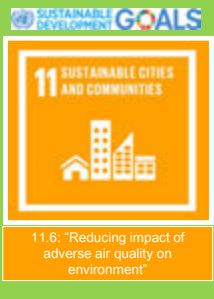




# EMISSION INVENTORIES FOR KEY SECTORS IN HO CHI MINH CITY, VIETNAM

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## 1. ABSTRACT

Emission inventory (EI) is required tool for both user community of air quality models and policy makers, regarding air pollution controlling. In light of this fact it is important to update and compile the local emission inventories using available data so that the scientific background of effective policies and the input data for atmospheric transport and deposition models can be designed.

**Objective** - to model the evolution of main anthropogenic emission sectors in HCMC using statistical data and remote sensing data. Expected outputs are gridded EIs for key anthropogenic emission sectors cover from 2009 to 2016. These EIs has monthly interval and 1 km space resolution and includes 12 species: SO<sub>2</sub>, NO<sub>x</sub>, CO, NMVOC, PM<sub>10</sub>, PM<sub>2.5</sub>, BC, OC, NH<sub>3</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and CO<sub>2</sub>.

**Study sites**: - Hochiminh city, Vietnam. This city has the relative independence on other adjacent sources. facilitating the compiling local EI.

**Result**: Emissions of Transportation sector in HCMC were over 682 Gg CO<sub>2</sub>, 84.8 Gg NO<sub>x</sub>, 20.4 Gg PM<sub>10</sub> and 22000Gg CO<sub>2</sub> in 2016, which are were 1.8, 2.6, 2.5 and 2.03 times of the ones in 2009, respectively. The emissions of Manufacturing industry and Residential sectors include both fuel consumption and electricity consumption. Electricity consumption is the most dominated emission source. In 2016, the electricity consumption of these two sectors emitted 6985 Gg and 6691 Gg of CO<sub>2</sub>, respectively, increasing by 87% and 45% in compare with 2009, respectively. Transportation is by far the highest emission source. The central business districts like Quan 1, Quan 4 and Quan 7 express the highest emission intensities.

## 2. STUDY SITE AND BACKGROUND

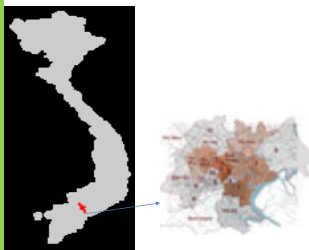


Fig. 1 Study site – Ho Chi Minh city, Vietnam.

Available EIs in HCMC applied Tier 1 approach provided by 2006 IPCC Guidelines and they are not up to date anymore. Besides, the spatial allocation of emissions to create emission maps is needed for both policy makers and air quality numerical model users.

### GHG Emissions by Sector



### GHG Emissions in Stationary energy Sector

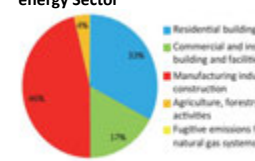


Fig. 2 GHG emissions by sector in HCMC, 2013 provided by JICA, 2015. Three key emission sectors are: Transportation, Manufacturing Industry and Residential sectors

## 3. METHODOLOGY

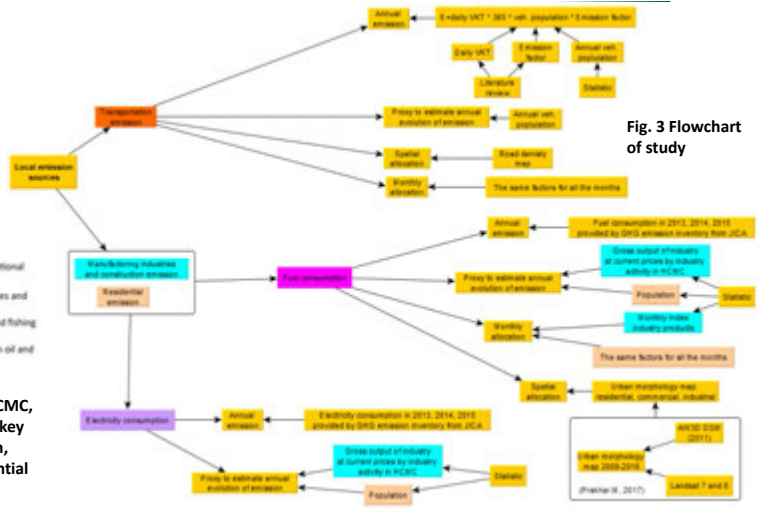


Fig. 3 Flowchart of study

## 4. RESULTS

### 4.1. Annual emissions of three key sectors

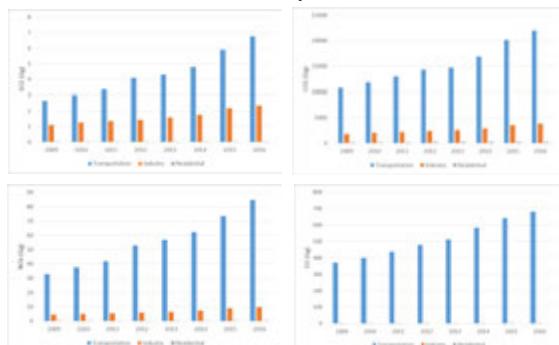


Fig. 4 Comparison of annual emissions (Scope 1) among three main sectors in HCMC from 2009 to 2016

### 4.2. Emission maps of three key sectors

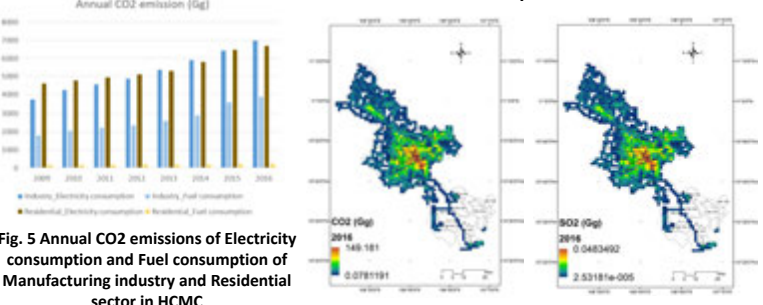


Fig. 5 Annual CO<sub>2</sub> emissions of Electricity consumption and Fuel consumption of Manufacturing industry and Residential sector in HCMC

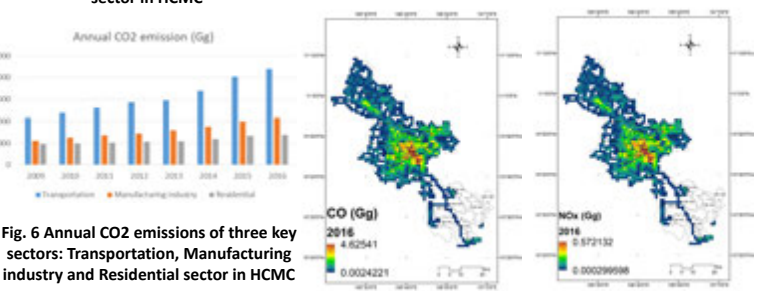


Fig. 6 Annual CO<sub>2</sub> emissions of three key sectors: Transportation, Manufacturing industry and Residential sector in HCMC

Fig. 7 Emission maps of three key sectors in HCMC in 2016

## 5. CONCLUSIONS

- Transportation has the highest sharing ratio among three emission sectors. The emissions of CO, NO<sub>x</sub>, SO<sub>2</sub> and CO<sub>2</sub> from traffic in 2016 in HCMC were 1.8, 2.6, 2.5 and 2.03 times of the ones in 2009, respectively.
- In terms of Manufacturing industry and Residential sectors, electricity consumption is the most dominated emission source. In 2016, the electricity consumption from these two sectors increased by 87% and 45% in compare with 2009, respectively.
- Basing on emission maps, the central business districts like Quan 1, Quan 4 and Quan 7 express the highest emission intensities, which can be over 1900 times of the ones in outskirts area.

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