

NAVIGATOR

SEVERITY

Severity shows the scale of the overall or absolute global impact of a given indicator and the breadth of effects internationally. "Major" impacts might involve, for example, tens of billions of dollars of economic damage or over 100,000 deaths on average per year. Other indicators estimate much lower levels of damage or even positive net impacts, in which case the severity may be assessed as "Minimal".

SCALE (FROM MOST TO LEAST)

- Major
- Serious
- Select Concern
- Minimal

CONFIDENCE

Confidence shows the level of confidence that the research team attributes to the indicator, based on a multi-point assessment. Judgements are made in relation to the set of indicators that make up the Monitor assessment only; so, for example, the research team has more confidence in indicators labelled "Robust" than in indicators labelled "Speculative". Some experts may however consider the robust indicators to still possess inadequate confidence, or speculative indicators to exceed simple speculation. A 3-point scale is used to evaluate whether each criterion reviewed contributes or detracts from the overall level of confidence.

CONFIDENCE LEVEL SCALE (FROM MOST TO LEAST)

- Robust
- Indicative
- Speculative

CRITERIA PER INDICATOR

- Science - Level of certainty/agreement in science on the basic parameters involved
- Architecture - Strength of the underlying model, with preference for global/multi-country and higher resolution studies
- Climate (Only applies to the Climate section) - Level of certainty/agreement in science on the magnitude of change in key climate change variables, such as rainfall or temperature
- Data - Quality of the socio-economic data sets used, with preference for accurate, updated, comprehensive and comparable data

MDG EFFECT

The Millennium Development Goals (MDGs) represent the international community's eight primary objectives for poverty reduction to be achieved by 2015. The MDG Effect indicates an impact for specific MDGs. One of the eight goals relates to an international partnership for development and is not relevant to the Monitor's impact analysis. Any of the other seven goals are highlighted whenever an indicator assesses a Climate or Carbon effect that is understood to specifically undermine one or another of these goals.

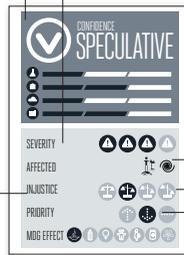
(For more information on the MDGs visit: www.un.org/millenniumgoals)

- End Poverty and Hunger
- Achieve Universal Primary Education
- Promote Gender Equality
- Reduce Child Mortality
- Improve Maternal Health
- Combat HIV/AIDS, Malaria and other diseases
- Ensure Environmental Sustainability

AFFECTED GROUPS

Affected Groups indicates the specific population segments or communities particularly affected or susceptible to the impacts of a given indicator. The groups may be socially, economically, geographically or otherwise defined depending on the impacts under examination.

- River basins
- Small islands
- Mountainous communities
- Industrialized countries
- Cities
- Subsistence farmers
- Humid tropical countries
- Outdoor occupations
- Middle income countries
- Pregnant women
- Elderly
- Farmers
- Indigenous groups
- Deforestation zones
- Heavily labouring workers
- Tropical countries
- Dryland communities
- Water-Intensive industries
- Arid regions
- Infants
- Small children/infants
- Children
- Cyclone belt countries
- Africa
- Arctic communities
- Low-elevation coastal communities
- Coastal cities
- Lower income communities
- Chronic disease sufferers
- Outdoor workers
- Fishermen
- Rural populations with poor energy access
- Remote communities
- Sahel meningitis belt
- Young adults
- Livelihoods derived from fishing
- Energy companies
- Beach resorts
- Low-elevation winter resorts
- Densely populated river ways
- Women
- Oil sand host communities
- Coastal communities
- Tropical forest zones
- Newly-industrialized countries
- Transition economies
- Industrialized countries
- Lower-income groups
- Coal miners
- Vehicle drivers
- Coal and gas power plant workers
- Fair-skinned
- Developed countries
- China
- Subsistence fisherfolk
- SIDS
- Arid forested zones



PRIORITY

(Only applies to Climate section)

Priority shows the amount of support a specific effect area has received through international climate funding. It denotes the level of priority that the effect or set of effects assessed by one Monitor indicator has, as reflected in international climate finance expenditures for adaptation. "High priority" denotes higher levels of funding from developed countries, targeting the issue in affected developing countries. "Low" or "no priority" is given to concerns for which financial support has been marginal or virtually absent. The OECD Creditor Reporting System sub-sector flows for 2010 have been used as the basis for the analysis (OECD CRS, 2012).

PRIORITY OF EFFECTS IN INTERNATIONAL CLIMATECHANGE FINANCE FLOWS SCALE (FROM MOST TO LEAST)

- High priority
- Low priority
- Not a priority

INJUSTICE

(Only applies to Climate section)

Injustice shows how unjust or not a given effect is on the global scale. It denotes the level of injustice of a specific effect or set of effects as they are assessed by one of the Monitor's indicators. Injustice is highest when the affected countries have least responsibility for climate change and at its lowest when impacts are shared the most among countries with high responsibility. The four-point score is defined by statistical quartiles, so the level of injustice is also relative only to the Monitor's Climate section indicators themselves. Responsibility for climate change is based on total country GHG emissions from 1990-2005 (Mueller et al, 2007).

DISTRIBUTION OF CLIMATE CHANGE IMPACTS VERSUS RESPONSIBILITY FOR CLIMATE CHANGE

SCALE (FROM LEAST TO MOST)

- Least unjust
- Most unjust

TITLE

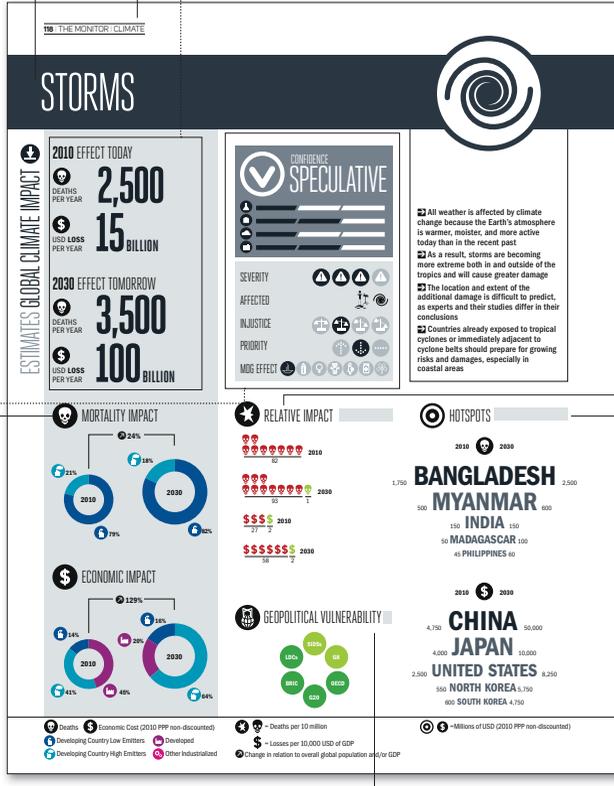
CHAPTER TITLE



2010 DATA



2030 DATA



RELATIVE IMPACT

Relative Impact shows how countries with different levels of vulnerability experience impact relative to their size. Climate or Carbon impact is shown as a share of country-level population (for mortality) or country-level wealth/GDP (for economic) for countries with Acute or Moderate vulnerability levels for the years 2010 and 2030. The scale varies per indicator and is provided at the bottom of each page.

Additional deaths due to climate/carbon per 100 share of population - yearly average

Additional economic costs due to climate/carbon per share of GDP - yearly average

- Acute
- Moderate

N/A indicates that the item is not applicable to this indicator

PEAK IMPACT

Peak Impact illustrates how severe certain time-specific impacts can become. Historical maximums in impact are cited from the relevant databases with the year of occurrence provided alongside disaster data from that year. Peak impacts in no way imply any assumed attribution to climate change or not. They serve simply to illustrate the maximum scale of individual impacts that have been attained in the recent past (2000-2012).

- Top 5 historical yearly losses (2000-2012) by number of deaths
- Top 5 historical yearly losses (2000-2012) by economic costs

MORTALITY & ECONOMIC IMPACT

This section displays both the global impact of climate change as it is distributed across the key Monitor country groups, and as the change in impact over time, as a share of overall global population (for mortality) or wealth/GDP (for economic). These are presented either using pie charts or (as percentage shares) or as bar charts (for indicators with positive and negative impacts) showing shares of the total impact by absolute amount.

- Developed
- Developing Country Low Emitters
- Developing Country High Emitters
- Other Industrialized

GEOPOLITICAL VULNERABILITY

Geopolitical vulnerability provides the average vulnerability level in 2030 for all countries comprising key geopolitical groupings. The groups covered range from Least Developed Countries (LDCs) or Small Island Developing States (SIDS), to the Brazil-Russia-India-China (BRIC) nations, or members of the Organization for Economic Co-operation and Development (OECD).

- Acute
- Severe
- High
- Moderate
- Low

HOTSPOTS

Hotspots show countries estimated to experience the largest total impacts of any country irrespective of overall size of population or wealth/GDP. The overall impacts are given as yearly averages for 2010 and 2030 for the top five countries by total impact in 2030.

Countries with the largest total climate-related mortality by number of deaths. Additional deaths due to climate/carbon - yearly average

Countries with the largest total climate-related damage costs. Additional economic losses due to climate/carbon (2010 USD PPP) - yearly average

KEY COUNTRY GROUP DATA

Country Group	UNFCCC Classification	Number of Countries	Share of Global Population*		Share of Global GDP (PPP)**		Average Per Capita GDP (PPP)**	Share of Total GHG Emissions	Average Per Capita GHG Emissions
			2010	2030	2010	2030			
Year	2012	2010/2030	2010	2030	2010	2030	2010	2005	2005
Developed	Annex II	23	13%	12%	48%	25%	\$38,000	30%	13 tons CO ₂ e
Developing Country High Emitters	Non-Annex I	60	40%	38%	32%	50%	\$15,000	50%	14 tons CO ₂ e
Developing Country Low Emitters	Non-Annex I	85	42%	45%	13%	17%	\$5,000	12%	2 tons CO ₂ e
Other Industrialized	Non-Annex II Annex I	16	6%	5%	8%	8%	\$17,000	7%	7 tons CO ₂ e
World Total (World Average)		184	6.8 billion	8.1 billion	\$73 billion	\$210 billion	(\$19,000)	42 GtCO ₂ e	(8 tons CO ₂ e)

* Population data - source: UNSD, 2012 ** GDP data - sources: CIESIN, 2012; IMF WEO, 2012
 † GHG data includes all Kyoto gases and Land use, land-use change and forestry (LULUCF) - source: Climate Analytics, 2012

BIGGER PICTURE

Bigger Picture gives insight into the situation beyond Climate or Carbon effects. The Monitor only measures the share of impact estimated to result from climate change or the carbon economy. In many instances, Climate or Carbon are just one -sometimes small, sometimes large- causal factor in contributing to losses. Elsewhere, it is useful to know how impact relates to the overall issue analysed. Thus, the Bigger Picture provides an indication of the overall scale of a concern and the Climate or Carbon linked part of the issue under analysis.

ENVIRONMENTAL DISASTERS 10

Whether or not specific events can be identified as "caused" by climate change, all weather is more affected by a global climate system that is warmer, more active, and wetter (Trenberth, 2012). As a result, it is evident that storms are generally becoming more extreme, particularly in terms of wind speeds and quantity of rainfall. Moreover, there is a poleward shift to the north and south of cyclone storm tracks, as parts of the world adjacent to the tropics are experiencing more "typical" weather. Where vulnerabilities to more severe storms are accentuated by environmental and income-related factors -such as for high risk urban slums in low-lying coastal areas- the dangers of these changes are much higher (IPCC, 2012a). Corresponding measures will need to offset the additional risk by reducing community vulnerabilities and, where possible, limiting exposures. To storm hazards (LINSNER, 2009 and 2011). Heightened emergency assistance should also be focused in the coming years and decades.

CLIMATE MECHANISM
Climate change increases air and sea temperatures, boosting the level of moisture in the atmosphere; this leads to acceleration of the planet's hydrological system, heavier precipitation, higher maximum winds and a general tendency to more extreme weather (IPCC, 2007). These hallmarks have been recognized in storms, including cyclones (IPCC, 2012a). Whether or not there has been a change in the frequency or overall number of cyclones in recent years can side-track the focus on other important factors, such as wind speed changes (Keaton et al. in Chan et al. (eds), 2010). Simply counting the change in the number of cyclones often leads to the conclusion that there is less cyclone activity, since there is generally understood to be a slight increase in the most extreme cyclones, such as categories 3 to 5, but an overall decrease in the total number of cyclones since the reduction in less severe storms is expected to be greater (Keaton et al., 2010). It is not surprising that an increase in the most extreme cyclones, as measured on the well-known Saffir-Simpson scale results in fewer cyclones overall, since the scale itself is static, measures overall power, and is a rough proxy for the size of storms (Dolan and Davis, 1992; Inghel et al., 2008). Larger more powerful storms absorb and dissipate considerably more energy than smaller ones, whose declining numbers have been attributed to an overall decline in cyclone frequency in recent times (IPCC, 2012a). Not is the ultimate number of storms as important as the intensity or size of those storms: in the US, 85% of all cyclone damage is caused by the most extreme storms (Rudeza and Gurev, 2007; Pielke et al., 2008). A large share of the damage caused by cyclones is the result of storm surge, or inundations from rainfall, high winds, and freak waves caused by major storms, which have been worsened by heavier rainfall and sea-level rise, both of which are fuelled by climate change (Gangopai et al., 2009).

IMPACTS
The impact of climate change on both tropical cyclones and major storms outside of the tropics (extra-tropical cyclones) is estimated to already cost 15 billion dollars and to be responsible for an average of almost 2,500 deaths each year, with around 1.5 million people affected and in need of emergency assistance. A number of small island countries, such as Antigua and Barbuda, Dominica, Grenada, and Vanuatu are identified as experiencing the most severe economic and human loss

ENVIRONMENTAL DISASTERS 11

CLIMATE VULNERABILITY

CLIMATE UNCERTAINTY

Vulnerability measure: comparative mortality risk as a result of exposure (rainfall) and losses as a share of GDP in USD (national) with same full weighting to each

Legend: Limited Partial Considerable

BIGGER PICTURE

2010: 3 SURGE
2010: 2 OCCURRENCE
2010: 1 GENDER BIAS
2010: 1 INDICATOR INFORMATION

MONITOR

2008 MYANMAR: 138,366 2008 UNITED STATES: 19,230
2007 BANGLADESH: 4,270 2004 JAPAN: 6,144
2004 HAITI: 2,297 2000 INDONESIA: 7,850
2000 UNITED STATES: 1,862 2000 CHINA: 1,469
2004 PHILIPPINES: 1,861 2000 NORTH KOREA: 6,400

● Acute ● Severe ● High ● Moderate ● Low

● = Millions of USD (Historic)

● = 5 countries (outside)

VULNERABILITY SHIFT

COUNTRY	2010	2030
Abkhaz	1	1
Andhra Pradesh	1	5
Armenia	1	1
Australia	1	1
Bahrain	1	1
Bangladesh	1	1
Belarus	1	1
Bhutan	1	1
Bolivia	1	1
Brazil	1	1
Bulgaria	1	1
Canada	1	1
Chad	1	1
China	1	1
Colombia	1	1
Costa Rica	1	1
Cuba	1	1
Czechia	1	1
Dominican Republic	1	1
Dominica	1	1
Ecuador	1	1
Egypt	1	1
El Salvador	1	1
France	1	1
Germany	1	1
Ghana	1	1
Greece	1	1
Guatemala	1	1
Haiti	1	1
Honduras	1	1
India	1	1
Indonesia	1	1
Iran	1	1
Italy	1	1
Japan	1	1
Kenya	1	1
Madagascar	1	1
Mali	1	1
Mexico	1	1
Moldova	1	1
Morocco	1	1
Mozambique	1	1
Nepal	1	1
Netherlands	1	1
Nigeria	1	1
North Korea	1	1
Philippines	1	1
Poland	1	1
Portugal	1	1
Romania	1	1
Russia	1	1
Saudi Arabia	1	1
Senegal	1	1
South Africa	1	1
Spain	1	1
Sweden	1	1
Switzerland	1	1
Taiwan	1	1
Tanzania	1	1
Togo	1	1
Turkey	1	1
Ukraine	1	1
United Kingdom	1	1
United States	1	1
Vietnam	1	1
Zimbabwe	1	1

MODEL (Cassini et al., 2014; Mendelsohn et al., 2011)
EMERGENCY SCENARIO: SRES A3B (IPCC, 2000)
BASE DATA: Tropical storms: Mendelsohn et al., 2011
Non-tropical storms: Mendelsohn et al., 2011
Cyclone deaths: Mendelsohn et al., 2011
Cyclone economic losses: OECD/IEA (2012) March by NADCE 2010 assumptions

MAIN TEXT

Main Text provides a descriptive overview of the indicator. It is a summarized explanation of the particular effect or effect area under assessment for each of the Monitor's 34 indicators.

CLIMATE/CARBON VULNERABILITY

The map shows the 2030 vulnerability level for every country (all 184) for each indicator.

STORMS

CLIMATE VULNERABILITY

CLIMATE UNCERTAINTY

ENVIRONMENTAL DISASTERS 11

Vulnerability measure: comparative mortality risk as a result of exposure (rainfall) and losses as a share of GDP in USD (national) with same full weighting to each

Legend: Limited Partial Considerable

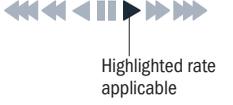
COUNTRY	2010	2030	2010	2030
Abkhaz	1	1	1	1
Andhra Pradesh	1	5	1	5
Armenia	1	1	1	1
Australia	1	1	1	1
Bahrain	1	1	1	1
Bangladesh	1	1	1	1
Belarus	1	1	1	1
Bhutan	1	1	1	1
Bolivia	1	1	1	1
Brazil	1	1	1	1
Bulgaria	1	1	1	1
Canada	1	1	1	1
Chad	1	1	1	1
China	1	1	1	1
Colombia	1	1	1	1
Costa Rica	1	1	1	1
Cuba	1	1	1	1
Czechia	1	1	1	1
Dominican Republic	1	1	1	1
Dominica	1	1	1	1
Ecuador	1	1	1	1
Egypt	1	1	1	1
El Salvador	1	1	1	1
France	1	1	1	1
Germany	1	1	1	1
Ghana	1	1	1	1
Greece	1	1	1	1
Guatemala	1	1	1	1
Haiti	1	1	1	1
Honduras	1	1	1	1
India	1	1	1	1
Indonesia	1	1	1	1
Iran	1	1	1	1
Italy	1	1	1	1
Japan	1	1	1	1
Kenya	1	1	1	1
Madagascar	1	1	1	1
Mali	1	1	1	1
Mexico	1	1	1	1
Moldova	1	1	1	1
Morocco	1	1	1	1
Mozambique	1	1	1	1
Nepal	1	1	1	1
Netherlands	1	1	1	1
Nigeria	1	1	1	1
North Korea	1	1	1	1
Philippines	1	1	1	1
Poland	1	1	1	1
Portugal	1	1	1	1
Romania	1	1	1	1
Russia	1	1	1	1
Saudi Arabia	1	1	1	1
Senegal	1	1	1	1
South Africa	1	1	1	1
Spain	1	1	1	1
Sweden	1	1	1	1
Switzerland	1	1	1	1
Taiwan	1	1	1	1
Tanzania	1	1	1	1
Togo	1	1	1	1
Turkey	1	1	1	1
Ukraine	1	1	1	1
United Kingdom	1	1	1	1
United States	1	1	1	1
Vietnam	1	1	1	1
Zimbabwe	1	1	1	1

INDICATOR INFORMATION

Additional persons affected/in need of emergency assistance due to climate change - yearly average

SURGE

Surge shows how fast or slowly impacts are accelerating relative to other indicators. The rate of change in impacts as a share of population (for mortality) or wealth/GDP (for economic) may be increasing rapidly or slowly, or may be decreasing or be stable over time. One of seven possible values spanning this spectrum are assigned on a statistical basis independently for the Climate and Carbon sections of the Monitor and only in relation to the other indicators of those sections.



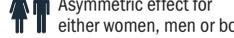
OCCURRENCE

Occurrence shows how extreme events will become more frequent over time. It indicates the expected change in the occurrence of a major event over time as the frequency of events is evolving. For example, a major flood or landslide that occurred in 1990 once every 20 years, would occur in 2030 once every 15 years.



GENDER BIAS

Gender Bias indicates the degree to which a particular effect is understood to have a pronounced negative impact either for women or men. In certain cases, there may be independent reasons for heightened exposure in both men and women, in which case a double bias is emphasized.

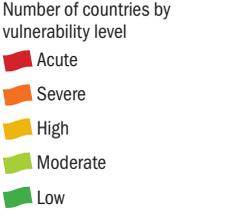


INDICATOR INFORMATION

Indicator Information provides essential source information. It gives references for the model or models used to calculate either climate or carbon effects, the reference emission scenario relied upon, and sources of socio-economic or environmental base data.

VULNERABILITY SHIFT

Vulnerability Shift illustrates the degree to which a particular effect is understood to have a pronounced negative impact either for women or men. In certain cases, there may be independent reasons for heightened exposure in both men and women, in which case a double bias is emphasized. Typically, more countries register in the Acute or Severe levels of vulnerability in 2030 versus 2010, as countries experiencing milder levels of impact begin, with accelerated climate change, to share similar intensities to those felt by only few front-line countries today.



CLIMATE UNCERTAINTY

(Only applies to Climate section)

The map indicates regional uncertainties of key climate factors. It shows the level of disagreement among groups of climate models on the direction of change of a given indicator's key climate variable(s), e.g. whether rainfall will increase or decrease as the planet warms. Information is provided for each of the Monitor's 21 sub-regions. Regions have "Limited" uncertainty when less than 10% of models disagree on the direction of change for that zone. Uncertainty is "Considerable" when less than two thirds of models agree, and "Partial" when more than two thirds agree, but not as many as 90% or more.