

GEODIVERSITY EDUCATIONAL ACTIVITY IN THE CILENTO UNESCO GLOBAL GEOPARK (SOUTHERN ITALY)

Abstract: The paper illustrates the educational, dissemination and formation activities carried out in the Cilento UNESCO Global Geopark by the teachers from Salerno University and Geopark Management Team. Topics are addressed on rising the private and public awareness in resource, risk and global change assessment and management. The activities involve students at different level, professional and public and private stakeholders about geodiversity supporting biodiversity, cultural landscape and sustainable local development. The integrate educational methods follow the the UNESCO Guide Lines for Cultural and Natural Heritage Management Plan in one of the eight Multiple International three Designation Area in the world.

Keywords: Geodiversity, Cilento Geopark, Salerno University, outside geo-education.

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Introduction

Since its birth, one of the main mission of the UNESCO Global Geopark Network was the educational, dissemination and formation activity about “geodiversity” [1]. Based on the Environmental Educational Centers Network [2], a permanent activity of multi-level education, formation and dissemination has been planned yearly and carried out in seasonal steps [3] in the the Cilento, Vallo di Diano and Alburni National Park – Global Geopark, in the following CVDANP_UGGp. In this global UNESCO framework, educational actions were planned to rising public awareness in assesment and management of the natural resources, geological risks [4] and climate and social-cultural change impacts. In the following sections, a short discussion of these activity is done. During the schooltime, educational activities are carried out in the Primary and Secondary School by Geopark Managers, academic researchers and expert professional in environmental topics by visiting the Geopark Virtual Museum Network (MUVI's) about karst systems, prehistoric heritage and geosite reconstruction. In the section 2, the Week End Field Trip program is explained as educational program addressed to the University students in Environmental Engineering and Sciences about river-karst interaction in one of the most interesting Karst Systems of the CVDANP_UGGp, the Middle Bussento Karst System. Students are applied in geological and geomorphological field surveys, hydraulic and hydrological monitoring, biotic and abiotic data collection, discharge and chemical data elaboration and, finally, field reporting. In the successive section, the Hydro-geomorphological Summer School is briefly commented. Planned by Regional and Provincial Professional Councils of the Geologist and Engineers it is endorsed by CVDANP_UGGp and Salerno University in order to disseminate best practices stemming from scientific researches in the land use planning and management. From 2014, an original experiment, linking research, education, dissemination and application in new opportunities for gradutate local young people, was

planned by involving and motivating them in sustainable tourism. This experiment was started in selected complementary geosites, linking in an olistic way geodiversity, biodiversity and cultural heritage instances. The most fruitfull activity was the so called “Geopark Local Caretakers” experienced at the Focal Geosite of the Venus Hair Waterfall Oasis, near Casaletto Spartano village (SA) [7]. For the next year 2018, an International Summer school on Karst and Fluvial is currently going to plan. This last will be adressed to graduate and master student from universities around the world sharing similar research and educational program with other geoparks.

The territory of the Cilento UNESCO Global Geopark

Since 19th Century, the area broadly defined as Cilento attracted the attention of the Earth scientists, both Italian and European. The same geographical place-names “Cilento”, “Vallo Diano” and “Alburni” have its roots in Earth Sciences: the first from the latin Cis-Alentum as “*on this side of Alento river*” (Ancient Cilento), nowadays extended to a broader area; “Vallo” is not “Vallum” nor “Valley”, but corresponds to an inter-mountain plain surrounded by mountainous reliefs; finally, “Alburni”, means “*mountain built-up by white rocks*”. Starting by these premises and others, the CVDANP was recognized as Geopark in the 2010 by the European Geopark Network in Lesvos (Greece) and recognized as UNESCO Global Geopark in the 2015 by the UNESCO General Assembly in Paris. The territory is bounded by the Tyrrhenian sea, Policastro gulf to the South and Cilento coastland to the West, by the Sele and Tanagro rivers to the North and by the Maddalena mountains to the East. These boundaries corresponds roughly to the Cilento, Vallo Diano and Alburni National Park and their “Adjacent Areas”(Fig. 1).



Figure 1: Map of the Cilento, Vallo di Diano and Alburni UNESCO Global Geopark.

Geologically, the CVDA_UGGp represents the southernmost segment of the Tyrrhenian Borderland in the Southern Apennine chain. At Mediterranean scale, Southern Apennine constitutes a chain of the circum-mediterranean orogenic system and, more precisely, a segment of the Apennine-Magrebian chain system, related to the final stage of the Alpine Orogeny. Southern Apennine is an eastward fold-and thrust chain, with the Bradanic Forethrough, Apulia Foreland and the Tyrrhenian back-arc area. The chain represent the orographic expression of an accretionary wedge due to a west-verging basement subduction, including overthrust successions from several palaeo-geographic domains. The tectonic history was developed from Mesozoic to Cenozoic by successive eastward deformation from Oligocene to Quaternary times and migration of the orogenic front, creating several foredeep and piggy-back basins. Geomorphologically, the CVDANP_UGGp can be considered a morpho-structural province, well defined by main morphological systems: mountainous, carbonate and karst-influenced massifs to the North and NE; mountainous terrigenous ridges in the middle of the region, separated from the previous by a regional tectonic line, the so-called Paestum-Sapri Line. Hilly landscapes are located in the Calore, Mingardo and Bussento river valleys. The isolated Bulgheria carbonate massif delimitates, on the South, Cilento from the Policastro gulf. Narrow and limited coastal and alluvial plains are located downvalley the main river basins. Low coastland are alternated

with rocky coasts on terrigenous succession and carbonate, respectively. Ecologically, the CVDANP_UGGp results identified as “Cilento” Sub-section of the “Latium-Campania” Section, inside the “Tyrrhenian Borderland” Province of the Mediterranean Division.

The CVDANP-UGGp promoting research and education activity

Since before the Cilento National Park institution and constitution, geological considerations have had primary attention in assessing, planning, programming and managing natural and cultural landscape [6]. Prior the CVDA GGp institution, in the 1997, Cilento National Park was recognized as Biosphere Reserves (Man and Biosphere Program) and, successively, included in the Cultural Landscape of the UNESCO Heritage (Code 842). As MAB Reserve, Cilento National Park programmed initiatives on the Ecological Network and experienced the first Environmental Survey and the Biodiversity Observatory in the Italian National Parks. In the 2000, during the multi-disciplinary analysis supporting the elaboration of the Park Plan, the Geosite Inventory and Classification was performed. Consequently, the Park Plan Accomplishment Rules acknowledged the geodiversity conservation instances, as in the Art. 12. “ *The Plan localizes the areas comprising geosites of stratigraphical, palaeo-environmental, palaeo-biological, structural and geomorphological interest, both in the park and in the “adiacent Areas, where are prohibited new buildings or land use transformations...Are consented interventions addressed to conservation and rehabilitation of these areas and correct exploitation and fruition of the geosites”*. After the CVDANP_UGGp designation, Geopark management directed discussion with the geo-academic community from the Campania region universities (Naples, Benevento and Salerno), forcing the traditional academic self-reference and sharing a step-by-step path to synthetizing the state-of-art of the scientific knowledge in Cilento geology. In addition, CVDANP_UGGp coordinated geo-research activities and addressed results in communication toward a non-academic communities for wider educational and dissemination targets. In fact, the initial slogan was “*Geopark: the House of Geoscientists*”.

The Cilento UNESCO Global Geopark start-up activities in geodiversity researches and education

After its designation, the CVDA GGp has addressed the up-to-date geo-scientific knowledge in the multi-level educational system using as “tool”, the Italian Geopark Week and, as “locations”, the Educational Local Center Network. So, in the May 2011, CVDA Geopark organized, in collaboration of MIDA Foundation and Regional Geologist Association of Campania, the Official Public Presentation of the Geopark in the Focal Geosites of Angel Cave in Pertosa-Auletta towns and the Morigerati WWF Oasis, involving both emeritus professors in Cilento geology, undergraduate students in geology from Salerno University and professional geologists from Campania and Lucania regions. The participants visited both the Angel Caves with geomorphologists, speleologists and expert guides and the MIDA Museum System dedicated to site promotion (i.e. a gastronomic uniqueness: the Pertosa white artichok), geo-tourism fruition (i.e. rafting) and environmental education (Spelaeological Museum). In the May 2012, the CVDA Geopark organized the second educational geo-event, also in collaboration with Castelcivita Cave Management, Regional Geologist Association of Campania and Campania region, a seminar on the new geological mapping of the Cilento (CARG Project) in the fascinating underground landscape of Castelcivita caves. Students in geology from Salerno University courses enjoyed new geological knowledge on karst cave system in the perspective of their future involvement as professional or scientific operators and stakeholders.

The Week End Field Trip Program for University students

Starting from the above initial activities, since 2013, at the end of May, CVDANP_UGGp promotes the Geopark Week with several initiatives about geodiversity education for under- and graduate level from Salerno University, both Civil-Environmental Engineering Department and Environmental Science Faculty. The most interesting initiative is the Week End Filed Trip. This educational event involves student, professional in geology and other stakeholders as environmental guides and touristic operators. During the Field Trip, the students, grouped in interdisciplinary

workgroup, are accompanied to visit geosites, performing analysis, carrying out measures along streams and collecting rock, sediment, fauna and plants samples. At the end of each activity, the student groups are committed to organizing, archiving and processing the data recorded on the fieldbook and drafting the Field Report.



Figure 2: Salerno University teachers and students involved in the Week End Field Trip, in May 2015.

The Laurito hydro-geomorphological Summer School

Since 2015, each year, at the end of September, the geodiversity dissemination mission of the Cilento Geopark is addressed to the professional geologists in the Hydrogeological Summer School. The event is held in the Nature House and Environmental Educational Laboratory located in Laurito (SA) village, organized by Geopark Office, Campania and Italian Geologist Associations and Laurito Municipality. Topics are chosen differently for each year depending on timely emerging environmental issues: bio-engineering in the 2015 edition, surficial and groundwater resources assessment in the 2016 and lastly, in the 2017 edition, risk and resources in the Climatic Change perspective (Fig. 3).



Figure 3: In boulder stream lesson during the Hydro-geological summer school.

The “Geopark Local Caretakers”

Since 2010, one of the focal points for the Cilento-Vallo Diano Geopark has been the involvement of young people in the management of geo-heritage.

The feasibility of the above objective was recognized during the field trip following the 12th EGN Conference in September 2013 to the “Veneris Hair Waterfall”, near Casaletto Spartano village (fig. 4), involving young people together with musical entertainment.



Figure 4: Location and view of the Veneris Hair Waterfall Geosite.

Based on this initial experience, an agreement was reached between the local government, local professionals and the Geopark management to create a new procedure involving young people involvement in geosite management. The requirements of the *new professional* included: good knowledge of the specific geosite, its connections with local traditions, culture and economy; sufficient knowledge about Geopark geodiversity, Geopark trails, public and private transport and accommodation. The teaching key was to transfer the ability to accompany all categories of visitors, ranging from week-end visitors to more experienced geo-tourists and to participate in voluntary services involving geosite conservation and the maintenance of reception facilities. But the main requirements were an understanding of the need to take care of the landscape, a strong awareness of the local identity leading to a strategy for the sustainable use of local environmental resources and an appreciation of the role of management. Based on these factors, the new stakeholder concept was called “*Geopark Local CareTaker*” (LCT). During the last summer a LCT start-up activity was initiated at the “Veneris Hair Waterfall”, managed by the dr. Arnaldo Iudici, as Local CareTaker Manager (Fig. 5).



Figure 5: Young Local CareTaker at the Veneris Hair Waterfall.

Toward the International Summer School in Hydro-geomorphology

The First Cilento International Summer School will be held into the Cilento, Vallo di Diano ed Alburni National Park and Unesco Global Geopark (Geopark in the following) during August 2018. The theme of the first edition will be focused on Karst and Fluvial Hydro-geomorphology. The school is aimed at hosting 15-20 international preferably just graduated or master students with an age limit of 30 of years old, participants with higher education will be considered. Fields of interest for the school are geology, hydraulic engineering, hydrology and hydro-geomorphology, including topics on hydro-chemistry and ecology. Topics are orientated toward the application of the EU Water Framework Directive (Directive 2000/60/EC) and related EU Groundwater Directive 2006/118/EC in

Protected Areas and Site of Community Importance (92/43/CEE). A special agreement between Geopark and the entities managing both hydro-domestic and hydro-power systems will allow to perform two “unique” field experiments on karst and fluvial hydro-geomorphology”. Lectures will be given by teachers from Departments of Salerno (Naples, Potenza and Sannio University) and European Universities suggested by Unesco Global Geopark. In order to improve communication toward the local population a limited number of seats will be reserved for undergraduate and graduate students, residents in the Geopark, that will participate to the course working together with their international colleagues. The School will be divided in 2 modules: karst and fluvial hydro-geomorphology; each module will include both theoretical lessons and field activities. The Karst hydro-geomorphology module will focus on the Middle Bussento Karst System (MBSKS). Participants will be based in the Caselle in Pittari/Morigerati/Casaleto/Tortorella “Hotel House” System (accommodation in private residences located in historical centers). The Fluvial hydro-geomorphology module will focus on the different fluvial landscapes available in the Park-Geopark. Participants will be based in the Laurito-Nature House/Celle Bulgheria - Mingardo Student Hotel Outside Educational Centers. For both module activities will be 50% indoor and 50% outdoor. Some introductory didactic material will be provided to participants before their arrival in Italy.

Conclusion

The activity of the CVDA GGp, in agreement with geologist Councils and local governments, results in promoting education and dissemination about the “*geodiversity culture*”. This effort gives opportunity not only for best practices in assessment, planning and management of risks, resources and heritages to student at different levels, as future researchers and professionals. It induces also an increasing number of geotourists, geo-researches and geo-professionals, both local, national and international, which use the Geopark as laboratory for their cultural skill improvement and own professional capacity performing. In figure 3, the results gained at the Venus Hair Waterfall Bio-Geosite are show and the increasing visitor number after Global Geopark promotional visit (2013) and Local Geopark Caretakers activities (2014) could be representative of a larger strategy in all the Geoparks with similar socio-economic context.

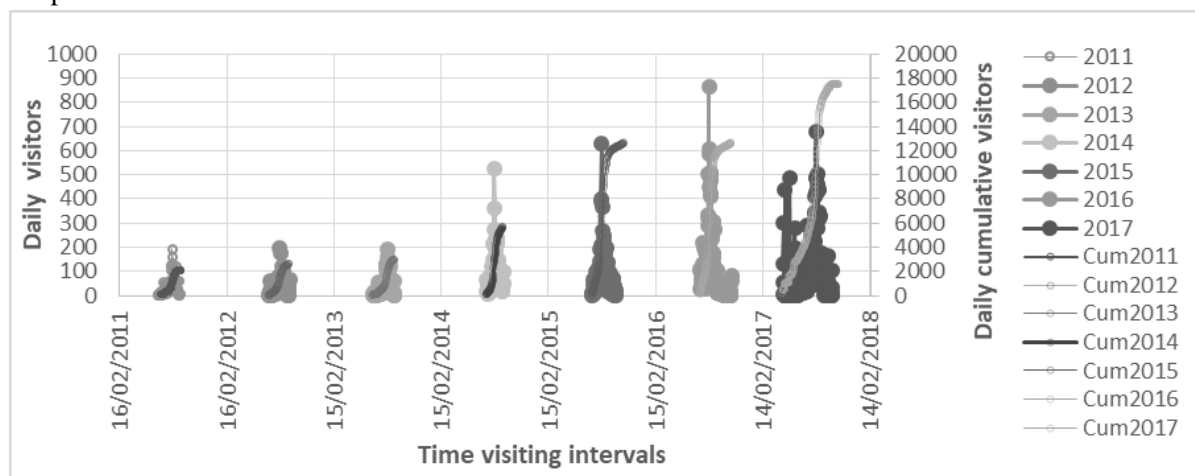


Figure 3: The multiple plot showing the daily and cumulative curves for the visitors at the Venus Hair Waterfall Bio-Geosite and the increasing visitor number after Geopark Visit (2013) and Caretakers activities (2014).

In conclusion, the paper demonstrates the validity of the multifunctional role of the “*geodiversity culture*” educational activity on different targets: students, professionals, public decisors and politicians, supporting local sustainable development.

References:

1. Aloia A., De Vita A., Guida D., Toni A., Valente A.-(2010) *The geodiversity’ of the National Park of the Cilento and Vallo di Diano: toward Geopark (in italian)* - Atti del Convegno Nazionale Geologia e Turismo “Il Patrimonio Geologico: una risorsa da proteggere e valorizzare”, 29-30 Aprile Sasso Castalda (PZ);

2. Aloia A., Catino N., De Vita A., Guida D., Pescatore E., Positano M.P., (2012) - *Museum Network as educational and dissemination tool in Cilento and Vallo di Diano Geopark*. in Sà, A.A., Rocha D., Paz A. & Correia V. (eds) 2012. Proceedings of 11th European Geoparks Conference. AGA – Associação Geoparque Arouca, Arouca, 5-6;
3. A. Aloia, D. Calcaterra, A. De Vita & D. Guida (2015) - *The strategy of management of Cilento and Vallo di Diano Geopark*, in Abstract Book of the 13th European Geopark Conference Rokua Geopark Finland, September 2015, 163 p. – pag. 110.- Editors Katja Saari, Jarkko Saarinen & Mari Saastamoinen Edition Humanpolis Oy / Rokua Geopark, ISBN 978-952-93-5939-4
4. Nakada Setsuya (2013) - *Characteristics of recent geohazards and roles of geoparks*, in Aloia A., Calcaterra D., Cuomo A., De Vita A., Guida D. (eds) (2013): Proceedings of the 12th European Geoparks Conference. National Park of Cilento, Vallo di Diano e Alburni – Geopark-Italy, 4-7 September 2013, 332 p. ISBN 978-88-907281-0-5, p. I-IV;
5. Aloia A., Calcaterra D., De Vita A., Guida D. (eds) (2013) reprint 2014 - *Water and earth: resources and natural hazards*. Geopark's Book n. 2 National Park of Cilento, Vallo di Diano e Alburni. 80 p.p. ISBN 978-88-907281-0-5
6. Domenico Guida (2013) - *The contribution of the geo-scientific community to risk, resource and climate change management, education and dissemination in the Cilento, Vallo Diano and Alburni - Geopark (Southern Italy)*, in Aloia A., Calcaterra D., Cuomo A., De Vita A., Guida D. (eds) (2013): Proceedings of the 12th European Geoparks Conference. National Park of Cilento, Vallo di Diano e Alburni – Geopark- Italy, 4-7 September 2013, 332 p. ISBN 978-88-907281-0-5, p. X-XII;
7. Aloia, D. Guida, A. De Vita (2016) - *Preserving cultural and natural heritage in multiple-designation site (unesco world heritage, mab, unesco global geopark, mediterranean diet)*, in Abstract Book of the 7th International Conference on UNESCO Global Geoparks (2016). Torquay, English Riviera UNESCO Global Geopark, England 27-30 September 2016, 318 p. – pag. 274)
8. Aloia A., De Vita A., Guida D., Iudici A. (2015) "*Local Geopark care Takers: an fruitful experience at Veneris hair geosite (Casaletto Spartano, Eastern Bussento River Landscape)*". European Geoparks Magazine. Issue 12- published by Natural History Museum of the Lesvos on behalf of the European Geoparks Network.