High Resolution Emission Inventory of NOx and CO for Mega City Delhi, India

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ABSTRACT

In order to support as critical input to air quality forecasting task during Commonwealth Games (CWG) – 2010 in mega city Delhi, we have developed a high resolution emission inventory of major atmospheric pollutants. For the same, inventories of ozone precursors like NOx and CO are developed over a domain of 70 km × 65 km with a grid of 1.67 km × 1.67 km resolution covering Delhi and surrounding region using Geographical Information System (GIS) technique for base year 2010. All possible source of emission like transport, thermal power plants, industries, residential, slum cooking and commercial cooking are taken into account for the first time. It has been found that total emissions of NOx and CO over the study area are found to be 255 and 703 Gg/yr for 2010 respectively. The spatial distributions of major hot spots are discussed with possible dominant sources at particular regions. The present inventory will help to improve the modeling study over mega city, Delhi and its surrounding regions.

Keywords: NOx; CO; Emission inventory; Urban pollution; GIS; Mega city.

INTRODUCTION

Ambient air concentrations in mega cities continue to be a major concern due to rapidly growing economy and urban concentration (USEPA, 2000). Rising concentration of atmospheric pollutants has made the air pollution an international issue because people from any geographical region could affect by air pollution generated elsewhere (Akimoto, 2003). Global as well as regional air-quality issues exist in the form of trace gas like tropospheric ozone, a potential greenhouse gas that also is toxic to humans, animals and plants (Houghton et al., 1990). Oxide of nitrogen (NOx) and carbon monoxide (CO) are indirect greenhouse gases (GHGs) which plays an important role in global, regional and urban atmospheric chemistry in terms of troposphere ozone formation (Crutzen and Carmichael, 1993; Seinfeld and Pandis, 1998). Surface emission is critical input to any air quality model and chemical transport model and the quality of model simulation highly depend on surface emission estimation. Unfortunately this kind of emission data over Delhi and surrounding region was missing during CWG-2010. An accurate and comprehensive high resolution emission inventory of above ozone precursors is needed for air quality modelling to understand the ozone chemistry as well as sensitive regions over mega cities.

A comprehensive emission inventory of ozone precursors like NOx and CO for mega city Delhi and surrounding national capital region (NCR) does not exist for latest base year 2010. However, existing few earlier studies over Delhi indicate that emission inventories are available for base year 1995 and 2000 (Goyal and Jaiswal, 2003; Gurjar et al., 2004; Sharma and Pundir, 2008; Ramachandra and Shwetmala, 2009) but all estimations have their own limitations in one way or other and focused on some specific sector (i.e., transport, industrial, etc.) or objective. A major limitation in past studies is that they provided a gross estimation at broader level. Moreover, inventories are not gridded in finer scale required to be useful for air quality forecasting models. Hence the task remained unfulfilled and no air quality forecasting system is developed until recently in absence of fine scale emission inventories as latest as possible. In such an adverse condition, for better air quality forecasting during Commonwealth Games (CWG) -2010, an attempt has been made to develop a high resolution emission inventory (EI) (1.67 km × 1.67 km) for a domain of 70 km × 65 km covering Delhi and its adjacent region (hereafter called as NCRD) using the comprehensive activity (primary and secondary) data base obtained by specially organized a year long field campaign under the project SAFAR, scientifically executed by Indian Institute of Tropical Meteorology, Pune (Ministry of Earth Sciences, Govt. of India) in logistic association from Organizing Committee of Commonwealth Games -2010. The project SAFAR has been recognized as the pilot project by GURME (Global Atmospheric Watch - Urban Research Meteorology and Environment) of World
Meteorological Organization (WMO) due to the importance of such work in this part of the world.

**STUDY AREA**

Mega city and capital of India, Delhi having approx... 1483 sq. km is situated in Northern part of India. With growing urbanization and industrialization, the rising populations in Delhi drive to formation of National Capital Region (NCR) in 1962 which composed of Delhi and surrounding expanded states regions. The present area of interest (AOI) for our SAFAR project is around domain of $65 \times 70$ sq. km and called as NCRD as shown in Fig. 1(a) where approximately 29.5 million inhabitance resides by 2010. The contribution from Delhi will be around 17 million along with another 12.5 million population from surrounding region in the domain. The urban amalgamation is another major reason along with industrialization and urbanization to increase the Delhi population.

**SOURCE OF EMISSION, FIELD SURVEY AND ACTIVITY DATA**

Fossil fuel combustion which involves the burning of coal and petroleum products and biomass burning which includes burning of wood, crop residues, cow dung etc. are considered to be main source of various pollutants especially in Indian cities. Main focus of the present work is to estimate NO$_x$ and CO emission due to numerous combustion activities like vehicles, industries, use of diesel generator (DG) sets, thermal power plants and cooking etc. The cooking activities which dominate through Indian residential as well as commercial sector predominantly use fossil fuel like gasoline, liquefied petroleum gas (LPG), diesel, furnace oil (FO), coal, compressed natural gas (CNG), kerosene and bio-fuel such as wood and cow dung to generate energy. We rearranged and group all above sources into four broader categories viz. power sector, transport sector, industrial sector and residential sector. Due to lack of systematic and comprehensive database on fuel consumption pattern over NCRD regions, several diverse data sources like fuel consumption pattern, hours of usage, vehicle density, vehicle kilometers traveled (VKT), type of fuel used, etc., were gathered from primary survey as well as secondary sources. To serve the purpose of developing reliable EI, activity data were generated with careful planning by involving around 200 students from different universities and colleges. The volunteers were first trained through workshop and then allowed to involve in the rigorous field campaign over NCR region. During field campaign, street vendors, people in slums, officials of restaurants and hotels, vehicle owners were interrogated to know the exact condition prevailing in term of quantity and type of fuel used in above discussed sectors, usage hours for cooking in slums, hotel and restaurants, number and types of vehicles plying over the road along with fuel type and age. The data collected from primary and secondary sources were thoroughly checked by the team of experts for quality assurance before used for development of emission inventories. We do believe that the present generated activity data will fulfill the data gap up to some extent.

**Activity Data Collection**

In a nutshell we are summarized the major finding of activity data collected through primary and secondary sources. It is found that there are around 3.85 lakhs of Jhuggies which is scattered over 975 clusters in the entire NCRD (Fig. 1(b)). The clusters are further regrouped into 70 slum pockets scatter over Central, Easter and South-Eastern region of Delhi. Approx. 1.5 million inhabitance is residing in slum pockets where wood, kerosene, coal and cow-dung are mostly used for cooking with lower technological combustion (i.e., kerosene stoves, traditional chullas, etc.). Present field survey also found that nearly 1.30 lakhs of street vendors of different categories are performing various kind of business on road side in NCRD where LPG and kerosene are widely used as main fuel followed by coal and wood to cook food. Moreover it is also found that approx. 7652 restaurants and hotels are operational across various part of NCRD and they highly depend on LPG and coal for cooking practices followed by wood as alternative sources. It is impossible to interact with each and every people working in various hotel, restaurants and street vendor to know the exact situation prevailing in NCRD. In the present field campaign, approx. 370 street vendors and nearly 689 hotels all across the NCRD regions are selected and interrogated to know fuel used pattern. The recent trend of vehicle population after 2001 is determined by compiling data from various secondary sources like Department of Planning, economic survey of Delhi, Govt. of NCT of Delhi and annual registered vehicles during the period 1980 to 2010 by CPCB, Delhi Transport Department and MoEF, Govt. of India etc. The vehicle number increased from 2.5 million (2001) to 5.73 million (2010) where the major growth of vehicle occurred in two wheeler. Based on age and technology, the total vehicle fleet is divided into six different categories as shown in Fig. 1(c). It is estimated that another 22 lakhs of vehicle from surrounding region of Delhi also plying on NCRD. As it is well anticipated that not all vehicle ply on the road at any point of time. It is assumed from our best judgment using collected activity data that approx... 80% of the vehicles are plying on the road at any point of time. The major and minor road network over NCRD is very complex and dense. The prepared digital vector map of road network show an approx. 2,143 kms major road followed by 29,356 kms minor road network. The vehicles were counted at various road types for whole days to see the vehicle density on it. It is observed that nearly 67% of vehicular ply on major road as compared to just 33% on minor road based on various survey sites. The digital road network of major and minor over NCRD is depicted (Fig. 1(d)). The real time VKT data has been collected during field campaign and also compared with the earlier old VKT (Goyal and Jaiswal, 2003) in the Table 1. There are three coal based thermal power plants, viz. Rajghat Power House, IP Station, and Badarpur Power Station in NCRD. The sub-bituminous coal is used as fuel to these thermal power plants with avg. calorific value of 0.02 GJ/kg. Approximately 3.77 million Tons (MT), 0.69 MT and 0.34MT of fuel is consumed...
in Badarpur power station, Rajghat power house and IP station respectively. There are nearly 27,400 large and small scales industries in NCRD which are well scatter over Central, South-eastern and North-western region of Delhi region. It has been seen that stacks from industries are attached to other units such as boilers, furnaces, ovens, scrubbers, paint booth along with diesel generator sets. The actual fuel consumption pattern of each and every industrial unit is not available. The different type of fuel consumption data from secondary source has been collected from Delhi Pollution Control Committee (DPCC) and cross checked with field survey data. The consumption pattern for different fuel per annum for coal, CNG, LPG, wood, kerosene, farness oil and diesel are found to be 8.67 MT, 3.55 MT, 2 MT, 0.56 MT, 1.03 million liters per day (MLD), 2.15 MLD and 5.91 MLD respectively to meet the energy requirement in various industrial sectors. Due to space limitation, we are unable to elaborate activity data in detail. Some more details about the used activity data in this work could be found in published paper (Sahu et al., 2011).

**EMISSION FACTOR**

Keeping the large uncertainty associated with emission...
factor (EF), it is very sensitive to select the right EF suit to Indian condition. Available most recent NO\textsubscript{x} and CO emission factor suit to Indian condition from different sources have been tabulated in Table 2 and Table 3. These EFs are assumed to be best estimate available based on number of experiments conducted by automotive vehicle emission regulatory, reports and government certified agencies (US EPA, 1998; TERI Delhi; Ministry of Environment and Forestry (MoEF), 2009; CPCB, 2010). The transport in Delhi is one of the prominent sources of air pollution and is also not homogenous due to mixture of complete range of technological based fuel type used like diesel or gasoline or natural gas; use of various kind of engine type and technology. Based on the factor like age of vehicles, type of the fuel, engine technology, corresponding emission factor of two wheelers, three wheelers and four wheelers are provided in the Table 3. The EFs for different fuel types used in the current work is gathered from different source. By keeping the Indian condition in mind, we try to choose EFs developed indigenously and widely used in research community (US EPA, 1998; CPCB, 2010; TERI Delhi). The EFs used in present work are also scrutinized as per the government procedure. Due to lack of transparency and unknown factors, the uncertainties are introduced into emission inventories but we do feel that the present effort with our scientific understanding is best possible estimation with minimum uncertainties.

**METHODOLOGY FOR DEVELOPMENT OF EMISSION INVENTORY**

Development of emission inventory is a complex process due to numerous, diverse and widely dispersed emission sources in mega cities like Delhi. Present methodology have followed “bottom up” approach to improve the accuracy, reliability and uncertainty of inventory where emissions were estimated on the basis of activity data at each grid level (1.67 km × 1.67 km). The number of sources for different pollutant may differ significantly with varying magnitude. Identification of such sources is important to development of emission inventories. The methodology is well proven and details are provided and discussed (Sahu et al., 2011). This methodology has further refined. The above formulation is similar to what used by us earlier (Sahu et al., 2008; Sahu et al., 2011, 2015) that described in detail by Kalimont et al., (2002) and Bond et al. (2004). The total emission is expressed by following equations for all pollutants unless specified otherwise.

\[
TE = \sum_{a} \sum_{b} \sum_{c} FU_{a,b,c} \left[ \sum_{r} EF_{a,b,c,r} U_{a,b,c,r} \right]
\]

where,
- \(a, b, c = \text{Sector, fuel type, Technology}\)
- \(TE = \text{Total emission}\)
- \(FU = \text{Sector and fuel specific amount}\)
- \(EF = \text{Technology specific EFs}\)
- \(U = \text{Fraction of fuel for a sector with particular technology, where }\Sigma U = 1 \text{ for each fuel and sector.}\)

### Table 2. Emission factors of fuel used in Industrial, residential and power sector.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Pollutant</th>
<th>Unit</th>
<th>Fuel type</th>
<th>CNG/NG</th>
<th>LPG</th>
<th>Wood</th>
<th>Diesel</th>
<th>Coal/Coke</th>
<th>Kerosene</th>
<th>FO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industries</td>
<td>CO</td>
<td>kg/KL</td>
<td>0.000272*</td>
<td>0.19</td>
<td>-</td>
<td>0.63</td>
<td>1#</td>
<td>-</td>
<td>-</td>
<td>0.63</td>
</tr>
<tr>
<td>Residential</td>
<td>NO\textsubscript{x}</td>
<td>kg/KL</td>
<td>0.0028*</td>
<td>1.45</td>
<td>-</td>
<td>2.75</td>
<td>7.5#</td>
<td>-</td>
<td>-</td>
<td>7.5</td>
</tr>
<tr>
<td>Power</td>
<td>CO</td>
<td>g/kg</td>
<td>0.25</td>
<td>115.4</td>
<td>-</td>
<td>-</td>
<td>24.92</td>
<td>62**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>NO\textsubscript{x}</td>
<td>g/kg</td>
<td>1.8</td>
<td>1.4</td>
<td>-</td>
<td>-</td>
<td>3.99</td>
<td>2.5**</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

\* kg/m\textsuperscript{3}, \# kg/MT, \** g/lit.

**CNG** Compressed Natural Gas, **NG** Natural Gas, **LPG** Liquefied Petroleum Gas, **FO** Furness Oil.

### Table 3. Emission factors used for transport sector.

<table>
<thead>
<tr>
<th>Vehicle category</th>
<th>2W</th>
<th>3W (2S)</th>
<th>3W (4S)</th>
<th>PV</th>
<th>PV</th>
<th>PV</th>
<th>LCV</th>
<th>HCV</th>
<th>Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel used</td>
<td></td>
<td>Petrol</td>
<td>CNG</td>
<td>CNG</td>
<td>Petrol</td>
<td>Diesel</td>
<td>CNG</td>
<td>CNG</td>
<td>Petrol</td>
</tr>
<tr>
<td>CO 5 yrs</td>
<td>0.40</td>
<td>0.69</td>
<td>2.29</td>
<td>0.84</td>
<td>0.6</td>
<td>0.85</td>
<td>3.66</td>
<td>6.00</td>
<td>3.72</td>
</tr>
<tr>
<td>10 yrs</td>
<td>1.65</td>
<td>0.69</td>
<td>2.29</td>
<td>2.74</td>
<td>0.30</td>
<td>0.85</td>
<td>3.66</td>
<td>6.00</td>
<td>3.72</td>
</tr>
<tr>
<td>15 yrs</td>
<td>1.65</td>
<td>0.69</td>
<td>2.29</td>
<td>4.83</td>
<td>0.30</td>
<td>0.60</td>
<td>3.00</td>
<td>19.30</td>
<td>3.72</td>
</tr>
<tr>
<td>NO\textsubscript{x} 5 yrs</td>
<td>0.25</td>
<td>0.19</td>
<td>0.53</td>
<td>0.09</td>
<td>0.28</td>
<td>0.53</td>
<td>2.12</td>
<td>9.30</td>
<td>6.21</td>
</tr>
<tr>
<td>10 yrs</td>
<td>0.27</td>
<td>0.19</td>
<td>0.53</td>
<td>0.21</td>
<td>0.49</td>
<td>0.53</td>
<td>2.12</td>
<td>9.3</td>
<td>6.21</td>
</tr>
<tr>
<td>15 yrs</td>
<td>0.27</td>
<td>0.19</td>
<td>0.53</td>
<td>0.645</td>
<td>0.49</td>
<td>0.53</td>
<td>2.48</td>
<td>13.84</td>
<td>6.21</td>
</tr>
</tbody>
</table>


In the presence of technology specific vehicular EFs for transport sector for India (ARAI, 2007; CPCB, 2010) the EFs derived by using vehicular technology information are applied to the vehicle technology information and numbers. The emission from transport sector thus has been calculated as per Eq. (2).

\[ E_t = \sum (Veh_t \times D_t) \times EF_{km} \]

where,
- \( E_t \) = Total Emission of compound
- \( Veh_t \) = Number of Vehicle per type
- \( D_t \) = Distance traveled in a year per different vehicle type
- \( EF_{km} \) = Emission of compound, vehicle type per driven kilometer

For this purpose, the daily average mileage per vehicle category have been developed using the field campaign data, where heavy commercial vehicles including goods-vehicles and tractors use diesel as fuel, motorcycle use gasoline, cars use diesel, gasoline and CNG as fuel. The buses and auto rickshaws use CNG as fuel while fraction of light commercial vehicles uses CNG and remaining use gasoline as a fuel. The process of spatial distribution, grid extraction along with digital data generation and statistical modeling using GIS have been followed as per our earlier work (Sahu et al., 2011) where the traffic flow of various categories of vehicle in terms of technology and fuel type and corresponding VKT, major and minor road network density, population density map, industrial location and its capacity are used as weighted factor to distribute these emissions. In case of residential activity, the ward level population density map is used to distribution of emission. Similarly locations of large scale point sources i.e., thermal power station are used also. An overall similar brief schematic methodology diagrams for the development of emission inventory as well as the spatial allocation technique is provided in Sahu et al. (2011).

RESULTS

**Anthropogenic NO\textsubscript{x} Emission in NCRD**

The estimated NO\textsubscript{x} emission is calculated to be around 255.4 Gg/yr over NCRD. The geographical distribution of NO\textsubscript{x} emission in 1.7 km resolution is depicted in Fig. 2(a). The relative contributions from different sector like power, vehicular sources, industrial and residential source are estimated to be 6.9 Gg/yr, 79.8 Gg/yr, 162.3 Gg/yr and 6.4 Gg/yr respectively. The relative contribution of above four sectors in percentage is shown in Fig. 2(b).

A high emission of the order of 500–2500 ton/yr is found over eastern, northern and central Delhi as well as some part of the outskirts of Southern Delhi and some of the south-eastern region of Delhi. Whereas a moderate emission of the order 250–750 ton/yr is well scattered over major other part of the NCRD regions. Emission especially from transport sector plays a dominating important role. However, the hot spots of the order 2000–5500 ton/yr are further drive by emission from industrial practices and large point sources like thermal power followed by well scattered transport and residential emission. It has been found that Central and Eastern Delhi region in downtown are one of the highly polluted regions (2000–5500 ton/yr) where industrial source contributes approx. 750–4800 ton/yr followed by transport (approx. 250–600 ton/yr) and residential sector (approx. 50–80 ton/yr). Few hot spots over Southeastern and Central Delhi region are further dominated by large point source like thermal power emission (approx. 1500–3800 ton/yr) followed by transport sector (300–500 ton/yr). Except few surrounded hot spot areas like Noida, Gurgaon, Faridabad and Ghaziabad, most of the outskirts of Delhi have relatively very low NO\textsubscript{x} emission of the order of just 30–75 ton/yr where major part of total emission comes from transport sector followed by residential practice. However, western and northern region of Delhi shows comparatively lower value of NO\textsubscript{x} emission in the range of 15–40 ton/yr due to agricultural land cover, low population density, low industrial activities and semi urban zone. The minimum road density over above discussed region clearly indicates the minimum Industrial hot spots (750–4800 ton/yr) play a major role in polluting the Southern, Eastern Central and Northern Delhi regions. Our analysis indicates that nearly 71% of total emission is coming from Delhi where central and Eastern and South-Eastern Delhi contributes more than 67%. As said earlier, the transport followed by industrial sectors dominates the total emission. The road density is very over Delhi and some industrial regions around surrounding regions like Gurgaon, Faridabad and Ghaziabad etc. In case of residential, Kerosene and wood burning related combustion activities, the sum lying over Central and South-Eastern Delhi is more responsible. It is found that coal is predominantly used in industrial sector followed by diesel as fuel. Dense major road network over above regions drives to higher transport related activities further intensify the NO\textsubscript{x} emission. Discussed above regions where the population density is also very high due to presence of the slum pockets drives the low technological combustion practices for cooking activity. NO\textsubscript{x} emission from large point source like thermal power station is too high of the order of 1500–3500 ton/yr. High population density due to urban agglomeration is the main reason which directly or indirectly drives the high emissions in Delhi. In terms of relative contribution from different sectors, important sector contributing to total NO\textsubscript{x} emission in NCRD is transport which is found to be around 162.3 Gg/yr as shown in Fig. 2(b) followed by industrial source (79.8 Gg/yr). The emission from slum is small but it is confined to specific regions. Recent rising tend of vehicle numbers in Delhi road in last ten year has put tremendous pressure on road network expansion. All major traffic junctions are found to have highly polluted by NO\textsubscript{x} emission of the order 300–600 ton/yr.

**Anthropogenic CO Emission in NCRD**

The spatial distribution of total CO emission from major sectors viz. power, industrial, transport and residential over Delhi-NCR for the year 2010 is shown in Fig. 2(c). The estimated total CO emission from all the sources is estimated to be around 703.2 Gg/yr. The relative contributions of CO from power, industrial, transport and residential sector are
Fig. 2. Emission over NCRD (a) Geographical distribution of NOx emissions from all sources in NCRD, (b) Relative contribution of NOx emission from different sectors, (c) Geographical distribution of CO emissions from all sources in NCRD, (d) Relative contribution of CO emission from different sectors.

estimated to be 0.04% (0.29 Gg/yr), 1.6% (10.92 Gg/yr), 60.8% (427.55 Gg/yr) and 37.6% (264.41 Gg/yr) respectively as shown in pie-chart (Fig. 2(d)). The spatial pattern shows that CO emission hotspots of the order of 750–5300 ton/yr are found to be over the large region of Central, Eastern and South-eastern Delhi regions along with few more over surrounding NCR regions like Noida, Gurgaon, Ghaziabad and Faridabad etc. Transport sector is the dominating source in the above discussed regions due to high population density driving to high vehicular density and major road network. The estimated emission from transport is found to be around 427.55 Gg/yr where the petrol driven vehicles emits more CO as compared to diesel vehicle. The petrol vehicles are mostly the personal vehicle along with for taxi use in India. The vehicle numbers have gone up nearly two folds in Delhi during last 10 years. In Delhi, the petrol driven vehicles contribute more than 80% of total CO emission. Rising population drive the rapid increase in vehicle numbers in Delhi road. It is also found that personal vehicle number growth contributing a lot to total emission as compared to commercial vehicle growth. Most of the major traffic junctions in down town are highly polluted by transports related CO emission (approx. 1200–1800 ton/yr) where the population density along with road density is too high. Industrial zones in Delhi are more confined to Central & Eastern Delhi and few more specific regions outskirt of Delhi.

The second most dominant source is residential sector where major slum clusters play an important role. The regions are more confined to the Central, Eastern, South-Eastern part of Delhi and few surrounding regions. It is also found that highly dense population with middle income group is lying over above discuss areas too. It is found from sector specific CO emissions that above regions are also receiving significant amount of emission collectively from slum cooking, residential cooking, street vendors and commercial cooking etc. Poor cooking practices in slum areas drive to high emission of CO in those regions. The slum population density located near major river (Yamuna) belts in eastern and central Delhi is found to be very high which is one of the important sources of residential CO emission in those regions. A relatively low emission of the order of 25–150 ton/yr is found to be in the outskirt of Delhi and adjacent
districts like Rotak, Jhajjar and Gauttam Budhanagar etc. Low population density along with agricultural lands cover are the main reasons for low emission of CO. Collectively, the street vendor cooking and commercial cooking contribute a significant amount of CO emission in densely populated regions and are well uniformly scattered over large area. CO emission hot spot of the order of 3000–5300 ton/yr is found over these densely populated industrial zones. Similar hotspots are also identified over the Noida, Gurgoan, Faridabad regions surrounding the Delhi where an emission of the order 1000–1500 Ton/yr is found. CO emission from large point sources like thermal power is too low due to high combustion. Our estimation for NOx and CO is compared with some recent publication from Guttikunda and Calori (2013). The best part of comparison is that both are developed for base year 2010. There estimated NOx (376 Gg/yr) and CO (1425 Gg/yr) emission is higher by factor of nearly two due to different in domain size as well as due to difference in sources.

CONCLUSIONS

The regional emission inventory which is an integral part for air quality modeling especially for Indian mega cities is accomplished at 1.67 km resolution. For a realistic estimation of air pollutants over Delhi need detail surface emission that to in gridded form has been achieved in the present work. It has been found that the total emission of NOx and CO is 255.4 Gg/yr and 703.2 Gg/yr over NCRD for the base year 2010 respectively. The contribution of various sectors is determined over different geographic regions of selected domain with possible source. We can conclude that the Central, Eastern, and South-Eastern Delhi region of Delhi are responsible for emission load followed by some scattered industrial hot spots lying around outer boundary of Delhi. The transport emission is dominate source followed by industrial sector in case of NOx whereas residential sector is followed in case of CO. Present developed inventories, not only helpful for regional modeling study to understand the air quality but also useful for policymaker to make better mitigation strategy to control the pollution in mega city.

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