**Social vulnerability indexes methodological note (draft)**

**Index 1: Social vulnerability to physical climate impacts**

Categories and variables:

1. **Wealth.** Variable: wealth component of HDI (log GNI per capita, PPP). Justification: Higher income gives the population more agency to invest in adaptation measures, or to have assets such as cars, air conditioning, etc. that improve their mobility and reduce their exposure. Sources backing relevance of category and variable:

<https://doi.org/10.1002/wcc.287>, <https://doi.org/10.1007/s10113-017-1105-9>

1. **Health.** Variable: life expectancy at birth. Justification: This is an indirect measure of the general health of individuals, which is important in the comorbidities that can increase excess deaths, and the quality of the health system, including its ability to serve individuals during emergencies. Sources backing relevance of category and variable:

<https://doi.org/10.1146/annurev-publhealth-012420-105026>, <https://doi.org/10.3233%2FSJI-140840>

1. **Age dependency.** Variable: percent of population under 15 or over 65 years old. Justification: young and old individuals are more affected by extreme events and have less agency due to their increased dependency. Sources backing relevance of category and variable:

<https://doi.org/10.1038%2Fs41612-023-00487-z>, <https://doi.org/10.1289%2Fehp.1002233>.

1. **Rurality.** Variable: percent of rural population. Rural areas are generally less developed, with less health facilities, and the sparse population can mean they are harder to serve with emergency, early waning, and preventive services, Sources backing relevance of category and variable:

<https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap9_FINAL.pdf>

1. **Gender.** Variable: Gender Development Index. Justification: it measures the difference access to wealth, education, and health between males and females, making women less resilient. Sources backing relevance of category and variable:

<https://doi.org/10.1080/13552070215903>, <https://doi.org/10.1002/wcc.451>

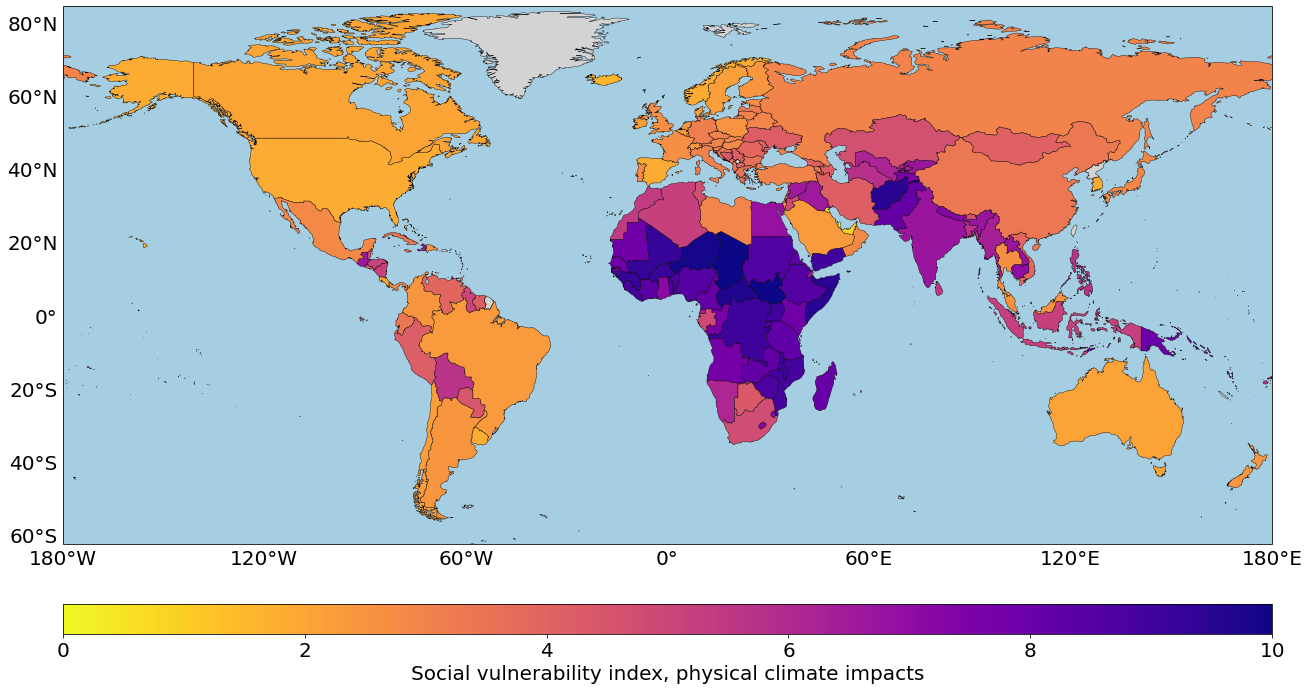


Figure 1. Social vulnerability to physical climate impacts

**Index 2: Social vulnerability to climate transition impacts**

Climate change poses numerous risks for the global workers[[1]](#footnote-1). Two of the main factors that influence a just transition for workers in the face of climate change a flexible and highly mobile workforce and a strong income support system[[2]](#footnote-2). Fundamental programs to enable a transition that leaves no one behind are a trade adjustment assistance and income support[[3]](#footnote-3), programs which may have large costs that will mostly be born by governments. An ageing workforce has less flexibility and mobility is a hindering mechanisms. Technical innovation and governmental support for new industries are important to avoid sunk investments in industries that no longer are compatible with a future affected by climate change[[4]](#footnote-4). Economic sectors can be affected by physical risks due to extreme weather events[[5]](#footnote-5) or to transition risks, due to economic changes in markets[[6]](#footnote-6). Industries where workers will most be affected by physical risks are Agriculture[[7]](#footnote-7) and Construction[[8]](#footnote-8), while energy, fossil fuel extraction[[9]](#footnote-9), manufacturing[[10]](#footnote-10), and mining[[11]](#footnote-11) are most at risk from transition factors. Other industries, like tourism, may exhibit a loss of income source and physical damages in the case of dwindling ecosystems and sea level rise. The transition vulnerability index aims to consider factors at a personal and structural scale that enable and hinder a just transition for workers. Additionally, the proportion of workers in industries affected by physical and transitional risks will be compared to the general social vulnerability index to transition risks. It is important to also compare workers exposed to physical risks with climate change exposure.

Categories and variables:

1. **Workforce age:** Variable: Ratio of population 20-39 years old to population 40-65 years old. Justification: a personal component of vulnerability; an older workforce is more at risk of having their skills become obsolete, and companies will likely be less interested in investing in their reskilling.
2. **Education:** Variable: Mean years of schooling. Justification: A personal component of vulnerability, the general economic transition gears toward more skilled job positions, and a worker with a basic set of skills and a higher education may be more attractive to a new industry. While it would be more directly useful to measure continuing education as measured by UNESCO (Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months), but it is a variable for which several countries have no data.
3. **Inequality:** Variable: Gini coefficient. Justification: A structural component of vulnerability; in more unequal economies, a just transition will be harder to achieve, with the wealthier workforce having the means and support to reskill and the opportunities to find new jobs in growing industries, while less well-off workers will more likely be locked in sunk industries and be left behind.
4. **Research and development**. Variable: Scientific and Technical Journal Articles per Capita. A structural component of vulnerability; it is aimed at measuring an individual country’s ability at actually creating new jobs and industries and leading the economic transition.
5. **Government debt.** Variable: Total debt service as % of GNI (reported mostly for global south countries, includes the interest payment), and Central Government debt as % of GDP (reported mostly for global north countries). Justification: A structural component of vulnerability, world governments might be in need to offer buyouts, early retirement packages or otherwise bear the brunt of reskilling costs in order to ensure a just transition for all. This will further increase debt burdens.
6. **Gender**. Variable: Gender inequality index, measuring female reproductive health and contrasting male and female empowerment and labour market participation. Justification: a personal and structural component of vulnerability, since it relates to women’s agency and the opportunities they have in the labour market and the government. A more inclusive workforce can be more easily diversified and retrained, and households with more sources of income are less vulnerable to job losses.

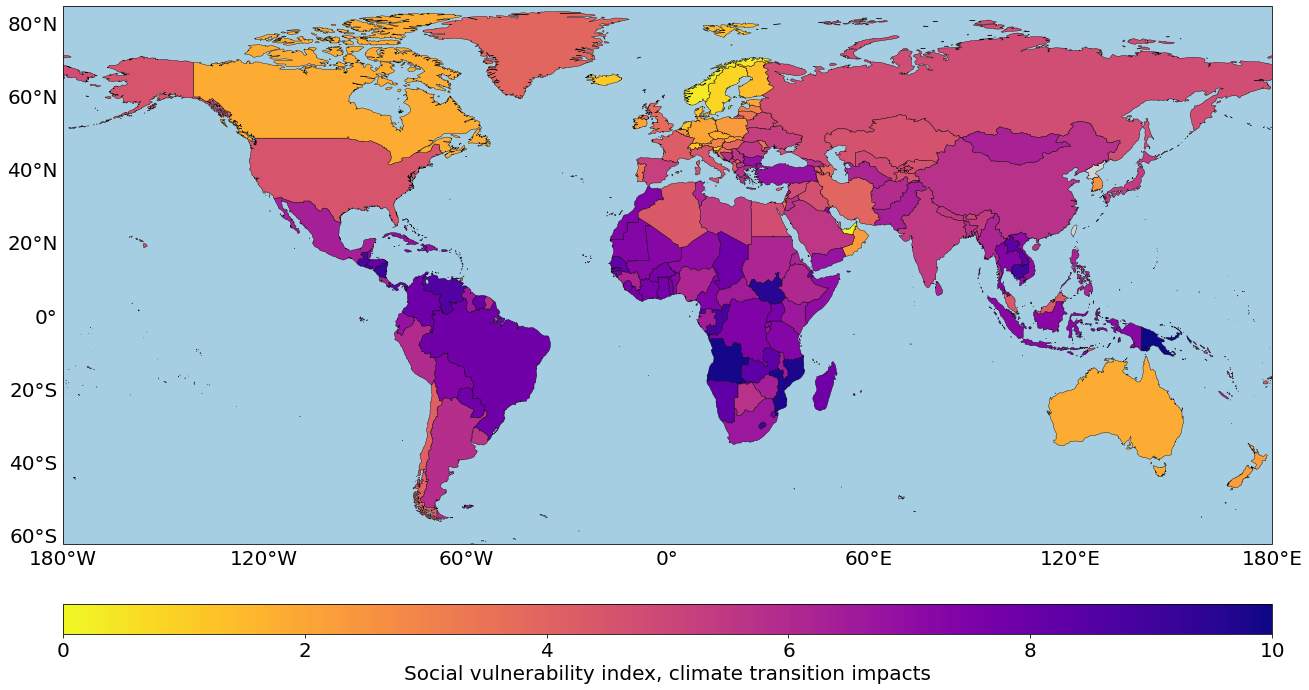


Figure 2. Social vulnerability to climate transition impacts

1. <https://researchrepository.ilo.org/esploro/outputs/995319441202676> [↑](#footnote-ref-1)
2. <https://dx.doi.org/10.2139/ssrn.3456148> [↑](#footnote-ref-2)
3. Barrett, J. (2001). *Worker transition & Global climate change*. Pew Center on Global Climate Change [↑](#footnote-ref-3)
4. <https://doi.org/10.1080/09644016.2014.923632> [↑](#footnote-ref-4)
5. <https://doi.org/10.3390/ijerph16183458>), [↑](#footnote-ref-5)
6. <https://doi.org/10.3929/ethz-b-000424345>, <https://doi.org/10.1088/1748-9326/acc347> [↑](#footnote-ref-6)
7. <https://doi.org/10.1080/1059924X.2021.1849211> [↑](#footnote-ref-7)
8. <https://doi.org/10.1177/089692051988095>, <https://doi.org/10.3390/ijerph15020247> [↑](#footnote-ref-8)
9. <http://dx.doi.org/10.2139/ssrn.3862256> [↑](#footnote-ref-9)
10. <https://doi.org/10.1007/978-3-030-75834-9_15> [↑](#footnote-ref-10)
11. <https://doi.org/10.1016/j.erss.2024.103672> [↑](#footnote-ref-11)