NETWORKS AS AN INNOVATIVE APPROACH IN GEOPARKS AND GEOTOURISM

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ABSTRACT

Geoparks as an innovation for the protection of natural and geological heritage play an important role in the development of geotourism and knowledge exchange. The European Geopark Network (EGN) and the UNESCO Global Geoparks Network (GGN) have introduced geotourism as a target for geopark creation, and they introduced the network concept to geotourism activities. Geoparks through network activities can encourage the small and medium-sized enterprises and local producers in geotourism. This paper aims at analysing network activity between geoparks and evaluating the connectivity rate of the Global Geoparks Network and the European Geoparks Network. To this end, nineteen geopark strategies were analysed (13 in Europe and 5 in Asia – China, Malaysia, Japan, and Iran- and 1 in Australia). It was concluded that UNESCO Global Geoparks Network and European Geoparks Network have concentrated their network activity on the area of meeting, conference, and exchange of knowledge. Moreover, authorities of geoparks attempt for development of tourism marketing in their territory.

KEYWORDS

Collaboration, Geopark, Geotourism, Innovation, Network Analysis.

1. INTRODUCTION

Geotourism is “tourism that sustains, or even enhances, the geographical character of a place, such as its culture, environment, heritage, and the wellbeing of its residents”. Geotourism follows sustainability principles (Alan A, 2002) ; The above definition as ‘geographical tourism’ was introduced publicly in 2002 and was reported by the Travel Industry Association of America and National Geographic Traveler (Tourtellot, 2000: 2). It can be said that the emergence of geotourism is an innovation in tourism marketing.

Meanwhile, the European Geoparks Network (EGN), as important geotourism destinations, was set up by four regions of different European countries - France, Germany, Spain, and Greece - with similar natural and socio-economic characteristics. The main characteristic of the EGN is that it works as a network of collaborating areas, rather than a list of members. The network operates primarily by continuous electronic communication, frequent coordination meetings, and the establishment of
common projects through which territories can exchange ideas, experiences, and best practices, thereby supporting each other to fulfil their common goals.

In 2001, the EGN signed a formal agreement with the UNESCO Division of Earth Sciences whereby UNESCO gave the network its endorsement. During The First International Conference of Geoparks in Beijing (China, 27-29 June 2004), held by UNESCO, two main streams of activities were combined, and a UNESCO World Network of Geoparks was set up (EGN, 2007). The aim of this network is to provide a platform of cooperation and exchange between experts and practitioners in geological heritage matters under the umbrella of UNESCO. The objective of the World Heritage Convention is to recognize natural and cultural sites of "outstanding universal value" (Eder and Patzak, 2004).

It is evident that the EGN and GGN have introduced geotourism as a target for geopark creation; and they introduced the network concept to geotourism activities.

Results of researches indicate that developing geotourism in geoparks can generate new job opportunities, new economic activities, and additional sources of income, especially in rural regions (Farsani et al., 2011; Zouros, 2010). Moreover, a geopark stimulates local socio-economic activities through attracting increasing numbers of visitors. It encourages production of local products and local handicrafts involved in geotourism and geo-marketing.

Establishing geo-restaurants, geo-bakeries, geo-museums, family guest houses and rural accommodations; organizing geological education programs (for children including schoolchildren) and geo-tours; holding workshops, regional fairs, and festivals; involving locals in conservation activities; engaging locals in surveillance of geo-sites or leadership in geopark museums are new job opportunities which directly emerge through geotourism and geopark activities.

According to Hjalager's definition (2002) new job profiles, collaborative structures, and authority systems belong to the category of management innovation. Pursuant to management innovation definition and the importance of collaborative structure; it is worth mentioning that geoparks are established at an international level but managed at a local level. Network activities play an important role in geopark management. All experts believe that the most promising vehicles for innovation are cooperation, alliances, and/or networking in various fields such as technology, marketing, distribution, and human resource sharing.

Aside from the UNESCO Global Geoparks Network (GGN), European Geoparks Network (EGN), and Asia-Pacific Geoparks Network (A.P.G.G.N) activities; some countries such as Germany, Italy, Ireland, Greece, Japan, France, and China have developed national and local geopark network to create close collaboration between geoparks, tourism sectors, schools, universities, and businesses. Establishment of German Geoparks Network, Italian National Geoparks Forum, Ireland Geoparks Forum and Greece National Geoparks Forum are examples of network activities in geoparks territories. Thus, the National or Local Network not only provides an opportunity for exchange of knowledge but also encourages locals, NGOs (Non-Governmental Organizations), schools, universities, and private sectors in participating in geopark activities.

Whereas, the private sector and Small and Medium-Sized Enterprises (SMEs) in villages such as family businesses only undertake innovation if they promise to be profitable, geopark networks provide opportunities and possibilities for rural SMEs to apply innovation. For instance, if a local businessman or producer joins the geopark local network as an open economy model, he can take advantage of recommendations of geopark authorities for creation innovation, together with the usage of the geopark brand for local products, which are related to geopark activities. Furthermore, under the
umbrella of the network local businessmen become stronger and more profitable. They also become
eager to apply innovation.

Consequently geoparks, through geotourism “as a niche marketing (special interest groups) with Geo
interest”, encourage innovative firms to achieve economies of scope, innovating on the basis of
cooperative alliances and other forms of networking.

This paper is an initial attempt to investigate the network analysis in the GGN and EGN.

2. METHODOLOGY

Since network activities are a management innovation in geoparks and the EGN and GGN introduced
the network concept to geo-sciences and geotourism, the main objective of this paper is to discover
areas of collaboration between geoparks by comparing nineteen different geoparks as geotourism
destinations in Europe, Asia, and Australia.

An e-survey as a new category of questionnaire-based surveys (mail) was used in this study. Besides the
e-survey method, a social network analysis technique was applied, and networks were designed by
means of Pajek as a visualisation program.

In the first phase, an electronic questionnaire was designed for network analysis in geoparks, and the
questionnaire was sent to all geoparks around the world in 2010; data was gathered from October to
December. This questionnaire investigated the collaboration between geoparks in the area of tourism
marketing, educational activities, conservation programs, production of new products, and exchange of
knowledge, conferences, meetings and themed networks.

The number of geoparks registered in the GGN was 66 geoparks until October 2010. According to
the 9th European Geoparks Network conference in Lesvos Island (Greece) in October 2010, the
number of geoparks increased to 77 in 25 countries. Since data for this part of the study was collected
from October to December 2010, obviously, the former geoparks had no collaboration with the new
11 geoparks for this period. Thus the new geoparks (n=11) were excluded from the population
(N=77), with exception of the one in Hong Kong. This is due to the existing collaboration between
this geopark and Itoigawa Geopark in Japan, and Yandangshan Geopark in China. Therefore, we end
up with 67 geoparks (Figure 1). Nineteen questionnaire responses were received (28%). The majority
of responses were collected from Europe (68%), and the others were from China, Australia, Iran,
Malaysia, and Japan (Table 2).

The second phase was focused on network analysis in the European Geoparks Network. According to
the 9th European Geoparks Network conference in Lesvos Island, Greece, the number of European
Geoparks increased to 42. Since data for this part of study was collected from October to December
2010, we exclude the new European geoparks (n=5) from the population (N=42), therefore, we end
up with 37 European Geoparks (Figure 2). It is worth mentioning that thirteen questionnaire
responses were received (35%) (Table 5).

Samples of geoparks were analysed, by the Pajek program, to discover the collaboration areas between
geoparks and to evaluate the rate for connectivity of the GGN and EGN.
3. MAIN RESULTS

3.1. NETWORK ANALYSIS IN THE UNESCO GLOBAL GEOPARKS NETWORK

Social network analysis technique was used to examine the relationship between members of the GGN. Regarding analysis data in Pajek a coded matrix was created in Microsoft Excel, the value of 1 indicates collaboration and the value of 0 points to non collaboration, and then the coded matrix was imported to a text document and the file was imported to Pajek software. Finally, the Pajek program produced a picture of the social relationship network between the interviewed geoparks (Figure 1). Our Network illustrates that the number of links are 501 and nodes (geoparks) are 67. It is noteworthy that the number of disconnected nodes is 13 (Table 1, Table 2).

Based on the results of formula related to Network analysis (Network Connection Rate (CN= 0.2) and Maximum Connectivity of the Network (MCN= 2211)); Network activity in the UNESCO Global Geoparks Network is weak, and the GGN should try to expand network activities between geoparks.

It is worth mentioning that all geoparks participate in activities such as holding UNESCO Global Geoparks Network conferences, and/or European Geoparks Network conferences every year. In addition, all geoparks are involved in writing chapters for books related to geoparks and geotourism activities.

Table 1: Main characteristics of Network analysis of the UNESCO Global Geoparks Network

<table>
<thead>
<tr>
<th>Number of Nodes</th>
<th>67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disconnected Nodes</td>
<td>13</td>
</tr>
<tr>
<td>Number of edges</td>
<td>0</td>
</tr>
<tr>
<td>Density1 [loops allowed]</td>
<td>0.0449989</td>
</tr>
<tr>
<td>Density2 [no loops allowed]</td>
<td>0.0456807</td>
</tr>
<tr>
<td>Average Degree</td>
<td>6.0298507</td>
</tr>
</tbody>
</table>

Figure 1: Network related to collaboration between GGN members
Table 2: Network indicators for UNESCO Global Geoparks Network members who replied to questionnaire

<table>
<thead>
<tr>
<th>NO</th>
<th>Geopark</th>
<th>IC= $i_1$</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Réserve Géologique de Haute-Provence</td>
<td>0.15</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>Naturejo Geopark</td>
<td>0.2</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Arouca Geopark</td>
<td>0.11</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Vulkaneifel Geopark</td>
<td>0.6</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>Swabian Alb Geopark</td>
<td>0.47</td>
<td>69</td>
</tr>
<tr>
<td>6</td>
<td>Psiloritis Natural Park</td>
<td>0.09</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>Sobrarbe Geopark</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>Magma Geopark</td>
<td>0.18</td>
<td>21</td>
</tr>
<tr>
<td>9</td>
<td>Gea Norvegica Geopark</td>
<td>0.09</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>Marble Arch Caves Global Geopark</td>
<td>0.51</td>
<td>103</td>
</tr>
<tr>
<td>11</td>
<td>Geopark Shetland</td>
<td>0.33</td>
<td>36</td>
</tr>
<tr>
<td>12</td>
<td>Hateg Country Dinosaurs Geopark</td>
<td>0.04</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Papuk Geopark</td>
<td>0.33</td>
<td>32</td>
</tr>
<tr>
<td>14</td>
<td>Kanawinka geopark</td>
<td>0.09</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>Qeshm Geopark</td>
<td>0.09</td>
<td>6</td>
</tr>
<tr>
<td>16</td>
<td>Langkawi Geopark</td>
<td>0.09</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>Itoigawa</td>
<td>0.03</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Yandangshan Geopark</td>
<td>0.03</td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td>Leiqiong Geopark</td>
<td>0.03</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0.81</td>
<td>501</td>
</tr>
</tbody>
</table>

Our result also investigated the collaboration areas between geoparks (Table 3). Further analysis demonstrates that among geoparks, Marble Arch Caves Global Geopark (UK) with 103 links (Table 2, 3) is the leading geopark in network activity. As well as collaboration in the field of tourism marketing, educational activities, conservation programs, the production of new products, exchange of knowledge, conferences, and meetings, Marble Arch Caves Global Geopark joined EU projects with Nature Park Terra Vita (Germany), Vulkaneifel Geopark (Germany) and Geopark Bergstrasse-Odenwald (Germany). Moreover, Marble Arch Caves Global Geopark has collaboration with Langkawi Geopark (Malaysia) in the field of exchange of knowledge in schools. Furthermore, Marble Arch Caves Global Geopark works with aspiring geoparks and gives them advice and information. This Geopark has acted as host for future geoparks; for instance, some new or proposed geoparks such as Hong Kong, Taiwan, Canada and Ireland visited this geopark in order to gain experience and...
information. This geopark has a member in advisory missions and gives some practical advice to aspiring geoparks.

Vulkaneifel Geopark (Germany) with 85 links is the second most active geopark in the network. Vulkaneifel Geopark (Germany) has collaboration with 42 geoparks, and the majority of collaborations are in the field of meeting and tourism marketing (Table 3). Creating a print media for cross-marketing of participating geoparks by Vulkaneifel Geopark and geoparks of Ireland and Britain is the first collaborative activity. Providing a brochure for the target group teachers that contains information on Vulkaneifel Geopark together with other geoparks aiming to recommend those as destinations for school trip is another collaborative activity in this geopark. The production of common material and common presentation for fairs, and participation with European geoparks in writing a common coffee table book are enterprises of Vulkaneifel Geopark in network activities.

Aside from meetings and tourism marketing, Vulkaneifel Geopark (Germany) has cooperation with Papuk Geopark (Croatia), the Petrified Forest of Lesvos Geopark (Greece), Hateg Country Dinosaurs Geopark (Romania), and Cabo de Gata Natural Park (Spain) in the field of the production of new products.

Swabian Alb Geopark (Germany) with 69 links is the third most active geopark in the network. The majority of its activities are focused on conferences and meetings. Geopark Shetland (UK) with 36 links is the fourth most active geopark in the network.

It is worth mentioning that there are two kinds of clusters in geoparks: thematic clusters and geographic clusters.

Asia-Pacific Geoparks Network (A.P.G.G.N) and European Geoparks Networks (EGN) which are under the umbrella of UNESCO Global Geoparks Network (GGN) are examples of geographic clusters. Moreover, there are seven thematic clusters in European Geoparks such as: Volcanic, Karstic, Fossils, Glacial, Mining, Coastal, and Tectonic cluster.

According to Table 3, the majority of collaboration in GGN is concentrated on the field of meeting (Link=132), exchange of knowledge and conference (both include 80 links). Consequently, it can be said that at present, exchange of knowledge is an important target in GGN activity. Moreover, development of tourism marketing (Links=65) is the fourth target of network activities in GGN.

Table 3: Numbers of links in each field of collaboration for the geoparks which replied to the questionnaire

<table>
<thead>
<tr>
<th>Geoparks</th>
<th>Field of Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□  ◊  △  •  ♦  ＊  ⊕  ⊗  ×  ∆</td>
</tr>
<tr>
<td>Réserve Géologique de Haute-Provence</td>
<td>3  5  -  1  2  3  3  -  -  6</td>
</tr>
<tr>
<td>Naturtejo Geopark</td>
<td>6  3  -  7  2  2  4  -  -  1</td>
</tr>
<tr>
<td>Arouca Geopark</td>
<td>-  3  -  -  4  4  5  -  -  1</td>
</tr>
<tr>
<td>Vulkaneifel Geopark</td>
<td>39 - - 4 2 1 36 - - 3</td>
</tr>
</tbody>
</table>
3.2. NETWORK ANALYSIS IN THE EUROPEAN GEOPARKS NETWORK

This section focuses on network analysis in European Geoparks. As mentioned in the methodology, thirteen questionnaire responses were received (35%) from European countries.
Based on the results of formula related to network analysis (Network Connection Rate ($CN = 0.65$) and Maximum Connectivity of the Network ($MCN = 666$)); network activity in European Geoparks is stronger than in the UNESCO Global Geoparks Network and Asia Pacific Geoparks Network. There are no disconnected nodes in the European Geoparks, and all nodes are involved in network activities (Figure 2, Table 4, 5).

**Figure 2: Network related to collaboration between EGN members**

![Network related to collaboration between EGN members](image1)

**Table 4: Main characteristics of Network analysis of the European Geoparks Network**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Nodes</td>
<td>37</td>
</tr>
<tr>
<td>Disconnected Nodes</td>
<td>0</td>
</tr>
<tr>
<td>Number of edges</td>
<td>0</td>
</tr>
<tr>
<td>Density1 [loops allowed]</td>
<td>0.1468225</td>
</tr>
<tr>
<td>Density2 [no loops allowed]</td>
<td>0.1509009</td>
</tr>
<tr>
<td>Average Degree</td>
<td>10.8648649</td>
</tr>
</tbody>
</table>
Table 5: Network indicators for European Geoparks Network members who replied to the questionnaire

<table>
<thead>
<tr>
<th>NO.</th>
<th>Geopark</th>
<th>IC=\frac{n!}{n-1}</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Réserve Géologique de Haute-Provence</td>
<td>0.25</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Naturejo Geopark</td>
<td>0.36</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Arouca Geopark</td>
<td>0.14</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>Vulkaneifel Geopark</td>
<td>0.91</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>Swabian Alb Geopark</td>
<td>0.86</td>
<td>69</td>
</tr>
<tr>
<td>6</td>
<td>Psiloritis Natural Park</td>
<td>0.17</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>Sobrarbe Geopark</td>
<td>0.3</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>Magma Geopark</td>
<td>0.3</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>Gea Norvegica Geopark</td>
<td>0.17</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>Marble Arch Caves Global Geopark</td>
<td>0.83</td>
<td>97</td>
</tr>
<tr>
<td>11</td>
<td>Geopark Shetland</td>
<td>0.53</td>
<td>33</td>
</tr>
<tr>
<td>12</td>
<td>Hateg Country Dinosaurs Geopark</td>
<td>0.08</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Papuk Geopark</td>
<td>0.61</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1.02</td>
<td>434</td>
</tr>
</tbody>
</table>

On the basis of the results, it can be concluded that the EGN has concentrated its network activity on areas of meetings (links=122), conferences (links=68), and exchange of knowledge (links=65). In addition, the development of tourism marketing (links=56) is the fourth target of establishment of the EGN (Table 6).

Table 6: Numbers of links in each field of collaboration for the European Geoparks which replied to the questionnaire

<table>
<thead>
<tr>
<th>Geoparks</th>
<th>Field of Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□</td>
</tr>
<tr>
<td>Réserve Géologique de Haute-Provence</td>
<td>3</td>
</tr>
<tr>
<td>Naturejo Geopark</td>
<td>6</td>
</tr>
<tr>
<td>Arouca Geopark</td>
<td>-</td>
</tr>
<tr>
<td>Vulkaneifel Geopark</td>
<td>35</td>
</tr>
<tr>
<td>Swabian Alb</td>
<td>-</td>
</tr>
</tbody>
</table>
Among the European Geoparks, Vulkaneifel Geopark (links= 35), Marble Arch Caves Global Geopark (Links= 7), and Naturtejo Geopark (Links= 6) more than the other geoparks are active in the field of tourism marketing (Table 6).

It is noteworthy that the production of new products is an innovation in geoparks. As illustrated in Table 6, Naturtejo Geopark (Links=7) and Marble Arch Caves Global Geopark (Links=7) are pioneers in collaboration concerning the production of new products.

There are 44 links regarding other kinds of collaboration. According to the questionnaires filled in by respondents, these links refer to activities such as organizing European projects, writing book chapters, organizing common presentations, holding common fairs and exhibitions, organizing field trips, and cultural projects.

4. CONCLUSIONS

Network activity is a management innovation in geoparks as new geotourism destinations. The establishment of geopark networks enables the exchange of ideas, experiences, and best practices, thereby supporting each other to fulfil their common goals (conservation of natural, geological and cultural heritage, education, and development of the local economy through geotourism).

![Legend of Table]

- Tourism Marketing
- Educational Activities
- Conservation Programs
- Production New Products
- Knowledge Exchange
- Conference
- Meeting
- Volcanic thematic Network
- Coastal thematic Network
- Others

<table>
<thead>
<tr>
<th>Geopark</th>
<th>56</th>
<th>37</th>
<th>9</th>
<th>21</th>
<th>65</th>
<th>68</th>
<th>122</th>
<th>6</th>
<th>6</th>
<th>44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psiloritis Natural Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sabrarbe Geopark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magma Geopark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gea Norvegica Geopark</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marble Arch Caves Global Geopark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shetland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hateg Country Dinosaurs Geopark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Papuk Geopark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Numbers of links

Legend of Table
Results allow us to conclude that the GGN and EGN have concentrated their network activity on meetings, conferences, and exchange of knowledge. In addition, authorities of geoparks attempt to develop tourism marketing in their territory. It can be said that geoparks not only try to popularize geological and geomorphological heritage and sciences, but also introduce geoparks and geosites as new tourism destinations.

According to network analyses, among the geoparks, Vulkaneifel Geopark (Germany), Marble Arch Caves Global Geopark (UK), and Naturejo Geopark (Portugal) more than the other geoparks are active in the field of tourism marketing in the form of geotourism. Thus, the results can provide some support for introducing geoparks as new geotourism destinations in the near future.

**BIBLIOGRAPHY**


