GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

The Worst Health Risk You've Never Heard Of

NIH Household Air Pollution Training Course

Jacob E. Moss, U.S. Department of State

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A Little Perspective on Poor Air Quality
($PM_{2.5}$ as an indicator)

Chicago, IL: August 16, 2000
$PM_{2.5}$ < 10 µg/m³

Chicago, IL: August 26, 2000
$PM_{2.5}$ = 34 µg/m³

Home with Open Fire (Guatemala)
Peak $PM_{2.5}$ = 8670 µg/m³
Typical 24-hr : 100s - low 1000s µg/m³

Some Pollutants in Indoor Smoke	**Criteria Pollutants:** $PM_{2.5}$, CO, NO_2 **Toxics:** formaldehyde, benzene, 1-3 butadiene, benzo[α]pyrene **Climate Forcers:** CO_2 (partial), CH_4, CO, NMHCs, BC, OC **For Coal:** CO_2 (full), SO_2, As, Pb, Hg, & F

	Annual		24-hour	
	EPA Standard	WHO Guideline	EPA Standard	WHO Guideline
$PM_{2.5}$	15.0 µg/m³	10.0 µg/m³	35 µg/m³	25.0 µg/m³

A Little Perspective on Fire & Cooking

Originally: fire via preserving natural embers

Paleolithic Era: fire created (friction, flint)

Neolithic Era: coal use in China

3rd Century B.C.: closed clay stoves in China and Japan

577: early match in China

Middle Ages: brick/mortar stoves in Europe – 1st use of chimney

16th Century: design improvements – fire chamber

18th Century: Europe's 1st completely enclosed fire stove; cast iron wood stoves in qty

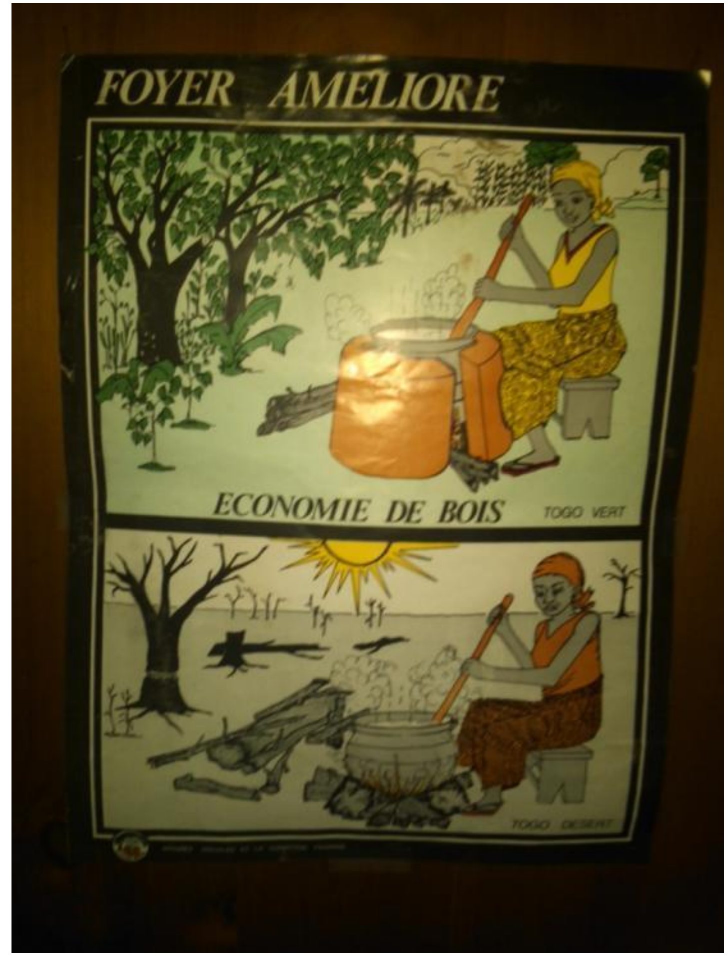
19th Century: wood stove improved; modern match (1805); gas stove developed (1820s) & commercialized (1860s); electric stove developed (1892)

20th Century: modern stoves commercialized, including electric, glass-ceramic, and electromagnetic induction stoves, and microwave ovens

Question: How many cookstoves do you have in your home?

A Brief History of "Improved Cookstoves": *1970s-1990s*

- **Focus on forestry and fuel use**
  - Lots of individual NGO programs
  - Very little rigor on testing or design
  - Initial EPA work on pollutants
  - Initial international efforts (WB, UN, GTZ,…)
- **China's national program**
  - 180 million efficient stoves distributed
  - Transition to private industry trade effort
  - It can be done, but not entirely replicable
- **India's national program**
  - 30 million efficient stoves distributed
  - Very mixed results – greatest success where commercial dissemination model used

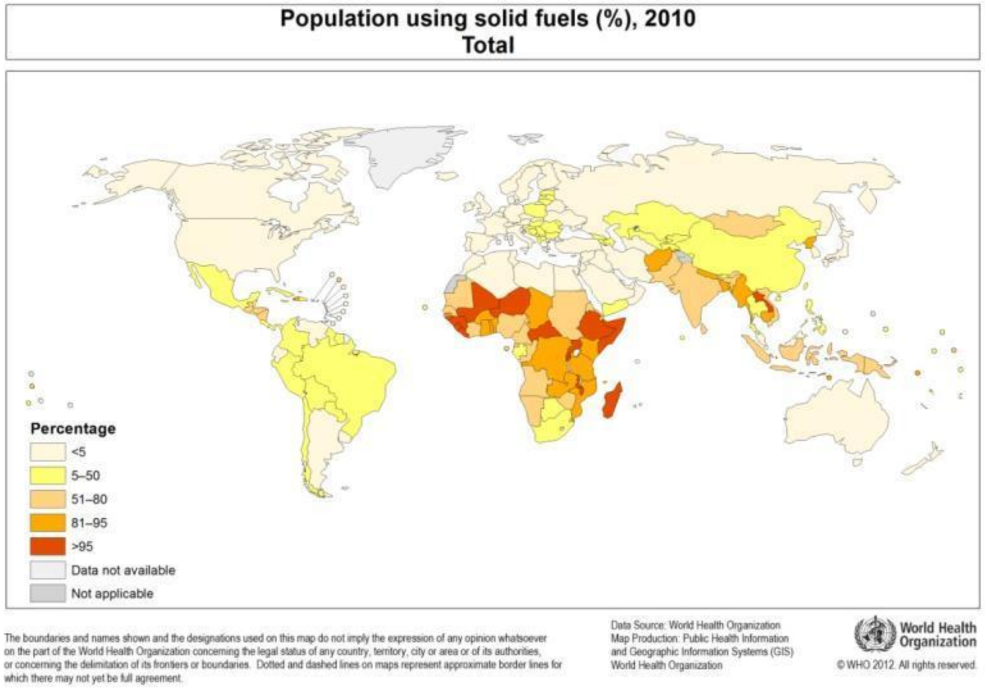


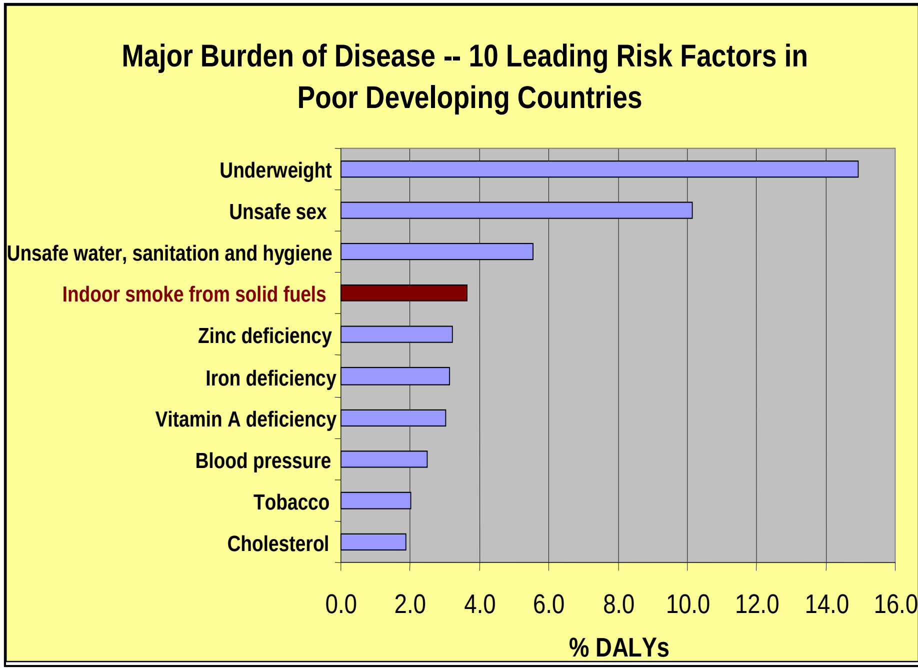
Peace Corps Togo (1988)

A Brief History of "Improved Cookstoves": *interest in health impacts (thanks to Kirk)*

- 1981: first personal exposure from cookstoves measured in India
- 1986-1989: first RCT proposals to do stove studies
- 1991-1999: Guatemala pilots – does stove work and do people use it?
- 2001: NIEHS funding secured for Guatemala study
- 2002-2006: field work for Guatemala study
- 2004 Global CRA: 1.5 million deaths/year from IAP
- 2000s: NIH funds RCTs in Nepal and Ghana
- 2007: WHO published National Burden of Disease from IAP
- 2009: WHO Global Health Risks report, 2.0 million deaths/yr from IAP
- 2011: Guatemala study results published
- 2012?: Revised Global CRA (with CVD, lung cancer, AAQ, cataracts?)

Nearly Half the World Still Uses Solid Fuels and Crude Stoves for Home Cooking and Heating





Indoor smoke from cookstoves:

- **Leads to 2 million premature deaths each year**
- **Is one of the 5 Worst Health Risk Factor in Poor Developing Countries**

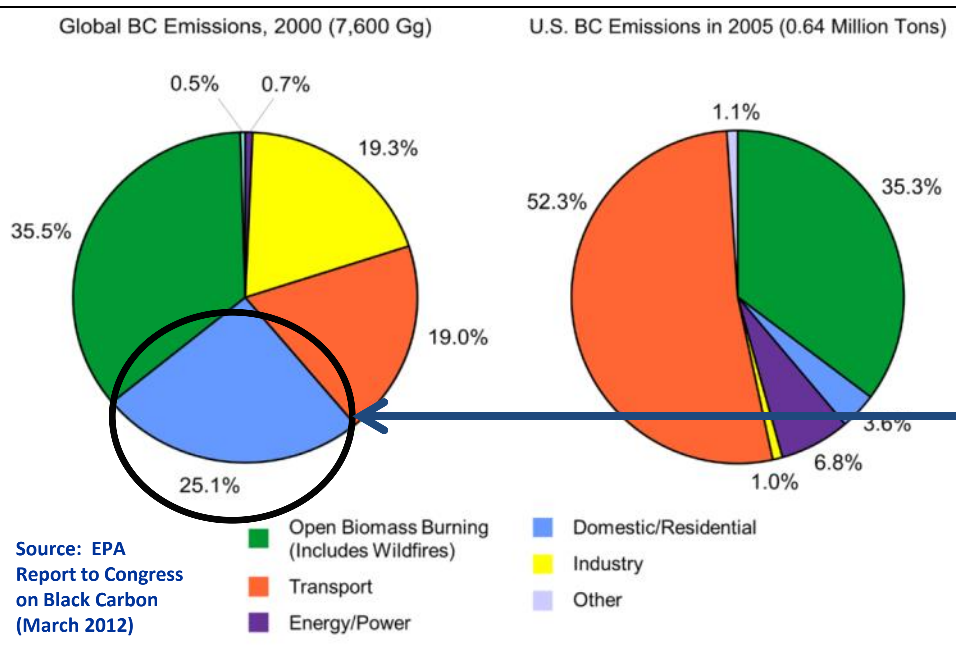
A Brief History of "Improved Cookstoves":
2000s, launch of new generation of efforts

- Shell Foundation in 2001
- Partnership for Clean Indoor Air 2002
- GIZ/HERA programs
- Humanitarian efforts led by WFP and others
- Heavy and new found focus on rigor:
  - Testing in lab and field
  - Evaluation
  - Improving stoves/fuels
- Commercial focus for scale

Links to climate create significant opportunities

Carbon Financing

- typical savings from an improved stove = ~0.5-2 tCO_2-e/year
- demands monitoring for results
- incentivizes large-scale efforts that endure
- can help reduce the price of efficient solutions



Source: EPA Report to Congress on Black Carbon (March 2012)

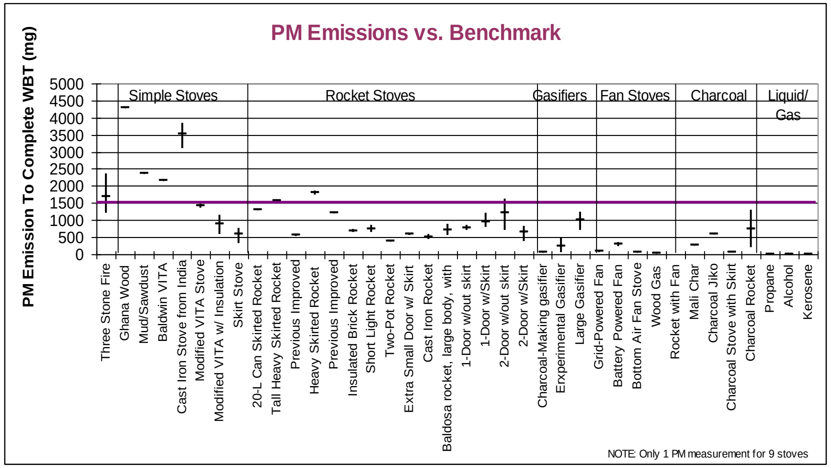
Black Carbon: a short-term, but potent climate forcer

Cookstoves represent 21% of the global black carbon inventory.

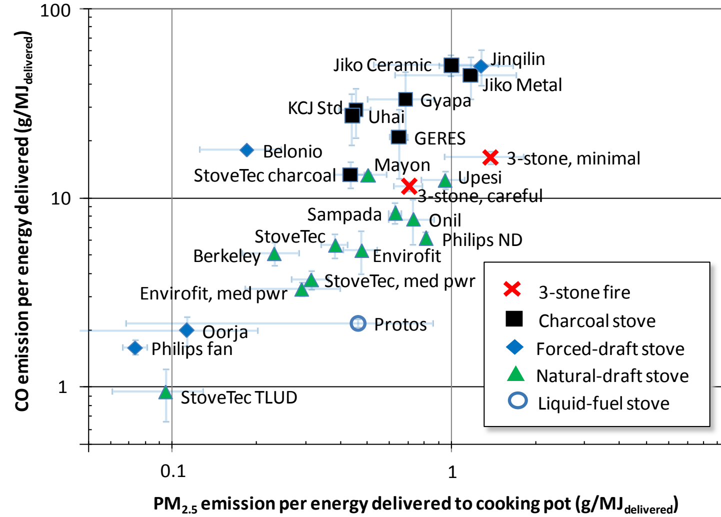
A Brief History of "Improved Cookstoves": late 2000s to present

The sector begins to mature….

Rigor and performance testing in the lab

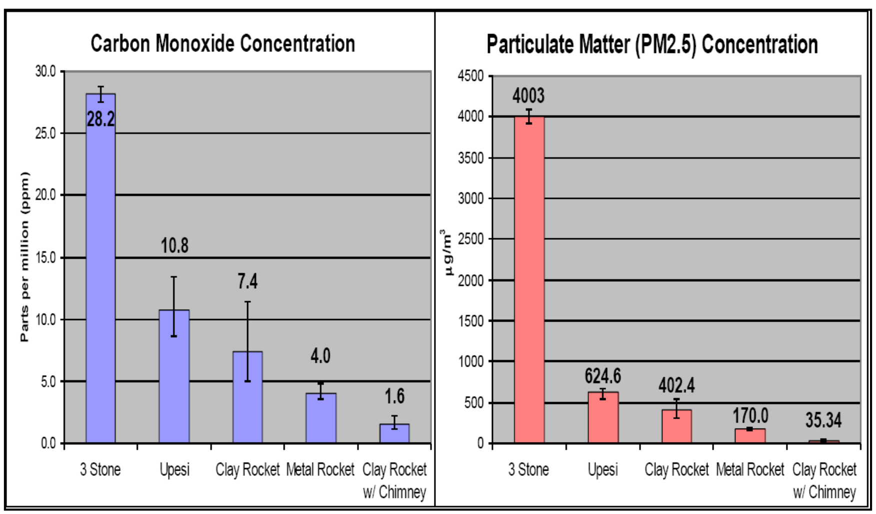


Shell Foundation/Aprovecho lab benchmarks

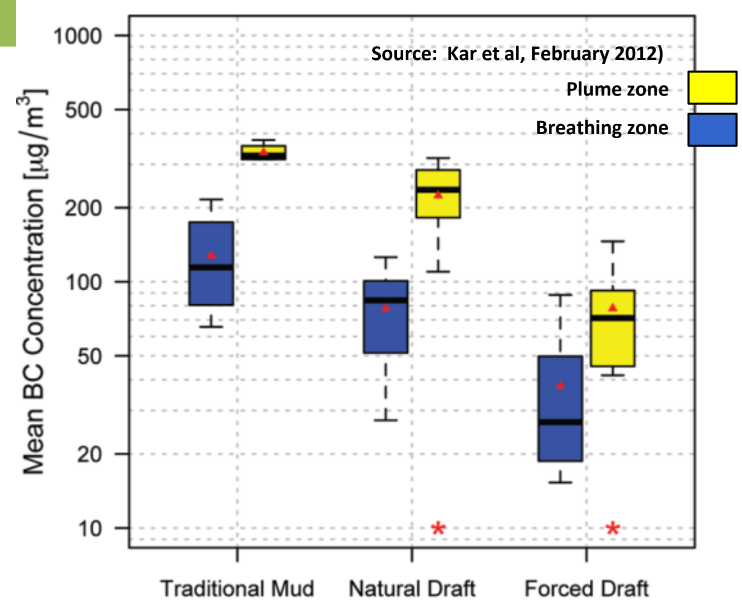


U.S. EPA lab stove testing (2010)

… and in the field



Columbia Univ. MVP field testing (2009)



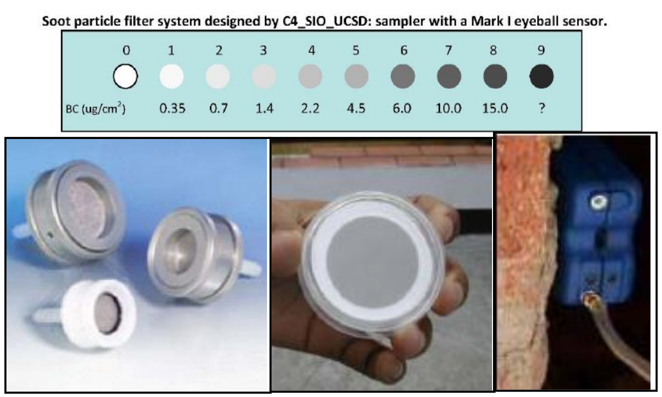
Field tests for black carbon emission (2012)

Easy-to-use and high quality monitoring devices (examples)

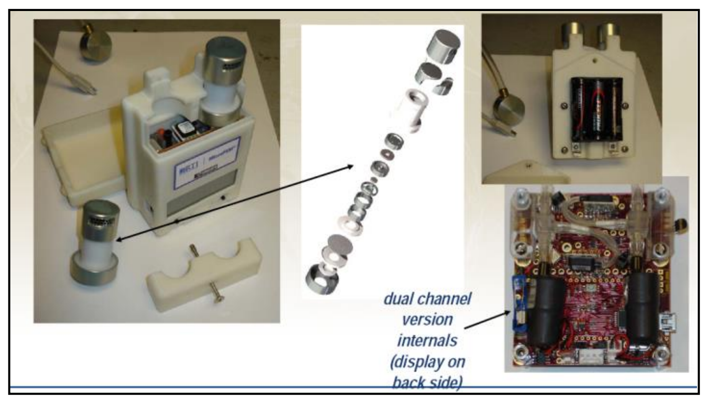
Fine particle monitor (UC/Berkeley)

Portable emissions testing kit (Aprovecho Research Center)

Temperature dataloggers as stove use monitors (Thermochron iButtons®)



Particle filter system (UCSD, for Project Surya)



Several personal exposure monitors (RTI MicroPEM shown here; also UC/Berkeley & Aprovecho)

Mobile personal sensing (UCLA/CENS, with Qualcomm phones)

New stove/fuel technologies in the market (examples)

Intermediate Stoves

GERES charcoal stove (SE Asia)

Over $1M carbon financing in 2008; over 1 million sales

StoveTec wood or charcoal stove

Mass production for export at low cost globally

Envirofit wood stoves – stand alone and build in place

Mass production for export at low cost globally

HELPS wood plancha stove (Guatemala)

Very durable, very safe, stove with chimney designed for local use

Innovative Element

Advanced Stoves/Fuels

Philips fan stove (Lesotho/Africa)

Very clean, fast, & durable; turn down capacity; many fuels

Alpha Eco Chuhlafan stove (India)

Very clean, fast, and durable;

Oorja pellet fan stove (India)

Very clean; pellets from local ag waste; emerging mkt vision

Ethanol: Dometic stove (Mozambique)

Very clean & safe; policy issues re. ethanol at scale

SNV home biogas system (Africa)

Extremely clean, but more costly; gas from household waste

Innovative Element

Examples: Advanced stoves in the pipeline

Biolite fan stove w/USB (global)

Side-fed; can charge cell phone or LEDs; set to begin manufacture in summer 2012

TERI fan stove (India)

Very clean; made in India; prototype field tested

TERI 2-burner fan stove

First advanced 2-burner stove (prototype only); made in India

Envirofit fan stove

Very clean; (prototype only)

Turbococina wood stove (El Salvador)

Advanced gasifier stove for institutions – home model currently being refined

Xunda wood fan stove (China)

Very clean; being adapted for use in global markets

RTI fan stove attachment (global)

Boosts performance of intermediate stove nearly to that of advanced fan stove (prototype being field tested)

A variety of business models are reaching significant scale (examples)

Government-led Efforts: A government leads a domestic effort to bring clean fuels and/or stoves to its population, often in partnership with private, multilateral, and other partners.

Examples:
- **India**
- **Uganda and GIZ**
- **Peru**
- **Ethiopia**
- **Indonesia & LPG**

Local Factory Selling Directly: A local company manufactures, markets, and sells stoves directly – often in partnership with (and initial funding from) NGO partners.

Examples:
- **GERES/Cambodia**
- **HELPS/Guatemala**
- **First Energy/India**
- **Ugastove/Uganda**
- **Prakti/India**
- **JikoPoa/Kenya**

International Manufacture/Local Distribution: Central, high-quality, and rapidly scalable production of off-the-shelf stove to overseas partners for distribution, sales, & service.

Examples:
- **CleanStar/Dometic**
- **EnviroFit**
- **EcoZoom**
- **SEWA (women)**
- **Inyenyeri/Rwanda**

Impact Investing with Local Partners: Global investors partner with donors to support scalable local production and business model.

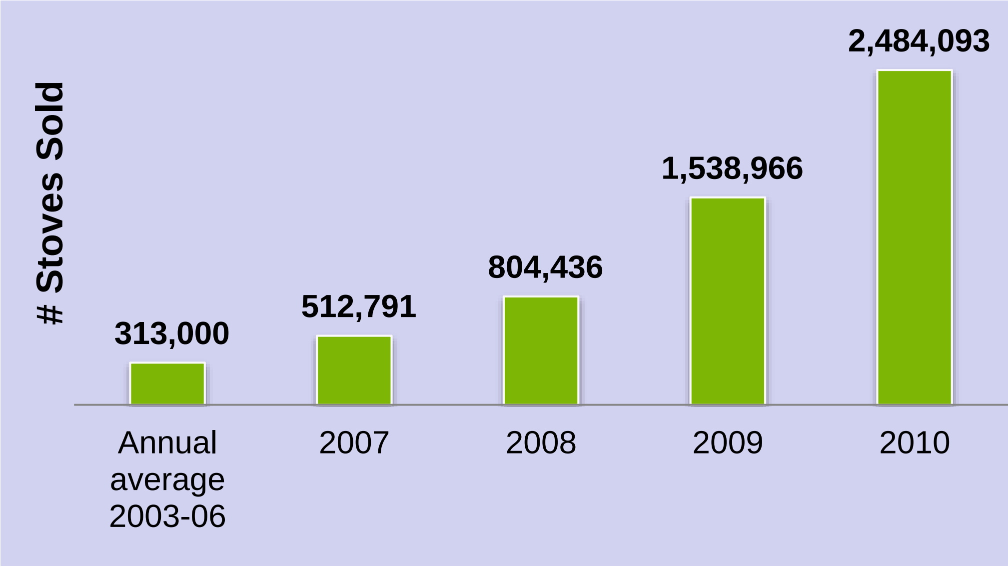
Examples:
- **Paradigm Project**
- **E+Co**
- **C-Quest**
- **Soros EDF**

Partnership for Clean Indoor Air Results Reporting

- **PCIA Launch:** at the 2002 World Summit on Sustainable Development (Johannesburg)

- **PCIA Goal:** Increase the use of clean, reliable, affordable, efficient, and safe home cooking and heating practices that reduce exposure to indoor air pollution.

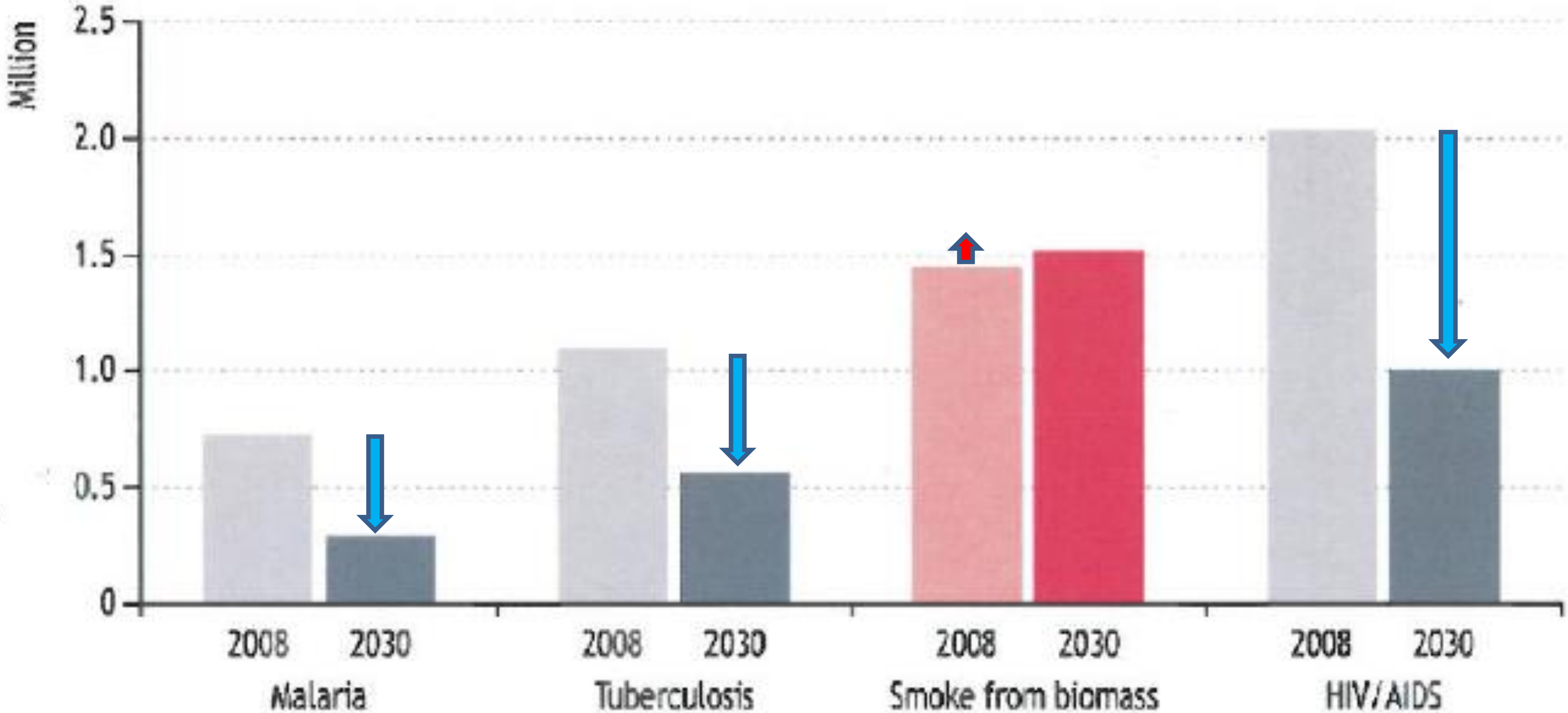
- **Breakthrough Growth:**
  – from 13 to over 600 partners
  – partners' results have grown dramatically in recent years



But, that's not enough…

Source: IEA, 2010

Figure 5: Premature annual deaths from household air pollution and other diseases



Sources: Mathers and Loncar (2006); WHO (2008); Smith *et al.*, (2004); WHO (2004) and IEA analysis.

Launch of the Global Alliance for Clean Cookstoves

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

"The benefits from this initiative will be cleaner and safer homes, and that will in turn, ripple out for healthier families, stronger communities, and more stable societies…. This could be as transformative as bed nets or even vaccines."

Secretary of State Hillary Clinton, September 21, 2010

U.S. Commitment: 5+ years, over $117M

Diplomacy

- Sec. Clinton
- State Department
- U.S. embassies
- U.S. officials

Health $27.7M

- NIH
- CDC
- EPA
- USAID
- HHS/OGA

Technology and Fuels $18.3M

- DOE
- EPA
- CDC
- USAID
- USDA

Climate $3.8M

- EPA
- NOAA

Financing $50M

- OPIC
- USAID

Implementation $10.6M

- USAID
- EPA
- State Dept.
- MCC

Adoption $5.8M

- USAID
- CDC
- NIH
- Peace Corps

The Global Alliance for Clean Cookstoves

Problem	Every day, 3 billion people (500 million households) rely on solid fuels to power their rudimentary stoves, leading to 2 million deaths annually, wasted productivity, and environmental degradation.
Mission	Save lives, improve livelihoods, empower women, and preserve the environment by creating a thriving global market for clean and efficient cookstoves and fuels.
Goal	100 million households adopt clean and efficient cookstoves and fuels by 2020.
Vision	Universal adoption of clean and efficient cookstoves and fuels.

The Alliance convened the sector to develop a cohesive strategy to ignite change.

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

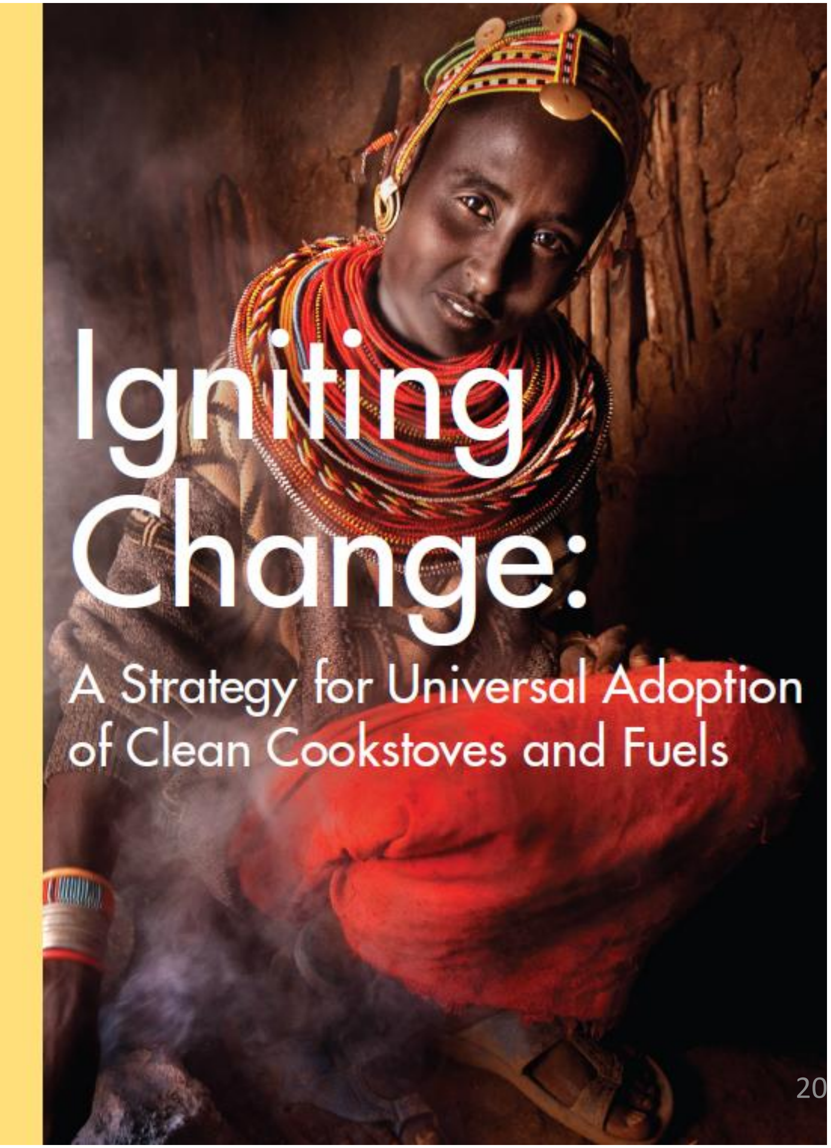
More than 350

practitioners and other experts

11 expert Working Groups

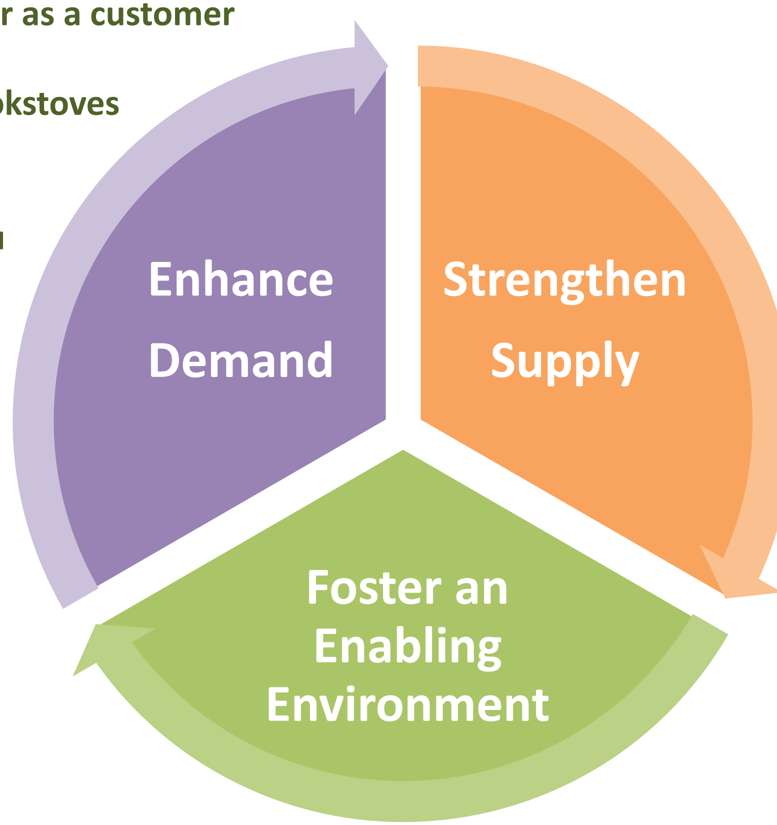
6 months of engagement

Strategy report released in November 2011!



A three-pronged strategy has been developed to spur the clean cookstove market.

- Understand and motivate the user as a customer
- Reach the last mile
- Finance the purchase of clean cookstoves and fuels
- Develop better cookstove technologies and a broader menu of options



- Finance clean cookstoves and fuels at scale
- Access carbon finance
- Build an inclusive value chain for clean cookstoves and fuels
- Gather better market intelligence
- Ensure access for vulnerable populations (humanitarian)

- Promote international standards and rigorous testing protocols, locally and globally
- Champion the sector to build awareness
- Further document the evidence base (health, climate, and gender)
- Engage national and local stakeholders
- Develop credible monitoring and evaluation systems

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

Nearly 400 Partners and Growing

Donor Countries

Canada
Denmark
Finland
Germany
Italy
Ireland
Malta
Netherlands
Norway
Spain
Sweden
United Kingdom
United States

Private Sector Donors

DOW CORNING
Morgan Stanley
Deloitte.
BAKER & McKENZIE
B/S/H/
FUJI TELEVISION NETWORK, INC.

NGO and MFI

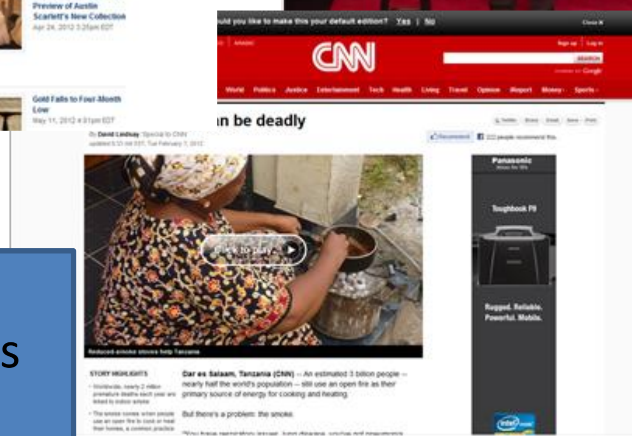
UNITED NATIONS FOUNDATION
SHELL FOUNDATION
BARR FOUNDATION
SNV Connecting People's Capacities
THE WORLD BANK
IDB
OSPREY FOUNDATION

National Partners

Afghanistan
Bangladesh
Burkina Faso
Cambodia
China
Colombia
El Salvador
Ethiopia
Ghana
Guatemala
Kenya
Laos
Lesotho
Malawi
Mexico
Nepal
Nigeria
Rwanda
South Africa
Tanzania
Peru
Viet Nam
Uganda

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

The Alliance continues to *Champion the Issue* through variety of supporters, channels and events.



Julia Roberts during Alliance Video recording

UN Welcome to the United Nations. It's your world.

RIO+20 United Nations Conference on Sustainable Development

Key Year 2 Milestones/Progress

- **Strategy and Partnership:**
  - **Strategy:** issued *Igniting Change* and ten-year strategic business plan
  - **Resources:** Raised over $29 million in total for the Alliance, and leveraged more than $120 million in parallel funding for the sector
  - **Partners:** grew partnership base 130% to more than 400 organizations across six continents – including 16 new national partners
- **Enabling the Sector**
  - **Standards:** developed consensus guidelines and initiated standards for cookstove efficiency, safety, and emissions through an ISO process
  - **Country Outreach:** held stakeholder consultations in 18 countries, completed 16 market assessments; and initiated country action plans in 6 countries
  - **Research:** Commissioned $4 million in research in the areas of child survival, climate change, gender and stove testing centers
  - **Testing Inventory:** developed a stove performance inventory with data from over 600 tests to compare lab and field results and set credible standards

Announcements made at Alliance's 2nd Anniversary Celebration (9/24/12)

- **First priority countries:** Bangladesh, China, Ghana, Kenya, Nigeria, and Uganda
- **Investment:**
  - **Spark Fund:** $2 million to support capacity building for entrepreneurs
  - **$9 million investment:** by Soros Economic Development Fund and the Industrialization Fund for Developing Countries in CleanStar Mozambique
  - **Loan guarantee mechanism:** with Sweden to drive sector investment
  - **World Lung Foundation:** support for Alliance child health research
- **Leadership:**
  - **PCIA Integration:** announced integration of PCIA into Alliance
  - **Alliance Leadership Council:** with former Irish president Mary Robinson and Swedish Minister for Int'l Development Cooperation Gunilla Carlsson
  - **Alliance Ambassador Rocky Dawuni:** the Ghanaian international music star

But…. There Remain Key Gaps, including Health Research

- What is the full burden across acute and chronic exposures?
  - birth outcomes
  - childhood pneumonia, TB, HIV?, adult pneumonia?, other infections?
  - NCDs: cancer, cardiovascular disease, COPD, asthma
  - other: cataracts, burns, back injuries, gender, IQ, …?
- Only 1 RCT completed so far – RESPIRE
- What is the balance of quick evaluation vs. mid-range research vs. long-term studies needed?

But…. There Remain Key Gaps, including Health Research (cont.)

- How clean do we need to make cooking environments to reduce each of these burdens?
- How many lives do different improvements save?
  - What is the dose-response relationship?
- What are the social variables that can predictably impact researchers’ ability to test these questions?

The Social Dimension

Philips stove in use in India – the women love it and it emitted no noticeable smoke

But they were also using the traditional stove at the same time.

They needed to work with the manufacturer to adapt the stove to cook the local bread evenly.

Stove performance often depends critically on how the cook – cooking habits, how fuel is fed in, etc.

Simple to explain – but complex to solve.

To get the research right, researchers must…

- Be clear about their goals. For example:
  - Are you showing that a drop in exposure improves health?
  - Or that actual use of a given stove/fuel will improve health?
  - Of that a given dissemination mechanism will yield results?
  - Those are very different questions!
- Get the technology right to your goal
  - It meets the research goals
  - It has been tested in both lab and field settings
- Ignore the social dimension at your peril!
  - Be sure women want to cook with it
  - Understand the full cooking and household energy situation – cooking, heating, lighting, etc.

Summary Points

- If we can’t in 10 years estimate with much greater accuracy how many lives we are saving with different interventions, we will have failed.
- This health research is arguably the biggest key to unlocking the resources needed to truly address this on a global scale.
- This is not cheap – we need partners.
- If you do not succeed, we cannot succeed.

Thank You!!!!