Climate-change induced displacement and environmental refugees

Quantifying sea level rise

- **IPCC, 2013 →** global mean rate of sea level rise was 1.7 mm yr^{-1} between 1901 and 2010 for a total sea level rise of 0.19 m. Between 1993 and 2010, the rate was higher at 3.2 mm yr^{-1}.
- Dominant 20^{th}C contributors to sea level rise: ocean thermal expansion + glacier melting
- For the period 2081–2100, compared to 1986–2005, global mean sea level rise is projected by the IPCC in representative concentration pathways:
  - 0.26 to 0.55 m for RCP2.6 (emissions peak 2010-20, then decline)
  - 0.32 to 0.63 m for RCP4.5 (emissions peak 2040, then decline)
  - 0.33 to 0.63 m for RCP6.0 (emissions peak 2080, then decline)
  - 0.45 to 0.82 m for RCP8.5 (emissions continue rising)
- **However, sea levels could rise beyond projected ranges due to unpredictable velocity of ice-sheet discharge.**

Contention surrounding sea level rise

Table 1. Range of global sea-level rise (metre per century) according to post-AR4 research.

sea-level rise (metre per century)	methodological approach	source
0.5–1.4	semi-empirical projection[b]	Rahmstorf [28]
0.8–2.4[a]	palaeo-climate analogue	Rohling *et al.* [27]
0.55–1.10	synthesis[b]	Vellinga *et al.* [31]
0.8–2.0	physical-constraint analysis[b]	Pfeffer *et al.* [22]
0.56–0.92[a]	palaeo-climate analogue	Kopp *et al.* [26]
0.75–1.90	semi-empirical projection[b]	Vermeer & Rahmstorf [6]
0.72–1.60[c]	semi-empirical projection[b]	Grinsted *et al.* [7]

[a]Higher rates are possible for shorter periods.
[b]For the twenty-first century.
[c]For the best palaeo-temperature record.

Sea level rise accelerating faster than previously thought

- **US study published in *Nature* in January 2015 showed that the increase in the rate of sea level rise is greater than expected**
  - Previously: **1901 – 1990: GMSL rose 1.6 - 1.9mm y^{-1}**
  - Revised: **1901 – 1990: GMSL rose only 1.2mm y^{-1}**
  - Giving a larger gap in GMSL rate of 3.0mm **y^{-1}** between 1993 – 2010
- The study used probabilistic techniques combining sea-level records with physics-based and model-derived geometries of the contributing processes.
- Implication? Projections of future sea-level rise based on the time series of historical GMSL (esp. semi-empirical approaches) should be revisited

Linking carbon emissions to rising sea levels

- A 2012 UK study found that surface warming, and steric changes in sea level (due to thermal expansion) increase nearly linearly with cumulative carbon emissions.
- The study drew upon
  - thermal expansion (temp ↑ density ↓ volume ↑)
  - how carbon is partitioned between atmosphere and ocean
  - the effects of increasing acidity and warming in reducing the effectiveness of the ocean in taking up carbon

Link between carbon emissions and rising sea levels

Surface warming increases with cumulative emissions with a proportionality factor dependent on climate sensitivity ($\Delta T_{surface:\ 2xCO2}$) and buffered carbon inventory (I_B)

$$\Delta T_{surface}\left(t_{equilib}\right) = \left(\frac{\Delta T_{surface:2\times CO_2}}{I_B \ln 2}\right)\Delta I_{emission}$$

Change in steric sea level η is also given by a linear dependence on cumulative carbon emissions for a long term equilibrium.

$$\Delta\eta\left(t_{equilib}\right)\approx\left(\frac{\overline{\alpha}^{V} D\Delta T_{ocean:2\times CO_2}}{I_B \ln 2}\right)\Delta I_{emission}$$

Proportionality factor (in brackets) depends on thermal expansion coefficient (α) over ocean volume (V); ocean depth (D), and climate sensitivity for the bulk ocean ($\Delta T_{ocean:\ 2xCO2}$). This takes into account positive feedback from ocean acidity due to increasing carbon emissions.

Populations affected by rising sea levels

- At least 600 million people live within 10 m of sea level today → these populations growing rapidly
- Populated deltaic areas and coastal cities are highly threatened by small rises in sea level
- Risk of forced displacement of up to 187 million people over the century (up to 2.4% of global population) → reflects high population density in coastal areas
- Africa and southeast Asia are the most vulnerable regions → high exposure and low adaptive capacity

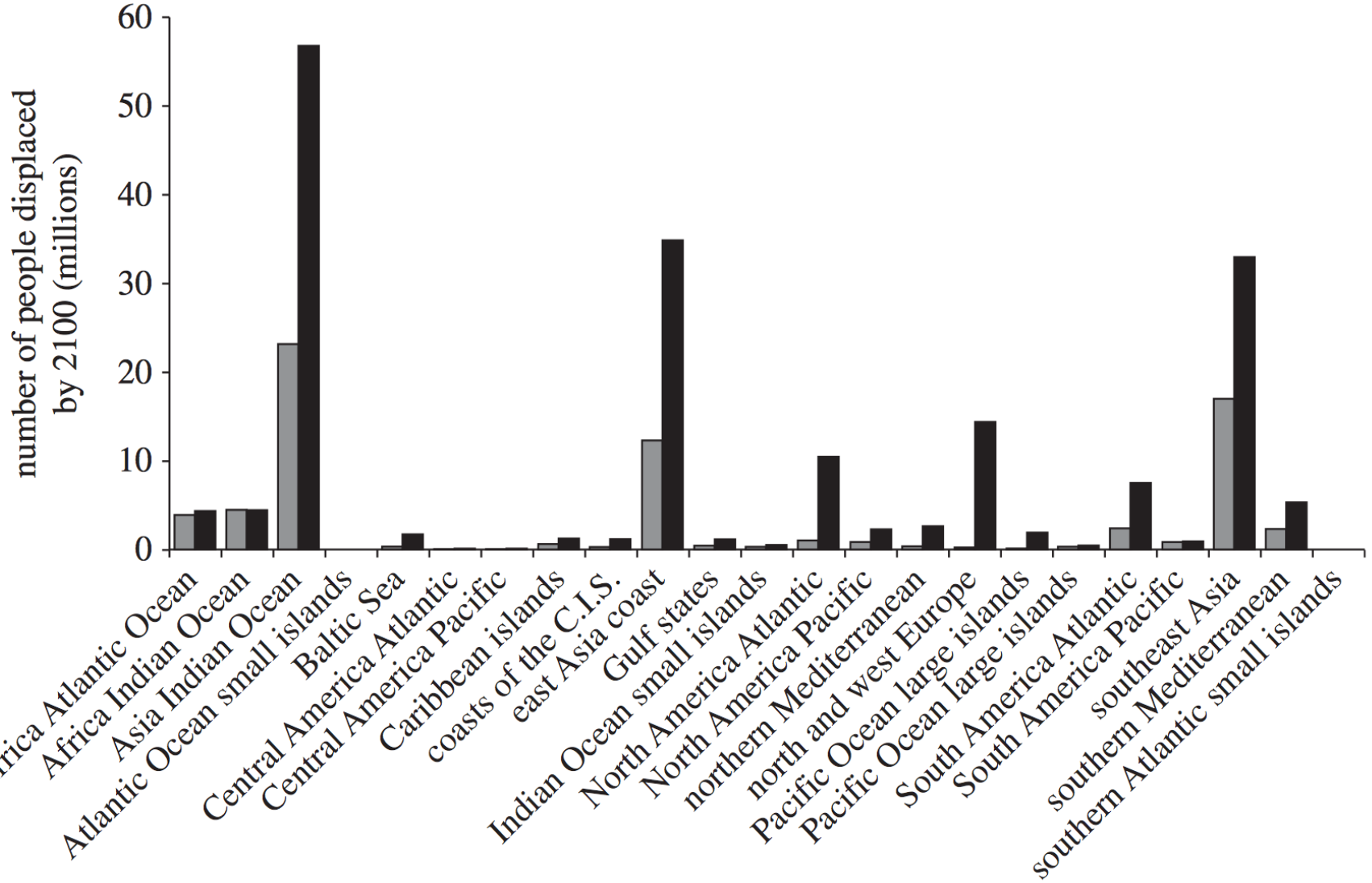


Figure 3. The distribution of net population displacement over the twenty-first century by region assuming no protection for a 0.5 m (grey bars) and a 2.0 m (black bars) rise in sea level. C.I.S., Commonwealth of Independent States.

Examples of displacement - Inuit

- Dec. 2005 – Inuit of Arctic regions of the US and Canada submitted a petition to the Inter-American Commission on Human Rights seeking relief from human rights violations resulting from global warming caused by US GHG emissions
- Human rights to benefits of culture; to property; to the preservation of health, life, physical integrity, security, and a means of subsistence; and to residence, movement, and inviolability of the home.
- Disruptions to Inuit lifestyle:
  - animals on which the Inuit rely are disappearing/moving;
  - thawing permafrost causing landslides and complicating food storage;
  - travel dangerous and difficult due to unpredictable weather;
  - warmer climate rendering traditional knowledge about safety of sea ice unreliable → hunters drowning
- Legal precedent
- March 2007 – petition rejected

Source: New Internationalist

The Carteret Islands, PNG

- 1.5m above sea level
- Singapore, Port Moresby, Buka, then 60-mile journey by banana boat
- Fertile land submerged, crops (bananas, sweet potatoes) destroyed by salt water
- Isolated by inability to travel – storm surges, flooding, no rice shipments
- Diet limited to fish, coconut, seaweed → increased rates of diabetes and diarrhoea
- Many have migrated to larger, higher neighboring islands
- Loss of cultural, family and traditional ties – feel like foreigners on the main island of Bougainville
- How much of their culture will survive the migration?

Kiribati and Tuvalu, Pacific Islands

- Kiribati
  - Population 110,000 scattered over 33 small, low-lying islands
  - 2014, paid $8.77m for 20 sq. km of land on Fiji
- Tuvalu
  - 2m above sea level
  - June 2014 – family from Tuvalu granted residency by the Immigration and Protection Tribunal in New Zealand after claiming to be threatened by climate change in Tuvalu
  - Family raised 3 arguments: (1) refugees; (2) “protected people”; (3)"exceptional humanitarian grounds (successful)
  - No land; no jobs; no drinking water; unable to raise children
  - Strong connection to New Zealand
  - Residence visas granted
  - Judgment notable for explicitly recognizing harmful humanitarian impacts of climate change
- Both nations face risk of whole-nation displacement → physical extinction of the territory of the State itself → legal extinction of legal personality of the State which hinges upon the existence of that territorial space
- How can we preserve a nation conceptually, emotionally, socially once it is absorbed into an entirely different nation and has no land of its own?

Predicted future displacement

- IPCC - Overall vulnerability of small island States stems from four interrelated factors:
  1. the degree of exposure to climate change;
  2. a limited capacity to adapt to projected impacts;
  3. the fact that adaptation is not a high priority, in light of other pressing problems; and
  4. uncertainty surrounding global climate change projections and their local validity.
- Current estimates – between 50 million and 200 million people will be displaced by 2080, owing to the direct impacts of climate change (Nicholls 2004)

Geographic vulnerability to sea level rise

Figure 6.6. *Relative vulnerability of coastal deltas as shown by the indicative population potentially displaced by current sea-level trends to 2050 (Extreme = >1 million; High = 1 million to 50,000; Medium = 50,000 to 5,000; following Ericson et al., 2006).*

International refugee law

- Currently, those displaced by climate change are not recognized in international law as an identifiable group whose rights are expressly articulated, or as a formal legal category of people requiring special legal protection
- 2 possible approaches:
  - Elongate/adapt existing legal principles (in the same way norms developed to protect traditional refugees have been expanded to apply to IDPs)
  - Create new norms (in recognition of the deficiencies of existing norms)
    - Lack of political will
    - Lowest common denominator
    - Implementation costs

Limitations of existing legal system

- 1951 Refugee Convention - definitional obstacles
  - Classic legal definition of “refugee”
    - Outside country of origin
    - Well-founded fear of persecution
    - Based on race / religion / nationality / political opinion / social group
  - Requirement of exile not applicable to those who haven’t yet moved or have only moved internally
  - UN High Commissioner for Refugees (UNHCR) only deals with IDPs forced to move as a result of conflict
  - Features of climate change ≠“persecution” → no legal causation
  - To form a “particular social group”, must be connected by a fundamental, immutable characteristic other than risk of persecution itself
  - Devaluation of current protection for trad. refugees who cannot rely on their own governments for protection – source of persecution
- International treaties on statelessness not applicable
  - ‘Statelessness’ defined as the denial of nationality through the operation of the law of a particular State, rather than through the physical disappearance of a State altogether

Human rights law

- Human rights affected by climate change displacement:
  - Right to self-determination
  - Right to have a nationality and not be stateless
  - Right to life, housing, health care, education, adequate standard of living
  - Right not to be deprived of means of subsistence
  - Right to practice culture (forced assimilation)
  - Rights of indigenous peoples to maintain their distinctive and spiritual relationship with traditional lands and waters and conserve and protect them
- Are major carbon-emitting States responsible for violating the human rights of those displaced by climate change? What is accepted jurisprudence?
- Human rights law:
  - Minimum standards of treatment afforded to individuals within State territory
  - "Complementary protection" – outside scope of 1951 Convention
  - If relocation occurs, human rights law requires minimum standards of treatment to be observed in the host State
  - *Non-refoulement* - no one should be sent back to persecution or other forms of serious harm → could this be expanded? (ICCPR)
- Problems: not persecution, torture or cruel, inhuman or degrading treatment
- Inability to attribute direct responsibility to one State or assess individual claims

International environmental law

- International environmental law requires States to
  - implement programs for mitigating GHG emissions;
  - prevent, reduce and control pollution (atmosphere/ocean;
  - conserve biodiversity.
- Customary international law – States responsible for transboundary environmental harm of any kind → refrain from use of territory which causes environmental harm beyond borders
- Rio Declaration, Principle 2 → States' sovereign right to exploit their own resources must not cause damage to environments beyond national jurisdiction
- Transboundary example: emission of greenhouse gases
- Problems:
  - Attribution / distribution of responsibility
  - Quantifying harm
  - Identifying and proving causation given multiplicity of factors
  - Establishing accountability of corporations when obligations are State-based
- Migration of displaced persons in numbers proportionate to host countries' cumulative greenhouse gas emissions

Lingering legal questions

- What institution should be responsible for environmentally displaced persons? UNHCR responsible for 20m refugees – overburdened, under-resourced
- UN 1998 Guiding Principles on Internal Displacement?
  - No definitional barrier
  - Flexibility in national implementation
  - Limited applicability – nonbinding legal status
  - Doesn't cover transborder climate change displacement
- Continued regional practice → grant temporary residence to people fleeing a natural disaster → development of a right of temporary protection on humanitarian grounds under customary international law
- New international agreement?
  - Multi-party lowest common denominator
  - Lack of political will – "refugee floodgates"
  - Difficulties attributing responsibility
- Regional agreements – greater level of commitment (eg Africa)
- Recognition of climate change refugees along a **graduating** scale, permitting differing degrees of protection depending on severity of situation (acute vs. chronic)

What do displaced people want?

- Greater control over their own situation
- Marginalized by imposition of alien conceptual frameworks by foreigners
- Many Pacific communities reject label “refugee” → associations with weakness and dependence → dampens community morale → strength, self-sufficiency, self-reliance, self-preservation
- Dominant, developed-country discourse → entrenching communities in inequitable power relations → further redirecting fate from their hands
- Seized upon by media sources as “visual proof” of climate change
- Image of climate refugee → victim-commodity, providing news value, political point-scoring, and a human embodiment of climate change
- Dominant climate change discourse has evoked a narrow range of options for displaced persons – portrayed only as helpless victims, dependent on the developed world, necessary recipients of the compassion and protection of the West

What do displaced people want?

- Concept of environmental “refugee” is provocative but also inaccurate and negative
- Studies conducted in Tuvalu → “refugee protection” insufficient to address complex combination of political, economic and social changes of climate change
- Permission to cross a western border as a refugee falls far short of remedies required
- What is needed:
  - extensive, immediate reductions in global greenhouse gas emissions
  - significant legal and financial action to redress lost livelihoods and self-determination if emissions reduction is not achieved
  - effective adaptation and mitigation strategies

Strategies for the future

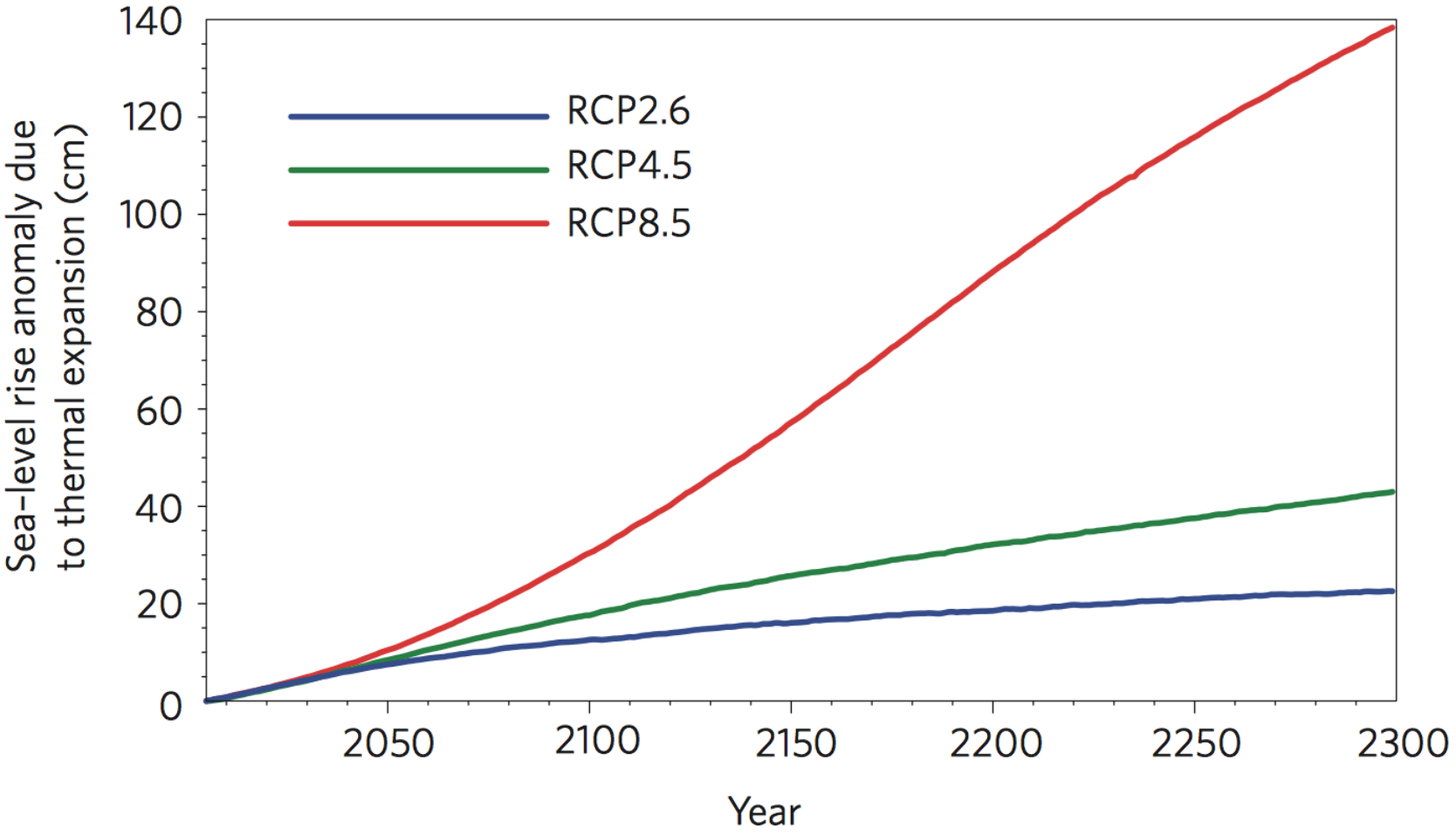
1. Monitor sea level to detect any significant accelerations in the rate of rise in a timely manner
2. Improve our understanding of the climate-induced processes that could contribute to rapid sea-level rise, e.g. the role of the two major ice sheets → produce better models that quantify the likely future rise more precisely
3. Respond using appropriate mix of mitigation and adaptation measures

Sea level rise can be slowed, but not stopped

- European study published in *Nature* 2012 → even an abrupt switch to zero emissions would have no effect on sea level over the coming 50 years and only a moderate effect on sea level by 2100
- Long response time of sea level due to slow response of large ice sheets and deepest parts of ocean to climate change
- Even with aggressive mitigation strategies and a stabilization of globally averaged temperatures below 2°C, sea levels would continue to rise
- Sea-level rise cannot be stopped for next several hundred years:
  - Thermal expansion of sea water – even as the surface layer cools, heat is being mixed down into deeper layers from intermediate layers, producing thermal expansion of the entire column – downward diffusion of heat from upper layers to lower layers → warmer waters occupy more space

Reducing rate of sea level rise

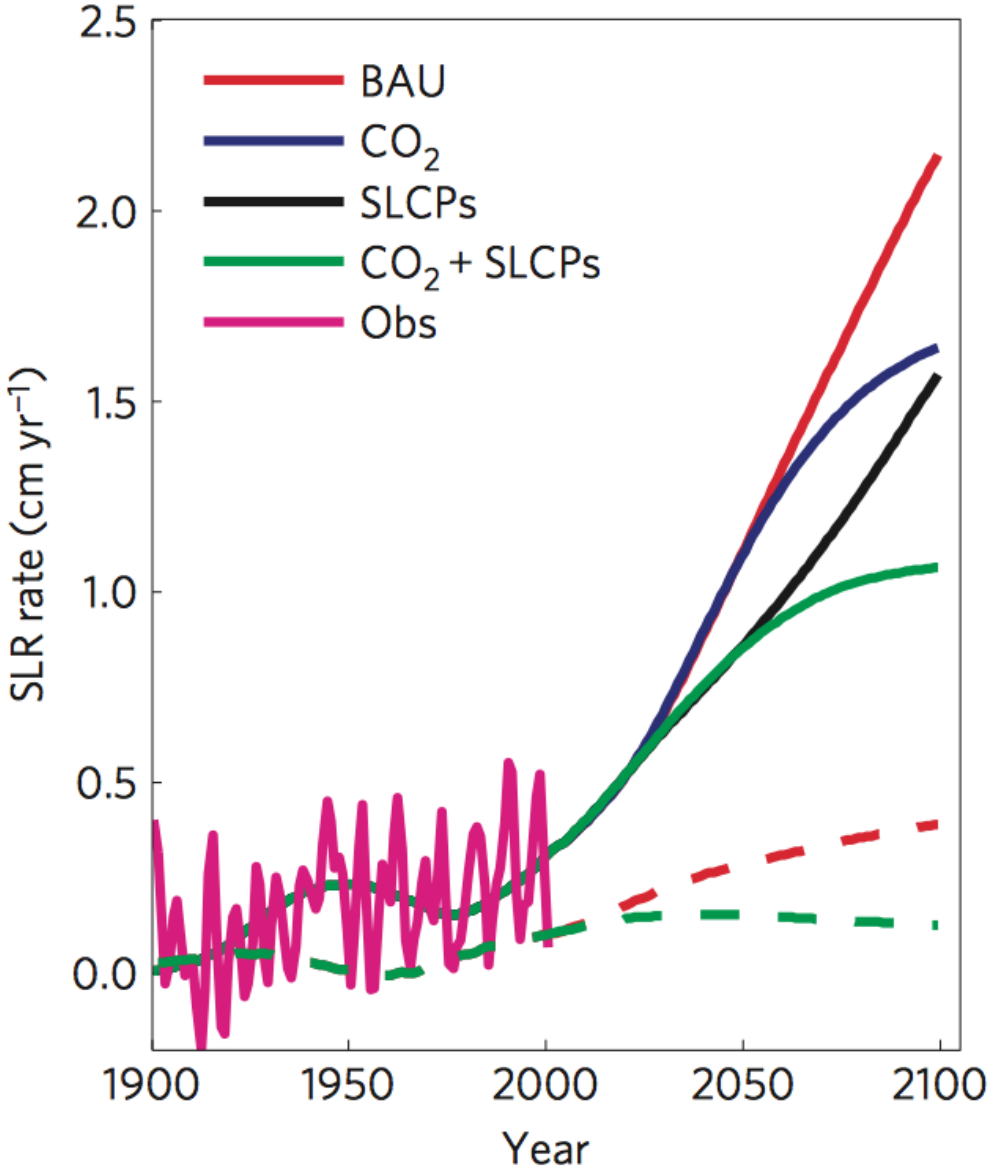
- Sea level rise **can be** slowed using aggressive mitigation measures → this would buy time for the adoption of effective adaptation measures
- Assumptions for most aggressive mitigation model RCP2.6:
  - keep climate change below 2 °C above pre-industrial levels
  - negative CO_2 emissions starting in 2070 → more CO_2 being removed than being emitted
  - primary energy sources in 2070
    - 20% fossil fuel without carbon capture and storage (CCS)
    - 45% fossil fuel with CCS
    - 35% renewables and nuclear (include biomass and CCS as well)



Globally averaged annual mean sea-level rise anomaly (relative to 1986–2005) due to thermal expansion. Even with the likelihood of ongoing sea-level rise for several centuries, with aggressive mitigation in RCP2.6 the increases in sea level are likely to be much less than those in RCP4.5 and RCP8.5.

Reduction of short-lived climate pollutants slows sea level rise

- US study (2013) – mitigation of methane, tropospheric ozone, HFCs and black carbon could significantly decrease the rate of sea level rise
  - Used a climate-carbon-geochemistry model and a semi-empirical SLR model to estimate the response of SLR to SLCP mitigation
  - The SLCP mitigation scenario: reductions of 50% in CO emissions and 30% in methane emissions by 2030; 50% in black carbon emissions by 2050.
  - CO_2 mitigation according to RCP2.6 (BAU scenario is RCP6.0)
- Findings:
  - In comparison with BAU, mitigation of SLCPs can reduce the SLR rate by about 18%, with negligible effect from CO_2 reduction before 2050.
  - By 2100, CO_2 mitigation can reduce the SLR rate by about 24%
  - With mitigation of both SLCPs and CO_2, the projected SLR rate is almost halved by 2100.
  - SLCP mitigation is much more effective in curbing SLR in comparison with CO_2 mitigation on decadal to centennial timescales.
  - Methane mitigation has the largest effect in mitigating SLR with CO_2 next, followed by black carbon and HFCs.



Source: Hu, A. et al. "Mitigation of short-lived climate pollutants slows sea level rise", Nature Climate Change, 2013.

Current adaptation measures

- Strategic attempts to plan long-term adaptation to sea-level rise have only occurred in the developed world:
  - Thames Estuary 2100 (TE2100)
    - Designed to protect 1.25 million people and £200 billion worth of property from tidal flood risk in GB up until 2100
  - Delta Commission – the Netherlands
  - Sea Level Rise Adaptation Strategy for San Diego Bay

References

- Farbotko, C. & Lazrus, H. “The first climate refugees? Contesting global narratives of climate change in Tuvalu”, *Global Environmental Change*, 2012, 22(2), 382-390
- Nicholls, R. et al. “Sea-level rise and its possible impacts given a ‘beyond 4◦C world’ in the twenty-first century”, *Phil. Trans. R. Soc. A,* 2011, 369, 161-181
- Meehl, G. “Relative outcomes of climate change mitigation related to global temperature versus sea-level rise”, *Nature Climate Change,* 2012, Vol. 2, 576–580, doi:10.1038/nclimate1529
- Church, J. et al. “Sea Level Change”, in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2013, Cambridge University Press
- Williams, R. et al. “How warming and steric sea level rise relate to cumulative carbon emissions”, *Geophysical Research Letters*, 2012, Vol 39, available at: http://www.liv.ac.uk/~ric/lfs/pdf/grl2012_wgrw.pdf
- McAdam, J. & Saul, B. “An Insecure Climate for Human Security? Climate-Induced Displacement and International Law”, *Sydney Centre for International Law, Working Paper 4,* available at: http://sydney.edu.au/law/scil/documents/2009/SCILWP4_Final.pdf
- Williams, A. “Turning the Tide: Recognizing Climate Change Refugees in International Law”, *Law & Policy*, Vol. 30, Issue 4, October 2008, available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9930.2008.00290.x/full
- Hay, C. et al. “Probabilistic reanalysis of twentieth-century sea-level rise”, *Nature,* 2015, available at: http://sciences.blogs.liberation.fr/files/niveau-marin-20ème-siècle.pdf
- Schaeffer, M. et al. “Long-term sea-level rise implied by 1.5◦C and 2◦C warming levels”, *Nature Climate Change*, June 2012, available at: http://ssi.ucsd.edu/scc/images/Schaeffer%20SLR%20at%20+1.5%20+2%20NatCC%2012.pdf
- Hu, A. et al. *“Mitigation of short-lived climate pollutants slows sea level rise”, Nature Climate Change,* 2013, available at: http://ramanathan.ucsd.edu/files/pr194.pdf