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Emissions from S Asian Brick Production & Potential Climate Impact

Ellen Baum

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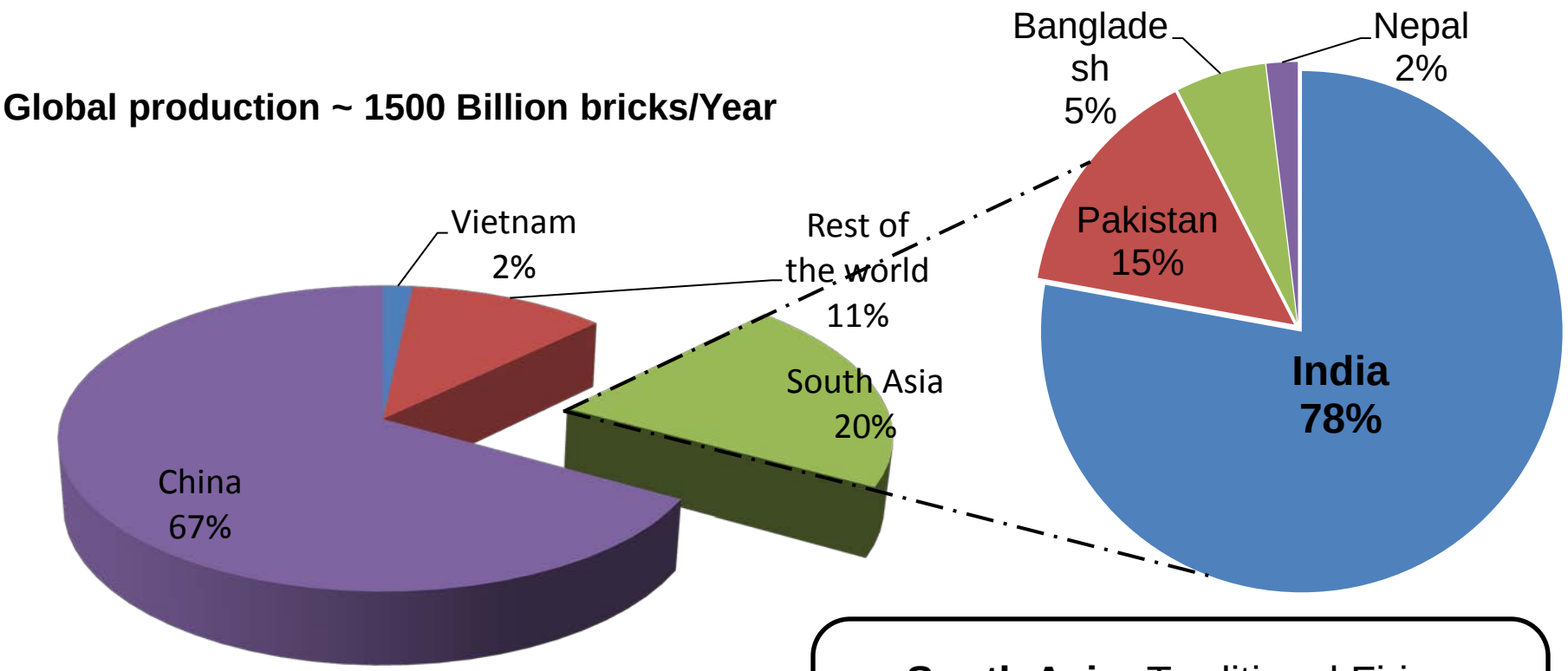
Global Brick Production

South Asia production ~ 310 Billion bricks/Year

Global production ~ 1500 Billion bricks/Year



South Asia- Traditional Firing Technology (FCBTK, Clamps) – **high black carbon emissions**

But how high? And how do we know how high?

- Many of the emission factors in black carbon inventories are based on educated guesses, not actual measurements

WHY?

- It takes skill and resources to conduct measurements to come up with quality data.

Black Carbon Research Project Team

Black Carbon Measurements* of 13 kilns: 2011 and 2012 in India & Vietnam

University of Illinois, USA

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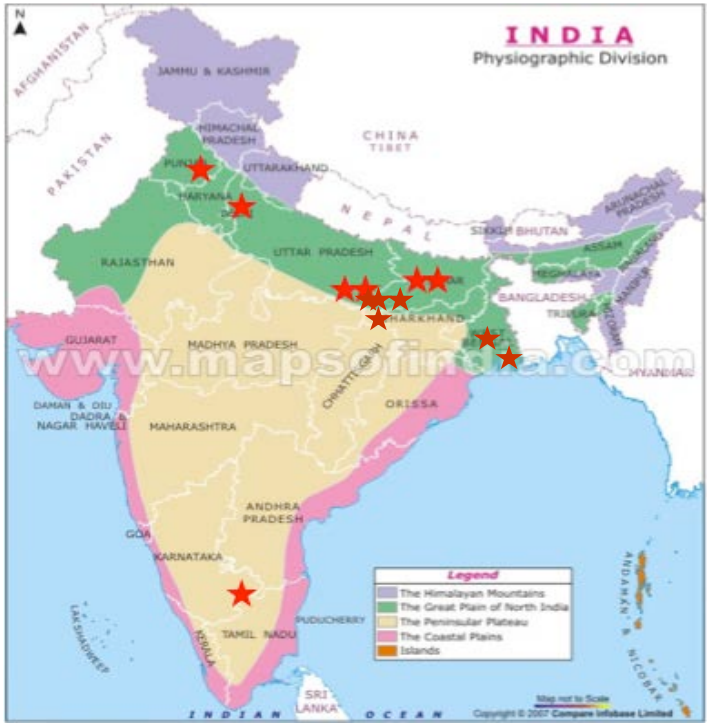
Clean Air Task Force (CATF), USA

Ellen Baum

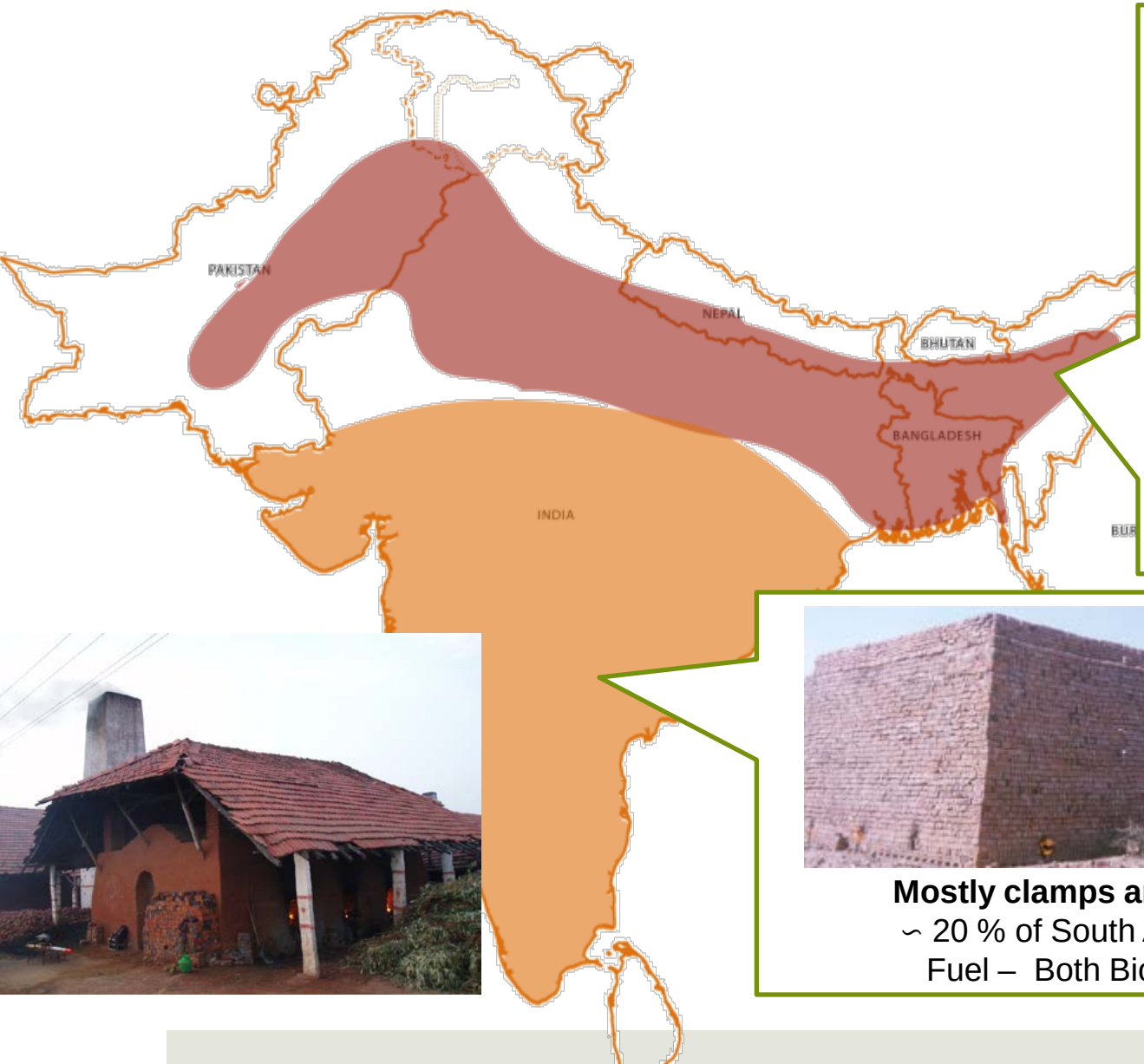
Funding: Shakti Sustainable Development and ClimateWorks

*Note emissions measurements were undertaken in conjunction with efficiency measurements

Brick kiln measurements- 13 kilns of five types in India & Vietnam



Traditional Brick Firing Technologies



Fixed Chimney Bulls Trench Kilns

∽ 80% of production of South Asia. Mostly coal fired

Mostly clamps and down drafts

∽ 20 % of South Asia production

Fuel – Both Biomass & Coal

Improved Technologies

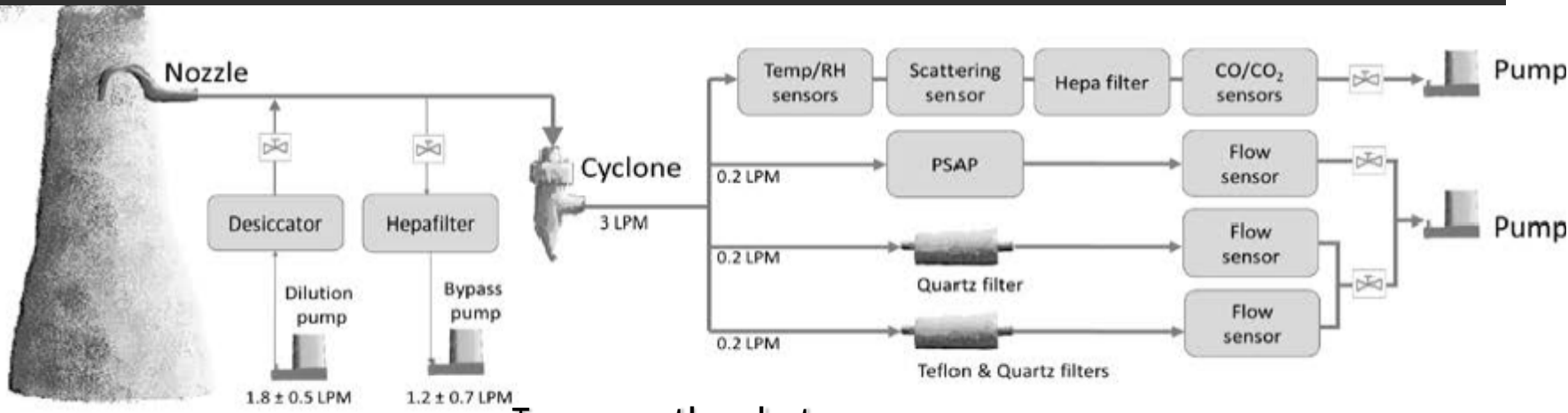
Zigzag Kiln (natural and forced draft)

Vertical Shaft Kiln

Tunnel Kiln

For more information
Factsheets on Brick Kilns in South and South East Asia

Measured aerosol and gaseous emissions, including black carbon



Two methods to measure black carbon: Particle Soot Absorption Photometer and Thermal-optical ("elemental carbon") Filters were collected, sealed and maintained below -4^{0}C, then analyzed at University of Illinois lab

Brick Kiln Measurement Campaign

Platforms were built considering guidelines to avoid upstream and downstream flow disturbances, but also taking into consideration safety and integrity.

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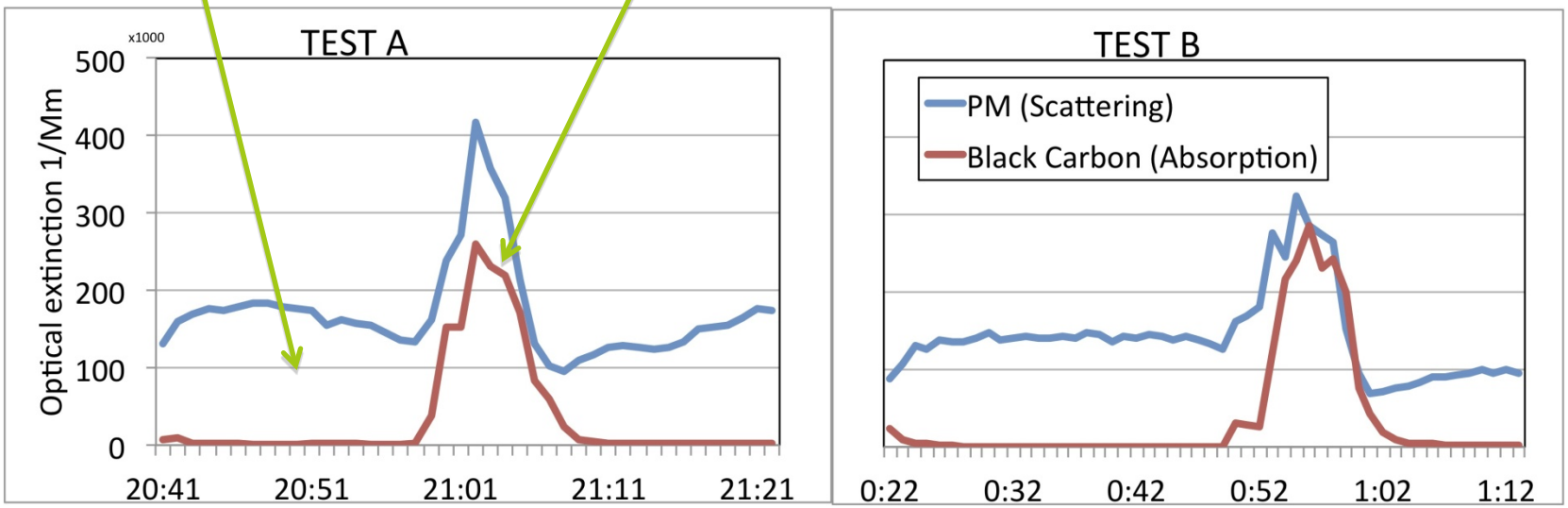
Commitment to measuring under realistic operating conditions

- The strong dependence of BC emissions on combustion processes demands the development of emission factors under realistic operating conditions.
- As kilns have – like most sources have several operating modes – it was important to take measurements and capture emissions during typical burn cycles, especially feeding.

Example of feeding at a FCBTK

PM emitted continuously - little BC

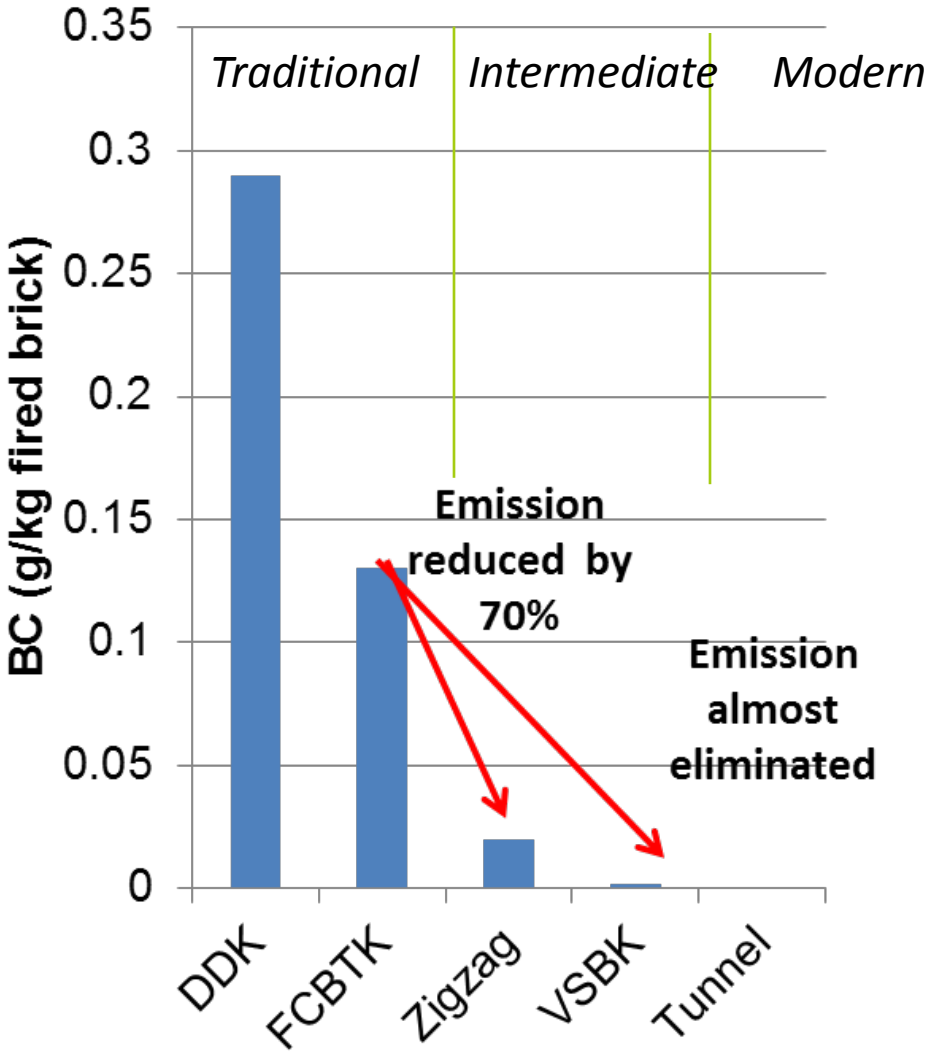
More PM and more BC after fuel addition



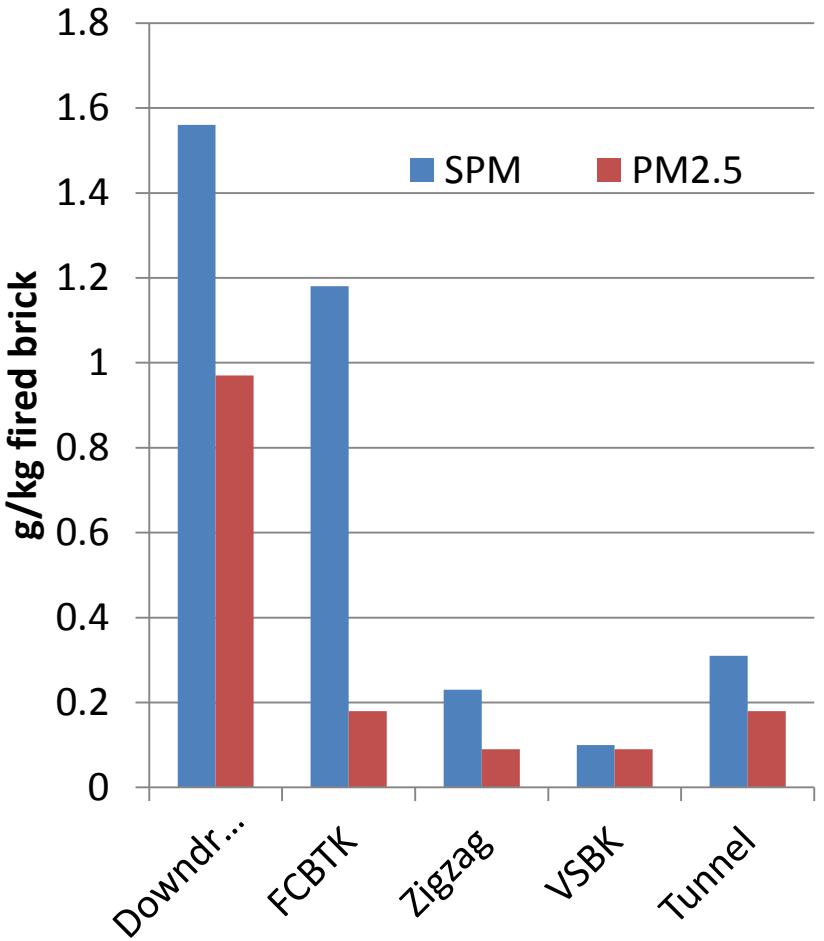
Weyant, et. al., 2014

Results of Black Carbon Emissions and Particulate Matter

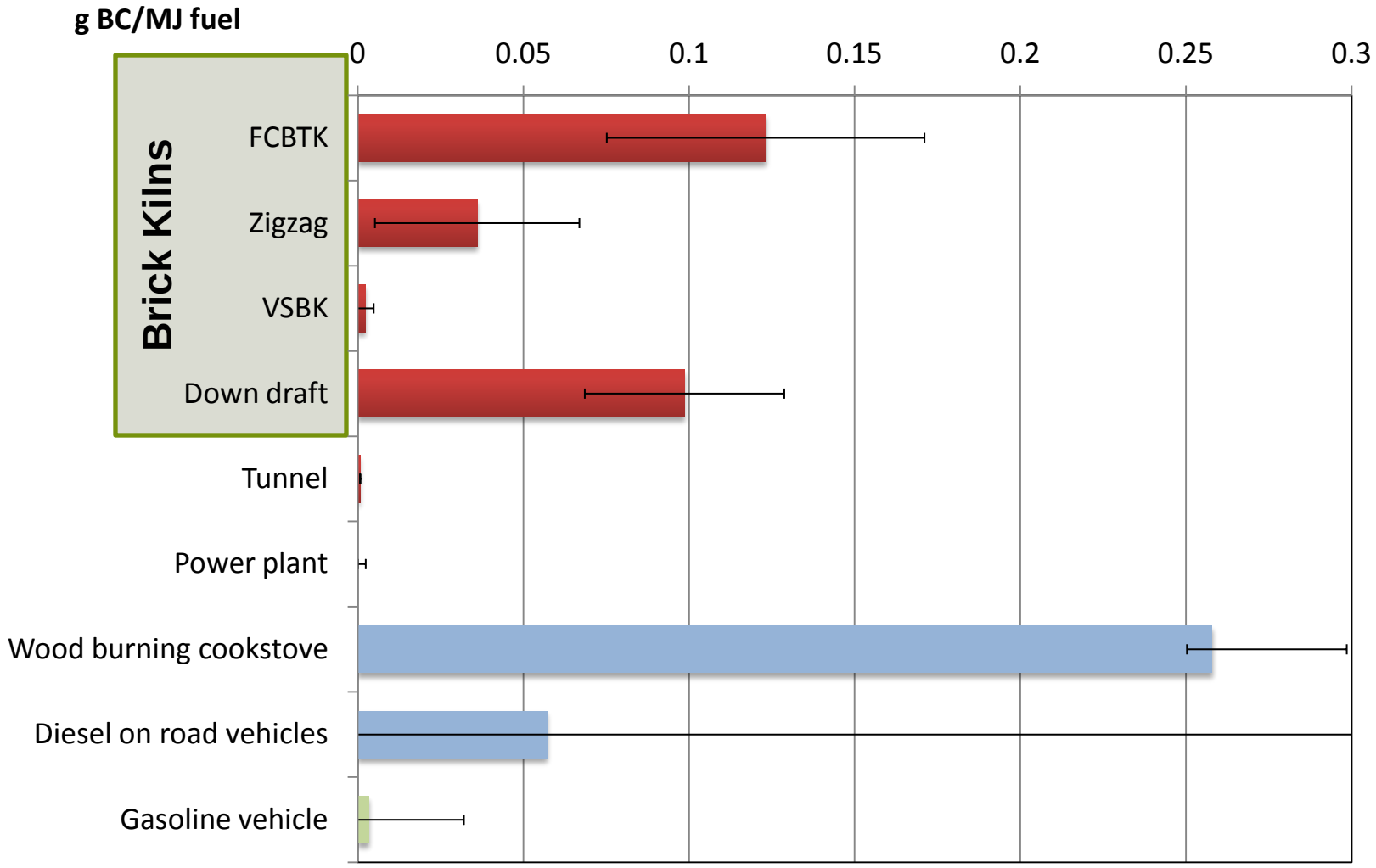
***Elemental Carbon* ("black carbon")**



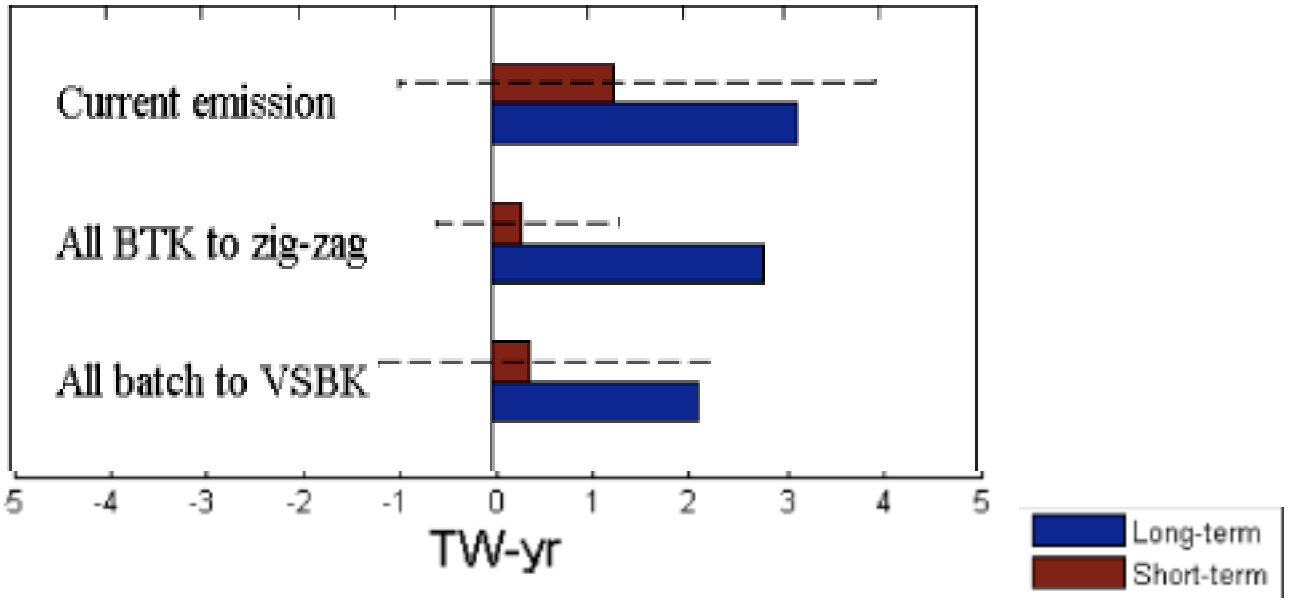
SPM and PM2.5



Comparison of BC emission factors with other sources



Black Carbon Mitigation Responses



Estimate radiated forcing by one year's of emissions, integrated over 100 years. Red bar is forcing after one year, mainly attributable to aerosols (black carbon, organic carbon and sulfates). Blue bar is the longer-lived greenhouse gases. Short-lived forcing is about half of long-lived forcing.

Weyant, et. al., 2014

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Conclusions from this work

- Traditional brick kiln technologies like FCBTK and downdrafts are high emitters of black carbon compared to improved kilns.
- Reductions in both black carbon as well as CO_2 emissions can come via a transition from:
  - Traditional brick kiln technologies to zigzag, VSBK or tunnel kilns;
  - External fuel to internal fuel firing
  - Solid to hollow bricks

Next steps for measurements

- Planned activities through the Climate and Clean Air Coalition:
  - Development of standardized protocol to conduct emissions and efficiency measurements at different types of brick kilns.
  - Construction and deployment in the region of an improved sampling kit, capable of being used to conduct stack measurements at brick kilns.
  - Seeking regional lab for analysis. IIT –Kanpur?

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Thank you

More information

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