

The Third IPCC Expert Meeting on Short-Lived Climate Forcers (SLCFs)

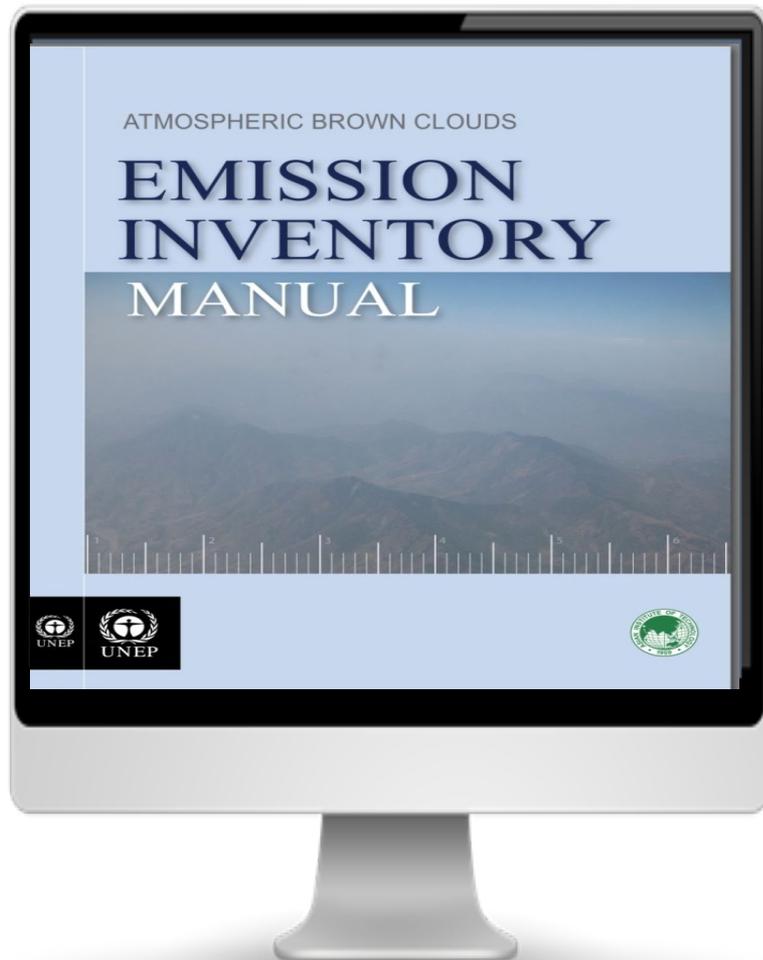
National emission inventory of SLCF for Indonesia



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General approach



01

Sources included

Fuel combustion, biomass open burning (forest fire, crop residue OB, MSW OB), & Other sources.

02

Species

Gases: CO, NO_x, NMVOC, SO₂, NH₃, CH₄, particulate matter (PM₁₀, PM_{2.5}, BC, OC).

03

Inventory base-year

EI was done for the base-year of 2010.

04

Spatial and temporal distribution

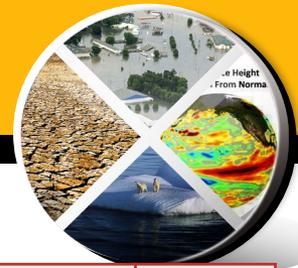
- Provincial emission was distributed to more than 300 cities
- Monthly emission profile was constructed.

05

Tool

ABC EIM EXCEL Spreadsheet

Coverage: sources and pollutants



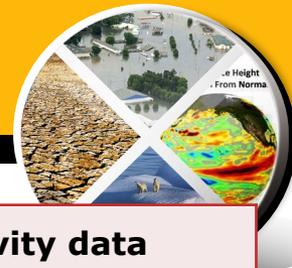
No	Emission Sources	SO ₂	NO _x	CO	NMVOC	NH ₃	PM	CH ₄	BC	OC
I. Energy Combustion										
1.	Power Generation	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.	Manufacturing industry	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.	Residential and commercial	✓	✓	✓	✓		✓	✓	✓	✓
4.	On-road-transportation	✓	✓	✓	✓	✓	✓	✓	✓	✓
5.	Air-transportation (LTO)	✓	✓	✓	✓		✓	✓	✓	✓
6.	Other transportations (harbour & railway)	✓	✓	✓	✓		✓	✓	✓	✓
II. Fugitive emissions and industrial process										
1.	Fugitive emissions from fuels				✓					
2.	Industrial process	✓	✓	✓	✓	✓	✓	✓	✓	✓
III. Open burning										
1.	Agro-residual-OB	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.	Forest fire	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.	Solid Waste OB	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV. Non-combustion emission sources										
1.	Livestock related Emissions & fertilizer application					✓		✓		
2.	Methane-landfill							✓		

Source and type of activity data



Sources	Activity data	Type of activity data
I. Energy combustion		
- Energy industry	National electricity corporate (PLN) 2011	Fuel type & consumption, control technology
- Manufacturing industry	Manufacturing Industrial Statistics (2011)	Fuel consumption (limited info on contro tech.)
- Transport (on-road, airport, harbour, railway)	Statistics of Transportation 2011, VKT (local studies)	VKT and EF from Kimoanh et al (2019); AIT-IGES (2017)
- Residential combustion	National statistics, PT Pertamina, MEMR	Fuel consumption (% of fuel type)
II. Fugitive emissions and industrial process		
- Fugitive emission from fuel and industrial process	MEMR (2011), Jumar and Wandebori (2012), Manufacturing Industrial Statistics (2011)	Amount of fuel sale, Industrial products
III. Biomass open burning		
- Forest fires (peat burning from GFED)	Permadi et al (2013)	MODIS MCD45A1, land-cover, etc
- Crop residue open burning	Provincial statistics, local studies	Crop production, crop to product ratio, etc.
- Municipal solid waste open burning	National statistics, Ministry of Health	Population, solid waste management study
IV. Non-combustion sources		
- Livestock related emission & fertilizer application	National statistics (2011), FAO database	Livestock headcount, manure manag., etc
- Final disposal site (methane)	MPW (2011) and MoEF (2011)	Amount of waste transferred to landfills, etc.

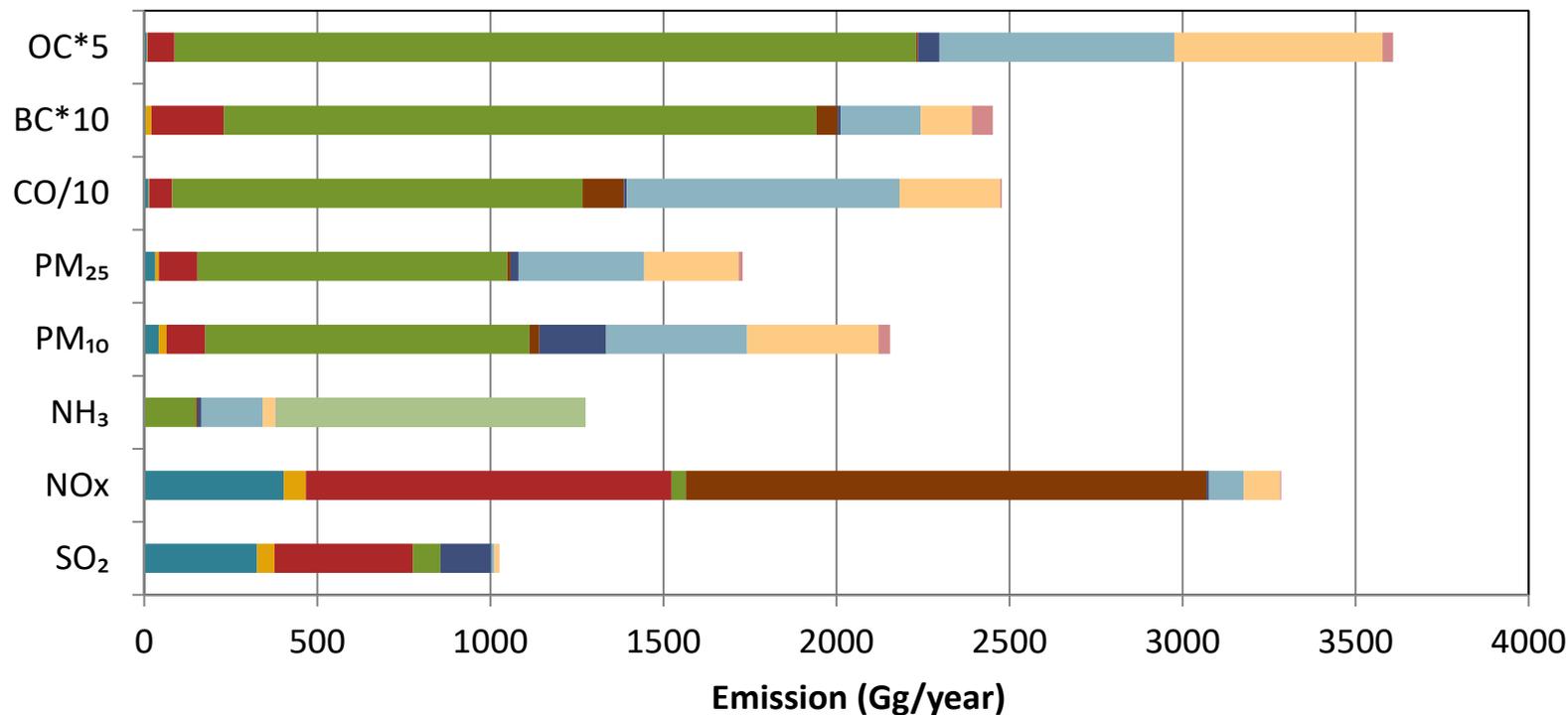
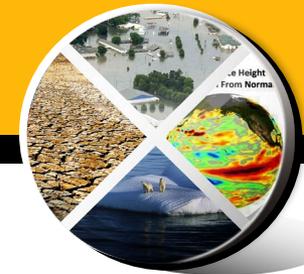
Summary of activity data, 2010



Sectors	Types of activity data	Activity data
Power generation	Fuel consumption (Mt y ⁻¹):	
	- Coal	23.4
	- Natural gas	3.2
	- Fuel oil	9.4
	- Biomass	6.3
Manufacturing industry	Fuel consumption (Mt y ⁻¹)	
	- Coal	5.4
	- Gasoline	0.34
	- Fuel oil	1.8
On road transport	Number of registered vehicle (Million y ⁻¹)	48
Air traffic	LTO (*1000/year)	344
Residential & commercial	Fuel consumption (Mt y ⁻¹)	
	- Coal	0.028
	- Wood	100.5
	- Kerosene	7.3
	- LPG	1
	- Charcoal	20.4
Fugitive emission from fuel	- Gas production (Tg y ⁻¹)	8,654
	- Oil production (Tg y ⁻¹)	29
	- Gasoline distributed (Mt y ⁻¹)	13.7
Agro residue open burning	Total dry crop residue openly burned (Mt y ⁻¹)	43.5
Forest fire	Total forest area burned, including peatland fire (ha y ⁻¹)	545,881
Solid waste open burning	Total dry solid waste burned (Mt y ⁻¹)	1.26
Agriculture related activities	- Total number of livestock population (head, *10 ⁶)	1,359
	- Fertilizer consumption (Mt y ⁻¹)	6.8

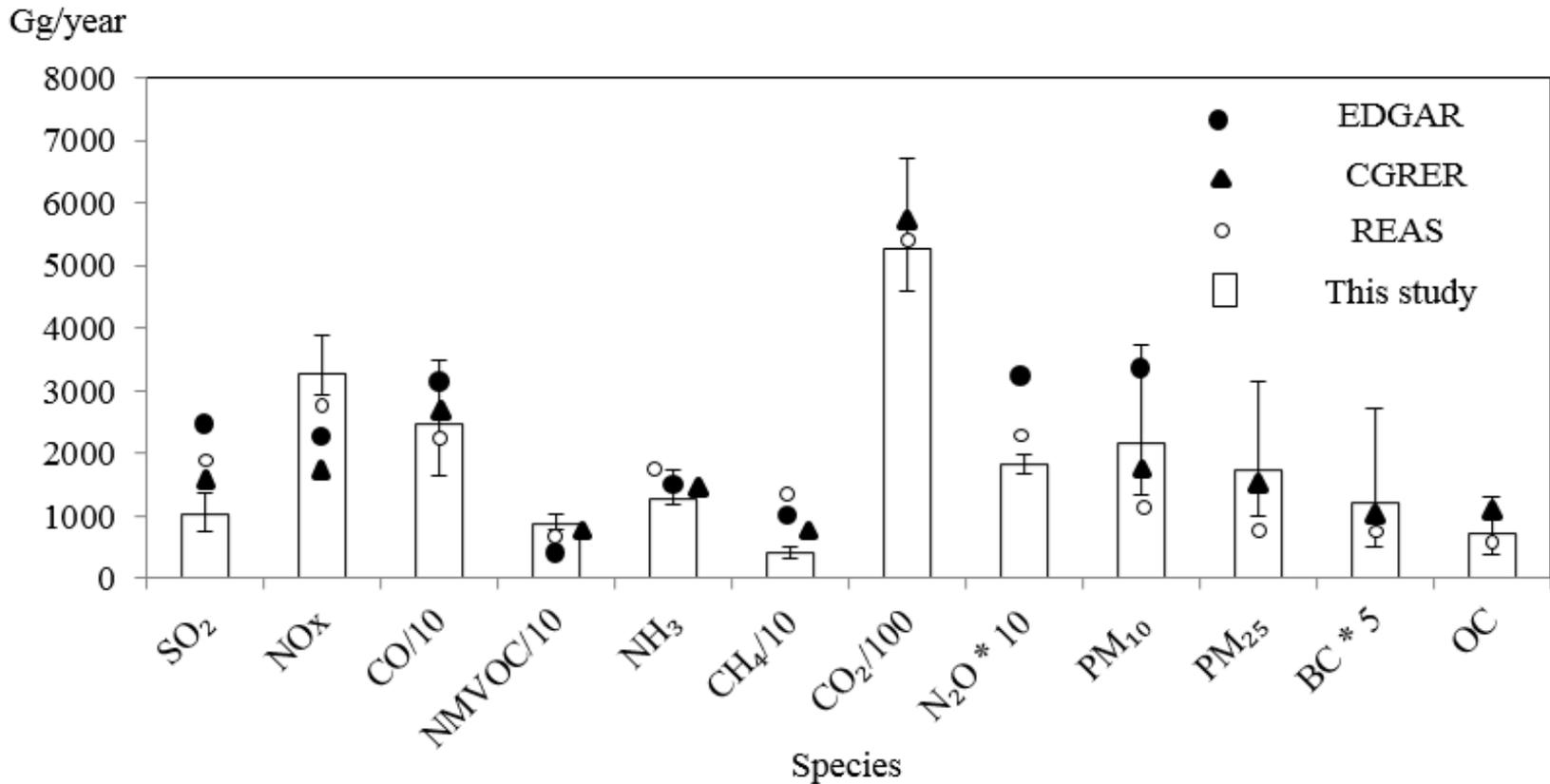
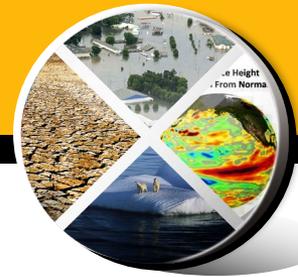
Source: Permadi et al (2018)

Results of total emission, 2010



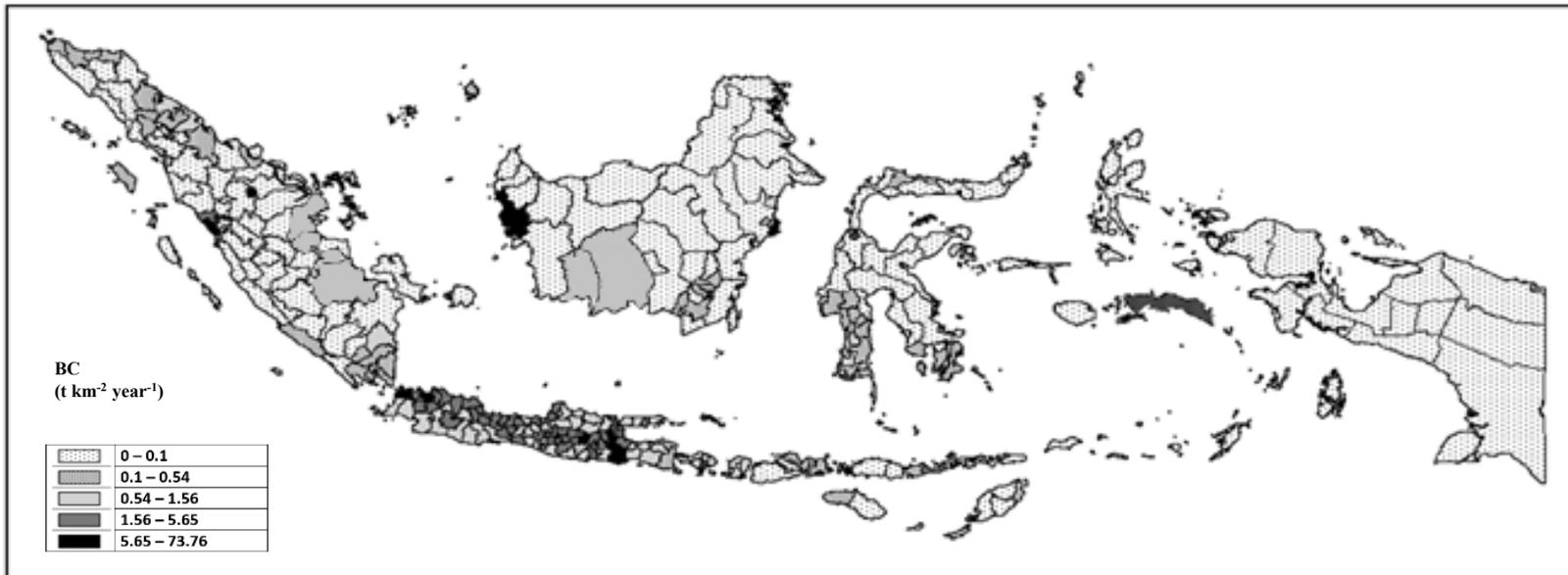
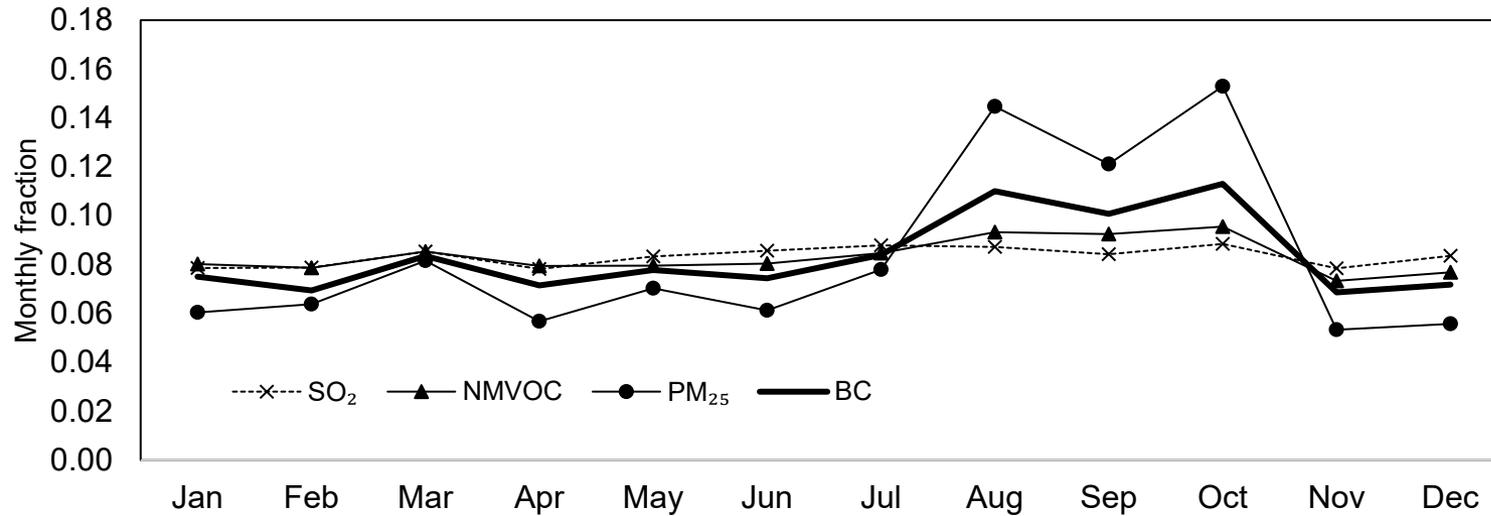
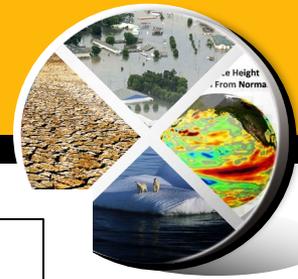
Source: Permadi et al (2017)

Comparison with other works

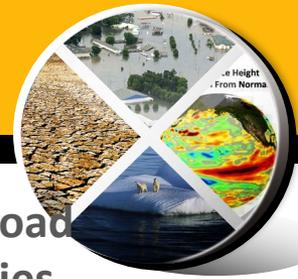


Source: Permadi et al (2017)

Temporal and spatial distribution

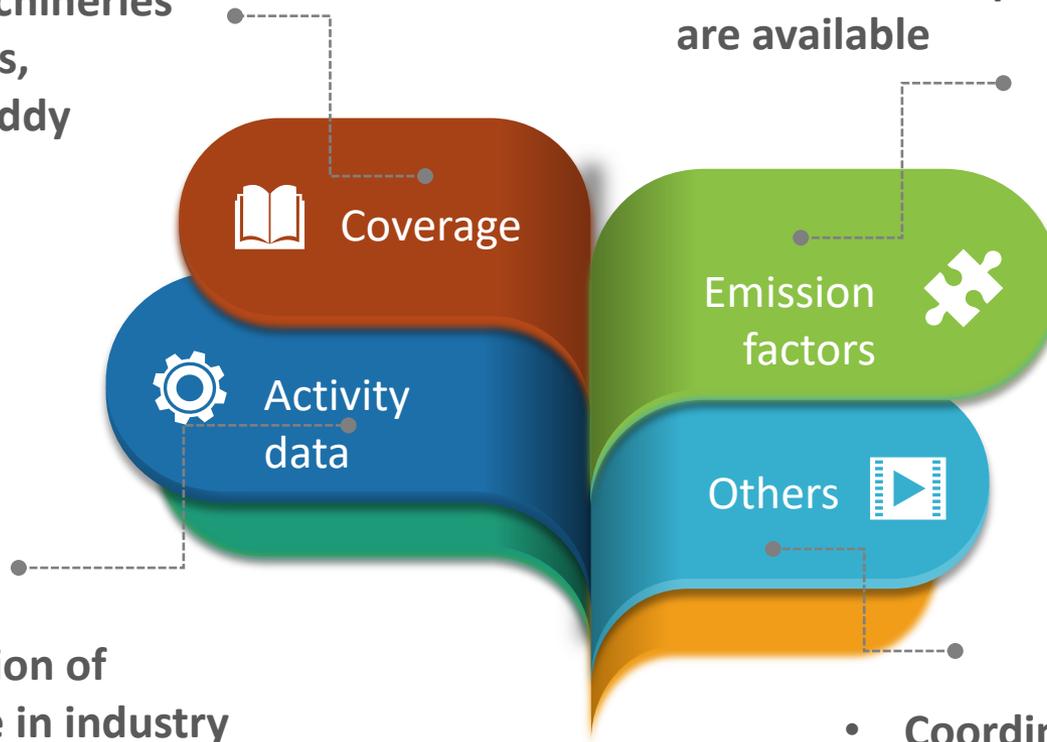


Lesson learned



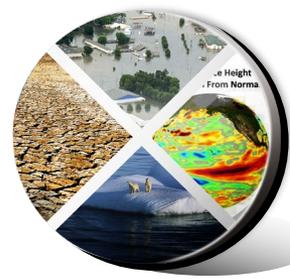
- There are still missing sources:
- Cruise emissions
- Agriculture machineries
- Agricultural soils, wetland and paddy
- Etc.

- Emission modeling for on-road transport limited to few cities
- Locally measured EFs for crop residue OB and peat burning are available



- Less information of control device in industry
- Large uncertainty of solid fuel residential combustion

- Coordination with the national GHGs emission inventory
- Uncertainty estimate



Acknowledgment:

AIT.RRCAP - ABC emission Inventory project

SDCC/AIT-France Network

PEER-NSF-USAID