

A sociedade deve empreender ações transformadoras agora para mitigar e adaptar-se à crise climática

Ações abrangentes para limitar e adaptar-se às alterações climáticas causadas pelo homem são urgentemente necessárias para proteger a vida atual e futura na Terra e promover o bem-estar, a equidade e a segurança globais.

O Desafio

A crise climática global, inequivocamente impulsionada por atividades humanas que aumentam as emissões de gases de efeito estufa (GEEs)ⁱ está se revelando cada vez mais dispendiosa e perturbadora em todo o mundo.

A responsabilidade e os impactos da crise estão distribuídos de forma desigual entre diferentes regiões, populações e setores. Para reduzir a perda de vidas, o sofrimento e o agravamento das desigualdades, devem ser tomadas ações mais rápidas e abrangentes para mitigar as causas e adaptar-se aos efeitos. Ações climáticas inclusivas e estratégicas podem aumentar a diversidade de soluções, levar a uma maior equidade, bem-estar e segurança, e proteger o direito humano a um ambiente saudável e sustentável.ⁱⁱ

As Evidências e Projeções para Sistemas Naturais

Desde a Revolução Industrialⁱⁱⁱ as atividades humanas, especialmente a queima de combustíveis fósseis, fizeram com que as concentrações atmosféricas de GEE^{iv} subissem para níveis sem precedentes, pelo menos nos últimos 800.000 anos (no caso do CO₂, pelo menos nos últimos 2 milhões de anos).^v A temperatura média global da superfície atingiu 1,1°C acima dos níveis de 1850–1900 em 2011–2020 e continuou a aumentar.^{vi} Os 10 anos mais quentes no registro de 174 anos ocorreram todos durante a última década (2014–2023), sendo 2023 o ano mais quente.^{vii}

O grau de aquecimento que ocorrerá nas próximas décadas e os riscos resultantes para os sistemas naturais e para a humanidade dependerão principalmente das escolhas que os governos, as organizações e os indivíduos fizerem agora sobre as futuras emissões de GEE e a remoção de CO₂ da atmosfera. As temperaturas médias globais só se estabilizarão depois que as emissões de CO₂ forem igualadas pela quantidade removida (líquido zero) e pelo declínio das emissões de poluentes climáticos não-CO₂.^{viii} Limitar o aumento global da temperatura média a 1,5°C acima dos níveis pré-industriais, a meta ambiciosa estabelecida no Acordo Climático de Paris de 2015, exige que estes objetivos sejam alcançados por volta de 2050^{ix}—ou mesmo mais cedo, se o aumento das temperaturas reduzir a capacidade da natureza de absorver e reter carbono.^x

Ver um declínio gradual nas temperaturas médias após um pico exigirá a remoção sustentada de mais CO₂ da atmosfera do que o emitido (emissões líquidas negativas) e maiores reduções de poluentes climáticos não-CO₂ de vida curta.^{xi} Mesmo que a temperatura global estabilize, a

resposta tardia do aquecimento dos oceanos e do derretimento das camadas de gelo significa que o nível do mar continuará subindo durante séculos ou milênios, embora o aumento ocorrerá muito mais lentamente do que se o aquecimento continuar.^{xii}

Muitas outras mudanças relacionadas ao aquecimento global e ao aumento das concentrações atmosféricas de GEE já foram observadas e espera-se que continuem. Estas incluem eventos extremos que estão se tornando mais frequentes, mais intensos ou ambos (ondas de calor, chuvas intensas, ciclones tropicais, secas, tempestades e incêndios florestais); redução da neve e do gelo nas geleiras das montanhas, no mar Ártico, no Hemisfério Norte, na Groenlândia e na Antártica Ocidental; mudanças na qualidade e disponibilidade da água; aumento na proliferação de algas prejudiciais; branqueamento de corais; mudanças no crescimento e no valor nutricional das plantas terrestres; e acidificação das águas oceânicas.^{xiii}

Um maior aquecimento global aumenta o risco de atingir pontos de viragem climáticos – limiares críticos para além dos quais um sistema se reorganiza, muitas vezes de forma abrupta e irreversível, como o colapso da camada de gelo e a extinção da floresta tropical.^{xiv} As respostas dos ecossistemas a um maior aquecimento, como o aumento das emissões de GEE resultantes do degelo do permafrost, das zonas úmidas tropicais e dos incêndios florestais, apenas agravarão os problemas.^{xv} As mudanças climáticas estão alterando cada vez mais as paisagens, colocando os ecossistemas mundiais em riscos severos e conduzindo a riscos crescentes de novas extinções e à perda irreversível de biodiversidade em terra e nos oceanos.^{xvi}

As Consequências para os Humanos

A humanidade enfrenta desafios profundos decorrentes dos impactos atuais e projetados das alterações climáticas^{xvii}; mas os impactos não são uniformes entre regiões e populações.^{xviii} Sem uma ação estratégica, os riscos afetarão desproporcionalmente as comunidades e as pessoas que experimentaram desigualdades sistemáticas pré-existentes, como a pobreza, a discriminação de gênero, o colonialismo dos agricultores e as histórias racializadas dos regimes de propriedade.^{xix} As alterações climáticas, aliadas a estas desigualdades sociais, ameaçarão cada vez mais a segurança alimentar, hídrica e energética^{xx} e aumentarão ainda mais as mortes, doenças e lesões relacionadas aos fenômenos de calor extremo, degradação florestal e outras degradações ambientais, poluição e doenças sensíveis ao clima transmitidas pela água, solo, ar e insetos^{xxi, xxii}. Os impactos das alterações climáticas nos ecossistemas e nas comunidades continuarão a afetar negativamente a saúde mental e a alterar profundamente as tradições culturais e espirituais das comunidades indígenas e locais de formas tangíveis e intangíveis.^{xxiii}

A ruptura econômica e social será consequência de grandes mudanças compostas em múltiplos sistemas naturais e sociais, tais como a produtividade agrícola e pesqueira; submersão e perda de terras devido à subida do nível do mar; diminuição da produtividade do trabalho; ruptura nos sistemas educativos; danos a infraestruturas críticas; colapso dos mercados de seguros e deterioração da qualidade do ar, da água e do solo.^{xxiv}

Estas rupturas impulsionarão cada vez mais a migração e o deslocamento da população. ^{xxv} Insegurança e riscos compostos, incluindo a possibilidade de conflitos e instabilidades, irão colocar cada vez mais pressão em todas as regiões e setores do mundo. ^{xxvi}

Sem medidas compensatórias, as desigualdades pré-existentes serão exacerbadas pelas disparidades causadas pelas alterações climáticas e por ações injustas de mitigação e adaptação às alterações climáticas. ^{xxvii} As medidas de adaptação, embora críticas, não podem, por si só, prevenir todas as perdas e danos, que continuarão a ser distribuídos e concentrados de forma desigual entre as populações mais pobres e vulneráveis. ^{xxviii}

As Respostas Necessárias

Enfrentar as consequências destrutivas causadas pelas alterações climáticas exige que os governos, a indústria, o setor financeiro, o meio acadêmico e outras organizações promovam simultaneamente ações transformadoras de mitigação e adaptação. Muitas ações têm co-benefícios econômicos e de saúde. ^{xxix} As ações transformadoras incluem conservação e eficiência energética; transição para fontes de energia, produtos e serviços que não emitam GEE; medidas rápidas em relação aos poluentes climáticos de curta duração ^{xxx}; implementação de tecnologias e práticas para remover e armazenar CO₂ e possivelmente outros GEE da atmosfera; melhora dos sistemas alimentares e agrícolas; e adaptação a mudanças inevitáveis através, por exemplo, de soluções baseadas na natureza, infraestruturas resilientes e práticas sustentáveis de gestão da água.

Outras abordagens de intervenções climáticas exigem mais pesquisas e uma análise cautelosa dos riscos e não podem substituir cortes profundos nas emissões ou medidas de adaptação. ^{xxxi}

São necessárias ações a nível mundial, com atenção às variações e compensações locais, e devem aliviar, em vez de exacerbar, as injustiças e desigualdades pré-existentes. ^{xxxii} Para distribuir equitativamente a responsabilidade pela ação, uma maior responsabilidade financeira para a mitigação, adaptação e cobertura dos custos de perdas e danos inevitáveis, deverá recair sobre aqueles cujas emissões históricas foram maiores. ^{xxxiii}

Uma governança eficaz dos riscos climáticos requer pesquisa e monitoramento contínuos dos sistemas terrestres, pesquisa comunitária orientada e coproduzida para soluções e envolvimento de cientistas com políticos, comunidades, empresas e o público. ^{xxxiv} Diversas formas de conhecimento, incluindo o conhecimento indígena e o conhecimento local, devem ser reunidas para enfrentar a crise. ^{xxxv} Os cientistas podem ser aliados de organizações comunitárias e movimentos sociais, incluindo aqueles liderados por jovens, mulheres e comunidades indígenas e étnicas, que podem fomentar a esperança, dar prioridade à justiça climática e impulsionar mudanças culturais e políticas. ^{xxxvi}

Ações abrangentes para mitigar e adaptar-se à crise climática para proteger os sistemas naturais e a humanidade são urgentemente necessárias. Se forem verdadeiramente

transformadoras e justas, estas ações podem produzir benefícios significativos para as gerações atuais e futuras.

ⁱ Segundo o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020.”

ⁱⁱ Seguindo a resolução da ONU [adopted 2022, The human right to a clean, healthy and sustainable environment](#).

ⁱⁱⁱ Segundo o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Observed increases in well-mixed GHG concentrations since around 1750 are unequivocally caused by GHG emissions from human activities over this period.”

^{iv} Incluindo CO₂, metano, óxido nitroso, halocarbonos e carbono negro.

^v Segundo o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “In 2019, atmospheric CO₂ concentrations (410 parts per million) were higher than at any time in at least 2 million years, and concentrations of methane (1866 parts per billion) and nitrous oxide (332 parts per billion) were higher than at any time in at least 800,000 years.”

^{vi} Segundo o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals (high confidence)”

^{vii} Segundo o [Annual 2023 Global Climate Report](#) of the U.S. National Oceanographic and Atmospheric Administration National Centers for Environmental Information: “The year 2023 was the warmest year since global records began in 1850 at 1.18°C (2.12°F) above the 20th century average of 13.9°C (57.0°F). This value is 0.15°C (0.27°F) more than the previous record set in 2016. The 10 warmest years in the 174-year record have all occurred during the last decade (2014–2023).”

^{viii} Net zero significa que a quantidade de CO₂ que os humanos emitem para a atmosfera é igualada pela quantidade removida por meios naturais ou tecnológicos. De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “...reaching net zero anthropogenic CO₂ emissions is a requirement to stabilize human-induced global temperature increase at any level.” De acordo com o [IPCC Special Report: Global Warming of 1.5°C \(2018; Summary for Policymakers\)](#): “Reaching and sustaining net zero global anthropogenic CO₂ emissions and declining net non-CO₂ radiative forcing would halt anthropogenic global warming on multi-decadal time scales (high confidence). The maximum temperature reached is then determined by cumulative net global anthropogenic CO₂ emissions up to the time of net zero CO₂ emissions (high confidence) and the level of non-CO₂ radiative forcing in the decades prior to the time that maximum temperatures are reached (medium confidence). On longer time scales, sustained net negative global anthropogenic CO₂ emissions and/or further reductions in non-CO₂ radiative forcing may still be required to prevent further warming due to Earth system feedbacks and to reverse ocean acidification (medium confidence) and will be required to minimize sea level rise (high confidence).” O mesmo relatório define o forçamento radiativo sem CO₂ como: “Non-CO₂ emissions...are all anthropogenic emissions other than CO₂ that result in radiative forcing. These include short-lived climate forcers, such as methane, some fluorinated gases, ozone precursors, aerosols or aerosol precursors, such as black carbon and sulphur dioxide, respectively, as well as long-lived greenhouse gases, such as nitrous oxide or some fluorinated gases. The radiative forcing associated with non-CO₂ emissions and changes in surface albedo is referred to as non-CO₂ radiative forcing.”

^{ix} De acordo com o [IPCC Special Report: Global Warming of 1.5°C \(2018; Summary for Policymakers\)](#): “In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO₂ emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range).”

^x De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Limiting human-caused global warming requires net zero anthropogenic CO₂ emissions. Pathways consistent with 1.5°C and 2°C carbon budgets imply rapid, deep, and in most cases immediate GHG emission reductions in all sectors (high confidence). Exceeding a warming level and returning (i.e., overshoot) implies increased risks and potential irreversible impacts; achieving and sustaining global net negative CO₂ emissions would reduce warming (high confidence).”

^{xi} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Global modelled pathways that reach and sustain net zero GHG emissions are projected to result in a gradual decline in surface temperature (high confidence). Reaching net zero

GHG emissions primarily requires deep reductions in CO₂, methane, and other GHG emissions, and implies net negative CO₂ emissions.”

^{xii} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Sea level rise is unavoidable for centuries to millennia due to continuing deep ocean warming and ice sheet melt, and sea levels will remain elevated for thousands of years (high confidence).”

^{xiii} Os impactos e mudanças observados nos sistemas climáticos são amplamente referenciados aqui: [IPCC 6th Assessment Report \(2023; Longer Report, page 12, 2.1.2. Observed Climate System Changes and Impacts to Date\)](#)

^{xiv} A definição de pontos de inflexão é proveniente do [IPCC 6th Assessment Report \(2023; Annex 1, Glossary\)](#). The recent [Global Tipping Points Report](#) (led by the University of Exeter’s Global Systems Institute with the support of more than 200 researchers from over 90 organizations in 26 countries) identified five major Earth system tipping points already at risk of being crossed due to the present level of global warming (related to the Greenland and West Antarctic ice sheets, warm-water coral reefs, North Atlantic Subpolar Gyre circulation, and permafrost regions), and three more tipping points threatened to be crossed in the 2030s as the world exceeds 1.5°C global warming.”

^{xv} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “In scenarios with increasing CO₂ emissions, the land and ocean carbon sinks are projected to be less effective at slowing the accumulation of CO₂ in the atmosphere (high confidence). While natural land and ocean carbon sinks are projected to take up, in absolute terms, a progressively larger amount of CO₂ under higher compared to lower CO₂ emissions scenarios, they become less effective, that is, the proportion of emissions taken up by land and ocean decreases with increasing cumulative net CO₂ emissions (high confidence). Additional ecosystem responses to warming not yet fully included in climate models, such as GHG fluxes from wetlands, permafrost thaw, and wildfires, would further increase concentrations of these gases in the atmosphere (high confidence).”

^{xvi} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “As warming levels increase, so do the risks of species extinction or irreversible loss of biodiversity in ecosystems such as forests (medium confidence), coral reefs (very high confidence) and in Arctic regions (high confidence).”

^{xvii} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people (high confidence).”

^{xviii} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Climate change has caused widespread adverse impacts and related losses and damages to nature and people that are unequally distributed across systems, regions and sectors.”

^{xix} De acordo com o [IPCC 6th Assessment Report \(Climate Change 2022: Impacts, Adaptation and Vulnerability\)](#): “Vulnerability at different spatial levels is exacerbated by inequity and marginalization linked to gender, ethnicity, low income or combinations thereof (high confidence), especially for many Indigenous Peoples and local communities (high confidence). Present development challenges causing high vulnerability are influenced by historical and ongoing patterns of inequity such as colonialism, especially for many Indigenous Peoples and local communities (high confidence).” And: “The intersection of gender with race, class, ethnicity, sexuality, Indigenous identity, age, disability, income, migrant status and geographical location often compounds vulnerability to climate change impacts (very high confidence), exacerbates inequity and creates further injustice (high confidence). There is evidence that present adaptation strategies do not sufficiently include poverty reduction and the underlying social determinants of human vulnerability such as gender, ethnicity and governance (high confidence).”

^{xx} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Climate change has reduced food security and affected water security, hindering efforts to meet Sustainable Development Goals (high confidence).”

^{xxi} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “In all regions increases in extreme heat events have resulted in human mortality and morbidity (very high confidence). The occurrence of climate-related food-borne and water-borne diseases (very high confidence) and the incidence of vector-borne diseases (high confidence) have increased.” De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “In the near term, every region in the world is projected to face further increases in climate hazards (medium to high confidence, depending on region and hazard), increasing multiple risks to ecosystems and humans (very high confidence). Hazards and associated risks expected in the near term include an increase in heat-related human mortality and morbidity (high confidence), food-borne, water-borne, and vector-borne diseases (high confidence), and mental health challenges.”

^{xxii} De acordo com o [IPCC 6th Assessment Report \(Climate Change 2022: Impacts, Adaptation and Vulnerability\)](#): “It is well established that climate change compounds the impacts of pressures that humans place on the environment (high confidence) and that environmental degradation can undermine options for adaptation and an enabling environment, with poor and natural resource-dependent groups most acutely affected.”

^{xxiii} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “In assessed regions, some mental health challenges are associated with increasing temperatures (high confidence), trauma from extreme events (very high confidence), and loss of livelihoods and culture (high confidence).”

^{xxiv} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Economic damages from climate change have been detected in climate-exposed sectors, such as agriculture, forestry, fishery, energy, and tourism. Individual livelihoods have been affected through, for example, destruction of homes and infrastructure, and loss of property and income, human health and food security, with adverse effects on gender and social equity. (high confidence)”

^{xxv} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Climate and weather extremes are increasingly driving displacement in Africa, Asia, North America (high confidence), and Central and South America (medium confidence), with small island states in the Caribbean and South Pacific being disproportionately affected relative to their small population size (high confidence).”

^{xxvi} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “With further warming, climate change risks will become increasingly complex and more difficult to manage. Multiple climatic and non-climatic risk drivers will interact, resulting in compounding overall risk and risks cascading across sectors and regions. Climate-driven food insecurity and supply instability, for example, are projected to increase with increasing global warming, interacting with non-climatic risk drivers such as competition for land between urban expansion and food production, pandemics and conflict. (high confidence).”

^{xxvii} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Prioritising equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions and climate resilient development. Adaptation outcomes are enhanced by increased support to regions and people with the highest vulnerability to climatic hazards. Integrating climate adaptation into social protection programs improves resilience.”

^{xxviii} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Adaptation does not prevent all losses and damages, even with effective adaptation and before reaching soft and hard limits (high confidence).”

^{xxix} De acordo com o [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “Mitigation and adaptation options can lead to synergies and trade-offs with other aspects of sustainable development. Synergies and trade-offs depend on the pace and magnitude of changes and the development context including inequalities, with consideration of climate justice. The potential or effectiveness of some adaptation and mitigation options decreases as climate change intensifies. (high confidence) In the energy sector, transitions to low-emission systems will have multiple co-benefits, including improvements in air quality and health. There are potential synergies between sustainable development and, for instance, energy efficiency and renewable energy. (high confidence)”

^{xxx} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “GHG emissions reductions by 2030 and 2040, particularly reductions of methane emissions, lower peak warming, reduce the likelihood of overshooting warming limits and lead to less reliance on net negative CO₂ emissions that reverse warming in the latter half of the century.”

^{xxxi} Ver [AGU Position Statement on Climate Intervention \(revised and reaffirmed April 2023\)](#).

^{xxxii} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Adaptation and mitigation actions that prioritise equity, social justice, climate justice, rights-based approaches, and inclusivity, lead to more sustainable outcomes, reduce trade-offs, support transformative change and advance climate resilient development. Redistributive policies across sectors and regions that shield the poor and vulnerable, social safety nets, equity, inclusion and just transitions, at all scales can enable deeper societal ambitions and resolve tradeoffs with sustainable development goals. Attention to equity and broad and meaningful participation of all relevant actors in decision making at all scales can build social trust which builds on equitable sharing of benefits and burdens of mitigation that deepen and widen support for transformative changes.”

^{xxxiii} De acordo com o [IPCC 6th Assessment Report \(2023; Summary for Policymakers\)](#): “Adaptation does not prevent all losses and damages, even with effective adaptation and before reaching soft and hard limits. Losses and damages are across systems, regions and sectors and are not comprehensively addressed by current financial, governance and institutional arrangements, particularly in vulnerable developing countries. With increasing global warming, losses and damages increase and become increasingly difficult to avoid, while strongly concentrated among the poorest vulnerable populations.” According to the [IPCC 6th Assessment Report \(2023; Longer Report\)](#): “There is improved understanding of both economic and non-economic losses and damages, which is informing international climate policy and which has highlighted that losses and damages are not comprehensively addressed by current financial, governance and institutional arrangements, particularly in vulnerable developing countries (high confidence).” Veja também a decisão adotada durante a COP 28 de operacionalizar um fundo de Perdas e Danos ([FCCC/CP/2023/L.1](#)).

^{xxxiv} Veja também: [AGU Position Statement on Resilience \(revised and reaffirmed August 2022\)](#).

^{xxxv} De acordo com o [IPCC 6th Assessment Report \(Climate Change 2022: Impacts, Adaptation and Vulnerability\)](#): “Enhancing knowledge on risks, impacts, and their consequences, and available adaptation options promotes societal and policy responses (high confidence). A wide range of top-down, bottom-up and co-produced processes and sources can deepen climate knowledge and sharing, including capacity building at all scales, educational and information programmes, using the arts, participatory modelling and climate services, Indigenous knowledge and local knowledge and citizen science (high confidence). These measures can facilitate awareness, heighten risk perception and influence behaviours (high confidence).”

^{xxxvi} According to the [IPCC 6th Assessment Report \(2023; Technical Summary\)](#): “Climate-induced changes are not experienced equally across genders, income levels, classes, ethnicities, ages or physical abilities (high confidence). Therefore, participation of historically excluded groups, such as women, youth and marginalised communities (e.g., Indigenous Peoples, ethnic minorities, the disabled and low-income households), contributes to more equitable and socially just adaptation actions.”