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AUFSTIEG DURCH BILDUNG
OFFENE HOCHSCHULEN

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

Bauhaus-Universität Weimar
Professional.Bauhaus

Ergebnisse aus dem Pilotprojekt

International Blended Learning:

„Introduction to Geographic Information Systems (GIS) in Urban Planning "

Kollaboratives Online-Seminar

im Sommersemester 2016

zur Entwicklung des berufsbegleitenden und weiterbildenden

Masterstudiengangs „**Urban Resilience**"

im BMBF-Projekt „Aufstieg durch Bildung – Offene Hochschulen":

Professional.Bauhaus

Fakultät Architektur und Urbanistik

Bauhaus-Universität Weimar

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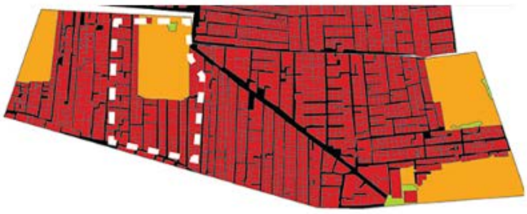
AUFSTIEG DURCH BILDUNG OFFENE HOCHSCHULEN

GEFÖRDERT VOM Bundesministerium für Bildung und Forschung

ESF Europäischer Sozialfonds für Deutschland

EUROPÄISCHE UNION

Introduction



Welcome to our course "Introduction to Geographic Information Systems (GIS) in Urban Planning" at Bauhaus-Universität Weimar which is focusing on students of our master's courses European Urban Studies and Advanced Urbanism with mostly backgrounds in architecture or landscape architecture.

Geographic Information Systems (GIS) are a useful tool for different disciplines, among others urban and spatial planners. Collecting, managing, analysing and visualising data with GIS software can help in different states of planning processes – from identifying areas of work to spatial analyses it is possible to create easy understandable maps and to enable communication processes.

In this online-course you will get:

- a theoretical insight in what GIS is about
- an idea of how to create maps by using ESRI ArcGIS software and
- an insight in how experts are using GIS for different purposes related to questions of planning and design.

This course has been created in cooperation of the Project Offene Hochschulen, the Institute of European Urban Studies and the E.Lab with the chair of Instructional Design at Bauhaus-Universität Weimar with the goal to establish new courses based on online-formats. It has been funded by the Thuringian Ministry for Economics, Education and Digital Society (Thüringer Ministerium für Wirtschaft, Wissenschaft und Digitale Gesellschaft). Another goals is to create new components for the existing curriculum of the above-mentioned master-programmes that offer an array of methods and instruments that can be applied in fields related to urban planning and design.

On the next page you will learn more about the idea and the concept of this course.

Wish you a successful completion of our course "Introduction to Geographic Information Systems (GIS) in Urban Planning"!

The course team

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Bauhaus-Universität Weimar 2015/2016

- Syllabus

Course concept and idea of a collaborative teaching project

At the Institute for European Urban Studies a variety of courses, be it seminar or study projects, are dealing with a holistic approach on city's development. The perception of spatial conditions and relations as they are manifested in urban design as well as in terms of social and technical conditions usually require a strong analysis of many variables that serve to define limits and assets of the complex structure of human settlements. Within such an interdisciplinary framework, it is a good value if these different variables can be communicated in such a way that they reach to connect and bridge between different disciplines and urban actors, creating a common base for identifying and interlinking urban conditions and setting adequate planning processes.

Our "urban realm" can therefore be understood as a set of many different parameters that define the conditions and composition of settlements which can be explained through many layers of data that may be collected one next to each other. Geographic Information Systems can help to visualise such layers of data and bring them into larger context.

With this course you will be introduced into GIS by learning some theoretical backgrounds and basic applications. Beyond software application, the course intends to show that the virtue to select and combine appropriate data is one of the most important factors how to deal with the many data that can be found about our cities. Some examples of in-depth applications in applied research and science will show this in the course. For this purpose we have invited some experts who are either specialized on a certain gis-expertise or do research on urban issues that heavily rely to gis. The course concept has therefore been created as a collaborative teaching project at Bauhaus-Universität but working together with teacher's and experts for the course.

We hope that you will be able to successfully draw back on that thinking and transfer that thinking after your studies – not with the goal to make you a GIS expert – but with the goal that you interact from a generalist perspective which may require you to draw back on such expertise as part of interdisciplinary work. By getting not only an insight *how* to apply a certain method but *why and when* we hope that you will be able to refer to some of that impulses for your future ideas to find innovative and responsible urban solutions for more sustainable cities.

Course method

Created as an online-course, we included different components in this course. The course content has been partitioned in units. Those consist of **lectures**, **tutorials** and **exercises**. You are asked to carefully listen to the lectures and follow the tutorials. The videos allow you to repeat and pause certain sequences. This can be helpful especially when you are applying the software in the exercises. Each of the units also consists of **knowledge tests** which are meant to reflect the content of the video lectures or tutorials.

The units are divided into a time frame that will allow participants to go through the course content step by step. On the other sides it also means that you will get feed-back and respond to it where indicated at the exercises.

Course requirements

The course **requires full participation in all above mentioned components**. This means you should participate in each lectures, follow the tutorials and upload your results at the proper tasks.

There are **deadlines** in which you have to fulfil those tasks and eventually submit by uploading your results.

It is a **necessity to hold deadlines** to stay in the course flow. In return that teacher's can review your submission and can be given the adequate time to respond.

Completion of course goals and course credits

You have completed the course when you have

1. participated in all units
2. have worked through all components as mentioned in the course requirements and
3. have made successful submissions to all required tasks and tests within the indicated deadlines.

Course Credits

With the successful completion you are credited **3 Credit Points**.
The course is offered as a "**Compulsary Elective**" exercise course.

Legal conditions

The use of this course material is only allowed for educational purpose with the course.
All course material including the movies are copyrighted by Bauhaus-Universität Weimar. Any linking or other use in media or copying is prohibited.

Before starting with the course units, learn more about the software requirerments on the next page.

- # Software Requirements

  - The tutorials in this course are based on ESRI ArcGIS for Desktop, Version 10.3. Unless you do not have access to a full version, you need to download the 60-days trail first. For this, it is necessary to create an account. http://www.esri.com/software/arcgis/arcgis-for-desktop/free-trial
  - When you got your student trial license number via e-mail from the SCC, go to: http://www.esri.com/landing-pages/software/arcgis/arcgis-desktop-student-trial, or please enter the code in ArcGIS Administrator to get the one year student version.
  - Unfortunately, ESRI ArcGIS does not run on iOS. Either try to install Boot Camp or try to arrange a Windows Computer. For this course it is necessary that you are able to access this programme. Please check the following webpage for more details: http://edcommunity.esri.com/software-and-data/mac-os-support
  - If you have problems by installing the program, please check this page first: http://desktop.arcgis.com/en/desktop/latest/get-started/quick-start-guides/arcgis-desktop-quick-start-guide.htm
  - Please note, that remote trouble shooting is often unrewarding. Please be aware of this before contacting us.

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- Unit 1 - Basics in GIS I
- Unit 2 - Basics in GIS II
- Unit 3 - Participation with GIS
- Unit 4 - Urban Heat Islands Analysis with GIS
- Unit 5 - Urban Resilience, Climate Change and Social Conditions
- Literature
- Course Survey

Course Tools

Unit 1 - Basics in GIS I

In this unit, learn about the basic principles of GIS and about different fields where GIS is applied.

Lecture

The first **video lecture** is giving an overview on the theoretical background.

Tutorials

You are then introduced in how to start using the software in three **tutorial videos** (Surface, Visualising, Symbols).

Excercises

After carefully viewing these four videos, you are asked to answer some general questions to **check your knowledge**.
Another tasks refers to think about possible applications and concepts of GIS that you should **describe as a own case**.
Based on the skills you learn from the tutorials, you will **create a own map** based on data that is provided. You can easily access the tutorials again to support your work on the task, while applying the software.

Lecture - The Theory of GIS (Part 1)

from eLab on Vimeo.

Tutorials - Creating your first map

Within the three tutorials we are creating an informational map of Thuringia, the federal state of Germany where the Bauhaus-University is located.

Exercises

PREVIOUS SECTION
Software Requirements

NEXT SECTION
Unit 2 - Basics in GIS II

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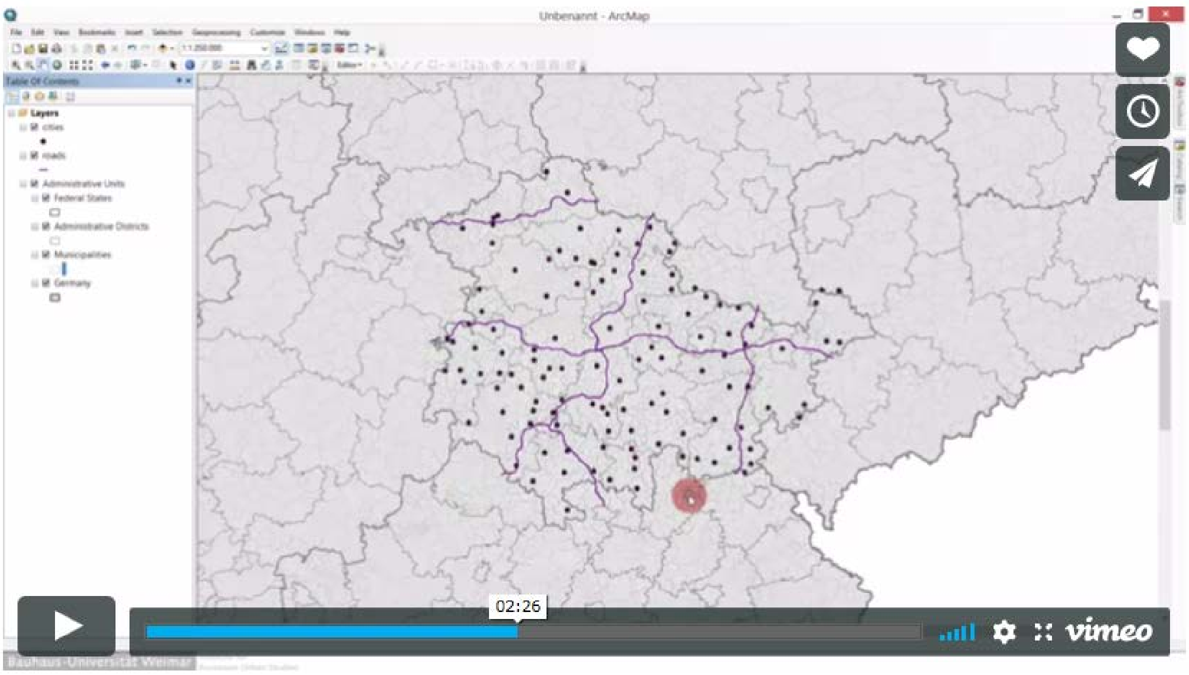
- Literature
- Course Survey

1. Introduction to the Surface

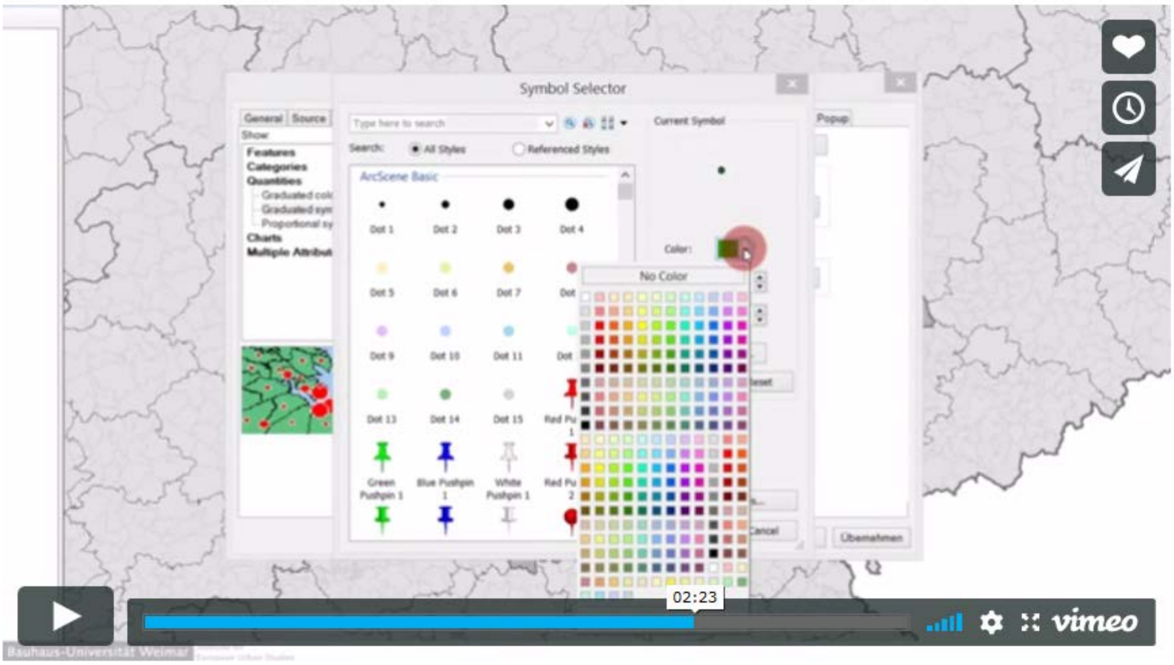
from eLab on Vimeo.

Last modified: Dienstag, 3 Mai 2016, 10:09

2. Visualising Data



3. Graduated Symbols



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Describe another case in the field of urban or spatial planning where GIS is used!

Can you imagine, in which researches it is helpful for you to use GIS? Have you worked with GIS before? Think about a case which you refer to needs or assets in urban or regional development. Consider the possible it may be useful to refer to a current (study) project you are involved in.

Write a short reply of max. five sentences.

In case your contribution doesn't meet the requirements, you will get a feedback.

Add a new topic

Using GIS
by anonfirstname9 anonlastname9 - Montag, 23 Mai 2016, 9:50

Until today I only watched others using GIS. Since it is useful to analyze most spatial questions I think it's the same with my current field of study: discourses about shrinking villages and the demographic change are suffering from a lack of clear and differentiated information. GIS can definitely help to see how different villages are developing or how people migrate for instance

Unit 2 - Basics in GIS II

In this unit, you continue to learn about the basic principles of GIS and about different fields where GIS is applied.

Lecture

The **video lecture** is the second of the two lectures that gives an overview on the theoretical background.

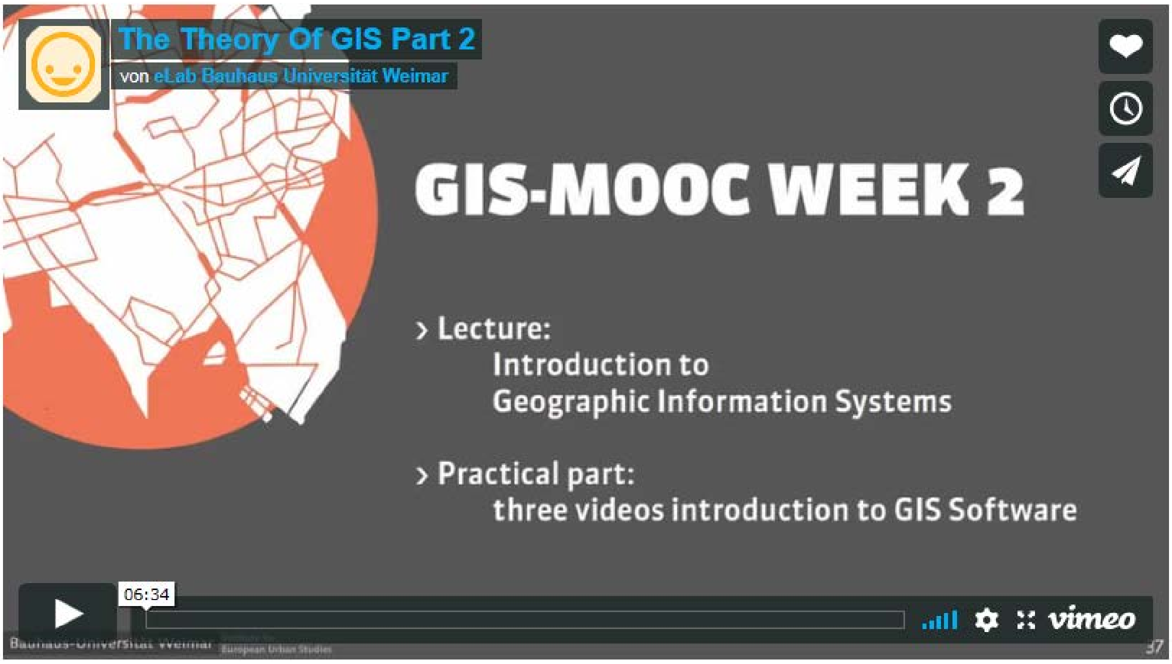
Tutorials

You are then introduced in how to start using the software in two texts and two tutorial videos (database concepts, retreive statistical data, layout, geo-reference).

Excercises

After carefully viewing these tutorials, you are asked to answer some general questions to check your knowledge.
Another tasks refers to think about possible applications and concepts of GIS that you should **describe as a own case**.
Based on the skills you learn from the tutorials, you will **create a own map** based on data that is provided. You can easily access the tutorials again to support your work on the task, while applying the software.

Lecture - The Theory of GIS (Part 2)



o

Tutorials

In some cases – especially for geographic analysis- it is important to be able to combine and organize data and statistical values to identify regional trends. A **table join** in GIS is used for various purposes and is especially helpful to **geo-reference existing statistical data**, combine different empirical datasets, among other aspects.

In this two tutorial videos we are using a fictional example: We want to analyze where most dwellings and abandoned dwelling units can be found. This example will combine existing geodata with official statistics. However, the concept can be used in your own research concepts as well.

Text: Database concepts in GIS

DATABASE CONCEPTS GIS HOW TO DEVELOP A GIS-COMPATIBLE DATABASE? The following text is abstracted from Steinberg & Steinberg (2015), Pp. 179. Due to copyright-regulations, the content is ...

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Database concepts GIS

How to develop a GIS-compatible database?

The following text is abstracted from Steinberg & Steinberg (2015), Pp. 179. Due to copyright-regulations, the content is determinated for students from this course, only. The format is adapted by the teachers; however, the accentuations are copied. The figures are adapted from ibid.. At some parts, the text is - where indicated - shortend.

"Unit of analysis

A statistical concept that is relevant to any analysis and potentially imposed by the data when conducting a spatial study is the unit of analysis. The **unit of analysis** refers to the sample unit being analyzed. For example, when surveying people about their smoking habits, you could select a variety of different units of analysis. You may want to examine each individual respondent, or if your work is focused on differences in smoking rates throughout an entire state, your unit of analysis might more appropriately be at a county level. Individual responses would be aggregated at the county level, simplifying the data substantially. Selecting and altering the unit of analysis may have important implications in your analysis, depending on the area of the spatial unit selected. […]

One important point to consider in any statistical analysis of data is **independence** of the observations. When looking for datasets or preparing to collect new data, it is important to understand if individual observations are independent, that is, the observations are unrelated to one another. Nonindependence in data has a variety of causes, which are discussed in most introductory texts in statistics. The unique consideration in spatial analysis is **spatial autocorrelation.**Spatial autocorrelation refers to a situation where observations taken close together in space are similar (positive spatial autocorrelation). For example, people who live in the same neighborhood may be more likely to be of a similar socioeconomic class than people from different neighborhoods. Sometimes spatial autocorrelation is useful in pointing you to the presence of an underlying factor that influences the observed characteristics. If the relationship is negative (observations near one another are different), this would indicate a greater diversity of data in space. The Spatial Statistics toolbox in ArcGIS provides tools to examine spatial autocorrelation. Two of the most popular statistics are Moran's I and Geary's C. It is beyond the scope of this text to provide the details of these statistics; however, numerous resources are available in both the statistical and the GIS literature or in software documentation.

The bottom line in considering the unit of analysis is to select an appropriate **level of analysis** considering both the variables to be measured and the level at which those variables actually operate. Data at the individual level may not be relevant if they actually function at a higher level. For example, in electing the president of the United States, individuals vote, but for most states, all of the electoral college votes are ultimately cast for the candidate receiving the majority of votes in that state. This is what makes it possible for one candidate to win the popular vote, while another may win the electoral college vote. Conducting a study using individuals as the unit of analysis is not particularly relevant given that the selection of the president operates at the state level.

Sometimes when seeking data for use in a study, you need to be especially careful. Just because a secondary dataset is available at a particular level of detail does not mean that level is the appropriate unit for your analysis. Consider your own question, the level at which the variables operate, and then (if appropriate) aggregate the data to an appropriate level. Of course, it is not possible to obtain additional detail in data that were previously collected and aggregated by someone else; for example, if you know which candidate won a given state, the dataset may not give the breakdown of individual votes. You can, however, aggregate detailed data to a larger unit of analysis, for example, you could group individual responses to the county or state level. There is always a risk that you may commit an ecological fallacy [...] if you do not conduct your analysis at the same level as the generalizations you intend to draw from the data.

Database concepts and GIS

Some basic database concepts are important to introduce at this point. In simple terms, a **database** is a collection of organized information. Of course, modern databases are computerized, but in the past, many databases existed in a physical form, residing in filing cabinets, library card catalogs, or bound volumes. Many of these older datasets are still of great value in GIS analyses, and when this is true, coding the relevant information into the computer is necessary. Databases that already exist in digital format, or those being newly collected, must follow some simple rules to ensure they blend well with GIS.

The software used to store database information is, at some level, irrelevant. Of course, using a formal database software program can streamline the process, especially for complex datasets; however, for simpler data, you may prefer readily available spreadsheet software such as Microsoft Excel. In fact, even a simple word processor or text editor can be used as a database, so long as the basic rules are followed. In short, this means that for purposes of GIS analysis, you can consider a wide array of digital and nondigital data sources as potentially useful. Of course, ArcGIS incorporates its own database tools, allowing data to be coded or imported directly into the software. Many of the common formats mentioned (Excel or various text file formats) can be directly opened in ArcGIS as well.

Rules for GIS database development

What are these basic rules? First, let's consider the layout of the information on the computer screen. A database is typically organized in rows and columns. The rows represent individual **records** in the database; these might be individual survey respondents, field sites, or counties in many cases, they directly represent your units of analysis or subcomponents of those units that may be aggregated during the analysis process. In figure 7.4, we see the individual respondents A, B, and C are represented in rows. In GIS jargon, we often refer to these as **entities** in the database.

Columns in the database represent the descriptive information collected about each record, for example, the answer given by the respondent for each question on the survey, field measurements, or other descriptive data. These are called the **attributes** in GIS. Figure 7.4 provides an example of a small database. There are three entities, A, B, and C-in this case, the respondents. For each entity in the database, we have recorded four attributes, in this example, their numeric answers to each of four questions, perhaps using a 5-point Likert scale. It is useful to introduce here the concept of a **cell,** one individual box in the table. In the example in figure 7.4, a cell might store information representing an entity (e.g., respondent B) or an attribute (e.g., 2 being respondent B's answer to the first question). The column heading, for example, "Question_1" in figure 7.4, is referred to as a **field** name.

Figure 7.4 An example of a simple database table with three entities, A, B, C, each represented by a row in the database. Each entity's answer to four questions are recorded as attributes; each question is represented as its own column in the data table.

One item missing from the database table in figure 7.4 is geographic information that would allow you to easily link the data in the table to a GIS map-that is, a spatial component or identifier. If you would like to tie these data to a basemap, adding one additional column would easily solve the problem. Assume you are collecting data for a large urban area with the intent of analyzing results by ZIP Code. Adding a ZIP Code column to the table would facilitate linking your survey data to a US Postal Service ZIP Code map. The key to accomplishing this connection between a database table and a basemap is to ensure there is a common spatial attribute, in this example, the ZIP Code. Thus, a more effective database including a spatial identifier might appear as shown in figure 7.5. In ArcGIS, this is easily accomplished by using the **Joins and Relates** function to make the connection between a data table and a basemap.

Figure 7.5 An example of a database table that incorporates a spatial identifier that can be associated with a map, in this case, a US Postal Service ZIP Code map.

Creating GIS-friendly data tables

So long as you follow the basic format described earlier, you will be well on your way to developing data that are readily compatible with a GIS. However, to facilitate an even smoother transition, a number of additional formatting considerations are relevant:

1.
    1. Consistent use of space and case
    2. Format and coding of the data
    3. Structure of the file saved by your software

Space and case

First let's look at some issues related to space and case. Although the Microsoft Windows operating system and many of the programs that run on it allow you to put spaces into file names, this is not generally good practice. This is because some computers and software, including ArcGIS, do not allow for spaces in file names. Another thing Windows ignores is the distinction between uppercase and lowercase characters. However, when working with databases in ArcGIS, variations in case can cause problems.

The reason these two issues cause problems relates to the fact that a significant amount of GIS data, and particularly older base datasets coming from large government agencies, were originally developed on Unix-based computers, where case matters. That is, a Unix-based computer considers "E" and "e" to be different letters, whereas a Windows-baseed computer views these as identical. A related concept is punctuation. For most computer databases, it is also good to avoid using punctuation, as these characters often have special meaning.

Athough issues of space and case might not cause problems in every situation, given realities of data sharing, downloading information from the Internet, and a variety of different software and hardware platforms, it is best to avoid using punctuation and spaces when naming database fields or data files. You may notice that in figures 7.4 and 7.5, in those places where a space might normally be expected, an underscore was used instead. Similarly, is important to be consistent in the use of character case.

At this point, you might ask, "What about when I need to store somebody's first and last names?" Although it might seem appropriate to place the name in a single field, from a database perspective, it would be preferable to place the first and last names into their own, separate fields. Of course, in many social science research applications, you may need to protect your respondents' privacy by coding information as numbers instead of using names. There are situations where use of spaces or punctuation may be appropriate, for example, a city name, such as Los Angeles, can reasonably be coded in a single attribute column. However, it would be less appropriate to include the state name, separated with a comma, in the same cell, for example, "Los Angeles, California."

The reason for splitting city and state into separate columns is to facilitate sorting and analysis later in the process. This is no different than you might do when entering data into Excel or SPSS formats. In using separate columns for city and state, you could select only those cities in a particular state for an analysis comparing different states. Later, the same database might be used for a more detailed analysis compa3-ng different cities done via use of the city name column. In short, the more you differentiate attribute components into separate columns, the more options you will have in the data analysis phase later in the process.

Data format and coding considerations

When preparing to code into the computer, be it your own, new data or a transcription of existing data, there are several important considerations. As mentioned in the previous section, computer programs take the data literally, so differences in spacing, case, or coding can cause significant problems when creating and combining datasets for an analysis. Humans have an uncanny ability to understand that all of the codes in figure 7.6 refer to the same real-world location, even though there are substantial variations in how the coding has been done (including the possibility of typographic errors).

Although most individuals would interpret any of the following codes as referring to the same location, a compute takes the data literally and would view some, or all, of these as unique values.

Unfortunately, a computer database would consider each of the codes for San Francisco as unique. This would result in an analysis that requested all data for San Francisco excluding any of the data records that are coded differently than the request made by the analyst. This is an important consideration when developing a coding scheme. Of course, if you are planning to link your data to an existing basemap, it is preferable to use the same codes used in the existing dataset. Similarly, when working with multiple datasets from multiple sources, it will be important to verify that coding is consistent. If coding is not consistent between datasets, one or more dataset may require editing or updating to facilitate interoperability.

It is not unusual for differences in coding to occur at political or jurisdictional boundaries between organizations, for example, two adjoining counties. For example, if you were attempting to conduct a regional planning exercise in a large metropolitan area consisting of several counties, it would not be unusual to find that each county in the region uses different zoning codes. Just as the variations in spelling or abbreviations in figure 7.6 would cause you problems, so, too, would several different counties each using their own zoning designation codes.

Of course, when there are opportunities to develop consistent coding schemes between organizations, often recorded in a **data dictionary,** many of these issues can be preempted prior to any individual or organization attempting to create databases of their information. Data dictionaries are used to set out the specific codes and definitions to be used when entering data into the database so that the codes are clearly understandable by anyone who uses the database.

One additional, computer-specific issue in coding is the difference between a **number field** and a **character field (string).** Many software programs used for data entry, especially database, GIS, and even spreadsheet programs, differentiate data by the type of information being entered into the computer. Although it may seem obvious chat numbers are numbers, a computer also can treat a number as a character. In ArcGIS, for example, you could store a value that appears to be a number a variety of different ways: a short or long integer value, a floating point number value, a double precision number value, a character, or a special case number-a date value. By contrast, letters and words are always treated as characters and thus cannot be inadvertently stored as numbers. Data tied to a GIS will ultimately reside in a database, and databases treat these data types differently when conducting analysis.

In short, what this means is that your computer will not view a number stored in a character field in the same way as a number stored in a number field, and furthermore, most mathematical operations will not work on character data in the same manner as they will on numeric data. Therefore, it is important to consider, in advance, the format your data should cake before coding occurs. If your data values represent a real measurement (interval or ratio data) for a quantitative analysis, the numbers should be coded as number fields in the database. If you are using a qualitative approach (nominal or ordinal data), you may find that either numeric or character fields are appropriate.

One final comment on data entry and coding relates to the choice of software to use. Many of us are limited by two realities when it comes to software: (1) what we have available or can afford and (2) the software we know how to use or have time to learn. Of course, if you are reading this book, you are most likely contemplating the use of ArcGIS software even if you have not yet acquired it. ArcGIS and other similar software packages include a database component as part of their functionality; nonetheless, many people find it preferable to use an external software program for data entry and management of the nonspatial data. If you are already using another software package for data entry, you may decide to continue using it.

The one major advantage to using a true database program, be it the one built into ArcGIS or a stand-alone product such as Microsoft Access, is that this type of program allows for a high degree of control during data input. That is, when developing a database, each individual field or cell can be programmed in advance to accept only appropriate data. Using these techniques can significantly reduce data entry errors by allowing only acceptable data to be placed into the database. This may not be a major concern if you have a small amount of data, and in fact, programming a database may take more time than simply entering the data. However, in large projects involving multiple people in the data entry process, the ability to preprogram automatic checks to ensure proper coding can be very advantageous.

For example, if you are using a 5-point Likert scale, the database could be programmed to allow only the digits 1 through 5, rejecting any letter or number other than that specifically allowed under the predetermined coding scheme. Similarly, databases can offer lists of possible answers, which in the case of textual responses can reduce misspellings or other typographic errors.

Software output formats

Regardless of the software you use to enter your data into the computer, you will eventually have to find a way to make the data work with your GIS software. Of course, file compatibility can be problematic, and there are too many possible variations to discuss in detail here; however, we will discuss three of the more common formats. Typically, these are available in most of the major software programs, including ArcGIS, and are generally applicable to other GIS and database packages and datasets you may encounter.

Essentially, all of the mainstream GIS, database, and statistics software packages are able to directly read or import files in **delimited text formats.** Because much of the data you use will have been created or stored using these sorts of software, it is valuable to recognize that text formats, which are one of the simplest, are readily exported and imported from these software packages. However, it is also worthwhile to review the specific documentation to determine if your GIS can read formatted database files, thus circumventing this step. Historically, one of the most common database file formats was **dBASE.** These files are typically named using a .dbf file extension. This format originated in the early days of the PC and became quite popular as a database format in the 1980s and 1990s. Because of its widespread use in the database market for more than twenty years, compatibility with the DBF file format has been integrated into many other software packages, including programs like ArcGIS, SPSS, and Microsoft Excel, used to create and manage data. When you can use common formats such as dBASE to import and export between the software you use to create data and your GIS, you will inevitably avoid some of the more common errors associated with data sharing.

If using dBASE files is not appropriate for the particular software you plan to use, files saved in plain or ASCII delimited text are another excellent choice. Typically, you will find options to save your data to a text format within the Save As menu or an Export menu option in your software. The delimited descriptor indicates that the file will be saved with simple formatting that indicates where one data value ends and the next begins, most commonly using a comma or space, as shown in figure 7.7, and often named with a .csv file extension.

Notice that the comma delimited file simply puts the data from a given row all together using a comma to indicate the end of one cell and the beginning of the next. With this in mind, it should be easier to understand why using commas within the database (e.g., names entered as last, first) could be problematic when saving to a comma delimited format – the comma between the names would be confused with a comma used to indicate the cells of the original database table.

Figure 7.7 An example of a database table (top) exported into a comma delimited format. Notice that the columns are separated by commas (botoom). Had any commas been included as part of the data values, they would present problems. Column headings are retained in the first row, with each subsequent row in the list corresponding to an individual record in the database.

With the popularity of Microsoft Office, and in particular the Excel spreadsheet application, for many datasets, this has become a dominant data storage format. Although a spreadsheet is technically not a database, it can take on many of the same characteristics. The use of rows and columns as an organizing concept is especially compelling as a database-like structure. Given the frequency of Excel (.xls) files being used for data storage, ArcGIS added the capability to read these directly as data tables for use in GIS analysis simply by using the Add Data function. This saves the extra step of exporting data from Excel into a comma delimited format prior to importing into ArcGIS.

The Excel, dBASE, and comma-delimited text formats are some of the most common methods for moving data between software packages. If your preferred software does not offer an option to import and export in these formats, you may need to explore alternative approaches or use third-party data translation tools (although if your software cannot work with one of these formats, we recommend finding new software). In addition to the data conversion tools included with each individual software package, a variety of stand-alone data conversion tools are available both free and commercially."

Further Readings:

- Campbell, J. & Shin, M. (2012): Geographic Information System Basics
- Steinberg, S. & Steinberg, S. (2015): GIS Research Methods. Incorporating Spatial Perspectives. Redlands, CA: ESRI Press. Pp. 179

Figures of Text: Database Concepts

Text: Statistical Data from official sites

In order to create a structure for statistical purposes, most administrative institutions or areas have unique numbers. In this case, **we are going to use the so called NUTS**, a geocode standard, initiated by the European Union, which geodata is publically accessable.

Read more »

In order to create a structure for statistical purposes, most administrative institutions or areas have unique numbers. In this case, we are going to use the so called NUTS, a geocode standard, initiated by the Euroapean Union, which geodata is publically accessable. Furthermore, there is statistics available, which helps us to gain a quick overview of the ecological, economic and social structure. Both the geodata with its borders as well as statistical information are accessible as open data. As with any statistics, the scope and indicators have to be individually assed with regard to the specific research question in mind. NUTS are statistical geographic units used by the European Union and other governmental agencies (french: nomenclature d'unités territoriales statistiques). It is a hierarchal systematic used to identify and classify spatial areas for statistics. The NUTS mainly describe different administrative areas, which are not necessarily coherent across different nations, but which do have some common aspects.

There are four levels: NUTS-0 (which is sometimes not specifically stated): represents the national level, NUTS-1 are "major socio-economic regions", which in Germany are represented by the federal states, NUTS-2 show the "basic regions (for the application of regional policies)"; in Germany these are mainly administrative districts or federal states. Further, NUTS-3 are "small regions (for specific diagnoses)"; in Germany these are represented by the counties. Most of the data compiled by the EU is differentiated into these NUTS-levels. TheNUTS categories help the EU in the allocation of funds such as for those for spatial planning. The NUTS areas also have a great amount of publicly available statistics. For us, it will deliver a quick overview of the distribution and the vacancy rate of dwellings to visualize the potentials for reallocating people.

Official statistics can be found, for example, at ESPON or Inspire for the European scale and at INKAR for statics from the area of Germany.

CLOSE

o Move here

Link: Eurostat - Conventional Dwellings

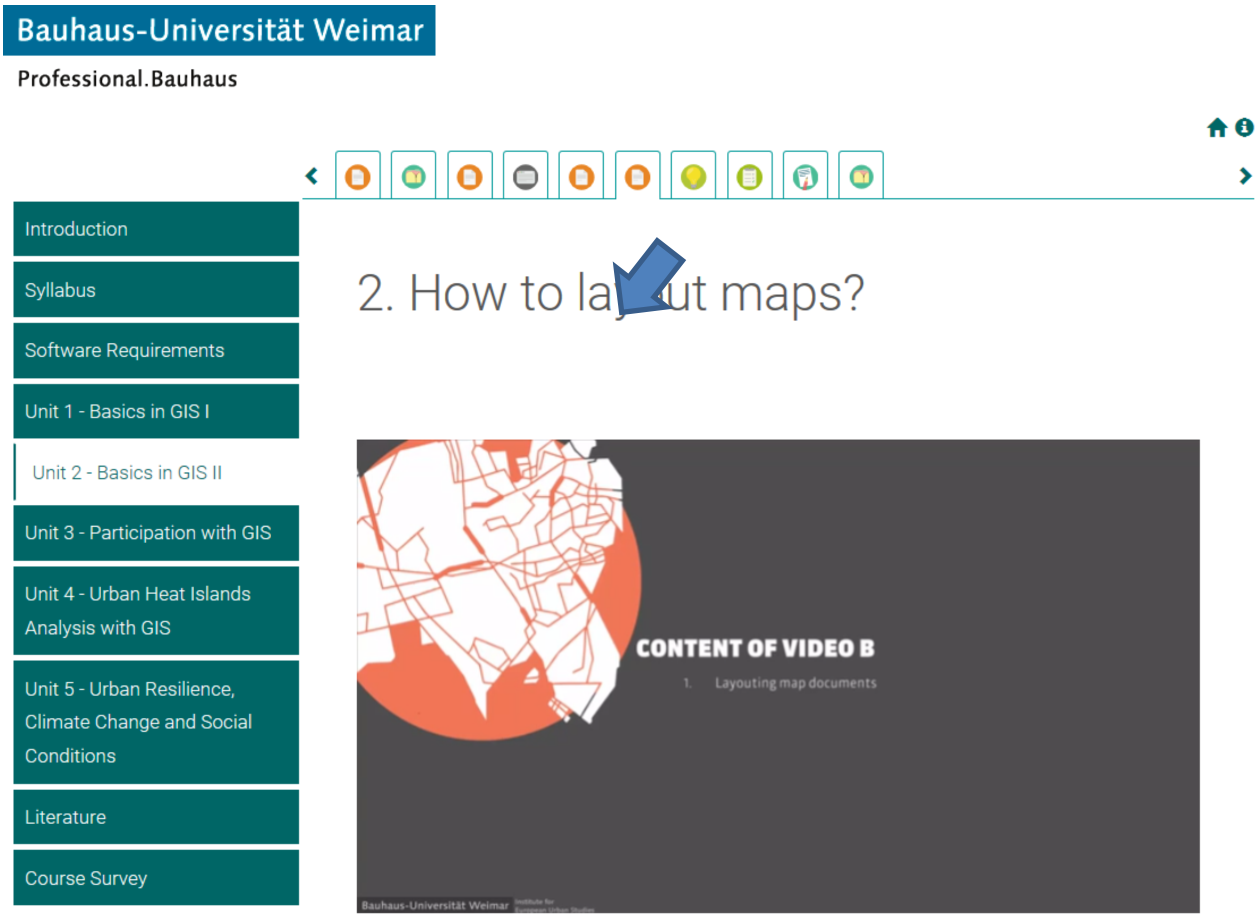
If the link doesn't work, go to the EUROSTAT homepage and search for "Conventional dwellings by occupancy status, type of building and NUTS 3 region". Then view the table of the first result.

- Move here

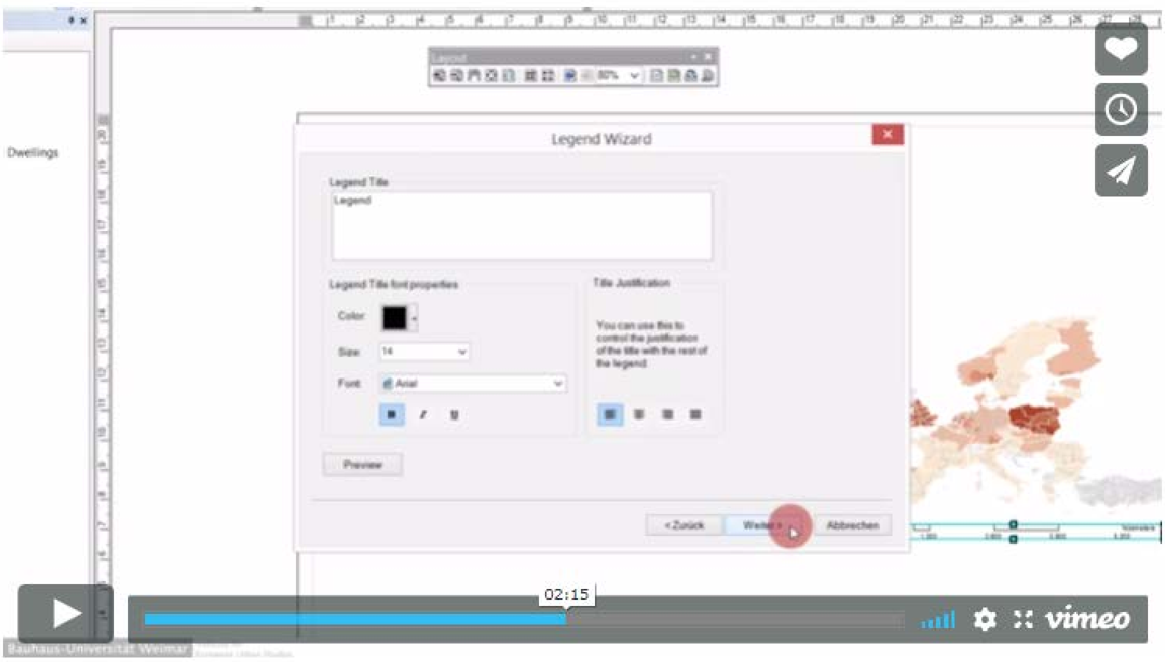
1. Join Tables To Your Map

Tutorial_2a from eLab on Vimeo.

Read more »



Tutorial_2b from eLab on Vimeo.



Exercises

Unit 3 - Participation with GIS

Urban challenges and related underlying urban conditions become more clearer and understandable when you are able to make them visible and to communicate them. Data is not always available and thus needs to be created. The availability and updating of reliable data sources and the collection of data is a main pre-requisite on GIS application. GIS often proves to be an useful instrument to visualize and to understand large scale phenomena, like the famous "Ashwayats" in Cairo, neighbourhoods of non-formalised buildings and settlements which cover large areas of the city and provide housing to many people. Learn about an exciting project that considers the broad collection of data from the neighbourhood level on.

Lectures

In our first lecture, learn about how participation connected to GIS has been applied at the **Participatory Development Project** of Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) in Cairo. Before continuing to train with the exercises, learn more about the larger context and the urban texture of Cairo's Ashwayats in the second lecture "**Getting to Know Cairo**".

Tutorials

You the learn one basic approach how to calculate and analyse distances of objects.

Excercises

The questions in this unit require a careful viewing of the two videos.

Recommendation

If you are further interested in the subject and want to further apply your GIS knowledge, we recommend you to take part in our Bauhaus Summer School course "Cultural Landscapes and Urban Resilience".

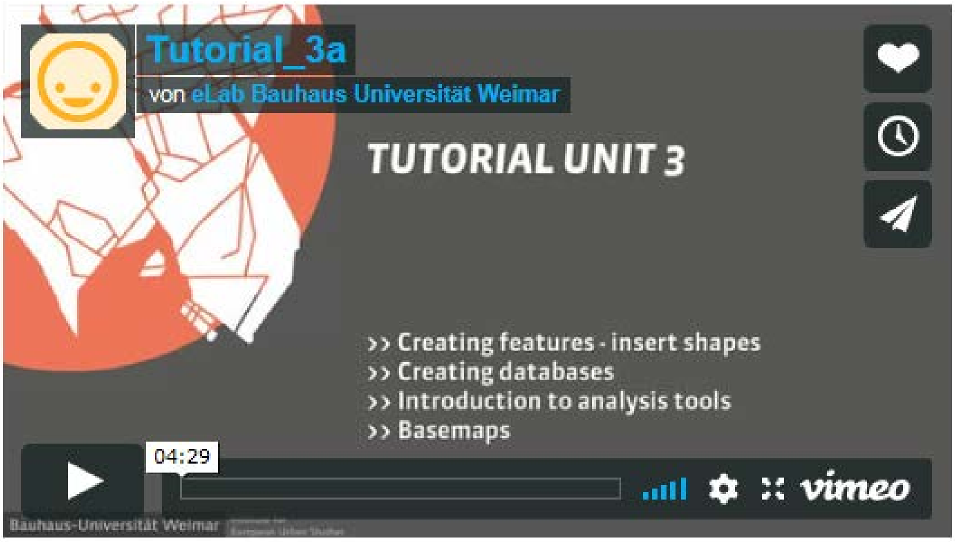
- Move here

Lecture - GIS “with the hood”

Learn about how neighbourhood management and data-collection, on-site analysis and data verification through local participation help to understand more and get a clearer picture of Cairo's Aswayat neighbourhoods in terms of their urban texture.

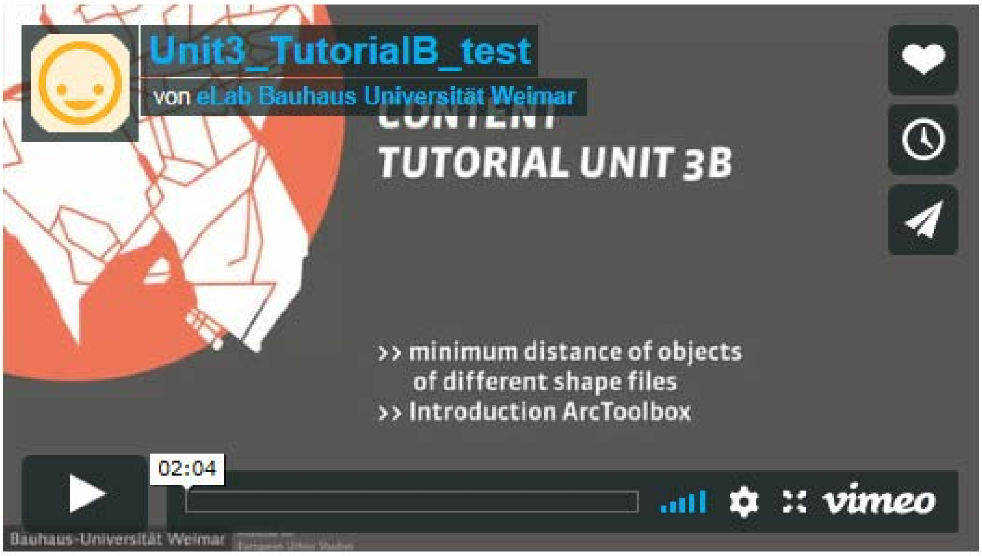
Kairo Fly - The urban texture of Cairo

1. Tutorial Video



Unit3 from eLab on Vimeo.

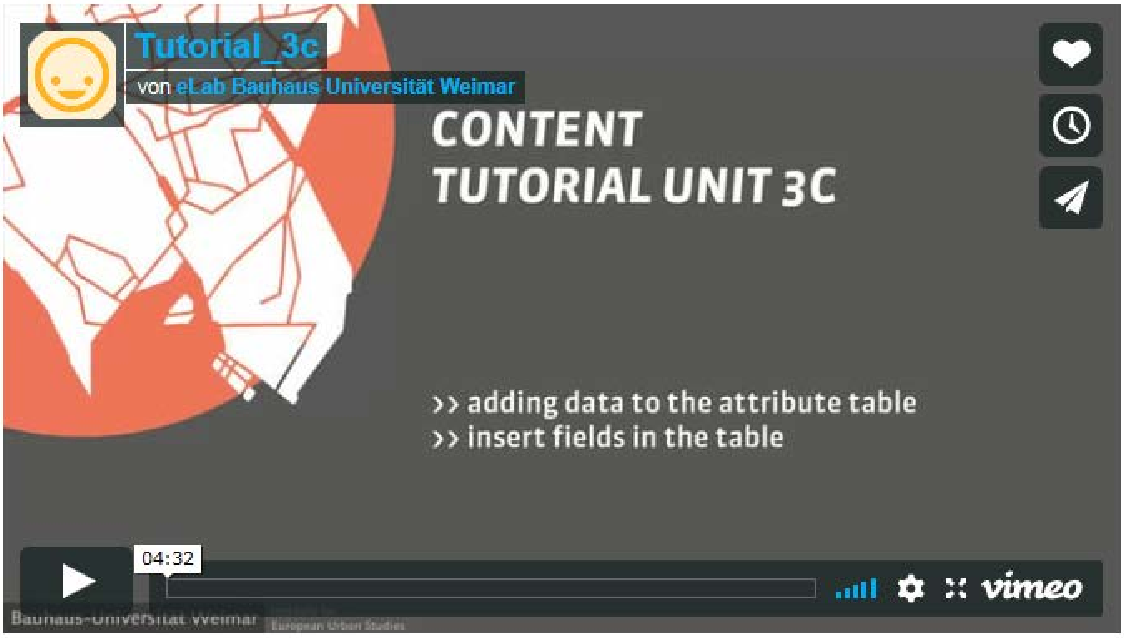
2. Tutorial Video



Unit3_TutorialB_test from eLab on Vimeo.

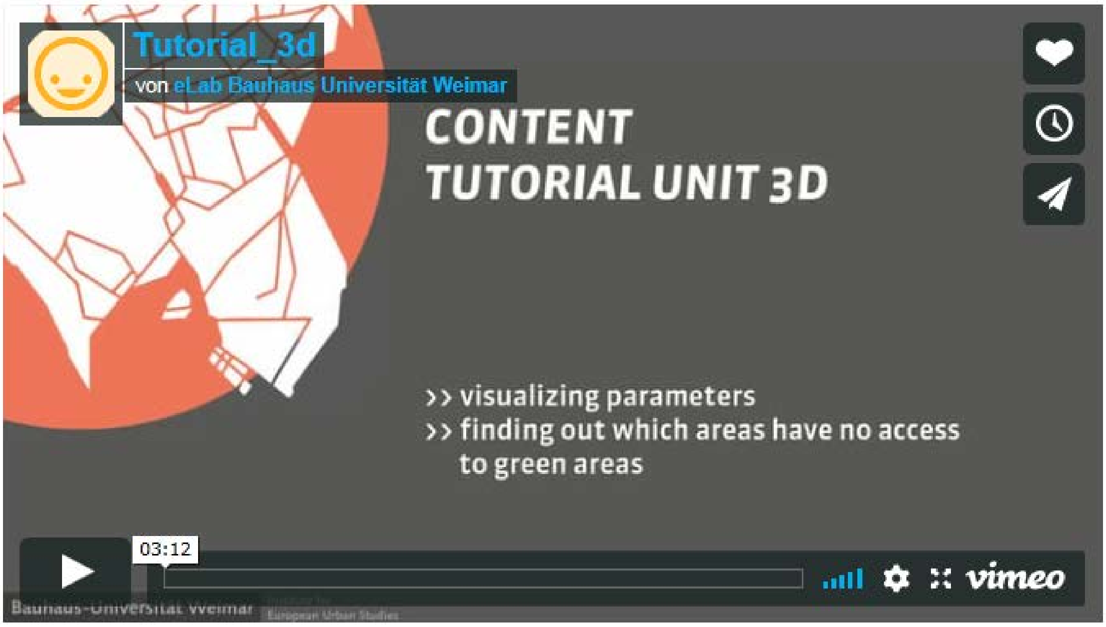
Last modified: Mittwoch, 25 Mai 2016, 8:58

3. Tutorial Video

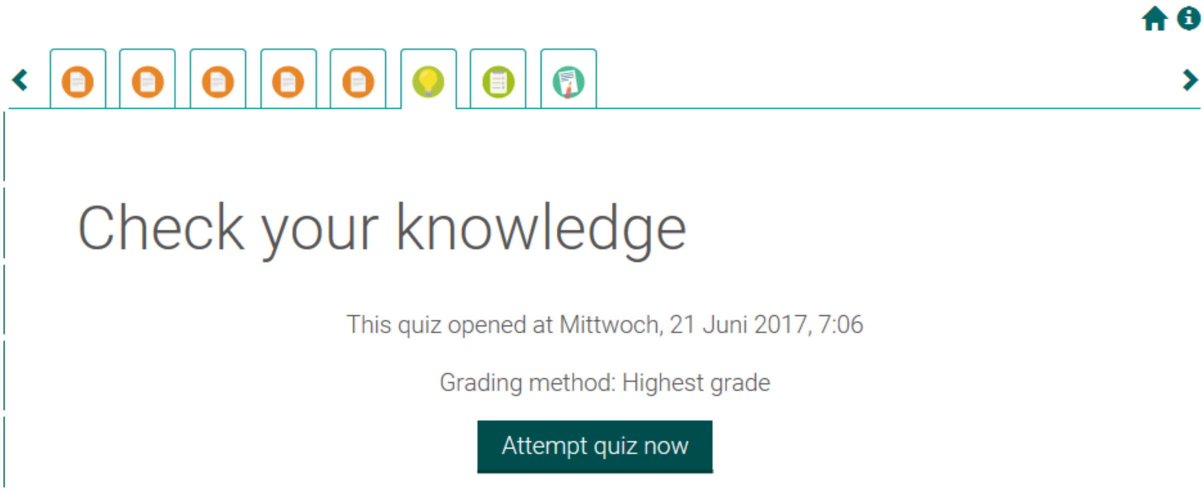


Last modified: Mittwoch, 25 Mai 2016, 10:10

4. Tutorial Video



Last modified: Mittwoch, 25 Mai 2016, 10:11



Create your own map

And now it's your turn again.

Create a map where you show an area in Kairo with blocks of houses and investigate if there is a spacial lack of e.g. green areas around. Choose an area where you have similar amount of items to draw like in the example - the scale may vary if it's for the purpose of the research question.

Draw the shapefiles and create the database. Use the "near" and the "buffer" tool in a senseful way. Also split one of the feature classes, either blocks or green areas, in at least two categories and visualize them differently.

You can also visualize the distances saved in the attribute table of the polygon shapes. Therefore use graduated colors for example. *Maybe have a look in the tutorials of unit 1 again for a little help here.*

Instead of green areas you could also map other objects like supermarkets (points) or water (lines or polygones), you just need to choose the right geometry before drawing the shapes. You can be creative if you like, or stick to the example shown in the video.

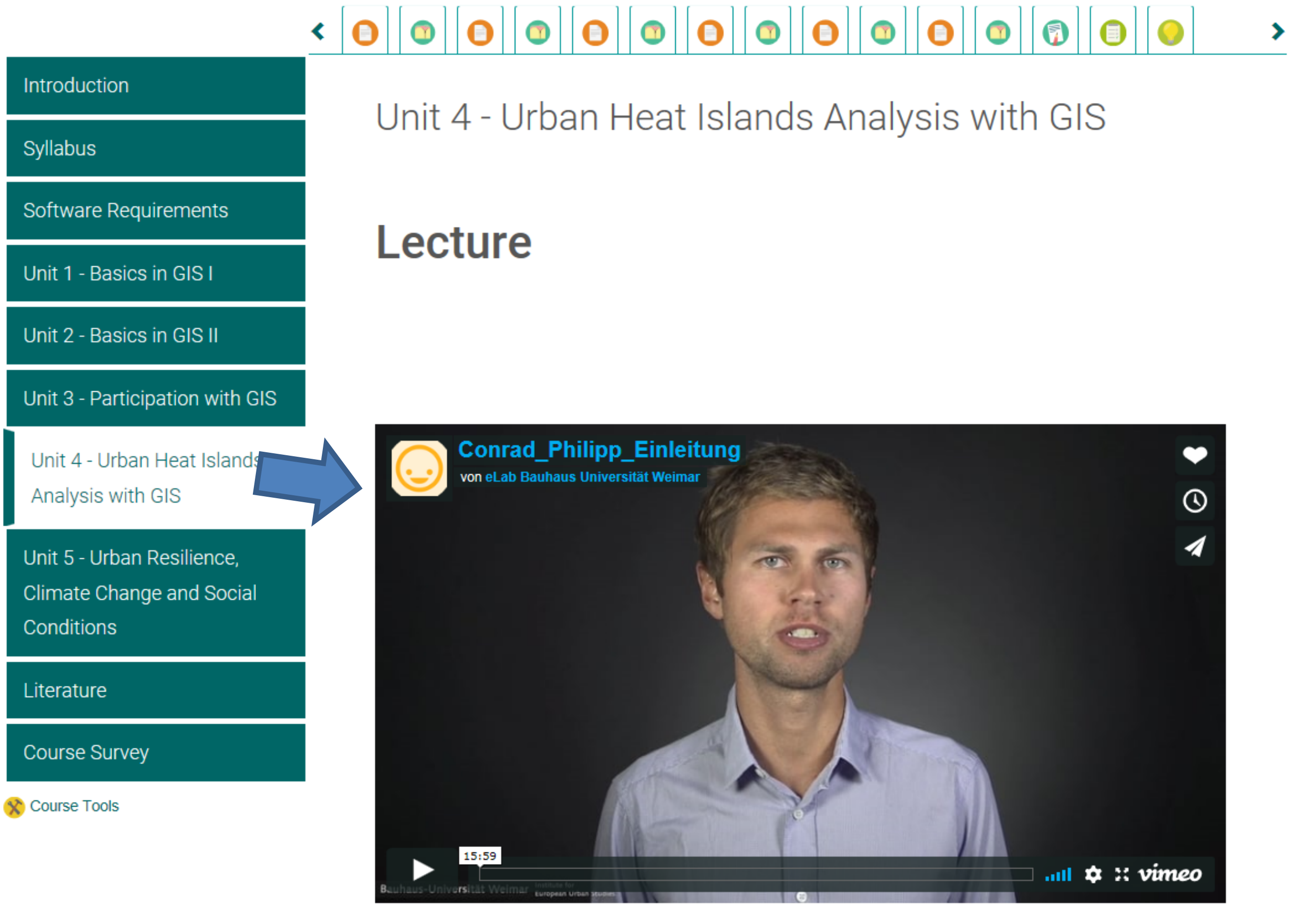
Please upload two files:

1. map layout with all the necessary items. Your "research question" should be readable.
2. a sreenshot of the ArcMap document with the table of content (the menu on the left) visible.

The deadline is set to **wednesday (1.June) 11pm** this time, since the exercise is a bit more complex.

Submission status

Submission status	No attempt
Grading status	Not graded
Due date	Mittwoch, 1 Juni 2016, 11:00
Time remaining	Assignment is overdue by: 1 year 152 days
Last modified	-
Submission comments	Show comments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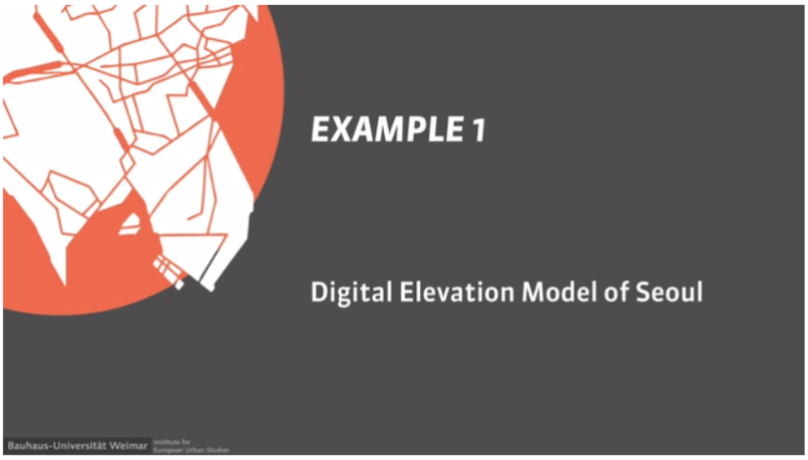
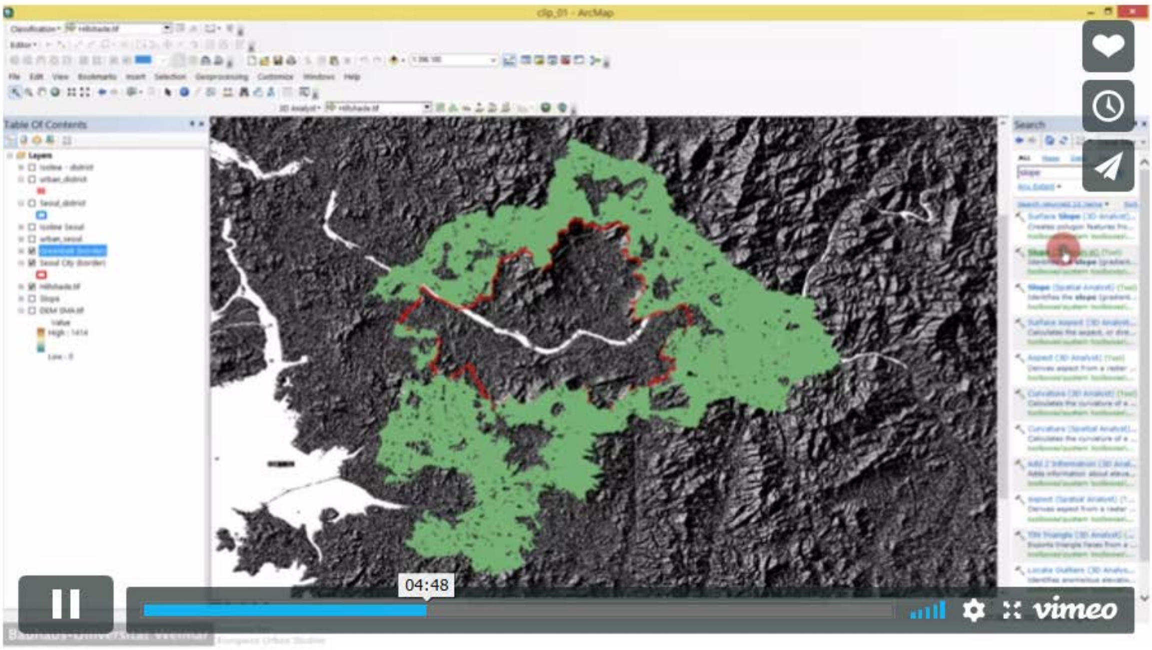
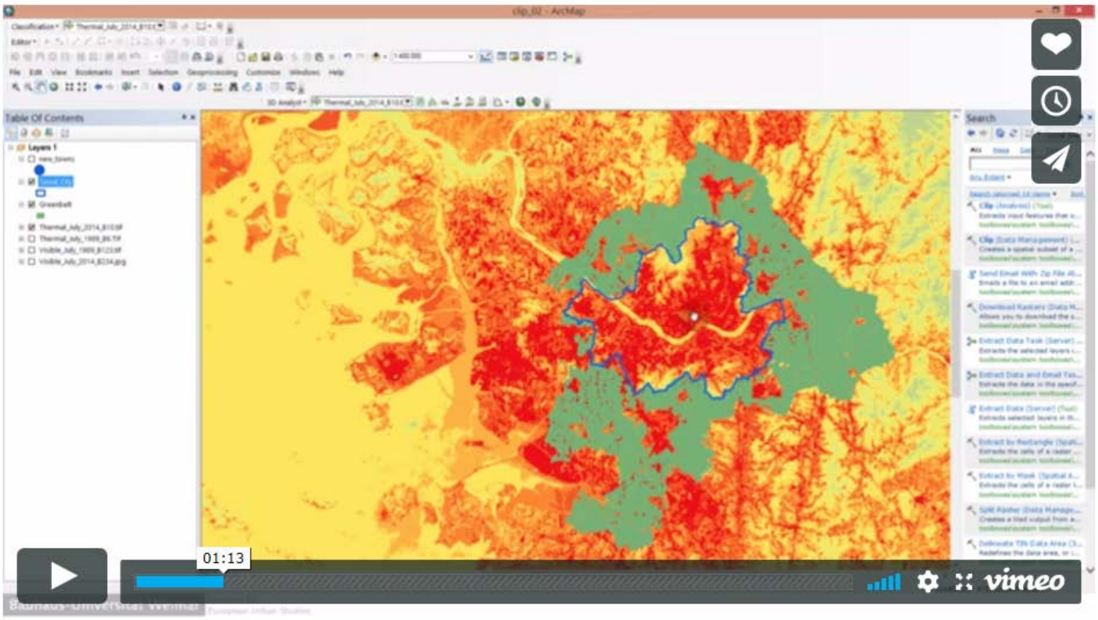
Unit 4 - Urban Heat Islands Analysis with GIS
Lecture
Conrad_Philipp_Einleitung
von eLab Bauhaus Universität Weimar
15:59
vimeo

Case Study Seoul (Example 1)





Leapfrog urbanization and UHI (Example 2)



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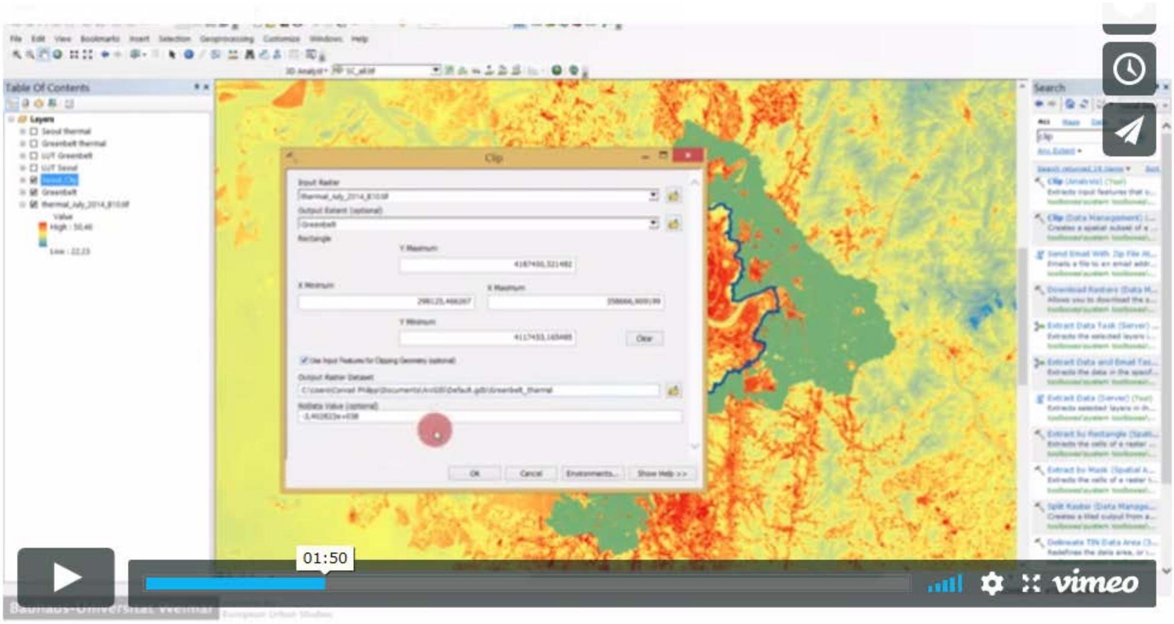
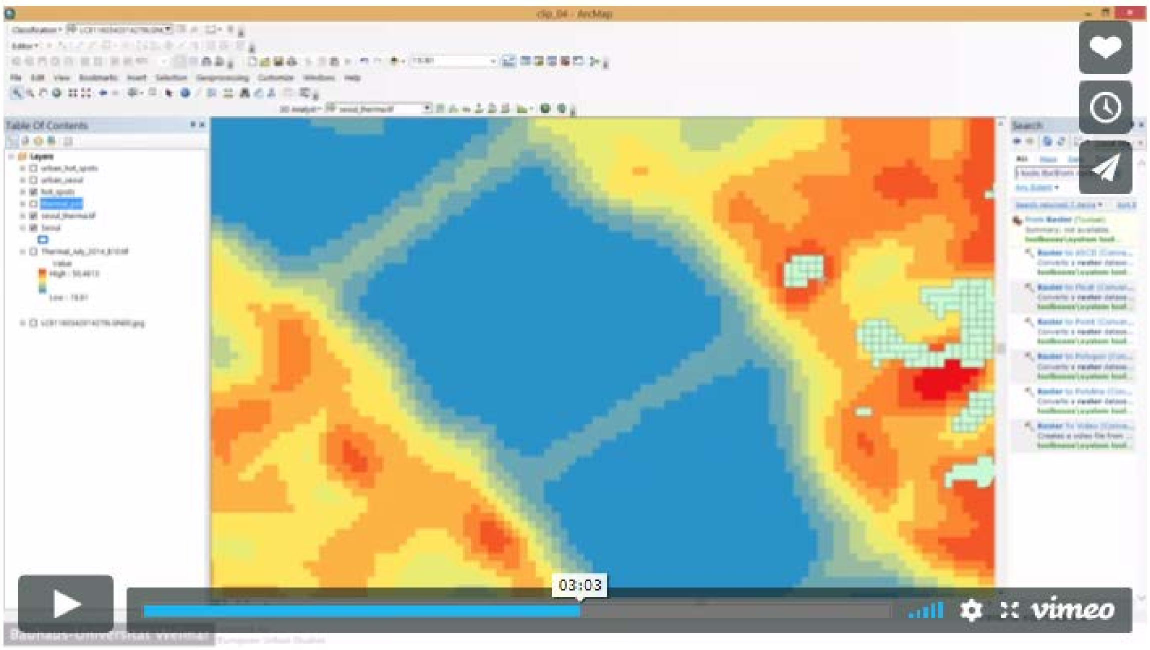
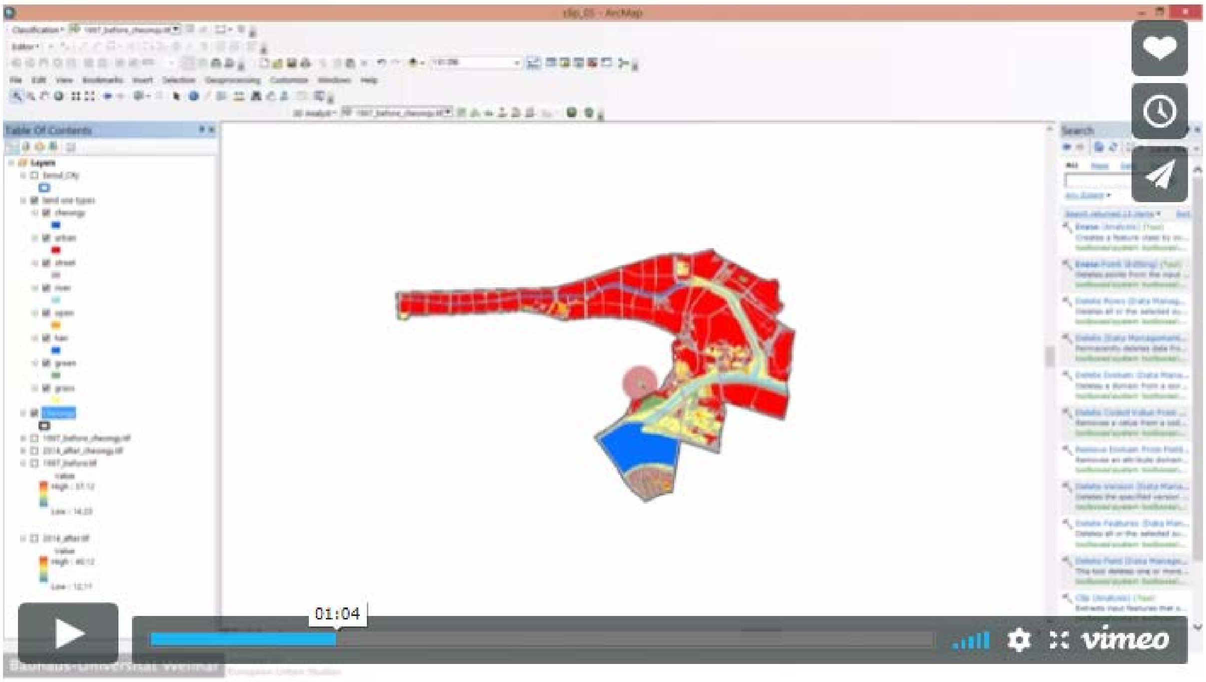
Making the urban heat effect visible (Example 3)



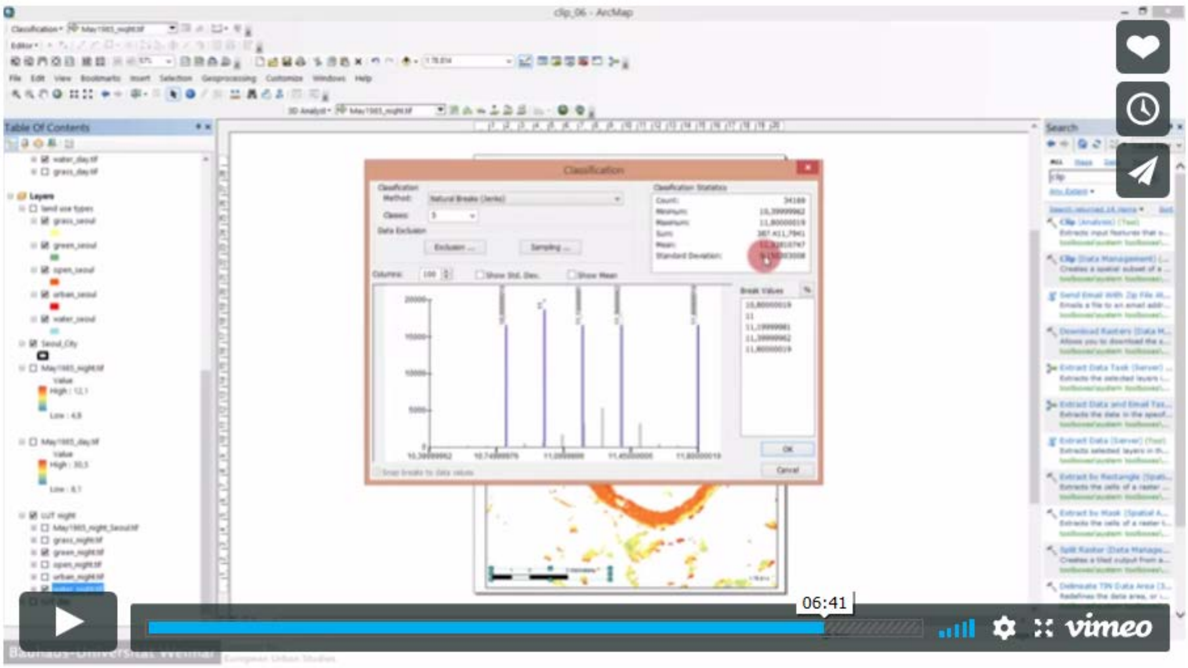
Locating Hot Spots in the City (Example 4)



Mitigation Strategies (Example 5)



Day/night comparison of UHI (Example 6)



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- Unit 4 - Urban Heat Islands Analysis with GIS
- Unit 5 - Urban Resilience, Climate Change and Social Conditions
- Literature
- Course Survey

Create your own map

After watching and following all the examples, choose 4 out of 6 that you prepare on a poster (each example on one sheet) in a way one could discuss the topic based on the map. Don't forget all the items necessary for understanding the map, like heading, legend and so on.

Please upload the 4 PDF or picture files.

Submission status

Submission status	No attempt
Grading status	Not graded
Due date	Sonntag, 10 Juli 2016, 11:00
Time remaining	Assignment is overdue by: 1 year 113 days
Last modified	-
Submission comments	Comments (0)

Add submission

Check your knowledge (Unit 4)

This quiz opened at Mittwoch, 21 Juni 2017, 7:15

Grading method: Highest grade

Summary of your previous attempts

Attempt	State	Review
Preview	In progress	

Continue the last attempt