Assessment and Development of National Emission Inventory of Major Air Pollutants from Open Municipal Solid Waste Burning in India (2018)

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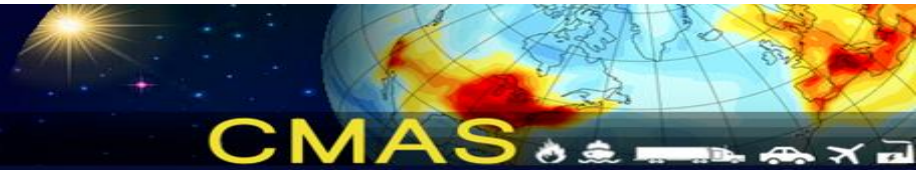

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Introduction:

- ✓ Municipal solid waste management (MSWM) is one of the major environmental issues of Indian cities.
- ✓ Residential, or domestic, open waste burning is a global event and in India, the waste management problems are aggravated by poor waste segregation at the source . (John et. al)
- ✓ The extremely low calorific value accompanied with high moisture content of the MSW, extremely high population densities, and poor management services for proper collection as well as disposal leads to phenomenon of open burning of the waste mostly on the collection and disposal sites.
- ✓ The government report shows an annual generation of almost 53 Million tonnes of wastes for the year 2018, whereas the present study shows an estimate of approx.. 180 million tonnes.
- ✓ The specificity of the work can be assessed as this contains the India level emission estimation of pollutants in a very finer scale of 0.1^{o} generated from waste burning. Factors like per-capita waste generation as well as waste disposal practices have been incorporated.

Status of MSW in India:

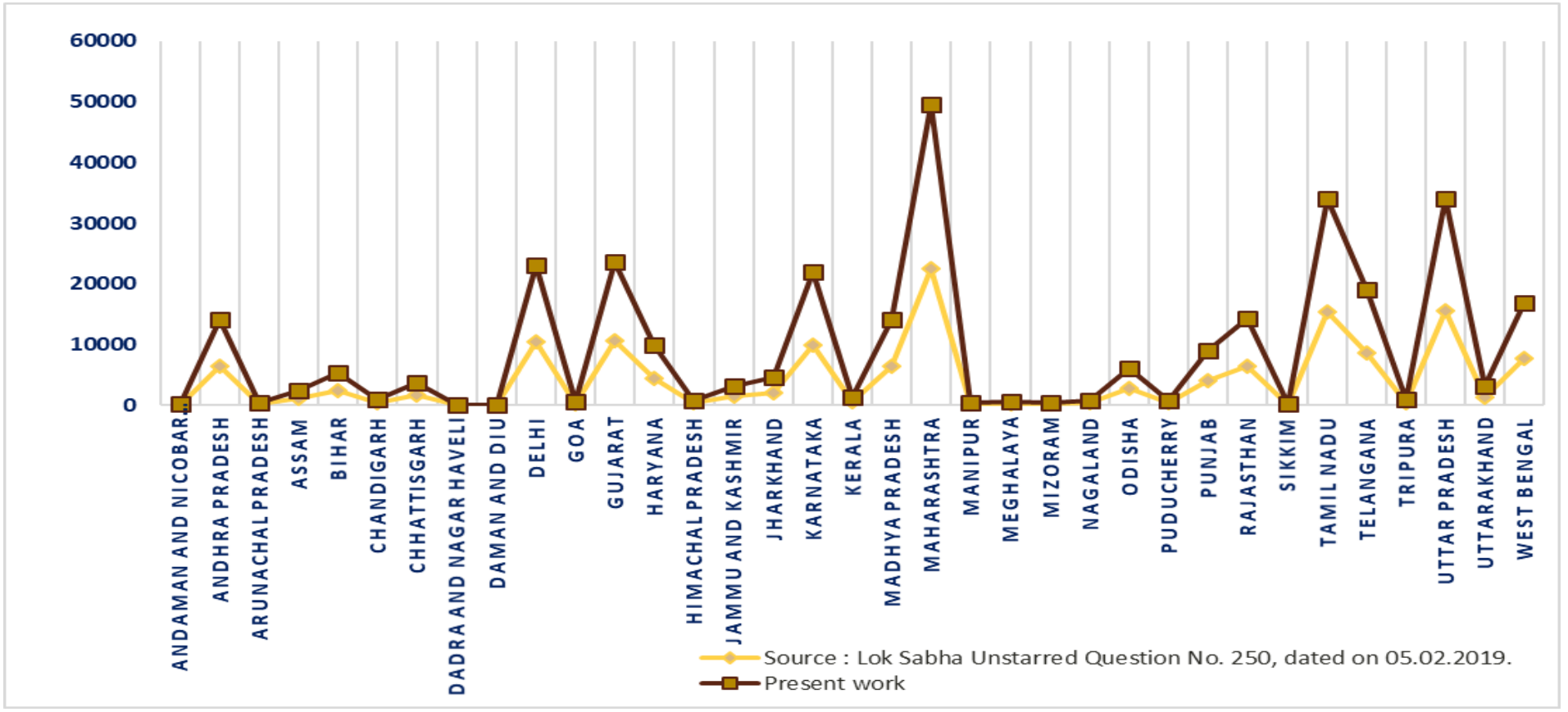


Fig (a) describes the comparison in per day MSW generation in India for the year 2018 (Source: Indiastat, Lok Sabha Unstarred Question No. 250, dated on 05.02.2019. v/s Present work).

Methodology:

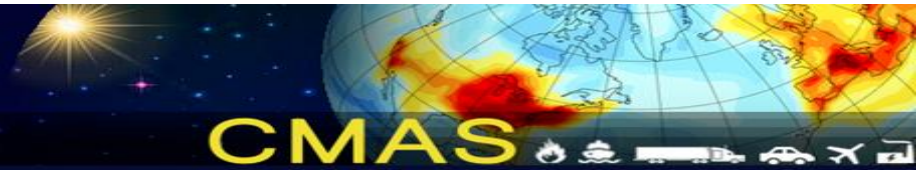
- ✓ *Incorporates specific factors like per-capita waste generation, City specific MSW generation and population-dependent growth factor.*
- ✓ *The sets of emission factor used here are dynamic and technologically based for a lesser variation in uncertainties of result. These are combined with a specific consumption pattern for a better and defined result.*

Population	Waste generation (kg/capita/Day)
>2000000	0.6
1000000 - 2000000	0.45
500000 - 1000000	0.4
100000 - 500000	0.3

EMISSION FACTOR (g/Kg)						
CO	NOX	PM10	PM2.5	SO2	BC	OC
67	3.74	14	13	0.5	1	13

Source: Calculated from CPCB (2016), MNRE (2016)

Source: CO, PM_{10}, $PM_{2.5}$, BC & OC = Obtained from Sharma et. al., 2019, NO_X and SO_2 =Akagi et al., 2011



Emission Estimation:

✓ **The total district wise emission estimated from the waste burning is calculated as,**

$$E = MSWB \times EF \times N$$

Where,

E = Total emission from waste burning sector across India

MSWB = Amount of MSW burnt

EF = Pollutant specific Emission factors used.

N = Total Number of Days

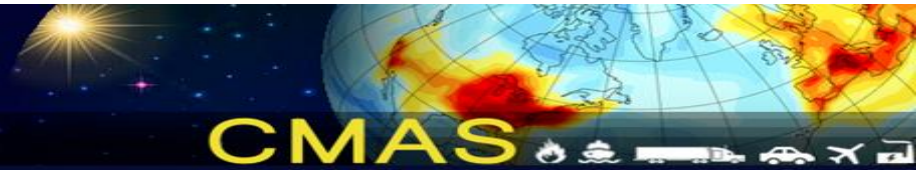
✓ **And again the grid representation of emission is spatially exhibited in the grid cells of $0.1^{o} \times 0.1^{o}$.**

The total emission of the grid is represented as,

Where,

$$gE = \sum_{m=1}^{M} E_m$$

gE = Total gridded Emission, **E_m = Emission estimation in each grid**



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Result and Discussion:

- ✓ **The emissions obtained by critically following the methodology summarizes the total estimation process by the adapting the 'bottom-up' approach.**

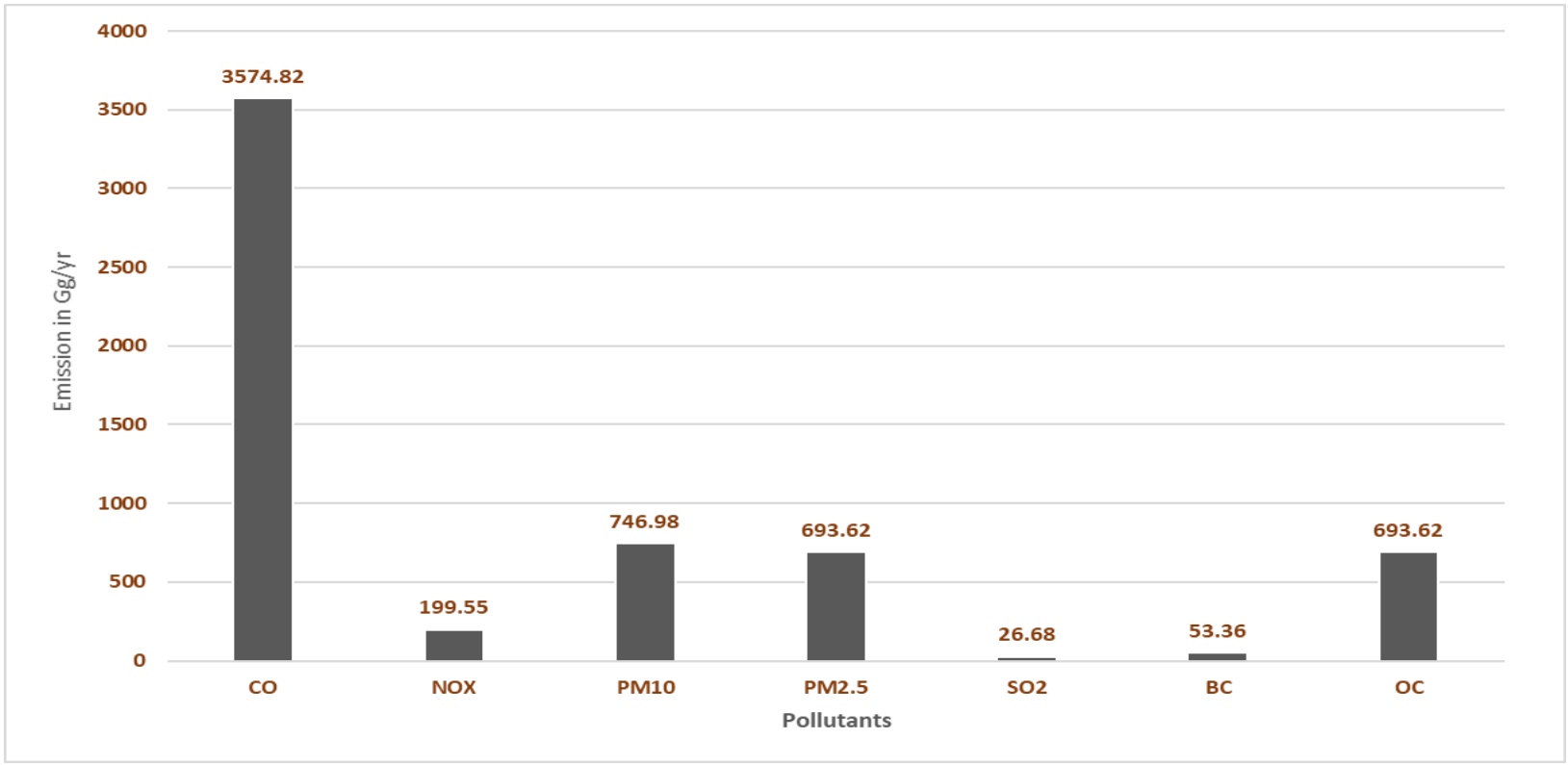

Fig showing Emissions of CO, NO_x,PM_{10},$PM_{2.5}$$SO_2$, BC and OC from open-burning of MSW in India (2018)

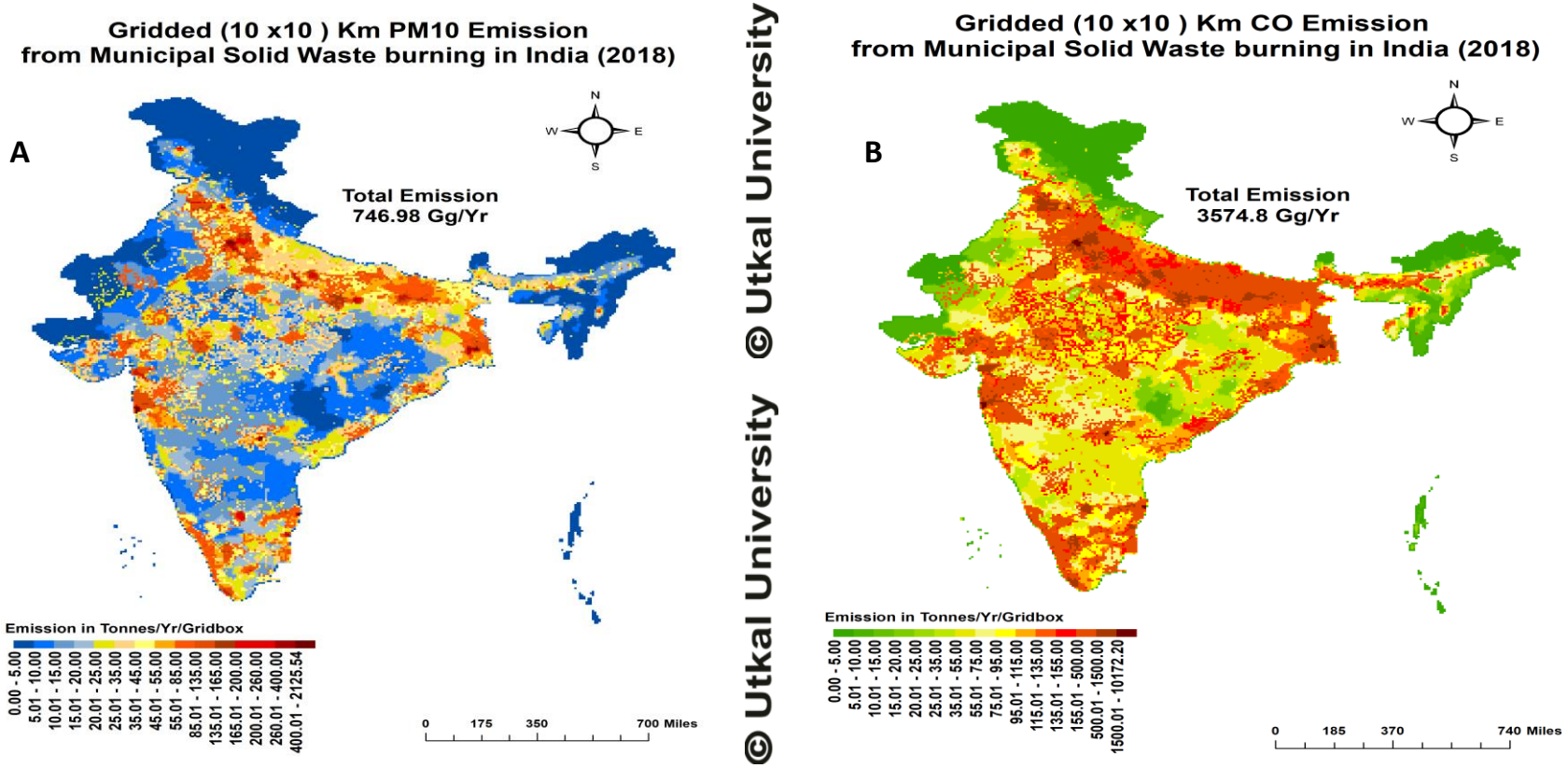

Fig. A and B showing PM_{10} and CO emissions from Open burning of MSW in India (2018)

- ✓ **The spatial patterns of emission shows a much denser value over the Northern, western and some parts of southern India.**
- ✓ **The trend of emission is similar for the spatial pattern of all the pollutants. High emission pattern for PM_{10} in the order of (400-2125.8) tons/yr/grid box across the Indo-Gangetic Plain (IGP) region, in Southeastern and Western India. High population density, major residential sectors and significant value of per-capita waste generation are the indicative reasons for the higher emissions over these regions.**
- ✓ **Similarly, emission in the order of (135-400) tons/yr/grid/box are shown in Central, Southwestern and some part of Northern India. Emissions in the costal belt of eastern India, at the Eastern tip of Southern India and in some areas of the Northeastern, states are significantly lower i.e. almost (10-55) tons/yr/grid box.**

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- *Environ. Sci. Technol. 2019, 53, 4765−4774 Gridded Emissions of CO, NOx, SO2, CO2, NH3, HCl, CH4, PM2.5, PM10, BC, and NMVOC from Open Municipal Waste Burning in India Gaurav Sharma, Baerbel Sinha,*

THANK YOU

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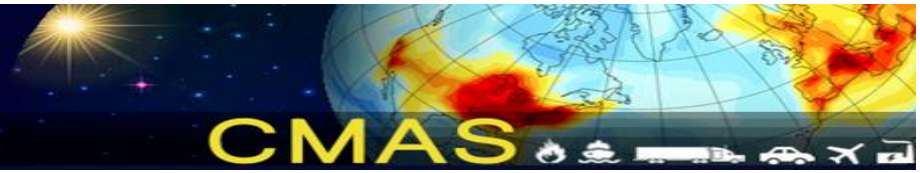

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