

Environmental Cost of Refugee Crisis

Case Study of Kutupalong - Balukhali Rohingya Camp Site: A Remote Sensing Approach

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Background

- ◆ **August, 2017**, an ethnic cleansing of Rohingyas (a Muslim ethnic minority group in Myanmar) by Myanmar Military operations (Gee, 2017).
- ◆ According to UNHCR a total of **6,700 Rohingyas killed, 1.2 millions Rohingyas become refugees**, among them 947,000 are in Bangladesh (BBC, 2018).
- ◆ This influx formed **more than 10 refugee camps** in Teknaf, Cox's Bazar Area by cleaning forest areas and cutting hills.
- ◆ UNHCR mentioned **Kutupalong - Balukhali expansion (KBE)** is the largest refugee camp in the world **accommodating more than 600,000 Rohingyas**.

Methodology (Image Analysis)

1. Data Collection

LandSat Surface Reflectance (L7 ETM+)
23rd March 2017 (Date 1)
04th December 2017 (Date 2)

2. Pre Processing

Combined Several bands of the image together and then re-sized to focus on study area.

3. Tasseled Cap (TC) transformation

change in vegetation based on brightness and greenness of TC

4. CVA-Magnitude

$$C_m = \sqrt{\{(brightness_2 - brightness_1)^2 + (greenness_2 - greenness_1)^2\}}$$

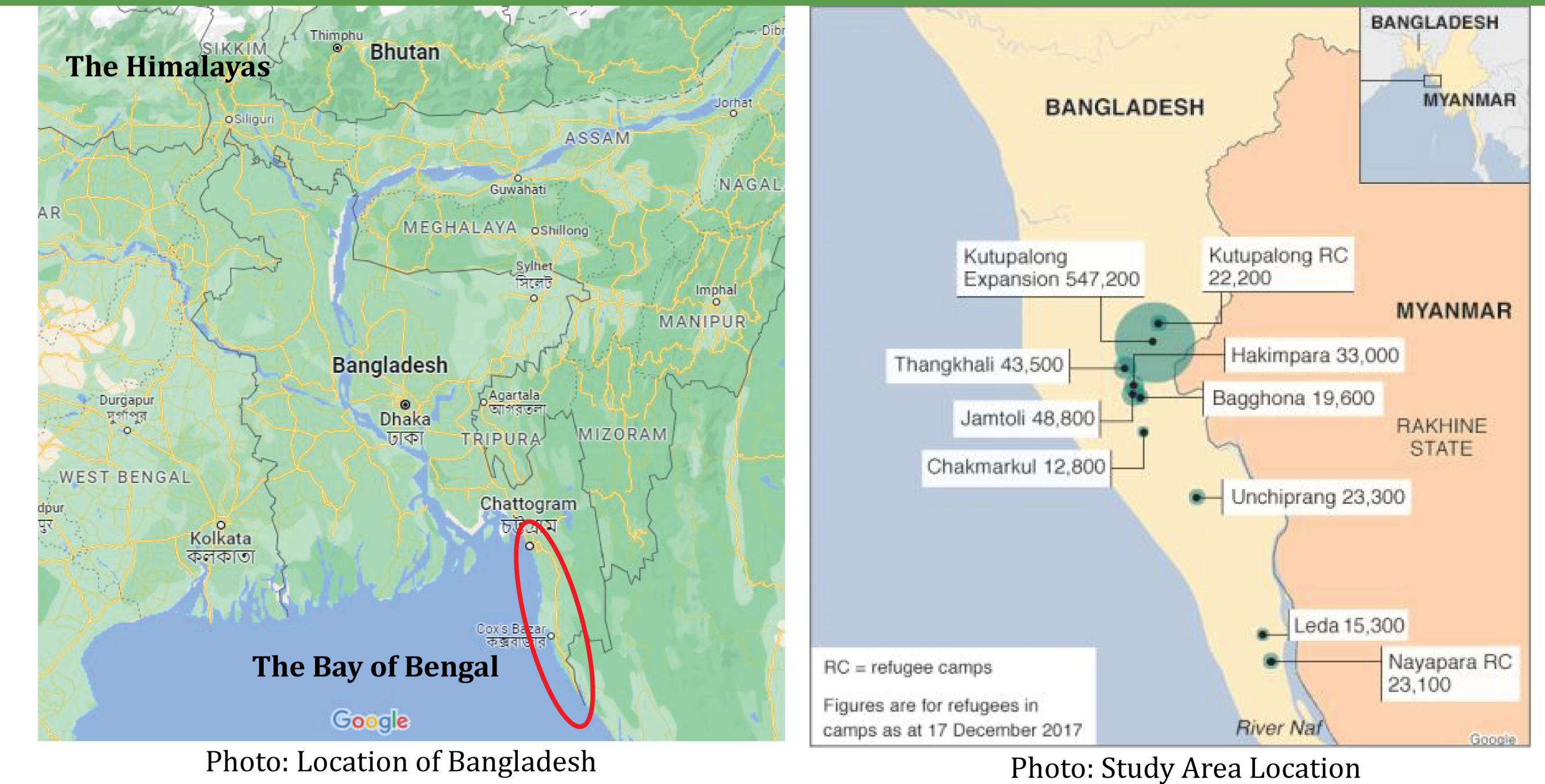
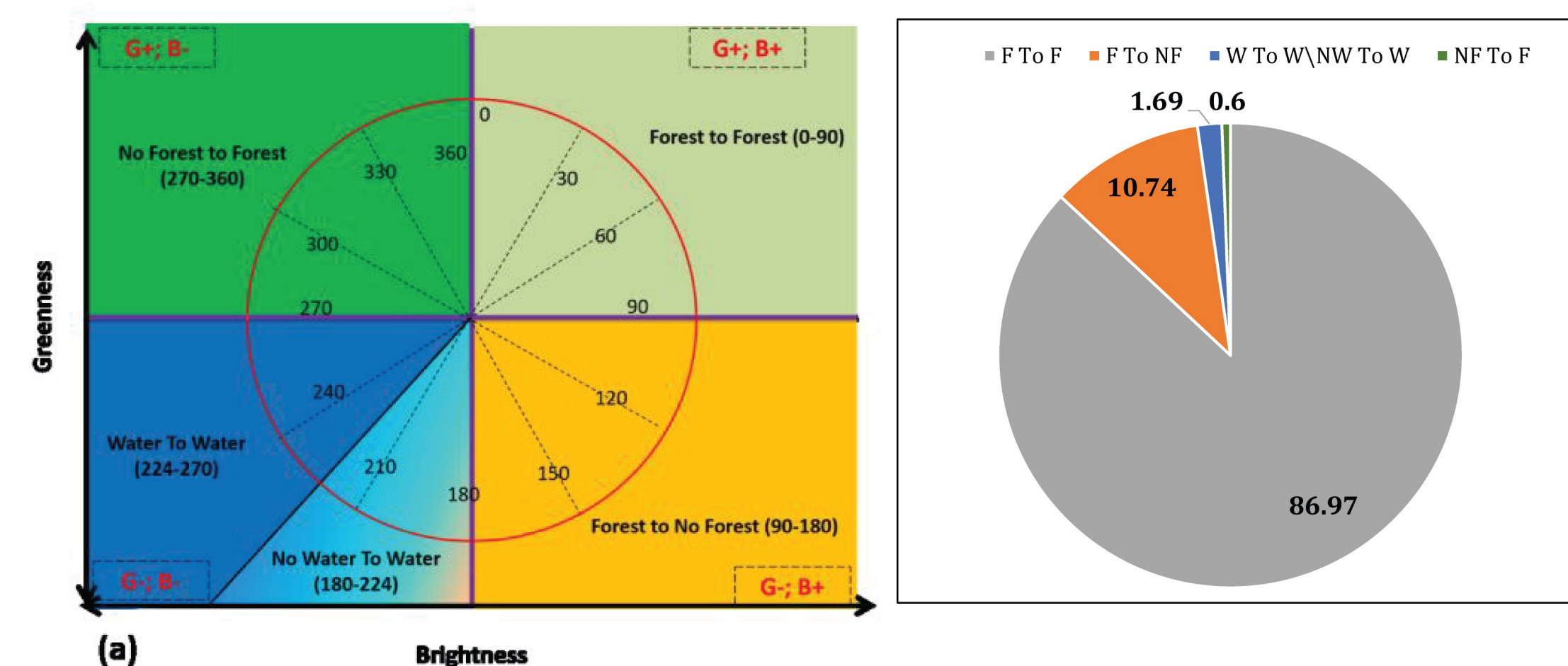
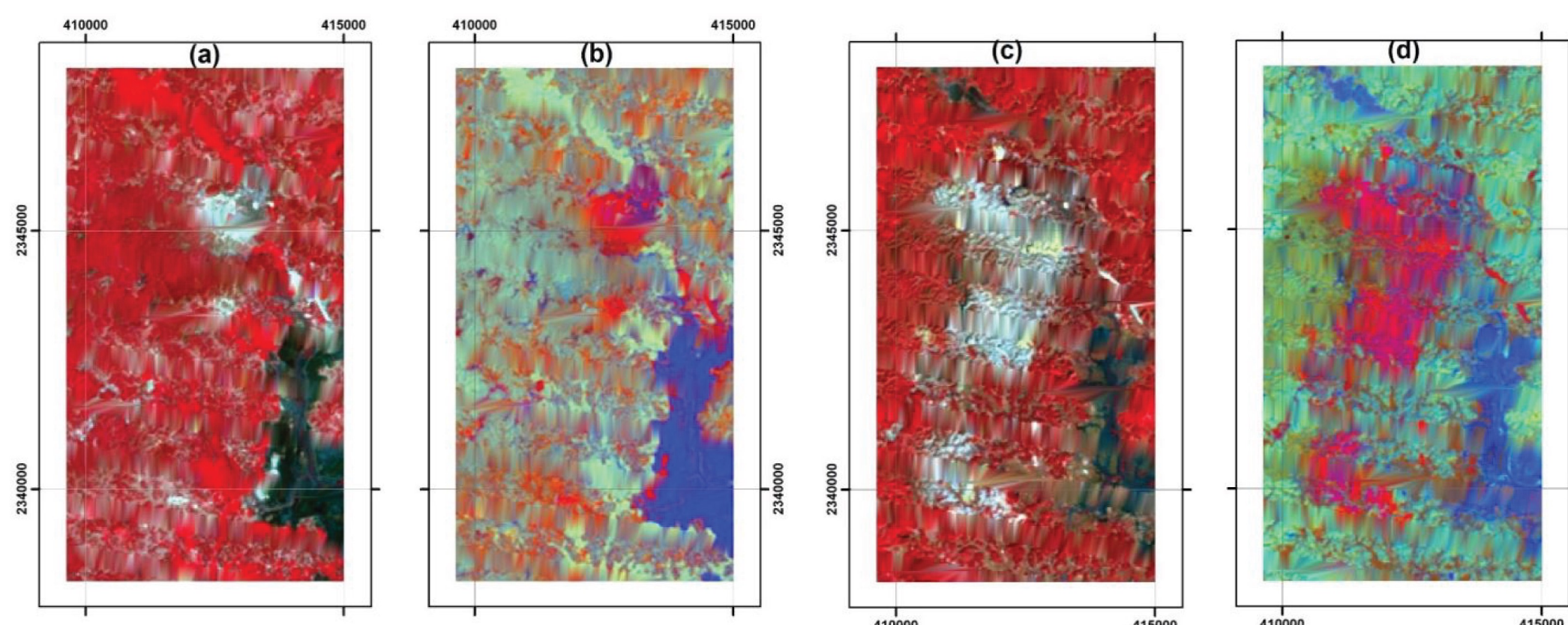
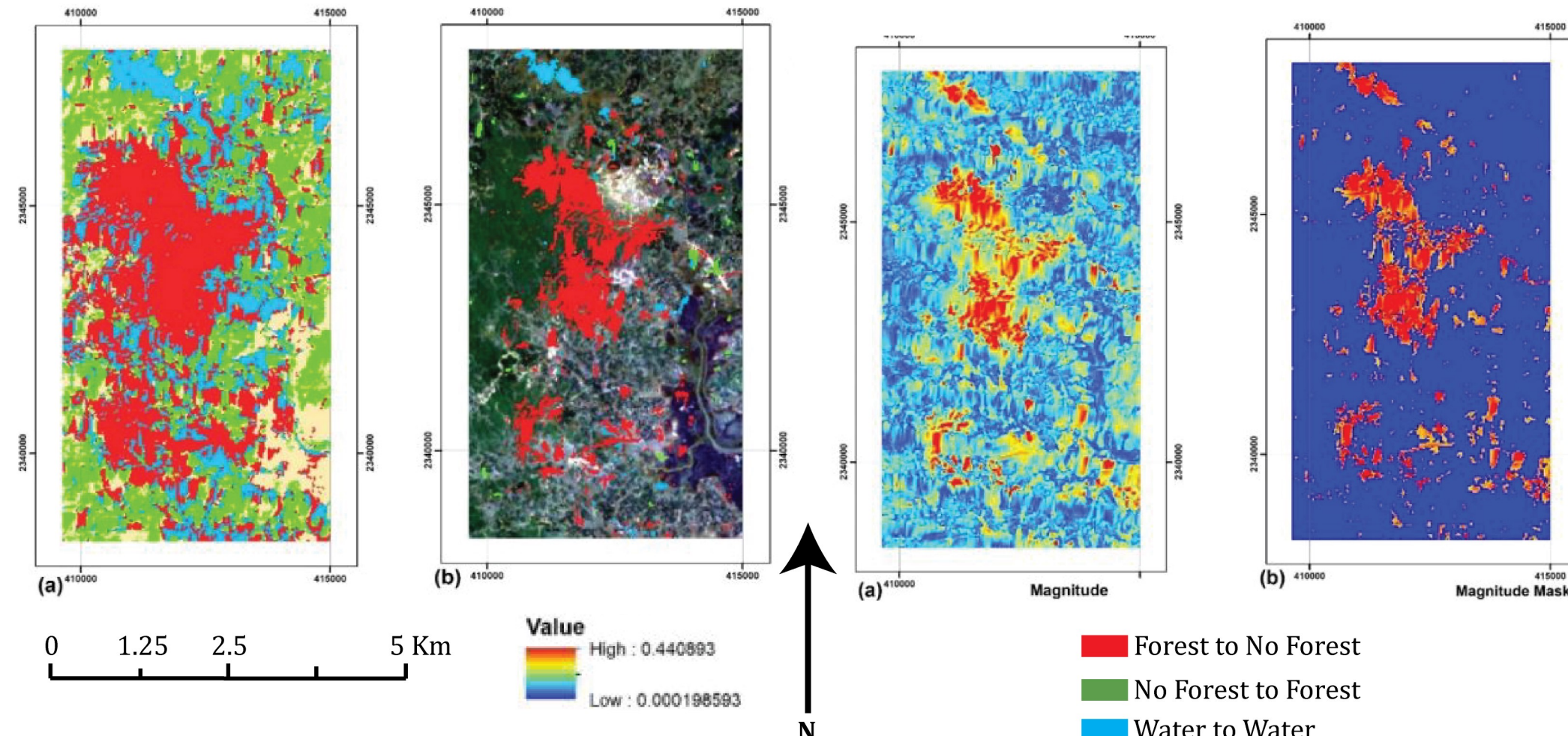
5. CVA-Direction

$$\theta = \text{actangent} \left\{ \frac{greenness_2 - greenness_1}{brightness_2 - brightness_1} \right\}$$

6. Threshold Selection and apply threshold

Mean + 1SD (Karnieli et al., 2014)

Study Objective
In this study, KBE site and surrounding areas are considered to evaluate how much vegetation loss took place to provide shelter, the related cost due to carbon sequestration loss.



Result and Findings (Loss Calculation)

$$C_{\text{loss}} = \text{FA} * S * \text{PC}$$

C_{loss} = Carbon loss,
FA = Forest Area in Hectare,
S = Sequestration capacity (hectare/year),
PC = Per unit cost of Carbon-tonne in USD.

Sequestration capacity of the forest areas in Teknaf, is 43.08 Carbon-tonne/Hectare/Year (BFD, 2018). Per unit cost of carbon-tonne under mid scenario would be 20 USD up-to year 2020 (Luckow, 2014)

The loss of forest: 572.85 hectare
Total loss of 24,678.35 tonne of carbon sequestration per year.
The loss would be 493,567 USD/year

This camp exists till now!

Let's assume, this camp exists for another 3 years, and reforestation initiatives need 5 years to revive the loss vegetation, it would account 320,820 tonne-carbon sequestration loss.

Total loss in thirteen years would be 6,416,378 USD!!!

Conclusion

- ◆ Rohingya exodus has created massive humanitarian crisis, and the value of human lives are unmeasurable in this context.
- ◆ Further studies may improve the cost estimation by integrating ground water resource depletion, temporary waste generation and validate the results applying proper accuracy assessment.

Reference

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Source: United Nations News (2019)



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