ETH
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Center for Comparative and International Studies

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Institute for Environmental Decisions

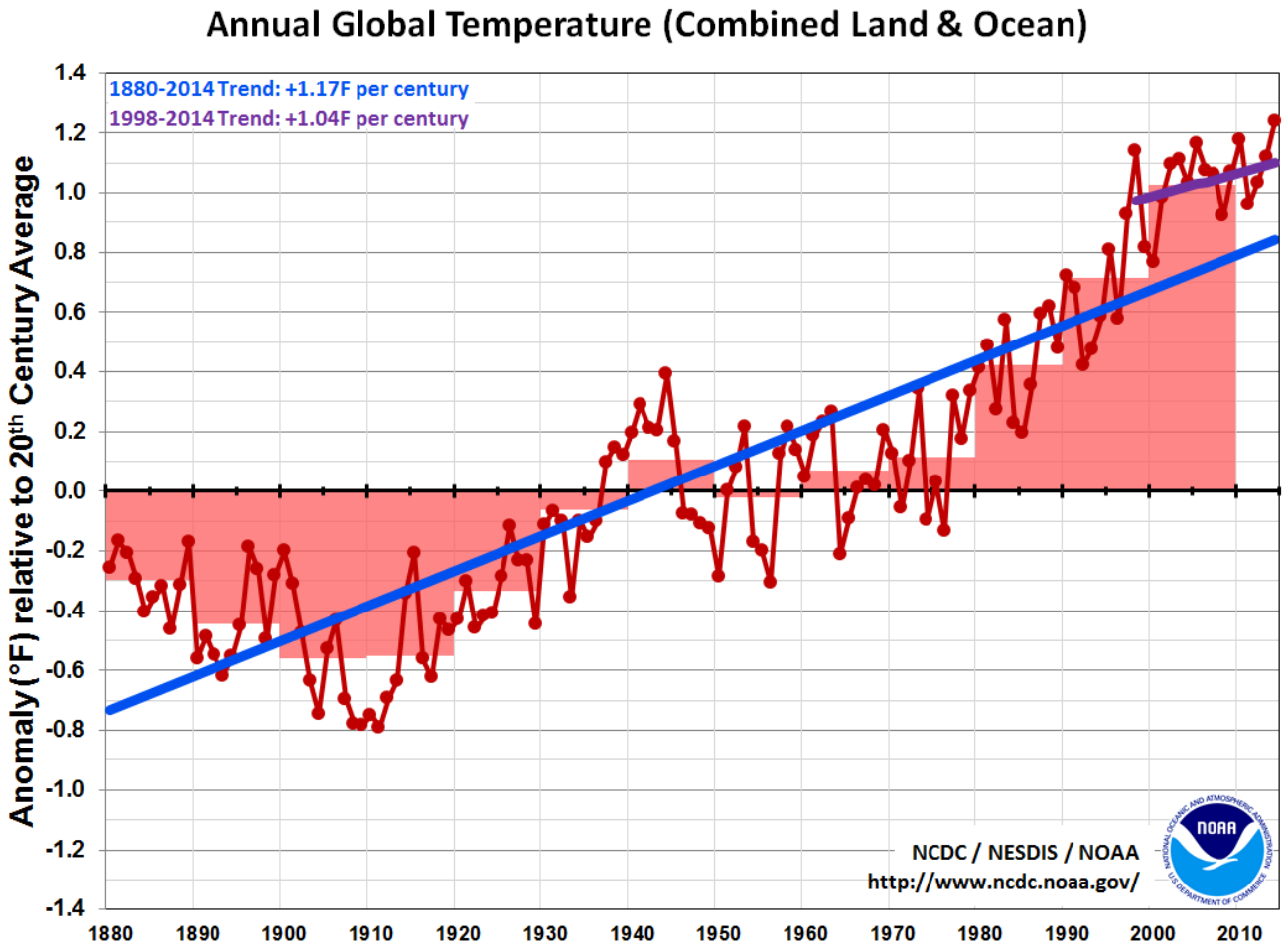
Climate Change and Disasters: Sustainable development impacts, trends, interlinkages with migration and conflicts, and likely scenarios

Vally Koubi

UN: Gathering Storms and Silver Linings

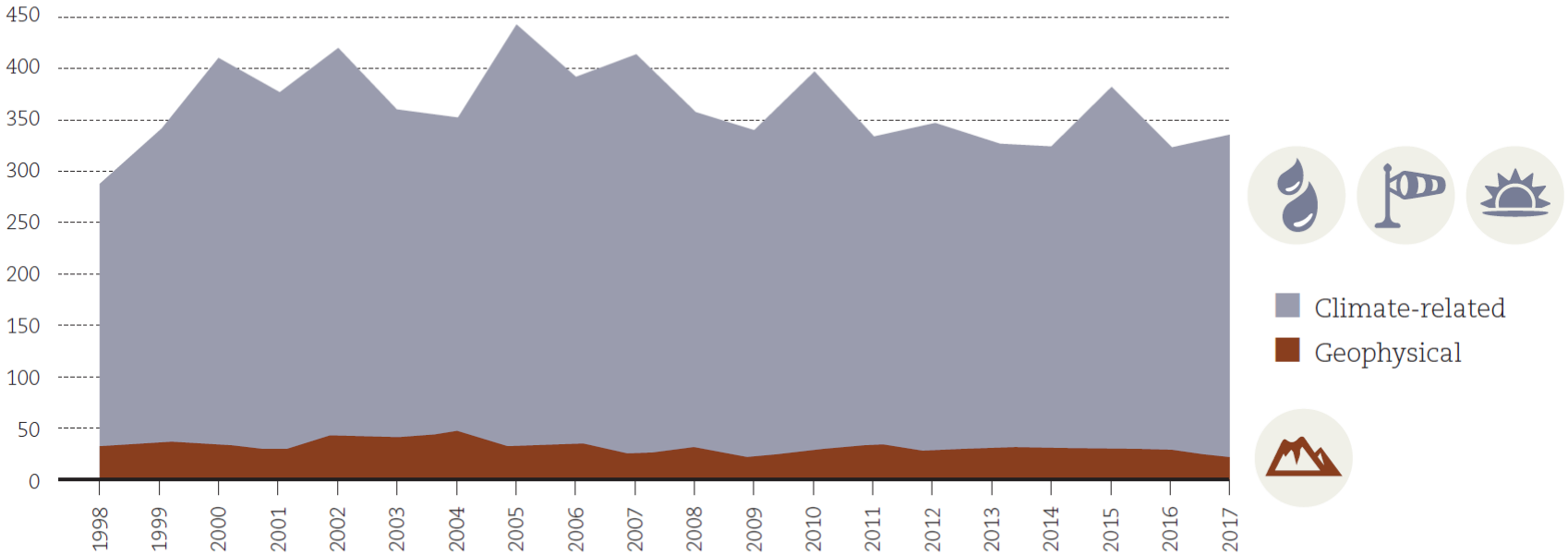
New York, February 20-21, 2019

IPCC AR5:"Warming of the climate system is unequivocal"



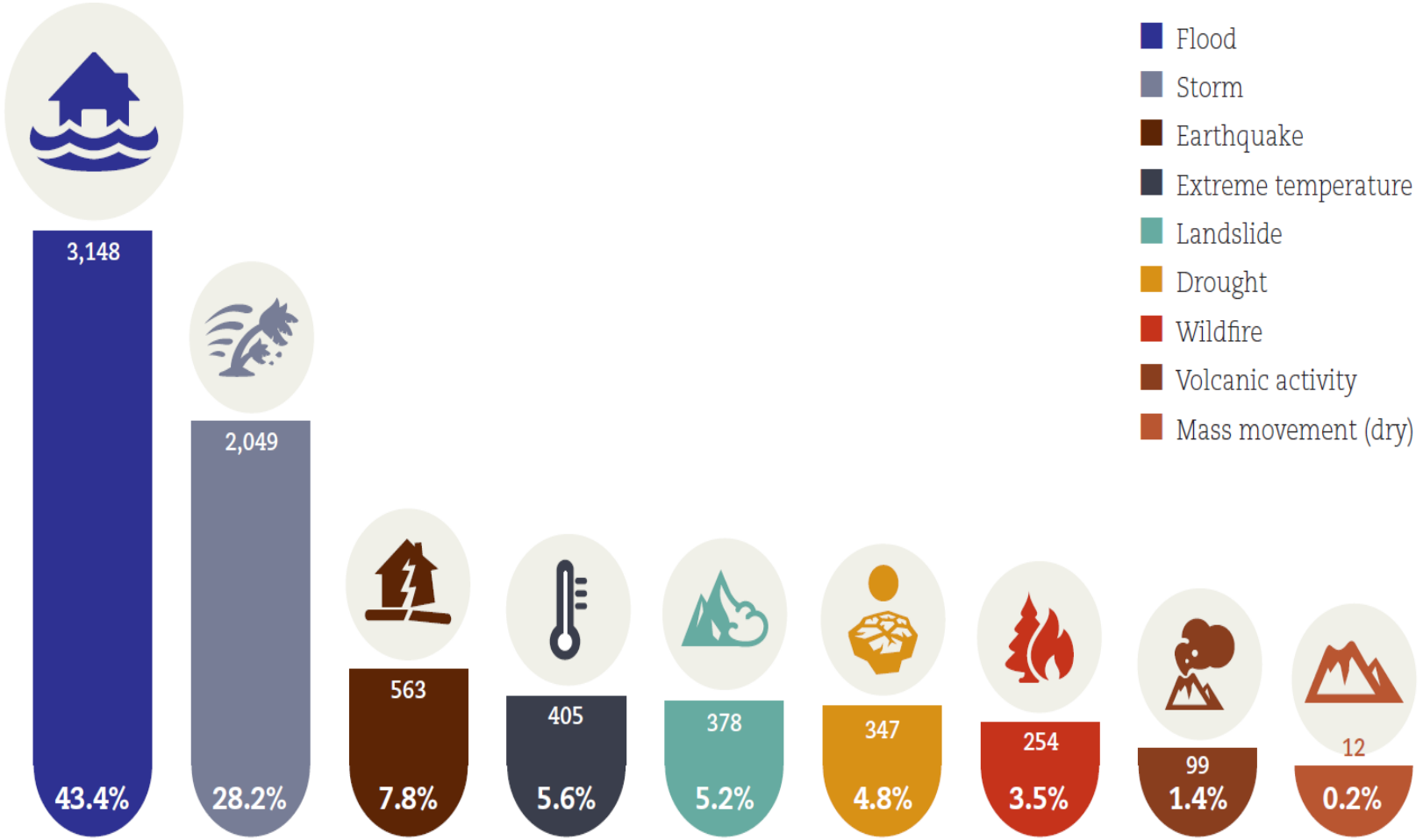
IPCC AR5: "Changes in many extreme weather and climate events have been observed since about 1950"

Number of disasters by major category per year 1998-2017



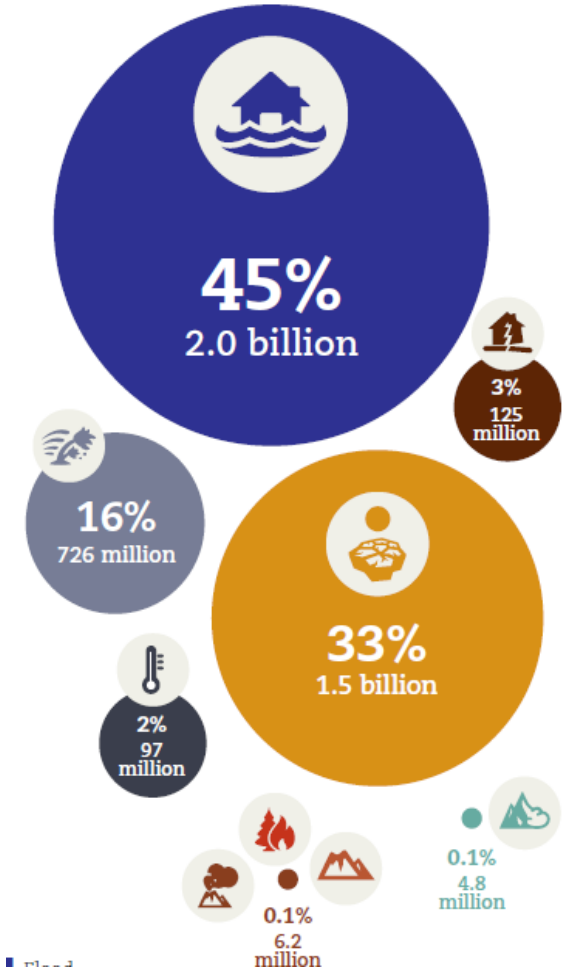
Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Numbers of disasters by type 1998-2017

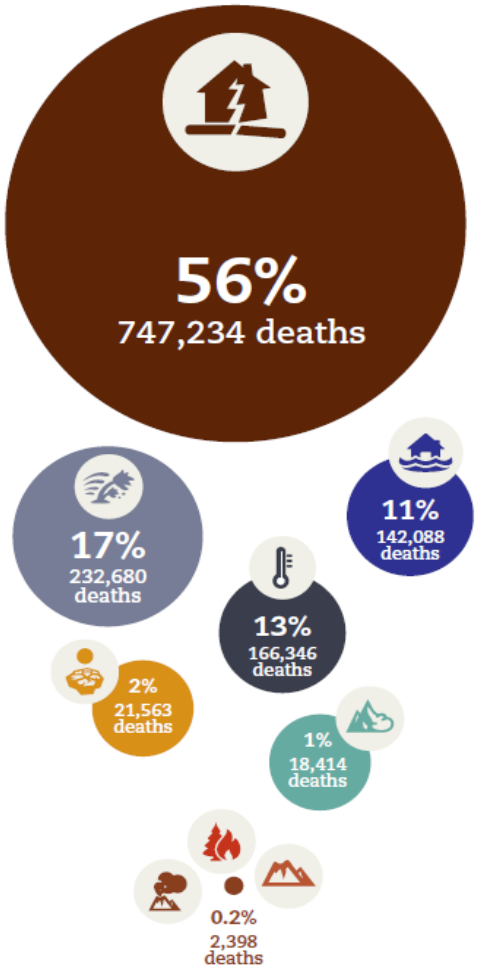


Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Number of people affected
per disaster type 1998-20173



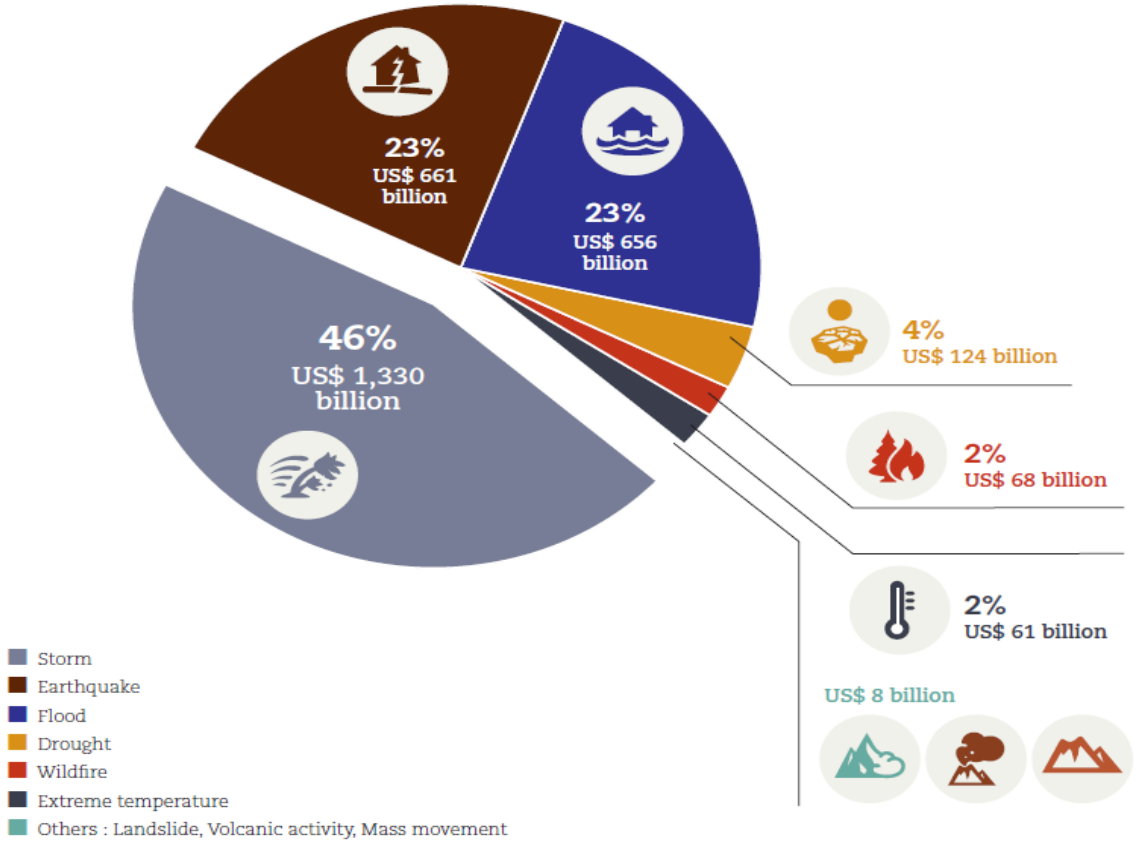
Number of deaths
per disaster type 1998-2017



- Earthquake
- Storm
- Extreme temperature
- Flood
- Drought
- Landslide
- Wildfire, Volcanic activity, Mass movement (dry)

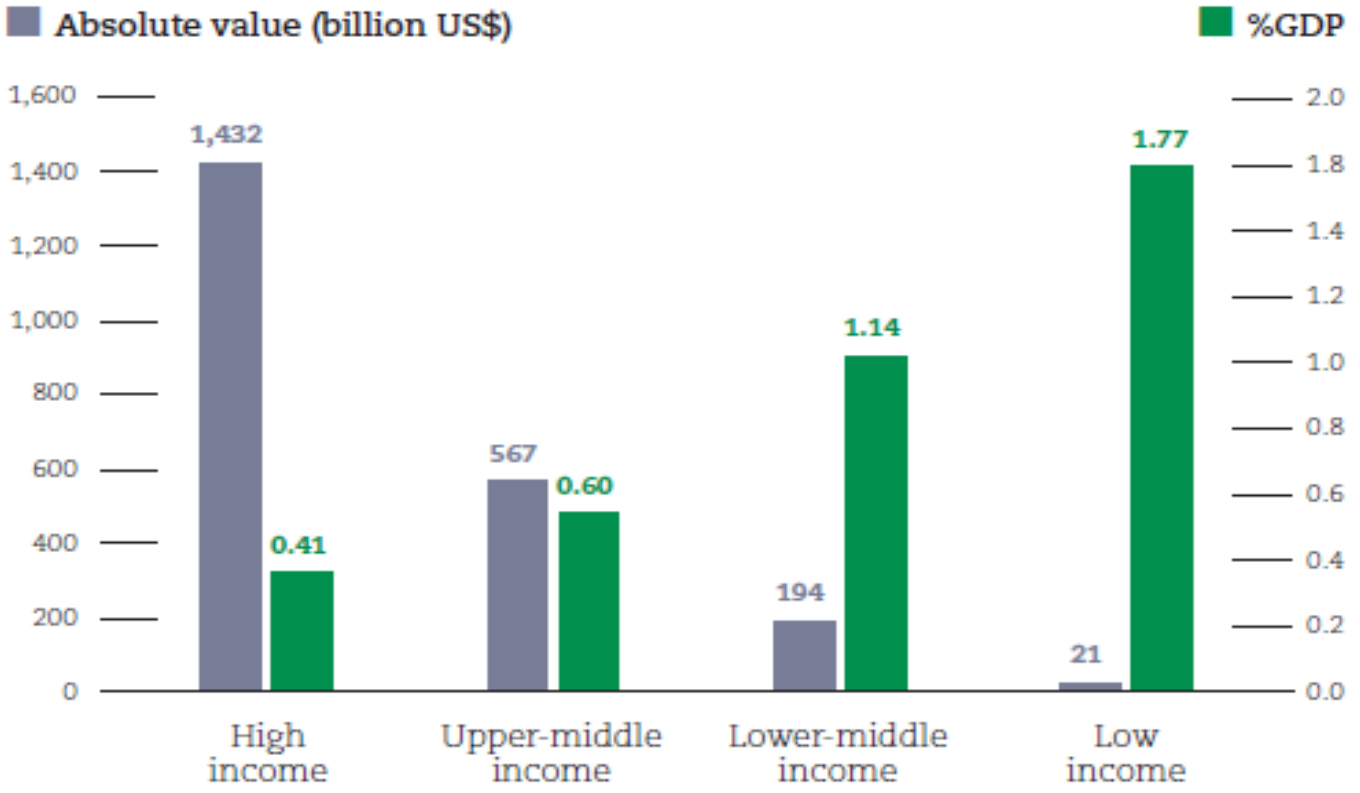
Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Breakdown of recorded economic losses (US$) per disaster type 1998-2017



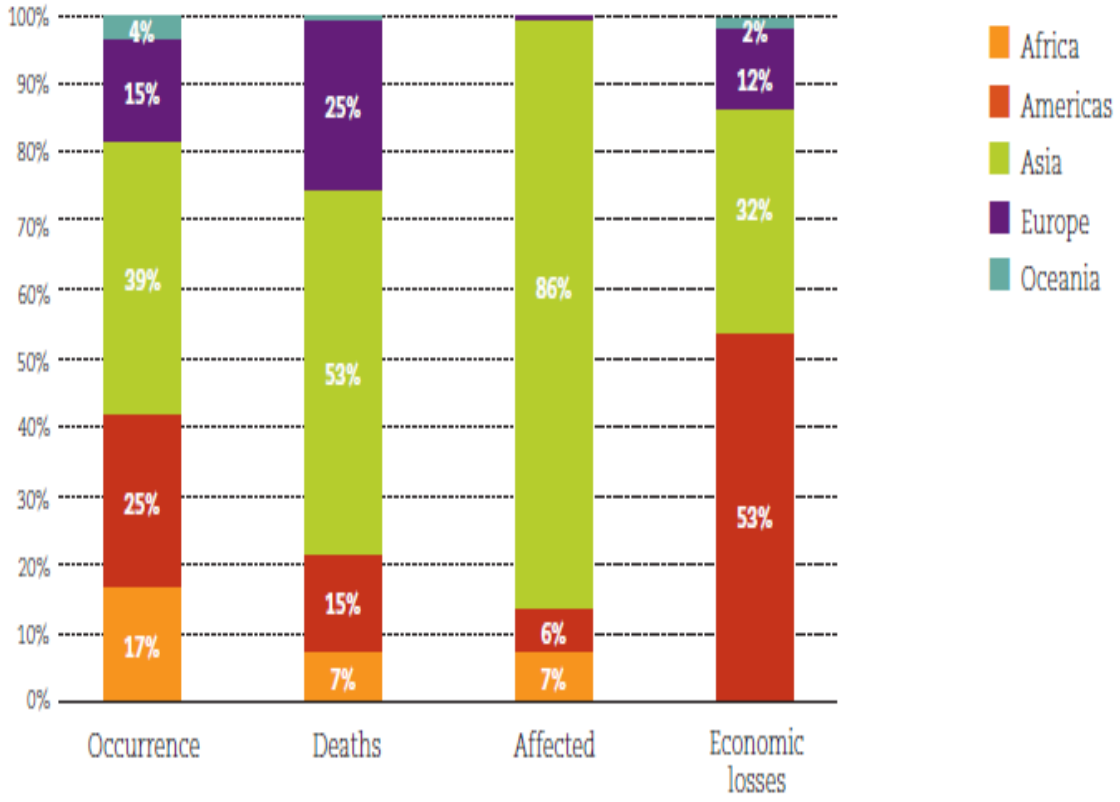
Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Recorded climate-related disaster losses per income group compared to GDP losses 1998-2017



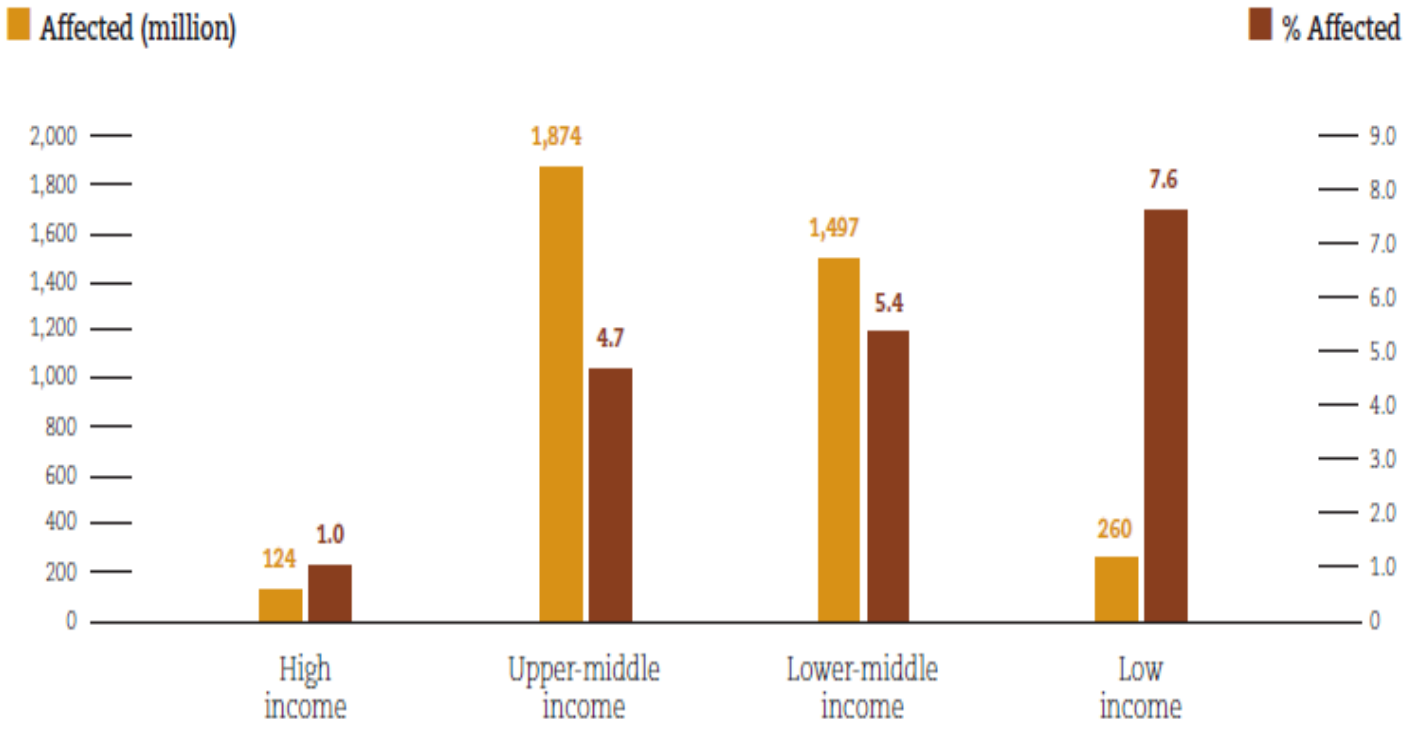
Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Relative human and economic costs of climate-related disasters on continents 1998-2017



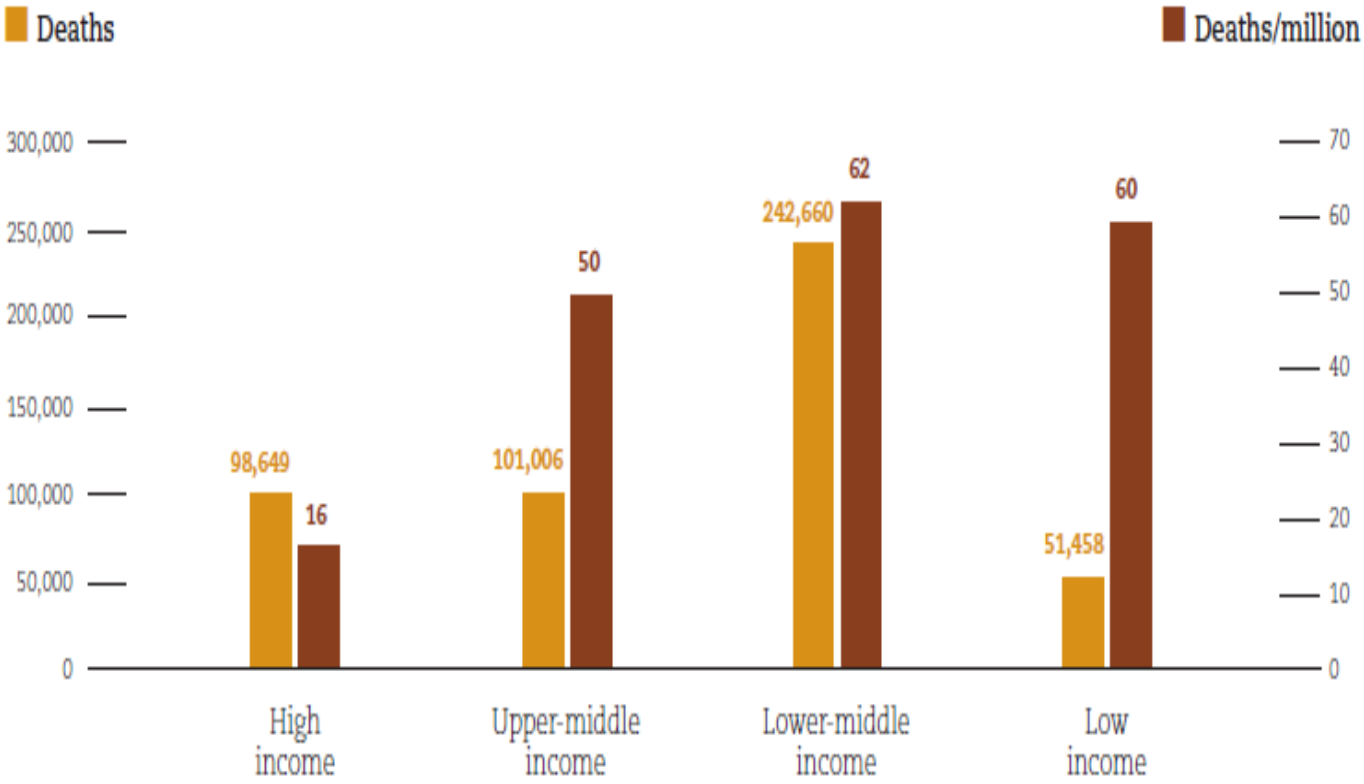
Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Climate-related disaster affected totals in absolute numbers and percentage of population potentially exposed (PPE) 2000-2017



Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

Climate-related disaster deaths in absolute numbers per million population potentially exposed (PPE) 2000-2017



Source: Mizutori/Guha-Sapir, Economic Losses, Poverty and Disasters 1998-2017

IPCC AR5: +2^{0}C or 1.5^{0}C desirable target upper limit

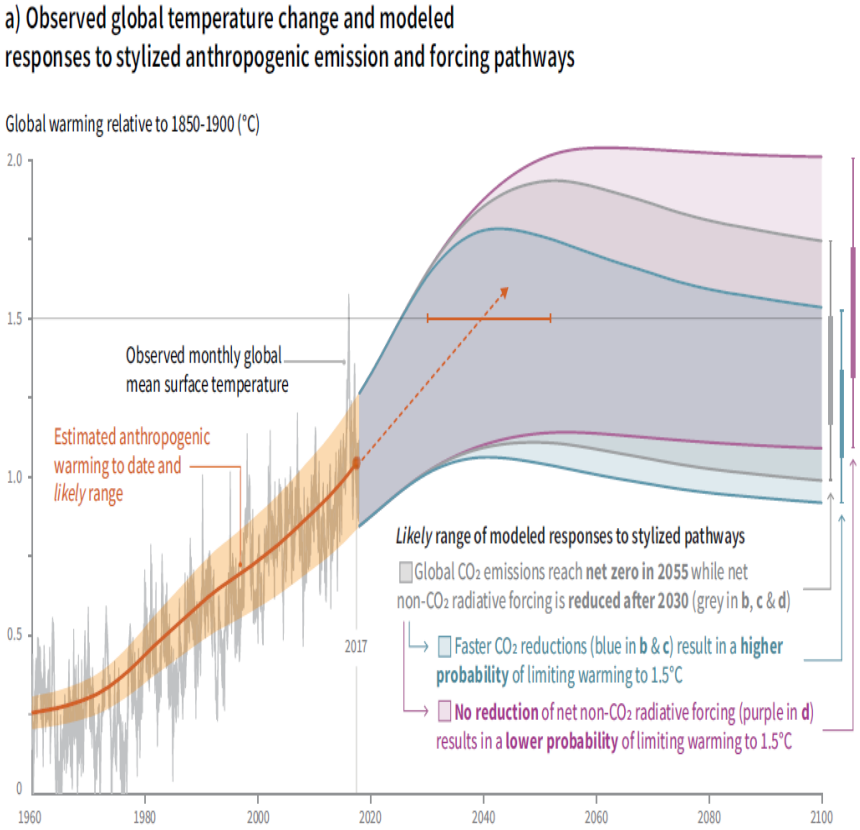
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Sendai Framework
for Disaster Risk Reduction
2015 - 2030

Provided the foundation for sustainable, low-carbon and resilient development under a changing climate.

….and then some bad news: We are not on track to meet climate change targets

IPCC Global Warming of 1.5^{0}C



Global warming is *likely* to reach 1.5^{0}C between 2030 and 2052 if it continues to increase at the current rate.

Climate-related risks to livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5^{0}C and increase further with 2^{0}C.

Limiting global warming to 1.5^{0}C can makes it easier to achieve the SDGs but this would require mitigation actions and adaptation measures to be taken at all levels.

…some Impacts and threats of global warming

- **Farming and fishing communities** will be hit the hardest, particularly in the Arctic, drylands, islands and the poorest countries = the number of people susceptible to poverty (SDG 1) increases
- The **quantity and quality of staple crops and livestock** will suffer = the availability of food in many parts of the world (SDG 2) decreases.
- **Economic growth** is expected to also suffer: net present value of global economic damage caused by climate change is estimated to be $54 trillion and $69 trillion at 1.5^0C and 2^0C warming respectively, relative to 1961- 1990
  - Developing countries especially in Africa, Southeast Asia, and Latin America) are more likely to disproportionately experience these negative economic effects (Burke et al. 2018; Pretis et al. 2018).

    => climate change will act as a poverty multiplier by increasing the number of poor people and by making poor people even poorer (SDG 1).
- *Fourth US National Climate Assessment report*: the US economy could lose hundreds of billions of dollars – or, in the worst-case scenario, more than 10% of its GDP – by the end of the century if global warming continues apace.

Climate change as a security threat (SDG 16)

- Numerous academic studies have sought to explore whether a climate change-conflict link exists and how climate change is – or could be – linked to conflict:
  => contradictory findings

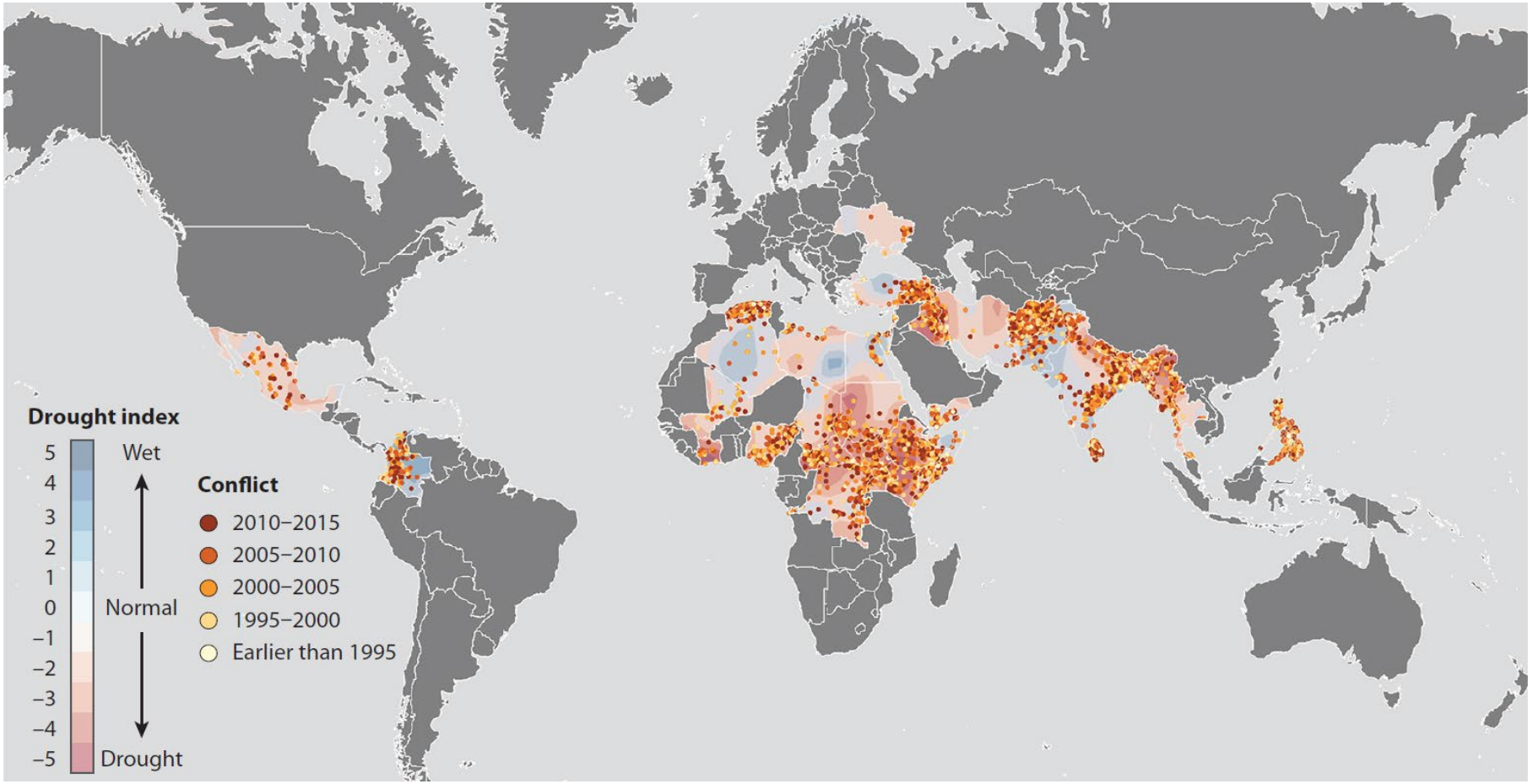
- A meta-analysis of 50 studies: Strong causal evidence linking climate to social conflict at all scales and across all major regions of the world (Hsiang and Burke 2014); a 1 standard deviation increase in temperature or rainfall anomaly is associated with an 11.1 % change in the risk of "intergroup conflict (Hsiang et al 2013)

Yet

This meta-analysis has been criticized with respect to sample selection, selection of indicators and interpretation of results (Buhaug et al. 2014)

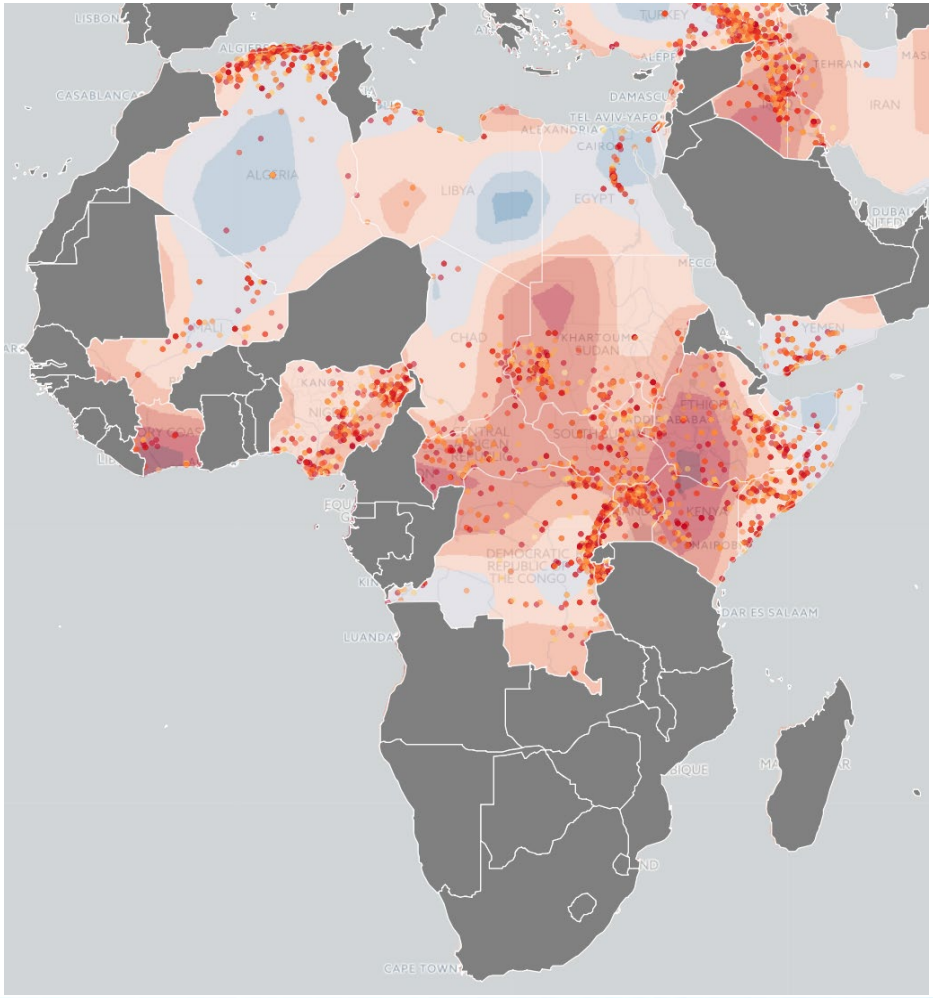
- The Human Security Chapter of the IPCC AR5 (2014) stated that '…collectively the research does not conclude that there is a strong positive relationship between warming and armed conflict'.

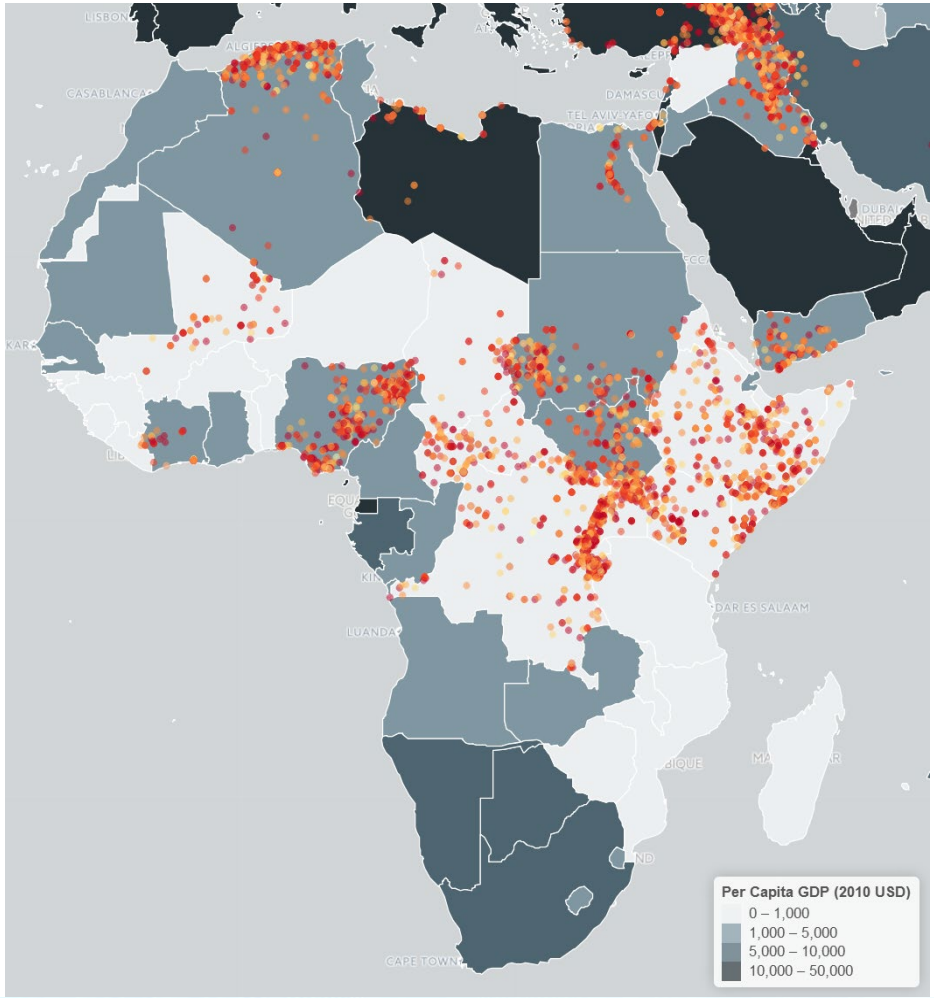
Drought Trends and Low Intensity Civil Conflict, 1989-2014



Palmer Drought Severity Index (2005–2014) and location of armed conflict events (1989–2014). Results are screened for countries with more than one recorded armed conflict event per year.
Data: NOAA PDSI and UCDP GEO v17.1. Koubi (2019)

Climate change as a threat multiplier: Drought, GDP per capita, and low level conflict





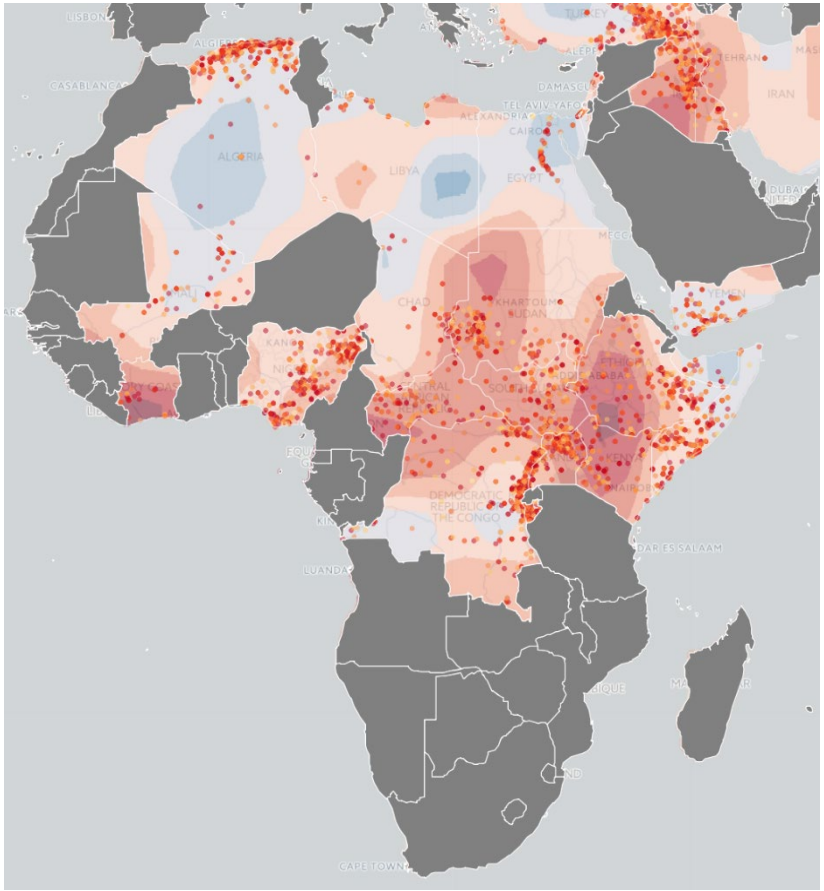
Climate-driven economy downturns and conflict

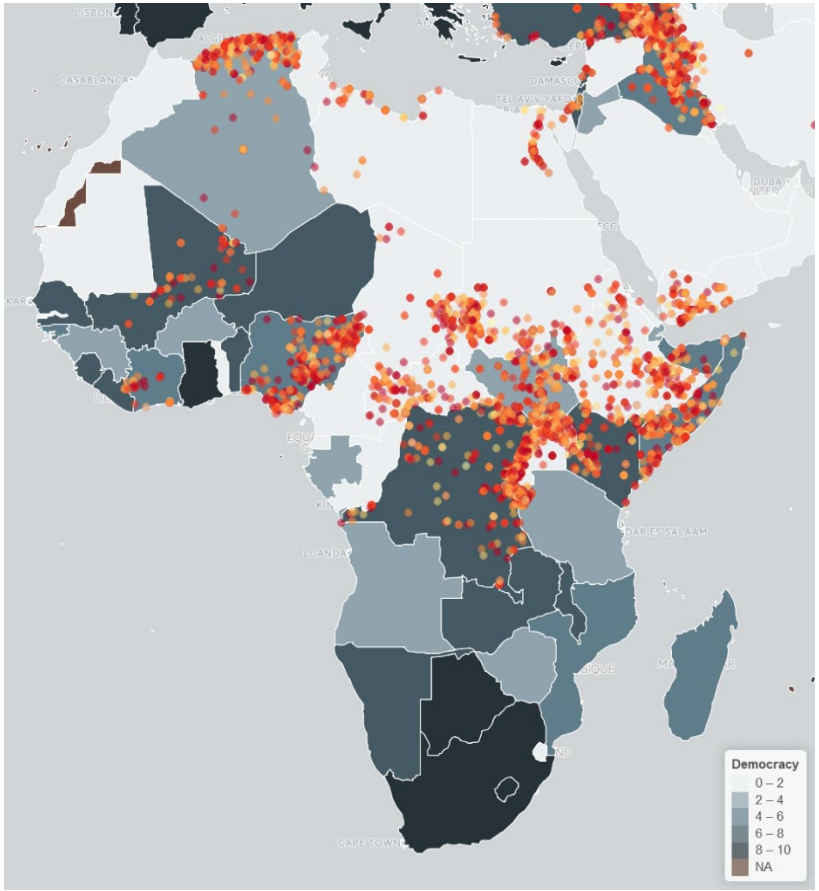
- Recent studies focus on areas where agriculture represents a large share of the national income and with predominantly rain-fed crops such as sub-Saharan Africa and Asia.

- Climatic conditions affect various types and dynamics of conflict via their negative effect on
  - agricultural production (Harari and La Ferrara 2018)
  - livestock prices (Maystadt and Ecker 2014)
  - incomes (Blakeslee and Fishman 2017)
  - food prices (Raleigh et al. 2015)

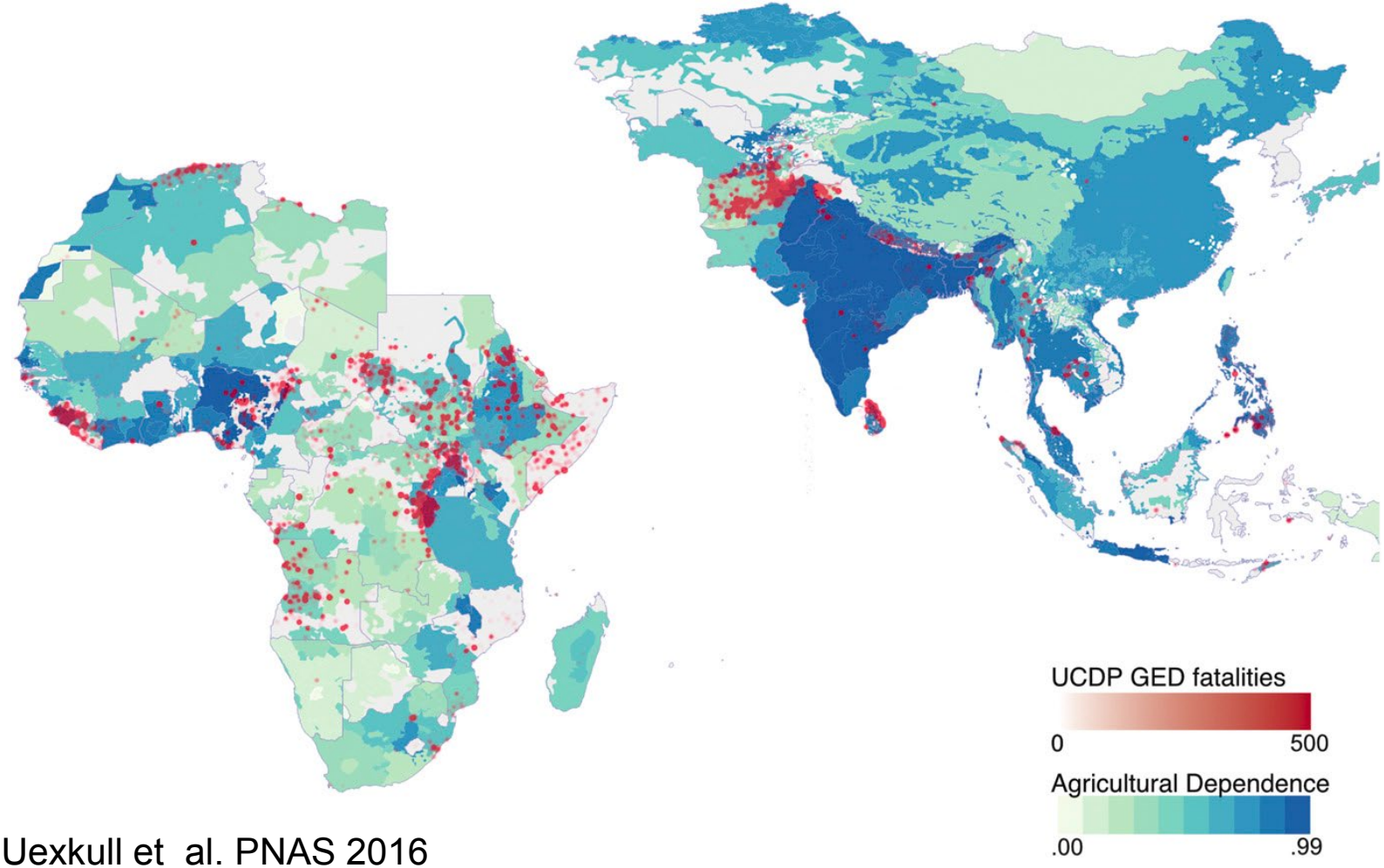
The role of political institutions

- Climate-driven economic downturns lead to conflict in *non-democratic*, and *ethnically fractionalized* and *marginalized* countries (e.g., Schleussner et al. 2016, Wischnath and Buhaug 2014, Koubi et al. 2012)





Agricultural dependence by ethnic group settlement area and location of armed conflict events,1989–2014



von Uexkull et al. PNAS 2016

Conclusions and Knowledge Gaps

- Strong evidence that climate-driven economic downturns can lead to conflict in specific context and space: i.e., **in countries and regions which are dependent on agriculture, host politically excluded groups, and have ineffective institutions**

But

- The evidence is generated from specific countries, regions, and problems, such as failed harvests and increasing food prices
- Would climate-induced lower agricultural production and higher food prices lead to conflict if they were well managed by capable governments? E.g., Syria
- Future work must
  - specify and examine the conditions under which climate-induced economic shocks lead to conflict: *when* and *where*.
  - examine countries, which regularly experience adverse climatic conditions but not conflict in order to properly understand how climatic conditions and conflict are connected: avoid a) selecting on the dependent variable and b) the 'streetlight effect'.
  - study the causal mechanisms that link climate change to conflict: *how and why*

Climate change, migration, and SDGs

- AR5 identified the potential impacts of climate change on migration and displacement as an emerging risk (Oppenheimer et al 2014).
- SDG13 does not mention migration or displacement, or recommend the inclusion of this important phenomenon in climate policies.
- Other SDGs, specifically SDGs 8,10,17, point to the need for facilitated, planned and well-managed migration policies – but do not make the connection with climate change.
  - SDGs 8 (8.8: protect labor rights and promote safe and secure working environments for all workers, including migrant workers)
  - SDG 10 (10.7: facilitate orderly, safe, and responsible migration and mobility of people, , including through implementation of planned and well-managed migration policies
  - SDG 17 (17.18: By 2020, enhance capacity-building support to developing countries to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender,.., migratory status, and other characteristics relevant in national contexts)
- Hence, the ways in which migration may be altered by climate change and the challenges this poses for policy and planning are not directly addressed in the SDGs. Nor are the broader challenges that human mobility presents to meeting goals on mitigating and adapting to the impacts of climate change.

Climate change and migration

- Detecting the effect of climate change and assessing its magnitude on migration is quite challenging: the social, economic, political, and environmental factors underlying migration are complex and varied (McLeman 2014)
- Although the majority of scientific studies agree that environmental conditions are relevant for population mobility, empirical knowledge in the field remains, varied, patchy, and limited (Hunter et al. 2015)
- Across studies, the size and even the direction of estimated coefficients largely differ depending on the type of migration (international versus internal), measurement of migration, climatic factors and natural disasters, direct versus indirect effects, country samples and sample periods, perspectives (macro- versus micro-level studies), and estimation strategies and techniques.

Some empirical evidence: *International migration*

- *Temperature and precipitation anomalies (direct effect):*
  - do not have direct effect on migration (Beine and Parson 2015); deter emigration from middle-income countries, but have no effect on migration from poor countries due to liquidity constraints (Beine and Parson 2017)
  - increase migration flows (Backhaus et al 2015); induce outmigration from poor to rich countries (Coniglio and Pesce 2015)
- *Temperature (indirect effect):*
  - increases outmigration but only for agriculture-dependent countries (Cai et al 2016)
  - does not increase migration through changes in agricultural productivity (Cattaneo and Peri 2016)
- *Natural disasters (floods, droughts, and storms)*
  - increase out-migration (Coniglio and Pesce 2015)
  - do not affect migration in middle-income and poor countries migration (Cattaneo and Peri 2016; Beine and Parson 2015)

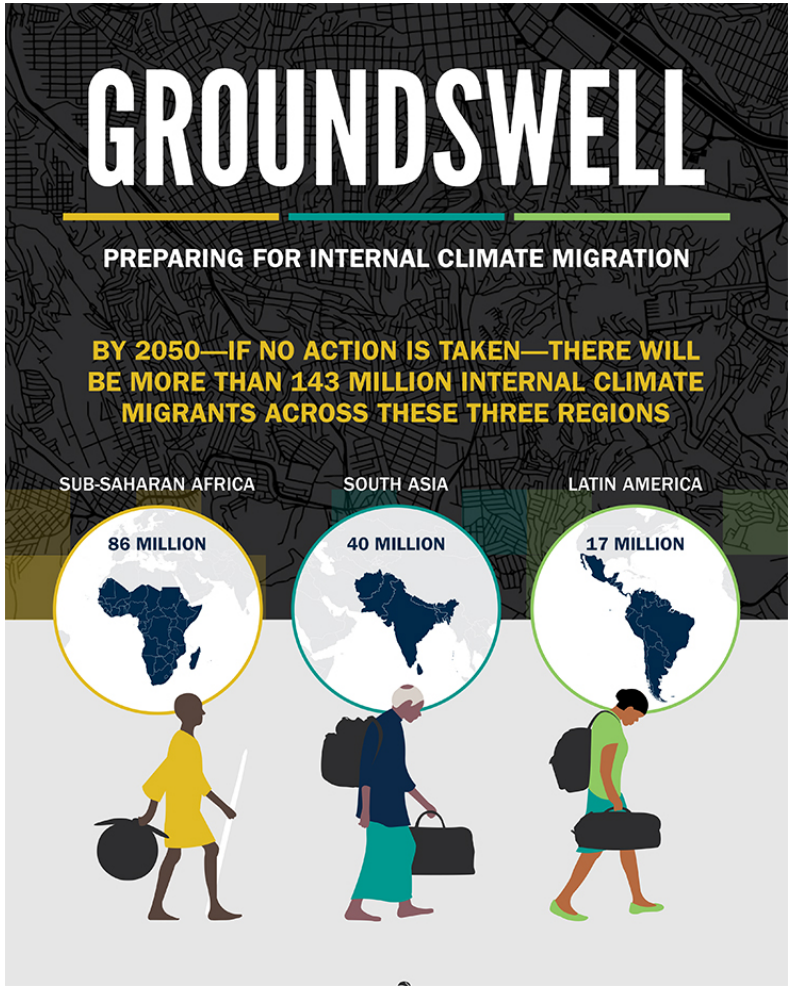
Some empirical evidence: *Internal migration*

- Focus on countries with relatively low level of development: Africa, South America, and South Asia.
- *Temperature (direct effect)*
  - increases interstate migration in South America (Thiede et al 2016); Northern Latin America and the Caribbean (Baez et al 2017a); Central America and the Caribbean (Baez et al 2017b)
- *Temperature and precipitation extremes (indirect effect: agriculture)*
  - increase out-of-village migration in Pakistan (Mueller et al 2014); outmigration on the inter-district level in South America (Mastrorillo et al 2016) and provinces in Philippines (Bohra-Mishra et al 2017)
- *Natural disasters*
  - floods increase outmigration in Vietnam, Cambodia, Kenya, Peru, and Nicaragua (Koubi et al 2016); only in case of fatalities in Costa Rica (Robalino et al 2015); on migration in Indonesia (Bohra-Mishra et al 2014)
  - Droughts decrease in Vietnam, Cambodia, Kenya, Peru, and Nicaragua (Koubi et al 2016)

Conclusions and Knowledge Gaps

- While some papers find evidence of climate-induced migration, others find either no evidence of such an effect or an opposite effect, i.e., adverse climatic conditions increasing the immobility of affected individuals, i.e., 'trapped populations' (Foresight 2011).
- Future research should
  - develop common standards in terms of data measurement
  - apply appropriate estimation techniques
  - identify the channels or mechanisms through which climate shocks affect migration
  - conduct more country case studies based on common methodology to tease the effect of climatic factors on migration decisions.

World Bank Report (2018)



Focus: Water and Migration

Methodology: literature review and modelling

Main Conclusion: Under a BAU scenario (i.e., high GHG emissions and unequal development) 143 million people will migrate

Recommended actions:

1. Drastically cut GHG emissions;
2. Embed climate migration in development planning;
3. Invest in better contextualizing and understanding of climate migration

World Bank Report (2018)

- The climate in- and out-projections are based on a model which uses 'demographic, socioeconomic and climate impact data at a 14 square kilometers grid cell level'.

- Possibly overestimation of the number of environmental migrants due to
  - projections are usually based on the people exposed to increasing environmental risks
  - projections do not consider technological advances or adaptation and development responses that might allow rural areas to sustain large populations in an era of climatic changes

Climate induced migration and conflict

- Kumari Rigaud, lead author of the Groundswell report: "*Without the right planning and support, people migrating from rural areas into cities could be facing new and even more dangerous risks…We could see increased tensions and conflict as a result of pressure on scarce resources.*"

Causal mechanisms

- The influx of large numbers of 'environmental migrants' could lead to conflict in the receiving areas by
  - burdening economic and resource bases, promoting thus contests over scarce resources (Brzoska and Fröhlich 2015), e.g., migrants and residents compete over land, jobs, access to health, education, and social services.
  - stirring ethnic tensions that arise when migrants and residents belong to different ethno-cultural groups and the arrival of newcomers upsets an 'unstable' ethno-political balance (Brzoska and Fröhlich 2015)

Empirical evidence for the climate, migration, and conflict relationship

- Limited research
  - "there is evidence that the 2007-2010 drought contributed to conflict in Syria" (Kelley et al 2015)
  - greater rates of internal migration in India due to irregular rainfall patterns are associated with a higher risk of riots (Bhavnani and Lacina 2015)
  - displacement due to catastrophic floods lengthens the duration of an existing civil conflict, but does not affect the risk of a new one (Ghimire et al 2015)
  - conflict incidents increased during the early years of the Darfur war in areas that experienced higher water availability and more vegetation (De Juan 2015)
  - migrants of long-term climatic changes (e.g., droughts) show significantly higher levels of perceived conflict in their new location due to the grievances they developed in their original location (Koubi et al 2018)
- Future research needs to examine the climate-migration-conflict nexus

Remarks

- Drastic cuts in GHG emissions
  - have strong distributional effects within countries, imposing higher opportunity costs on some sectors, individuals, or geographic areas, than on others.
  - require painful trade-offs between reduced economic growth in the short or even medium term, which may cause severe social conflict, and avoiding large economic damage from climate change in the long-term, which may cause even worse social conflict in both poor and rich (e.g., 'Gilet Jaune' unrest in France) countries.

- Scientific research could contribute to such policy efforts by coming up with quantitative assessments of the net effects of different GHG mitigation strategies both on economic welfare and social conflict
  - Hegre et al (2016) show that broader socioeconomic development, expressed by higher growth in education and poverty alleviation, could help in offsetting most of the conflict risk in developing countries associated with reduced economic growth due to implementation of policies to curb GHG emissions.

Thank you for your attention!

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