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Time to act

时不我待 立即行动

To reduce SLCPs

减少短期气候污染物排放

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The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) is a voluntary partnership uniting governments, intergovernmental organizations, civil society and the private sector in the first global effort to address short-lived climate pollutants (SLCPs) as an urgent and collective challenge, in ways that protect the environment and public health, promote food and energy security, and address near term climate change. The Coalition's work is complementary to the global action to reduce carbon dioxide, in particular efforts under the United Nations Framework Convention on Climate Change (UNFCCC).

气候和清洁空气联盟（CCAC）是一个旨在减少短期气候污染物排放的自愿性合作伙伴关系，该组织汇集了政府、政府间组织、民间社会和私营部门第一次共同应对日益紧迫的短期气候污染物挑战，从而保护环境和公共健康、促进粮食和能源安全并应对短期气候变化。联盟工作是全球 CO2 减排行动，特别是联合国气候变化框架公约（UNFCCC）下开展行动的重要补充。

More information:

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“If someone proposed that you could save close to 2.5 million lives annually, cut global crop losses by around 30 million tonnes a year and curb climate change by around half a degree Celsius,

“如果有人提议采取的行动，每年会拯救 250 万人的生命，减少 3000 万吨的农作物损失并减缓全球气温上升 0.5℃，

what would you do?”

你会怎么做呢？”

“Act of course …”

“立即采取行动…”

Achim Steiner

阿奇姆·施泰纳

Executive Director

执行主任

United Nations Environment Programme (UNEP)

联合国环境规划署

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Time to Act 是不我待 立即行动

It is time to act.

必须立即采取减排行动。

Recent scientific assessments coordinated by the UN Environment Programme (UNEP) have identified a number of "win-win" measures for near term climate protection and clean air benefits (UNEP & WMO 2011; UNEP 2011a, UNEP 2011b). Fast uptake of these cost-effective and readily available measures, which target emissions of short-lived climate pollutants (SLCPs) in key sectors, could bring rapid and multiple benefits for human well-being.

联合国环境规划署（UNEP）协调的最新科学评估已经确定了短期气候保护和清洁空气福祉的双赢举措（UNEP 和 WMO2011、UNEP2011a、UNEP2011b）。尽快采取这些节约成本和可行的措施，减少重要部门的短期气候污染物排放，将会给人类社会带来多重利益。

SLCPs, such as black carbon (BC),methane (CH4), tropospheric ozone (O3),and many hydroflorocarbons (HFCs),have a warming effect on climate, and most of them are also dangerous air pollutants with detrimental impacts on human health, agriculture and ecosystems.

短期气候污染物（SLCPs），如黑碳（BC）、甲烷（CH4）、对流层臭氧（O3）和很多氢氟碳化合物（HFCs），是造成全球气候变暖的元凶之一。此外，大部分的短期气候污染物也是有害的空气污染物，危害人类健康、农业生产和生态系统。

These measures are spread across a variety of sectors, from waste management, where CH4 emissions can be harnessed as a source of energy, to transport, where high-emitting vehicles can be eliminated to reduce BC emissions, to industry where new technologies can be phased in to avoid use of HFCs with a high global warming potential (GWP) (see full list of measures on page 20)

这些行动分布在不同的行业，从废物管理（利用甲烷作为能源来源），到交通部门（消除高排放车辆减少黑碳排放），再到工业部门（新技术可以逐步淘汰高全球升温潜能值的 HFCs）。完整行动清单，见 20 页。

"If someone proposed that you could save close to 2.5 million lives annually, cut global crop losses by around 30 million tonnes a year and curb climate change by around half a degree Celsius, what would you do? Act, of course" UNEP's Executive Director, Achim Steiner, has written. "More than a decade of painstaking science has built a case that cannot be ignored, namely, that swift action on the multiple sources of black carbon, HFCs, and methane can deliver extraordinary benefits in terms of public health, food security and near term climate protection."

"如果有人提议每年可以拯救 250 万人的生命、减少每年约 3000 万吨的农作物损失并避免全球气温上升 0.5 摄氏度，你会怎么做？答案是必须马上采取行动"，UNEP 执行主任阿奇姆·施泰纳

表示，“十几年艰辛的科学研究表明，我们必须立即采取行动减少黑碳、甲烷和 HFCs 等 SLCPs 的排放，保护公共健康、促进粮食安全并应对短期的气候变化。”

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The SLCP Challenge

SLCP 挑战

SLCPs and co-emitted pollutants have important impacts on our climate system and the quality of our air.

SLCPs 和同时排放出的其他污染物严重影响了地球的气候系统和空气质量。

CH4, BC, and O3 are the most important contributors to current global warming after carbon dioxide (CO2). While HFCs emissions are currently small, they are projected to rise and could be equivalent to 7 to 19% of CO2 emissions by 2050 (UNEP 2011b).

甲烷、黑碳和臭氧是目前仅次于二氧化碳的温室气体来源。虽然目前 HFCs 的排放量不大，但是预计到 2050 年将可能达到 7-19%的二氧化碳排放量（UNEP 2011b）。

At the regional level, BC and O3 in the lower atmosphere disturb rainfall and regional circulation patterns, such as the Asian Monsoon, and may increase destructiveness of storms, such as tropical cyclones in the Arabian Sea. BC darkens the surface of snow and ice, increasing the absorption of sunlight and exacerbating melting, particularly in the Arctic and other glaciated and snow-covered regions.

在地区层面，低层大气中的黑碳和甲烷会干扰降雨和地区环流，如亚洲季风，甚至可能会增加破坏性的风暴，如阿拉伯海的热带气旋。吸附在冰雪表面的黑碳会增加冰雪对阳光的吸收，从而加剧冰雪的融化速度，特别是北极和其他冰雪覆盖的区域。

BC and co-pollutants make up for the majority of particulate matter 2.5 (PM2.5) air pollution, one of the leading environmental causes of ill health and premature death. 3.5 and 3.2 million people die prematurely each year from exposure to indoor and outdoor PM2.5 pollution, respectively (Lim S. et al. 2012).O3, of which CH4 is one of the main precursors, is also a major air pollutant, which damages ecosystem structure and functions and the health and productivity of crops, thus threatening food security. O3 also reduces the ability of plants to absorb CO2, altering their growth and variety.

黑碳和同时排放出的污染物是 PM2.5 的主要组成部分，是造成疾病和过早死亡的主要环境因素之一。室内和室外的 PM2.5 空气污染每年分别会导致 350 万人和 320 万人的过早死亡（Lim S. et al. 2012）。臭氧和甲烷也是主要的空气污染物，它们会破坏生态系统的结构和功能、农作物的健康和生长，日益威胁粮食安全。臭氧还会降低植物吸收 CO2 的能力，从而改变植物的生长和变化。

SLCPs are responsible for a substantial fraction of near term climate change, with a particularly large impact in sensitive regions of the world, and can have significant, detrimental health, agricultural and environmental impacts. However, the challenge is yet to be fully recognised by the international community.

SLCPs 是造成短期气候变化附的主要因素，特别是全球的敏感地区。SLCPs 对健康、农业和环境具有破坏性的影响。但是，国际社会仍然没有完全认识到这一严峻挑战。

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The SLCP Opportunity: Benefits of Control Measures

SLCP 机遇：减排带来的收益

Compelling scientific evidence indicates that rapid and large-scale implementation of SLCP control measures could deliver near term multiple benefits for climate protection, public health and food and energy security.

科学证据表明，快速并大规模地减少 SLCP 排放，将会给气候保护、公共健康和粮食及能源安全带来近期的多重收益。

Recent reports have identified 16 BC and CH4 measures that can deliver significant benefits to human well-being by protecting the environment and public health, promoting food and energy security, and addressing near term climate change. These measures involve technologies and practices that already exist and in most cases are cost effective.

最新报告已经确定了 16 项黑碳和甲烷减排措施，这些措施将会通过保护环境和公共健康、提高粮食和能源安全以及应对短期气候变化，给人类社会带来重大的利益。这些措施包括已有的技术和实践，且大部分是节约成本的技术和实践。

If fully implemented by 2030, these measures could reduce global CH4 emissions by about 40% and BC emissions by about 80% relative to a “reference” scenario (UNEP & WMO 2011).

如果在 2030 年采取全部措施，与“参考”情景比较，全球将会减少约 40%的甲烷和 80%左右的黑碳排放（UNEP & WMO，2011）。

For CH4, the main reductions would be achieved by addressing emissions from coal mining and oil and gas production, including through pre-mine degasification, recovery and oxidation of methane from ventilated air from coal mines, and improved control of unintended fugitive emissions from oil and natural gas production.

甲烷的减排主要通过解决煤炭开采和石油天然气生产过程中的排放，包括煤炭开采前的脱气、从煤矿通风口恢复和氧化甲烷以及改进石油天然气生产过程中非正常排放。

At the global level, measures targeting the residential and transport sectors offer the largest potential for reductions of BC emissions, including implementation of standards for the reduction of pollutants from vehicles, elimination of high-emitting vehicles, and dissemination of cleaner and more efficient cooking and heating stoves. About half of these emission reductions could be achieved through net cost savings over the lifetime of the measures (UNEP 2011a).

在全球层面，针对居民和交通部门的措施将会大幅减少潜在的黑碳排放，包括实施车辆污染物排放标准、淘汰高排放车辆以及使用更加清洁和节能的烹饪和取暖炉灶。大约一半的减排可以通过这些措施周期的净成本节约方式来实现（UNEP 2011a）。

Large-scale implementation of these measures by 2030 would likely prevent 2.4 (0.7–4.6) million premature deaths from outdoor air pollution annually and avoid annual crop yield losses of over 50 (30–135) million tons, which represents an increase of a up to 4% of the total annual global crop production. Implementation could also slow down the warming expected by 2050 by about 0.5°C (UNEP & WMO 2011) – and by about 0.7°C in the Arctic by 2040 – and could have significant regional climate benefits in sensitive regions of the world, reducing disruption of rainfall patterns and slowing the melting of some glaciers (WB & ICCI 2013). Action to reduce the climate impacts of HFCs, such as using hydrocarbon refrigerants in domestic refrigerators, freezers and small air conditioning units, could deliver additional near term climate change mitigation benefits.

在 2030 年前大规模地实施这些措施，每年将会拯救 240（70-460）万例因室外空气污染造成的过早死亡，避免 5000（3000-13500）万吨的农作物损失，占全球粮食年产量的 4%。到 2050 年，这些措施还能缓解全球气温上升 0.5℃（UNEP & WMO，2011），到 2040 年能缓解北极地区气温上升 0.7℃，从而给全球敏感地区带来巨大的气候福利，减少对降雨模式的破坏并减缓冰川的融化过程（WB & ICCI 2013）。采取行动减少 HFCs 对气候的影响，如减少冰箱、冰柜和空调对 HFCs 制冷剂的使用，将会为缓解短期气候变化带来更多的利益。

However, while fast action to mitigate SLCPs could help slow the rate of climate change and improve the chances of staying below the 2°C target in the near term, longer term climate protection will only be possible if deep and persistent cuts in CO2 emissions are rapidly realized.

虽然迅速减少 SLCPs 排放有助于缓解气候变化的速度，并为保持 2℃的目标增加短期的机会，但是只有持续并深入地削减 CO2 排放才能实现长期的气候保护目标。

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What are Short-Lived Climate Pollutants?

什么是短期气候污染物？

SLCPs are substances with a relatively short lifetime in the atmosphere – a few days to a few decades – and a warming effect on near term climate. The main SLCPs are BC, CH4, tropospheric O3, and many HFCs.

SLCPs 是指在大气中寿命较短（几天到几十年不等）并会影响短期气候的物质，主要包括黑碳、甲烷、对流层中的臭氧和 HFCs。

The short atmospheric lifetime of SLCPs means that their concentrations can be reduced in a matter of weeks to years after emissions are cut, with a noticeable effect on global temperature within the following decades. In contrast, CO2 has a long lifetime, so the majority of the climate benefits will take many decades to accrue after the reductions. Long-term warming, however, will be essentially determined by total cumulative CO2 emissions – assuming SLCPs are eventually reduced – and will be effectively irreversible on human timescales without carbon removal. The SLCPs and CO2 both have important effects on climate, but these occur on very different timescales.

SLCPs 寿命较短的性质意味着采取减排行动后，在未来的几周到几年时间里它们在大气中的浓度将会显著减少，从而有效缓解未来几十年的全球气温。与之相反，由于 CO2 寿命较长，主要的气候收益只有在削减后的几十年才能实现。即使最终会消除所有的 SLCPs 排放，长期的全球变暖仍然取决于 CO2 的累积排放量。如果不完全消除碳排放，那么在人类社会的时间尺度上全球变暖将无法避免。SLCPs 和 CO2 都会导致重大的气候变化，但是产生变化的时间不同。

In some cases, mitigation of SLCPs and CO 2 will be achieved via different strategies, aimed at different sectors, and many SLCP reductions may be motivated primarily by their air quality benefits. Hence, reducing emissions of SLCPs and CO2 are complementary goals.

在某些情况下，可以通过不同的策略针对不同的行业实现 SLCPs 和 CO2 的减排。减少 SLCP 排放的主要动力来源于减排带来的空气质量效益。因此，减少 SLCPs 和 CO2 排放是相互补充的目标。

Slowing the rate of near term climate change leads to multiple benefits, including reducing impacts from climate change on those alive today, reducing biodiversity loss, providing greater time for climate adaptation, and reducing the risk of crossing thresholds for irreversible climate feedbacks. Additionally, reducing SLCPs is likely to have enhanced benefits in mitigating warming in the Arctic and other elevated snow- and ice-covered regions in the Himalayan/Tibetan regions and in reducing regional disruption of traditional rainfall patterns. There are some longer term benefits as well via carbon-cycle responses and reduced sea-level rise.

减缓短期气候变化的速度将会带来很多利益，包括减少气候变化对地球生物的影响、减少生物多样性的丧失、为适应气候变化提供更多的时间以及缓解气候变化不可逆转的临界点风险。此外，

减少 SLCPs 的排放，还可以缓解北极及其他冰雪覆盖区域（喜马拉雅和西藏）的冰雪融化速度，减少对地区传统降雨模式的破坏，以及对碳循环和减缓海平面上升等长期收益。

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Black Carbon and Co-pollutants from Incomplete Combustion

不充分燃烧导致的黑碳及其他污染物排放

BC (or soot) is a tiny black particle and major component of particulate matter 2.5 (PM2.5) air pollution, which is emitted with other co-pollutants through the incomplete combustion of fossil fuels and biomass.

黑碳（或称煤烟）是非常细小的黑色微粒，也是 PM2.5 空气污染物的主要组成部分，一般通过化石燃料和生物质的不充分燃烧，和其他同时排放的污染物一起释放到空气中。

When suspended in the atmosphere, BC particles contribute to global warming by absorbing incoming solar radiation and converting it to heat. When deposited on ice and snow, black carbon darkens the surface, making it less reflective and more light absorbent, which causes local warming and increases the melting rate of snow and ice. The Arctic and glaciated regions like the Himalayas are particularly vulnerable to the effects of BC.

漂浮在大气中的黑碳颗粒会吸收太阳辐射并转化成热能，从而导致全球变暖；沉积在冰雪表面的黑碳颗粒，会减少冰雪对阳光的反射并吸收更多的太阳光，导致当地的气候变暖，加速冰雪的融化速度。北极和其他冰雪覆盖地区（如喜马拉雅），极易受到黑碳的影响。

BC is always emitted with co-pollutant particles, such as organic carbon and sulphates, which can have a neutral or even cooling effect on the climate. The ratio of BC to its co-pollutants varies depending upon the emission source and fuel-type, and impacts whether the source has a net-positive or -negative warming effect. For example, emissions from diesel engines have a high proportion of BC to cooling co-pollutants, whereas emissions from wildfires and the open-burning of biomass contain a more balanced ratio. It is important to take the net climate effect into account when assessing BC emission reduction measures.

黑碳通常与其他污染物颗粒（如有机碳和硫酸盐）一起排放到大气中，这些污染物有着中和甚至降低气温的作用。黑碳和其他污染物的比例根据排放源和燃料类型而不尽相同，其影响也取决于排放源对气候产生的是正面影响还是负面影响。例如，柴油发动机的排放气体中黑碳占较大比例，会冷却其他的排放气体，但是野火和生物质露天焚烧排放物中的比例相当。因此，评估黑碳减排措施中，必须认真考虑净气候影响。

BC and co-pollutants make up the majority of PM2.5 air pollution, which consists of particles 2.5 micrometers or smaller in diameter (approximately 40 times smaller than a grain of table salt), and is the leading environmental cause of poor health and premature death. In 2010 household PM2.5 air pollution and ambient outdoor PM2.5 air pollution were estimated to have caused over 3.5 and 3.2 million premature deaths, respectively (Lim S. et al. 2012).

黑碳及其他同时排放出的是 PM2.5 空气污染物的主要组成部分，由直径等于或小于 2.5 微米的颗粒构成（约一粒食盐的 1/40），是导致身体不适和过早死亡的主要环境因素。仅 2010 年，室内和室外 PM2.5 空气污染分别导致 350 万和 320 万过早死亡病例（Lim S. et al. 2012）。

BC can also affect ecosystem health in several ways: by depositing on plant leaves and increasing their temperature, dimming sunlight that reaches the earth, and modifying rainfall patterns. The latter can have far-reaching consequences for ecosystems and human livelihoods, for example by disrupting monsoons, which are critical for agriculture in large parts of Asia and Africa.

黑碳还会影响生态系统的健康：吸附在叶子的黑碳上增加植物的温度、使抵达地球的阳光变暗和改变降雨模式。降雨模式的改变会对生态系统和人类生计产生深远的影响，例如扰乱季风会破坏亚洲和非洲大部分地区的农业生产。

The main sources of BC include residential and commercial combustion and transport, which accounted for 80% of anthropogenic emissions in 2005 (UNEP & WMO 2011). Other important sources include industrial processes and the burning of agricultural waste. There are also small sources such as fossil fuel extraction, large scale combustion (including power plants and industrial boilers) and open burning of garbage. New data also shows that kerosene lamps may be a significant source of black carbon (Jacobson A. et al. 2013). Important regional variations in emissions are expected in the coming decades, with decreases of up to half in North America and Europe due to mitigaon measures in the transport sector and significant increases in Asia and Africa.

黑碳的主要排放源来自于住宅和商业的燃烧和运输，占 2005 年人为排放的 80%（UNEP & WMO 2011）。其他的主要排放源包括工业生产和农业垃圾焚烧，小的排放源如化石燃料提取、大规模的燃烧（包括电厂和工业锅炉）和露天垃圾焚烧。最新资料煤油灯也可能是重要的黑碳来源（Jacobson A. et al. 2013）。预计在未来的几十年黑碳的排放将会出现重大的地区性差异，北美及欧洲地区因在交通部门采取的减排措施，将会减少一半以上的黑碳排放，相反，非洲和亚洲将出现大幅增长。

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Methane

甲烷

CH4 is a powerful greenhouse gas with an atmospheric lifetime of approximately 12 years. CH4 emissions caused by human activities are one of the most significant drivers of climate change. CH4 directly influences the climate system but also has indirect impacts on human health and ecosystems, including agricultural production, through its role as the primary precursor of tropospheric O3, a powerful greenhouse gas and air pollutant (UNEP & WMO 2011). O3 air pollution has been estimated to cause around 150,000 deaths annually worldwide and affects the health of many more (Lim S. et al. 2012).

甲烷是一种强效温室气体，在大气中的寿命约为 12 年。人类活动排放的甲烷是导致气候变化的最主要驱动力之一。甲烷不仅会直接影响气候系统，而且会间接影响人类健康和生态系统，包括农业生产。甲烷还是形成对流层臭氧的主要前驱物之一，对流层臭氧也是一种强效温室气体和空气污染物（UNEP & WMO 2011）。臭氧空气污染估计每年会造成 15 万人的死亡，并引发很多健康问题（Lim S. et al. 2012）。

Approximately 60% of methane is emitted from human activities. In 2005, agriculture (livestock rearing and rice production), fossil fuel production and distribution, and municipal waste and wastewater management accounted for 93% of global anthropogenic methane emissions. According to the projected trends, without further mitigation efforts, anthropogenic methane emissions are expected to increase by about 25% by 2030 (UNEP & WMO 2011).

大约 60%的甲烷来源于人类活动。农业（畜牧业和水稻生产）、化石燃料生产和运输以及城市垃圾和污水处理占 2005 年全球人为甲烷排放的 93%。根据预测的趋势，如果不采取进一步减排行动，到 2030 年人为排放的甲烷预计会增加 25%（UNEP & WMO 2011）。

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Tropospheric O3

对流层臭氧

O3 is known as a secondary gas because it is not directly emitted, but rather formed by sunlight-driven oxidation of “precursor gases” such as non-methane volatile organic compounds (NMVOCs) and nitrogen oxides(NOx) (U.S. EPA 2013; UNEP & WMO 2011).

臭氧是由前驱物氧化形成，如非甲烷挥发性有机化合物（NMVOCs）和氮氧化物（NOx）,因此被称为次生气体（U.S. EPA 2013; UNEP & WMO 2011）。

In the upper atmosphere (stratosphere) O3 acts as a shield, protecting the earth from harmful ultraviolet radiation. But in the lower atmosphere (troposphere) O3 is a potent greenhouse gas and a harmful air pollutant adversely affecting public and ecosystem health. Tropospheric O3 also reduces the ability of plants to absorb CO2, altering their growth and variety. It damages ecosystem structures and functions, as well as the health and productivity of crops, thus threatening food security. As a result, O3 is understood to reduce net carbon sequestration in terrestrial ecosystems due to reduced net primary productivity, which could, according to estimates, be responsible for as much warming as O3´s greenhouse effect. Tropospheric O3 is a major component of urban photochemical smog, and a highly reactive oxidant which, when inhaled, can worsen bronchitis and emphysema, trigger asthma, and permanently damage lung tissue. Tropospheric O3 exposure is responsible for an estimated 150,000 premature deaths every year (Lim S. et al. 2012). Children, older adults and people with lung or cardiovascular diseases are particularly at risk of adverse health effects.

高层大气（平流层）中的臭氧是地球的保护壳，保护地球上的生物免受紫外线辐射的伤害。但是，低层大气（对流层）中的臭氧是一种强效温室气体和有害的空气污染物，影响公众和生态系统健康。对流层中的臭氧还会降低植物吸收 CO2 的能力，改变植物的生长。低层臭氧会破坏生态系统的结构和功能，以及农作物的健康和生产力，从而威胁粮食安全。因此，因为减少了净初级生产力，臭氧被认为减少了陆地生态系统的净碳封存。对流层臭氧还是城市光化学烟雾的主要组成部分，同时也是一种高活性氧化剂。当人们吸入后，会加重支气管炎和肺气肿，从而引发哮喘并对肺组织造成永久性伤害。对流层臭氧是导致全球每年大约 15 万人过早死亡的罪魁祸首（Lim S. et al. 2012），特别影响儿童、老人和患有肺或心血管疾病人群的身体健康。

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Hydroflorocarbons

氢氟碳化合物

Hydroflorocarbons (HFCs) are powerful factory-made greenhouse gases used primarily in air conditioning, refrigeration, foam-blowing, fire suppression, solvents, and aerosols. Their use is growing because they are being widely adopted as replacements for O3-depleting substances (ODS), including chloroflorocarbons (CFCs) and hydrochloroflorocarbons (HCFCs), which are being phased out under the Montreal Protocol on Substances that Deplete the Ozone Layer.

氢氟碳化合物（HFCs）是工业生产排放出的强效温室气体，主要被用于空调、制冷剂、发泡剂、灭火剂、溶剂和气雾剂。HFCs 被当做消耗臭氧层物质（氟利昂和氢氟碳氯化合物）的替代品而广泛使用。蒙特利尔议定书逐步淘汰了这些消耗臭氧层物质的生产和使用。

The mix of HFCs in current use, weighted by usage (tonnage), has an average atmospheric lifetime of 15 years (Velders G.J.M. et al. 2009). Although they currently represent only a small fraction of the total greenhouse gases (less than 1%), they are among the fastest-growing ones (in percentage) in many countries, including the United States, the European Union, China, and India. Emissions of high-global warming potential (GWP) HFCs are rising very quickly at 8% or more per year (UNEP 2011b).A recent study concluded that replacing high-GWP HFCs with low-GWP alternatives could avoid 0.1°C of warming by 2050 (Xu Y. et al. 2013).

目前使用的混合 HFCs 在大气中平均寿命约为 15 年（Velders G.J.M. et al. 2009）。虽然 HFCs 目前仅占温室气体总量的很小一部分（不到 1%），但是它是很多国家中增长比例最快的温室气体，包括美国、欧盟、中国和印度。高全球变暖潜能值（GWP）的 HFCs 正以每年 8%以上的速度增加（UNEP 2011b）。最新研究指出，到 2050 年，使用低 GWP 替代品取代高 GWP 的 HFCs 可以避免气温上升 0.5℃。

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SLCP Control Measures

SLCP 减排措施

In 2011 a scientific assessment coordinated by UNEP and the World Meteorological Organisation (WMO) identified 16 SLCP control measures. If implemented globally by 2030, these measures could deliver significant benefits for near term climate protection and air quality (UNEP & WMO 2011).

2011 年，联合国环境署联合世界气象组织发表的科学评估报告确定了 16 项 SLCP 减排措施。如果到 2030 年全球都采取这些措施，将会带来重大的短期气候收益并改善空气质量（UNEP & WMO 2011）。

These control measures involve technologies and practices that already exist and have been implemented around the world, targeting primary SLCP emitting sectors, including fossil fuel production and distribution; energy use in the residential, industry, and transport sectors; waste management; and agriculture. If globally implemented by 2030, these 16 measures could reduce global CH4 emissions by about 40% and global BC emissions by about 80%, relative to a “reference” scenario (UNEP & WMO 2011). About half of these emission reductions could be achieved through net cost savings over the lifetime of the measures.

这些针对主要 SLCP 排放部门的减排措施包括已经在全球范围内开始实施的技术和实践方案，如化石燃料生产和运输，住宅、工业和交通行业的能源利用，废物管理和农业生产等方面。在 2030 年前全部采取这 16 项措施，与“参考”情景相比较，全球将会减少约 40%的甲烷和 80%左右的黑碳排放（UNEP & WMO 2011）。大约一半的减排可以通过这些措施周期的净成本节约方式来实现。

In addition to these measures, replacing high-GWP HFCs with available low GWP and not-in-kind alternatives has the potential to effectively address climate forcing from this sector. Because they are factory-made, HFCs can be most effectively controlled through a phase-down of their production and consumption (UNEP 2011b). In addition to the direct climate benefits from HFC mitigation, a global HFC phase-down could also provide indirect benefits through improvements in the energy efficiency of the refrigerators, air conditioners, and other products and equipment that use these chemicals. These efficiency gains could reduce CO2 emissions as well (UNEP & CCAC 2014).

除了这些措施之外，利用低 GWP 的替代品取代高 GWP HFCs 可能促使这些行业有效应对气候变化、因为 HFCs 是工厂生产排放出来的，通过逐步淘汰这些产品的生产和消费将会有效地遏制 HFCs 排放（UNEP 2011b）。此外，除了 HFCs 减排产生的直接气候收益，全球逐步淘汰 HFCs 还会通过提高冰箱、空调和其他使用这些化学品的产品和设备的能源效率，带来更多间接的气候收益。

While fast implementation of measures to mitigate SLCPs, including BC, methane, tropospheric O3 and many HFCs, could help slow the rate of climate change and improve the chances of staying below the 2°C target in the near term, longer term climate protection will only be possible if deep and persistent cuts in CO2 emissions are rapidly realized (UNEP & WMO 2011).

虽然快速削减黑碳、甲烷、低层臭氧和 HFCs 等 SLCPs 的排放，有助于缓解气候全球变暖并提高短期内控制气温上升 2℃的机会，但是只有深入持久地削减 CO2 排放才能实现长期的气候保护目标（UNEP & WMO 2011）。

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Cost of Control Measures

减排成本

The 16 BC and CH4 control measures identified have already been implemented around the world. Hence direct implementation costs can be estimated for most of the measures. Indirect costs of the measures linked, for instance, to the valuation of health and crop production benefits are more difficult to assess.

全球范围内已经开始实施的 16 项黑碳和甲烷减排措施，大部分减排措施可以估计出直接的实施成本，但是与减排措施相关的间接成本却很难预计，如健康评估和农作物生产收益。

Even without taking into account the value of health and crop production benefits, about half of the temperature reduction benefits associated with BC and CH4 measures could be achieved at net cost savings (as a global average) over the full technical lifetime of the measures, i.e. the initial investment will be offset by subsequent cost savings (e.g. through the use of recovered gas).

即使不考虑健康价值和农作物生产收益，但是通过这些措施完整技术周期的净成本节约方式（全球平均值）减少黑碳和甲烷排放，将会避免约一半的温度上升值，例如初期投资将会与后续成本节约相抵消（如利用回收的气体）。

The costs of some measures relying not only on the implementation of a new technology but on a governance change, such as the elimination of high-emitting vehicles or the ban of open burning of agricultural waste, are more difficult to quantify. These measures represent just over 10% of the total temperature benefits (UNEP 2011a).

这些措施成本不仅包括新技术的实施，还包括管理方式的变革，如淘汰高排放车辆或禁止露天焚烧农业废物，虽然这些措施的成本很难计算，但是会实现 10%左右的气候收益（UNEP 2011a）。

Assessments of the costs of low-GWP HFCs alternatives are underway. Such measures can be associated with important energy efficiency benefits in a number of sectors, such as domestic and commercial refrigeration and some air conditioning systems (UNEP & CCAC 2014).

低 GWP HFCs 替代品的成本评估正在进行当中。这些措施与很多部门重要的能源效率息息相关，如家庭与商业制冷和一些空调系统（UNEP & CCAC 2014）。

SLCP Climate Benefits: Avoided Global Warming

SLCP 气候收益：避免全球变暖

Full implementation of the 16 BC and CH4 control measures by 2030 could prevent up to 0.5°C of additional warming by 2050 (UNEP & WMO 2011). Recent studies project that replacing high-GWP HFCs with low-GWP alternatives could avoid an additional 0.1°C of warming by 2050 (Xu Y. et al. 2013).

在 2030 年前，全面采取 16 项黑碳和甲烷减排措施将会避免全球气温到 2050 年上升额外的 0.5℃（UNEP & WMO 2011）。最新研究预测，采用低 GWP HFCs 取代高 GWP HFCs，到 2050 年将会避免气温上升额外的 0.1℃（Xu Y. et al. 2013）。

Rapid implementation of SLCP control measures, if accompanied by deep and persistent measures to reduce CO2 emissions, would greatly improve the chances of keeping the Earth's temperature increase to less than 2°C relative to pre-industrial levels.

快速采取措施控制 SLCP 排放的同时，深入持久地减少 CO2 排放，才能提高把地球升温幅度控制在 2℃以下的机会。

Finally, although the greatest benefits are near term, reducing SLCPs could have some longer term benefits as well, regarding carbon-cycle responses and reduced sea-level rise. However, it is important to note that implementation of SLCP control measure does not buy us any time to act on CO2. Regardless of the trend of SLCPs, scientists tell us it will be nearly impossible to stay within the 2˚C limit unless the growth in CO2 emissions is quickly curtailed and reversed.

虽然减少 SLCPs 排放不仅会产生巨大的短期气候收益，也会带来一些长期的气候收益，如碳循环反应和减缓海平面上升。但是，我们必须清楚地认识到 SLCPs 减排措施不会给 CO2 减排增加一点时间。科学家指出，不管 SLCPs 减排情况如何，只有快速遏制并减少 CO2 排放才能实现控制温度上升 2℃的目标。

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Consequences of Delayed Mitigation

推迟减排行动的后果

It is not enough to act. We have to act now. Delayed implementation of either CO2 or SLCP control measures would have significant negative consequences on temperature, cumulative sea-level rise and human well-being. The relatively short lifetimes of SLCPs means that climate benefits could be achieved quickly after mitigation, whether it occurs today or at the end of the century. In addition, the timing of reductions does not greatly affect the induced peak warming.

必须立即采取行动。无论是推迟 CO2 还是 SLCP 的减排措施都会给气温、海平面上升和人类福祉造成严重的后果。这些污染物的短寿命意味着采取减排行动后，可以快速地产生气候收益。此外，减排的时间不会对诱发的变暖峰值造成太大的影响。

However a delay in cuts could lead to a failure to reap multiple near term benefits. One recent modelling study has projected that delaying implementation of SLCP control measures by 25 years could lead to significant and irreversible impacts on the climate system (Hu. A. et al. 2013).

但是，推迟减排将会导致无法获得多个短期的气候收益。一项最近的模型研究预计，如果推迟 25 年实施 SLCP 的减排措施，将会对气候系统造成严重且不可逆转的影响（Hu. A. et al. 2013）。

For CO2, the slower climate response to mitigation means that the longer mitigation is delayed, the more severe the long-term and permanent warming and resulting impacts will be. If action is not taken now, the inertia in the climate system would cause temperatures to surpass the 2°C threshold within this century, leaving people no time to adapt.

放缓 CO2 的减排行动则意味着，推迟减排措施的实施，长期和永久的气候变暖将会造成更加严重的后果。如果不立即采取行动，气候系统惯性将会导致本世纪内气温上升超过 2℃的安全值，导致人类社会没有足够的时间适应气候的变化。

Furthermore, this might push the climate over a tipping point – a point at which a chain of events escalates so fast that it is impossible to return to a previous condition.

更为重要的是，这可能会推动气候超过一个临界点——该临界点将会加速一系列事件的发生并导致无法恢复到之前的状况。

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13 SLCPs and Sea-Level Rise

SLCPs 和海平面上升

As land glaciers and ice sheets melt and warming oceans expand, sea-level rise has accelerated to about 3 millimetres annually in recent years (IPCC 2013). The latest IPCC assessment pointed out that the rate of sea-level rise since the mid-19th century has been larger than the mean rate during the previous two millennia.

由于陆地冰川和冰盖融化及变暖海洋的扩张，最近几年全球海平面以每年 3 毫米左右的速度上升（IPCC 2013）。IPCC 最新评估报告指出，自 19 世纪中叶以来海平面上升的速度远远超过了之前两个千年的平均速度。

The potential impact of rising oceans is one of the most concerning effects of climate change. Many of the world's major cities, such as Amsterdam, Bangkok, Calcutta, Dhaka, Miami, New York, Shanghai, and Tokyo, are located in low-lying coastal areas. If temperatures continue to warm, sea-levels may rise by as much as a metre this century, and even more in subsequent centuries (IPCC 2013). Such an increase could submerge densely populated coastal communities, especially when storm surges hit. Sea-level rise comes with various threats to populations: large inhabited coastal areas will be permanently flooded, and storm surges are expected to be stronger and reach further inland. Dramatic costs and damages lie ahead, entire island nations might be lost, and vast populations may need to be relocated. A report ranked the top twenty at-risk cities from sea-level rise of only one metre, and estimated that $35 trillion in assets and 150 million people could be at risk in these cities in 2070 (OECD 2010). Eight of the top ten cities with assets exposed, and nine of the top ten with populations at risk, are in Asia.

海平面上升的潜在威胁是气候变化最受关注的影响之一。全球很多大城市，如阿姆斯特丹、曼谷、加尔各答、达卡、迈阿密、纽约、上海和东京都位于地势低洼的沿海地区。如果气温持续上升，全球海平面可能在本世纪上升 1 米，未来的几个世纪可能会更高（IPCC 2013）。这样的增长速度将会淹没人口稠密的沿海地区，尤其是遭受暴风雨侵袭的时候。海平面上升将会给人类带来各种威胁：大部分沿海居住地区将被洪水彻底淹没；暴风雨预计更加强烈并进一步抵达内陆地区；岛屿国家可能被彻底淹没；大量人口将流离失所。一份研究报告列出了前 20 名受海平面上升 1 米威胁的城市，到 2070 年这些城市的 35 万亿资产和 1.5 亿居民将面临威胁（OECD 2010）。亚洲前十个城市中的 8 个城市将面临巨大的资产损失，9 个城市的居民将处于风险之中。

One recent study has estimated that immediate implementation of SLCP control measures could reduce the rate of sea-level rise by about 20% in the first half of the century, as compared to a "reference" scenario. By 2100, the combined mitigation of CO2 and SLCPs could reduce the rate of sea-level rise by up to 50%, and cumulative sea-level rise by about 30% as compared to the same scenario (Hu A. et al. 2013).

最新一项研究预计，快速减少 SLCP 排放将会降低本世纪上半叶 20%的海平面上升速度（与“参考”情景相比）。到 2100 年，共同减少 CO2 和 SLCPs 排放将会降低 50%的海平面上升速度，与同样情景下相比较累积海平面上升 30%（Hu A. et al. 2013）。

Because some processes of the climate system, especially melting of the large land ice sheets of Greenland and Antarctica, have a nearly unstoppable momentum once begun, even with aggressive CO2 and SLCP mitigation two-thirds of predicted sea level rise is likely to be inevitable. But early mitigation could reduce its rate by up to one half, which would reduce vulnerability by giving coastal communities and low-lying states time to adapt (Hu A. et al. 2013).

由于气候系统的一些进程，尤其是格陵兰岛和南极洲陆地冰盖的融化，即使大量削减 CO2 和 SLCP 排放，海平面仍可能不可避免的上升三分之二。但是尽早采取减排措施将会缓解一半的海平面上升速度，让沿海和地势低洼地区有时间适应并减少海平面上升带来的危害。

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Effects on Public Health

危害公共健康

In addition to their climate impacts, BC and tropospheric O3 are also powerful air pollutants with detrimental impacts on public health.

除了 SLCP 的气候影响，黑碳和对流层中的臭氧还会给人类健康造成巨大的危害。

BC is a primary component of PM2.5 air pollution, and tropospheric O3 is a major air pollutant. PM2.5 air pollution is a major global cause of premature mortality. According to the 2010 Burden of Disease study, indoor and outdoor PM2.5 air pollution are the fourth and seventh leading risk factors for early mortality globally (Lim S. et al. 2012).

黑碳是 PM2.5 的主要组成部分，对流层臭氧也是一种主要的空气污染物。PM2.5 是导致过早死亡的主要因素。2010 年疾病负担研究指出，室内和室外 PM2.5 空气污染分别是导致过早死亡的第四大和第七大原因（Lim S. et al. 2012）。

In some regions its impacts can be much more significant. For example, in South Asia indoor PM2.5 air pollution alone is the leading preventable risk factor for the burden of disease, while in Eastern, Central, and Western Sub-Saharan Africa it is ranked second, and third in South East Asia (Lim S. et al. 2012).

在某些地区影响更加严重。例如，南亚地区仅室内 PM2.5 空气污染就是首要的可预防的疾病负担。撒哈拉以南非洲的东部、中部和西部地区 PM2.5 是第二大疾病因素，在东南亚地区排在第三位（Lim S. et al. 2012）。

Some populations are also particularly vulnerable. Globally, indoor and ambient PM2.5 air pollution are the two leading risks factors for the death of children in the first six days of life (Lim S. et al. 2012).

PM2.5 还会对一些人群造成特殊影响。全球范围内，室内和室外 PM2.5 空气污染是导致新生儿在出生后六天内死亡的两大主要风险因素（Lim S. et al. 2012）。

In 2010 indoor air pollution and ambient outdoor particulate matter pollution were estimated to have caused over 3.5 and 3.2 million premature deaths, respectively, while 0.15 million deaths were attributed to ambient O3 pollution (Lim S. et al. 2012).

仅 2010 年，室内和室外细微颗粒物污染分别造成 350 万和 320 万过早死亡病例，15 万人死于室外臭氧污染（Lim S. et al. 2012）。

Recent assessments have shown that fast implementation of measures to reduce BC and CH4 (tropospheric O3 precursor) emissions, such as the widespread adoption of clean fuels, have the potential to prevent over two million premature deaths each year by 2030 from outdoor air pollution with significant additional benefits from reduced indoor air pollution(UNEP & WMO 2011).

最新评估表明，快速减少黑碳、甲烷和对流层臭氧排放，如广泛推广清洁燃料的使用，在 2030 年前，每年将会拯救 200 多万因室外空气污染导致的过早死亡病例，还会通过减少室内空气污染产生显著的额外收益（UNEP & WMO 2011）。

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15 Benefits for Public Health

公共健康的福利

Global implementation of the 16 BC control measures would substantially improve air quality and could avoid approximately 2.4 (0.7–4.6) million outdoor air pollution related premature deaths annually, and have an even larger impact on reduced chronic morbidity beginning in 2030 (UNEP & WMO 2011; Shindell D. et al. 2012). These measures would also deliver significant additional health benefits from reduced indoor pollution, and smaller benefits could also be achieved from reduced O3 pollution, including from CH4 measures.

在全球范围内实施 16 项黑碳减排措施，将会显著改善空气质量，每年拯救约 240 万（70 万-460 万）与室外空气污染相关的过早死亡人数，并从 2030 年起大大减少慢性病的发病率（UNEP & WMO 2011; Shindell D. et al. 2012）。这些措施还会通过减少室内空气污染带来显著的额外健康收益，此外，通过减少臭氧和甲烷的污染，带来较小的健康收益。

The most substantial benefits will be felt immediately in or close to the region of implementation, with the greatest health benefits expected in Asia, both in number of lives saved, and in terms of quality of life and avoided chronic diseases. Improved cook stoves would deliver the greatest benefits in Africa, Asia and Latin America and the Caribbean, followed by measures targeting the transport sector.

已经采取措施的亚洲地区将很快体会到这些最显著的收益，包括拯救生命、改善生活质量及降低慢性病发病率。改进做饭取暖的炉灶以及对交通部门采取针对性的措施，给非洲、亚洲和拉美及加勒比地区带来了巨大的健康收益。

Replacing domestic wood-burning technologies with pellet stoves would bring the largest benefits in North America and Europe, while the ban of open burning of agricultural waste would also bring important health gains in all regions (UNEP & WMO 2011).

用颗粒炉取代传统的木材燃烧，将会给北美和欧洲地区带来最大的收益。此外，禁止农业废物的露天焚烧将会给所有地区带来重大的健康收益（UNEP & WMO 2011）。

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16 Effects on Agriculture

影响农业生产

While feeding a growing world population has become one of the major issues of our century, SLCPs are damaging ecosystems, including crop yields.

本世纪最主要的一个问题是如何养活全世界不断增长的人口。SLCPs 正在破坏生态系统，包括农作物减产。

Tropospheric O3 is the main air pollutant responsible for crop yield losses. It affects plants by suppressing their ability for photosynthesis, and, at high concentration, causes necrosis. Present day global relative yield losses due to tropospheric O3 exposure has been estimated for four major crops and range between 7–12% for wheat, 6–16% for soybean, 3–4% for rice, and 3–5% for maize (Harmens H. et al. 2011).

对流层臭氧是导致农作物减产的主要空气污染物。臭氧通过抑制植物的光合作用影响植物的生长，高浓度的臭氧会导致农作物坏死。目前预计对流层臭氧对全球四种主要农作物减产的范围包括：小麦 7-12%、大豆 6-16%、水稻 3-4%、玉米 3-5%（Harmens H. et al. 2011）。

Reductions in the quality of crops affect food security as well. Prolonged exposure to tropospheric O3 has been shown to decrease carbohydrates and increase protein concentrations in wheat and potatoes, and reduce the protein and oil content of rapeseed (the world's third largest source of vegetable oil) (Harmens H. et al. 2011; U.S. EPA 2013).It can also decrease the nutritional value of forage plants, which can lead to lower milk and meat production, harming some of the world's most vulnerable populations.

同时，农作物质量的下降还会影响粮食安全。研究表明，长期暴露在对流层臭氧中的小麦和土豆，会增加其蛋白质浓度而减少碳水化合物的成分，并减少油菜籽的蛋白质和含油量（油菜籽是全球第三大植物油来源）（Harmens H. et al. 2011; U.S. EPA 2013）。此外，臭氧会减少饲料作物的营养价值，从而降低牛奶和肉制品的质量和产量，危害一些地区的人类健康。

BC may also affect crops in several ways. When deposited on leaves it increases temperature and impedes growth. By limiting the amount of solar radiation reaching the earth, it reduces photosynthesis. BC and its co-pollutants can also influence cloud formation and affect regional atmospheric circulation and rainfall patterns, disrupting, for example, the monsoons on which large parts of Asia and Africa rely.

黑碳会在几个方面影响农作物的生长。沉积在叶子上的黑碳会增加植物的温度，阻碍农作物的生长。黑碳还会阻止到达地球的太阳辐射，减弱植物的光合作用。此外，黑碳和其他同时排放的污染物会影响云层形成和地区大气环流与降雨模式，从而干扰亚洲和非洲大部分地区农业生产依赖的季风。

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Benefits for Agriculture 减排给农业带来的收益

Rapid implementation of 16 SLCP control measures to reduce CH4 and BC has the potential to avoid the annual loss of over 50 million metric tonnes of crop yields per year by 2030 (UNEP & WMO 2011). Benefits are evenly split between CH4 and BC control measures, which similarly impact O3 formation. For CH4 measures, addressing emissions from coal mining, especially in Asia, and from oil and gas production, would bring the greatest benefits followed by improved waste treatment. For BC measures, the greatest benefits would come from measures addressing the transport sector. CH4 tends to impact O3 formation further away from the source than BC co-pollutants, some of which are also O3 precursors. Hence benefits from BC measures are felt closer to the emission source than those of CH4 measures.

快速采取 16 项 SLCP 减排措施，减少黑碳和甲烷的排放将会避免每年 5000 万吨的粮食损失（到 2030 年）（UNEP & WMO 2011），还会有效地减少对流层臭氧的形成。采取措施解决煤矿开采（尤其是亚洲）、石油和天然气生产以及改进垃圾管理中甲烷排放，减少交通运输中的黑碳排放，都会产生非常大的收益。甲烷对对流层臭氧的形成远远超过了黑碳及同时排放出的其他污染物。因此，与甲烷减排相比，黑碳减排措施的收益更大。

In terms of tonnage, the largest avoided crop yield losses will be achieved in China, India, and the United States, followed by Pakistan and Brazil. In terms of percentage, the main improvements will be gained in the Middle East, followed by Central and South Asia.

在数量方面，中国、印度和美国将会避免大量的农作物损失，巴基斯坦和巴西紧随其后。就比例而言，中东地区以及中亚和南亚地区将会获得较大的改善。

A large impact on percentage crop yields in Mexico, quite distinct from neighbouring countries, reflcts the inflence of local emission changes (Shindell D. et al. 2012).

农作物百分比影响较大的墨西哥与邻国的情况截然不同，反映了当地不同的排放情况（Shindell D. et al. 2012）。

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Cryosphere: Zoom In on the Arctic

北极冰冻圈

Over the past century, the Arctic and many other portions of the earth's "cryosphere" – regions of ice and snow – have been warming two to three times faster than the global average rate, and are undergoing dramatic changes (WB & ICCI 2013). BC speeds warming, because when it deposits on the surface of ice and snow, it lowers albedo and accelerates melting. CH4 reductions also have greater temperature reduction benefits in the Arctic.

过去的一个世纪，北极及地球其他很多地区的"冰冻圈"——冰雪覆盖的地区——变暖速度是全球平均速度的 2-3 倍，并且仍在发生着剧烈的变化（WB & ICCI 2013）。黑碳会加速变暖的速度，因为吸附在冰雪表面的黑碳会降低冰雪反射阳光的能力并加速冰雪融化。减少甲烷排放也会降低北极地区的温度。

Increased melting of the cryosphere makes these regions absorb more heat by uncovering the darker, more heat absorbent land and water below, driving additional warming and melting in a positive feedback loop. Arctic sea ice coverage at the summer minimum has retreated by nearly half since the 1970´s (WB & ICCI 2013).

冰冻圈的加速融化，暴露出来的土地和水面将会吸收更多的热量，使得北极地区的气温进一步上升。自 20 世纪 70 年代以来，北极地区夏季的海冰覆盖已经消退了一半左右（WB & ICCI 2013）。

In addition, vast areas of land and coastal waters in the Arctic and sub-Arctic consist of permafrost, which contain large quantities of carbon at least equal to the amount released by all human activities to date. Global warming is also gradually causing this permafrost to thaw. While the rate of thaw and release of permafrost carbon remains highly uncertain, some CH4 and CO2 are released, representing a potentially large risk to accelerating warming further.

此外，永久冻土是北极和亚寒带大部分陆地和沿海水域的重要组成部分，这些永久冻土中蕴含的碳存量与人类活动造成的碳排放数量相当。全球变暖将逐渐导致永久冻土的解冻，从冻土中会"逃逸"出多少甲烷和二氧化碳，仍然不得而知，但这也会成为加剧全球变暖的一个巨大的潜在风险。

Beyond the Arctic, almost all land glaciers are melting rapidly, and may disappear entirely by mid-century, posing threats to water resources. Increased iceberg carving poses a threat to ships and to operations of rescue preparedness and response (IPCC 2013).

北极地区之外几乎所有的陆地冰川都在加速融化，预计到本世纪中叶将会彻底消亡，从而引发水资源危机。海洋中不断增加的冰山会给运输船只带来威胁，需做好预防和救援的准备（IPCC 2013）。

These changes pose various threats to coastal communities, infrastructures and traditional indigenous livelihoods through greater storm surge risks, faster coastal erosion, infrastructure damage from permafrost melt and more hazardous and unpredictable sea ice routes.

更大的风暴潮、更快的海岸侵蚀、永久冻土融化对基础设施的破坏以及更危险和不可预知的海冰线路，日益威胁着沿海地区的居民、基础设施和传统的土著生计方式。

Implementing a defied set of SLCP control measures could cut the rate of warming in the Arctic by up to two-thirds by mid-century, and likely produce similar climate benefits in other cryosphere regions as well (Shindell D. et al. 2012).

到本世纪中叶，采取 SCLP 减排措施将会缓解北极地区 2/3 的气温上升速度，并给其他冰冻圈区域带来相似的气候收益（Shindell D. et al. 2012）。

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The Himalayas: SLCPs in High Elevation Regions

喜马拉雅山脉：高海拔地区的 SLCPs

Rapid implementation of SLCP control measures could help cut the rate of warming over the elevated regions of the Himalayan-Tibetan plateau, and would be beneficial to human health, food security and disaster risk reduction in the region (WB & ICCI 2013).

快速采取 SLCP 减排措施将有助于缓解喜马拉雅山脉和青藏高原等高海拔地区的气温上升速度，并减少该地区的灾害风险、改善人类健康和提高粮食安全（WB & ICCI 2013）。

The Himalayas, together with the Tibetan Plateau, the Hindu Kush and the Karakoram region, are home to the largest area of glaciers and permafrost outside the Polar Regions. Like the Arctic, this region is sensitive to warming and BC pollution. Fresh water in the Hindu Kush-Himalayas plays a substantial role in both regional and global food security. Ten of the largest rivers in Asia flow through the region. More than 1.3 billion of people find their livelihoods in these river basins, which supply water for over half of Asia´s cereal production, nearly 25% of the global total. Rapid climate induced changes in the region directly affect water resources, as well as services, such as electricity, and the food supplies of 3 billion people (WB & ICCI 2013).

喜马拉雅山、青藏高原、兴都库什山和喀拉昆仑山地区是北极之外最大的冰川和永久冻土的家园。该地区和北极一样，对气候变化和黑碳污染非常敏感。兴都库什山和喜马拉雅山的淡水资源是保证全球和该地区粮食安全的关键。该地区流经的河流包括亚洲十个最大的河流，超过 13 亿居民的生计依赖于这些流域，并为亚洲一半以上的谷物产量提供水资源，约占全球总产量的 25%。该地区的快速气候变化将直接影响水资源及其服务，包括电力供应和 30 亿人的粮食供给（WB & ICCI 2013）。

Increased glacier melt also leads to increased river floods and increased risk of glacial lake outburst floods. The Himalayan-Tibetan Plateau is near large emission sources of BC, which may increase warming, especially in those regions covered by snow and ice. Over half of global BC and methane emissions occur in Asia (Bond T.C. et al. 2013).

加速融化的冰川还增加了河流洪水和冰川湖突发洪水的威胁。喜马拉雅山和青藏高原是较大的黑碳排放地区，从而加速该地区，尤其是冰雪覆盖地区的变暖速度。亚洲地区黑碳和甲烷排放占全球一半以上（Bond T.C. et al. 2013）。

Cookstoves, coal stoves and likely kerosene lamps are key sources of BC that contribute to household air pollution, which is the leading preventable risk factor for the burden of disease in South Asia (including India) (Lim S. et al. 2012). BC also affects the monsoon cycles in the region, which in turn has implications for water access and agricultural yield (UNEP 2008).

炉灶、煤炉灶和煤油灯是黑碳排放的主要来源并产生家庭空气污染，它是南亚地区（包括印度）可预防的主要疾病因素。 黑碳还会影响该地区的季风周期，进而影响水资源获取和农作物产量（UNEP 2008）。

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The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants

以减少短期气候污染物排放为目标的气候和清洁空气联盟

Building on over a decade of scientific efforts, in February 2012, the Climate and Clean Air Coalition to Reduce SLCPs (the CCAC) was launched by six governments and UNEP as the first global effort to address SLCPs as an urgent and collective challenge. Aft two years it now has more than 80 Partners, including 40 countries which have endorsed its Framework and agreed to engage in meaningful action to reduce SLCPs.

经过十多年的科学探索，2012 年 2 月联合国环境规划署联合六个国家政府正式成立以减少 SLCPs 排放为目标的气候和清洁空气联盟（CCAC），这是全球首次共同应对这项紧迫的挑战。如今，CCAC 已有 100 个合作伙伴，其中包括 45 个批准框架文件并同意采取行动减少 SLCPs 排放的国家。

The Coalition is a non-binding, voluntary international partnership, bringing together diverse, experienced, and influential players around the world to leverage high level engagement and political will and catalyze concrete and substantial action to reduce SLCPs in ways that protect the environment and public health, promote food and energy security and address near term climate change. All Partners in the Coalition recognize that its work is complementary to global efforts to reduce CO2 in particular under the UNFCCC.

联盟是一个不具法律约束力的自愿性国际合作伙伴关系，汇集世界各地多领域、经验丰富和具有影响力的政府和组织通过高层参与和政治意愿，推动具体和实质性行动减少 SLCPs 的排放，保护环境和公众健康，促进粮食和能源安全并应对短期的气候变化。联盟所有合作伙伴认识到此项工作是 UNFCCC 框架下减少 CO2 排放行动的重要补充。

The Coalition’s activities are structured around 10 high-impact initiatives led by the Partners:

联盟工作围绕由合作伙伴领导的 10 项具有高度影响力的项目展开：

1. Reducing Black Carbon Emissions from Heavy-Duty Diesel Vehicles and Engines

减少重型柴油车辆和引擎的黑碳排放

2. Reducing SLCPs from Household Cooking and Domestic Heating

减少家庭烹饪和取暖的 SLCPs 排放

3. Mitigating SLCPs from Municipal Solid Waste

缓解城市固体废物的 SLCPs 排放

4. Promoting HFC Alternative Technology and Standards

促进 HFC 替代技术和标准

5. Mitigating SLCPs and Other Pollutants from Brick Production

缓解砖生产过程中的 SLCPs 和其他污染物排放

6. Addressing SLCPs from Agriculture

解决农业的 SLCPs 排放

7. Accelerating Methane and Black Carbon Reductions from Oil and Natural Gas Production

加速减少石油和天然气生产过程中的甲烷和黑碳排放

8. Financing Mitigation of SLCPs

为缓解 SLCPs 排放融资

9. Regional Assessments of SLCPs

开展 SLCPs 地区评估

10. Supporting National Planning for Action on SLCPs

支持短期气候污染物计划国家战略行动

To learn more about the Coalition, visit us at: www.unep.org

更多联盟信息，请访问：www.unep.org

Glossary

术语

Aerosol

气雾剂

A suspension of airborne solid or liquid particles that reside in the atmosphere for at least several hours. For convenience the term aerosol, which includes both the particles and the suspending gas, is often used in this report in its plural form to mean aerosol particles.

气雾剂是指飘浮在空气几个小时并通过空气传播的固态或液态颗粒。为了方便起见，报告中一律采用该词的复数形式（包括颗粒和悬浮气体），泛指气雾剂颗粒。

Albedo

反照率

The albedo of a surface is its ability to reflect incoming solar radiation. It is expressed as a number between 0 (dark, all radiation absorbed) and 1 (total radiation reflected). The more radiation reflected, the higher the albedo. Ice and snow typically have a very high albedo.

表面反照率是指物体自身反射接收的太阳辐射的能力，用数字 0（吸收所有辐射）到 1（反射所有辐射）之间来表示。反射能力越强，反照率越高。通常情况下，冰雪具有很高的反照率。

Biomass

生物量

The total mass of living organisms in a given area or volume; dead plant material can be included as dead biomass. Biomass burning is the burning of living and dead vegetation.

生物量是指单位面积或体积内生物体的总质量；死去的植物体可以包括死去的生物量。生物量燃烧是指燃烧活的和死的植物。

Black carbon

黑碳

Operationally defied aerosol species based on measurement of light absorption and chemical reactivity and/or thermal stability. It is sometimes referred to as soot.

黑碳在操作上被解释为以光吸收、化学反应和/或热稳定性为基础的气雾剂种类。一些情况下也被定义为煤烟。

EURO VI

European emissions standards which defied acceptable limits for exhaust emissions of new vehicles sold in EU member states.

欧 6

欧洲排放标准是指在欧盟成员国出售的新型车辆尾气排放的允许界限。

Global Warming Potential

全球升温潜能值

The total energy a gas absorbs over a period of time (usually 100 years), compared to carbon dioxide.

全球升温潜能值是指特定气体和相同质量二氧化碳比较之下，一段时期内（通常为 100 年）吸收的全部能量。

Ozone

臭氧

Ozone, the triatomic form of oxygen, is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (smog). Tropospheric ozone acts as a greenhouse gas. In the stratosphere, it plays a dominant role in radiative balance and shields the Earth from excessive ultraviolet radiation.

臭氧由三个氧原子组成，是一种气态的大气成分。对流层中的臭氧包括自然形成和由人类活动排放的气体经过光化学反应后形成。对流层臭氧是一种温室气体。平流层臭氧在维持辐射平衡和保护地球不受过多紫外线辐射中扮演着非常重要的角色。

Particulate Matter Air Pollution

颗粒物空气污染

PM is a widespread air pollutant, consisting of a mixture of solid and liquid particles suspended in the air. Commonly used indicators describing PM that are relevant to health refer to the mass concentration of particles with a diameter of less than 10 μm (PM10) and of particles with a diameter of less than 2.5 μm (PM2.5).

颗粒物（PM）是一种广泛传播的空气污染物，由空气中漂浮的固态和液态颗粒组成。通常用于描述 PM 的指标与健康相关，包括直径小于 10 微米的颗粒（PM10）和直径小于 2.5 微米的颗粒（PM2.5）。

Positive feedback

积极反馈

A feedback is the way a system responds to a forcing. In the case of the climate system, a temperature forcing – like warming – can set the conditions for either the opposite effect (cooling), or further warming. The second case is known as a positive feedback, and the Arctic region is particularly rich in positive feedbacks.

反馈是一个系统回应强迫的方式。例如在气候系统中，温度强迫（如气候变暖）可以导致相反的效果（变冷或进一步变暖）。另外一个例子是积极反馈，特别是北极地区丰富的积极反馈。

Radiative forcing

辐射强迫

A measure of the influence of a particular factor (e.g. greenhouse gas (GHG), aerosol or land-use change) on the net change in the Earth's energy balance.

辐射强迫是对某个因子（温室气体、气雾剂或土地利用方式的改变）改变地球——大气系统射入和逸出能量平衡影响程度的一种度量。

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Acronyms 缩写

BC 黑碳

CFCs 氟氯碳化物

CH4 甲烷

CO 一氧化碳

CO2 二氧化碳

GHG 温室气体

GWP 全球变暖潜能

HCFCs 氢氯氟碳化物

HFCs 氢氟碳化物

NMVOCs 非甲烷挥发性有机物

NOx 一氧化二氮

O3 臭氧

ODS 消耗臭氧层物质

PM 颗粒物

RF 辐射强迫

SLCPs 短期气候污染物

SLR 海平面上升

UNEP 联合国环境规划署

WMO 世界气象组织

UNFCCC 联合国气候变化框架公约