

## Teaching Notes & Implementation Plan

**Case study or module title:** Visualizing Global CO2 emissions data (adapted from the original case study [Regulating Carbon Emissions](#) by Robyn Smyth, Sandra Penny, Curt Gervich, Gautam Sethi, Eric Leibensperger, and Pinar Batur, InTeGrate)

**Course/Course format:** “Socio-Environmental Data Analysis Workshop”, junior/senior/graduate major and non-majors, 20 students, 2 2-hour lab time each week, taught in a computer lab

**Abstract:** Using CO2 emissions data from the World Bank, students are introduced data visualization tools in the software Tableau. Students learn how to display data in bar charts, line charts, thematic maps, and other types of visualization such as tree maps, box plots, bubble charts, etc. Tableau is a software for business intelligence and analytics with a focus on user-friendly data visualization. In class, we use the free version Tableau Public to practice data visualization skills.

**Quantitative learning objective:**

- The ability to search and obtain data on climate change-related topics (carbon emissions specially) from the public domain
- The ability to clean up and organize data on a spreadsheet
- The ability to create relevant data visualization (charts, maps, tables) to answer specific research questions related to climate change
- The ability to use the Tableau software to present visualization work
- The ability to tell a story about climate change (based on data analysis) and put together a Tableau dashboard

**Socio-environmental learning objective:**

- The ability to describe trends in climate change data. For carbon emissions specifically, trends through time and trends across countries
- Based on the trends identified above, develop the ability to connect carbon emission data to socio-economic development of different countries through time
- Based on the trends identified above, develop the ability to connect carbon emission data to environmental justice questions on the global scale
- Based on the trends identified above and the following discussion, develop the ability to formulate carbon emission reduction strategies and plans

**Expected dates of implementation:** Spring Quarter, 2018

**1. What learning objectives (content) are you planning to address in your course using the selected materials?**

*The list above are the specific learning objectives I have for my course, especially emphasizing the quantitative skills with a focus on data analysis and visualization. The original Module*

*encompasses a broader range of topics related to carbon emission, from climate forcings to economic-based strategies for carbon emission mitigation. The learning objectives on the part about socio-environmental synthesis are implicit rather than explicit in my teaching since this is a data analysis course.*

**2. Briefly describe the pedagogical techniques you plan to use to facilitate the case/module and reinforce the learning objectives you identified above.**

*I plan to use the software Tableau Public to work on this data analysis activity. Tableau Public is free and is an online-based interface. My purpose is both to practice data visualization skills and to learn this specific software.*

- *More about Tableau Public: <https://public.tableau.com/en-us/s/>*
- *The Resources page uses World Bank CO2 emission data to demonstrate basic functions of Tableau: <https://public.tableau.com/en-us/s/resources>*

*My plan is to follow the exact same example as shown in the videos to introduce students this software. For their assignment, they will need to find another climate change-related data set to create similar visualization work.*

*Please see the document “Instruction and Assignment” for the assignment details.*

**3. Are you planning on making any adaptations to the case/module? If yes, please describe them here. If no, please indicate why.**

*As described above, I will not follow through this specific Module closely. Instead, I plan to adapt only the main concepts and then focus on carbon emission data specifically given the nature of my course - a lab-based data analysis course.*

**4. Do you think you will need to incorporate any supplemental materials with this module? If yes, please either describe what you are planning or include any materials you have already found.**

*I plan to include a few other climate-change data visualization examples to give my students some inspirations on what they can do with their projects. This can also be a crowd-sourced student-driven activity.*

*“Tableau Gallery – Viz of the Day” (<https://public.tableau.com/en-us/s/gallery>) is a great place for browsing some Tableau visualization examples. This can give students some inspiration for what they can do with their own data set. Many of the shared visualization workbooks can be downloaded and imported to the Tableau program for use.*

**5. What assessments are you planning on using to measure student progress? If possible, describe, attach, or provide a link here.**

*The assignment has two parts. Part one is to be able to follow the same carbon emission data visualization project demonstrated by the Tableau videos. This part gives students the basic skills with the software, based on which they can develop more sophisticated data visualization with their chosen topic in Part two. Part two asks students to find another climate-change-related*

*data set, to create a few visualizations, and to compile a Tableau dashboard to tell a story based on their visualization work.*

*Please see the document [“Instruction and Assignment”](#) for the assignment details.*

**6. Please provide any additional notes here (i.e. a to-do list of items that you need to accomplish before your implementation)**

*After implementing this module, my students overwhelmingly enjoyed working with Tableau to do visualization work. The software is user-friendly and the visualization are quick and easy to do. For Part two of the assignment, my students were able to find other data sets to use Tableau to do visualization work. Additionally, visualization work can be published to students' online profile and shared online. This allows users to interact with the visualization dashboard and can be good examples for students' portfolio.*