Urban metabolism and circular economy

Local manufacturing systems in the piedmont area.

New scenarios for an inland metabolism.

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Abstract:

The Italian alpine foothills territory (IAFT) has gone through various "seasons of manufacturing" that determined different representations of it. Today, in the context of an exceptional transition phase, foothills local manufacturing systems (FLMS) need an overall reinterpretation. Even if we can still recognize the IAFT as one of the most economically relevant areas of Italy, we are unable to understand its complex transformation, due to the large amount of investments, their transience, and their multifaceted implications on the territory as well as on the environment as a whole. After the economic crisis of 2008, interesting possibilities for coexistence and collaboration were vexed by a set of important and hardly controllable forces, mostly due to the imposed combination of divergent local clusters' FLMS evolving levels and their relation to different types of economies. Apart from the traditional type of FLMS, some types are constantly growing, taking in consideration the proximity between diversified and specific industrial basis that allows for new complex products to be invented and for the economy to grow in the long run. Conversely, other FLMS have suffered a setback, which is related, firstly, to the exhaustion of resources that drew on the adjacent mountain environment, and, secondly, to the lack of local adequate competences and skills. Finally, a third type of FLMS follows a "third road", based on an innovative approach to handicraft and to the cultural industry, which favors new forms of experiential tourism. My research aims to elaborate on a set of efficient modalities, combining the existing knowledge of the biophysical flows together with an informed insight into the socio-economic transitions of the different FLMS, which are understood as part of an unique system, oriented towards a circular metabolic perspective.

Keywords: manufacturing; transition; territorial metabolism

Introduction

This paper is based on a set of considerations that have been developed as part of a PhD research in progress, at the PhD school "Architecture, city and design", University IUAV of Venice, within the specialization of urbanism [1]. The thesis focuses on the investigation and representation of an Italian specific area, which has been called "Italian alpine foothills territory" (IAFT). This territory can be identified as a strip of land extending longitudinally from the foothills of the Alps towards the district of the springs (which generally overlaps with the A4 highway route), and, transversally, from Biella (Piedmont) to Manzano (Friuli Venezia Giulia).

Roles and scenarios of the IAFT

In this essay, IAFT is identified as a territorial typology, broadly discussed – over the course of the last century – in a number of prospective projects and political hypotheses regarding the Italian territory.
The aim of this paper is not that of analyzing the whole of the definitions – and, accordingly, of the divergent functions – that have been attributed to this territory, but instead, that of considering some relevant case studies.
In 1965, in the study promoted for the inter-municipal plan of Milan, Bacigalupo, Corna, Pellegrini e Mazzochi argue that "the goal of the development process is not to be understood as that of realizing a physical urban continuity, but, instead, that of residing in constructing roads and public transport routes as well as in distributing them around residential areas and production sites […] the development structure under discussion is, accordingly, able to do away with the centralized model of the polarizing metropolis, and to effectively solve the issues of the relations between transportation infrastructures and settlements." (Bacigalupo, Corna, Pellegrini e Mazzocchi, 1965). In this proposal, which approached the subject through geographical and historical lenses, the authors sharpened the focus on the significant discontinuity that historically characterized the piedmont area. In 1967, in the context of the research undertaken by Centro Studi and of the economic studies concerning the first state plan for the regional development of Italy, scholars proposed a "linear model resulting from the combination and arrangement of three different kinds of territorial typologies" (Moroni e Marcialis, 1967). The entirety of the concept of the piedmont area is comprehended within this image, as each space "has its own name and function, as part of a mechanism that grinds, perforates and connects"(Mazza, 1992). Finally, in 1992, a study, commissioned by the Agnelli Foundation, combined a number of reflections on the 1990's Italian economic and social geography with the very themes scrutinized in the undergoing reform of the republican state, which was considered necessary, not only in the context of the political crisis, but also in that of the future economic potentialities (Marcelo Pacini, 1992).
In this paper, the piedmont territory is contextualized within the debate regarding the new definition of the Regione Padana, which is understood as "the sum of relatively mutually autonomous sub-systems" (Marcelo Pacini, 1992) [2].

Manufacturing in the IAFT. A pervasive trend. The different seasons of manufacturing

Taking into consideration several studies that, within the context of the future development of Northern Italy, built a set of implicit scenarios of the IAFT, it appears that IAFT begun to be acknowledged and taken into account almost exclusively with regard to its evident contribution to the economic production of the country. Indeed, it must be noted that this territory was increasingly and progressively being understood as a significant area, mainly because of its prevailing role in the Italian manufacturing sector. Before that, there was nearly no mention of the IAFT in the studies of the other elaborate scenarios for the project (Mazza, 1992). Throughout the first decades of the twentieth century, the IAFT was understood as fundamental in the axis composed by the valley floor and the railway/highway system connecting Turin, Milan, Venice, and Trieste. At that point, the idea of a linear territory connecting medium-small cities, new centers of expansions, and open land emerges. Namely, this very territory is understood as "a great axis for the development and balancing of the process of centralization in few big-size poles". Thus, in the context of the analysis of the piedmont area, we cannot ignore the manufacturing drive around which it is structured. Indeed, the IAFT lived through a various series of "seasons of manufacturing", which, most of all, determined its different representations.

Up until the nineteenth century, the most representative image of this area was that of "the proto-industrial nebula" (Lanzani, 1993).

After, the IAFT was referred to as a "territory of widespread industrialization" (Bagnasco, 1977 and Fuà, 1983), or a "territory governed by the traditional model of the manufacturing district" (Boeri, Lanzani, Marini, 1993). As a matter of fact, this is a representation that corresponded with the period of the peak influence and relevance of the model of the local manufacturing district (LC), which was widely considered as "the foundational cell of the Italian economic system of the second half of the twentieth century" (Cerruti But, 2018). LC is a concept that G. Becattini borrowed from the theories of Marschall, and which was postulated as a result of the collaboration between many scholars, both Italian and international [3]. Around the same time, several urban planners introduced a visual understanding of the piedmont areas as "reticular" (De Matteis), constituted of a collection of economic-territorial systems, embedded in different contexts.

Specifically, this mosaic-like representation is able to highlight the interdependency between different systems of diverse nature – not necessarily hierarchically – and prove the fallacy of the traditional distinction between the city and the countryside, as well as between the inland and external characteristics of the very territory under discussion (Lanzani, 1993).

It followed a season that coincided with the establishment of the European economic union, as well as with the increasingly open attitude towards the new model of global interconnections. IAFT production system, while maintaining its position as the "Backbone of the Made in Italy" (Gurisatti, 2001), "leaked" outside of its territorial borders, thereby subverting the grounds of the traditional concept of industrial district, and redesigning the language and the site of production (Gurisatti, 2017). In this framework, wherein the territorial representation becomes profoundly unhinged from the local territory it refers to, the image of the territorial grid seems to fall apart, favoring, conversely, global-scale network dynamics over the local-scale processes it traditionally sustained (Pasquato, 2016).

More recently, the IAFT has been afflicted by the consequences of the 2008 economic crisis. This structural crisis marked the very end of a once-prevailing social and economic model, due to a set of different processes, that will be investigated later in this paper. Over the course of the last years, scholars have predominantly constructed scenarios elaborating on the concept of land abandonment, as well as on the subject of "local development". Furthermore, the processes of landscape homologation, investigated by a number of studies on the widespread regional industrialization, have acquired new relevance (Boeri, Lanzani, Marini 1993; Turri 2000).

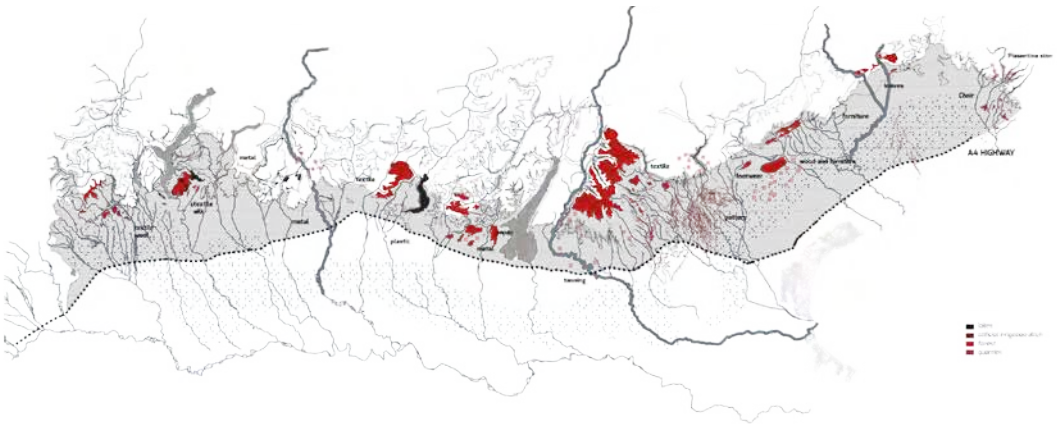

Figure 1. IAFT as "territory of widespread industrialization"

FLMS and the concept of "Designing territorial metabolism (TM)"

Today we are in an exceptional transition phase, wherein the IAFT needs an overall reinterpretation of its manufacturing spaces. As a matter of fact, although we can still recognize the IAFT as one of the most economically relevant areas in the country, we are unable to understand the complex set of its transformations and, specifically, to grasp those related to the evolution of the foothills local manufacturing systems (FLMS). The FLMS are strongly affected by the mechanisms of metamorphosis and redefinition. It is, therefore, crucial to observe this metamorphosis on the basis of different evolutionary actions that question, support, or subvert the district model. In order to understand and address these complex and diverse changes that strongly influence the relation between the city and the environmental resources, I propose to apply the concept of urban metabolism. Thanks to this concept, the shift from linear to circular modalities of production/consumption becomes imperative in order to reduce the external influences on our territories and to meet stricter environmental targets.

Urban metabolism is generally defined as the processing of inflows and outflows of resources and energy within the city fabric (Giezen, Reho, McCarthy, 2019). It is important to underline that this paper, in dealing with the concept of urban metabolism, specifically focuses on the recently conceived notion of "Designing territorial metabolism"(TM) [4]. This notion lays the ground for a paradigmatic shift in connection to three fundamental aspects:

- First of all, the idea of going beyond the boundaries of the consolidated city, in order to further understand the dynamics of the production process and the modalities whereby resources are deployed and allocated (Kampellman, 2018). Thus, as the

question of scale becomes relevant, overcoming the city/countryside dichotomy means equally considering FLMS as a unique system, where different material and immaterial flows interweave, as part of a circular structure [5]. This understanding is not opposed to the idea of simultaneously reinforcing the key roles of the local sector. At the local level, the role of diverse, complex and fragile types of urban economies becomes fundamental in the process of fostering small interventions and urban innovation (Casabella, 2018).

- Second of all, in order provide an operative input for the current practices of policy-making, the intricate and mostly idiosyncratic nature of circular TM must combine the (mostly quantitative) research on biophysical flows with (predominantly qualitative) insights into the socio-economic process of transition. Since the vast number of the socio-ecological factors cannot be expressed in commensurate metrics, the design of a circular socio-ecological system cannot be separated from a qualitative exercise that needs to construct new social, economic, and political institutions. Seizing this opportunity requires a characterization of TM that demands a transition to the circularity of the sole energy and materials flows. It also needs to question its intensity, the spaces, and the agents that underpin the metabolic exchanges. (Kampelmann, 2018).
- Finally, although the notion of TM has mostly been featured in traditional urban studies (for instance, Renzoni and Tosi discussed the idea of "città diffusa" in the region of Veneto in 2018), today we can still posit a novel understanding of it, which is useful in combining urbanism and ecology in addressing a new kind of circular urbanism, and to serve as a new tool for urban planners interested in the TM. In other words, we have to find a new formal language, as well as a set of efficient means through which the spatial/physical elements and socio-political elements of metabolism can be conjointly redesigned; we need new instruments to "reimagine relations between social, technical, economic, and ecological forces in urban areas" (Broto et al., 2012).

My research aims to identify a new set of useful modalities in order to combine the existing knowledge of biophysical flows with a meaningful perspective on the socio-economic transitions of the different FLMS, taking them as a unique system, oriented towards a circular metabolic scenario. This is especially useful in the context of the current Italian political landscape, which lacks both a clear understanding of the circularity related issues, and a fruitful perception of urban metabolism as a way to challenge the current theoretical and practical views of urbanism, promoted by national and local administrations. The first step in this process would be providing a clear overview of the transition phases that affected the different FLMS within the IAFT.

The redefinition of space in the FLMS

During the past few years, the district model has been strongly criticized and discussed. For instance, Cerruti But identified three phases in the evolution of the concept of the district, namely (i) the construction of the model, (ii) "the hybridization and the development of the

model", (iii) the "critique of the model" which, temporally at least, coincides with the crisis of the notion of the district, as noted by Fabio Bracci (2016).

Indeed, it was precisely during this third phase that, following the 2008 economic crisis, the traditional manufacturing-dependent model of district development seemed to reach its endpoint. The causes are multifaceted. Some of them are external, such as the crisis of the global economy, the physical limits to the expansion of the construction industry within the territory, the scarcity of resources caused by the environmental crisis, and a set of social obstacles (e.g. the decreasing interest paid by youngsters to crafts and manufacture). On the other hand, several of them are intrinsic to the very comprehension of the district, which is no longer understood as the site of a one-sector production system relying on physical continuity. Namely, the district territory is no longer delimited by a geographical context defined by the market, but rather defined by a transition to a variable geometry characterized by economic and relational contexts [6]. Thus, the period of the traditional districts today seems over, and replaced by a new one, wherein a diverse set of the development processes of the FLMS coexist in a non-homogeneous manner.

As of today, it is extremely difficult to understand the FLMS changeability. Neither "the modalities of zenithal perspective" (adopted by scholars in urban planning in the study of the case of the widespread industrialization in the nineties), nor the closer analysis via photographic means (which focuses on the sole exterior aspects of the production sites) are sufficiently apt (Basilico, Boeri 1996, Aimini 2017). As most of the novelties reside inside the very sites of production, it is necessary, in order to grasp them fully, not to limit ourselves to an outside view regarding them (Lanzani, 2014). For this reason, it was decided to undertake this research – a "new journey" – in the IAFT, focusing on interviews with the main stakeholders and the direct field survey of some area of FLMS.

While exploring the IAFT, it is necessary to return to the observation of the constellation of the manufacturing production sites, often considered "ordinary", that for decades were the backbone of the economy of the one of the most dynamic territories in Italy.

First of all, it is critical to identify the various generative processes involved in the systems of production, which imply a set of differences, not only in terms of the foundational aspects of economy, but also with regard to their own geographical organization, thereby questioning the very concept of "designing territorial metabolism".

Although this paper is part of a research still in progress, the choice of the FLMS under discussion is purposely inconsistent with what is today defined by the regulations concerning the industrial policies [7]. As discussed by Viesti, the currently classifications employed show inherent limitations and merely analytical potentialities that, most of all, are exclusively normative and non-exhaustive [8].

With full awareness, it was considered that, while conducting the operation of selection, these modalities would not be apt to relate to the final target, which is that of observing FLMS's differences and anomalies, current limitations, and potentialities, with specific attention paid to the spatial and territorial features.

Thus, it was chosen not to focus on the "district" per se, as much as on the territories that still show the marks – sometimes more visible than others – of what is left of the productive system, as well as on the transformations extorting their influence on the physical capital, thereby purposely overlooking the analysis of the economic/production features of the district, which have been already brilliantly described by numerous renowned scholars.

First Hypothesis of rereading and classification of the FLMS

In the following paragraphs, a first attempt at classifying different kinds of FLMS will be presented, which is based on a direct in-field observation. It must be stressed that the four classes of elements presented here are not distinctly ideal types, and that they can be preexistent in a given territory. Thus, the dynamics defining them can be easily juxtaposed and interwoven. This classification is, therefore, necessary in defining a shared representation of the phenomena of metamorphosis of the FLMS.

1. Dwindling local districts (DLC). Exhausted and fragmented territories

DLC are particular districts that have suffered a setback. DLC might comprise both the traditional districts, based on the processes of mining and extraction of natural resources, and the districts relying on the supply chain of the textile industry.
The setback is, firstly, related to the exhaustion of the resources drawn from the adjacent mountainous environment. Mountains have always superficially been considered merely a "reservoir of resources", thereby overlooking their limitations. Many of the resources that were crucial in the founding of and development of these districts, in the first place, were already being exhausted in the last century. Some others, instead, are still in the process of being exhausted, thereby forcing the sectors of production relying on them to question their own future [9]. Another example of DLC is the "Verona stone district", located in the foothills of the Lessini mounts, where high-hill and medium-mountain environments blend. The district is the epicenter for the Italian production of marble and granite, and, additionally, is the most important in the global production of agglomerates. The territories of this district are today sites where economic activities, tourism, repurposing and safeguard of the environment struggles to meet. In this forgotten landscape, due to the inadequacy of regulations concerning the process of excavation, slabs as tall as 100 meters have been produced, regardless of the delicate environmental balance that is, today, thoroughly subverted, and which cannot be reestablished.
Some quarries still lay in the open air, despite the fact that their function as mining sites is exhausted, others are still in use, and some others are under evaluation, in order to find a right compromise between what has been removed from the landscape and what should be given back to it.
The main issues concerning these FLMS, as well as similar others, emerge on two different levels. The first is caused by the inequalities in the supply chain as well as by the employment of the resources. Indeed, marble is today mostly imported, as the preexistent quarries are no longer sufficient to match the internal demand. Thus, marble is only refined in this territory, mainly by important companies relying on a dense network of tertiary contractors, and, then, exported back again, thereby causing an enormous environmental impact. Moreover, in the last years, much of the backfilling material defined as "cappellaccio", which is necessary for an adequate reinstatement process, has been taken away from the original extraction site, and, in the light of profit-maximization, moved to construction site located outside the district.

As a matter of fact, there are very few cases of natural reactivation of the abandoned and exhausted quarries [10]. Indeed, as noted in "Rapporto Cave 2014", the absence of a real plan regarding this sector caused a widespread and irregular development of the mining activities. The actual necessities required by the process of production, as well as those related to the safeguard of the environment, were ignored. Today, in a period characterized by the crisis of the extraction sector, this negligence manifests itself as nearly a hundred inactive sites.
For these reasons, these territories are subjected to growing environmental issues, which point to the disconnection between economy, society and territory (Savinio, 2005). The decisions influencing the future of these quarries expose clashes in the attribution of the jurisdiction between the different administrative hierarchies involved (Regione, Provincia e Comuni).

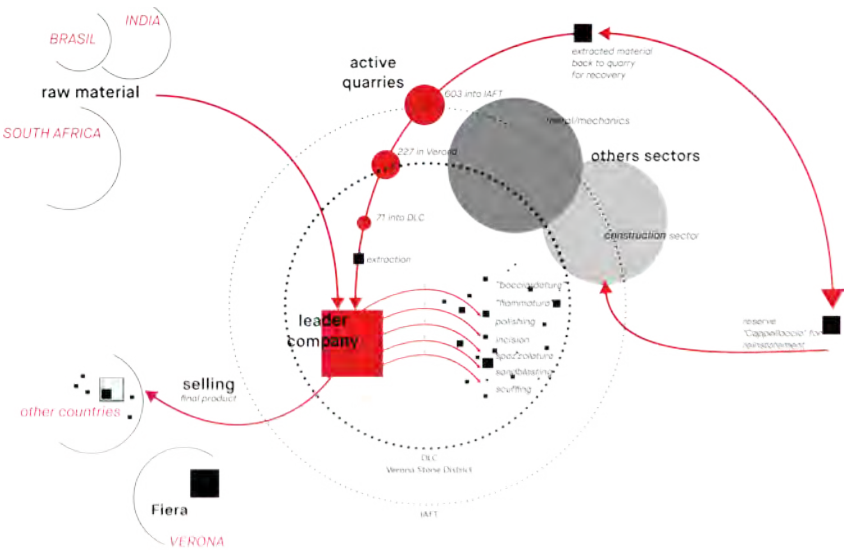

Figure 2. Personal interpretation "Verona stone district"

Secondly the setback of this second type of DLC is related to the lack of an adequate body of local competences and skills. This is one of the effects of the process of internationalization, whose consequences impacting on this class of FLMS are easily identifiable in the process of deterioration of the production chains.
From an historical perspective, the internationalization of the production processes concerning the piedmont companies can be broken down into three different periods. (i) The first phase, which spanned the last two decades of the past century, led companies – specifically those part of the fashion industry – to delocalize production, in order significantly reduce the manufacturing costs; (ii) during the second period, which stretched from the beginning the twenty-first century to beginning of the 2008 financial crisis, the companies involved in the stage famously labeled as "quarto capitalismo" have become the main actors in the process of internationalization: investor pools has widened, thereby including small and medium size companies. During this phase, the number of the investments in the foreign markets decreased, and yet the process of internationalization reached its peak in spread and intensity. (iii) The third one, beginning in 2008, has been characterized by a slowing down of the foreign investments in the territory: the repercussions of the financial crisis on funds and prospective revenues have forced companies to slim down the undergoing initiatives as well as to postpone a great number of pending projects (Fedreghini and Perugini 2015).

In some of territories under discussion, the constellation of small-size and medium-size companies, once the core of the supply chain of the district, fell apart. Thus, we are left with nothing more than “the crumbles of important and renowned historical producers” [11]. Moreover, many of the intermediary actors facilitating the sustainability of the process of production, such as consortiums, citizens led communities, and sectorial associations, were forced to merge, as the result of the economic crisis and of the cuts in the public funding.
This led to the current absence of institutional benchmarks – with strong ties in the territory [12] – that had been previously critical to development of both the economical aspects and the social actors operating in the territory.

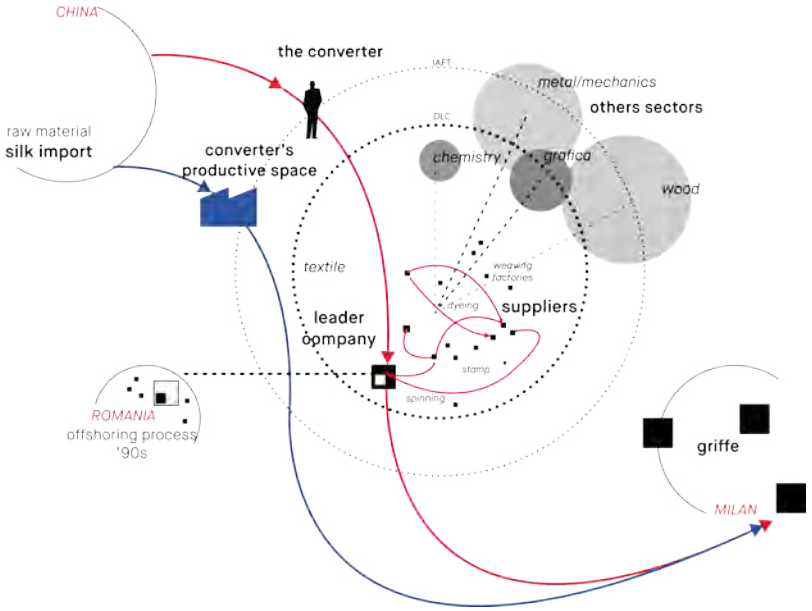

Figure 3. Personal interpretation silk district in the area called Comasco

2. Traditional districts (TLPC)

TLPC is a class of FLMS that, while maintaining the traditional economic/production structure, are still capable of achieving good results in terms of growth, revenues and profitability. In this framework, the presence of both competent human capital and a set of developed services (design, consultation, research) is vital. In this case, the manufacturing district is still economically relevant as a dense “fabric” of micro companies (many of which are still family-managed), which are still considered complementary to the process of construction of “actual medium-size companies, distinctively specialized in both the design and commercialization of products” (Becattini and Dei Ottati, 2006).
Specifically in the context of these FLMS, the companies standing out are those investing in the territory and presenting themselves as firmly environmentally aware. Thus, the reduced impact on the environment becomes a competitive factor for companies, which are keen to invest for the safeguard of the very sites and ecosystems their own production is depended upon.

However, this tendency is still today very much rhetorical. Indeed, useful and actual territorial implementations – to be focused on concepts such as *circual econonmy* and *sustainability* – are not yet fully comprehended, as these concepts are currently addressed from the sole standpoint of productivity.
New tools are needed, which are able to design fruitful relations between the social, technical, economic, and ecological forces operating in the territories of TLPC, as well as to trigger a set of virtuous synergies in the operations of waste reduction and recycling – with specific focus put on the large amount of polluting waste that is often disposed directly in the territory.
A new virtuous environmental approach has been showed, for instance, by the TLPC of Concia in the Agno valley (Veneto), whose dynamism is best epitomized by a collection of institutionally-supported artistic projects [13].
In this area the country's largest amount of water supplies can be found, thanks to the presence of both subterranean reservoirs and perennial springs.
This abundance favored, firstly, the development of the craft of leather tanning, and, secondly, the construction of the tanning industry, which was highly impactful at the environmental level. Indeed, factories used to dispose waste and leftovers – rich in lime and sulfides –directly into the rivers, which, consequently, would turn red, brown and grey according to the polluting agents involved. [14]
In the 1978, with the installation of a purification plant, a virtuous set of initiatives was started, which is still oriented towards sustainability, and which has progressively co-involved the whole of the companies operating in the area – thereby allowing for an appropriate process of water treatment for Chiampo (Boriello, 2019).
However, several environmental issues are still embedded in this territory, mainly due to a greater degree of pollution in both air and water.

3.Adaptive local clusters (ALC). Their new roles within the territory

ALPC is the class of FLMS allowing for a "third road […] related to the creative craftsmanship and to the cultural industries focused on the development of different economic models inclined towards forms of experimental tourism" (Ostanel, Panozzo, Tosi, 2018). In this case, in order to adapt to the new economic configurations, the concept of FLMS hybridizes with a set of tertiary and immaterial functions. It is thereby "extended to other sectors and new combinations: agricultural, rural, touristic, cultural" (Dematteis, 2005: 12).
Thus, ALPS, in this way, lay down on the territories a dense network of new sites and equipment.
These ones originate from the repurposing of abandoned buildings, whose historical role was that of possessing important functions within the supply chain.
They are fundamental sites promoting the knowledge and the understanding of a specific industrial sector. They can assume the form of factory museums [15], as well as of different types of craftsman workshops that valorize an attentive and sustainable process of repurposing that combines traditional know-how and innovation. In this context, a renewed focus on recycling and on the employment of sustainable energy is effectively brought about.
A useful instance might be found in the ceramics district in Nove and Bassano. In this territory, several abandoned and anonymous industrial buildings were turned into sites of research and experimentation, in order to find innovative waste-minimizing solutions.

The findings of this study showed that the piedmont districts are still benefiting from a proximity-based network of production, which allows local companies to pee-review the process of innovation, mutually share a diverse set of know-hows, and reshape the supply chain according to a locally incremented distribution system.

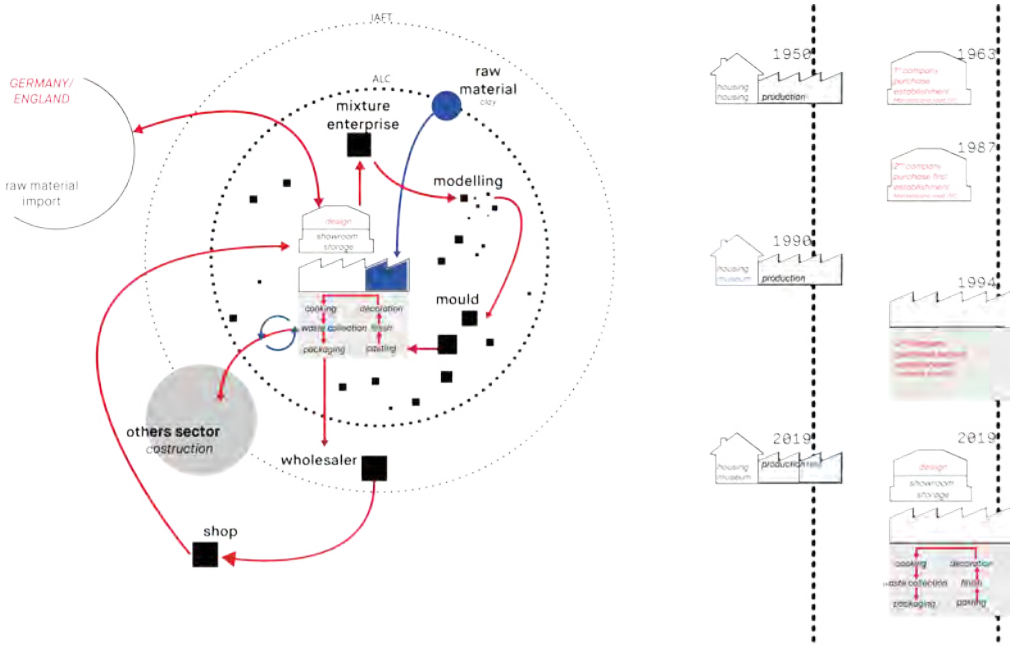

Figure 4. Personal interpretation Ceramics district of Nove e Bassano

4. Beyond the district: clusters. An extended and redesigned territory of production

These types of FLMS are continuing to grow and they are, most of the time, identified as "productive clusters" [16] (PC).

In the PC territories the SMEs understood that the proximity between diversified and specific industrial base inside a metropolitan space allows for the invention of complex products and the growth of the economy in the long run (Hausmann, Hidalgo et al. 2011).

Thus, the frame of reference is broadened, and a new a set of new links is established, which connect the piedmont territories to the nearby urban poles hosting important tertiary services. Clusters allow for a novel perception of the territories they are located in, as well as for the construction of a new vocabulary redefining the territorial scenario [17].

Thus, newly introduced terms are useful in positing that the "boarders exceed the simple geographical edges as well as the administrative limits: PC is a complex industrial system, abundant with top-notch producers in many industrial fields […] PC fosters an understanding which is complementary to, not opposed to, the orthodox one (which considers only the industrial activities located in the province), which offer a more comprehensive perception of the actual dimension of manufacturing" (Fedreghini, Perugini, 2015). Companies are today able, thanks to this superstructure connecting them, to merge into a unique system that is beneficial to all.

Clusters propose a more complex, and yet more unifying, representation of the system of production, which, additionally, makes companies more interesting for potential foreign investors.

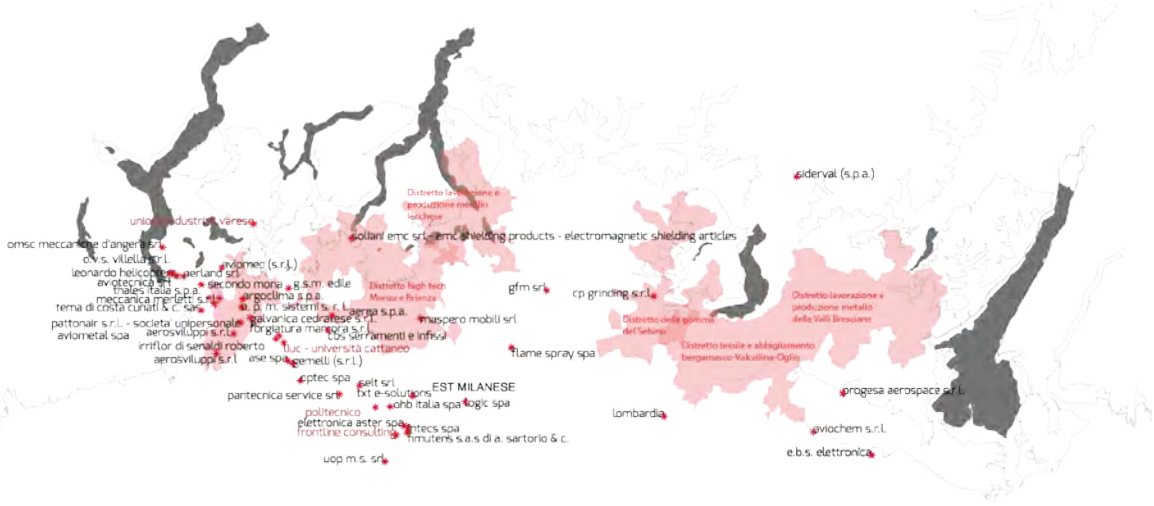

Figure 5. Personal interpretation Cluster aerospace

PCs can be considered, from a metabolic standpoint, the first attempt at creating strong links between the different flows of production, be they material or immaterial.

As far as immaterial flows are concerned, the will to collaborate,

heterogeneous set of production sectors, is transposed within the urban contexts as the profitable trend of transforming formerly decommissioned sites into multifunctional spaces. This collaboration originated, in the first place, in tackling the issues related to the significant expenses involved in the process of innovation, as well as to systemize comprehensive programs of training and knowledge sharing.

Thus, these very spaces become sites for the "social innovation", where different actors, such as entrepreneurs themselves, reutilize physical structures (most of the times decommissioned warehouses), which previously held no purpose whatsoever [18].

The cluster is conceived of as "fluid urban agglomeration", able to establish a set of new connections between different innovative forms of production.

However, what is still lacking in these territories is a clear and shared vision, necessary to address a circular process, based on productively balancing inflows and outflows of both energy and resources within the cluster.

Considering the strength with which the local supply chain still operates within these territories, despite the massive implications of the process of internationalization, it might not be inconsiderate to promote a solid interfacing between local companies, in order to favor this very circular approach.

The aim would be that of reducing waste generally speaking – not only energy waste and industrial waste – thereby adopting a set of resolutions that cross over the limits of the single-sector system.

Indeed, cooperation between the different sectors would also imply a greater degree of systematization of the different flows, which, in turn, could be reutilized and, therefore, minimized within an open bigger-scale system. This very system should be able not only to coordinate the aforementioned material flows, but also the immaterial ones. However, this

aspect is still at very early stage of development, inasmuch as companies still operate according to an individual, rather than synergic, logic.

Conclusion

In conclusion, IAFT is today living through a hybrid existence. It is a territory whose core is built by a "mix of companies running at different speeds". It is no longer a homogeneous a unitary site of widespread industrialization, but rather a territory where big-size, medium-size, and small-size companies locally coexist. Generally speaking, the heterogeneous combination of these different companies triggers new favorable mechanisms of centralization, hierarchization, and polarization, thereby remodeling the territories of the widespread production.
Analyzing the IAFT and its complexities, as well as classifying the different evolutionary processes of the FLMS, are useful tools in the systemization of these important forms of production, which, nowadays, are no longer attributable to a unique and unitary evolutionary process. Today, each of them is observed to undertake a different development path, thereby defining its own trajectories and its own relations with the specific territory it is inscribed in.

Thus, the classification proposed above is intended to serve as a support for the construction of a platform that, crossing the traditional boundaries, is able to show a variably geometrical landscape, where new relations can be fostered and established. These very relations, that might be economic, spatial, or social, must be considered in conjunction with a set of both material and immaterial flows, in order to meet shared targets such as waste minimization and resource enhancement.
This is a useful platform for questioning, planning and formulating a synergic and unifying model, as well as to test and systematize a set of actions required in the development of a fundamental metabolic territorial system, which is today still missing in the spectrum of the Italian politics.

Acknowledgements

[1] The research is still in progress. The field research will be concluded in October 2019. The results will be featured in the PhD thesis, which will be concluded by November 2020.
[2] In this study the focus is sharpened on the two ramifications composing the notorious "triangolo Milano, Bologna, Padova", which, in turn, can be divided a Northern segment "the old industrial triangle in Lombardy (Milano, Varese, Como)" and an Easter part, namely "the new vector connecting Vicenza and Pordenone" which complete the "pulsating heart of the Padano system".
[3] S. Brusco, A. Bagnasco, and G. Fuà also took part in the process formulation of the concept of LC. All the scholars acknowledge the "social embeddedness" of the economic processes (Granovetter, 1985), that is "a series of historically alimented socio-institutional infrastructures, such as networks, regulations, conventions and interactions, based on trust and mutual horizontally mutual relationships" (Mac Leod 2001).
[4] This concept has been introduce in the book by G. Grulois, M. C. Tosi, C. Crosas (eds.) Designing Territorial Metabolism. JOVIS, 2018.
[5] Today, the main line of reasoning – elaborated in favor of economic forms sustaining the concept of urban metabolism – is, conversely, centered on the small-scale of the individual district, thereby overlooking a systemic view of the problem.

[6] An ever more complex vocabulary regarding the identification of the various FLMS emerges, which originates in the continuous alternation of different regulations at the level of regional industrial politics ("production district", "meta-district", "conglomerates" "cluster", "multi-located supply chain"). In the context of this new complexity, it is worth to mentioning the discordant attention paid to the territory. In Lombardy (Legge n.29 del 23 novembre 2016) and in Friuli Venezia Giulia (Legge regionale 20 febbreio 2015, n. 3, art. 15) the concept of *Productive Cluster* (PC) is employed. There is no longer mention of a specific district, but the Region as a whole is taken into account. Conversely, the Veneto Region proposed to update the notion of the district by substituting it with that of the RIR (Rete innovativa regionale). RIRs are the result of the regional Smart Specialization Strategy, which defines strategic thematic areas on a regional scale. The notion of traditional production systems endures within the context of a limited territory.

[7] The local production systems of the territory here analyzed are to be found in Veneto, in the Ceramics district of Nove e Bassano, the Sportsystem district in Asolo and Montebelluna, the Verona Stone Distric, the engineering in the area called Alto Vicentino, the stainless steel district. Others are in Friuli Venezia Giulia, such as the Arredo Casa Cluster, the COMET (cluster della meccanica regionale) Cluster, the former "knife district" and the DITEDI (distretto industriale delle tecnologie digitali) Cluster. Others are in Lombardy, such as the aerospace cluster, the silk district in the area called Comasco, the engineering district in the area called Lecchese, the automotive cluster, the former water fittings and cutlery district, and the district of the area around the Arno valley.

[8] In the past years, in Italy, we witnessed a significant proliferation of mappings and classifications, each of them bearing its on different approach, according to the different purposes underpinning these operations. Specifically, we can identify two main tendencies in the description of the Italian districts: a statistical approach and one that, conversely, focuses on the potentialities of the local districts.

[9] Reference is made, for instance, to the Piasentina stone district in Friuli Venezia Giulia.

[10] An example is that of the quarry on the Loffa Mount in Sant'Anna d'Alfaedo, where a gigantic, 20 meters cut has been replenished with backfilling material and then converted to a grass field.

[11] The supply chain of the textile industry is that suffering the most. For instance, the former textile district in the area called Alto Vicentino is, since 2017, no longer officially acknowledged by the Regione Veneto, due to the lack of a shared project for the area (LR8/2003), via a development agreement (see note number 6). Moreover the silk district in Como, Lombardy. There it remain a collection of big-size companies, which still are the beacon of a their own sector, and yet, most of the times they show no interest in the development of the territory.

[12] In Veneto, companies always had, and still have, a strong organizational structure based on consortiums, which, in turn, used to hold a significant influence over the regional government.

[13] Among them "Tanneries" (M. Power) and "Water". In this photographic reportage the main elements are the frantic activity of the river Chiampo, the territories that are brushed by it, and the essential interventions needed in the water purification, which aims to preserve its vibrant colors of the water – despite the industrial processes the river is involved in.

[14] A fictional investigation portraying the water pollution in the Chiampo valley is featured in the novel "Il fiume sono io" (A. Tasinato).

[15] For instance, the paper mill Museum in the paper mill Valley, located nearby Brescia.

[16] The traditional production districts are widely acknowledged entities, thanks to their ability to aggregate and promote "development agreements", a to represent a diverse set of shared and communal targets.

[17] For instance, "Grande Brescia Manifatturiera" (Fedreghini and Perugini, 2015).

[18] With reference to LEF, namely the training school focused on the topics such as the lean production and the concept of 4.0 industries. Moreover, LAMA, a shared workshop pivoting around the technological skills transfer from universities to Regione (institution). Both of these programs are hosted in formerly decommissioned warehouses.

[19] For instance, in the context of a structural analysis, commissioned by the Comet cluster, it appears to be clear that, nowadays, companies are able to find the efficiency, the competences and project-related skills they need at the local level. In this scenario, the main factor underpinning important logistic decisions is – as it used to be during the season of the traditional industrial districts – proximity.

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