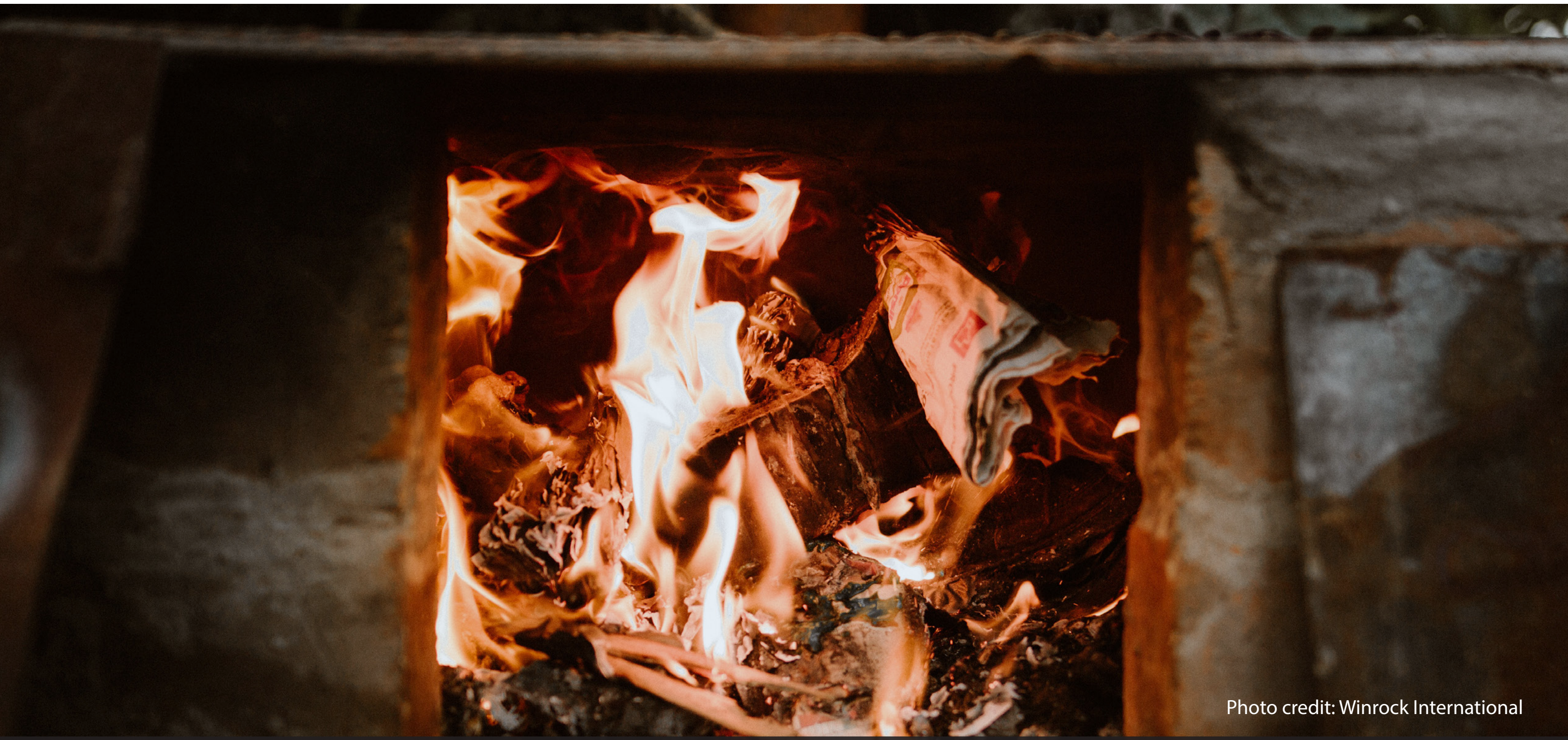
CLEAN AND EFFICIENT COOKING TECHNOLOGIES AND FUELS

3. CLIMATE IMPACTS OF TRADITIONAL STOVES AND FUELS



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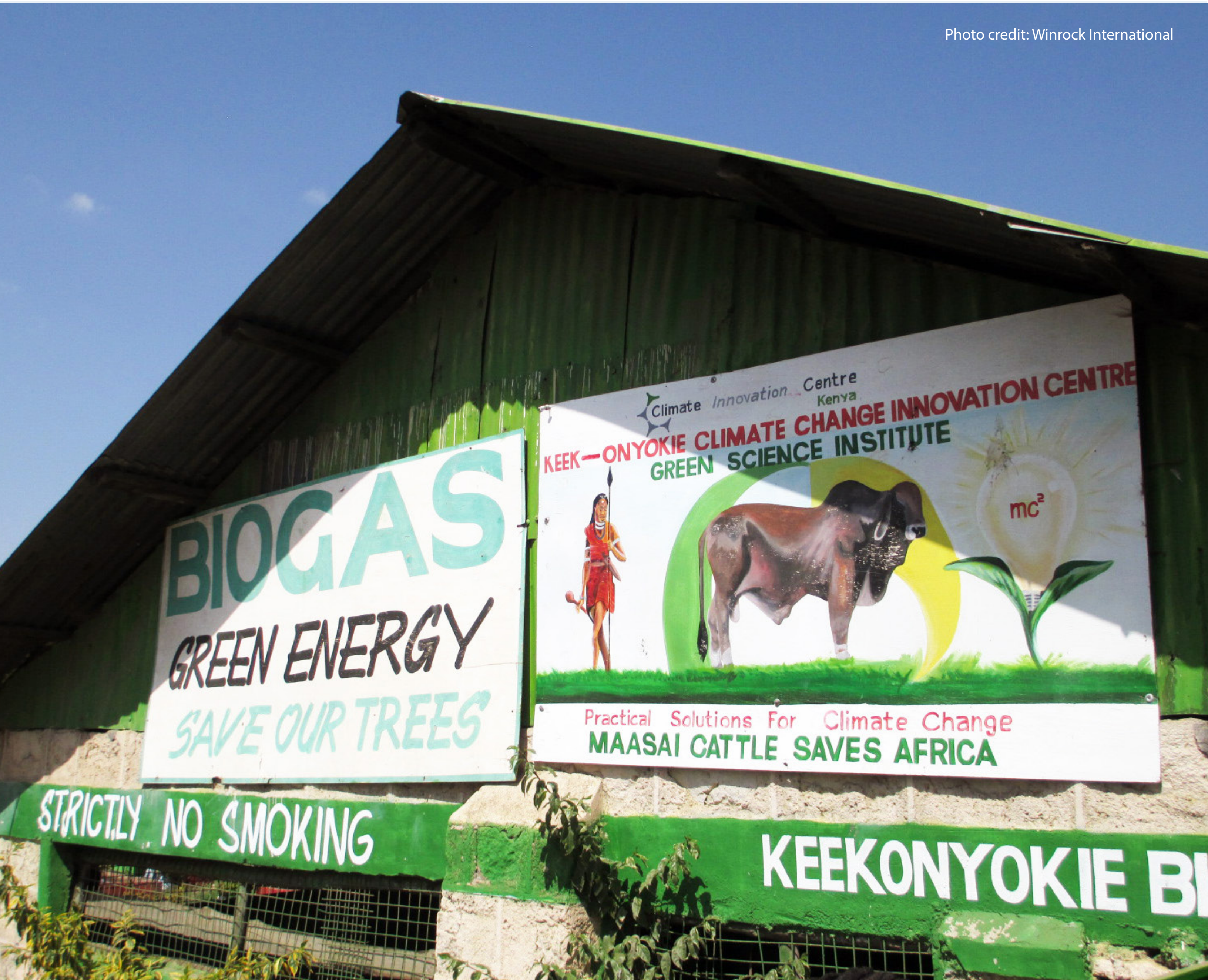
3. CLIMATE IMPACTS OF TRADITIONAL STOVES AND FUELS

Burning solid fuels for cooking emits some of the most significant contributors to global climate change, and unsustainable wood harvesting contributes to deforestation, reducing carbon uptake by forests. Increased fuel efficiency and the introduction of alternative fuels, utilizing renewable fuel sources, can reduce climate emissions caused by cooking. To achieve a significant climate impact, uptake of clean and efficient stoves and fuels must be large, and stoves must perform well in homes. Although not all climate impacts of cooking are fully understood, existing methodologies estimate that clean and efficient stoves can save anywhere from 1-3 tonnes of CO_2e/stove/year, with 1-2 tonnes being most common.



WHY IT MATTERS	Burning solid fuels for cooking emits some of the most significant contributors to global climate change, but the climate impacts of cooking, and of shifts to clean cooking, still require further research and exploration.
BEST PRACTICES	**1.** If your project has climate impact goals, make sure the technology you're promoting has been tested for total emissions, or partner with a reputable testing lab to test the technologies, including in the field, prior to dissemination, to ensure emissions reductions. **2.** Investigate carbon finance opportunities, but ensure that carbon revenues are not essential to the project's overall sustainability. Carbon prices can fluctuate dramatically, and carbon markets require significant upfront resources and time to navigate, which must be considered and planned for during project design.

CARBON FINANCE / CALCULATING CLIMATE IMPACTS

According to Bailis et al, over half of all wood harvested worldwide is used as fuel, and biomass used for cooking is 27-34% non-renewable (unsustainably harvested), with large variations by country/region. Burning solid fuels releases carbon dioxide, methane and other ozone producing gases such as carbon monoxide, as well as short-lived climate forcers like black carbon. Up to 25% of global black carbon emissions are estimated to come from burning solid fuels for household energy needs. According to a 2013 report by the Stockholm Environment Institute, the global potential for greenhouse gas (GHG) emission reductions from improved cookstove projects is estimated at 1 gigaton of carbon dioxide equivalent (CO_2e) per year. Carbon markets can incentivize reducing these emissions.

Carbon finance refers to the purchase of greenhouse gas (GHG) emission reduction credits from a registered project that has been approved to generate those carbon credits by any number of governing bodies that govern the carbon markets. To claim carbon credits, a project must first be registered to an international carbon standard in the compliance or voluntary market. The primary compliance mechanism is the Clean Development Mechanism (CDM), and the Gold Standard is the primary voluntary carbon standard. These carbon standards have sets of rules that determine what a project must do to become registered, how credits will be calculated, and what monitoring is required to verify emissions reductions. While the whole system is based on getting results at scale, there are mechanisms for smaller-scale projects to receive carbon finance through joining a small-scale Program of Activities (PoA), which is an aggregation of smaller projects. Also worth noting is that, while there have been linkages made between cookstoves and REDD+ goals, to date efforts to promote cookstoves as part of REDD+ financing mechanisms have been limited.

Carbon finance developers can help navigate the process of setting up a carbon program for a fee, as it can be complicated for those new to the system. As of 2016, carbon prices are very low, and the primary option for carbon revenues is to sell credits to a select few national governments who are occasionally willing to sign forward contracts, (wherein the price of carbon is set in advance for the duration of the project). Forward contracts are scarce but possible from EU country governments through CDM, or through the World Bank's Carbon Initiative for Development (CI-DEV) fund. Some companies are also willing to pay higher prices through forward contracts as part of corporate social responsibility initiatives. Under any of these scenarios, credit payments are received only after the project is in full implementation (e.g., after stoves are already being used in homes), which can limit the involvement of organizations that need upfront financing to get programs started, or to pay for the M&E requirements and verification costs that are needed to start and continue receiving payments.

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal, which is due to enter into force in 2020. While a carbon trading system including carbon offsets is expected to be part of the new system, what form such a market will take is unknown.

Various models exist to calculate carbon impacts. A Global Alliance-supported research project entitled "Geospatial Analysis and Modeling of Non-Renewable Biomass: WISDOM and beyond" developed two models to simulate the impacts of woodfuel consumption on forest resources at different scales. The first relies on a web-based map server that shows the results of a pantropical woodfuel sustainability analysis. Users can download estimates of overall woodfuel consumption and non-renewable wood harvesting for any geographic unit of interest. These data can be used to calculate CO_2 emissions resulting from woodfuel consumption and estimate the potential benefits of wood energy interventions in different regions. The second, NRBv1.0, is a software tool that assesses woodfuel-driven forest degradation or deforestation for smaller geographic regions. The tool uses several freely available software packages to simulate wood extraction and woody biomass regeneration within a user-defined geographic region. The objectives of simulations are 1) to demonstrate where and when woodfuel demand is likely to contribute to forest degradation and 2) model the impact of interventions that aim to reduce woodfuel consumption.

USAID and Winrock developed the AFOLU carbon calculator as part of the USAID Carbon Reporting Initiative. The calculator uses the Intergovernmental Panel on Climate Change (IPCC) accounting methods to estimate the potential climate benefits of different types of projects, including clean cooking interventions.

BLACK CARBON

Black carbon is a small, dark particle that is released as a result of incomplete combustion of solid fuels. Although black carbon is a particle rather than a greenhouse gas, it is the second largest climate warmer, after carbon dioxide. A 2013 study by black carbon expert Tami Bond and 30 other experts published in the Journal of Geophysical Research-Atmospheres says the current influence of black carbon on warming the climate may be about two-thirds of the effect of carbon dioxide. Unlike carbon dioxide, the atmospheric lifetime of black carbon is only a few days, so reducing black carbon would bring about a more rapid climate response than reductions in carbon dioxide and other long-lived greenhouse gases alone. While black carbon definitely has climate warming effects, other aerosols that are lighter in color are also emitted from the burning of biomass and fossil fuels, and these produce a cooling effect. Further complicating the issue, the impact of black carbon reductions on climate depends on geographical characteristics. For example, the warming potential of black carbon abated in the Himalayas (due to white surfaces) is much greater than in central Africa.

According to Dr. Veerabhadran Ramanathan, professor of climate sciences at the Scripps Institution of Oceanography at UC San Diego and leading expert on the role of black carbon in regional and global climate change, it is probable that greenhouse gas emissions to date will cause warming of close to 2 degrees Celsius, but that with available technologies, it is possible to cut short-lived climate pollutants drastically. He and colleagues note that reductions of 30% for methane, 75% for black carbon, and nearly 100% for the most potent hydrofluorocarbons are achievable. This would avoid up to 0.6 °C of warming by mid-century, while also slowing the rise in sea levels, the melting of glaciers, and the retreat of the Arctic ice cap[1]. Dr. Ramanathan leads Project Surya, the only project currently monetizing black carbon. Project Surya aims to mitigate the regional impacts of global warming by reducing atmospheric concentrations of black carbon, methane, and ozone,

1. http://www-ramanathan.ucsd.edu/files/pr212.pdf

Photo credit: Project Gaia

through the introduction of cleaner cooking technologies, and is currently working in India.

In 2015 The Gold Standard launched a methodology for quantifying and monitoring emissions from black carbon and other short-lived climate pollutants, in an effort to drive finance into projects that provide an immediate and measurable impact on mitigating climate change at a local level. This methodology quantifies the emissions of black carbon and other short-lived climate pollutants when wood, charcoal, animal dung or coal are burned for cooking. It also measures the reductions of these emissions when improved cookstove technologies or clean burning fuels are introduced. Rather than carbon credits, this methodology results in the issuance of black carbon certificates. There have been no transactions to date using this methodology, perhaps because of the absence of a measure like CO_2e that is widely understood and easy to monetize. Developing such a measure, or link to CO_2e, could benefit the monetization of the climate co-benefits.

Many of today's more efficient cookstoves have been shown to reduce fuel use by 30-60%, and provide cleaner, more complete combustion, which can result in fewer greenhouse gas and black carbon emissions and reduce impacts on forests. Recent evidence also demonstrates that advanced (efficient and low emission) cookstoves and fuels can reduce black carbon emissions by 50-90%. Emission reductions are not guaranteed to accompany fuel reductions, however, so it's important to measure emissions in addition to fuel use. The Gold Standard black carbon methodology includes a number of approved black carbon monitoring devices and approaches.

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