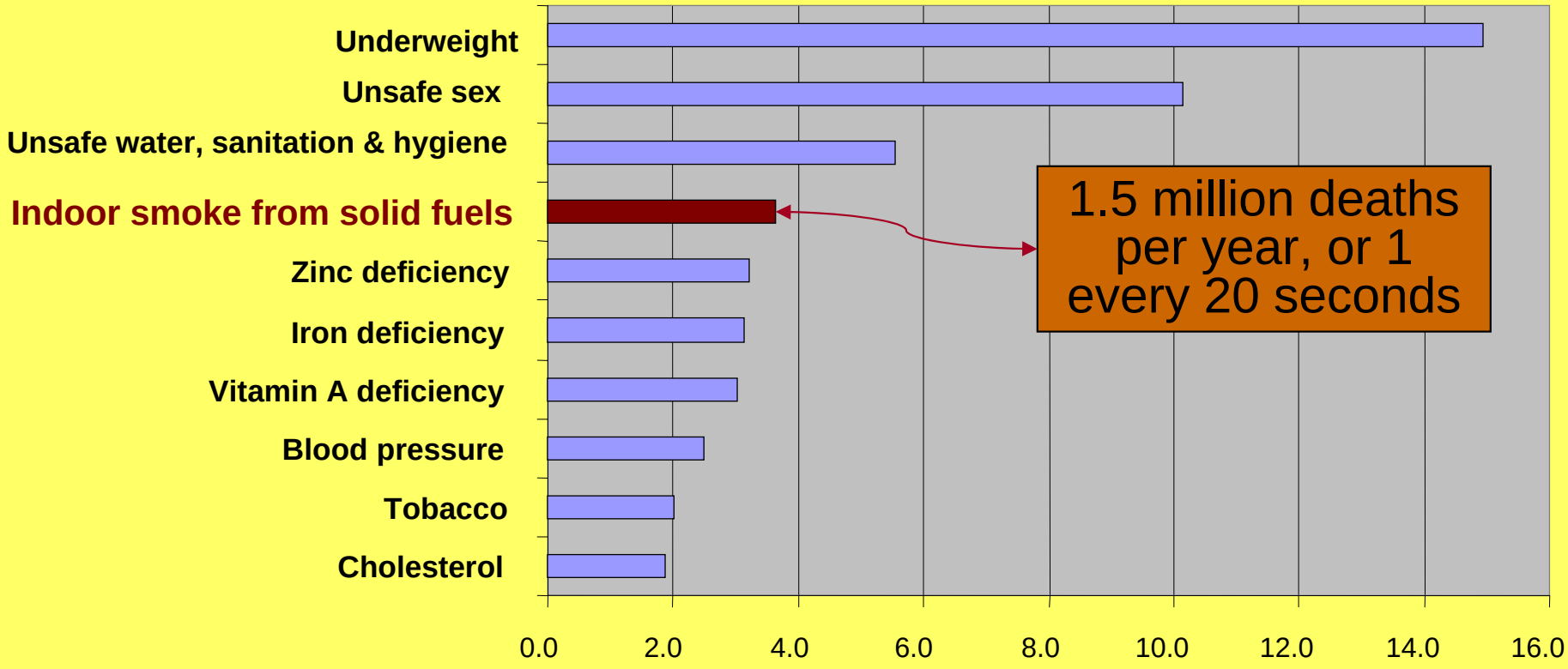
Partnership for Clean Indoor Air

Solving the Biggest Health Risk Factor You've Never Heard Of

Presentation for the Clean Air Act Advisory Committee
September 20, 2007

Jacob Moss, US EPA

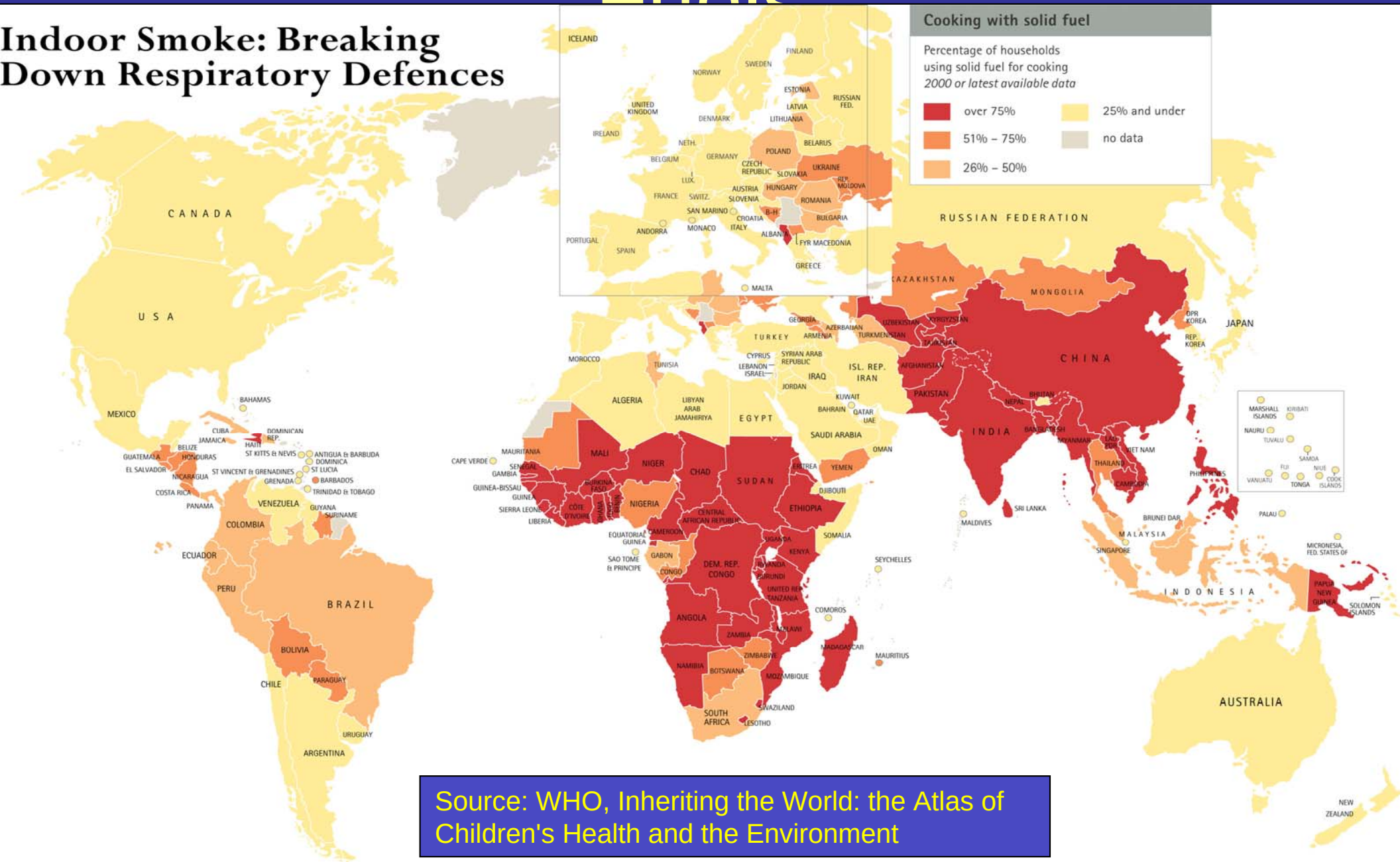
What are the Ten Worst Health Risk Factors in Poor Developing Countries?



Source: WHO's World Health Report, 2002

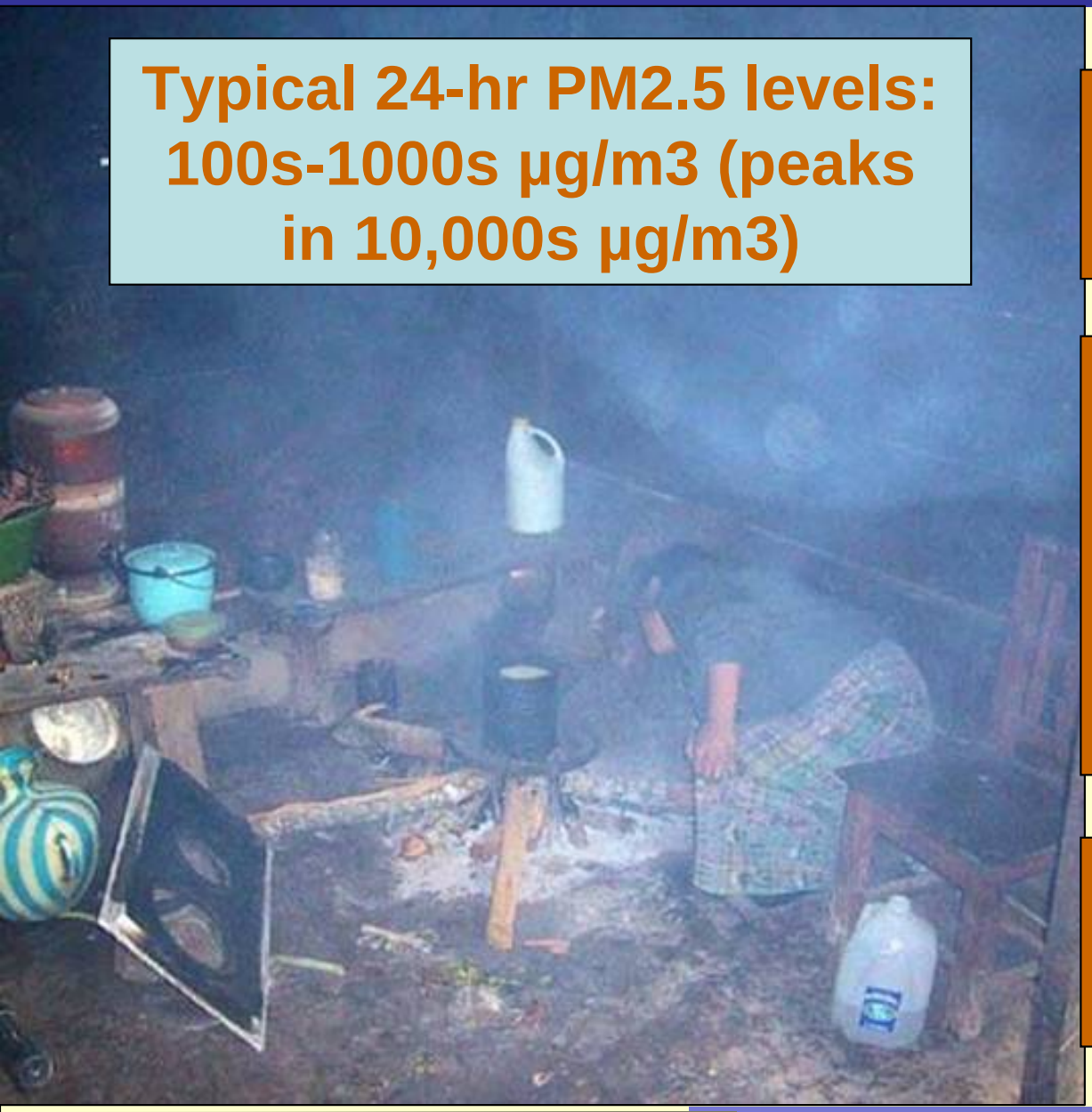
Indoor Smoke is the 4th Worst Health Risk Factor in Poor Developing Countries

Half the World Cooks with Solid Fuels



Source: WHO, Inheriting the World: the Atlas of Children's Health and the Environment

Indoor Smoke from Cook Stoves



Typical 24-hr PM2.5 levels: 100s-1000s µg/m3 (peaks in 10,000s µg/m3)

Traditional stoves fueled by biomass, coal, dung, etc. are very poor combustors.

A complex mix of pollutants, incl.:

- $PM_{2.5}$, CO, NO_2
- Toxics such as formaldehyde, benzene, 1-3 butadiene, toluene, styrene, etc.
- Polyaromatic hydrocarbons
- For coal: SO_2, As, Pb, Hg, & F.

WHO: Over 80% of global PM exposure is indoors in developing world.

Solutions: Moving up Energy Ladder

Dung

Wood & Crop Residues

Charcoal

Liquid Fuels

Gaseous Fuels

The transition to clean fuels and stoves is not typically incremental – most cooks continue to use traditional stoves and fuels, even as they start to invest in cleaner options.

Household Energy/Indoor Air Pollution: *a seemingly simple issue*

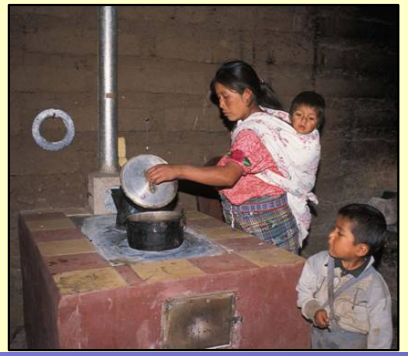
China

Improved cooking stoves are typically over 50% more efficient.

Uganda

Improved cooking stoves typically reduce emissions by 50-90%.

Guatemala



This is still not clean.

Household Energy/Indoor Air Pollution: *an incredibly complex issue*

Health
- Our understanding of many of the health impacts is weak.
- How does this risk compare to other health risks?
- Are interventions effective?
- What is the cost/life saved?

Commercial-Scale Solutions
- Sustainable, large-scale solutions must be enterprise-based.
- How can stove/fuel businesses serve the scale of this problem?
- How can clean stove and fuel

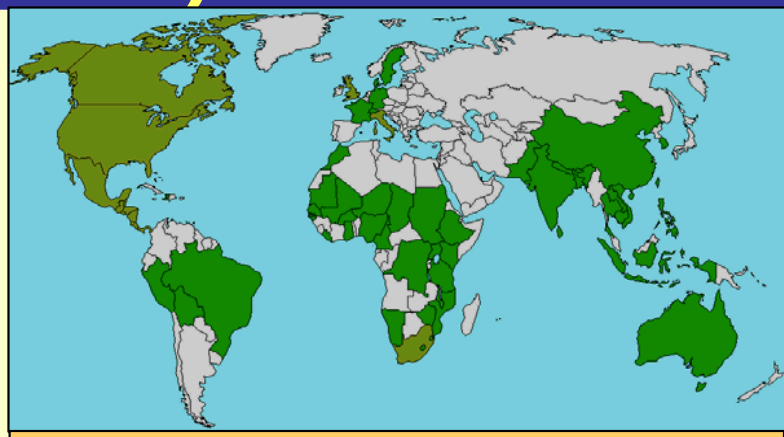
Some Dimensions of Indoor Air Pollution

Technology
- Clean stoves in lab do not always yield results in field.
- What is a “clean” stove or fuel? Now vs. in future?
- Improved stoves often look very similar to poor stoves.
- Life-cycle fuel studies needed.

Social Issues
- Cooking practices are driven by local customs and needs.
- Social factors include: local foods, available fuels, traditional stoves, gender roles, ventilation customs
- Solutions depend upon behavior.
- Households often use many

About the Partnership for Clean Indoor Air (PCIA)

- PCIA Launch: World Summit on Sustainable Development
- USG Funding: ~$7M total from FY2003-2007 (budget, staff, travel, etc.); leveraging significant additional resources
- Activities to Date:
  - pilot projects, biennial forums, networking and advocacy, tools and resources, website, quarterly bulletins, stove testing
  - capacity building: stove design & performance, monitoring & evaluations, commercializing enterprises, social marketing

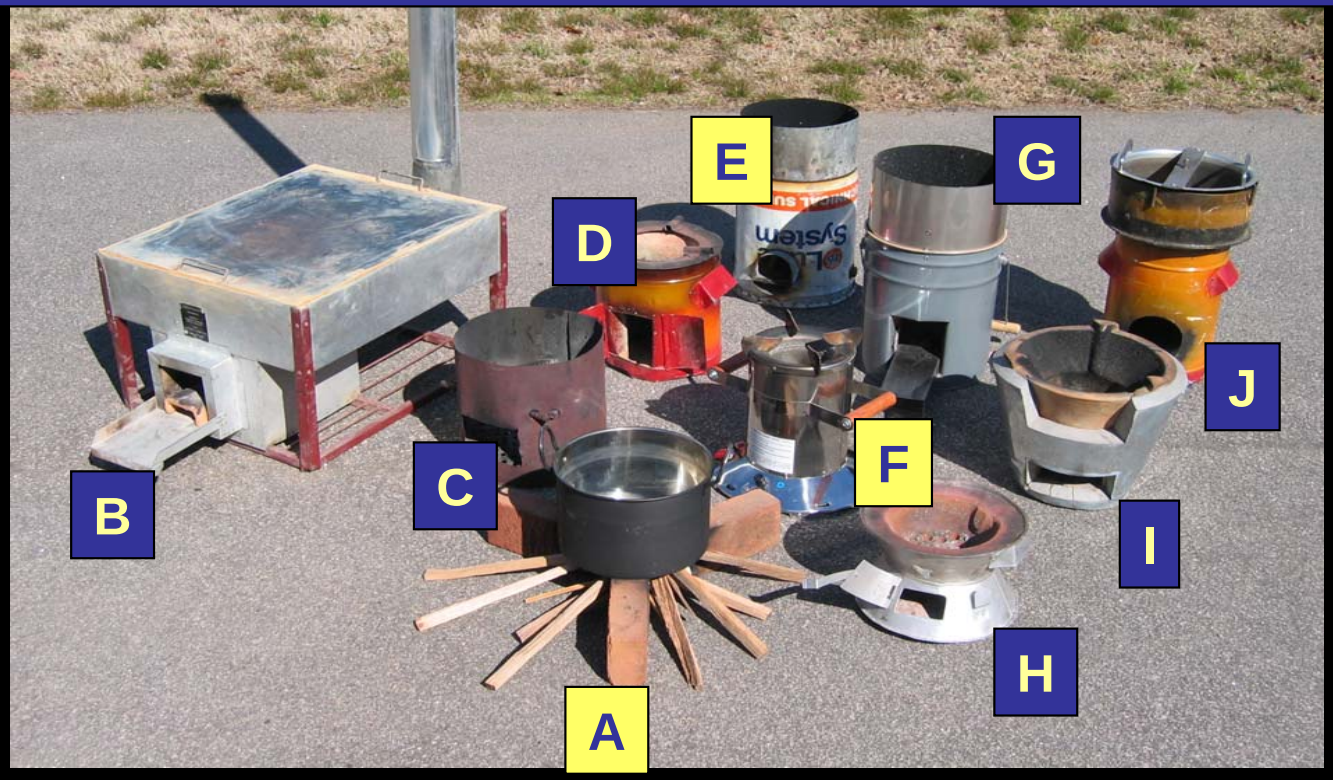


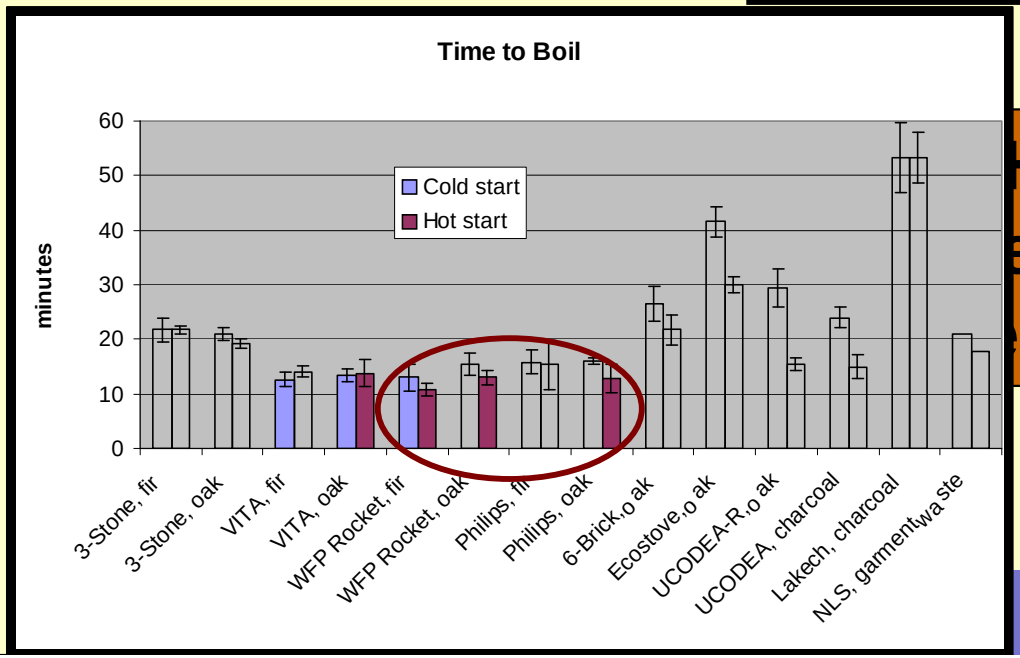
In 5 years, PCIA has grown from 10 to 140 partners, working in 60+ countries.

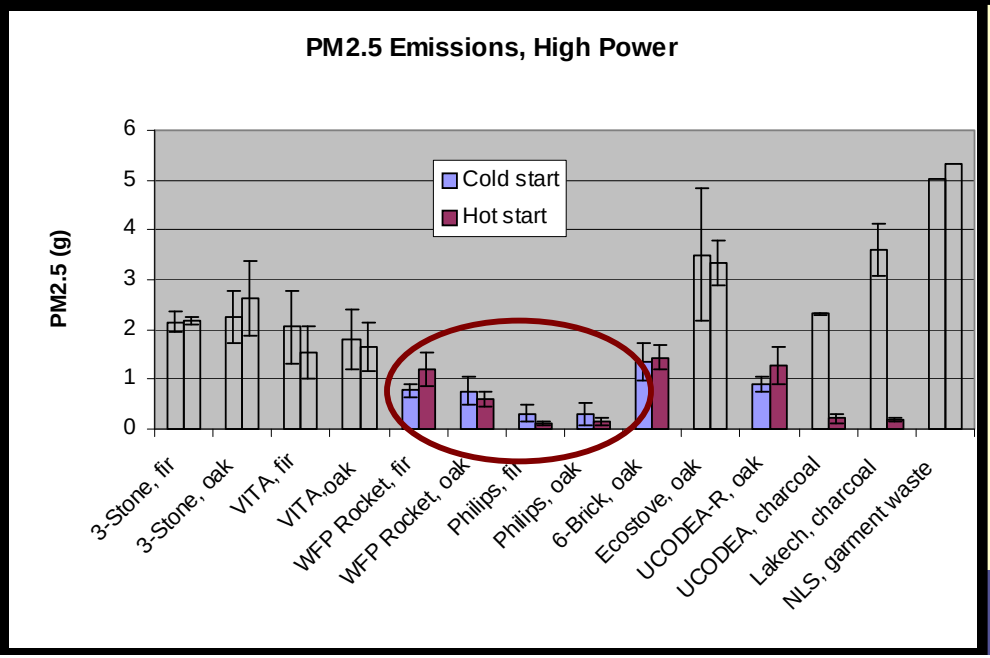
PCIA Stove Testing (EPA/ORD)

Stoves tested:

- **A: 3-stone fire**
- **B: Ecostove**
- **C: VITA**
- **D: UCODEA charcoal**
- **E: WFP rocket**
- **F: Philips**
- **G: 6-brick rocket stove**
- **H: Lakech charcoal**
- **I: NLS**
- **J: UCODEA rocket**







Results of 10 PCIA Pilot Projects

USG investment of $1.2 million resulted in:

- 1.5 million households educated about IAP
- 76,000 homes using clean & fuel-efficient practices
- 700(?) new small businesses producing & marketing improved techn
- Over 320,000 people with reduced exposure to indoor smoke

Overall cost = < $4 per person

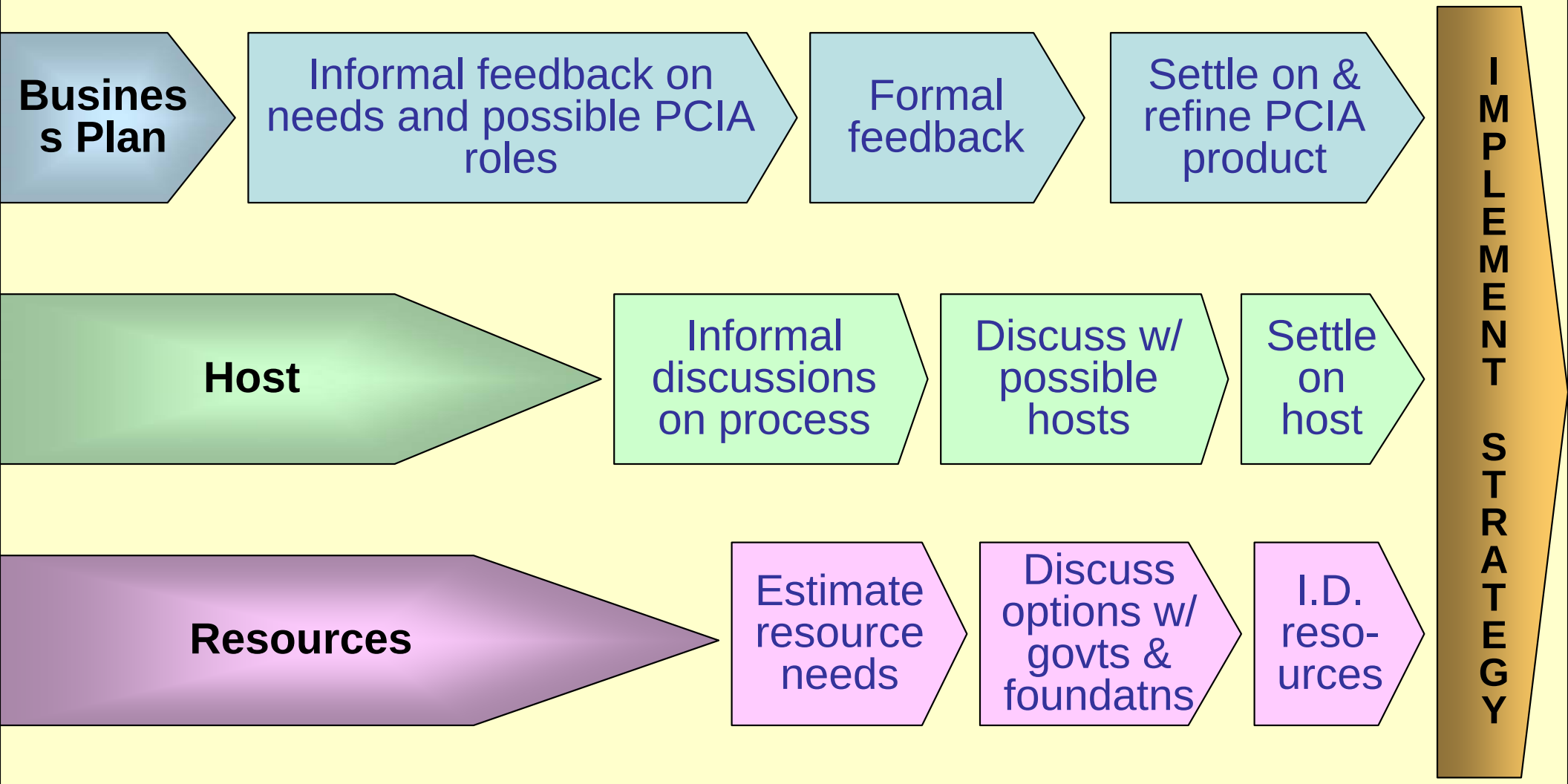
Progress and Goals Reported at PCIA Forum Last March

	# Homes with Clean Stoves	# People Affected
Target Population	**231 million**	**> 1 billion**
Results: 2003-6	**1.3 million**	**~6 million**
Goal: 1 Year	**~1.4 million**	**~6.7 million**
Goal: 2-3 Years	**~6.5 million**	**~31 million**

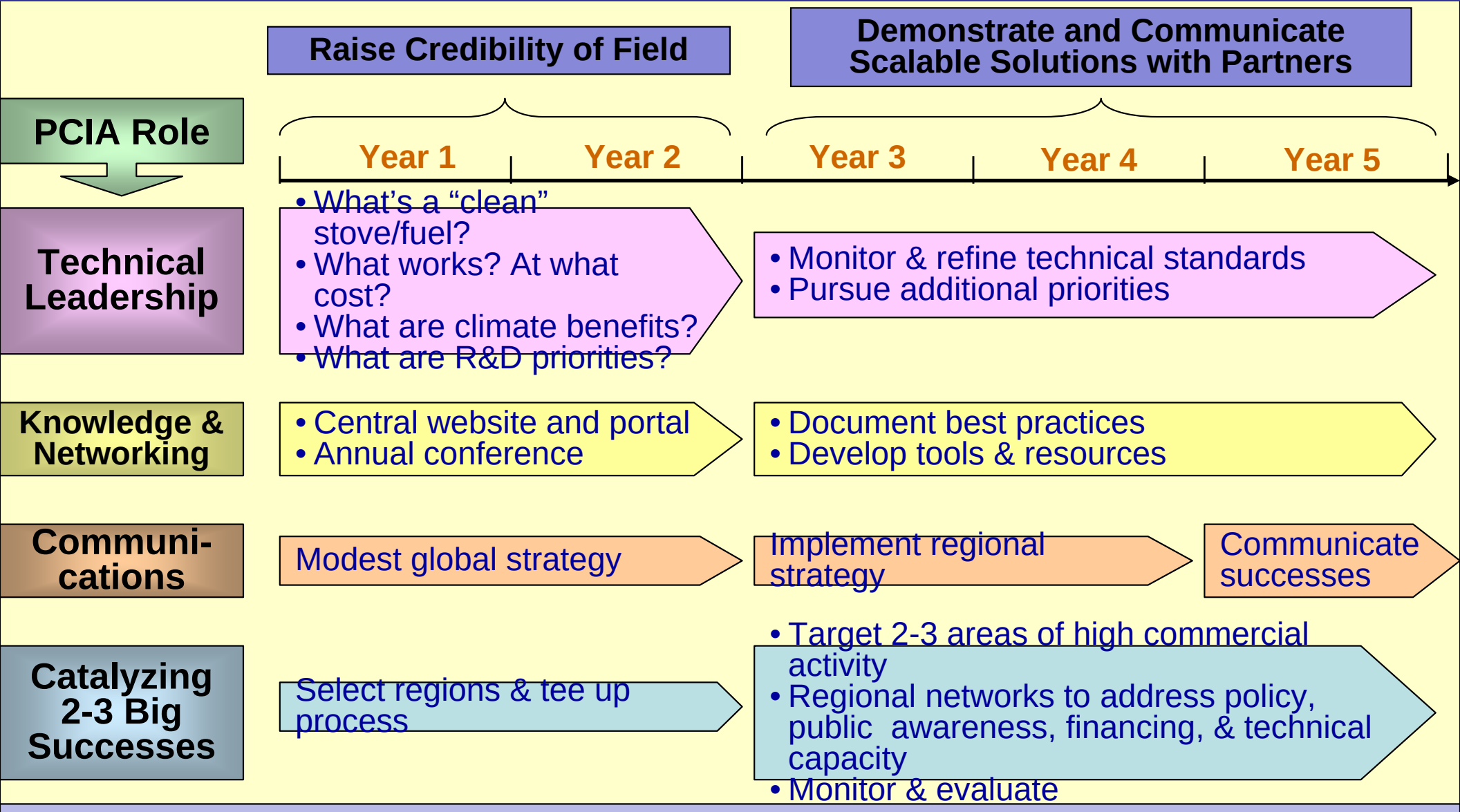
Figures based on reports from 34 organizations at the 3rd Biennial PCIA Forum (Bangalore, India – March 2007)

PCIA

Question: ***How can government can incubate a sustainable development initiative, and then re-launch it as a bigger, independent, & sustainably funded entity?***



Emerging Vision for PCIA



Activities in each area to be prioritized as resources allow

Concept Behind *Catalyzing 2-3 Big Successes:* Aligning all Actors in Region to Demonstrate Scalable Solutions

Enterprises

major corporations, domestic supply chains (layer on stoves), domestic stove manufacturers

+

Regional Networks

private sector, govts, multilateral, NGO, donor,…

Technical Demands	Government Policy	Financing Tools	Awareness Campaign
Set national or regional, stove/fuel stds or labels	Macro: MDG goals, PRSP, white papers	For profit centers in stoves/fuel supply	Radio, TV, print, other…
Establish regional stove testing labs	National Policies: stds, economic, agriculture, health, energy, enviro…	Stove/fuel enterprises (manufacture, retail,...)	Regional, national, local
Capacity building/training		Women's businesses	Govt: health, education
Broad R&D if possible	Regional Policies…	Purchase of stove/fuel?	NGO networks
			Advertising
PCIA, donors, universities, NGOs	*multilaterals, PCIA, governments*	*banks, μfinance, multilaterals*	*governments, NGOs, private sector, PCIA*

Monitoring & Evaluation

- # of Households Using Clean Stoves/Fuels
- Exposure (e.g., pollutants, timeframe)
- Environmental (e.g., efficiency, fuels, climate)
- Economic (e.g., time, illness, lost work days)
- Monitor at: installation, +6 months, +1 year, +3 years
- *private sector, NGOs, PCIA, independent organizations*

Iterate and Demonstrate Successful Models at Scale

Communications

- Professional strategy
- Let world know of success
- Use to catalyze major global effort
- *PCIA, donors, + all partners*

Organizations That Have Expressed an Interest in Hosting PCIA

Universities

- UC/Berkeley
- Columbia University
- Colorado State Univ.
- Univ. of Maryland
- Univ. of Wisconsin
- Univ. of Liverpool
- Many possible

Other Orgs

- NAS/NRC
- Global Village Energy Partnership International
- Global Environment & Technology Foundation
- WHO
- TERI

The Time is Ripe for PCIA to Lead a Quantum Leap for this Field

Broad Mission:

- IAP intersects many development priorities, including energy, poverty, children's health, gender, & climate.
- IAP has received far less attention

PCIA addresses a major cross-cutting and under-addressed health risk.

Commercial Scale:

- Only market-based solutions can access sufficient capital to address this issue at a meaningful scale.
- The private sector needs to partner with several sectors to reach scale.

PCIA networks can help enable sustainable and scalable commercial solutions.

Is the Field at a Tipping Point?

- Leading donors are ramping up efforts.
- Major corporations are investing.
- Climate change is causing global environmental awareness to peak.

It is a particularly ripe and important time to enter and catalyze this field.

Leadership:

- This is little agreement among leaders in this field on what works.
- Most orgs are working independently.
- A need exists to convene and

It is a rare opportunity to lead solutions to such a critical global health risk.

Discussion Questions

1. Do you have any advice on the PCIA process or strategic vision I have outlined?
   - What's strong and likely to succeed in this vision?
   - What's missing from this vision?

2. Do you have any suggestions of possible hosts or funders for the re-launched PCIA?

3. How can CAAAC or its members support the goals of an independent PCIA?

Thank You

Jacob Moss

Tel: (202) 564-1388

Email: moss.jacob@epa.gov

Appendices

Urban Air Quality & PM in the U.S.

Chicago, IL: August 16, 2000

$PM_{10} \approx 18\ \mu g/m^3$

$PM_{2.5} < 10\ \mu g/m^3$

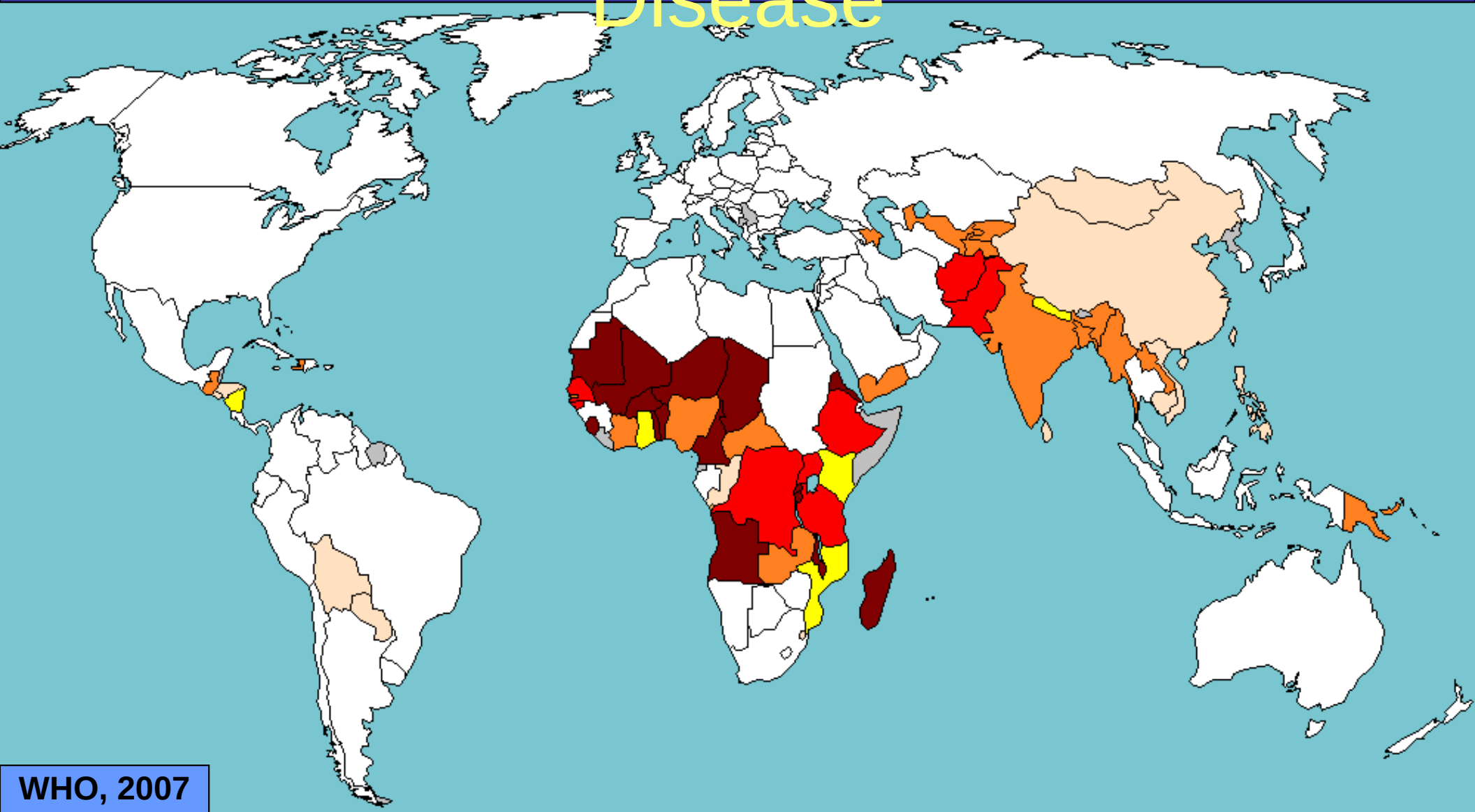
Chicago, IL: August 26, 2000

$PM_{10} \approx 63\ \mu g/m^3$

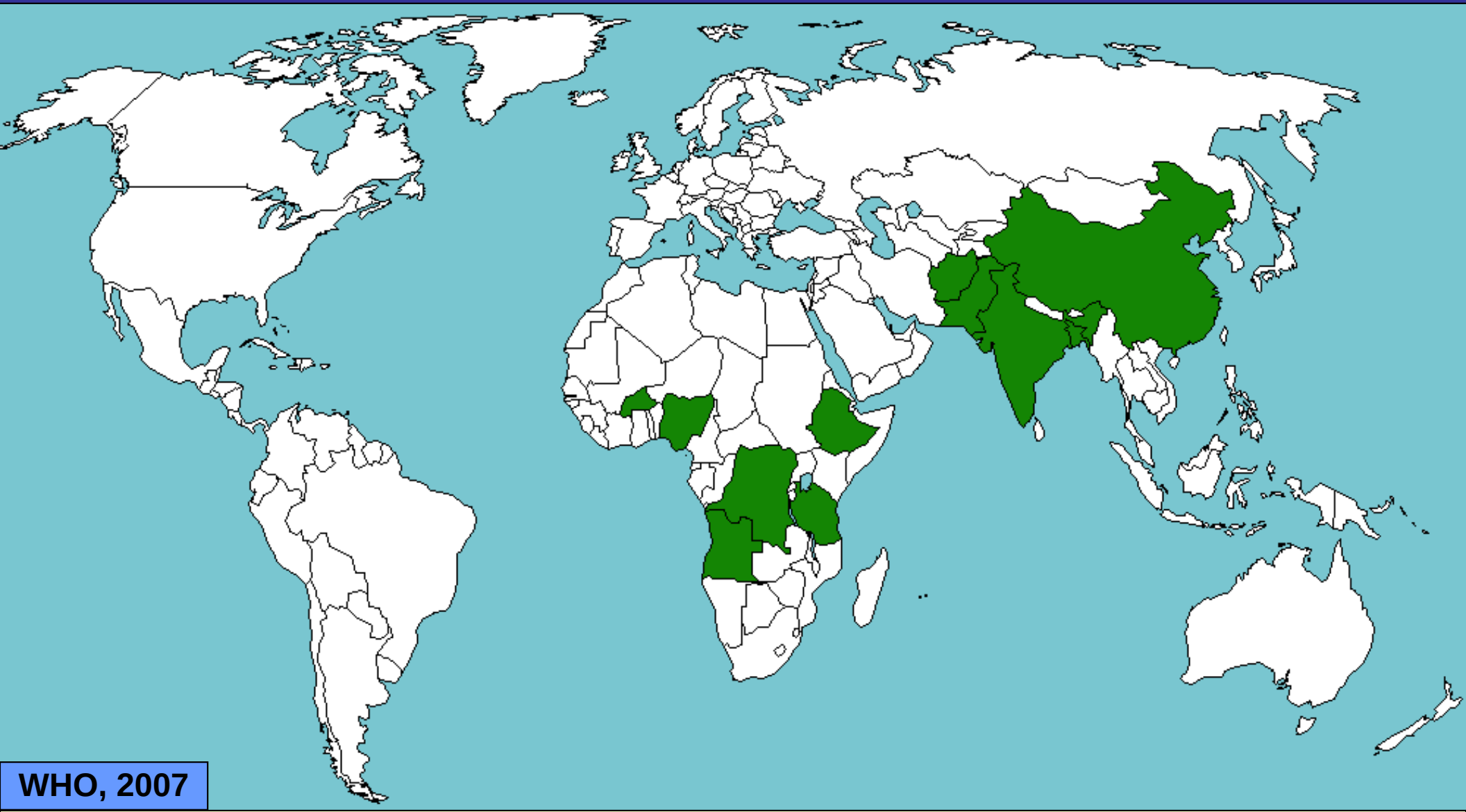
$PM_{2.5} = 34\ \mu g/m^3$

	Annual Standard		24-hour Standard	
	EPA	**WHO**	**EPA**	**WHO**
PM_{10}	Revoked	20.0 $\mu g/m^3$	150 $\mu g/m^3$	50.0 $\mu g/m^3$
$PM_{2.5}$	15.0 $\mu g/m^3$	10.0 $\mu g/m^3$	35 $\mu g/m^3$	25.0 $\mu g/m^3$

Indoor Air Pollution: Estimate of Percentage of National Burden of Disease



Indoor Air Pollution: 80% of 1.5 million global deaths each year occur in just 11 countries



WHO, 2007

Mortality Comparisons to Recent Disasters

IAP leads to....

- Hurricane Katrina, Aug. 23, 2005: 1,836 fatalities
  - **....over 800 "Katrinas" every year (nearly 2.5/day)**
- Terrorist Attacks, September 11, 2001: 2,973 fatalities
  - **…over 500 "9/11s" every year (~1.5/day)**
- Iran Landslide, June 20, 1990: 40-50,000 fatalities (est.)
  - **…over 30 "Iran landslides" every year**
- Pakistani earthquake, Oct. 8, 2005: 74,500+ fatalities
  - **…over 20 "Kashmir earthquakes" ever year**

Major Burden of Disease: 10 leading diseases/injuries; leading 10 selected risk factors (high mortality

Risk Factor	% DALYs	Disease or Injury	% DALYs
Underweight	14.9	HIV/AIDS	9.0
Unsafe sex	10.2	Lower respiratory infections	8.2
Unsafe water, sanitation, & hygiene		Diarrhoeal diseases	6.3
Indoor smoke from solid fuels	3.7	Childhood illness & mortality	
Zinc deficiency	3.2	Low birth weight	5.0
Iron deficiency	3.1	Malaria	4.9
Vitamin A deficiency	3.0	Unipolar	
Blood pressure	2.5	Ischaemic	
Tobacco	2.0	Tuberculosis	2.9
Cholesterol	1.9	Road traffic injury	2.0

Lower respiratory infections

ARI is the most common cause of illness & mortality in children in the developing world.

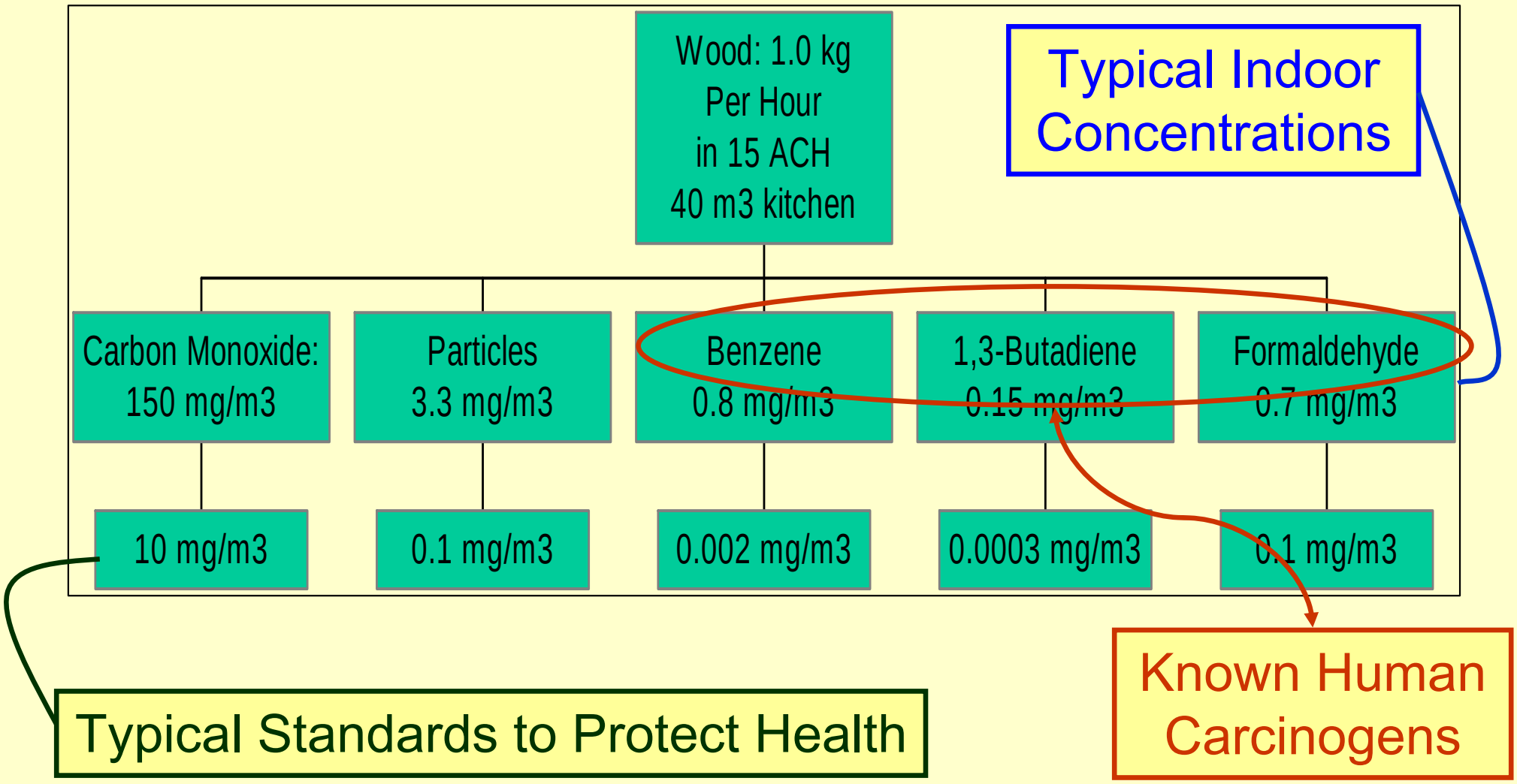
ALRI accounts for 20% of annual deaths of children < 5 (nearly all deaths are in developing countries).

World Health Report, WHO (2002)

% population attributable fraction: 1-24% 25-49%

Typical Indoor Pollution Concentrations from a Typical Wood-Fired Cookstove

Source: Smith et al, 2000



Evidence for a Health Impact of Indoor Smoke

Source: Smith, Mehta, & Feuz, 2004; IARC 2006

Health outcome	Evidence	Strength of Evidence
❋ALRI (children <5yr) ❋COPD (adults) ❋Lung cancer (coal)	❋Between 10 - 20 studies ❋Few measured exposure ❋Confounding problematic	Strong
❋Tuberculosis ❋Cataract ❋Upper airway cancer ❋Asthma	Several consistent studies (more conflicting for asthma)	Moderate
❋Low birth weight ❋Perinatal mortality ❋*Otitis media*	Very few studies – support from environmental tobacco smoke & ambient air pollution studies	Moderate
Cardiovascular disease	No studies, but suggestive	Weak

Relative Risk Estimates

Source: Smith, Mehta, & Feuz, 2004

- Children exposed to indoor smoke are more than twice as likely to suffer from pneumonia than children not exposed.
- Women exposed to indoor smoke are more than three times as likely to suffer from chronic respiratory disease than women not exposed.

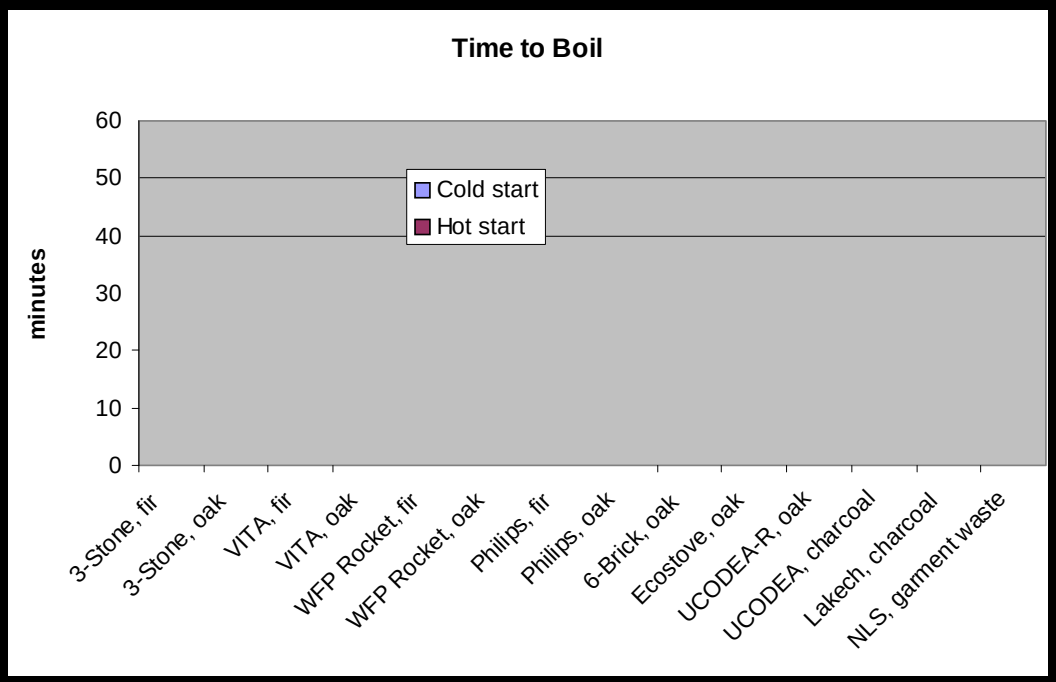
Illness	Population	Relative risk	Confidence interval
ALRI	Children <5	2.3	1.9 – 2.7
COPD	Women ≥30	3.2	2.3 – 4.8
Lung cancer (coal)	Women ≥30	1.9	1.1 – 3.5
COPD	Men ≥30	1.8	1.0 – 3.2
Lung cancer (coal)	Men ≥30	1.5	1.0 – 2.5

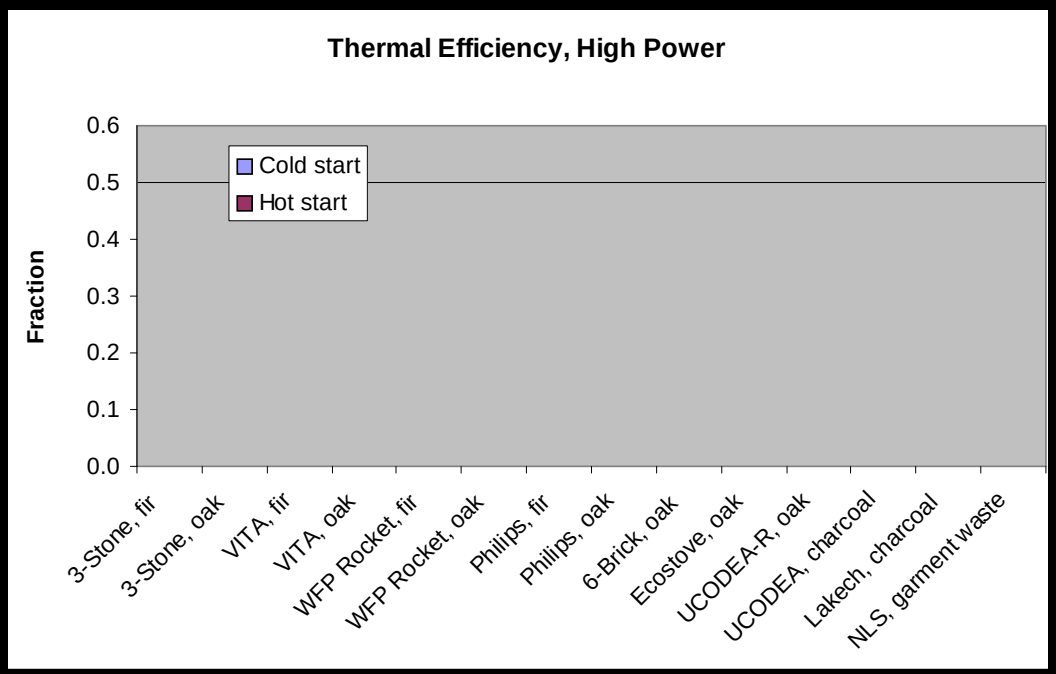
The Number of People in Developing Countries Who Rely on Biomass Fuel to Cook Their Food is Growing

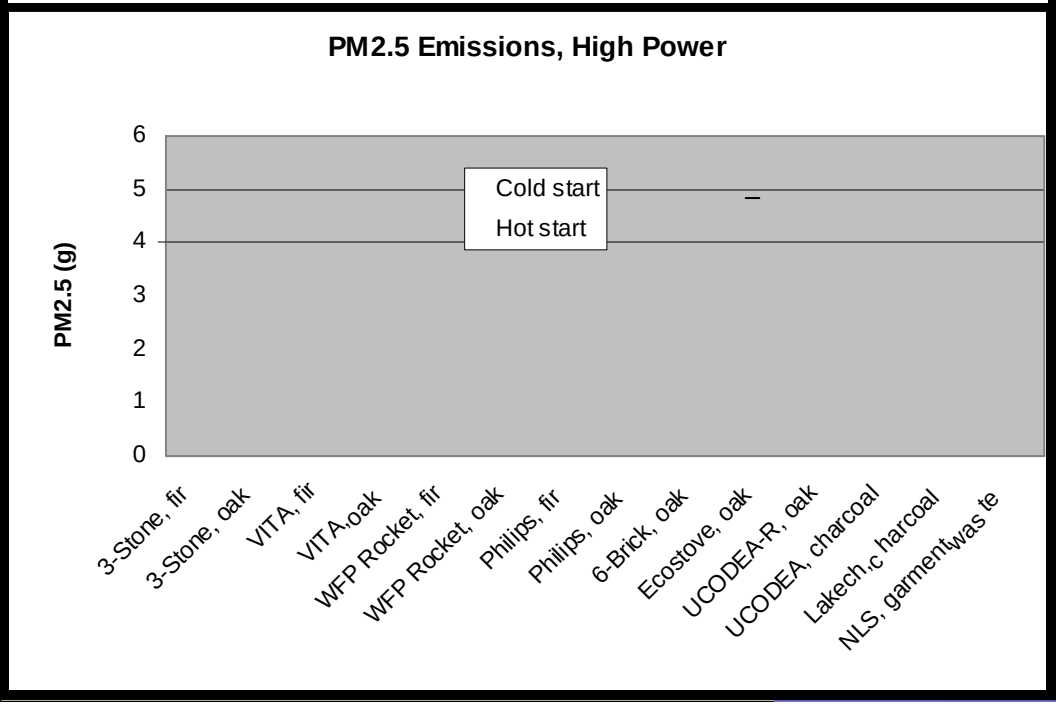
IEA, 2006

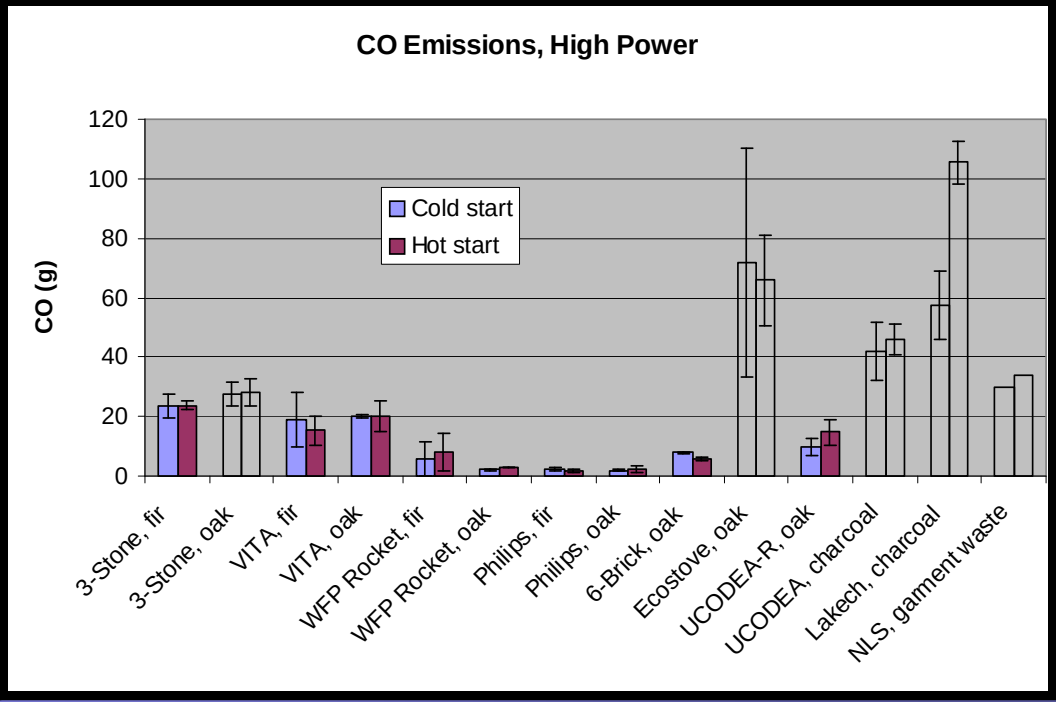
Country/ Region	2004 (million)	2015 (million)	2030 (million)	Change 2004-2030
Sub-Saharan Africa	575	627	720	+25%
India	740	777	782	+6%
China	480	453	394	-18%
Indonesia	156	171	180	+15%
Rest of Asia	489	521	561	+15%
Brazil	23	26	27	+17%
Rest of Latin America	60	60	58	-3%
Developing Countries (Total)	2528	2640	2727	+8%

PCIA Stove Testing – Performed by ORD









Partnership for Clean Indoor Air: Summary of Feedback re. Future Strategy (May 2007)

Feedback	General Role	Specific Roles	Notes
Strong Agreement – Roles to Play	**Technical**	o Standards: emissions & efficiency (What's an ICS?) o Monitoring and Evaluation strategy (What's working?) o Climate: develop robust protocols (Climate impacts of ICS?) o R&D: coordinate global agenda/strategy (Who does what?) o Cost-effectiveness & cost-benefit (What's cost/life-saved?)	o Goal: meet core needs to establish credibility for the field o PCIA as global convener to lead progress for each of these items o What's good enough (stoves, results)? Now vs. In Future o Strong expressed need to look at climate interactions
	Information & Resources	o Coordinate on central clearinghouse for information – websites, portals for tools and resources, publications, etc. o Document and publicize best practices and case studies o Produce priority tools, kits, and other resources o Establish simple, key reporting metrics for PCIA members	o Goal: collect, digest, and disseminate information from/to partners o Balance between not-duplicating existing efforts & meeting needs o Requires intense dialogue and coordination with existing knowledge hubs (HEDON, CREST, Bioenergy, Sparknet…) o Broad focus: health, stoves, fuels, climate, gender, env, financing…
	Networking	o Host annual conference/forum o Convene high level policy briefings o Develop global map/database of activity o Attend/speak at priority international fora o Coordinate on central hub for dialogues	o Goal: effective networking at global policy level & among partners o Balance between not-duplicating existing efforts & meeting needs o Requires intense dialogue and coordination with existing networking hubs (HEDON, CREST, Bioenergy, Sparknet…) o Requires needs assessment to identify partners' priorities
	Catalyze 2-3 Big Successes	o Select regions (key: where is scalable commercial activity?) o Convene active regional networks with all necessary leaders o Work jointly to create ideal conditions (macro & micro policies, financing, awareness, technical capacity, etc.) o Implement robust monitoring & evaluation strategy o Success could catalyze a "Global Indoor Smoke Initiative"	o Goal: demonstrate large-scale, commercially sustainable solutions o Over time, requires strong infrastructure in-region – PCIA office, stove testing labs &/or resource centers o Policy issues include: white papers; stove stds/label; policy barriers; incentives; financing tools; needed public resources o Targets specific geography, but results should support all partners
	Communica-tions	o Develop strategy to raise issue's profile (not just health) o Focus initially on U.S. & E.U., over time on priority regions o Multimedia campaign via print, television, radio,… o Communicate successes via professional strategy	o Goal: raise awareness of issue (initially) and solutions (over time) o Need to balance between global and local press needs/focus o Explore range of innovative tools ("IAP days", celebrities,…) o Requires up-front planning and high-level commitment by partners
Some Agreement – Roles to Play	**Broader Capacity Building**	o For implementers/evaluators (businesses, NGOs, etc.) o Prioritize trainings: stove design & performance; M&E; social marketing; commercialization; climate; µfinance; etc. o Targeted towards "catalyzing" regions (with all invited)?	o Or is this a global effort that seeks to directly support all partners? o Does PCIA do this itself, or do other partners take it on? o Need to increase application of trainings (follow-up; evaluation;…) o Establish mechanisms to expand breadth of trainers available
	PCIA as Source of Funding	Flexible & relatively small pot of funds to support: o R&D needs as they arise o innovative proposals that emerge o additional capacity building tools and resources	o Part of much larger questions: Convener vs. Funder; (big staff & in-house focus) vs. (small staff & contract out large roles) o Provides organization flexibility to stay current with field needs o High transaction costs (issuing; overseeing) – affects org design
Significant Agreement – Roles Not to Play	**Implemen-tation**	o Directly performed by PCIA: demands extensive in-country infrastructure and building up enormous capacity in org o Funded by PCIA: demands identifying grantees who can reach scale to catalyze that process	o Very resource-intensive – diminishes capacity in other areas o PCIA-direct requires significant in-country presence o Puts partnership in position of playing same roles as its partners o Very high transaction costs