Appendix 3: Spatial analysis between scores and GDP, population and SDI
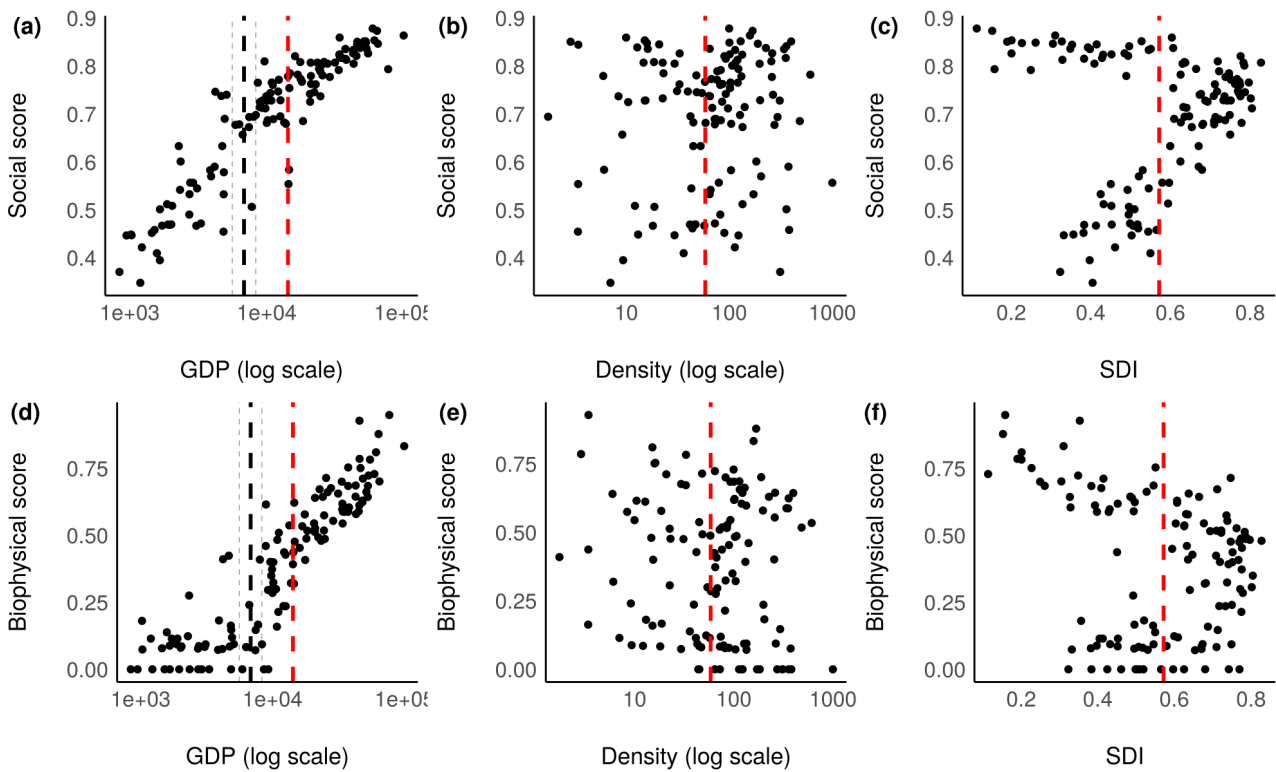

Figure A3.1: Relationships between the social score and the environmental score of SEI and external indices in 2011. (a) Social score related to GDP per capita (log values). The turning point in the relationship between SEI and GDP is depicted by a black dashed line (with 95% CI) and the red line represents the GDP value in 2011 for the world. (b) Social score related to population density (log values). The red line represents the average density value in 2011 for the world. (c) Social score related to SDI. (d) Biophysical score related to GDP per capita (log values). (e) Biophysical score related to population density (log values). (f) Biophysical score related to SDI.
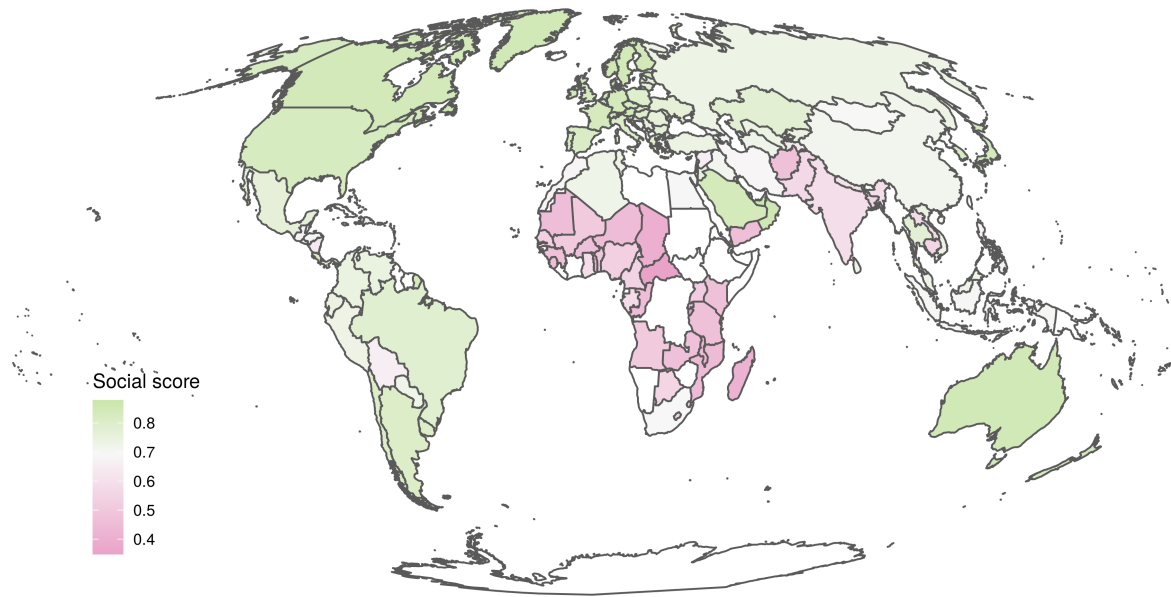
Figure A3.2: Spatial distribution of the social score. Low values are displayed in purple and high values in green.
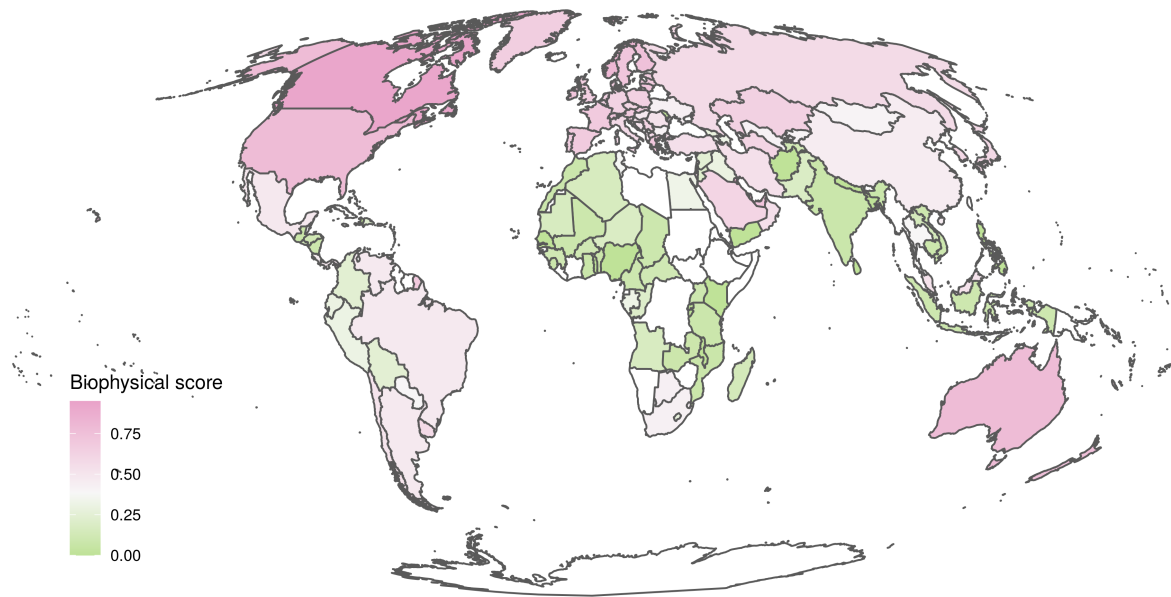

Figure A3.3: Spatial distribution of the biophysical score. Low values (low impact) are displayed in green and high values (high impact) in purple.

Focus on developed and developing countries

Developed countries were selected as member of the Organisation for Economic Co-operation and Development (OECD) and classified as advanced economy by the International Monetary Fund (IMF), and separated into countries that experienced economic growth between 2005 and 2015 and countries that experienced economic recession between 2005 and 2015 (bold):

Switzerland, Norway, United States, Netherlands, Denmark, Luxembourg, Japan, Germany, Austria, France, Canada, Belgium, Australia, Sweden, **Italy**, Iceland, United Kingdom, Ireland, Finland, **Spain**, New Zealand, **Greece**, Portugal, Czech Republic, Slovenia, Israel, Estonia, Latvia, Lithuania.

Developing countries were selected according to the IMF classification and separated into countries that experienced economic growth between 2005 and 2015 and countries that experienced economic recession between 2005 and 2015 (bold):

Albania, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, **Belize**, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, **Central African Republic**, Chad, China, Chile, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Ghana, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Iran, **Jamaica**, Kazakhstan, Kenya, **Kuwait**, Lebanon, Liberia, **Madagascar**, Malawi, Malaysia, Mali, Mauritania, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, South Africa, Sri Lanka.

Changes in social and biophysical indicators were then compared between countries that experienced economic growth between 2005 and 2015 and countries that experienced economic recession between 2005 and 2015 in developed and developing countries (Fig. A3.4). To do so, for each indicator, an ANOVA was conducted with indicator values as the response variable and GDP dynamic (growth vs. recession) between 2005 and 2015 as the explanatory variable.

The results showed that developed countries with a negative GDP change between 2005 and 2015 experienced a stronger decline in CO_2 emissions (-45±5%) and ecological footprint (-29±9%) than countries with a growing GDP (-31±15% and -12±18%, respectively) (Fig. A3.4). The reduction in CO_2 emissions in developed countries with decreasing GDP is thus 1.5 times faster than in developed countries with growing GDP and the reduction in ecological footprint 2.5 times faster. Yet, developed countries with declining GDP also experienced more negative changes than countries with growing GDP in social indicators such as life satisfaction (-12±7% vs. 0±10%), income (-1±1% vs. 0±1%), democratic quality (-5±16% vs. -1±5%) and employment (-7±7% vs. 0±3%).

Developing countries whose GDP changed negatively between 2005 and 2015 experienced a decline in their ecological footprint (-8±8%) whereas countries whose GDP increased experienced an increase (7±30%) (Fig. A3.4). This makes it possible for developing countries with decreasing GDP to reduce their ecological footprint, whereas the current trend makes it impossible in developing countries with increasing GDP to do so. Yet, as with developed countries, developing countries with decreasing GDP also experienced more negative changes than countries with

growing GDP in social indicators such as life satisfaction (-9±16% vs. 3±18%), social support (-13±28% vs. -2±15%) and nutrition (-23±78% vs. 17±55%).
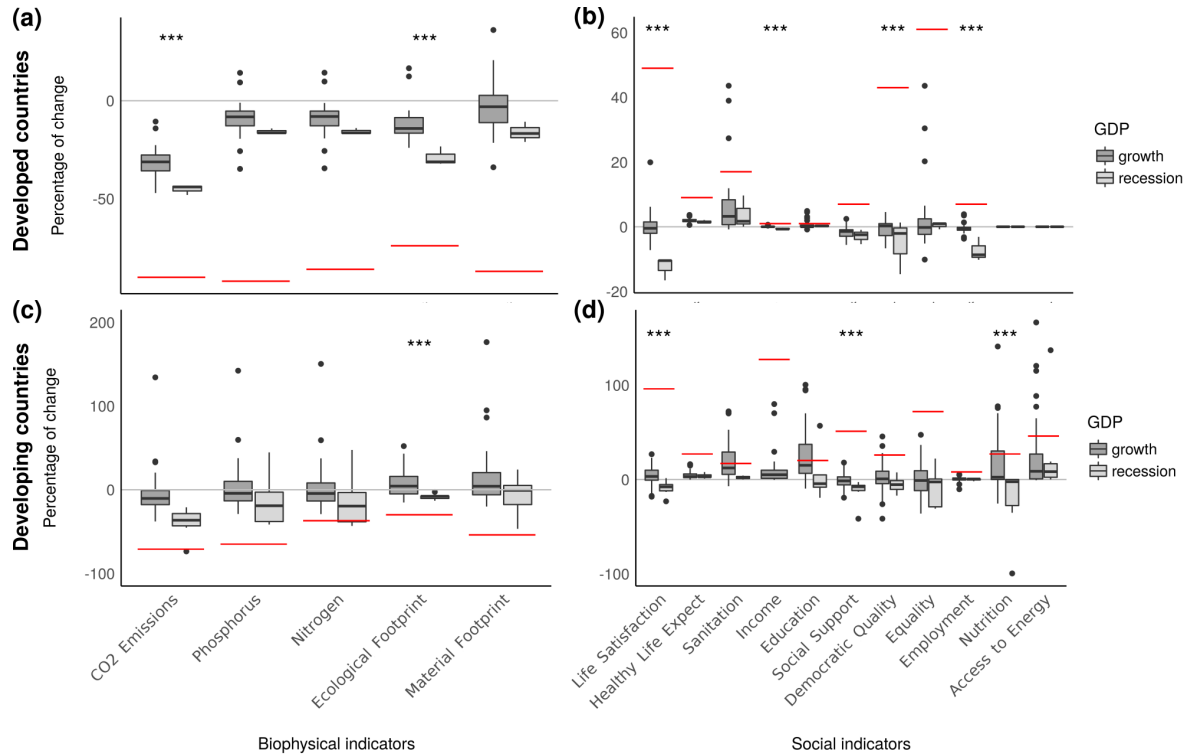

Figure A3.4: Difference in changes in biophysical and social indicators between 2005 and 2015 between countries that experienced economic growth or recession in developed and developing nations. (a) Changes (% of the 2005 value) in biophysical indicators in developed countries between countries that experienced economic growth (dark grey) or recession (light grey). Red lines: mean required change (% of the 2005 value) to pass below the biophysical threshold. (b) Changes (% of the 2005 value) in social indicators in developed countries between countries that experienced economic growth or recession. Red lines: mean required change (% of the 2005 value) to reach the maximum value. (c) Changes (% of the 2005 value) in biophysical indicators in developing countries between countries that experienced economic growth or recession. (d) Changes (% of the 2005 value) in social indicators in developing countries between countries that experienced economic growth or recession. ***: significant differences between countries that experienced economic growth or recession.
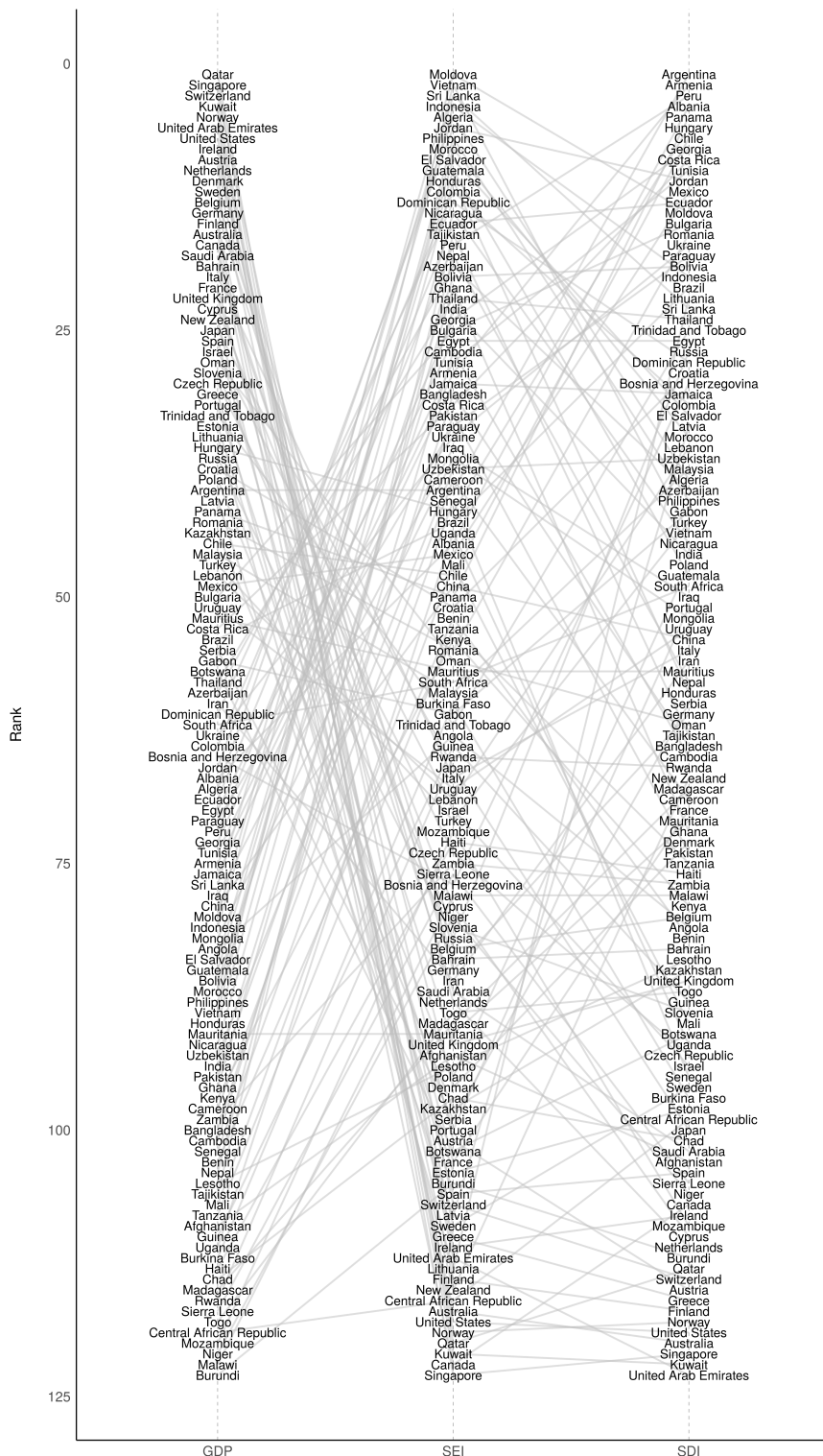
Figure A3.5: Comparison between countries ranked according to GDP, SEI and SDI.