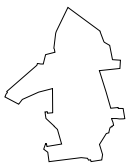
6 - *Terreni dell'Azienda Monteruga negli anni Settanta.* Map published in Diso, A. (2013), *Monteruga. Frammenti di memoria*, Monteroni.

7 - *Lottizzazione degli anni Cinquanta.* Map published in Mainardi, M. (1994), *Trasformazioni del paesaggio e habitat rurale in un'area salentina negli anni Venti e Cinquanta del Novecento: il caso Arneo.* In Annali del Dipartimento di Scienze Storiche Geografiche e Sociali dell'Università degli Studi di Lecce, VIII 1991-1992, Manduria, p. 375.

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LAYOUT 3

1 - *2023, current layout.* The visual survey of the site took place in two stages: May and September 2023.



LAYOUT 4

1 - *Co-productive solar energy landscape.* The project map includes the constraints imposed by current legislation regarding preserving cultural heritage and landscape.

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Maps repository

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2023, Current Layout, the visual survey of the site took place in two stages: May and September 2023.

Co-productive Solar Energy Landscape, the project map includes the constraints imposed by current legislation regarding preserving cultural heritage and landscape.

While in the recent decades, the field of architecture has primarily focused on the self-sufficiency of individual buildings, the current “Ardeth” issue wishes to bring back scholarly attention to an approach that prioritizes energy conservation and generation at the urban scale. Such an approach relies on the idea of the productive (and not only consumptive) urban environment, in which the built fabric, topography, soil, bodies of water, green spaces, as well as regional climatic conditions (determined by sun, wind, rain flows, and seasonal temperatures), serve as potential parameters for energy production.
How do different built fabric densities contribute to and limit the emergence of post-carbon energy landscapes? What are the implications of a British suburb, an Italian medieval town, or Greek informal settlements densities on the production, distribution, and use of post-carbon energy in those areas?

Contributions to #13:

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Reviews:

Power
an exhibition at CIVA - Centre International de la Ville et de l’Architecture, Brussels

Anthropocene: The Human Epoch
a movie directed by Jennifer Baichwal, Edward Burtynsky, Nicholas de Pencier

Landscape as Infrastructure: A Base Primer
a book by Pierre Bélanger

Technical Lands: A Critical Primer
curated byJeffrey S. Nesbit, Charles Waldheim

Architecture. From Prehistory to Climate Emergency
a book by Barnabas Calder

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