


# Transnational water resource management in the Karawanken/Karavanke UNESCO Global Geopark

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## Abstract

**PURPOSE:** The management of cross-border natural resources has been the focus of research in different disciplines. Nonetheless, beyond theoretical insights, empirical evidence of successful cross-border management or governance of natural resources is still limited, even in the European Union (EU), where a range of instruments are provided to foster cross-border cooperation between its Member States. This is where our paper departs, providing evidence from an example of cross-border cooperation between two Member States of the EU, Austria, and Slovenia, adding to the analytical framework to identify the drivers of successful cross-border cooperation. **METHODOLOGY:** Drawing from the example of the European Grouping of Territorial Cooperation (EGTC) Geopark Karawanken we evaluate the success factors and limits for transboundary cooperation encompassing different forms of cooperation. Furthermore, based on empirical evidence of workshops with local, regional, and national stakeholders, we investigate the potential of the EGTC organizational framework to provide for the successful cross-border management of water resources within the Geopark area. **FINDINGS:** Our analysis of project bundles, joint ventures/consortia, and EGTCs as possible forms of transboundary cooperation indicates that EGTCs have various advantages over looser forms of cooperation. Higher operational costs for the organization are contrasted by enhanced governance of transboundary

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activities, in accordance with legal frameworks and representation on both sides of the border. This increases acceptance and facilitates decision-making. Furthermore, it increases the potential for receiving funds in accordance with planned activities and regional requirements, while decreasing the individual financial risk for partners. The genesis of the Karawanken/Karavanke UNESCO Global Geopark (Geopark Karawanken) indicates that looser forms of organization, for instance, project bundles, enable stakeholders to get to know each other without great institutional effort. In the course of increasing integration, the organizational form can be more complex. The experience in developing transboundary, water management instruments shows that even in a more sophisticated form of cooperation like an EGTC, there are remaining obstacles in managing transboundary natural resources. Obstacles result from e.g., national laws and regulations, data standards, monitoring techniques, and soft factors such as language barriers. **IMPLICATIONS:** The example of the Geopark Karawanken shows that cross-border public authorities can be significantly supported with the introduction of an EGTC. Still, an EGTC tends to exclude private companies or societal actors because they cannot be active members of the Board. Exploring further options for closer integration of the private sector in Public-Private-Partnership (PPP) models may be useful to maintain the opportunity to include much-needed private skills and resources. The experience of the Geopark Karawanken suggests that EGTCs can and will be a significant form of organization in Europe for a number of activities, for example, in the field of cross-border resources, cross-border protected areas, or cross-border predicate regions. This will support the achievement of the goals of EU programs to face the climate and biodiversity crises through transnational agreements, e.g., the Green Deal or the Biodiversity Strategy. **ORIGINALITY AND VALUE:** This article provides a concise overview on transnational water resource management in the European Union in the context of an EGTC, and raises points for practitioners about potential challenges for the successful introduction of an EGTC. While the analysis of common experiences of various EGTCs could lead to the development of a European standard and guideline for the successful foundation of this territorial cohesion tool, this paper provides the first step, paving the road for future research.

**Keywords:** European Grouping of Territorial Cooperation, Karawanken/Karavanke UNESCO Global Geopark, transnational cooperation, European Union, water resources management

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## INTRODUCTION

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The management of cross-border natural resources, particularly water, has been studied in economics and political science, but first and foremost in geography. Economic implications resulting from the nature of water as a common good and prerequisite of human life, but also its institutional implications, constitute a major share of published literature (e.g., Beck, 2017; Noferini et al., 2020). For the European Union (EU), a couple of studies

exist on river management and water governance (e.g., Lindemann, 2006; Renner et al., 2018; Renner & Meijerink, 2018). While the majority of existing literature focuses on the governance of major transboundary river basins (e.g., Bernauer, 2002; Wiering et al., 2010), less attention has been paid to regional river basins that are shared between countries and represent a large share of the world's cross-border water resources. Empirical evidence of successful cross-border management or governance of water resources is still limited for the EU. Examples show that even though cross-border cooperation is mostly sanctioned at national level it is mostly shaped and organized at a regional and local level (Renner et al., 2018).

The EU provides a range of instruments to foster border-spanning cooperation in resource management between its Member States (MS) (Noferini et al., 2020). Still, the question of how cooperation can be developed and institutionalized on a sub-national level is hardly addressed. The issue is even more acute when it comes to the inclusion of non-public actors and citizens. This is where our paper departs, providing evidence from an example of cross-border cooperation between the local level of two MS of the EU, Austria, and Slovenia. We provide the example of the European Grouping of Territorial Cooperation (EGTC) Geopark Karawanken, which is the management organization of the Karawanken/Karavanke UNESCO Global Geopark (hereafter referred to as Geopark Karawanken). This geopark has at least 11 years of different cross-border cooperation experiences that can be analyzed and discussed in the context of their particular challenges.

The Geopark Karawanken is a cross-border region connected and divided by the mountain range of the same name. It is located along the border of Austria and Slovenia and is marked by the wide geological variety between the Alps and Dinarides. It was established in 2011, and in 2013 it became a member of the European and the Global Geopark Network (EGN and GGN, respectively). It covers an area of 1,067 km<sup>2</sup> and includes nine Austrian and five Slovenian municipalities (Štrucl et al., 2014). On the 27th of November 2019, the management organization of the geopark, the EGTC Geopark Karawanken, was officially founded (Geopark Karawanken, 2019a). It is the first EGTC on the Austrian-Slovenian border as well as the first EGTC with its official seat in Austria. With the new organizational structure, the Geopark Karawanken became an area where voluntary cooperation of municipalities was upgraded into an obligatory action. This new organizational structure of the Geopark Karawanken has several advantages over its previous forms of cooperation. For example, the advantages lie in the increased potential for gaining strategic projects to develop the cross-border region in a transboundary effort and maintaining the status of the best example of cross-border cooperation between municipalities on the border between

Austria and Slovenia. Enhanced cross-border cooperation between municipalities of the Geopark Karawanken in other areas (e.g., transport and mobility, protection of natural resources and protection against natural disasters, building up monitoring and early warning systems) is expected in upcoming years.

Cross-border cooperation between institutions is important for the development of peripheral border regions – such as the area of the Geopark Karawanken – to tackle socio-economic problems and thus improve the quality of life for residents on both sides of the border (Gruber, 2013). From the long-term experiences of the EGTC Geopark Karawanken we evaluate the success factors and limits for transboundary cooperation in different organizational forms. Furthermore, we investigate the potential that the organizational framework provides for the successful cross-border management of water resources within the geopark area, including remaining obstacles such as different national laws and regulations, data standards, monitoring techniques and soft factors like language barriers. These questions are framed in the context of the INTERREG SI-AT project KaraWAT (2021-2022). Regarding these objectives, in this paper we work on the following research questions (RQ):

- RQ1) What are the success factors and limits for transboundary cooperation for project bundles, joint ventures/consortia and EGTCs?*
- RQ2) How can the EGTC framework support successful cross-border water resource management decisions in the cross-border Karawanken UNESCO Global Geopark and what are the remaining obstacles?*

The paper proceeds as follows: Firstly, we discuss the relevant literature concerning cross-border management of natural resources and transboundary cooperation. We describe the genesis of the EGTC Geopark Karawanken and give insights into water resources within the Geopark area. In the methods section we explain the attributes that we used to rate the practicality of different cross-border organizational forms and the workshops that were carried out within the frame of the project KaraWAT. The results demonstrate the potentials and limitations of different cross-border organizational forms and the experiences on cross-border water management decisions within the EGTC Geopark Karawanken. The discussion highlights research gaps and limitations of transboundary cooperation. The article concludes with a recommendation of measures that were elaborated upon within the workshops.

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## LITERATURE REVIEW

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### Cross-border management of natural resources

Natural resources like water or forests play an essential role in modern societies, being relevant for economic development as well as ecological sustainability. Thus, the nature and related scarcity of many of these resources – and the associated problems of efficient management or pricing – represent a particular challenge that is discussed in the literature, especially regarding natural resources that stretch over national borders (Fullerton, 2003; Guo, 2021). The underlying assumption is that water – as with many natural resources – can be understood as both a private marketable good and a public good. In economic theory, rivalry and excludability are taken as indicators to differentiate between public and private goods. Rivalry defines the question of whether a good can be used by more than one user without a decrease in utility. Excludability stands for the question if non-paying users can be excluded from using the good (Randall, 1983). If rivalry and excludability are given, a good can be classified as being “private,” if there is no rivalry and no excludability at affordable costs, the good can be classified as a “public good.” Following these analytical dimensions, many natural resources can be understood as public goods or at least so-called “commons.” These common pool resources are similar to public goods in that they do not offer themselves simply to the exclusion of non-paying users, but their consumption is open to overuse – a fact that is apparent in cases of exhaustive natural resources. Hence, in these cases, as long as the total demand does not exceed the productive capacity of the resource, the consumer can use the respective good without threatening other consumers’ needs. However, once the demand exceeds availability, common pool resources can be overused due to a lack of ownership and control. To prevent overuse, consumers often develop rules about the protection and sustainable use of the resource (Ostrom, 2008).

Traditionally, public goods (including services) are provided by national governments in the interest of the public; the potential users of the good pay indirectly for the good via taxation. The geographic scope of natural resources is of great importance in this context, as the outlined concept is implicitly characterized by a national view. Thus, in the case of transboundary public goods the question emerges how such “cross-border” or even “global public goods” can be governed (Schomaker, 2017). Water resources, such as groundwater basins or rivers, have their own geographic boundaries that often do not match with administrative borders. Moreover, administrative boundaries often run along ecosystems, such as rivers or mountain ranges.

Mountain ridges and water features very often represent borders between administrative units or states (UNECE, 2015). Hence, holistic management of these ecosystems must often take place across borders. Therefore, the management of these ecosystems intrinsically requires transboundary measures and management (Petrova et al., 2019).

Beyond sheer economic and territorial analyses of natural resources, like water resources, there is a wide range of literature related to cross-border cooperation, especially in protected areas. Institutions such as IUCN (Vasilijevic et al., 2015), UNESCO (2013), the Ramsar Convention (2016), or Europarc (EUROPARC, n.d.) develop guidelines, toolkits or recommendations for the challenging activities of transboundary cooperation.

Furthermore, much literature focuses on institutional and regime-based water basin management (e.g., Bressers & Kuks, 2013) and international river management (e.g., Bernauer, 2002; Marty, 2001). Less attention has been paid to regional water basins shared between countries, representing a large share of the world's cross-border water resources. Renner et al. (2018) argue that cross-border cooperation is mostly shaped and organized by actors at regional and local levels. The EU's cohesion policy includes a variety of instruments to facilitate regional cross-border cooperation between MS, as outlined below.

## **Transboundary cooperation in the EU**

Against the backdrop of cross-border public goods, in particular with a view on the sustainable and efficient use of natural resources and the management of biodiversity and ecosystems, a suitable legal and organizational framework for cross-border cooperation is necessary. At the European level, different initiatives or arenas exist that provide such a framework, including a variety of single measures or concrete cooperation (e.g., Böhm, 2014). The European Territorial Cooperation (ETC), better known as "Interreg," is part of the EU's cohesion policy and provides a framework for the implementation of joint programs and actions between different MS. It is built around three pillars of cooperation: Interreg A, the so-called "European cross-border cooperation," supports cooperation between regions at the NUTS-III-level of two or more MS that are located directly on or adjacent to the borders (EC, 2021a). The second initiative, Interreg B, fosters transnational cooperation. It aims to form bigger areas, involving a number of regions from several countries of the EU (EC, 2021b). Interreg C focuses on interregional cooperation and works at the pan-European level.

To support these (project-oriented) approaches of ETC with a European cooperation structure that has legal force, the EU provides the following transboundary forms of cooperation to strengthen its economic, social, and territorial cohesion (Zapletal, 2010): European Economic Interest Grouping (EEIG) and EGTCs. An EEIG is a legal entity that was created by the Council of the European Communities in 1985. An EEIG agreement can be formed by companies and other public or private law entities under the national law of an EU country. The EEIG has no legal personality, but according to EU law it has (limited) contractual capacity (EC, 1985). An “EGTC is a European legal instrument designed to facilitate and promote cross-border, transnational and interregional cooperation” (EC, 2021c). This organizational form was established in 2006. It enables cooperation between regional and local authorities, associations and other public bodies from different MS (EC, 2006; Zapletal, 2010). While the purpose of the EEIG mainly lies in maximizing economic results through cross-border cooperation, the EGTC adds instruments to facilitate territorial cooperation between local and regional authorities (Zapletal, 2010).

Currently, there are 79 EGTCs in Europe, operating in various fields of activities ranging from tourism to transport topics. Examples include territorial and transnational cooperation in the field of ceramic art and craft, water management programs for border areas, enhanced cross-border waste management, management and valorization of mycological resources, and even management of a hospital (CoR, 2022a). Most EGTCs are driven by the motivation to facilitate the coordination of cross-border cooperation and to increase the binding nature of their political function (Beck, 2017). This motivation for increased liabilities and facilitated cross-border cooperation was experienced by the EGTC Geopark Karawanken. On its genesis it experienced a number of different organizational forms that will be outlined below.

### **Genesis of the EGTC Geopark Karawanken**

The Karawanks are a mountain chain in the southern Alps that form the border between two EU-member states, Slovenia and Austria. In their formation, caused by the collision of the African and Eurasian tectonic plates, they built out a dense number of natural features. These include (hydro-)geological phenomena like a high variety of different rock types and the formation of natural caves, a high number of springs that are fed by transboundary water bodies, characteristic alpine landscapes and valuable as well as sensitive ecosystems (Skoberne et al., 2013; Štrucl et al., 2014; Bedjanič, 2021a, 2021b).

The administrative borders of the region have shifted in the past. They once formed a common historical region that belonged to the Austrian part



of the Austro-Hungarian monarchy. After the peace treaty of Saint-Germain-en-Laye in 1919 and with the plebiscite in Kärnten/Koroška on the 10th of October 1920, today's border between the former Kingdom of Yugoslavia and Austria was fixed (Pohl, 2020). Ore mining has had a significant impact on the landscape and people's lives in the past (Modrej et al., 2018).

When the mining activities in the Mežica mine in Slovenia came to its end, the mines were reused for touristic purposes and the Podzemlje Pece museum was established. At approximately the same time, the Obir dripstone caves were opened for touristic purposes in the municipality of Eisenkappel-Vellach, Austria. Strong initiatives for the conservation of geological phenomena and their promotion for touristic and educational purposes first arose around 1980. Later, the feasibility and practicality of different forms of protected area designation were investigated (Jungmeier et al., 2003). In 2004, when Slovenia became a member of the EU, the cross-border working group (WG) "Dežela pod Peco – Petzenland" was established to promote the cross-border area jointly. The cooperation was supported by local communities, regional authorities and expert institutions (Štrucl et al., 2014).

The formation of the cross-border geopark was established between the Peca/Petzen and Koschuta/Košuta within a project in the period 2007–2013. The loose form of project-based cooperation enabled local authorities to build trust and get to know each other. In 2013, an ARGE (in German, Arbeitsgemeinschaft, or "working group") was established to increase the visibility and the commitment of its members, as well as to get it officially recognized as a member of the European geopark network (Štrucl et al., 2014). Under Austrian law, an ARGE is defined as an association of individuals, groups or institutions for the purpose of exchanging experiences, representing interests or dealing with issues and problems of common interest. The basis of collaboration is built upon a memorandum or an agreement on measures that have no legal binding (Pfefferkorn & Thamm, 2015). Within a follow-up project, several good practices and possible forms of cross-border cooperation were examined to increase the binding nature of collaboration and facilitate cooperation. Within the project EUfutuR (2016-2019), the application for the establishment of an EGTC was created.

In 2019, the EGTC Geopark Karawanken was officially founded to facilitate mutual decision-making between nine Austrian and five Slovenian municipalities. It has one and the same legal personality on the Austrian and Slovenian sides. Legally, the association is considered a community association, which, like a municipality, is authorized to make decisions on behalf of all 14 partner municipalities of the region (Geopark Karawanken, 2019a). This removes bureaucratic obstacles, as the local councils of municipalities do not need to be involved in the decision-making.



The main objective of the EGTC Geopark Karawanken is the conservation of its geological, natural and cultural heritage in the cross-border territory of its 14 member municipalities (Zillmer et al., 2020). Of equal importance are awareness-raising activities, information and education about the geological, natural and cultural heritage of the area within the geopark, and its promotion in the EGN and GGN (Geopark Karawanken, 2019b). The economic development of the peripheral cross-border region is being supported through local political coordination and general cross-border cooperation involving the tourism sector and the representation of sustainable regional policy interests of the entire region (CoR, 2022b).

The EGTC Geopark Karawanken thus experienced a number of different forms of cooperation through its development (Figure 1). The advantages and disadvantages on the levels of governance and suitability facilitated transboundary cooperation, and costs will be outlined in the results of this paper.



**Figure 1:** Genesis of the EGTC Geopark Karawanken

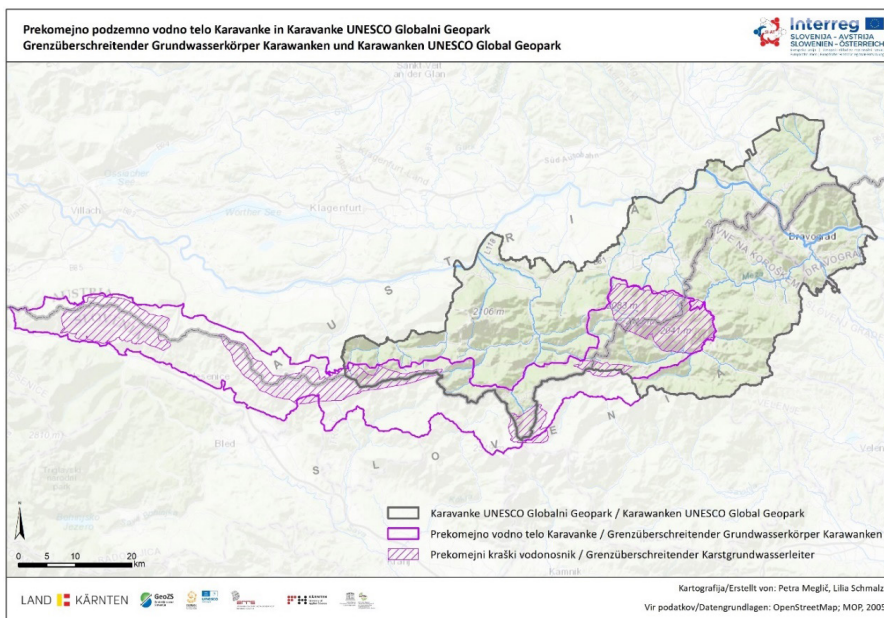
### **Water in the context of the Karawanken UNESCO Global Geopark**

The mission of the UNESCO Global Geopark network is to “promote the links between geological heritage and all other aspects of the area’s natural and cultural heritage, clearly demonstrating that geodiversity is the foundation of all ecosystems and the basis of human interaction with the landscape” (GGN, 2022). Geodiversity is defined as the variety of geological, geomorphological, pedological, and hydrogeological phenomena (IUCN, 2022). Water is directly related to the geology of the area and is responsible for the formation of geological features, including river incisions, tufa deposits, and caves. The geological composition influences the type of water aquifers, the temperature, mineralization and carbonization of waters as well as water run-off and filtration behavior. Water features are of essential importance as they sustain unique ecosystems that require conservation on the one hand and add aesthetic value to landscapes, which attract visitors and facilitate tourism, on the other hand. Therefore, management

of water resources is of emerging importance in UNESCO Global Geoparks (Ruban, 2019).

All EU member states are obliged to manage their water resources according to the principles of the Water Framework Directive (WFD 2000/60/EC). This includes the joint cross-border management of water resources. To address these water management questions within the EGTC Geopark Karawanken, a sustainable cross-border water management strategy for the protection and sustainable use of ground- and surface water resources is being developed in the frame of the INTERREG V-A SI-AT project KaraWAT (2021-2022).

Mountain ridges and water features very often represent borders between administrative units or states (UNECE, 2015). The Karawanks are one example of a mountain range connecting and dividing two MS of the EU. They form the border between Austria and Slovenia, incorporating a transboundary karstic groundwater body (Figure 2). They are an essential basis of living in both neighboring countries, as they provide excellent quality drinking water to neighboring areas.



**Figure 2.** Transboundary water body of the Karawanks and karstic aquifers

Karstic water aquifers are particularly sensitive to pollution due to the poor filtration capacity of limestone. Precipitation infiltrates underground

quickly, and the water finds its way through the mountains, discharging at springs that are found at the transition zones between limestone and other water-impermeable geological layers. The water does not respect borders on its way through the mountains, so in the case of the Karawanks some amount of precipitation that falls on the Slovenian side runs off through springs on the Austrian side and vice versa (Brenčič & Poltnig, 2008; Brenčič & Poltnig, 2009). Investigations on karstic water springs discharging from the Karawanks started in the early 1980s (e.g., Brandt & von Hütschler, 1980). To protect these water resources on a long-term basis, transboundary water bodies and risk areas were defined. It was not possible to designate transboundary, water protection zones across the border officially, due to differences in national laws and regulations. Still, both countries agreed to designate necessary areas to support water quality on both sides (Brenčič & Schlamberger, 2013).

Apart from karstic water aquifers, there are other transboundary water-related phenomena, like mineral water springs, within the geopark area. The question for the EGTC Geopark Karawanken is how those valuable natural assets can be protected and valorized for touristic and educational purposes. There are numerous highly mineralized and carbonated springs in the area alongside the Periadriatic fault system, which crosses the territory of the geopark, building the fault zone of the European and the Adriatic continental plates. The springs are mineralized due to the dissolution processes of water and rocks. Some of them have high concentrations of CO<sub>2</sub> from gases rising from the earth's crust (Brenčič et al., 2004; Štrucl et al., 2014).

Furthermore, climate change drastically influences the water balance of the geopark, similar to the rest of the Alps (Reszler et al., 2011). Frequent storms in recent years struck the whole area and flooding due to high precipitation caused a high amount of damage to streets, buildings, and other infrastructure. Forest landcover loss due to wind throws and bark beetles (Schmalzl & Weiß, 2020) increases the pressure on regulated streams and rivers (Calder, 2007). It also influences the quality of drinking water (Kreye et al., 2014). An increase in extreme weather events affects both sides of the border and demands transboundary efforts in risk management. Bracken et al. (2016) review different approaches to cross-border flood risk management. Integrated land use practices and nature-based forest management can reduce the risks of natural disaster and pollution of drinking water (BMLRT, 2021; Kreye et al., 2016). A close-meshed network of monitoring stations at springs and streams can help to understand changing flow regimes. In combination with early-warning systems, local authorities and inhabitants can be supported in disaster control management (Tadrist et al., 2022).

## METHODOLOGY

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The aim of our approach is twofold. Firstly, we carve out the success factors and limits of vertical, horizontal and cross-border cooperation between local, regional and national stakeholders acting in different forms of cooperation. Following a comparison of different forms of cross-border cooperation, we investigate the potential that the EGTC organizational framework provides for the sustainable management of transboundary water resources within the Geopark Karawanken and remaining obstacles resulting from different national laws and regulations, data standards and monitoring techniques, including soft factors such as language barriers between countries. Beyond a literature screening, empirical insights are generated in different formats; here, we try to draw on the particular experiences of the project team. Based on a similar way of presentation (Jungmeier, 2014) the diagrams (Figure 3, 4, and 5) were conceptualized and put under debate within the project team. Based on that, two national and two cross-border stakeholder workshops on the identification of water resources and risks in the Karawanken UNESCO Global Geopark were organized as part of the INTERREG V-A SI-AT project KaraWAT.

We evaluate the suitability of three transboundary cooperation forms that the EGTC Geopark Karawanken experienced from its genesis, namely “project bundle,” “joint venture/consortium” and “EGTC”:

- 1) Project bundle: Cross-border cooperation organized on the basis of individual projects that are prepared and implemented on a case-by-case basis.
- 2) Joint venture/consortium (i.e., ARGE): Cross-border cooperation based on an institution, e.g., a formalized WG, an NGO or a (non-profit) company.
- 3) EGTC: Cross-border cooperation based on the cross-border association of public bodies, e.g., municipalities

The forms of cooperation are rated on four criteria: ‘Governance,’ ‘Suitability,’ ‘Transboundary’ and ‘Costs.’ The selection of the criteria and designated attribute levels give reference to the literature on different aspects of transboundary governance (Beck, 2018; Böhm, 2014; Borrini-Feyerabend et al., 2013; Crofts et al., 2020; Vasilijevic et al., 2015; Zapletal, 2010). For each level, we associate different attribute levels that are rated from 1-3, where 1 is not suitable, and 3 is very suitable (Table 1). The selected criteria are defined as follows:

- 1) **Governance:** Governance is an essential element of transboundary cooperation and can be seen as the autonomy of local political action in cross-border regions. Local actors use different forms of cooperation to achieve their goals in the area. We analyze the success of the governance criteria regarding the effectiveness and legitimacy of decision-making, the transparency of decision-making and the liability of action, concerning responsibilities and functions within the cooperation.
- 2) **Suitability:** The functional role of cooperation is dependent on the ability to generate income or funding. EU funding has substantial influence on the shape of cross-border cooperation and their possibilities to fulfill regional requirements. Another factor influencing the suitability of different cross-border cooperation forms and their coherence with regional requirements is their ability to achieve planned activities.
- 3) **Transboundary:** Concerning transboundary aspects, the formation of cross-border forms of cooperation can be seen as emerging new political communities. The question of visibility and acceptance of activities of cross-border forms of cooperation is essential considering transboundary aspects. Often, people living within the cross-border area are unaware of the existence of cooperation and lack a sense of involvement.
- 4) The cost criterion is of great importance as well. The more sophisticated the organization of cross-border cooperation is set up, the higher the cost will be for setting up and for operating the institution. The financial risks on the other hand can be minimized for local actors, like municipalities or other partners, when there are limited liabilities for them.

**Table 1.** Description of criteria and associated attribute levels

Levels	Description
<b>Governance</b>	
A1 – Decision-making	Effective and legitimate decisions in the long-term
A2 – Transparency	Traceability of decisions and processes
A3 – Liability	Clarity of responsibilities and functions
<b>Suitability</b>	
B1 – Accordance with financial instruments	Suitability to generate funding or income
B2 – Accordance with regional requirements	Liaison with regional institutions and policies
B3 – Accordance with planned activities	Coherence with the objectives of the cooperation
<b>Transboundary</b>	
C1 – Acceptance on both sides	Correspondence to social and cultural requirements
C2 – Legal frame on both sides	Correspondence to legal and administrative requirements
C3 – Representation of both sides	Well-balanced depiction of interests

Levels	Description
<b>Costs</b>	
D1 – Investment required	Costs for setting up the institution
D2 – Operational cost	Costs for running the institution
D3 – Financial risks	Limited liabilities for individuals and partners

After comparing the potentials and limitations of different cross-border forms of cooperation, we next investigated the opportunities and obstacles of EGTCs for the sustainable cross-border management of water resources in the Geopark Karawanken. The results are based on four stakeholder workshops in the frame of the KaraWAT project. In May 2021, two national stakeholder workshops were staged. In the Austrian national workshop (n = 16 participants), local and regional stakeholders as well as experts in water management and sanitation, drinking water protection and hydrogeology discussed issues in water management, impacts of climate change on water resources, measures to protect the quality and amount of drinking water, land-use and land planning questions, and activities or processes necessary to improve collaboration between local, national and cross-border stakeholders. The same topics were discussed in the Slovenian national workshop (n = 10 participants). The aims of the two cross-border workshops were to carve out possibilities for a coordinated collaboration across borders. The first one was organized in November 2021 with experts in hydrogeology and natural sciences as well as regional and national authorities from Austria and Slovenia (n = 20). The second one was organized in December 2021 and was made up of local authorities and experts in water management (n (SLO) = 11 participants, n (AT) = 13 participants).

## RESULTS

### Potentials and limitations of different cross-border forms of cooperation

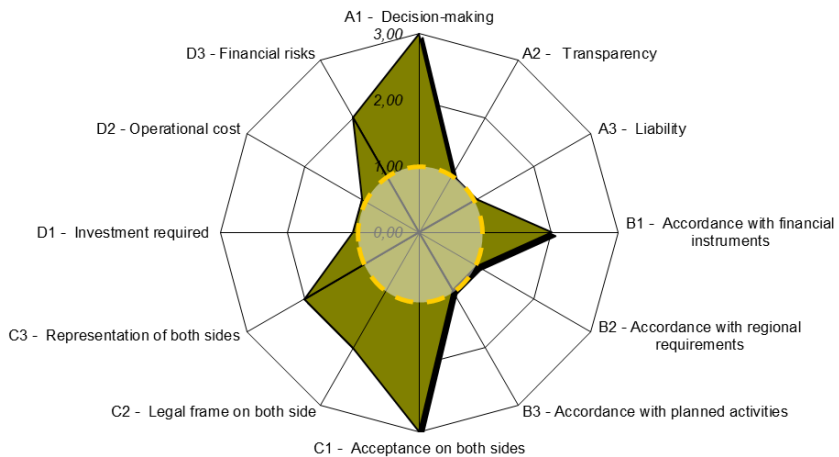
#### *Project bundles*

Project-based cooperation shows strengths in the criterion of decision-making (Figure 3). Decision-making is not time-consuming because it is by definition “lean” and only relates to the specific project. Acceptance for the project is high; otherwise it would not exist. However, acceptance can vary greatly from project to project. More complex initiatives and possible

conflict issues can hardly be addressed in project-based cooperation. Apart from the preparation costs, there are neither investments nor significant operational costs for project-related cooperation. Still, the financial risks for individual participants can be high. In the other criteria, purely project-related cooperation shows significant weaknesses, which are particularly obstructive in a longer-term perspective. This accounts for the low liability of projects. A lack of long-term responsibilities on project outputs after the project period can lead to problems in maintenance and service of infrastructure. Furthermore, project outputs do not necessarily have a direct relationship with planned activities and regional requirements of the cross-border regions, as they depend strongly on funding programs and individual interests. This leads to low transparency of project outputs because of resulting gaps between local needs and project outputs, generating open questions concerning the embedded and long-term responsibilities.

**D: Costs**

**A: Governance**



**C: Transboundary**

**B: Suitability**

**Figure 3.** Spider chart of project bundles

***Joint venture/consortium***

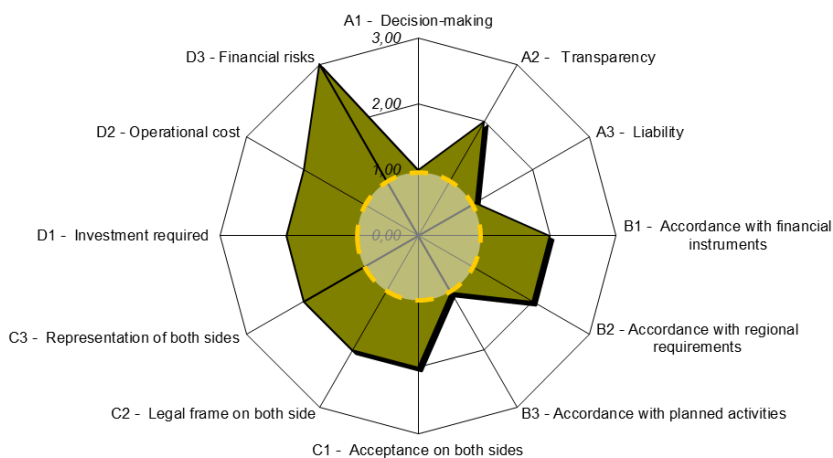
The joint venture/consortium (Figure 4) has the advantage of reducing the financial risk of individuals or partners. This is particularly advantageous in view of difficult funding “landscapes.” However, increased security entails higher operational costs (e.g., for annual financial statements, audits, consulting, etc.). This form of cooperation still has clear advantages over the project bundle with regard to other criteria, such as the accordance with regional



requirements and improved transparency. The basis of collaboration is agreed upon in a non-binding memorandum of understanding or agreement between partners. This leads to a partner structure of local and regional actors and explains the aims of cooperation. Still, the non-binding nature of agreement may lead to low liabilities concerning responsibilities and functions. In the area of governance, it is evident that decision-making is a weak point, which has an impact on the long-term quality of the cooperation. Restraints in decision-making directly relate to the legal capacity of consortia. The purely national legal capacity sometimes entails complicated and lengthy procedures.

D: Costs

A: Governance



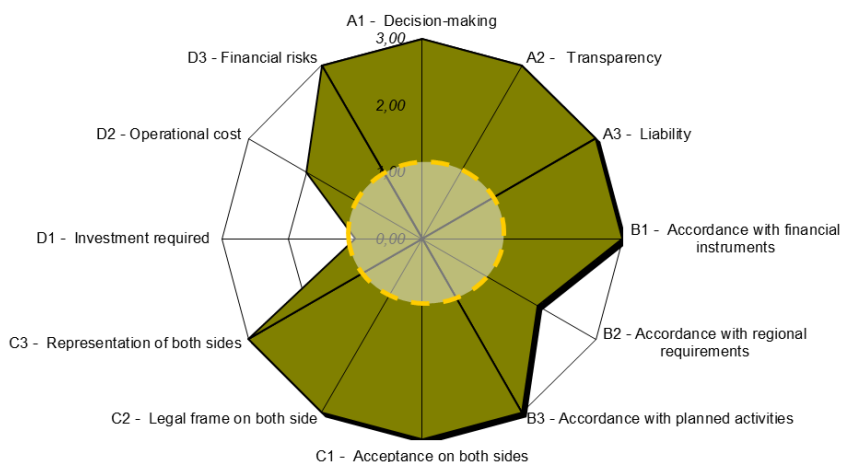
C: Transboundary

B: Suitability

**Figure 4.** Spider chart of joint ventures/consortia

**EGTC – European Grouping of Territorial Cooperation**

The evaluation shows that the advantages of the EGTC over other forms of organization lie mainly in the criteria of governance, suitability, and transboundary (Figure 5). This inevitably leads to higher costs for investment and operational costs. The evaluation in accordance with regional requirements assumes that antagonistic, unpredictable, and diverse demands from the respective regions can never be fully satisfied. Nonetheless, the concept of EGTC does not come without restrictions. Firstly, the operationalization of EGTCs is a critical factor. Secondly, EGTCs involve cooperation of public entities only, excluding private companies or societal actors from this institution. This may lead to a loss of private entrepreneurial resources in the management of cross-border issues.

D: CostsA: GovernanceC: TransboundaryB: Suitability

**Figure 5.** Spider chart of EGTCs

## Opportunities and challenges in the management of water resources in the cross-border EGTC Geopark Karawanken

The opportunities and obstacles of the EGTC Geopark Karawanken to manage water resources sustainably across borders proved to be diverse. Within expert talks and four workshops on the identification of water resources and associated risks in the area, possible cooperation between stakeholders was identified for the protection and sustainable use of cross-border water resources within the EGTC. In the agreement of members of the EGTC Geopark Karawanken, the common goal is the conservation and touristic valorization of cultural heritage as well as geological and natural assets (Geopark Karawanken, 2019b). Concerning water resources, the form of cooperation offers the opportunity for a coordinated collaboration between its members across borders. Still, there are remaining obstacles in data standards, laws, regulations, political functions as well as language that challenge this cross-border cooperation.

One example that was already outlined in the literature review is offered by the designation of water protection zones (Brenčič & Schlamberger, 2013). Even though the principles for drinking water protection in Austria and Slovenia are similar, the countries differ in their practical implementation. In Austria, groundwater belongs to the landowner, who is also responsible for its protection. In Slovenia, groundwater is a public good, and groundwater

protection is the responsibility of the state. Groundwater protection in both countries is regulated by water laws, but in Austria protection zones are delimited on the basis of the Austrian Water and Waste Management Association guidelines, whereas in Slovenia delimitation is regulated by law (Brenčič & Poltnig, 2008). This leads to differences in the effectiveness of designated protection zones. In Austria, 95 percent of necessary water sanctuaries for the karstic aquifer on Peca Mountain have been implemented. In the workshops, Austrian regional authorities stated that the remaining five percent are currently under discussion. On Slovenian side, water protection procedures can take a very long time due to the different political situation and thus remaining risk areas can be found with insufficient protection against microbiological contamination. The WG of the Drava Commission is responsible for coordination of protection zones across borders but currently there is no active political will to proceed with the joint mission of water protection. In the workshops, the stakeholders suggested that the municipalities inside the Geopark Karawanken could induce positive pressure at higher levels that the WG continues with the necessary procedures for protection.

Concerning the valorization of water resources for touristic and educational purposes, the EGTC Geopark Karawanken offers similar water-related phenomena on both sides of the border, such as the occurrence of mineral waters springs alongside the Periadriatic fault system. Even though those waters offer a high potential for their valorization, they are hardly used today, with the exception of the Carinthia-Lithion spring, which offers therapeutic treatment within a health center in the municipality of Eisenkappel. For the remaining springs, efforts were taken in previous projects to develop touristic infrastructure around them, including pathways, attractive catchments, and information signs (Brenčič et al., 2004). This infrastructure was developed and placed within the project but no provisions were assigned to the individuals who would be responsible for the maintenance work at the conclusion of the project period. This lack of responsibility and investment in the maintenance of existing infrastructure led to neglect at the sites. Revitalization of existing infrastructure and assignment of future responsibility for maintenance is being worked out within the KaraWAT project. With the joint promotion of sites on both sides of the border, the tourism sectors of Austria and Slovenia can profit equally from valorization efforts. In the workshops, stakeholders proposed that within the EGTC Geopark Karawanken, clear common goals for the valorization of springs need to be defined. Additionally, the question of how to protect the springs from tourist activities when putting them into the programs must be addressed. Clear rules and a plan for the revitalization, maintenance and development of infrastructure need to be defined prior to implementation. The main goal within the EGTC is to connect offers on both

sides of the border and to find common levels for internal protection as well as common levels for the interpretation and valorization of the springs.

On the level of risk management, municipalities play a central role concerning forward-looking land use planning and effective disaster management. The effects of climate change and an expected increase in the frequency of extreme weather events has struck the geopark area in recent years. This indicates the pressing requirement for effective disaster management. In the workshops, continuous and harmonized area-wide monitoring of smaller streams and rivers in Austria and Slovenia, the installation of common early warning systems, effective land-use and forest management within the municipalities, data exchange and joint interpretation of data, were named as important elements to be addressed at the transboundary level (Schmalzl et al., 2021). The methodologies for monitoring and interpretation of water-related data between Austria and Slovenia currently differ. Efforts to harmonize methodologies could improve the cross-border collaboration.

From the process perspective, the language factor proved to be a possible barrier for cross-border cooperation within the EGTC Geopark Karawanken. The workshops with local stakeholders had to be moderated bilingually, as many of the local authorities felt more comfortable speaking in their national language. Still, with experienced moderation, bilingual workshops can offer a fruitful exchange. In the workshops with regional or national stakeholders and experts on water management, no language barrier was experienced. Language also proved to be an obstacle in the review of literature and materials. Official national websites mainly provide information, (geo)data and literature in their national language. Local hydrogeological studies, land use laws and regulations, and planning instruments are available only in national languages, making exchange of knowledge more difficult.

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## DISCUSSION

UNESCO Global Geoparks aim to promote geodiversity as the foundation of all ecosystems and the basis of human interaction with the landscape (GGN, 2022). We have outlined the importance of water resources in the context of protection within the Karawanken UNESCO Global Geopark. Geoparks, as conservation areas, may contribute to effectively manage and promote water resources in their area across local, regional, and national borders. Thereby, geoparks can foster collaboration between members and stakeholders and promote water resources through awareness-raising activities for visitors, inhabitants, and relevant actors.

The genesis of the EGTC Geopark Karawanken suggests that the suitable form of cooperation for cross-border management of natural resources is developed in a chronological sequence. Accordingly, initial attempts at project-based cooperation for the conservation of cultural and natural heritage are possible without great institutional effort. In this way, getting to know each other, building trust and gaining common transcultural experience can be facilitated from the bottom-up. In the course of increasing integration, the organizational form of long-term cooperation can be more complex. A more sophisticated form of cooperation, like an EGTC, increases the liabilities and facilitates transboundary cooperation, giving it a clear legal framework and representation on both sides and increasing acceptance. In terms of governance, these sophisticated forms facilitate decision-making, improve transparency of activities and assign clear responsibilities to partners (Beck, 2017; Böhm, 2014). It increases the potential for gaining funds for strategic projects in accordance with planned activities and regional requirements. The suggested levels and attributes that were developed to rate the potentials and limits for transboundary cooperation were tested for the Geopark Karawanken.

Overall, the fingerprint of the EGTC showed that the concept does not come without restrictions. Even though EGTCs enable the cooperation between public authorities across borders, they still tend to exclude private companies or societal actors because these stakeholders cannot be active members of the Board. Still, private actors can be integrated in the expert council or within project WGs, but the concept does not imply a real “public-private partnership.” This may lead to a loss of private entrepreneurial resources in the management of cross-border natural resources and also restricts the option to include private financial resources to a larger extent. Given the difference between public and private values, this limitation may ease the use of EGTCs in a way. Nonetheless, exploring further options for closer integration of the private sector may be useful so as not to miss the opportunity to include much-needed private skills and resources.

In terms of water management, there are still a number of restrictions that cannot be addressed within the cross-border cooperation of the EGTC Geopark Karawanken due to differences in responsibilities, laws, and regulations of both countries. This concerns, for example, the designation of transboundary, water protection zones. The partner structure of the EGTC Geopark Karawanken is built by communal partners so they can implement communal tasks. Traditionally, the protection and supply of drinking water are provided by national, regional, and local governments (Schomaker, 2017). Still, as outlined above, natural resources, like water bodies, often do not match with administrative borders and transboundary

cooperation is necessary to manage these resources effectively. These issues of transboundary governance and decision-making will need to be elaborated further and national laws and regulations should be developed to facilitate the cross-border management (Petrova et al., 2019).

## **Recommendations**

Even though the Geopark Karawanken cannot formally designate water protection zones, it can nonetheless encourage designations by revealing their necessity and creating a platform of exchange for responsible stakeholders. It can proactively engage the protection of transboundary karstic aquifers by fostering communication between responsible authorities. Furthermore, the Geopark can educate visitors about karstic water bodies and possible impacts of use.

From a strategic point of view, and to address the mission of the GGN (GGN, 2022), the EGTC Geopark Karawanken needs to develop common educational, economic, and environmental approaches, like information material, touristic activities, and integrated protection measures around water resources. The promotion of mineral waters can improve economic development and foster cooperation between local actors like small- and medium-sized companies, tourist offices, and local authorities across borders. The valorization and development of touristic activities can create jobs and counteract emigration from the area (Forcher et al., 2021). Visitor activities to explore mineral waters in the Geopark Karawanken give the park another unique selling point. This broadens the appeal of the whole area and increases its attractiveness. In this way, the larger peripheral cross-border mountain region can benefit from an increase in visitor numbers based on its natural assets. Nonetheless, it is essential to define future responsibilities for maintenance of developed infrastructure after project periods. An institutional framework, such as an EGTC, enables longer-lasting responsibilities on project outputs, as it provides a legal body that can take over the responsibilities of maintenance.

Early warning systems enable immediate reaction to natural disasters and are therefore of central importance for municipalities. One of the geopark municipalities on the Austrian side is currently testing an innovative microclimate monitoring and early warning system (LoRaWan). The pilot project is being carried out in cooperation with the Graz University of Technology, the province of Carinthia, and a subsidiary of the Carinthian electricity company Kelag. Real-time monitoring and data transmission can simplify communication in the area of flood protection, enabling a quick response in disaster management. The system can be extended to the

neighboring municipalities, or even to the entire geopark area. The joint development and implementation of a close-meshed monitoring network of smaller catchment areas and the data exchange between municipalities guarantees a harmonized risk management program, including representative and comparable monitoring and interpretation of climate impacts within the Geopark Karawanken. The EGTC Geopark Karawanken will eagerly and actively continue its work in this area and push efforts to establish a rollout of the warning system to interested municipalities.

Finally, the establishment of a cross-border WG on water issues within the geopark structure enables public authorities to regularly meet and exchange best practices. While the two countries have different legislative rules, the local authorities in both countries still have the same mission to supply the public with high-quality drinking water and to protect their inhabitants from natural disasters. Regarding laws and regulations, the differences in national implementation cannot be overcome through the establishment of an EGTC. Nonetheless, a WG on water-related issues within the EGTC Geopark Karawanken can push joint efforts to facilitate communication across borders, to work on harmonization of interfaces and data standards and to improve cross-border monitoring and early warning systems.

## CONCLUSION

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The cross-border management and valorization of water resources within the EGTC Geopark Karawanken was demonstrated to be of great importance due to transboundary water bodies, cross-border occurrences of mineral waters and parallel challenges in risk management. The outcome of the project indicated that a cross-border collaboration of stakeholders in Austria and Slovenia can be facilitated within the framework of the EGTC Geopark Karawanken, even though obstacles remain, including different laws and regulations, data standards, and the language factor that proves challenging to overcome.

The management of transnational resources constitutes a challenge for countries in the EU and beyond. At the European level, the EGTC provides an instrument that helps public authorities to form cross-border cooperation. The first experiences with the EGTC, as presented in this article, suggest that this form of organization can and will be transferrable for a number of other tasks, for example, in the field of cross-border resources, cross-border protected areas or cross-border predicate regions. In view of the climate and biodiversity crises, transboundary management schemes are more important now than ever before. From a scientific perspective, a Europe-



wide comparative study of EGTCs would be of interest. The visualization method used in this paper could allow the first approximation. However, more in-depth insights involving comprehensive studies would be required in a transdisciplinary research design.

The current case study of the Geopark Karawanken provides empirical evidence and theoretical approaches for the analysis of the instrument of EGTC. The experience of the EGTC Geopark Karawanken should be consolidated with an analysis of other transboundary cooperation forms for the management of natural resources in Europe. Further research may focus on deriving common potentials and limitations experienced along the emergence of cross-border cooperation of different EGTCs in Europe. Identifying these common experiences could lead to the development of a European standard and guidelines for the successful foundation of this territorial cohesion tool. This seems to be even more important with a view on the wide range of potential EGTCs in the EU, but also the diversity of cultural backgrounds of the (potential) actors involved, and the very different societal needs in different MS.

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### **Abstrakt**

**CEL:** Zarządzanie transgranicznymi zasobami naturalnymi było przedmiotem badań w różnych dyscyplinach. Niemniej jednak, poza spostrzeżeniami teoretycznymi, dowody empiryczne skutecznego zarządzania transgranicznego lub zarządzania zasobami naturalnymi są nadal ograniczone, nawet w Unii Europejskiej (UE), gdzie zapewnia się szereg instrumentów w celu wspierania współpracy transgranicznej między jej państwami członkowskimi. Nasz artykuł, dostarcza dowodów na przykładzie współpracy transgranicznej między dwoma państwami członkowskimi UE, Austrią i Sło-

wenię, uzupełniając ramy analityczne w celu zidentyfikowania czynników stymulujących pomyślną współpracę transgraniczną. **METODYKA:** Na przykładzie Geoparku Karawanken Europejskiego Ugrupowania Współpracy Terytorialnej (EUWT) oceniamy czynniki sukcesu i granice współpracy transgranicznej obejmującej różne formy współpracy. Ponadto, w oparciu o dowody empiryczne z warsztatów z lokalnymi, regionalnymi i krajowymi interesariuszami, badamy potencjał ram organizacyjnych EUWT w zakresie skutecznego zarządzania zasobami wodnymi w wymiarze transgranicznym na obszarze Geoparku. **WYNIKI:** Przeprowadzona przez nas analiza pakietów projektów, wspólnych przedsięwzięć/konsorcjów oraz EUWT jako możliwych form współpracy transgranicznej wskazuje, że EUWT mają różne zalety w porównaniu z luźniejszymi formami współpracy. Wyższe koszty operacyjne ponoszone przez organizację kontrastują z lepszym zarządzaniem działalnością transgraniczną, zgodnie z ramami prawnymi i reprezentacją po obu stronach granicy. Zwiększa to akceptację i ułatwia podejmowanie decyzji. Ponadto zwiększa możliwość uzyskania środków finansowych zgodnie z planowanymi działaniami i wymogami regionalnymi, jednocześnie zmniejszając indywidualne ryzyko finansowe dla partnerów. Geneza Globalnego Geoparku UNESCO Karawanken/Karavanke (Geopark Karawanken) wskazuje, że luźniejsze formy organizacji, np. pakiety projektów, pozwalają interesariuszom na wzajemne poznanie się bez większego wysiłku instytucjonalnego. W miarę postępującej integracji forma organizacyjna może być bardziej złożona. Doświadczenie w opracowywaniu transgranicznych instrumentów gospodarki wodnej pokazuje, że nawet w bardziej wyrafinowanej formie współpracy, takiej jak EUWT, nadal istnieją przeszkody w zarządzaniu transgranicznymi zasobami naturalnymi. Przeszkody wynikają np. z krajowych przepisów ustawowych i wykonawczych, standardów danych, technik monitorowania i czynników miękkich, takich jak bariery językowe. **IMPLIKACJE:** Przykład Geoparku Karawanken pokazuje, że wprowadzenie EUWT może uzyskać znaczące wsparcie transgranicznych władz publicznych. Mimo to EUWT ma tendencję do wykluczania prywatnych przedsiębiorstw lub podmiotów społecznych, ponieważ nie mogą one być aktywnymi członkami zarządu. Zbadanie dalszych opcji ściślejszej integracji sektora prywatnego w modelach partnerstwa publiczno-prywatnego (PPP) może być przydatne, aby zachować możliwość włączenia bardzo potrzebnych prywatnych umiejętności i zasobów. Doświadczenie Geoparku Karawanken sugeruje, że EUWT mogą i będą znaczącą formą organizacji w Europie dla szeregu działań, na przykład w dziedzinie zasobów transgranicznych, transgranicznych obszarów chronionych lub transgranicznych regionów. Pomoże to w osiągnięciu celów programów UE w zakresie przeciwdziałania kryzysom klimatycznym i bioróżnorodności poprzez umowy ponadnarodowe, np. Zielony Ład czy Strategia Bioróżnorodności. **ORYGINALNOŚĆ I WARTOŚĆ:** Artykuł ten zawiera zwięzły przegląd transnarodowej gospodarki zasobami wodnymi w Unii Europejskiej w kontekście EUWT i przedstawia praktykom uwagi dotyczące potencjalnych wyzwań związanych z pomyślnym wprowadzeniem EUWT. Chociaż analiza wspólnych doświadczeń różnych EUWT może doprowadzić do opracowania europejskiego standardu i wytycznych dla pomyślnego stworzenia tego narzędzia spójności terytorialnej, niniejszy artykuł stanowi pierwszy krok, torując drogę przyszłym badaniom.



**Słowa kluczowe:** Europejskie Ugrupowanie Współpracy Terytorialnej, Karawanken/Karavanke UNESCO Global Geopark, współpraca transnarodowa, Unia Europejska, zarządzanie zasobami wodnymi, zasoby wodne

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**Michael Jungmeier** is the chairholder of the UNESCO Chair. Throughout his career, the ecologist and human geographer has been focusing on biodiversity research, concepts and tools in nature conservation, on human-nature-relationship and environmental history. He has worked extensively with inter- and transdisciplinary research designs and methods and has a long track of academic lectureships at different universities. Jungmeier has worked in planning and consulting of conservation areas, as well as in research and education, capacity building, and training for more than 30 years.

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### **Conflicts of interest**

The authors declare no conflict of interest.

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