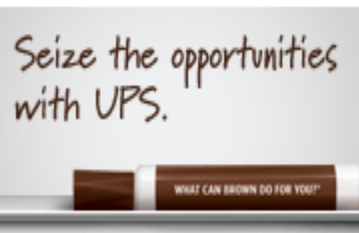


Energy and Climate Justice: the Sins of Commission

Kirk R. Smith

Professor of Global Environmental Health
University of California, Berkeley

Energy Justice Conference
The Center for Energy and Environmental Security
University of Colorado Law School
Boulder, October 23-24, 2009



The New York Times

Friday, October 23, 2009 Last Update: 10:08 AM ET



Search



Try Our
EXTRA
Home Page



[Get Home Delivery](#) |
 [Personalize Your Weather](#)

[Switch to Global Edition](#)

[JOBS](#)
[REAL ESTATE](#)
[AUTOS](#)
[ALL CLASSIFIEDS](#)

[WORLD](#)
[U.S.](#)
[POLITICS](#)
[N.Y./REGION](#)
[BUSINESS](#)
[TECHNOLOGY](#)
[SPORTS](#)
[SCIENCE](#)
[HEALTH](#)
[OPINION](#)

[ARTS](#)
[Books](#)
[Movies](#)
[Music](#)
[Television](#)
[Theater](#)
[STYLE](#)

ENVIRONMENT

Toxic Tsunami threatening US health

By OUR CORRESPONDENT
Evidence indicates that a wave of toxic material will soon be affecting US populations. As many as half of all households to be exposed to hazards from new technology far exceeding safety standards. Thousands likely to die.

TALKING BUSINESS

Pay Cuts, but Little Headway in What Matters Most

By JOE NOCERA

Kenneth R. Feinberg may succeed in trimming back



Ozler Muhammad/The New York Times

Loose Management in Mayoral Campaign

By MICHAEL BARBARO

The candidacy of William C. Thompson Jr. seems curiously lacking in intensity and discipline.

• For Mayor, Grand Environmental Plans, Small Steps

BASEBALL PLAYOFFS

OPINION »

EDITORIAL

Counting Backward

The United States needs to give Iraq's political leaders a strong shove to end their stalemate on election law.

- [Krugman: The China Problem](#) | [Comments \(15\)](#)
- [Brooks: Quiet Revolution](#)
- [Cohen: On Cameron](#)
- [Chernow: Everyman's Meltdown](#)
- [Warner: Equality](#)

MOVIES »

REVIEWS

Satan's Church

"Antichrist,"

Lars von Trier's new film, is conceptually thin, writes A. O. Scott.



Taking Flight

Manohla Dargis on



L.L.Bean

DAILY MARKDOWN

[Shop now](#)

MARKETS » At 10:17 AM ET

S.&P. 500	Dow	Nasdaq
1,088.47	10,041.03	2,174.83
-4.44	-40.28	+9.54
-0.41%	-0.40%	+0.44%

GET QUOTES [My Portfolios »](#)

Stock, ETFs, Funds

It will wash across the countryside exposing half the United States population to a toxic soup containing

- Dozens of poisonous organic chemicals known to be mutagens, immune system suppressants, severe irritants, blood poisons, inflammation agents, central nervous system depressants, cilia toxins, endocrine disrupters, or neurotoxins.
- Several other chemicals firmly established as human carcinogens.
- Other toxic inorganic chemicals known to cause asphyxiation, stillbirth, infant death, heart disease, and severe acute and chronic lung disease.

The Toxic Tsunami

- It will be the result of a process that pours this toxic soup directly into half of all US homes every day; all year; every year.
- It will expose families to toxic levels much higher than those of people living on top of toxic waste dumps, working in most heavy industries, or residing in the dirtiest cities
- These toxic levels will be tens or hundreds of times the levels set by international and national organizations to protect health
- Insidiously, it will target women and young children in these households

Why would it happen?

- Because a technology will be widely promoted that takes perfectly safe natural material and converts 10% of it to toxins in the course of functioning. Sometimes as much as 20%
- The efficiency of the process is extremely low, leading to little human benefit per unit toxin created as well as waste of the natural resource.
- Instead of carefully disposing of this toxic material in safe places, this industry will spread the toxic soup by air right into neighborhoods where people live.
- All this, in spite of there being well-known alternative technologies available producing very little toxin.

What might be the health consequences if this happens?

- A vast epidemic of a respiratory illness that kills faster than SARS or Avian Flu – initiation to death in 2 days in some cases.
- So fast, that trying to apply medical care is often hopeless.
- Estimates are that soon it would be killing at least 1000 children a week, 50,000 a year
- In addition, thousands of children will be severely burned each year because of this technology, many will die

What else?

- Thousands of women would have their breath taken from them as their lung function is slowly eaten away by exposure to the toxins
- Thus, at tragically young ages they will become unable to breathe normally or do common tasks.
- Alarmingly, once a woman is affected, there is no known medical therapy to reverse the process.
- More than 500 per week, 25 thousand per year, would soon start to die prematurely because their lungs would finally give out.

Anything else?

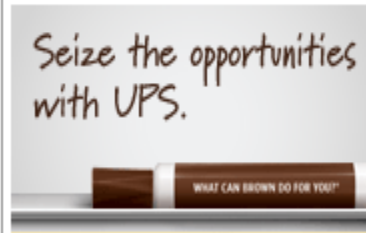
- There are strong indications that the burden on households would include many other insidious diseases, such as
 - Significant exacerbation of heart disease, the most important cause of death in the country
 - A major negative impact on babies' health and survival through reductions in growth before birth
 - Increases in several types of cancer, including lung and throat
 - Damage to the eyesight of tens of thousands
 - Perhaps a significant increase in tuberculosis, one of the most important and intransigent of the re-emerging infectious diseases
- Based on animal experiments, we can also expect
 - Reduction in child cognitive capacity (learning ability or IQ)
 - Several types of birth defects

What other problems?

- Will emit large quantities of one of the most insidious global warming pollutants, black carbon
- In addition, may cause reduction of water flows in major rivers during summer

What should the response be?

- Full time coverage on CNN and all other news channels
- A **In fact, nothing will happen** the
na — no one will notice
- Emergency legislation in Congress to provide funds for cleaner technologies?
- New laws and regulations to make sure it never happens again?



The New York Times

Friday, October 23, 2009 Last Update: 10:08 AM ET



ENVIRONMENT

Toxic Tsunami threatening US health

By OUR CORRESPONDENT

Evidence indicates that a wave of toxic material will soon be affecting US populations. As many as half of all households to be exposed to hazards from new technology far exceeding safety standards. Thousands likely to die.

Switch to Global Edition ▶

[JOBS](#)
[REAL ESTATE](#)
[AUTOS](#)
[ALL CLASSIFIEDS](#)

[WORLD](#)
[U.S.](#)
[POLITICS](#)
[N.Y./REGION](#)
[BUSINESS](#)
[TECHNOLOGY](#)
[SPORTS](#)
[SCIENCE](#)
[HEALTH](#)
[OPINION](#)

[ARTS](#)
[Books](#)
[Movies](#)
[Music](#)
[Television](#)
[Theater](#)
[STYLE](#)

Senate Leader Takes Risk Pushing Public Insurance Plan

By ROBERT PEAR and DAVID M. HERSZENHORN

Harry Reid is taking a calculated gamble that the 60 members of his caucus could support the plan if it included a way for states to opt out.

• Pelosi Says House Is Firm in Backing Public Option

TALKING BUSINESS

Pay Cuts, but Little Headway in What Matters Most

By JOE NOCERA

Kenneth R. Feinberg may succeed in trimming back



Ozier Muhammad/The New York Times

Loose Management in Mayoral Campaign

By MICHAEL BARBARO

The candidacy of William C. Thompson Jr. seems curiously lacking in intensity and discipline.

• For Mayor, Grand Environmental Plans, Small Steps

BASEBALL PLAYOFFS

Everything stated about the Toxic Tsunami is true, as best we know, except for three aspects:

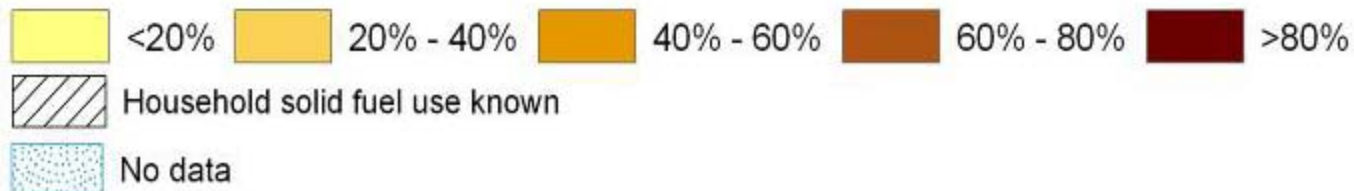
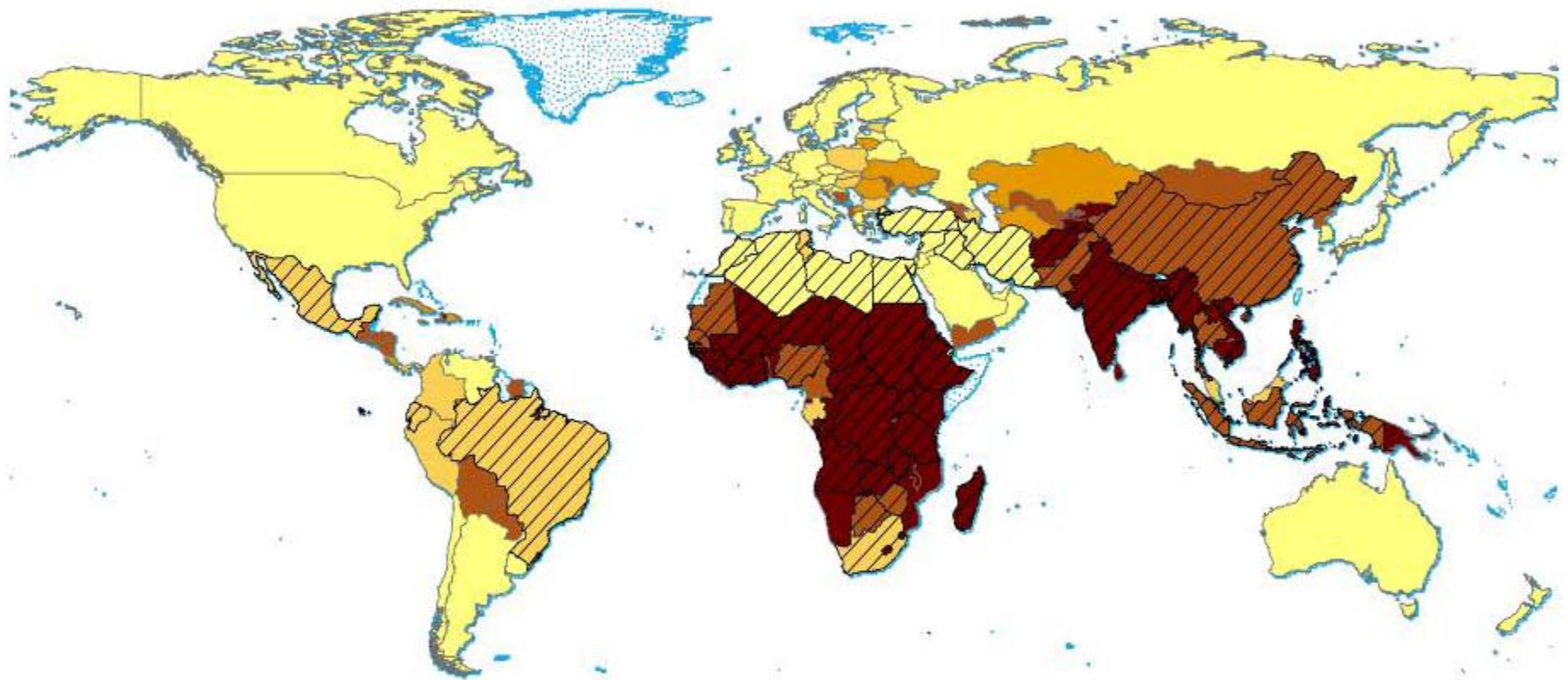
1. It is already happening
2. In half the world's households, but not US households
3. No industry is responsible – but poverty and complacency

A sin of omission, not commission

But still killing 1.5 million women and children



National Household Solid Fuel Use, 2000



Cumulative Percent of World Population

0 50 100

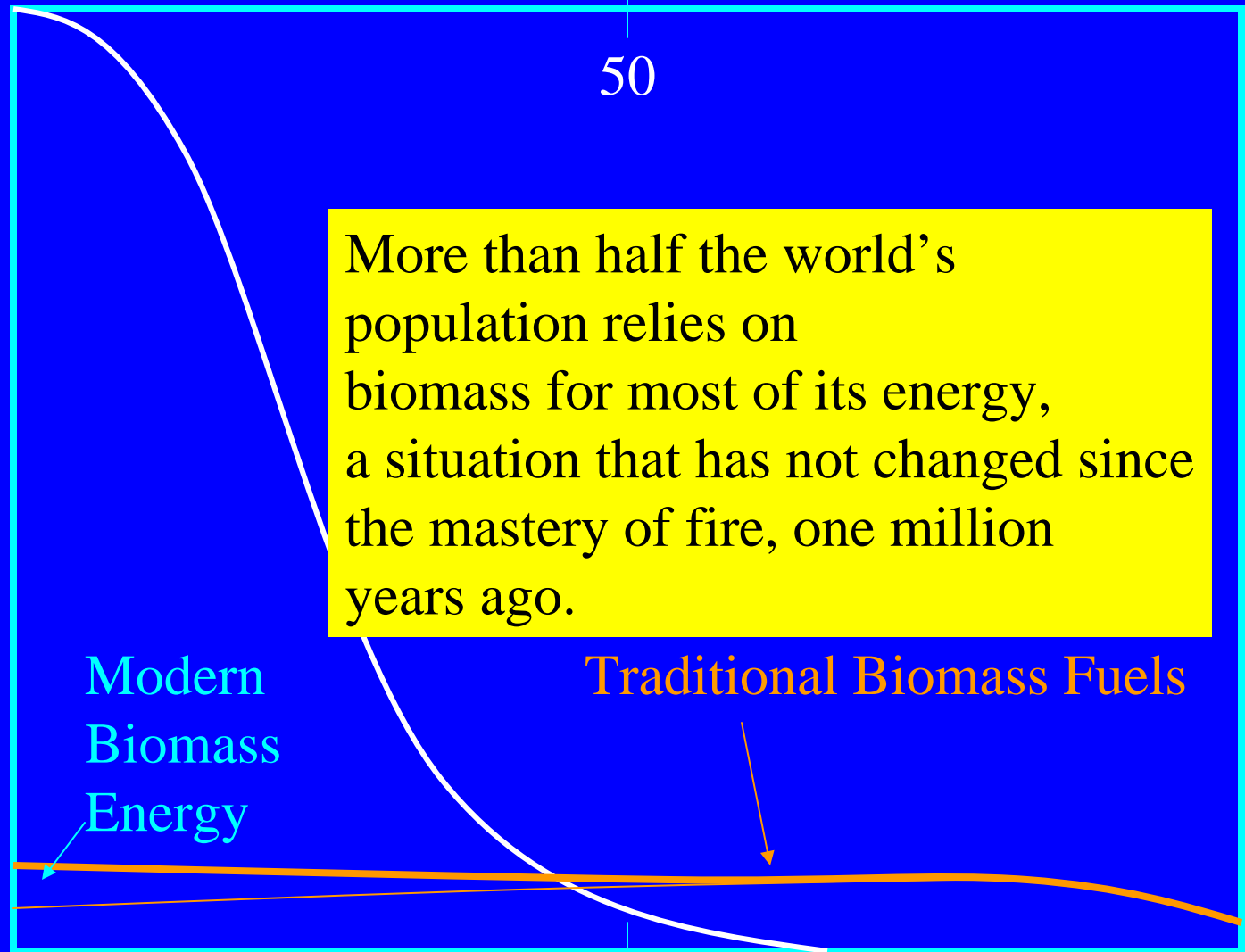
Energy per capita

More than half the world's population relies on biomass for most of its energy, a situation that has not changed since the mastery of fire, one million years ago.

Modern Biomass Energy

Traditional Biomass Fuels

Income



Woodsmoke is natural – how can it hurt you?

Or, since wood is mainly just carbon, hydrogen, and oxygen, doesn't it just change to CO_2 and H_2O when it is combined with oxygen (burned)?

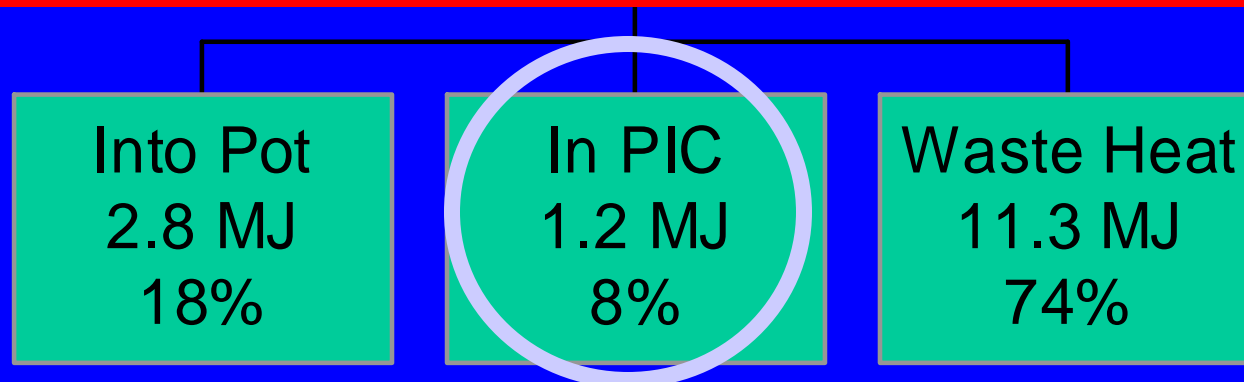


Reason: the combustion efficiency is far less than 100%

Energy flows in a well-operating traditional wood-fired Indian cooking stove

A Toxic Waste Factory!!

Typical biomass cookstoves convert 6-20% of the fuel carbon to toxic substances



PIC = products of incomplete combustion = CO, HC, C, etc.

Source:
Smith,
et al.,
2000

Toxic Pollutants in Biomass Fuel Smoke from Simple (poor) Combustion

- Small particles, CO, NO₂
- Hydrocarbons
 - 25+ saturated hydrocarbons such as *n-hexane*
 - 40+ unsaturated hydrocarbons such as *1,3 butadiene*
 - 28+ mono-aromatics such as *benzene & styrene*
 - 20+ polycyclic aromatics such as *benzo(α)pyrene*
- Oxygenated organics
 - 20+ aldehydes including *formaldehyde & acrolein*
 - 25+ alcohols and acids such as *methanol*
 - 33+ phenols such as *catechol & cresol*
 - Many quinones such as *hydroquinone*
 - Semi-quinone-type and other radicals
- Chlorinated organics such as *methylene chloride* and *dioxin*

Source: Naehrer et al,
J Inhal Tox, 2007

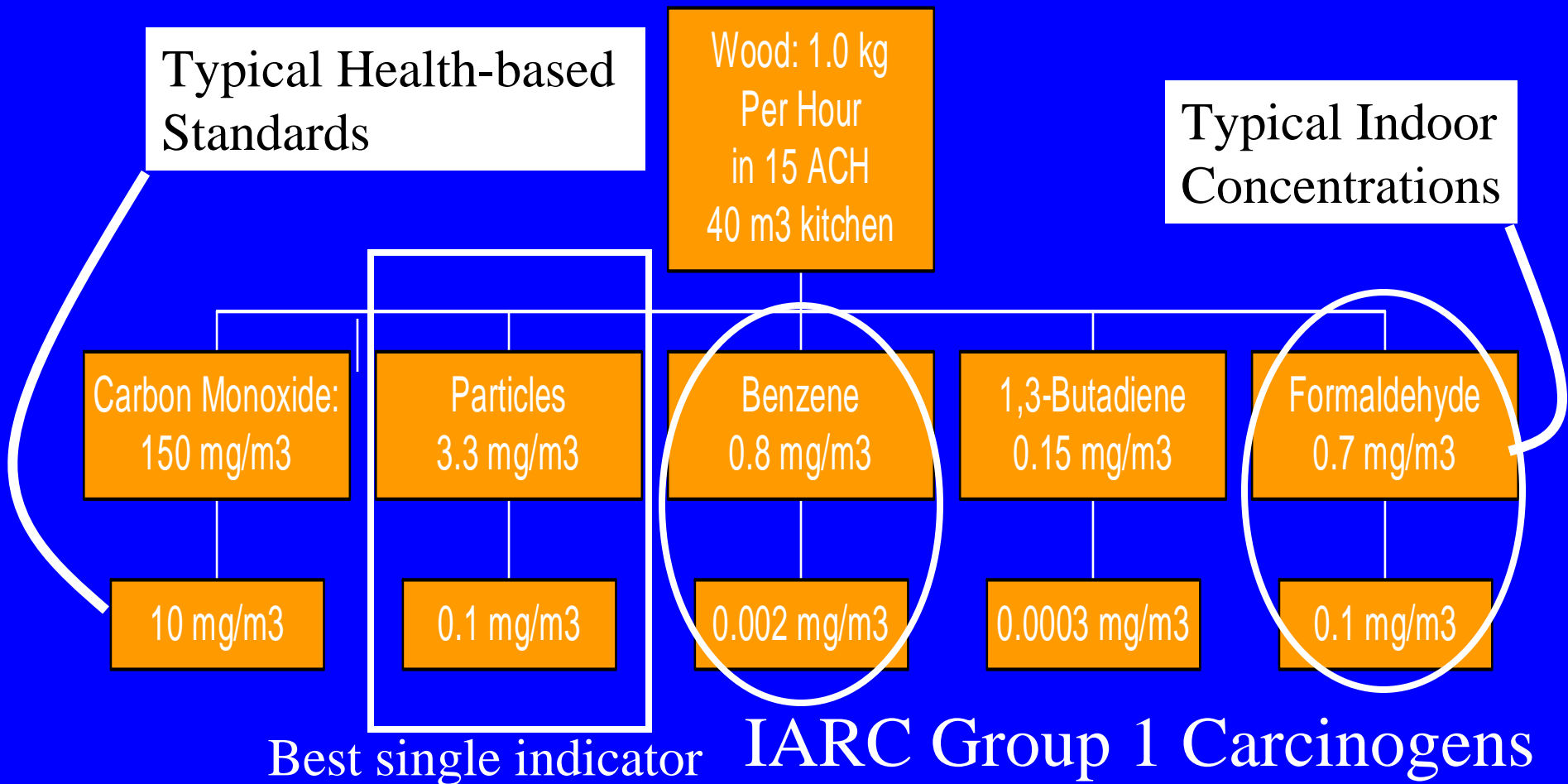
First person in human history to have her exposure measured doing one of the oldest tasks in human history



Kheda District,
Gujarat, India
1981

What kind of exposures?

Health-Damaging Air Pollutants From Typical Woodfired Cookstove in India.



Location	Region	Number of households	Range (24 hour average of PM 10)	Mean (µg/m3) (24 hr average of Kitchen & Living Concentrations of PM10)	Other Determinants
Tamil Nadu	South	4	WHO Global Air Quality Guideline for Indoor/Outdoor particle Levels 20 µg/m3 Absolutely no population even poorest countries should be exposure to more than 70 µg/3	223	Fuel/ Kitchen/Stove
Andhra Pradesh	South	3		485	Fuel/ Kitchen
Karnataka	South	3		898	Fuel/ Stove
Madhya Pradesh	West/Central	7		690	Fuel/ Kitchen
Gujarat	West	6		780	Fuel/ Kitchen
Goa	West	1		635	Fuel/ Kitchen
West Bengal	East/North East	9		795	Fuel/ Kitchen
Haryana	North	1		850	Fuel/ Kitchen
Uttaranchal	North/Mountain	76	270-2240	620	Fuel/ Kitchen

Diseases for which we have
epidemiological studies

ALRI/
Pneumonia
(meningitis)

Low birth
weight

Early
infant
death

Asthma?

Cognitive
Impairment?

Birth defects?

Chronic
obstructive
lung disease

Interstitial lung
disease

Cancer
(lung, NP, cervical,
aero-digestive)

Blindness
(cataracts, trachoma)

Heart disease

Tuberculosis



Diseases for which we have
epidemiological studies

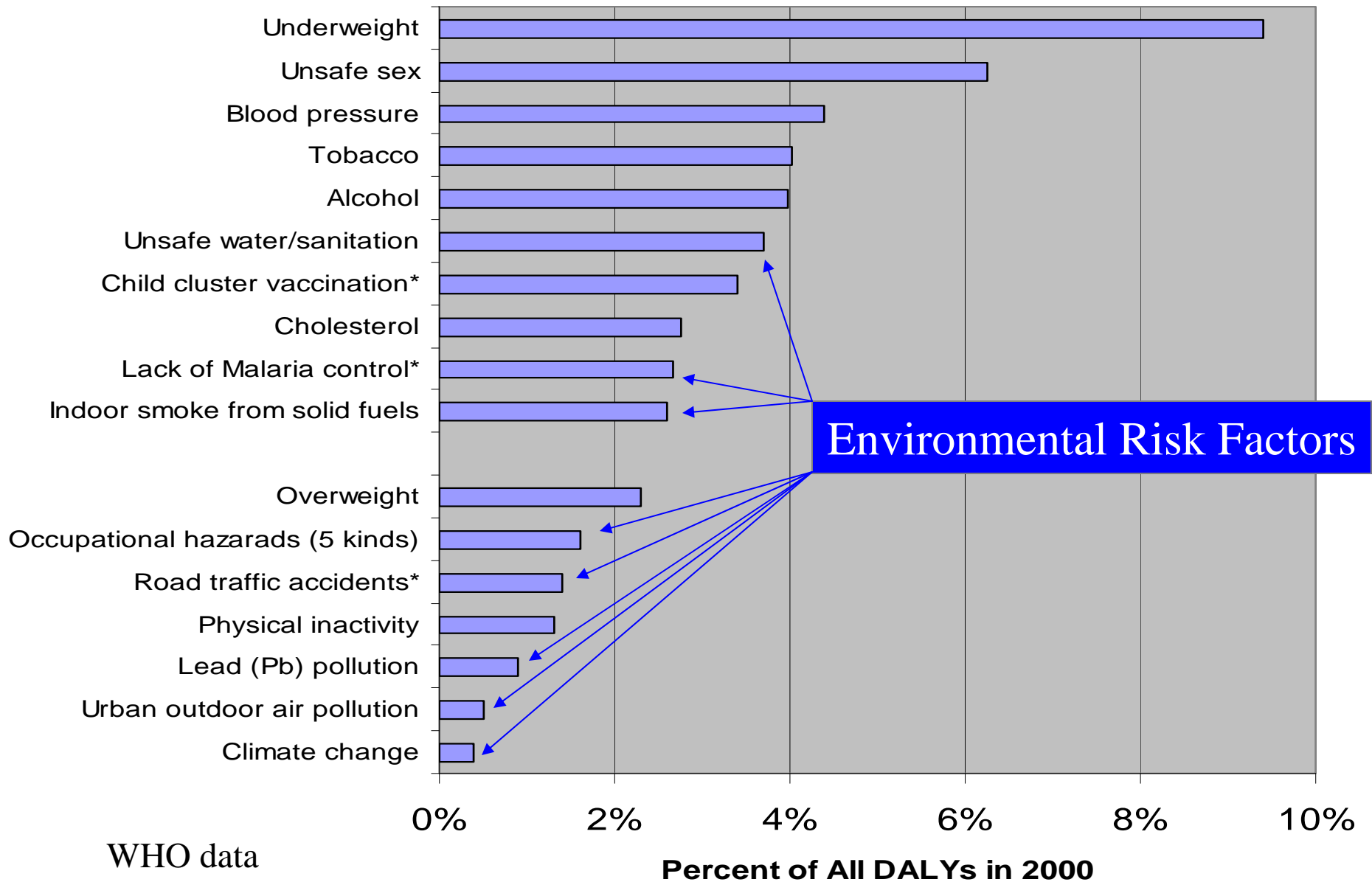


ALRI/
Pneumonia
(meningitis)

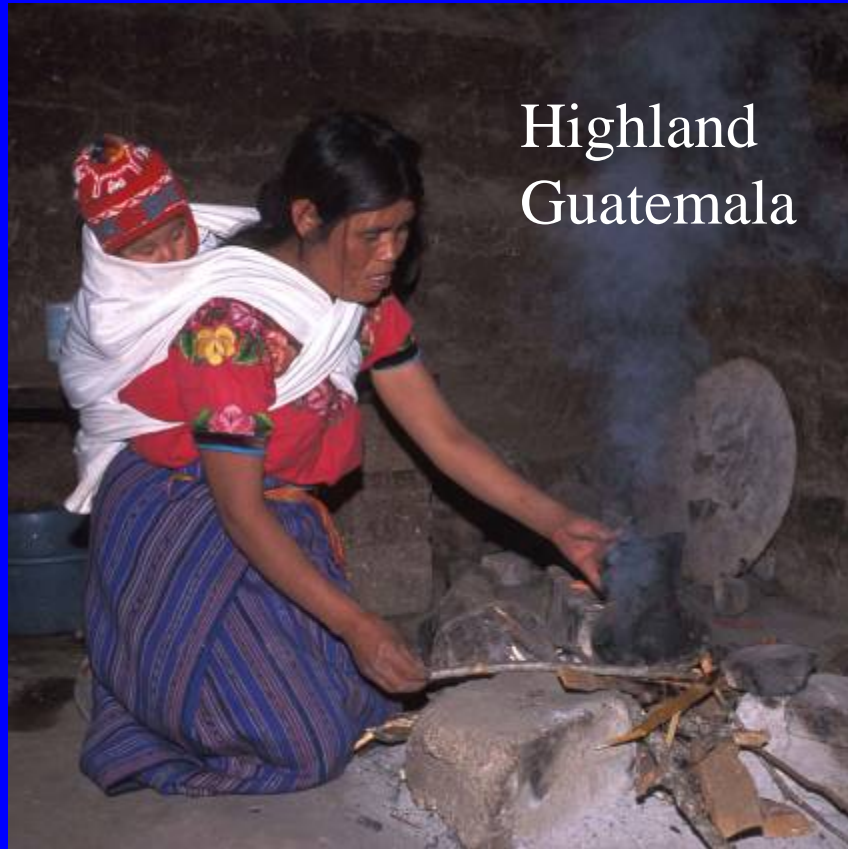
Chronic
obstructive
lung disease

Only two qualified with
sufficient evidence to be
included in the WHO CRA

Global Burden of Disease from Top 10 Risk Factors plus selected other risk factors



RESPIRE: (Randomized Exposure Study of Pollution Indoors and Respiratory Effects)



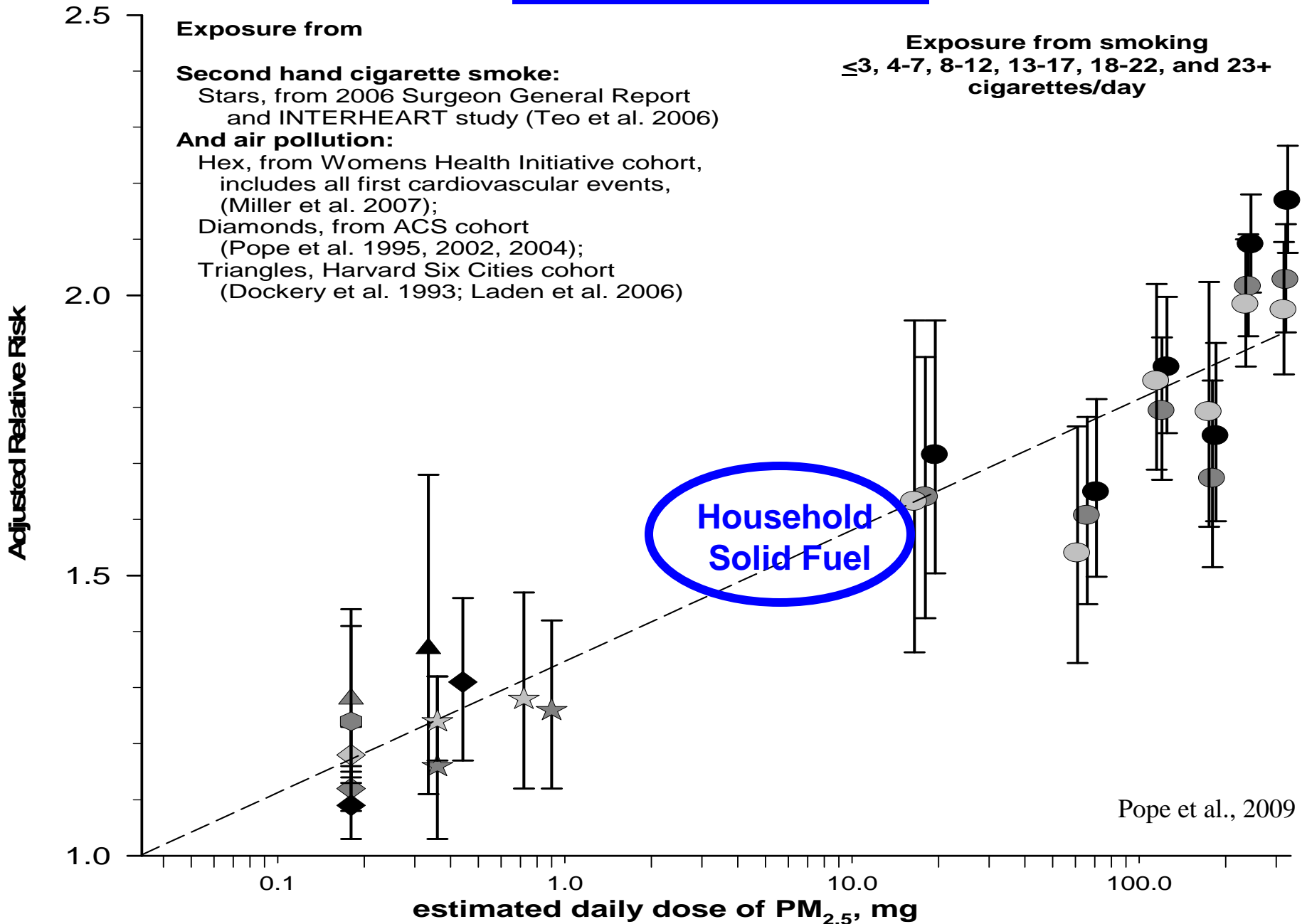
Highland
Guatemala

Traditional 3-stone open fire



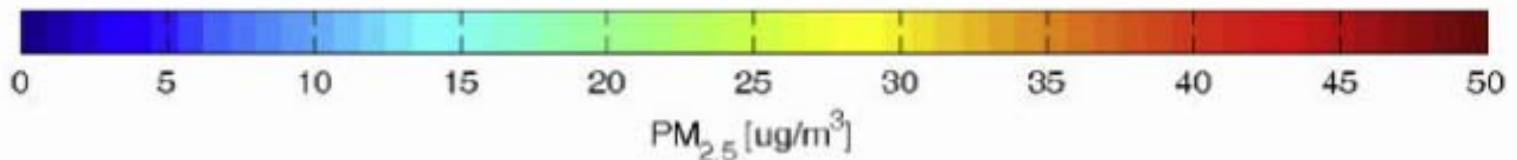
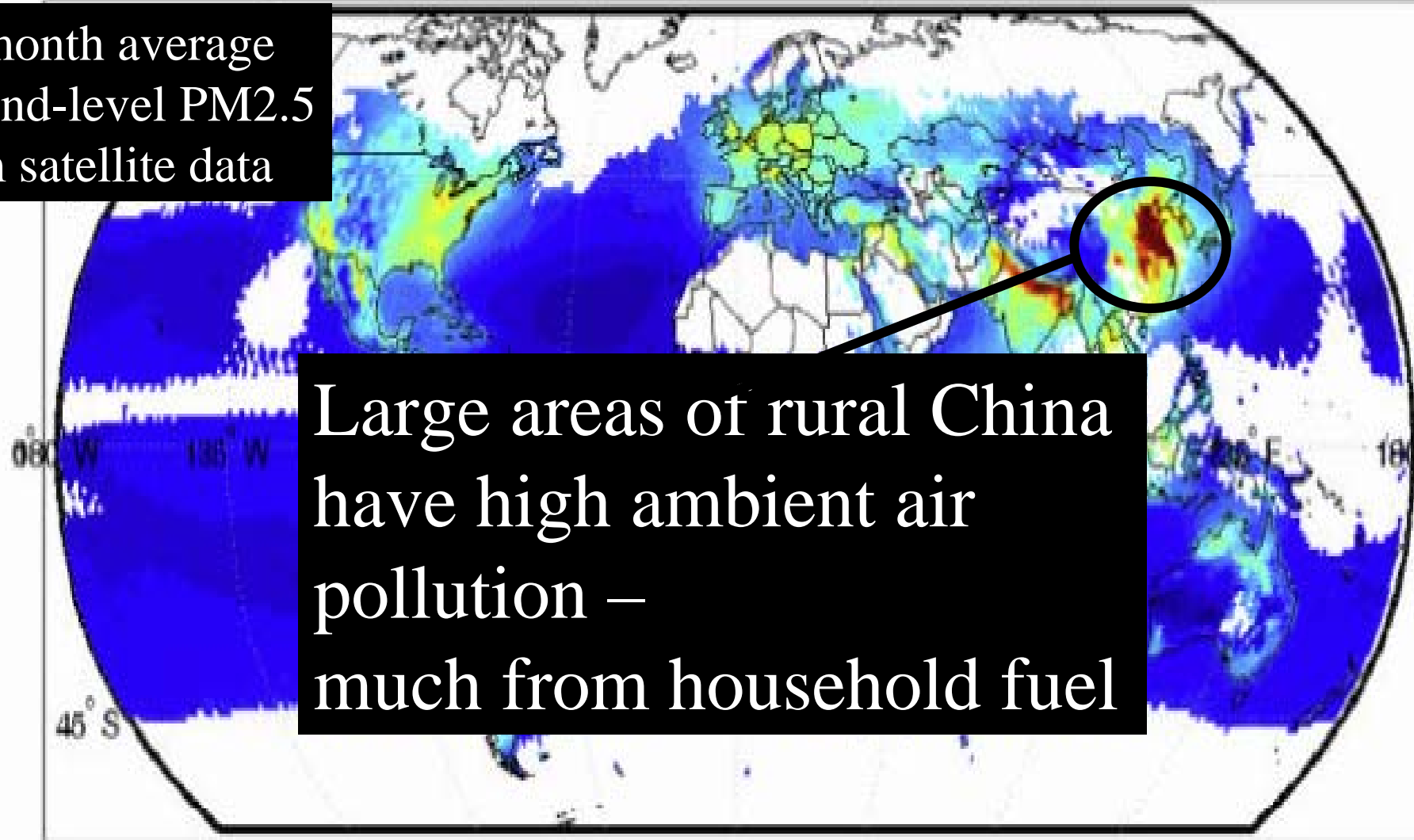
Plancha chimney wood stove

Combustion Particles and Heart Disease Mortality



20-month average
ground-level PM_{2.5}
from satellite data

MODIS

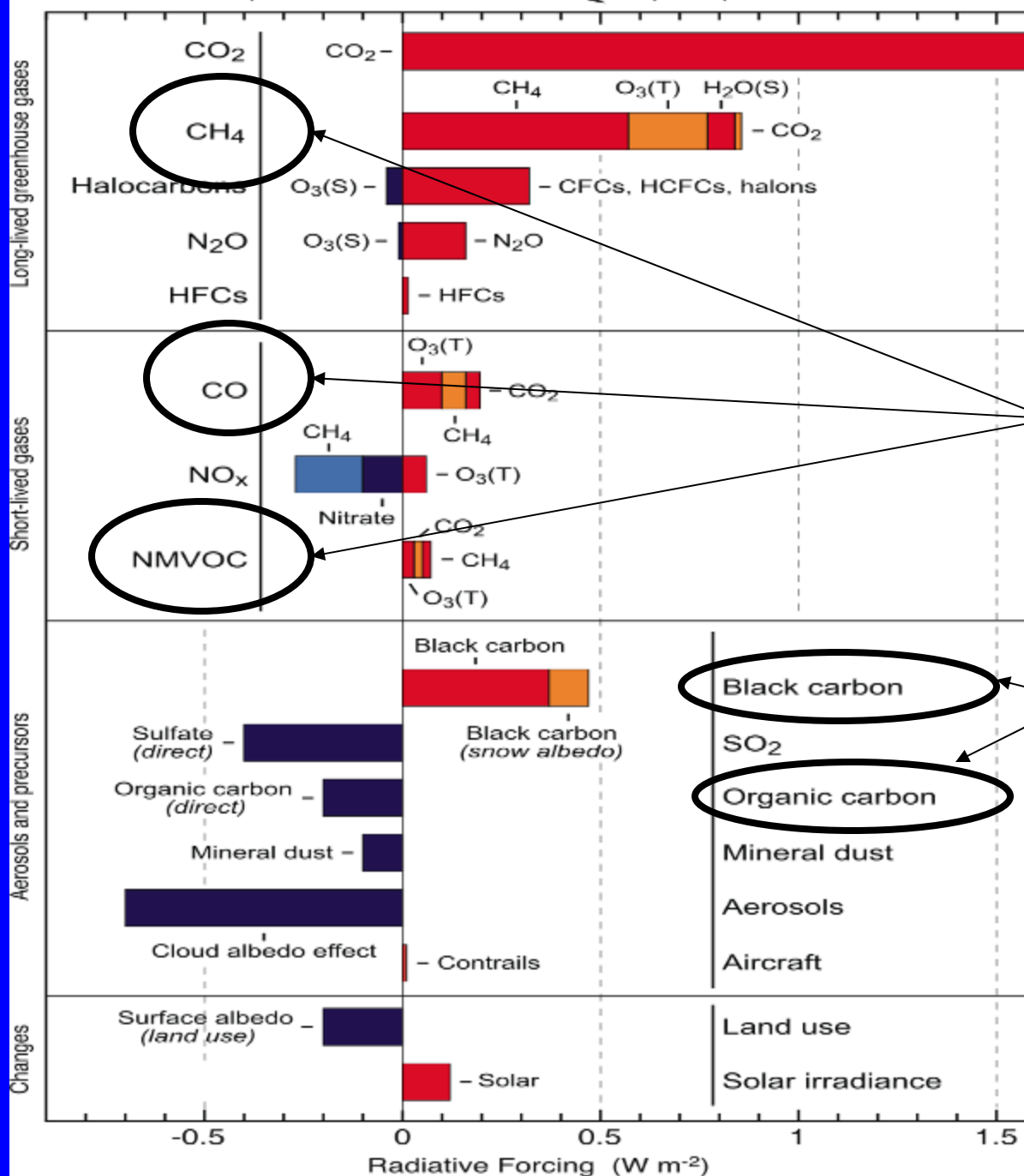


File Edit View Insert Format Tools Data Window Help Adobe PDF																												
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z		
1	Population (thousands)						6224984.81	317077.27	622741.70	817442.87	862866.38	427071.29	166180.20	30443.11	26749.24	317052.05	30191.79	582228.34	782026.21	646518.90	427846.34	181806.42	181					
2	GBD 2002: DALYs by age, sex and cause for the year 2002																											
3	WORLD																											
4	Male														Female													
5	Code	Cause			Total	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	Total	0-4	5-14	15-29	30-44	45-59	60-69								
6	U000	All Causes			1490125643	222552079	56142418	141637847	130501742	115374678	60641455	36229210	3832834	712912264	211279454	54553890	141633214	108257333	90621463	53460940	40							
7	U001	I. Communicable, maternal, perinatal and nutritional conditions			616319250	88888888	26975612	25721869	56146775	16651072	5676054	2915759	645869	88888888	88888888	25246712	53740250	35379204	11439502	4476564	25							
8	U002	A. Infectious and parasitic diseases			350332571	879777510	12810197	25516201	33372707	14085712	3710016	1519252	315539	179307135	89749119	13534884	31549467	23070592	8616676	2658113	14							
9	U003	1. Tuberculosis			34735908	839261	782431	5497848	7335503	4868489	1832663	658401	90612	21905208	738745	821735	4163278	3822011	2041939	833205	3							
10	U004	2. STDs excluding HIV			11347067	1521528	26245	1080828	660600	423721	103004	31641	7415	3854983	1726606	97221	4158088	1147558	260537	71612								
11	U005	a. Syphilis			4200039	1039452	2292	151945	285546	354596	99162	30394	6987	1970375	1265722	3432	521758	262487	107605	42492								
12	U006	b. Chlamydia			3571404	1199	7209	241593	50929	1169	136	0	0	302234	1152	69338	2635460	439449	109658	14084								
13	U007	c. Gonorrhoea			3365159	463945	16559	683964	301215	6664	719	91	3	1473160	447789	24323	989323	422675	6262	1616								
14	U008	d. Other STDs			210465	16932	185	3327	22911	61292	2987	1157	425	109215	11943	127	11546	22947	37012	13420								
15	U009	3. HIV/AIDS			84457784	6215039	1923486	11002792	18824803	4373213	299351	23497	420	42662599	5985984	1878957	17299389	13746555	2624463	230670								
16	U010	4. Diarrhoeal diseases			61966183	29217337	800330	791539	721612	446922	197262	122248	55269	32352519	26863437	754533	652616	545936	373258	201900	1							
17	U011	5. Childhood-cluster diseases			41479543	19033686	1422740	174377	55101	19437	4748	1821	613	20712522	19065281	1447659	172987	53966	19174	4837								
18	U012	a. Pertussis			12594810	6231695	50837	44	0	0	0	0	0	6282575	6261471	50717	34	0	13	0								
19	U013	b. Poliomyelitis			150660	15348	9021	29583	17300	3733	643	460	123	76211	15357	8675	28237	16931	3822	615								
20	U014	c. Diphtheria			184710	83919	8095	1348	1346	1207	206	21	11	96143	67627	19365	523	386	572	29								
21	U015	d. Measles			21475463	9387297	1255475	84251	83	20	23	0	0	10727148	9394304	1269212	84741	29	30	0								
22	U016	e. Tetanus			7073899	3315427	99323	59152	36372	14477	3876	1340	479	3530446	3326522	99690	59452	36620	14737	4192								
23	U017	6. Meningitis*			6191790	1504271	596798	445433	257091	184063	53527	33371	6998	3081551	1676034	734345	341757	167759	110215	48775								
24	U018	7. Hepatitis B			2170326	105358	137204	275807	430017	397164	82713	26027	4975	1459264	188406	62506	173729	115391	110437	36630								
25	U019	Hepatitis C			1003682	35920	56182	100610	192346	210317	48794	20514	3442	668127	72373	24200	67867	53705	61307	30322								
26	U020	8. Malaria			46485868	20191868	607710	620617	438228	247611	87288	40647	9444	22243414	22056596	601958	689661	453207	280704	93111								
27	U021	9. Tropical-cluster diseases			12245452	311034	2512134	3070382	1576828	643186	115534	37265	6156	8272521	266359	1203242	1297027	593336	496341	75537								
28	U022	a. Trypanosomiasis			1525287	75814	412387	236703	148103	84732	6426	1970	54	966168	41943	237244	149181	79329	46509	3694								
29	U023	b. Chagas disease			666764	65	50	182129	71755	58490	21730	6937	1754	342910	137	193	198737	51644	49058	15987								
30	U024	c. Schistosomiasis			1701795	8779	325555	322328	193817	110544	41702	15248	2506	1020479	5691	221149	232053	128589	58850	17056								
31	U025	d. Leishmaniasis			2089898	83685	477545	410956	200263	60230	13331	3321	135	1249465	115737	367279	240603	67203	30097	11647								
32	U026	e. lymphatic filariasis			5777436	133357	1268387	1866390	878568	248993	13583	3489	415	4413181	94654	349733	425651	206680	266630	15772								
33	U027	f. Onchocerciasis			484282	9335	28230	51876	84323	80198	18762	6301	1293	280317	8197	27645	45343	59892	4198	11380								
34	U028	10. Leprosy			198778	7694	25203	20293	25074	25666	7702	4506	516	116652	10370	23264	16689	15828	9135	4389								
35	U029	11. Dengue			615529	67552	177902	15445	9070	5409	2019	1034	440	278872	76029	215987	23174	10408	6396	2644								
36	U030	12. Japanese encephalitis			709219	100148	92418	61558	70268	9948	2292	1205	279	338116	160556	131203	41495	26926	7282	2513								
37	U031	13. Trachoma			2328780	1861	2594	32532	183952	201068	111206	53718	10162	597093	1973	7118	68754	517423	559520	344796	1							
38	U032	14. Intestinal nematode infections			2951341	257716	1196068	14526	7512	8174	4301	1450	492	1490238	273831	1158847	12068	5192	5921	3469								
39	U033	a. Ascariasis			1816942	157488	751279	695	270	222	11	15	40	910021	171105	735150	311	161	21	111								
40	U034	b. Trichuriasis			1006248	82408	432805	1371	908	699	367	108	27	518693	74437	41117	823	388	433	238								
41	U035	c. Hookworm disease			58617	339	3937	11																				
42	U036	Other intestinal infections			69534	17481	8047	11																				
43	U037	Other infectious diseases			41445320	8567237	2450753	2316																				
44	U038	B. Respiratory infections			94603349	32429989	6247258	241144																				
45	U039	1. Lower respiratory infections			91373521	31836027	5573644	23103																				
46	U040	2. Upper respiratory infections			1795292	458484	84253	869																				
47	U041	3. Otitis media			1434536	135477	589362	134																				
48	U042	C. Maternal conditions			33631593	0	0																					
49	U043	1. Maternal haemorrhage			4437585	0	0																					
50	U044	2. Maternal sepsis			6903085	0	0																					
51	U045	3. Hypertensive disorders*			2162701	0	0																					
52	U046	4. Obstructed labour			3048291	0	0																					
53	U047	5. Abortion			4652171	0	0																					
54	U048	Other maternal conditions			12427759	0	0																					
55	U049	D. Perinatal conditions*			97335086	53209265	1343	10																				
56	U050																											

Climate connection

- Solid fuel PIC contain important greenhouse pollutants (GHPs) including
 - Methane – second most important GHP after CO₂
 - Black carbon – extremely powerful GHP – 3rd most important after CO₂
- Making household solid fuel use probably the most GH intensive energy system in the world per unit useful energy
- Household stoves produce a few percent of global methane and >35% of global black carbon
- Major opportunities for co-benefits, i.e., tap international carbon market to pay for stove/fuel improvements

Components of radiative forcing for principal emissions

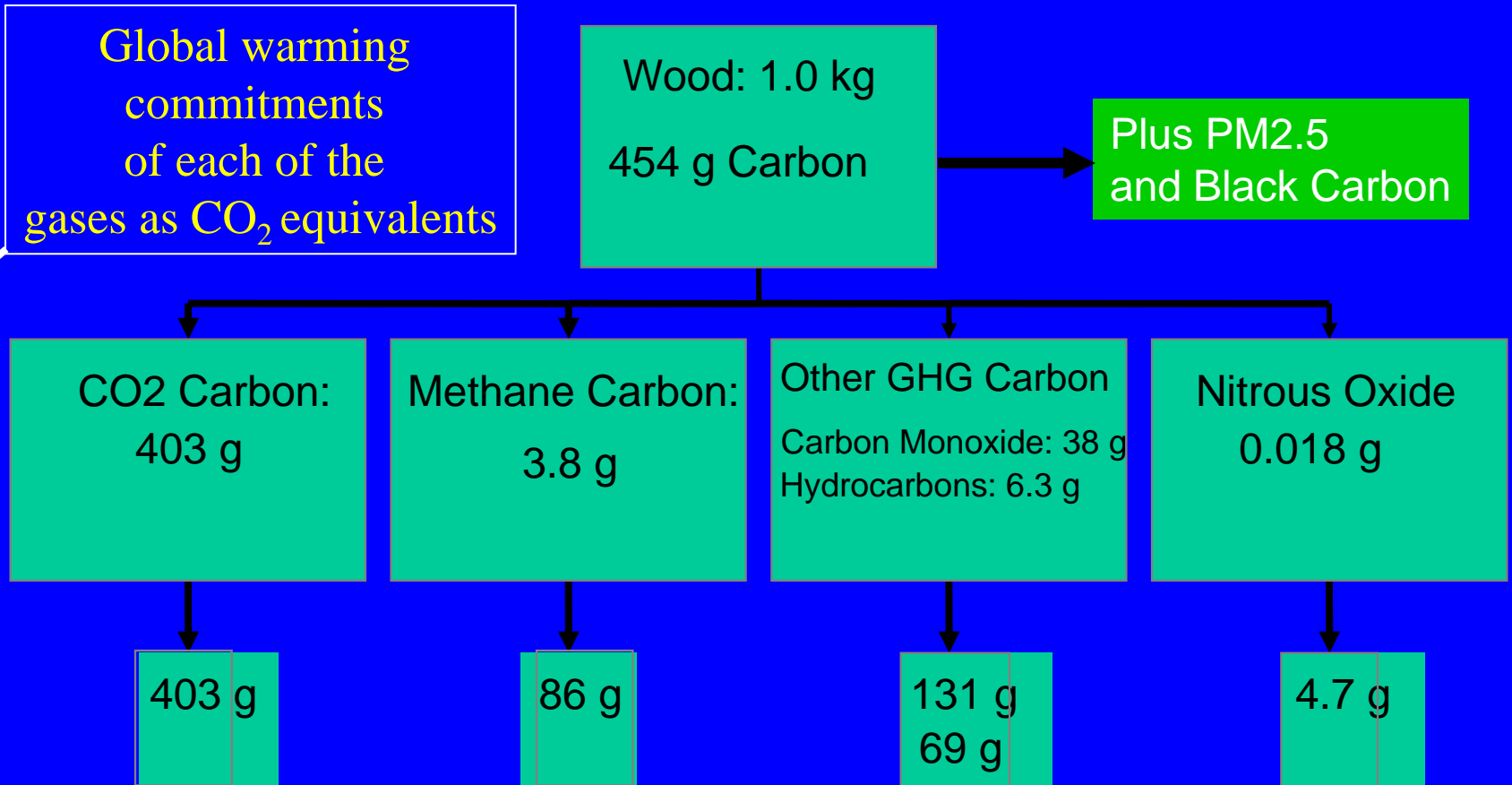


**Warming in 2005
from emissions
since 1750**

A large part from
PIC: products of
incomplete
combustion

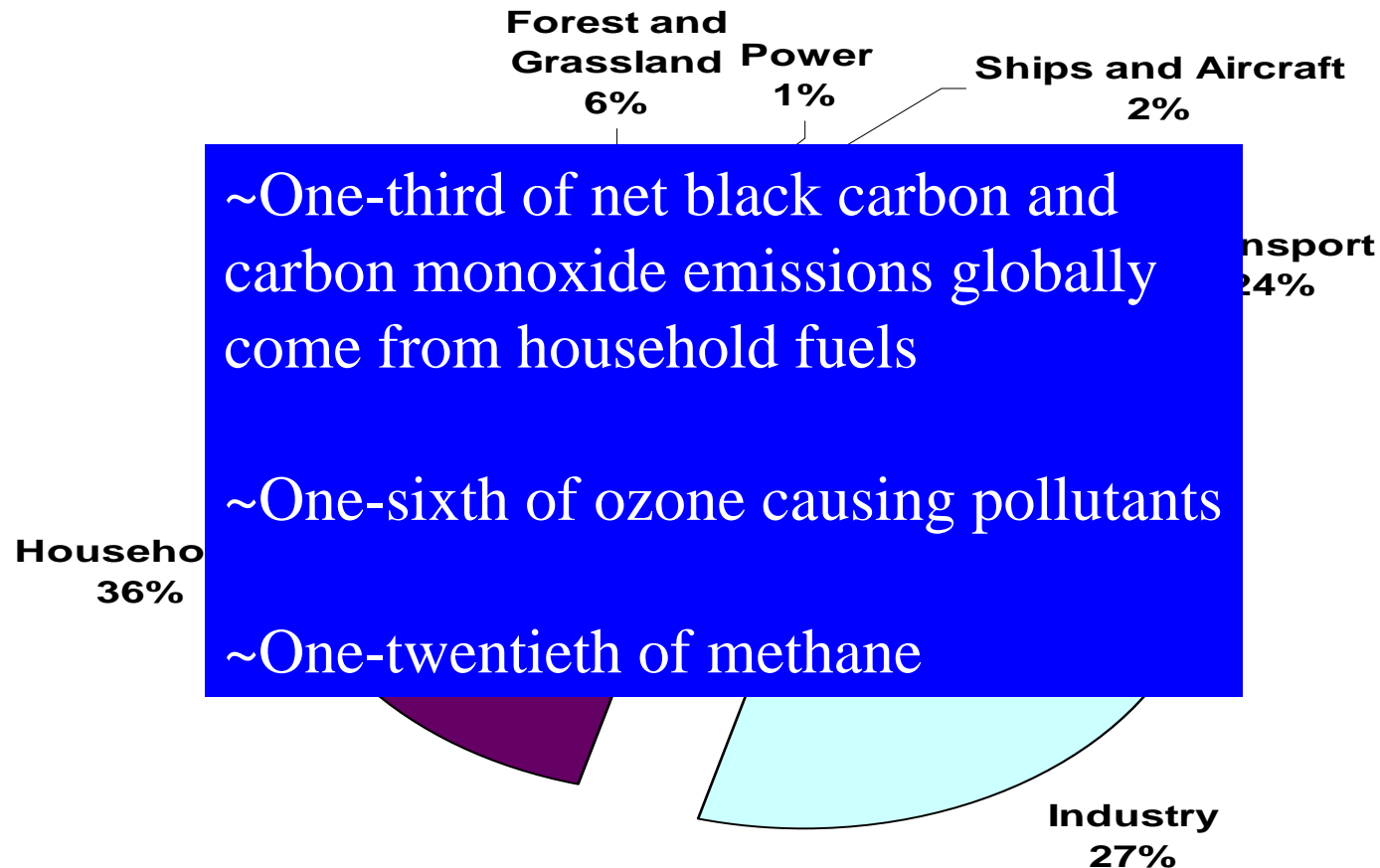
IPCC, 2007

Greenhouse warming commitment per meal for typical biomass-fired cookstove in China



Controllable Global Warming from Black Carbon Emissions

Net of OC, Forcings from IPCC, 2007: 0.25 W/m^2
Inventory from T Bond Database, V 7.1.1 Feb 2009



A Chinese Gasifier Stove

Winner of National Stove Contest

Efficiency 2x traditional stoves; Emissions ~20x less:
Low health risk and essentially no greenhouse emissions



Compared to Coal Stove
Change from:

- non-renewable to renewable
- 17% to 35% fuel efficiency
- 89% to 99% combustion efficiency
- 1.6 to 0.24 g PM/kg fuel
- High black carbon to very low black carbon
- Significant CO₂ to no CO₂

Retail cost
~700 RMB
(US\$100)

CO₂-eq
savings
~\$60/y

Hot water

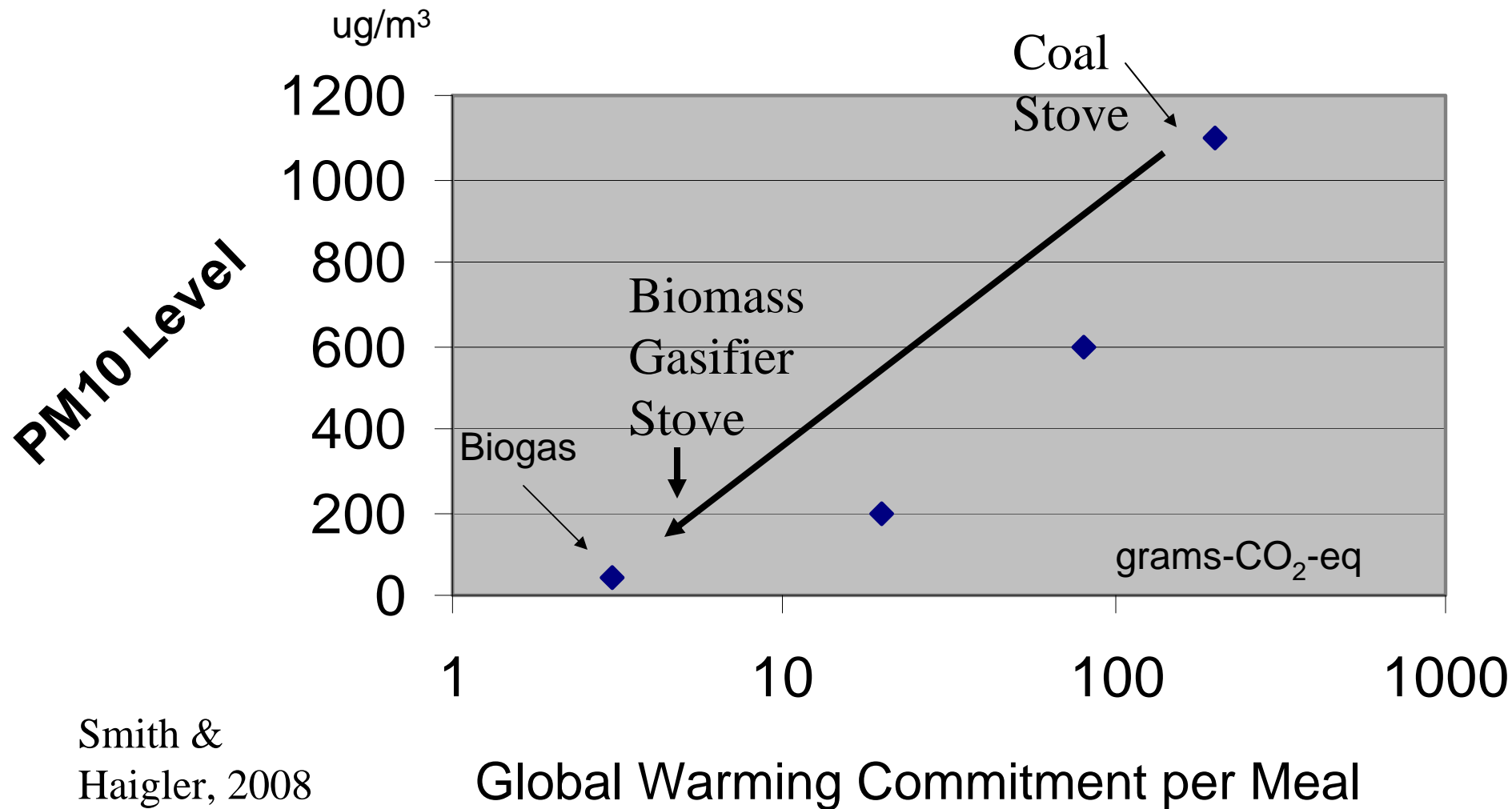
Corn cob

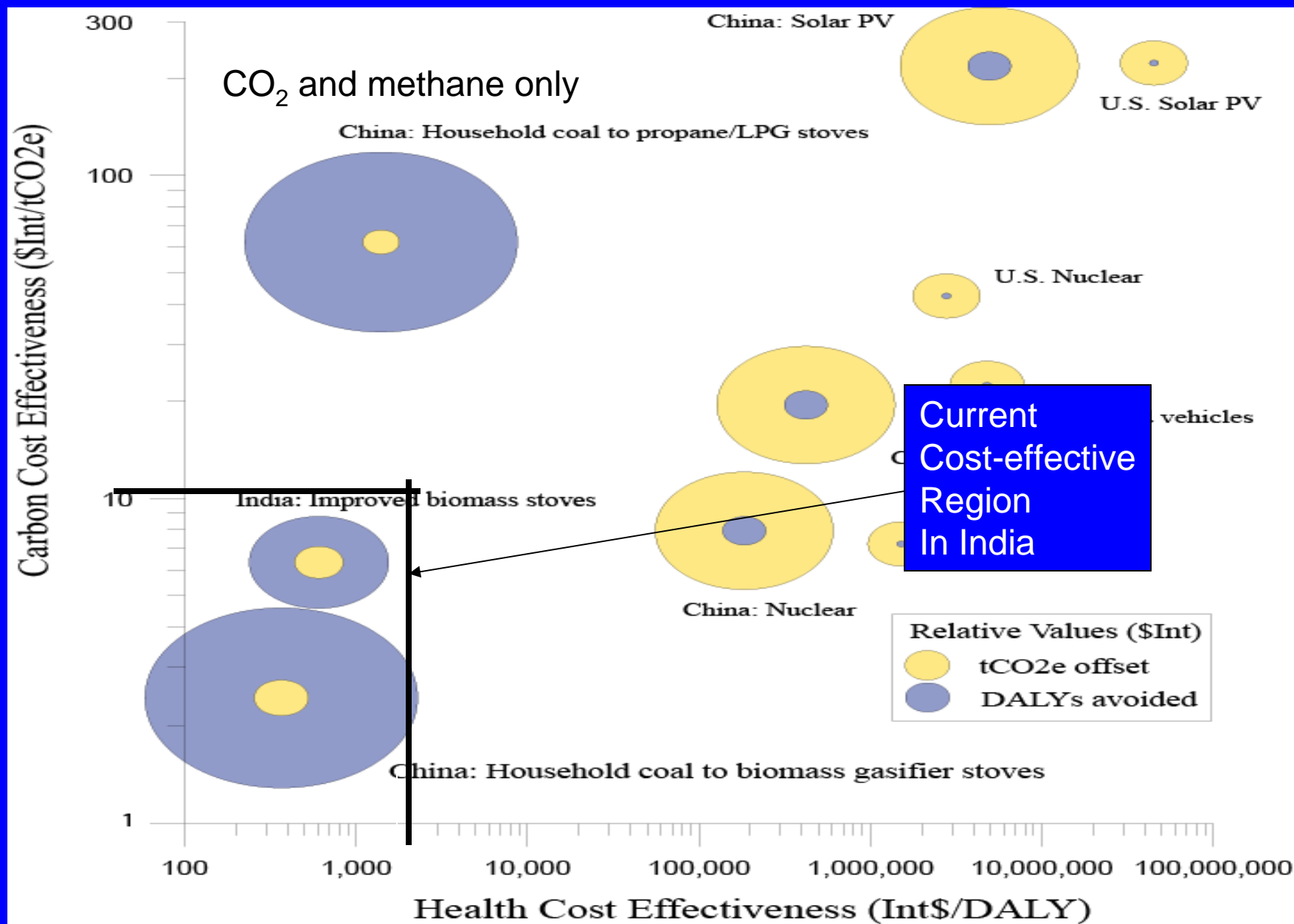
Blower

08.11.2008

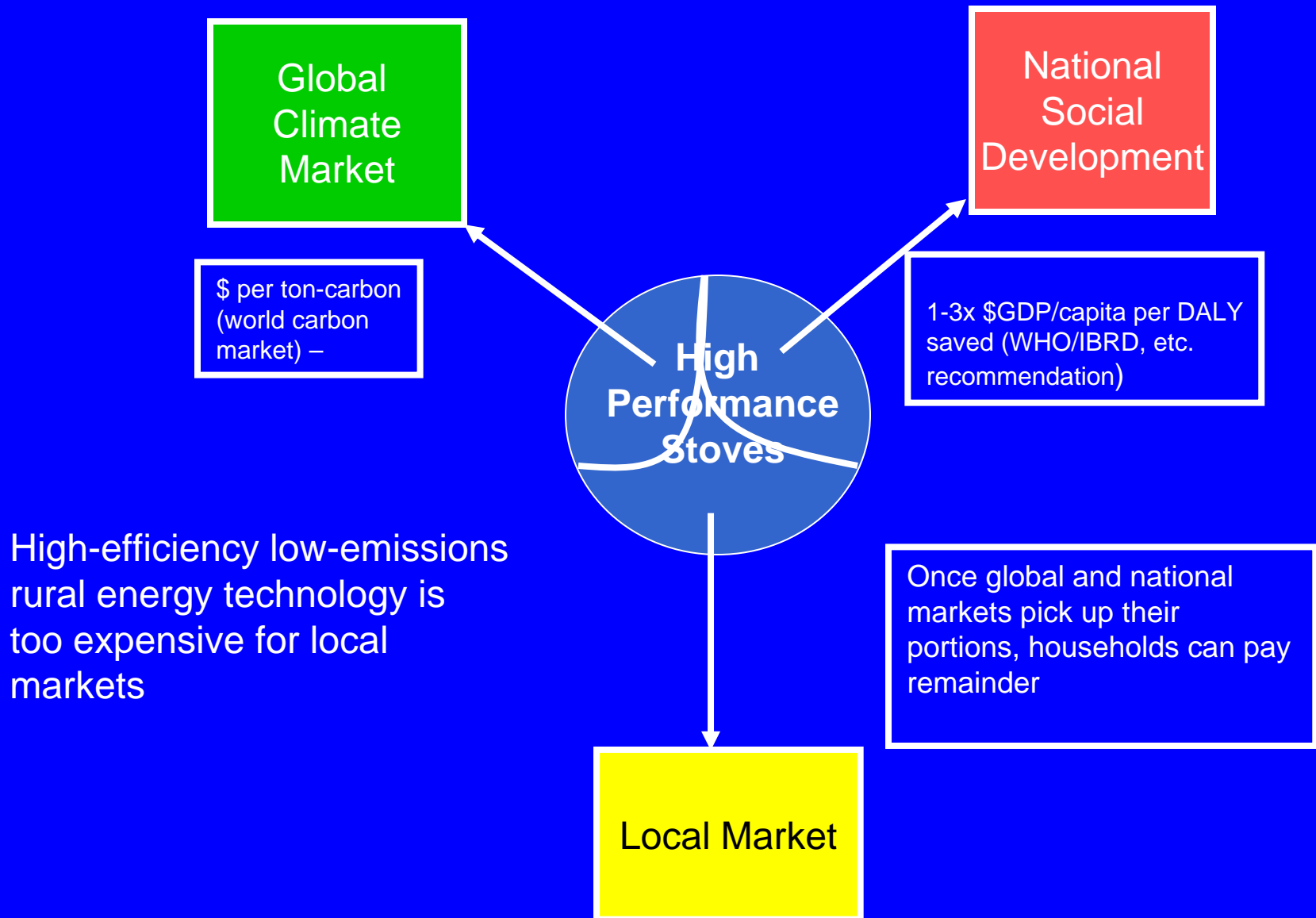


Health and Greenhouse Gas Benefits of Biomass Stove Options

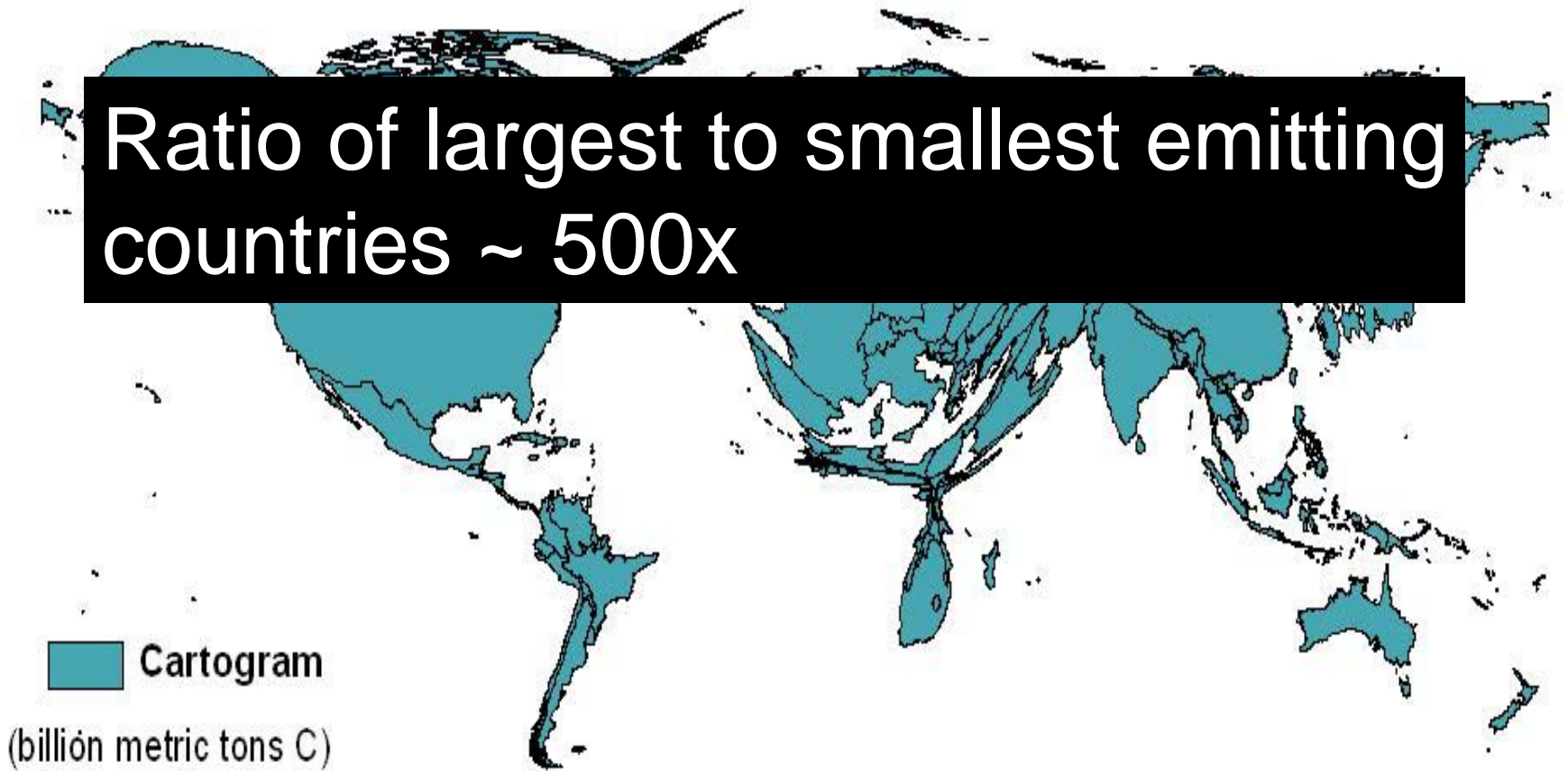




Paying for Rural Energy Development

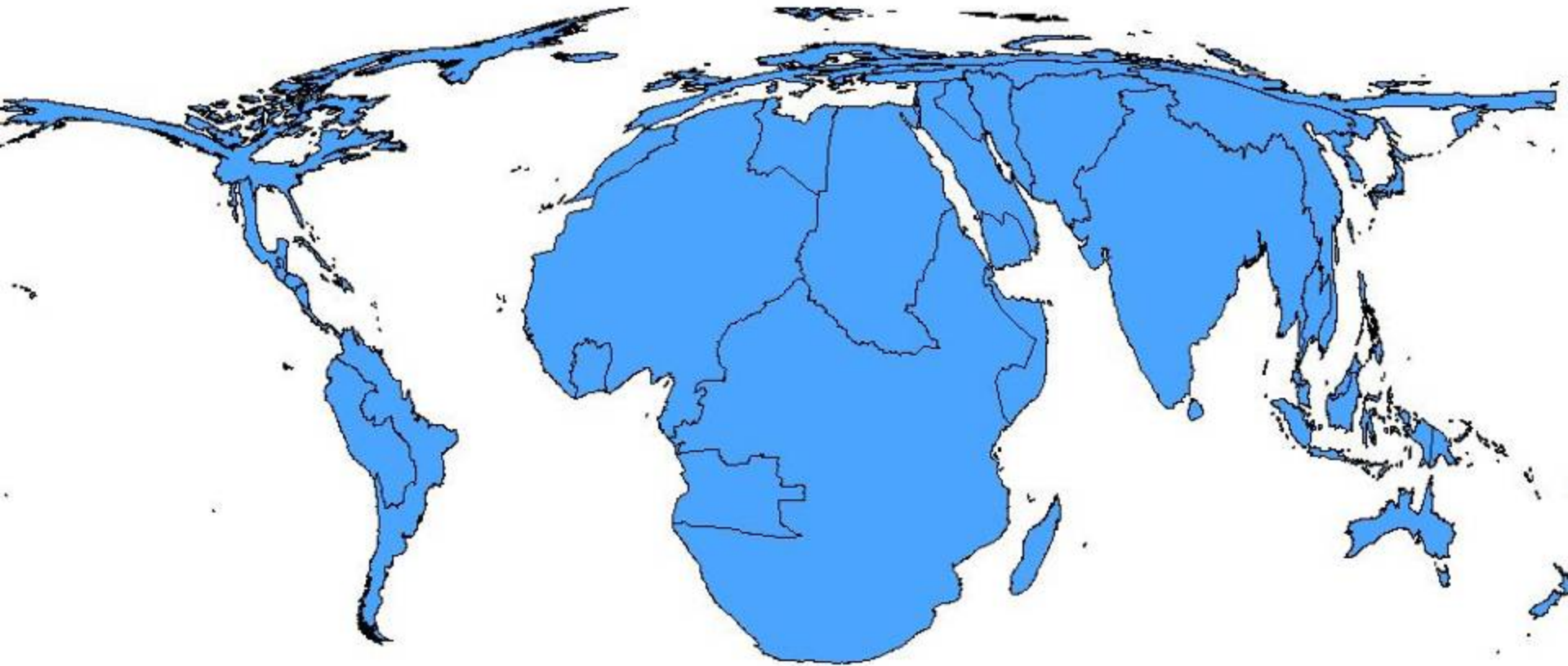


National Natural Debts: Cumulative CO₂ emissions, depleted by natural processes



Patz JA, Gibbs HK, Foley JA, Rogers JV, Smith KR, 2007, Climate change and global health: Quantifying a growing ethical crisis, EcoHealth 4(4): 397–405, 2007.

Cartogram of Climate-related Mortality (per million pop) yr. 2000



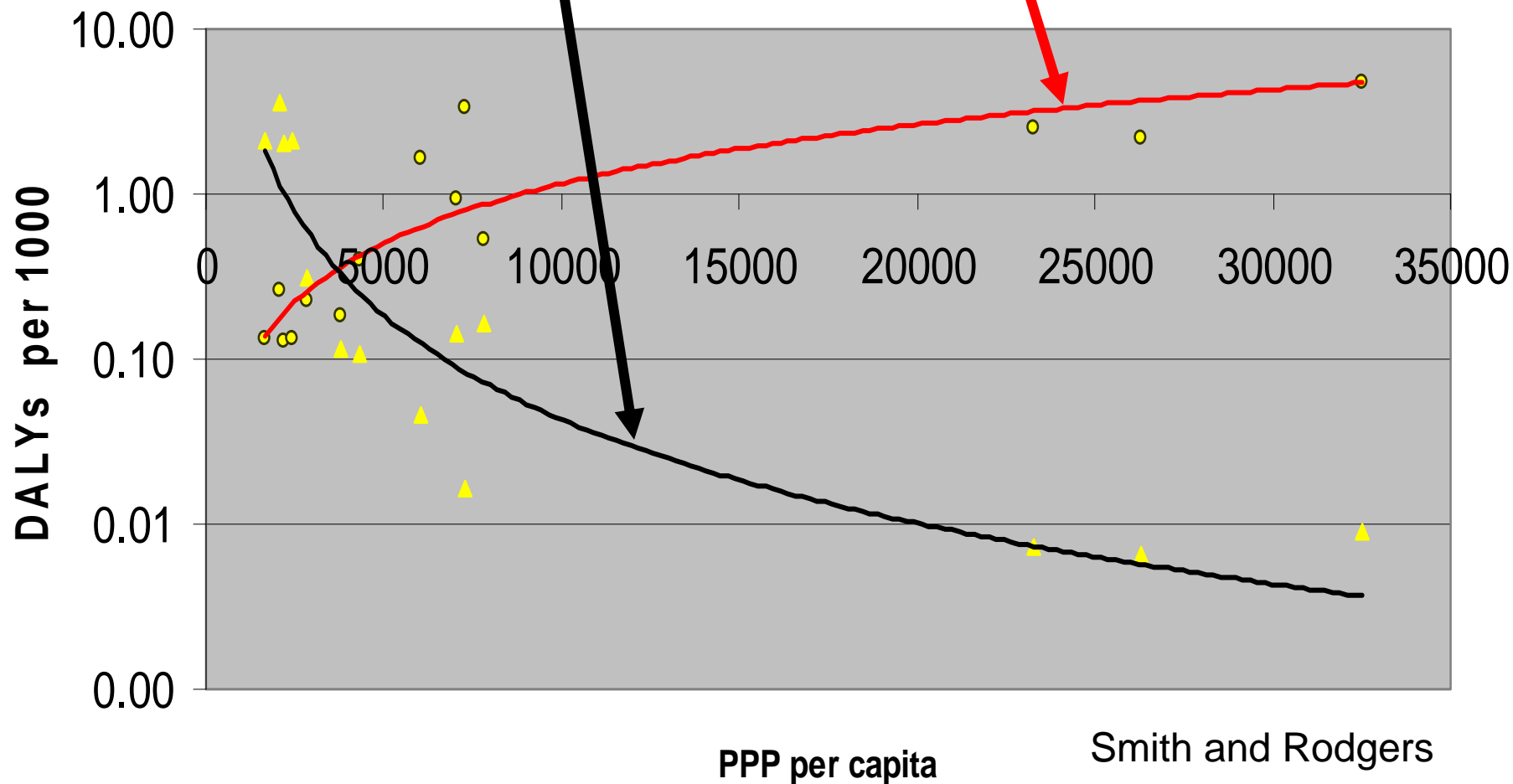
Patz et al.

This map shows estimated mortality (per million people) attributable to climate change by the year 2000. Map is a density-equalizing cartogram in which the sizes of the 14 WHO regions are proportional to the increased mortality.



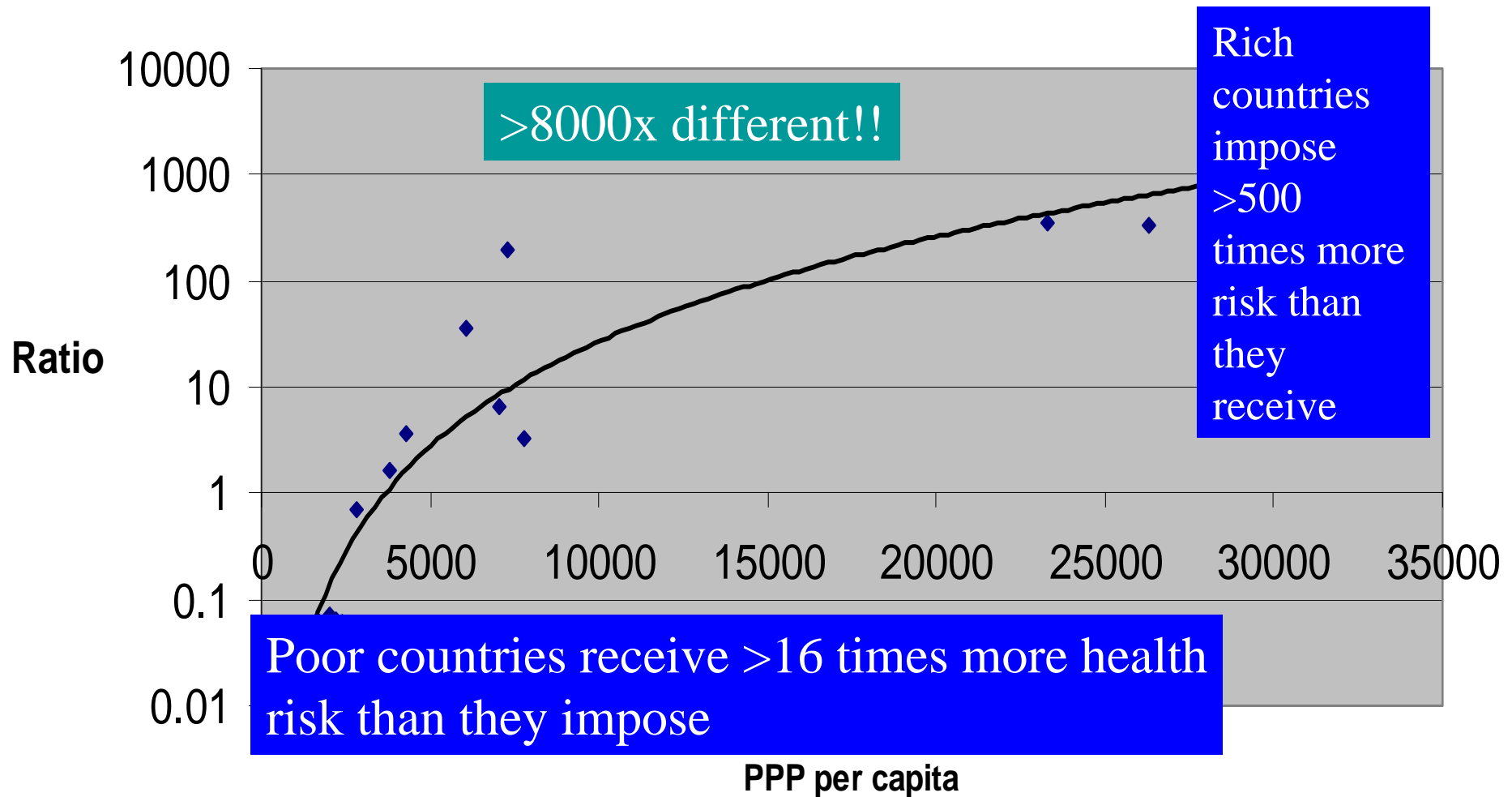
Distribution of Health Impacts from Climate Change

(Experiencing versus Imposing)



Distribution of Health Impacts from Climate Change

(Ratio: Imposing/Experiencing)



Food for a Week, Germany

© 2005 PETER MENZEL PHOTOGRAPHY



ALLEMAGNE 1500 sortes de saucisses, 1200 restaurants McDonald's, 750 millions de kebabs

avalés chaque année... Plus de la moitié des Allemands sont en surpoids ou obèses.

Food for a Week, Darfur Refugees, Chad

© 2007 PETER MENZEL PHOTOGRAPHY



TCHAD 230 000 réfugiés de guerre soudanais vivent dans les camps de l'Onu. Chacun a droit à 2100 Cal par jour: céréales, sucre, sel, huile, légumes secs et farine vitaminée.

Sins of Omission and Commission

- That children die unnecessarily in poor countries is mostly seen as a Sin of Omission – we do not cause it and our lapse is just in not doing more to stop it.
- Awareness of climate change has the effect of shifting it more to a Sin of Commission, i.e., at least in part directly due to our actions.

Hard questions about climate change

IF I ASKED YOU IF YOU'RE WORRIED ABOUT GLOBAL WARMING, YOU'D SAY...

NOT REALLY.

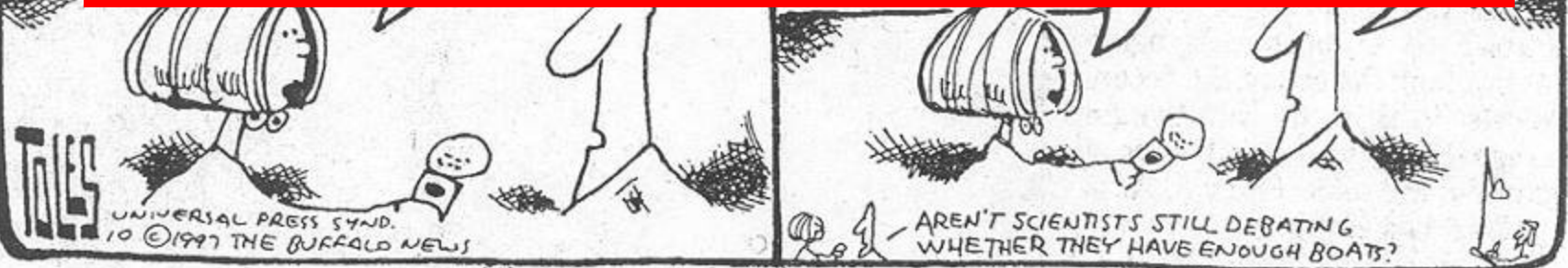
BUT IF I ASKED IF YOU'D GIVE UP A LITTLE FUEL USE TO PREVENT YOUR ROOF BEING BLOWN OFF IN A FREAK

WELL, YEAH...

Al Gore, at the end of *Inconvenient Truth*, says that we need to think of our obligation to forcefully address climate change as a moral issue; not as scientific, political, or economic issues

The perceived shift of global disparities as sins of omission to be more due to commission.

Will it help?



“Wood is the fuel that heats you twice” - ?

- Chopping
- Burning
- Actually four times
- Fever from pneumonia
- Global warming
- Bottom line: We can get rid of the last two by getting rid of PIC

Publications and presentations available at
<http://ehs.sph.berkeley.edu/krsmith/>

Many thanks