

# CONTRIBUTION OF BRICK KILNS TO AIR QUALITY AND HEALTH IMPACTS IN DHAKA, BANGLADESH



Scott Randall<sup>1,2</sup>, Bjarne Sivertsen<sup>1</sup>, Nathaniel Dela Cruz<sup>1,3</sup>, Md. Nasir Uddin<sup>4</sup>, Md. Masud Rana<sup>4</sup>

<sup>1</sup>Norwegian Institute for Air Research (NILU), <sup>2</sup>COWI AS, Division of Environment and Waste, <sup>3</sup>Clean Air Asia Center, <sup>4</sup>Clean Air and Sustainable Environment (CASE) Project, Bangladesh Department of Environment (DoE)

## Introduction

The brick industry is the main source of building material for Bangladesh's growing construction industry. 15 billion bricks are produced annually from approximately 5000 brick kilns around the country, and 90% of these kilns are outdated with uncontrolled emissions. 653 of these brick kilns are in our Dhaka modelling domain. Previous studies have investigated brick kiln emissions, but there has been little focus on the related health impacts. Thus, this study aims to determine the contribution of the brick kiln industry to air quality in Dhaka, evaluate its health effects, and generate policy-making scenarios.

## Methods

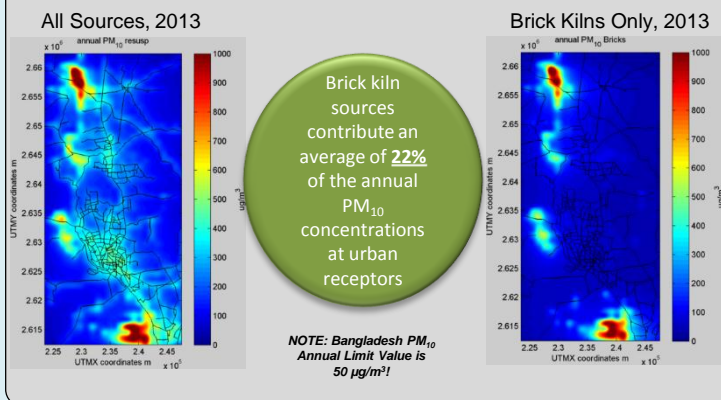
The AirQUIS model was used to compile a complete emission inventory for Dhaka - for all source sectors as well as for the brick kiln sector separately. Dispersion modelling for PM<sub>2.5</sub>, PM<sub>10</sub>, and SO<sub>2</sub> was performed based on the inventory (using EPISODE within AirQUIS, 1x1km<sup>2</sup> resolution). The resulting estimated concentrations for all 653 brick kilns in the Dhaka modelling domain are plotted versus the estimated concentrations for all sources.

## Results: Health Impacts

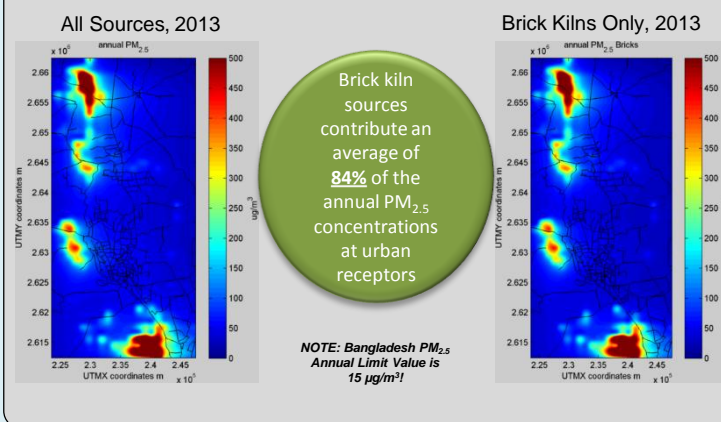
The annual impacts of the average annual PM<sub>10</sub> concentrations in Dhaka are on the basis of the chosen exposure-responses linked to more than 850 premature deaths as well as 4000 incidences of hospital admissions for people with respiratory and cardiovascular diseases. The effects of SO<sub>2</sub> concentrations in Dhaka have similar health effects as PM<sub>10</sub>.

Health endpoint	# of cases (PM10)			# of cases (SO2)		
	Dhaka			Dhaka		
	Value	S.E. (ER function)		Value	S.E.	
All-case mortality	857	573	1 139	917	689	1 143
Mortality due to CVD	313	235	390	252	189	314
Mortality due to RD	102	68	135	135	109	161
Mortality due to LC	292	262	320	-	-	-
Chronic respiratory illness, adults	500	485	515	-	-	-
Chronic respiratory illness, children	255	244	265	-	-	-
Hospital admissions for RD	2 088	1 751	2 422	2 095	1 688	2 497
Hospital admissions for CVD	1 841	1 323	2 353	3 914	3 320	4 501

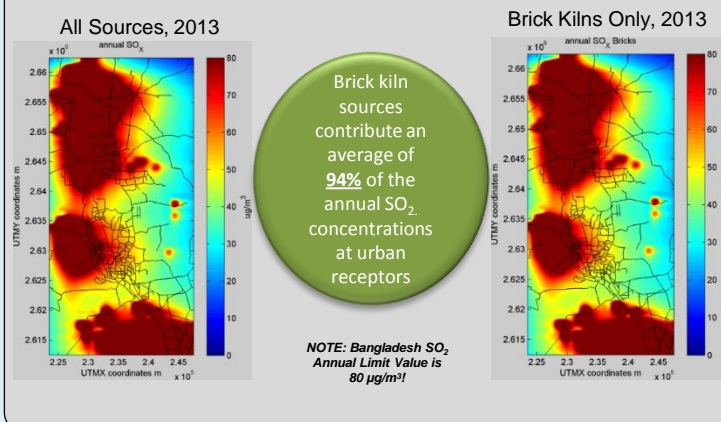
## Results: PM<sub>10</sub> Dispersion Models



## Results: PM<sub>2.5</sub> Dispersion Models



## Results: SO<sub>2</sub> Dispersion Models



Contact:  
Scott Randall  
sr@nilu.no



BAPMAN Project Funding:  
The Norwegian Agency for  
Development Cooperation



BAPS Project Funding:  
International Development  
Association (IDA), World  
Bank Bangladesh

