

Article

Mining and Europe's World Heritage Cultural Landscapes

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Abstract: This study examines the four cases of World Heritage protected cultural landscapes in Europe that are characterized by mining in order to identify the role mining plays today in such cultural landscapes, the legal requirements for their protection, and also the exploration and exploitation in these areas and the differences that exist between the five European countries concerned. Using a qualitative comparative case study approach, the authors find that active mining is taking place in the Austrian case, and exploration is happening adjacent to the German/Czech protected cultural landscape. The legal protection of the cases is mainly based on heritage and monument protection legislation as well as environment protection legislation including the Natura 2000 network. Differences exist, as other than in Germany, exploration and mining could be allowed in protected areas, which is also contrary to the position of the United Nations Educational, Scientific, and Cultural Organization, and the International Council on Mining and Metals.

Keywords: cultural landscapes; mining; mineral resources; World Heritage Sites; UNESCO; sustainable land use



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1. Introduction

Many cultural landscapes in Europe belong to our joint cultural and natural heritage of outstanding universal value that "(...) is so exceptional as to transcend national boundaries to be of common importance for present and future generations of all humanity" [1]. In addition to national governments and other bodies, which might have protected cultural landscapes and their heritage well before, the UNESCO (United Nations Educational, Scientific and Cultural Organization) since 1992 acknowledges such landscapes as world heritage, providing an international legal instrument for their protection [1,2] and unifying conceptual approaches of nature conservation and the protection of cultural properties [3,4]. Cultural landscapes are considered as "combined works of nature and man" that embody the longstanding human–nature interactions [5,6] and are subject to ongoing change. They are characterized by (i) (dis-)connections between people and their environment; (ii) bio-physical structure and varied land use of varied intensity; (iii) historic provenience based on long-term histories and landscape legacies; (iv) varied change rates that are linked to multi-scale, multi-stakeholder driving forces, (v) broad set of adjoined values and meanings; and (vi) governance approaches that can pursue either conservative (protection) or stewardship-oriented approaches [7,8]. The UNESCO differentiates three different categories: (i) designed landscapes, intentionally created by people (e.g., garden, park-landscapes), (ii) associative cultural landscapes, demonstrating powerful religious or cultural associations of natural elements rather than materially embodied cultural evidence, and (iii) organically evolved landscapes, based on their social, economic, administrative, and/or religious context and evolution. This last category is the focus of our research and can be further divided into relict (fossil) landscapes, where transformative processes have

stopped but their distinctive features are still present; and “continuing landscapes” that exhibit historic material evidence but transformative processes are still ongoing since the landscape still plays an active role for society and is associated with a “traditional way of life” and/or relict cultural landscapes [9]. Thus, cultural landscapes mirror specific, “traditional” land-use practices that are well embedded in the natural environment. Previous research stresses the capacity of cultural landscapes to support bio-cultural diversity and ecosystem services due to their sustainable land use [3,6,10]. However, the cultural landscape approach is critiqued, stressing a lack of a comprehensive typology or ranking, the conflation of historic and aesthetic values, or associated power struggles, e.g., [11,12].

Mineral resources play a crucial role in the European economy (e.g., environmental technologies, automotive, manufacturing) and the sustainable, continuous supply of mineral resources plays an important role. This is reflected in a broad range of different policies including, e.g., mining, development, and trade policies, environmental protection, and safeguarding land, as well as mineral wealth for future generations [13–17]. Clearly, mining landscapes are “continuing cultural landscapes”, mirroring human–nature interactions, but many are bearing the scars of mineral extraction and abandonment [18]. Most extractive processes have significant impact on the involved bio-cultural systems and the delivery of ecosystem services [19], which mostly produces landscapes with modest aesthetic quality for human well-being. More recently, scholars are sparking the academic discourse on sustainable practices in extractive industries [20,21] and the broadening of the debate on Social License to Operate (SLO), incorporating a societal dimension that complements the more traditional reading of “community”-focused SLO concepts. Lesser et al. (e.g., [22]) illustrate that worldviews and societal values such as heritage should play a more prominent role in SLO processes along the entire value chain (also [23]). However, the blasting of Aboriginal heritage in 2020 [24] may challenge mining companies’ colorful reports and policies on social and cultural responsibility when it comes down to the expansion and continuation of their operations.

The three core organizations regarding cultural and natural heritage, UNESCO, ICOMOS (International Council of Monuments and Sites), and IUCN (International Union for Conservation of Nature and Natural Resources), pursue a common position, considering the exploration and extraction of mineral resources and associated activities in general incompatible with the values that World Heritage Sites represent [25,26]. In 2003, ICMC (International Council on Mining and Metals) adopted the policy to refrain from mining exploration and mineral extraction in UNESCO-protected areas, which since then has not been taken up beyond ICMC’s membership, causing ICMC in 2016 to call upon countries to do more [27]. UNESCO reports that since the early 1990s, pressure from extractive industries is rising, resulting in 411 reports on 79 World Heritage Sites (47 states) concerning extractive practices, such as minerals, oil/gas, and quarrying; the 2015 World Heritage Report stresses that 18% of the inscribed properties are notably affected by exploration and/or mineral extraction (mining, oil, and gas). It further acknowledges that the increasing population growth and consumption practices result in development pressures and that “the mining industry is coming more and more in contact with protected areas” [25]. Thus, while mining sites are recognized as notable elements in cultural heritage, their characteristics seem more problematic in the context of landscape approaches: e.g., Reeves and McConville [11] emphasize that UNESCO’s cultural landscape conceptualization results in a confusion and conflation of historic and aesthetic values, which might result in an underrating of mining landscapes. Those landscapes might be historically significant but are neither aesthetically pleasing nor are they often following an organic, evolutionary change rather than abrupt disruptions with strong impacts on the landscape. Given the EU’s (European Union) increasing interest regarding “domestic” mineral extraction and continuous supply, it might be the case that in the future, the different goods that both sectors are creating are getting increasingly in conflict with one another. However, there are also mining-related initiatives (e.g., IRMA—Initiative for Responsible Mining Assurance) that recognize that “(. . .) in certain cases, whether or not there is governmental approval, due

to the potential impacts or other values or benefits, no mining could be the best option. We seek to advance methodologies that allow such decisions to be made within a sustainable development context". ([28]).

Cultural Landscapes designated as World Heritage Sites enjoy international protection: however, the implementation and transposition into national and/or subnational regulations in the EU is the responsibility of the respective state and its governmental and administrative bodies. Thus, it can be expected that the institutional design and practices in countries differ. Hence, our research departs from the above-mentioned previous UNESCO studies and reports that are dealing with heritage sites and mineral extraction. It investigates the handling of mineral resources in UNESCO protected areas within the EU in which extractive activities (e.g., quarries, mining) were (i) either part of the historic land use and landscape pattern or (ii) still play a notable role in and for the recent landscape. In the article, we discuss three main questions: (i) what role does mining play today in such cultural landscapes; (ii) what are legal requirements for exploration and exploitation in these countries/regions; and (iii) what are the differences and similarities between countries/regions?

2. Materials and Methods

2.1. Case Selection

The study follows a qualitative comparative case study approach [29–32] examining selected UNESCO World Heritage Cultural Landscapes in the EU [33,34]. The case selection is based on the UNESCO list of designated UNESCO World Heritage cultural landscapes in which extractive industries played or still play a key role from (i) the perspective of continuing landscapes, in which the landscape development is still ongoing and (ii) mineral extraction was a key driver for the designation of the site. Complementary, the list of World Heritage in Danger [33] was triangulated with potential case studies in the EU, in which mineral extraction and/or mineral exploration endangers the outstanding universal value or the integrity of the site and consequently also the World Heritage status. The screening showed that currently, no World Heritage Sites located in the EU are imminently threatened by mineral extraction, as is e.g., the case with the natural World Heritage Site of Mount Nimba in Guinea, where mining in the vicinity is listed as a contributor to the endangered status [33]. In this study, out of a total of 43 UNESCO World Heritage cultural landscapes within the EU, all four cases characterized by mining are examined: (i) Hallstatt-Dachstein–Salzkammergut (Austria); (ii) Nord-Pas de Calais Mining Basin; (iii) Montanregion Erzgebirge/Krušnohoří (Germany/Czech Republic); and (iv) Krzemionki Prehistoric Striped Flint Mining Region (Poland) (see Figure 1).

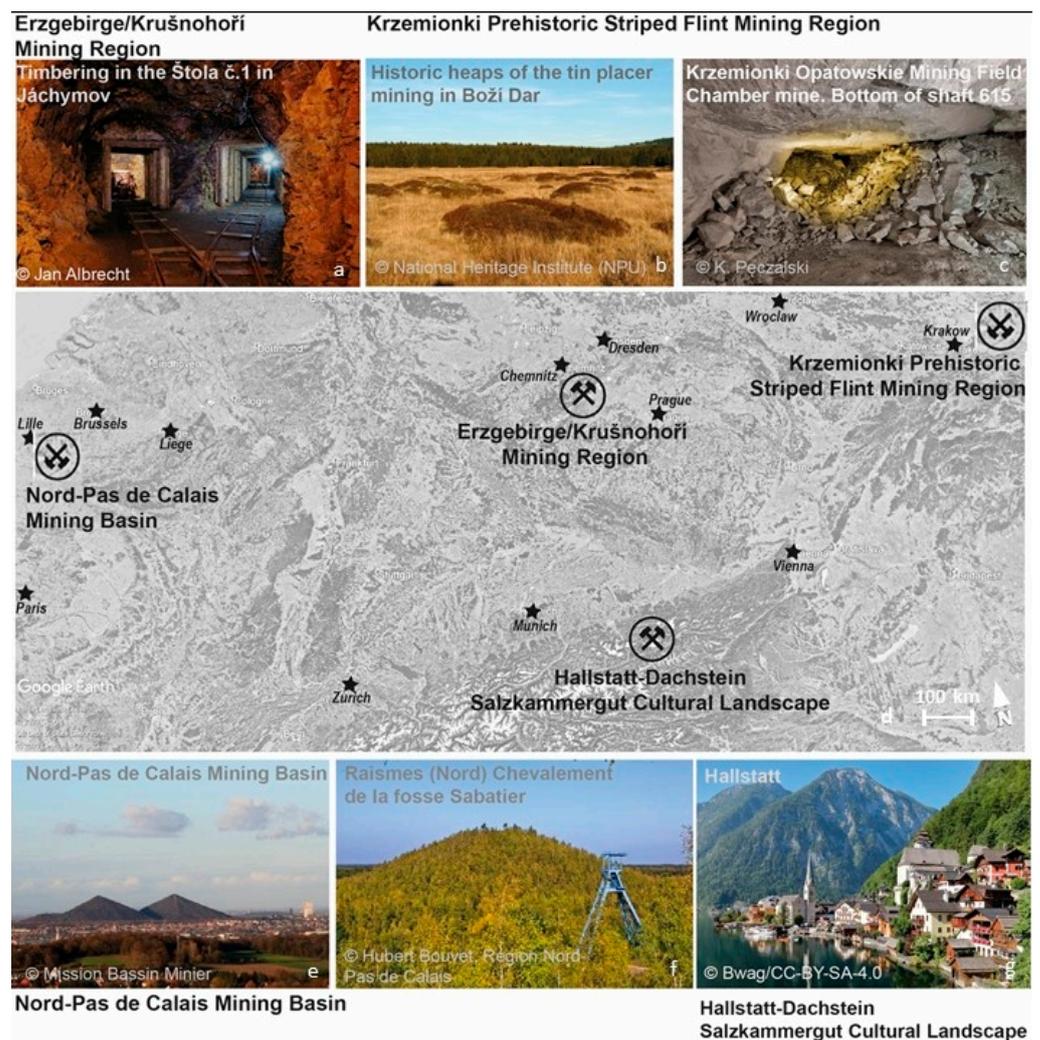


Figure 1. Location map (d) and examples of components for the four UNESCO World Heritage Sites: (a, b) Erzgebirge–Krušnohoří Mining Region (Germany/Czech Republic); (c) Krzemionki Prehistoric Striped Flint Mining Region (Poland); (e, f) Nord-Pas de Calais (France); and (g) Hallstatt Dachstein–Salzkammergut Cultural Landscape (Austria). (Basic map data: Google Earth Pro, Landsat/Copernicus © 2021 GeoBasis-De/BKG, editing: Katharina Gugerell; images retrieved from whc.unesco.org & wikipedia creative commons CC-BY-ND).

The four cases cover a broad diversity of different conditions, such as (i) the expectation that in cultural landscapes related to mineral extraction, a higher appraisal of mineral activities and thus more flexibility regarding exploration and extraction exists; (ii) covering a broader period regarding the date of inscription, (iii) sites in different EU member states (MS) to investigate if there are institutional and regulatory differences, and (iv) variety of commodities (see Table 1). The diversity of mining and heritage conditions is intended to investigate whether different responses and regulations regarding mineral exploration, extraction, and heritage conservation were taken.

Table 1. Key characteristics of the selected case studies. The criteria for inscription cover the criteria (ii) to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning, or landscape design; (iii) a unique or at least exceptional testimony to a cultural tradition or to a civilization that is living or has disappeared; (iv) outstanding example of a type of building, architectural, or technological ensemble or landscape that illustrates (a) significant stage(s) in human history; (vi) to be directly or tangibly associated with events or living traditions, with ideas, with beliefs, or with artistic and literary works of outstanding universal significance (linked to other values).

	Hallstatt-Dachstein— Salzkammergut	Nord-Pas de Calais Mining Basin	Montanregion Erzge- birge/Krušnohoří	Krzemionki Prehistoric Striped Flint Mining Region
Country	Austria	France	Germany/Czech Republic	Poland
Year of Inscription	1997	2012	2019	2019
Criteria for Inscription	(ii), (iv)	(ii), (iv), (vi)	(ii), (iii), (iv)	(iii), (iv)
Property (ha)	28,446.2	3943	6833.776	349.2
Buffer Zone (ha)	20,013.9	18,804	13,397.979	1828.7
Commodity and (time mining took place)	Salt (since Middle Bronze Age)	Coal (1700–1990)	Various metals, incl. Silver (1460–1560) and tin, cobalt, uranium (20th century)	Striped Flint (Neolithic)
Additional remarks in the context of mining			Natural uncontrolled revegetation of mining areas and features that can, over time, reduce access and modify the appearance of the mining landscape and its component features, flooding, pollution and potential tourism impact [35,36]	Revitalized, closed limestone quarries [37]

2.2. Case Introduction

Hallstatt-Dachstein—Salzkammergut Cultural Landscape (Austria) is located in the Eastern alpine region. Salt mining played a pivotal role for the historic landscape development, which started in prehistoric times and flourished in mediaeval times. The cultural landscape's appraisal is based on (a) intensive human activity of mining and processing salt in the alpine landscape (criterion iii); and (b) economic and cultural development of the alpine region due to salt mining, which is expressed in material and artistic evidence (crit. iv). Historically, the intensive, extractive industry also impacted other land uses such as forests and wood production, which was required for the processing. Although the inscription of the site into the UNESCO World Heritage List took place more than 20 years ago, the mandatory management plan has not been developed yet. Active salt mining is still taking place: 1.2 mt/year of salt are produced by Salinen AG, which is a privately owned company (approximately 520 employees). In addition to the active production underground mines, the company also runs a number of tourist mines as part of the regional touristic and heritage concept [38].

Nord-Pas de Calais Mining Basin (France) is located in the Northern French border region between the cities of Lille (France) and Charleroi (Belgium). The UNESCO cultural landscape is an assemblage of 109 single sites, overall representing a mining landscape rooted in intensive coal mining from the end of the 18th to the 20th century. The cultural landscape is imprinted by the strong mono-industrial focus of the mining region, presenting rich material evidence of that historic period (e.g., slag heaps, mining subsidence

ponds), mining industrial heritage (pit heads, industrial buildings, headgear); transport infrastructure—in particular, the so-called “cavaliers” (canals, railways, conveyors) and physical manifestations of the cultural and community life (e.g., mining villages, worker union premises, etc.) that are expressing the particular tangible and intangible cultural aspects of mining communities. The inscription in 2012 into the World Heritage List is based on criteria (ii), (iv), and (vi), emphasizing the material testimony of the area of European industrialization in its context to mineral extraction; (b) the spatial expression of large-scale industrial mining in the 19th and 20th century; and (c) the evolution of the socio-technical conditions of coal extraction [39,40].

Erzgebirge/Krušnohoří Mining Region (Ore Mountains) is a transboundary UNESCO World Heritage Site that consists of 22 single components and spans the region between Saxony (Germany) and North-Western Czechia. The cultural landscape is characterized by metal mining, which boomed at different times in the region: silver (High Middle Ages), tin, and cobalt were extracted from the 16th to the 18th century, which was followed by uranium extraction in the 19th and 20th century. The inscription into the UNESCO World Heritage list is rooted in three main characteristics: (a) material evidence (e.g., urbanization, housing, settlement plans) and governance systems related to mineral extraction (e.g., water management) in different time periods (crit. iv); (b) the intangible socio-cultural dimension of mining landscapes, which is nested in an evolving broader socio-technical system (crit. iii); and (c) the role and extent of socio-technical innovation ranging back into the Renaissance, illustrating significant technical innovations and resulting in transregional knowledge transfer [35,36].

Krzemionki Prehistoric Striped Flint Mining Region (Poland) is located in the north-eastern borders of the Świętokrzyskie Mountains in the central part of Poland. The property consists of four main parts: Krzemionki Opatowskie Mining Field; two smaller mining fields (Borwnia, Korycizna) and a prehistoric miners’ settlement (Gawroniec). Krzemionki is identified as a “rare prehistoric industrial landscape” that exhibits an early form of a socio-technical system based on mineral extraction. Its inscription is based on evidence for (a) a prehistoric underground mining system (criterion i); (b) living, working, and cultural patterns of prehistoric, disappeared communities (criterion iii); and (c) technical mining structures, comprising open pit, niche-gallery, gallery, room-and-pillar, and chamber mines, including 4000 shafts and pits. Limestone quarrying also took place nearby and in the buffer zone, which is considered a possible threat for the heritage site [37].

2.3. Methods

The empirical approach is based on in-depth document and policy analysis, including UNESCO reports, national legislation, and ICM policy documents related to cultural and natural heritage protection. A deductive content analysis enabled (i) an overview of heritage and mining in international heritage policies as well as (ii) a distinction of approaches to heritage and mining/mineral extraction at the national institutional level. The mapping of institutional regulations and mechanisms allowed the identification of instruments and approaches to mining and heritage in protected areas, mapping the following characteristics: (i) the extent of active mining in the protected area and the degree that mining contributes to the outstanding universal value of the World Heritage Site; (ii) current negative impacts and/or threats (rooting in mining) impacting the area; (iii) planning instruments for the implementation of heritage protection and their practical implications, i.e., concerning all stages of mining, from exploration to closure; and (iv) conservation issues related to the case.

For the purpose of this study, we use mining as the overall term to describe the extraction of mineral raw materials including all stages from exploration via exploitation to closure. In addition, potential overlaps of the cultural landscapes with Natura 2000, the network of nature protection areas in the EU, were considered.

3. Results

3.1. Role and Contribution of Mining and Mineral Extraction for the Outstanding Universal Value of the Sites

The mapping of case studies shows a broad variety of characteristics that form the basis for the outstanding universal value of the particular Site (Figure 2). The cases illustrate that criteria iii and iv seem to play an important role for the characterization of cultural mining landscapes. Although the specific characteristics mentioned in the nomination and reporting documents are diverse and appear patchy, they could be grouped into six thematic clusters. Those clusters cover tangible (1–4) and intangible (5–6) heritage-related characteristics: (1) Land Use and Mining Landscape Elements, (2) Built Environment, (3) Nature and Untamed Landscape, (4) Technology and Innovation, (5) Traditions, Culture, and Movement, and (6) Governance and Broader Context. The case research shows that the outstanding universal value of the sites is notably linked to socio-cultural appraisal factors such as criterion ii (important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design), iii (unique or at least exceptional testimony to a cultural tradition or to a civilization that is living or that has disappeared), and iv (outstanding example of a type of building, architectural, or technological ensemble or landscape that illustrates (a) significant stage(s) in human history). While one might be expecting that geodiversity (e.g., [41,42]) and/or geo-heritage (e.g., [43–46]) might have played an important role for mining landscapes, the study shows that UNESCO criterion viii (outstanding examples representing major stages of earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features) does in fact not play a role in the designation of the cases considered.

For the material testimony, the cases show that land-use patterns and landscape elements related to mineral extraction practices appear important. Mining landscapes differ in their physical representation from other landscapes due to their fragmented patchiness: mineral extraction and mineral practices are bound to the location of mineral deposits, resulting in a more uneven and patchy landscape development than in e.g., pasture landscapes and associated agricultural infrastructure. The inscription of the French, Polish, and German/Czech sites (2012–2019) as “serial properties” consisting of various elements might indicate that a certain degree of landscape fragmentation is considered in the inscription process. In addition, the nomination and revision documents show that mining practices and extractive industry produces distinctive landscape elements, settlements, and urban structures (Figure 2, groups 1 and 2) that assemble recognizable cultural landscapes witnessing the use and management of different mineral resources in different periods of human history. We can see that the characterization of mining landscapes expands conceptual debates of “landscapes” [47–51], including also subsurface spatial patterns, features, and elements: “cultural landscape (...) encompasses its functional, spatial and historical integrity, both above and below ground.” [35].

including e.g., a lithium project in Altenberg-Zinnwald [35,53]. The involved state parties commissioned a (preliminary) Heritage Impact Assessment to establish if negative impacts on the authenticity, integrity, and outstanding universal value is to be expected, and the preliminary conclusion was that mining would not negatively impact the site, and hence, it would be justifiable. However, ICOMOS stresses that the consultation processes are ongoing, and results remain preliminary and will be subject to further negotiations. The cases illustrate that mineral practices such as exploration and extraction seem to be tolerated to some degree. The example of the Austrian case shows that at least underground mining, with its small footprint on the landscape (mainly road infrastructure and buildings), can be operated within the boundaries of a heritage site. On the other hand, the Erzgebirge/Krušnohoří case shows that "(. . .) ICOMOS requested both States Parties to explain how they would act should any new requests for licenses be made in the future." [35]. The wording suggests that ICOMOS in general remains rather critical toward exploration and consequently extractive activities, stressing that new mining activities remain the "main long-term challenge for the protection and management of the property" (ibid.). The multi-stakeholder consultation process is required to pay particular attention to potential negative impacts of surface elements and potential mining activities underneath the protected old underground mine workings: "Modern developments, including in particular the possibility of new mining activities, are the main long-term challenge for the protection and management of the property. All relevant stakeholders were included in the management structure to secure a constant flow of information regarding potential new developments in the region and to assess their impact on the nominated component parts, and to mitigate negative impacts on the outstanding universal value of the property, its integrity and authenticity" [54]. The research shows that cultural mining landscapes consist of "above-ground" and underground features and landscape elements and thus pose very specific challenges and questions for landscape assessments and the sustainable management of such cultural landscapes. It also shows that while active mining and mineral exploration is not endorsed, show mines and exhibition mines in relation to tourism and knowledge/educational activities are implemented (e.g., Austria, France). The popularity of World Heritage Sites and "heritage tourism" is considered a positive driver for regional development, management, and local acceptance of such sites [55,56]; however, more recently, more critical voices are raised concerning (over-)tourism and crowding with the potential to impact tangible and intangible parts of the cultural heritage [57]. In several cases (Tables 1 and 2), tourism was assessed as a possible threat for the cultural mining landscapes.

Table 2. Overview of the researched cases: past and present role of mining/mineral extraction, instruments of protection, current threats, and challenges from a mining perspective.

Case Study	Current Practices of Extraction and Exploration (Core/Buffer Zone)	Instruments of Protection	Indicated Negative Factors or Threats Impacting the Area, based on UNESCO Reporting	Challenges from a Mining Perspective
Hallstatt-Dachstein/Salzkammergut	<ul style="list-style-type: none"> About 1.2 mt/year of salt are produced by Salinen AG In addition to the active production underground mines, the company also runs a number of tourist mines 	<ul style="list-style-type: none"> Austrian Monument Protection Act Townscape regulations Building codes and spatial planning provisions (provincial level) Environmental impact assessment, water, forestry acts Provincial Nature and Landscape Conservation Acts Parts are also protected under Natura 2000 	Currently, no negative factors or threats are reported.	
Nord-Pas de Calais Mining Basin	Coal mining ended in 1990, and today, there is no more active mining in the region	<ul style="list-style-type: none"> French national laws, regional, county or local decrees, and regulations including the following: <ul style="list-style-type: none"> Heritage Code Historical Monuments Act Urban and Landscape Architectural Heritage Protection Zone (territorial level) Scheme for Territorial Coherence (SCOT; level several municipalities) Local urban planning plan (PLU; municipalities level) 	UNESCO mentions that the site suffers from “ <i>potential threats to the landscape from economic development</i> ”. [40]	Hydrocarbons Act puts a direct stop to the exploration and introduces a progressive stop to the extraction of hydrocarbons and coal in France

Table 2. Cont.

Case Study	Current Practices of Extraction and Exploration (Core/Buffer Zone)	Instruments of Protection	Indicated Negative Factors or Threats Impacting the Area, based on UNESCO Reporting	Challenges from a Mining Perspective
Erzgebirge/Krušnohoří	<ul style="list-style-type: none"> No active mining taking place within the components Old mines have become tourist attractions Number of projects in the exploration and development phase in close proximity to components in Saxony 	<ul style="list-style-type: none"> German federal and state laws, including the following: <ul style="list-style-type: none"> Regional Planning Act Building Code Environmental laws, i.e., Federal Nature Conservation Act and the Environmental Impact Assessment Act Act on the Protection and Conservation of Cultural Heritage in Saxony Act on Nature Conservation and Landscape Protection of Saxony For the uranium mining sites, various ordinances and orders concerning nuclear safety and radiation protection In the Czech Republic: <ul style="list-style-type: none"> Heritage Preservation Act Act on the Conservation of Nature and the Landscape and related orders In both countries, areas of the components also lie within Natura 2000 habitats. 	<p><i>“Modern developments, including in particular the possibility of new mining activities, are the main long-term challenge for the protection and management of the property.” [54]</i></p>	<ul style="list-style-type: none"> No mining within components
Krzemionki Prehistoric Striped Flint Mining Region	There is no actual mining and there are also no plans for future mining	<ul style="list-style-type: none"> UNESCO Convention Protection of Monuments and the Care of Historical Monuments Act Partly covered under the Act on the Protection of Nature The Krzemionki Opatowskie Nature Reserve includes the archaeological reserve along with surrounding forest and post-industrial areas In 2009, the Krzemionki Opatowskie Nature Reserve became part of the Natura 2000 area Krzemionki 	Currently, no negative factors or threats are reported.	<ul style="list-style-type: none"> In 2014, a last active limestone quarry was rehabilitated In 2016, a quarry north of the proposed buffer zone of Krzemionki Opatowskie was declined on the basis of cultural heritage objections [37]

3.3. The Role of Exploration and Extraction in and on the Sites—Institutional Regimes/Legislative Regulations

The protection of World Heritage Sites in the five countries covered in this study is mainly based on heritage and environment protection legislation. Poland differs with regard to heritage, as the UNESCO Convention (which was ratified by Poland in 1976) itself is the only legal basis for activities related to the cultural heritage sites. Specific cases, as done here in 1994 for "Krzemionki—flint mines from the Neolithic period", might be declared a historical monument. In this case, a site is also protected under the Monuments and the Care of Historical Monuments Act [58]. Other legislation, such as building codes or spatial planning provisions can complement the above. In the case of Austria, France, and Germany, different government levels, ranging from national to municipal play a legislative (as well as regulatory) role. For the Saxon uranium mining sites, various ordinances and orders concerning nuclear safety and radiation protection also play a role.

Regarding environmental legislation, it is mainly generic environmental protection laws, nature protection or conservation laws, as well as requirements for environmental impact assessments that are used to protect the sites. The Natura 2000 designation, which is also used, is described in detail in Section 3.4.

Mining is not explicitly prohibited in cultural heritage areas but would only be allowed if it did not endanger the value or protection objectives, or "only for overriding reasons of public interest" and with determining appropriate compensation measures (Czech Republic).

For example, the French Mining Code [59] does not per se exclude mining in cultural heritage or Natura 2000 areas but refers to the Environment Code [60] and the Heritage Code [61]. Based on these, projects would have to undertake environmental impact assessments and analyze any eventual interactions and impacts. Similarly, the proximity of a national historic site will lead to a review of any visibility impacts caused by a project. However, exploring for coal is not possible anymore, as the French Hydrocarbons Act [62] puts a direct stop to the exploration and introduces a progressive stop to the extraction of hydrocarbons and coal.

On the other hand, Germany's Federal Mining Act does allow exploration for new mines within the boundaries of a heritage site, according to §11 (10), "An exploration license shall be denied if [...] overriding public interest prohibits exploration in the entire field to be assigned." [63]. This includes all public interests recognized by the legal system such as nature and monument protection or landscape conservation.

3.4. Natura 2000, Cultural Landscapes, and Mining

Three of the four cases overlap with Natura 2000, mainly in a way that this EU network of nature protection is also used as one of the "tools" to protect the landscapes. In the case of the German/Czech and Polish sites, it is especially used to protect the buffer zones surrounding the components of the heritage sites.

The rules for mining in Natura 2000 protected areas are the same as those described in Section 3.3 for cultural heritage: hardly allowed in Germany but allowed under certain conditions in the other countries. For the Austrian case, based on the Upper Austrian Nature Conservation Law, mining would only be allowed if (i) a significant impairment of the protective purpose of the protected area can be excluded by prescribing conditions, time limits, or requirements, or (ii) it must be carried out for compelling reasons of overriding public interest, including those of a social or economic nature, and an alternative solution is not available [64]. This is similar to the Czech Republic, based on the Act on the Conservation of Nature and the Landscape [65]: Activities endangering the aims of Natura 2000 protection could only take place with a permit from the Environmental Protection Authority. If a significant negative impact on the site could be expected, an Environmental Impact Assessment proves that, and there is no alternative solution minimizing the impact, it could be allowed "only for overriding reasons of public interest" and with determining appropriate compensation measures. In Poland, based on the Nature Conservation Act [66],

any project in or near such areas would require an environmental impact assessment. The result of which would have to show that the project does not, alone or in combination with other actions, significantly negatively affect the objectives of protection, including in particular: (1) aggravate the condition of natural habitats or the habitats of species of plants and animals, for which they are protected, (2) affect the species for which protection has been designated, or (3) impair the integrity of a Natura 2000 area or its links with other areas.

Overall, this is aligned with the European Commission's guidance on how mining can be aligned with Natura 2000 requirements [67], which does not automatically exclude mining projects but subjects them to an appropriate assessment.

4. Discussion

This article presents the results of an initial study examining cultural mining landscapes and the role of mineral exploration and extraction within such UNESCO designated areas. The research illustrates that for cultural mining landscapes, the combination of tangible and intangible elements plays an important role, while with the more recent nominations, the appreciation of the socio-technical systems has moved more into the spotlight. In particular, intangible elements such as cultural expression and "living tradition" require active land-use practices to some degree for their reproduction and to prevent a Disneyfication or "staged authenticity" [57,68]. While ICOMOS and UNESCO pursue a clear approach toward mineral exploration and mining, the case study research reveals that mineral practices are treated with lenience, even if they are not endorsed by UNESCO and ICOMOS. The examined documents indicate a possible concern regarding surface elements (e.g., mining infrastructure) and (visual) landscape impacts. Given the strong impacts of tourism, a comparison of the large-scale tourism and traffic infrastructure (including its e.g., visual effects) with the infrastructure related to mineral activities, particularly in cultural mineral landscapes, might be worth an in-depth investigation and discussion in the future. However, incidents happening such as those in Australia [24] make it difficult to establish such debates in practice. Nevertheless, considering UNESCO World Heritage Sites as "global" public interest, it is also an item that should, could, or has to be considered in more recently launched SLO debates that are emphasizing the "societal" dimension of SLO [22].

In only one of the four cases examined, the Austrian Hallstatt-Dachstein/Salzkammergut, active mining is still occurring within the boundaries of the World Heritage cultural landscape. However, the case is special, since the heritage designation is based on salt mining in the region, and the active salt mines were pre-existing to and part of the selection process in 1997. In the other case where exploration is happening, the German Erzgebirge, it can only happen outside of the boundaries of the protected components and with consultation processes and precautions to protect the heritage site in place.

None of the five countries analyzed in this study have put the World Heritage declaration principles into their national mining laws. Germany comes closest, as its mining law almost denies any exploration when public interest—which includes legally recognized nature and monument protection—is concerned. Thus, this would support the case of the ICM [27] asking for stronger support from countries in protecting World Heritage Sites from mining. It is also worth pointing out that the definition of public interest in Germany is opposite to the one used in Austria or the Czech Republic; there, a public interest in mining can supersede the protection of nature or cultural heritage (although with compensation measures). All countries protect both cultural and natural World Heritage Sites either directly through the UNESCO convention (Poland) or through national and regional heritage and monument, as well as environment protection legislation. In reality, this means that whilst not explicitly forbidden, it would be next to impossible to explore for and open a new mine within the boundaries of these four sites, except for underground salt mines in Hallstatt-Dachstein/Salzkammergut, and that compromises will be needed to open mines in the proximity. Nature conservation and protection via

Natura 2000 designations have also been used in three of the cases to protect the heritage sites, i.e., for the surrounding buffer zones. Once again, differences exist in the national laws if, to what extent, and how any development (including exploration and exploitation) could take place within Natura 2000 zones.

Focusing on four cases provides an indication of the legal situation in the EU. Further work examining the other 39 cultural landscapes in the EU would be beneficial, i.e., concerning potential pressure and conflicts related to mining concerning these. Examining the remaining 22 member states of the EU regarding the legal situation concerning heritage protection and mining might also be useful, i.e., since Nordic countries, where most of the exploration activities within the EU take place these days, were not covered by the cases. In addition, this paper focuses on the institutional and policy side and further work considering the perspective of heritage professionals and heritage management on the ground, which might differ from those at the high-level institutional scale, is needed.

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References

1. United Nations Educational, Scientific and Cultural Organization. *Operational Guidelines for the Implementation of the World Heritage Convention*; WHC.19/01; United Nations Educational, Scientific and Cultural Organization Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage: Paris, France, 2019.
2. United Nations Educational, Scientific And Cultural Organization. *16th Convention Concerning the Protection of the World Cultural and Natural Heritage*; UNESCO: Santa Fe, NM, USA, 1992.
3. Rössler, M.; Lin, R.C.-H. Cultural Landscape in World Heritage Conservation and Cultural Landscape Conservation Challenges in Asia. *Built Herit.* **2018**, *2*, 3–26. [\[CrossRef\]](#)
4. Taylor, K.; Lennon, J. Cultural Landscapes: A Bridge between Culture and Nature? *Int. J. Herit. Stud.* **2011**, *17*, 537–554. [\[CrossRef\]](#)
5. Bieling, C.; Plieninger, T. *The Science and Practice of Landscape Stewardship*; Cambridge University Press: Cambridge, UK, 2017; ISBN 9781316499016.
6. Aplin, G. World Heritage Cultural Landscapes. *Int. J. Herit. Stud.* **2007**, *13*, 427–446. [\[CrossRef\]](#)
7. Plieninger, T.; Kizos, T.; Bieling, C.; Le Du-Blayo, L.; Budniok, M.-A.; Bürgi, M.; Crumley, C.L.; Girod, G.; Howard, P.; Kolen, J.; et al. Exploring Ecosystem-Change and Society through a Landscape Lens: Recent Progress in European Landscape Research. *Ecol. Soc.* **2015**, *20*. [\[CrossRef\]](#)
8. Gugerell, K. A Spatial Governance Approach to Landscape Planning: Insights into Coordination Mechanisms and Gameful Learning. Habilitation Thesis, University of Natural Resources and Life Sciences Vienna, Vienna, Austria, 2019.
9. United Nations Educational, Scientific And Cultural Organization. *Operational Guidelines for the Implementation of TheWorld Heritage Convention*; UNESCO World Heritage Centre: Paris, France, 2012.
10. Mitchell, N.; Rössler, M.; Tricaud, P.-M. *World Heritage Cultural Landscapes. A Handbook for Conservation and Management*; World Heritage papers; World Heritage Centre UNESCO: Paris, France, 2009.
11. Reeves, K.; McConville, C. Cultural Landscape and Goldfield Heritage: Towards a Land Management Framework for the Historic South-West Pacific Gold Mining Landscapes. *Landsc. Res.* **2011**, *36*, 191–207. [\[CrossRef\]](#)
12. Gugerell, K.; Penker, M.; Kieninger, P. Landscape Co-Management Practices and Power Structures in the UNESCO World Heritage Site Wachau. In *Cultural Sustainability and the Nature-Culture Interface: Livelihoods, Policies, and Methodologies*; Birkeland, I.J., Bruton, R., Parra, C., Siivonen, K., Eds.; Routledge Studies in Culture and Sustainable Development; Routledge: Abingdon, WA, USA; Oxon, MD, USA; New York, NY, USA, 2018; pp. 109–124. ISBN 9781315625294.

13. European Commission. *Strategic Implementation Plan for the European Innovation Partnership on Raw Materials, Part II Priority Areas, Action Areas and Actions*; European Commission: Brussels, Belgium, 2013; p. 60.
14. Commission of the European Communities. *Communication from the Commission to the European Parliament and the Council the Raw Materials Initiative—Meeting Our Critical Needs for Growth and Jobs in Europe (SEC(2008) 2741) EN*; Commission of the European Communities: Brussels, Belgium, 2008.
15. Gugerell, K.; Endl, A.; Gottenhuber, S.L.; Ammerer, G.; Berger, G.; Tost, M. Regional Implementation of a Novel Policy Approach: The Role of Minerals Safeguarding in Land-Use Planning Policy in Austria. *Extr. Ind. Soc.* **2020**, *7*, 87–96. [[CrossRef](#)]
16. Tiess, G. Minerals Policy in Europe: Some Recent Developments. *Resour. Policy* **2010**, *35*, 190–198. [[CrossRef](#)]
17. Tiess, G. *General and International Mineral Policy*; Springer: Vienna, Austria, 2011; ISBN 9783211890042.
18. Sinnett, D. Going to Waste? The Potential Impacts on Nature Conservation and Cultural Heritage from Resource Recovery on Former Mineral Extraction Sites in England and Wales. *J. Environ. Plan. Manag.* **2019**, *62*, 1227–1248. [[CrossRef](#)]
19. Tost, M.; Murguia, D.; Hitch, M.; Lutter, S.; Luckeneder, S.; Feiel, S.; Moser, P. Ecosystem Services Costs of Metal Mining and Pressures on Biomes. *Extr. Ind. Soc.* **2020**, *7*, 79–86. [[CrossRef](#)]
20. Endl, A.; Tost, M.; Hitch, M.; Moser, P.; Feiel, S. Europe’s Mining Innovation Trends and Their Contribution to the Sustainable Development Goals: Blind Spots and Strong Points. *Resour. Policy* **2019**, 101440. [[CrossRef](#)]
21. Mudd, G.M. The Environmental Sustainability of Mining in Australia: Key Mega-Trends and Looming Constraints. *Resour. Policy* **2010**, *35*, 98–115. [[CrossRef](#)]
22. Lesser, P.; Gugerell, K.; Poelzer, G.; Hitch, M.; Tost, M. European Mining and the Social License to Operate. *Extr. Ind. Soc.* **2020**, 787. [[CrossRef](#)]
23. Kuntonen van-Riet, J. The Soft Skills Approach to Mining and Metallurgy: Education as a Key Ingredient for Society-Wide SLO. **2020**, unpublished.
24. Allam, L. “Devastated” Indigenous Owners Say Rio Tinto Misled Them Ahead of Juukan Gorge Blast. *The Guardian*, 9 December 2020.
25. United Nations Educational, Scientific And Cultural Organization. *Proceedings of the Technical Workshop on World Heritage and Mining, Gland, Switzerland*; UNESCO: Paris, France; IUCN: Gland, Switzerland; ICME: Stanford, CA, USA, 2001; ISBN 1895720389.
26. United Nations Educational, Scientific and Cultural Organization. *WHC Nomination Documentation: The Wachau Cultural Landscape*; UNESCO: Paris, France, 2000.
27. ICMM (International Council on Mining and Metals). ICMM Calls for Stronger Legal Protection of World Heritage Sites. Available online: <https://www.icmm.com/en-gb/news/2016/icmm-calls-for-protection-of-world-heritage-sites> (accessed on 21 December 2020).
28. IRMA (Initiative for Responsible Mining Assurance). *IRMA Principles of Engagement*; IRMA: Westchester, IL, USA, 2020.
29. Yin, R.K. *Case Study Research and Applications: Design and Methods*, 6th ed.; SAGE: Los Angeles, CA, USA, 2018; ISBN 9781506336169.
30. Gerring, J. Strategies for social inquiry. In *Case Study Research: Principles and Practices*, 2nd ed.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2017; ISBN 9781316632505.
31. George, A.L.; Bennett, A. BCSIA studies in international security. In *Case Studies and Theory Development in the Social Sciences*; MIT Press: Cambridge, MA, USA, 2005; ISBN 9780262072571.
32. Flyvbjerg, B. Five Misunderstandings About Case-Study Research. *Qual. Inq.* **2006**, *12*, 219–245. [[CrossRef](#)]
33. United Nations Educational, Scientific and Cultural Organization. World Heritage in Danger. Available online: <https://whc.unesco.org/en/danger/> (accessed on 21 December 2020).
34. United Nations Educational, Scientific and Cultural Organization. *World Heritage State of Conservation Information System*; UNESCO: Paris, France, 2020. Available online: <https://whc.unesco.org/en/soc> (accessed on 9 December 2020).
35. ICOMOS (International Council on Monuments and Sites). *Advisory Board Evaluation: Erzgebirge/Krušnohoří (Germany/Czechia) No 1478*; UNESCO: Paris, France, 2019. Available online: <https://whc.unesco.org/en/list/1478/documents/> (accessed on 9 December 2020).
36. United Nations Educational, Scientific and Cultural Organization. *Erzgebirge/Krušnohoří Mining Region Annex 1: Management Plan 2013–2021 Transboundary Serial World Heritage Nomination of the Federal Republic of Germany/Free State of Saxony and the Czech Republic*; UNESCO: Paris, France, 2019. Available online: <https://whc.unesco.org/en/list/1478/documents/> (accessed on 9 December 2020).
37. FOCPS (Foundation for the Protection of Industrial Heritage of Silesia). *Krzemionki Prehistoric Striped Flint Mining Region. Management Plan 2019–2030. Draft. Annex to the Application for Inscription onto the World Heritage List*; The Foundation for the Protection of Industrial Heritage of Silesia: Warsaw, Poland, 2018.
38. Salinen Austria. Salinen Austria AG Is One of the Leading Salt Producers in Europe. Available online: <https://www.salinen.com/en/the-company/salinen-group/salinen-austria-ag/> (accessed on 20 December 2020).
39. ICOMOS (International Council on Monuments and Sites). *Periodic Reporting Cycle 2, Section II*; UNESCO: Paris, France, 2014. Available online: <https://whc.unesco.org/en/documents/164156> (accessed on 9 December 2020).
40. ICOMOS (International Council on Monuments and Sites). *Nord-Pas de Calais Mining Basin (France) No. 1360 Advisory Body Evaluation (ICOMOS)*; UNESCO: Paris, France, 2012. Available online: <https://whc.unesco.org/en/list/1360/documents/> (accessed on 9 December 2020).

41. Gray, M. Geodiversity, Geoheritage and Geoconservation for Society. *Int. J. Geoherit. Parks* **2019**, *7*, 226–236. [CrossRef]
42. Gray, J.M. *Geodiversity: Valuing and Conserving Abiotic Nature*, 2nd ed.; Wiley Blackwell: Chichester, UK, 2013; ISBN 9780470742143.
43. Brillha, J. Geoheritage. In *Geoheritage*; Elsevier: Amsterdam, The Netherlands, 2018; pp. 69–85. ISBN 9780128095317.
44. Filocamo, F.; Roskopf, C.M.; Amato, V. A Contribution to the Understanding of the Apennine Landscapes: The Potential Role of Molise Geosites. *Geoheritage* **2019**, *11*, 1667–1688. [CrossRef]
45. Bentivenga, M.; Cavalcante, F.; Mastronuzzi, G.; Palladino, G.; Prosser, G. Geoheritage: The Foundation for Sustainable Geotourism. *Geoheritage* **2019**, *11*, 1367–1369. [CrossRef]
46. Sallam, E.S.; Ponedelnik, A.A.; Tiess, G.; Yashalova, N.N.; Ruban, D.A. The Geological Heritage of the Kurkur–Dungul Area in Southern Egypt. *J. Afr. Earth Sci.* **2018**, *137*, 103–115. [CrossRef]
47. Kühne, O. *Landschaft Und Wandel: Zur Veränderlichkeit von Wahrnehmungen*; Raum Fragen; Springer: Wiesbaden, Germany, 2018; ISBN 9783658185336.
48. Angelstam, P.; Elbakidze, M.; Axelsson, R.; Dixelius, M.; Törnblom, J. Knowledge Production and Learning for Sustainable Landscapes: Seven Steps Using Social–Ecological Systems as Laboratories. *AMBIO* **2013**, *42*, 116–128. [CrossRef]
49. Burckhardt, L.; Ritter, M.; Schmitz, M. *Warum ist Landschaft schön? die Spaziergangswissenschaft*, 4th ed.; Schmitz: Berlin, Germany, 2015; ISBN 9783927795426.
50. Rippon, S. *Historic Landscape Analysis. Deciphering the Countryside*; Practical Handbooks in Archeology; Council for British Archeology: York, UK, 2004; Volume 16.
51. Antrop, M. The Concept of Traditional Landscapes as a Base for Landscape Evaluation and Planning. The Example of Flanders Region. *Landsc. Urban Plan.* **1997**, *38*, 105–117. [CrossRef]
52. IUCN (International Union for Conservation of Nature). *World Heritage Nomination—IUCN Comments to Icomos Basin of the Nord-Pas-De-Calais (France) ID No. 1360*; IUCN: Gland, Switzerland, 2012. Available online: <https://whc.unesco.org/en/list/1360/documents/> (accessed on 9 December 2020).
53. Deutsche-Lithium Zinnwald-Lithium-Projekt. Available online: <http://www.deuschelithium.de/projekte/zinnwald-lithium-projekt/> (accessed on 16 December 2020).
54. United Nations Educational, Scientific And Cultural Organization. *Erzgebirge/Krušnohoří Mining Region Nomination for Inscription on the UNESCO World Heritage List. Transboundary Serial World Heritage Nomination of the Federal Republic of Germany/Free State of Saxony and the Czech Republic*; TU Freiberg: Freiberg, Germany, 2019.
55. Timothy, D.J. Aspects of tourism texts. In *Cultural Heritage and Tourism: An Introduction*, 2nd ed.; Channel View Publications: Blue Ridge Summit, PA, USA, 2020; ISBN 9781845417703.
56. Li, M.; Wu, B.; Cai, L. Tourism Development of World Heritage Sites in China: A Geographic Perspective. *Tour. Manag.* **2008**, *29*, 308–319. [CrossRef]
57. Chhabra, D.; Healy, R.; Sills, E. Staged Authenticity and Heritage Tourism. *Ann. Tour. Res.* **2003**, *30*, 702–719. [CrossRef]
58. SEJM (Sejm Rzeczypospolitej Polskiej). *The Act of 23 July 2003 on the Protection and the Care of Monuments*; Journal of Laws 2003 No 162 Item 1568: Warsaw, Poland, 2003. Available online: <http://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20031621568/U/D20031568Lj.pdf> (accessed on 10 December 2020).
59. Ministère des Mines. *Code Minier (Nouveau) Français*; Ministère des Mines: Paris, France, 2017.
60. Ministère de la Transition Écologique et Solidaire. *Code de l'environnement*; Ministère de la Transition Écologique et Solidaire: Paris, France, 2017.
61. Ministère de la Culture et de la Communication. *Code Du Patrimoine*; Ministère de la Culture et de la Communication: Paris, France, 2011.
62. Ministère de la Transition Écologique et Solidaire. *LOI No. 2017-1839 Du 30 Décembre 2017 Mettant Fin à La Recherche Ainsi Qu'à l'exploitation Des Hydrocarbures et Portant Diverses Dispositions Relatives à l'énergie et à l'environnement (1)*; Ministère de la Transition Écologique et Solidaire: Paris, France, 2017.
63. Bundesministerium für Justiz und Verbraucherschutz. *Bundesberggesetz Vom 13. August 1980 (BGBl. I S. 1310), Das Zuletzt Durch Artikel 237 Der Verordnung Vom 19. Juni 2020 (BGBl. I S. 1328) Geändert Worden Ist. BbergG*; Bundesministerium für Justiz und Verbraucherschutz: Berlin, Germany, 1980.
64. Land OÖ. *Landesgesetz Über Die Erhaltung Und Pflege Der Natur (Oö. Natur-Und Landschaftsschutzgesetz 2001—Oö. NSchG 2001)*; Land OÖ: Linz, Austria, 2001.
65. Czech National Council. *Czech National Council Act No. 114/92 on the Protection of Nature and the Landscape*; Czech National Council: Prague, Czech Republic, 1992.
66. SEJM (Sejm Rzeczypospolitej Polskiej). *The Act of 16 April 2004 the Nature Conservation Law*; Journal of Laws 2004 No 92 Item 880: Warsaw, Poland, 2005. Available online: <https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20040920880/U/D20040880Lj.pdf> (accessed on 10 December 2020).
67. European Commission. *EC Guidance on Undertaking New non-Energy Extractive Activities in Accordance with Natura 2000 Requirements*; Publications Office of the European Union: Luxembourg, Luxembourg, 2011.
68. Bryman, A. *The Disneyization of Society*; Sage Publishers: London, UK; Thousand Oaks, CA, USA, 2004; ISBN 9780761967651.