



THE ECOLOGICAL CRISIS IN THE ARAVALI HILLS OF GURGAON: A STUDY

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ABSTRACT

The Aravalli Hills of Gurgaon, India, are facing a critical ecological crisis, which is a result of rapid urbanization and industrialization in the region. This study aims to assess the current condition of the Aravalli Hills and examine the major ecological challenges faced in the region. The study found that the hills have been stripped of their natural vegetation, leading to soil erosion and degradation, loss of biodiversity, and ecological imbalance. Additionally, illegal mining activities and declining groundwater levels have further exacerbated the situation.

The study highlights the need for effective measures to conserve and restore the ecological balance in the region, including reforestation, stricter enforcement of mining regulations, and promotion of sustainable practices. The study also identifies the impact of air pollution and water pollution on the local population and their health, calling for urgent action to be taken to address these environmental challenges.

The study concludes that the current ecological crisis in the Aravalli Hills of Gurgaon is a result of human activities, and it is our responsibility to take action to protect this important ecosystem. The findings of this study serve as a call to action, urging all stakeholders to work together to conserve and restore the ecological balance in the Aravalli Hills. It is time for us to take concrete steps towards a more sustainable future, and the protection of the Aravalli Hills is a crucial first step in this direction.

KEYWORDS

Aravalli, Ecology, Illegal Mining, Restoration, Urbanization

INTRODUCTION

The Aravalli Range is a range of mountains in western India, running approximately 800 km (500 mi) from northeast to southwest across the states of Rajasthan, Haryana, and Gujarat. It is one of the oldest mountain ranges in the world, with a geological history dating back to more than 1.5 billion years ago.

The Aravalli Range is known for its diverse flora and fauna, with many species of plants and animals found only in this region. The forests of the Aravalli Range are home to a variety of wildlife, including leopards, hyenas, wild boars, and antelopes.



Figure 1 Aravalli Range

Source: Hindustan Times

The range has been heavily exploited over the years for its mineral resources, including copper, zinc, and lead. This has led to significant environmental degradation and loss of habitat for many species. However, in recent years, there has been growing awareness of the need to protect the Aravalli Range and its biodiversity, and efforts are underway to restore and preserve the region's natural resources.

HISTORY

The history of the Aravalli Range can be traced back to ancient times, with evidence of human habitation in the region dating back to the Palaeolithic era.

In ancient times, the Aravalli Range was an important centre of trade and commerce, with several important trade routes passing through the region. The Aravalli Range was also an important centre of religious and cultural activity, with several ancient temples and monuments located in the region. The range has also been associated with several important historical figures, including the legendary warrior-king Prithvi Raj Chauhan (Ministry of Tourism, n.d.).

During the medieval period, the Aravalli Range was ruled by several powerful Rajput kingdoms, including the Chauhan dynasty, the Tomar dynasty, and the Kachwaha dynasty. These kingdoms were known for their military prowess, as well as their patronage of the arts and culture. The Aravalli Range was also an important centre of Jainism, with several important Jain temples located in the region (Britannica, n.d.).

During the colonial period, the Aravalli Range was part of British India, with the British establishing several hill stations in the region for their officials and soldiers. The Aravalli Range was also an important centre of the Indian independence movement, with several important leaders of the movement, including Mahatma Gandhi, visiting the region.

Today, the Aravalli Range is an important ecological and cultural heritage site, with several important wildlife sanctuaries and protected areas located in the region. The range is also an important centre of tourism, with several important tourist destinations, including the cities of Udaipur and Jaipur, located in the region.

GEOLOGY

The geology of the Aravalli Range is characterized by a variety of rocks and geological formations, including gneiss, schist, quartzite, limestone, sandstone, and volcanic rocks. These rocks represent a wide range of ages, from the Archean to the Paleogene, and are evidence of the diverse geological processes that have shaped the region. The Aravalli Range is believed to have formed during the Proterozoic era, around 2.5 billion years ago, as a result of the collision of the Indian and Eurasian tectonic plates. This collision led to the formation of the Aravalli-Delhi orogenic belt, which includes the Aravalli Range, the Delhi Ridge, and the Chambal Valley (Ed. Stanley Wolpert & Santa Barbara, 2006).

During the Proterozoic era, the Aravalli Range was subjected to intense metamorphism, resulting in the formation of gneiss and schist rocks. These rocks are rich in minerals such as quartz, feldspar, mica, and garnet, and are characterized by their banded appearance.

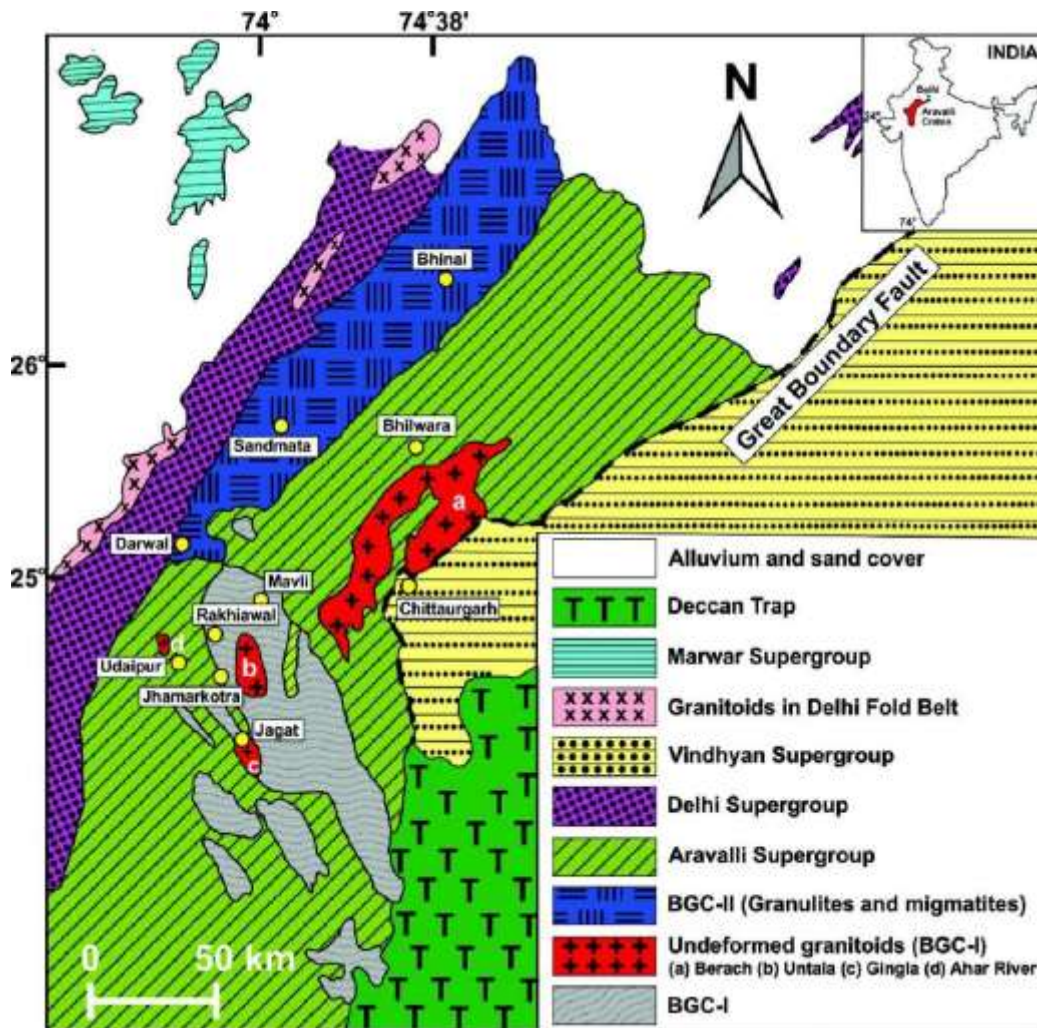


Figure 2 Generalized geological map of the Aravalli Craton

Source: Semantic Scholar



In the Paleoproterozoic era, around 2 billion years ago, the Aravalli Range was subjected to volcanic activity, resulting in the formation of basalt and andesite rocks. These volcanic rocks are found in the southern part of the Aravalli Range and are evidence of the region's volcanic history (India Environment Portal, n.d.).

During the Mesozoic era, around 250 million years ago, the Aravalli Range has uplifted again, leading to the formation of the Delhi Supergroup. The Delhi Supergroup consists of sandstone, shale, and limestone rocks that were deposited in shallow seas and deltaic environments (S. Singh, 2018).

In the Cenozoic era, around 50 million years ago, the Aravalli Range was subjected to extensive weathering and erosion, resulting in the formation of the present-day topography of the region. The range was also affected by volcanic activity during this time, resulting in the formation of lava flows and volcanic ash deposits. The Aravalli Range is an important source of mineral resources, including copper, zinc, lead, and silver. The region has been subjected to extensive mining activity over the years, leading to significant environmental degradation and loss of habitat for many species (S. G. Sridhar, 2013).

In recent years, there has been growing awareness of the need to protect the Aravalli Range and its biodiversity. Efforts are underway to restore and preserve the region's natural resources, including afforestation, reclamation of mining sites, and restoration of degraded areas.

In conclusion, the Aravalli Range is a complex geological structure that has been shaped by a variety of geological processes over billions of years. Its rich and diverse geology is evidence of the region's dynamic history and provides important insights into the evolution of the earth's crust. The Aravalli Range is an important natural resource that must be protected and conserved for future generations.

IMPORTANCE OF ARAVALLI

The Aravalli Range in India is of significant importance for various reasons. Here are some of the main reasons why the Aravalli Range is important:

1. **Ecological Importance:** The Aravalli Range is home to a wide variety of flora and fauna, including several endangered species like leopards, hyenas, and Indian pangolins. The hills also play a vital role in regulating the regional climate and act as a natural barrier against dust and sandstorms. The range is also a major source of groundwater recharge and provides water to several rivers and lakes in the region (S. K. Gupta & S. K. Verma, 2017).
2. **Cultural Importance:** The Aravalli Range has a rich cultural heritage associated with several important historical figures, including the legendary warrior-king Prithvi Raj Chauhan. The region is also home to several ancient temples and monuments, including the Dilwara Temples in Mount Abu and the Kirti Stambh in Chittorgarh (S. K. Sharma, 2001).
3. **Economic Importance:** The Aravalli Range is an important centre of agriculture and mining, with several mineral-rich areas located in the region. The range is also an important source of marble and granite, with several mining sites located in the hills.



4. **Tourist Attraction:** The Aravalli Range is a major tourist attraction and is home to several popular destinations, including the cities of Udaipur and Jaipur. The range is also home to several wildlife sanctuaries and national parks, including the Sariska National Park and the Mount Abu Wildlife Sanctuary.
5. **Spiritual Importance:** The Aravalli Range is an important centre of spirituality, with several ancient temples and shrines located in the hills. The region is also home to several holy sites associated with Jainism, including the Dilwara Temples in Mount Abu (P. R. Gupta, 2014).

In summary, the Aravalli Range in India is important for its ecological, cultural, economic, tourist, and spiritual significance. It is a vital resource that needs to be protected and conserved for future generations.

THE EXPLOITATION OF ARAVALLI

The Aravalli Range in India is facing an ecological crisis due to a range of human activities that are impacting its biodiversity, soil and water resources, and ecosystem services. The region is facing a range of environmental problems, including deforestation, mining, urbanization, and pollution, which are causing serious ecological damage to the area.

- **Deforestation:** Deforestation is a major problem in the Aravalli Range, with large areas of forest being cleared for agriculture, urbanization, and mining. The Aravalli Range is one of the few remaining forested areas in the region, and the loss of forests has serious implications for the region's biodiversity, soil and water resources, and ecosystem services. The deforestation of the Aravalli Range has led to the loss of habitat for many species of plants and animals and has disrupted the delicate balance of ecosystems in the region. The loss of forests has also led to soil erosion, degradation of water resources, and increased vulnerability to natural disasters such as landslides and floods. Deforestation has also had serious implications for the climate, as forests play a key role in regulating the earth's climate by sequestering carbon dioxide from the atmosphere (NASA, n.d.). The loss of forests in the Aravalli Range has contributed to increased levels of greenhouse gases in the atmosphere, exacerbating the problem of climate change. The deforestation of the Aravalli Range is largely driven by human activities such as agriculture, urbanization, and mining. The expansion of agriculture into forested areas has led to the conversion of forests into farmland, resulting in the loss of forest cover. Urbanization has also led to the expansion of cities and towns into forested areas, resulting in the loss of habitat for many species. Mining activities have also contributed to deforestation, with large areas of forest being cleared for mining operations.
- **Mining:** Illegal mining is a major problem in the Aravalli Range, with unregulated mining activities being carried out in the region for minerals such as copper, zinc, and lead. Illegal mining activities have serious environmental implications, including soil erosion, water pollution, and loss of habitat for many species. The mining activities have also disrupted the ecosystem services provided by the Aravalli Range, such as groundwater recharge, which has important implications for the region's water resources and sustainability. Illegal mining in the Aravalli Range is largely driven by the demand for minerals and the lack of effective regulation and enforcement mechanisms (Down to Earth, 2020). Despite the existence of laws and regulations to govern mining activities in the region, illegal mining continues to be a problem due to weak enforcement and corruption. The illegal mining activities in the Aravalli Range have serious implications for the environment and local communities. The mining activities have resulted in the degradation of soil and water resources, which has impacted agriculture and the livelihoods of local communities. The loss of



habitat for many species has also disrupted the delicate balance of ecosystems in the region, leading to a decline in biodiversity.



Figure 3 Illegal Mining at Aravalli

Source: India Times

- **Urbanization:** Urbanization has had a significant impact on the Aravalli Range in India. The region has experienced rapid urban growth in recent years, with cities and towns expanding into forested areas and agricultural lands, resulting in the loss of habitat for many species and the degradation of natural resources. One of the main impacts of urbanization on the Aravalli Range has been the loss of forest cover (P. Bhatnagar & M. N. Jha, n.d.). The expansion of cities and towns into forested areas has resulted in the conversion of forests into urban areas, resulting in the loss of habitat for many species. This has disrupted the delicate balance of ecosystems in the region, leading to a decline in biodiversity. Another impact of urbanization on the Aravalli Range has been the degradation of soil and water resources. The construction of buildings and infrastructure has led to soil erosion and increased runoff, which has resulted in the loss of topsoil and the degradation of water resources. This has had serious implications for agriculture and the livelihoods of local communities. Urbanization has also led to increased demand for natural resources, such as water and energy, which has further exacerbated the ecological crisis in the region. The over-extraction of groundwater has resulted in a decline in groundwater levels, which has impacted agriculture and the availability of water for domestic and industrial use. Furthermore, urbanization has also contributed to increased pollution in the Aravalli Range. Industrial pollution, vehicular pollution, and agricultural pollution have all contributed to environmental degradation in the region. Pollution has led to air and water pollution, soil degradation, and loss of biodiversity, which have important implications for human health and environmental sustainability.
- **Pollution:** Pollution has had a significant effect on the Aravalli Range in India, with air and water pollution being the main types of pollution in the region. The pollution has resulted in the degradation of natural resources and the loss of biodiversity, which has serious implications for the environment and human health. Air pollution is a major problem in the Aravalli Range, with industrial pollution, vehicular pollution, and agricultural pollution being the main sources of pollution. The region has experienced rapid urban growth in recent years, which has resulted in increased traffic congestion and the expansion of industries. This has



contributed to increased levels of air pollution, which has resulted in respiratory problems, cardiovascular diseases, and other health problems (S. Das, 2018). Water pollution is also a major problem in the Aravalli Range, with industrial effluents, agricultural runoff, and untreated sewage being the main sources of pollution. The pollution has resulted in the degradation of water resources, which has impacted the availability of clean water for drinking and irrigation. The pollution has also impacted aquatic life, leading to the loss of biodiversity in the region. Pollution has also had a significant impact on soil health in the Aravalli Range. The pollution has resulted in the degradation of soil, which has impacted agricultural productivity and the availability of natural resources. The loss of soil fertility has also impacted the health of natural ecosystems, leading to a decline in biodiversity.

The Policy Problem in Haryana

In the case of Haryana, several other issues also remain. One of these is of ownership and the process of privatization of land in the Haryana Aravallis. In the 1970s, when changes were made to the common land ownership norms, instead of transferring the common land to the forest department, the state government, vested it with the village panchayats as per the Punjab Village Common Lands Act (applicable to Haryana). Later during the 1970s-80s, the revenue department allowed the transfer of shares in common land to the stakeholders. Thus, the land was apportioned among landowners and sold off at a low price, creating scope for the resale of the land to make profits. According to environmentalists, this forms the basis of the privatization of Aravallis in Haryana, especially around Delhi where the real estate interest continues to be high. Another issue is regarding the definition of forest. In T.N. GODAVARMAN THIRUMULPAD VERSUS UNION OF INDIA AND ORS18 (1996 Judgment), the apex court laid down the provisions of the Forest (Conservation) Act 1980, which shall apply to all thickly wooded areas. However, the state of Haryana has failed to record or notify major parts of the Aravalli forests. The state has also failed to officially notify around 60,000 acres of the Aravallis as the Natural Conservation Zone (NCZ) as per the Regional Plan 2021 of the National Capital Regional Planning Board, formulated in 2005. The NCZ status allows construction only in 0.5 per cent of the area and its purpose as specified should be “regional recreational activities”.¹⁹ Thus without any legal protection, the forests of Aravallis continue to be exploited by the real estate lobby and threatened by deforestation. The ineffective implementation of the policies, lack of political will and rising urbanization have given a serious blow to the Aravallis ecosystem. The various adverse impacts of this have been highlighted in the next section.

Relation of Aravalli and DLF in Gurugram

It is important to note that the Aravalli Range is a complex ecosystem that is under threat from various factors, including deforestation, mining, urbanization, and agricultural activities. Therefore, it is difficult to attribute the degradation of the Aravallis solely to DLF's development activities in Gurgaon.

That being said, there have been concerns about the impact of DLF's development projects on the Aravallis. Some of DLF's projects in Gurgaon were found to violate environmental regulations and were subsequently cancelled or modified by the courts. In some cases, DLF was found to have encroached on forest land in the Aravallis, leading to protests and legal action.

DLF has also been accused of causing damage to the Aravalli ecosystem through its mining activities. In 2011, DLF was fined by the Haryana government for illegal mining in the Aravalli hills (Bennett & Coleman & Co. Ltd, n.d.). There have also been concerns about the impact of DLF's construction activities on the groundwater resources of the Aravalli, which are critical for the survival of the ecosystem and the people living in the region.



Overall, while it is difficult to say that DLF destroyed the Aravallis while developing Gurgaon, their development activities have been a subject of controversy and concern, with some of their projects being found to violate environmental laws and regulations. The Aravallis are a critical ecosystem, and it is essential that any development activities in the region are carried out in an environmentally sustainable manner, with due consideration for the ecological, social, and economic implications.

Places of Destruction

The Aravalli Mountain range is an important ecological and geological feature in northern and western India, and its destruction can have far-reaching consequences for the region's environment and communities. However, it is important to note that the Aravalli range is not a single entity that can be destroyed all at once. Instead, it is a complex system of hills, valleys, forests, and waterways that can be impacted in different ways by human activities.

That being said, there have been instances of damage and destruction to various parts of the Aravalli range due to mining, quarrying, and other human activities. Some of the places that have been impacted by such activities include:

The Faridabad-Gurugram-Mewat belt: This region, which falls in the National Capital Region (NCR), has seen extensive mining and quarrying activities over the years, leading to severe damage to the Aravalli hills and its natural resources. The hills here have been flattened to create space for real estate projects, while the rivers and streams have been polluted due to mining waste and other industrial effluents.

Alwar district: Alwar is a district in the eastern part of Rajasthan that is known for its rich biodiversity and natural beauty. However, the Aravalli hills in this region have been subjected to mining and quarrying activities for several decades, leading to extensive deforestation, soil erosion, and loss of wildlife habitat.

Udaipur district: The Aravalli hills in the Udaipur district of Rajasthan are home to several important wildlife sanctuaries and national parks, including the Kumbhalgarh Wildlife Sanctuary and the Sariska Tiger Reserve. However, these protected areas have been threatened by mining and quarrying activities, which have led to deforestation, soil erosion, and loss of wildlife habitat.

Overall, it is important to note that the destruction of the Aravalli range can have severe ecological, social, and economic consequences, and it is crucial to take steps to protect and conserve this vital natural resource.

Stakeholders to save Aravalli's

Several individuals and organizations have been working tirelessly to save the Aravallis and restore its ecological health. Some of these include:

- **Aravalli Bachao Citizens Movement:** This is a community-led organization that has been advocating for the protection of the Aravallis for over a decade. They have been actively involved in protests and campaigns against mining, deforestation, and other activities that threaten the ecosystem.



- Haryana Forest Department: The forest department of Haryana has been taking various initiatives to restore the degraded forest cover in the Aravallis. They have been involved in afforestation drives, soil conservation, and biodiversity conservation efforts in the region.



Figure 4 Save Aravalli Trust

Source: India Times

- NGOs: Several non-governmental organizations, such as the Wildlife Institute of India, the Aravalli Foundation, and the Aga Khan Rural Support Programme, have been working on conservation projects in the Aravallis. They have been involved in habitat restoration, wildlife conservation, and community development initiatives in the region.
- Researchers and scientists: Researchers and scientists from various institutions, including universities and research organizations, have been conducting studies on the Aravallis to understand the ecological dynamics of the region and develop conservation strategies.
- Local communities: The local communities living in and around the Aravallis have also been actively involved in conservation efforts. They have been involved in afforestation drives, biodiversity conservation, and water conservation initiatives in the region.

Upcoming projects that might affect Aravalli

However, some upcoming projects in the vicinity of the Aravallis in Gurgaon have raised concerns among environmentalists and local communities. Here are some examples:

1. Gurugram-Faridabad metro link: The proposed metro link between Gurugram and Faridabad will pass through the Aravalli Range. There are concerns that the construction and operation of the metro line could



have adverse effects on the Aravalli ecosystem, including soil erosion, loss of biodiversity, and disruption of wildlife corridors.

2. KMP expressway: The Kundli-Manesar-Palwal (KMP) expressway is a 135-kilometre-long expressway that will pass through several districts in Haryana, including Gurgaon. The expressway will cut through the Aravalli Range, raising concerns about its impact on the ecosystem and the people living in the region.
3. Bandhwari waste-to-energy plant: The Bandhwari waste-to-energy plant is a controversial project that has been in the works for several years. The plant is designed to convert municipal waste into energy, but its location in the Aravalli foothills has raised concerns about its impact on the ecosystem and the health of the people living in the vicinity.

Any upcoming projects in the Aravalli region must be subject to rigorous environmental impact assessments and be carried out in a manner that minimizes their impact on the ecosystem. The conservation of the Aravalli ecosystem is critical for the sustainable development of the region and the well-being of the people living in the vicinity.

Protection

Recently in 2022, the Supreme Court of India extended Green Protection to forest land in the Aravalli ranges.

The court's ruling will mean around 30,000 hectares across the Aravallis and Shivaliks in Haryana will be considered forest land.

The Supreme Court held that all land covered by the special orders issued under Section 4 of the Punjab Land Preservation Act (PLPA) in Haryana will be treated as forests and be entitled to protection under the 1980 Forest Conservation Act.

Such land covered under Section 4 can see no commercial activity or non-forest use without the consent of the central government.

It also stated that land covered by the special orders issued under Section 4 of PLPA have all the trappings of forest lands within the meaning of Section 2 of the Forest Act.

The court directed the state government to clear any non-forest activity from such land in three months and report compliance.

The bench considered a September 2018 judgment which held all land under PLPA could be treated as forest.

The recent verdict clarified that the previous judgment failed to closely examine the scheme of Section 4 of PLPA and its legal effect in relation to Section 2 of the Forest Act.



Satellite Images of Aravalli



Figure 5 Satellite Image of 1984

Source: Google Earth

Built up area near Aravalli is 15.5 km².



Figure 6 Satellite Image of 1994

Source: Google Earth



Built up area near Aravalli is 23.5 km².



Figure 7 Satellite Image of 2004

Source: Google Earth

Built up area near Aravalli is 52.2 km².



Figure 8 Satellite Image of 2014

Source: Google Earth

Built up area near Aravalli is 146 km².

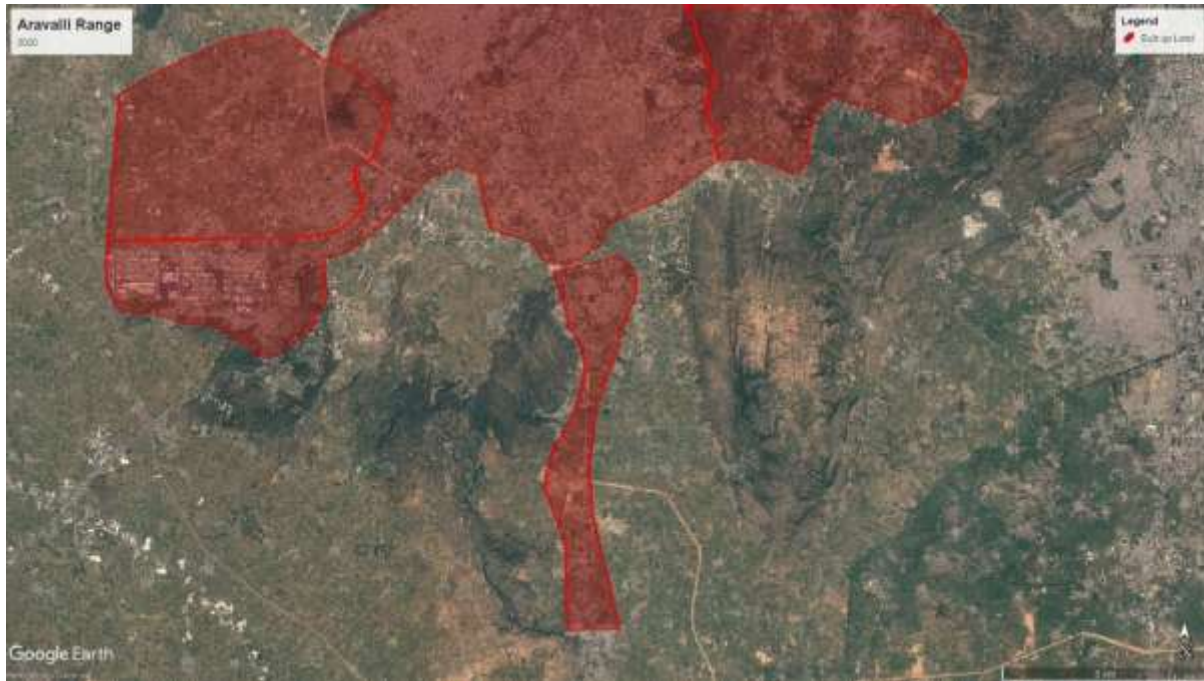


Figure 8 Satellite Image of 2020

Source: Google Earth

Built up area near Aravalli is 291.2 km².

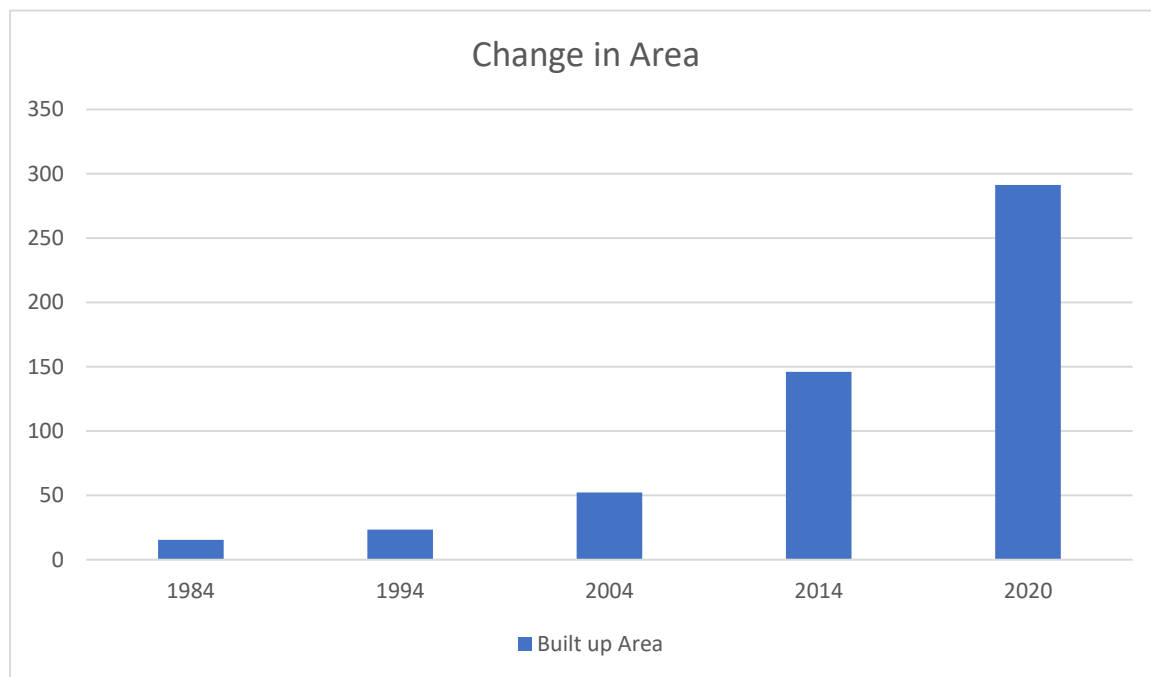


Table 1 Change in Built-up Area



Conclusion

In conclusion, the Aravalli Range is a significant geological and ecological feature in northern and western India, with a rich cultural and historical heritage. The range has faced various environmental challenges over the years, including deforestation, mining, urbanization, and pollution, which have caused significant damage to its natural resources. However, efforts are being made to restore and preserve the Aravalli Range's biodiversity and ecosystem services through afforestation, reclamation of mining sites, and restoration of degraded areas. It is essential to take steps to protect and conserve this vital natural resource, which has far-reaching ecological, social, and economic consequences. Several individuals and organizations are working tirelessly to save the Aravalli Range and restore its ecological health, including the Aravalli Bachao Citizens Movement, the Haryana Forest Department, and NGOs. It is crucial to recognize the complexity of the Aravalli Range ecosystem and work towards sustainable development and conservation practices to ensure its survival for generations to come.

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