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Three rising tourism directions and climate change: Conceptualizing new opportunities

Geological, archaeological, and industrial tourism can serve efficiently for the communication of climate change knowledge to the public, which is a literacy function. Importantly, each of these directions deals with information on a particular time slice, and thus, taking these tourism directions together delivers climate change knowledge very logically. Thematic, climate change-oriented parks (e.g., on the basis of geoparks) can combine geological, archaeological, and industrial tourism activities in order to sufficiently increase public awareness and to correct the public perception of climate change. Correct interpretation and availability of trained interpreters are the main challenges.

Key words: geotourism, archaeology, industrial heritage, public awareness, interpretation

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Introduction

Tourism is a weather- and climate-dependent industry (Craig and Feng, 2018). Its relevance to climate change has remained popular and, at the same time, a contested research issue in science for three decades. The first contributions appeared in the early 1990s (Smith, 1990; Wall, Badke, 1994), and among the most cited works are those published by Elsasser and Burki (2002), Amelung et al. (2007), and Hamilton et al. (2005). It has also been established that climate change was a complex factor for tourism in the historical past (Weir, 2017).

Despite the evident diversity of *tourism versus climate change* research, four major subjects can be outlined, namely

- negative effects of climate change on tourism (Smith, 1990; Elsasser and Burki, 2002; Buzinde et al., 2010; Hall et al., 2015; Damm et al., 2017; Zhang and Zhang, 2018) and relevant tourism adaptation (Njoroge, 2014);
- positive (more or less) effects of climate change on tourism (Rossello-Nadal, 2014; Shani and Arad, 2014; Grillakis et al., 2016a,b; Amelung et al., 2017);
- tourism effects on climate changes (Buckley, 2011; Korstanje and George, 2012a,b; Peters and Eijgelaar, 2014; Gössling and Peeters, 2015; Gössling et al., 2015; Hall et al., 2015; Michailidou et al., 2016);
- climate change awareness (Wall and Badke, 1994; Gaita and Both, 2008; Becken et al., 2015) and perception by tourists and tourism managers (Becken, 2004; Saarinen and Tervo, 2006; Wyss et al., 2014; Martin et al., 2017).

Disputes on these subjects and the relevant state-of-the-art interpretations have become very common in professional journals (not only tourism-focused or climate-focused) (Becken, 2013), although some research gaps still exist (e.g., Hewer and Gough, 2018). Generally, the theme of *tourism versus climate change* has gradually become an old message

(note that "old" never means "outdated" or "insignificant") linked to the "classical" understanding of the climate change (and "global warming" as a popular label) and its consequences (DiMento and Doughman, 2007; Houghton, 2009; Graves, 2017; Shukla et al., 2017). If so, the finding of new ways of thinking about the noted theme seems to be important. For instance, the educational component expands for modern tourism, and why not to use this educational potential for better delivery of climate change knowledge to the broader public?

In this brief paper, the authors intend to turn the attention of the research community to the appearance of some new ideas in tourism science that permit significant extension of discussions and interpretations relevant to the theme of *tourism versus climate change*. The main purpose of this paper is to emphasize three relatively new directions for tourism that can distribute climate change knowledge efficiently, and thus contribute to climate change mitigation. In other words, this paper is a contribution to the modern tourism research agenda, which should be extended because of the new opportunities provided by geological, archaeological, and industrial tourism. Attempting doing this, the authors rely on their own research experience and review the main findings as reflected in the literature. Methodologically, this paper is essentially a kind of conceptualization of tourism directions relevance to climate changes, and it also offers theoretical analysis of education potential of these directions that can increase the public awareness of the past, present, and future climate changes.

Tourism directions related to the distribution of the climate change knowledge

Geological, archaeological, and industrial tourism have either started to grow or continued to expand at the beginning of the 21st century (Fig. 1). Indeed, these activities existed (in different forms) far before the last decade, but they have been conceptualized and

studied in-depth only very recently, together with their global rise. Importantly, all these directions can be related to the idea of climate change, which is explained below.

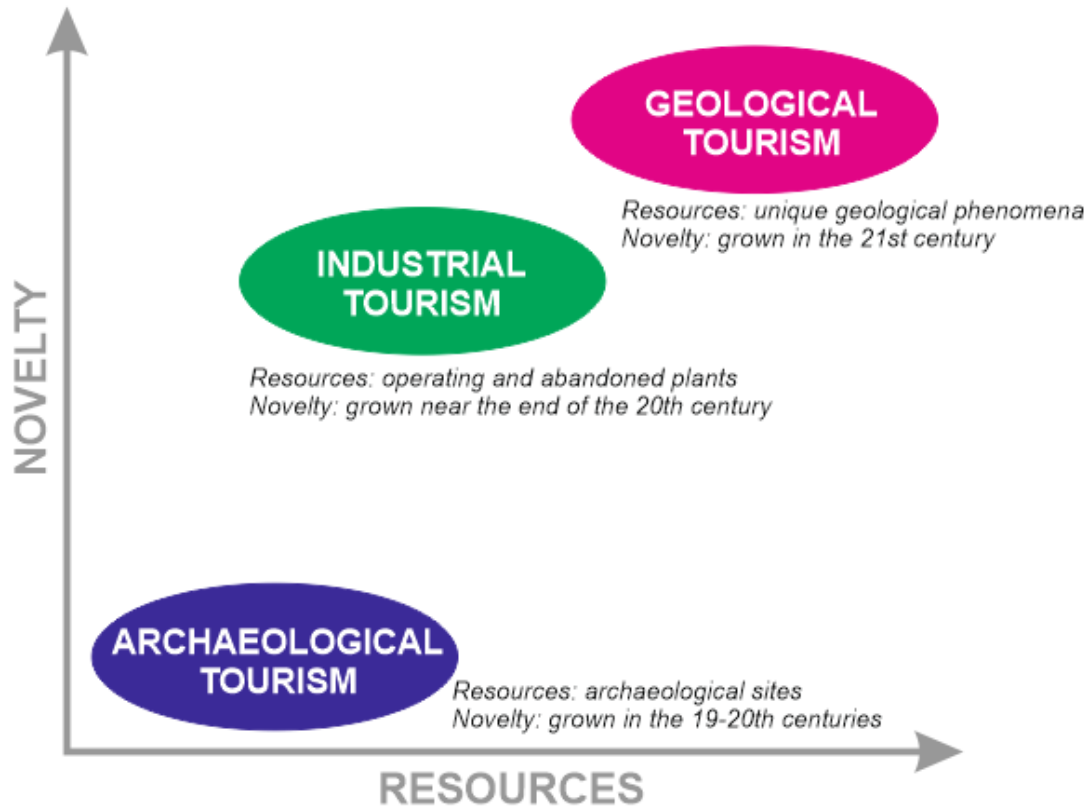


Figure 1: A conceptual representation of the relative importance of three directions of tourism considered in this paper

Geological tourism (geotourism) can be defined as a public activity aimed at learning about interesting, unusual, and spectacular geological features either in the field or in a museum. In other words, this tourism direction involves the "exploitation" of unique geological phenomena for tourism purposes (Dowling, 2011; Hose, 2012; Henriques and Brilha, 2017; Ruban, 2015, 2017; Habibi et al., 2018; Ólafsdóttir and Tverijonaite, 2018). Single manifestations of spectacular geological phenomena (e.g., unusual rocks or fossil-rich deposits) termed as "geosites" can be arranged to attract visitors. Similarly popular is the creation of geoparks. These are thematic parks displaying a diversity of unique features and

geological landscapes; in other words, geoparks are territorial establishments emphasizing geological heritage and providing infrastructure for the relevant learning and recreation activities (cf. Habibi et al., 2018). Finally, unique mineral, rock, and fossil specimens can be preserved in museum collections open to visitors. As the climate of the Earth changed through geological history and the climate belts also shifted, some (if not many) geological objects bear important information about climate changes (including extreme and catastrophic changes) in the "Deep Past". In doing so, these objects support the concept of modern climate change and its possible consequences. The involvement of such objects in tourism programs is important for the communication of climate change knowledge to the public. This approach has been suggested, particularly, by Gnezdilova et al. (2015). For instance, a geosite in Europe representing rocks and fossils of the Eocene Epoch (~45 mln yr ago) provides sharp evidence of extreme warm conditions on a territory where the modern climate is temperate. Similarly, if it is known that the ongoing human-induced global warming can return the planet to the "greenhouse" Cretaceous world (~100 mln yr ago) (Hay, 2011), then localities of Cretaceous rocks and fossils can be used to demonstrate the reality of such significant climate shifts. The possible geotourism contribution to public awareness of climate change was also considered by Rutherford et al. (2015) in the case of Rottneest Island (Australia) and Muda (2016) in the case of Northern Sabah (Malaysia). More general ideas on this issue were also expressed by Prosser (2013) and Gill (2017). Additionally, Ansari et al. (2016) proposed that the UNESCO World Heritage Sites can be employed for purposes of demonstrating the geological activity of humans, i.e., their real ability to influence Earth-related processes including climate change.

Archaeological tourism (Ross et al., 2017) can be defined as a public activity aimed at learning about notable archaeological discoveries directly at archaeological sites (also excavations) or in museum exhibitions. This tourism direction can also be expanded with the

involvement of a creative component (Ross et al., 2017). It offers visitors of archaeological sites a vision of past societies, but it also puts these societies into an environmental context. For instance, one can learn about the ancient peoples of Sahara, realizing that the world of these peoples was less hostile than today with wetter conditions. In some other cases, archaeological sites make possible an explanation for the end of civilization by climate change; the "classical" example is the collapse of the Maya society linked to extraordinary climate drying (Haug et al., 2003; Douglas et al., 2016; Marx et al., 2017). Even if the climatic trigger for this societal collapse is disputed by some specialists (Aimers, 2012), the very possibility of such discussions permits an emphasis on links between climate change and humankind development. Archaeological touristic experiences and climate change learning have been coupled in the case of the Mimosbrunnr Climate Park 246 (Norway) where visitors have a unique chance to learn about ice melting, as well as about Norse archaeology and mythology (Vistad et al., 2016).

Finally, *industrial tourism* can be defined broadly as the visitation of operating plants, and it supports the sustainable development of former industrial areas with closed and abandoned plants and related infrastructural objects (Jonsen-Verbeke, 1999; Otgaar, 2012; Yashalova et al., 2017). This direction of tourism can be realized in different ways, ranging from obvious excursions (to open or closed enterprises) to the creation of industrial museums and the redesign of industrial environments into creative spaces. Typical examples can be found in the German region of Ruhr (e.g., Copic et al., 2014). With regard to climate change, industrial tourism facilitates direct perceptions of voluminous human greenhouse gases emission (in the case of excursions to operating plants), as well as technologies to prevent (or to minimize) this and other human influences on the environment. Additionally, industrial tourism may promote renewable energy resources (Beer et al., 2018).

Two principal approaches of communication of the climate change-related knowledge

to geological, archaeological, and industrial tourists are

- explanation of the reality of past, present, and future climatic changes with the given example of geological, archaeological, and industrial heritage on specially installed information panels or in the course of guided excursions;
- provision of the climate change experience with the given heritage through interactive tools (e.g., demonstration of a melting glacier or sea-level rise that leave sharp and well-visible geological marks).

Good examples of such approaches can be found, particularly, in the Mimisbrunnr Climate Park 246 in Norway (Vistad et al., 2016).

From the three tourism directions characterized above, geotourism has one significant advantage. As shown by modern assessments of the relevant research (Ruban, 2015; Ólafsdóttir and Tverijonaite, 2018), geotourism develops actively in such countries as China and Brazil, as well as in some countries of Africa. Industrial growth in these countries leads to significant emission of greenhouse gases that facilitate climate change. In such a case, the distribution of climate change knowledge is especially urgent for these countries. The rise of geological tourism there, which provides a vision of the reality of such changes in the past and their far-going consequences (see above), can help in the potential achievement of this goal.

Climate change literacy functions

Each of the above-mentioned tourism directions taken alone can potentially contribute to better public awareness and can correct public perceptions of climate change. This contribution can be termed a *climate change literacy function*. Each direction provides its function of this type (Fig. 2). The latter is realized *via* three approaches, namely

- tourist attraction (*general functional approach*);
- general geological/archaeological/industrial (technological) education (*essential*

functional approach);

- climate change-focused interpretation (*specific functional approach*).

The two first approaches are necessary for the development of a given tourism attraction or program. The third approach is required because climate change is difficult both to perceive directly (this is a slow process measured by years, decades, and longer time intervals) and to relate features displayed on-site to those of climate change. "Simple" observation of a Cretaceous rock outcrop is not sufficient to understand its relevance to both past and future greenhouse conditions, and visiting the ruins of Maya towns is not sufficient to visualize a drought-induced civilization collapse. Such relationships should be *explained* by professional guides or demonstrated on panels and exhibits.

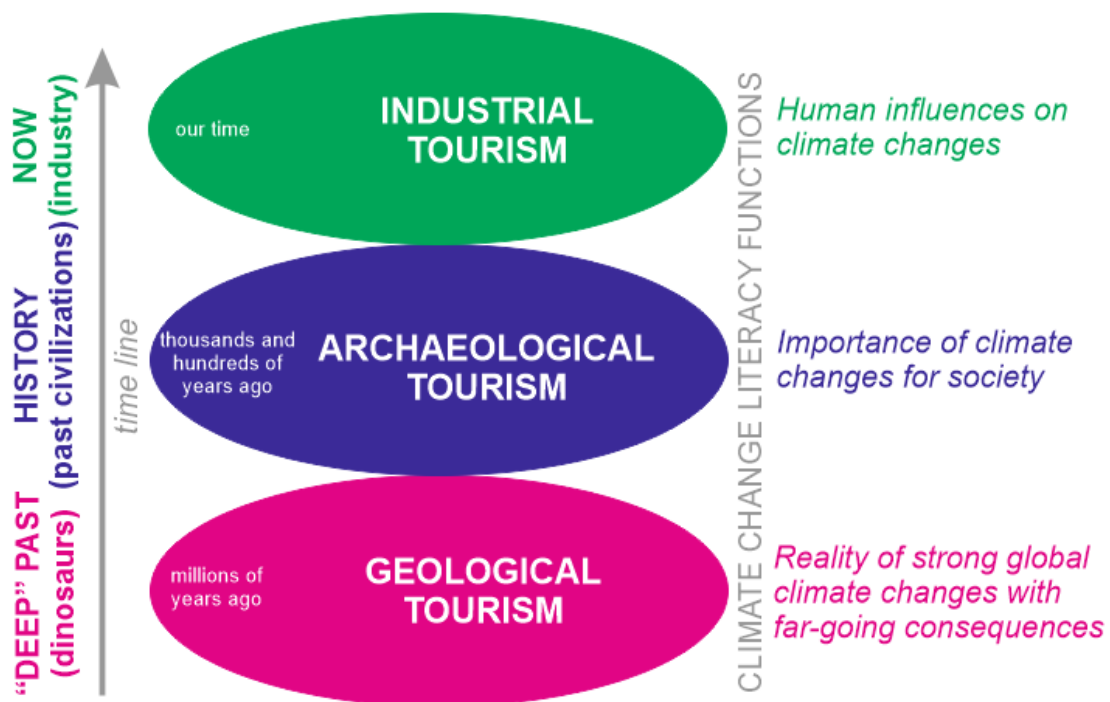


Figure 2: Climate change literacy functions of three rising tourism directions

A strong requirement of special tourism *interpretation* in such cases was also noted by other specialists (Gnezdilova et al., 2015; Rutherford et al., 2015; Muda, 2016; Powell et

al., 2017). The approaches and challenges of interpretations were addressed for the case of geological heritage by Moreira (2012), Pacheco and Brilha (2014), You et al. (2014), Gordon (2018), and Santos et al. (2018), for the case of archaeological heritage by Jameson (2010) and Ababneh (2018), and for the case of industrial heritage by Goodall (1993), Uzzell (1996), Hale (2001), and Jelen and Kucera (2017). Moreover, the entire tourist attraction site can be designed to communicate climate change knowledge efficiently, which is shown by the example of the Mimisbrunnr Climate Park 246 in Norway (Vistad et al., 2016). As shown in the cited literature sources, there are a variety of possibilities that offer appropriate interpretations of the noted heritage types for the efficient education of tourists. The same possibilities are possible for interpretations focused on climate change.

The utility of a specific functional approach can be demonstrated by the example of an outcrop of Cretaceous rocks with dinosaur bones (such localities are ideal geological heritage sites employed for geotourism). Interpretation of such a site should start from a basic explanation of what is available at the locality. Tourists often do not have detailed knowledge to realize this themselves. This is why it is necessary to explain that the rocks were formed in the Cretaceous Period, i.e., about 100 mln yr ago, and that the "strange objects" in them are bones that belonged to "beasts of the past." The next portion of interpretation would be an explanation that these rocks and fossils represent an ancient environment that differed by its extreme warmth, with no analogues in the modern world. It is very important to stress that this is not a hypothesis, but a fact – the climate really can be so hot. The final interpretation should be to introduce the visitor to the following idea: *if this is possible in the past, this will be possible in the future*. The two main purposes of the entire interpretation are to introduce tourists to the reality of climate changes in the past and to relate those past changes to expected future changes.

The central problem is the lack of *professional interpreters*. Individuals who are able

to explain how geological, archaeological, and industrial heritages are linked to climate changes are few. Indeed, training programs can be developed (Powell et al., 2017). Others, such as enthusiastic middle-school teachers with perfect knowledge (McNeal et al., 2017), can be involved, and the tourism-related eco-pedagogy techniques (e.g., Nakagawa, 2018) can be employed. However, only a general shift toward a more environmentally-oriented education for future specialists of the tourism industry will lead to a resolution of this problem.

Separate functioning of geological, archaeological, and industrial tourism is less important than their joint contribution. These tourism directions offer logical and time-sequenced promotion of climate change knowledge (Fig. 2). Indeed, the combined impact of their global development can be outstanding. Their literacy functions complement one another and also bring into order climate change knowledge so that it can be delivered to the public. This conclusion has two implications:

- the ongoing growth of geological, archaeological, and industrial tourism should be supported on local, national, and international levels because it contributes to climate change mitigation;
- different opportunities for combining these tourism directions within the same destinations has to be considered.

Apparently, the best opportunity for combining the discussed tourism directions is the creation of thematic parks like geoparks (Henriques and Brilha, 2017), archaeological parks (e.g., Alazaizeh et al., 2016), industrial parks (e.g., Xu, 2012), or even special climate change parks (Vistad et al., 2016). This practice shows that these can serve efficiently not only for their direct purpose but also for the desired combination of activities (Moroni et al., 2015; Vistad et al., 2016; Ramsay, 2017). The main advantage of thematic parks is the availability of an interpretation infrastructure that permits the efficient realization of climate change

knowledge.

It is essential to note that the interests and the needs of environmental protection in general and climate change mitigation, in particular, are not the same (cf. Ingold, 2000; Giddens, 2011). Although such paradoxes of the climate change perception and awareness are difficult to avoid, it remains very important to explain the true essence of this phenomenon. The discussed triad, namely the geological, archaeological, and industrial tourism can achieve this important task because these offer not only abstract explanation but a kind of *real-world demonstration* of the climate changes and their possible mechanisms.

Further inferences

Ecological tourism (ecotourism) is the very important direction of tourism, which is tied closely to the both geotourism (Dowling, 2011; Koizumi and Chakraborty, 2016; Hakim and Soemarno, 2017) and the climate change awareness (Aldous, 2013; Hornoiu, 2015). Undoubtedly, it plays the same or even more important role in the promotion of climate change knowledge than the directions considered in this paper. However, it does this differently. Geological and archaeological tourism offer a historical vision of the climate changes and, thus, ensure in their reality. Industrial tourism demonstrates the factors of ongoing climate changes. In contrast, ecotourism appeals to the nature fragility and sensitivity of ecosystems to the climate changes. In other words, it provides examples of climate change *consequences*, not direct evidence. However, this inference is very tentative and needs further investigation.

The other tourism direction that should be discussed together with climate change is *post-disaster tourism*. The latter term generally describes tourist activities on sites experienced devastation by any natural or human-triggered disaster. This tourism direction has risen recently (Tucker et al., 2017; Liu et al., 2018; Zhang et al., 2018). On the one

hand, this can also contribute to climate change awareness, because it displays consequences of catastrophes that can be induced (potentially) by these changes. However, this requires very careful attachment of a given natural disaster to climate change, which may be a serious challenge even for professionals. On the other hand, geological and archaeological tourism can also be seen as representatives of post-disaster tourism because these demonstrate the effects of some past climate changes. If so, experience with post-disaster tourism of some people can facilitate their climate change education *via* participation in geological, archaeological, and industrial tourism initiatives.

Conclusion

The main conclusion of this research note is that three rising tourism directions can contribute systematically, and thus significantly, to climate change mitigation *via* climate change education (in the form of special interpretation). The coherent and combined use of the various climate change literacy functions of geological, archaeological, and industrial tourism can lead toward this goal.

The four major subjects of *tourism versus climate change research* (see above) do not include considerations of the potential of the rising tourism directions for climate change mitigation through public education, although the potential for the relevant studies is demonstrated in this paper. If so, a research gap is revealed. Filling this gap is an urgent task for further investigations, and some general recommendations are possible to formulate:

- the idea of climate change literacy function should be fully conceptualized;
- the climate change literacy function of different directions of tourism (not only those three considered in this paper) has to be examined;
- interpretation approaches that are valuable for climate change mitigation and education need to be characterized, and the costs of their implementation should be

estimated;

- it is necessary to understand how the climate change literacy function of different directions of tourism may contribute to the climate change adaptation (see complexities of this process in Giddens (2011) and Simpson et al. (2018)) – for instance, can such an education help to affect prevailing commercial interests and cultural values of capitalism?

Finding a new idea in the theme of *tourism versus climate change* is highly important for tourism policy-makers and practitioners, including those in developing countries and countries responsible for voluminous greenhouse gases emissions. Geological, archaeological, and industrial tourism should be promoted actively, jointly, and on the state level because of their potential contribution to climate change mitigation.

Acknowledgments

The authors gratefully thank the editor and the both, anonymous reviewers for their suggestions and support, as well as C.P. Conrad (Norway) for his linguistic improvements. The reported study was funded by RFBR according to the research project № 18-010-00549.

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