

Forest Fires in Brandenburg, Germany: Calculation of Differential Normalized Burn Ratio (dNBR) With QGIs and Sentinel2 imagery

**Background & Location** 

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During 2017-2019 large forest fires occured with **varying fire intensity** from ground fire to crown fire in east Germany.

Landscape is shaped by reclaimed marshland mainly pine-dominated forests on dry and poor sites in Treuenbrietzen, Jüterbog and Lieberoser Heide.

Fire Year	2017	2018	2019
Treuenbrietzen	0 ha	334 ha	0 ha
Jüterbog	0 ha	255 ha	744 ha
		300 ha	110 ha
Lieberose Heide	250 ha	340 ha	100 ha
			120 ha
Total	250 ha	1229 ha	1074 ha





Fig 1: Aerial photograph of burnt forest in Treuenbrietzen in August 2018 (Hirschberger 2018)

Tab 1: Shows area size of burnt landscape

Fig 2: View into burnt forest in Treuenbrietzen in June 2020

## Method

- The fire period (beginning and end) is determined via news, fire departments or other source
- Sentinel2 satellite imagery (as little clouds and interference as possible) of pre- and postfire for SWIR- and NIR-bands were acessed used in the resolution of 10m
- Calculation of pre- and postfire-NBR via QGIS Raster Calculator by the following formula:



SEVERITY LEVEL	dNBR RANGE
Unburned	<1 to +.1
Low Severity	+.1 to +.27
Moderate Severity	+.27 to +.66
High Severity	>.66

Tab 2: dNBR classification table. Source:United States Geological Survey (USGS)

A high **NBR** value indicates healthy vegetation while a low value indicates bare ground and recently burnt areas.

• Calculation of **dNBR** via *Raster Calculator:* 

 $dNBR = prefireNBR - postfireNBR \quad (2)$ 

 Classification of the the raster differences according to the severity of the burn with the **dNBR** classification table

Results

The fire spread beyond the main road and railway moat and caused crown fire with high burn severity impact in the northeast part. A meandering line with unburned trees crosses from southwest to northeast.

(1)



In the southern part was the strongest burn severity. Northwest fires were in marshlands and around lakes.



Jüterborg had the most moderate burn severities compared with the other areas.

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Fig 3: Shows burnt forest classified by burn severity (Treuenbrietzen, 2018)

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Fig 4: Shows burnt forest classified by burn severity (Lieberose Heide, 2018 & 2019)

Outlook

**1.** The method to calculate the dNBR by choosing the data manually is accurate but time consuming. This procedure requires the fire period beforehand, which is simple to implement in populated areas like Germany. Especially here, the fire management is well organised.

An automated method, using the Google Earth Engine (GEE) in R, will be developed and tested in my upcoming BSc thesis.

**2.** However, most of the losses due to forest fires occur in rural areas. Here it would be useful to work with a reusable and automated analysis method, that creates the dNBR for any area of interest (AOI) even without knowing the fire period for example.

References: QGIS: Version 3.12.2-Bucuresti; Sentinel2 Imagery: European Space Agency (ESA). 2020. https://scihub.copernicus.eu/dhus/#/home (August 19, 2020); Aerial photograph: Hirschberger R. 2018. Luftaufnahmen nach dem Waldbrand bei Treuenbrietzen – MAZ - Märkische Allgemeine. https://www.maz-online.de/Lokales/Bildergalerien-Region/2018/8/Luftaufnahmen-nach-dem-Waldbrand-bei-Treuenbrietzen/1 (August 19, 2020); dNBR classification table: UN-SPIDER Knowledge Portal. Fri, 2020. Normalized Burn Ratio (NBR). http://www.un-spider.org/node/10959 (August 19, 2020); Shapefiles AOI: Blumröder, Jeanette (2020)

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