International Union for Conservation of Nature
ISSUES BRIEF
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SPECIES AND CLIMATE CHANGE

Threats and responses

- **Current global mean warming of less than 1ºC above pre-industrial levels** has already **significantly impacted the Earth's climate system** and the majority of **the world's ecosystems and species**.
- The majority of this warming is caused by fossil fuel-generated CO_2 which is also causing **ocean acidification** to occur at an unprecedented rate, with profound ramifications for biodiversity and humanity.
- Observed species-level impacts include **exposure to rapidly shifting climate zones, increased extreme weather events, rising sea levels** and **changes in the distribution and seasonal activities of a wide range of species**.
- **Conserving and restoring terrestrial, freshwater and marine ecosystems** – and their component species – need to be recognised as an **essential part of climate change mitigation and adaptation policy**.
- Urgent **mitigation action** to stabilise and reduce CO_2 levels is essential if catastrophic biodiversity impacts are to be avoided.
- Essential **adaptation action** needs to include **ecosystem protection** to ensure as much **species resilience** as possible and to **maintain natural carbon sinks**.

What is the issue?

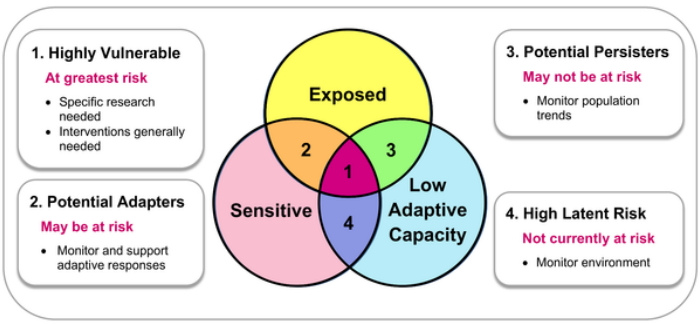
The combined effects of human-induced global warming and ocean acidification constitute an unprecedented threat to biodiversity and humanity alike. The Intergovernmental Panel on Climate Change (IPCC) confirms that the current global mean warming of less than 1ºC above pre-industrial levels has already significantly impacted the Earth's climate system and the majority of terrestrial, freshwater and marine ecosystems and species. Observed species-level impacts include exposure to rapidly shifting climate zones, increased extreme weather events, rising sea levels and changes in the distribution and seasonal activities of a wide range of species, including many invasive pest and disease vector species.

The **true impact of current warming and ocean acidification levels is being masked** by a combination of climate system inertia (it will take many more decades for the full impacts of current carbon dioxide (CO_2) levels to be experienced) and biodiversity response lags. The possibility that current climate sensitivity – commonly defined as the amount of warming that results from the doubling of atmospheric CO_2 levels – is greater than generally assumed needs to be seriously considered. **Greater climate sensitivity severely increases impact risks**, and lowers the 'safe' target CO_2 level, as well as the response time remaining for reaching target levels.

An additional threat factor is the rate at which global warming and ocean acidification are occurring. This is important because the current unparalleled rate of **climate change severely limits the ability of species and ecosystems to adapt**, increasing their risk of extinction.

Why is this important?

The widespread species impacts observed to date highlight the **major biodiversity impacts associated with projected distribution of novel and disappearing climates by 2100**, including current biodiversity hotspot regions. Increasingly **severe impacts are certain**, and are likely to include **disruption and collapse of food webs** (e.g. from changes in plankton abundance). **Increases in extreme weather events** such as hurricanes, droughts and floods will **increase the vulnerability of many species**. Even relatively **modest additional temperature increases are sufficient to compromise many reptiles** – along with some **bird and fish species** – whose sex is temperature-determined. Higher temperatures can increasingly result in **feminisation of populations of a wide range of species**, compromising breeding success. Extremes in



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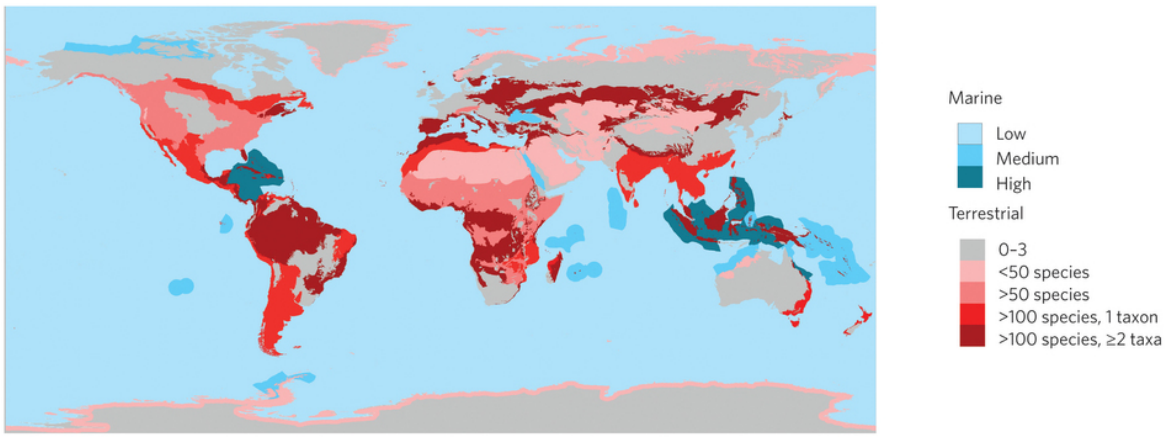

Figure 1: Ecoregional global concentration of terrestrial and marine climate change vulnerable species (Pacifici et al. 2015)

temperature will also affect many species, especially **freshwater species**, as they are more restricted in their movement and the smaller water bodies they inhabit heat up more rapidly. Species reliant on low-lying coastal habitats, including many **migratory species** and important **fisheries species**, will be severely compromised as **sea level rise** and other **environmental stressors** affect their viability. **Ocean acidification** will increasingly directly and indirectly impact a wide range of species reliant on aragonite and calcite concentrations, including **corals**, **molluscs** and **krill**, with **serious consequences for entire ecosystems**.

The combination of climate system inertia and the fact that fossil fuel emissions are still tracking IPCC's high emissions trajectory scenario greatly increases the risk of **climate-change driven 'tipping points' for major systems**. These include the **Greenland ice-sheet melt**, **dieback of the Amazon rainforest** and **shift of the West African monsoon**. Such regional tipping-point sensitivities, and their amplifying feedback risks, need to be taken into account when defining the level of dangerous anthropogenic interference with the climate system. It is the scientific rationale for considering 350 ppm CO_2 as the safe planetary boundary for climate change.

What can be done?

The **key climate change mitigation action for biodiversity and humanity** alike is to **stabilise and reduce CO_2 levels** if truly catastrophic impacts are to be avoided. **Conserving and restoring terrestrial, freshwater and marine ecosystems, and their component species**, needs to be recognised as **essential climate change mitigation and adaptation policy**. **Ecosystems play a key role in the global carbon cycle** (including the sequestration of vast amounts of carbon), conferring **adaptive resilience to climate change** whilst providing a wide range of **ecosystem services essential for human well-being**.

Improving threat evaluation and associated response policy is an ongoing challenge, but the severity of threat is already evident, along with the essential mitigation and adaptation actions. It is therefore essential that the latest climate change science and its implications for policy are considered.

Where can I get more information?

- **iucn.org/species**
- *IUCN's Climate Change Specialist Group website and climate change reference tool*
- Barnosky, A.D. et al. (2012) *Approaching a state shift in Earth's biosphere*. Nature, 486: 52–58
- Dutton,A. et al. (2015) *Sea-level rise due to polar ice-sheet mass loss during past warm periods*. Science, 349(6244)
- Foden, W.B. et al. (2013) *Identifying the World's most climate change vulnerable species: A systematic trait-based assessment of all birds amphibians and corals*. PLOS One, 8(6)
- Gattuso, J.-P. et al. (2015) *Contrasting futures for ocean and society from different anthropogenic CO_2 emissions scenarios*. Science, 349(6243)
- Hansen, J. et al. (2013) *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*
- Hansen, J. et al. (2015) *Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modelling, and modern observations that 2°C global warming is highly dangerous*. Atmos. Chem. Phys. Discuss., 15: 20059-20179
- Pacifici, M. et al. (2015) *Assessing species vulnerability to climate change.* Nature Climate Change
- Steffen, W. et al. (2015) *Planetary boundaries: Guiding human development on a changing planet*. Science, 347(6223)

More on IUCN at COP21:

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