W03-1: Your own story

While the previous worksheets provided at least some pre-selected information and content, it is now time to come up with your idea, your story, your analysis, your map.

Things you need for this worksheet

- ArcGIS StoryMap — as part of ArcGIS online, ESRI provides an app for easily creating story maps. As the time of this writing, non-commercial user accounts are free of charge. Please double check the present licensing information prior to using ArcGIS online for creating story maps using a free account.
- As the time of this writing, we recommend to use **Google Chrome browser** for a stable working with Story Maps by ESRI.
- R — the interpreter can be installed on any operation system. For Linux, you should use the r-cran packages supplied for your Linux distribution. If you use Ubuntu, this is one of many starting points. If you use Windows, you could install R from the official CRAN web page.
- R Studio — we recommend to use R Studio for (interactive) programming with R. You can download R Studio from the official web page.

Learning log assignments

To tell a story, you need a story. So let's get started:

 Find a story.

1. Please do a little brain storming and come up with an idea of a story you want to tell.
2. If you have chosen your story, ask yourself if you have sufficient information to tell it or if you need some more information. Information can be data, images, etc. but also analysis.
3. If you need more information or analysis, check if you can get it in time. If not, go back to 1.

 Collect your information and formulate some guiding analysis questions

1. Once you have chosen your story, collect all required data sets.
2. Formulate some key questions, hypothesis etc. to narrow down your analysis pathway.
3. Again, check if the required data fits your guiding questions and if the later fit your story. If not, reconsider the data you require or go back and find a new story.

 Analyze your information following your guiding questions. This is where R starts!

 Prepare publication quality graphics and prepare your final story map using ArcGIS online.

Additional software, data and tools

If you want something to play with, here you will find some additional software, data and tools:

- ## Software

  ### ESRI story maps

  ArcGIS StoryMap — as part of ArcGIS online, ESRI provides an app for easily creating story maps. As the time of this writing, non-commercial user accounts are free of charge. Please double check the present licensing information prior to using ArcGIS online for creating story maps using a free account.

  ### Vensim PLE software

  Vensim software — you can download the software from here. There is an academic license option during the installation process which we think is the best option if you use the software solely for your studies and without any commercial intentions (please double check the respective license terms and make sure that the license has not changed). Instead of Vensim PLE you can of course use any of the more advanced Vensim versions.

  ### Vensim PLE software German

  Vensim Software — Sie können die Software über diesen Link herunterladen. Vensim wird u. a. mit einer Lizenz zum Einsatz in der Lehre bereitgestellt (Vensim PLE), die kostenfrei ist. Bitte wählen Sie diesen Lizenztyp während der Installation aus. Bitte beachten Sie, dass mit dieser Lizenz keinerlei kommerzielle Zwecke verfolgt werden dürfen (schauen Sie sich hierzu auch die Lizenzbedingungen noch einmal genau an).

  ### Spreadsheet software

  Spreadsheet software — any of the various programs like Microsoft Excel, OpenOffice Calc, LibreOffice Calc or Google Sheets will do.

  ### Spreadsheet software German

  Tabellenkalkulationssoftware — irgendeine der vielen Softwareprodukte wie Microsoft Excel, OpenOffice Calc, LibreOffice Calc oder Google Sheets.

  ### Presentation software German

  Präsentationsprogramm — irgendeine der vielen Softwareprodukte wie Microsoft Powerpoint, OpenOffice Impress, LibreOffice Impress oder Google Slides.

Shell

Shell — any command line environment will do for most of the exercises. For Linux we recommend the Bash shell. For Windows, although the Windows command line can be used, we strongly recommend the shell coming with the OSGeo4W installation. If you want a Linux flavoured shell in Windows, you can also use the one that comes with the Git installation which you would need for Git anyway.

Git environment

Git environment for your operating system. For Windows users with little experience on the command line we recommend GitHub Windows.

Text editor

Text editor — we recommend to use an advanced text editor like notepad++. While such an editor is enough for everything, you may want a little more specific one for software development, for which Geany is a good choice.

MOC GitHub repository

MOC GitHub repository - you will find some useful scripts and functions in our MOC repository at GitHub.

R Studio

R Studio — we recommend to use R Studio for (interactive) programming with R. You can download R Studio from the official web page.

GIS Software

GIS — most commercial or open source GIS systems will be fine. For open source software running on Ubuntu Linux, the Ubuntu GIS package is a good choice. For Windows, it will be a good choice installing everything via the OSGeo4W environment and not individually. Actually both repositories make available a comprehensive bundle of GI -tools and software packages. We will focus on GRASS, QGIS and SAGA. On the commercial side, ArcGIS is one of the powerful options.

Google Earth

Google Earth — Google Earth allows visual interpretation of remote sensing data extended by basic map information and editing functionality.

Linux GIS Distros

You will find some basic information about Linux and GIS at Linux GIS Intro. If you don't want to install it by manually you are maybe interested in a special XubuntuGIS Distro that is available via the giswerk.org. Further help is available under Linux & GIS

Windows OpenGIS ToGo

For Windows users we provide a special portable version of the necessary tools. This helps for dealing with a lot of problems when you don not have administrator privileges and when you are not used in setting environment variables. It is strongly recommended for the Advanced GIS

class. It is available via the giswerk.org. Find further help at OpenWinGIS in a Nutshell

QGIS

QGis — QGIS has become one of the most promising and most integrative open source GIS systems over the last years. Through the processing plugin, it additionally integrates modules from the other leading free GIS solutions like GRASS, SAGA and the Orfeo toolbox which is specifically designed for remote sensing operations. Regarding installation, for Ubuntu Linux, the Ubuntu GIS package is a good choice. For Windows, we strongly recommend installing everything via the OSGeo4W environment and not individually.

SAGA

SAGA — [http://www.saga-gis.org/en/index.html|SAGA]] is the workhorse under the open source GIS solutions when it comes to raster data analysis. Although many of the valuable SAGA routines are included in QGIS through the Sextante plugin, some quite useful LiDAR and raster data modules are only accessible in the main program. Regarding installation, for Ubuntu Linux, the Ubuntu GIS package is a good choice. For Windows, installation packages can be found at Sourceforge.

ArcGIS

ArcGIS — ArcGIS is the de facto industry standard of GIS solutions.

Idrisi

Idrisi — Aside from a variety of open source solutions, most notable the Orfeo ToolBox and some additional QGIS plugins or some modules from SAGA, Idrisi is worth a look if you prefer commercial solutions. It offers a huge collection of remote sensing image manipulation and classification modules along with spatial and/or time series analysis and comes to a very affordable price.

Klett-GIS

Klett-GIS — Klett-GIS ist (nach eigenen Angaben) ein Web-basiertes GIS-System für die Schule. Seitens des Verlags sind diverse Projekte bereits vorbereitet. Ein kleiner Teil dieser Projekte ist frei im Internet zu Testzwecken verfügbar.

Diercke-GIS

Diercke-GIS — Diercke-GIS ist (nach eigenen Angaben) ein Web-basiertes GIS-System für die Schule. Seitens des Verlags sind diverse Projekte bereits vorbereitet. Aufgabenblätter u. ä. können zusätzlich erworben werden.

OTB

OTB — The Orfeo ToolBox is a quite handy open source suite for remote sensing tasks. While it can directly be used through a programming API e.g. using Python, it can also be integrated into QGis (processing plugin has to be installed) or run as a stand alone GUI called Monteverdi2. Please refer to the actual download options to select the installation of your choice.

QGIS and OTB

QGIS and OTB — For remote sensing related tasks, we recommend to use the capabilities of QGIS including the Orfeo ToolBox (OTB) plugin. Regarding the installation, the unstable repository of the Ubuntu GIS package is a good choice for Linux while we strongly recommend the OSGeo4W environment as installation source for Windows users. Please have a look at the actual OTB download options prior your installation of QGIs. If you experience troubles with the OTB plugins in QGis, you can also install Monteverdi2 which is a stand alone GUI for OTB.

Internet Browser German

Internet browser — Jeder aktuelle Internet Browser ist für die Recherche geeignet.

Internet Browser

Internet browser — Any browser will be fine.

Smartphone

Smartphone — Smartphone with GPS and camera functionality.

Python environment

Python — the interpreter can be installed on any operation system. For Linux, you should use the python packages supplied for your Linux distribution. If you use Ubuntu, this is one of many starting points. If you use Windows, you could install Python from the official page however we recommend to use the Python environment that comes OSGeo4W since the most important libraries for Geographers are already included (the latter can be easily installed under Linux but not so easily under Windows).

R environment

R — the interpreter can be installed on any operation system. For Linux, you should use the r-cran packages supplied for your Linux distribution. If you use Ubuntu, this is one of many starting points. If you use Windows, you could install R from the official CRAN web page.

GnuWin

GnuWin provides Win32-versions of GNU tools, or tools with a similar open source license. The ports are native ports, relying only on libraries provided with any modern 32-bits MS-Windows operating system, such as 2000 / XP / Vista / 7

wget

GNU Wget is a computer program that retrieves content from web servers, and is part of the GNU Project. Its name is derived from World Wide Web and get. It supports downloading via HTTP, HTTPS, and FTP protocols (Source:GNU Wget Wikipedia). On *ix systems it is most commonly installed. On Windows systems you may install the port as you can download from sourceforge.

Online resources

GIS Basics Online

GIS Basics Online — online courses for learning GIS (German).

Try Git

Try Git — an interactive online-school for learning Git.

USGS Earth Explorer

USGS Earth Explorer — an interactive online-tool for searching/downloading remote sensing data.

Data

GeoMOC

GeoMOC - a data repository holding various data sets for visualization and download.

Remote sensing index database

Remote sensing index database - a database with an overview of indices used in remote sensing applications.

Klimastation Cölbe

Klimastation Cölbe - ein Datensatz der Klimstation Cölbe des DWD kann über einen internen Universitätsserver als XLS-Datei heruntergeladen werden.

DEM Marburg

DEM Marburg - a DEM from the region around Marburg in 10 m resolution can be downloaded from an internal university server.

LiDAR Dammelsberg

LiDAR Dammelsberg - a LiDAR data set from the Dammelsberg near Marburg can be downloaded from an internal university server.

LiDAR Stadtwald

LiDAR Stadtwald - a LiDAR data set from the Stadtwald/Heiligengrund area near Marburg can be downloaded from an internal university server.

LiDAR Burgwald

LiDAR Burgwald - a LiDAR data set from the Burgwald area can be downloaded from an internal university server.

LiDAR Elisabeth church

LiDAR Elisabeth church - a LiDAR data set from the Elisabeth church area in Marburg can be

downloaded from an internal university server.

LiDAR based data Marburg

LiDAR based data Marburg - a LiDAR derived data set comprising a digital elevation model as well as a digital surface model of Marburg can be downloaded from an internal university server.

Gridded LiDAR Marburg for Heiligengrund

Gridded LiDAR Marburg for Heiligengrund - a readily gridded LiDAR data set covering the south-western area of Marburg can be downloaded from an internal university server.

RapidEye Marburg

RapidEye data for Marburg - a RapidEye scene from October 2010 covering the Marburg area can be downloaded from an internal university server.

Landcover classification data Marburg

Landcover classification data Marburg - a collection of optical and LiDAR-based remote sensing datasets as basis for a land cover classification of Marburg can be downloaded along with the training site information from an internal university server.

Landsat 7 and 8 training sites for Marburg

Landsat 7 and 8 training sites for Marburg - a collection of training areas for Landast 7 (2001) and Landsat 8 (2013) can be downloaded from an internal university server

Atmosphere corrected Landsat 8 Marburg

Atmosphere corrected Landsat 8 Marburg - the data can be downloaded from an internal university server

Landsat 8 Marburg for LCC

Landsat 8 Marburg for LCC - several data sets suitable for a land-cover classification can be downloaded from an internal university server

Botany plots Marburg

Botany plots Marburg - a data set encompassing the locations of botany observation plots near Marburg can be downloaded from an internal university server.

Botany and remote sensing data Marburg

Botany plots and remote sensing data Marburg - a data set encompassing the locations of botany observation plots near Marburg, vegetation cluster analysis and remote sensing information can be downloaded from an internal university server.

Land-cover classification baseline data

Land-cover classification baseline data - a geometrically aligned set of RapidEye and Landsat 8 bands as well as a digital elevation model covering the Marburg area can be downloaded from an internal university server.

MODIS NDVI time series

MODIS NDVI time series - a time series covering 2002 to today from the Aqua-MODIS sensor for the region of marburg can be downloaded from an internal university server.

MODIS smoothed NDVI time series

MODIS smothed NDVI time series - a time series covering 2002 to today from the Aqua-MODIS sensor for the region of marburg which is already been quality corrected and gap filled can be downloaded from an internal university server.

Fogo field survey 2002

Fogo field survey 2002 - results from a field survey of areas in the Fogo natural park between 1998 and 2002 by T. Leyens which has been funded by the GTZ. For more information, please refer to this report. The data can be downloaded from an internal university server

Fogo field survey 2014

Fogo field survey 2014 - a subset of the BIS-Fogo field survey data from 2014 can be downloaded from an internal university server.

Fogo Landsat 11/2014

Fogo Landsat 11/2014 - a subset of a Landsat scene from 11/24/2014 over Fogo, Cape Verde, can be downloaded from an internal university server.

SRTM DEM

The SRTM (Shuttle Radar Topography Mission) sensor was mounted on a Space Shuttle and obtained Earth surface data by remote sensing technology utilizing a synthetic aperture radar (SAR). The data was processed and converted into height data aka Digital Elevation Model (DEM).

Up to now There are at least 4 versions of SRTM data and version 4.1 available . Additionally since 2012 you can obtain the 30 meter data (only available for the cross referenced parts of the pathes) from the DLR data center . Additionally there are improved “non official” SRTM data providers. To make a long story short, just visit *Christoph Hormann's* Elevation data search page.

You can choose almost all available sources for a meta search. By default it tries to offer you the SRTM data of *Jonathan de Ferranti* and provides you after the search the links to the download links of the data.

Jonathan is doing an incredible good job. For the actual improvements have a look at Digital

Elevation Data.

Statistiken

Statistiken - Statistiken der Bundesländer (Quelle Statistisches Bundesamt) können von einem internen Universitätsserver heruntergeladen werden.

Marburg crop template

Marburg crop template - a GeoTiff template for the region around Marburg in the geometry of the RapidEye sensor can be downloaded from an internal university server.

Landsat Marburg template

Landsat Marburg template - a GeoTiff template for the region around Marburg in Landsat's geometry can be downloaded from an internal university server.

RapidEye Marburg template

RapidEye Marburg template - a GeoTiff template for the region around Marburg in RapidEye's geometry can be downloaded from an internal university server.

Marburg Heiligengrund and Dammelsberg templates

Marburg Heiligengrund and Dammelsberg templates - two GeoTiff templates for Marburg's Heiligengrund and Dammeslberg region in RapidEye's geometry can be downloaded from an internal university server.

Tools

GPS

GPS - any handheld GPS receiver which can be used to store and export way points will be fine.

R packages

GDAL/Ogr

GDAL is a translator library for raster and vector geospatial data formats. As a library, it presents a single raster abstract data model and vector abstract data model to the calling application for all supported formats. It also comes with a variety of useful command line utilities for data translation and processing.

Traditionally GDAL used to design the raster part of the library, and OGR the vector part for Simple Features.

You need a running binary installation of these Tolls. Please follow the Installation hints on the GDAL binary site to get the appropriate version for your system.

spgrass6

The `spgrass6` package provides a comfortable R to GRASS interface for the GRASS versions 6 and 7. It is a wrapper package what means that it works slightly different to “normal” R

packages.

Using GRASS GIS directly in R is two folded:

- First you may run R outside of GRASS, transferring GRASS data and results to R do something with them and and re-import the R results back to GRASS.
- Second you may use R as a scripting language basically using the execGRASS function.

Note: you need a Running installation of GRASS GIS on your system.

```
if (!require(spgrass6)){install.packages(spgrass6)}
library(spgrass6)
```

gdalUtils

gdalutils is nothing else then a very comfortable to use R packages that works as wrapper for the Geospatial Data Abstraction Library (GDAL) Utilities. So it not only simplify the GDAL calls but integrates them fully in R. In most cases it follows the naming conventions of the original functions unlike RSAGA allows for more R-like handling.

```
if (!require(gdalUtils)){install.packages(gdalUtils)}
library(gdalUtils)
```

rgdal

The rgdal package reads numerous spatial data formats using the standalone, open-source Geospatial Data Abstraction Library (GDAL). This is also the recommended package for performing map projections and datum transformations, using the external PROJ.4 library.

```
if (!require(rgdal)){install.packages(rgdal)}
library(rgdal)
```

osmar

The osmar package integrates the OpenStreetMap project into the R world. It provides methods to access OpenStreetMap data from different sources, to enable working with the OSM data in the familiar R idiom, and to convert the data for using with existing R packages.

```
if (!require(osmar)){install.packages(osmar)}
library(osmar)
```

sp

sp is a package that provides classes and methods for spatial data manipulation. Utility functions are provided, e.g. for plotting data as maps, spatial selection, as well as methods for retrieving coordinates, for subsetting, print, summary, etc.

```
if (!require(sp)){install.packages(sp)}
library(sp)
```

raster

The `raster` package is **the** major player for dealing with spatial rasterized data. It is for all purposes the agent of choice. It is incredible powerful and comprehensive dealing with "reading, writing, manipulating, analyzing and modeling of gridded spatial data. The package implements basic and high-level functions and processing of very large files is supported"

```
if (!require(raster)){install.packages(raster)}
library(raster)
```

Misc

mdenoise

Sun et al, (2007) developed a **feature-preserving** mesh de-noising algorithm that smooths the surfaces of computer models of three dimensional objects such as those used in computer-aided design and graphics. This algorithm is perfect to reduce unwanted details of an DEM while preserving the main structures as ridges peaks and valleys.

Please follow the installation instructions as listed under preparation.

Pencil

Pencil — any kind of pencil will do it. Pens are also ok. Paper is helpful, too.

GPS-App (GER)

Die App muss lediglich die Tracks exportieren können. Für Android z. B. GPS Logger for Android, für i-Phones z. B. MyTracks - der GPS-Logger.

Federmäppchen

Federmäppchen — zu den Inhalten des Mäppchens gehören Buntstifte, Geodreieck, Lineal, Zirkel und ein Taschenrechner.

Präsentationsmaterial

Präsentationsmaterial — als Material für Präsentationen können Sie jegliche Form von Präsentationsmaterialien (Tafelbilder, Flipcharts, Poster, Folien etc.) verwenden.



The following links from BIS-FOGO Project will be helpful to find further content and data, code examples, and additional ideas and material to finish the tutorial section freely.

From:
https://www.geotraining.geomedienlabor.de/ -

Permanent link:
https://www.geotraining.geomedienlabor.de/doku.php?id=en:courses:training:element-20:worksheets:sm-ws-03-1

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