I CONGRESO INT. DE BIOÉTICA:
VULNERABILIDAD, JUSTICIA Y SALUD GLOBAL
Universidad de La Laguna
30-31 de marzo de 2017

Mesa 4: Problemas de salud global

Cambio climático, riesgos ambientales y desafíos para los programas de salud pública: un enfoque de bioética global

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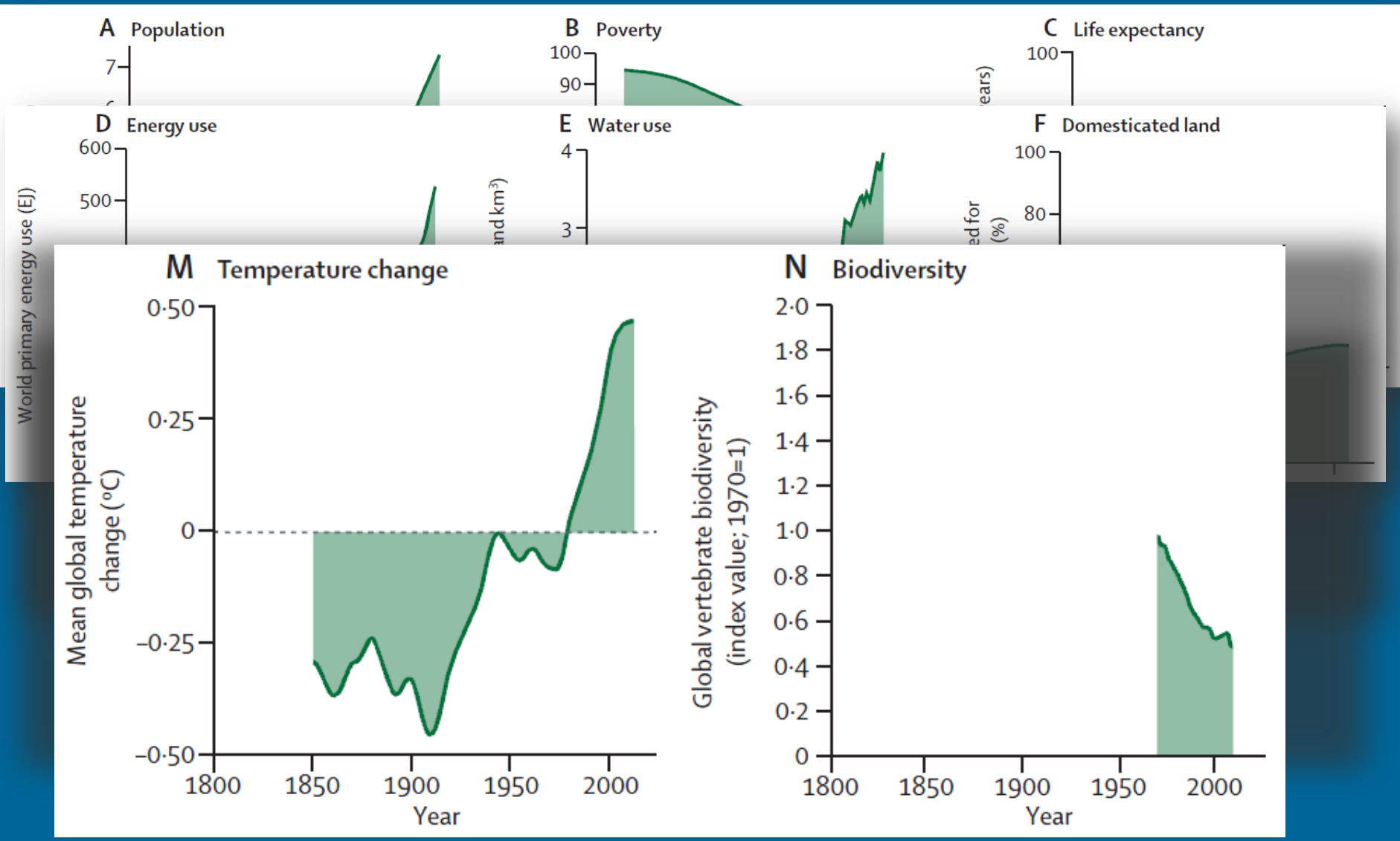
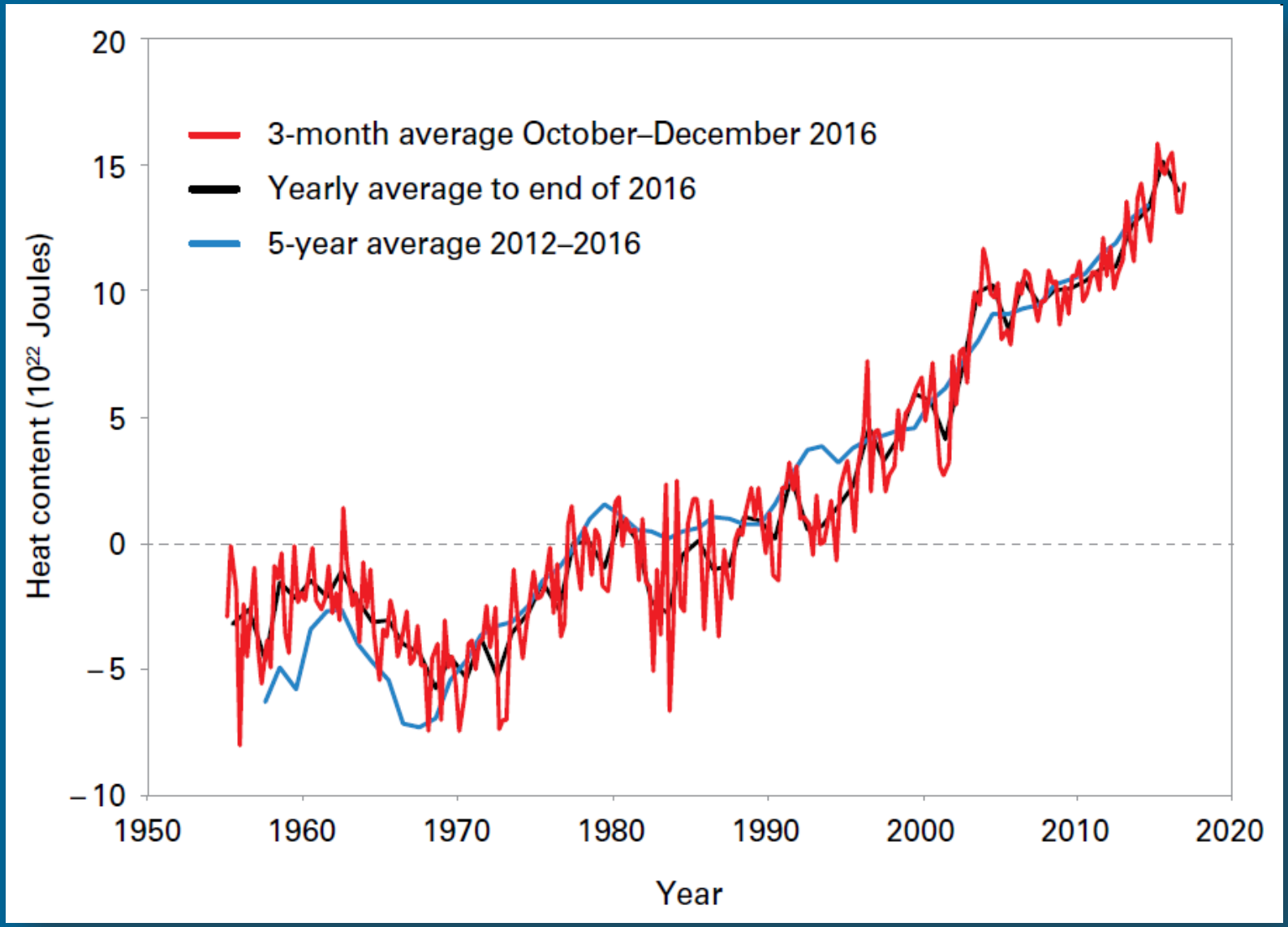
Indicadores de éxito como especie, pero con huella ecológica devastadora

Whitmee, S. et al. (2015), The Lancet, 386 (10007): 1973–2028.



Total global ocean heat content (in units of 1022 J) **for the 0–700 m layer**, **compared with 1955–2006** reference period. Data averaged over periods of three months (red line), one year (black) and five years (blue)

Source: WMO / data from the US NOAA National Centers for Environmental Information.



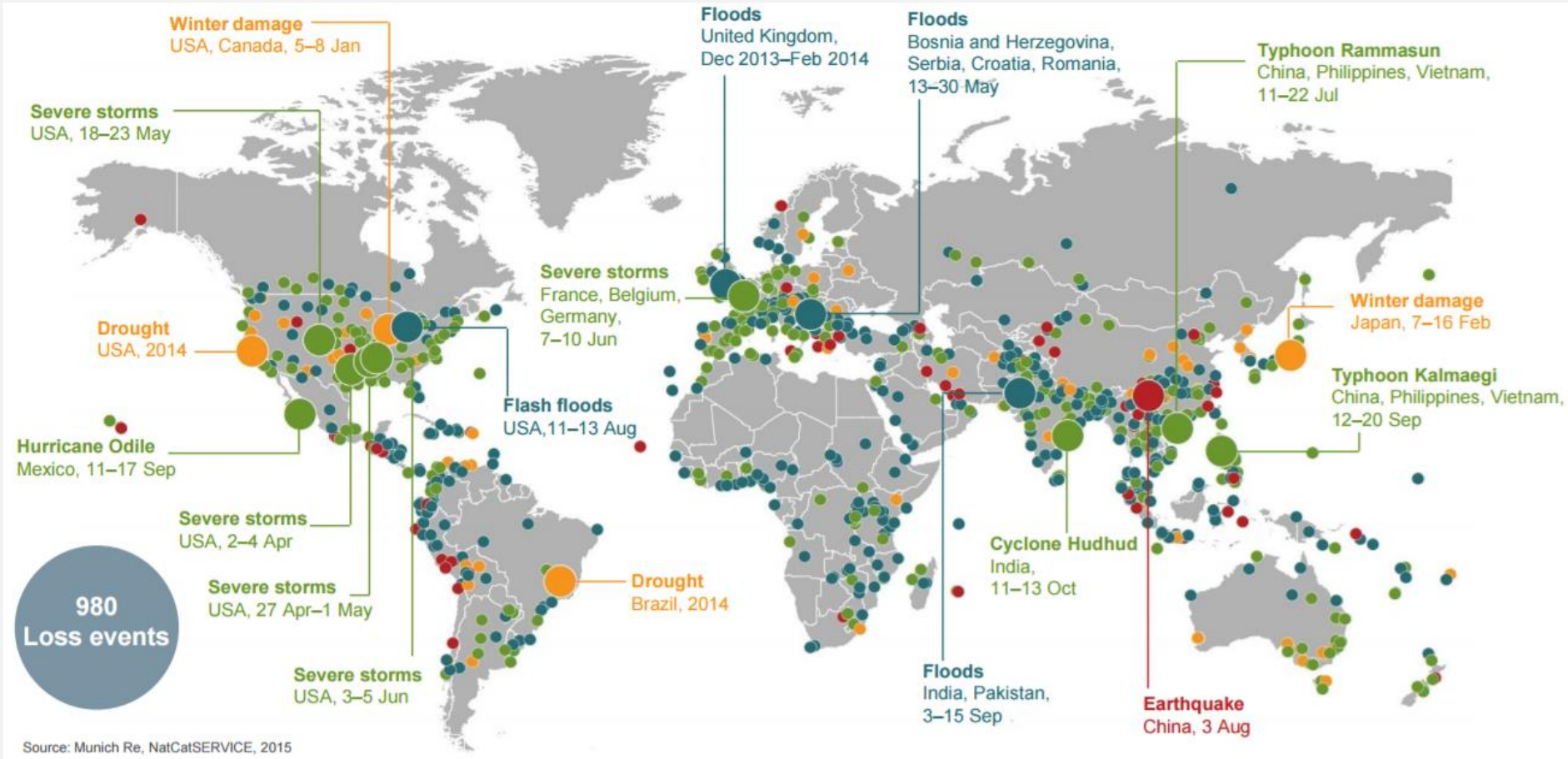
NatCatSERVICE

Loss events worldwide 2014

Geographical overview

Munich RE

http://www.preventionweb.net/files/41773_munichreworldmapnaturalcatastrophes.pdf



- **Loss events**
- **Selection of catastrophes**
  Overall losses ≥ US$ 1,500m
- **Geophysical events**
  (Earthquake, tsunami, volcanic activity)
- **Meteorological events**
  (Tropical storm, extratropical storm, convective storm, local storm)
- **Hydrological events**
  (Flood, mass movement)
- **Climatological events**
  (Extreme temperature, drought, wildfire)

Sucesión de máximos en la serie

- WMO Statement on the State of the Global Climate in 2016
- Filleul, L. et al. "Extreme Temperatures and Mortality." Enc. Env. Health. 2011: 693–699.

2016: récord en la temperatura mundial, en la reducción del hielo marino y en la subida del nivel de océanos y mares.

- En 2017 continúan las condiciones climáticas extremas
  - Fuentes múltiples de ref. internacional, mantenidos de forma independiente por los centros de análisis climáticos mundiales, más información presentada por decenas de Miembros de la OMM, Servicios Meteorológicos e Hidrológicos Nacionales e Institutos de Investigación.
  - Mejores herramientas informáticas y la disponibilidad de datos climáticos a largo plazo demuestran claramente la existencia de vínculos entre el cambio climático causado por el hombre y muchos casos de eventos extremos de alto impacto como olas de calor.
- Tendencia: Desde 2001, aumento de 0,4 °C o más sobre el promedio a largo plazo (1961-1990 sería el escenario base para el cambio climático).
  - Aumento de 0,1 - 0,2 °C por década en las temperaturas mundiales
  - Expansión de la masa de agua oceánica y subidas del nivel del mar
  - Cambio en la corrientes de agua fría/salada (intensidad/frecuencia de huracanes)

Sucesión de máximos en la serie

WMO Statement on the State of the Global Climate in 2016

"This report confirms that the year 2016 was the warmest on record – a remarkable 1.1 °C above the pre-industrial period, which is 0.06 °C above the previous record set in 2015.

This increase in global temperature is consistent with other changes occurring in the climate system."

(WMO Secretary-General, Petteri Taalas)

Naomi Oreskes: *The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong?*

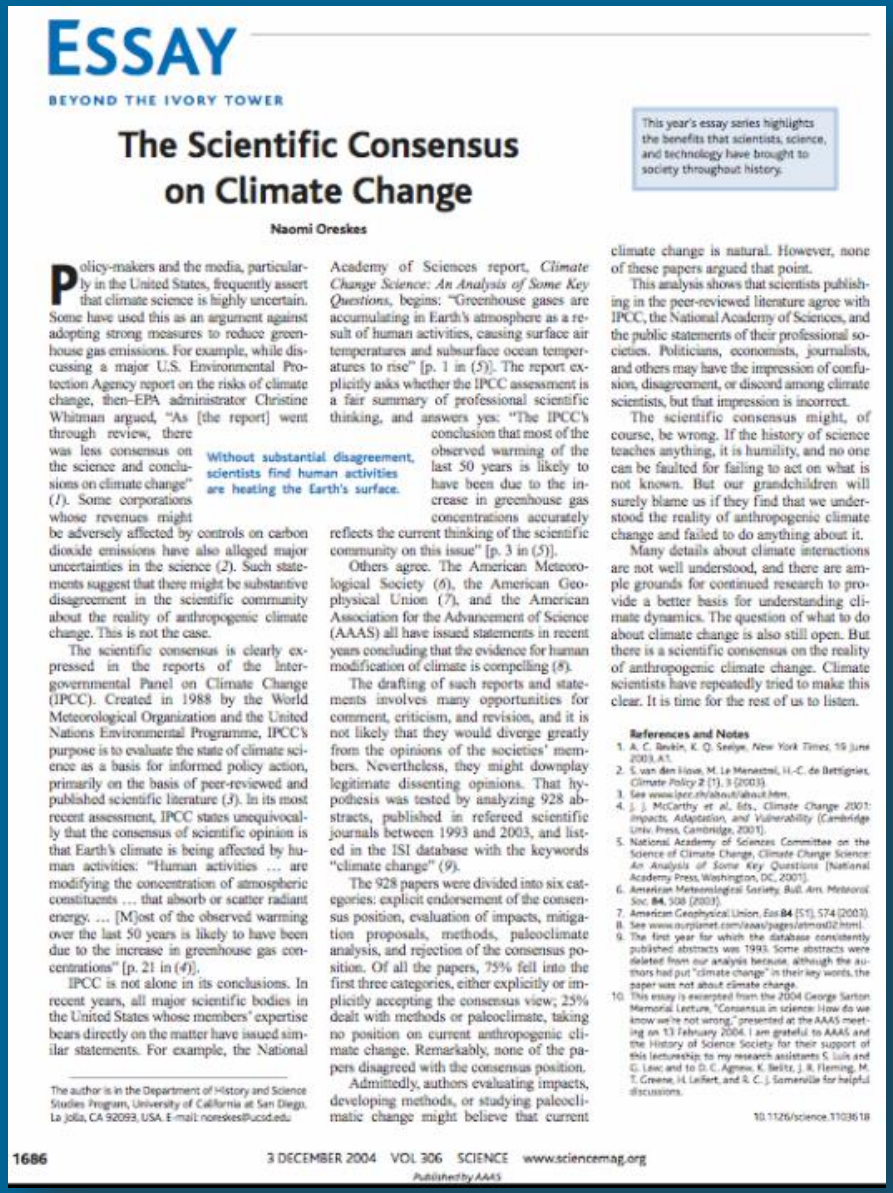
http://www.lpl.arizona.edu/resources/globalwarming/documents/oreskes-on-science-consenus.pdf

- **Es la misma posición del IPCC desde 2001:**
  - Sigue siendo la posición con mayor respaldo científico
  - Prácticamente no ha cambiado desde 1979:

"Si el dióxido de carbono sigue aumentando, no tenemos ninguna razón para dudar de que el clima resultará afectado, ni para creer que esos cambios serán insignificantes."

U.S. National Academy of Sciences
"Carbon Dioxide and Climate: A Scientific Assessment"
(Charney report, 1979)

Resultados consistentes, en la literatura más rigurosa



ESSAY

BEYOND THE IVORY TOWER

The Scientific Consensus on Climate Change

This year's essay series highlights the benefits that scientists, science, and technology have brought to society throughout history.

Naomi Oreskes

Policy-makers and the media, particularly in the United States, frequently assert that climate science is highly uncertain. Some have used this as an argument against adopting strong measures to reduce greenhouse gas emissions. For example, while discussing a major U.S. Environmental Protection Agency report on the risks of climate change, then–EPA administrator Christine Whitman argued, "As [the report] went through review, there was less consensus on the science and conclusions on climate change" (*1*). Some corporations whose revenues might be adversely affected by controls on carbon dioxide emissions have also alleged major uncertainties in the science (*2*). Such statements suggest that there might be substantive disagreement in the scientific community about the reality of anthropogenic climate change. This is not the case.

Without substantial disagreement, scientists find human activities are heating the Earth's surface.

The scientific consensus is clearly expressed in the reports of the Intergovernmental Panel on Climate Change (IPCC). Created in 1988 by the World Meteorological Organization and the United Nations Environmental Programme, IPCC's purpose is to evaluate the state of climate science as a basis for informed policy action, primarily on the basis of peer-reviewed and published scientific literature (*3*). In its most recent assessment, IPCC states unequivocally that the consensus of scientific opinion is that Earth's climate is being affected by human activities: "Human activities … are modifying the concentration of atmospheric constituents … that absorb or scatter radiant energy. … [M]ost of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations" [p. 21 in (*4*)].

IPCC is not alone in its conclusions. In recent years, all major scientific bodies in the United States whose members' expertise bears directly on the matter have issued similar statements. For example, the National Academy of Sciences report, *Climate Change Science: An Analysis of Some Key Questions*, begins: "Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise" [p. 1 in (*5*)]. The report explicitly asks whether the IPCC assessment is a fair summary of professional scientific thinking, and answers yes: "The IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue" [p. 3 in (*5*)].

Others agree. The American Meteorological Society (*6*), the American Geophysical Union (*7*), and the American Association for the Advancement of Science (AAAS) all have issued statements in recent years concluding that the evidence for human modification of climate is compelling (*8*).

The drafting of such reports and statements involves many opportunities for comment, criticism, and revision, and it is not likely that they would diverge greatly from the opinions of the societies' members. Nevertheless, they might downplay legitimate dissenting opinions. That hypothesis was tested by analyzing 928 abstracts, published in refereed scientific journals between 1993 and 2003, and listed in the ISI database with the keywords "climate change" (*9*).

The 928 papers were divided into six categories: explicit endorsement of the consensus position, evaluation of impacts, mitigation proposals, methods, paleoclimate analysis, and rejection of the consensus position. Of all the papers, 75% fell into the first three categories, either explicitly or implicitly accepting the consensus view; 25% dealt with methods or paleoclimate, taking no position on current anthropogenic climate change. Remarkably, none of the papers disagreed with the consensus position.

Admittedly, authors evaluating impacts, developing methods, or studying paleoclimatic change might believe that current climate change is natural. However, none of these papers argued that point.

This analysis shows that scientists publishing in the peer-reviewed literature agree with IPCC, the National Academy of Sciences, and the public statements of their professional societies. Politicians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect.

The scientific consensus might, of course, be wrong. If the history of science teaches anything, it is humility, and no one can be faulted for failing to act on what is not known. But our grandchildren will surely blame us if they find that we understood the reality of anthropogenic climate change and failed to do anything about it.

Many details about climate interactions are not well understood, and there are ample grounds for continued research to provide a better basis for understanding climate dynamics. The question of what to do about climate change is also still open. But there is a scientific consensus on the reality of anthropogenic climate change. Climate scientists have repeatedly tried to make this clear. It is time for the rest of us to listen.

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References and Notes

1. A. C. Revkin, K. Q. Seelye, *New York Times*, 19 June 2003, A1.
2. S. van den Hove, M. Le Menestrel, H.-C. de Bettignies, *Climate Policy* **2** (1), 3 (2003).
3. See www.ipcc.ch/about/about.htm.
4. J. J. McCarthy *et al.*, Eds., *Climate Change 2001: Impacts, Adaptation, and Vulnerability* (Cambridge Univ. Press, Cambridge, 2001).
5. National Academy of Sciences Committee on the Science of Climate Change, *Climate Change Science: An Analysis of Some Key Questions* (National Academy Press, Washington, DC, 2001).
6. American Meteorological Society, *Bull. Am. Meteorol. Soc.* **84**, 508 (2003).
7. American Geophysical Union, *Eos* **84** (51), 574 (2003).
8. See www.ourplanet.com/aaas/pages/atmos02.html.
9. The first year for which the database consistently published abstracts was 1993. Some abstracts were deleted from our analysis because, although the authors had put "climate change" in their key words, the paper was not about climate change.
10. This essay is excerpted from the 2004 George Sarton Memorial Lecture, "Consensus in science: How do we know we're not wrong," presented at the AAAS meeting on 13 February 2004. I am grateful to AAAS and the History of Science Society for their support of this lectureship; to my research assistants S. Luis and G. Leav; and to D. C. Agnew, K. Seltz, J. R. Fleming, M. T. Greene, H. Leifert, and R. C. J. Somerville for helpful discussions.

10.1126/science.1103618

Published by AAAS

- Un millar de artículos revisados
  - Consenso científico en las fuentes que sólo difunden artículos sujetos a revisión por pares
  - Contrasta con el panorama confuso en algunos medios generalistas
- Los medios ponen en pie de igualdad a disidentes sin solvencia científica
  - Explotan la predisposición escéptica ante noticias alarmantes
  - Instrumentalizan el bajo nivel de alfabetización científica

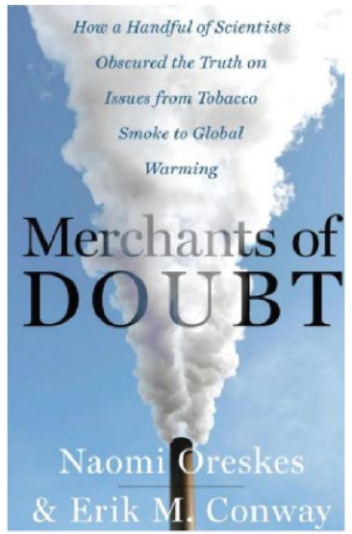
Oreskes N, Conway EM (2010): *Merchants of doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. Bloomsbury Press: London.

- Amplio consenso de las principales organizaciones científicas:
  → IPCC, NAS, AMS, AGU, AAAS

- Respaldado por un **análisis exhaustivo de las bases de datos** con literatura científica publicada

- Sin desacuerdos sobre el papel de los gases de efecto invernadero (GEI) y su relación con la actividad humana

- **Consenso ya constatable en 1993**, y reforzado en la última década



Cook, J., Oreskes, N. et al. (2016). “Consensus on consensus: a synthesis of consensus estimates on human-caused global warming”. *Env. Res. Letters*, *11*(4): 48002.

– The consensus that humans are causing recent global warming is shared by 90%–100% of publishing climate scientists according to six independent studies.

– Consistent with the 97% consensus reported by Cook et al (*Environ. Res. Lett*. 2013/8, 024024) based on 11.944 abstracts of research papers, of which 4.014 took a position on the cause of recent global warming.

Vuelven los negacionistas

https://www.nytimes.com/2017/03/21/climate/trump-climate-change.html?_r=1

CLIMATE

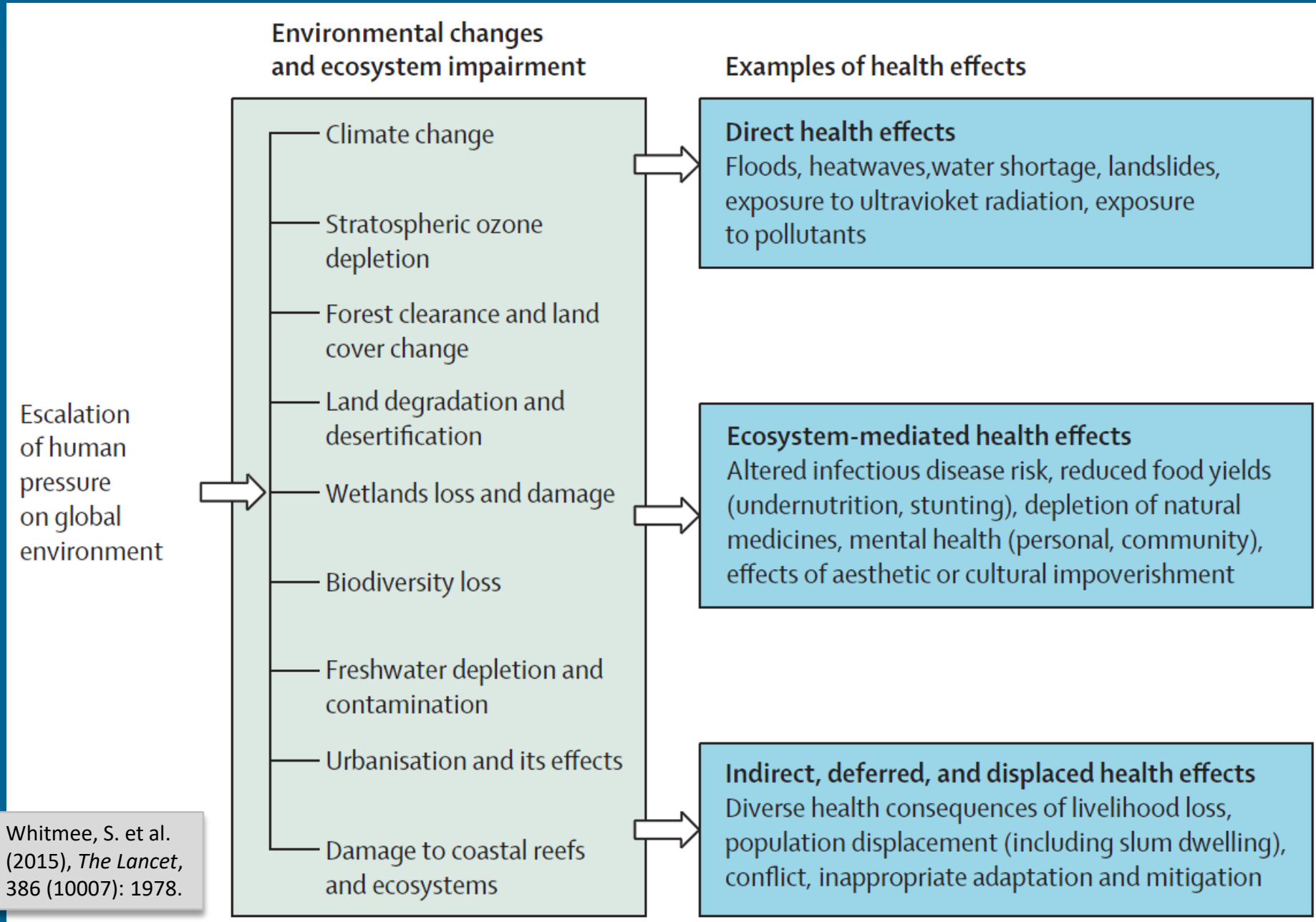
Trump Lays Plans to Reverse Obama's Climate Change Legacy

By CORAL DAVENPORT MARCH 21, 2017

Scientists and climate policy advocates around the world say they are watching the administration's global warming actions and statements with deep worry. Many reacted with deep concern to Mr. Pruitt's remarks this month that he did not believe carbon dioxide was a primary driver of climate change, a statement at odds with the global scientific consensus. They also noted the remarks last week by Mick Mulvaney, the director of the White House Office of Management and Budget, in justifying Mr. Trump's proposed cuts to climate change research programs.

IMPACTO EN LA SALUD

Cómo puede afectar a la salud humana el impacto ecosistémico nocivo



Whitmee, S. et al. (2015), *The Lancet*, 386 (10007): 1978.

Abundante literatura sobre el impacto de los desastres ligados al clima en salud pública

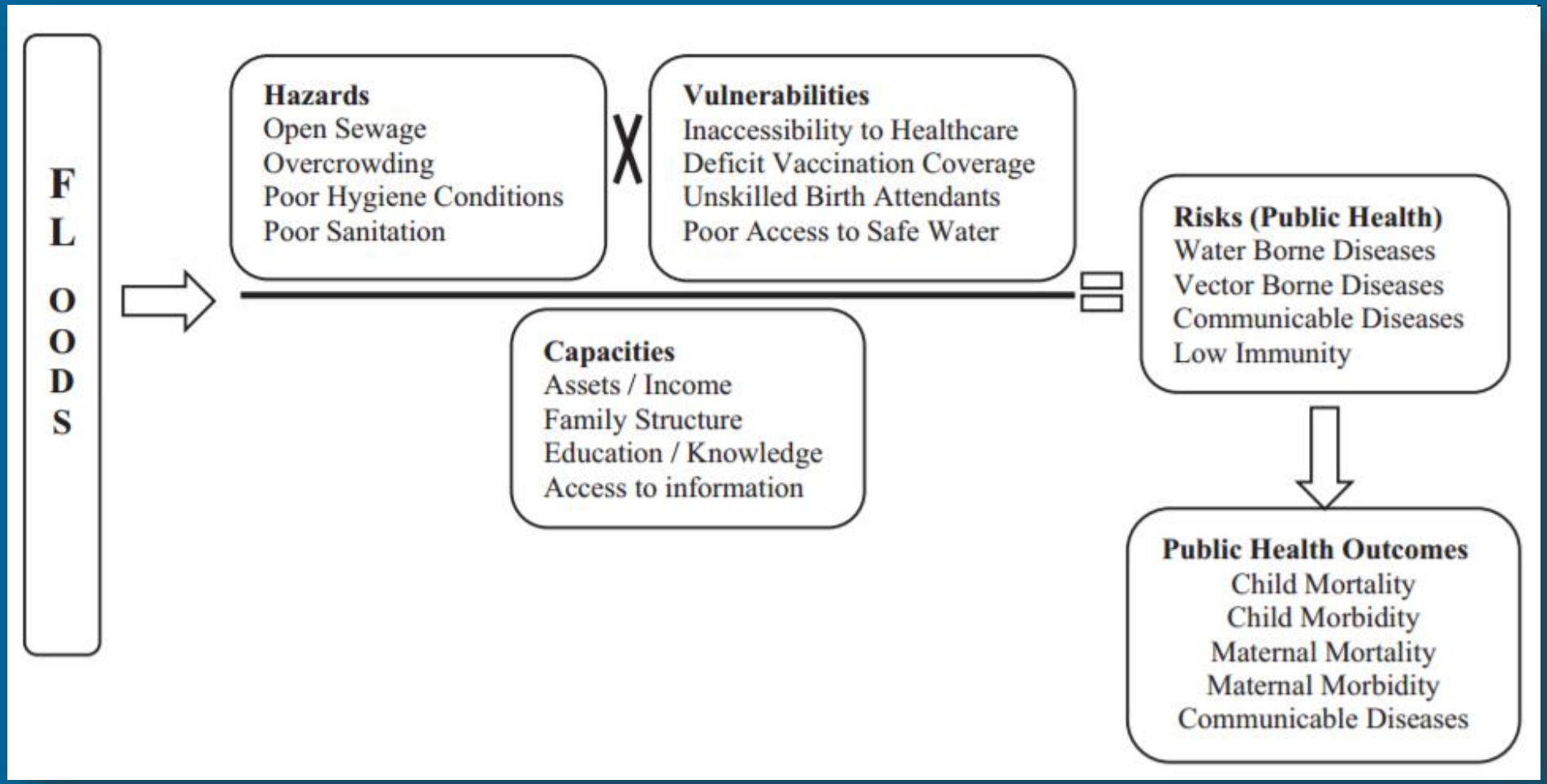
Sadia, H. et al. (2016), Int. J. Disaster Risk Reduction, 19: 49.

Table 4
Previous studies which have used the variable to measure health vulnerabilities, hazards and risks with reference to disasters.

Variable	Authors, Research Study Title, Journal, Year
Age – Sex	[76] Jonkman, S. N., Maaskant, B., Boyd, E. and Levitan, M. L. (2009) 'Loss of life caused by the flooding of New Orleans after Hurricane Katrina: analysis of the relationship between flood characteristics and mortality', in Risk Analysis 29(5): 676–698
Source of Income	[76] Jonkman, S. N., Maaskant, B., Boyd, E. and Levitan, M. L. (2009) 'Loss of life caused by the flooding of New Orleans after Hurricane Katrina: analysis of the relationship between flood characteristics and mortality', in Risk Analysis 29(5): 676–698
Education	[77] Banerjee, L. Rev Black Polit Econ (2015) 42: 111.
Type of Toilets and Flushing Site	[78] Watson, J. T., Gayer, M., & Connolly, M. A. (2007). Epidemics after Natural Disasters. *Emerging Infectious Diseases*, *13*(1), 1–5.
Access to Health Care	[79] Nickerson JW, Chackungal S, Knowlton L, McQueen K, Burkle FM (2012) Surgical care during humanitarian crises: a systematic review of published surgical caseload data from foreign medical teams. Prehosp Disaster Med 27:184–189
Shortage of Vaccine Coverage	[80] Sankoh, O., Welaga, P., Debpuur, C., Zandoh, C., Gyaase, S., Poma, M. A., … Aaby, P. (2014). The non-specific effects of vaccines and other childhood interventions: the contribution of INDEPTH Health and Demographic Surveillance Systems. International Journal of Epidemiology, 43(3), 645–653
Inaccessibility to Healthcare	[81] O'Reilly, K. M., Durry, E., ul Islam, O., Quddus, A., Abid, N., Mir, T. P., … Grassly, N. C. (2012). The effect of mass immunization campaigns and new oral poliovirus vaccines on the incidence of poliomyelitis in Pakistan and Afghanistan, 2001–11: a retrospective analysis. *Lancet*, *380*(9840), 491–498
Unskilled Birth Attendants	[82] Prata, N., Passano, P., Rowen, T., Bell, S., Walsh, J., & Potts, M. (2011). Where There Are (Few) Skilled Birth Attendants. *Journal of Health, Population, and Nutrition*, *29*(2), 81–91.
Over Crowding	[83] Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung IC, Schmidt WP. Water, sanitation and hygiene for the prevention of diarrhoea. Int J Epidemiol. 2010 Apr; 39 Suppl 1: i193 – 205
Safe Drinking Water Non-Availability	[84] Wolf, J., Prüss-Ustün, A., Cumming, O., Bartram, J., Bonjour, S., Cairncross, S., Clasen, T., Colford, J. M., Curtis, V., De France, J., Fewtrell, L., Freeman, M. C., Gordon, B., Hunter, P. R., Jeandron, A., Johnston, R. B., Mäusezahl, D., Mathers, C., Neira, M. and Higgins, J. P. T. (2014), Systematic review: Assessing the impact of drinking water and sanitation on diarrhoeal disease in low- and middle-income settings: systematic review and meta-regression. Trop Med Int Health, 19: 928–942.
Poor Sanitation	[85] Department for International Development (DfID) (2013). Water, Sanitation, and Hygiene. Evidence Paper. SHARE Research Consortium and the London School of Hygiene and Tropical Medicine.
Poor Hygiene Conditions	[86] Curtis, V., & Cairncross, S. (2003). Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *The Lancet infectious diseases*, *3*(5), 275 – 281.

Impacto de las grandes inundaciones en salud pública

Sadia, H. et al. (2016), Int. J. Disaster Risk Reduction, 19: 53.



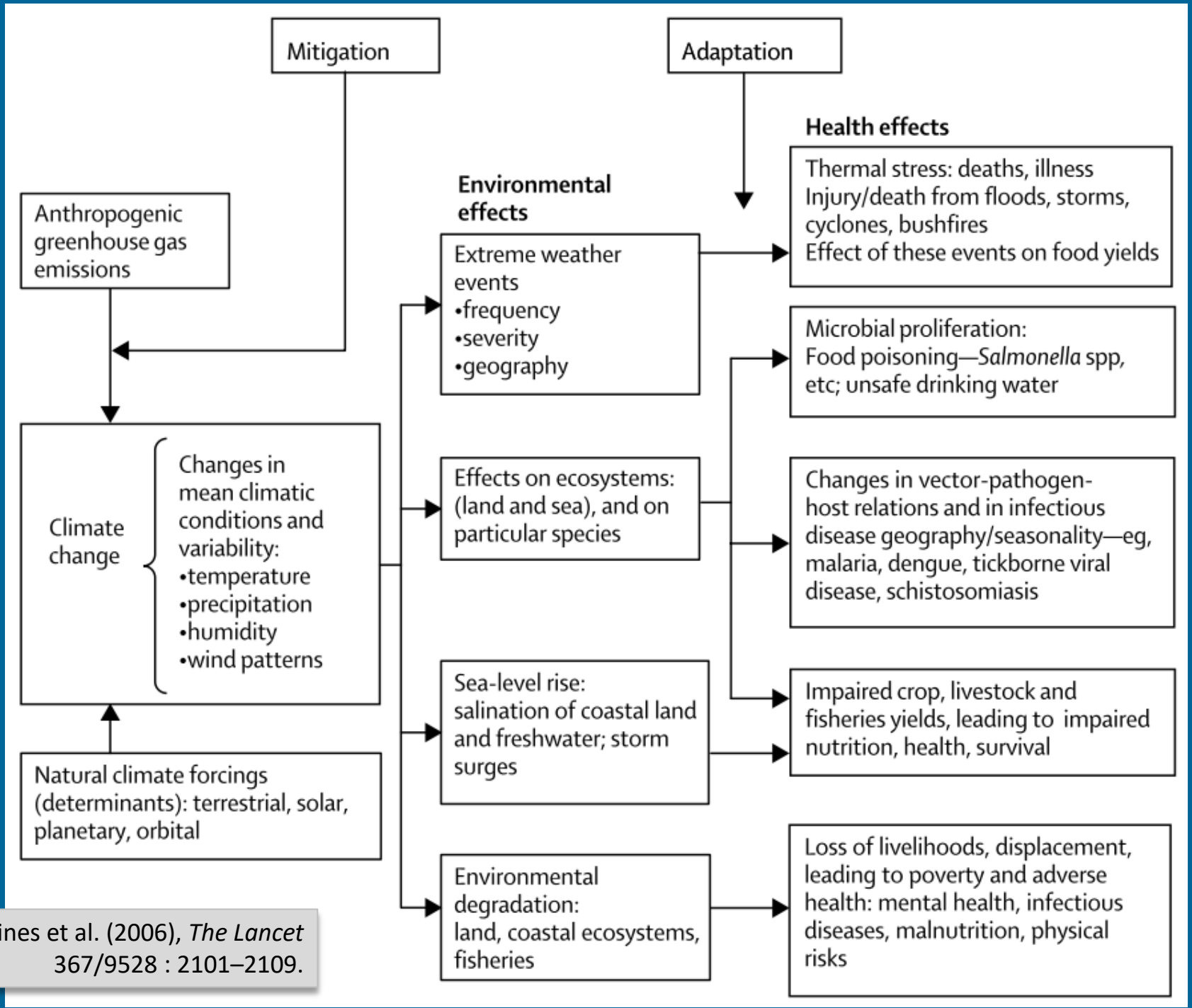
Impacto de las grandes inundaciones en salud pública

Sadia, H. et al. (2016), Int. J. Disaster Risk Reduction, 19: 53.

(V) Vulnerabilities	
(V.1) Received Antenatal Care	39.63% (n = 153)
(V.2) Received Neonatal Anti-Tetanus Immunization	29.27% (n = 113)
(V.3) Delivery Attended by Skill Birth Attendant	22.79% (n = 88)
(V.4) Delivered Baby in the Health Facility	19.68% (n = 76)

(H) Hazards	
(H.1) Water Supply Facility	
Water Tap Water	16.83% (n = 65)
Tube-well Water	72.27% (n = 279)
Water Pump	4.40% (n = 17)
Surface Water	2.33% (n = 9)
Others	4.14% (n = 16)

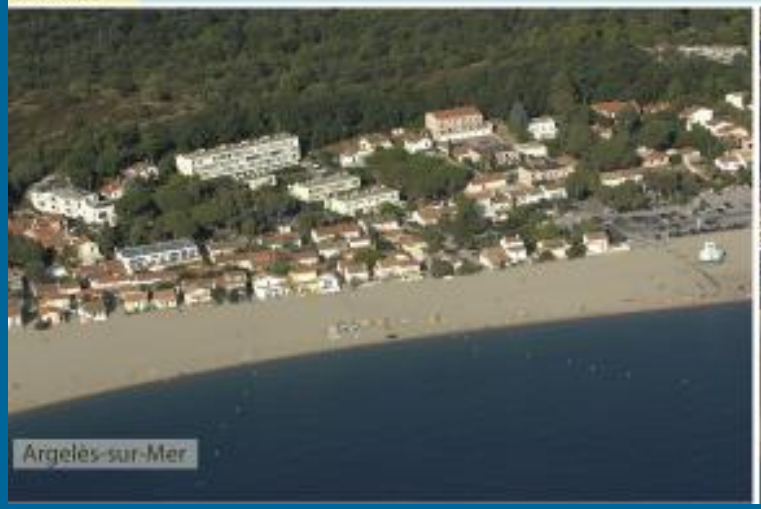
(H.2) Water Sanitation	
Flush into Open Street	62.6% (n = 241)
Piped Sewer System	3.9% (n = 15)
Flush into Farms	18.7% (n = 72)
Flush to River / Canals	11.9% (n = 46)
Don't Know	2.9% ((n = 10)



Haines et al. (2006), *The Lancet* 367/9528 : 2101–2109.

Efecto directo en la disponibilidad de recursos para salud por los daños en las infraestructuras (ref. Francia)

André, C. et al. (2016). Ocean & Coastal Manag. 134: 173–182.



Efecto directo en la disponibilidad de recursos para salud por los daños en las infraestructuras (ref. Francia)

André, C. et al. (2016). Ocean & Coastal Manag. 134: 173–182.

- ✓ Adapting to sea-level rise involves comparing protection and relocation scenarios.
- ✓ Traditional Cost-Benefit Analysis considers in most cases only direct damages.
- ✓ High costs of property purchasing for relocation favour protection scenarios.
- ✓ Enhanced Cost-Benefit Analysis allows considering tourist economy and environment.
- ✓ Coastal risk management policies should evolve towards land-use management logic.

Efectos diferenciados según grupos/género

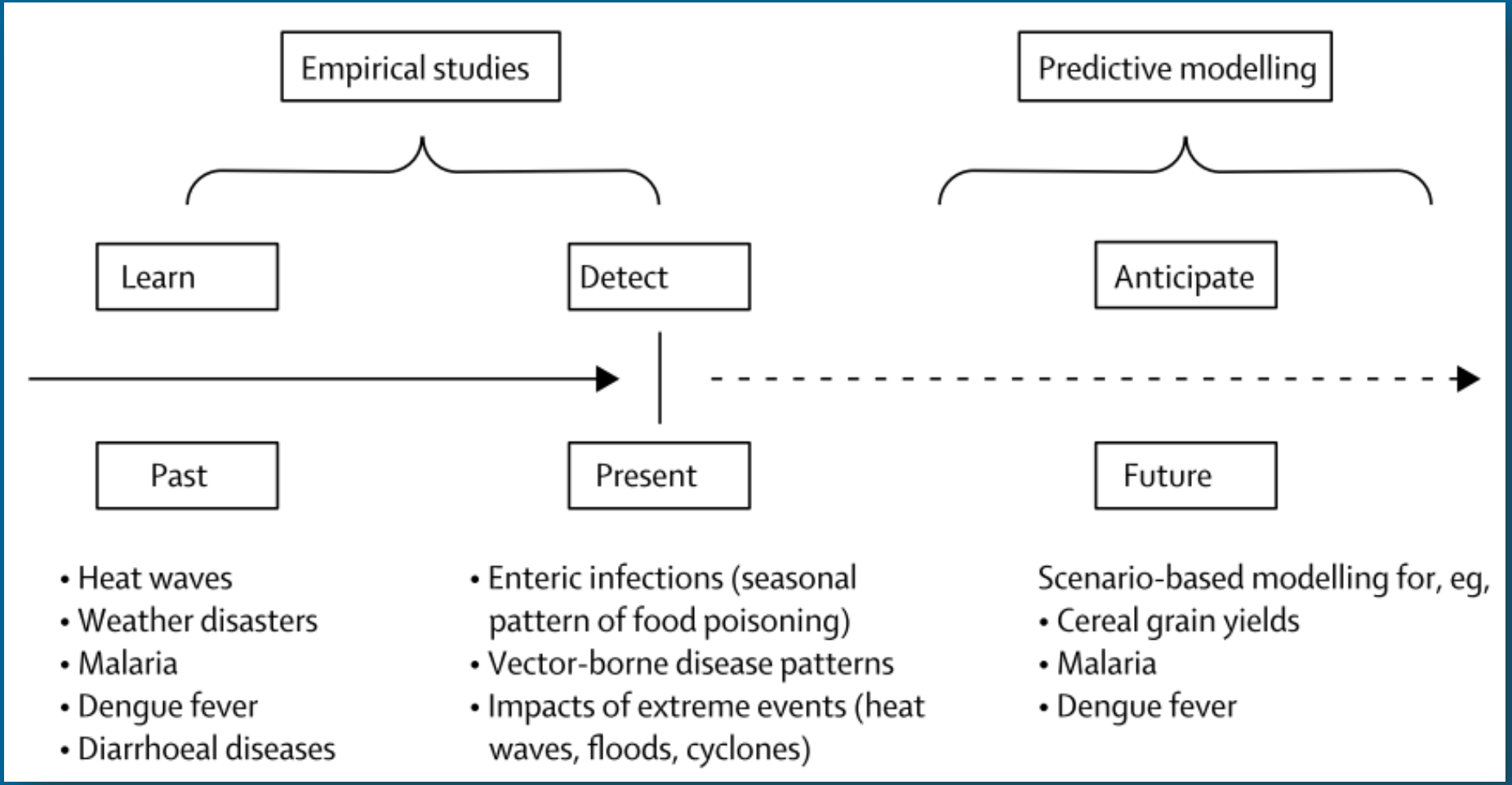
Sadia, H. et al. (2016), Int. J. Disaster Risk Reduction, 19: 47–56.
Fordham, M. "Gender and Disasters." *Encyclopedia of Environmental Health*. Elsevier, 2011. 834–838.

Los desastres naturales afectan a todos por igual, pero las mujeres soportan el mayor impacto de las consecuencias:

- Inundaciones de Pakistán (en 2010, con 1.700 muertes, daños generalizados y 1 millón de damnificados directos):
  - Mayor vulnerabilidad de las mujeres, necesitadas de atención sanitaria pre- y postnatal.
  - Representan el 51% de la población, pero sólo el 5% están al frente del hogar.
  - Sólo el 26% recibieron atención especializada en el parto.
  - Sólo un 39% tuvo algún seguimiento postnatal.
  - Una tasa de alfabetización femenina mucho más baja agrava la vulnerabilidad.

Líneas de investigación

Mitigación: verdadera prevención primaria (reducción de las emisiones de gases de efecto invernadero).
Adaptación (prevención primaria tardía): intervenciones para disminuir los efectos adversos en la salud.



Haines et al. "Climate change and human health: impacts, vulnerability, and mitigation." The Lancet 367/9528 (2006): 2101–2109.

Mortalidad excepcional atribuida a la ola de calor de 2003 en Europa

Haines et al. (2006), "Climate change and human health: impacts, vulnerability, and mitigation." *The Lancet* 367/9528: 2103.

Location (date)	Excess mortality (% increase)	Reference
England and Wales (Aug 4–13)	2091 deaths (17%)	Johnson et al[16]
Italy (Jun 1–Aug 15)	3134 (15%) in all Italian capitals	Conti et al[17]
France (Aug 1–20)	14 802 (60%)	Anon[18]
Portugal (Aug)	1854 (40%)	Botelho et al[19]
Spain (Jul–Aug)	4151 deaths (11%)	Simon et al[20]
Switzerland (Jun–Sept)	975 deaths (6·9%)	Grize et al[21]
Netherlands (Jun–Sept)	1400–2200 deaths (not reported)	Garssen et al[22]
Germany (Aug 1–24)	1410 deaths (not reported)	Sozialministerium Baden-Wuerttemberg[23]

Impacto en la calidad y cantidad de los alimentos producidos

Whitmee, S. et al. (2015), The Lancet, 386 (10007): 1989.

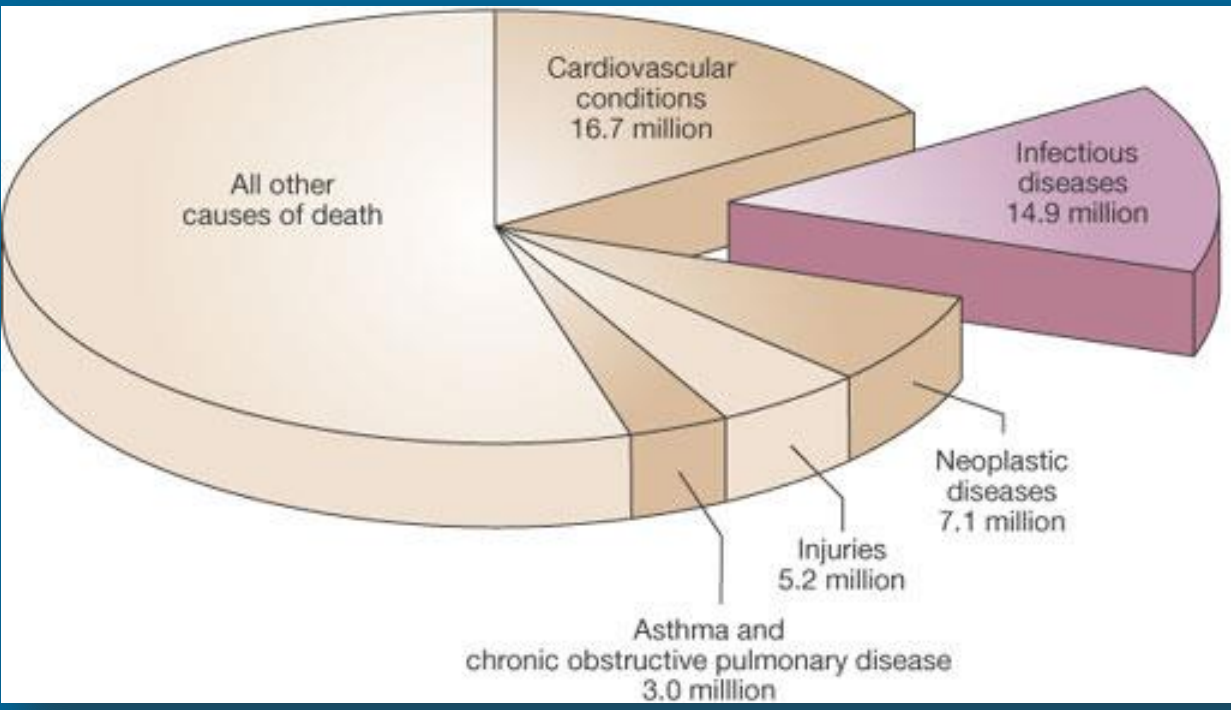
Neill, P.E., and M. Arim. "Human Health Link to Invasive Species." Enc. Env. Health. 2011: 116–123.

Climate change

Climate change is expected to affect the quality and quantity of food produced in a range of ways. The IPCC also concluded with medium confidence that, based on models of present agricultural systems, "large negative impacts on agricultural productivity and substantial risks to global food production and security" would arise from mean local warming of 3–4°C, with particular risks to tropical countries.[42] The IPCC concluded with high confidence that although positive trends on crop and food production have been recorded in some high latitude regions, overall negative trends have been more common.[42]

About 15 million (>25%) of 57 million annual deaths worldwide are the direct result of infectious disease

World Health Organization (http://www.who.int/whr/en, and ref. 7)



Infectious diseases	Annual deaths (million)
Respiratory infections	3.96
HIV/AIDS	2.77
Diarrhoeal diseases	1.80
Tuberculosis	1.56
Vaccine-preventable childhood diseases	1.12
Malaria	1.27
STDs (other than HIV)	0.18
Meningitis	0.17
Hepatitis B and C	0.16
Tropical parasitic diseases	0.13
Dengue	0.02
Other infectious diseases	1.76

Worldwide reporting trends in fungal EIDs. (a) Disease alerts in the ProMED database for pathogenic fungi of animals and plants; (b) spatial location of the associated reports

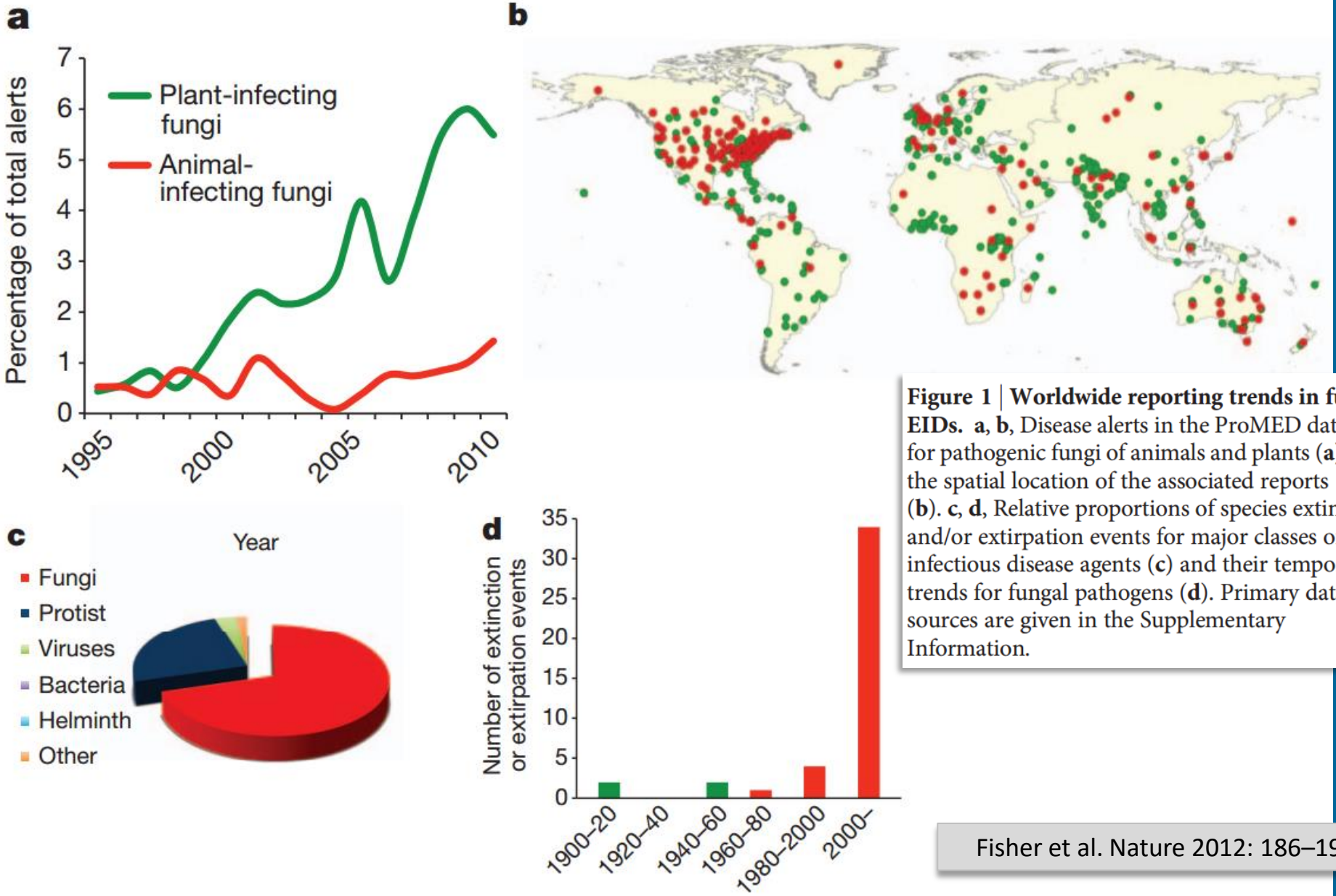
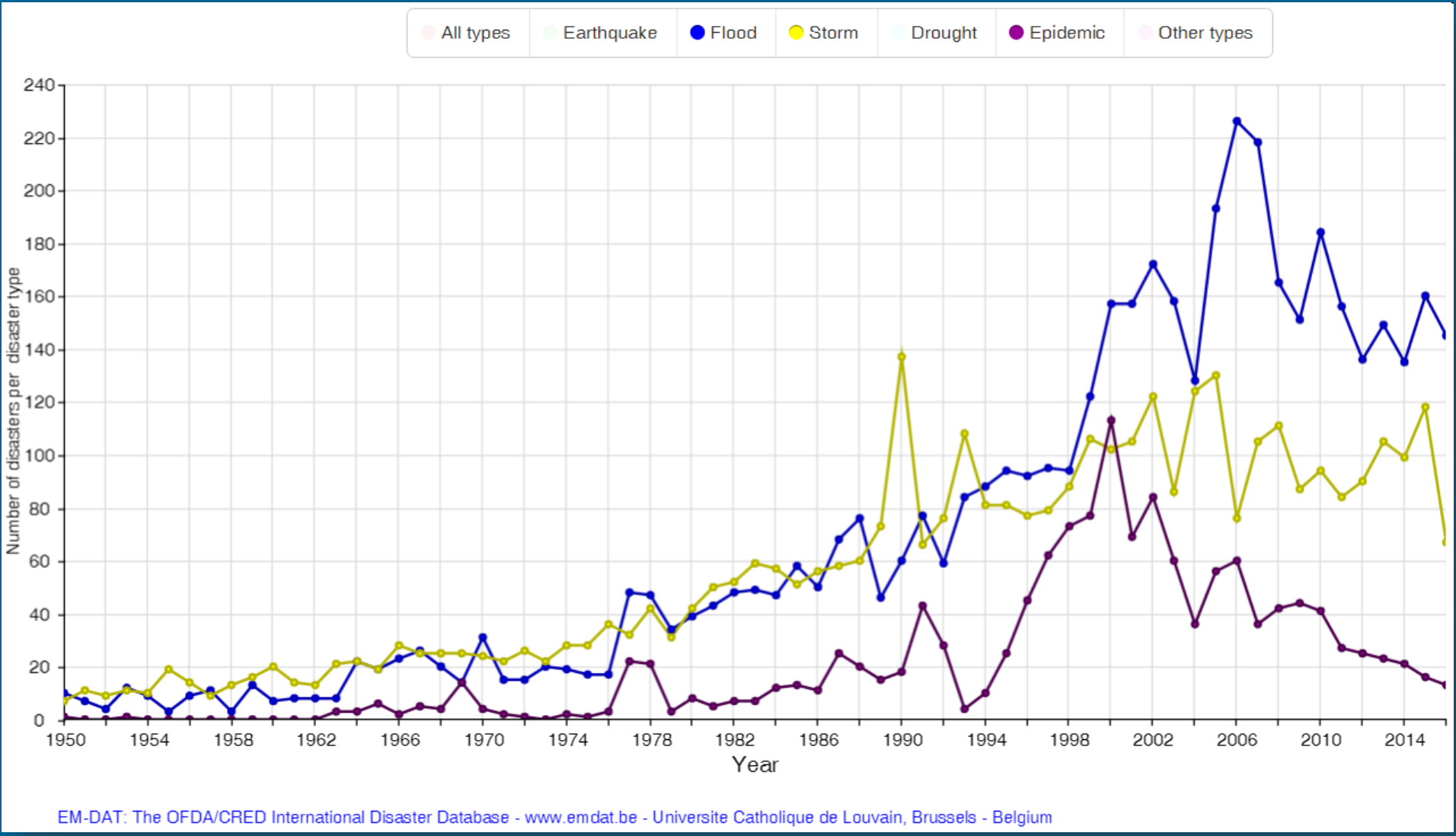


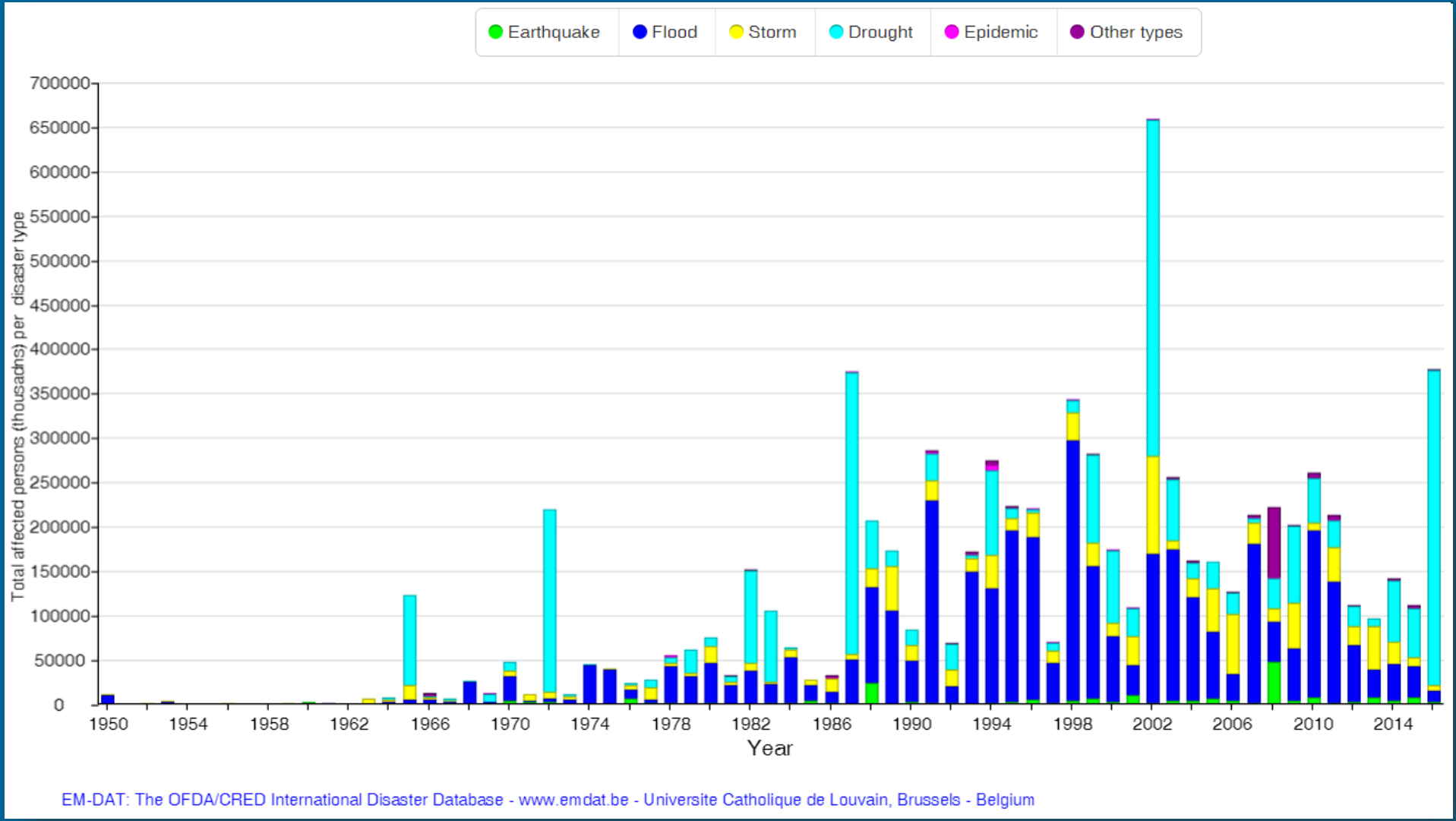
Figure 1 | Worldwide reporting trends in fungal EIDs. **a**, **b**, Disease alerts in the ProMED database for pathogenic fungi of animals and plants (**a**), and the spatial location of the associated reports (**b**). **c**, **d**, Relative proportions of species extinction and/or extirpation events for major classes of infectious disease agents (**c**) and their temporal trends for fungal pathogens (**d**). Primary data sources are given in the Supplementary Information.

Fisher et al. Nature 2012: 186–194.

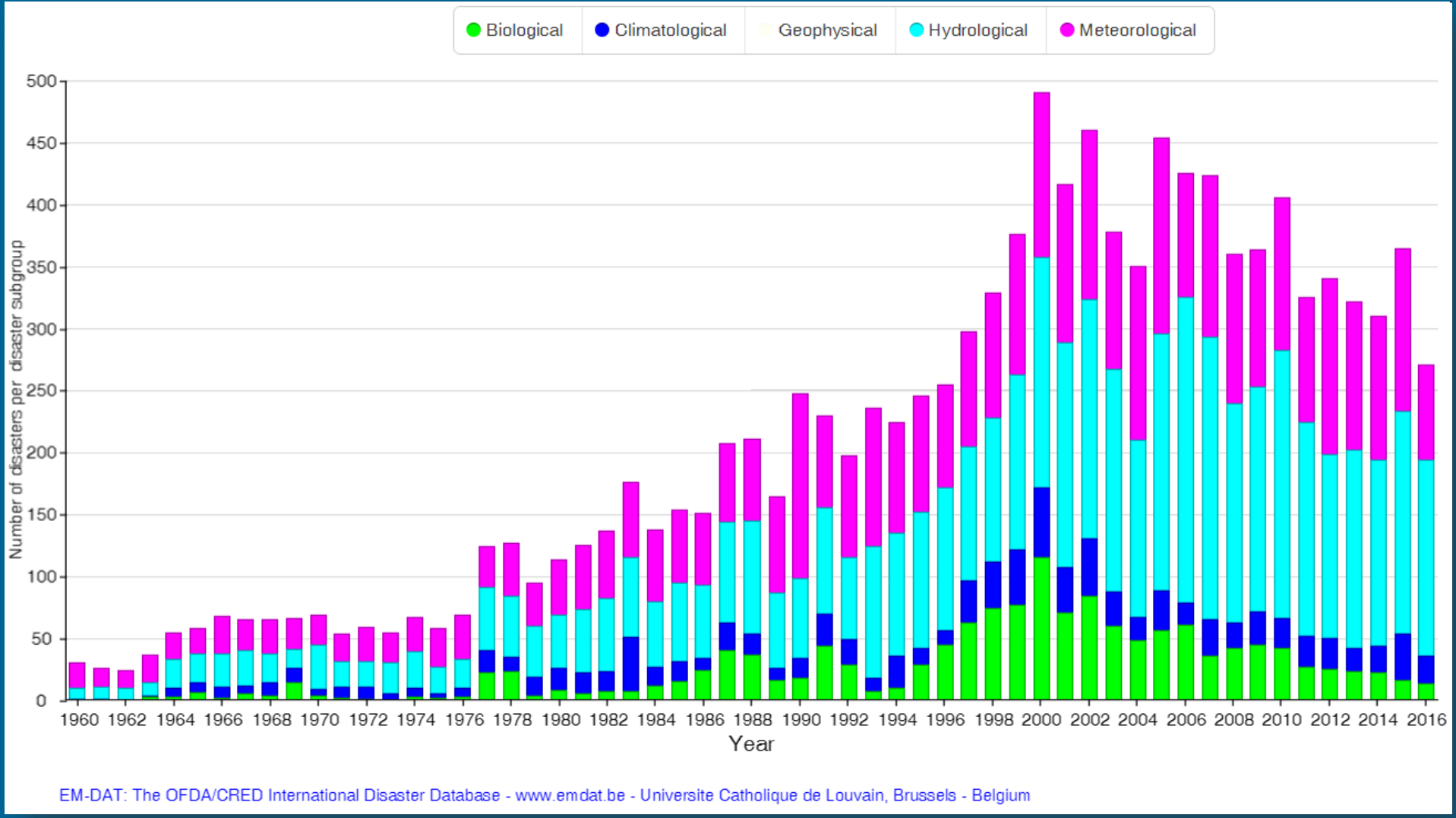
TOTAL NUMBER of reported Natural disasters 1950 - 2016



TOTAL AFFECTED PERSONS by Natural disasters 1950 - 2016



TOTAL NUMBER of reported Natural disasters 1960 - 2016



VULNERABILIDAD HUMANA

Factores que agravan los desastres

- **Vulnerabilidad humana asociada a pobreza y desigualdad social**
- **Degradación ambiental y urbanización intensa en zonas de riesgo**
- **Crecimiento rápido de la población urbana con pocos recursos**

  1920: 100 millones hab. → 1980: 1.000 mill.

  |2004: 2.000 mill. (20 ciudades con >10 mill. habs.)

  Dic. 2016: 7400 mill. habs. → 2050: 9.500 mill. habs.

- **Imprevisión e incumplimiento de normas de construcción**

Los desastres no afectan por igual

>90% de las muertes ocurren entre el 66% de la población en las regiones más pobres.[1]

- **Tasas diferentes de mortalidad por desastre**:
  - ✓3.000 en zonas pobres
  - ✓500 en países industrializados

[1] Anderson MB (1991): "Which costs more: prevention or recovery?" En: Kreimer A, Munasinghe M, eds. *Managing natural disasters and the environment*. Washington, D.C.: World Bank.

Vulnerabilidad

IPCC (2000):

"El grado de susceptibilidad de un sistema natural o social para soportar los daños del cambio climático en función de su magnitud, la sensibilidad del sistema a los cambios del clima y la habilidad de este para adaptarse a esos cambios".

Un **sistema muy vulnerable** es aquel que es muy sensible a cambios moderados del clima y cuya capacidad para adaptarse está muy restringida.

Vulnerabilidad

Fuente: http://www.bcie.org

Predisposición o susceptibilidad física, económica, política o social que tiene una comunidad de ser afectada o de sufrir daños por un fenómeno desestabilizador de origen natural o antrópico. (Cardona, 2001: 2)

Las condiciones de pobreza de las poblaciones disminuyen la capacidad de recuperación.
Los efectos negativos en muchos lugares son acumulativos (inundaciones o sequías cada año).

Conceptualización de la vulnerabilidad

Eric NOJI, *Crit Care Med* 2005 Vol. 33, No. 1 (Suppl.): S32
http://www.academia.edu/2650236/Public_health_issues_in_disasters

- **Myth**: disasters are random killers.
- **Reality**: disasters strike hardest at the most vulnerable groups such as the poor, especially women, children, and the elderly.

Riesgo

- **Probabilidad de que un evento suceda.**
  - ✓ **Referida a procesos naturales**: probabilidad de que las personas y sus bienes resulten afectados de forma negativa, en función de su exposición y vulnerabilidad.
  - ✓ **Reducción del riesgo:** resultado de relacionar la amenaza (probabilidad de que ocurra un evento) y la vulnerabilidad de los elementos expuestos (factores interno que modulan la severidad de los efectos).
  - ✓ **Medidas estructurales**: desarrollo de obras de protección
  - ✓ **Medidas no estructurales**: regulación de los usos del suelo;
    - Financiar adecuadamente la actividad preventiva
    - **Dimensionar los medios y servicios locales** para atención en situaciones de emergencia y catástrofe (los factores que más pueden reducir las consecuencias de un evento sobre una región o una población).

Población vulnerable

Ebi, K.L. "Climate Change and Health." Enc. Env. Health. 2011: 680–689.

- **Exposición**: Riesgo = Vulnerabilidad * Amenaza
  - El cambio climático aumenta el riesgo en todos los países
  - **Población expuesta a mayor riesgo**
    - urban poor, older adults, children, traditional societies, subsistence farmers, and coastal populations, particularly in low-income countries.
  - **Factores determinantes del impacto**
    - Densidad de población
    - Tipo de asentamiento
    - Nivel de desarrollo económico y cultural
    - Condiciones ambientales locales
    - Estado de salud previo
    - Calidad y disponibilidad de asistencia médica
    - Servicios públicos a su alcance
    - Fragilidad/posibilidad de afectación del modo de vida

ADAPTACIÓN Y MITIGACIÓN

Algunas enfermedades transmitidas por vectores que pueden ser sensibles al cambio climático

Vector	Major diseases
Mosquitoes	Malaria, filariasis, dengue fever, yellow fever, West Nile fever
Sandflies	Leishmaniasis
Triatomines	Chagas disease
Ixodes ticks	Lyme disease, tick-borne encephalitis
Tsetse flies	African trypanosomiasis
Blackflies	Onchocerciasis
Snails (intermediate host)	Schistosomiasis

Haines et al. “Climate change and human health: impacts, vulnerability, and mitigation.” The Lancet 367/9528 (2006): 2104.

Medidas de adaptación al impacto del cambio climático en salud pública

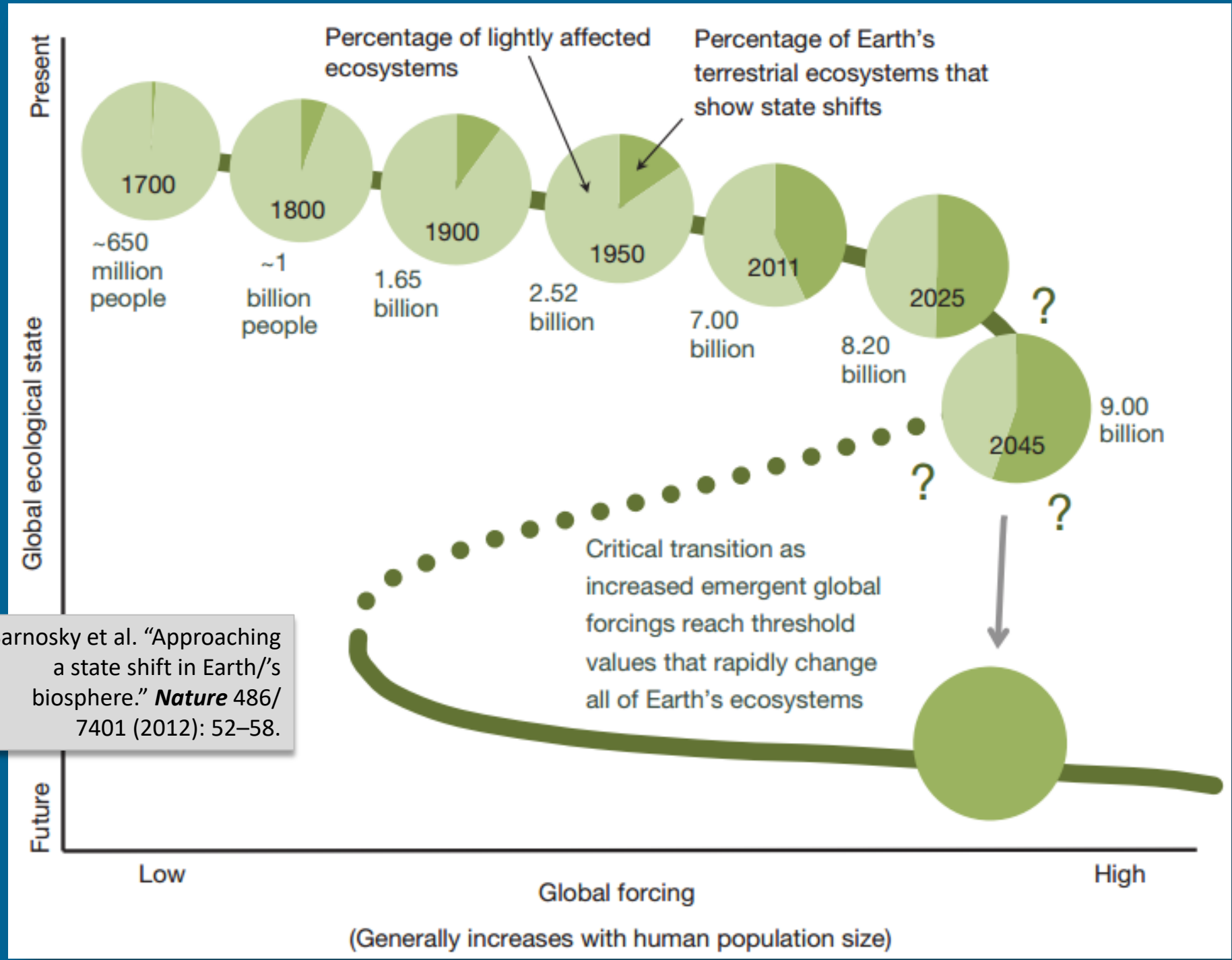
Health outcome	Public health	Surveillance
Mortality and morbidity due to heat waves	Public-health education Heat health warning systems Emergency preparedness	Enhance health surveillance of routine data for early detection of heat wave effects (eg, monitoring from funeral homes, calls to NHS Direct)
Floods	Public-health education—eg, boil water notices Emergency preparedness Check list for post-flood activities	Surveillance for flood effects, with long-term follow-up Coordinated national surveillance for flood deaths, injuries, and illnesses
Air quality	Warnings for high pollution days	Daily air pollution measurements
Vector-borne diseases	Public education, especially to avoid contact with ticks	Monitoring of vectors and reservoir host Integrated surveillance for human and animal diseases
Food-borne disease	Maintenance and strengthening of food hygiene measures	Integrated surveillance for human and animal diseases
Water-borne diseases	Risk assessment for extreme rainfall events Risk assessment of health effects of algal blooms	Increased microbiological monitoring of public water supplies and private wells, and enhanced surveillance during and following heavy rainfall events

Haines et al. *The Lancet* 367/9528 (2006): 2104.

The cost of climate mitigation and adaptation

What is the cost of avoiding climate change? According to the UK Government commissioned Stern review on the economics of climate change in 2006, if we do everything we can now to reduce global greenhouse gas emissions and ensure we adapt to the future effects of climate change, the average estimated cost is 1% of the world gross domestic product (GDP) every year.[14] However, if we do nothing, the effects of climate change could cost 5–20% of the world GDP every year. These figures have been disputed. Pielke and colleagues[5] argue

Costello et al. "Managing the health effects of climate change." *The Lancet* 373, no. 9676 (May 22, 2009): 1700.



Barnosky et al. "Approaching a state shift in Earth/'s biosphere." ***Nature*** 486/ 7401 (2012): 52–58.

ENFOQUE DE BIOÉTICA GLOBAL *vs* ENFOQUE DE RIESGOS/OPORTUNIDADES

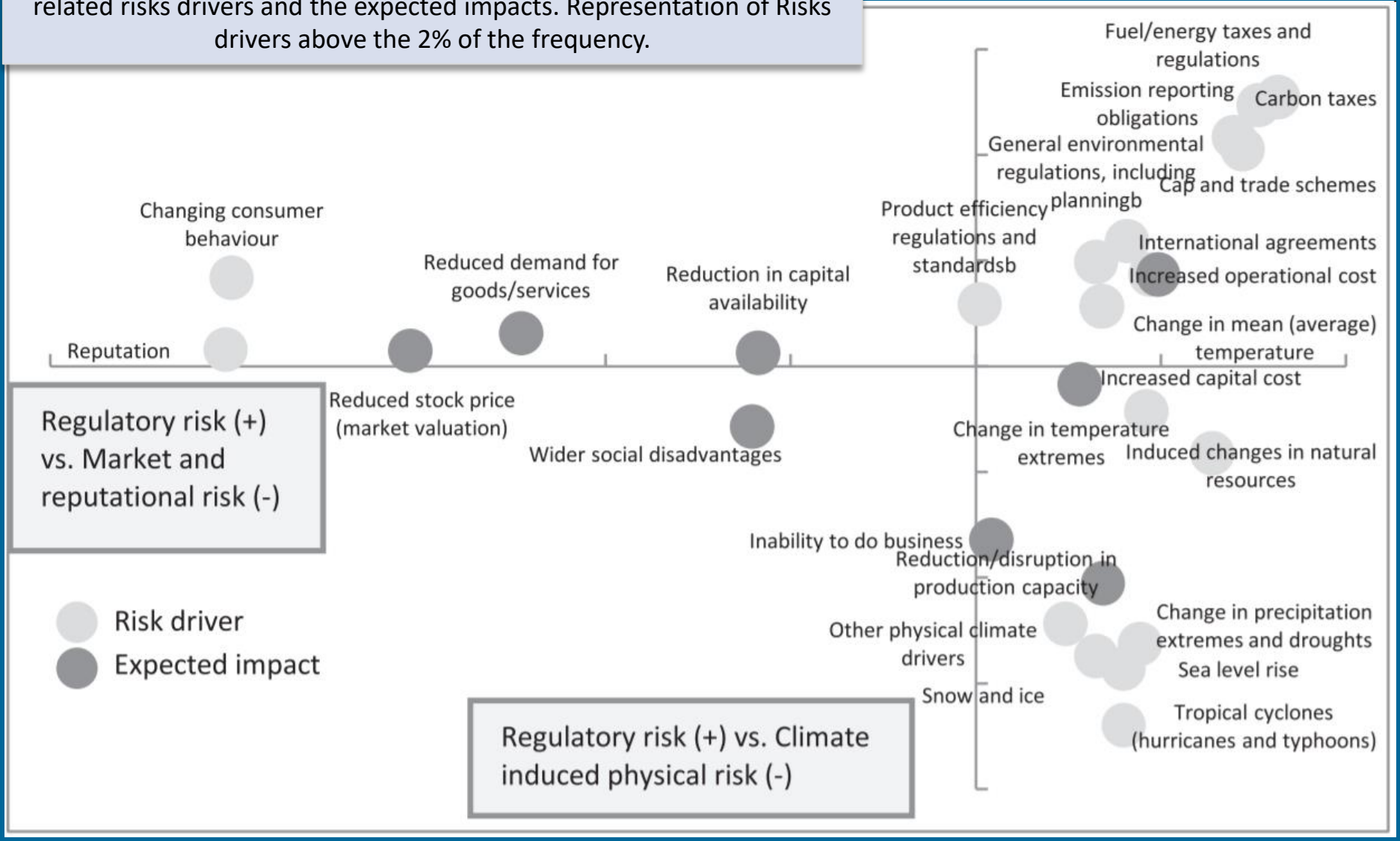
Insuficiencia del enfoque de negocios

Gasbarro, F., Iraldo, F., & Daddi, T. (2017) *J. Clean. Prod.* 10.1016/j.jclepro.2017.03.01

- La literatura on *business responses to climate change* se asocia con **métodos de investigación cualitativa**:
  - regulatory changes; physical changes;
  - product and technology innovation; operational efficiency; reputation; financial impacts; and changes in consumer needs.
- **Faltan análisis cuantitativos** de los factores contextuales que incentivan las respuestas de empresas multinacionales, en función de riesgos y oportunidades:
  - Risks (Gasbarro et al., 2017): "Legal compliance and competitiveness, assets integrity and resource availability, public relations and financial issues, innovation capacity and physical security".

→"Climate change can represent both a risk and an opportunity for organizations".

Fig. 1. Positioning map of the correspondence analysis between climate-related risks drivers and the expected impacts. Representation of Risks drivers above the 2% of the frequency.



Gasbarro, F., Iraldo, F., & Daddi, T. (2017). The drivers of multinational enterprises' climate change strategies: A quantitative study on climate-related risks and opportunities. *Journal of Cleaner Production*. http://doi.org/10.1016/j.jclepro.2017.03.01

Ambigüedad de las oportunidades de negocio derivadas del análisis del cambio climático en términos de riesgos y oportunidades

Table 1
Climate-related risks and opportunities.

Risks	Opportunities
Regulatory: e.g. carbon taxes, emissions reduction requirement, cap and trade systems could represent an additional cost (Lash and Wellington, 2007; Wittneben and Kiyar, 2009)	Regulatory: e.g. financial companies may assist customers affected by carbon taxes, emissions reduction requirement, cap and trade systems through facilitating their emission trading or financing offset projects for them (Furrer et al., 2000; Kolk and Pinkse, 2004)
Physical changes: e.g. can pose major challenges to those sectors relying on particular temperature and seasonal conditions such as agriculture, forestry, tourism etc. (Alcamo et al., 2007)	Physical changes: e.g. the increase in temperatures in Margaret River Wine Region of Australia is perceived beneficial for wine production (Galbreath, 2012)
Product and technology innovation: e.g. choosing or adopting an innovative technology or product under environmental incertitude could also be risky	Product and technology innovation: e.g. Owing climate-resilient and resource-efficient assets, then investing in know-how and innovation in growing markets related to climate change could mean potential competitive advantage (Gasbarro et al., 2016)
Changes in customer needs: e.g. water utilities worry about the rise in average summer temperatures, which increases the demand for water resources, putting pressure on the grid (Gasbarro et al., 2016)	Changes in customer needs: e.g. if tropical diseases migrate into more industrialized nations pharmaceutical companies may see their market expand (Packard and Reinhardt, 2000)
Reputation: e.g. reputational risks if companies pursue to use products, processes or practices with a negative impact on climate (Lash and Wellington, 2007)	Reputation: e.g. implementing a strategy to cope with climate change or accepting responsibilities can lead a company to improve its public relations in terms of brand, image and reputation improvements (Hoffman, 2005; Kolk and Pinkse, 2004)
Financial impacts: e.g. rating societies take into account environmental and sustainability performance in their investment decisions (Wittneben and Kiyar, 2009)	Financial impacts: e.g. many governments are introducing financial incentives to reduce GHGs (Hoffman, 2005), and financial companies may assist customers affected by GHGs regulation (Furrer et al., 2000; Kolk and Pinkse, 2004)
Operational efficiency: e.g. an increase in the back-flow condensation water temperature affects the ability to run certain generating assets at full capacity because of restrictions in cooling water discharge temperature and flow restrictions (Gasbarro et al., 2016)	Operational efficiency: e.g. companies could introduce process or energy efficiencies improvement and cost savings (Hoffman, 2005; Porter and Reinhardt, 2007)

"Considering regulation as a business risk or opportunity can depend on the type of industry. For example, oil and gas, mining, metals and utilities generally could perceive regulation as a risk, instead financial companies could assist customers affected by such regulation through facilitating their emission trading or financing offset projects for them". (Gasbarro et al., 2017:3)

Encuadre del trabajo

- **El principio de "no-dañar" referido al medio natural**
  - Relación entre clima, salud y condiciones de vida
  - Las alteraciones del clima provocan daños importantes a las poblaciones humanas y reducen la biodiversidad
  - La influencia antropogénica en el clima puede tener un impacto catastrófico en la biosfera
  - Daños/lastre para las generaciones futuras
  - Atribución de responsabilidad y obligaciones de reparar daños
  - Desafíos para los sistemas de gobernanza y coordinación internacional de las iniciativas de mitigación/adaptación

PREVENCIÓN Y PLANIFICACIÓN DE LAS INTERVENCIONES EN DESASTRES

Desafíos

- **Desarrollo de métodos más fiables para cartografiar la vulnerabilidad y diseñar planes de prevención**
  - Importa investigar antes y después de las catástrofes
  - Las estrategias de prevención acertadas evitan decenas de miles de víctimas

- **La vulnerabilidad es universal, pero los recursos para afrontar las consecuencias son locales e insuficientes:**
  - Preston, B. L., Yuen, E. J., & Westaway, R. M. (2011). Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks. *Sustainability Science*, *6*(2), 177–202. http://doi.org/10.1007/s11625-011-0129-1
  - Brown, T. (2011). "Vulnerability is universal": Considering the place of "security" and "vulnerability" within contemporary global health discourse. *Social Science & Medicine*, *72*(3), 319–326. http://www.sciencedirect.com/science/article/pii/S0277953610006581
  - Lynn, K., Mackendrick, K., & Donoghue, E. M. (2011). Social Vulnerability and Climate Change: Synthesis of Literature. Retrieved from http://www.fs.fed.us/pnw/pubs/pnw_gtr838.pdf

Instrumentos de gobernanza internacional, para coordinación y prevención de riesgos

- **Marcos jurídicos centrados en el ámbito estatal**
  - Dificultades para la coordinación eficaz entre territorios dentro del mismo Estado
  - Obstáculos para una respuesta rápida en emergencias
  - Dificultades para un reparto equitativo y justo de costes

- **Descuido de la prevención**
  - dotación insuficiente de recursos técnicos y humanos
  - autorización para construir en zonas de elevado riesgo
  - Vulnerabilidad creciente, tb de colectivos y países ricos

Importancia de la prevención y coordinación

Preparedness saves the nation: Comparison of differential impacts of cyclones in Bangladesh (2007) and Myanmar (2008)

	Bangladesh: Cyclone Sidr, 2007	Myanmar: Cyclone Nargis, 2008
Tidal wave (and storm surge)	5 to 6 metres	3.5 to 7.0 metres
Wind speed	240 km/hr	255 km/hr
Population evacuated	3 million	None
Deaths	3,406	84,537
Missing	1,001	53,836
Population "severely" affected	1 million	2.4 million
Total losses and damage	US$1,674 million	US$4,134 million
Human Development Index (2007)	140	132
Per capita GDP (2007 values)	PPP$1,400	PPP$1,900
Population below poverty line (2004)	45%	33%

Source: USAID, 2008. Available from www.ausaid.gov.au/hottopics/pdf/AIDRF_Feasibility_Study_Report_annex6-10.pdf.

Referencias

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Preston, B. L., Yuen, E. J., & Westaway, R. M. (2011). Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks. Sustainability Science, 6(2), 177–202. http://doi.org/10.1007/s11625-011-0129-1

Brown, T. (2011). "Vulnerability is universal": Considering the place of "security" and "vulnerability" within contemporary global health discourse. Social Science & Medicine, 72(3), 319–326. Retrieved from http://www.sciencedirect.com/science/article/pii/S0277953610006581

Lynn, K., Mackendrick, K., & Donoghue, E. M. (2011). Social Vulnerability and Climate Change: Synthesis of Literature. Retrieved from http://www.fs.fed.us/pnw/pubs/pnw_gtr838.pdf

Sadia, H., Iqbal, M. J., Ahmad, J., Ali, A., & Ahmad, A. (2016). Gender-sensitive public health risks and vulnerabilities' assessment with reference to floods in Pakistan. *International Journal of Disaster Risk Reduction*, *19*, 47–56. http://doi.org/10.1016/j.ijdrr.2016.08.024

André, C., Boulet, D., Rey-Valette, H., & Rulleau, B. (2016). Protection by hard defence structures or relocation of assets exposed to coastal risks: Contributions and drawbacks of cost-benefit analysis for long-term adaptation choices to climate change. *Ocean & Coastal Management*, *134*, 173–182. http://doi.org/10.1016/j.ocecoaman.2016.10.003

Walther, G.-R., Hughes, L., Vitousek, P., & Stenseth, N. C. (2005). Consensus on climate change. *Trends in Ecology & Evolution*, *20*(12), 648–649. http://doi.org/10.1016/j.tree.2005.10.008

Sadia, H., Iqbal, M. J., Ahmad, J., Ali, A., & Ahmad, A. (2016). Gender-sensitive public health risks and vulnerabilities' assessment with reference to floods in Pakistan. *International Journal of Disaster Risk Reduction*, *19*, 47–56. http://doi.org/10.1016/j.ijdrr.2016.08.024