International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 1, ISSN No. 2455-2143, Pages 732-736
Published Online May 2020 in IJEAST (http://www.ijeast.com)

DETAIL STUDY ABOUT GAWILGARH FORT IMPORTANCE IN MAHARASHTRA, INDIA USING GEOSPATIAL TECHNOLOGY

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Abstract— **Chikhaldara is a famous cold place in Vidarbha. Legend has it that the story of the Kichak massacre in the Mahabharata took place in this place. While the Pandavas were in hiding, Bhima killed Kichka at this place and threw him into the valley. That is why this place got the name Kichkadara, which is a corruption of the name of this village "Chikhaldara". Gawilgarh is on the list of mudflats. But since the perimeter of the fort is huge, tourists go back to see the outside of the fort. The entire fort is seen in the whole day because the fort is divided in two parts seen in output. Gawilgarh fort top elevation is nearby 1065-1070m from AMSL. Gawilgarh fort is the Central Archaeological Survey of India Protected monument (Central ASI). The forest in the hilly area of Melghat is typical Southern dry deciduous forest seen in land use land cover Gawilgarh Fort. Archaeological & historical importance is the Gawilgarh Fort in Master base map.**

Keywords: Fort, SRTM DEM, ALOS PALSAR DEM, Land use/Land cover, Master Base Map, Remote sensing, Geographical Information System.

I. INTRODUCTION

Maharashtra there are 350 Forts, so, it is said that Forts are the brilliance of Maharashtra (Wikipedia). Considering the scope of Indian and Maharashtra history traces, historical study centers should be set up in selected forts.

A historic building just to show off a beautiful garden and laser beam shows is like diverting the attention of tourists from history. The system of the present Department of Archeology, which is under the jurisdiction of the Central and Maharashtra Governments, is insufficient to conserve and protect these structures.

Many of these forts still maintain their beauty. Including Raigad, Rajgad, Karnala Fort, Sindhudurg and Pratapgad. This twin fortification was built with the exceptional rules from Shivaji. This fortress is celebrated for its tranquil natural excellence and its notable significance (Trekshitiz).

Shivaji Maharaj was born on Shivneri fort (Trekshitiz). Shivneri Fort is one twenty km. from Pune city (Trekshitiz). One must see the 300-year-old fine engineering stronghold of some fort. Fort is perfect for trekking.

The forts built or conquered by the Maharaja on the shoulders of the Sahyadri are still standing in mind but some the forts are in the state of disrepair due to indifference of the government and citizens. We can see these 350 forts which were built conquered by Maharaj as a memorial of Maharaj. This fort is a precious deposit Maharashtra.
One such fort in Amravati district is like Gawilgarh fort (Wikipedia).

II. STUDY AREA

The study area is found in the Lawada village, North West parts of the Amravati district, Maharashtra. The study area covered during this investigation is about 8.50 sq.km falls between Longitude 77°19'53.289"E to 77°20'58.901"E and latitude 21°22'14.971"N to 21°23'5.128" N (Fig: 1). Gawilgarh fort is the distance of three km from Chikhaldara village. Nagpur is that the closest airport, 230 km away, while Amravati is that the closest railway station, 100 km away. Well-connected road is to be the Chikhaldara (Trekshitiz).
Chikhaldara is a famous cold place in Vidarbha (Wikipedia).
The fort also called Gawilgad fort was a very much braced mountain fortress of the Maratha Empire north of the Deccan Plateau, within the region Melghat Tiger Reserve, Amravati District, and Maharashtra.

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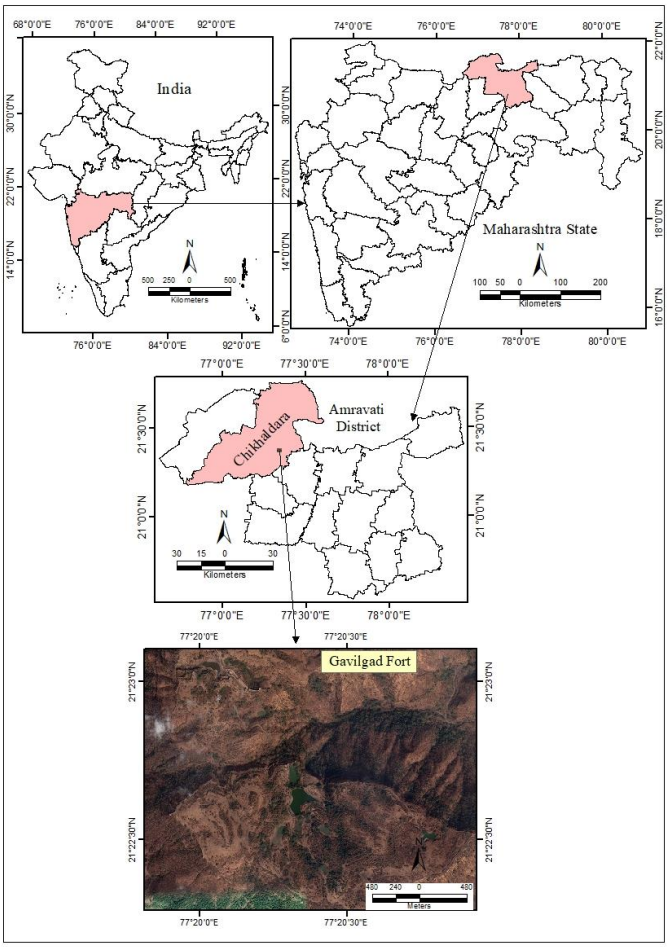

Fig. 1. Location Map of Study Area

III. OBJECTIVES

The target of this study is explore the fort and surrounding areas the following specific objectives will be pursued in order to achieve the aim above.

- To Generated the Contour Map & Hill Shade From SRTM and ALOS PALSAR Elevation Data.
- To Generated base map of Fort include all fort monuments. All Archaeological Importance Monuments.
- To generated Land use /Land cover map 23 March 2019 & 28 November 2019.
- Transport map for how to reach the fort.
- Other open-source data available on the internet like (Ex. Fort Sketch, ISRO Bhuvan Data Drainage, Watershed)

IV. MATERIALS, METHODS & SOFTWARE USE

A. Elevation data use for Contour & Hill Shade & others
SRTM- The Shuttle Radar Topography Mission (SRTM) was flown aboard the space shuttle Endeavour February 11-22, 2000. SRTM spatial resolution is 30m (Demirkesen 2008) for in-text citation.
ALOS PALSAR- From 2006 to 2011, PALSAR's L-band engineered gap radar (SAR) yielded point by point, all-climate, day-and-night perception, just as rehash pass interferometry (https://asf.alaska.edu/). PALSAR information is from numerous perception modes with variable polarization, goals, area width, and off-nadir edge (https://asf.alaska.edu/). PALSAR was one of three instruments on the Advanced Land Observing Satellite-1 (ALOS), otherwise called DAICHI, created to add to the fields of mapping, exact provincial land-inclusion perception, debacle checking, and asset looking over (https://asf.alaska.edu/). ALOS was a crucial the Japan Aerospace Exploration Agency (JAXA) (https://asf.alaska.edu/). The DEM Resolution is 12.5 m. (Oliveira et al. 2012) for in-text citation.

C. Very High Resolution (VHR) Open Source Data of Google Earth, Resolution Nearby 0.07m for Generated Base Map or Master Plan of Fort Gawilgarh.

D. Satellite Data Sentinel – 2B for Land use Land Cover
Sentinel-2 is an Earth perception strategic the Copernicus Program that efficiently secures optical symbolism at high spatial resolution (10 m to 60 m). The crucial a wide scope of administrations and applications, for example, agrarian checking, crises the executives, land spread grouping or water quality.
Sentinel-2B is Multispectral image with the 13 bands in the visible spectral band, near-infrared, and short wave infrared part of the Electromagnetic spectrum (Lee et al. 1999).
Band-2, Band-3, Band-4, Band-8 Composited or layer stack image (10 m Resolution) and False Color Composite (FFC) for Land use / Land cover map of Gawilgarh Fort.
Classification Technique - These are False Color Composited (FCC) Image for classification were outwardly understanding utilizing on-screen digitizing so as to depict the land spread classes that could be effectively deciphered, for example, Built-up territory, Forest and Agricultural land, Waterbody for Land use/Land Cover Map data use two seasons 23 March 2019 and 28 November 2019 (Sachin et al. 2004) for in-text citation.
Software use: QGIS, ArcGis 10.5, Google Earth

V. RESULT & DISCUSSIONS

Contour Map - Study area elevation details of fort and surrounding. SRTM and ALOS PALSAR Elevation data download from website. Generated 5m interval contour (Fig. 2) from SRTM data & ALOS PALSAR data in ArcGis software.
Hill Generated from SRTM & ALOS PALSAR Data. (Fig. 3)

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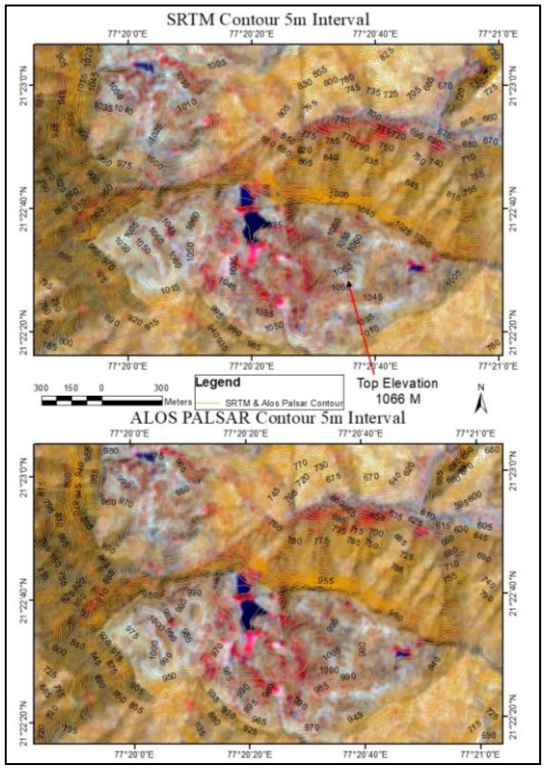

Fig. 2. Contour Map of Gawilgarh Fort

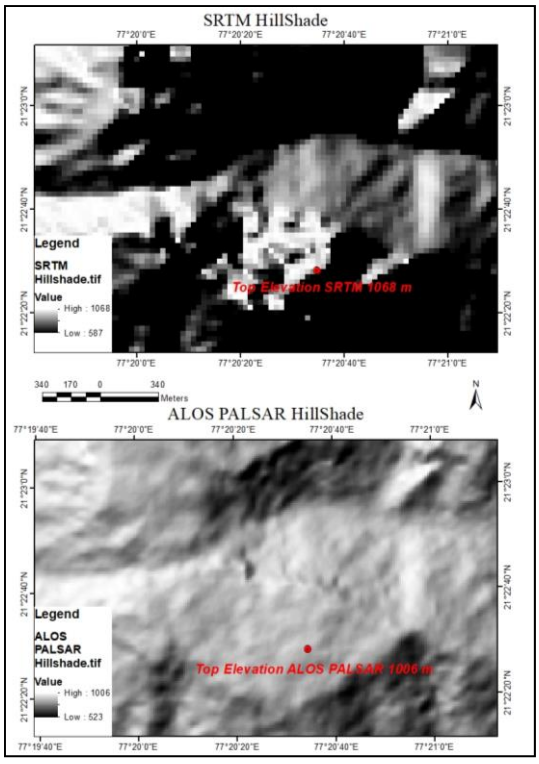

Fig. 3. HillShade Map of Gawilgarh Fort

Master Base Map – Interpreted the google satellite open-source image and generated the master base map of the fort with all monuments present on the fort. Historical & archaeological importance monuments are mapped. (Fig. 4)

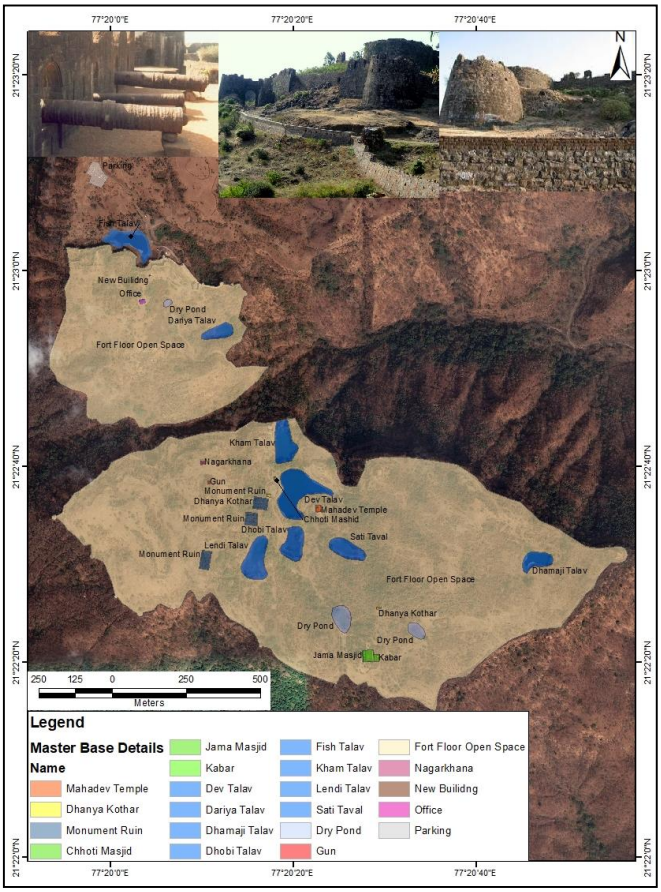

Fig. 4. Master Base map with Photo of Gawilgarh Fort

Three management/buffer - areas are delineated around every monument/heritage site using remote sensing and GIS tools. These buffer areas are defined according to the Ancient Monuments and Archaeological Site and Remains (AMASR 2010) Act of GoI. (Fig. 5)

Protected area: It is the management core zone enclosing the heritage site/monument with its various elements. The ownership of this area is generally with the ASI and is directly under its full administrative control. The protected zone has been delineated using the footprint of the heritage site seen clearly on the high-resolution satellite data or by superimposing the boundary derived from the collateral data onto the satellite data, or generating a vector from field surveys using customized mobile apps based on GPS and mobile GIS technology exclusively developed for this project.

Prohibited area: It is a 100 m buffer area around the designated the protected area of a heritage site/monument.

Prohibited area: It is a 100 m buffer area around the designated protected area of a heritage site/monument.

Regulated area: It is a 200 m buffer area around the prohibited area.

These three management buffer zones define the protection status of the monuments and also the conservation strategy to be adopted. The protected area prescribes the zone of no development and complete conservation of all the elements within its jurisdiction.

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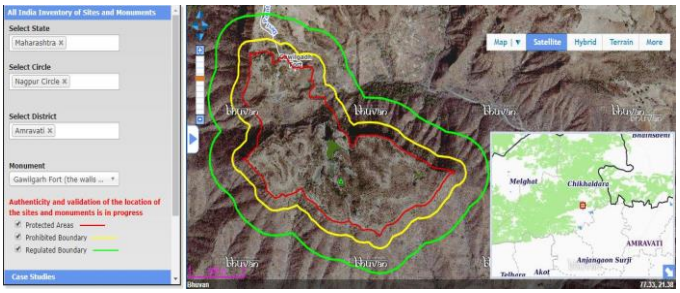

Fig. 5. Three management buffer Monuments, Archaeological Site

Landuse/Landcover Map – Interpreted the FCC sentinel-2B 23 March 2019 & 28 November 2019. On-screen digitize. 6 Landuse landcover class Agriculture plantation, Buildup, Deciduous forest, Dry deciduous forest, Waste scrub and open, Waterbody. (Fig. 6)

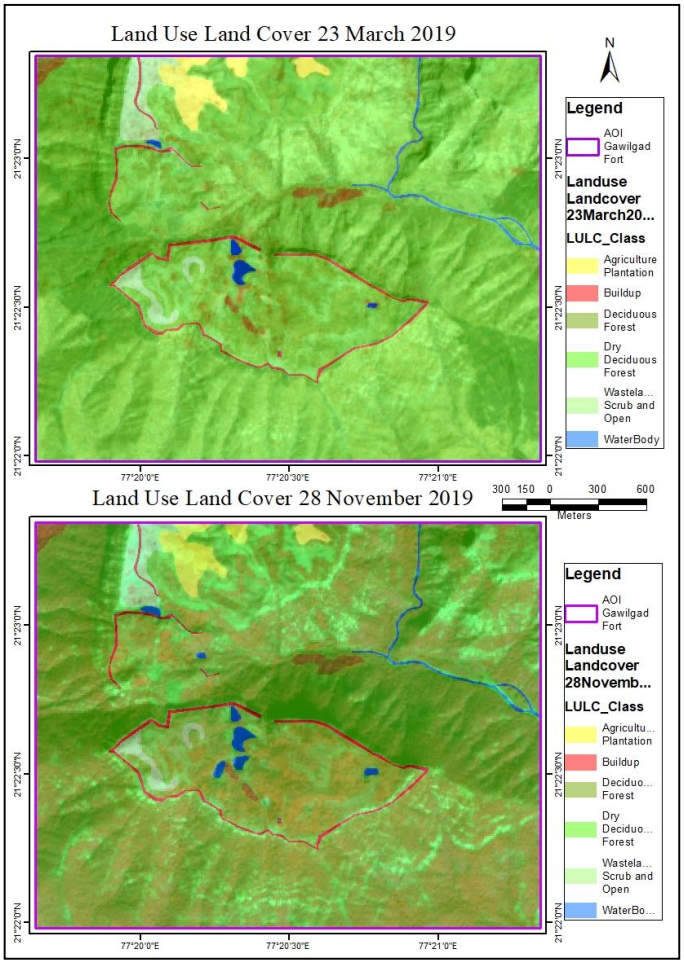

Fig. 6. Land use Land Cover Map of Gawilgarh Fort

Road Map – Transport data download from Open Street Map (OSM) (Fig. 7) AOI in red color for the study area of fort & surrounding.

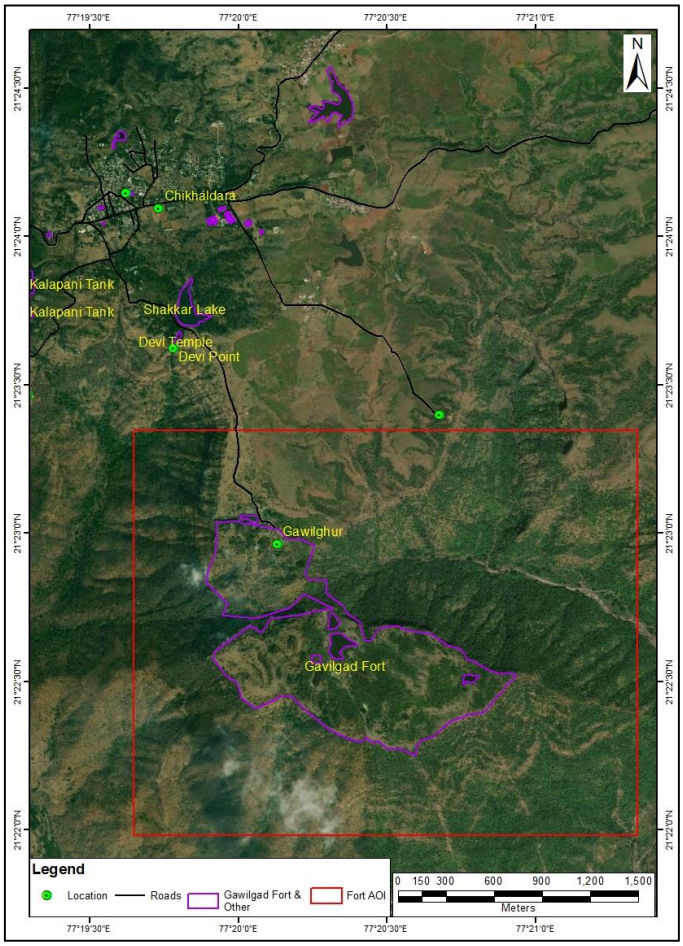

Fig. 7. Transport map of Gawilgarh Fort

Watershed and three management buffer – 6 Watershed intersect to the fort. (Fig. 8)

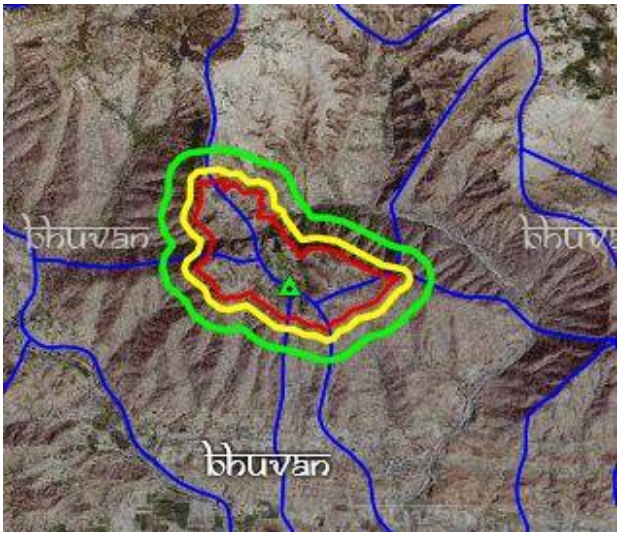

Fig. 8. Watershed and three management buffer

Drainage map with three management buffer – this map downloads from Bhuvan ISRO portal. (Fig. 9)

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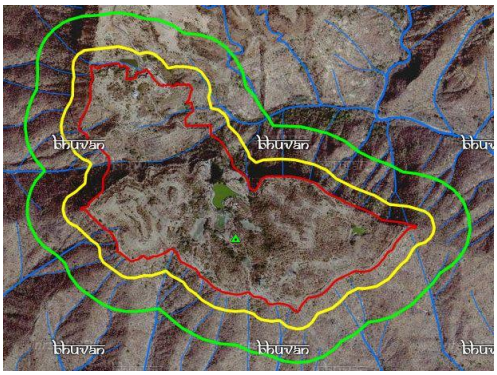

Fig. 9. Drainage & with three buffers & Gawilgarh Fort

VI. CONCLUSION

This paper is about the detailed study about Gawilgarh fort, chikhaldara tahsil, Maharashtra, India using Geospatial Technology. From the results, Shuttle radar topographic mission (SRTM) DEM, ALOS PALSAR DEM elevation not the same SRTM Resolution Low but accuracy is good, ALOS PALSAR resolution is 12.5 m but accuracy but not good for this analysis. The Top elevation is SRTM DEM on the Gawilgarh fort 1068m match to the Google earth elevation. Gawilgarh fort is a hill fort. Investigate the fort Waterbody through a master base map of the fort there are total 11 water bodies on the fort 8 with water and 3 are dry fort Gawilgarh. In the master base map 3 Archaeological excavation (3 monument ruins) seen there.

it is evident that Land Use Land Cover map for the canopy are removed in summer season 23 march 2019 and post monsoon season 28 November 2019 recover the canopy cover also in Waterbody change the water availability in the pond post-monsoon season.

Well transport facility reach to the fort is seen in the road map. Open area for parking vehicle far the way from the fort.

Three management/buffers - areas are delineated around every monument/heritage site using remote sensing and GIS tools. These buffer areas are defined according to the Ancient Monuments and Archaeological Site and Remains (AMASR 2010) Act of GoI. Importance of Archaeological monuments

VII. ACKNOWLEGEMENTS

This work was supported by Maharashtra Remote Sensing application centre and my Friends, Maharashtra, India.

Thanks to ISRO to providing the Importance of Archaeological monuments three management/buffers. Thanks to Japan Aerospace Exploration Agency (JAXA) to available the ALOS PALSAR Digital Elevation Model (DEM). Thanks to International Journal of Engineering Applied Sciences and Technology suggest to correction in my Research Journal.

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