Scientific Journal of the Observatory of Mediterranean Basin.
Polis University / Ferrara University /
UNECE Center of excellence / Co-PLAN Institute.

TITLE: **OILANDSCAPES / Coupling ecological and social dimensions with oil infrastructures in Adriatic-Ionian region**

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SOURCE: *Scientific journal of the Observatory of Mediterranean Basin, Volume 3 / 2016, pp. 188-199*

ISSN: *2959-4081*

ISBN: *978-9928-4459-1-9*

PUBLISHED BY: *POLIS-Press*

DOI: *10.37199/o41003119*

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keywords / oil industry, landscape, infrastructures, territorial transformations

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Abstract

The aim of the paper is to explore the potential of oil industry landscapes if 'coupled' with new socio-ecologic realms, for the definition of a innovative local development processes. It will lead the reader in understanding, firstly, the conceptual transition from previous 'oil infrastructures' to 'oil meshes', necessary to set the analytical and designing scale of our proposed OILANDSCAPES. Starting from the assumption that 'oil infrastructures' have always played an important role in the definition of the stratified territorial morphology and that can be considered as cultural heritage because of their socio-cultural values, in the first part the paper focuses on the definition of three kinds of oil landscapes: upstream, midstream and downstream landscapes. Then, it leads the reader's attention on 'oil infrastructures' concept which is tightly related to an engineering approach in territorial planning. In the second part, the paper wants to introduce the suggested transition from 'oil infrastructures' to 'oil meshes' concept, supporting the idea that these three kinds of landscape have to be studied as a unique realm, so enlarging our point of view towards the territorial scale. After, the paper introduces the two current issues which are differently affecting oil industry on the Western coasts of Adrion region and on the Eastern ones: the crisis of the downstream sector in the first case, and the increasing in exploration and production oil activities in the second one. The effects of these local and regional dynamics will influence the territorial 'oil meshes' in their entirety. Therefore, 'oil meshes' are questioned to be responsive to a de-engineering reconversion process in one case and to be sensitive to innovative planning tools in the other one. In the third part, two case studies, representative of the opposite outlined current trends, are identified thanks to their concentration of oil infrastructures: the South-Eastern Sicilian oil district (Gela-Ragusa-Syracuse) in Italy and the Myzeqe plain oil district (Fier-Patos-Marinza-Ballsh-Kucova) in Albania. The two oil regions, defined by a 130x130 km area, are comparatively analysed thanks to some thematic GIS cartographies. In the conclusion the paper evokes the socio-ecologic potential for local development processes of our shaped 'oil meshes' in defining new urban and ecologic centralities. Some results of the IDAUP PhD workshop in Tirana have been taken as examples to briefly sketch how we could imagine new possible scenarios for 'oil meshes' only coupling them with socio-ecologic territorial strategic vision. In this sense the paper proposes to 'explore the new domain of OILANDSCAPES'.

Oil infrastructures: between 'palimpsest' and 'milieu'

According to André Corboz, 'territory as a palimpsest' is meant to describe morphological territorial transformations as the result of natural and human processes of stratification (1983). The industrialization process itself has always been carrier of some productive patterns and infrastructures, being one of the principal organizers of contemporary urban landscapes (Castells, 1973).
In particular from the end of XIX century, oil represents a 'critical agent in shaping

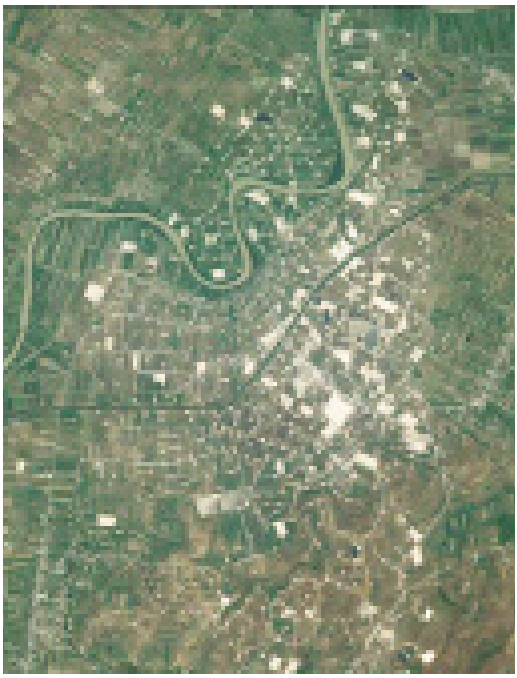

Fig1 / Upstream oil sector in Albania: Kucova drilling wells (in the white circles) / source Google Earth)
Fig2 / Upstream oil sector in Albania: pattern of Patos-Marinza horizontal wells / source Google Earth

global geographies – urban, rural and maritime - through physical infrastructure at major production sites, along networks of consumption, and through intangible, international flows of the finances, people, and ideas that sustain it` (Hein, 2013, p.437).
Thanks to their sediment material and immaterial components, we assume that on-shore oil infrastructures, being descriptive of a specific socio-economic context and of a work cultural know-how, may be counted as part of our historical and cultural industrial heritage, in this sense, they represent an opportunity for the construction of a competitive local development process.
These considerations allow us to associate to our morphological study, based on the interpretation of material and physical elements as proposed by 'palimpsest', a broader and immaterial realm by using 'milieu' concept to describe the specific socio-cultural values of the industrial cultural heritage (Governa, 1998).

According to a first morphological analysis of oil infrastructures, it is worthy to subdivide them in three major sectors of the oil industry, each of which corresponds to a peculiar landscape:

1. upstream oil sector matches with exploration and production stage. Spatially speaking, conventional oil extraction is characterized by typical drilling wells, which punctually harvest huge surfaces (fig.1). The recent wide diffusion of new extraction technologies for conventional and non-conventional oil, such as horizontal wells, contribute in changing the usual vertical petroleum landmarks into flat surfaces, which scatter satellite images in a very peculiar manner (fig.2);

2. midstream oil sector includes transportation activities of crude oil through different infrastructures (oil pipelines, rails, highways or waterways). It also involves storage and marketing activities for the delivery of crude or refined products to downstream distributors. Crude oil pipelines normally lie in the subsoil and they are materialized on the surface by non-building buffer zones. According to Neeraj Bhatia (2013, pp. 274) pipelines are the interface between the territorial scale and architecture;

3. downstream oil sector comprises the refining of crude oil activities and the processing of derived products. Refineries and petrochemical plants are the industrial architectural materialization of these processes. They represent huge surfaces, which normally lie near watercourses and seaports, because water is a fundamental element for their functioning and for shipping facilities. These sites are characterized by the presence of high chimneys, storage tanks, highly technological and specific buildings, artificial water basins and huge voids. A particular dense network of mobility infrastructures can be found in their proximity for a multimodal logistic organization.

The principal consideration which emerges from this morphological analysis is related

to the territorial influence of onshore oil infrastructures, based on functional interconnections among the three landscapes and on their physical distance. The potential of oil infrastructures resides in considering them as a whole, as 'territorial meshes'. Thus, the paper means to deepen how these 'oil meshes', if considered as cultural heritage in the sense of 'milieu', could be an organizing support for the definition of a local development process.

Oil meshes: questioning the role of energy infrastructures

Talking about oil industry is talking about infrastructures, in every of their declinations. As Ruiz (2013, pp. 68-79) and Bhatia (2013, pp. 273-286) assert, in XX century we assisted to a disruptive detachment between engineering and architecture disciplines. In this subdivision of competences, infrastructures belonged to civil engineering domain by completely abandoning design issues. Only recently architecture and landscape architecture have understood the importance in reintegrating infrastructures as a multi-scalar design challenge, infrastructural scale that contemporary urban and territorial challenges can be faced through an enlarged and long-term strategic planning vision. The reintegration of infrastructures' domain in architects and landscape architects' competences thus would allow them to intervene on and manage social and environmental realms from a broader point of view, reconciling contemporary architecture potential with its historic relationship to the city (Waldheim 2011, pp. 4-5).
In this context, the current shifting of energy infrastructures' policies from centralization to territorial distribution could be pivotal in the definition of their new territorial role in optics of a competitive local development, as its relationship with cultural heritage reveals practices of re-invention of territories (Bourdin, 1984). In this sense, we assist to an epochal transition from the notion of 'territory as a resource to be exploited through infrastructures' to the one of 'territory as a non-renewable resource to be valorised through landscape'. The choice of using the two terms 'infrastructures' and 'landscape' is not accidental, but lies on some Bélanger's theoretical assumptions (2012): landscape is infrastructure (think at rivers in example), but if the first unites, the second one, in their engineering meaning, separates.
The centralization of energy consumption lies on the assumption that no matter what energy resource has to be harvested from the soil and processed in more or less close huge productive sites, but normally far from urban settlements, to then be distributed in a wide-ranging region through energy infrastructures that only cross territories, without returning anything to local communities except for creating spatial separation.
Following on Ruiz's and Bhatia's enquiry: if infrastructures have been planned as technical objects, how could they be redesigned by architecture to become flexible for other uses? Using Bélanger's terms: how design could de-engineer existing infrastructures?

In this quick-sketched energy production framework, it is necessary to deepen why are we questioning about the future role of oil infrastructures, if we actually still live in a mostly oil-based energetic culture. We are aware that there are some different theories about the future of our oil-based economy, we can briefly summarize as follows:

1. the peak oil theory, by Marion King Hubbert (1956) asserts that it is possible to predict the extraction dynamic and the 'peak oil' of maximal oil production which stands as the beginning of production decreasing. The peak oil theory assumes that the decline of oil production is not necessarily due to the complete physical exhaustion of the hydrocarbon reserves, but it is mostly due to the unsustainable augmentation of the costs for the extraction (Bardi, 2013);

2. the detractors of peak oil theory affirm that this theory is only based on geologic and extractive data, ignoring that oil production is also influenced by social and technological progress. Even if world oil consumption has increased, exploitable predictable reserves have not decreased thanks to new and more efficient extraction techniques and to a broader social environmental sensitivity (Maugeri, 2012). So, oil era will not end because of oil scarcity but because of the development of more convenient energy sources. As to electric energy production, for example, oil has already been substituted by natural gas and renewable energies, while it remains the unique significant energy source for mobility industry (Zuliani, 2015);

3. the Energy (R)evolution scenario, proposed by more radical wings of no-profit organizations (i.e. Greenpeace), describes how global energy supply has to move to a mix of renewable energy

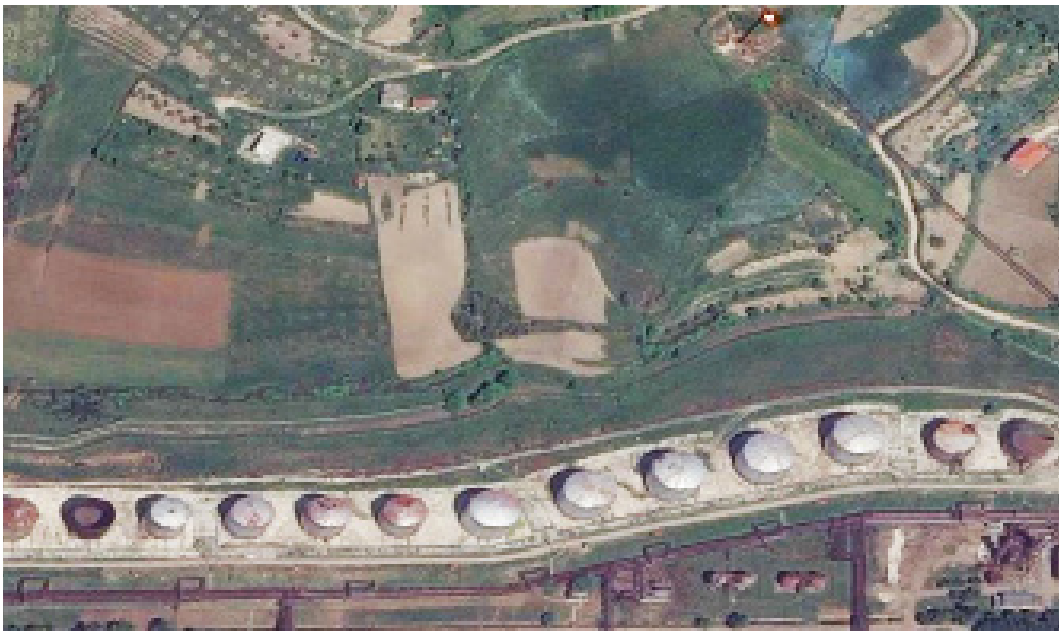

Fig3 / Midstream oil sector in Albania: Ballsh oil pipeline / source Bing Maps
Fig4 / Downstream oil sector in Italy: ENI Gela refinery oil plant / source Bing Maps
Fig5 / Downstream oil sector in Italy: LUKOIL Priolo Gargallo refinery oil plant / source Bing Maps

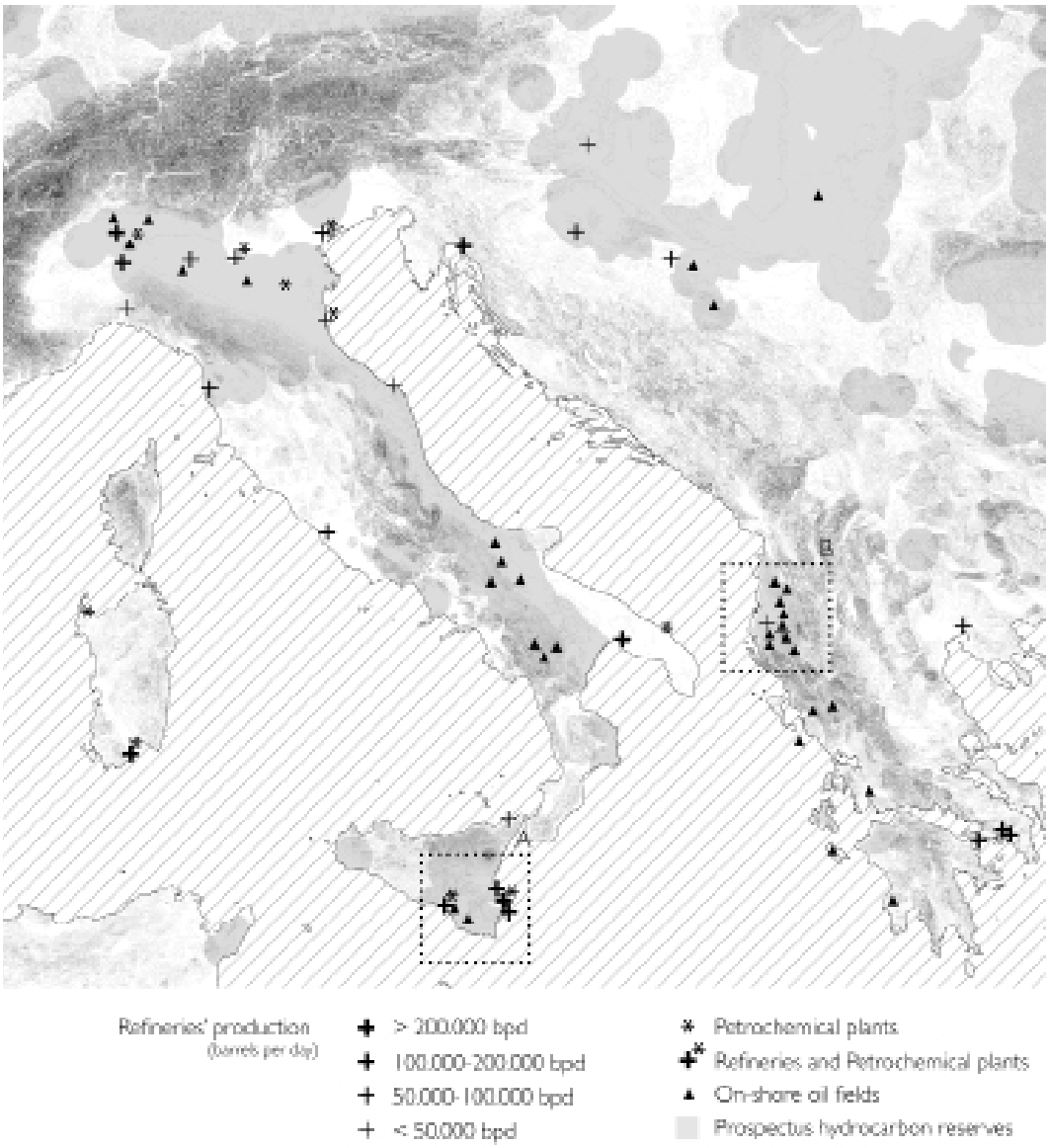

Fig6 / ADRION oil meshes: A_ Gela, Ragusa, Syracuse; B_ Fier, Patos-Marinza, Ballsh, Kucova - elaborated by the author through GIS mapping tools, WGS84/Pseudo Mercator – EPSG: 3857 sources / Prospectus hydrocarbon reserves: https://www.prio.org - Petroleum Dataset v1.2; Refineries location and productivity: http://globalenergyobservatory.org; On-shore oil fields location: Wikipedia – Oil fields in Italy, Slovenia, Croatia, Serbia, Albania, Greece.

sources (i.e. ocean energy, solar thermal, geothermal, biomass, photovoltaic, wind power, hydropower) to abandon carbon fossil sources exploitation by 2050 (Greenpeace, 2015).

The above reported theories could act as a starting point for future macro-economic oil policies, but certainly local challenges are fundamental for strategic decisions referred to oil infrastructures.
In a near future we are going to face two different issues of oil industry: a progressive contraction of downstream activities or a flourishing implementation of non-conventional oil production.
In particular, inside our chosen geographical framework, defined by European Union as Adriatic-Ionian region, it is possible to recognize two opposite issues for future petroleum industry. In fact, if on the Western coasts of Adriatic-Ionian region the high-cost of energy and very restrictive environmental laws are causing structural problems in a consolidated downstream sector, on the Eastern coasts, instead, problems are connected with a recent expansion of the extraction horizons.
Both in the case of dismissing or implementation of oil infrastructures, the territorial strategic vision for a local development process could be supported by the changing perspective about energy infrastructures from a centralized territorial energy consumption towards a territorial distributed energy production. From an energetic point of view, 'oil meshes' intersect several territories and could differently interacts with local characteristics for a specific production of alternative renewable energies.

Adrion oil meshes: case studies

Two interesting case studies along Adrion

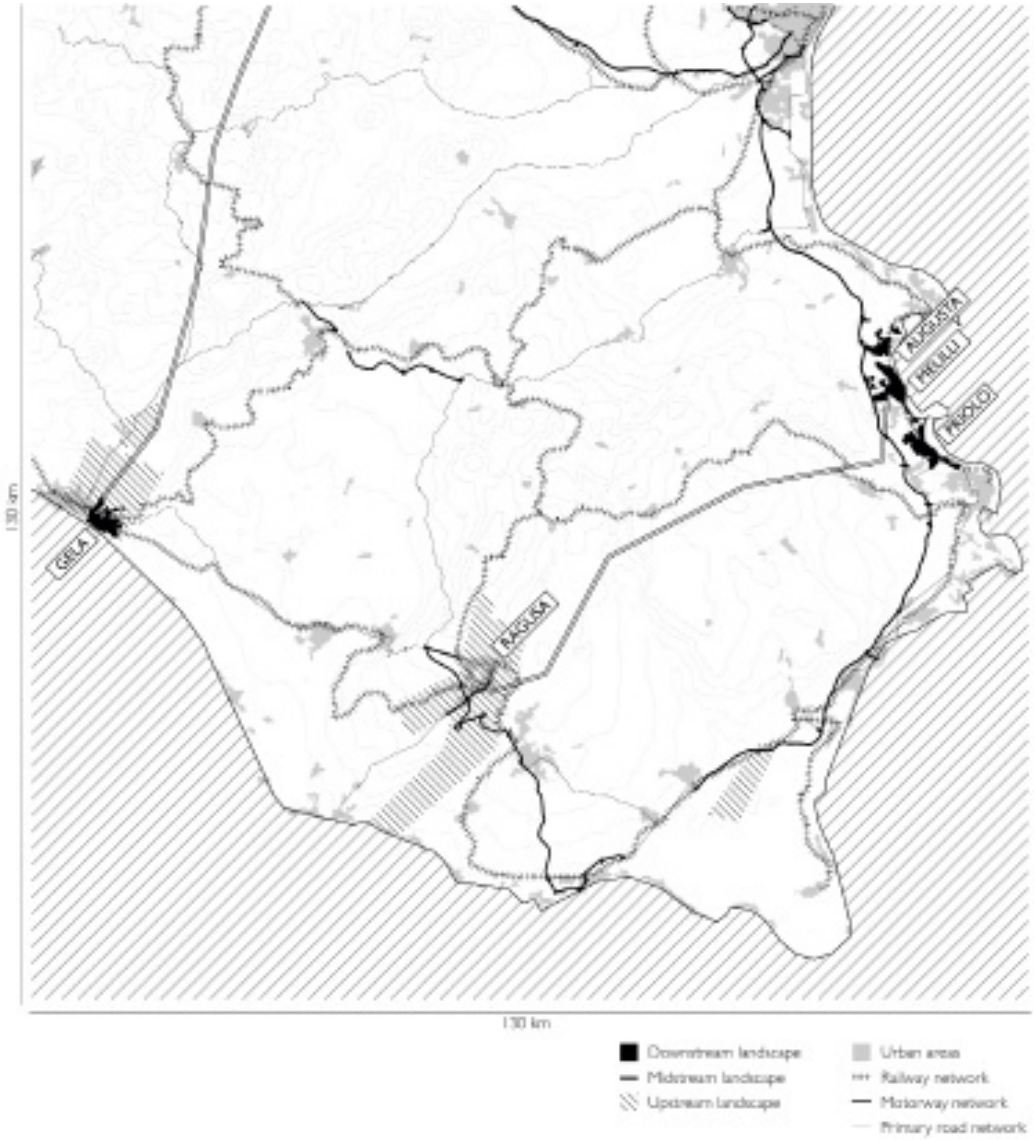

Fig. 7 / The South-Eastern Sicilian oil district - elaborated by the author through GIS mapping tools, WGS84/Pseudo Mercator – EPSG: 3857
sources / Urban areas and Downstream landscape: www.eea.europe.eu - Corine Land Cover; Midstream landscape: ENI factbook 2014; Upstream landscape: Ministero italiano dello Sviluppo Economico - http://unmig.mise.gov.it; Transportation networks: http://www.diva-gis.org/gdata.

coasts can provide us with useful elements regarding potential of oil infrastructures' influence on local development, focusing on the remarkable differences between Western and Eastern Adrion Region oil settlements. In particular, the two cases do stand for a high concentration of oil infrastructures in an area of 130x130 km, analysed through GIS mapping tools: the Sicilian case study (Gela, Ragusa, Syracuse) and the Albanian one (Fier, Patos-Marinza, Ballsh, Kucova).

1. Adrion Western Italian coasts: after the crisis of the downstream sector

Italy, due to its strategic geographic position easily accessible from North African and Middle East countries, imposed itself until '90s as one of the principal European leader in refining and petrochemical sector.

The present crisis in downstream oil sector is due to some structural reasons, such as (Oliva, 2014):

- the stagnation in demand of derived oil products on part of Western countries;
- the presence of foreign competitors with less restrictive regulations concerning environmental matters and lower energy costs;
- the reduced size of downstream plants preventing any advantage from the economies of scale;
- the unstable geo-political situation of the main suppliers of crude oil;
- the depression of fuel consumption.

The South-Eastern Sicilian oil district is one of the most significant oil regions in Italy. In a very concentrated 130x130km area, comprised between Gela and Syracuse, oil infrastructures have shaped one of their most relevant expressions. The three typical oil industry landscapes unfolding on those territories are (MISE,

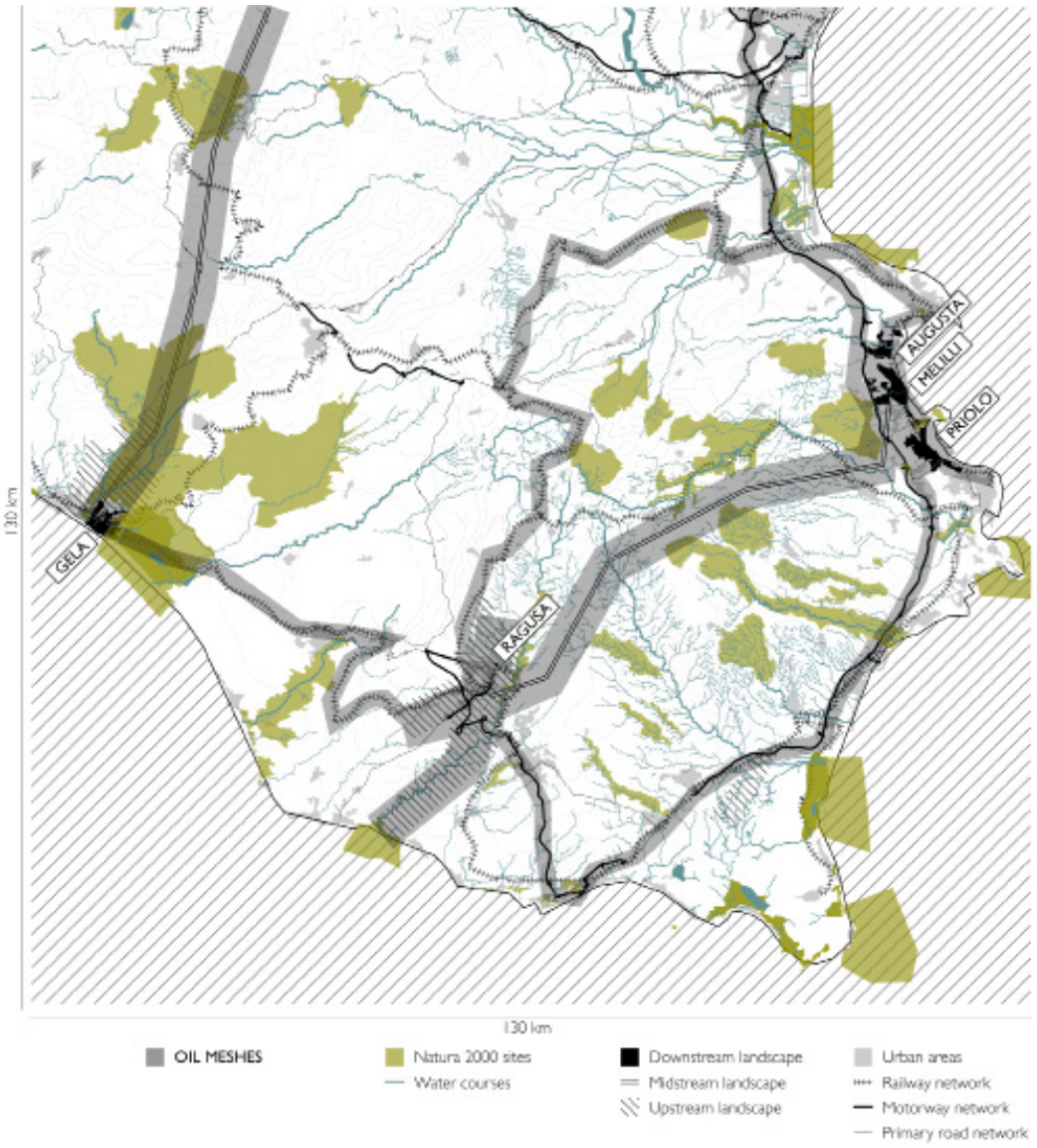

Fig8 / The South-Eastern Sicilian OIL MESH and its social-ecological potential - elaborated by the author through GIS mapping tools, WGS84/Pseudo Mercator – EPSG: 3857 sources / Urban areas and Downstream landscape: www.eea.europe.eu - Corine Land Cover; Midstream landscape: ENI factbook 2014; Upstream landscape: Ministero italiano dello Sviluppo Economico - http://unmig.mise.gov.it; Transportation networks and watercourses: http://www.diva-gis.org/gdata; Natura2000 sites: www.eea.europe.eu - Natura2000 sites

2015):
- upstream onshore sector, mostly concentrated in two principal portions of the territory (Ragusa and Gela), has been explored since '30s, while new huge areas could be interested by new explorations;
- downstream sector consists of four refining and petrochemical poles, one in Gela, and the other 3 between Syracuse and Augusta;
- oil midstream infrastructures (crude oil pipelines) unfold from the Central Sicilian oil and gas fields of Gagliano Castelferrato to the Gela refinery, and from the Ragusa oil fields to the petrochemical plants located near Syracuse (Augusta, Priolo and Melilli).

At the end of World War II, Sicilian economic and social situation was catastrophic, so a big national industrialization development plan incentivised the settlement of highly technological industries in South-Eastern Sicily, completely reshaping their morphology (La Rocca, 2010; Renda, 1987). Doubtless, the cultural context in which these oil infrastructures were mostly settled was less receptive to environmental issues than how we currently are: refining and petrochemical infrastructures were located in very fragile environments, even adjacent to protected areas (i.e. Natura 2000 sites), or were even situated in the proximity of important cultural heritage sites (in Syracuse they have been settled on archaeological Hellenistic sites, such as Thapsos, Megara Hyblaea).

These economic development policies generated a sort of fragile 'oil district', ecologically and socially speaking, which

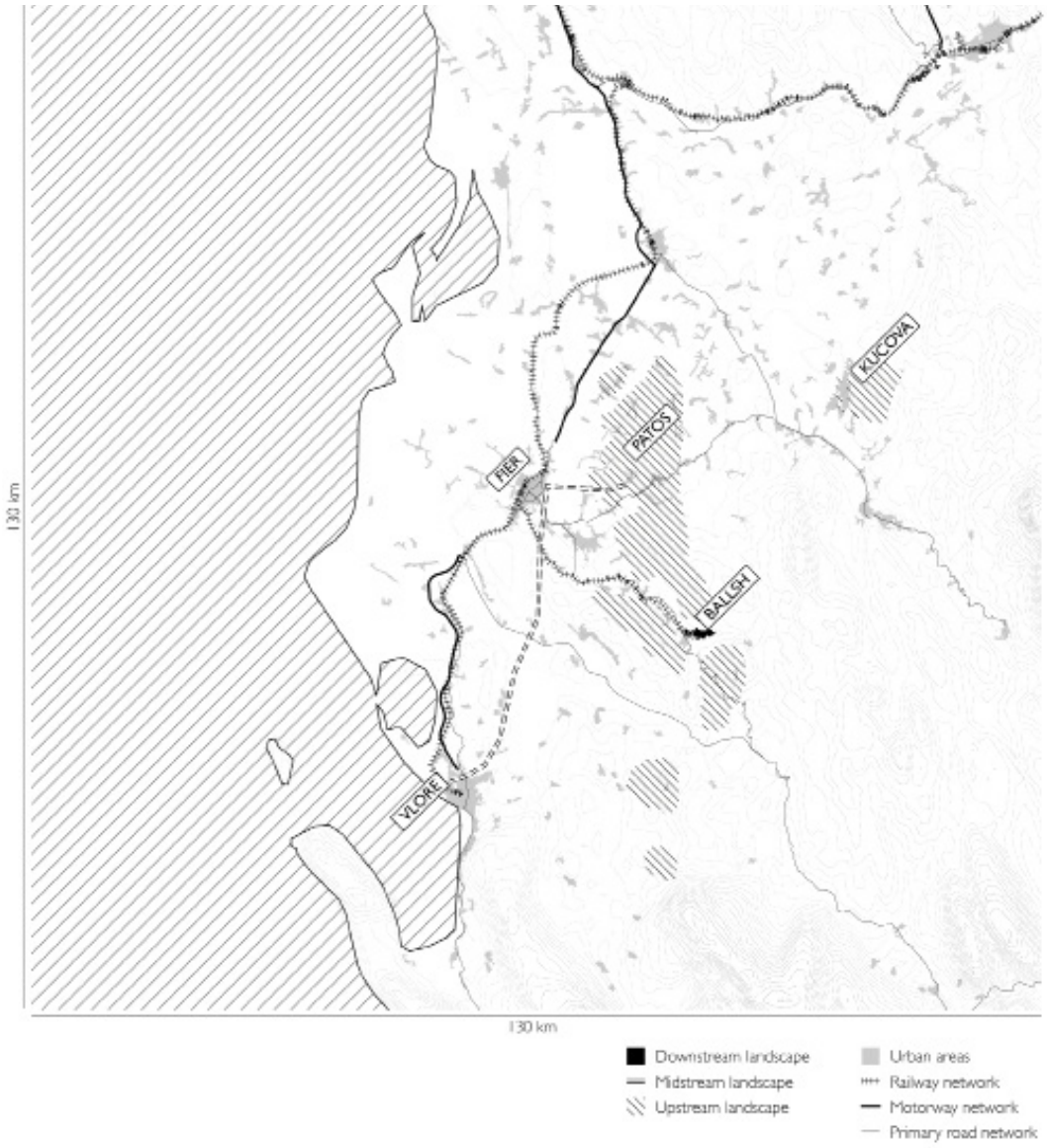

fig. 9: The Myzeqe plain oil district - elaborated by the author through GIS mapping tools, WGS84/ Pseudo Mercator – EPSG: 3857 (sources / Urban areas: www.eea.europe.eu - Corine Land Cover; Midstream landscape: Bankers Petroleum; Downstream landscape: http://www.diva-gis.org/gdata; Upstream landscape: Bankers Petroleum, Petromanas Energy; Transportation networks: http://www.diva-gis.org/gdata

heavily influenced the work culture of local people and the regional economic development until the current Western European downstream crisis.
Thus, the industrial mono-functionality of these territories didn't make them adaptive in front of external changes during crisis periods, creating social tensions and unemployment, disintegrating the widespread cultural know-how related to oil work culture. Even the response for Gela site's dismissing process lacks of a long-term perspective and is approached from a traditional engineering point view: in fact, it has been proposed as a productive reconversion of the historical Gela refinery into a 'bio-refinery' just to reduce an imminent unemployment rate and avoid environmental problems generated by the abandonment of an industrial brownfields without remediation. This kind of technical answer aims in hiding the real problem, that of oil infrastructures, short lasting due to the energy transition, where there is the need to look at them as infrastructures that must ecologically and socially compensate what they harvested from territories which are hosting them. Thus, the Sicilian 'oil mesh' could be interpreted as a 'milieu' through which efforts should be made up in order to set up a local development process which could allow territories to invest in several realms (from alternative renewable energy production to tourism and services), offering a wide range of jobs, breaking the previous regional industrial mono-functionality typical of 'industrial districts' and converting infrastructures in open systems which interact with communities.

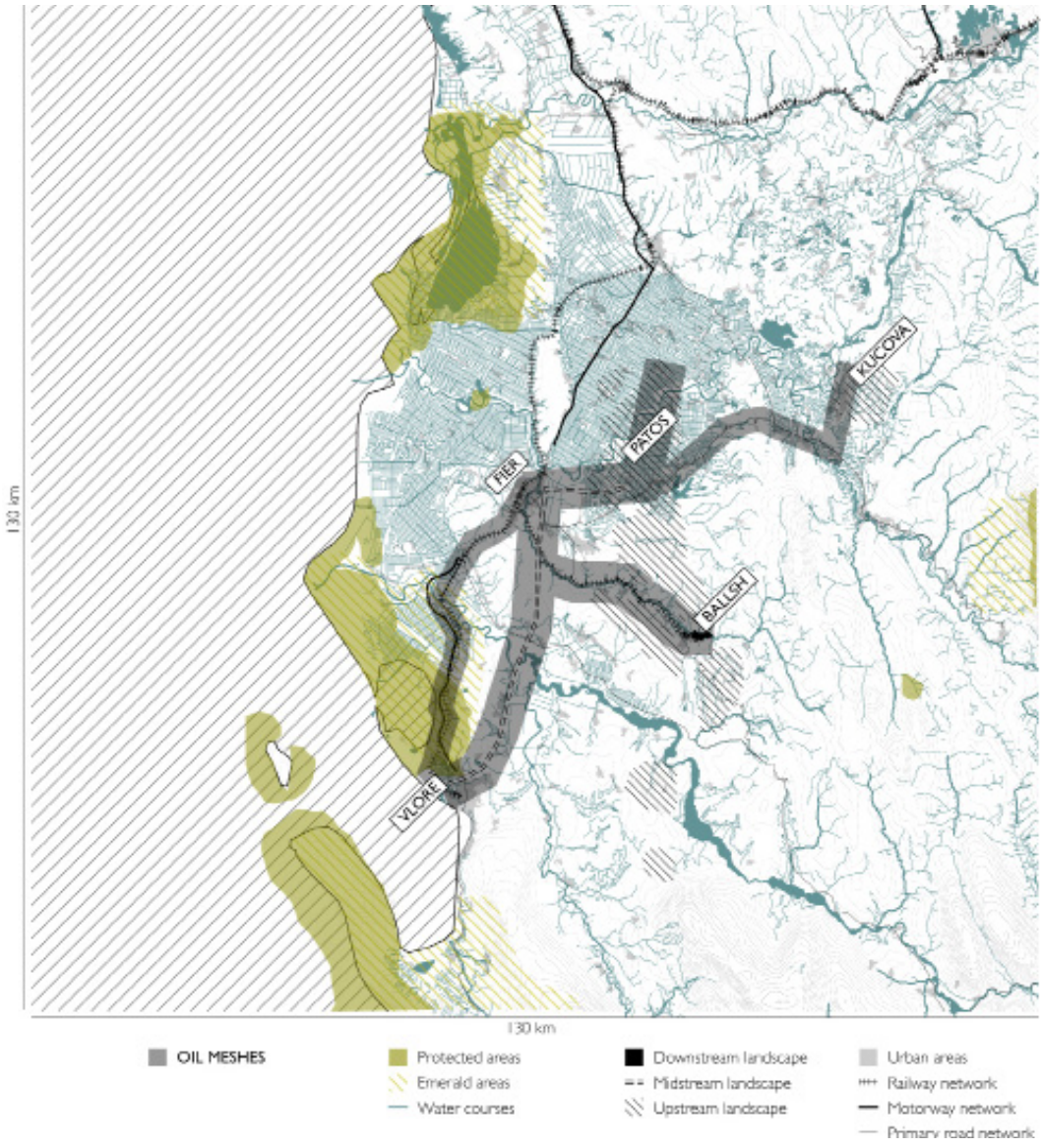

fig. 10: The Myzeqe plain OIL MESH and its socio-ecological potential - elaborated by the author through GIS mapping tools, WGS84/Pseudo Mercator – EPSG: 3857 (sources: Urban areas: www.eea.europe.eu - Corine Land Cover; Midstream landscape: Bankers Petroleum; Downstream landscape: http://www.diva-gis.org/gdata; Upstream landscape: Bankers Petroleum, Petromanas Energy; Transportation networks: http://www.diva-gis.org/gdata; Water courses: furnished by Co-Plan, Polis University; Protected areas and Emerald areas: Albania 2030 Manifesto)

2. ADRION Eastern Albanian coasts: expansion of upstream oil activities

Until World War II, the Myzeqe plain was characterized by unproductive swamps and wetlands, but after the massive drainage works during the communist period, the Myzeqe plain is better known as the 'Albanian granary'. The plain is crossed by some important natural infrastructures, such as the Vlorë, the Seman and the Vjose rivers. The area is also rich in oil fields, which have been firstly explored during the '20s but never fully-operating (Patos-Marinza and Kucova oil fields). The Patos-Marinza oil field is considered one of the most extensive and richest onshore oil reserves in Europe.

We can try to geographically locate the different landscape morphologies related to three main oil sectors:

- in Kucova and in Patos-Marinza, as mentioned above, we can find some upstream landscapes, very different between them. In fact, in Kucova we recognize the presence of old and non-operating vertical drilling wells, dislocated in private and public voids, intermingling with dwellings. On the contrary, in Patos-Marinza oil fields, are more recent drilling horizontal wells scatter the agricultural pattern creating a very peculiar network;
- downstream sector is not so developed in Albania. Only in Ballsh, along the Gjanica river (a Seman's tributary) it is possible to find an obsolete and polluting oil refinery;
- midstream infrastructures are not pervasive in this region. An ancient over ground crude oil pipeline connected Kucova oil wells to Ballsh refineries and only recently some Canadian investments has foreseen in improving the capacity of loaded oil in Vlore harbour connecting

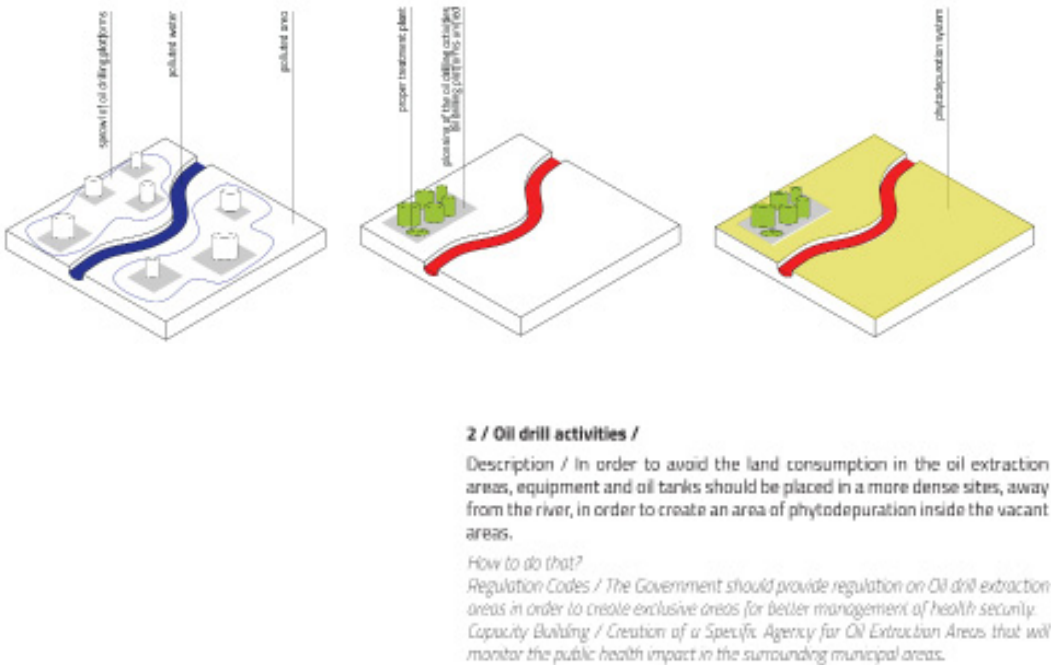

Fig11 / Oil drill activities toolkit
source / PhD international workshop students

it with Patos-Marinza oil fields. To underline the strategic importance of the area, the territory also provides a railway connection which links Ballsh refinery to Vlore harbour, constituting an exception in the very weak Albanian railway network, which principally runs parallel to the coastline, and not in the internal areas.

In Albania, the oil panorama is less developed than that of Western Europe, but it is more dangerous from an environmental point of view. It is likewise set near watercourses (the Gjanica river is the most polluted river in Albania because of the petroleum waste in Patos-Marinza and in Ballsh), so affecting the agricultural, herding and fishing activities. Meanwhile, Albania cannot refuse the opportunity from its rich hydrocarbon reserves and is willing to allow foreign investments to increase oil production. This favourable developing situation in a context free from EU restrictive environmental legislation could cause big environmental risks.
Thus, Albanian backwardness in oil sector does not allow us to argue upon an 'oil industrial district' where there is still lack of a widespread work cultural know-how in the domain. In this case, we cannot argument our territorial interpretation under the socio-cultural value of recognizing oil infrastructures as a 'milieu', but here the future of oil infrastructures has yet to be written in a cultural context, sensitive to environmental issues and it may not be so dangerous if integrated right away with future local development which tries to match agricultural land uses with energy ones.

Conclusions: coupling oil and landscape

If the very question for Western Adrion oil sites stands in the way of how we can de-engineer oil infrastructures, the principal question in Eastern Adrion ones could investigate the right approach on how we can design them as 'landscapes' by integrating responsive strategies to environmental, energetic and socio-economic challenges and not as infrastructures?

Oil meshes' potentiality lie in their territorial component, allowing them to be interpreted as supports for territorial organization of new urban or ecologic centralities, re-shaping and structuring of 'sprawl' territories, of that 'Horizontal Metropolis' which is an energetic, ecological and social renewable resource (Secchi, Viganò, 2012).
During the International PhD Workshop 'When a river flows into the sea' (Tirana, Polis University, 22-28 January 2016), IDAUP PhD students have been asked to sketch a viable scenario for a local development process of the Seman watershed.
Already proposed 'toolkits', constituted by operative actions and regional policies, for the main problems are affecting this watershed and oil pollution was one of them.

The national development strategies enhanced and suggested by 'Albania 2030 Manifesto: a national spatial development vision' (Aliaj, 2014) predict the Myzeqe region as an 'agricultural and energetic Albanian granary'. Following on

this forecast, PhD students have tried to interpret 'oil meshes' as a support for merging energy land uses and agricultural ones in a more responsive way, aiming towards a polyvalent energy production in an contemporary energetic transition.

Nevertheless, the territorial strategic vision foresees the coexistence of extractive activities with agricultural biomass plantations in the same area. Some cultivation, like sunflowers, which do hold phytoremediation capacities, allowing them to remediate soils through the absorption of hydrocarbons. The dismissed chemical factories in Fier, considering their favourable location along the Gjanica river and near the Seman river, could be reconverted in a biomass power plant and water treatment plant, bringing at the same time a responsive ecological and social improvement.

Although this scenario embodies only a hypothetical vision for local development processes, we think that it represents an interesting operative method of how we could 'design infrastructures as landscapes' uniting two separate entities such as the 'oil' and 'landscape'. In this sense we would like to imagine the transition from 'oil infrastructures' to 'oil meshes' with a new environmental and social dimension; taking in account the reasoning behind the name OILANDSCAPES.

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Fig12 / Polyvalent energetic production landscape in Seman Basin souce / PhD international workshop students

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