



# *Improved Cooking Stove*

*Environment friendly, cleaner burning & more fuel efficient*

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# Traditional Cooking Stoves

- ▶ Open cooking fire (e.g. 3-stone fires, open pit fire, etc.)
- ▶ Liquefied petroleum gas (LPG) stove
- ▶ Kerosene stove
- ▶ Conventional clay stove
- ▶ Electric stove



# Liquefied petroleum gas (LPG) stove

- ▶ very convenient (fast cooking w/o smoke emissions) but expensive (about \$15 per 11 Kgs. tank)
- ▶ fuel of choice for urban dwellers but constitute a large percentage of an urban poor family's monthly expenses
- ▶ imported raw materials that help deplete the country's dollar reserves
- ▶ derived from a non-renewable resource



# Conventional Clay/Cement Stove

- ▶ Cooking stove made of clay or cement that mostly utilizes wood charcoal as fuel is one of the numerous traditional stoves in the Philippines
- ▶ Charcoals are popular in the urban areas due to its availability & transportability. Although charcoals emit less PM-particulate matter (since ! of it were already emitted during its production) it emit a lot of CO-carbon monoxide during the burning process





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# CO-Carbon Monoxide

- ▶ non-irritating, colorless, tasteless, odorless gas and a waste product of incomplete combustion
- ▶ a flammable gas that is lighter than air
- ▶ interferes with the blood's ability to carry oxygen (it combines with the hemoglobin of blood 250 times better than oxygen does, thus denying body tissues a sufficient supply of oxygen)
- ▶ at low levels, CO exposure causes no obvious symptoms. Symptoms of acute CO poisoning are headaches, dizziness, sleepiness, nausea, vomiting, and collapse
- ▶ CO poisoning can lead to coma and death



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# Black Carbon /Soot /Particulate Matter- PM

- ▶ each year, more than 1.6 million deaths among women and children worldwide are attributed to smoke inhalation during indoor cooking using biomass fuels, one of the primary sources of black carbon (according to the World Health Organization)
- ▶ according to a study, sharply reducing the amount of black carbon (commonly known as soot) in the atmosphere could help slow global warming and buy precious time in the long-term fight against climate change
- ▶ two researchers in the United States calculated that black carbon is the second largest contributor to global warming after CO<sub>2</sub>-carbon dioxide
- ▶ a major focus on decreasing black carbon emissions offers an opportunity to mitigate the effects of global warming trends in the short-term since soot reduction can only help delay the unprecedented climate change
- ▶ providing alternative energy-efficient and smoke-free cookers could have major impacts on reducing soot's role in global warming



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# More health effects

- ▶ studies estimate that tens of thousands of elderly people die prematurely each year from exposure to ambient levels of fine particles
- ▶ the average adult breathes 13,000 liters of air per day; children breathe 50 percent more air per pound of body weight than adults
- ▶ because children's respiratory systems are still developing, they are more susceptible to environmental threats than healthy adults
- ▶ Breathing fine particles, alone or in combination with other pollutants, can aggravate asthma, causing greater use of medication and resulting in more medical treatment and hospital visits





# Disadvantages of Traditional Stoves

- ▶ traditional stoves are effective at turning biomass fuel into energy, but inefficient at transferring the released energy into the cooking vessel
- ▶ most of the released energy in the fuel is wasted heating the surrounding air rather than the cooking vessel
- ▶ the inefficient transfer of energy requires the use of more biomass fuel, w/c has to be harvested from the surrounding environment, causing environmental stress
- ▶ biomass fuels release large amounts of air pollutants when burned on traditional stoves (due to incomplete combustion), and these pollutants become concentrated in inadequately ventilated homes and dwellings
- ▶ when fanning or blowing to increase the fire, ashes usually end up in surrounding air or in the frying pan (cooking vessel) itself



# How to improve a cooking stove

- ▶ the main way to improve the fuel efficiency of stoves is to improve the heat transfer from the fire to the cooking vessel
- ▶ in order to reduce air pollution, stoves must improve combustion of the biomass fuel, which means reducing the amount of smoke and harmful emissions produced during the burning process. Fully burned biomass fuel produces less smoke and emissions.
- ▶ the key to efficient combustion is to burn biomass fuel at high temperatures w/c can be achieved by having a good air draft into the fire and good insulation around the fire amongst others.



# An improved Cooking Stove

- ▶ use 30-50% less biomass fuel
- ▶ efficient combustion ensures less emissions
- ▶ can even use cardboard and old newspapers as fuel
- ▶ more safer to use



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# Can even use cardboard & paper as an alternative fuel

- ▶ not all kinds of papers & cardboards are being purchased by recyclers. If accepted by recyclers, papers (e.g. old newspapers) are bought at a low price. It will have more value as a cooking fuel since the cost of biomass fuel (e.g. charcoal) that it will replace is very high
- ▶ many people just dispose their paper & cardboard wastes to unsanitary landfills or open dumpsites where they just spontaneously burn
- ▶ for those who have the time, patience and wanted to save on fuel cost, they can use carton boxes, old notebooks, telephone directories, paper packaging, envelopes, folders, newspapers, etc. as a free alternative fuel
- ▶ paper and firewood or scrap wood is a good combination fuel (i.e. inserting twisted papers while burning firewood)
- ▶ unwanted papers from the mailbox can now be useful as fuel





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# Using Charcoal as fuel in the improved cooking stove

- ▶ the grate should be positioned at the upper most part of the bottom opening to allow air to enter from the underside to create a draft





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*Crumpled  
newspaper  
soaked w/  
kerosene*

*starting a fire w/  
charcoal is a great  
challenge for the  
unskilled, so this  
soaked paper can do  
the trick in less than 5  
minutes*



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# Insulated improved cooking stove

- ▶ insulated by cement enclosed in a biscuit tin can
- ▶ with a 3-inch skirt
- ▶ good for cooking bulalo or foods that need long hours of cooking





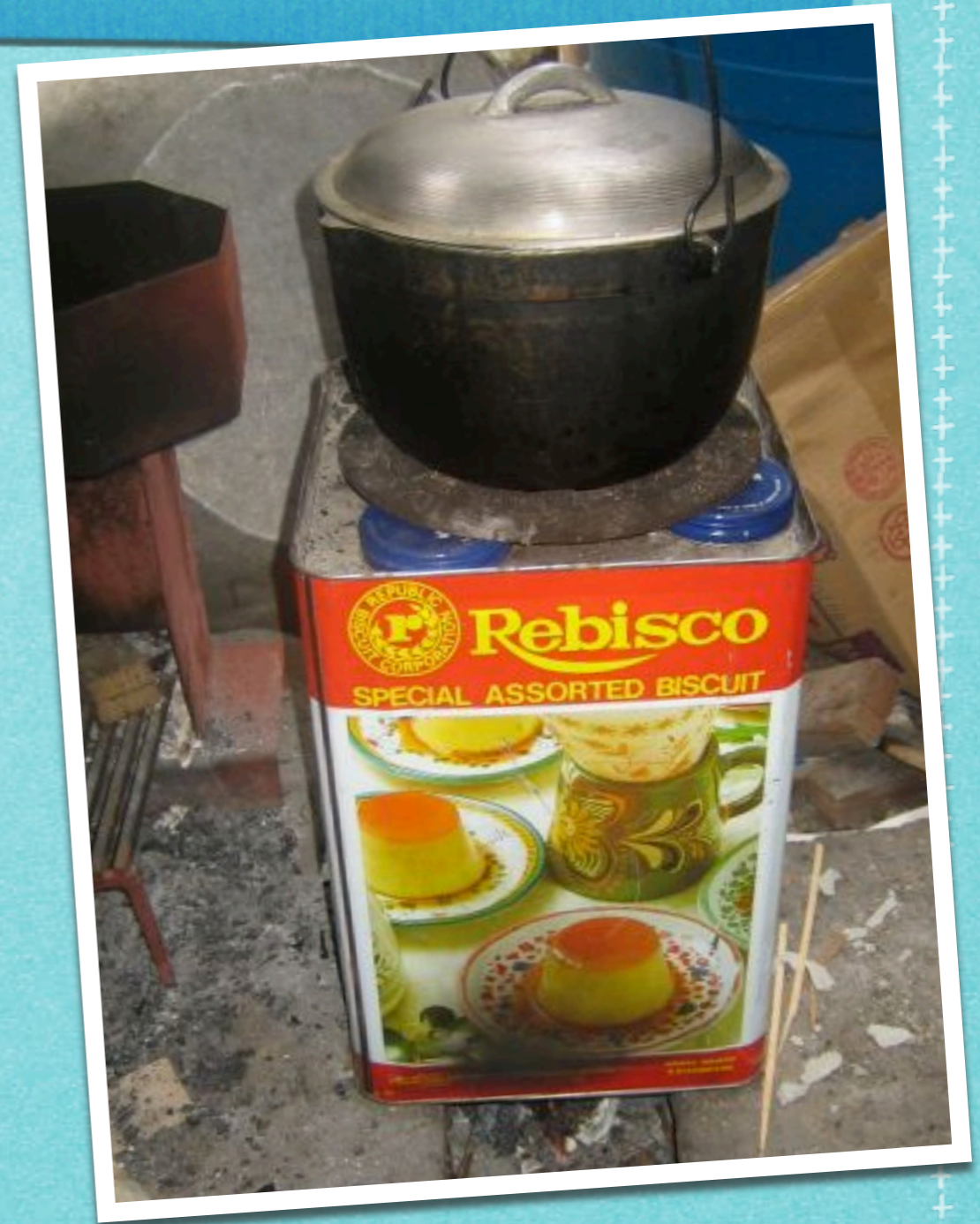
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# Charcoal fed rocket stove

- ▶ heat is concentrated at the bottom of the cooking vessel
- ▶ the 13 inch long chimney increases air draft that burns carbon monoxide (made of 3-med sized paint cans)
- ▶ less CO means better air quality
- ▶ insulated by a mixture of cement and sawdust enclosed in a biscuit tin can





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# Conclusions

- ▶ urban poor communities who can't always afford to spend money on convenient LPGs can improve their biomass cooking stove to be more sustainable, i.e. save money using less fuel and save the environment by generating less air pollution while protecting their own health from poor air quality thru efficient combustion
- ▶ there is a persistent illegal charcoal trade in the Phils. and until a solution to stop this is in place, we can only help by reducing the demand thru efficient utilization of charcoal as cooking fuel
- ▶ access to the environment-friendly charcoal briquette projects in the country can enhance the sustainability of utilizing improved cooking stoves



# Conclusions

- ▶ for those who recycle wood waste as fuel, they can now cook more food w/ the same amount of scrap wood w/ an improved cooking stove
- ▶ people don't need to store large volumes of wood waste to cook a week's meal
- ▶ firewood and charcoal are not sustainably harvested in the Philippines so we have to use them wisely
- ▶ firewood are more expensive in urban areas due to its bulkiness that affect storage and transport cost
- ▶ improving cooking stoves can have a positive impact on household economy and on the reduction of carbon black/soot/particulate matter



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# Next Steps

- ▶ a workshop to help the urban poor communities of GK Kapalaran & St. Hannibal Empowerment Center beneficiaries produce their own improved cooking stoves (this will lower their investment cost since they get free labor from their own sweat) as well as its use will be conducted as part of an overall Energy Efficiency Project
- ▶ an efficient charcoal fueled rocket stove will likewise be introduced in the workshop as well as solar cookers (cooking food from the free energy of the sun during sunny days) -this were some of the wish list output in the basic environmental awareness workshop conducted in 2007 w/ urban poor participants
- ▶ if we can reach a million biomass fuel users in the Philippines and help them save 30-50% on fuel costs, then the demand for firewood and charcoal can be cut almost into half that can lessen the amount of trees to be cut by “kaingeros” thereby making a difference
- ▶ a holistic energy efficiency program for urban poor households utilizing one of the environmental management accounting tools, i.e. ‘environmental budgeting’ is currently under development



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*Thank You!*

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