

THE IMAGE OF PRODUCTIVE LANDSCAPES: A METHOD FOR THE PERCEPTUAL ANALYSIS OF INDUSTRIAL HERITAGE

Eugenio Morello, Barbara E.A. Piga

*Department of Architecture and Urban Studies, Politecnico di Milano,
Milan, Italy*

Introduction

The context: rethinking the industrial heritage with new forms of production

Rethinking European industrial heritage for envisioning new forms of production to be compatible with the sustainable vision for the city of the future is an urgent challenge of today's policies. In order to do this, tools for analyzing, designing and evaluating the requalification of the existing stock considering a landscape design approach, is needed.

In particular, we refer to the case study of Europe, affected by a more than two decades long process of re-localization of industries outside the continent and the consequent loss of work and the rapid disappearing of the working class. Following this process, the emergence of new landscapes of dereliction of former active workspaces offers new interpretations of the heritage of these places. Arising questions that several scholars and policy makers are tackling do not only refer to the definition of a new identity and land use of brownfields, but also to the opportunities of reuse that given physical objects, like big boxes or wide industrial sites, like quarries, can offer. Therefore, observing industrial places, and interpreting subtle dynamics of transformation becomes a scientific operation.

The mental construction of the image of places, what Lynch (1960)¹ calls 'imageability', derives from the direct and indirect man-environment relationship. For instance, the physical and sensory experience of places, which includes a multiplicity of aspects, contributes to the personal construction of the mental image of places. The visual access to places, the distance or immersivity that relates us to them, the ways and speed of approaching them, the climate conditions

¹ Lynch, Kevin. *The Image of the City*. MIT Press, Cambridge, Massachusetts. 1960.

of the atmosphere, all these facts together inevitably affect the formation of mental images based on the senses and in particular on the sight.

Objective

If the urgent societal need is to rethink the European industrial heritage for envisioning new forms of production to be compatible with the sustainable vision for the city of the future, we firstly need to provide the tools to interpret the industrial heritage. Specifically, we have to understand and interpret the physical presence and the significance of the industrial heritage. Only after, we will be legitimated to investigate and launch new ideas for the reuse of the existing building stock. In order to tackle the topic of the image of productive landscapes, the methodology we propose is based on the use of perceptual visual analysis, which enables to support design and evaluation of the transformations and to communicate the vision to the larger audience of citizens and decision makers.

Methodology

Simulating the present and future of heritage as a design, evaluation and communication device

Envisioning future productive landscapes requires the anticipation and simulation of urban transformations in comparison to the current conditions of places. Hence, the use of urban simulation will support the re-use of productive landscapes considering different purposes, namely: design, evaluation and communication. During the design phase, the use of different techniques for analyzing the environmental and visual aspects of the image of the industrial heritage will inform the actions to promote on site. Comparing the current condition to alternative future scenarios will help in the choice of design solutions. Moreover, the use of visual simulation is a crucial device for communicating and informing a wider public, in particular for promoting a paradigmatic shift in the social acceptance of the new identity of industrial places. In short, we argue that citizen awareness and engagement in the co-creation of a shared vision is an unavoidable step for industrial transformation.

Techniques applied for the visual perceptual analysis

The experimental part of the paper will focus on visual analysis techniques for mapping current conditions of the image of productive landscapes. In particular, 2-D digital maps, 3-D digital urban modeling, spherical panoramic pictures, cylindrical videos, Google Maps and Street View, and a post-processing work on photography and models (image processing analysis, augmented panoramic pictures to be accessed online and onsite) were tested on an industrial area located in the urban fringe of Milan characterized by the diffused presence of productive landscapes.

We argue that the visual perceptual analysis is crucial for getting a complete understanding of the visual assessment of places (Piga & Morello, 2013)². In fact, cartographic maps represented as top-views cannot give back at different points in space the information on the qualitative analysis of the perceived materials. In line with this statement, we proposed the analyses as follows.

Firstly, we quantify the perceived urban materials at specific points in space. For instance, we quantify the physical materials that are visible on the 360 degrees sphere; we use pictures taken on the road. On these images that get close to a subjective view³ we can measure the relevance of materials of interests, like for example: areas to be preserved, areas to be transformed and background (the sky)⁴ categories of urban materials⁵ (roads and pedestrian pavements, greenery, sky, horizontal and vertical faces of buildings, urban furniture and parked cars, mobile elements like vehicles and people). Fig. 1 is an example for this features extraction analysis.

² Piga, Barbara E.A., Morello, Eugenio. "Perceptual simulation for urban design: its use for developing and sharing urban design guidelines", in: Morello Eugenio, Piga Barbara E.A. (eds.), *Envisioning Architecture: Design, Evaluation, Communication*. Milan (Italy): 11th conference of the European Architectural Envisioning Association (EAEA). 2013, pp. 259-266.

³ Pictures are used as a simplification of the human perceptual image of reality and, of course, are not one-to-one reliable. On the topic of image reliability numerous scholars gave their contribution (among others: Sheppard, Stephen R.J. *Visual Simulation: A User Guide for Architects, Engineers, and Planners*. New York: Van Nostrand Reinhold. 1989; Bosselmann, Peter. *Representation of Places: Reality and Realism in City Design*. Berkeley, Los Angeles, London: University of California Press. 1998; Lange, Eckart. "Issues and Questions for Research in Communicating with the Public through Visualizations", in: Buhmann, Erich; Paar, Philip; Bishop, Ian David; Lange, Eckart, *Trends in Real-Time Landscape Visualization and Participation*. Anhalt (Germany): 6th International Conference on Information Technologies in Landscape Architecture. 2005, pp. 1-11.).

⁴ Piga & Morello. *op. cit.*

⁵ As applied in: Radaelli, Roberta, Salerno Gessica, Villani Valeria, Piga B.E.A., Morello E. "Designing child-friendly urban environments: a proposal for a method of investigation based on visual simulation", in: Breen, J., Stellingwerff, M. *Envisioning Architecture*. Delft (Netherlands): 10th Conference of the European Architectural Envisioning Association. 2011, pp. 181-188.

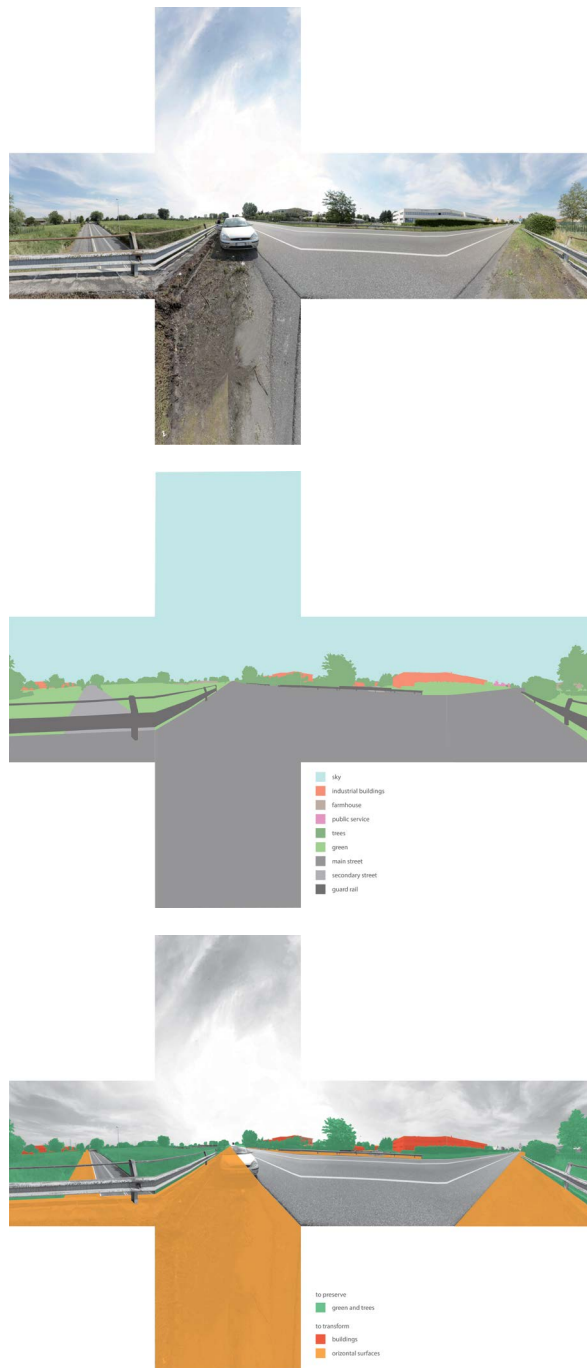


Fig. 1 (a) a panoramic spherical picture projected on a cube, (b) the image processing and quantification of the captured urban materials according to the proposed urban categories, (c) another categorization based on the areas to preserve (green) and the areas to transform (red)

Source: by the authors.

Application on an industrial area located on an urban fringe

The case-study area is a productive area in the urban fringe of the metropolitan city of Milan. If perceived from the motorway, the buildings contribute in creating the typical anonymous landscape of productive boxes.

In particular, the productive area faces the Strada Statale 11 Padana Superiore, a motorway that bypasses the urbanized area of Gorgonzola (refer to the map in Fig. 2). The productive buildings on site were not designed with a particular attention to the perception from the motorway, even if this aspect could represent a potential advertisement for the business. The lack of aesthetic quality originates from different reasons, mainly: (i) no need for advertisement on the road; (ii) the façade on the road was initially designed as a back, in many cases before the construction of the road; (iii) no need to invest on aesthetic quality by the business owners; (iv) no guidelines by the municipality.

In summary, this transect represents the typical situation of a low-quality productive district, hence it is a relevant sample to analyze in order to propose short and long-term re-design solutions.

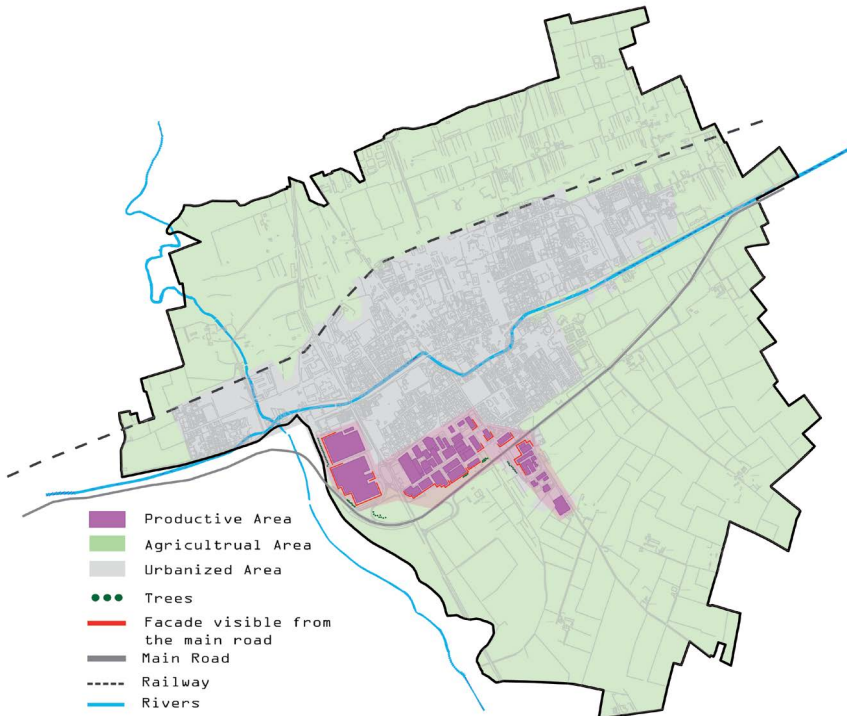


Fig. 2. Above: The key-plan of the case-study area with the productive areas highlighted in purple, the facades of industrial buildings visible from the road in red, and the trees that partially cover the facades in dotted green

Source: by the authors.

Visual analyses conducted

We conducted a series of visual analyses on digital supports.

Firstly, a quantitative analysis of the perceived facades of productive buildings was conducted using the sky view factor (SVF) analysis. Considering the SVF of the unobstructed sky vault as 100% visibility, the resulting visibility of the productive buildings was calculated as the obstructed portion of the sky. The visibility of the productive frontages can be computed point by point from the road or as an aggregated average data for the entire road section to obtain the general relevance of the buildings to the viewer (Fig. 3). This information gives back the ‘visibility field’ of the perceived industry and identifies the road sections that are mostly affected by this phenomenon. This map can be used to select specific points of view to focus on during the analysis and the design phases.

Of course, the quantification of visibility alone is not enough to give back the environmental quality of the perceived landscape. Hence, we proceeded with qualitative analyses on pictures. First of all, we reconstructed the frontages of the productive buildings that are visible from the road. In Fig. 4 the visible frontages are highlighted in red.

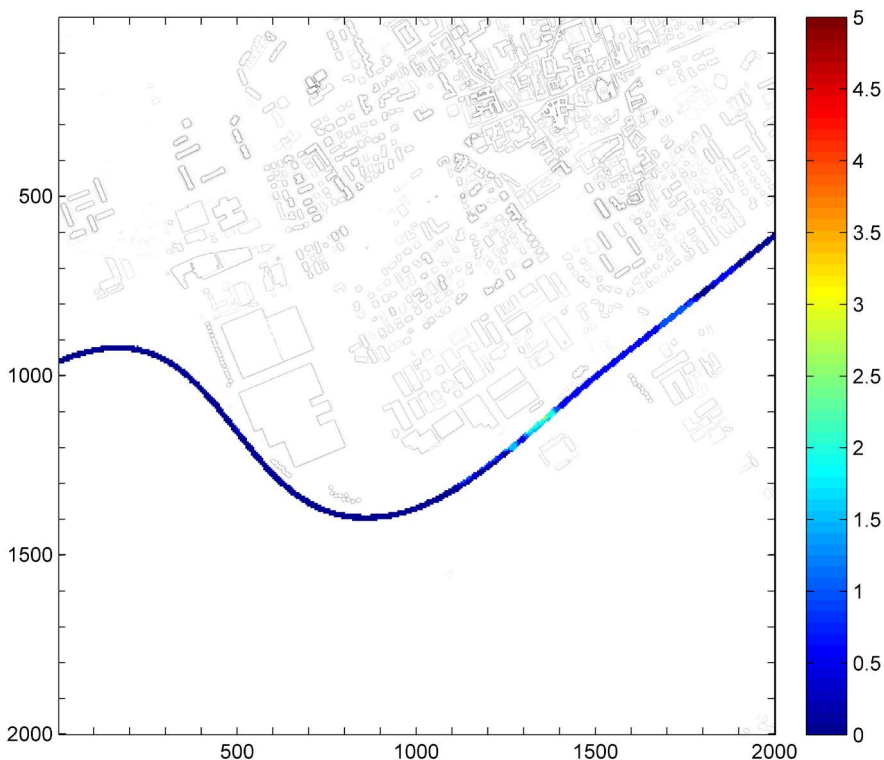


Fig. 3. The visibility map of the productive buildings perceived from the road only (the unit is the percentage of the sky vault)

Source: by the authors.

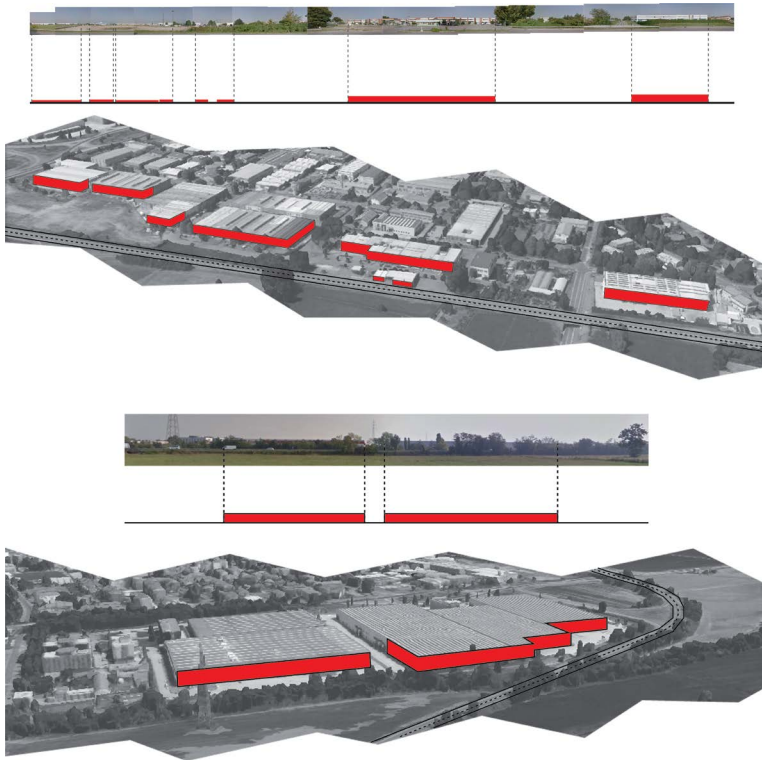


Fig. 4. Above: The key-plan of the case-study area with the productive areas highlighted in purple and the facades visible from the road in red

Source: by the authors.

Afterwards, immersive spherical photography was used to map urban materials and qualitative information on the areas to preserve and to transform. So far, this analysis was conducted on punctual areas only (Fig. 1, Fig. 5) and does not enable general considerations on a more distributed area yet. For a continuous view from the road a 360° videos was recorded. Panoramic photos and videos can be visualized in an interactive way, by panning the image; this interaction enables the user to get an intuitive understanding of the environment because this way of fruition recalls the natural interaction of looking around. Spherical panoramic images can also be unwrapped (see Fig. 1) for specific usages. The contextual work on interactive panoramas and the exploded one helps the architect to obtain a greater understanding related to a continuous shifting from the perceptual view (interactive panoramas) and the conceptual one (exploded panoramas and technical maps). We argue that the combination of different types of representation is really relevant for supporting design thinking.



Fig. 5. The pano-tour map with the spherical panoramic images taken during the survey and used for the perceptual analysis

Source: by the authors.

Considerations

In this paper we proposed a visual perception analysis to be used as a methodology for the evaluation, communication and design of places. In particular, the work was applied for the urgent challenge of re-thinking industrial areas which characterize the visual landscape of numerous urban fringes.

The tentative application of the methodology on a production landscape with low aesthetic value offered the opportunity to derive some considerations as follows:

1. The proposed methodology is easy to implement and can be applied at different levels of complexity.
2. Of course, the recording of cylindrical videos and the manual post processing of images is very time consuming if applied on numerous points of view.

3. In general, the subjective visual analysis offers complementary information to the top view one. This is the peculiarity of this work.
4. An extended analysis distributed in space represents the most useful application because it reveals the areas that are perceptually interested by sight effects (e.g. panoramic viewpoints, visually poor viewpoints).

Future work

Future work will focus on the improvement of the proposed methodology. In particular we will propose the automation of post processing steps, in order to reduce manual work on images. This will enable to save time on the computation and make this type of analysis economically feasible. Moreover, we would like to improve the content and provide a truly comprehensive tool that takes into account quantitative and qualitative analysis together. Quantification of visual aspects alone is not enough if not accompanied by a qualitative interpretation of visuals.

Finally, after the analysis phase, we will devote our attention to the design phase. This will involve the use of urban simulation techniques for depicting future environments that will undergo the visual analysis presented here.

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