**CHANGE DETECTION ANALYSIS IN HARIDWAR DISTRICT, UTTRAKHAND, INDIA**

**1. Introduction:**

Change Detection Analysis is a technique to identify the transformation of phenomena over a period of time. Multi-temporal dataset is used to perform quantitative analysis. In this study, LISS III Datasets are used to carry out change detection. The study reveals how vegetation have changed over a time period of 2012 to 2018.

**2. Study Area:**

Haridwar (29.9457° N, 78.1642° E) is located in Uttrakhand state, North India.

**3. Data Used:** LISS III data from ISRO.

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| **S.no** | **Toposheet No** | **Dataset 1** | **Dataset 2** |
| 1. | H44M01 | 12 Mar 2012 | 21 Feb 2018 |
| 2. | H44G04 | 12 Mar 2012 | 21 Feb 2018 |
| 3. | H44M02 | 12 Mar 2012 | 21 Feb 2018 |
| 4. | H43L16 | 12 Mar 2012 | 21 Feb 2018 |
| 5. | H43R13 | 12 Mar 2012 | 21 Feb 2018 |
| 6. | H43R14 | 12 Mar 2012 | 21 Feb 2018 |
| 7. | H44M06 | 26 Jan 2012 | 26 Feb 2018 |
| 8. | H44M05 | 29 Jan 2012 | 26 Feb 2018 |
| 9. | H44G08 | 12 Mar 2012 | 21 Feb 2018 |
| 10. | H43R09 | 12 Mar 2012 | 21 Feb 2018 |
| 11. | H43L12 | 12 Mar 2012 | 21 Feb 2018 |

**4. Methodology:**

* To cover the entire district, a total of 11 tiles were downloaded (22 tiles for both years) from Bhuvan geoportal.
* Image Mosaicing Utility, an open-source software from NRSC, ISRO used to perform the mosaic operation.
* In QGIS application, Stacking and stretching process is performed for all the bands. For better visual interpretation, all the images were stacked in False Color Composite. Study area clipped using the boundary file taken from the Mapathon Portal.
* Normalized Difference Vegetation Index is calculated for the two separate datasets and the image differencing technique applied to get the final output.
* Formula For NDVI:

**NDVI = (NIR-RED)/ (NIR+RED)**

* Difference Formula: **(NDVI\_DATE1 – NDVI\_DATE2)**

**DATA**

CHANGE DETECTION 2012-2018

IMAGE DIFFERENCING

NDVI

YEAR 2018

NDVI

YEAR 2012

NDVI CALCULATION

DATA

MOSAIC/STACKING/CLIPING

LISS III

Year 2012

LISS III

YEAR 2018

Fig. Methodology

**5. Complexity**

Pre- processing of data is one of the major part, it includes different types of operation like mosaic, clip, and radiometric correction. For a better output it is extremely important to choose correct data. The data which include 60 to 80 % of cloud is not considered as a good data. LISS III provide multispectral data in 4 Bands and each band is modulated and normalized to equal extent which is a time consuming process. To validate the result some basic knowledge of remote sensing and visual interpretation is also an important aspect.

**6. Application of Change Detection Map**

There are several applications of change detection map like to detect the temporal changes take place in the area over a time, to analyse Land-use and land-cover change, Vegetation mapping, Damage assessment, Forestation and deforestation mapping, damage assessment, urban change detection, environment change, crop monitoring, shifting cultivation. These maps can be utilize by urban planner, environmentalist, scientist, remote sensing experts, GIS analyst to analyse the data in their own way.

**7. Conclusion**

Red area in map displays decrease in vegetation and green area defines increase in vegetation whereas yellow represent no change