

# Streaming National Maps as a Service to India

As the seventh largest country in the world by area, India boasts an extremely diverse landscape. From the Himalayan mountains, the Indo-Gangetic Plain, and the Thar Desert to Indian Ocean coastlines and densely populated cities along India's three major rivers, providing maps and geospatial data for such varied geographical regions presents a tremendous challenge.

National Informatics Centre (NIC) provides map services to the national government of India and different departments of state governments across the country.

NIC has been a lead developer of e-Governance applications for the Government of India, down to the grassroots level, as well as a promoter of digital opportunities for sustainable development for the country. Through its ICT Network, NICNET, NIC has institutional linkages with all the Ministries and Departments of the Central Government, 37 State Governments and Union Territories, and about 720 District Administrations in India.



## Taking a National GIS Framework to the Next Level

To support the Indian government's Digital India initiative to transform the country to a digitally empowered society, NIC sought to create a national image web service of natural color products and imagery.

Previously, NIC developed a National GIS Framework at 1:50,000 scale for planning, decision-making and e-governance projects for planning commissioning. Due to limitations of content, the existing GIS framework was proposed to be upgraded at a scale of 1:10,000.

NIC wanted to incorporate high-resolution standard datasets of the country's Indian Remote Sensing satellite sensors (IRS), in particular Cartosat-1 and Resourcesat-2 satellites, for a project "Up-scaling of Multilayer GIS framework," which aims at upgrading NIC's existing basemap services to 1:10,000 scale for both street map and satellite data services.

At present, many Indian GIS applications are unable to provide the Indian satellite data as basemaps. So, the GIS applications have been incorporating commercial maps in their backdrops, which is against the Government of India's Remote Sensing Data Policy of 2011.

By developing a national image service, NIC can ensure that Indian GIS applications will consume a national service in any e-gov application in a secured environment, help agencies to better understand the topography of an area for improved planning and better utilization of the resources available, and provide an image service that adheres to Remote Sensing Data Policy of 2011 and avoids dependence on commercial services.





## Preparing Imagery for a National Basemap

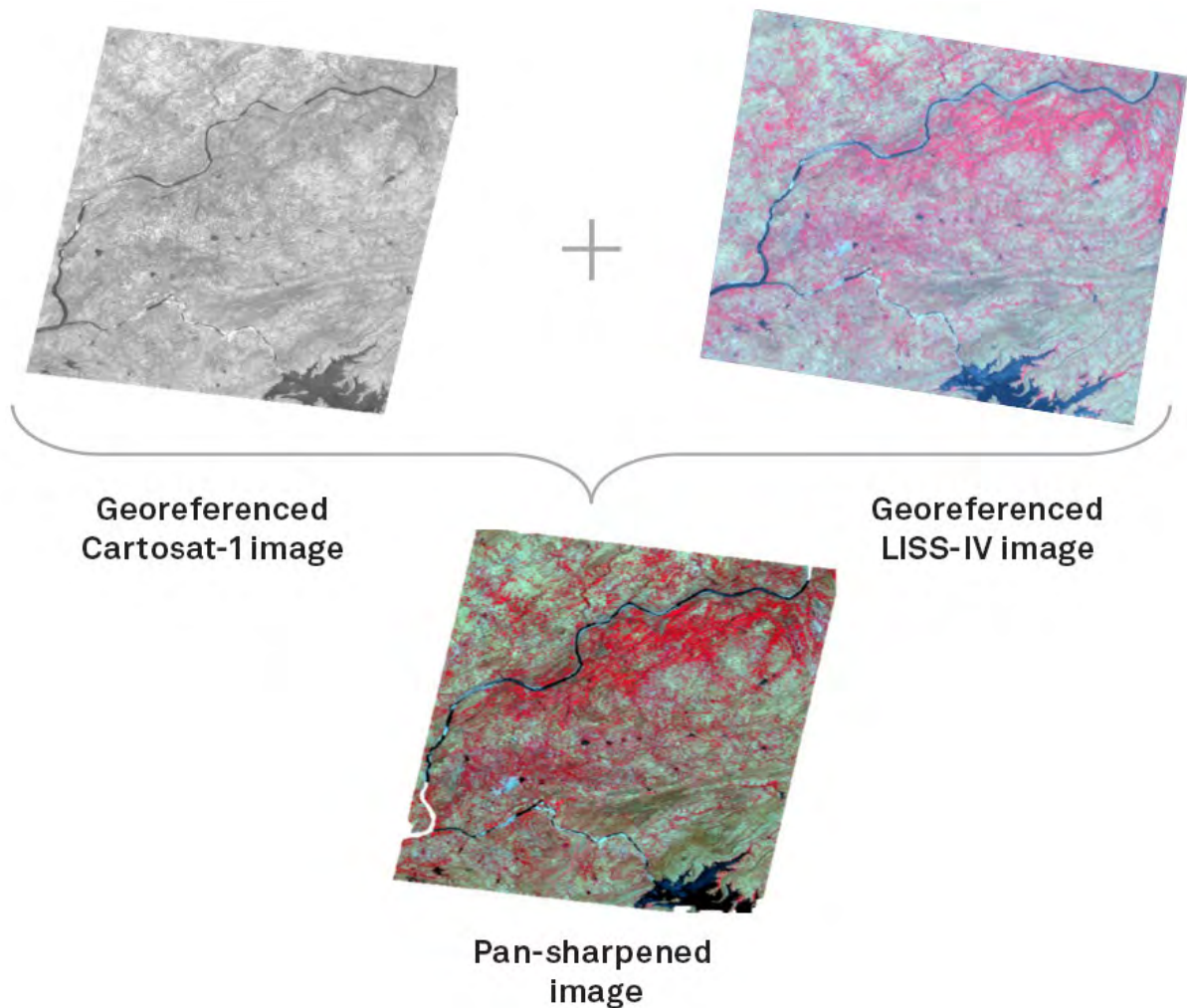
To prepare the country-wide basemap, high-resolution satellite imagery of the entire country were captured to using Cartosat-1 and the LISS-IV camera on board the Resourcesat-2 satellite. The project intended to use satellite imagery to enrich the content of existing road and rail networks, rivers, bridges, large power stations, helipads, water bodies, settlements, built-up areas, forests, communication lines, and more.

Approximately 7,500 Cartosat scenes of resolution 2.5 meter and 1,200 LISS scenes of resolution 5.0 meter were procured. These scenes were individually georeferenced with the available external global services using ERDAS IMAGINE® Expansion Pack tools.

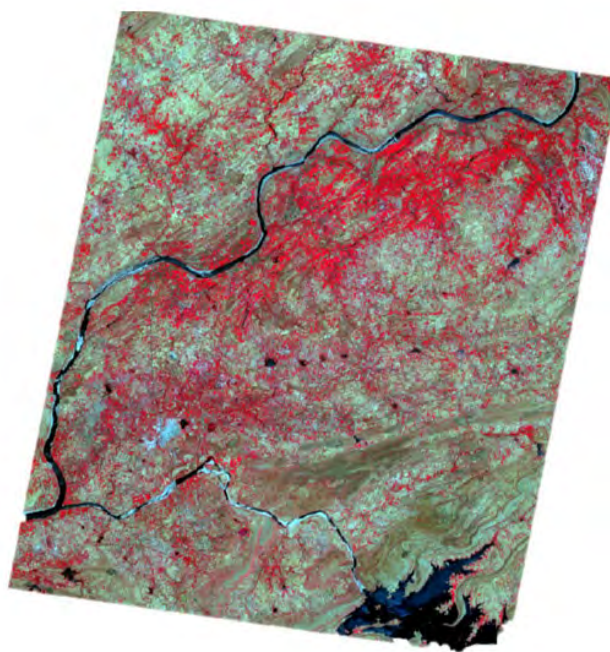
The high-resolution Cartosat scenes are panchromatic (greyscale), and the lower-resolution LISS scenes are multi-spectral, meaning they contain different spectral bands that produce what is known as false color. However, to accurately interpret and use geodata, non-remote sensing professionals need the data to have its natural color.

By using pan sharpening techniques and ERDAS IMAGINE's Natural color tool, NIC merged Cartosat scenes and LISS scenes together to create natural color imagery product by adding a synthesized/artificial blue band to the image.

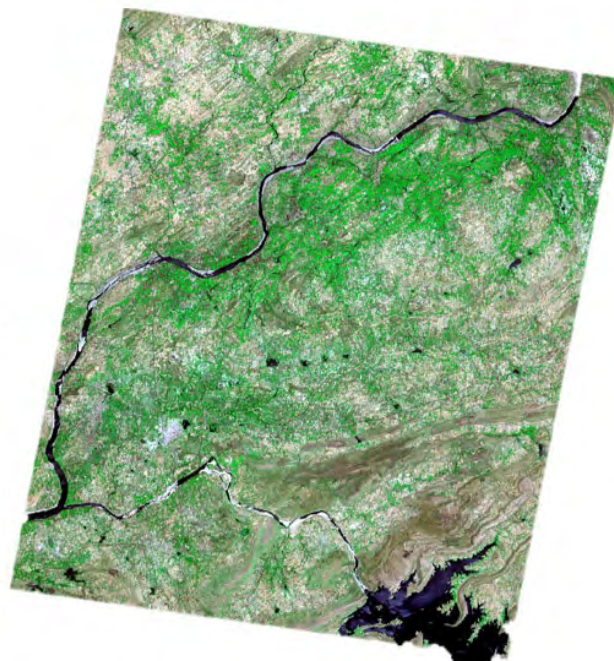
Then these natural color composite (NCC) images were mosaicked and pan-sharpened to create the statewide NCCs across India. These mosaics were later joined to create a single seamless NCC mosaic image of the entire country of India.



Development of Pan-Sharpned Image



Pan-sharpened image



Natural color composite image

Development of Natural Color Composite Image



**NIC is making maps as a service available to the user community, which is quite exciting. Through this we are geo-enabling various digital platforms developed by NIC for ministries and state government departments.”**

**Vishnu Chandra**

Deputy Director General of India's National Informatics Centre (NIC)



## Efficiently Serving Imagery Over the Web

Considering the massive size of the high-resolution NCC data created for the entire country, it is necessary to convert it to a format that can be efficiently published and served over the web without compromising data quality and performance. The size of a natural color product corresponding to one Cartosat-1 scene is 1.2 TB approximately, and there are approximately 7,500 scenes across India. 9,000 terabytes (9 petabytes) worth of uncompressed images would be very difficult to efficiently stream across the web.

NIC needed to choose a file format that could drastically reduce the size of images to enable fast streaming without compromising on the visual quality of data. Enhanced Compression Wavelet (ECW), the proprietary wavelet compression format from Hexagon, has been optimized for satellite imagery. ECW can compress imagery more than ten times of the original size, while remaining visually lossless. Its delivery has been benchmarked as the industry's fastest.

NIC created an Open Geospatial Consortium (OGC)-compliant WMS service that streams ECW imagery using ERDAS APOLLO software, serving terabytes of data to thousands of concurrent users. This fast imagery serving delivers the best experience for end users, and the streaming capability allows for the best performance in areas with poor network bandwidth.



Single Seamless NCC Mosaic Image of the Entire Country of India



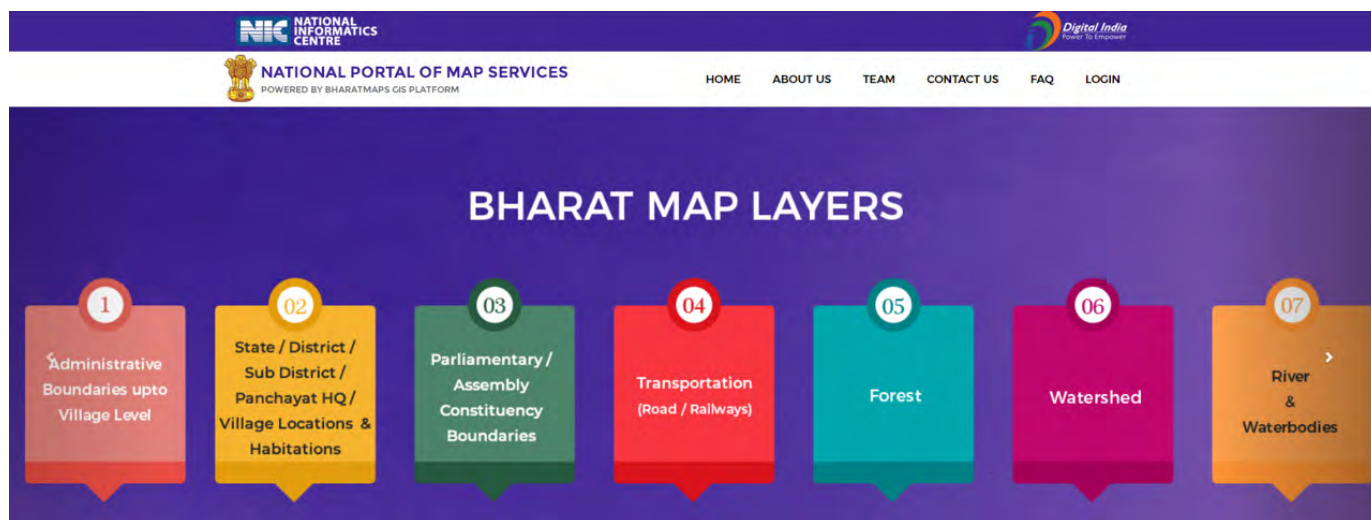
## National Basemap Available on the Web to Multiple Agencies

The country-wide NCC mosaic images were published as an OGC-compliant map service to BharatMaps, part of the National Portal of Map Services of India. BharatMaps is an integrated basemap service using 1:50,000 scale reference data from Survey of India, Indian Space Research Organisation (ISRO), Forest Survey of India (FSI), Registrar General and Census Commissioner of India (RGI) and other agencies. This encompasses 23 layers containing administrative boundaries, road and railway networks, forest layers, settlement locations, and more.

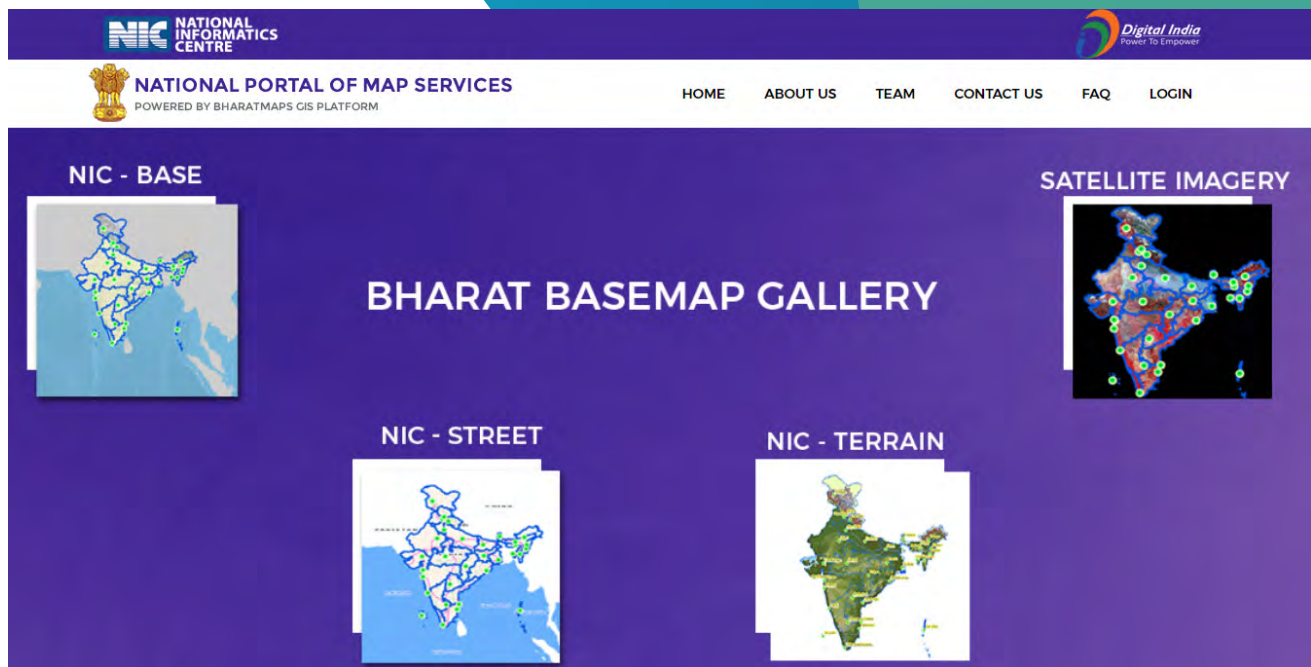
The map service has been developed in-country using Hexagon's image processing tools in ERDAS IMAGINE, and image web serving technology in ERDAS APOLLO.

### Benefits of the map service include:

- 5 TB of country-wide high resolution IRS satellite data service (NCC service of Cartosat-1) is efficiently and seamlessly served over the web.
- An OGC-compliant service ensures interoperability and ease of integration in e-governance application of various ministries and departments for visualization, validation, and 1:10,000 scale mapping of GIS data.
- Encourages the use of Indian satellite data services instead of commercial services. Using data from domestic sources helps with analyzing the challenges of developing and serving of world-class high-resolution data.



These layers have been updated to 1:10,000 scale. Hence, the basemap services developed through these mosaics helped in creating a basemap with improved accuracy. The service is being used in various e-government applications such as banking, agriculture, transportation, and others.



## Conclusion

With this fully developed national image web service in place, state governments and departments across India have access to seamless country-wide basemaps rendered with impressive speed, topographic maps, satellite images, and hybrid maps, all aligned to global geospatial standards. As an essential component of Digital India campaign, this national image web service provides citizens with electronic delivery of services for better planning and good governance.

## Products Used

ECW Compression  
 ERDAS IMAGINE  
 ERDAS IMAGINE Expansion Pack  
 ERDAS APOLLO



**It has been a herculean task to align 5 TB of satellite data to develop a seamless, OGC-compliant, all-India Natural Color Composite image service of very high resolution effortlessly on Web using file compression techniques.”**

**Dr. Vijay Veer**  
 Scientist 'F'



Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's critical services and infrastructure. Our solutions turn complex data about people, places and assets into meaningful information and capabilities for better, faster decision-making in public safety, utilities, defense, transportation and government. Learn more at [hexagon.com](https://www.hexagon.com) and follow us [@HexagonAB](https://twitter.com/HexagonAB).