Land use Change Detection

Norcia, Italy

Presented By: Ann Nibana S L
NET ID: AXS240170

Satellite images

Norcia, Italy was affected by a devastating earthquake in October 2016, leading to significant alterations in its physical landscape. The satellite composite images shown below: captured for the years **2015** (pre-earthquake) and **2017** (post-earthquake), clearly illustrate the extent of land use and land cover changes over time.

Latitude: 42.7911°
Longitude: 13.0961° E

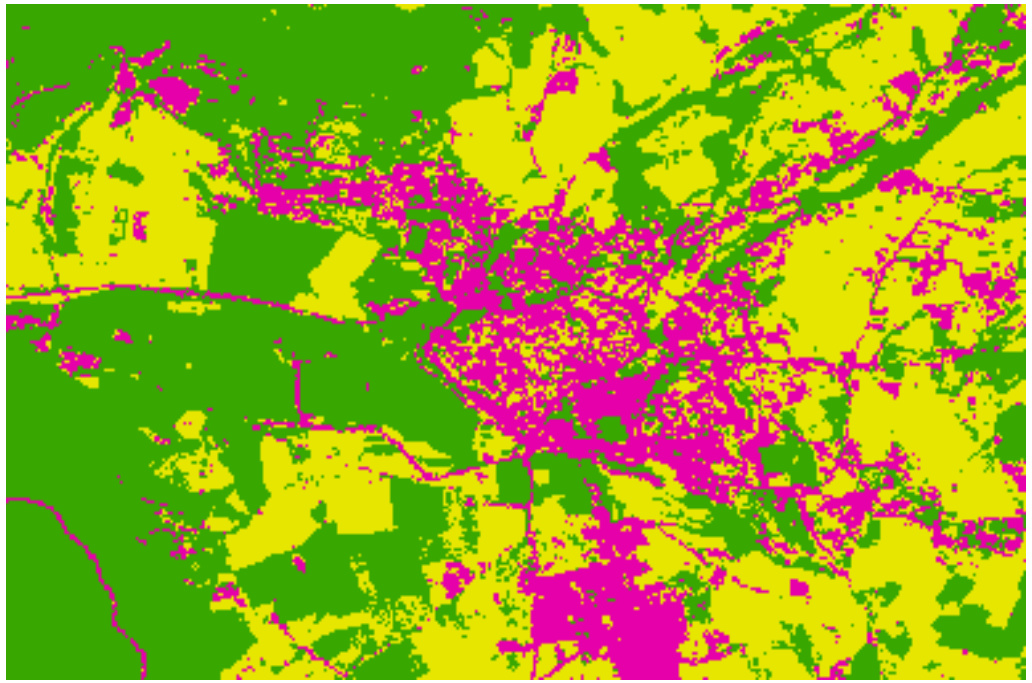
2015 composite image

2017 composite image

Supervised Images

2015

2017



Color Representation:

- **Green** – Vegetation
- **Yellow** – Barren Land
- **Magenta** – Urban/Built-up Areas

Confusion Matrix

2015 Supervised Image

Kappa 80%

Accuracy88%

Suprvisd2015Confuematrix

Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clea

	OBJECTID *	ClassValue	C_1	C_2	C_3	Total	U_Accuracy	Kappa
1	1	C_1	25	0	2	27	0.925926	0
2	2	C_2	0	10	0	10	1	0
3	3	C_3	2	2	9	13	0.692308	0
4	4	Total	27	12	11	50	0	0
5	5	P_Accuracy	0.925926	0.833333	0.818182	0	0.88	0
6	6	Kappa	0	0	0	0	0	0.801061

Click to add new row.

2017 Supervised Image

Kappa 81%

Accuracy88%

Super2017Confusmatrix

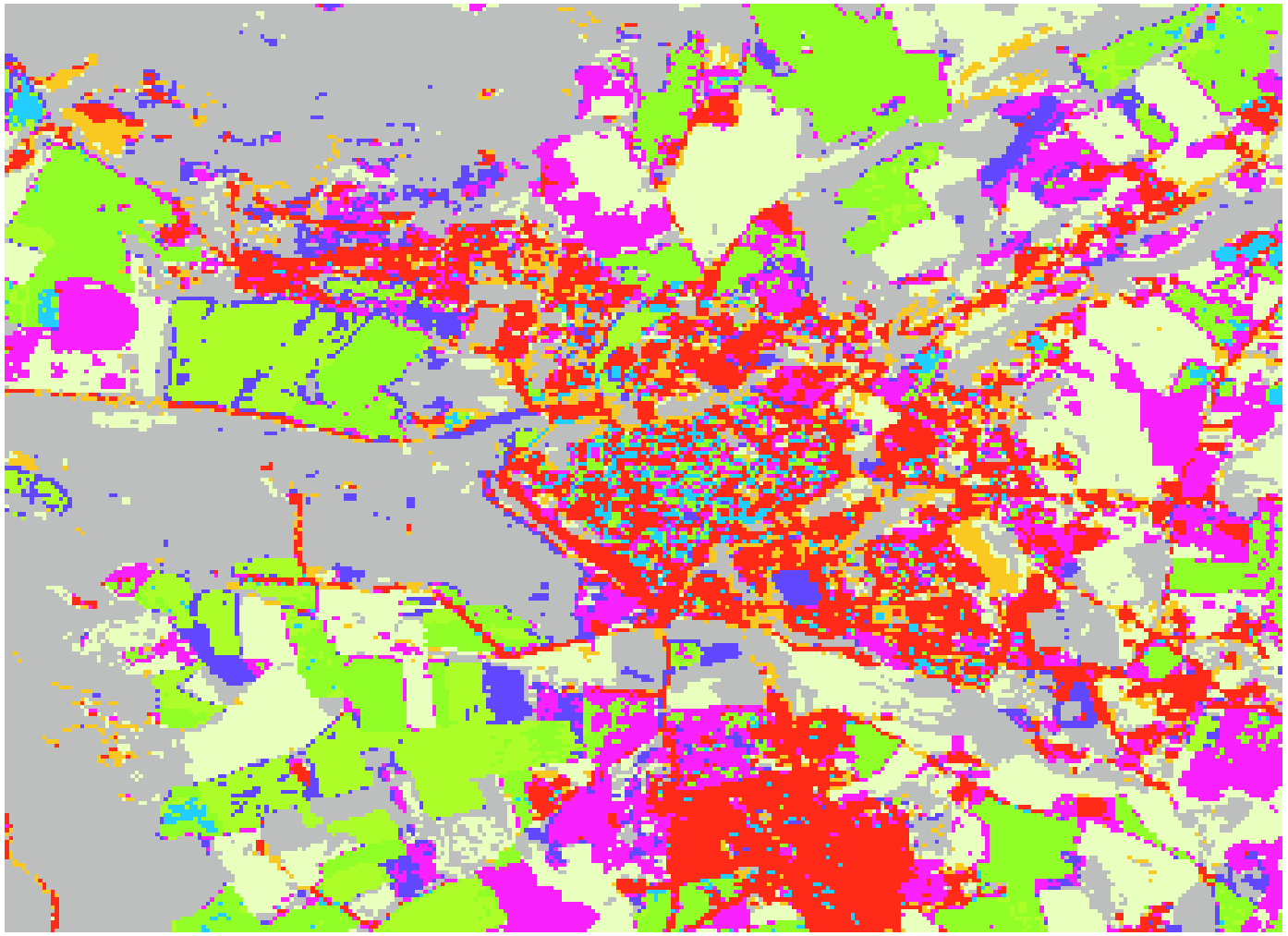
Field: Add Calculate Selection: Select By Attributes Zoom To Switch

	OBJECTID *	ClassValue	C_1	C_2	C_3	Total	U_Accuracy	Kappa
1	1	C_1	21	1	0	22	0.954545	0
2	2	C_2	1	17	1	19	0.894737	0
3	3	C_3	1	2	7	10	0.7	0
4	4	Total	23	20	8	51	0	0
5	5	P_Accuracy	0.913043	0.85	0.875	0	0.882353	0
6	6	Kappa	0	0	0	0	0	0.812844

Click to add new row.

In this study, three classes were defined: **C1** represents **vegetation**, **C2** represents **barren land**, and **C3** corresponds to **urban or built-up areas**. The classification was applied to satellite images from 2015 and 2017 to detect changes before and after the 2016 earthquake in Norcia, Italy. The results achieved a high **overall accuracy of 88%** for both years, with **Kappa values of 0.80 (2015)** and **0.81 (2017)**, indicating strong agreement between the classified outputs and ground truth data.

Final Classified Image



Red – Urban
Light Green –Vegetation
LightYellow – Barren
Magenta – Agri Land to barren land
Grey – No Change zones
Blue – Mixed Transition Zones

The image shown is the **classified composite**, combining supervised classification results from **2015 and 2017** due to the **2016 earthquake in Norcia, Italy**. The area experienced a significant shift from **vegetation** to **barren and a few urban** use. In contrast, regions with **no change**, is mostly in **peripheral agricultural and forested areas**,.

This image provides a consolidated view of where the earthquake triggered the **greatest landscape transformation** and where **land cover remained stable**.

Conclusion

The pie chart depicting **Land Use Change Detection (2015–2017)** concludes the classification findings. It shows that approximately **32.2% of the area experienced a conversion from vegetation to barren land**, indicating significant landscape degradation likely due to the 2016 earthquake.

A modest **16.0% of the area recovered from barren to vegetation**, while **urban land change accounted for 2.1%**, suggesting limited reconstruction within the short timeframe. Notably, **49.7% of the land remained unchanged**, highlighting that while large areas were affected, nearly half retained their original land cover.