

# One doughnut for all?

## Combining Education for Sustainable Development and Statistics Education: Visual analysis of social and economic data with Gapminder

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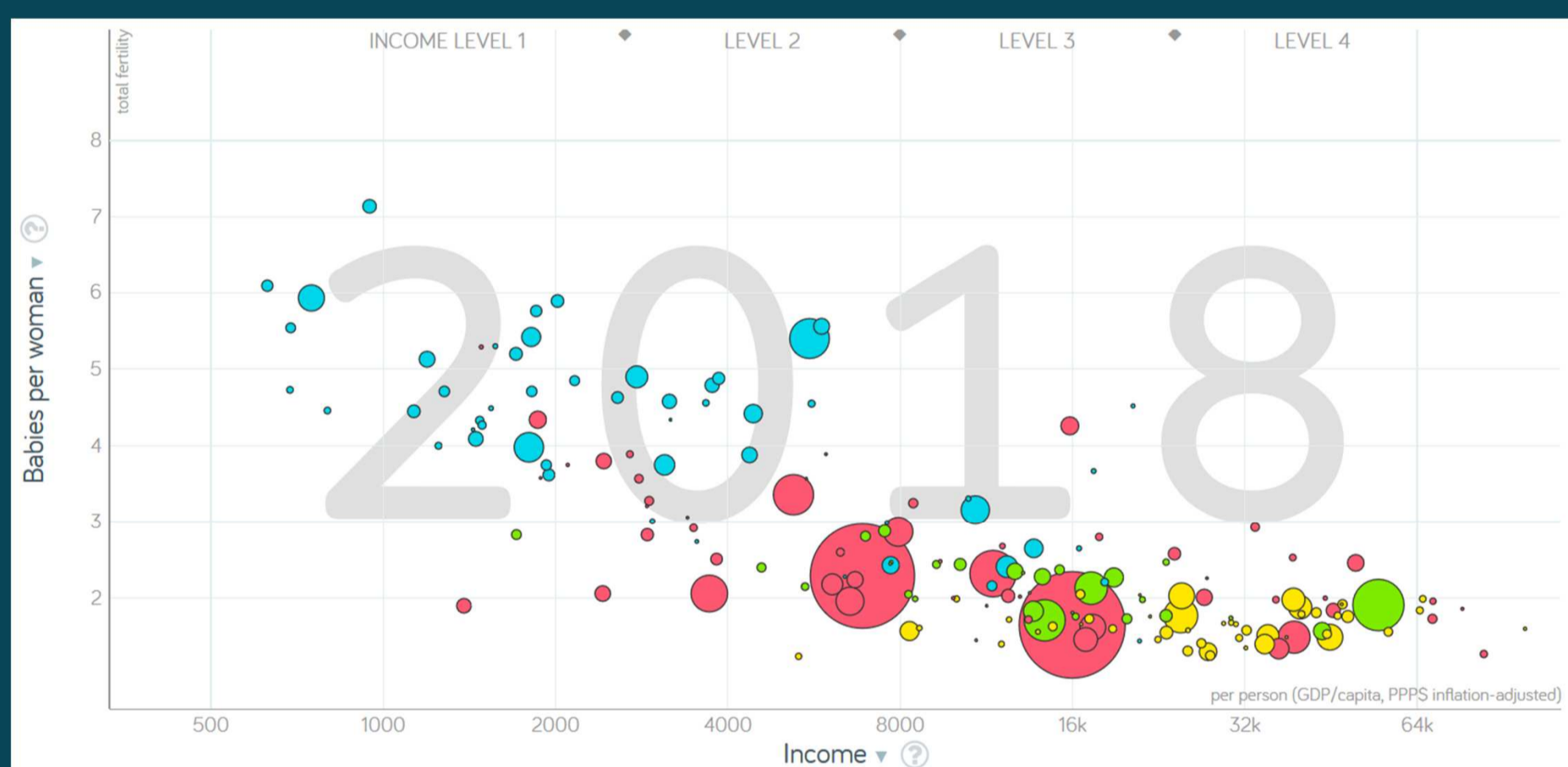
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### Introduction

Humans are having major impact on the world's ecology and earth processes. Many countries worldwide are not able to offer basic social living standards to their citizens and planetary boundaries are exceeded at the same time. We should teach future generations how to think and act in a way that social-economic needs may be fulfilled everywhere without overshooting planetary boundaries.

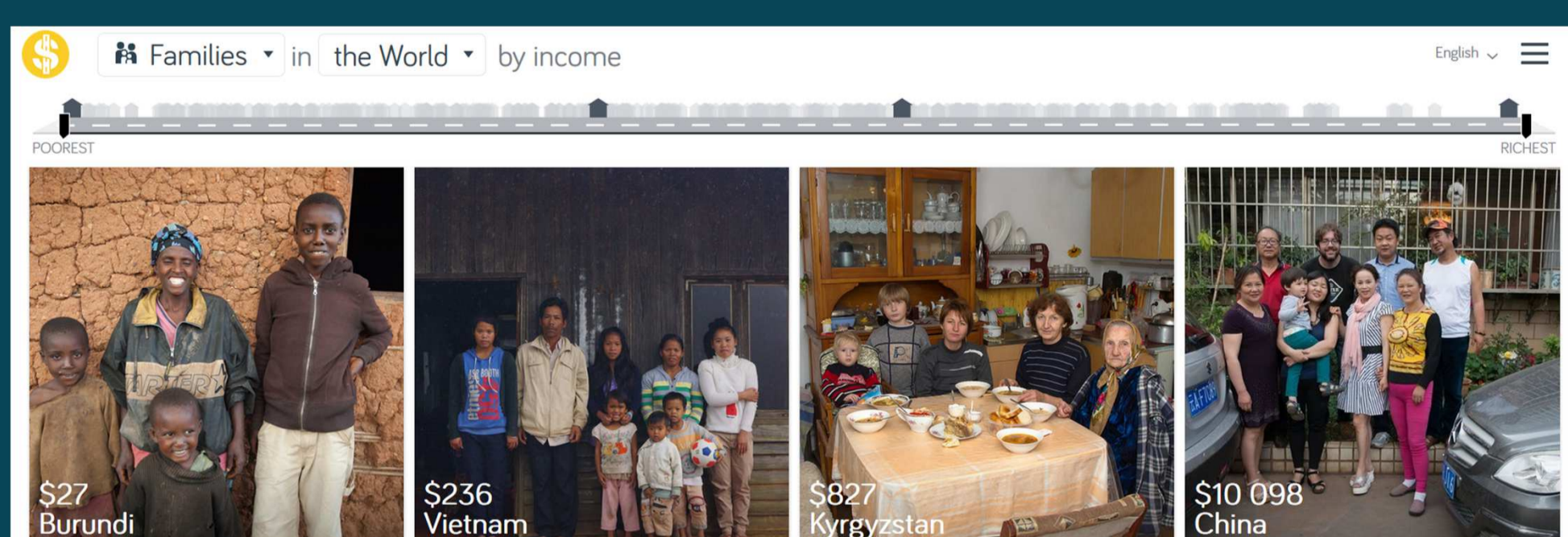
### Gapminder

Using the software Gapminder (Rosling et al., 2005) to visualize social and economic data of all countries worldwide, students explore data in the context (Makar & Ben-Zvi, 2011) of sustainable development. The data contain, e.g., variables on the average income of the countries, on health, economy, education or emissions. Documentation of the data sources allows us to rate the quality of data. The various accessible types of diagram foster approaches to visually analysing data (Prodromou, 2014).



### Dollar Street

The online database Dollar Street consists of thousands of photos showing the living circumstances of people worldwide, considering their income. There are photos of the families' houses, their vehicles and even their cutlery or toilets. These pictures complement Gapminder's statistical data on an elementary level and can be used to deepen insight into the given task.



### Literature

Andre, M., Lavicza, Z., & Prodromou, T. (2019, February). Formalizing students' informal statistical reasoning on real data: Using Gapminder to follow the cycle of inquiry and visual analyses. Paper presented at CERME11, Utrecht, Netherlands.

Garfield, J. B., & Ben-Zvi, D. (2008). Developing students' statistical reasoning: connecting research and teaching practice. New York: Springer.

Makar, K., & Ben-Zvi, D. (2011). The Role of Context in Developing Reasoning about Informal Statistical Inference. *Mathematical Thinking and Learning*, 13(1-2), 1-4.

O'Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018). A good life for all within planetary boundaries. *Nature Sustainability*, 1(2), 88.

Prodromou, T. (2014). Drawing Inference from Data Visualisations. *International Journal of Secondary Education*, 2(4), 66.

Rosling (2005). .... In: Organisation for Economic Co-operation and Development (Ed.). (2005). *Statistics, knowledge and policy: key indicators to inform decision making*. Paris: OECD.

Raworth, K. (2012). A safe and just space for humanity: Can we live within the doughnut? *Oxfam Policy and Practice: Climate Change and Resilience*, 8(1), 1-26.

### The Doughnut Economics

Doughnut Economics (Raworth, 2012) is a model to illustrate global development processes considering various factors of basic human needs and planetary boundaries. It facilitates a deeper understanding of sustainable development and can be used as a tool to recognize and analyse challenges and possibilities for sustainable development on different levels (O'Neill et al. 2018). Focussing on corresponding variables, visualisations of the doughnut model reveal the development of countries, confederations or continents.

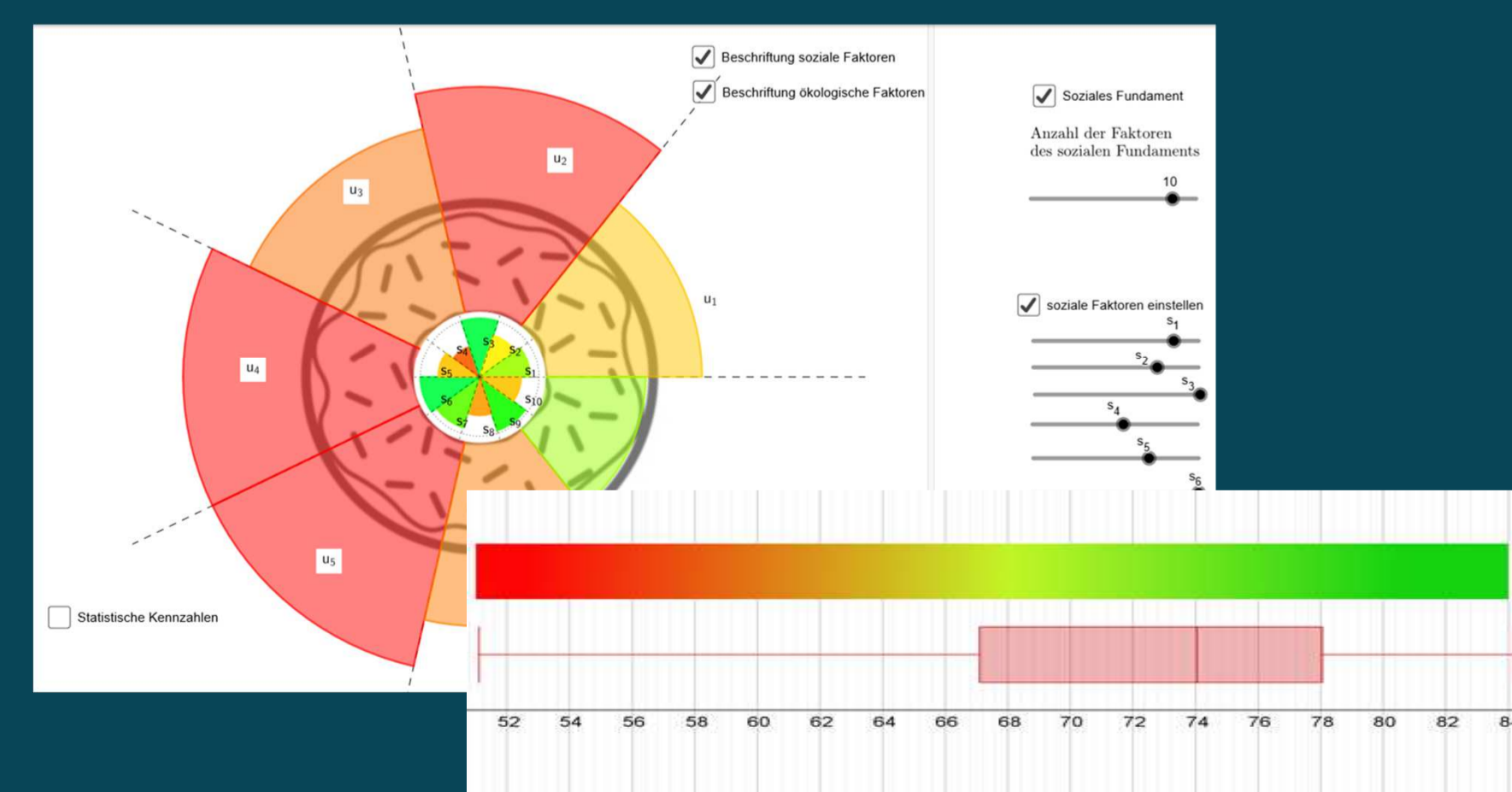


### Visual Data Analysis

The cycle of inquiry and visual analysis (Prodromou, 2014) is a concept for visual data analysis, starting with a) a statistical question or task, goes on to b) foraging for data and c) implementing visualizations, d) developing insights through interaction with the resulting data visualizations, and ends with e) further work on any step to develop deeper insight or ending the cycle.

### GeoGebra Applet

The interactive applet together with the working materials provided allows students to explore the quality of sustainable development of different countries visually. Intuitive approaches to the big ideas of statistics (Garfield & Ben-Zvi, 2008; Andre et al., 2019) in the context of sustainable development and the concepts of student centered learning environments are the main idea behind this application.



### Contact and information

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