Origin of the event and formation of the Ries crater

1) 35 milliseconds before impact
2) 10 milliseconds after impact
3) Beginning of crater formation after 60 milliseconds
4) Formation of the deep “transient crater” after about 10 seconds
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Annex 5: Geological and Geographic Summary

*Per application dossier for UNESCO Global Geoparks and including supplemental information (denoted as NKrit) required by the German National UNESCO Committee in "Synopse Kriterien UNESCO Global Geoparks (für Neuanträge, Version 1, 2016)."
A – Identification of the National Geopark Ries

1. Name
(With Supplement NKrit 5 – Recognition as National Geopark)

Geopark Ries – Europe’s “riesig” Meteorite Crater*

*The “riesig” Ries Crater is a play on words – in German, riesig means “tremendous, gigantic, enormous.” In fact, the name Ries is derived from the name of the large Roman province Raetia, for which today’s Ries basin served as the so-called breadbasket.

With its 25-km crater diameter, the Nördlinger Ries is one of the best preserved meteorite craters worldwide and is regarded as a textbook example of an impact crater. The Geopark Ries encompasses the crater and its ejecta masses, still preserved today. Since its founding in 2004, the Geopark Ries has become enshrined in the consciousness of the residents of the region. The interest of media and tourists has grown enormously during this time.

With possible recognition as a UNESCO Global Geopark, we pursue multiple goals: Intensifying already established high-level scientific work, education for sustainable development and sustainable regional development, worldwide perception and an even stronger identification of the local population with their unique geology and the cultural heritage so intertwined with it.

Supplement Nkrit 5:
The Geopark Ries was certified as a national geopark on 11 May 2006, and this validation was successfully renewed in 2011 and 2016. This attests to the exceptionally high quality of the National Geopark Ries and to its exemplary presentation in many respects.
2. Location
(Includes parts of Nkrit 1 – Geo-scientific importance, areas and cross-border geotopes)

Geographic regions
The National Geopark Ries encompasses the Nördlinger Ries with crater basin and rim as well as the neighboring areas of the Swabian and Franconian Alb where ejected materials are still preserved today. The largest portion of the total area lies in Bavaria, a smaller part of the Geopark is in Baden-Württemberg (see details in A3).

Geological coordinates: 49° 04’ 28.22’’ N, 10° 41’ 59.51’’ O

3. Surface area, physical and human geography characteristics
(Includes Nkrit 2 – Representation and Nkrit 4 – Size)

The Geopark Ries comprises parts of five districts with 53 cities and municipalities. Of these, 46 communities are in the Free State of Bavaria and seven in the federal state of Baden-Württemberg. The outer border of the Geopark coincides with the borders of the respective municipalities. The Geopark Ries extends over a surface area of 1,748.8 km², of which 17% is in Baden-Württemberg and 83% is in Bavaria.

The Nördlinger Ries, a flat, round, circa 150-meter deep depression of about 25-km in diameter (“Ries basin”), forms the border between the Franconian Alb in the east and the Swabian Alb in the west. The outer boundaries of the Geopark were determined by the maximum extension of the still preserved ejected masses of the Ries crater (geologically termed “Vorries”). These reach from the center of the Ries to a radial distance of almost 50 kilometers and extend irregularly over the outer rim. There are about 162,500 residents within the area of the National Geopark Ries. The population density is 93 residents per km².

Of the 44 communities of the District Donau-Ries, 33 lie inside the borders of the Geopark.
Overview of the education and training institutions and opportunities

The theme of education is an essential element of District politics. With the task force “Lernender Landkreis” ("Learning District") commenced the interconnection of all educational institutions and initiatives in the District. In 2013 the District was awarded the seal of quality from the Bavarian State Ministry for Education and Culture, Science and Art in the “Educational Region in Bavaria.” This award confirmed that it is possible to create structures to provide and secure integrated and customized educational and training opportunities. Currently a databased communal educational management system is being initiated on the basis of the Mission Statement 2025. (See excerpt of Mission Statement on page 46.)

In 2016 Nördlingen became an official site of the University of Augsburg, and thereby the region is a university location. Within the Geopark region there are six secondary schools, eight junior-secondary schools, two commercial secondary schools, 13 junior high schools, seven vocational schools, six special education schools and 42 primary schools, for a total of 84 schools.

The Geopark Ries is very serious about its role as a partner in education with schools. In order to introduce teachers to the Geopark with all its special features and offers to schools, the Geopark hosted a continuing education program for teachers with the theme, “The National Geopark Ries as an outside-the-classroom learning environment,” on 25 November 2015 in Reimlingen. More than 60 teachers from the Geopark region attended.

The “Lerntheke” is another example: In honor of the 10th anniversary of the National Geopark Ries in May 2016, interested schools in the Geopark region received, free of charge, a “Lerntheke” learning module. Each specially made case contains didactic learning materials in various fields relevant to the National Geopark Ries, so that the Geopark Ries fulfills, in an exemplary fashion, the criteria for Education for Sustainable Development. Each school can also access the interdisciplinary geo-science databank. The learning module was produced in collaboration with the Chair of Geographical Didactics, Institute of Geography, University of Augsburg. (See details in D2.)

Overview of the region’s economy

This region has one of the lowest unemployment rates in Germany (1.9% annual average). With the increase in overnight stays and day visitors through tourism, many additional new jobs are created and existing part-time jobs expanded. DWIF (tourism business institute of the University of Munich) calculates the workplace equivalent to be 2,950 jobs. The image of this uncommon region and its extensive leisure-time facilities play an ever more important role in the (partly international) search for skilled personnel. The economy recognizes the Geopark Ries as a unique selling point of the region.

The Geopark played a central role in the framework of the brand development of DONAURIES, as evident in the slogan (Glückstreffer= Lucky Strike) and logo. The Geopark Ries is integrated as a premium partner in the brand DONAURIES.

The economic region DONAURIES regularly scores highly in regional rankings due to its low unemployment, good education situation and demographic development. Businesses in the region report a high level of satisfaction with the location due to the advantageous local economic climate, central location and good transportation infrastructure.

The District of Donau-Ries is an attractive location for the economy and therefore also for the employee. The number of jobs subject to social insurance contribution climbed above the 50,000 mark for the first time in September 2008. Seven years later, the end of September 2015, there were 60,000 registered, of which 48.2% were in production industries.

More than 16,000 people commute into the District daily, equivalent to over 27.9%. At the same time more than 12,500 employees leave the District every day to work elsewhere. All in all, there is a positive commuting balance of about 4,000 people – remarkable for a district with an overwhelmingly rural structure.
Production and service companies lead to an outstanding economic structure and a well balanced mix of trades and industries. For example, in the cluster of metalworking, Lessmann and SPN Schwaben Präzision are important companies. The spectrum of products ranges from precision parts to wire brushes. Donauwörth is the German center of Airbus Helicopters, the worldwide leading manufacturer of helicopters. With more than 7,000 employees, Airbus Helicopters is the largest employer in northern Swabia.

In the electronics branch, the firm HAMA is especially noteworthy as a specialist in accessories. The region is also home to many well-known printing operations, including APPL, C.H. Beck and Staudigl Druck, producing books, magazines, calendars, inserts and large-format products. Besides the large employment in commerce and health care, the financial sector is also well developed in the District. The credit institutions Sparkasse and Raiffeisenbank ensure decentralized service with over 100 branches.

Small and medium sized companies in the trades contribute to the diversity of the regional economy. The wide array of handicrafts businesses in the District of Donau-Ries strengthens this variety. The National Geopark Ries strives to work on the image, standing and active involvement of the stone quarry industry. (Refer to Expert Team 4 for details.)

4. Organization in charge and management structure

(With part of NKrit 3 – Overlap with other UNESCO sites, with Nkrit 11 – Personnel and facilities/infrastructure)

The Geopark Ries was founded on 29 March 2004 by unanimous resolution of the Donau-Ries District Council. Since 2017 the Geopark Ries is an association and therefore a separate legal entity. The 53 communities within the National Geopark Ries are eligible for membership, as are the five districts whose territories are adjacent to or part of the National Geopark Ries. The composition of the board of the registered association, with a total of ten members, represents the members of the various regions and subregions. The association is an in-house organization according to the public procurement regulations of the European Union. It will be aligned as necessary with the requirements and tasks of UNESCO as well as the new national guidelines.

The business office of the association is organizationally affiliated with the Administrative Department for District Development of the District of Donau-Ries. Management of the Geopark is organized on a continuing basis by full-time and technically qualified staff members. Professional support in various specialized areas is provided by five expert teams who function voluntarily or within the scope of their professional full-time commitments.

The five expert teams cover all relevant thematic areas of the Geopark Ries (see graphic “Management Structure”). The expert teams consist of a core of about 60 team members. The team members are experts in their respective fields (for example, geologists, representatives of nature protection authorities or museums) as well as associations (such as nature conservation societies) and institutions and organizations (for example, quarry enterprises) and interested individuals (such as hobby archeologists, plant specialists or nature preservation activists).

Furthermore, additional project groups are formed to implement individual measures. These consist of representatives of the expert teams and can be supplemented as needed by additional experts or other involved or interested individuals. This structure guarantees intensive participation, provides extensive possibilities for participation and has been proven very successful since the founding of the Geopark Ries.

The Administrative Department for District Development also has responsibility for the following: Tourism marketing, economic development, energy (cross-sectional task), education and training management, regional management. Consequently, decisions regarding areas important to the Geopark but also involving economic promotion or tourism can be made harmoniously and in a timely fashion.
Since the beginning, financing and human resources have been secure and independent of subsidies or subsidized projects (when possible, project related subsidies are requested, but these are neither existential nor indispensable). Strong partners are directly available to the Geopark Ries, due to its organizational integration and with regard to the SDG’s relevant thematic areas.

In turn, this high concentration of competence benefits the entire Geopark region. The application of integrative, cooperative and “bottom up” approaches, optimal use of synergies and working hand-in-hand have been practiced for many years now in the entire region.

Because the Geopark Ries was created through the Agenda-21 process, the worldwide sustainability goals are the basis for its development (see District Mission Statement, page 47).

Geopark management, with function and background of the named individuals:

**Association Chairman:** Stefan Rößle, Chief Administrative Officer, District of Donau-Ries, *Dipl. Verwaltungswirt*

**Managing Director/Expert Team 5:** Günther Zwerger: Director of the Administrative Department for District Development, Managing Director of the Ferienland Donau-Ries e. V., Tourism Manager, *Dipl. Verwaltungswirt*

**Deputy Director:** Heike Burkhardt: Energy Management Officer, Project Director of District Mission Statement Process, *Dipl. Biologin*

**Expert Team 1:** Gisela Pösges: Deputy Director of the Ries Crater Museum Nördlingen, *Dipl. Geologin*

**Expert Team 2:** Roland Scholz: Nature Conservation Authority, Donau-Ries District Office, *Dipl.ling.Landespflege*

**Expert Team 3:** Dr. Wilfried Sponsel: City Archivist, City of Nördlingen, Ph.D. History

**Expert Team 4:** Dr. Sabine Heuschkel, Laboratory Director, Märker Cement (largest quarry operation in the region), *Dipl. Geologin*

**External Scientific Consultants, permanent members Expert Team 1 (as an example):**

Prof. Dr. rer. nat. Richard Höfling, Dean of Studies in Geoscience; *Dipl.-Geol., GeoZentrum Nordbayern*, Friedrich-Alexander-University Erlangen-Nuremberg, responsible for establishing geoscientific information panels (geological mapping, texting, graphs) based on the newest scientific research, presentations of Geopark Ries at national and international conferences and training of Geopark Guides

Prof. Dr. rer. nat. Stefan Hözl, Director of the Ries Crater Museum, as a member of the Faculty of Geo-Sciences and the Department of Geo- and Environmental Sciences of the Ludwig Maximilian University of Munich.

**Geopark management work flow**

Broader contact to science and important multipliers within the Geopark area as well as to national and international experts is established through the respective team leader with the experts working on an honorary basis in these teams. Management invites the directors of the expert teams to exchange information on average twice a year. Projects are always carried out with the inclusion of all expert teams. In this way, each team is responsible for delivering the technical input from their area of expertise. Leaders of the expert teams impart information to the team members. The teams are arranged flexibly; the team leaders can involve the appropriate experts according to the needs of each project. In addition, about 100 representatives of various groups and associations, as well as engaged individuals, are so well established in the Geopark network that they can augment the teams as needed on a project basis.
Basic groundwork for the Geopark

Management organizes workshops on fundamental development work and important management topics, for example, updating plans or formulating building-stone sustainability. The administrative districts, cities and communities that are in the Geopark, but outside of the Administrative District of Donau-Ries, work in a network with the expert teams. The fundamental support for the Geopark Ries from all district chief executives and mayors to the application of the Geopark as a National Geopark was assured and obtained in writing. By means of the organization with management and expert teams and external consultants, project ideas, decision making and ultimately the entire development process are designed to be interdisciplinary and grounded in the basics. The fundamental expert preparation in one expert team ensures consensus building and coordination with other teams and management. The importance of involving commerce and industry is demonstrated by an expert team headed by a representative of the quarry industry. In close collaboration with this enterprise, geotopes could be designed to be experienced and enjoyed by local visitors as well as geo-tourists. This succeeds only by reconciling the different utilization concepts. In this way commerce and industry accept the Geopark, just as the extractive industry gains acceptance in the region. Communities with major facilities such as museums and castles are also involved in the related projects. Intensive support results, moreover, through the continuing cooperation with (scientific) organizations (details under D).

Supplement NKrit 11:

Employed by Geopark Ries:

<table>
<thead>
<tr>
<th>Employees</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
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<td>1</td>
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<td>1</td>
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<td>1</td>
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<td>Gap year volunteer (Sept – Aug)</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Part-time “mini” jobs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

For several years now recent high-school graduates have worked for us as volunteers in environmental projects for their “gap years.” Thereby it is our paramount priority to communicate an awareness of the sustainability of the Geopark. Practical application has proven that the young colleagues have each provided almost full-fledged employment performance. The current volunteer will work in tourism for the Ferienland Donau-Ries (Donau-Ries Tourist Region) upon completion of her education. In addition, because of its financial endowment, it is possible for the Geopark Ries to requisition competent specialists on short notice by means of contracts for work and labor. One example of this is the creation of an impact animation with specialized scientific supervision by impact researchers and the University of Aalen. Furthermore, employees of the district administration assist management with task fulfillment. Thus employees of the municipal maintenance and landscaping departments help to maintain our adventure.
geotopes. Working closely with our tourism association, Ferienland Donau-Ries e.V., results in synergies that have consequences for the employment situation. Thus the Geopark Ries has a presence at all trade shows; members of the Ferienland Donau-Ries staff undertake all logistical tasks. Ultimately, in the event of a successful application, we would strengthen our staffing as necessary.

**Project Buget:**

<table>
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<th>BUDGET</th>
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<th>Expenditure</th>
<th>Balance</th>
<th>Comments</th>
</tr>
</thead>
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<td>167,000</td>
<td>- 64,000</td>
<td>Geotope development, resources from previous years’ reserves</td>
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<td>176,200</td>
<td>192,000</td>
<td>- 16,000</td>
<td>Geotope development, resources from previous years’ reserves</td>
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<td>2013</td>
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<td>172,000</td>
<td>7,000</td>
<td>Geotope development, resources from previous years’ reserves</td>
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<tr>
<td>2014</td>
<td>128,000</td>
<td>152,000</td>
<td>- 24,000</td>
<td>Geotope development, resources from previous years’ reserves</td>
</tr>
<tr>
<td>2015</td>
<td>98,000</td>
<td>97,000</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>126,100</td>
<td>117,400</td>
<td>8,700</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>155,400</td>
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</table>

The budgetary requirements for the fulfillment of the obligations as a UGG are given; the District of Donau-Ries guarantees uninterrupted and sufficient financing for the Geopark Ries. In the years 2011 to 2015 our work and financing focused on the development of six “adventure” geotopes. A total of 360,000 € was invested here from 2011 to 2015. The development was carried out with financial assistance from EFRE-funds (EU subsidies for regional development). Annually, 90,000 € is spent for marketing, publicity, scientific preparation, education for sustainable development and so forth. In addition, we have used funds from other sectors, such as regional management and tourism promotion.

**Supplement Nkrit 3:**

There is no overlapping with other UNESCO sites. There are no UNESCO sites within the Geopark Ries itself. In Baden-Württemberg, however, the National Geopark Ries borders the UNESCO and National Geopark Swabian Alb. As described, all landscape features that are associated with the Ries impact are components of the National Geopark Ries. The Geopark Ries has exclusive rights to the Ries impact as a unique feature and selling point. In contrast, with its essentially larger area, the Geopark Swabian Alb has other geological focal points such as caves, etc.

**5. Application contact persons**

**National Geopark Ries**  
Pflegstraße 2  
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E-mail: guenther.zwerger@geopark-ries.de

**Heike Burkhardt (Associate Director)**  
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E-Mail: heike.burkhardt@geopark-ries.de
B – Geological Heritage

1. General geological description
(Includes part of Supplement NKrit 1 – Geo-scientific importance)

Geology and geomorphology

The Nördlinger Ries

With a crater diameter of about 25 km, the Nördlinger Ries represents one of the best preserved and most intensively researched meteorite craters on Earth. Worldwide there are about 190 known impact craters ranging in size from about 14 meters (Carancas Crater, Peru) up to 300 kilometers (Vredefort Dome, South Africa). The Nördlinger Ries belongs to the class of “complex” impact craters, with uplifts forming a ring in the crater (the inner ring = “primary crater”). As in very few cases on Earth, in the Nördlinger Ries most of the “continuous” blanket of ejected masses is preserved, especially in the southwest, south and east. This ejected material is referred to in geological terms as Bunte Breccia.

The landscape is characteristically undulating and hilly. The crater itself is a round, level depression, interrupted by hills of broken and loosened fragmental crystalline rocks or megablocks (“inner ring”). This “inner ring” is surrounded by a morphologically identifiable crater rim that rises above the level of the plain created by post-impact Ries-Lake sediments and a Pleistocene loess veneer – 150 meters in the southwest, south and east and just 30 to 50 meters in the northwest and north.

In the southwest, south, southeast and east the crater is pressed into Upper Jurassic (Malmian) limestone; in the northwest and north it is sunk into the sedimentary rock of the Middle Jurassic (Dogger), Early Jurassic (Liassic) and Late Triassic (Keuper) composed of limestone, marl, clay and sandstone lithologic sequences. As a consequence, the Ries is embedded in the Swabian-Franconian Cuesta Landscape.

Until 1960, the Nördlinger Ries was considered a volcanic explosion crater. It was recognized as an impact crater in 1960 through the discovery by Drs. Shoemaker and Chao of the high-pressure minerals coesite and later stishovite (high-pressure modifications of quartz). Together with the Steinheim Basin and the “moldavite” type of tektites found in Bohemia, Moravia, Lusatia and upper Austria, the Nördlinger Ries constitutes the most extraordinary geological phenomenon in Europe.*

According to recent research, this phenomenon came into being just about 15 million years ago (Miocene), quite probably due to the crash of a binary asteroid traveling with a speed of about 70,000 km/h (about 20 km/sec) on a sloped (35-45°) trajectory. The binary asteroid consisted of two bodies of about 1,200 meters and 120 meters in diameter that rotated around a common center of gravity.
The smaller object created the Steinheim Basin, the larger one the Nördlinger Ries. Immediately before the impact of the Ries asteroid, through vaporization and melting of the topmost layer of Tertiary sand and clay (Upper Freshwater Molasse), small melted shreds (tektites) were hurled in a high-speed stream up to 450 km away to today's Silesia (Poland) and Bohemia, Moravia and Lusatia (Czech Republic) (moldavite strewn field).

Originally the impact in the Ries created a primary crater with a diameter of about 11 km, a depth of more than 4 km (transient crater floor, today a central ring of uplifts) subsequently modified by a crater floor uplift and a marginal collapse zone (now "megablock zone") which enlarged the crater to the about 25-km final ("secondary") diameter. Geophysical research shows that the impact shattered the rock layers to a depth of about 4.5 km and displaced and partially ejected rocks from a depth of circa 2 km.

Material with different lithologies encompasses the following stratigraphic units: Late Jurassic (Malmian), Middle Jurassic (Dogger), Lower Jurassic (Liassic), Upper Triassic (Keuper), Permian (Rotliegend) and Variscan crystalline basement with mainly gneisses, granites and amphibolites. The rock types modified or created by the impact itself comprise different formations of the continuous ejecta blanket ("proximal ejecta masses") that are accessible in surface exposures:

1. **Megablocks** *(Schollen)* of displaced Mesozoic and Variscan crystalline rocks range in size from 10 to 1,000 meters.
2. **Bunte Breccia**, a polymict breccia with rock and mineral fragments of all stratigraphic units with a remarkable preponderance of sedimentary rocks, comprises the continuous ejecta blanket of the crater.
3. **Polymict crystalline breccias** consist of rock and mineral fragments of the crystalline basement.
4. **Suevite (impact breccia)**, composed of rock and mineral fragments with "glass bombs" of crystalline basement melt with a small portion of sedimentary fragments, was deposited over the crater by the ejecta plume, a hot, glowing cloud.
5. **Impact-melt breccia** refers to rock and mineral fragments embedded in the melt matrix.
6. **Dike breccia**, consisting predominantly of rock and mineral fragments of the crystalline basement, discordantly penetrates surrounding rock and are found in displaced megablocks as well as in the crater bedrock explored during the research drilling "Nördlingen 1973."
7. **Monomict breccia**, composed of in-situ brecciated rock, occurs in the entire (crystalline) crater basement as well as in displaced megablocks.

Formations 6 and 7 are predominantly limited to the crater basement but are exceptionally well documented in the research drilling "Nördlingen 1973." Core samples from the entire 1,206-meter-deep drill hole are accessible to visitors in the Zentrum für Ries- und Impaktforschung Nördlingen (ZERIN) (Center for Ries and Impact Research Nördlingen).

*Suevite on Bunte Breccia in the Aumühle quarry.*

*Summary publications:*
Discontinuous ejected materials ("distal ejecta masses") can be found beyond the continuous ejecta blanket, outside the actual Geopark, up to 450 km away:

1. The so-called "Reuter blocks" and "Brockhorizonte" are displaced Late Jurassic limestone boulders found at distances from the Ries Crater of 70 km (Reuter blocks), up to 200 km (Brockhorizonte) near St. Gallen in sequences of the Upper Fresh Water Molasse in front of the Western Alps. The limestone detritus there is fractured into small pieces up to a cubic centimeter in size.

2. Moldavites are small, green colored, aerodynamically shaped glass bodies from 1 to 5 cm in diameter. They are found in strewn fields at a distance of 250-450 km from the Ries in Bohemia, Moravia, Lusatia and Silesia, Poland.

3. Fluvially relocated ejecta masses derived from Suevite and Bunte Breccia (see above) were deposited by rivers and afterwards eroded and transported in a distance of more than 150 km. Such fluvially reworked sandy ejecta masses are found in Miocene Molasse valleys ("Graupensandrine") (southern Ries) and in the "Monheim Höhensande" (eastern Ries).

Features in rock and mineral fragments of allochthonous polymict breccia and Suevite led to the defined "progressive shock wave" phenomenon, comprehensively researched and interpreted worldwide for the very first in the Nördlinger Ries (Stöffler 1965). It involves specific deformation and transformation phenomena in rocks altered by extremely high temperatures and pressure that lie far above the pressures appearing in the Earth's crust or upper mantle: ca. 10 to 100 GPa (100,000 to 1 million atmospheres). The entire range of effects of shock-wave metamorphism is only represented in the Suevite and highly shock-affected crystalline rocks. The Nördlinger Ries is one of the most outstanding type localities for shock-wave-induced deformations and mineral modifications*, the most important of which are:

1. Planar deformation features (pdf) in the minerals quartz, feldspar, pyroxene, amphibole.
2. Mechanical twinning and kink bands in pyroxene, amphibole and mica.
3. Dialectic glasses ("amorphous crystals" produced without fusion) of quartz and feldspar.
4. High-pressure minerals of quartz (coesite and stishovite), feldspar (hollandite structure), zircon (reidite), graphite (choaite, diamond).
5. Shatter cones (in crystalline and sedimentary rocks). A large number of high-pressure phases -- more than in other impact craters -- are found from the Ries Crater: coesite, stishovite, jadeite, majorite, diamond, choaite, silicon carbide, TiO₂, with an alpha PbPO₂ structure, ahaogiti, reidite and kyanite.

In Central Europe characteristic mechanical deformation features and mineralogical peculiarities such as coesite, stishovite (both SiO₂), choaite ("white carbon"), reidite (ZrSiO₄), and lonsdaleite (hexagonal diamond) are only known from the Ries crater area; some of them were first discovered and described from this locality. They are key features for impact structures in general and therefore highly important for the Ries crater to verify its impact origin. Some of them were also detected in other terrestrial impact structures (e.g., USA, South Africa) and even in lunar rock samples. However, meanwhile only coesite has also been proven from ultra-high pressure metamorphic rocks from the Western Alps and Norway as well as from kimberlite xenoliths. The high velocity deposition of Bunte Breccia as ballistically (and under confining pressure as well) moving ejecta caused a high energetic lateral flow, which has three significant effects on the ground zero rocks: abrasion of hard rocks and formation of polished surfaces with striae, horizontal displacements of near-surface layers, mixing of the ballistically landing ejecta with local target rocks by a roll-and-glide movement. Because of this process, the proportion of locally derived rock material in the Bunte Breccia increases distinctly with radial distance and reaches more than 90% in the outer zones of the continuous ejecta blanket, whereas the proportion of crater ejecta decreases. The Ries is the only terrestrial impact crater where this effect, which has fundamental implications for heavily cratered surfaces could be observed. These have been studied quantitatively by a set of NASA-funded shallow drillings (Hörz et al., 1983, Fig.3.28*).

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2. Listing and description of geological sites within the Geopark
(Including part of NKrit 1 – Geo-scientific importance.)

The Geopark Ries currently encompasses 175 geotopes.

This registration succeeded through:
- Baden-Württemberg Office for Raw Materials and Mining: Official state geotope cadaster.
- Geopark Ries: Registration assignment Pösges/Barfeld as well as fieldwork.

Based on this comprehensive registration, in 2010 the Geopark Ries ordered an expert opinion regarding geotope development to be generated. The goal was to identify the 25 suitable geotopes from this entire pool after a comprehensive assessment.

Plans for the geotope development were derived from this opinion. In the first step, the Geopark selected ten geotopes from the 25. From 2011 to 2014 with EFRE financial assistance, these ten geotopes were developed into the adventure geotopes, with nature trails and a total of 41 information panels, summarized here:

<table>
<thead>
<tr>
<th>Geotope</th>
<th>Integrated Geotope</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adventure-Geotope Lindle, Nördlingen-Holheim</td>
<td>Lindle quarry near Holheim</td>
<td>City of Nördlingen</td>
</tr>
<tr>
<td>Geotope Kalvarienberg, Huisheim-Gosheim</td>
<td>Quarry Kalvarienberg</td>
<td>Municipality Huisheim-Gosheim</td>
</tr>
<tr>
<td>Geotope Klosterberg, Maihingen</td>
<td>3 Outcrops: Kloster- and Langenmühle near Maihingen and exposure Hahnberg (Ries-Lake limestone)</td>
<td>Municipality Maihingen</td>
</tr>
<tr>
<td>Geotope Glaubenberg, Harburg-Großsorheim</td>
<td>Quarry Glaubenberg near Großsorheim</td>
<td>Town of Harburg</td>
</tr>
<tr>
<td>Geotope Kühstein, Mönchsdeggingen</td>
<td>2 Outcrops on Kühstein in Mönchsdeggingen</td>
<td>Municipality Mönchsdeggingen, Community Association Mönchsdeggingen</td>
</tr>
<tr>
<td>Geotope Kalvarienberg, Donauwörth-Wörnitzstein</td>
<td>Quarry Sendenberg and Kapellen-cliff Wörnitzstein</td>
<td>District Town of Donauwörth Locality of Wörnitzstein</td>
</tr>
</tbody>
</table>

In the course of geotope development, all locations were newly studied and mapped in detail by the external consultant, Dr. Richard Höfling, and his working group (GeoCenter, University Erlangen-Nuremberg) on the scale of 1:5,000, and some geotopes were included in final scientific theses written on the subject, supervised by Dr. Richard Höfling. Two additional geotopes were integrated into thematic hiking trails with information panels: the outcrop on Wennenberg in the “7-Hills Trail” and the Suevite exposure at Doosweiher near Wemding in the “Saga Trail.”
Excerpt from expert opinion on geotope selection by environmental engineering firm HPC AG:
(Existing text not included here is indicated by “….”)
2. Content of the conception

2.1 Development focal points

Development focal points for the Ries geotopes are:

- Highlight opportunities to observe natural history: Geology, geomorphology, paleontology, ecology, flora, fauna, astronomy,
- Create visual focal points: Insight into inner Earth and outlook in the surrounding landscape,
- Point out references: Settlement history from the prehistoric and protohistoric ages up to modern times, history, culture and utilization: Quarries, building materials, historic monuments, archaeological monuments,
- Propose destinations: Recreation connected with nature, hiking and relaxing, playing and experiencing (playgrounds, seating, picnic areas), education (nature trails, info-panels, guided tours), reflection (convents and monasteries, churches, chapels), etc.

The following thematic areas can be observed in detail (list is not exhaustive):

A) Rocks – Witnesses to the history of the Earth
Effects of the Ries impact, shock-wave metamorphism, brecciation, deformation and depositing, parautochthonous and allochthonous Schollen, Suevite, melt products Fläde, Bunte detritus, tectonics, transport mechanisms,...
Formation of types of rock, formation of facies, fossils, stratigraphy, forms of erosion, mineral paragenesis,...

B) Landscape formation – Topography in flux
Sedimentation, relief reversal, erosion, karst formation, old river systems, cliff line OMM,...
Meteorite, dislocation, tectonics, deposition, tilting, etching of buttes, equalization of old landscape forms through Bunte Breccia,...
Forms of land use, landscape images, effects of settlement and agriculture,...

C) Quarry – Stone as a building material
Cultural-historical significance, historical utilization, quarry operations undergoing change, excavation and re-cultivation, misguided development,...
Building materials, type of production and use, construction works,...

D) Rocks – Soil formation
Initial soil development: Cliff, talus, virgin soil, topsoil,...
Creation of types of soil,...

E) Ecology and habitat
Succession and dynamism: Vegetation sequences, ruderal locations,...
Extreme range of stands: Hot dry grassland locations and cool damp biotopes: Diversity of vegetation with broad spectrum of species,...
Protection of species: Refuges, stepping-stone biotopes and secondhand surrogate habitat for rare types of plants and animals,...

2.3 Work stages of concept preparation

2.3.1 Selection criteria for the geotope concept

This is the result of research of well-known and less well-known exposures of Ries geology in the Geopark Ries (District of Donau-Ries) with special observational possibilities according to the following criteria:

Visibly interesting Ries geology:
Rocks: Granite, crystalline breccia, Suevite, Jura (parautochthonous, allochthonous), Ries-Lake sediments,...
Processes: Transport- and ejection mechanisms, tilted stratification layers, deposits, fracturing, bleaching, brecciation, striated surfaces,...
Specific characteristic / special position / exclusivity / special suitability for accentuation,...

Areal dispersal of geotopes in the Geopark:
Distribution of themes / observation opportunities,...
Spreading the locations among types of landscapes: Ries basin, inner crater rim, crater rim, outer crater zone, autochthonous ranges,...

Accessibility / development possibility:
Ownership relationship, feasibility,...
Development: Parking, open access, low utilization conflict,...
Development potential of the geotope:
Loop trail, site for rock chipping, site for search for fossils,...
Thematic extensions in the surrounding area,
Location on existing route, e.g. infrastructure facilities

2.3.2 Selection of preliminary objects
The Geopark’s top management decided to initially investigate the generally more familiar and meaningful (for the Ries) geotopes (for example, the “Lindle” quarry near Holheim, the Gosheim quarry, Wennenberg near Alerheim, the exposures near the Kloster- and Langenmühle near Maihingen). Later this list was extended in the course of examining possible suitable geotopes by HPC. For this the exposures named in the excursion guidebook from Schmidt-Taler were subject to investigation regarding their development potential. In the process, it turned out that a range of geotopes were deemed not suitable for development due to the low potential, unfavorable development, adverse location or because of ownership relationships.

Suitable geotopes, according to the expert opinion

<table>
<thead>
<tr>
<th>Formation</th>
<th>Type of exposure / Location</th>
<th>Nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suevite</td>
<td>Exposure at Doosweihner north of Wemding</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Quarry Bollstadt</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Quarry Amerdingen and Seelbronn</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Quarry Polsingen</td>
<td></td>
</tr>
<tr>
<td>Crystalline</td>
<td>Exposure Kloster- and Langenmühle bei Maihingen</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Exposure on Wennenberg near Alerheim</td>
<td>3</td>
</tr>
<tr>
<td>White Jura</td>
<td>Quarry on Gläubenberg near Großsorheim</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Quarry „Lindle“ near Holheim</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Quarry on Kalvarienberg near Gosheim</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Quarry by Oppertshofen</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Exposure on Kühstein in Mönchsdegingen</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Exposure by Unterappenberg</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Quarry Sendenberg and Kapellen cliff Wörnitzstein</td>
<td>12</td>
</tr>
</tbody>
</table>

3. Details on the interest of these sites in terms of their international, national, regional or local value
(With part of NKrit 1 – Geo-scientific importance and NKrit 2 – Representations)

For a long time in the scientific history of geology, the geological phenomena of the Nördlinger Ries and Steinheim Basin were considered the “Sphinx of European geology.” Their exploration is a textbook example of the development and modification of theories in geo-sciences in general and specifically of the development of theories from empirical observation. Therefore, the Ries represents a unique geological legacy in Germany and in Europe. Moreover, the Ries is of global importance for the development of “new” catastrophe doctrines in the geo-sciences and of planetology in the course of the investigation of the planetary system through space probes. The Ries played a prominent important role in the “second great paradigm shift” in the geo-sciences, that Engelhardt named the Copernican Revolution in the geo-sciences (“Von der Sphinx der Geologie zum Kronzeugen der Planetologie” = “From the Sphinx of Geology to the Star Witness of Planetology”). The Ries Crater is considered the “star witness” in the relevance of collisions in earth-moon systems.

The Ries was of critical importance to NASA’s Apollo-program exploration of the Moon and for the interpretation of lunar rock as impactite. The Ries Crater Museum’s exhibit of a large sample of lunar breccia (collected by Apollo 16) is unique in Germany. For good reasons, NASA conducted geological field training for the Apollo 14 and 17 astronaut teams in the Nördlinger Ries and Steinheim Basin in 1970.

The Ries Crater with the Steinheim Basin is one of the very few double-impact craters of the Earth (worldwide very rare). The Ries is a complex crater with an inner ring and very well preserved ejecta blanket.
Special features of the Ries event include:

- Large deposits of Suevite and Bunte Breccia,
- Type locality for Suevite and Bunte Breccia,
- Type locality for progressive shock-wave metamorphism (1965),
- Excellent exploration of the deeper crater area resulted from research drilling: 14 deep boreholes. With a final depth of 1,206 meters, the research drilling in Nördlingen was the deepest drilling to date. In addition, NASA carried out numerous drilling in the southwestern crater foreland (no impact crater on Earth has more drillings in the crater area and periphery),
- Shatter-cone finds in area of crater center (FBN73), inner ring, megablock zone as well as in the distal and proximal ejecta blanket, numerous publications, e.g., the most recent: “First description of genuine shatter cones in Upper Jurassic limestone clasts from the Bunte Breccia impactites of the Ries Crater,” Pösges, G., 79th Annual Meeting of the Meteoritical Society (2016),
- Unique green tektite (so-called moldavite) as ejecta material of the Ries event found in Silesia, Bohemia, Moravia, Lusatia and upper Austria,
- Comparative crater for Moon and Mars impact crater studies (numerous publications) as well as for impact craters on asteroids and comets, therefore visits by the ESA Comet Mission Rosetta to Comets 67/P Tschurjumov-Gerassimenko and the science teams of the NASA DAWN Mission to asteroid Vesta and planetoid Ceres,
- Ries Crater Museum: Special museum at the highest European level, concerned mainly with the creation of the Ries Crater but also with impact events worldwide; celebrated 25th anniversary in 2015.

Publications (relating to comparative craters on Moon and Mars):


The scientific importance of the Ries is documented by the naming of asteroids “Ries” and “Nördlingen” and “ZERIN” (Zentrum für Rieskrater- und Impaktforschung Nördlingen, affiliated with the Ries Crater Museum) by the International Astronomic Union. In addition, asteroids are named after renowned Ries researchers and also after deserving personalities, including: Prof. Wolf von Engelhardt (important Ries researcher), Prof. Dieter Stöffler (important Ries researcher), Dr. W.-D. Kavasch (founder, Ries Crater Museum), Paul Kling (former mayor of Nördlingen), Walter Barsig (former Chairman of the Rieser Kulturtage), Dr. Wolfgang Märker (sponsor of Ries research and former head of Märker-Zement, Harburg).

In 2006 the Akademie für Geowissenschaften in Hannover e. V. (Academy for Geo-Sciences) honored the Meteorite Crater Nördlinger Ries as one of the 77 most important geotopes in Germany.

Comparison of UNESCO Global Geoparks – UNESCO World Heritage Sites:

There is no other UGG with the unique special feature of an impact crater. The Ries Crater’s twin, the Steinheim Basin, is a structure on the border inside the UGG area of the Swabian Alb. Comparing Steinheim’s 3.4-km diameter to the Ries Crater’s 25 km and considering the fact that the impact body was a satellite of the Ries impactor, the Steinheim Basin is minor by comparison. The Geopark Ries and the Geopark Swabian Alb have signed a cooperative agreement. So far, one impact crater is a world natural heritage site: The Vredefort Dome in South Africa is the largest (ca. 300 km) and oldest (2.02 billion years) impact crater on Earth. It is notable for the deeply eroded multi-ring structure and large occurrence of pseudotachylite and shatter cones.
Supplement NKrit 2:
List of representative geological heritage sites:

1. Albuch: parautochthonous megablocks of crystalline material, Dogger and Malm.
2. Aumühle: unique outcrop displaying the two most important rocks of the Ries Crater – Suevite and Bunte Breccia.
3. Altenbürg: Suevite in the megablock zone.
5. Burgmagerbein: autochthonous Malm-limestone with Middle Miocene cliff line overlain by Bunte Breccia detritus.
13. Märker Quarry near Harburg, Bschor Quarry near Ronheim: Bunte Breccia on top of Malm-limestone.
14. Ipf: autochthonous rock (Malm and Dogger)
18. Limberg or Lehberg near Unterwifflingen: megablock with gneiss und granite plus dikelets of Suevite over lain by Bunte Breccia.
19. Marienhöhe (Hexenfelsen, Adlersberg), Wennenberg: inner ring hills (crystalline basement) encrusted with Ries-Lake carbonates.
20. Megesheim: delta deposits of Ries Lake (detritus, consisting chiefly of crystalline and only very rarely of Malm-limestone)
25. Riegelberg (Fuchsloch): megablock of Malm-limestone.
26. Rollenberg, Hexenküche am Kaufertsberg, Hansels Hohl near Thalheim, Hohenstein near Ederheim, Ofnethöhlen by Holheim, Hüllenloch by Harburg: Malm-limestone megablocks with important archeological finds.
27. Siegling Quarry near Holheim: Bunte Breccia on brecciated Malm-limestone.
29. Seelbronn: roadside exposure with Suevite and well preserved glass enclaves.
30. Landscape between Thalheim and Untermagerbein: allochthonous Malm-limestone blocks.
31. Wallerstein Cliff: Ries-Lake limestones, especially travertines and different stromatolites, geomorphological overlook Ries Crater.
32. Wengenhausen: megablock of crystalline basement rocks and occurrence of shatter cones with Ries-Lake limestones on top.
Representation in select literature with key words:
To 2. Aumühle: Former quarry displaying the two most important rocks of the Ries Crater – Suevite and Bunte Breccia. Literature: See under 17.

Literature on Ries-Lake sediment outcrops:

To 17. Unterwilflingen: Crystalline megablock with well exposed dikelet of Suevite.

Literature Aumühle, Altenbürg und Untervilflingen:

To 27. Seelbronn: Suevite quarry. Literature on Seelbronn:
- To 29. Wallersteiner Cliffs: Ries-Lake limestone cliff (part of the inner crystalline ring).
- To 30. Wengerhausen: Crystalline megablock with occurrence of shatter cones. Literature on Wengerhausen:
- Workshop on Meteorites from hot and cold deserts, LPI Technical Report, Number 95-02 LPI/TR-95-02.

Additional literature:

Literature on Ries Foreland:
- Bayerisches Landesamt für Umweltschutz (Bavarian Office of the Environment), Bavaria’s 100 most beautiful Geotopes, series of flyers, includes 2, 6, 26, 32.
4. Listing and description of other sites of natural, cultural and intangible heritage interest and how they relate to the geological sites and how they are integrated into the Geopark

Fundamental integration in Geopark management:
In order to achieve a balance between Geopark development and the protection of special natural features, Expert Team 2 is integrated in Geopark management – along with the full-time and volunteer nature conservancy proponents. Since the leader of Expert Team 2 also works for the nature conservancy authority of the District Office of Donau-Ries, the best and closest possible relationship exists between the two areas.

Relationship Geopark – Heide-Allianz
The Heide Allianz (Heath Alliance landscape preservation association) is a relatively new, large-scale project with financing on a sustained basis. Without a doubt, the Heide Allianz was brought to fruition only because the National Geopark Ries already exists. There is close cooperation between the Geopark and the Heide Allianz, including a partnership formalized in 2015. The director of the Heide Allianz works in the underground engineering department of the District of Donau-Ries, and the Geopark is represented in the uppermost decision-making body.

Project areas
The Life+Nature Project “Heide Allianz” comprises sections of seven Natura 2000 areas between Nördlingen and Donauwörth. These are the most ecologically valuable and specialized nature conservancy areas of the southern Nördlingen Ries, adjoining the Swabian-Franconian Alb and the Wörnitz valley between Heroldingen and Donauwörth. In total the project territory encompasses an area of 3,554 ha.
Stakeholders and project implementation: District of Donau-Ries, Rieser Naturschutzverein e.V. (Ries Nature Protection Association) and the Schutzgemeinschaft Wemdinger Ried e.V. (Wemding Marsh Protection Association), BUND Naturschutz in Bayern e.V. (BUND Nature Protection in Bavaria).
Project executing organization: Bayerische Staatsministerium für Umwelt und Verbraucherschutz (BayStMUV) (Bavarian State Ministry for Environment and Consumer Protection).
Financing: Total package: 2,508,469 €. European Union subsidies: 50%.
Co-financing: Bavarian Nature Protection Funds.

Involvement of volunteer nature protection associations
Besides the full-time specialized staff and the nature protection guardians of the district offices, many volunteer organizations are also active in the area of nature protection. In addition to BUND, BN and LBV, two local organizations have been established in the Ries, namely the Rieser Naturschutzverein e.V. (Ries Nature Protection Association) and the Schutzgemeinschaft Wemdinger Ried e.V. (Wemding Marsh Protection Association). Representatives of both of these organizations are members of Expert Team 2.

Basic observations regarding natural heritage in the Geopark Ries

Biotope environments
The varied and agriculturally used countryside exhibits a biotope diversity that is above-average in both richness of structures and distinctiveness of features. Due to the high biotope quality in combination with the topography and utilization, a meaningful abundance of biodiversity developed and was preserved. The Arge Flora Nordschwaben (Consortium Flora Northern Swabia) verified about 1000 different plant species in the Harburg area alone in the past few years.
Numerous wild plants indicate special geological conditions. Some geo-botanical examples are: Alpine Clover (Trifolium alpinum) and Early Forget-me-not (Myosotis ramossissima) in silicate in the Suevite quarry “Alte Bürg,” Strict Forget-me-not (Myosotis stricta) in silicate on the Riegelberg hill, Adonis Rose (Adonis flammea) in limestone on the hill near Kirchheim am Ries, Poorman’s Weatherglass (Lysimachia foemina) in limestone on the “Käsbühl” in Oberdorf.

Soil and Agriculture
The soils of the Ries plain are mainly characterized by loess deposits in the west, sandy soils in the east and clayey soils in the north. Therefore, in the past, the Ries basin – because of its good conditions and lack of forests – was considered a so-called breadbasket.
The juniper heaths on the edge of the Ries, above all in the south and east as well as in the Swabian Alb and on the Härtsfeld, are characterized by traditional nomadic sheepherding. Supported by the District of Donau-Ries, the best and closest possible relationship exists between the two areas.
Ries, the Heide-Allianz actively campaigns for the preservation of this juniper heath which is so very germane to the geomorphology of the Geopark. All in all, the economic importance of agriculture is earmarked by a very high gross value and a comparatively high share of gainful employment in agriculture and forestry.

Forest
The 50,000 hectares of forest represents 27% of the surface area of the Geopark. The dispersion of the forests in the landscape and the current composition of tree species are the result of thousands of years of man’s continuous cultivation activity. In the Ries Crater basin favorable locations and climates led to intensive agricultural utilization, reducing the forest into a few islands of trees. Clearly offset from the Ries basin are the heights of the Ries rim, almost completely covered by forest. On the tablelands of the Alb, the natural scenery is imprinted by the variation of widespread forests, agricultural fields and settlement areas.

In the course of reforestation following the Ice Ages, beech established itself as the most highly competitive tree species. That prevailed in the majority of forest locations. In the decalcified loess-loam of the White Jurassic table, the clay-marl substrata of the ejected masses, in part overlaid by Pleistocene silt loam, as well as on the sandy substrata of Keuper and the deposits of the Urmain, beech forests are the predominant forest community, aside from a few exceptions. Its function as a habitat for a multitude of plants and animals is underscored by the designation of Natura 2000 regions over a wide area. Especially the still widely distributed beech forests, with their rich inventory of species, represent a habitat worthy of preservation and of worldwide importance. Thus with the Unterliezheim forest as well as the woods around Kaisheim, large-scale beech forests with over 5,000 hectares have been included in the European network Natura 2000.

As a large, natural, terrestrial ecosystem, the forest furthermore provides a place for recreation and adventure to a wide population. For that purpose, there are 1,500 kilometers of forest roads in the National Geopark available to those seeking recreational and close-to-nature experiences.

Relationship between Geopark and cultural and intangible heritage

Integration in Geopark management:
The full-time director of the Nördlingen City Archives is the leader of Expert Team 3. He is also a member of the “Castles and Museums” working group of the Ferienland Donau-Ries and chairman of the Rieser Kulturtage, a bi-annual month-long series of cultural events, for which the leader of Expert Team 1 leads the “Geology” working group. These levels of involvement assure optimal integration and synergy. A prime example of this success is the hiking trail “Swedes’ Way” – a joint project of the Geopark Ries with the towns of Bopfingen and Nördlingen, represented by their city archivists.

Examples of additional relationships:
The theme “culture” is anchored in the Administrative Department for District Development, whose manager is also the director of the Geopark, assuring an optimal relationship. Both the branding and mission statement processes benefited from important impulses from the Geopark and its work of the last ten years. The brand logo as well as the slogan and nucleus clearly show traces of the Geopark, as does the District mission statement. The KunstMuseum (Art Museum) Donau-Ries offers courses in the artistic interpretation of the themes of the Geopark Ries. Artist Annette Steinacker-Holst leads the courses, in cooperation with a geographer who gives children a better understanding of the Geopark through a tour complete with informational panels right in the museum itself.

Fundamental considerations regarding the cultural and intangible heritage in the Geopark Ries

Cultural heritage
Seldom is a landscape – in the past as in the present – so frequently and extensively the subject of scientific examination and literary description as the Ries. This is certainly not surprising, because among south German landscapes the Ries is distinguished precisely by its manageable size, unique closeness and unsurpassed characteristics.

The special and perpetual significance of the Ries in historiography and to other authors is mirrored in the many songs of praise that have celebrated this landscape. One example is provided by Georg Monninger, the Nördlingen city chronicler, who in the year 1893 wrote: “One of the most peculiar areas of Swabia is the Ries. A ring of magnificent heights, the connecting elements of the Swabian and Franconian Jura, encloses a great
number of beautiful, often ancient and historically memorable sights; monasteries and castles, towns and villages are strewn throughout an area that can be embraced in just 18 hours, one of the most blessed districts of the German homeland."

The multitude of historic buildings, structures and archeological monuments in the area of the Geopark Ries make it impossible to name them all. In Nördlingen alone there are over 480 historic buildings. The towns of Donauwörth, Monheim, Oettingen, Wemding and Harburg also have numerous buildings and structures of historic importance. These and many more are well documented in the series of volumes Band B.-P. Schaul, Denkmäler in Bayern, Schwaben, München 1986. Archeological monuments are also indicated, organized by location.

Today we know that the special structure of the Ries Crater formed the foundation for the development of a self-contained cultural area – but one that always engaged in active exchange with its surroundings. Geology and morphology constitute the basis for the accouterments of this cultural area. Suevite, created by the meteorite impact, was a preferred building material in the construction of numerous buildings, of which St. George’s Church in Nördlingen is an especially prominent and noteworthy example. The structural-spatial outline of the landscape with its frame of heights, cave systems, the Ries plain with its broad network of rivers, offered ideal conditions for settlement and the prerequisites for the development of a unique cultural area.

It is no coincidence that evidence of all levels of human civilization, from the Old Stone Age up to the eras of Celts and Romans, is found in the Geopark Ries. And it is definitely not without reason that especially the Ries is referred to as “the treasure chamber of prehistoric and protohistoric archeology.” The finds of 6,000-year-old skulls in the Ofnet caves and the human and animal portrayals in the Hohlenstein cave are of international significance. The Goldberg and especially the Ipf, the residence of a Celtic prince, are among the most impressive prehistoric fortifications in southern Germany.

Of the numerous Roman finds, besides the well-researched Kastellen Losodica (Munningen) and Opie (Oberdorf), the villa rustica near Holheim is noteworthy. The foundations of this Roman countryside estate have been almost completely excavated and restored, creating a sort of open-air museum.

Viewed from the perspective of the Middle Ages, the Ries can be considered a “land of fortresses and castles.” The many fortified hilltops and castle ruins, together with still preserved fortresses and castles, bear witness to a rarely-seen enormous abundance of former princely sites. Outstanding examples include the Oettingen Castle and the imposing Harburg, one of the oldest and largest fortified castle complexes in Southern Germany. Today these historic settings host top-class cultural events, such as “castle concerts” in Oettingen and Leitheim, famous well beyond the region.

Besides fortresses and castles, churches and monasteries – some of them reaching back to the Romanesque – adorn the landscape of the Geopark Ries. These include the former Benedictine monasteries at Auhausen and Mönchsdeggingen, the oldest in the Ries, as well as the former Cistercian convents Kirchheim and Zimmern, the Carthusian monastery Christgarten and the former town monasteries and convents in Nördlingen and Wemding. Art historians designate Nördlingen’s St. George’s Church as a building of European wide significance, as is the Neresheim abbey church, a later work of Balthasar Neumann.

So richly blessed with churches and monasteries, the landscape is also enhanced by numerous witnesses to its Jewish past in the form of cemeteries, former synagogues and other historic monuments, for example, the Jewish ritual bath building in Mönchsdeggingen. Completely restored 20 years ago, the former synagogue in Hainsfarth is today a cultural focal point.

Just as a range of sites remind us of the Jewish past of the Ries, there are also many sites with meaningful artworks. One example is found in the Hochaltingen church – the funerary monument for Eberhard von Hürnheim and his wife, from the year 1525, one of the most important Renaissance artworks north of the Alps. The altar by Friedrich Herlin, now in the Nördlingen City Museum and the Marienaltar by Hans Schäufelin, the Nördlingen city painter, in the monastery church in Auhausen are also of special significance.

Important pillars and patrons for cultural life were – and are – besides the former Free Imperial Cities of Donauwörth (until 1608), Nördlingen and Bopfingen and also the Residence Towns like Wemding (Bavarian since 1467), Oettingen and romantic Harburg on the Wörnitz. Nördlingen is considered a model of a medieval city. Here in the towns, but also in the countryside, a multitude of museums displays the rich cultural life of the region in many different ways. One of the outstanding institutions is the Ries Crater Museum, welcoming over one million visitors since its founding 1990. Among the many noteworthy city- and local-history museums, the
Nördlingen City Museum has a rich collection and is one of the oldest museums in Bavaria. The Museum KulturLand Ries in Maihingen is the most recently updated museum. The KunstMuseum Donau-Ries and the Käthe-Kruse Museum in Donauwörth have also developed into centers of attraction. The Nördlingen Railway Museum (Eisenbahnmuseum) thrills lovers of historic railroads and casual visitors alike.

Intangible heritage
The intangible heritage of the Geopark is illustrated by many, many examples: The umpteen historical festivals include the Schwäbischer Kindertag (children’s festival since the mid-17th century) in Donauwörth, the Hopfingen Rutenfest and the Nördlingen Stabenfest (children’s festival taking place for more than 600 years). Other traditional events with a long history are – alone in Nördlingen – the Pfingstmesse (annual market) since 1219 and the Scharlachrennen (horse races) since 1438. The historic City Wall Festival in Nördlingen is a special highlight. And open-air theaters in Donauwörth and Nördlingen now attract thousands of visitors.

A "cultural concentration" occurs every two years when the Rieser Kulturtage (Ries Culture Days) take place, presenting more than 150 events and performances within four weeks. This umbrella event was initiated by Economic Minister Anton Jaumann and first held in 1976. The Rieser Kulturtage embraces a wide range of cultural topics, from geology to history, art, music and themes and questions stemming from industry and commerce.

C – Geoconservation

1. Current or potential pressure on the Geopark

Threats to the geological heritage
Potential threats to the geological heritage are probably the same as in all geoparks – if not environmentally or naturally foreshadowed, as through erosion, then they are mainly of a man-made nature.

In this context, the new or changed utilization of the soil and underground resources through potentially environmentally dangerous or damaging processes plays the most meaningful role. Protection against man-made processes, especially use as inert waste deposal sites but also from illegal dumping, is present and included in the concept of designated exposures.

Around the 1970s, quarries, sand pits and material extraction sites were designated as “landscape damaging” with the result that much land restoration planning was allowed, often with filling and subsequent agricultural use. Hence many sites were used as landfills or repositories for trash, construction and excavation waste. Similarly numerous sinkholes in the Swabian and Franconian Alb were filled up and levelled. This view has fundamentally changed in terms of nature and species protection. Today these are important secondary habitats, stepping-stone biotopes and refuges for plants and animals threatened with extinction.

Exposures and quarries provide a so-called geological window and so offer interesting insight into the composition and formation history. Abandoned and unused quarries become overgrown with bushes through incipient succession and if, the process continues to the end stage, would be forested, unless the necessary intervening maintenance is performed from time to time.

Previous construction missteps, for example, on the Ries rim, led to the inclusion in today’s regional plan of the Augsburg region, a fixed goal to protect the Ries rim as much as possible from construction. This applies especially to the superimposition of the characteristic landscape with large-scale compounds. The erection of wind mills (GROWIAN) should be avoided on the crater rim area that is such a prominent and visual symbol of the Ries crater.
2. Current status in terms of protection of geological sites within the Geopark Ries

There is no legal protection of geotopes in Germany. Geotopes are protected by the corresponding and specified nature conservancy category.

Description of the nature conservancy categories in Germany, Bavaria and Baden-Württemberg:

Numerous areas and individual creations of nature are protected: directly by law, through regulations, rules and guidelines, or voluntary agreements.

Relevant statutory sources include:
Federal Nature Conservancy Law as framework legislation
State Nature Conservancy Laws in Baden-Württemberg and Bavaria
EU-Guidelines for the Preservation and Advancement of Species and Habitats of Top Priority

The following types of protected areas are represented in the Geopark Ries (See 2.2. Attachment to Annex 1-SED and scale map Annex 4):

1. Nature protection areas (abbreviation NSG from the German term Naturschutzgebiet): Areas protected to preserve biocenoses (self-sufficient communities of naturally occurring organisms occupying and interacting within a specific biotope) or biotopes of certain wild animals and plants due to their rarity, peculiarity, beauty and/or out of scientific, natural history or applied geography grounds. (All acts that could lead to destruction, damage or change to the nature protection area or its components or to a lasting disturbance are forbidden according to provisions of closer regulations. As far as the protective purpose allows, nature protection areas of the community can be made accessible.)

2. FFH areas: Areas that serve the structure and protection of the European ecological network “Natura 2000” and are of collective significance (Guideline 92/43/EWG).

3. SPA areas: European bird sanctuaries of collective significance (Guideline 79/409/EWG).

4. Natural monuments (abbreviation ND from the German term Naturdenkmal): Protection of individual creations of nature because of their rarity, peculiarity, beauty and/or scientific, historical, folkloric or local-, nature- or regional-historical reasons (removal, destruction or other alteration is forbidden).

5. Landscape components: Components of nature and landscape that do not fulfill the requirements for a natural monument, but are necessary in the interest of the ecological balance of the area or because of their importance for the development or preservation of the linked biotope system.

6. Legally protected biotopes: The respective state laws contain lists of protected biotope types, which also include some geotopes.

7. Landscape preservation area (abbreviation LSG from the German term Landschaftsschutzgebiet): Areas protected for the preservation or restoration of the productivity of the ecological balance of the area or the utilization capability of the natural assets or because of the diversity, peculiarity or beauty of the natural scenery or because of its special importance for recovery. (All acts that change the character of the area or run counter to the protective purpose are forbidden.)

8. Nature parks (NP): Spacious areas, corresponding to the natural physical regions, that are overwhelmingly appointed landscape preservation areas and, because of their scenic preconditions are especially suitable for environmentally sensitive regeneration.

Supplement NKrit, Water protection areas:
Water protection areas (abbreviation WSG from the German term Wasserschutzgebiet) account for 10% of the surface area in the Geopark Ries. (See scale map Annex 4.)

One example of protection and improvement through voluntary agreements is noteworthy: The Vertragsnaturschutzprogramm (Contractual Nature Conservancy Program, through which the Free State of Bavaria compensates farmers to promote nature conservancy and preservation of the countryside on agricultural lands) has been very well received.
**Surface area of protected areas in Geopark Ries 2017:**

<table>
<thead>
<tr>
<th>Protection Type</th>
<th>Km²</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotope</td>
<td>1,748.80</td>
<td>100.00</td>
</tr>
<tr>
<td>FFH (Flora, Fauna, Habitat)</td>
<td>150.31</td>
<td>8.60</td>
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<tr>
<td>SPA (Bird Sanctuary)</td>
<td>179.42</td>
<td>10.26</td>
</tr>
<tr>
<td>NP (Nature Parks)</td>
<td>586.52</td>
<td>33.54</td>
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<tr>
<td>WSG (Water Protection Areas)</td>
<td>170.14</td>
<td>9.73</td>
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<tr>
<td>NSG (Nature Protection)</td>
<td>5.67</td>
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<tr>
<td>LSG (Landscape Preservation)</td>
<td>450.93</td>
<td>25.79</td>
</tr>
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</table>

**Type of Protection for Geotopes**

* A geotope can have more than one type of protection. For example, 63 geotopes are within landscape protection areas.

**Examples of the integration of protected geological features of the National Geopark Ries:**

**NSG:**
The Offnet caves near Hohlheim are under multiple protections. The status as a nature protection area is the highest. The Bavarian Office of the Environment distinguished it as one of the hundred “Best Geotopes of Bavaria.” The Geopark’s thematic hiking trail “Shepherd’s Way” incorporates these multiple protections as well as the geological and cultural special features (including the findings of skulls from the Stone Ages).

**FFH- and partially SPA-areas:**
The Wörnitz valley as well as the Wemding Marsh and the dry grasslands on the edge of the Nördlingen Ries are large protected areas. The Geopark Ries includes these in the following projects and thereby opens up their special features for the population: Thematic hiking path "7-Hills Trail," Geotope Kalvarienberg in Donauwörth-Wörnitzstein as well as Geotope Klosterberg in Maihingen, Geotope Kalvarienberg in Huisheim-Gosheim and the thematic hiking trail "Saga Trail" near Wemding.

**Natural monuments and protected landscape components:**
Like the Offnet caves, the former Suevite quarry “Altenbürg” lies directly on the thematic hiking trail “Shepherd’s Way.”
3. Data on the management and maintenance of all heritage sites (geological and non-geological)

All nature and water protection areas are represented on the large-scale map in Annex 4. The following authorities administer or are responsible for, respectively, these protected areas.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Department/Unit</th>
<th>Street address</th>
<th>Postal code</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsible Authority in Area: Nature Conservancy - Bavaria</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Staatsministerium für Umwelt und Verbraucherschutz</td>
<td>Supreme nature conservancy authority</td>
<td>Rosenkavalierplatz 2</td>
<td>81925</td>
<td>München</td>
</tr>
<tr>
<td>Regierung von Schwaben</td>
<td>Higher nature conservancy authority</td>
<td>Fronhof 10</td>
<td>86152</td>
<td>Augsburg</td>
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<tr>
<td>Landratsamt Donau-Ries</td>
<td>Lower nature conservancy authority</td>
<td>Pflegstraße 2</td>
<td>86609</td>
<td>Donauwörth</td>
</tr>
<tr>
<td>Bayerisches Landesamt für Umwelt (LfU)</td>
<td></td>
<td>Bürgermeister-Ulrich-Straße 160</td>
<td>86179</td>
<td>Augsburg</td>
</tr>
<tr>
<td><strong>Responsible Authority in Area: Nature Conservancy - Baden-Württemberg</strong></td>
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<td></td>
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<tr>
<td>Landratsamt Heidenheim</td>
<td>Lower nature conservancy authority</td>
<td>Felsenstraße 36</td>
<td>89518</td>
<td>Heidenheim</td>
</tr>
<tr>
<td>Landratsamt Ostalbkreis</td>
<td>Lower nature conservancy authority</td>
<td>Stuttgarter Straße 41</td>
<td>73430</td>
<td>Aalen</td>
</tr>
<tr>
<td>Regierungspräsidium Stuttgart</td>
<td>Higher nature conservancy authority</td>
<td>Ruppmannstraße 21</td>
<td>70565</td>
<td>Stuttgart</td>
</tr>
<tr>
<td>Ministerium für Ländlichen Raum und Verbraucherschutz Baden-Württemberg</td>
<td>Supreme nature conservancy authority</td>
<td>Kernerplatz 10</td>
<td>70182</td>
<td>Stuttgart</td>
</tr>
<tr>
<td>Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW)</td>
<td></td>
<td>Griesbachstraße 1- 3</td>
<td>76185</td>
<td>Karlsruhe</td>
</tr>
<tr>
<td><strong>Responsible Authority in Area: “Protection of Cultural Assets“ - Bavaria</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bayerisches Staatsministerium für Bildung und Kultus, Wissenschaft und Kunst</td>
<td></td>
<td>Salvatorstraße 2</td>
<td>80333</td>
<td>München</td>
</tr>
<tr>
<td>Bayerisches Landesamt für Denkmalpflege</td>
<td></td>
<td>Hofgraben 4</td>
<td>80539</td>
<td>München</td>
</tr>
<tr>
<td>Landratsamt Donau-Ries</td>
<td>Lower historic monuments protection authority</td>
<td>Pflegstraße 2</td>
<td>86609</td>
<td>Donauwörth</td>
</tr>
<tr>
<td><strong>Responsible Authority in Area: “Protection of Cultural Assets“- Baden-Württemberg</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regierungspräsidium Stuttgart</td>
<td>Dept. 8 (District Office for Preservation of Historic Monuments)</td>
<td>Ruppmannstr. 21</td>
<td>70565</td>
<td>Stuttgart</td>
</tr>
<tr>
<td>Regierungspräsidium Tübingen</td>
<td>Unit 21</td>
<td>Konrad-Adenauer-Str. 20</td>
<td>72072</td>
<td>Tübingen</td>
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<tr>
<td>Landratsamt Ostalbkreis</td>
<td>Lower historic monuments protection authority</td>
<td>Stuttgarter Straße 41</td>
<td>73430</td>
<td>Aalen</td>
</tr>
</tbody>
</table>
Nature guardians are active on the ground in the countryside, in order to monitor the conditions on site. There is at least one attendant assigned to each of the developed nature trails and geotopes of the Geopark. To some extent, the building and landscape departments of the municipalities are assigned maintenance responsibilities. A landscape maintenance association is being established in the District of Donau-Ries. It should begin work in October 2016; the management office is currently under proposal. Landscape maintenance associations already exist in the Baden-Württemberg and Franconian areas.

D – Economic Activity & Business Plan

1. Economic activity in the Geopark Ries

The Geopark Ries association is a non-profit organization and therefore without economic activity in the business-management sense (see definition in the national accounts system of the United Nations). We, the Geopark Ries, deliberately foster regional economic development (value added chain completely in the Geopark) with the Culinary Geopark initiative. It serves the promotion of the cultivation and usage of regional foodstuffs as well as the presentation of a regional cuisine in gastronomy. The participants (restaurateurs and food producers) pledge to increase the visibility and recognition of the regional cuisine through the use of local products and to forgo packaged and convenience products, flavor enhancers, genetic manipulation and artificial aromas. The Geopark Ries tour guides work as independent contractors. Their training was conceived and organized in 2008 by the Geopark Ries and carried out in cooperation with the Bavarian Academy for Nature Protection and Landscape Preservation. Advanced training takes place every year, organized by the Geopark. The Geopark promotes and markets the tours.

2. Existing and planned facilities of the Geopark Ries
(Considering NKrit 8 and 15)

Fundamentals

Since its founding in April 2004 the Geopark has developed very dynamically. This tendency not only continues unabated today – it increases as much as ever – like the snowball effect. This is felt in all fields of management. The continuously escalating interest of the media – especially media from outside the region – already frequently stretches our personnel capacity. The same is true for the development of infrastructure, the education and science areas and the networking efforts. The development pressure is enormous and will definitely not ease in the foreseeable future. In the region and already far beyond, the Geopark Ries is regarded as a success story and showcase model. The Geopark is a coveted partner.

Existing situation
(p. 28 – 36, includes ongoing, not yet completed projects)

Geopark & Schools: The National Geopark Ries as a place for learning “outside the classroom.”
The Geopark Ries offers programs for schools, including:

- Printed classroom materials (at no charge)
- Mentoring of final-year projects and theses of high-school students (This frequently provides good opportunities to integrate aspects of sustainability or sustainable education because the projects and theses are generally interdisciplinary and cross-curricular.)
- Special tours suitable for school classes have been developed and are summarized in a separate brochure. Fully 20-25% of booked tours are booked by school groups.
- Teaching materials for the Adventure-Geotope Lindle (See below for contents and development.)
- Learning module “Networked Know-how about the Ries Event” (See below for contents and development.)
Programs are offered to all schools, regardless of type or geographical location. All materials and activities available for schools are listed on the Geopark website under “Geopark & Schools.” The schools in the Geopark region are contacted regularly (at least once a year) and receive a prepared fax-ready order form, on which all materials can be ordered simply by checking the required box. Administrative department colleagues service the Donau-Ries “regional educational network” and can facilitate network contacts — for example; with the local education authorities as well as other educational institutions (also see A3).

On 18 February 2014 a cooperative agreement was signed with the University of Augsburg. Since then, the Chair of Geographical Didactics has worked with students in seminars and on work contracts to compile extensive teaching materials based on the latest didactics and educational insights and directly related to the curricula in Bavaria and Baden-Württemberg (in Germany education is the domain of the states). The teaching materials are scientifically supported and implemented by the university and optimized on the basis of their findings.

- **Teaching materials for the Adventure-Geotope Lindle** (excursion manual for pupil centered learning, individual exploration of the various themes of the Geopark on location with preparatory lessons in advance and post-processing and exam questions afterwards), fulfilling the criteria for Education for Sustainable Development

- **Geopark-Ries learning module “Networked Know-how about the Ries Event”** (pupil centered learning materials for 6 mandatory and 4 elective stations with solutions, exam questions, preparatory and post-processing lessons, teacher worksheets, etc.), fulfilling the criteria for Education for Sustainable Development

Both are available on DVD free of charge to schools upon request through the Geopark website. The teacher handout on Adventure Geotope Lindle can be downloaded from website. The learning module was provided free of charge to 30 schools within the Geopark region at a ceremony attended by the Chief Administrative Officer of our District on 25 April 2016 to celebrate the 10th anniversary of accreditation as a National Geopark.

Outfitted with all necessary worksheets (laminated) and related materials, the learning module was presented in the form of a large wooden case. The case was manufactured and assembled by the Donau-Ries-Werkstätten, one of the three shelter workshops in the Geopark region. They had won the open competitive bidding process, executed by the Geopark Ries together with the Donau-Ries regional education network, having followed the comprehensive federal bidding guidelines in consideration for this type of shelter workshop.

In November 2015, in cooperation with the regional educational network, the Geopark carried out a continuing education program for teachers that was officially recognized by the educational authorities and publicized through the official teachers’ continuing education portal in both Bavaria and Baden-Württemberg. The program was an exceptional success and enthusiastically received by the 60 participating teachers. The Geopark Ries and its offers of activities, locations and materials were introduced. A lecture presented the latest didactic findings and their consideration in the formulation of new teaching materials for the Geopark Ries and the Ries Crater Museum by the University of Augsburg. In addition, more than 20 other institutions – including the Ries Crater Museum, Adventure Farms, Behinderteneinrichtung Stiftung St. Johannes (St. John Foundation Shelter Workshop) and others – presented their own outside-the-classroom related activities and proposals. These options were summarized and formatted uniformly for the comprehensive participant notebook and can be ordered from the Geopark.

A second continuing education program is planned for fall 2017 in collaboration with the Donau-Ries regional education network and the GeoUnion Alfred-Wegener Foundation.
A further written cooperative agreement was concluded in 2017 with the Friedrich-Alexander University of Erlangen-Nuremberg, GeoZentrum Nordbayern. This retains the educational research in the area of geology didactics as well as the support of the Geopark in the preparation and implementation of concepts considering the entire Earth-Mankind system including climate change, resource management, etc. Lectures on behalf of the Geopark at relevant—and international—conferences are also included in the cooperative agreement.

In the year 2018 – for the very first time – it will be possible for a school to be distinguished as a “Geopark school.” The criteria will be established in cooperation with the University of Augsburg.

Articles about the Geopark Ries are included in the following materials of the Bavarian State Ministry for Environment and Health: Lernort Geologie (=Geology) and Lernort Boden (=Earth), conceived as learning materials for schools as well as outside-of-school learning, were prepared and distributed free of charge for all respective institutions in Bavaria.

At the beginning of each school year, all Bavarian schools and other places of learning in Bavaria receive the “Info-Brief Geology”. The Geopark Ries and our outside-the-classroom learning opportunities have been represented in this publication for many years, and since 2016 there are additional new pages for teacher aids and the learning module.

Since 2010 the Geopark Ries has been recognized as an institution participating in the FÖJ (freiwilliges ökologisches Jahr = gap year in voluntary environmental projects). The Geopark is currently sponsoring its sixth gap-year volunteer. Up to this point, three women and three men have each been active for one year in the program. Three of them came from the local region and three from outside the area. These young people have begun right after graduation from high school and found orientation for their path in life. All were very engaged, motivated and enthusiastic about the work, especially because they could get involved and assume responsibility for their own projects. The work is very varied, never boring, and offers an intensive introduction to a broad range of educational and sustainability themes.

Geopark & Science – Geopark Ries as a remote learning site for universities:
Since its founding the Geopark has offered the following to universities and students:
• Internships
• Supervision /mentoring for theses

Every year the Geopark Ries oversees one to four internships lasting from four weeks to a half year, providing office space and equipment as well as work assignments with supervision. Another four-month internship began 1 April 2017. Frequently these are students of geo-sciences with fields of study in human or physical geography, but students of environmental sciences have also taken part.

To date at least 20 final theses have been written and to some extent comprehensively mentored by the Geopark. The various specialties, from numerous different universities, have included dissertations in education, paleontology, geology, bachelor’s and master’s theses in geography in the field of geo-science, up to a master’s thesis on optimizing the utilization of the interactive map on our website. This technical work, on the part of the Munich University of Applied Sciences, Print and Media Technologies, has been fully integrated in the revision of the Geopark website.
Increasingly, the Geopark facilities and products are themselves becoming the subjects of research. For example, currently a dissertation is being prepared for the University of Augsburg, Chair of Geographical Didactics. The objective is to research the applicability of the Geopark facilities and other Geopark offerings in the development of new teaching materials. The results will immediately be implemented and in the course of our cooperation with the University will lead to the preparation of new learning materials. The Hahnberg exposure in the Geotope Klosterberg in Maihingen was the focal point of two master’s theses in geology under the tutelage of Professor Dr. Höfling at the University of Erlangen-Nuremberg.

From their orientation (that is, depth of information, degree of simplification, etc.), the Geopark’s Adventure-Geotopes, Information Centers, and other facilities are not necessarily designed only for casual tourists “with normal” interests. Instead, especially in the area of geology, they were purposefully created in cooperation with representatives of the contributing universities to be destinations for university student excursions.

**Other educational contributions - contributions of the Geopark Ries**

The cooperation with the University of Augsburg described above yielded unexpected gains just a few months ago. An academic councilor (a young family man) of the University of Augsburg is an avowed “fan” of the Geopark and instrumental in promoting activities for teaching materials for the Geopark. Through our networking contacts, he has obtained a permanent seat in the strategy commission “Environmental Education” of the Bavarian Environmental Ministry.

In addition, the Akademie für Personalführung und Lehrerfortbildung, the Bavarian institution for teachers’ continuing education in Dillingen, will offer in October 2017, for the very first time, a weeklong seminar on the theme “Excursions Didactics” – in fact using the example of the Geopark Ries. The management of the Geopark will provide a total of 1.5 days of presentations of the Geopark Ries as an excursion destination as well as an outside-the-classroom learning environment. Opportunities like these are made possible by the strategy commission and the cooperation with the University of Augsburg. Additional networking partners of Geopark management are integrated. Moreover, the Geopark Ries itself has organized continuing training for the Geopark Ries Guides, one to two days per year, on the themes they find most pertinent.

Once a year, as part of the trade-show training provided by the Ferienland Donau-Ries, tourism staffs in the region are informed of all important information and innovations in this sector. Geopark management as well as the Ries Crater Museum, Geopark Ries Guides, and even to some extent partners at the universities, give lectures upon request and as needed, for various target groups, multipliers, political decision makers and/or boards and committees. Most lectures focus on relevant developmental themes of the Geopark. The Geopark provides transparencies, formats and even standard presentations, as required.

The KunstMuseum Donau-Ries in Wemding hosts a Geopark Info-Point and provides a venue for periodic art projects related to the Geopark Ries for school classes (GeoparkArt).

In 2010 the Geopark Ries commissioned the creation of a didactic concept from the Catholic University of Eichstätt-Ingolstadt (Frau Prof. Dr. Hemmer).

In 2015-2016 the Geopark Ries, Ries Crater Museum, Aalen University, Steinbeis-Transfers Centers TIB (Prof. Dr. Bauer) and other leading experts in impact research cooperated to produce an animated film of the Ries impact. The 4.5-minute film is presented in the Geopark Info-Centers together with the animated geological timeline, enabling the visitor to enjoy an interactive experience with geological history (plate tectonics) and the Ries impact at a high scientific level. The Geopark Ries’s integration in the region’s education and training is described in “Overview of the education and training institutions and opportunities” under section A3 on page 5. The Geopark Ries is a co-founder of a new “Education for Sustainable Development” working group of the German National Geoparks, listed under D2 “Collaborations” on page 42.
Infrastructure of the Geopark

Any infrastructure development in the Geopark is implemented with partners. The Geopark itself neither possesses real estate nor operates facilities.

<table>
<thead>
<tr>
<th>What</th>
<th>Where</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geopark Bike Path</td>
<td>From Crater to Crater (July 2010)</td>
<td>Nördlingen, Community of Steinheim</td>
</tr>
</tbody>
</table>

All of the themes of the Geopark – including settlement history, historic sights, religious buildings – are integrated in every adventure geotope, hiking trail and individual panel in Info-Centers and -Points. Each of the various thematic areas is represented by a distinctive color code in the corporate design of the Geopark. (See also large-scale map, Annex 4, for locations of panels.):

**Color Code**

- Special geological feature
- Museum
- Geopark Info-Center /-Point
- Fortress, castle
- Special landscape feature
- Archeological & historical site, archeological monument
- Scenic overlook
- Geopark trail, Geopark nature trail
Geo-tourism

Geopark Info-Centers and Info-Points:
Since its recognition as a national geopark, the Geopark Ries has established three information centers and four Geopark “Info-Points” – each with partners. Quality criteria are defined for both.

Info-Center Nördlingen: The city purchased and renovated a building next to the Ries Crater Museum specifically for the Info-Center that is serviced by the staff of the Ries Crater Museum.

Info-Center Oettingen: The town made space available in City Hall and contributed an extensive display related to the archaeology of the northern Ries.

Info-Center Treuchtlingen: The Geopark Info-Center is housed in the town’s Environmental Info Center. Info-Point in the JUFA Hotel Nördlingen: Illustrated information panels hang in the central connecting corridors and make an unbeatable contribution to Education for Sustainable Development.

Info-Point Deiningen: The first outdoor Info-Point is accessible around the clock, the entire year, in the recently renovated courtyard of Deiningen’s city hall. Appropriately, it is located near the actual center of impact.

Info-Point Wemding: Housed in customized rooms in the former city pharmacy, that also accommodates a handicapped-accessible office of City Hall; the Info-Point complements an exhibit about the Botanist Leonhard Fuchs, a Wemding native whose work led to the town’s “Fuchsia City” nickname. Located on the eastern edge of the Ries, Wemding was a well-known medieval town and is the location of one of the most important Bavarian pilgrimage churches, Maria Brünlein.

Info-Point Monheim: The Geopark’s second outdoor Info-Point was erected beside the school and motor home campsite.

Info-Point Harburg: The fifth Info-Point is now in the concept phase.

Geopark bike paths, thematic hiking trails, adventure-geotopes and nature trails
Since 2006 four Geopark Ries thematic hiking trails with directional signposting and informative panels have been planned, designed, constructed, signposted, ceremonially opened and then turned over to public for enjoyment. Accompanying brochures were created and distributed.

From 2011 to 2014, six Adventure-Geotopes with nature trails were constructed. These include the development of a total of eleven geotopes (see table p. 14) with a total of 37 informative panels and four scenic overlooks with panoramic photos. On 25 June 2016, the fourth thematic hiking trail was opened. The Saga Trail in and around Wemding splendidly complements the Geopark and tourism activities there. A seventh geotope with nature trail – Wallerstein cliff with town nature trail – is currently in the planning stage.

At present, a total of 80 large-format informative panels enrich the four thematic hiking trail and six adventure-geotopes with nature trails. A distinctive feature here is that information on all themes relevant to the Geopark – as far as available and including their relationship to each other – are represented on these panels.

As shown on the large-scale map in Annex 4, in the Geopark’s corporate design, each thematic area is consistently represented by a distinctive color, to be identifiable at a glance by the visitor.
The bike path “Crater to Crater” was conceived and signposted – and in fact is “run” – in cooperation with the Geopark Swabian Alb and their partners. It is one of the 70 top bike paths listed in the ADFC brochure “Deutschland per Rad entdecken” (“Discover Germany by Bike”), for which certain quality standards are required. This 180-km loop connects the two impact craters, the Nördlinger Ries and the Steinheim Basin, and enables the visitor to impressively and uniquely experience both crater structures.

**Marketing of the Geopark**

**Information materials to promote the facilities and activities of the Geopark Ries:**

Materials in German: Brochures and flyers include Geopark Ries, Shepherd's Way, Swedes’ Way, 7-Hills Trail, Guided Tours in the Geopark, open-to-the-public Guided Tours (updated every year), and Tours & Activities for Families, Children, Young People and School Classes. Booklet for Adventure Geotopes “Fenster in die Erdgeschichte” (“Window into the History of the Earth”). Map “Crater to Crater.”

Materials in English: Geopark Ries brochure and large-format information booklet.

The first brochure appeared in December 2007! Since that time the array of products has been expanded to the broad palette described here. These print materials are selectively distributed (at trade shows, by mail upon request and on display at diverse sites throughout the region): Currently about 70,000 pieces are distributed per year, a continuous increase.
Additional marketing
The Geopark Ries operates its own website, which was completely redesigned in 2016 (the contents were retained but the function and design were accordingly adapted to the most up-to-date standards, for example, a “responsive website” for mobile devices). Every year the Geopark Ries issues about 100 press releases, places 10-20 advertisements in various media and provides at times considerable preliminary work about the Geopark Ries for diverse publications and various media. For example, the magazine “Geographie Heute” (“Geography Today”) for geography teachers published an extensive article in 2016 about the Ries and referenced teaching materials developed by the Geopark. As with many other media, the contact required permission for use of images.

Geopark Tours and Tour Guides:
In 2008 the Geopark Ries carried out a 200-hour, comprehensive, extra-occupational, modular training program for 25 Geopark Ries tour guides. The training program was conceived according to the guidelines of the Bundesarbeitsverbandes für Natur- und Landschaftsführer/innen (Federal Association for Nature and Landscape Tour Guides) and was carried out together with the ANL (Akademie für Natur- und Landschaftspflege) (Academy for Nature and Landscape Preservation). Over 130 people applied for the 25 announced openings in this extra-occupational continuing education program. We were surprised by this initial response and had to institute an application procedure. These certified nature and landscape guides with the local title “Geopark Ries Tour Guide” have been active since 2009. Tours are booked directly with the individual tour guide. Customer requests received by the Geopark office are communicated to the tour guides for follow-up. The same procedure is used by the regional tourist information offices and the Geopark Info-Centers.

Pre-designed standard tours can be booked, but the exact contents and details of a tour can also be customized by working directly with the tour guide. In addition, every year the Geopark Ries publishes a new calendar of tours, regularly scheduled and open to the public, to facilitate participation by locals and visitors. The variety of tours ranges from purely geological tours in geotopes to agriculturally oriented tours that highlight how the characteristics of the soil due to the Ries event still affect agriculture today. On some tours for children, the tour guide dresses in Celtic or Roman garments, or the children craft jewelry from stones. There are even tours combined with the gastronomic specialties of our Culinary Geopark partners.

The tours are well received. About 4,000 people per year participate in the around 200 tours of the Geopark Ries, to connect with the countryside with all their senses.

The tours are available in several languages and have been booked by Japanese, American and Norwegian tour groups, among others. (The Romantic Road travels through Nördlingen and the Ries Crater.)

In addition, in combination with a visit to the museum, the Ries Crater Museum offers excursions into the countryside with museum personnel for interested school children, college students and professional colleagues as well as visitors with more casual interests. The number of excursions led by Ries Crater Museum personnel increased from a 2015 total of 14 to an all-time high of 17 up to just mid-July of 2016!
**Culinary Geopark Ries**
The geological bedrock, subsoil, soil and climate made the Ries into a so-called breadbasket of Bavaria. Grain has been cultivated in the Ries since the 6th century BC; root and forage crops arrived later. The “Culinary Geopark Ries” has become a showcase project for all of Germany. In cooperation with restaurateurs and producers, the Geopark Ries markets this initiative with a motto that translates as “the impact of a taste experience out of the crater.” The initiative intends to preserve typical regional cuisine and calls for a return to the former “breadbasket of Bavaria” with its traditional fare and products. The Geopark Ries unites the restaurateurs and regional food producers on a high level. All Culinary Geopark partners pledge to uphold an honorary codex. Food producers must comply with additional producer guidelines. Important supra-regional events of the initiative include Culinary Geopark Ries appearances at: The Berlinale, an annual film festival; the Viktualienmarkt, a traditional food market in the Munich’s old city, in cooperation with the European Metropolitan Region of Munich; the award ceremony of the ADAC (German automobile club) Tourism Prize in Nördlingen at which the Culinary Geopark Ries initiative was also recognized.

**Tourism Infrastructure**
The geo-tourism planning of the Geoparks Ries is closely connected to that of the Ferienland Donau-Ries e.V. (Donau-Ries Tourist Region) (a shared executive director, see A4, Managing Director). In the past 10 years the expanded geo-tourism products (see above) have been an integral component of the marketing mix of the Ferienland Donau-Ries. In conventions, trade and road shows, in print production and on-line marketing, they have been intensively marketed as a unique selling feature of our destination. The Geopark campaigns for continuous but also environmentally compatible development of additional Geopark tourism infrastructure. Some projects are already in the planning stages (Info-Point Harburg, geotope with nature trail in Wallerstein). The Ferienland Donau-Ries contains about 1,000 kilometers of bike paths signposted according to federal guidelines and around 600 kilometers of signposted hiking trails meeting the criteria of the Deutschen Wanderverband (German Hiking Association). Three years ago the Ferienland Donau-Ries began a hiking initiative especially for tourists, to prepare and promote 16 top hiking trails, to which the Geopark’s thematic “Shepherd’s Way” and “Saga Trail” also belong. The associated brochure “Wandern” (“Hiking”) was published in January 2017; the official opening ceremony takes place on 6 May 2016. All projections point to a resulting fresh surge in tourism – and with it increased publicity for the Geopark Ries. The region of the Geopark is replete with a wide variety of hotels and other accommodations (see Annex 4) as well as a healthy, mixed gastronomy infrastructure (as is frequently the case in Bavaria!). Among the multitude of castles, fortresses, monasteries, museums and other sites of cultural interest are some very important representatives of their historical periods (see B4 as well as map Annex 4).
Management plan of the Geopark Ries
(S. 37 - 42)

Description of the basic work methods to develop the management plan

The Geopark Ries – with its management system – has accomplished a great many projects since its certification as a National Geopark on 11 May 2006 (see above under “Existing Situation”). At least every five years Geopark management holds a full-day workshop to develop a management plan that applies to a maximum of five years. The individual projects and their implementation are developed in the five subject-specific Expert Teams. Overall the development process can involve up to 100 or more people – individuals as well as representatives of clubs and associations in all subject areas. Also see the organizational chart and work flow description under A4 on page 8.

At the outset of Geopark development (2005), in the first workshops involving Geopark management and two representatives of each Expert Team, a development plan was established and a vision plus strategic goals in all three sustainability areas were composed. Extracts of these are reported below.

Excerpt from the first workshops of Geopark development 2005
(Existing text not included here is indicated by “….”)

Vision

With its cosmic roots, the Geopark Ries establishes the connection between the heavens and Earth. Traces of the impact event are clearly visible in the Geopark Ries. Geology is understandable without great technical imprints. The Geopark makes possible a pronounced interconnection of geology, nature conservation, history, tourism and also the economy. A special highlight is the high scientific penetration of the meteorite impact in the Ries and the presence of science, for example, in the form of the ZERIN….

….The scientific findings gained in the Ries are processed for specific target groups. The local population has the opportunity to share in the current knowledge of their homeland.

….Already existing thematic hiking and nature trails are extended and supplemented. With guided tours the impression is even deeper.

Through the development of existing museums into Geo-Info-Centers, the visitor becomes closer acquainted with the story of this unique event as it relates to Earth’s history and geology as well as to the formation of our solar system. Video simulations of the impact event as well as demonstrations of the formation and deformation of various characteristics of rock assist understanding. Children and school classes can take part in regularly scheduled or specially booked demonstrations that offer close-to-nature experiences. Geopark colleagues are continually being qualified.

….The geology of the Geopark Ries can be experienced without interfering with its valuable natural potential. The uniquely well preserved legacies of the meteorite impact are educationally useful and easily visible in the landscape. A “guidance system” including large information boards directs the visitor to the most important geotopes and geologically important sites. Model-like “show” quarries are developed for the hobby-geologist and to communicate the most important geological aspects.

Nature has also retained its rights in this landscape so imprinted by a meteorite impact. The combination of geology and nature is presented in detail. Because the geological structural diversity represents special habitat for flora and fauna, a variety of locations are developed to be educationally meaningful. Geology can be experienced differently here, with the on-site natural educational experience complemented by informative brochures in combination with maps of the locations. Children and adults discover something about the great interdependency on this planet (ecology).

The special crater structure also has spawned special cultural features. The cultural center of northern Swabia lies in the crater….

The region will develop projects in the future, as it has in the past, that are exemplary models with regard to the balance of economy, ecology and social/cultural aspects. The population has a high awareness of the development history of its landscape. The residents identify with the unique history of their homeland and are therefore aware of the experience destinations of the Geopark Ries. As hospitable and competent contacts, local residents are multiplying factors for tourists. Visitors are always welcome.

With its own logo, the Geopark’s consistent design concept supports marketing and recognition internally and externally. The Geopark tour guides are an essential element of the comprehensive package. Guided tours are combinable and bookable as desired. Geopark events are also organized and advertised by museums and tourist information offices. All of these efforts make possible good and professional tourism marketing as an attractive vacation destination with adventure, play, entertainment, knowledge and culture.
**Defined strategic goals**
The region of the Geopark already has a multitude of interesting sites and objects in the thematic areas of geology, culture, history, ecology and archeology, clearly relating to the meteorite impact and the resulting special geological features.

These already existing sights should be further extended, developed and complemented with objects important to the Geopark, under the umbrella of the Geopark, focused on the theme “the meteorite impact and its aftermath.” On a broader basis, thematic specific concepts for the entire Geopark region should be developed with the involvement of the concerned persons. Implementations will be ensured by the Geopark management and expert teams. This structure will be complemented by additional participation by residents or involved parties where practical.

Short-, medium- and long-term strategic goals were defined in the areas: economy, social issues, ecology.

Every subsequent workshop was based on these start-workshops so that the vision was realized more and more. In each workshop the goals were adapted to the current situation (see below for examples of actual goals), the implemented projects were evaluated and an analysis of strengths and weaknesses was carried out for each project and business area. Development was driven with maximum participation (see below for examples of the process of a project realization).

**The business areas of the Geopark Ries are:**
- Management
- Infrastructure
- Marketing
- Knowledge and Science Management

**Overview of the topics of every Geopark Ries development workshop:**
- The strengths and weaknesses of every business area are analyzed,
- The work of each business area is assessed,
- Goals are identified: There are goals and a mission statement for each business area of the Geopark.
- For each business area, projects are proposed and the objectives prioritized with short-, middle- and long-term goals.
- The financial plan is initiated according to these measures (projects).

**Illustration of a participatory applied implementation process as an example of the planning and realization of an Info-Center:**
- Management and town/municipality/enterprise want an Info-Center.
- The project must comply with the objectives established by the entire management in the development workshops.
- Management develops a framework plan for the concrete execution including contents and financing
- This plan is sent to the expert team leader(s) (specific to theme, depending on planned contents) and the town/municipality/enterprise.
- The expert team leader discusses the project with the team.
- Reconciliation of the details takes place between management and the expert team leader(s) (for example, text, pictures) and other partners, as necessary.
- Project realization follows.
Management plan 2015-2020

Cost budget and financial plan

The basic principle deciding the implementation of measures is that the annually compiled budget of the Geopark is a component of the budget of the District of Donau-Ries.

In detail, the following funds are available annually to the Geopark Ries (average since 2006):

<table>
<thead>
<tr>
<th>Area</th>
<th>Available funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing</td>
<td>50,000 €</td>
</tr>
<tr>
<td>Experts' fees</td>
<td>13,000 €</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>10,000 €</td>
</tr>
<tr>
<td>Geotope maintenance</td>
<td>5,000 €</td>
</tr>
<tr>
<td>Upgrading infrastructure</td>
<td>40,000 €</td>
</tr>
<tr>
<td>Management costs (office, computing, etc.)</td>
<td>4,000 €</td>
</tr>
<tr>
<td>Human resources (see A4)</td>
<td>Ø 77,500 €</td>
</tr>
</tbody>
</table>

1. These are expenses for external technical expertise, mainly incurred through work contracts. Examples: Professor Hemmer of the University of Eichstätt prepared a concept of geo-didactics. The assignment for a detailed geological map of the adventure geotopes on a scale of 1:5,000 in addition to further research tasks by Professor Höfling at the University of Erlangen-Nuremberg are financed here. Also included is the composition of teaching materials, teachers' aids and the learning module "Networked Know-how about the Ries Event" through the Chair of Geographical Didactics at the University of Augsburg. This included the composition as well as the scientific implementation in five secondary schools and the technical evaluation and layout preparation.

2. These funds maintain the existing infrastructure, chiefly the signage on the hiking trails and the information panels. Larger projects, like those named above or the establishment of an adventure geotope, are not included here.

3. Mainly this involves the removal of encroaching vegetation (bushes) from the geotopes.

4. Currently rough planning for the proposed projects, Info-Point Harburg and Wallerstein hiking trail, as subsidies to the municipalities. The final sums will be stated precisely as soon as detailed planning is concluded.

5. Human resources (see A4): Financing is assured, also in anticipation of increases in personnel.

Current goals

In the most recent workshop on this theme (November 2014), the management of the Geopark Ries agreed on the following goals (Goals are formulated in the present tense):

Goals of overriding importance for all business areas

1. An interdisciplinary approach is ideally incorporated in all areas of operation of the Geopark.
2. The infrastructure is further optimized and developed.
3. Information in the geotopes is further developed on a didactic and target-group specific basis.
4. The Ries Crater Museum is the focal point and "heart" of the Geopark.
5. The various organizations, who erect signs in the Geopark, cooperate as well as possible (unfortunately this is not always possible due to technical or practical reasons).
6. Coordination of events and exhibits is optimized.
7. The area of Knowledge and Science Management is developed further.
8. There is more integration among already existing projects.
9. Themes of Expert Teams 3 are even better incorporated into Geopark development.

A representative selection of the many additional, important objectives in business areas:
• The current management system is good and will be retained (management).
• Cooperation with the universities and colleges will be continued (science management).
• Networking with the schools and universities that are active in the Geopark is constantly improving (science management).
• Culinary Geopark Ries will be continuously refined – with the focus on "Regionality" (marketing).
• Network communications will be constantly improved (management).
Infrastructure – Measures for development, maintenance and care

Info-Centers/Info-Points
Info-Centers and Info-Points are very important in the first impression made by a geopark. Therefore, we plan the facilities of the Geopark Info-Centers as comprehensively as possible. After the Info-Centers already operating in Nördlingen, Oettingen and Treuchtlingen, first and foremost, another in Bopfingen is under consideration in the medium to long term. An Info-Point in Harburg is in the planning stage; it should be ready in 2018, and financing is assured. In addition, the tourist information offices in Bopfingen, Donauwörth, Harburg, Monheim, Nördlingen, Neresheim, Oettingen, Treuchtlingen und Wemding accept responsibility for distributing information about Geopark products and facilities. Museums and castles in the Geopark Ries are also active as information providers.

Hiking trails
There is already a thick network of hiking trails overseen and marketed by cities and municipalities and especially by the tourism marketing association Ferienland Donau-Ries. Several of these trails have a geological, historical or geomorphological background. To experience a geopark, to visit its most important sights like geotopes, means transportation “per pedes” – by foot. Therefore, in the next years, we are planning the continuous designation of newly developed hiking trails directly related to the Geopark. The concept envisions for the hiking trails the development of special signage with the corporate design of the Geopark as well as numerous information panels, which contain both knowledge specific to the location and basic information about the Geopark.
The largest task in this area is quality control through care and maintenance of the trails and signage. A significant expenditure is required due to the high density of information panels, signage and trails. Besides the control of the infrastructure facilities, replacement purchases are frequently necessary due to damage or theft. An example: A large information panel was hit by a vehicle in a hit-and-run incident (unidentified driver), and the Geopark Ries absorbed the replacement costs.

Sustainability: Besides bicycling, hiking is the most environmentally friendly leisure and vacation activity. This tourism segment attracts almost exclusively guests from Germany and neighboring countries, which has positive CO²-balance effect compared with long-distance travel. This creates added value and the preservation of jobs especially related to gastronomy businesses.

Markt (market town) Wallerstein
Wallerstein plans a hiking trail within their community with cultural as well as geological points of interest. The Wallerstein cliff and castle of the Prince of Wallerstein will be the central features. The town of Wallerstein and the Geopark want to share the costs. The project will be planned and realized cooperatively. There is no detail and cost planning at this time. Schedule: Completion 2018. Assessment: Meets the guiding principles of the Geopark. Financing: Assured.

Municipality of Daiting
Here the mayor has initiated a project idea that fits well into the Geopark concept. The main theme is the mining of iron ore. The community is located in a LEADER area and is pursuing LEADER sponsorship. We would gladly realize this project; however, no statements can be made at this point concerning costs or time frames. Based on our experience, we expect implementation in 2018 or 2019. Schedule: Completion 2019. Assessment: Meets the guiding principles. Financing: To be arranged by the end of 2017.

Geotopes
The development of individual geotopes to adventure geotopes was the focus of our work of the past four years (cost expenditure: 360,000 €). Along with this is the complete protection of the Geotope as well as care and preservation for years to come. It is a primary element of our management plan to perpetually provide for the optimal preservation of these geotopes and to promote them as tourist attractions and outside-of-school learning environments.
Furthermore, additional geotopes will be developed based on our fundamental planning (see HPC expert opinion). Also incorporated in the maintenance planning are the five geotopes on the list of „Bavaria’s 100 schönste (most beautiful) Geotopes” from the Bavarian State Office for the Environment.
Five of „Bayerns 100 schönste Geotope“ are in the Geopark Ries:

<table>
<thead>
<tr>
<th>Geotope</th>
<th>Brief geological description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aumühle north of Oettingen</td>
<td>Ejecta masses of the Ries event: <em>Bunte Breccia</em>, overlain with Suevite</td>
</tr>
<tr>
<td>Wengenhausen</td>
<td>Polymict crystalline breccia of gneiss, granite and amphibolite</td>
</tr>
<tr>
<td>Karlsgraben (Fossa Carolina) near Treuchtlingen</td>
<td>Archeological monument from the time of Charlemagne</td>
</tr>
<tr>
<td>Ofnethöhlen (Ofnet caves) in Holheim near Nördlingen</td>
<td>Brecciated megablocks of Malm-limestone, site of discovery of skulls from the Middle Stone Age</td>
</tr>
<tr>
<td>Büschelberg in Hainsfarth</td>
<td>Post-Ries Ries-Lake limestone with algal bioherm facies</td>
</tr>
</tbody>
</table>

**Marketing (geo-tourism, public relations) – Goals and measures**

We manage our geo-tourism marketing based on market research (financed by the Geopark) by the Mittelstandsinstutit (Small Business Institute) of Kempten University of Applied Sciences, and a guest-opinion survey by TOPAS (work group of tourism students at the University of Eichstätt), as well as a verified target-group definition according to Sinus-Milieus plus the target-group model of Invent-Tourismus (of the Öko-Institut – Institute for Applied Ecology Berlin).

**Marketing goals:**

**Quantitative:**
- Minimum 10% increase in the next five years in arrivals, overnight stays and day visitors
- Increase of overnight guests from outside of Germany
- Improvement in the capacity utilization in low occupancy months
- Increased prominence in the educational market

**Qualitative:**
- Improving the positioning as a “special” nature experience
- Increase in the number of products offered in the context of the Geopark Ries
- Raising customer satisfaction
- Improving the structure of options in the overnight and gastronomy areas

**Our target areas:**

Our marketing budget is well established, nonetheless, there must be a strong focus on certain source markets, in order to achieve a satisfactory market penetration/awareness. Therefore our marketing is directed at the following source regions (order based on intensity of advertising):

1. Southern Germany
2. Austria, Switzerland
3. Western and Eastern Germany
4. Northern Germany
5. Italy, Spain
6. Other European countries
7. Other continents (primarily USA, Japan, China)

We prepare an annual marketing plan in which the planned expenditures are itemized according to the categories of the marketing mix:

- Online marketing
- Print products
- Public relations / publicity
- Television
- Trade shows and conventions
- Posters / placards
- Road shows
- Advertisements / advertorials
- Umbrella brand marketing of the German Geoparks

Flexibility within these categories is required. For example, when the marketing plan is set up, we do not know how many brochures will be requested and whether a reprint will be necessary.
Geopark tours

The Geopark tour-guide training was comprehensive and substantial. We deliberately chose the designation “Geopark Ries Tour Guide” because the name “ranger” is associated with authoritative responsibilities such as issuing warnings, fines or expulsions. The training was organized with both large Volkshochschulen (adult education centers) of Donauwörth and Nördlingen as well as the ANL (Bayerischen Akademie für Naturschutz und Landschaftspflege = Bavarian Academy for Nature and Landscape Preservation). Certificates were issued upon successful completion of the training. Through this cooperation with the ANL, the Geopark Ries Tour Guides are nature and landscape guides with certification valid throughout Germany. The training conveyed to the participants specialized knowledge in the specific areas geology, settlement history, ecology, nature conservation, land use, regional development, tourism and economy. The fundamentals of communication and leadership including presentation techniques, law and marketing were the second most important training topics, after the specialized knowledge.

Geopark Guides are important representatives of the Geopark Ries and carry out their guide functions, as a rule, on a part-time or avocational basis, independently and in a large network. Nature and landscape guides consider themselves intermediaries between nature and man. They make an important contribution to fostering tourism that is compatible with the preservation and maintenance of landscape and culture. These high demands require sustained continuing training, organized and financed at least annually by the Geopark Ries. Participation is required for the guides. Besides the actual tours, the guides are involved as representatives of our Geopark in public relations and publicity work (for example, as interview partners for TV programs and as personnel at trade shows).

Education and science – Goals and measures (examples)

Cooperation with universities will be further intensified and expanded. The teaching materials developed by universities will continue to be reviewed for technical accuracy and adjusted as necessary by the expert teams. Schools will continue to be informed of the offers of the Geopark Ries on a regular basis. “Sustainable learning on site” will continue to be supported and facilitated. In doing so, as many Geopark thematic areas as possible will be integrated. Current societal themes and challenges will be emphasized in order to promote independent critical thinking and action.

Collaborations

The Geopark Ries pursues every opportunity for appropriate collaboration and for cooperation that promises synergy effects. The network is open to participation by individuals as well as institutions, organizations, etc. At the present time, the National Geopark Ries has two officially signed, written cooperative agreements, that contain the defined objectives of planned collaboration: With the Geopark Swabian Alb (since October 2006) and with the University of Augsburg, Institute for Geography, Chair for Geographical Didactics (as of 18 February 2014). The Geopark Ries works as closely as possible with the diverse colleges and universities in the surrounding areas; there is no college or university in the Geopark Ries itself (except for the branch of the University in Augsburg whose area of study is not relevant).

A further written cooperation was signed (4 July 2017) with the Friedrich-Alexander University Erlangen-Nuremberg, GeoZentrum Nordbayern. The purpose is collaboration in geosciences, with the focus on geology and education (also see p. 30).

One other cooperative agreement is being prepared; written proposal for collaboration is already on the table, requiring final agreement and then signatures: With the Ries Crater Museum (abbreviated RKM for RiesKratemuseum) and the City of Nördlingen.

From its very beginning more than 27 years ago, the Ries Crater Museum has fostered scientific contacts in the field of impact research and associated disciplines on national and international levels. The RKM continues to maintain, operate and cover these areas today. In this regard, the engagement of the Geopark is neither necessary nor productive. It is intended, and has been followed up to now, that the Ries Crater Museum provides the leader of Expert Team 1 and in this way participates at the very core of management.
In addition, the Director of the RKM, Professor Höfling, as a member of the Faculty of Geo-Sciences and the Department of Geo- and Environmental Sciences of the Ludwig Maximilian University (LMU) of Munich, is a permanent member of Expert Team 1. Thus we assure a close relationship to research and teaching at the Ludwig Maximilian University and also at the Technical University (TU) Munich, for example, through joint courses as well as in the framework of joint research projects.

The Geopark Ries collaborates as well with Aalen University (Baden-Württemberg). The animated geological timeline developed there was acquired for the Geopark organization and complemented with the animation of the Ries event (for details, see p. 31).

As a regional museum of the Staaltlichen Naturwissenschaftlichen Sammlungen Bayerns (Bavarian State Natural Sciences Collections), the Ries Crater Museum is closely tied to their 15 other facilities (State Mineralogy Collection in Munich, Bavarian State Paleontology and Geology Collection, Jura Museum in Eichstätt and others) and is a member of the Bavarian nature study network currently being established. With this, expert professionals in different scientific specialties are available as required. Furthermore, since 1998, the City of Nördlingen has operated the Zentrum für Rieskrater- und Impaktforschung Nördlingen (ZERIN, Center for Ries Crater and Impact Research Nördlingen) not far from the Ries Crater Museum. As a research, training and documentation center, ZERIN supports the work of the Ries Crater Museum and houses a Ries- and impact-specific library, a comprehensive collection of core samples, thin sections and other samples from the Ries and related relevant locations as well as a laboratory for the analysis of radiogenic isotopes. ZERIN and its facilities are used within the scope of particular research projects (e.g., in Ries research together with Dr. G. Arp, Göttingen), available to third parties (scientists, students, etc.) for research and theses, used for the training of Geopark Guides and other purposes.

The University of Erlangen-Nuremberg leads very many geo-science excursions in the Ries. Quite a few students’ final projects and theses are carried out in the areas of geological mapping and geological-paleontological aspects of Ries geology. Prof. Höfling works intensively on the geological text for the informative panels, lectures at congresses, etc.

The work with each individual Geopark tour guide is contractually regulated.

We are the official partner of the Heide Allianz since 2016 and have a corresponding partnership document. We have written a cooperative agreement with the Volkshochschule (adult continuing education program) in Donauwörth to offer guided tours of the Geopark and promote existing programs. There are collaborative agreements at the management level with the tourism associations of the Swabian Alb and the Altmühltal Nature Park.

Several months ago the Altmühltal Nature Park initiated a geo-tourism network. The occasion was the establishment of a large dinosaur park located near the A9 autobahn in Denkendorf (open August 2016). Driving time is 1-1.5 hours from the Geopark Ries to areas of the Altmühltal Nature Park of geological and paleontological interest. Shared marketing endeavors include collaborative printed materials such as an overview map with descriptions of all relevant sites. It is also possible to display promotional materials and sell merchandise at the dinosaur park gift shop. An info-pavilion employs various media, and the Geopark Ries is represented with an informational panel (2.80 by 1.60 meters) at a re-creation of the Chicxulub Crater, the impact event that occurred at the end of the dinosaur era.

We are similarly interconnected with our Environmental Ministry, Earth and Geology Unit, as well as their subordinate agencies, and the Bavarian State Office for the Environment, Geology Department (previously known as the Geological Service). Here we receive support predominantly in the area of geological maps and geotope cadasters.

Regarding Education for Sustainable Development (in German called Bildung für nachhaltige Entwicklung and abbreviated BNE), the German National Geoparks established a new BNE working group in October 2016. The Geopark Ries is one of the four founding members. In the proceedings of the “Geo Top” conference in May 2017, the Geopark Ries with the Geopark Porphyryland presented a workshop on the further development of the joint school educational activities. Within the framework of the German Geography Congress in October 2017, the Geopark Ries will participate in the professional division of “Geoparks as outside-of-school Learning Locations” with a lecture by the collaborative partner, the University of Erlangen-Nuremberg.

We work with the KunstMuseum Donau-Ries (Art Museum Donau-Ries) in Wemding. As with other allied or relevant organizations, the art museum is included in our comprehensive marketing and the appropriately related materials (also see page 31).
Likewise, we work closely with the **Catholic University of Eichstätt-Ingolstadt**. In this case the cooperation includes the Geopark’s providing internship positions, mentoring final projects and theses, plus individual cases of contract, in the areas of didactics as well as geography, with the focus on tourism or physical geography.

We have very intensive collaboration with the partners of the **Culinary Geopark Ries** initiative. We organize the initiative and run their marketing under the corporate design of the Geopark.

We have already delineated the advantages of collaboration with the various task areas within the Administrative Department for District Development, in which the Geopark organization is also located. One organization is especially noteworthy: **Ferienland Donau-Ries e.V.** – representing comprehensive marketing cooperation of regional management and education, with project oriented collaboration up to shared financing, conversion management and undertakings in the theme of "regionality."

Through cooperation with the Ferienland Donau-Ries, the regional tourism marketing organization, there exist in turn manifold interconnections – “downstream” (that is, to the tourist information offices of the towns and communities) as well as “upstream” to the administrative region level (such as the Tourismusverband TV Allgäu Bavaria-Swabia), the state level (*BayTM*, the Bavarian Tourism Marketing Association) and even the federal *DZT* (the umbrella organization for German tourism). The Ferienland works with all of these organizations on state, national and international marketing activities and in this way positions the regional unique selling feature – the National Geopark Ries.

The **7-HillsTrail** demonstrates that the Geopark Ries is fundamentally receptive to all appropriate and relevant participation. This thematic hiking trail with an archeological focus was initiated by an amateur archeologist, implemented by the Geopark Ries and realized together with the Geopark’s entire network. The trail is maintained by the same amateur archeologist who started the project in motion.

The examples cited here are neither exclusive nor comprehensive but should provide insight into our collaborations. Our commitment to sustainability is described below.

### 3. Analysis of geo-tourism potential of the Geopark

Tourism demand has increased enormously since 2006. For this thesis, the authoritative data are derived from the regional setting of the Ferienland Donau-Ries. Indeed, the regions of the Ferienland Donau-Ries and the Geopark Ries are to a large extent identical. The development data shows the greatest increase precisely in the places and areas most relevant to geo-tourism.

From 2006 to 2015, the number of overnight stays in the Ferienland Donau-Ries increased 25.13%, compared to 17.45% in Bavaria as a whole. Far more significant is the number of day visitors. According to a study by the DWIF, in 2011 the regions of the Ferienland Donau-Ries had 5.2 million day visits, for value creation of 101.9 million €. For overnight tourists, the DWIF calculated value creation at 52.9 million €.

In Nördlingen, for example, as a central location and "perceived Ries center," the rate of increase in the same time period was over 80%.

We attribute these increases – but without further substantiation – to the dynamic development of the Geopark and our high and – in our view – efficient improvement in marketing the Geopark working with the Ferienland Donau-Ries.

The geo-tourism potential is far from being exhausted. The demand for especially close-to-nature experiences swells and plays a disproportionately role in decision making regarding vacation and day-visit destinations. And so, the exceptional and unique geo-tourism offers of the geoparks in general, on one hand, and the specialness of our meteorite crater, on the other hand, compound to improve the position in the tourism market. The UNESCO name registers a high degree of recognition, so that acceptance as a UGG would clearly foster our activities and objectives. We would expect a definite increase in international guests (currently about 22%).
4. Overview and policies for the sustainable development

(geo-) Tourism and economy

Our sustainability strategy for tourism development intends to fulfill more than the requirements of tourists and the local population. Our strategy should also be conducive to ensure and improve the future developmental possibilities. The natural and cultural integrity should be preserved and thus our tourism potential assured. Every new tourism project will therefore be measured in the spheres of ecological, economic and social activity. An example: The creation of a new hiking trail must be close to nature, yet compatible with fauna, flora and geology, adding value (gastronomy, hotel sector) and in agreement with the local population in view of the common welfare and quality of life. Still, the tourism development of the Geopark should also bring quantitative growth. We want to achieve further increase in overnight stays and day visits. The District of Donau-Ries has initiated another project important for the regional economy: The development of a regional brand DONAURIES. The geology of the Ries and the Geopark Ries play significant roles in this context. The impact crater was the crystallizing seed in this branding process, and besides the corporate design of the Geopark Ries, the regional identity of the crater should in the future be transported, communicated and promoted with the brand, internally as well as externally.

Education and science

Summary of the represented activities:
The Geopark Ries has a multitude of plans and projects in the area of education and science. The basis for the work in this area is the overall management plan (see Management plan, Vision, page 37. Implemented projects based on this include:
- Establishment of Information Centers with information boards, computer animation of Earth’s geological history including Ries impact, display cases with typical rocks; to serve as starting points for visits to the Geopark Ries and to introduce the fundamentals of the impact phenomenon and its consequences for the region (see D2, Infrastructure).
- Development of reservable guided tours of the Geopark Ries, including special offerings for school groups, by Geopark Ries tour guides (see D2, Geopark guides).
- Construction of geotopes and development of thematic hiking and nature trails, with the intent to facilitate on-site understanding and appreciation of the consequences of the impact events (see D2, Geopark thematic hiking trails, etc.).
- Positioning information boards on location (currently 80 in three different formats all incorporating the Geopark corporate design) which present, as vividly as possible in graphics and text, the impact events and consequences for geology, nature and ultimately culture (see D2, Infrastructure).
- Target-group specific marketing of the existing offerings, including those for schools and institutions of higher education (see D2 Marketing).
- Cooperation with universities to foster research in the region (see D2 Collaborations).
- Cooperation with universities to develop outside-the-classroom and outside-the-university learning locations in the Geopark Ries (see D2, Geopark & Schools, Collaborations).
- Development of unique teaching materials for schools about the impact phenomenon and its consequences (see D2, Geopark & Schools).
- Participation in networking in the area of education and training: cooperation with the Bayerischen Umweltministerium, collaboration with the educational region, cooperation with the German National Geoparks, collaboration with the educational region DONAURIES.

Geological heritage

The geological sites listed under section B were evaluated as much as possible according to the particular urgency and ability to be developed. The development in the past ten years has shown that stagnation is neither in sight nor is threatened. There are enough sites – geological and not geological – that positively cry out to be developed, and the impulse from the population is great enough, through their elected representatives or communicated directly to us, with requests for development formulated faster than we can deal with them in terms of financial as well as human resources. Up to now these requests could be incorporated into management’s goals, and it was always possible to achieve a balance within the region.
5. Policies for, and examples of, community empowerment
(Including NKrit 12 – Regional planning and participation as well as NKrit 13 – Sustainable site development)

Participation of citizens and decision makers in the Geopark Ries

As already described several times, since the Geopark is sustained by the administrative district, the political decision makers at all levels are “automatically” connected. Development plans as well as financing are approved and carried by official positions. The integration of every interested party on a permanent and/or a project specific basis is possible by means of the management system and especially the expert teams. For example, we have added a private citizen to the innermost management circles in the areas of geology and nature conservancy, where his know-how and commitment to volunteer service make substantial contribution. It is possible to play an instrumental role in the Geopark at any time. For example, to celebrate the Geopark’s 10th anniversary, a photography competition was held in summer 2016. This allowed every resident of the Geopark area to express their viewpoint through pictures. These photographs will be compiled in a newspaper supplement and in one or several traveling exhibits that the Geopark will loan out. In fall 2016, the Culinary Geopark hosted an event based on the “regional products” theme, to bring all of the eligible participants in the initiative closer together, to publicize the initiative – and the principles it represents – and to attract suitable new partners.

Whether permanent or project related, the members of the expert teams reflect all of the relevant institutions and represent their individual areas, beginning with BUND to financial support to management of a relevant company.

Representation of the Geopark in other bodies and processes

Through its structural integration with the Administrative Department of District Development and its institutionalization in the District of Donau-Ries, the Geopark Ries is closely interlocked with touristic marketing, land use regulation, nature conservancy authorities, etc. In the Ferienland Donau-Ries there are working groups in which many experts, volunteers and even the communities themselves collaborate on specific themes, as in the working group “Ries, Nature and Leisure” in which the Geopark is the point of emphasis. The Geopark is also officially represented in: LEADER-process Monheim-Alb-Altüml Jura and Hesselberg; regional and conversion management steering committee; the Heide Allianz; personal union by the Deputy Director of the Mission Statement Process and District Energy Management. Geopark management was completely integrated in the brand marketing development process.

Because the Chief Administrative Officer of the District of Donau-Ries is also the chairman of the Geopark as well as a member of the District Council with corresponding mandate, the Geopark is represented in regional, state and federal politics. Even though the Geopark is not an officially recognized representative of public interest, there is internal agreement when required. The District of Donau-Ries adopted its second mission statement in December 2016. The process of balancing the first overall concept, adopted by the district council in December 2004, was concluded in 2013. Process management was led by the Geopark’s Deputy Director in her capacity as an employee of the Administrative Department of District Development. The Geopark Ries is explicitly named in several areas of the list of objectives. The 2030 Goals for Sustainable Development are included in the Mission Statement 2025. Responsibility for the Energy Use Plan, Energy Goals and their implementation is also located within the Administrative Department of District Development. It is not a task of the Geopark to be concerned with resource management; however, it is a function of the Administrative Department of District Development and therefore is administrated for the region.

We are convinced, that it will be difficult to find another geopark that is so thoroughly integrated and interconnected in an organizational unit of an administrative body, that is prepared to commit itself over a very extended period of time to this level of successful and yet sustainable development in such a highly developed and economically successful region.
Excerpt from District of Donau-Ries Mission Statement 2025

The National Geopark Ries is the District’s most important unique selling point. The Geopark Ries’s vast educational potential in the areas of outside-the-classroom learning, geological history and explorative learning is especially beneficial, communicating the scientific contributions beyond District borders and promoting reference to the homeland.

**Geo-science**

At a glance:
- The National Geopark Ries is the region’s central educational institution for sustainability
- Collaborations with universities have been developed
- The National Geopark Ries is well utilized for educational and training purposes
- Tourism in the National Geopark Ries is further improved qualitatively

The Ries Crater is an outstanding worldwide document of our Earth’s geological past and evolution. Its geo-scientific development also has meaning for the contemporary questions of our civilization: Which geological and natural conditions are important for a sustainable development on our planet? The scientific, pedagogical and sociopolitical aspects of the history of the Ries Crater have been systematically developed—for practical educational work but also for tourism in the Ries area—by means of intensive cooperation with neighboring college and university locations since there is no university within the District.

With its geological fascinations, the National Geopark Ries is ensconced as a unique learning environment and destination for excursions.

**Economy**

**Tourism**

At a glance:
- Infrastructure improvement
- Commitment to sustainable tourism
- Strengthening of tourism marketing

The National Geopark Ries is competitively positioned in geo-tourism worldwide as a UNESCO Global Geopark. Tourism marketing has sufficient financial and personnel resources at its disposal to meet these requirements.

**Our Mission Statement in a global context**

Correspondingly, the existing District Mission Statement also apprehends its obligation within the goals of worldwide sustainable development as formulated in the Agenda 2030. It achieves a contribution toward realization of these goals in our areas of living and responsibility in the region. Thereby we purposely position our Mission Statement for the District of Donau-Ries in the global context.
6. Policies for, and examples of, public and stakeholder awareness in the Geopark

(With Supplement NKrit 9 – International collaboration)

Mission statement sustainability

The impulse to create a Geopark for the crater region of the Nördlinger Ries came from the work of the Agenda 21 program of the District of Donau-Ries in 2003. The first large “bottom-up” process in the District, Agenda 21 began in January 2000 and continued for more than five years. At its conclusion, the successfully initiated processes and products – together with other optional functions of the district – were combined in the Administrative Department for District Development. After evaluating the prospects and establishing the offices in spring 2004, the designation “National Geopark” and the goals related to it were viewed as good possibilities to support and accelerate the development of the region as defined by the 1992 Rio de Janeiro documents.

The objectives are to preserve natural resources of plants, animal and humans, economical use of land and soil and landscape-compatible transportation planning, to strengthen sustainable tourism as an economic factor and to harmonize economic development with the uniqueness of the landscape. To this day the Geopark has proven itself to be an identity generating element in regional development. Sustainable regional development is the primary goal.

The District of Donau-Ries devised a district mission statement as part of the Agenda 21 process. It was prepared on the basis of the usual methods involving the district and contained a compilation of strengths and objectives. The overriding guideline is sustainable development. All of the principles build a solid foundation for the sustainable development of the Geopark region. The mission statement adopted by the district council in December 2004 was evaluated in 2012 by the Administrative Department for District Development and revised with the broad participation of many important groups and individuals. The district council adopted the new, second mission statement in December 2016. Objectives for the Geopark are incorporated!

Energy Alliance and Energy Use Plan

The District of Donau-Ries has also been involved in energy initiatives since the Agenda 21 process. Comprehensive activities have resulted in the District achieving an extremely good standing in state and nationwide benchmarking related to the use of renewable energy for electricity and heating. The Energy Alliance was founded in 2009 to focus municipalities, private citizens and businesses on one main goal. District Development is also assigned this function. In 2014 the Energy Use Plan was adopted along with comprehensive implementation measures and controls.

Regional development, education

The educational region explained in A was integrated into regional management, which likewise was then itself integrated into the Administrative Department for District Development in 2010. Both integrations incorporated participatory processes, working with the “bottom up” approach and in which the management of the Geopark is involved. The new participatory educational management system, described earlier, is developed and managed here.
Contribution to joint Geopark activities

The Geopark Ries has played an ever active role in the network of German (and thereby also German UNESCO) geoparks since its inception: with moderation of (development) workshops as well as their arrangements, in the recently established Education for Sustainable Development working group, and in the nature parks working group.

We have been active in personnel arrangement as well as organization and equipment preparation, for example, at the German School Geography Day in Passau. We participate intensively in brand marketing activities that we consider decisive and very important in terms of the Geopark idea. We participate in all GeoTop meetings in Germany, often actively. The 2011 GeoTop meeting was held in Nördlingen. We have hosted the bi-annual Geopark conference two times. Effectively immediately, the Geopark Ries will be participating in international geopark meetings, beginning with the EGN Azores conference in September 2017. The Geopark Ries looks forward to collaborating on geopark projects at an international level and is willing to host international events.

Supplement NKrit 9:
(For further national and international collaboration – especially in the area of impact research – see "Collaboration – Ries Crater Museum")

The national and international collaboration in the area of impact research is to a large degree carried out by the Ries Crater Museum.

Intensive contacts exist to:
- Universities and colleges, especially in Munich, Göttingen, Berlin, Freiburg, Münster and Vienna,
- Geo-science museums: Natural History Museum in Berlin, Natural History Museum in Vienna, Senckenberg Dresden, and others,
- Museums: Steinheim Meteor-Crater Museum, Moldavite Museum Cesky Krumlov, Barringer Crater Museum, Jura Museum in Eichstätt, Museum Reich der Kristalle (Kingdom of Crystals) in Munich, Museum Mensch und Natur (natural history) in Munich, Museum for Natural History Berlin, Natural History Museum Vienna, Senckenberg Museum Dresden, and others,
- Deutschen Luft- und Raumfahrt Agentur (DLR) (German Air and Space Agency),
- European Space Agency (ESA),
- National Aeronautics and Space Administration (NASA) since 1970,*
- Lunar and Planetary Institute in Houston (LPI),
- The Meteoritical Society (International Society for Meteoritics and Planetary Science): Bestowal of 2016 Service Award to G. Pösges, leader of Expert Team 1 of the Geopark Ries,
- Max-Planck Institutes, such as the Max-Planck Institute for Solar System Research in Göttingen.
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- Space Agencies since 1970,*
- National Aeronautics and Space Administration (NASA) since 1970,*
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- Max-Planck Institutes, such as the Max-Planck Institute for Solar System Research in Göttingen.

A very special feature in this context is ZERIN – Zentrum für Ries und Impakt-Kraterforschung with its archive of core samples from the Ries. Researchers from around the world travel here, to develop their own understanding and carry out research on location.

Working in the field for more than 30 years, the GeoZentrum Nordbayern of Erlangen-Nuremberg University has expertise concerning field and laboratory research in the Ries Crater and its surroundings (Prof. Dr. R. Höfling and his working group together with international partners). A significant number of diploma, bachelor, master and Ph.D. theses has been successfully finished here. Two bachelor and one master theses are in progress. The corresponding data and experience provided and still give a major input into the creation of Ries geotope information panels.

*The Ries’s relationship with NASA can be traced back to its recognition as a meteorite impact crater. Dr. Eugene Shoemaker, the co-discoverer of the origin of the Ries, was the leading American geologist of his time and a consultant for NASA. Because the first lunar samples collected by the Apollo missions were not what he wanted to examine, Dr. Shoemaker arranged for the Apollo 14 and 17 astronauts to receive field training in the ways rocks are changed by the impact of meteorites—in the Ries in August 1970. The same quarrries that the astronauts—Alan Shepard, Ed Mitchell, Gene Cernan, Joe Engle—explored in their field training can now be visited in the Geopark Ries. To thank Nördlingen for its hospitality, NASA gave the Ries Crater Museum, on permanent loan, a piece of a Moon rock, the largest outside the US. Research in the Ries has been instrumental in the field of planetary science. Evidence from impact craters on Earth—especially the discovery of the Barringer Crater and the Nördlinger Ries—triggered a "Copernican Revolution" in the geosciences: The geocentric world view was substantially changed. It is now considered an open system that can be influenced by outside forces—meaning that meteorite impacts have left traces on Earth.
The Geopark Ries is an open network, in which everyone may participate.

E – Interest and arguments for becoming a UNESCO

The goals of the development strategy of our region coincide with those of UNESCO. Precisely the advancement of education, science and culture is an indispensable requirement for the sustainable development of our region (see Management plan, Vision, page 37). These themes are, therefore, the central building blocks of the mission statement of the District of Donau-Ries (see Excerpt from Mission Statement, page 46).

Geology, here the unique feature of the meteorite crater, bestows exceptional significance. With possible recognition as a UGG we want to anchor the commitment to the preservation of this unique geological heritage even deeper in the consciousness of the local population. As a UGG, we promise to use the stronger worldwide recognition to foster the feeling of self-worth of our citizens and through it their readiness to champion the sustainable development of their home region.

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