社会必须立即采取变革性行动，以减缓和适应气候危机

为了保护地球上当前和未来的生命，以及促进福祉、全球的公平和安全，迫切需要采取全面行动来限制和适应人类造成的气候变化。

挑战

全球气候危机毫无疑问是由人类活动所增加的温室气体(GHGs)[i]排放造成的，其代价越来越高，对全世界造成的破坏也越来越大。

危机的责任和影响在不同地区、人群和部门之间的分布并不是均衡的。为了减少生命损失、痛苦以及加剧的不平等，必须采取更快、更全面的行动来缓解危机的成因并适应其造成的影响。包容性和战略性的气候行动可以增加解决方案的多样性，促进更大的公平、福祉和安全，并保护人类享有健康和可持续环境的权利。[ii]

自然系统的证据和预测

自工业革命以来，[iii]人类活动，尤其是燃烧化石燃料，已导致大气中温室气体浓度[iv]上升至过去 80 万年来(就二氧化碳而言，至少过去 200 万年来)前所未有的水平。[v]全球平均地表温度在 2011-2020 年间已达到比 1850-1900 年高出 1.1˚C 的水平，且还在持续上升。[vi]在 174 年的记录中，最热的 10 年全部发生在过去 10 年（2014-2023 年），其中 2023 年是最热的一年。[vii]

未来几十年将发生的暖化程度，以及由此给自然系统和人类带来的风险，将主要取决于各国政府、组织和个人当前对未来温室气体排放和二氧化碳移除所做的决策。只有当二氧化碳排放量与移除量相匹配（净零），并且非二氧化碳类气候污染物的排放减少后，全球平均气温才能趋于稳定。[viii]将全球平均气温的升幅限制在比工业化前水平高 1.5˚C 以内，即 2015 年《巴黎气候协定》设定的理想目标，需要在 2050 年左右实现这些目标[ix]—如果气温暖化削弱了自然界吸收和保持碳的能力，则需要更早的实现这些目标。[x]

要使平均气温在达到峰值后逐渐下降，需要从大气中持续移除比排放更多的二氧化碳(净负排放)，并大幅减少短寿命非二氧化碳气候污染物。[xi]即使全球气温趋于稳定，由于海洋变暖和冰盖融化的滞后效应，海平面仍将在数百年或数千年内持续上升，尽管上升的速度将远低于全球变暖持续加剧的情况。[xii]

与全球变暖和大气中温室气体浓度增加相关的许多变化已经被观测到，并预计将继续发生。这些变化包括更加频繁、更加剧烈或两者兼而有之的极端事件(例如热浪、暴雨、热带气旋、干旱、风暴潮和野火)；山地冰川、北极海、北半球、格陵兰岛和南极洲西部的冰雪量的减少；水质和水资源供应发生变化；有害藻类的增加；珊瑚白化；陆地植物的生长和营养价值发生变化；以及海水酸化等。[xiii]

进一步的全球变暖将增加触发气候临界点的风险——即系统发生重组的关键阈值，而这往往是突发且不可逆的，例如冰盖崩塌和雨林顶梢枯死。[xiv] 生态系统对进一步暖化的反应，如永久冻土解冻、热带湿地和野火导致的温室气体排放增加，只会使问题进一步加剧。[xv] 气候变化正在日益改变地貌，给世界生态系统带来严重压力，导致陆地和海洋生物进一步灭绝和不可逆转的生物多样性丧失的风险不断增加。[xvi]

对人类的影响

人类正面临气候变化当前和预计造成的影响所带来的深远挑战；[xvii] 但这些影响在不同地区和人群之间并不是均衡分配的。[xviii] 若不采取战略行动，这些风险将不成比例地影响到那些已经经历系统性不平等的社区和群体，例如贫困人口、受性别歧视影响的群体、受拓民殖民主义影响的群体以及因财产制度的种族化历史而受影响的群体。[xix] 不断变化的气候，再加上这些社会不平等，将进一步威胁粮食、水和能源安全，[xx] 并导致更多与极端高温事件、森林和其他环境退化、污染以及通过水、土壤、空气和昆虫传播的气候敏感疾病相关的死亡、病痛和伤害。[xxi,xxii] 气候变化对生态系统和社区的影响将持续损害人类的心理健康，并以有形和无形的方式深刻改变土著和地方社区的文化以及传统精神。[xxiii]

多种自然和社会系统的重大复合改变将造成经济与社会的动荡，如农业和渔业的生产力下降；海平面上升造成的土地淹没和损失；劳动生产率降低；教育系统受到干扰；关键基础设施受损；保险市场崩溃以及空气、水和土壤质量恶化。[xxiv]

这些干扰将越来越多地推动人口迁移和流离失所。[xxv] 不安全与复合风险，包括潜在的冲突和不稳定，将给全球每个地区和部门带来越来越大的压力。[xxvi]

如果不采取对抗性措施，气候变化所导致的不平等以及不公正的气候减缓和适应措施都将加剧原有的不平等。[xxvii] 尽管适应措施至关重要，但它们无法单独防止所有损失和损害，而这些损失和损害仍将不均衡的分布，并集中在最贫穷和最脆弱的群体中。[xxviii]

需要采取的应对措施

应对气候变化带来的破坏性后果需要政府、工业界、金融部门、学术界和其他组织同步推进变革性的减缓和适应行动。许多行动具有健康和经济方面的协同效益。[xxix] 变革性行动包括节能和提高能源效率；向不排放温室气体的能源来源、产品和服务转型；针对短寿命气候污染物采取快速行动，[xxx] 实施从大气中移除并储存二氧化碳以及其他可能的温室气体的技术和实践；改善粮食和农业系统；以及通过基于自然的解决方案、弹性基础设施和可持续水资源管理等方式适应不可避免的变化。

其他气候干预方法仍需进一步研究，并需谨慎考虑其风险，无法替代深度减排或适应措施。[xxxi]

在全球范围内都需要采取行动，同时需要关注地方差异和权衡，并确保这些行动能够缓解而非加剧已有的不公正和不平等。[xxxii] 为了公平分配应对责任，减缓、适应行动以及不可避免的损失和损害的财务责任，应更多地由历史排放量最大的群体承担。[xxxiii]

有效的气候风险治理需要持续的地球系统研究和监测，以解决方案为导向的共同社区研究，以及科学家与政策制定者、社区、企业和公众的互动。[xxxiv] 应汇集包括土著知识和地方知识在内的多种知识体系，以共同应对这一危机。[xxxv] 科学家可以作为社区组织和社会运动的盟友，包括由青年、女性、原住民和少数民族群体领导的运动，这可以激发希望，优先考虑气候争议，并推动文化和政策变革。[xxxvi]

为了保护自然系统和人类，迫切需要采取全面的减缓和适应行动。如果这些行动真正具有变革性和公正性，将为当前和未来的世代带来重大福祉。

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[i] 根据 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] 遵循联合国决议 adopted 2022, The human right to a clean, healthy and sustainable environment.

[iii] According to the 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] 包含二氧化碳，甲烷，一氧化二氮，卤化碳和黑碳

[v] 根据 IPCC 6th Assessment Report (2023; Summary for Policymakers): “In 2019, atmospheric CO_2 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] 根据 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] 根据 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] 净零是指人类排放到大气中的二氧化碳量与通过自然或技术手段移除的量相匹配。根据 IPCC 6th Assessment Report (2023; Summary for Policymakers): “...reaching net zero anthropogenic CO_2 emissions is a requirement to stabilize human-induced global temperature increase at any level." 根据 IPCC Special Report: Global Warming of 1.5°C (2018; Summary for Policymakers): “Reaching and sustaining net zero global anthropogenic CO_2 emissions and declining net non-CO_2 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 CO_2 emissions up to the time of net zero CO_2 emissions (high confidence) and the level of non-CO_2 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 CO_2 emissions and/or further reductions in non-CO_2 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).” 同一报告将非二氧化碳辐射强迫定义为: “Non-CO_2 emissions…are all anthropogenic emissions other than CO_2 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-CO_2 emissions and changes in surface albedo is referred to as non-CO_2 radiative forcing.”

[ix] 根据 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 CO_2 emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range)."/

[x] 根据 IPCC 6th Assessment Report (2023; Longer Report): “Limiting human-caused global warming requires net zero anthropogenic CO_2 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 CO_2 emissions would reduce warming (high confidence).”

[xi] 根据 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 CO_2, methane, and other GHG emissions, and implies net negative CO_2 emissions.”

[xii] 根据 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] 此处详细介绍了观测到的对气候系统的影响和变化: IPCC 6th Assessment Report (2023; Longer Report, page 12, 2.1.2. Observed Climate System Changes and Impacts to Date)

[xiv]临界点的定义来源于 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] 根据 IPCC 6th Assessment Report (2023; Longer Report): “In scenarios with increasing CO_2 emissions, the land and ocean carbon sinks are projected to be less effective at slowing the accumulation of CO_2 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 CO_2 under higher compared to lower CO_2 emissions scenarios, they become less effective, that is, the proportion of emissions taken up by land and ocean decreases with increasing cumulative net CO_2 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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.” 另外根据 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 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 根据 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] 参见 AGU Position Statement on Climate Intervention (revised and reaffirmed April 2023).

[xxxii] 根据 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] 根据 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).” 另见第 28 届联合国气候变化大会通过的关于损失和损害基金运作的决定(FCCC/CP/2023/L.1).

[xxxiv] 另见: AGU Position Statement on Resilience (revised and reaffirmed August 2022).

[xxxv] 根据 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.”