Best practice guidelines for the use of the geoheritage in the city of Segovia.

A sustainable model for environmental awareness and urban geotourism

Juana Vegas and Andrés Díez-Herrero
Best practice guidelines for the use of the geoheritage in the city of Segovia
A sustainable model for environmental awareness and urban geotourism

Juana Vegas and Andrés Díez-Herrero

2018
This Best Practice Guidelines is one of the results of the contract between the City of Segovia and the Geological Survey of Spain (Instituto Geológico y Minero de España, IGME) for the elaboration of scientific activities that contribute to increase knowledge, interpretation and awareness in the protection of geoheritage of Segovia, highlighting the importance of its sustainable development and its geotourist and educational potential.

**Edit:** Town Hall of Segovia.

**Coordination:** Felipe Arroyo Rueda (Environment Department, Town Hall of Segovia).

**Authors:** Juana Vegas Salamanca y Andrés Díez Herrero (IGME).

**Photographs:** Andrés Díez Herrero (IGME).

**Historic photographs of the neighborhood of San Lorenzo:** Josefa Gómez.

**ELIGES Map of Segovia:** Ana Cabrera (IGME).

**Web:** Miguel Ángel Collado Alonso (Municipal Service of systems and technology of Information, Town Hall of Segovia).

**Collaborations:** Alberto Díez Herrero, Nuria Sacristán Arroyo y Sara González Álvaro (“Segovia Educa en Verde” Program, Town Hall of Segovia); Leopoldo Yoldi Enríquez y Vicente Esteban Alonso (Environment Department, Town Hall of Segovia); Ángel Luis Ayuso de Lucas (Roads and civil works Section, Town Hall of Segovia).

**Graphic design:** Marta Sacristán (Artes Gráficas Rabalán Inc., Segovia).

Subsidized by Order of December 15, 2017 of the Ministry of Development and Environment of the Regional Government of Castile and Leon for the financing of environmental education programs and actions linked to environmental management within the framework of the II Environmental Education Strategy of Castile and Leon, 2016-2020

**Legal deposit:**
Environmental education and the nature conservation have developed a mutually beneficial relationship: environmental education advances by sensitising and raising awareness of actions to protect the environment; it supports the process of defining standards and regulations through communication and participation; and finally enables the implementation and effectiveness of the initiatives adopted, through dissemination and training.

The geoheritage is an indissociable part of the natural heritage, and has great potential for environmental education in sensitive key areas such as climate change, natural hazards, pollution and groundwater, among others. Since 1990, the city of Segovia has been a pioneer in Spain in the study, research and enhancement of geological heritage (Díez, 1991; Vegas, 2000), and particularly in its urban scale (Díez-Herrero and Vegas, 2011). This best practice guidelines for urban geoheritage is the result of research and a new methodological development for assessing this heritage that contributes to increasing the knowledge, interpretation and awareness of their protection in the city of Segovia, highlighting the importance of its sustainable use and its potential for tourism and education, as expressed in the 2nd Castile-León Environmental Education Strategy (2016 – 2020).

This 2nd Castile-León Environmental Education Strategy was approved through agreement 35/2016 of 9 June 2016 of the Castile-León Regional Government, and is the reference document aimed at stimulating environmental education in the Autonomous Region. It consists of eight strategic guidelines focused on seven stakeholder groups, and has ten general objectives and 18 specific objectives that are embodied in 87 lines of action. The 2nd strategy has sought to involve the stakeholders in its implementation and maximise the use of the available resources. Among other new developments, the 2nd Strategy establishes 12 indicators to assist in its monitoring and assessment.

This manual covers the GENERAL OBJECTIVE: A.I. “The offer of a consistent and credible educational action by the public authorities”; and, within this, develops objective no. 3: “To
develop specific programmes for environmental education” which includes action line 3.2. To further the knowledge and interpretation of the geological heritage, highlighting the importance of its sustainable use and its potential for tourism and education.

We therefore present this best practice guidelines containing concepts, tools and basic recommendations that are easy to understand and implement by the local government through the ten ELIGES (acronym in Spanish: “places containing geosites for environmental education in the city of Segovia”), where all the stakeholders involved in the city can perceive the geoheritage as an ally with the potential to generate opportunities and advantages.

The geological heritage of the city of Segovia, a sustainable resource

1.1. What is geoheritage?

The discipline of geoheritage is one of the most recent incorporations into the science of Geology. This is unsurprising, as the 19th century—and particularly the early 20th century—brought a change in attitude towards the value of Nature, and a growing awareness and understanding of the need to conservation nature for its own sake and guarantee its enjoyment for future generations. In contrast to the traditional view of nature as an economic resource materialised through the exploitation of animals, plants, woods and forests and rocks and minerals, the most unspoiled sites in natural settings began to provoke, evoke and inspire emotions that found an echo in practitioners in the field of science and in naturalists, explorers, travellers and even members of politicians and policy makers both in Europe and the United States of America in the first two decades of the 20th century. Against this backdrop of a radical change in attitudes towards exploitation versus conservation, the first legislation was enacted to create the National Parks, with the aim of preserving and protecting places where nature could be left to flourish for people’s use and enjoyment. Spain was one of the pioneers in this movement; the National Parks Law was passed in 1916, and in 1918 the two first National Parks were declared: the Montañas de Covadonga in Asturias, and Ordesa in Huesca.

Also in Spain, research for the analysis and inventory of geological heritage began in the late 1970s (Elizaga et al., 1980, 1993; Elizaga, 1988). However, it was not until the 21st century that geoheritage gained recognition as a part of nature, thanks to major laws passed in 2007 and subsequently, such as Law 42/2007 on Natural Heritage and Biodiversity, Law
The geological heritage of the city of Segovia, a sustainable resource

1.2. Are there geoheritage in Segovia?

Segovia has been a pioneering city in Spain in appreciate and managing its geoheritage, as the oldest initiatives for the inventorying and cataloguing of geosites date from the late 1980s, within the framework of the provincial inventory. The province, and particularly the city, have also pioneered the public outreach of this heritage, with ground-breaking initiatives and experiences that have been exported to other places in Spain and throughout the world.

The compilation of the geoheritage inventory of the province of Segovia began in 1980-90, as a local response to the official drive launched at the end of the period 1975-1980 by the erstwhile organisation ICONA and the Geological Survey of Spain (Instituto Geológico y Minero de España –IGME– in Spanish). It was publicly presented in 1991 during the 2nd Earth Meetings (INICE, Segovia), and partially published in the journal LITOS (Díez, 1991). It consisted of a list of 94 geosites, with their location on a map and their categories of interest (petrological, structural, stratigraphic, mineralogical, and so on).

In 1988, the Segovia Association of Amateur Mineralogists (ASAM) announced the first Daniel de Cortázar Award (national competition on geological, scientific and educational sites of interest, PIGCE); it was discontinued as the jury opted to withhold the prizes established for the first edition. However, it can be considered a pioneering initiative at the national and even international level regarding the use of geoheritage for educational purposes.

New geosites have subsequently been added to the catalogue until a total of 142, for which it was proposed to develop a management and conservation plan that were presented at the 3rd International Symposium ProGEO on the Conservation of Geological Heritage (Díez and Vegas, 1999), and at the meeting on Geological Heritage and Sustainable Development in Soria (Díez and Vegas, 2000). In parallel, significant progress has been made in the assessment and hierarchisation of the geosites using standardised methodologies. This quantitative assessment, along with a review of the tasks for heritage management carried out until the present, was published in a book summarising the work done within the framework of the 11th Caja Segovia Environment Awards (Vegas, 2000).

The most significant task for geoconservation in Segovia was the development of the “guidelines for the urban planning of Segovia and the surrounding area” (DOTSE in Spanish) for the Castille-León Regional Government, involving the review and expansion of the geoheritage inventory corresponding to the southern and western third of the province of Segovia. This catalogue has been uploaded to a digital map for the management by geographic information systems (ArcView by ESRI), associating to each georeferenced geosite in the cover (such as points or polygons, according to their spatial dimension at a scale of 1:50,000), and a data base associated (Santos et al., 2001; De las Rivas, 2006). The spatial scope of the DOTSE was subsequently redefined, and the catalogue was expanded from a total of 36 geosites, containing exact location and protected by specific regulation (Castile and León Regional Government, 2005). It was later published and distributed to the participating local authorities (De las Rivas, 2006).
In regard to the municipal scope for the capital of Segovia, in addition to the geosites included in the provincial catalogues mentioned above, it is worth noting the first publication of the sites and areas of geological and hydrological interest for the “Environmental diagnostic of the abiotic physical environment (Gea and hydrosphere)” in the local Agenda 21 in Segovia. A new and detailed catalogue of the municipal district was then compiled as part of the review of the General Urban Ordination Plan (GUOP) for Segovia, containing 85 geosites, where four of them are collections of minerals, rocks and fossils (movable geological heritage). It contains a data base describing the names, properties (singular or interesting geological features) and location (UTM coordinates taken with a GPS receiver and a map at a scale of 1:25,000, with an accuracy of ± 20 m) and arranged according to type of geological interest; an assessment based on standardised criteria; and concludes with technical recommendations for their protection and conservation and potential uses (De las Rivas, 2006). It was later published to coincide with the GUOP, the General Urban Planning Regulations (Segovia City Council, 2005).

1.3. A resource forever? Yes, it is a sustainable natural resource

The geoheritage is part of the planet’s natural resources, and refers to the goods that can be obtained from nature without the intervention of human beings. These resources have a direct influence on the economy and on social development, and most are essential for the needs of the population. According to their nature, they are usually classified as biotic, such as forest stands or livestock, and geotic, such as ornamental rocks or ore deposits, among many others.

However, natural resources can also be classified in terms of their duration within the human timescale (millennia), and this is where we see the emergence of three terms: renewable, which is equivalent to unlimited when used sustainably, such as water, forests or soil; non-renewable for resources whose sustained use leads to their depletion and disappearance, such as coal, petroleum and copper; and inexhaustible, meaning they will never disappear, as in the case of solar energy.

In this classification, geological elements have traditionally been seen as non-renewable resources when applying a more consumer-oriented vision, where the extraction and transformation of mineral deposits and rocks will lead to their definitive depletion from the lithosphere in the continental part, and—as has been discovered this decade—also in the oceanic crust and marine platform, as new technologies allow us to extract these resources in the most inaccessible regions of the planet.
However, this new conception of the geoheritage has meant that the elements whose geological history makes them unique and valuable are now considered to be a renewable and even inexhaustible resource for human beings. This is because their "non-destructive consumption through their use for education and geotourism sets them apart from other geological resources as it involves non-destructive practices that respect the environment and the communities where they are located".

1.4. Be careful! what is geoheritage and what is not

Geoheritage comprises all the geological elements that have originated in a natural way on planet Earth, without the intervention of humans; and which have a scientific and educational value and/or a value for tourism. Sometimes this geoheritage is evident and creates spectacular landscapes such as the gorges of the Hoces del Duratón, while on other occasions it consists of less evident geological elements like the folds in the Las Romeras quarry.

Human beings have used and transformed geological resources since their earliest origins. Their importance for the development of the different hominids species in the last two million years is such that it is impossible to disassociate humans from the geology of the planet. Since prehistoric times caves and rocky shelters have been crucial for refuge and living spaces; rocks have served to manufacture tools and for the lithic technology and artefacts; minerals have been used for manufacturing pigments and ornaments; crags, cliffs, volcanoes and unique morphologies have been chosen as sacred places with a spiritual or mystical significance for worshipping deities; and rocks are important as building materials for dwellings. It is also worth noting the endless wars and conflicts that have been fought over the possession of these geological elements.

But above all, the large-scale development of mining using ever more industrial methods highlighted the dependence of the economy and progress on geological resources. In fact, we could still be said to be living in a “Stone Age”. So when humans transform geological resources they cease to have a geological interest and value and enter the category of mining heritage, which can be defined as the set of open-air and underground mining activities, installations, movable and immovable structures, documents, objects and intangible elements associated with past mining operations to which a social group of varying size has attributed historic, cultural or social values (e.g. Sánchez et al., 2012; the Bierzo Charter in Jiménez et al., 2009). Apart from their undeniable association with the geoheritage, as mining operations take place on mineral deposits and in rocks, it also has connections with the historic, archaeological and industrial heritage and with economic, technological and social history.

1.5. What is geotourism?

The shortest and simplest definition of geotourism is the one formulated by Hose in 1995, as a form of nature tourism (ecotourism) that uses the geological heritage as a resource. Following the guidelines of EUROPARC-Spain (2005) and the International Union for Nature Conservation (IUCN), ecotourism is an environmentally responsible tourist activity consisting of travelling to or visiting natural areas in order to enjoy, appreciate and observe the natural attractions (landscape, geology, flora, fauna and others) in these areas, and any cultural manifestation of the present and the past to be found there, through a process that promotes conservation, has a low environmental and cultural impact and encourages the active participation of the local populations, favouring a model of sustainable development of the environment.
For a geosite to be considered as a sustainable geotourism destination and a touristic product, it is necessary to have specific equipment, in addition to the guides and specialized companies. It is not enough to have only geoheritage. For a real urban geotourism experience it is necessary to carry out a tourism strategy appropriate to this type of sector into the cities and a specific promotion within ecotourism in urban areas.

1.6. Is it possible to practice geotourism in cities? Yes, in the urban geoheritage

All cities and population centres that have a geoheritage within their urban and surroundings spaces have a major resource within their reach to be able to offer another form of tourism. Geological resources may be located both in public spaces and in squares, parks and gardens and in private spaces inside courtyards and homes. Urban geotourism has five basic features that make it a promising new niche tourism:

- **It diversifies** the offer of tourism in cities with new and surprising elements.
- **It supplements** the traditional offer, maximising its appeal and increasing the length of time in overnight stays.
- **It is there all year round**, prolonging the traditional offer in certain seasonal periods (winter in the interior) and at certain times of day (dawn, midday and dusk).

- There is an alternative in the absence of historical and artistic resources in new neighbourhoods and surrounding zones, distributing tourism and any resources generated more widely.
- **It is accessible** and universal to everyone, as most of the geoheritage outcrops are in public places in the open air. Their visit and enjoyment does not therefore represent a cost; they are free to access and in equal conditions for all potential visitors. The fact that this geoheritage is located in public spaces also guarantees greater accessibility for people with disabilities, as opposed to the geoheritage that is in protected natural spaces or in the rural areas that are much more difficult to access.

The use of the urban geoheritage confers significant benefits and above all favours the creation of strong links with people, because the use of geological elements within the city causes them to be perceived as a familiar and everyday element. Urban rocks also bear a close relation with historic buildings and serve as a support and a raw material, creating strong links between the geoheritage and the history of the city and its inhabitants. Segovia’s geological resources are closely associated with traditional trades and industries such as quarrying and the manufacture of pottery, plaster, sand, lime, tile and others, which demonstrate and enable
an understanding of the experiences of people’s ancestors and the utility of the geoheritage. In addition, their location makes them easily accessible and they have strong emotional associations for people as they have been the settings for games in parks, squares and streets.

Benefits and opportunities of the geoheritage for the city hall

2.1. The proximity of the geoheritage in the urban area of Segovia

The geology of the city of Segovia is a sign of its own identity and an indissociable part of its "skyline". Its location itself is not fortuitous, as the first settlers chose a rocky promontory formed by limestones and dolostones located between two river valleys, with numerous caves and shelters, conforming a strategic fortress and lookout point in its own right. These carbonate rocks are responsible for the golden and ochre colouring that is so characteristic of the city, and their physical properties have favoured their use in building its architectural and cultural heritage. The additional presence in the surrounding area of igneous and metamorphic rocks and a variety of reliefs make Segovia one of the most geodiverse cities in Spain.

The geoheritage contributes to the scenic, environmental and social quality of the visited environment. This heritage is a source of tourism and an educational resource outside the classroom that is considered always accessible and “low-cost” as there is no need to pay to visit these natural spaces in public areas. It has a unique appeal, and is an opportunity to understand the city’s establishment by the first human settlers, the geological resources available and the progress of society. The city perceives an added value from the rocks used as building materials, from the modelling of the valleys as a natural defence, and from water in all its aspects (river courses for the installation of mills, springs and fountains, water quality due to the rock composition of aquifers, etc.).
According to the UNESCO, a sustainable city is one that respects the priorities of sustainable development from its social, economic and environmental perspective, and allows its inhabitants to live in decent conditions in harmony with nature. Currently, half of mankind (3.5 billion people) lives in cities and it has been estimated that by 2030 almost 60% of the world’s population will inhabit urban areas. In coming decades, 95% of this urban expansion will take place in the developing world. The world’s cities occupy only 3% of the emerged part of the planet, but represent 60-80% of its energy consumption and over 70% of its carbon emissions.

2.2. Benefits and values of the geoheritage in urban areas

Social changes, the concentration of the population in cities, the increase in mobility and the time dedicated to leisure means that society and citizens are demanding recreational spaces and natural areas in the urban environment. Due to its position on the Iberian Peninsula, Segovia’s geological record covers the last 600 million years of Earth’s history (the planet is 4.57 billion years old). This long history has contributed to the fact that the city alone is the site of metamorphic, igneous and sedimentary rocks (marine and continental) and a variety of landforms and their associated landscapes which have given it its own distinctive character. Segovia’s residents and visitors have the opportunity to enjoy a diverse geoheritage that reveals its fascinating past.

If we were to see a time-lapse or speeded-up view of the geological history of the natural areas and places among the buildings in the city of Segovia, it would take us back to the depths of the cold ocean on the edge of the continent of Gondwana in the Late Proterozoic age around 600 million years ago, which was then buried beneath ancient mountains –now long disappeared– from the major Variscan orogeny in the Carboniferous period. We would see the interior of the Earth’s crust where the rocks melt and form new ones, and how millions of years of erosion destroyed everything until we were invaded by the Late Cretaceous tropical sea with the remains of now extinct organisms when Iberia was a great island. We could observe the elevation of the mountains of the Central System Range while the continental sediments filled the Duero basin in the Neogene and the Eresma and Ciguíñuela rivers became incised, and note the effect of the glaciations of the Quaternary period that have finally etched the landscape we see now since the first human settlers arrived in these lands only 60,000 years ago, according to the geological record and the scientific knowledge available today.

We know it is not easy to explain and understand all these planetary events that are now part of the city’s buildings and public spaces, but it is the challenge facing all of us: politicians, the local authority, researchers, the education community, residents and visitors of all ages and genders and all the segments that make up the city. Understanding Segovia’s geological past and present through environmental education and geotourism generates more resilience among people when tackling important issues in our society such as climate change and its effects on the urban ecosystem and people. As an example: the impact of geological hazards and the occurrence of landslides, floods and earthquakes; where non-renewable geological resources come from and the need for correct management and recycling; the extinction of species and its consequences, with real examples from the past; groundwater and its correct use and management; our role in the contamination of soils and aquifers; the significance of geological time and the duration of natural processes; the degradation of stone in building; and nature conservation in the city and in the environment around us.

This can only be achieved by promoting education and public awareness in the use of geological resources and by highlighting the benefits they have for human beings through the ELIGES identified in the city.
Benefits and opportunities of the geoheritage for the city hall

Juana Vegas & Andrés Díez-Herrero

The local government are the most effective and direct way of connecting with the citizens and they also have the tools to do so. Below is a list of the direct benefits of the geoheritage in the city of Segovia, which can be extrapolated to cities and urban centres that also have a geoheritage:

• It is a natural laboratory for formal and informal education in the city. The opportunity for education centres and schools to organise activities around urban rocky outcrops and reliefs reduces costs and time and minimises the risks involved in conducting outdoor activities with the students. Most rocks have been on the planet since long before the appearance of humans. It can become a first-order educational resource, where the opportunity to recognise geological elements in the city aids the understanding of an abstract Science with little presence in the formal education syllabus in Spain. Fossils are also a very important resource that allow us to understand the evolution of the species, and to learn about extinct organisms and species that can no longer be seen. In the field of informal education, environmental awareness programmes such as “Segovia Educa en Verde” (Segovia educate in Green) from the Environment Town Council are an excellent way to experience the city’s natural areas, aimed primarily at children and families in their leisure and recreation time. This programme also organises activities around the geoheritage.

• A city’s geology is an element and sign of its identity. Rocks, through their colours, textures and arrangement in the landscape, are an integral part of the environment in which we humans have to adapt and live. Living in cities with a strong “geological” component favours the recognition of a unique urban landscape and a permanent connection with nature, as opposed to cities where urban development has eliminated almost all traces of nature from their inhabitants’ environment.

• Urban geology linked to knowledge of the planet and its functioning can produce fantastic stories because it deals with scales of time and space that are uncommon in our daily lives. The outcrops in the Segovia city are a magnificent setting within reach of everyone that provide an opportunity to understand the geological history of the last 600 million years.

• Confluence with other heritage values. Many of the objects we use in our daily lives are made from geological resources, such as clay, petroleum, minerals, gravel for aggregates and many more, and they serve as a starting point for the interpretation of the geological processes and raw materials to be found in natural outcrops, and of how they have been used in the buildings and monuments in the city. This knowledge creates a link with the traditional crafts of the past and with modern industry.

• Raising awareness of the major environmental problems and challenges facing society in line with the UNESCO's 17 Sustainable Development Goals and the UN's 2030 agenda (https://es.unesco.org/sdgs) based on the geological record and the functioning of the geological processes.

• Opportunity for nature conservation. Geology is a way of raising awareness of the need for nature conservation as a whole; it offers a holistic approach of nature and the natural heritage of our planet. Geology is a key piece for the conservation of ecosystems and species. Geodiversity—that is, the composition and arrangement of rocks on all scales—has conditioned life, biodiversity and the landscape today.

• Increasing the well-being and health of people living in urban environments where rocks and geological landscapes, together with vegetation, form natural elements that alternate and coexist with buildings and urban installations and give rise to recreational areas that contribute to a better quality of life, unlike cities where the environment is artificial. People receive this benefit in a subliminal way, but no one doubts the value of the availability of “natural” environments in an urban setting that contribute to better quality of life, as places for recreation that are essential for relieving the stress of everyday life and
Encouraging the practice of outdoor activities, sport and leisure all year round. They are essential spaces in the city and enhance the well-being of people of all ages.

- This is a new tourism niche and with great potential to contribute to endogenic development. Geotourism is a new tourist product, whose demand, along with nature tourism, is on the rise. This new form of tourism is already a reality in urban centres such as the case of Segovia, and also in Spanish cities like Granada, Burgos, Garachico and Icod de los Vinos (Tenerife); and in other places in the world like Curitiba and Sao Paulo (Brazil), Mexico City and Turin (Italy). The growing demand for this kind of tourism is in line with an increasing interest in past and present geological events.

The scale for this study is local, and consists of the semi-quantitative assessment of the 95 geosites previously identified for the city of Segovia in the publication of Díez-Herrero and Vegas (2011), plus another ten geosites recently identified from 2011 to the present day. The geology of Segovia is divided into 13 local geological frameworks according to the global chronostratigraphic scale, which includes rocks, minerals, fossils, soils, tectonic structures, morphologies and hydrogeology that are relevant for understanding the geological evolution of the urban environment in the city of Segovia. The classification of the urban territory in these geological frameworks is the first step in identifying these geosites.

<table>
<thead>
<tr>
<th>No.</th>
<th>Geological frameworks for the city of Segovia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metamorphic rocks from the Iberian massif</td>
</tr>
<tr>
<td>2</td>
<td>Carboniferous igneous rocks from the Iberian massif</td>
</tr>
<tr>
<td>3</td>
<td>Sandstones and clays from transitional sedimentary environments from the Late Cretaceous</td>
</tr>
<tr>
<td>4</td>
<td>Rocks from intertidal sedimentary environments in the Late Cretaceous</td>
</tr>
<tr>
<td>5</td>
<td>Carbonate marine rocks from the Late Cretaceous</td>
</tr>
<tr>
<td>6</td>
<td>Continental rocks and sediments from the Cenozoic</td>
</tr>
<tr>
<td>7</td>
<td>Tectonic structures from the Variscan and Alpine orogenies</td>
</tr>
<tr>
<td>8</td>
<td>Mineral deposits</td>
</tr>
<tr>
<td>9</td>
<td>Palaeontological sites</td>
</tr>
<tr>
<td>10</td>
<td>Geomorphological features</td>
</tr>
<tr>
<td>11</td>
<td>Movable geological heritage: museums and collections</td>
</tr>
<tr>
<td>12</td>
<td>Soil profiles</td>
</tr>
<tr>
<td>13</td>
<td>Hydrogeology</td>
</tr>
</tbody>
</table>

Main geological frameworks in the city of Segovia that have been identified previous to define the geosites that are representative of its urban geology.
A first semi-quantitative assessment was made of all of these aspects in the 110 geosites identified, specifically designed for public use for environmental education and in a subsidiary way for geotourism. The basis was the methodology developed by Suzuki and Takagi (2018) “Evaluation of geosite for sustainable planning and management in geotourism” which includes six main criteria that are key for managing the geoheritage for its use for tourism.

Following this method of six criteria proposed by these authors, the “Assessment of the geoheritage for environmental education and geotourism in the urban areas” was designed, each including in turn four sub-criteria that specifically assess aspects of environmental education and geotourism. The potential users of environmental education in the city have also been considered, such as students of primary, secondary and university education, families in their leisure time, visitors and different groups of people with disabilities. This assessment of the geoheritage is a novel design worldwide, and this is the first time that it has been implemented and applied to a city. Because of its methodological design it is a model that can be replicated in any other urban area in Castile-León and in any other autonomous region, or in any other city outside Spain.

<table>
<thead>
<tr>
<th>ID</th>
<th>Assessment criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ved</td>
<td>Value for environmental education</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
<tr>
<td>Vsc</td>
<td>Scientific value</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
<tr>
<td>Vtr</td>
<td>Tourism value</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
<tr>
<td>Vsa</td>
<td>Value for safety and accessibility</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
<tr>
<td>Vcs</td>
<td>Conservation and site sustainability</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
<tr>
<td>Vti</td>
<td>Value of the geosite’s environmental information for geotourism</td>
<td>1: Difficult to understand, even with the explanation from a geoguide</td>
</tr>
</tbody>
</table>

Main assessment criteria and their identifiers (ID) applied to the geosites in the city of Segovia for environmental education and urban geotourism.

These criteria have been assessed for each geosite in the city of Segovia, each of which in turn includes four sub-criteria to minimise their subjective choice. This methodology, which is very common and the most widely accepted in all the studies on geoheritage, is characterised by a semi-quantitative assessment of the sub-criteria, consisting of a score from 1—the lowest possible value for each criterion—to 4, the highest. Scores 2 and 3 represent intermediate situations.

The main aim of this assessment is to select the ten geosites that combine the best conditions for use in environmental education by the city of Segovia and which also have a high value for urban geotourism due to their intrinsic value as the most representative sites of the geology of Segovia and their connection with environmental issues (pollution, climate change, natural hazards, waste and recycling, among others), and to their conditions of accessibility and the type of interpretation tools available. Below is a description of the six criteria and sub-criteria designed for this assessment.

Ved: Value for environmental education. This criterion considers the values of the geoheritage for environmental education, focused on raising awareness of environmental issues such as pollution, natural hazards, climate change and others, the conservation of this heritage, and the consideration and understanding of geoheritage as a living laboratory.
<table>
<thead>
<tr>
<th>Vsc: Scientific value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Sub-criteria</td>
</tr>
<tr>
<td>Vsc1</td>
<td>Research significance</td>
</tr>
<tr>
<td>Vsc2</td>
<td>Clarity and non-obsolescence of the scientific story in the interpretational material (panels, guide books and web sites)</td>
</tr>
<tr>
<td>Vsc3</td>
<td>Rarity in the city of Segovia and its municipal district</td>
</tr>
<tr>
<td>Vsc4</td>
<td>Representativeness of the geosite within the city’s geological frameworks</td>
</tr>
</tbody>
</table>

**Vsc: Scientific value.** This criterion rates the intrinsic geological values of the geosites according to the current state of scientific knowledge.

<table>
<thead>
<tr>
<th>Vtr: Tourism value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Sub-criteria</td>
</tr>
<tr>
<td>Vtr1</td>
<td>Aesthetic / emotional value such as beauty or iconic site</td>
</tr>
<tr>
<td>Vtr2</td>
<td>Other natural and cultural values</td>
</tr>
<tr>
<td>Vtr3</td>
<td>Other tourist attractions in the vicinity</td>
</tr>
<tr>
<td>Vtr4</td>
<td>Proximity to the city’s tourist offices and information centres (measured by walking time)</td>
</tr>
</tbody>
</table>

**Vtr: Value for tourism.** This criterion has been specifically designed to assess the tourism potential of the geosites in the city of Segovia in relation to tourist information centres, the nearness to other famous attractions in the city and the time required to reach them by walking.
ELIGES to conserve, promote and raise awareness

Juana Vegas & Andrés Díez-Herrero

Vsa: Safety and accessibility

<table>
<thead>
<tr>
<th>ID</th>
<th>Sub-criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Safety conditions of the geosite and the route leading to it</td>
<td>Relatively dangerous: it is on the verge of a street or road without a pavement or it is necessary to cross very busy roads, or near dangerous places (escarpments or sites with natural hazards)</td>
</tr>
</tbody>
</table>

Vsa1: Safety conditions of the geosite and the route leading to it

Vsa2: Transit time walking between environmental interpretation centres in the city of Segovia

More than one hour

More than 30 minutes

More than 15 minutes

Less than 15 minutes

Vsa3: Walking time from the closest bus stop to the geosite

More than 30 minutes

More than 15 minutes

More than 5 minutes

Right beside the bus stop

Vsa4: Accessibility for people with physical and intellectual disabilities

It is not accessible to any disabled segment

It is only accessible to people with intellectual disabilities, but assisted by carers

It is perfectly accessible to any disabled segment

Vsa: Value for safety and accessibility. This criterion has the novelty of incorporating all the main stakeholders for the use of the geoheritage in the city of Segovia, including people who have disability, and assessing their possibilities of access to the geosites in order to take part in environmental education activities.

Vcs: Conservation and site sustainability

<table>
<thead>
<tr>
<th>ID</th>
<th>Sub-criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current state of conservation</td>
<td>Low: the geological values of the geosite are not conserved</td>
</tr>
</tbody>
</table>

Vcs1: Current state of conservation

Vcs2: Legal protection

Not protected: it is not covered by any law or regulations

Existing plans for protection, but with a general scope for the geosite, not specifically referring to its geological values

Protected due to its geological value (SNI or geosite in GUPR)

Vcs3: Natural site sustainability

Difficult to preserve, subjected to natural processes (geomorphological processes or vegetation that conceals it) with high activity or frequency, or possible extreme catastrophic events

It may be damaged by medium-term natural processes (return periods of ten or more years)

It could be affected by some natural disaster or exceptional vegetation growth with return periods of over 100 years

With no incidence due to natural processes that could affect its conservation

Vcs4: Anthropic sustainability

Difficult to preserve, subjected to constant, direct and damaging anthropic impacts on the geosite

It may be damaged by medium-term anthropic activities (over ten years)

It may suffer some anthropic impact but exceptionally, and with a frequency of over one century.

No incidence due to anthropic activities that affect its conservation

Vcs: Conservation and site sustainability. The main aim of the geoheritage is its conservation, protection and sustainable use. GUPR, General Urban Planning Regulations. SNI, Site of Natural Interest.
3.1. A stone on the path TAUGHT me...

The stones and outcrops on the paths, in the streets, squares and parks of our cities TEACH. But they do not only teach things about the origin and history of the planet –they tell us about the evolution of life with their fossils, changes in the climates and landscapes of the past and the processes and disasters that have shaped the Earth’s surface. They also teach us essential lessons about the environment, such as the use of natural resources and their benefits and impacts, global and climate change and the variations in sea and ocean levels, natural hazards and how to analyse them and prevent disasters and catastrophes, and nature conservation and the importance of restoring degraded areas.

Not all rocks are equally useful for teaching. Some are more useful as an educational resource as they are unique, representative or highly informative; and others are better for informative visits due to their spectacular nature. Sites containing these geological elements that are more valuable for education and tourism are known by the name of “geosites”. Over 100 geosites have been located, inventoried and described in the city of Segovia and its surroundings, with very different types of interest and nature, from unique minerals and rocks to fossil deposits, from curious reliefs to concentrations of minerals, and from natural springs to rock structures such as folds and faults. Segovia is home to a wide diversity of rock types and an unusual concentration of geosites.

These geosites are not distributed haphazardly and arranged at random, but are concentrated in certain places with a very high number of geosites in a limited space: these are the locations containing “Geosites for Environmental Education in Segovia city” (ELIGES). These are the “top ten” or the “jewels in the crown” of the locations with sites and elements for teaching. This Best Practice Guidelines has also been designed to improve their use and management, and fact sheets have been completed for each ELIGES with their basic geological features, observations, educational resources and recommendations for visiting them.

Now all that’s left is for you to visit the ten ELIGES so you can learn about the environment and nature. Are you ready? YOU CHOOSE.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES/
The oldest Segovia

What is the oldest item in the city of Segovia? No, it is not the Roman Aqueduct, nor the remains of the pre-Roman wall, nor the Bronze Age sites in the Eresma Valley, or even the Neanderthal sites in the El Molino shelter. By far the oldest items in Segovia are the rocks on which the city and the area around it stand, which contain the caves and shelters that served as dwellings in prehistoric times and which have been used to construct its main monuments and buildings. Of all the rocks in the city, the oldest –aged over 600 million years– can be found in the ancient quarry in whose cavity the Alonso Lake was formed, in the Nueva Segovia neighbourhood. In addition to their great age, you’ll also find that the rocks in the Alonso Lake are folded and fractured as though crushed by a giant, see surprising minerals that resemble fossilised plants, and learn why there is a lake there and how its water level changes in the different seasons of the year.

But you can also think about environmental issues like the benefits of using natural resources, the environmental impacts of mining, the effects on groundwater and its quality, and the management of geoheritage in periurban zones of the city.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES01/
ELIGES 02. Dia Sanz square

From hell to the Aqueduct

What is Segovia’s Roman Aqueduct made of? Of course everybody would answer in unison that the stones in the aqueduct are carved out of granite. However, this answer is only partially correct, because in fact it is made of different types and varieties of rocks from the group of granites known as ‘granitoids’. Good evidence of this are the rocks that were used as the foundation for the aqueduct in the Dia Sanz square, where its direction changes sharply and its one tier of arches becomes two. These rocks are lighter in colour than the stones in the aqueduct itself, and contain different minerals, dykes and multiple joints. But the most surprising thing is that both types of rock come from magma from the Earth’s interior that cooled as it rose to the surface and formed both the granitoids used in the foundation of the aqueduct and others quarried in other areas to build this legendary monument. So the granites in the Aqueduct come from “hell”, giving a new geological dimension to the typical Segovian legend about “the devil and the little girl”. But you can also think about environmental key questions like the benefits of using natural resources, the impacts on the environment, the relation between the natural heritage and the cultural heritage, and the effects of vegetation growth on the conservation of geoheritage.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES02/

ELIGES 03. The Los Molinos trail

The millstone riverbank

Why are almost all the mills in Segovia in the San Lorenzo neighbourhood? It may have something to do with the slope of the course of the Eresma River, whose rocky riverbank meant the waters could reach sufficient height to move the wheels and the milling machinery. This is why a walk along the verges and riverbanks between the Vía Roma bridge and the Alameda del Parral is a chance to see different types of granitic rocks (with their dykes, xenoliths, joints and fractures), the singular erosional forms of these rocks (castle koppies, flared slopes, tors, boulders) and how the River Eresma has shaped the rock by forming potholes as giant’s cauldrons, bars and islands of gravel and sand, etc.

This ELIGES is related to environmental key questions such as the natural hazards associated to rivers as flooding; the impacts of human activities on natural resources like water and the landscape.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES03/
ELIGES 04. El Terminillo

Our sands are the rivers...

The siliceous sands to be found in many places in the city of Segovia have been used for centuries as a building material and even as a raw material for manufacturing glass. What very few people know is that, incredible as it may seem, they were deposited on the bed of the broad braided rivers that flowed through this territory some 90 million years ago. In the area around El Terminillo, where the municipal district of Segovia comes into contact with the La Lasrilla town, the old sand quarries that used these materials are an opportunity to see banks of siliceous sands, gravels and clays, sedimentary structures formed on the riverbanks, bars, ripples and dunes moved by the river current, and even the iron oxide crusts that formed the soils in a sub-equatorial climate.

You can also think about environmental issues such as the impact of mining activities and the need to restore the degraded quarry landscape, collecting minerals and the geological hazards caused by the aftermath of mining.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES04/

ELIGES 05. San Cebrián door

A “laminated cake” of tides

Since its origins, the Moon, as a satellite of the Earth, has generated the cycles of tides in seas and oceans. When the coast of a warm and shallow sea reached Segovia’s current position some 84 million years ago, the tides caused repeated cycles of flooding and emersion at high and low tide. In each cycle the sands, silts and clays dragged by the seawater were deposited in fine sheets and thin layers, some of which were buried by other subsequent tides. Over time around ten metres of laminated sand, silt and clay were built up and arranged as if in a giant layer cake, like a Viennetta. The area around the Puerta de San Cebrián is certainly one of the places in the city of Segovia where these outcrop can be seen to their best advantage on the surface. You can observe the fine layers and the undulations in the ripples on the seabed, the remains of the galleries made by animals burrowing down to feed and protect themselves, and even their fossil remains.

This ELIGES resembles environmental key questions such as the variations in the global sea level due to climate change.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES05/
At the seaside!

The city of Segovia currently stands at an altitude of 1000 metres above sea level. But it has not always been so. A long, long time ago, no less than 84 million years ago, a tropical shallow sea covered part of the continents, including the Iberian microplate. As the coastline advanced from east to west due to the rise of sea level, it created a genuine beach with tides where Segovia stands today. The remains of these tidal beaches, similar to the estuaries in Korea and with the climate of today’s Caribbean Sea, can be found, among many other sites, in the rocks in the San Juan street that serve as the foundation for Segovia’s city Wall in the area near the Las Cadenas mansion. As you go up the pavement, the fine layers of calcareous sands and silts of the tidal beaches give way to banks of dolostones that are evidence of how Segovia was once entirely submerged by the sea.

But you can also think about environmental key questions such as climate change and the variations in the global sea level due to melting of the Poles; the impact of human activities and the effects of vegetation growth on geoconservation.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES06/

A valley that began life as a sailor

The walled enclosure of the city of Segovia is surrounded by two valleys in the form of canyons and gorges that have been shaped by the River Eresma and its tributary, the Clamores stream, over the last million of years. But before these river flows carved out their valleys, the rocks they eroded first needed to be formed, and are now visible in their cliffs and flanks. In both cases these are successions of dolomitic sandstone strata and sandy limestone and dolostones that were formed on the seabed in the coastal area of the shallow sea that covered this area during the Late Cretaceous period around 80 million years ago.

The valley of the Clamores stream in the pedestrian area between the old Sancti Spiritu Monastery and the point where it flows into the River Eresma is a genuine showcase of these rocks, their sedimentary structures (cross laminations, ripples, channel infills...) and the fossil remains they contain (mainly rudists and other bivalves). There is also evidence of more recent processes from the Quaternary period, such as the excavation of this valley, the slope movements (landslides, topples and others), the formation of tuffs, springs from karstic aquifers, and much more.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES07/
ELIGES 09. Tejadilla Caves

Hyenas on the Segovian tundra

The Tejadilla valley encircles the city of Segovia and its surroundings to the southwest, and is the "little brother" of the canyons in the River Eresma and the Clamores stream. The flanks and walls of the Tejadilla valley contain an abundance of small caves, shelters and overhangs that are formed by earlier karstic processes simultaneous to the embedding of the river network. During the last hundreds and tens of thousands of years, these caves have been inhabited and used as a place of shelter by several species of mammals, amphibians, reptiles and birds. Among the macromammals whose fossilised remains are conserved in the infill of caves like El Búho, La Zarzamora and El Portalón are particularly cave hyenas, equids (wild horses) and bovids (aurochs), and also woolly rhinoceros, deer, mammoth and other species typical of cold steppe environments similar to today’s circumpolar tundras.

But you can also think about environmental key questions such as climate change and the origin and scale of the change; extinctions; human impact on the landscape; and the regulations over the collection and trade of fossils, and its relation to the geoconservation.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES09/

ELIGES 08. La Fuencisla

Change of pattern in the patron saint

The area around the shrine to the patron saint of Segovia, the Virgin of La Fuencisla, is unique not only for its cultural, historic and religious values, but also because of its natural value. In fact, in an area of only a few hundred metres there are numerous geosites, from outcrops of Cretaceous marine rocks with well developed sedimentary structures, to springs and water table. There are also remains of historic landslides and an artificial change in the course of the River Eresma to prevent floods from damaging the foundations of the shrine.

Main environmental key questions are related to climate change; the management of geological hazards to avoid disasters in the form of flooding and landslides.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES08/
4.1. Main stakeholders involved in managing the geoheritage in the city of Segovia

The scope of action of this guidelines is intended for the local authorities in the city of Segovia, as the promoters of the sustainable use of the urban geoheritage for environmental education and geotourism, according to the guidelines of the 2nd Castile-León Environmental Education Strategy for 2016-2020. A series of objectives have been proposed to ensure that the best practices governing the urban geoheritage in the city of Segovia contribute to environmental awareness and geotourism, such as:

- The effective transmission to the city hall staff of best practices around the geoheritage.
- To reinforce that geoheritage as a part of nature.
- Environmental awareness through geoheritage, its processes and its relations with human beings.
- To contribute to nature conservation in the urban environment and awareness through the relations between geodiversity and biodiversity.
- To launch a sustainable development policy through environmental education strategies that leverage the potential of the geoheritage in the urban environment of the city of Segovia.

More information on this subject:
http://www.segovia.es/educaPatriGeo/ELIGES10/
Best practice guidelines for the conservation of geoheritage: local governance in favour of environmental education and geotourism

Juana Vegas & Andrés Díez-Herrero

- To guarantee the integration of the local population and all its segments in environmental education.
- To consider people as a dynamic component acting on nature and the urban environment who are empowered to conserve and enjoy this heritage.
- To obtain the recognition of the local authorities and entities involved in managing this heritage to conserve and communicate its value.
- To design, prepare and develop an environmental education strategy based on urban geoheritage.
- To adapt the campaigns for environmental education taking into account all the stakeholders involved in the urban environment of the city of Segovia.
- To establish mechanisms for monitoring and assessing environmental education through the urban geoheritage.

To achieve these proposed objectives, we have identified the main actors in the Segovia City Council, the equipment available and the capabilities and relations between them all. These actors have been identified at the departmental level, although we are aware that the departments can and tend to change in each legislative period. The departments involved have been categorised according to their relation with the management and use of the geoheritage.

The aim is to actively promote the protection of the geoheritage and its conservation among all the stakeholders in the city through the implementation of best practice guidelines. This manual is fundamentally aimed at the technicians in the city hall of Segovia, the companies who conduct environmental awareness activities, teachers at all levels (from preschool to university), the tourism sector and service providers based in the city of Segovia.

4.2. Best practices in the city of Segovia

The best practices guidelines for the sustainable use of the geoheritage are intended to achieve an optimal management at the local level so we can continue using these natural resources for the economic and social development of the inhabitants of the urban environment in a sustainable way and ensure that the future conservation of the nature or its possible uses are damaged in the future. To support these processes of continuous improvement in the management of the natural resources within the scope of the local authorities requires instruments that inform and raise awareness among the promoters and the local population.

This manual is an instrument to guarantee the management and conservation of nature in urban areas. It is necessary to implement a management system based on the scientific evidence obtained from the results of the methodology developed for the city of Segovia.
This heritage in urban settings is more fragile and vulnerable as it is subjected to greater pressure and impacts than the geoheritage in rural environments and protected natural areas such as national parks and nature reserves. Pollution, the pressure of urbanisation, in short, the occupation and management of public spaces, demand the promotion of best practice guidelines to guarantee their conservation and the legacy of the future.

A basic model of local governance to ensure the sustainability of the geoheritage as a resource for environmental education and geotourism in the city of Segovia.

The best practice guidelines recommended for the city of Segovia focus on three fundamental areas to achieve the proposed objectives:

1. Improving the management of geoheritage by the local authorities.
2. Improving awareness and environmental education through the city’s geoheritage.
3. Improving geotourism

The following table describes the measures needed to be implemented as best practices by the different council departments (in grey) and the different social sectors (in orange) that will benefit.
Specific recommendations for improving the ELIGES in the city of Segovia

Based on the results obtained, the best practices and specific recommendations that would improve management, environmental awareness and urban geotourism in the ten ELIGES in the city have been identified and are described below:

**ELIGES 01. ALONSO LAKE**
- Improvement of fencing in the escarpments between the berms and the lake.
- Improvement of accessibility for visitors with disabilities.
- Reinstall the information panels, but using stone supports (rock blocks, as they were in the original proposal) and materials that are not easily vandalized.
- ELIGES signalling to visualize its location.

**ELIGES 02. DÍA SANZ SQUARE**
- Periodic cleaning of sediments that fall due to weathering of the rock, without eroding the outcrop.
- Elimination of herbaceous vegetation that grows on the outcrop.
- Monitoring of the contact between the pavement and the outcrop, allowing a capillarity margin and not using cement in the rock.

**ELIGES 03. RIVER ERESMA IN SAN LORENZO**
- Cleaning the trails and access paths and the municipal solid waste accumulated beside the outcrops.
- Improving the conditions of accessibility and safety for the disabled segment.
- Removing artificial waste and vegetation that conceals or deteriorates the outcrops after flooding and overflowing in the River Eresma.
- Selective cleaning of graffiti on the granite boulders and outcrops in the area around the old pottery factory using sandblasting.

Above left, photograph contained in "the physical and geological description of the province of Segovia" paper (1891). Following photographs, effects of graffiti and later painted of the last decade.
Best practice guidelines for the conservation of geoheritage: local governance in favour of environmental education and geotourism

Juana Vegas & Andrés Díez-Herrero

ELIGES 04. LATE CRETACEOUS SERIES IN EL TERMINILLO
- Cleaning of the uncontrolled debris and municipal solid waste tips.
- Installation of vehicle retention systems (bollards, stone blocks...) to prevent new waste tips.
- Geomorphological restoration of the sand quarry of El Terminillo on Cretaceous rocks, maintaining the evidence of the mining heritage and the traditional uses of the sand factories. Opening new safe and adapted trails along the lowest most accessible part of the area.
- Installation of information panels using vandalproof materials.

ELIGES 05. SAN CEBRIÁN DOOR
- Creating and equipping a small interpretation space under the overlap of the rocky outcrop. Installation of standard fencing as a separation from traffic.
- Installation of an orthogonal pedestrian walkway between the pavement on the northern edge and the site of the outcrop to improve the accessibility and guarantee visitors’ safety.
- Clearing and controlling vegetation at the site and on the nearby walls, and clearing municipal solid waste.
- Installation of an information panel on one side of the outcrop, with vandalproof materials.
- Incorporation of the use of this space into the “Segovia Educa en Verde” programme run by the Department of the Environment.

ELIGES 06. CRETACEOUS INTERTIDAL OUTCROPS IN SAN JUAN STREET
- Control of the growth of herbaceous vegetation at the base of the outcrop.
- Removal of traces of weathering from the rocks in the outcrop and control of saline efflorescences.
- Regular cleaning of the aggregate between the paving stones and the surface of the outcrop.

ELIGES 07. CLAMORES VALLEY
- Maintenance tasks and clearing the vegetation concealing the rocky outcrops or access to them.
- Clearing of debris in areas close to the outcrops, particularly in rocky overhangs and shelters.
- Creation of an information brochure on the geoheritage of the Clamores valley as one of the most intensively transited and most visited areas, and installation of panels or QR codes.
- Removal of graffiti from the rocky outcrops through a combination of sandblasting and water cleaning, depending on the characteristics of the support rock.
- Access control and information in escarpment areas at risk of landslides and rock falls, particularly at times of noise and vibration (fireworks, artillery salvos, thunderstorms and similar), intense rainfall, intense winds or persistent frosts.
ELIGES 08. LA FUENCISLA

- Control of the vegetation at the base of the rocky escarpment, particularly in the area around fountains and springs, taking care not to eliminate the contact with the wall between the vadose area (free from vegetation) and the saturated area (covered with phreatophytic and rupicolous plants).
- Adaptation of the drainage of the springs through canalisation and ditches to prevent waterlogging or flooding of the paving.
- Control of the nesting of exotic and invasive birds in rocky cavities, whose droppings damage the rock and obscure the heritage elements.
- Periodic gauging of the main streams and springs to control any changes in the flow.
- Regular physical, chemical and microbiological analysis of the waters in the springs and streams to control any possible focuses of contamination.
- Installation of information panels in areas close to the outcrops where their visual impact will be limited.
- Creation of information leaflets on the ELIGES for their free distribution in the kiosk in the summer months when the influx of visitors is at its peak.

ELIGES 09. CAVES OF EL BUHO-ZARZAMORA-PORTALÓN

- Control of access to the interior of the caves in coordination with the management of archaeological heritage by the Castile-León Regional Government (Territorial Culture and Tourism Service) to protect the geological and archaeological heritage.
- Removal of the remains of sterile deposits from sieving in previous excavation campaigns and municipal solid waste.
- Installation of information panels, appropriately sited, with weatherproof and vandalproof materials.

ELIGES 10. COLLECTION OF ROCKS, MINERALS AND FOSSILS IN THE ARTILLERY ACADEMY

- Collaboration agreement between Segovia City Council and the Artillery Academy to promote the public use of the collection.
- Coordination between the Segovia City Council and the management of the Artillery Academy to produce a calendar and schedule of times the collection can be visited, implementing a mechanism of authorisations for schools to the "Segovia Educa en Verde" programme and other segments of the public.
- Organisation of temporary exhibitions in municipal exhibition spaces (La Alhóndiga, La Cárcel...) of part of the collection of minerals, rocks and fossils, coinciding with special dates or to reinforce other cultural activities in the city.
- Development of teaching material for teachers and students of different educational levels to optimise the school visits to the collection.
- Proposal in the medium- and long-term to transfer the collection to another location outside an active military centre to facilitate its exhibition and use for school activities, such as possibly the Casa de la Quimica (where it was housed for decades) or the Alcázar de Segovia itself (lower levels that are currently under-utilised) to guarantee the enjoyment of this unique movable geoheritage.

In this Best Practice Guidelines it is particularly worth mentioning a series of specific recommendations for the ELIGES in relation to people with disabilities:

- Assess the availability of parking places for vehicles adapted to people with disabilities in the car parks close to the ELIGES.
- Verify whether the panels and the QR codes are accessible to people with disabilities.
- Avoid isolated interventions or segregated initiatives exclusively for people with disabilities. Abandon the idea of working for people with disabilities and move to working with people with disabilities by involving these groups and associations. According to Europarc-Spain, accessibility is for everyone, and not only for people with disabilities. There are many other people who have limitations (temporary or permanent) who require accessibility to the environment: the elderly, children, pregnant women, families with pushchairs, people in plaster casts, etc.
- Estimate the diversity of the visitors: sensory skills (sight, hearing, ..., balance); physical skills (dexterity, manipulation, voice, strength, movement) and cognitive skills (intellect, memory, language, reading and writing).

- Improve the accessibility to the ELIGES in the city in application of Standard UNE 170001-1 DALCO on the universal accessibility of the ELIGES. Getting around – Understanding – Localisation – Communication.

Useful references


Best practice guidelines for the use of the geoheritage in the city of Segovia.

A sustainable model for environmental awareness and urban geotourism

Juana Vegas and Andrés Díez-Herrero