èkphrasis

46th International Conference
of Representation Disciplines Teachers
Congress of Unione Italiana per il Disegno

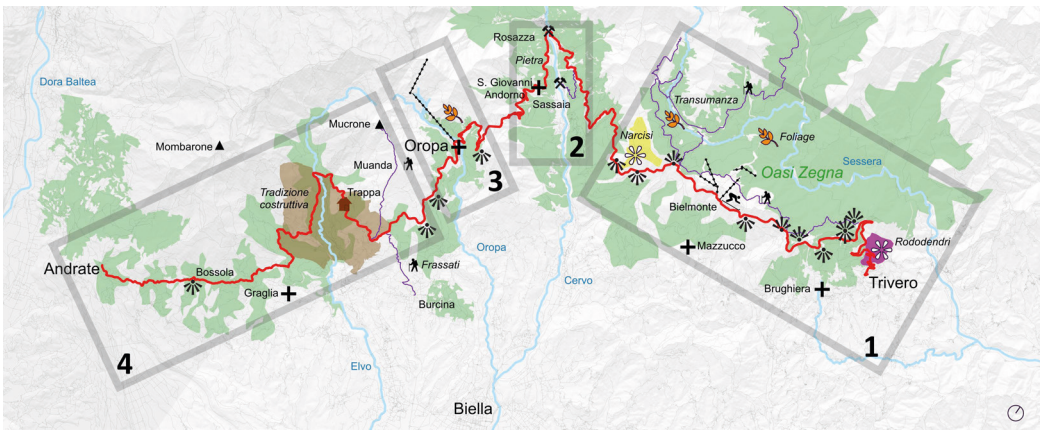
# Procedures Based on Situated Cognition and Direct Experience in Landscape Representation: a Toolbox for the Case Study of Panoramica Zegna Road

Andrea Rolando
Alessandro Scandiffio

*Abstract*

This research aims at investigating the potential of landscape representation tools and techniques for analyzing spatial patterns and specific scenic phenomena that can be perceived along the Panoramica Zegna road in the Province of Biella, north-western Italy. The mountainous landscape crossed by the panoramic road, 63 km long, from Andrate to Trivero, is characterized by a unique spatial configuration, as a 'balcony' in-between the Alps and the Po valley, that allows facing different topics related both to morphological and perceptive aspects of the landscape, which requires to be faced with a multiscalar approach jointly interconnected with specific representation tools and techniques. In this framework, the research, by exploring the situated knowledge approach, presents and discusses the role and the possible application of each tool and their linked representations to specific topics, such as landscape survey, landscape analysis of structural components, seasonal landscape mapping, and landscape visibility. By showing different kinds of representations, such as historical maps, thematic maps, schemes, sections, three-dimensional models, georeferenced pictures, multispectral satellite and UAV imagery, the research shows how this 'toolbox' can be used to read, understand, and configure new strategies for landscape conservation and design. Finally, the research discusses the strengths and weaknesses of this methodology, considering each tool and its potential applicability to different landscape contexts.

*Keywords*
Landscape, representation tools, survey, mapping, panoramic road.




The four distinct transects that define the main components of the landscape crossed by the Panoramica Zegna Road.



doi.org/10.3280/oa-1430-c967

## Introduction

This contribution explores the concept of situated knowledge as a methodological approach for landscape analysis and representation, considering the idea of knowledge in support of design based on site specific solutions as shaped by contextual, lived experience [Dewey 1925]. To illustrate this perspective, a location was selected for its exemplary landscape qualities: the Panoramica Zegna Road, which crosses the Biellese territory from Andrate to Trivero, north of Biella, between the Dora Baltea and the Sesia Valley. Along this road, a variety of specific landscape features can be observed: the geomorphology of the area, land use, historic villages, churches, and sanctuaries, historic paths, panoramic views of both the plains and the mountains, and seasonal phenomena such as the autumn *foliage* and the spring blooms of rhododendrons and daffodils. Added to these are cultural landscapes tied to local traditions, productions (industrial heritage), art and literature. By considering each element as an integral part of the landscape and identifying the locations where each characteristic stands out most prominently, the entire territory traversed by the Panoramica Zegna Road can be interpreted as an ideal laboratory for experimenting with methodologies for reading, interpreting, and configuring landscapes. These methodologies, developed in this specific context, can hold broader significance and be applied to other settings.
It is therefore proposed to describe the route with the aim of identifying the most suitable representation tools for landscape analysis in relation to the specific characteristics of each place. This approach offers a reading of the landscape not only as a scientific tool but also as an educational resource. Situated knowledge is thus supported by specific operational tools that help interpret the factors shaping the landscape. Each location will be described by identifying the specific tool for analyzing its characteristics, with reference to developed studies and insights. These will be contextualized and 'situated' more precisely, contributing to deeper and more applicable knowledge.

## The Panoramica Zegna Road: a case study for situated knowledge of the landscape

In the north-western alpine macro region of Italy, in between Turin and Milan, the Panoramica Zegna Road is a unique infrastructure, which crosses the alpine landscape, overlooking the Alps and Po valley [Canali 1985]. The Panoramica Zegna Road was built between 1938 and 1953 by Ermenegildo Zegna, with the extraordinary idea of making accessible the upper mountainous landscape above Biella and Trivero, through a reforestation project and the construction of a new landscape, aimed at fostering a better quality of life and wellbeing of inhabitants by encouraging mountain tourism. The

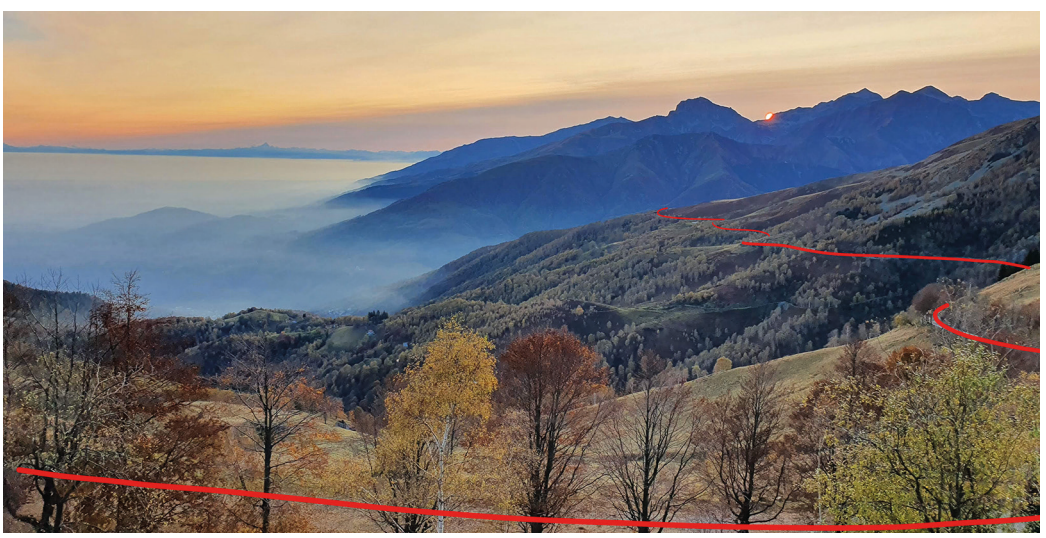


Fig. 1. Photo taken along the Panoramica Zegna Road near Bielmonte, over the autumn season toward south direction (image by the authors).

road has been conceived non only as a line connecting two points, but it can be considered a backbone of this territory, which encounters and includes several locations and places, ensuring access to a network of hiking paths widespread in the surrounding landscape, but most of all offering outstanding panoramic views, as a sort of 'balcony' on the landscape (fig. 1) [1]. The road, as a cross-valley connection at mid-altitude, which ranges between 750 m and 1.500 m a.s.l., traverses the alpine landscape characterized by woodlands, high-altitude grasslands, meadows, and pastures, spotted by small urban settlements, sanctuaries, scattered farmhouses and private houses. The whole road, 63 km long, can be divided into four main stretches from east to west (figs. 0, 2).

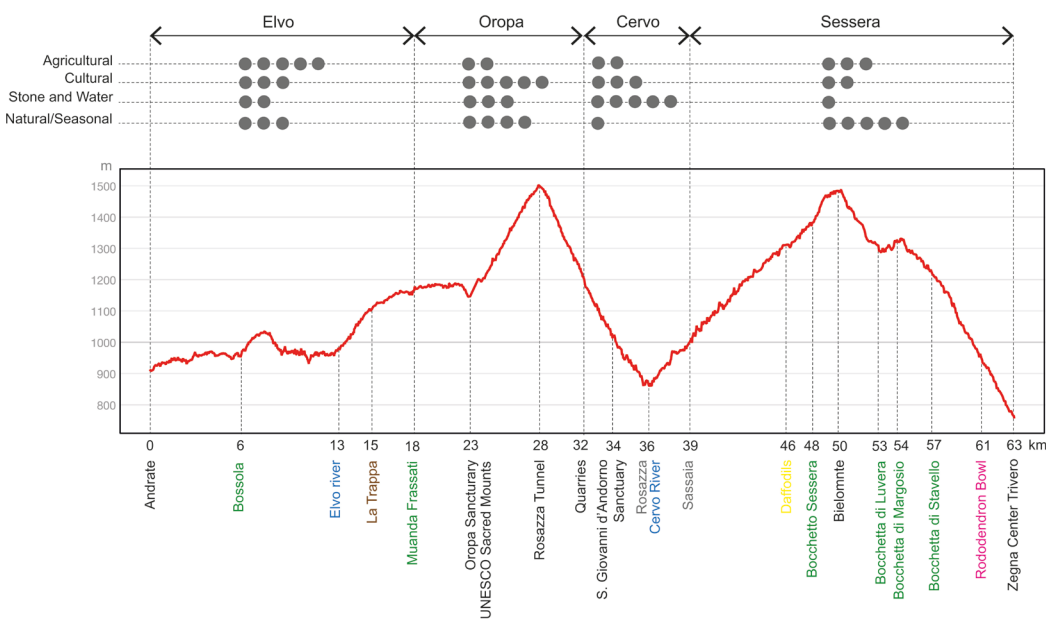



Fig. 2. Profile of the Panoramica Zegna Road from Andrate tro Trivero with evidence of the main landscape patterns (image by the authors).

The first one from Trivero to the Bocchetto Sessera, as stretch of the officially named 'provincial road 232', connects the Zegna Center, where is located the historical wool factory based in Trivero, with the Oasi Zegna. The upper mountainous landscape is characterized by natural and seminatural environments of woodlands and grasslands with outstanding panoramic viewpoints, named 'bocchette', oriented both on the north side (*i.e.* Margosio and Luvera viewing the Sessera valley and Monte Rosa peak) and on the south side (*i.e.* Vallemosso, Cossato viewing the Po valley with the main cities of Milan and Turin). The road also gets access to the ski resort area of Bielmonte, and the wooded area of Bocchetto Sessera with its thematic hiking paths related to specific topics (*i.e.* transhumance, geomorphology, foliage, wellbeing and wood therapy). This first stretch is also characterized by outstanding flowering areas such as the one of Rhododendron Bowl with its contemporary art installation and the one of daffodils along the slopes of Monticchio, which become of great interest for visitors, especially over the spring season for the blooming.

The second stretch can be identified as a traditional stone-working area and its characteristic architecture and villages. It corresponds to the intersection of the panoramic road with the upper Cervo valley spotted by the historic small urban settlement of Rosazza, known for the charm of its stone architecture and monuments, and the stories linked to the life of the philanthropist and politician Federico Rosazza. Even the small village of Sassaia, the hamlet of Campiglia Cervo, is of interest for the integrity of the traditional urban fabric, made by small street and stone architecture, reachable from the panoramic road through a hiking path. In this stretch the S. Giovanni d'Andorno sanctuary can be also included, which is a symbol, together with nearby Graglia sanctuary and

Oropa sanctuary, of the popular religiosity of these places which support the construction of Sacred Mounts in the outpost of the alpine area.
The third stretch, as part of the road named 'tracciolino', is marked by the majesty of the Oropa sanctuary and UNESCO Sacred Mounts of Oropa, groups of chapels dedicated to different aspects of the Christian faith, which are integrated into the surrounding natural landscape of woodlands. In this stretch, the distinctive landscape features are related to the co-presence of outstanding monumental architectural complexes, surrounded by woodlands and mountains, which are spotted by scenic viewpoints towards the Po Valley.
The fourth stretch defines the longest section of the 'tracciolino', from the slopes of Mucrone peak, a landmark of the Alps of this province, to the village of Andrate. It is the less frequented section of the panoramic road, intersected by the Elvo river, characterized by farmhouses and private houses, but also crossed by many traverse hiking paths, (*i.e.* 'Frassati' hiking path), which connect the lower small urban settlements (Pollone, Sordevolo, Graglia, Netro, Donato) to the panoramic road and the higher mountain peaks. These paths witness the daily movements of inhabitants related to traditional working activities (agriculture and breeding) throughout history, and nowadays are of interest for slow tourism and outdoor sport activities. This stretch is also marked by 'la Trappa', an old monastery that nowadays has been reconverted into an eco-museum which symbolizes the traditional way of using natural resources and building rural architecture in this landscape.

## A toolbox for landscape representation

In this paragraph the potential of landscape representation tools and techniques for analyzing spatial patterns and site-specific scenic phenomena in complex landscapes will be analyzed. Whilst the role of cartography is conventionally recognized and consolidated through history as a tool for reading and detecting the components of the landscape and open spaces, similarly to what happens with the architectural and urban survey for the knowledge of the building and the city [Rolando 2008; Pandakovic, Dal Sasso 2013], the emerging role and the applicability of new digital tools (*i.e.* imagery from UAV and satellites) for landscape representation is not yet fully clarified and expressed. Furthermore, the continuous improvement of computational capacity of software for spatial planning and cartography, largely used by users (*i.e.* GIS), jointly with the large availability of updated geospatial datasets enable to face specific topics related to the landscape by using dedicated tools and representations. Hence, it seems that many different tools (e.g., GPS, GIS, UAV, and Satellite imagery), which are also widely used in other research fields like geomatics, geography, and spatial planning, can be borrowed and jointly used to face and represent the different dimensions of landscape properly. Thus, the main research questions that lead this research are: what kind of tools and techniques are more suitable for landscape representation? How can specific dimensions of the landscape such as seasonality or visibility be visualized? What kind of representations can be carried out? So, the research presents and discusses different kinds of representations based on the landscape crossed by the Panoramica Zegna Road, which enables to face different landscape dimensions: spatial, seasonal, perceptual. By assuming that the knowledge of the landscape can be considered a spiral process that starts from a general overview and step by step refines itself to more specific and detailed topics and settings, the spatial analysis of the landscape is a fundamental step of this cognitive process to understand the landscape configuration and its main structural components. The privileged viewpoint to analyze and configure the landscape corresponds to the 'looking from above', which enables to get a landscape overview from a non-proper viewpoint and discern the main components: orography and hydrography, agriculture and vegetation, settlements, path and infrastructure. In this sense, the most helpful representations for spatial analysis are: current and past orthophotos [Sereno 1981], the historical maps, both in the form of thematic cartographies (*i.e.* military and administrative) and depicted cadastres [Longhi 2008; Coppo, Boido 2010], the views available through the 3D

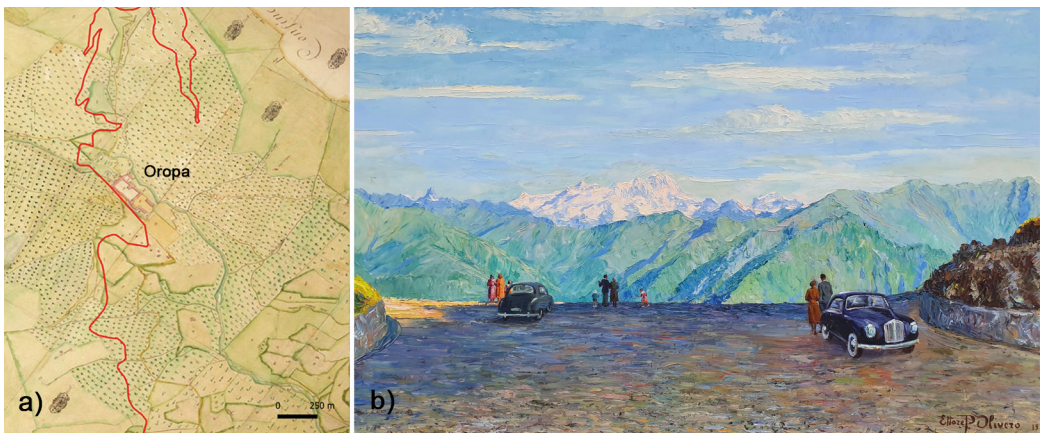



Fig. 3. a. historical map of Savoy Cadastre goreferenced on the Oropa Sanctuary, with overlapping of the panoramic road. Source of the base map: Archivio di Stato di Torino. Title: Biella. Mappa 'B'. Date: 1790. Author: Eusebio Colombino. Original size: 270 x 173 cm; b. view of the Monte Rosa from Bocchetta Margosio in a painting by Ettore Pistoletto Olivero, one of fourteen works created in 1952-1953 to document various phases of the construction of the Panoramica Zegna road (from the exhibition held at Casa Zegna, Trivero, 2013).

model by Google Earth and its related applications, the GIS-based maps and 3D views. By referring, for instance, to the map sheet of Savoy Cadastre focused on the Oropa Sanctuary along the panoramic road (fig. 3a), it can be understood how many spatial information about settlements, paths, roads, and land uses can be collected on this kind of map through the georeferencing process, especially for visualizing what the landscape was like in the past and hence for understanding invariant components and rebuilding long-term changes which are occurred on the landscape over the time.

Beyond the historical maps, the current digital representation tools, especially geospatial datasets and GIS, offer a wide range of applications which are useful for landscape analysis. Specifically, GIS enables the collection, management, querying and visualization of spatial information about landscape by using different representation forms such as maps, sections and 3D visualizations (figs. 2-4).

For instance, the analysis of orography and hydrography of the landscape crossed by the Panoramica Zegna Road, can be supported by 2D and 3D visualizations, which jointly using thematic geo-datasets and Digital Terrain Model (DTM) within GIS (fig. 4a); by using the same tools even thematic representations such as the one of land cover, which show the main components of the landscape (vegetation, agricultural lands, urban settlements, paths and infrastructure), can be carried out (fig. 4b).

These digital tools enable approaching landscape representation, and specifically the spatial analysis oriented to landscape design, in a multiscalar way, by switching quickly from the overall view to the detail view. When the process of knowledge is targeted to investigate more detailed features of the landscape, other tools that belong to the field of the landscape survey can be adopted. In this second group of tools, the most advanced technology related to Remote Sensing (RS) enable to collect High-Resolution (HR), Very-High-Resolution (VHR) and Ultra-High-Resolution (UHR) data (less than 10 cm), from different aerial platforms (satellite, aircraft, drones) enabling deeper landscape analysis on specific aspects [Yao, Qin, Chen 2019; Parrinello, Dell'Amico 2022]. In

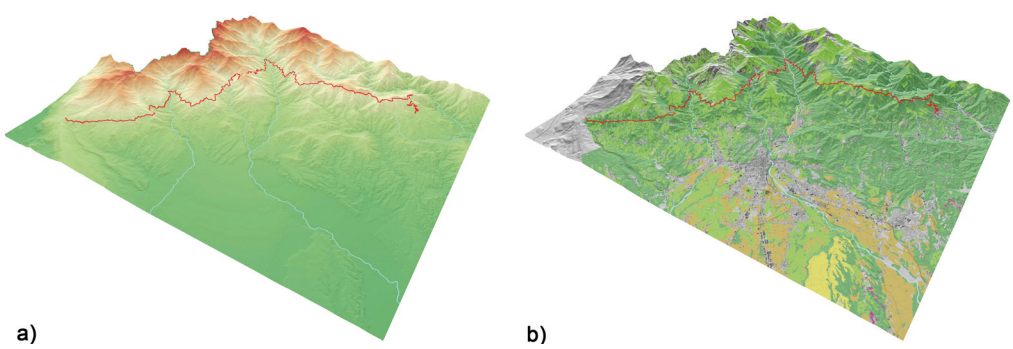



Fig. 4. GIS-based 3D models by DTM of the structural components of the landscape crossed by Panoramica Zegna road (red track); a. orograghy and hydrography; b. vegetation, agricultural lands, urban settlements, paths and infrastructure (images by the authors).

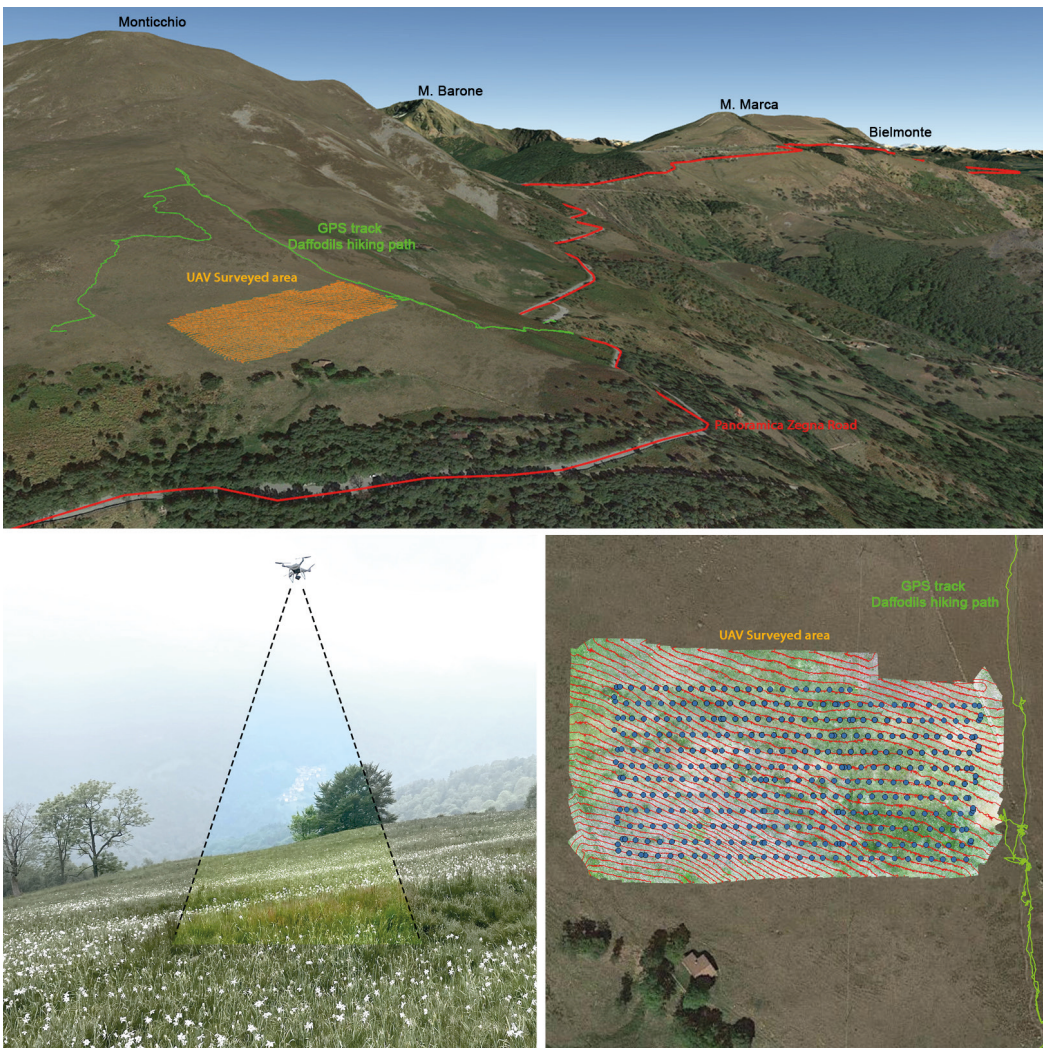



Fig. 5. Landscape survey on the daffodils hiking path connecting the panoramic road performed by UAV platform equipped with multispectral camera which aims at investigating different landscape features: orography, land cover, daffodils blooming (a) overview of the surveyed area by UAV on Google Earth. (b) UAV multispectral surveying of daffodils (c) 2D Orthomosaic with overlapping of contours lines obtained by processing Mesh and DSM (images by the authors).

this perspective, the most recent Unmanned Aircraft Vehicles (UAV), can be equipped with different sensors (*i.e.* RGB camera, Multispectral camera, LiDAR) which enable detecting landscape features with a very high level of detail (*i.e.* orography, land cover, vegetation types) [Colaceci, Chiavoni, Cianci 2022]. Specifically the UAV-based data acquisition can be used to perform photogrammetric workflows, which enable the making of 3D standard products such as Point Clouds, Meshes, DSM (Digital Surface Models), and 2D orthomosaics, contour lines.

By referring to the case study, it has been tested the performance of the UAV multispectral platform for surveying the area of daffodils over the spring blooming and its specific morphology, which extends over the slopes of Monticchio, accessible by a thematic hiking path from the panoramic road (fig. 5).

The UAV-based survey has been also integrated by the recording of GPS tracks and Georeferenced Pictures, which supply additional spatial information from the ground. The survey was performed by a UAV multispectral platform which provides spatial data into six separate bands (Blue, Green, Red, Red Edge, Near Infrared, and Long-Wave Infrared- Thermal). This distinctive feature of the camera enables to achieve both standard RGB visualization and customized visualizations related to the bands combination (*i.e.* false-color representation).

In this perspective, multispectral images are an essential data to investigate the seasonal phenomena occurring over the landscape crossed by the panoramic road, which is strongly influenced by the seasonality of vegetation.

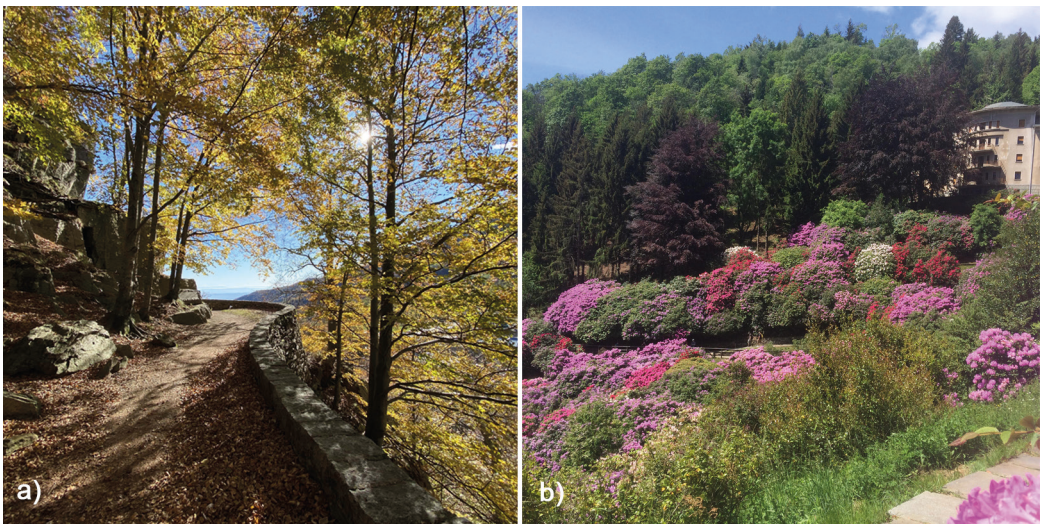



Fig. 6. a. autumn colouring *foliage* along the hiking paths connected to the panoramic road in the surroundings of Oropa Sanctury; b. Spring blooming in the rhododendron bowl along the panoramic road (photos by the authors).

The resulting representations by the UAV platform are: UHR 3D model from the mesh, DSM (Digital Surface Model), 2D orthomosaic and Vegetation Indices Maps (fig. 5).
The seasonal phenomena are a distinctive feature of the landscape crossed by the Panoramica Zegna Road, which intersects different environments, such as woodlands, grasslands, and flowery areas which change their color and aspect many times over the year. Several scenic phenomena occur over the seasons: the spring blooming, the autumn coloring foliage, and the snowfall. Each of them has a significant influence on the perception of this landscape in terms of colors, shapes, and atmosphere [Sestini 1963; Stobbelaar, Hendriks 2007]. Over the spring, the blooming in the rhododendron bowl and the daffodils along Monticchio slopes are the most appealing phenomena. Summer is the season of full and intense green, combined with cool air in the woodlands which surrounds the Bocchetto Sessera. In the same area, the autumn makes color contrasts and nuances in the woodlands, characterized by conifers and deciduos trees, especially in the surrounding of Oropa Sanctuary and in the area of the Oasi Zegna. The winter provides the most uniform view of the landscape due to snow (fig. 6). Mapping seasonal landscape phenomena requires dynamic tools, which enable to analyze both the spatial and temporal dimensions of the landscape landscape [Scandiffio 2021; Rolando, Scandiffio, Mininni 2023]. In the large-scale context (*i.e.* woodlands), the satellite platforms (*i.e. Sentinel-2* by ESA) provide HR multispectral imagery (10 m spatial resolution, 3-4 days temporal resolution) which can be processed by computing vegetation indices that can reveal the actual conditions of the landscape, both through RGB visualizations and thematic maps by spectral bands combination (fig. 7). In the small-scale context (*i.e.* rhododendron bowl and daffodils area) the UAV multispectral platform is most effective tool to provide UHR spatio-temporal information and visualizations about the timing of blooming. The visibility and the intervisibility relationships of the Panoramic Zegna

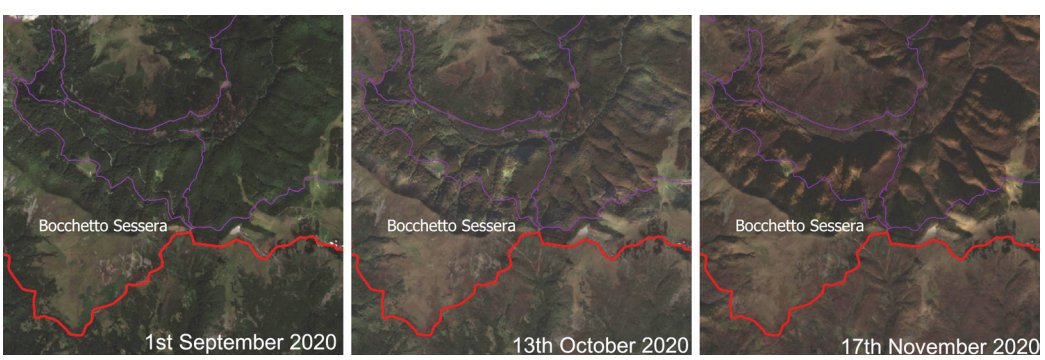



Fig. 7. RGB *Sentinel-2* satellite imagery of the autumn coloring *foliage* along the hiking paths connected to the panoramic road. Spectral bands combination of this imagery can be used to get thematic maps.

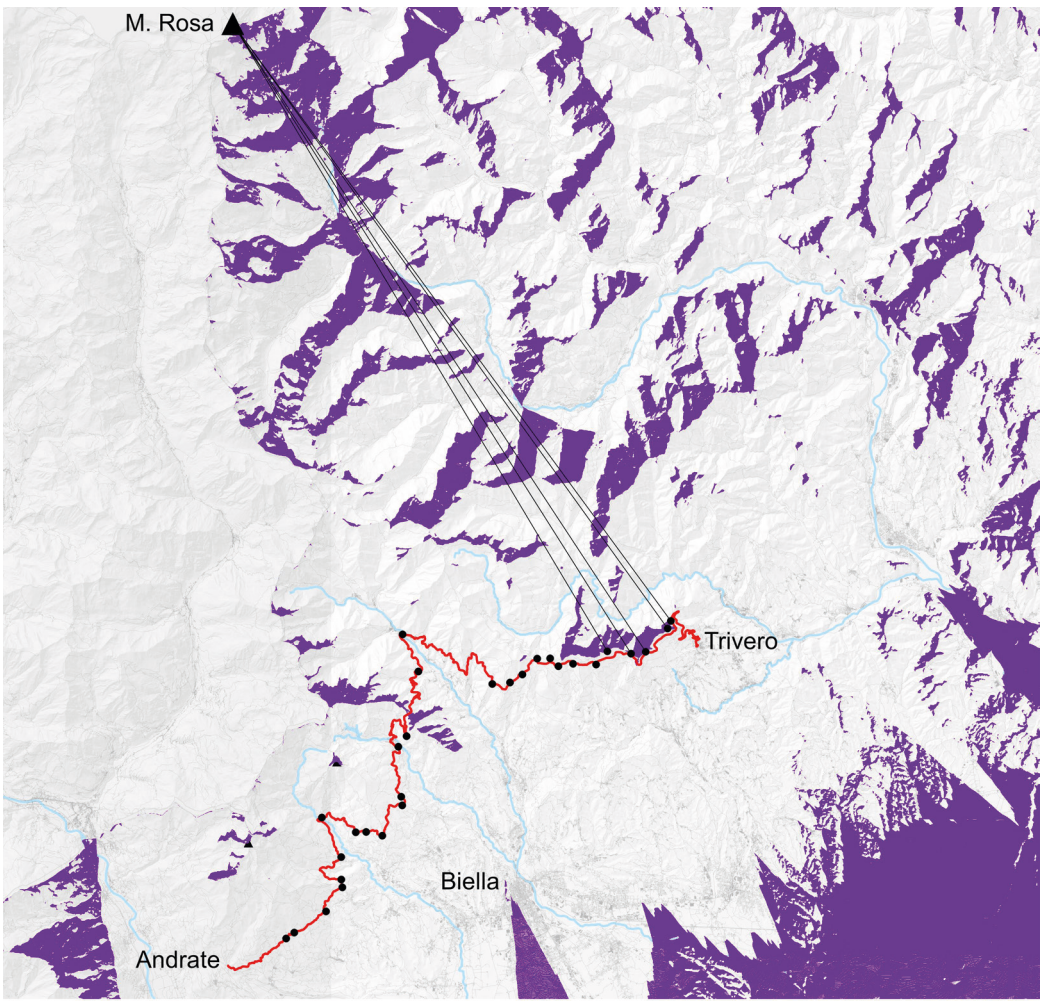



Fig. 8. Visibility analysis map of the Monte Rosa from the Panoramica Zegna road, based on Piedmont Region DTM 10-meter resolution. The viewshed and intervisibility network confirm the visibility of the Monte Rosa (4.554 m a.s.l.) from the viewpoints localized on the east side of the panoramic road: 'bocchetta' di Margosio and Luvera, San Bernardo sanctuary and Rocca di Argimonia (image by the authors).

Road with its surrounding landscape are key aspects, that can be faced by combining different representation tools: georeferenced photos taken on the ground and visibility maps. Whilst the photos taken from the ground level are largely used by all users for a qualitative reading of the landscape, the visibility analysis broadens the glance toward the landscape by using the zenithal viewpoint and it supports this kind of analysis with a higher level of objectivity. One of the main distinctive feature of the panoramic road is the double-side views on the surrounding landscape: mountainous landscape is visible on the north side, and hilly and flat landscape of the Po valley on the south side. The visibility map of Monte Rosa (fig. 8), shows the effectiveness of the methodology and the visual clarity of the map which confirm the visibility of the iconic mountain peak from the viewpoints localized on the east stretch of the panoramic road.

## Discussion and Conclusion

This research has analysed various landscape representation tools and visual devices that help address both the overall spatial configuration of the landscape and specific multiscalar components. These tools have been tested on the landscape crossed by the Panoramica Zegna Road, which serves as an ideal laboratory for experimenting with methodologies to read, interpret, and configure complex landscapes, supporting a site-specific design approach (tab. 1). The research does not aim to be exhaustive; rather, it seeks to consolidate key research activities developed through analytical procedures and representation

| LANDSCAPE DIMENSIONS | TOOLS | REPRESENTATIONS/VISUAL PRODUCTS |
|---|---|---|
| Spatial analysis (qualitative) | Historical maps and iconography | Thematic maps, Sections, Profiles of landscape components: orography, hydrography, agricultural lands and vegetation, settlements, path and infrastructure |
| | GIS, Geodatabase | |
| Survey of spatial dimension (quantitative) | GPS, RGB Camera, Google Earth | Georeferenced pictures, GPS tracks, 3D Models, Sketches |
| | UAV, Photogrammetry | Points cloud, Mesh, 3D Model, DEM, 2D Orthomosaic |
| Seasonality | GIS, Multispectral satellite imagery | HR Vegetation Indices Maps, Dynamic Maps |
| | UAV Multispectral imagery | UHR Vegetation Indices Map |
| Visibility | GIS visibility analysis, GPS, Camera | Visibility map, Georeferenced photos |

Tab. 1. Synthetic table of the main landscape dimensions analyzed and their related tools and representations.

tools that support design solutions. These methods have been tested in diverse landscape contexts over recent years. A specific touristic development strategy based on this landscape analysis approach, integrated with specific design solutions, has been developed in collaboration with local actors and supported by Fondazione Biellezza and opens new challenges that can benefit from contributions across related disciplines.


## Credits

All the authors shared the principles, and the research topics presented in the article. However, the paragraph titled 'Introduction' was written by both authors, the paragraphs *The Panoramica Zegna road: a case study for situated knowledge of the landscape, A Toolbox for landscape representation* were written by A. Scandiffio, the paragraphs titled *Discussion* and *Conclusion*' were jointly written by both authors.


## Notes

[1] Fondazione Biellezza, *Grande Balconata Alpina. Strategia e Metodi per il Biellese Destinazione Turistica*. https://www.e-scapes.polimi.it/wp-content/uploads/2025/05/Grande-Balconata-Alpina-studio-strategico_rid.pdf.

**Reference List**

Coppo, S., Boido, C. (a cura di). (2010). *Rilievo Urbano. Conoscenza e Rappresentazione della città consolidata.* Firenze: Alinea Editrice.

Colaceci, S., Chiavoni, E., Cianci, M. (2022). UAVs and GIS models for landscape representation. In *DisegnareCon,* 15, 29. https://doi.org/10.20365/disegnarecon.29.2022.10.

Canali, R. (1985). *La Panoramica Zegna. Storia di una strada.* Pero: Edizioni Virginia.

Dewey, J. (1925). *Experience and nature*. Chicago: Open Court Publishing Company.

Longhi, A. (2008). *Catasti e territori: l'analisi dei catasti storici per l'interpretazione del paesaggio e per il governo del territorio.* Firenze: Alinea Editrice.

Pandkovic, D., Dal Sasso, A. (2013). *Saper vedere il paesaggio.* Novara: Città Studi edizioni.

Parrinello, S., Dell'Amico, A. (2022). Drones and digital innovation: a new scenario in digital dimension. In S. Parrinello, S. Barba, A. Di Fillippo, A. Dell'Amico (Eds.). *D-Site. Drones. System of information on cultural heritage for a spatial and social investigation.* Volume 2, pp. 17-25. Pavia: Pavia University Press.

Rolando, A. (2008). *Forma, geometria, struttura: per il disegno dell'architettura, della città e del paesaggio.* Novara: De Agostini.

Rolando, A., Scandiffio, A., Mininni, M. (2023). Osservare i paesaggi stagionali dall'alto. Mappatura spazio-temporale del foliage nell'Appennino Lucano, mediante immagini satellitari multispettrali. In *Diségno,* 12, pp. 89-98. https://doi.org/10.26375/disegno.12.2023.11

Scandiffio, A. (2021). Mappatura dinamica delle condizioni stagionali del paesaggio. In E. Cicalò, V. Menchetelli, M. Valentino (a cura di). *Linguaggi Grafici. MAPPE*, pp. 1374-1391. Alghero: Publica.

Sereno, P. (1981). L'archeologia del paesaggio agrario: una nuova frontiera di ricerca. In L. Gambi (a cura di). *Campagna e industria. I segni del lavoro*, pp. 24-47. Milano: Touring Club Italiano.

Sestini, A. (1963). Il Paesaggio. In *Conosci l'Italia*, vol. VII, pp.9-12. Milano: Touring Club Italiano.

Stobbelaar, D. J., Hendriks, K. (2007). Seasonality of Agricultural Landscapes: Reading Time and Place by Colours and Shapes. In H. Palang, H. Sooväli, A. Printsmann (Eds.). *Seasonal Landscapes,* pp. 103-126. Dordrecht: Springer.

Yao, H., Qin, R., Chen, X. (2019). Unmanned Aerial Vehicle for Remote Sensing Applications – A Review. In *Remote Sensing,* 11(12), 1443. https://doi.org/10.3390/rs11121443.

**Authors**
*Andrea Rolando,* Politecnico di Milano, andrea.rolando@polimi.it
*Alessandro Scandiffio,* Politecnico di Milano, alessandro.scandiffio@polimi.it

*To cite this chapter:* Andrea Rolando, Alessandro Scandiffio (2025). Procedures Based on Situated Cognition and Direct Experience in Landscape Representation: a Toolbox for the Case Study of Panoramica Zegna Road. In L. Carlevaris *et al.* (Eds.). *èkphrasis. Descrizioni nello spazio della rappresentazione/èkphrasis. Descriptions in the space of representation.* Proceedings of the 46th International Conference of Representation Disciplines Teachers. Milano: FrancoAngeli, pp. 4103-4112. DOI: 10.3280/oa-1430-c967.

 ISBN 9788835182412