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## EXPLORING THE ARCHITECTURAL AND SPATIAL POTENTIAL OF WINE CULTURE. A SYSTEMATIC LITERATURE REVIEW

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**ABSTRACT:** This article presents the results of a systematic review of the Scopus bibliographic database, during which the state of knowledge on wine architecture and urban planning accompanying vineyards was examined in light of the contemporary development of enotourism. In the 2020s, global interest in enotourism has grown, accompanied by the revival and development of wine culture. The aim of the research was to identify and verify sources of literature contributing to disciplinary knowledge on wine architecture and accompanying urban planning in light of the contemporary development of enotourism, as well as to classify the thematic literature. Based on bibliometric analysis using the VOSviewer software, thematic groups of publications were identified. The topic is an attempt to find current directions for the research concentration to match the emerging wine-related architecture.

**KEYWORDS:** wine architecture, spatial planning, winery, enotourism, cultural landscape

## Introduction

Over the last decade, the share of vineyards in the structure of agricultural land use in Poland has increased, especially in the Lubuskie, Małopolskie and Podkarpackie Voivodeships (Brodnicka, 2019). Zieliński and Jadczyzsyn (2022) assume that multifunctional agriculture plays an important role in the protection of environmentally valuable areas, providing public goods such as agricultural biodiversity, including the quality of agricultural production and the attractiveness (e.g. tourism) of rural areas. There are numerous natural constraints on the territory of Poland that affect the production and economic effects of agriculture. However, they have a high non-economic value, constituting High Nature Value farmlands (HNVf) (Zieliński & Jadczyzsyn, 2022). Kowalska et al. (2017) created a ranking of ecosystem services for a locality of the Podlaskie Voivodeship in Poland. The survey results show social differentiation among respondents and the accompanying divergence of interests. Among other things, the potential of grasslands and croplands for education and science was recognised (Kowalska et al., 2017). The state of the natural environment is an element of regional competition, and environmental conditions have a bearing on their social and economic effect (Napiórkowska-Baryła et al., 2017).

Places famous for their wine agricultural activities are some of today's tourist destinations. The tourist attraction of vineyards is not only related to the natural qualities of the crops but also to the architectural objects associated with wine culture. Buildings as objects of historical, aesthetic or cultural value area destination for many travellers. Enotourism and architectural tourism are increasingly interdependent. For example, Spanish tourism offers include the combination of architectural and wine tourism, a.o. in the wine region of la Rioja (Bursiewicz, 2019). Both modern and historic architecture are of great public interest. In the study of architectural tourism, the emotions of the viewer play an important role (Bursiewicz, 2019). Leri and Theodoris (2019) conducted a questionnaire study from which they found that emotions arise as a result of evaluating the winery environment, the behaviour of other visitors and the desire to learn something new and enjoy themselves during their stay. Wine culture also has a significant impact on the facilities in the cities of wine regions, e.g. in the form of smuggled symbolism or facilities such as merchants' houses, wine cellars or wineries (Pink & Kokoszka, 2018). As stated by Pink and Kokoszka (2018) „(...) wine leaves its mark on architecture, the shape of economic life and becomes a centre of cultural life”. An architectural object, performing a function according to its purpose or adapted on demand, often constitutes a showcase for a vineyard. Such an object, in order to be attractive to tourists, must have artistic, historical or cultural value, as Bursiewicz (2019) reminds us in her publication. With the world becoming more open to tourism, people are increasingly seeking culinary experiences. According to 2017 data, it was one of seven elements driving global tourism (Pink & Kokoszka, 2018).

Should emerging vineyard architecture be an expression of modern form or historicising? How do we link the functions of new vineyards with economic efficiency? For the new architectural structures planned for vineyards, will enotourism be a sufficient function or is the architectural form of the building and its fit with the landscape important? To answer such research questions, a literature review focusing on the classification of thematic groups and the analysis of articles in groups related to building facilities was performed. The article presents the results of a systematic review of the Scopus bibliographic database, which examined the state of knowledge on wine architecture and spatial planning accompanying vineyards in light of contemporary enotourism development. Following the demand and interest in wine culture that motivates the contemporary expansion of tourism in the Lubuskie region, the aim of this review is to verify the research potential and directions of analysis in terms of the development of wine-growing heritage in architecture and spatial planning taking into account the thematic classification of the literature.

## Literature overview

Viticulture is an activity that dates back to antiquity. Already, the elite circles of the Roman Empire showed an interest in the so-called spectacle of wine production (Dodd et al., 2023). Architecturally, this was expressed by adapting the space appropriately to show the production. An example of such a building is the ancient wine cellar in the Villa Quintilles south of Rome (Dodd et al., 2023). There is

a relationship between cultural processes and industrial heritage. One region in Spain that needs protection from this culture is Montilla-Moriles. Merino-Aranda et al. (2021) spreads heritage in light of the Sustainable Development Goals by analysing four culturally significant vineyards. Alongside this is a belief in the impact of heritage conservation in creating a sustainable community of people (Merino-Aranda et al., 2021).

In the context of architectural design, Harea and Eplényi (2017) recognised that wine culture has undergone a redefinition over the past decades. As a result, wine architecture has also undergone a transformation in terms of functionality (new technologies) as well as brand image. Due to the modern orientation of winemaking, among other things, tourism and recreation, the visual aspect is becoming more relevant. In doing so, it is equally essential to respect the so-called *genius loci* (spirit of the place) and to maintain the necessary standards in the facility (Harea & Eplényi, 2017; Gómez, 2018). On this topic, Harea and Eplényi (2017) presented individual cases of six contemporary European wineries located in a protected cultural landscape. All the sites described are located in Western Europe. Rossi and Pelizzari (2013) also described the distinctive design of the Italian winery *Castelbuono Estate* and the method of electroforming the armour covering the building.

While considering the functional aspect of winery facilities, it is important to use technology to achieve optimal conditions in the venue, such as temperature or natural lighting. Torreggiani et al. (2013) described the study focused on the performance of window systems using the example of a farm in the Emilia-Romagna region of northern Italy. Such studies, aimed at optimising the design decisions made, make it possible to delineate criteria by which the quality of architecture is also dictated by the technology used. A contribution to the knowledge of the functional disposition of a wine facility was made by Gómez et al. (2018), publishing a study based on qualitative and quantitative data collected from the Rioja region in Spain. Developed using the Systematic Layout Planning (SLP) method, the authors propose a system of spatial relationships adapted appropriately to the class of winery based on its size. The SLP is based on both the way people and objects are moved within the facilities and the way they are transported to them. The interaction of spaces is presented in the form of a relationship diagram. The result is a block layout defining the location and size of each space (Gómez et al., 2018).

Inherent in winery projects is effective land-use planning. The culture of the wine industry does not only apply to rural and urban areas at different scales. Ferretti and Gandino (2018) described a proposal for a revitalisation strategy for the Italian region of La Morra as a tool to support social policy. In turn, Tóth and Timpe (2017) analysed individual European cities and metropolitan areas in the context of urban farming. The results show the spatial diversity and existing similarities of the cases analysed. Among the conclusions, it was suggested that agriculture should be given equal consideration in concepts and planning documents for green infrastructure at local and regional levels (Tóth & Timpe, 2017).

Over time, landscape structures change, including wine culture areas, as can be read in the articles by Verešová and Supuka (2013) as well as Bugár et al. (2020). Verešová and Supuka (2013) analysed the Slovak cadastre of Čajkov, in which vineyards occupy as much as 6% of the land area. The authors highly evaluated their value and set out criteria for their evaluation, including mosaic structures and architecture (Verešová & Supuka, 2013). The aforementioned mosaic structures are characteristic of agricultural areas, including wine culture. They can be observed, a.o. in the Nitra County area in Slovakia, as described by Bugár et al. (2020).

Although Poland is not associated with wine culture, it has regions where it is strongly rooted and characterised by cyclicity, such as the area of Lubuskie Province, the so-called 'Polish Tuscany' (Jeziorska-Biel et al., 2021). Pijet-Migoń and Królikowska (2020) address issues related to resurgent winemaking in Lower Silesia in Poland, especially new vineyards set against a historical background. The authors address the question of a rebirth of wine culture enotourism and how this can contribute to changes in rural areas (Pijet-Migoń & Królikowska, 2020).

Among contemporary studies of spatial phenomena related to viticulture, the use of technological solutions can be observed. Such an example is a remote sensing study of urban-rural patterns using satellite shots and source data from the provinces of Avellino and Benevento in southern Italy (Imberenda et al., 2023). As a result of the study, significant transformations of the rural-urban pattern of the study areas over the 1990-2018 period were perceived. Profitable crops, including vine-

yards and orchards, are characterised by stability, indicating investment in tourism and maintaining a connection to the cultural identity of the wine regions (Imberenda et al., 2023).

To obtain the best quality results, research methods are developed and transformed as needed. Assumma et al. (2022) proposed the author's "Group Analytic Hierarchy Process Sorting II" (GAHP Sort II) method to sort according to economic attractiveness a group of 101 Italian municipalities included in the UNESCO-listed "Piedmont's Vineyard Landscape: Langhe-Roero and Monferrato". The proposed multi-criteria evaluation model is derived from the Analytic Hierarchy Process Sorting method (AHP Sort) and is developed by taking into account the stakeholders' points of view (Assumma et al., 2022). The method uses indicators for assessing the economic attractiveness of a landscape and a geographic information system (GIS) to visualise the results (Assumma et al., 2022).

Based on a case study of the Auckland region, Ogunmakinde et al. (2023) produced a study that examined and evaluated the impact of seismic activity on elements of New Zealand wineries. These reveal the role of conditions in the design of facilities, in this case, natural ones. Dizhur et al. (2017) set a similar article presenting observations of the performance of winery land, its facility and associated infrastructure following an earthquake also in New Zealand's Kaikōura region.

Within the context of energy efficiency is a collection of publications examining various types of contemporary energy solutions. Such an example is an article analysing and evaluating a distributed renewable energy system for a British winery in Wiltshire (Hall-Smith et al., 2023). Hall-Smith et al. (2023) developed a design to reduce the carbon footprint of this facility and be economically competitive with alternatives. In turn, Gómez-Villarino et al. (2021) described the impact zero-energy winery systems have on cost efficiency in the context of wine maturation. The results show that when they are used, not only is energy efficiency improved, but it also benefits the costs incurred in wine production (Gómez-Villarino et al., 2021). The Mediterranean wineries' energy demand was analysed by Barbaresi et al. (2017), describing the results of a study for a small and medium-sized winery. The authors noted the need to implement energy efficiency strategies from an economic as well as environmental perspective (Barbaresi et al., 2017). Thermal performance in a winery was also described by Torreggiani et al. (2018) as a result of an analysis of thermal activity in an unconditioned facility. Nocera et al. (2020) addressed the topic of modernisation strategies for Sicilian wine cellars. Ancient Italian passive systems were identified as one of the research factors, and the need to balance historical techniques with modern solutions was taken into account (Nocera et al., 2020).

Building structures have a direct impact on the environment. For example, Tinti et al. (2017) described the results of an experimental calibration of heat transfer models under a winery facility. Through the use of a three-dimensional model, they investigated the effect of geometry and materials on the ground temperature under and next to the building. The authors presented the thermal performance of the soil under the winery and showed that it has an effect on raising the temperature of it (Tinti et al., 2017). According to modern standards, the issue of self-sustaining facilities is increasingly being addressed. Boulton (2017) describes the U.S. winery, which was built in 2006 and located 100 km from Davis, as being self-sustainable in terms of energy and water. The facility offers the option of either replacing systems or combining them, which is a contribution to technological expertise both because of the facility's self-sufficiency and adaptability and its ability to remotely monitor the environment (Boulton, 2017).

Wine tourism is influencing the development of wineries. An example of meeting the expectations of tourists was the organisation of a cyclical event called "Cantine Aperte" in Italy in 1993 (Colombini, 2015). The growing interest in enotourism is attested to by the number of visitors to wineries during the event, which has grown from several hundred to 4-6 million in twenty years and a tenfold increase in the number of participating vineyards. Colombini (2015) identified specific groups of wine tourists based on the purpose of the visit. The author proposed a division of wineries into different types according to the issues around which their facilities were oriented. It also investigated the influence of wine products on tourist spending in Italy. Wine sales on-site account for a small financial share of the total wineries' business; statistically, one in three Italians buys wine at the place of production (Colombini, 2015). Also, in light of the growing interest in enotourism, Barbierato et al. (2022) conducted a study to analyse the quality of services and their potential failures during wine cellar visits. The study analysed five highly developed wine regions globally. The results included issues such as wine, staff, tasting, tour, service, view, regional food and restaurant themes (Barbierato et al., 2022).

In order to study the dynamics of the development of the wine sector, Czupryna et al. (2018) conducted a study based on the agent model for the Polish region of Małopolska as an alternative to the econometric model. This research showed that the effect of industry grouping with the possibility of mutual exchange of knowledge and experience enables new producers to enter the market more conveniently. In conclusion, the authors identified the drivers of crop development in this region as social, economic, microclimatic or behavioural in nature (Czupryna et al., 2018).

## Research methods

To illuminate the current state of knowledge on wine architecture and spatial planning in light of enotourism development, a systematic literature review was conducted based on the information contained in the Scopus bibliographic database in steps shown in Figure 1.

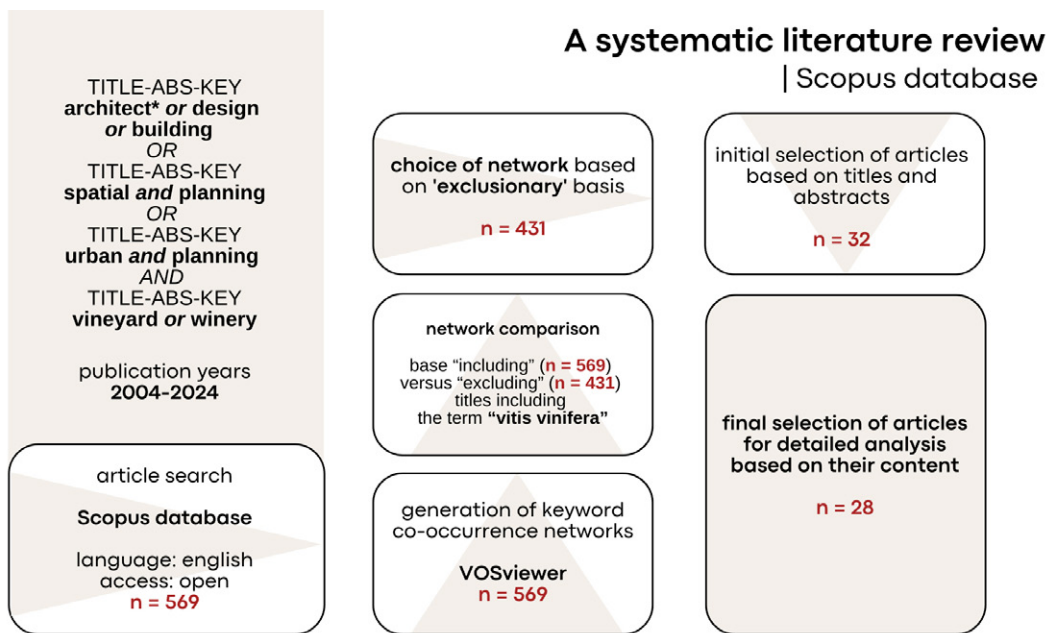


Figure 1. Stages of the systematic review of the Scopus database

The search was carried out on the basis of words identified in titles, abstracts and keywords in publications found in the Scopus database using the operators 'and' and 'or', according to the search order presented below:

- (ARCHITECT\* or DESIGN or BUILDING) OR,
- (SPATIAL and PLANNING) OR,
- (URBAN and PLANNING) OR,
- (VINEYARD or WINERY).

Keywords were selected in such a way as not to omit publications that can make a significant contribution to the knowledge of wine architecture and related urban planning, as well as enotourism, cultural heritage issues and economic development. The search was conducted among open-access publications in English only. A bibliometric analysis of the keyword co-occurrence network generated using VOSviewer software was used to build the database. The primary database included 569 publications.

The co-occurrence network 1 of the author's keywords (Figure 2) has several points concentrating on publications, particularly around thematic clusters linked to the agricultural industry. Among the publications, a thematic link was sought with the architecture of wine facilities, vineyard land use and wine tourism, specifically in the context of architecture. In order to refine the search area, it was decided to exclude the term 'vitis vinifera' from the titles of the publications as one of the focal points

of the publications around the agrarian theme. This action reduced the number of searched publications to 431 articles. The analysis of the re-generated network 2 (Figure 2) showed that, among the 14 identified thematic clusters, the retrieved publications are more related to the topics of architecture and urban planning. A significant phenomenon occurring in network 2 is the appearance of the term 'landscape' at its centre.

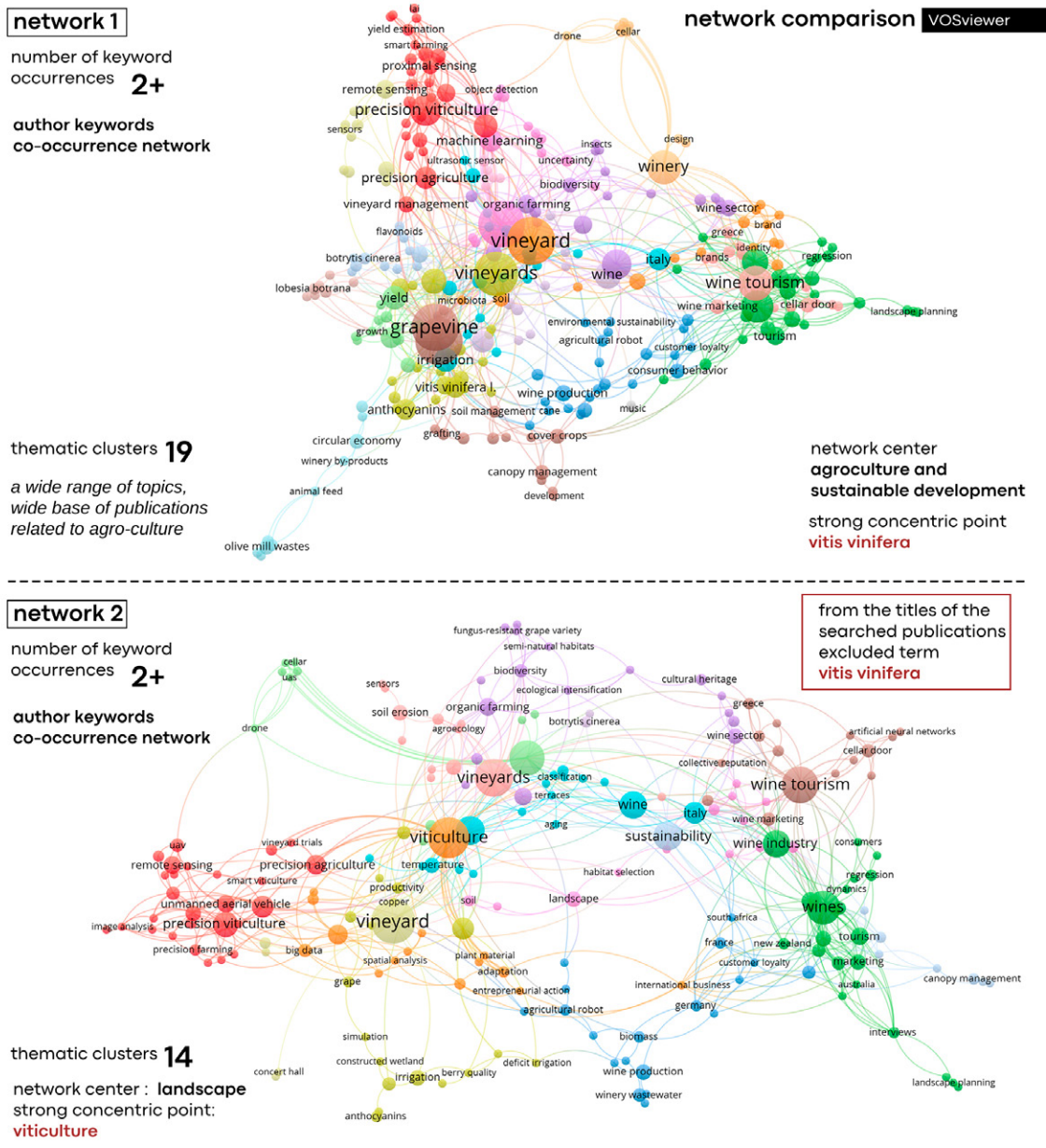


Figure 2. Author keyword co-occurrence network

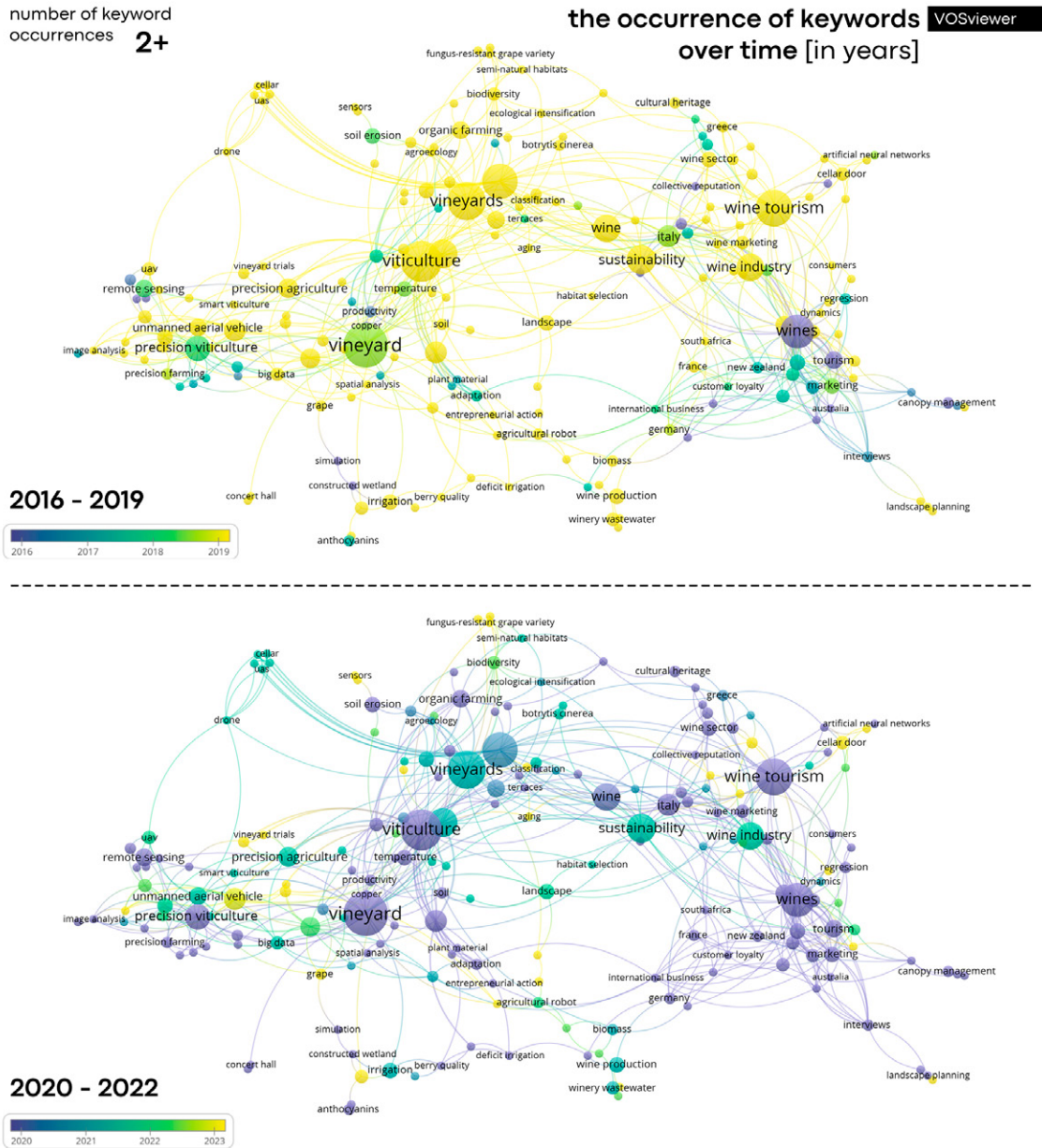


Figure 3. Comparison of author keyword co-occurrence networks over time

After generating the keyword co-occurrence network 2 (Figure 2), it was analysed in which years selected articles were created. Based on the analysis of the co-occurrence network and the occurrence of keywords over time (Figure 3), it was observed that publications (431 articles) were mostly published between 2016 and 2023. The largest number of articles were published between 2020 and 2021, indicating the topicality of the topic covered.

The final selection of articles based on titles and abstracts led to a selection of 26 publications based on their content. The articles selected for further analysis respond thematically to the imposed issues, which are wine architecture and the accompanying spatial development in light of the contemporary development of enotourism. During the analysis of the titles, abstracts and content of the articles, the group was narrowed down until the final set was subjected to detailed analysis. In the content, the answers were sought to previously posed research questions concerning the problem of the form of vineyard facilities, the solution of the vineyard function in terms of economic efficiency, or the link between the form and function of facilities located on vineyards – whether the vineyard function alone is sufficient or whether it should be enriched architecturally.

The articles from the group of 26 publications selected for detailed review were published between 2011 and 2023, but the largest number of them were written between 2017 and 2023. The thematic diversity of the publications of this set is characterised by a relatively even distribution over time, but the greatest interest in the issue of vineyard spatial planning can be seen in the years 2020-2021.

## Research results

In order to systematise the topics covered in the publications, they have been categorised into five thematic groups in Table 1. Among the articles analysed, links to the themes of enotourism and wine cultural heritage were sought and recognised, but they dealt with divergent issues, so two subgroups were identified among the main thematic groups to distinguish these publications.

Table 1. Division of publications into thematic groups

Thematic group	Thematic subgroup (if apperas)	Publications
The impact of seismic events		Ogunmakinde et al. (2023); Dizhur et al. (2017)
Energy efficiency issues		Hall-Smith et al. (2023); Gómez-Villarino et al. (2021); Barbaresi et al. (2017); Nocera et al. (2020); Tinti et al. (2017); Boulton (2017); Torreggiani et al. (2018)
Architecture		Harea and Eplényi (2017); Gómez et al. (2018); Rossi and Pellizzari (2013); Torreggiani et al. (2013)
		Dodd et al. (2023); Merino-Aranda et al. (2021)
Spatial planning	Cultural heritage	Tóth and Timpe (2017); Ferretti and Gandino (2018); Verešová and Supuka (2013); Bugár et al. (2020); Jeziorska-Biel et al. (2021)
		Imbrenda et al. (2023); Assumma et al. (2021)
		Pijet-Migoń and Królikowska (2020)
Business and economics	Enotourism	Colombini (2015); Barbierato et al. (2022)
		Czupryna et al. (2018)

In Table 1, it is apparent that to date is to address topics related to spatial planning. Equally frequently addressed in publications are issues for buildings and land use related to energy efficiency and design against seismic events. In the case of energy efficiency of buildings, this is driven by the need to ensure adequate thermal conditions for wine production, to meet sustainability objectives or to reduce maintenance costs. The thematic group on seismic events consists of publications on wineries located in earthquake-prone regions, such as New Zealand. Topics directly related to the architecture of winery facilities are an important group among the listed publications but are less numerous than the above-mentioned group of publications related to urban planning. The least numerous group of publications are articles related to business and economics, contributing knowledge on the link between architectural facilities and winery branding.

As previously mentioned, among the main thematic groups, subgroups addressing issues related to cultural heritage and enotourism development have been identified. Indeed, this follows from the aim of the article, which is to identify and verify the state of the art in architecture and urban planning in light of contemporary wine tourism development. In light of these issues, the cultural heritage of winemaking plays an important role in the issue of enotourism development, and these issues are complementary.

As in Figure 4 and Figure 5 most of the publications selected for detailed analysis deal with issues related to spatial planning with a distinction of subgroups dealing with the topic of cultural heritage and enotourism. In second place is the thematic group dealing with issues related to the energy efficiency of civic byways. Another group of publications are articles addressing issues related to wine architecture, and there is also a subgroup thematically focused on the aspect of cultural heritage.



Although the other 2 groups are less numerous (Business and economics and The impact of seismic events), they bring useful knowledge. Uniquely relevant to the review are the groups of publications thematically related to Architecture and Urban Planning.

Chart 1. Share of the selected group of publications [%] in individual thematic groups and subgroups

Total number of articles selected for detailed analysis **26**

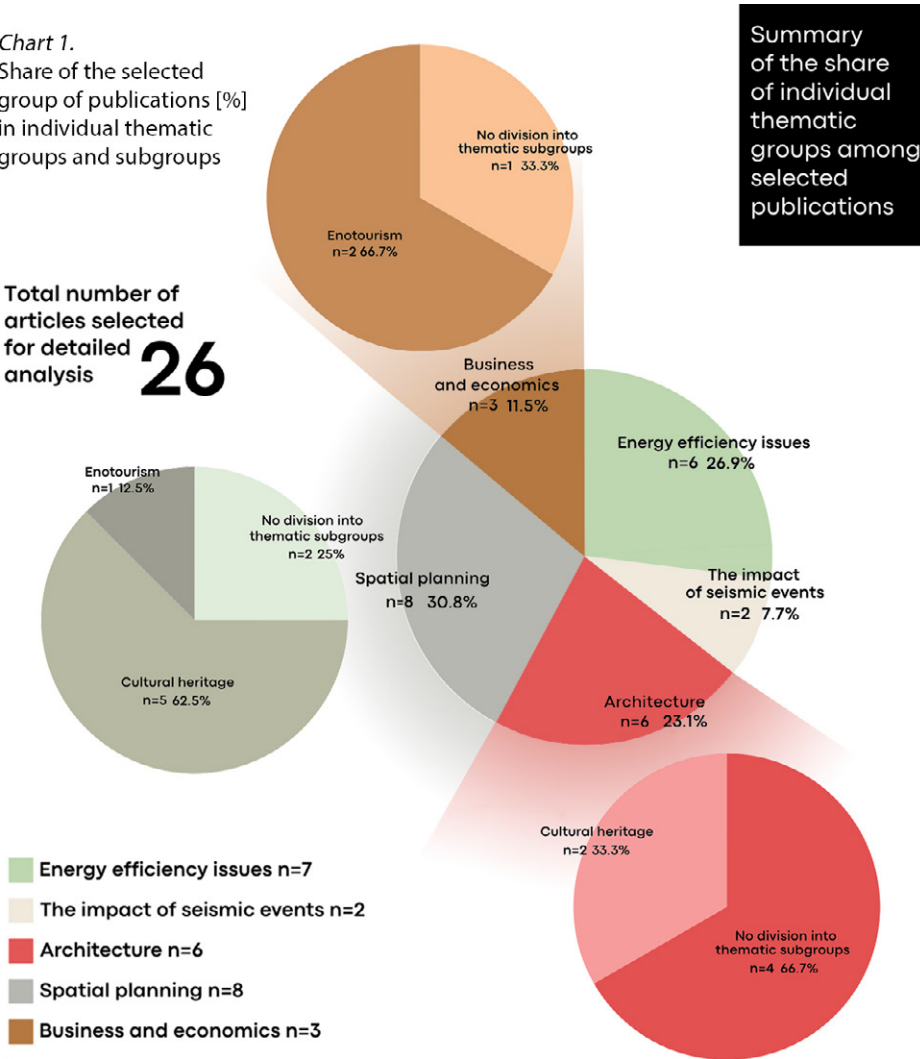


Figure 4. Percentage of publications selected for detailed analysis in individual thematic groups and subgroups

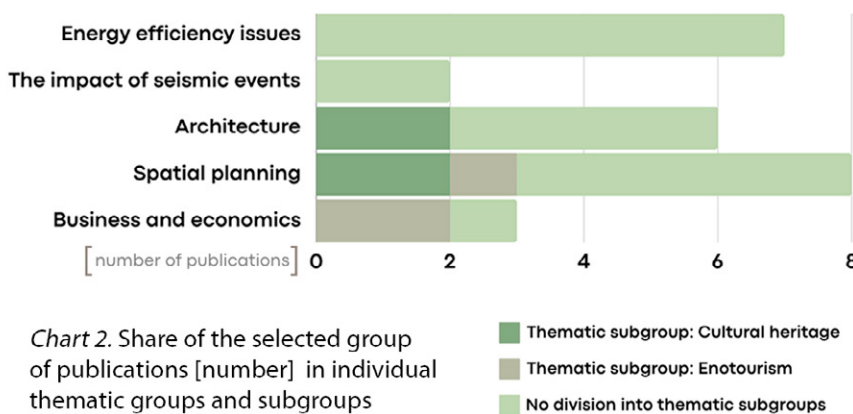


Chart 2. Share of the selected group of publications [number] in individual thematic groups and subgroups

Figure 5. The numerical share of publications selected for detailed analysis in thematic groups, specifying individual subgroups

## Conclusions

The results of the review showed the carrying capacity and validity of the topic and its orientation around the cradles of world winemaking, e.g. Italy. There are, however, publications on areas less identified with this culture, such as Poland and Slovakia. The bibliometric analysis conducted showed that in the first and second decades of this century, there was an intensity of publications in the area under study. Among the searched publications were those dealing with urban planning or architecture, as well as those discussing energy efficiency, highlighting the essence of sustainable design and climate resilience. The following review has shown that in projects embedded in the vineyard landscape, there are connections between spatial planning and architecture that have an impact on the interest and expansion of visitors to vineyards. The previously mentioned elements and features of a winery, namely architecture, landscape, and energy efficiency, affect the economic results of the plantation business.

The conducted review carried out made it possible to verify the research potential of topics related to vineyards' architecture and land use. The potential for tourism development and, consequently, economic development of wine regions was observed. The aim of the study was to identify the current state of knowledge on architecture and urban planning in light of contemporary wine tourism development and to systematise this knowledge through a thematic classification of the literature. Literature sources on the topic sought were identified, and publications were grouped into 5 thematic clusters, including 2 subgroups containing publications dealing with cultural heritage or enotourism.

This work attempts to answer the stated research questions. Addressing the first of these, "How to link the functions of new vineyards with economic efficiency?" – among the studies reviewed, there were publications determining the possibilities of linking vineyards to economic efficiency, e.g. as a result of the concentration of vineyard activities on both industry and tourism as part of a marketing strategy. There was also a question of whether enotourism would be a sufficient function or is the architectural form of the building and its fit with the landscape was important. Replying architourism resulting from the artistic and cultural attractiveness of vineyard sites complements enotourism, it has also been confirmed in the literature. However, it was not possible to find a direct answer to the issues related to the form of the new vineyard facilities, so one of the questions raised about whether they should be an expression of a modern form or a historicist one was not answered. Amongst publications, there is a lack of source knowledge on the ways to adapt historic winery facilities to contemporary production and service conditions. The author identified the need to develop design criteria for contemporary winery projects and land use, including the location of new wineries, in order to adapt new projects to local conditions and achieve the best economic outcome for the winery. It is also worthwhile to establish criteria for the evaluation of existing winery facilities and sites. Further exploration of the research area can provide knowledge for future design and planning activities that can influence the tourism and economic development of wine regions.

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## BADANIE POTENCJAŁU ARCHITEKTONICZNO-PRZESTRZENNEGO KULTURY WINIARSKIEJ. SYSTEMATYCZNY PRZEGLĄD LITERATURY

STRESZCZENIE: Niniejszy artykuł przedstawia wyniki systematycznego przeglądu bazy danych bibliograficznych Scopus, podczas którego zbadano stan wiedzy na temat architektury winiarskiej i urbanistyki towarzyszącej winnicom wobec współczesnego rozwoju enoturystyki. W drugiej dekadzie XXI wieku wzrosło globalne zainteresowanie enoturystyką, czemu towarzyszy odrodzenie i rozwój kultury winiarskiej. Celem badań była identyfikacja oraz weryfikacja źródeł wnoszących wkład do wiedzy dyscyplinarnej na temat architektury winiarskiej i zagospodarowania przestrzennego towarzyszącego winnicom w świetle współczesnego rozwoju turystyki winiarskiej, a także klasyfikacja tematyczna literatury. Na podstawie analizy bibliometrycznej z wykorzystaniem oprogramowania VOSviewer wyodrębniono grupy tematyczne publikacji. Zainteresowanie tematem jest próbą odzyskania aktualnych kierunków koncentracji badań umożliwiających dopasowanie powstającej architektury winiarskiej.

SŁOWA KLUCZOWE: architektura winiarska, planowanie przestrzenne, winiarnie, enoturystyka, krajobraz kulturowy