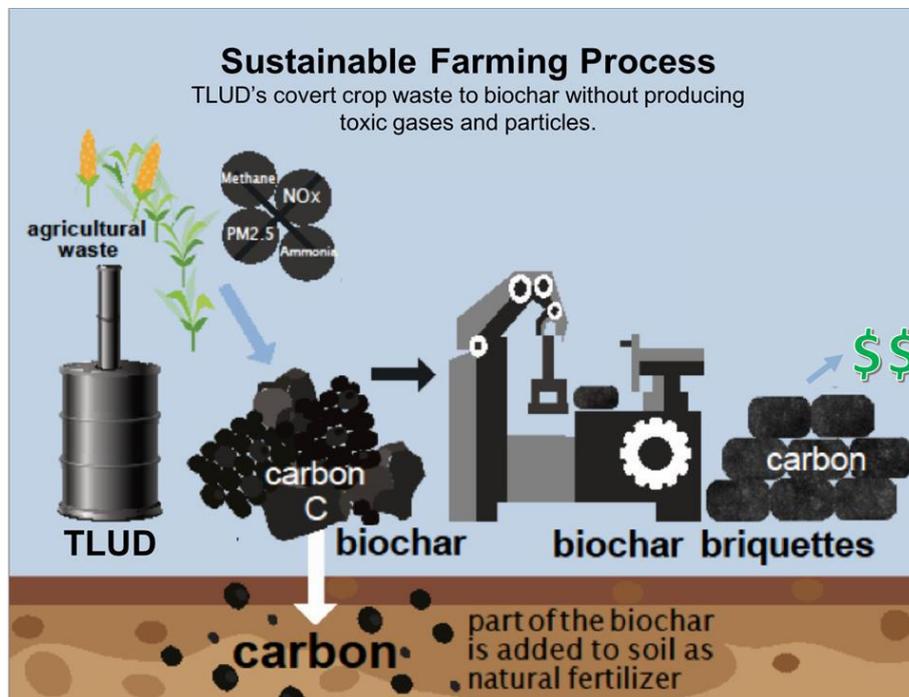


**A plan to help achieve Sustainable Development, ESG and CSR goals in the form of climate change, water, land and air pollution solutions for development in Chiang Mai, Thailand to support its World Heritage Status bid**

**The global challenge:** 6 billion tonnes of CO<sub>2</sub>, 4 billion tonnes of eCO<sub>2</sub> – particularly methane and NO<sub>x</sub> – closure of airports and schools due to haze, dramatic downturn in tourism, increase insocio-economic issues and financial hardship. 4.1 million deaths attributed to PM<sub>2.5</sub> in the developing world & serious general health hazards.

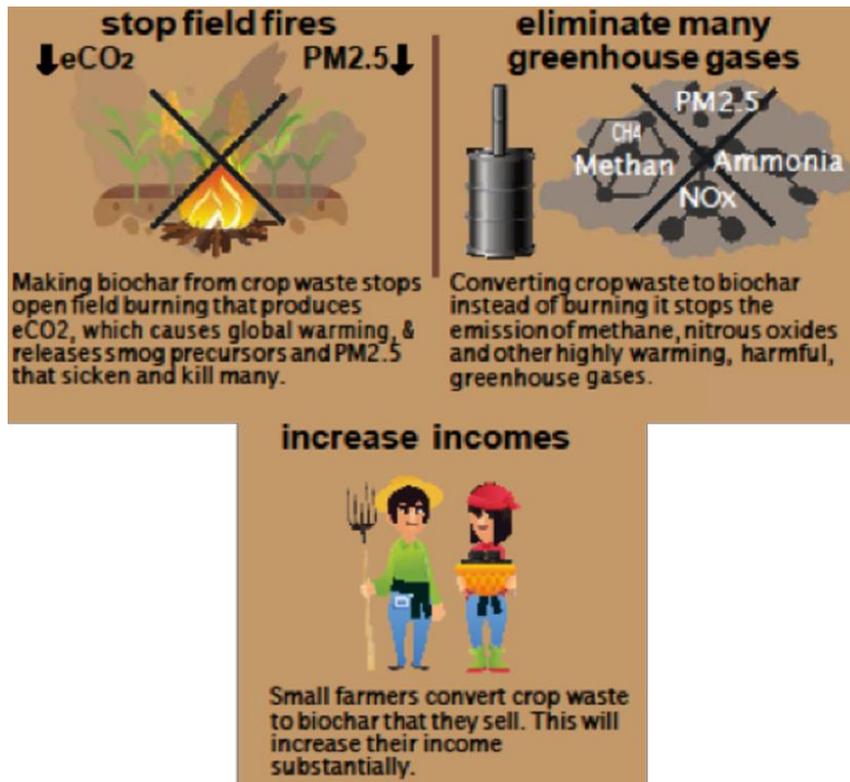
**The problem:** Open field burning of crop waste.

**A global solution:** Sustainable farming practices that provide economic incentives for rural farmers and communities. Crop waste can be easily and sustainably converted to valuable biochar using a Top Lit Up Draft (TLUD) or trench. Farmers and Villages are educated and provided equipment to manufacture biochar briquettes from crop waste and provided with biochar sales channels to benefit economically.



**Benefits:** *Environmental* - Reduction of billions of tons in CO<sub>2</sub> and eCO<sub>2</sub> particularly greenhouse gases Methane and NO<sub>x</sub>. *Health* – Reduction in millions of deaths, illnesses and hospitalizations caused by emission of millions of tonnes of PM<sub>2.5</sub>. *Social* - Substantial increase in income for farmers; new skills for rural and small farmers. *National* - \$10's – \$100's billion in savings that can be redirected to worthwhile causes, instead of being spent on health, reactive environmental measures or lost on productivity, trade and tourism due to crop haze.

**Opportunity:** Offering: Biochar Briquettes at market competitive pricing. Basic charcoal briquettes for cooking and heating are an established market across rural Thailand, Southeast Asia and the developing world. Worldwide briquette market is expected to grow at a CAGR of 7.8% over the next 5 years (\$6.7M to \$10.6M), with highest growth in the Asia-Pacific region. Biochar Briquette outperform other fuel sources. They are readily available, cheaper than gas and compared to wood and charcoal light faster, burn hotter and longer, don't smoke or smell. Currently ~ 25 million people in North and Northeast Thailand cook on wood or charcoal, as do millions more in neighboring Cambodia, Laos and Myanmar. Recent Thai government regulation barring the use of lump wood charcoal presents a huge opportunity for alternatives such as Biochar Briquettes.



A biochar programme in Chiang Mai costs \$50,000 to set up and run can be replicated throughout the Chiang Mai region. An environment education programme costs \$100,000 to set up and run. Both programmes can be **expanded exponentially**. Supporting Partners include the Four Seasons Hotel Group, the Shangri-La, the United States Consulate, local charities / NGOs and philanthropists. The US State Department and Canadian government have provided funding.

### Beyond Biochar Briquettes

#### Biochar soil amendment as a low-cost solution to widespread “poor man’s pollution”

Biochar does more than burn clean. In the soil, it has a remarkable capacity to lock up (absorb) heavy metals, industrial chemicals and pesticide residues which helps bar them from leaching into the water table or entering the food chain. Because biochar can be produced beneficially, profitably and sustainably from crop waste by poor farmers, this is very important in developing countries with large pollution problems and limited resources.

Here we will examine the case of Thailand for the simple reason that as a country with good environmental services, Thailand provides data few countries can. A major problem everywhere is the so-called “poor man’s pollution” - pollution generated by daily life that collects unnoticed in plain sight, farmers’ fertilizers and pesticides, oil and hydraulic fluid dumped at filling stations, household cleaners, paints, building materials, electronics – plowed into fields, soaked into the ground, tossed in village dumps, burned in trash fires, etc. Thailand, for example, has more than 25 battery manufacturers, millions of flashlights and cellphones with batteries, motorbikes, cars, trucks and tractors with batteries – all of which contain toxic heavy metals.

Many of these batteries end up burned in open trash fires or dumped in open landfills that owners then burn to reduce volume before covering. Even the best sanitary landfills leach poisonous liquids into local ground water and aquifers, open dumps and landfills leach heavy metals as well as organic and inorganic toxics.<sup>1</sup>

The volume of such pollution is hard to estimate, but is surely huge. How, for example, should we estimate the volume of fuel leaking into aquifers from underground tanks at gas stations or dumped out the back by do-it-yourself mechanics? How many tons of animal excrement should we assume will escape containment after heavy rains? How much toxic fallout do front yard trash fires generate? Rain washes pollutants from roads and vehicle particulate emissions from the air. Construction generates hundreds of thousands of tons of asbestos, paint, formaldehyde and other VOC emitting wastes. These are recycled as fill where rain and floodwaters can reach them. Mercury and cyanide in mine tailings pollute downstream waters. Wastewater has long concerned the government.

Similar problems bedevil the oversight of pesticides and hazardous chemicals. Thailand has the longest list of banned pesticides in Asia, but most pesticides are available on store shelves in the countryside. The responsible agencies lack the manpower to track the more than 20,000 different brand name products that contain even the 265 permitted ingredients. It is understandably still more difficult to monitor the more than 2,000 listed hazardous chemicals and the tens of thousands of products that contain them.

Thai farmers – 40% of the population occupying 40% of the country – spray as much as 150,000 tons of pesticides on crops every year. Thailand, however, lacks a pesticide management system. Likewise, it is estimated that just 5,300 of Thailand's 68,000 factories dispose of their waste properly, while an environmental activist estimates that 1.9 million tonnes of hazardous waste "goes missing" every year after leaving factory gates. Much of it ends up in rural areas where it pollutes the food chain and water supply.

PBEC members and their contacts can support biochar-based programs that address these problems village-by-village in rural areas or at the factory level. The programs are waiting. Supporting them will have immediate, tangible benefits for the environment and people at the sites. It will also generate demand for biochar and so provide all of the benefits identified to start.

A series of seminars are planned to create awareness and attract support and investment for the biochar and environment education programme which will become a key part of the UNESCO World Heritage status bid. This project can also become a benchmark and example of best practice in sustainability, ESG and CSR which can be discussed and showcased at PBEC, APEC and ASEAN forums.

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*Disclaimer: this paper must not be read as a condemnation of the Thai government's long standing effort to manage waste and pollution; to the contrary, Thailand has a long history of sustained effort to do so. It is the fact of the government's policies that makes it possible to use Thailand and no other country as an example. The proposed programs also simply recognize a reality identified long ago by scholars of bureaucratic politics: big bureaucracies are not finely tuned instruments; they mash, not slice. This said, it is important to recognize what Thailand's large, complex waste and pollution management bureaucracy has and will achieve. It has mobilized huge amounts of public capital to address the large-scale issues best addressed by broad legislation, regulation and central bureaucracies. The most immediate water pollution problem that Thai citizens face, however, comes not from large-scale, centralized sources, but from tens of thousands of tiny sources scattered across the countryside. These are not realistically within the grasp of central authority. Small or not, collectively these sources are deadly today and will only get more so over the years that it will take for an improved national regulatory system to manage them better. In the meantime, ways to minimize the accumulation of waste and pollution to which citizens are exposed must be found. These approaches are not just for Thailand, indeed, it offers even more to the great majority of developing countries that lack Thailand's wealth, technical expertise, and waste and pollution management capacity.*

<sup>1</sup>Citation reports over 200 total chemicals in common landfill leachates, 35 of which are classified as toxic or potentially carcinogenic.