IUCN Conservation Outlook Assessment 2014 **(archived)**
Finalised on 23 September 2014

Please note: this is an archived Conservation Outlook Assessment for Vredefort Dome. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Vredefort Dome

SITE INFORMATION

Country:
South Africa
Inscribed in: 2005
Criteria:
(viii)

Site description:
Vredefort Dome, approximately 120 km south-west of Johannesburg, is a representative part of a larger meteorite impact structure, or astrobleme. Dating back 2,023 million years, it is the oldest astrobleme yet found on Earth. With a radius of 190 km, it is also the largest and the most deeply eroded. Vredefort Dome bears witness to the world's greatest known single energy release event, which had devastating global effects including, according to some scientists, major evolutionary changes. It provides critical evidence of the Earth's geological history and is crucial to understanding of the evolution of the planet. Despite the importance of impact sites to the planet's history, geological activity on the Earth's surface has led to the disappearance of evidence from most of them, and Vredefort is the only example to provide a full geological profile of an astrobleme below the crater floor. © UNESCO

SUMMARY

2014 Conservation Outlook

Significant concern

The geological values for which the Site has been inscribed on the World Heritage List have not been significantly impacted and remain intact, although some localized impacts may have occurred where specific geological evidence is vulnerable to damage caused by inappropriate visitation. The rural and natural landscape setting of the Site remains essentially intact, but unapproved tourism infrastructure development has caused some impacts. Pollution of the Vaal River from contamination by upstream mining activities remains the most significant threat to the landscape setting of the Site, with the potential to cause dieback of riparian vegetation. While the Republic of South Africa has taken steps to regulate tourism development and to address pollution of the Vaal River from communal waste water, the delay in the proclamation of the Site under national legislation, and the ensuing absence of a Management Authority, causes the Site to be inadequately protected. Until that situation has been adequately addressed, the Conservation Outlook of Vredefort Dome is of significant concern.

Current state and trend of VALUES

Low Concern
Trend: Stable

The geological features of the Site have not been significantly impacted and remain intact (RSA, 2013), although some minor localized impacts to specific geological evidence may have occurred. The rural and natural landscape setting of the Site is vulnerable to inappropriate development, and some limited impacts from unapproved tourism infrastructure developments have occurred (UNESCO and IUCN, 2010). Steps have been taken to regulate tourism development (RSA, 2013).

Overall THREATS

High Threat

Asteroid impact tourism is happening on an individual operator basis allowing for potential disturbance of sensitive sites. As such there is a significant risk that geological features are not adequately protected against theft and/or damage. Expansion of tourism infrastructure as well as uncontrolled tourism activities could potentially therefore have negative impacts on the scenic values of the site and on its geological features of Outstanding Universal Value.

Overall PROTECTION and MANAGEMENT

Serious Concern

Progress was made in 2012 with the signatory of a Memorandum of Agreement with private landowners, which is a key requirement for the proclamation of the World Heritage Site under national legislation. Nevertheless, in 2014 the proclamation of the site under national legislation is still not a fact. Similarly, no progress has been made with the establishment of a Management Authority. Although there are interim arrangements in place to ensure the management of the Site, significant gaps are likely to remain until a Management Authority is established and operational, and its responsibilities clearly defined.

FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ **Complex Meteorite impact structure (Astrobleme)**
Criterion:(viii)

Vredefort Dome is the oldest, largest, most deeply eroded complex meteorite structure in the world. It is circular in shape being 180 kilometres radius with the World Heritage property and serial sites sampling part of the ring structure and dome. It is the only example on Earth providing a full geological profile of an Astrobleme below the surface through high quality geological outcrops (IUCN 2005). The rural and natural landscapes of the property help portray the magnitude of the ring structures that were created by the impact (SOUV, 2014).

▶ **Impact structural features**
Criterion:(viii)

The detachment surface or fault plane (above which the rock displacement occurred) is evident at the property in ramp faults that underlie nappe structures (IUCN 2005).

▶ **Energy release evidence**
Criterion:(viii)

Vredefort Dome is the site of the world’s greatest known energy release event. The extreme physical conditions of the impact produced unique shock metamorphic effects that included shatter cones, impact related breccias (pseudotachylite), stress release features in very hard rock (chocolate tablet

boudinage brecciation); the creation of polymorphs of quartz (Coesite and Stishovite) and possible impact melting. Two Serial Sites help protect exemplar sites for the chocolate tablet boudinage brecciation and for pseudotachylite (IUCN 2005).

► **Evidence of rebound**
Criterion:(viii)

The core of the property includes rock equivalents to those found at a depth of 25 kilometres below the surface and those exposed to enormous energy release. They include granulite-hornfels facies grade metamorphics (IUCN 2005). The property exposes the rocks at the base of the Astrobleme structure.

► **Evidence of pre-impact environments**
Criterion:(viii)

Evidence of the surface of the site pre-impact is found through fossil stromatolites and these have been protected in one of the serial sites (IUCN 2005).

Other important biodiversity values

► **Fauna and flora values**

The site has remnant native flora environments which add to the rural – semi natural setting of the ring structure landscapes. It has important populations of butterflies (IUCN 2005).

Assessment information

Threats

Current Threats

High Threat

The property is managed by the Provinces, but the Management Authority actually responsible is yet to be established and Asteroid impact tourism is happening on an individual operator basis. Expansion of tourism infrastructure as well as uncontrolled tourism activities could have negative impacts on the scenic values of the site and on its geological features.
Due to further delays in the approval of management documentation (eg Integrated Management Plan (IMF), Environmental Management Framework (EMF), Spatial Development Framework, etc) the threat of tourism expansion and visitors number has again increased significantly (IUCN consultation, 2014).

► Tourism/ visitors/ recreation

High Threat
Inside site

A management plan has yet to be developed for the property. Access arrangements have yet to be determined. There is no agreed management plan, there are no formal access arrangements negotiated and tourism operations are happening and being negotiated on an individual operator basis (UNESCO-IUCN 2010, RSA 2013).

► Water Pollution, Household Sewage/ Urban Waste Water, Industrial/ Military Effluents

High Threat
Inside site
Outside site

The water quality of the Vaal River has been impacted by contamination from upstream mining activities outside the Site, and from the release of partially treated waste water both within and outside the Site (UNESCO and IUCN, 2010). In addition to concerns over general environmental health, extreme pollution from contamination by upstream mining activities has the potential to cause dieback of riparian vegetation, thereby impacting the rural and natural landscapes of the Site (UNESCO and IUCN, 2010) which help portray the magnitude of the ring structures resulting from the impact.

▶ Tourism/ Recreation Areas

Low Threat
Inside site

Expansion of tourism infrastructure has impact on the scenic and landscape features of the site. The State Party has taken direct steps to regulate illegal tourism developments on-site, and no new infringements have been reported (RSA 2013). The new Environmental Management Framework (EMF) being developed will determine the kind of land uses permissible for the area. The detail of this spatial planning tool is critical for ensuring protection of the rural-natural scenic and landscape values of the property (RSA 2013).

Potential Threats

High Threat

The potential for disturbance to sensitive sites and theft of geological features is high.

▶ Other Activities, Tourism/ visitors/ recreation

High Threat
Inside site

Geological values of the site are not being protected at key sites and specimens could be stolen (UNESCO-IUCN 2010).

▶ Mining/ Quarrying

Very Low Threat
Inside site

The private property status of the lands and their agricultural landuse may permit some quarrying activity (IUCN 2005), although this is not known to be the case at present.

Protection and management

Assessing Protection and Management

▶ Relationships with local people

Serious Concern

The site was inscribed in 2005. A Memorandum of Agreement (MoA) with the private landowners was only signed in 2012 (RSA 2013), and its implementation is still pending (IUCN consultation, 2014).

▶ Legal framework and enforcement

Serious Concern

Legislation has still to be enacted in 2013 to establish the legal basis for the WH property and its management. The MoA signed in 2012 provides the basis for the proclamation of the World Heritage Site under national legislation. According to the most recent information provided by the Government of South Africa, the necessary documents have been drafted and the proclamation would be gazetted shortly (RSA 2013). Until that process has been completed, there remains concern about the legal framework for the protection and management of the property. Despite the urgency of completing this process, it is reported to have derailed again in 2014 (IUCN consultation, 2014).

▶ Integration into regional and national planning systems

Serious Concern

Although the State Party (2013) reported that this work was underway, and that an integrated management plan had been developed which would guide a plan to be developed by the Management Authority (RSA 2013), in 2014 the Integrated Management Plan is yet to be finalized, and the Management Authority still has not been appointed (IUCN consultation, 2014).

▶ Management system

Serious Concern

The Management Authority has yet to be established. Its establishment is linked to the proclamation of the World Heritage Site under national legislation. In the meantime, the management of the property is ensured by the Provinces and facilitated by an interim Governmental Steering Committee (RSA 2013). Although the Government of South Africa has

reported (RSA, 2013) progress in the acquisition of land for a Management Authority office and the establishment of a business plan and Regulations, the current absence of a Management Authority remains a serious concern.

► Management effectiveness

Data Deficient

The Authority has not yet been established (RSA 2013). There is insufficient information to assess the effectiveness of the current interim management arrangements. The effectiveness of the Management Authority, once it is established, will depend on a clear definition of its responsibilities, the availability of sufficient funding, and the strength of cooperation with existing organisations and institutions (UNESCO and IUCN, 2010).

► Implementation of Committee decisions and recommendations

Some Concern

This work has been conscientious but slow; given the nature of the Tenure it has been difficult (RSA 2013).

► Boundaries

Some Concern

This work has been lower priority relative to other establishment tasks. A decision was made by South Africa not to demarcate the boundaries of the three satellite sites, as their current good condition is in part due to their exact locations not being generally known (RSA 2013). There remains uncertainty about whether the boundaries of these three satellite sites have been legally defined (SOC report, 2013).

► Sustainable finance

Data Deficient

The Management Authority is not yet operating (RSA 2013). There is insufficient information to assess the level of funding invested in the management of the World Heritage site within the current interim management arrangements.

▶ Staff training and development

Data Deficient

This topic is not relevant in the current absence of an operating Management Authority.

▶ Sustainable use

Data Deficient

There is insufficient information available to assess the measures that are in place to regulate sustainable use of the World Heritage Site. Unmanaged visitor use of geological sites has the potential to cause direct impacts to the geological evidence that underpins the inscription of Vredefort Dome on the World Heritage List.

▶ Education and interpretation programs

Data Deficient

In the absence of an operating Management Authority, there is insufficient information available about any education and interpretation programs that may be in place within the interim management arrangements.

▶ Tourism and interpretation

Some Concern

The Management Authority is not yet operating, and an overall tourism management plan is currently lacking (RSA 2013). Tourism activities are currently being carried out and negotiated on an individual operator basis (UNESCO and IUCN, 2010; RSA, 2013), which is a concern given the potential of unmanaged visitor use to cause damage to geological sites (see also the assessment of “sustainable use” above). Steps have been taken to regulate illegal tourism developments within the World Heritage Site (RSA, 2013).

▶ Monitoring

Some Concern

The Management Authority is not yet operating (RSA 2013). In the meantime, continuous monitoring of pollution of the Vaal River is in place, as well as monitoring of tourism developments to ensure compliance with

environmental and development legislation (RSA, 2013). No information is available about monitoring of geological sites.

▶ Research

Mostly Effective

Much geological research has been done at the site since it was first recognized in 1937, with at least 750 publications listed. To this day Vredefort Dome continues to be of considerable scientific interest (UNEP-WCMC and IUCN, 2005).

Overall assessment of protection and management

Serious Concern

Progress was made in 2012 with the signatory of a Memorandum of Agreement with private landowners, which is a key requirement for the proclamation of the World Heritage Site under national legislation. Nevertheless, in 2014 the proclamation of the site under national legislation is still not a fact. Similarly, no progress has been made with the establishment of a Management Authority. Although there are interim arrangements in place to ensure the management of the Site, significant gaps are likely to remain until a Management Authority is established and operational, and its responsibilities clearly defined.

▶ Assessment of the effectiveness of protection and management in addressing threats outside the site

Data Deficient

The Management Authority is not yet operating (RSA 2013). Once the Mangement Authority becomes operational, its effectiveness in addressing threats outside the site will depend on the strength of collaboration with relevant authorities, institutions, and organisations.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ Complex Meteorite impact structure (Astrobleme)

Low Concern
Trend:Improving

None of the available information suggests that the features of Vredefort Dome that display the full geological profile of an Astrobleme below the surface have been or are likely to be damaged or degraded. The rural and natural landscape setting of the property is vulnerable to uncontrolled development, and there has been some impact from illegal tourism infrastructure developments (UNESCO and IUCN, 2010). Steps have been taken to ensure that such developments are better regulated (RSA, 2013).

▶ Impact structural features

Good
Trend:Stable

The ramp faults displaying evidence of the fault plane have not been impacted and remain intact (RSA, 2013).

▶ Energy release evidence

Low Concern
Trend:Stable

The geological features displaying the evidence of the world’s greatest known energy release event remain intact (RSA, 2013). Some of these features are vulnerable to impacts from inappropriate visitor use (UNESCO and IUCN, 2010), and some minor localized impacts may have occurred.

▶ Evidence of rebound

Good
Trend:Stable

These features have not been impacted and remain intact (RSA, 2013).

▶ Evidence of pre-impact environments

Low Concern
Trend:Stable

Fossil stromatolites are protected in one of the satellite sites, however, they are vulnerable to impacts from inappropriate visitor use (UNESCO and IUCN, 2010). Some minor localized impacts may have occurred.

Other important biodiversity values

► Fauna and flora values

The site has remnant native flora environments which add to the rural – semi natural setting of the ring structure landscapes. It has important populations of butterflies (IUCN 2005).

Summary of the Values

► Assessment of the current state and trend of World Heritage values

Low Concern

Trend: Stable

The geological features of the Site have not been significantly impacted and remain intact (RSA, 2013), although some minor localized impacts to specific geological evidence may have occurred. The rural and natural landscape setting of the Site is vulnerable to inappropriate development, and some limited impacts from unapproved tourism infrastructure developments have occurred (UNESCO and IUCN, 2010). Steps have been taken to regulate tourism development (RSA, 2013).

► Assessment of the current state and trend of other important biodiversity values

Low Concern

Trend: Stable

The natural values remaining on site have essentially been protected voluntarily and there is some natural regeneration. Pollution of the Vaal River (both from sewage and contamination by upstream mining) is a concern, both in terms of general environmental health and its potential to cause dieback of riparian vegetation (UNESCO and IUCN, 2010). The Ngwathe and Parys waste water treatment works have been upgraded in order to improve

the water quality of the Vaal River (RSA, 2013).

Additional information

Key conservation issues

▶ **Absence of legislative status**
National

Proclamation of South Africa’s World Heritage Legislation for Vredefort Dome has not been completed.

▶ **Absence of a Management Authority**
National

The establishment of a Management Authority is directly linked to the proclamation of the Site under national legislation.

▶ **Absence of a Management Plan**
National

An Integrated Management Plan has been developed, which should guide the development of a Management Plan by the future Management Authority. Adoption of management documents remains pending.

▶ **Absence of an Integrated Environmental Management Framework**
National

Work on the development of an Environmental Management Framework has commenced, which will provide land use control for the Site and surrounding areas (RSA, 2013).

▶ **Absence of planned and supervised on-ground access**
National

In the absence of a Management Authority, there is no detailed management of key sites.

Benefits

Understanding Benefits

► Outdoor recreation and tourism

Economic benefits. Visitors will wish to see the site of the greatest release of energy on Earth. Tourism to the site will grow following improved management, access and information.

► Contribution to education

Education benefits: The Astrobleme is one of the great historical events on Earth and has immense benefits as part of the education of locals and other people of Earth

► Importance for research

Research benefits: The Astrobleme is one of the best sites on Earth to study the effects of a large asteroid impact event.

Summary of benefits

Vredefort Dome is an important site for ensuring greater understanding and knowledge of earth forming processes. In addition it provides economic benefits through tourism, as well as educational benefits.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1	Provincial Governments		Establishment of Visitor Centres, offices, supervising tourism developments, providing interim on-site protection.

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	Future Management Authority	Delineating the detailed boundary of the property	
2	Future Management Authority	Negotiating legal access for visitors and management protection investments for key sites	
3	Future Management Authority	Finalising Visitor Information Centres	
4	Future Management Authority	Building management access facilities for visitors	
5	Future Management Authority	Developing the suite of educational information for visitors	
6	Future Management Authority	Developing skilled and capacitated staff to manage the World Heritage Site on a day to day basis and give effect to interpretation. In addition to undertake regular Management Effectiveness Assessments.	
7	Future Management Authority	Identify research needs and solicit researchers	

REFERENCES

№	References
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2	RSA [Republic of South Africa] (2013) State of Conservation Report for the Vredefort Dome World Heritage Site, Department of Environmental Affairs, Government of the Republic of South Africa, Pretoria
3	Statement of Outstanding Universal Value (SOUV), http://whc.unesco.org/en/list/1162, accessed September 2014.
4	UNEP-WCMC and IUCN, 2005. Vredefort Dome World Heritage Information Sheet.
5	UNESCO-IUCN (2010) [United Nations Educational, Scientific Cultural Organisation – [International Union for the Conservation of Nature] (2010) Vredefort Dome (South Africa) Report of the Joint UNESCO-IUCN Monitoring Mission, 10-14th September 2010, IUCN, 28 Rue Mauverney, Gland