

Health and Solid Fuel Use: Five New Paradigms

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Clean Cooking Conference, DFID/WHO/GACC

London, May 1, 2014

and

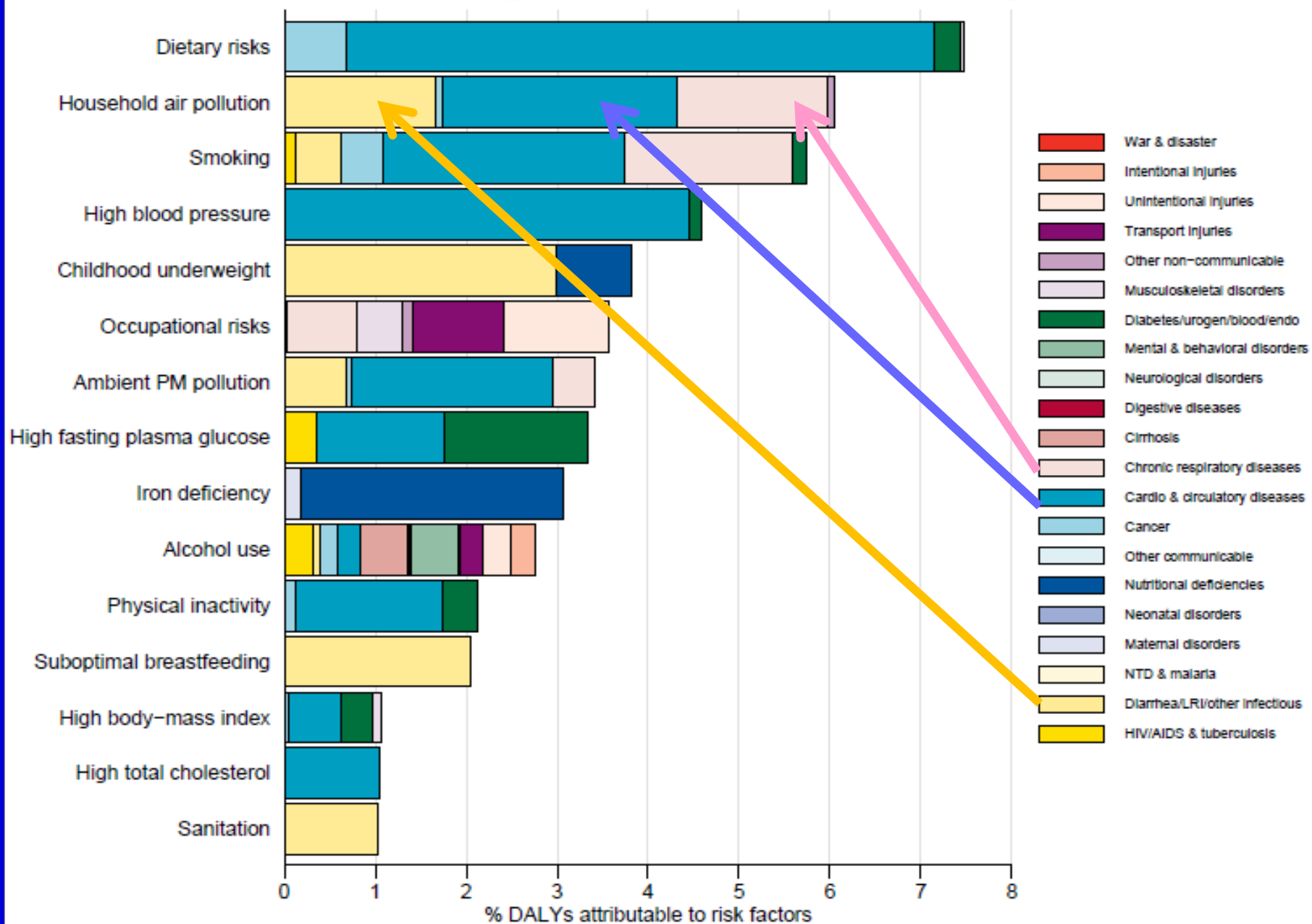
SE4All and UNIDO

Vienna, May 7, 2014

Declarations of Bias

- A focus on health, with other objectives secondary
- A focus on India, which does not represent all parts of the world
- Moment in time during ongoing shifts in thinking

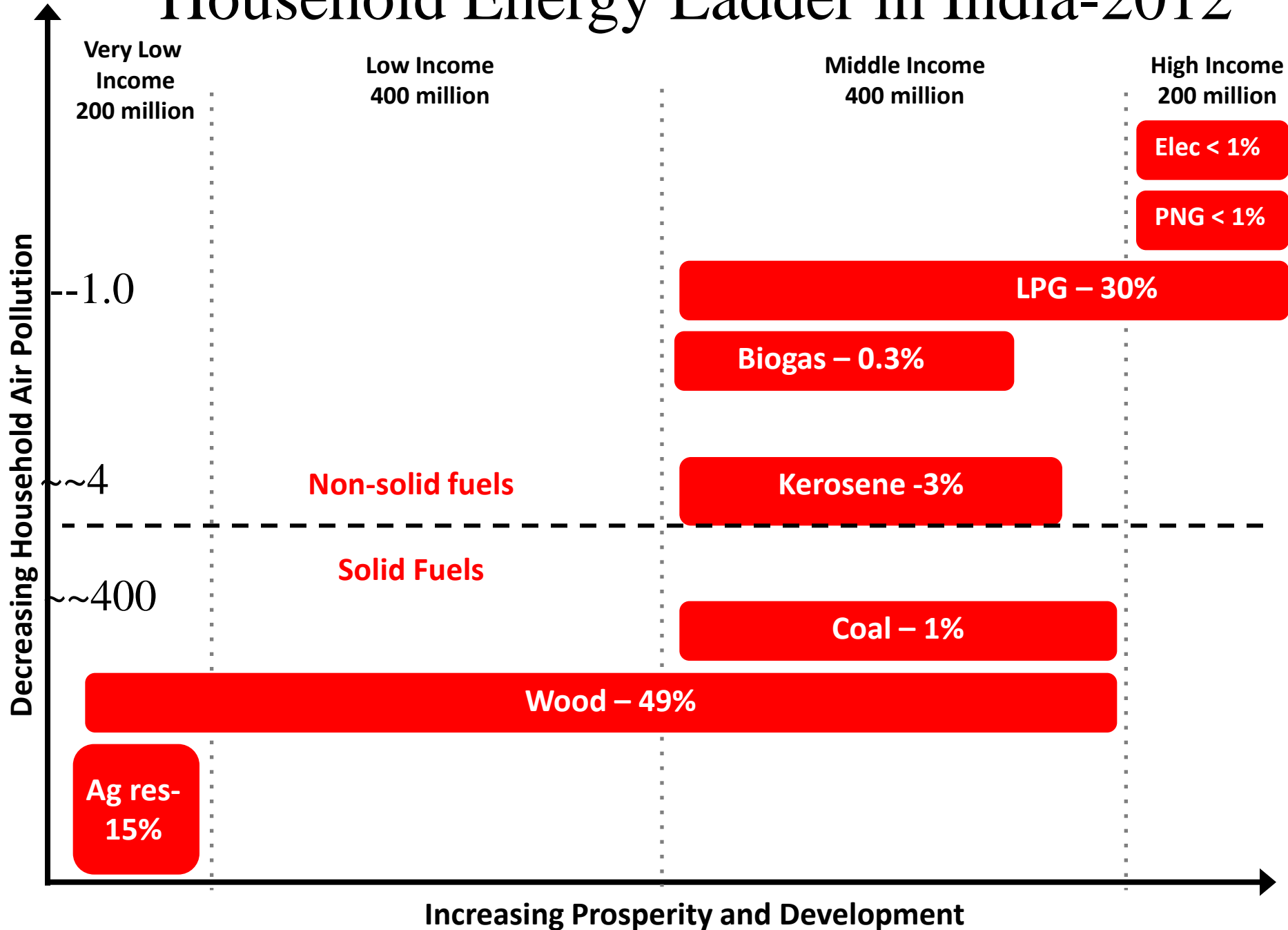
Burden of disease attributable to 15 leading risk factors in 2010, expressed as a percentage of India DALYs



Summary of Health Impacts

- One of the top risk factors in the world for ill-health.
- Biggest impact in adults –3.4 million premature deaths (two-thirds the DALYs)
- Still important for children ~500,000 deaths (one-third the DALYs)
- About one million premature deaths in India
- Biggest single risk factor of any examined for Indian women and girls
- Important source of outdoor air pollution
- Impact going down slowly because background health conditions improving

Household Energy Ladder in India-2012



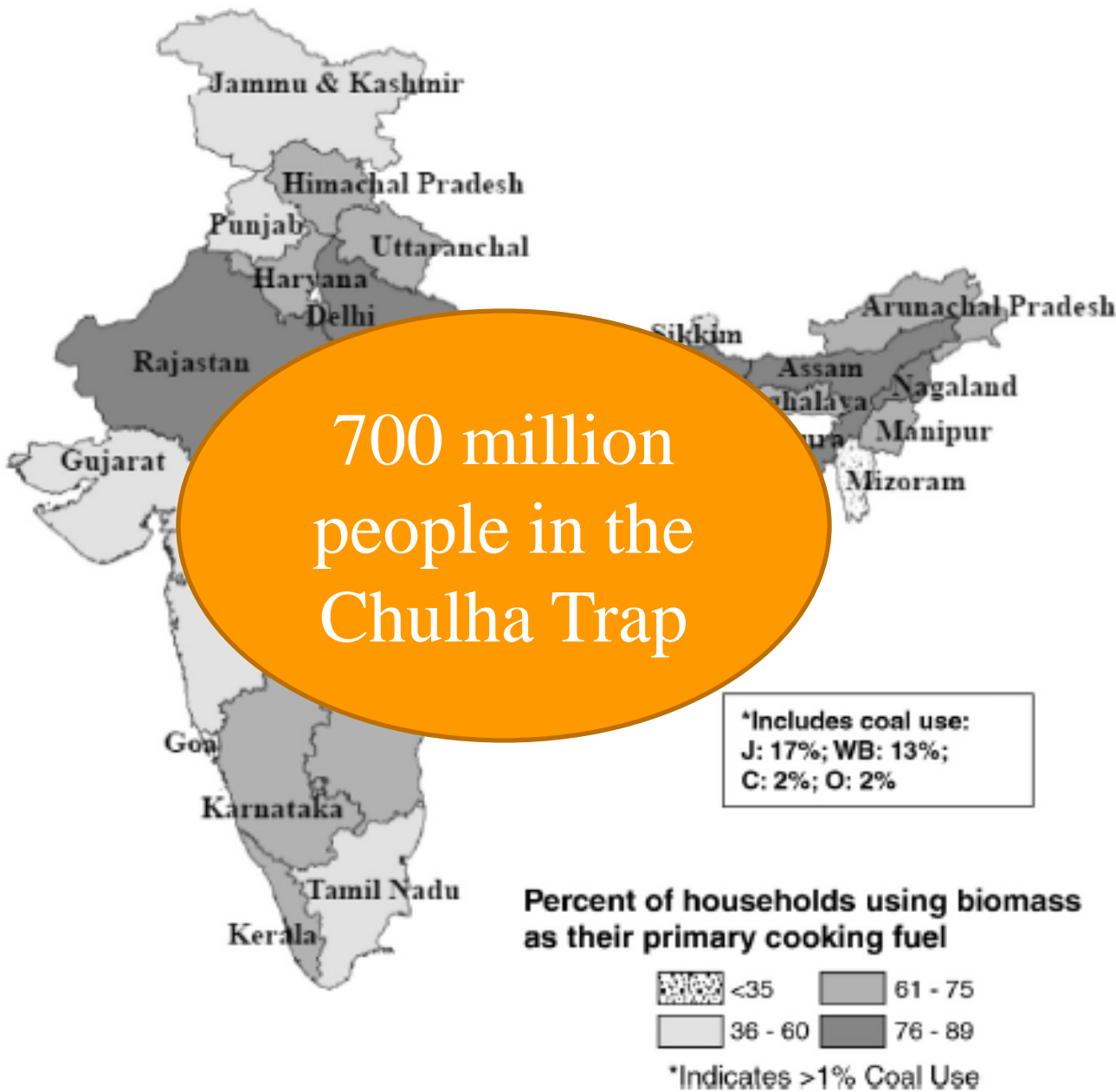


Fig. 1. Distribution by state of households using biomass or coal as their main cooking fuel in 2005. From (IIPS, 2007).

1990:
85%: 700
million people
using solid fuels

2010:
60%: 700
million people

~1980
700 million
people
in entire country

What else has been done?

- Many hundreds of “improved” biomass stove programs over ~60 years
- Including major national programs in China and India in the 1980s covering ~200 million households in all
- And in Peru, Mexico, Nepal and other countries today
- Hundreds of NGOs, big and small, promoting stoves around the world over the decades
- Until recently, focused on fuel not health
- Hundreds of stove models

Diversity of improved cook stoves



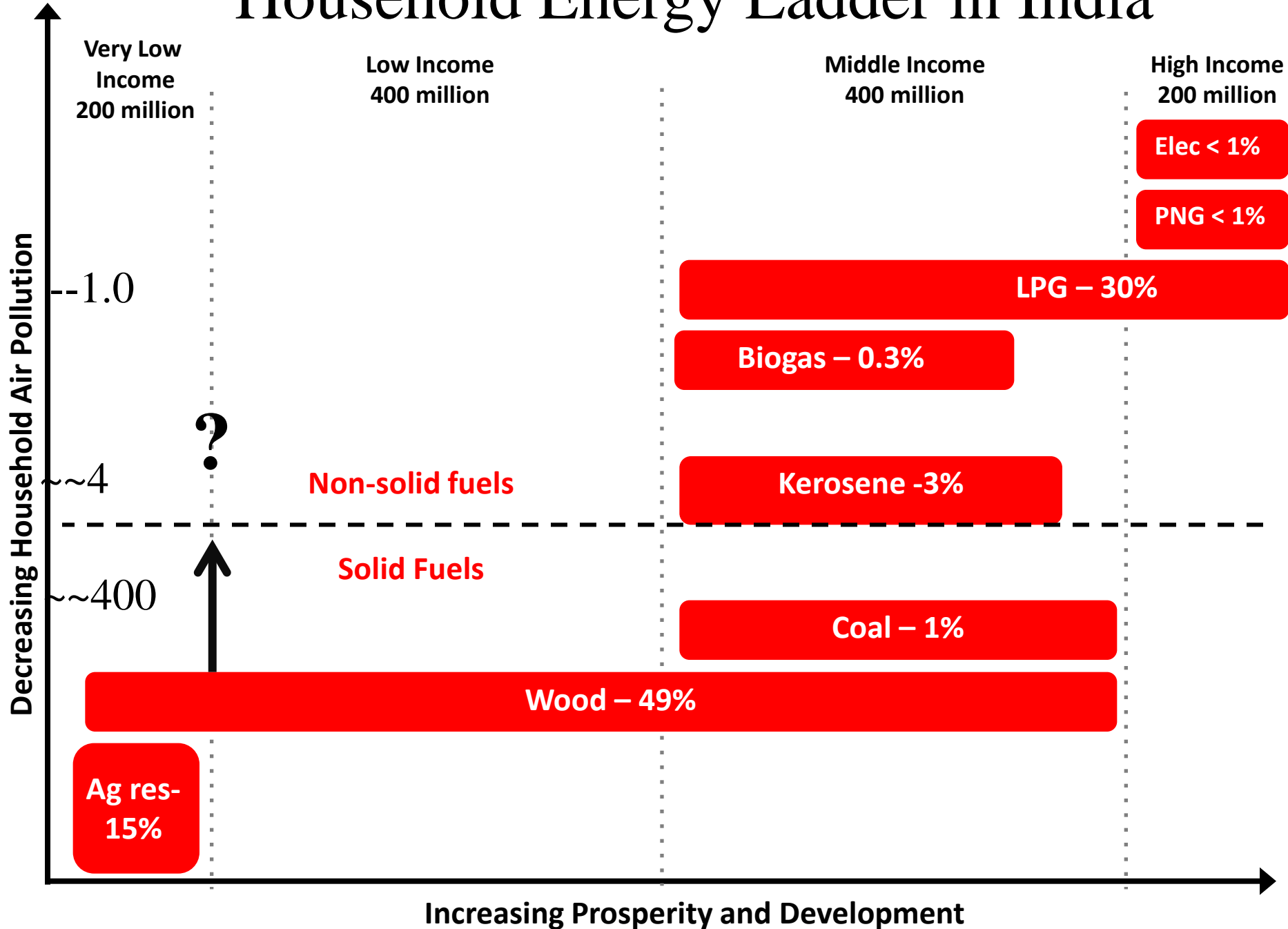
27.0



Being done, cont.

- Link to climate co-benefits in carbon market
- Health effects research expanding greatly
- Global Alliance for Clean Cookstoves: 2010
- Standards being developed with ISO and WHO
- Often improvement in fuel use has occurred
- But, unfortunately,
- The cleanest models have been disseminated to only a few 100s of thousands of households
- And, as yet, no biomass stove in the world comes close to the boundary – is clean enough to be truly health protective in household use

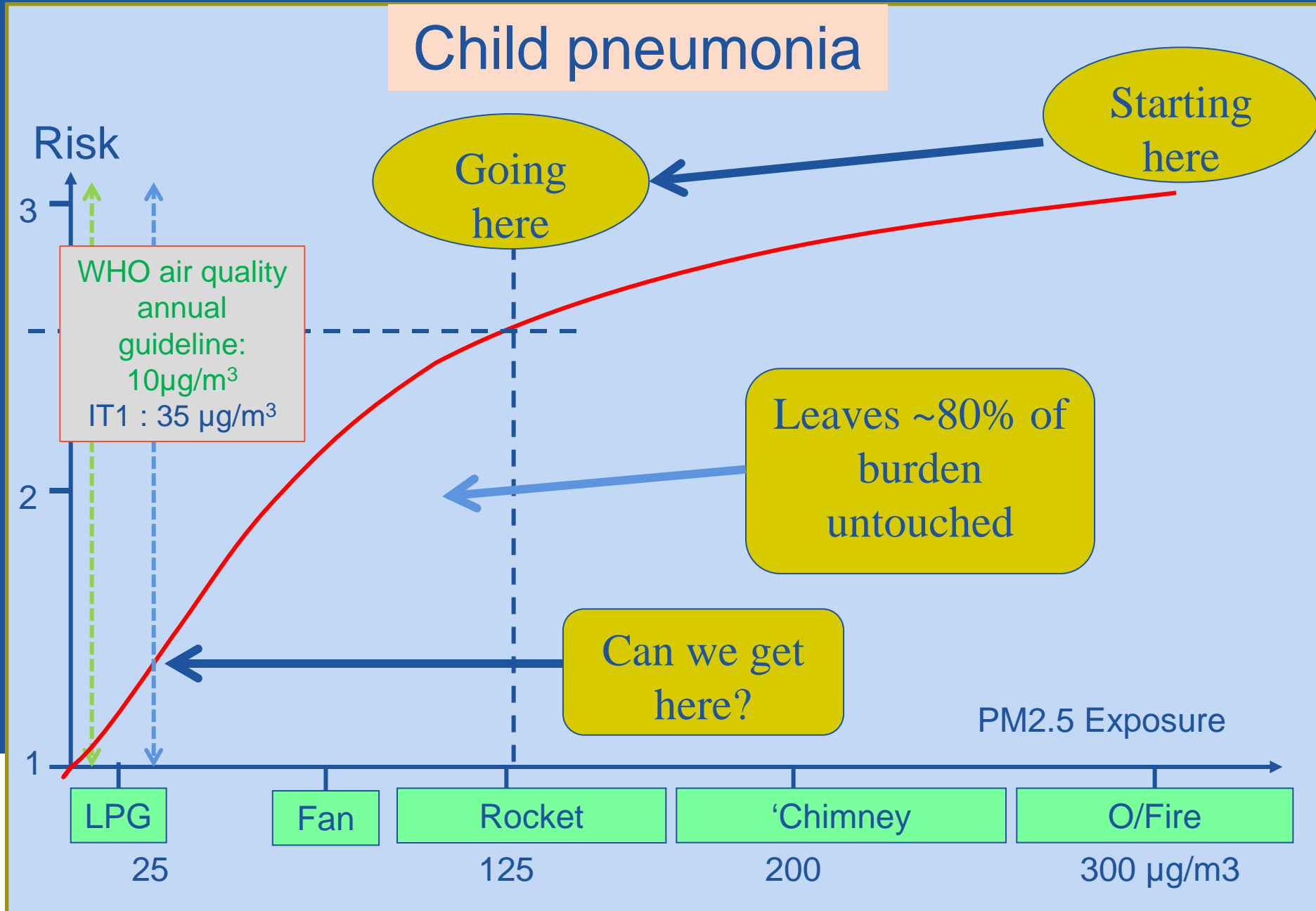
Household Energy Ladder in India



Current Health Evidence

- Shows now that even major reductions (<90%) in emissions still lead to small health improvements
- Posing a very large technical challenge to solid fuels to reach 99% or greater reductions over open fires
- This is very difficult with any solid fuel
- But still worth pursuing

Integrated Exposure-response relationship



Five New Paradigms

Paradigm #1

Making the clean
available

Associates



तेल उद्योग सुरक्षा निदेशाल
OIL INDUSTRY SAFETY DIRECTORATE

&

Centre for Occupational and Environmental Health (MAMC)

International Conference Occupational and Environmental Health

13-14 December 2013, New Delhi



OIL INDUSTRY SAFETY DIRECTORATE

and



Centre for Occupational and Environmental Health (MAMC)

International Conference
on
Occupational and Environmental Health



Secretary Vivek Rae

- Doubled number of distributors for next year
~10 million new people
- Brought together heads of marketing for the 3 oil companies to hear the lecture
- By adjusting requirements for distributors and a massive push
- Ministry developing a plan to double LPG access in rural India by 2020
- ~250 million people!
-

LPG Expansion Requires

- Understanding and preparing upstream
 - Import arrangements, port facilities, etc
- Domestic infrastructure:
 - rail, truck, cylinder manufacture, etc
- Downstream: relook at distribution
 - Size and location of distributors
 - Modes of distribution: e.g., household versus community
- Technology upgrades
 - Cylinders, stoves, lamps, etc.

Porous radiant burners → Porous medium combustion

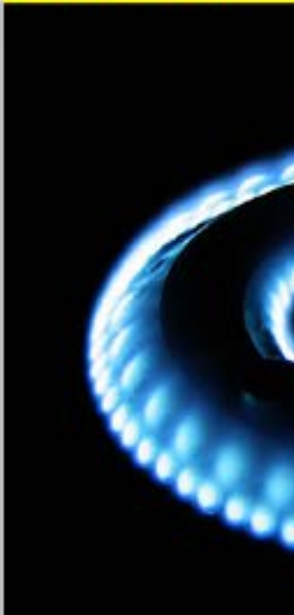
Advantages

- ✓ Flameless combustion
- ✓ Based on rich mixture

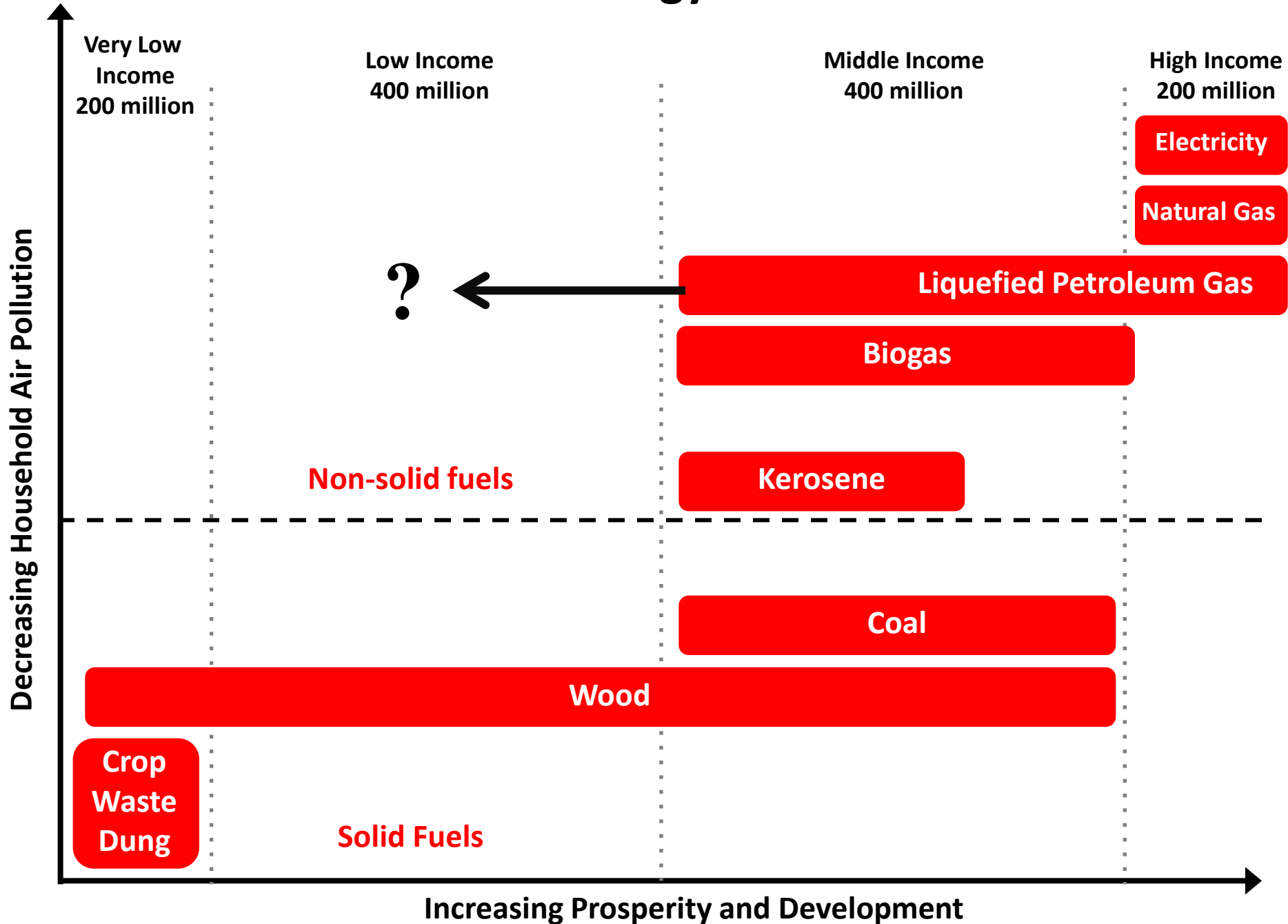
Up to 25% more efficient

High heat flux
for high value fuels

Conventional L



Indian Energy Ladder



Paradigm #2

Stepping out of the box

Story of Three States

Gujarat: 1981-2013

Kerala: 2005-2013

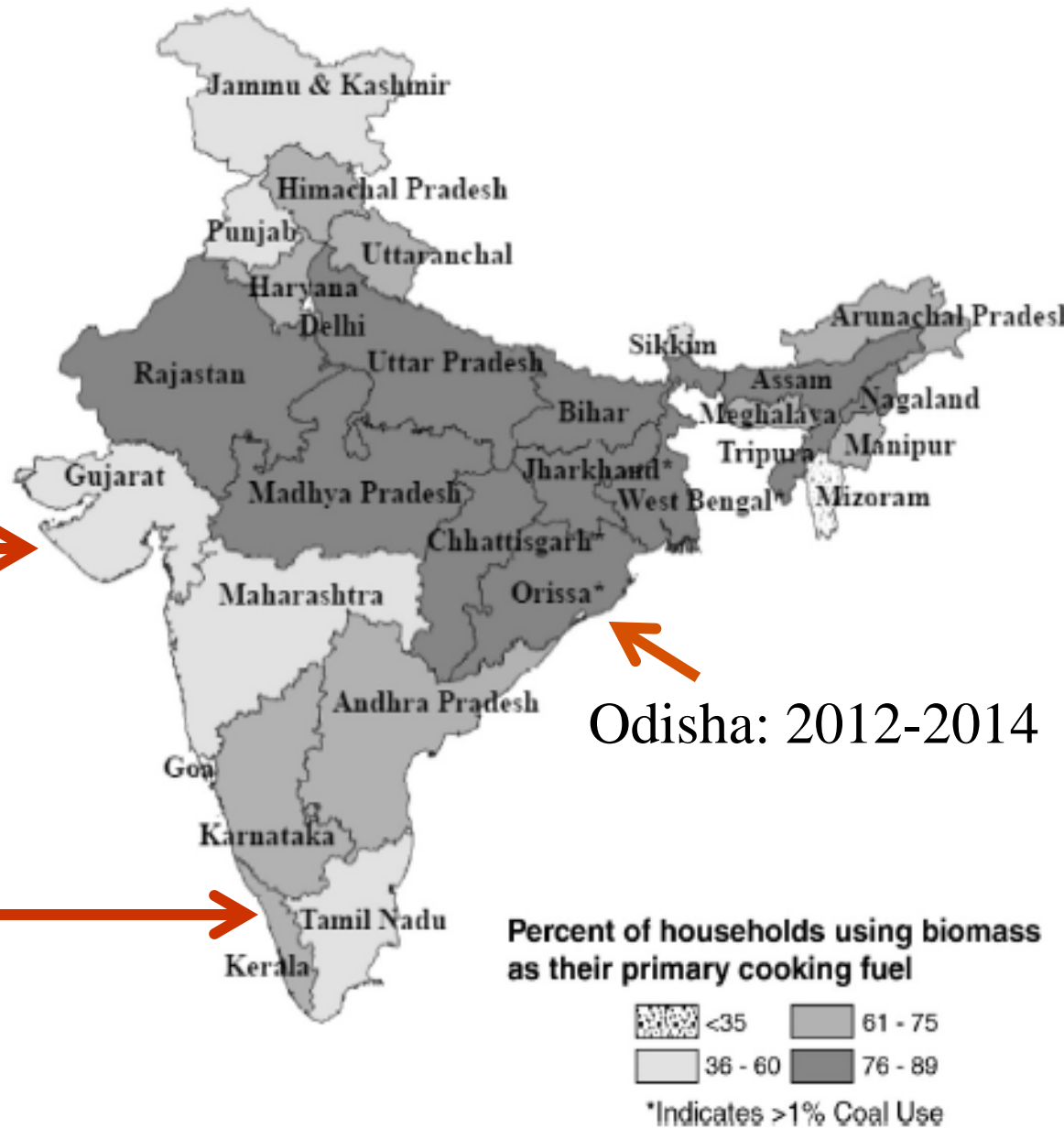


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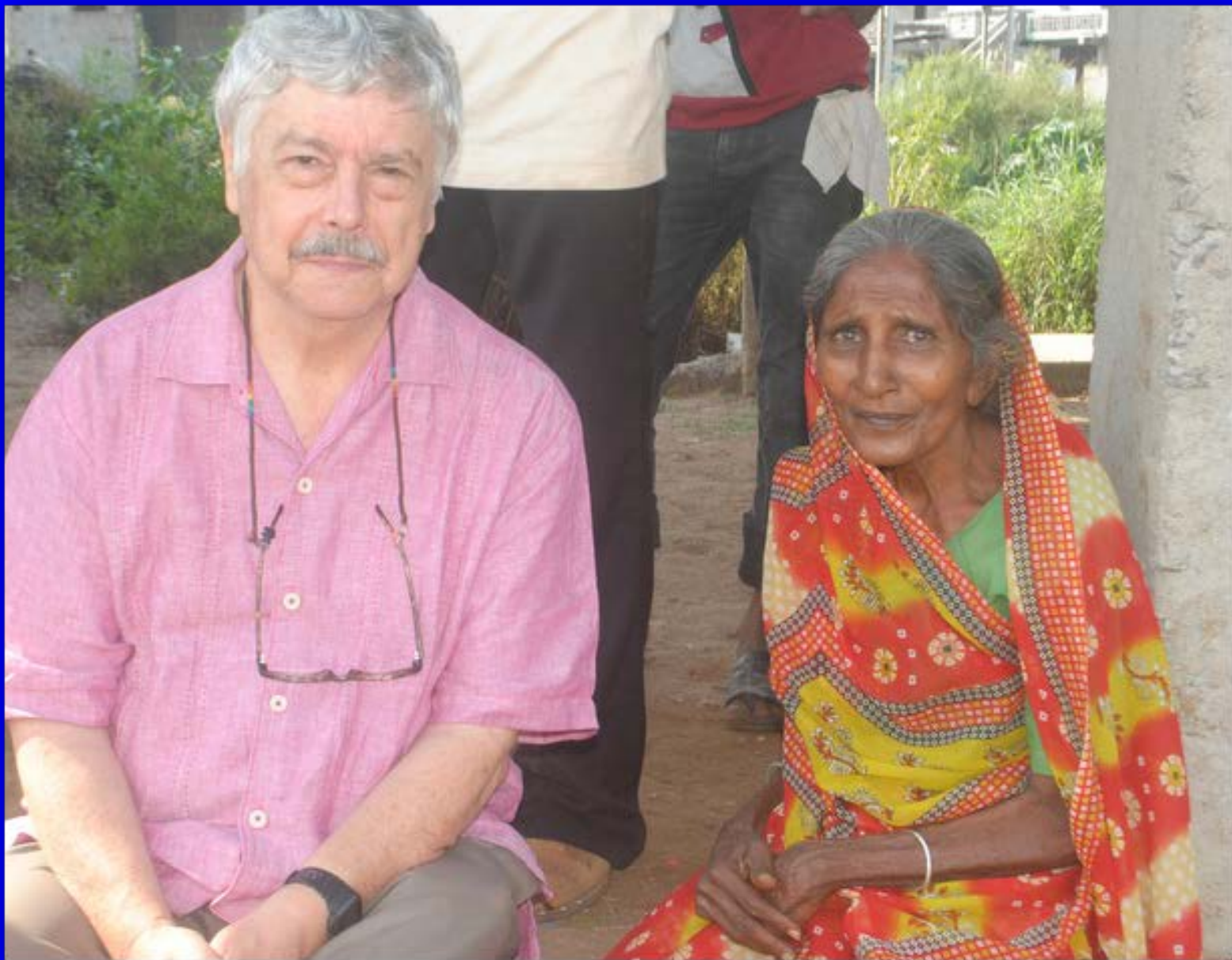
First person in human history to
have her exposure measured
doing the oldest task in human history



Kheda District,
Gujarat, 1981



Field Team, Gujarat, 1981



Diwaliben, October 2013

Gujarati Villages since 1981

- Reliable electricity and piped water
- Cell phones and satellite TV
- Pucca schools
- More pucca houses and roads
- In spite of 3-5 “improved” biomass stove programs since the 1970s – none now in existence
- Chulhas in every house
- But another transition taking off



What is an induction cookstove?

- Entirely different technology from traditional electric stoves
- High frequency magnetic field induces heat in pot alone
- More efficient ~90% instead of ~60%
- Faster cooking ~1.5x
- Safer and cooler— surface is warm but does not burn or cause fires
- Long-lived, easy to clean
- Large economies of scale in manufacture like other electrical devices

Kerala story

- Like most of India, Kerala has had an electric peak in early evenings
- Starting after mid last decade, however, Kerala started experiencing a fast-growing morning peak as well
- Reason: massive sales of induction cookstoves (ICs) were shifting demand
- Experience is that once a woman is used to an IC, she does not want to go back.



Odisha



Chaiwallahs
now using ICs

नालको  NALCO [Home](#)



Smelter Plant, Angul Captive Power Plant, Angul

National Aluminium Company Ltd. (Nalco) is considered to be a

10,000
induction
cookstoves
to NALCO
employees



Roti being made
on an induction
stove

SDA Market
New Delhi

April 2014

Induction Cooktop Market in India 2012-2016

Published: March 2013
Infiniti Research Limited

35.4% per year growth
predicted: 2012-2016

Factor of nearly
five increase!

- Bajaj Electrical Ltd.
- Compton Greaves Ltd.
- Eurolux
- Glen Appliances Pvt. Ltd.
- Inalsa
- Jaipan Industries Ltd.
- Kenwood Ltd.
- Khaitan Electrical Ltd
- Morphy Richards
- Panasonic Corp.
- Phillips
- Preethi Kitchen Appliances, Ltd.
- Sunflame
- TTK Prestige Ltd.**
- Usha International Ltd.
- Westinghouse

Flying off the shelves in China



Costs coming down dramatically

Foshan Shunde Wave Electric Appliance Co.,

Home

Product Categories ▾

Company Profile ▾

Contacts

Home > Product Categories > 2013 Induction cooker > cooker electric commercial induction cooker



US \$7.80 each (with warranty):
The cost of two coffee lattes

\$7.80
up
~~\$10.00~~



Port:	Shunde
Minimum Order Quantity:	500 Piece/Pieces
Supply Ability:	60000 Piece/Pieces per Month
Payment Terms:	L/C,D/A,D/P,T/T

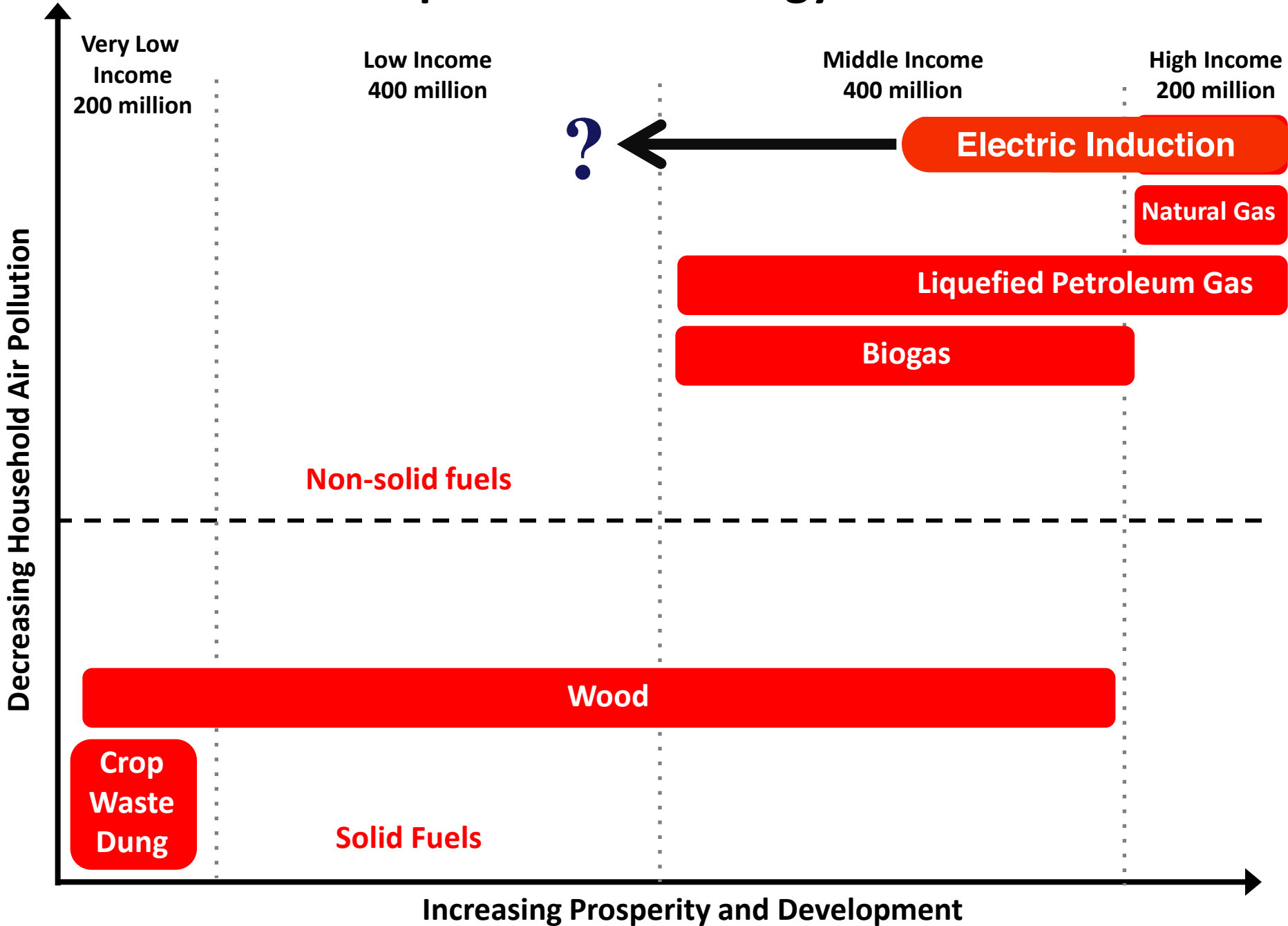
Considerations

- Power now only reliable in major cities and 2-3 full states, but on the march nationally.
- Cooking would add serious additional demand, but at great benefit, and not large compared to need in general
- To whatever degree ICs substitute for biomass or even LPG, the calculus for electrification benefits changes dramatically

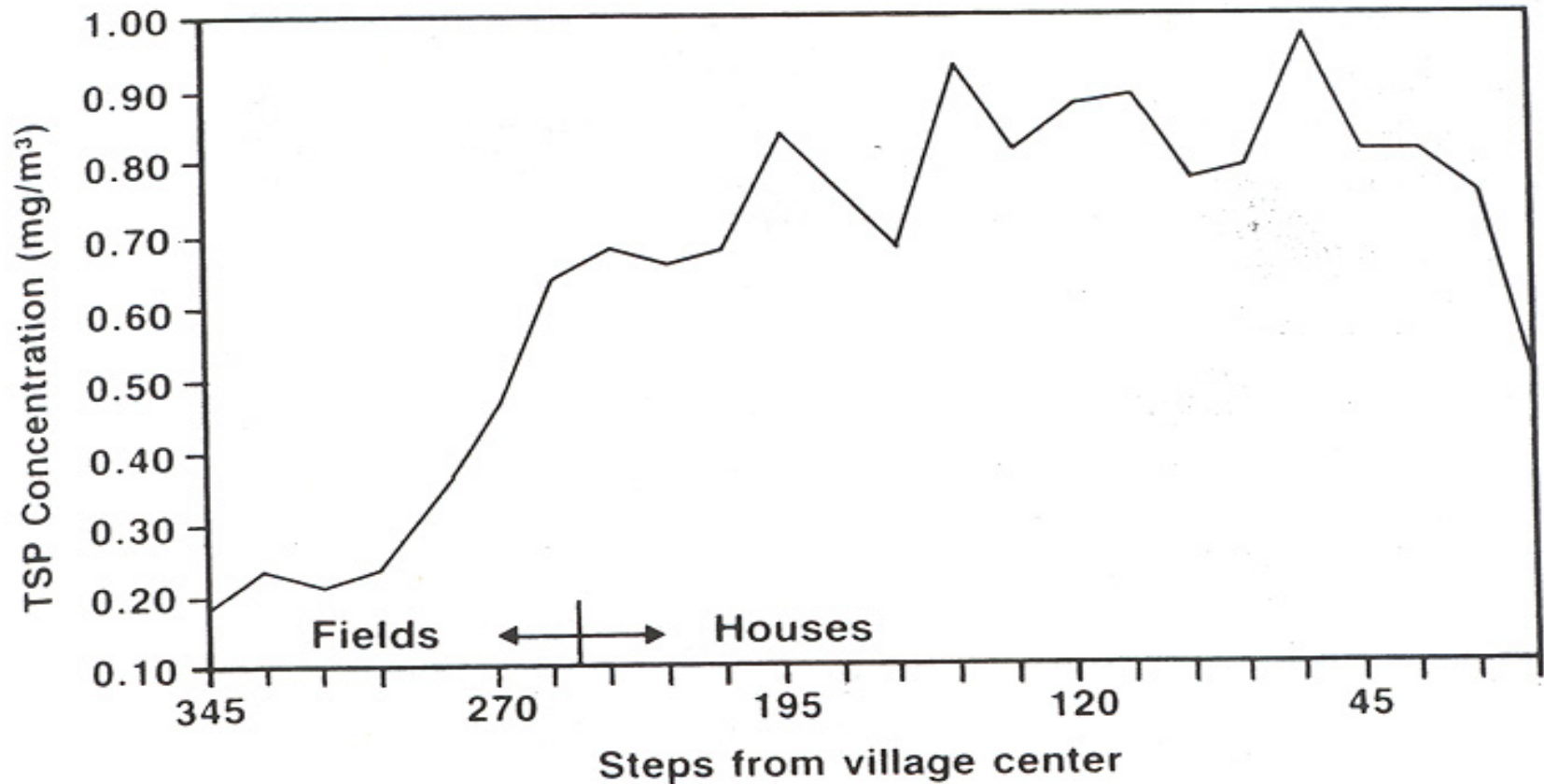
Considerations, cont.

- PV microgrids are proliferating in India to supply villages with power
 - Technically doable to provide sufficient power for induction cooking, but economics uncertain
- Pushback because of
 - Cost
 - Utilization of primary fuel
 - Displacement of pollution to power plant
 - CO₂ from the coal
- Good counter-arguments available for all

Conceptual Indian Energy Ladder



Paradigm #3: It takes a village



Village pollution in Gujarat

Changing out one chulha at a time is not as effective as changing out whole villages

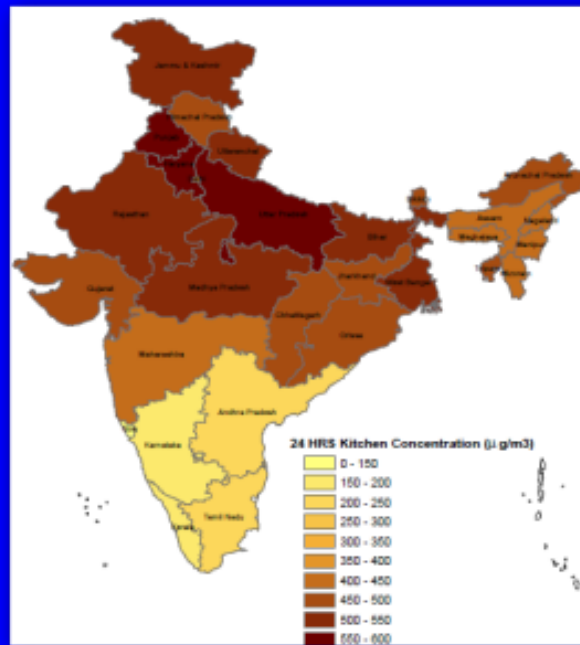
- Learned in sanitation programs years ago
- There are both household and community benefits to clean fuels/stoves and latrines.
- And with community interventions, a new set of incentives and social pressures become possible.

Nirmal Gram Puraskar

- Government of India has been promoting sanitation coverage to ensure better health and quality of life for people in rural India.
- In 2005, it launched an award-based Incentive Scheme for open-defecation-free villages, blocks, etc called “Nirmal Gram Puraskar”
- Perhaps we need a parallel or even joint “Smokeless Village Scheme”?

Paradigm #4:

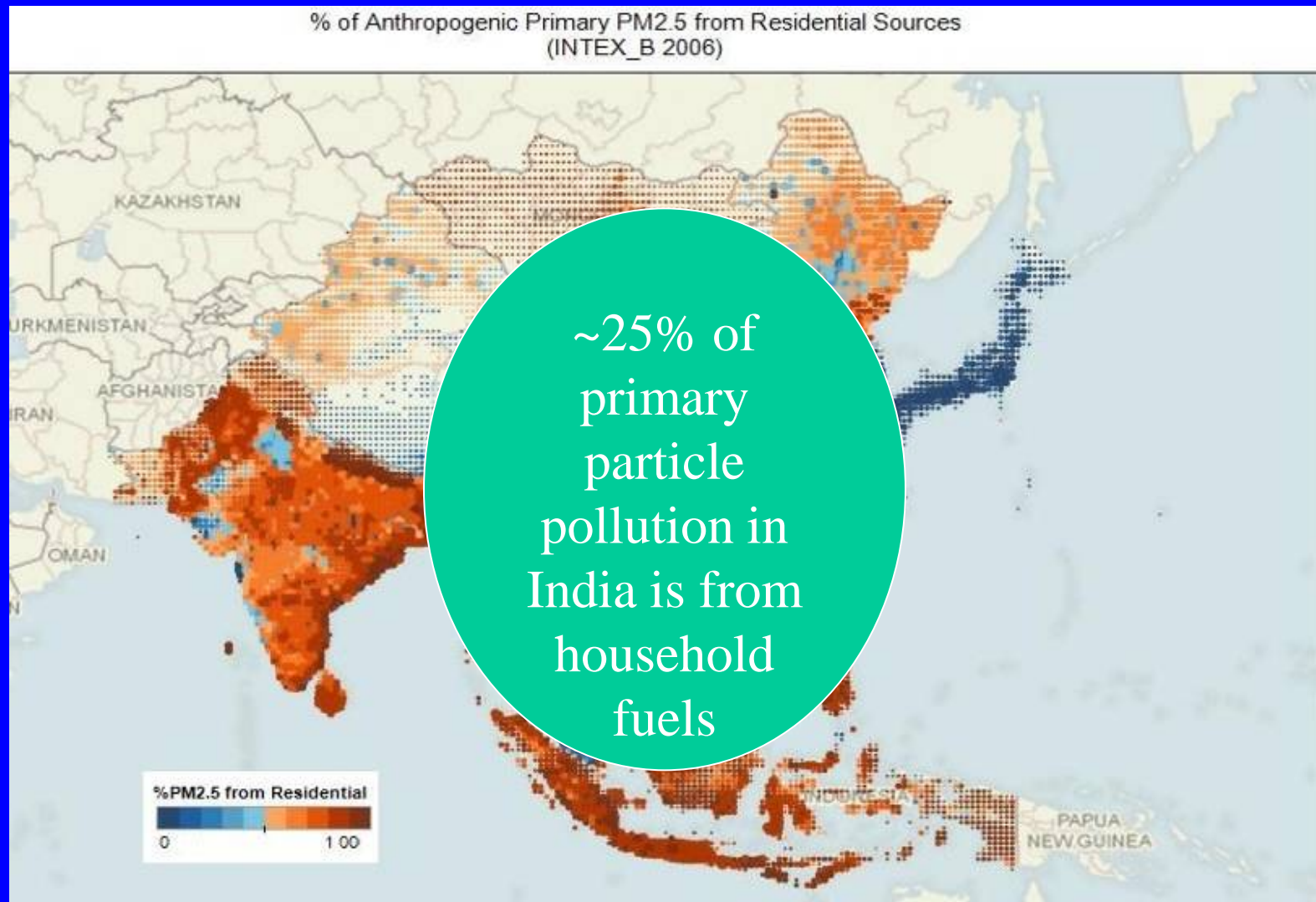
All
Indians cook
in the same kitchen!



How is that?

- All breathe the pollution coming from everyone else's kitchen
- Health impacts directly affect all – families, migration, worker productivity, etc.
- Clean fuel availability for cooking linked nationally

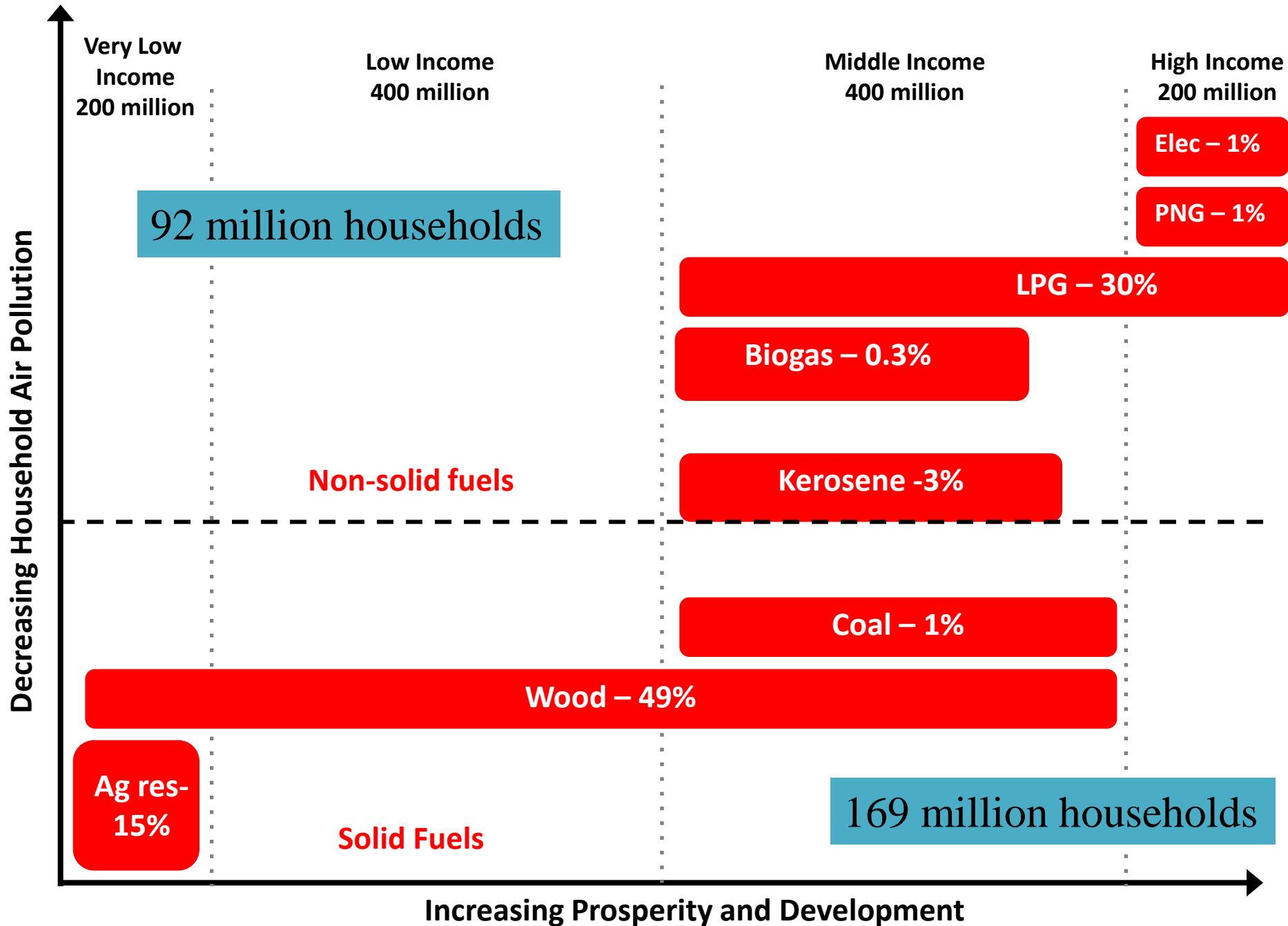
%PM_{2.5} from “Residential” Emissions : NASA



Source: Asian Emission Inventory for NASA INTEX_B 2006 (accessed 2010)

Chafe, 2010

India's Kitchen - 2012



Energy Scenarios Website Launched By Planning Commission (March 2014)

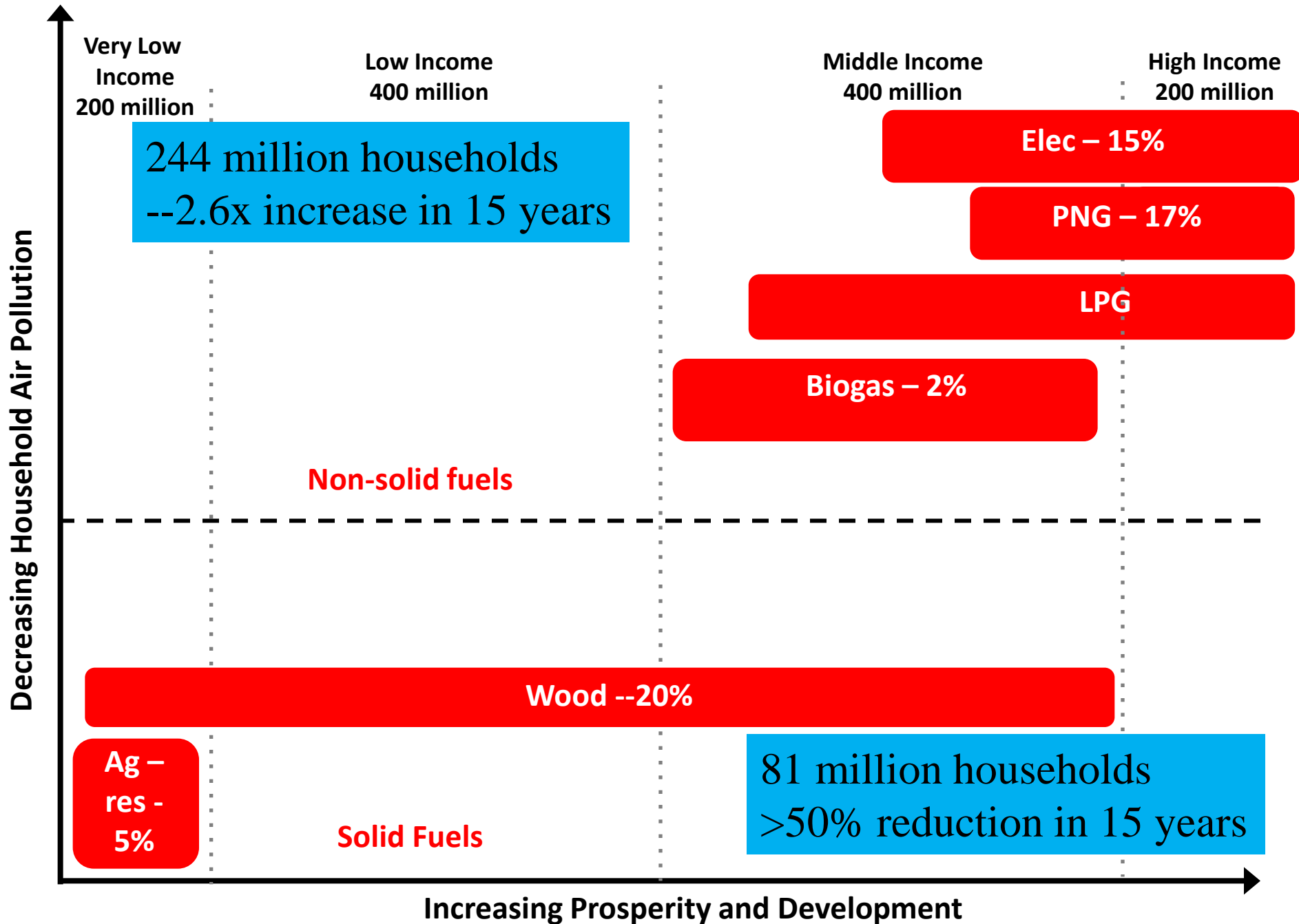


<http://www.indiaenergy.gov.in/>

Business India, Jan 2013

- ---piped natural gas (PNG) - is slowly replacing liquefied petroleum gas (LPG) ...
- ---- there are 28 areas - whose size can vary from a single city to a whole district - where the network of pipes is already in place.
- They are also being built in 49 more areas.
- By 2015, it is expected that 201 geographical areas will be supplied with PNG.

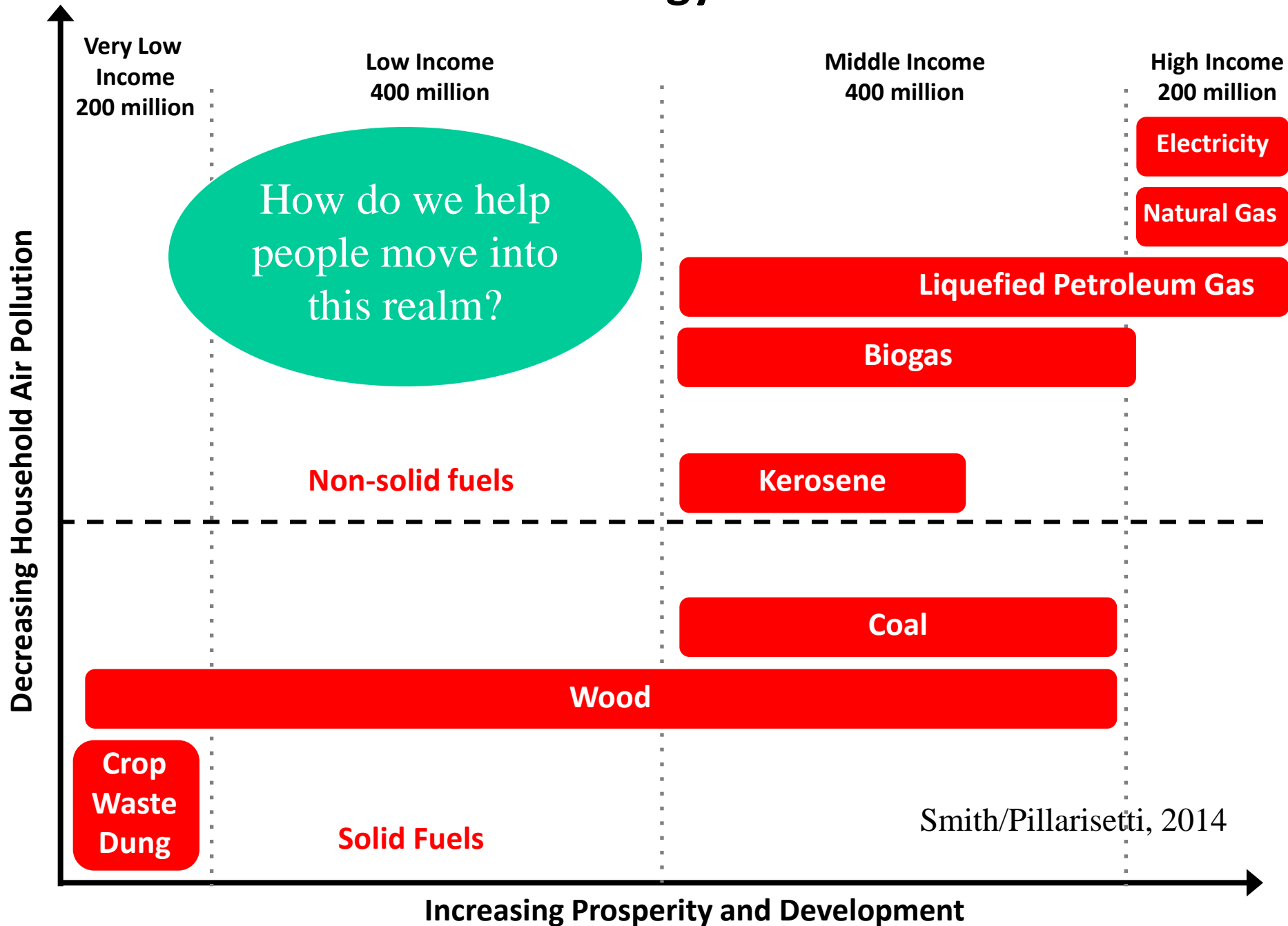
India's Kitchen - 2027



Paradigm #5: It is a health issue

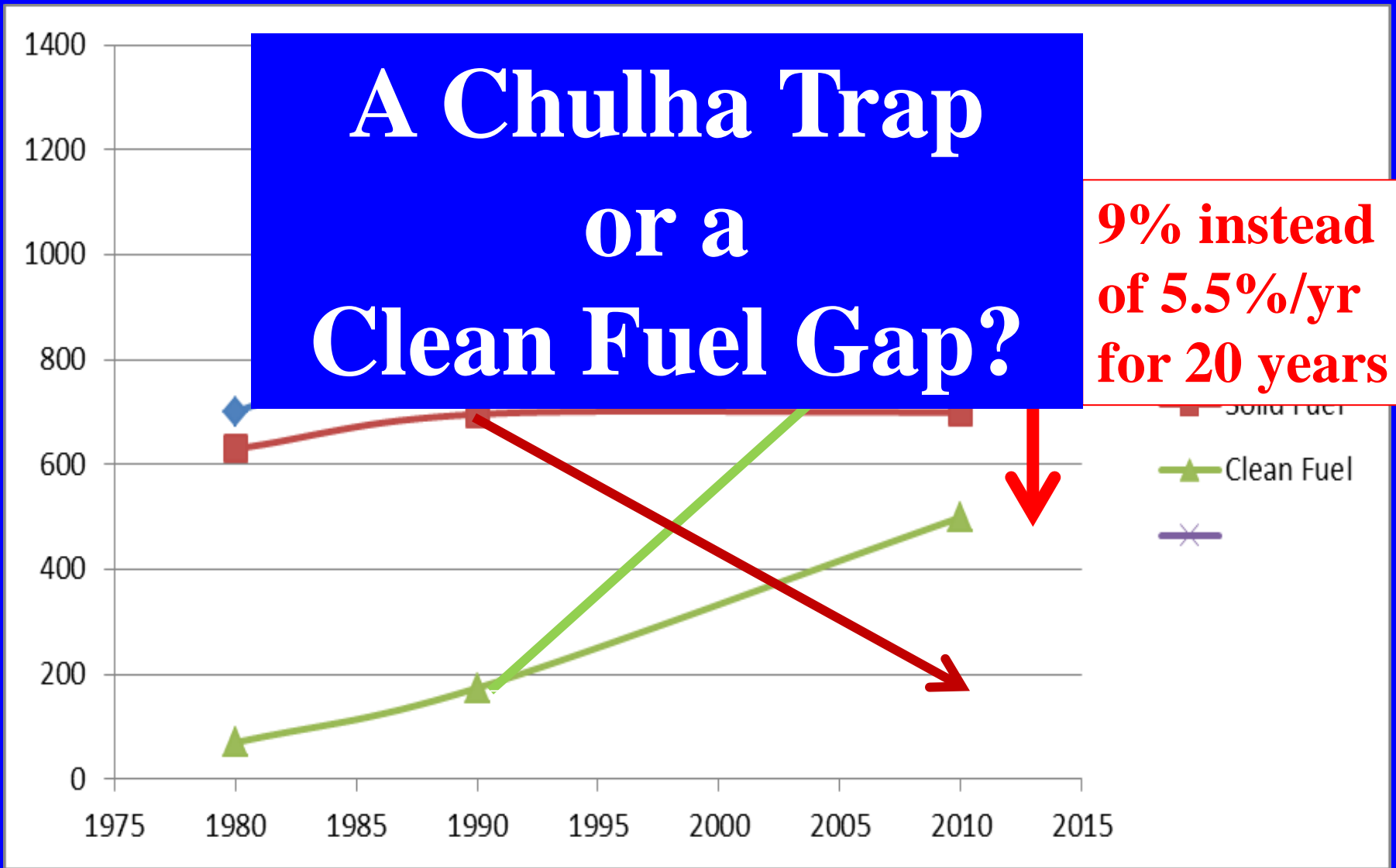
- Not primarily an energy, climate, or employment issue
- Health sector finds the most effective solutions possible and makes them available
- Treats all the same: we do not have rural vaccines and urban vaccines
- Not stopped by taste, custom, poverty, special interests, or political correctness
- Not afraid of advanced tech that works

Indian Energy Ladder



India: What If?

Millions



Five Paradigm Shifts

- **Make the clean available**, as well as make the available clean
- Embrace/enhance transformational leap-frog technologies
- Look for community solutions
- Enhance displacement of clean fuels from richer to poorer households
- Act recognizing that it is primarily a health issue

Many thanks

Publications and
presentations on website
– easiest to just
“google” Kirk R. Smith

