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EOCap4Africa

6 Introduction to handling Spatial Data in QGIS and RStudio

b) Handling Raster Data



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Learning Objectives



Import and export raster data in QGIS and RStudio

Use both QGIS and R to work with raster data



Part 1:

Handling Raster Data in QGIS



Load in your own Raster Data

1. Download the Raster file and unzip it
2. Move the folder of the Raster file to your desired location
3. Load in the Data

Method 1)

Just pull the .tif file from your explorer into QGIS

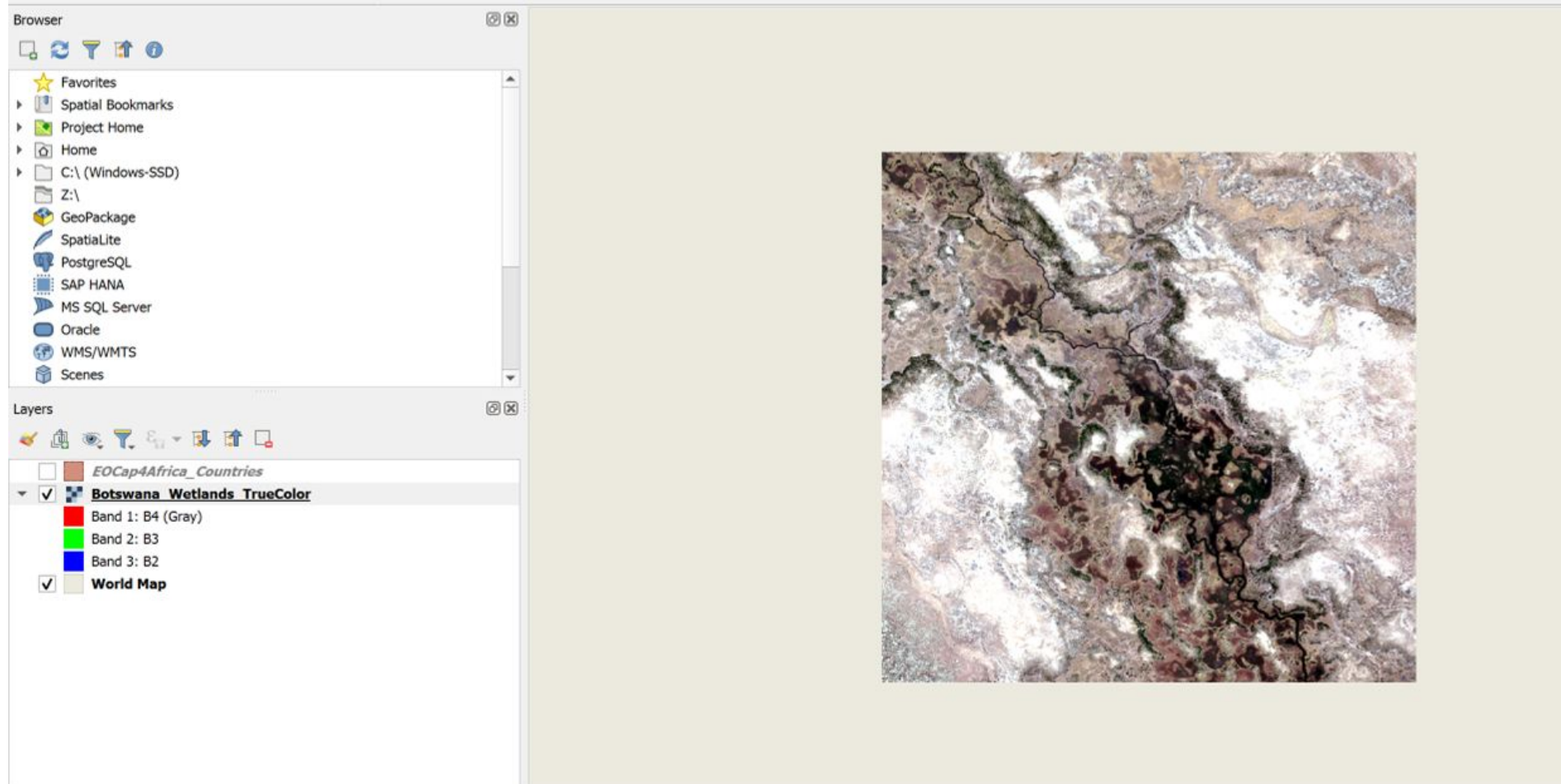
Method 2)

- 1) Go to Layer in the Menu Bar
- 2) Add Layer
- 3) Add Raster Layer
- 4) Go to the Raster file and double click it



Inspecting Raster Data

Inspect the properties of the raster file. Are they different compared to the vector file?



Tip!
 Right click on
 your layer and
 select "Zoom to
 layer" to
 immediately
 switch the map
 view to the
 layers extend



Inspecting the Bands of the Raster Image

Layer Properties - Botswana_Wetlands_TrueColor — Symbology

Band Rendering

Render type: Multiband color

Red band: Band 1: B4 (Gray) - B4
Min: 1456 Max: 3257,5

Green band: Band 2: B3 - B3
Min: 1531 Max: 2770

Blue band: Band 3: B2 - B2
Min: 1367,5 Max: 2446,99

Contrast enhancement: Stretch to MinMax

► Min / Max Value Settings

Layer Rendering

Blending mode: Normal [Reset]

Brightness: [Slider] 0 Contrast: [Slider] 0

Gamma: [Slider] 1,00 Saturation: [Slider] 0

☐ Invert colors Grayscale: Off

Hue: ☐ Colorize [Slider] Strength: [Slider] 100%

Resampling

Zoomed: in Nearest Neighbour out Nearest Neighbour Oversampling: 2,00 ☐ Early resampling

Style [Dropdown] OK Cancel Apply Help

Switch out the bands in the layer properties and create false-color images

Can you think of cases where you would want to switch the bands?



Raster Tools in QGIS

Tool Name	Category	Function
Clip Raster by Mask Layer	Geoprocessing	Cuts a raster using the shape of another layer (e.g., extract a DEM for a country).
Reproject Raster	Geoprocessing	Changes the CRS of a raster layer.
Resample Raster	Geoprocessing	Changes the resolution of a raster (e.g., from 30m to 10m).
Raster Calculator	Analysis	Performs mathematical operations on raster layers (e.g., NDVI calculation).
Hillshade	Terrain Analysis	Creates a shaded relief effect from an elevation raster.
Slope & Aspect	Terrain Analysis	Computes slope and direction from a DEM.
Convert Raster to Vector	Data Conversion	Converts a raster dataset into vector format (e.g., land use classification).



Load in your own Raster Data

1. Form Groups of at least two people
2. Choose a Raster Tool you want to present
3. Run the Tool
4. Explain the Tool and its functionality to your fellow classmates



Part 2:

Handling Raster Data in RStudio



Load in your own Raster Data

1. Double click on the downloaded and unzipped R-file
"5.2_How_to_handle_Raster_Data.r"
2. The file will open in RStudio

Using Packages

```

# 1. Install and load necessary packages
install.packages(c("terra", "ggplot2"))

# Load the libraries
library(terra)      # For handling raster data
library(ggplot2)    # For visualization
    
```

Do you still remember what the "c" does?



Get the Raster Data

- 1) We are using the raster we already visualised in QGIS
- 2) Define the variable "raster_path" using the file path where you placed the .tif file

```

# 2. Load raster data
# Replace this path with the path to your raster file
raster_path <- "C:/Users/schu1/Documents/Berufliches/Hiwi EOCap4Africa/Geodata_tasks/

# Read the raster file into R using `rast` from `terra`
true_color <- rast(raster_path)
    
```

- 3) We assign the raster to the variable "elevation"

Assesing Meta Data



- Print() gives you the most basic information about your raster
- Summary() displays statistics as well as a range of information about the geometry

```

# Check the structure of the raster data
print(true_color) # Displays basic information about the raster
summary(true_color) # Provides statistical summaries of pixel values
  
```

Visualise Raster Data



- Use the basic plot() function to display any type of data
- Using "main" we define the plot title

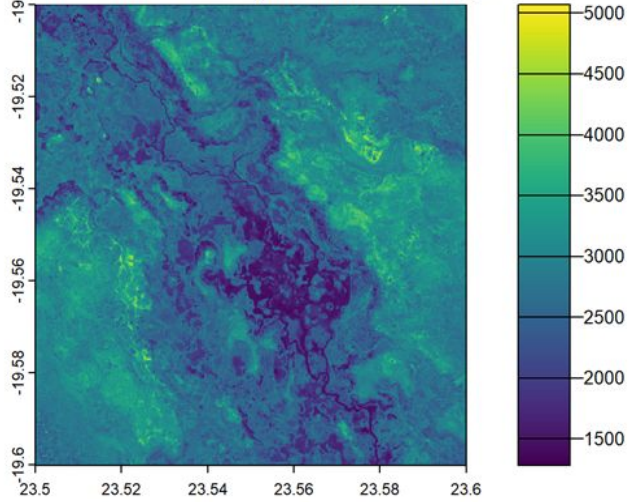
```

# 3. visualize the raster data
# quick visualization of individual bands
plot(true_color, main = "True Color Raster (Individual Bands)")
    
```

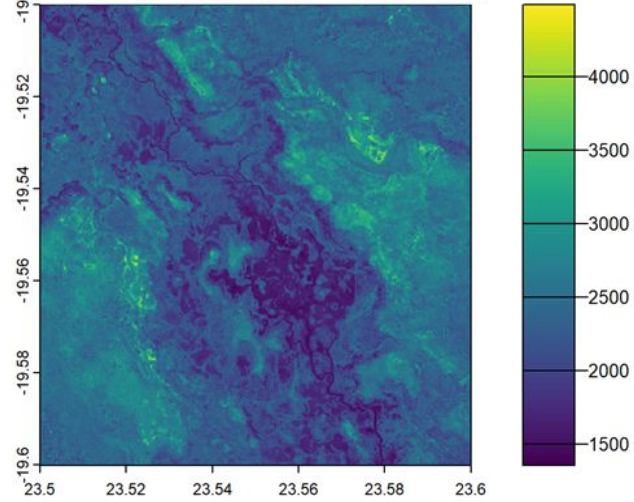


Visualising Raster Data

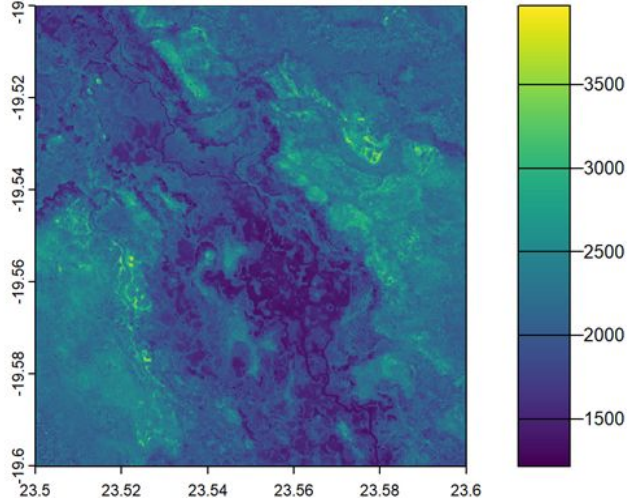
True Color Raster (Individual Bands)



True Color Raster (Individual Bands)



True Color Raster (Individual Bands)



So, why are there 3 images?

Because the raster data has 3 bands!



Visualising Raster Data

- To visualise Raster Data as a true color image we need to assign the rasters bands to the variables "r" (red), "g" (green), "b" (blue)

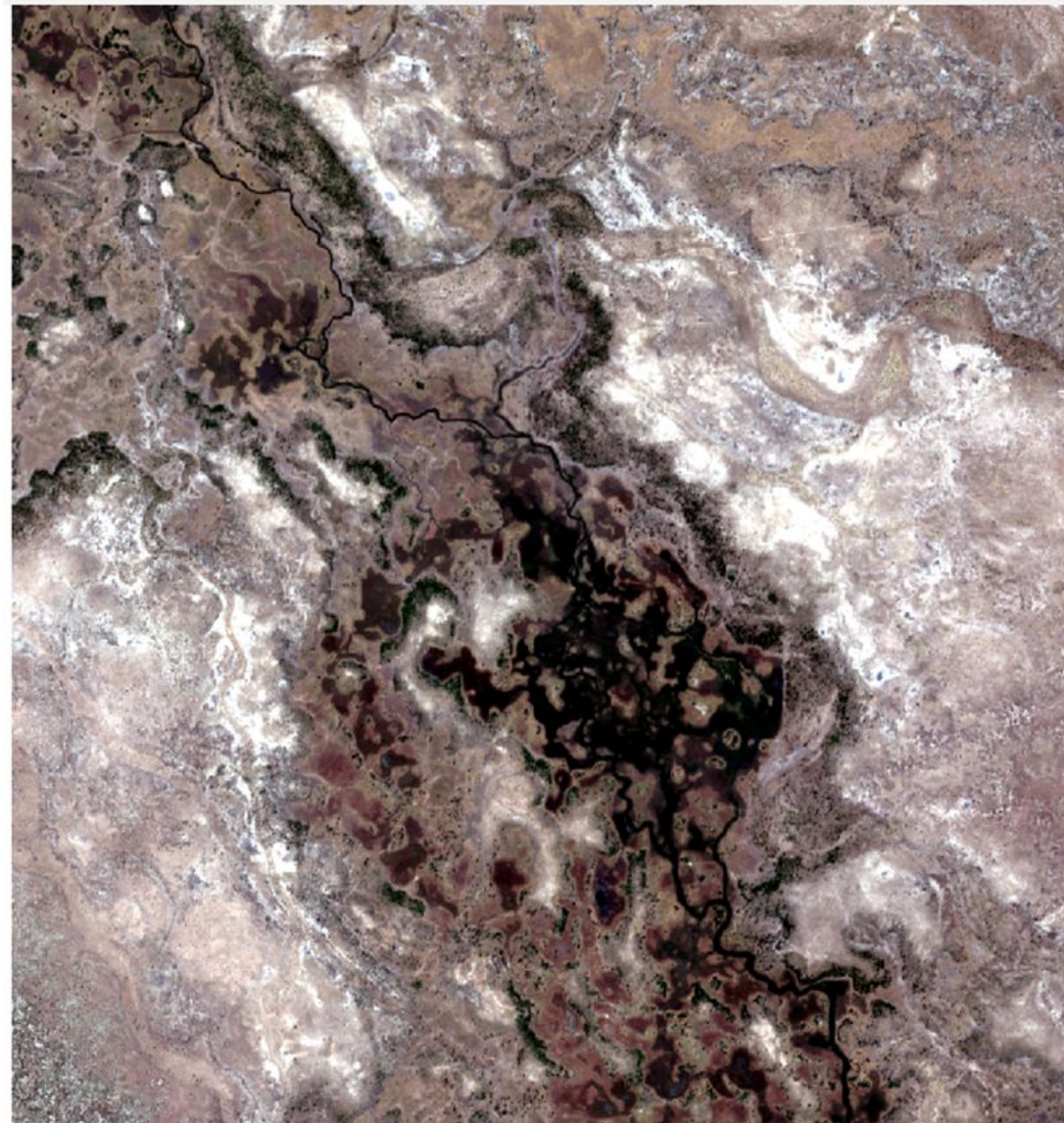
```

# Combine bands for visualization as a true-color image
# terra::plotRGB() is used for RGB visualization
plotRGB(true_color, r = 1, g = 2, b = 3, stretch = "lin",
        main = "True Color Image")
    
```


Visualising Raster Data



The Result:



Load in your own Raster Data

1. Create a false color image in R by switching up the band combinations
2. In which circumstances could you maybe want a false color image as a result?

Summary & Key Takeaways

Raster data can be imported and exported in both QGIS and RStudio

Basic raster manipulations include extraction by mask, resampling, reprojecting, and raster math

QGIS is great for interactive raster processing, while R enables automation and large-scale analysis

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Thank you for your attention!

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