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# Environmental Issues and Sustainable Development of Karst Landforms of the Kanger Valley Region, Bastar, Chhattisgarh, India

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## ABSTRACT

Caves are one of the foremost imperative and well-known topographical highlights in the world, a natural and social legacy, as well as a critical financial asset for numerous nations. The entire Bastar Region is endowed with Natural Resources. Kanger Valley National Park area is not an exception. This Region is famous for its Biodiversity, Geodiversity, and caves. The Kotumsar, Dandak, Kailash, Aranyak, Gupteshwar, etc. caves enkindle deep divine devotion amongst the tribal people of Bastar. These caves become Centres of pilgrimage during the Mahashivratri pooja. Apart from that several thousand tourists visit these caves and the tourism-related sector flourishes and paves the way for the creation of livelihood for the local population. The development of Karst topography, the development of underground caves, beautiful speleothems, hams, and solution valleys, all make this area very unique. Reasons behind the confinement of Karst Topography and Caves in this area are evident. The presence of faults, folds, joints, rivers, and intrusive bodies all indicate why these caves are so beautifully and extensively developed in this area. Apart from that Natural and exotic landscapes of Tiriya, Machkote, Gupteshwar, and Kanger Valley need utmost care and attention so that these natural treasures can be preserved, despite human encroachment and intervention. Industrial development of the far-flung tribal and densely forested region is a debatable issue; sometimes policymakers insist on the concept of sustainable development. This paper aims to signify the importance of this region amongst the policymakers, common people, and geo heritage enthusiasts so that we together may preserve the uniqueness of this region and take an initiative for the development of Geopark and Geotourism related activities so that objective of conservation and sustainable development can be achieved.

*Key words: Speleothems, Hams, Geotourism*

## Introduction

The Kanger valley national park region has a unique karst landform. The Speleothems, Geological structures, fauna, and flora in and around this region need conservation and sustainable development Gautam (2014). The Kanger Valley region represents a complete lithological succession of the Indravati

Group of rock formations. The Archaean basement is exposed near the Darbha ghat area followed by the Tirathgarh sandstone, Cherakur shale and sandstone, Kanger Limestone, and Jagdalpur shale member respectively. The Tirathgarh, Keam, and Kerka faults here made this region suitable for the development of the karst landscape and the origin of waterfalls. Several explored and unexplored caves

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make this region heaven for the speleologist and common curious persons. Kotamsar, Dandak, Kailash, Madarkonta, and Gupteshwar caves are well-known caves in this region. Some new caves have been explored recently and chances of finding several new caves can't be ruled out. All these explored caves are ornamented with stalactites, stalagmites, cave pillars, joints, indications of subterranean flow, and subterranean waterfalls. Water bodies inside the cave have very interesting fauna. Gupta *et al.* (2022).

**Materials and Methods**

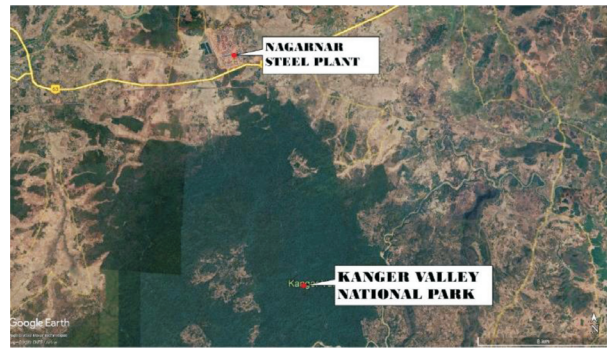
**Study area**

The study area Kanger Valley region, situated in the southern part of Chhattisgarh. (Map. 1). Kanger Valley region and adjoining area belong to the Indravati basin which covers the toposheet no 65F/13,65J/1 and 65J/5. The study area falls under the (A) 81°51'8"E, 18°57'43"N, (B) 82°9'8"E, 18°45'50" N, and (C) 82°16'4" E, 18°56'46" Coordinates, and falls at an altitude of meters from the M.S.L. Kanger valley. Kanger Valley is spread over 200 square kilometers. Jha *et al.* (2009).

**Environmental issues of caves and other resources in the Kanger Valley Region**

Construction of the Nagarnar Integrated Steel plant and sprawling Limestone quarries near the National Park area may affect the flora and fauna of the adjoining areas (Fig. 1).

In the Kanger Valley region development of karst topography is unique because the entire of central India has the presence of carbonate rocks but the

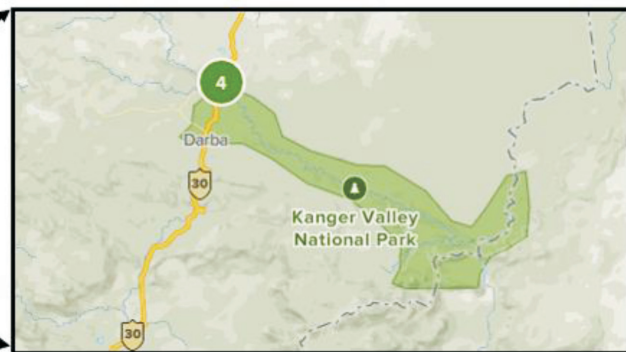


**Fig. 1.** Satellite imagery of Nagarnar integrated steel plant and Kanger valley national park.

development of karst topography particularly underground carbonate caves is quite evident in this region. These carbonate caves have the presence of very well-developed and well-preserved speleothems. Gupta *et al.* (2021). Apart from that, subterranean flow inside the caves during the monsoon period makes these caves susceptible to the introduction of pollutants inside the caves. During the monsoon period when there is heavy rainfall in this region; several ephemeral waterfalls and subterranean flows during this period become so pronounced that the potential threat of several mechanical weathering and collapse of already loose blocks inside the cave cannot be ruled out (Fig. 2). At the same time, the movement of anthropogenic pollutants inside the cave is increased because some caves are situated in a depression-like portion of the Kanger valley Region. All the above-mentioned reasons may impose an adverse effect on the fauna inside the cave as well as pose a threat to the development of speleothems inside the caves. Brinkmann



**Map 1.** Location of Kanger Valley National Park in Map of Chhattisgarh (source-<https://www.slideshare.net/pankujanku/chhattisgarh-district>)



**Map 2.** Kanger Valley National Park (source- <https://www.alltrails.com./parks/india/chhattisgarh/kanger-valley-ghati-national-park>)



**Fig. 2.** Subterranean flow inside the caves during the monsoon period.

and Mario (2012).

One more worth mentioning aspect is over exposure of Kotamsar Cave for the tourists during peak tour periods. Non-regulated and overcrowding of tourists inside the cave may seriously affect the fragile ecosystem of this beautiful and famous cave.

The Kotamsar Cave is not only the cave situated in this National Park area but also several other natural caves exist in this area. It is our responsibility to be vigilant about a harmonious existence.

Pahadi Maina /Hill Maina (*Gracula religiosa*), and other species of birds, butterflies, sloth bears, crocodiles, deer, etc. are natural habitats of these



**Fig. 3.** Satellite imagery of Chhote Kadma mine and cave.

areas ever since a long time but human encroachment is gradually changing this healthy coexistence and environment. Pati and Agrawal. (2002)

Massive illicit deforestation, poaching, and human intervention are responsible for the migration of tigers, leopards, and other species of wild lives from this region. It is the need of the hour to spread awareness and necessary actions are required by the responsible authority to achieve harmonious development. Jha *et al.* (2015).

**Here two observations are worth mentioning**

**First** – The Chhote Kadama (coordinates 18.972610N, 81.862035E) area adjoining the Kanger Valley National Park. Many limestone quarries are operating here; as a consequence of that explosions and movements of heavy vehicles are not uncommon. These activities always pose an adverse effect

**Table 1.** Information regarding tourism-related activities.

Month	Barrier Name - Kotamsar				
	Number of Tourists from Chhattisgarh	Number of Tourists from outside Chhattisgarh	No. of Foreign Tourists	Total No. of Tourists	Total Received Fee amount
January 2022	4919	0	0	4919	205265
February 2022	1944	0	0	1944	81900
March 2022	2302	0	0	2302	91635
April 2022	2171	0	0	2171	547500
May 2022	3972	0	0	3972	993000
June 2022	4728	0	0	4728	11822000
July 2022	0	0	0	0	0
August 2022	0	0	0	0	0
September 2022	0	0	0	0	0
October 2022	2016	0	0	2016	960100
November 2022	3982	523	12	4517	2066975
December 2022	10334	195	4	10533	4648250
<b>Total</b>	<b>36368</b>	<b>718</b>	<b>16</b>	<b>37102</b>	<b>10776625</b>

(Source: office of the Kanger valley national park)

on wildlife. Apart from that threat to the existence of the caves nearby; cannot be ruled out.

In this satellite imagery; one can observe the proximity of this cave to the limestone quarry. Frequent use of explosives and movements of heavy vehicles over the last several years have disturbed the natural habitats of the wild organism in this region.

### Second observation

Thousands of tourists visit the famous Kotamsar cave. A huge number of tourists inside the cave consume oxygen during breathing and they exhale CO<sub>2</sub>. therefore, deficiency of oxygen is prevalent during the peak hours of tourist visits to the cave; which poses a serious threat to the cave ecosystem.

### Conclusion

- Proper regulation of tourist movements inside the cave should be maintained so that the biological demand for oxygen can be maintained.
- The use of explosives in the nearby region must be banned and the movement of heavy vehicles should be avoided in the proximity of any cave.
- The use of plastics, caves electrification, and chemicals should not be allowed inside the cave.
- Cave animals are adopted for such environmental conditions artificial sources of light disturb their natural existence; therefore, electrification of caves must be avoided.
- Marking of Eco-sensitive zones inside the cave must be done and the movement of tourists in that eco-sensitive zone should be avoided.
- Engraving names etc. in the cave wall or speleothems is a very bad action by any tourist.
- Human touch and excavation of cave soil by any tourists should not be allowed
- In the Machkote, Tiriya, and Gupteswar, area very unique landforms have been developed by river erosion. These natural landforms and the presence of stromatolites (an indication of the presence of one of the most primitive life forms on Earth) and biodiversity need to be taken proper care of to preserve this uniqueness.

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