

FACT SHEET

Climate Change and Demography

Humans and climate change

Human populations are at the center of climate change research. On the one hand, human activities contribute to climate change. On the other hand, changes in the climate system affect human wellbeing and livelihoods. Both the contribution to and the impact of global warming is not distributed equally across the planet. Rather, different people in different places contribute and suffer to different degrees, depending on their characteristics and their level of affluence. Climate risks are the outcome of differential exposure and vulnerability to hazards. Understanding the reciprocal relationships between human populations and climate change and how they will evolve in the future, thus, is crucial for policy design and planning, both in the area of mitigation and adaptation.

Vulnerability and adaptation

Wittgenstein Centre research comprises two key elements. First, we assess the direction and the extent to which climate change affects human populations with a focus on demographically differentiated vulnerability. Using advanced statistical methods, we produce the empirical evidence on how climate variability and extremes affect subgroups of populations depending on their sociodemographic characteristics, as well as location-specific aspects that affect their livelihoods. Different demographic outcomes are considered, including impacts on migration, health and well-being, and union formation and Countries with most people affected by natural disasters, 2011-2020 From: Hoffmann R (2021) Risk transfers support adaptation. Nature Climate Change 11, 1019-1020. < 1% 2.5% - 5% 7.5% - 10% Count of people affected by disasters relative to population size (2011-2020) 1% - 2.5% 5% - 7.5% 10% - 20%

fertility. Second, we apply demographic techniques, in particular, multidimensional cohortcomponent population projections to predict future vulnerability and adaptive capacity given changes in population composition and distribution under different scenarios. Such predictions of future vulnerability are of high societal relevance because they allow for more specific interventions to tackle foreseeable future threats.

Regional differences

The impact of climate change is already being felt in all regions of the world. However, the impact is not distributed evenly. The areas where the population is already vulnerable, e.g. because of civil strife, high levels of poverty, and poor services and infrastructure will have lower capacity to respond to, cope with and adapt to climate change. Rural areas that depend heavily on rain-fed agriculture will be vulnerable to food insecurity, while urban areas are vulnerable to heat extremes. Even in a high-income country like Austria, certain subgroups of the population, particularly the elderly, but also children, minorities and marginalized groups can be more vulnerable to climate risks than others due to their higher susceptibility to certain climatic hazards and lower adaptive capacity.

> This includes also Austria, where population aging and increasing social vulnerability coincides with levels of warming exceeding the global average.

Disaster displacement in Africa and the Middle East, South and Eastern Asia, and Latin America and the Caribbean, 2019



Source: Internal Displacement Monitoring Centre (2020). From: Hoffmann R & Muttarak R (2021) <u>Environment, migration</u> and urbanisation: challenges and solutions for low- and middle-income countries. T20 Task force on migration.



Our research on the relationship between past temperature extremes and hospitalizations shows that elderly people are at a particular risk of becoming victims of heatwaves. As the Austrian population is aging rapidly and global warming leads to rising numbers of heat days every year, the health system will have to be prepared for carrying the additional burden of dealing with increasing numbers of patients, particularly during the hot summer months. While in the past, death was more concentrated in the cold season of the year, under future climates excess mortality is increasingly going to shift to the summer.

Also, preliminary statistical analyses show that climate change can hamper the global progress in eradicating gender-based violence and harmful practices. This points towards the need to better protect women and girls. As temperatures increase and crop failures become more prevalent, family resources are often put under severe strain in many parts of the global South, putting more and more women at risk of becoming victims of abuse.

The role of education

The climate-related research carried out at Wittgenstein Centre over the past couple of years has consistently shown that formal education matters for both climate change mitigation and adaptation. In particular, we show that providing at least secondary level of education universally can substantially reduce disaster vulnerability. At the same time, education enhances adaptive capacity through changing risk perception, increasing awareness, and improving socioeconomic resources necessary to implement adaptation and responses to change.

Further investments into both climate mitigation and adaptation are needed. In particular, a focus should be placed on those population groups that are characterized by a high vulnerability, making them more susceptible to the consequences of climate change. Together with demographic factors, social inequality and poverty are important vulnerability drivers. Policy can provide effective support by strengthening adaptive capacities and by building resilience, among others through increased education.

Uncertain future

Up until now, we have analyzed the impact of climate variability and extremes that occurred in a 1.2°C world (global mean near-surface temperature 1.2°C warmer than the pre-industrial level). Even under these comparably moderate levels of warming, we have already observed the effects on human health, wellbeing and live-lihoods. For instance, there is evidence that migration increases in response to adverse climatic conditions. However, these effects are highly contextual and in some contexts, migration has also been shown to decline, as climate change deprives people of the resources necessary to afford to migrate.

Nonetheless, there are many things that we still do not know about the future, when much more extreme changes are likely. Given the current trends in greenhouse gas emissions, the global average temperature is on the course of rising by 3°C compared to pre-industrial levels by the end of the century.

Projections of future climate impact typically consider only biophysical changes but neglect future societal changes. The key contribution of our work is to point out that the climate of the future will not match the societies of today i.e. emphasizing that future societal and demographic changes need to be accounted for when predicting future societies' vulnerability to climate change. We provide critical information for policy makers to improve decision-making related to tackling the impacts of future socioeconomic and demographic trajectories. We help identify specific population subgroups, as well as geographical vulnerability hotspots where interventions are most urgent given existing resource constraints.



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PUBLICATIONS

 Hoffmann R, et.al. (2020) <u>A meta-analysis of</u> country-level studies on environmental change and migration. Nature Climate Change 10, 904–912.

• Hoffmann R, et al. (2022) <u>Climate change experiences activate environmental concerns and promote green voting</u>. Nature Climate Change 12, 148–155.

 Lutz W & Muttarak R (2017) Forecasting societies' adaptive capacities through a demographic metabolism model. Nature Climate Change 7, 177–184.

 Muttarak R (2021) <u>Demographic perspectives in</u> research on global environmental change. Population Studies 75, 77–104.

• Striessnig E, et al. (2019) <u>Empirically based spatial</u> projections of US population age structure consistent with the shared socioeconomic pathways. Environmental Research Letters 14, 114038.

RESEARCH PROJECTS

 APCC Special Report: Health, Demography and Climate Change, <u>https://sr18.ccca.ac.at/</u>

• Climate, Health and Population - Climate Change and Differential Vulnerabilities in the Metropolitan Area of Vienna (CHAP), <u>https://www.oeaw.ac.at/</u> vid/research/research-projects/chap

 Forecasting Societies Adaptive Capacities to Climate Change (FutureSoc), <u>https://iiasa.ac.at/pop/futuresoc</u>

• Just Transitions to net zero carbon emission for all (JustTrans4ALL), <u>https://iiasa.ac.at/web/si.html</u>

 Population Dynamics under Global Climate Change (POPCLIMA), <u>https://cordis.europa.eu/project/</u> id/101002973

• Warum auf Wissen nicht immer Taten folgen: Eine experimentelle Studie zu Barrieren klimafreundlichen Verhaltens im Labor und im Feld (StartClim), <u>https://startclim.at/projektliste</u>