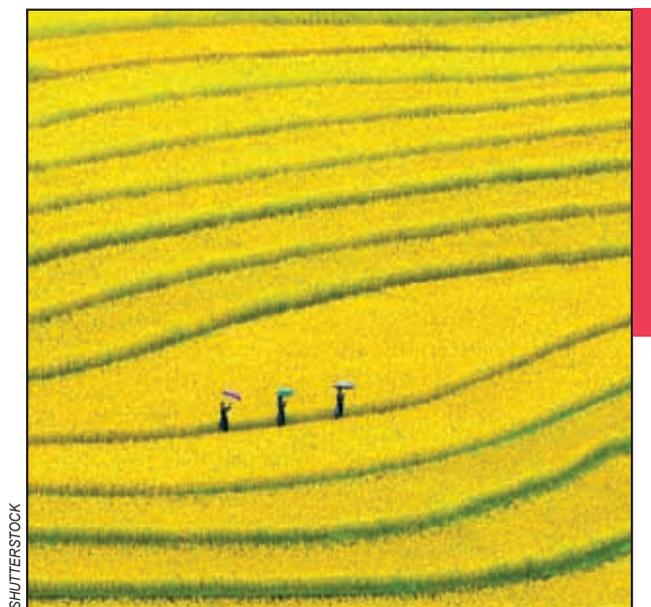


# TERRACED LANDSCAPES: AN INCREASINGLY PROMINENT CULTURAL LANDSCAPE TYPE

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Terraced paddy fields in Vietnam.

## Terraced landscapes: an increasingly prominent cultural landscape type

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**ABSTRACT:** Over the past decades, attractive terraced landscapes composed of cultivated terraces have been increasingly dealt with in studies in geography, landscape architecture, ethnology, rural sociology, agronomy, pedology, and other spatial disciplines. Around 2000, several important research projects were carried out. The Terraced Landscapes Alliance (ITLA) was established, and terraced landscapes have also obtained their place within the European Geosciences Union (EGU) and EUCALAND. During this period, research on terraced landscapes has also intensified in Slovenia. All five articles featured in this special thematic issue of *Acta geographica Slovenica* are also briefly presented.

**KEY WORDS:** geography, cultural landscape, terraced landscape, terraces, cultural heritage, terraced landscapes bibliography

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# 1 Introduction

Terraced landscapes are constructed cultural landscapes with special value, and an exceptional physiognomy, in which terraces are the most important element (Ažman Momirski and Kladnik 2015b). Terraces can be found across the entire globe. In some areas, they were created by developed civilizations over millennia, whereas elsewhere they developed completely spontaneously as people adapted to the natural conditions and improved their ability to make a living. They reflect a harmony between man and nature, and in many cases also between people themselves (Kladnik et al. 2016b), which is expressed through the appearance and numerous functions of terraced landscapes. In many areas cultivated terraces provide food and have incomparable scientific, cultural, historical, ecological, and aesthetic value, and even psychological, philosophical, and religious value (Kladnik et al. 2016b). The terraces facilitate the lives of the people and they safeguard the environment by protecting the land and water (Junchao 2015). Their aesthetic value (Smrekar, Polajnar Horvat and Erhartič 2016) is defined by a repeating pattern of terrace platforms and slopes, or hill slope geometrization (Ažman Momirski and Radikon 2008; Ažman Momirski and Kladnik 2015b).

The EU has included cultivated terraced landscapes in its 2007–2013 rural development plan, its agricultural biodiversity action plan (to improve or maintain biodiversity through the abandonment or change of agricultural activities), its thematic strategy for soil protection (Lasanta et al. 2013), and numerous research projects and civic movements (Varotto 2015).

This special issue of *Acta geographica Slovenica* presents some of the latest research achievements in examining cultivated terraces and terraced landscapes connected with investigation of some more important elements of the modern transformation of terraced landscapes in Slovenia, neighboring Croatia, and nearby Slovakia.

## 2 International research on terraced landscapes

### 2.1 Main research topics

Terraces consist of flat or slightly inclined platforms of various widths used for cultivation separated by steeper embankments. These embankments differ in their type of material, which determines the solidity of the terraces, and in their height and individual slope (Kladnik et al. 2016b). They reduce the overall slope gradient and length, facilitating cultivation on steep slopes, and increase the infiltration of water in areas with moderate to low soil permeability, with positive effects on agricultural activities (Tarolli et al. 2015).

As an agricultural system, terracing has been known and used since the Neolithic (Agnoletti et al. 2015). One can find agricultural terraces in different topographic conditions, e.g., coastal areas, hilly areas, and steeply sloping mountain landscapes (Tarolli et al. 2015).

Agricultural terraces are among the most evident and extensive human signatures on various landscapes of the world. Accordingly, they have been the focus of a wide variety of studies, especially over the past two decades. The studies concentrate on their origins and time of creation, exploring their shapes and main types. A significant body of research is dedicated to their geographical distribution and the related natural conditions, primarily involving studies of relief elements and soil degradation. Terraces are built to retain more soil and water, to use sun exploitation and the reflection of the warmer temperature from the steep. Furthermore to reduce both hydrological connectivity and erosion, and to support irrigation. This is dealt with in studies of the numerous terrace functions, comprising the economic approaches mentioned above, studies in the humanities, and entirely geomechanical examinations of terraces' contribution to slope stability. Connected with this are studies of the processes and factors related to rural transformation, such as changes in land use and its intensity, and analyses of the impact of ownership and accessibility on the extent of terracing in the landscape. It can be argued that, due to a large number of influential factors, terraced landscapes are a sensitive indicator of rural development or transformation. This is what their significant social role (crop, fruit and wine production) was based on in the past. With the increasing importance of tourism, this role is now gaining new dimensions (Peters and Junchao 2012; Tillmann and Bueno de Mesquita 2015).

On the other hand, agricultural terracing introduced critical issues: increases in slope failures and hydraulic erosion processes with consequent loss of nutrients and redistribution of chemicals. Perhaps the

most important topic related to cultural terraces (especially in developed countries) is that of land abandonment. Industrialization was associated with people moving from the countryside to towns and with fundamental demographic changes, especially shrinking and aging of the farming population and a resulting shortage of agricultural labor. Lack of irrigation equipment and poor road access to the land resulted in the abandonment of a significant number of traditional terraces in recent decades, especially in the Mediterranean area. Land abandonment has resulted in a progressive increase in various processes of land degradation in agricultural terraced landscapes (Tarolli et al. 2015). Terraces' sporadic and partial revitalization only took place in the last decade and can be ascribed to suburbanization, strengthening of the market economy and resulting increased demand, better road access to the land for farm machinery and emerging tourist flows.

## 2.2 A brief historical outline of studying cultivated terraces and terraced landscapes

Cultivated terraces were mentioned in research as early as the mid-nineteenth century (e.g., Kelly 1862). They attracted more attention after the Second World War, but organized research on terraced landscapes only intensified around 2000. Several important projects were carried out at the end of the twentieth century and during the first decade of the twenty-first century: the PROTERRA (1997–2001), RERTC (1997–2001), PATTER (1999–2001), TERRISC (2004–2006), and ALPTER project (2005–2008) (see Ažman Momirski and Berčič 2016 for details). The project team of the ALPTER project, founded in 2003 and 2004 based on university initiatives developed the methodological bases for evaluating terraced landscapes. Its results appeared in two publications: *Terraced Landscapes of the Alps: Atlas* (Scaramellini and Varotto 2008) and *Terraced Landscapes of the Alps: Projects in Progress* (Fontanari and Patassini 2008). The first one features one Slovenian article (Ažman Momirski 2008) and the second features two (Ažman Momirski, Škvarč and Kodrič 2008; Komac and Zorn 2008).

The international study of terraced landscapes reached its peak with international conferences on terraced landscapes. At the first one, which took place in China in the fall of 2010, the International Terraced Landscapes Alliance (ITLA) was established and the Honghe Declaration on the protection and development of terraces was adopted. Together with over one hundred conference papers on various aspects of terraced landscapes from around the globe, this declaration was published in an extensive volume in Chinese and English (Peters and Junchao 2012), which also includes one Slovenian contribution (Ažman Momirski and Kladnik 2012).

The second conference was held in Peru in May 2014. One of its results is an extensive volume of conference proceedings (Tillmann and Bueno de Mesquita 2015), which also features two Slovenian papers (Ažman Momirski and Kladnik 2015a; Ažman Momirski 2015a).

The third conference (Terraced Landscapes: Choosing the Future 2016) was held in Italy in October 2016, right at the time when this editorial was being written. In line with the rich Italian tradition of studying terraced landscapes (e.g., Barbera et al. 2010; Tarolli, Preti and Romano 2014; Agnoletti et al. 2015), pre-conference meetings were held in ten areas, each one highlighting a specific topic.

In connection with the third world conference, a special edition of the Slovenian journal *Annales, Series Historia et Sociologia* dedicated to terraced landscapes was issued. Among its seventeen articles, fourteen of which deal with cultivated terraces or terraced landscapes, four focus on the findings of detailed studies of Slovenian terraced landscapes (Kladnik et al. 2016a; Ažman Momirski and Berčič 2016; Berčič 2016; Guštin 2016).

Research is also taking place as part of the European Geosciences Union (EGU). One of its sections, titled »Agricultural terraces of the world: Their pedological, geomorphological and hydrological role« (Tarolli et al. 2015), dedicates special attention not only to the topics highlighted in its title, but also to the use of technological applications for field data analysis and topographic surveys (i.e., remote sensing), empirical and modeling approaches, and advances in environmental planning strategies for agricultural terrace management. In 2015 and 2016, when this section was active, a series of papers exploring terraced landscapes were presented, including three Slovenian ones (Ažman Momirski 2015b; Kokalj 2015; Komac and Zorn 2015).

Since 2015, systematic research on terraced landscapes has also been carried out as part of the non-governmental organization of European experts, EUCALAND (European Culture Expressed in Agricultural Landscapes), which promotes the systematic study of typical European landscape types. It is closely connected

with the activities of the Permanent European Conference on the Study of the Rural Landscape (PECSRL). Wooden pastures were the first to be studied as part of EUCALAND; they comprise pastures in traditional rural orchards, fruit-tree and cork-oak plantations, olive groves, and farmland that is already being overgrown by shrubs or trees. In addition, research on water meadows and enclosed fields is still ongoing.

### 3 Studying cultivated terraces and terraced landscapes in Slovenia

Although Slovenia does not have terraces that rank among the best-known such landscapes in the world (i.e., those that are irrigated for rice production), Slovenian terraced landscapes are sufficiently diverse that they deserve special treatment. We seek to reveal their inner structure and to highlight the elements by which they differ from one another. Their diversity is also a consequence of the fact that Slovenia has a great variety of natural landscape types (Ciglič and Perko 2013; Perko, Hrvatina and Ciglič 2015).

For a long time, Slovenian geographers failed to treat terraces as an important landscape phenomenon. There were only individual regional studies, among which Titl's (1965) was the most notable. His study relies at least partly on Melik's rather in-depth discussion on cultivated terraces in the countryside along the Slovenian coast (Melik 1960). Titl was also the first to develop a typology of terraces. Much later the terraces in the Koper Hills were dealt with in Drobnjak's article on the physiogeographic significance of cultivated terraces and typology (Drobnjak 1990) and in Kladnik's article on the possibilities of their intensification (Kladnik 1990). An in-depth study of the Gorizia Hills (Vrišer 1954) devotes only scant attention to cultivated terraces, mostly concerning field division and cultivated plants. In eastern Slovenia, in the monograph *Ljutomersko-Ormoške gorice* (The Ljutomer–Ormož Hills), the author (Belec 1968) mentions the completely altered landscape image caused by the terraces.

An exhaustive chronological overview of research on cultivated terraces and terraced landscapes in Slovenia and an outline of Slovenian terraced landscapes were only published a few years ago (Ažman Momirski and Kladnik 2009). Also noteworthy are an article about terraced landscape in the Brkini Hills (Ažman Momirski and Kladnik 2015b) and a comparative study of land-use changes in the Mediterranean terraced settlements of Krkavče in the Koper Hills and Ostrožno Brdo in the Brkini Hills (Ažman Momirski and Gabrovec 2014), a study created based on fieldwork in selected Slovenian terraced landscapes (Križaj Smrdel 2010a; Križaj Smrdel 2010b), and the in-depth volume *Terasirana pokrajina Goriških brd* (Terraced Landscapes of the Gorizia Hills; Ažman Momirski et al. 2008). It is an interdisciplinary, geographical, historical, ethnographic, and architectural study, which still remains the most in-depth study of a Slovenian terraced landscape. Another two studies from this time that should be mentioned address the threat that landslides pose to Slovenian terraced landscapes (Zorn and Komac 2007; Komac and Zorn 2008).

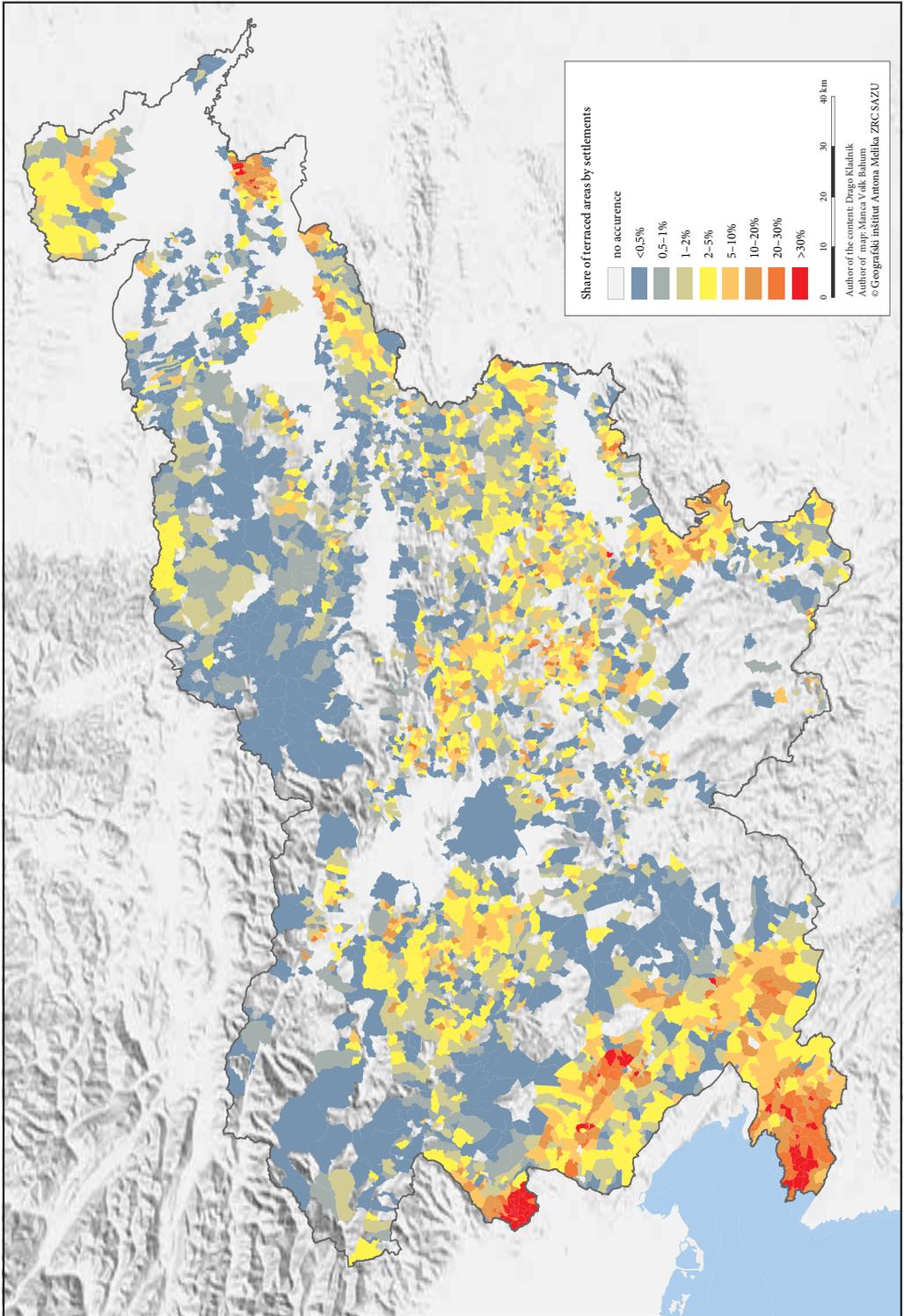
In one of the most recent articles (Kladnik et al. 2016a), the geographical distribution and characteristics of selected typical terraced landscapes in Slovenia are presented, based on analysis of the metric characteristics and the qualities of individual terraces and their components (terrace platforms and terrace slopes).

The extensive volume *Terasirane pokrajine* (Terraced Landscapes; Kladnik et al. 2016b) was published in April 2016 upon the seventieth anniversary of the ZRC SAZU Anton Melik Geographical Institute. It is an illustrated text that presents terraced landscapes around the world and Slovenian landscapes, as well as natural and manmade non-agricultural terraces. As far as we know, it is the first and only work of this type in the world.

### 4 The articles

The journal *Acta geographica Slovenica* has a long tradition in regional geography. With the articles in this special issue (volume 57, issue 2), we present the comprehensive and multidisciplinary nature of the geographical approach to the study of cultural terraces and terraced landscapes.

Figure 1: Share of terraced areas by settlement in Slovenia. The level of terracing in Slovenia reflects various natural conditions and cultivation trends associated with them. ► p. 78



Following this introduction the special issue begins with the article *Cultivated terraces in Slovenian landscapes* (Šmid Hribar et al. 2017). Its authors study the characteristics of cultivated terraces and their use at selected pilot sites in various Slovenian landscape types. They report that one of the greatest problems for the continued existence of cultivated terraces is the abandonment of their use and subsequent overgrowth, highlighting the issue of land ownership and assuming that the share of privately owned overgrown terraced land is smaller than that of publicly owned land of this type. They also identify natural conditions as factors influencing the abandonment and overgrowth of terraced landscapes. In addition, they raise the issue of further maintenance and protection of aesthetically complete terraced landscapes, recognizing their significant tourism potential.

In the article *Terraced landscapes in Slovakia* (Špulerová et al. 2017) its authors investigate the distribution of terraced landscapes and analyze their structural characteristics and land use. They found that traditional farming and terrace building as a part of agricultural intensification resulted in two main types of terraced landscapes: historical terraced landscapes and new terraced landscapes. The two types differ in size, structure of various elements, their management intensity, and the impact of these spatial structures on biodiversity. The preservation of such landscapes mostly depends on tradition and is highly dependent on the demographic situation. These areas are of great value, both from the perspective of nature and heritage conservation as well as with regard to landscape and aesthetic values.

In the article *Classifying the Mediterranean terraced landscape: The case of Adriatic Croatia* (Andlar, Šrajer and Trojanović 2017), the authors present the Croatian Adriatic terraced landscape classification, with the aim of highlighting its natural and cultural background and proposing a classification framework for further research. The proposed classification framework is based on the landscape pattern dimension whereby the extraction of the class is primarily based on the structure, but also interpreting the geomorphological, biophysical, and cultural-historical circumstances that affected its genesis. Nine classes of terraced landscapes are singled out, described, and referred to with example locations, and also clarified with illustrations and photos.

In the article *Terraced landscapes as protected cultural heritage sites* (Kladnik, Šmid Hribar and Geršič 2017), the authors present the current state of protection of terraced landscapes, both globally and in Slovenia. The UNESCO World Heritage List, the Satoyama Initiative list, and the Slovenian Register of Immovable Cultural Heritage are analyzed. The findings show that terraces rarely appear as a factor justifying protection, even though certain progress has been made in recent years. Intangible aspects of terraced landscapes (e.g., group work, celebrations, rituals) are already being recognized around the globe, but this does not apply to Slovenia. Slovenia shows both a lack of appropriate criteria for identifying terraced landscapes worth protecting and an insufficiently systematic treatment of heritage sites that are already being protected.

In the last article *Transformation of the Jeruzalem Hills cultural landscape with modern vineyard terraces* (Pipan and Kokalj 2017), the authors emphasize that the terraced landscape in the Jeruzalem Hills is the result of specific socioeconomic conditions under communism. Nowadays its appearance is drastically changing for the second time in the last fifty years. The authors examine the creation of a new landscape layer of modern cultivated terraces, study their disappearance, and discuss the return to a condition similar to the original state. It is determined that, despite the recognized aesthetic value of terraces, legal protection in the form of a nature park has not impacted their preservation. The analysis is based on interviews and visual interpretation of aerial laser scanning (lidar) data.

## 5 Conclusion

The articles in this special issue of *Acta geographica Slovenica* provide an interdisciplinary and comprehensive examination of terraced landscapes in three countries on the border between central and eastern Europe, combining the research potentials of geographers, landscape architects, and biologists. The geographers highlight the spatial, developmental, and protection aspects of terraced landscapes, the landscape architects develop the typology of cultivated terraces using detailed images of terrace structure in individual terraced landscapes, and the biologists explore the landscape ecology elements within the established typology of terraced landscapes.

Due to its comprehensive approach, fresh methods, and newly covered topics, this special issue of *Acta geographica Slovenica* dedicated to terraced landscapes and cultivated terraces is a significant contribution to a better understanding of the characteristics of terraced landscapes and their typology.

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