Clearing the Air

Crispin Pemberton-Pigott
International Technical Consultant, World Bank

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Introduction

Crispin Pemberton-Pigott:

Stove manufacturer and designer

Active in Standards development ISO TC-285

Designed the SEET Lab in UB

Designer of low-emissions stoves burning coal, wood, dung

Worked with WB/UB-CAP in UB for 10 years

What is 'Smoke'?

Unburned fuel

Particles of incomplete combustion

Particulate matter (PM)

Result of ***not*** burning coal completely

PM10 : all particles 0-10 microns in diameter

PM2.5 : all particles 0-2.5 microns in diameter

PM2.5 is included in the PM10 count

What are main sources?

#1 Domestic low pressure boilers

#2 Domestic heating stoves (#1?)

#3 Heat only boilers (HOB) in apartments etc

#4 Dust from soil, ash ponds, traffic, construction

#5 Vehicle engine – less than assumed

But….recently, source apportionment data is not collected!

What are main contributing factors?

Incomplete burning of fuel creates most of the problem
Equipment not designed for the fuel used
Equipment in poor condition
Incorrect or sub-optimal operation
Behaviour of households (putting various fats, wastes to the stove)
Improper use of stove TLUDs
More than 50% of improved stoves are sold to other places
Inversions almost every day in winter
Smoke trapped in the city valley – like Los Angeles
2016-17 : unusually low wind speed

What is in the smoke?

#1 Evaporated coal from fuel loaded on top of a fire mostly from devices not intended to burn coal

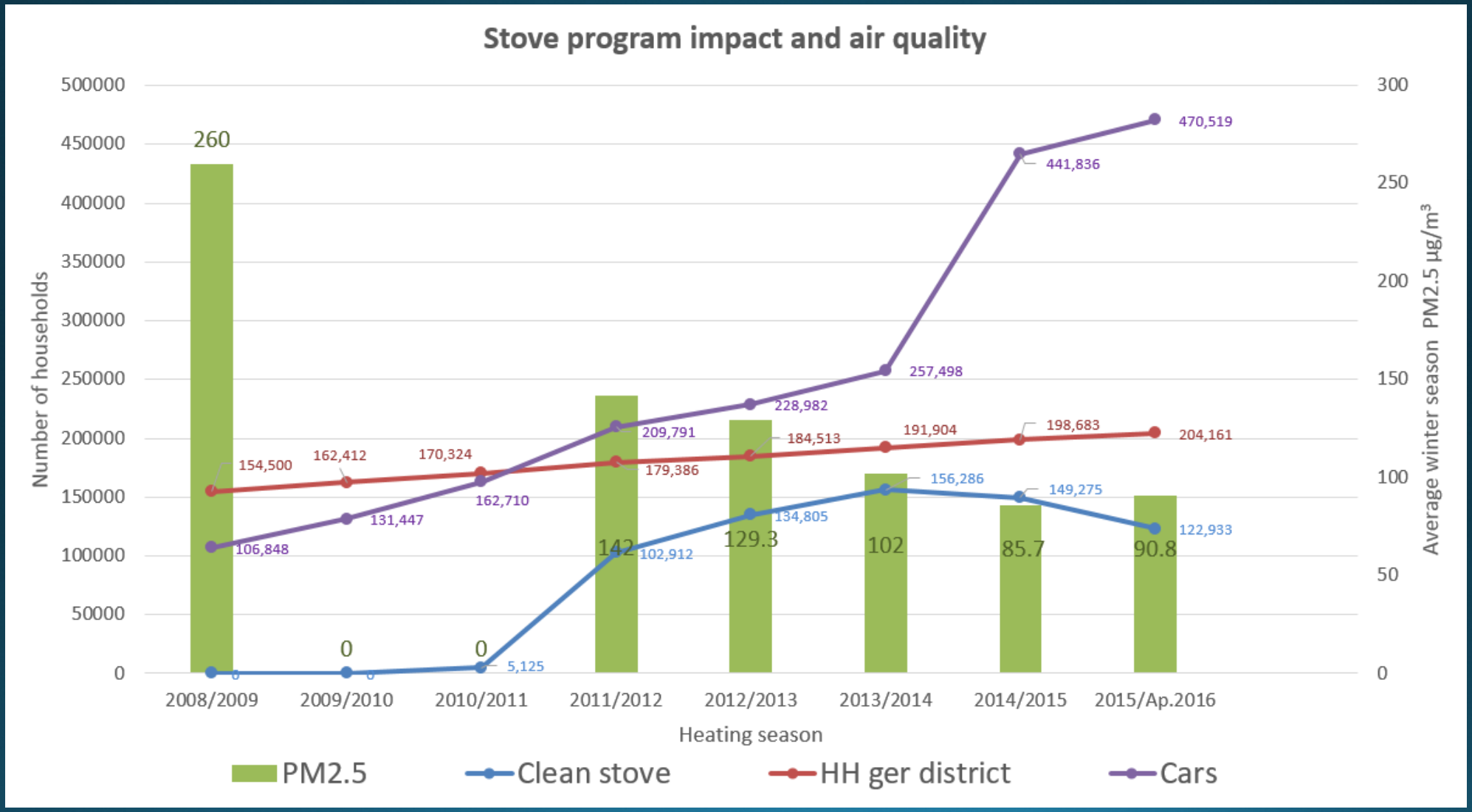
#2 Incomplete burning of hydrocarbon volatiles

#3 Incomplete burning of wood, plastic and tires

#4 Poor or incorrect vehicle maintenance – small number of vehicles make most of the problem

What is in the cure for smoke?

#1 Evaporated coal	Complete combustion of fuel
#2 Incomplete burning of hydrocarbon volatiles	Complete combustion of fuel
#3 Incomplete burning of wood, plastic and tires	Complete combustion of fuel
#4 Poor or incorrect vehicle maintenance	Complete combustion of fuel by proper adjustment/repair


Stove program impact and air quality
Number of households
Average winter season PM2.5 µg/m³
Heating season
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/Ap.2016
260
0
0
142
129.3
102
85.7
90.8
154,500
162,412
170,324
179,386
184,513
191,904
198,683
204,161
106,848
131,447
162,710
209,791
228,982
257,498
441,836
470,519
0
5,125
102,912
134,805
156,286
149,275
122,933
PM2.5
Clean stove
HH ger district
Cars

What is a good analogy?

Cars might have a gasoline or diesel engine

If you put diesel into your gasoline engine

it makes a ***lot*** of smoke!

Why?

Because that is a mis-match between engine design and fuel

Even gasoline comes in different grades according to engine

Traditional stove is a good ***wood*** stove.

What are other countries doing?

Researching better burning stoves and boilers

Testing the stoves as they will be used

Designing stoves to suit the cooking and heating culture
and to burn exactly, the fuels available

Training local artisans to make greatly improved products

Concentrate on eliminating the root problem, not 'repairing it'.

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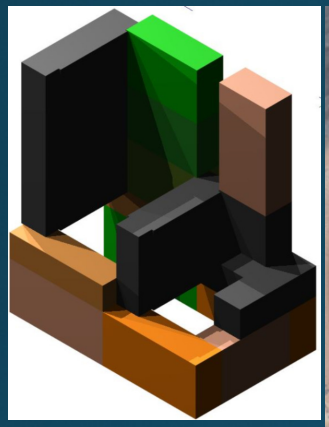
X Concentrate on eliminating the root problem, not 'repairing it'.

What news is there?



Altanzul's stove - evolved from GTZ-7

What news is there?

Dung burning stove
Kyrgyzstan

What news is there?

Testing of new materials

High efficiency small boiler new design

What news is there?

Condensing heat exchangers China

Integrated water heating Tajikistan

What news is there?

Producer training Bishkek

International scientific cooperation China-South Africa

What are the important steps?

Correct installation

Correct operation

What are the important steps?

Localisation of skills, designs and capacity

Thank you!

Questions?