Recommendations to the Government

on India's Official GHG Emission Estimation Process

GHG Platform INDIA

About the Platform

The GHG Platform India is a collective civil-society initiative engaged in providing an independent estimation and analysis of India's greenhouse gas (GHG) emissions. The platform consists of the Council on Energy, Environment and Water (CEEW); Center for Study of Science, Technology and Policy (CSTEP); Local Governments for Sustainability, South Asia (ICLEI); SHAKTI Sustainable Energy Foundation; Vasudha Foundation; and World Resources Institute – India.

The platform seeks to add value to various ongoing efforts of the Government of India by helping address data gaps and data-accessibility issues (extending beyond the scope of national inventories) and by increasing the volume of analytics and policy dialogue on India's GHG emission sources, profile, and related policies. This is especially relevant in light of the pronouncements of the Government of India to come up with annual GHG inventories and create a climate budget. In this regard, the GHG Platform India proposes to share some of its experiences and learning from estimating GHG emissions of India at the national and state levels for 2005 to 2015. Further, based on our experiences and learning, we would also like to provide recommendations for strengthening the basis on which GHG estimations are conducted. These recommendations concern highlighting existing data gaps, further strengthening of ongoing data-gathering efforts of the Government of India, as well as certain process-related aspects of calculating India's GHG emissions.

Overarching Suggestions

To increase the reliability of India's national emissions inventory, the Ministry of Environment, Forest and Climate Change (MoEFCC) must consider developing 'country-specific' emission factors using real-time measurements across all sectors. At present, many of the employed emission factors are either defaults or global estimates.

Overall, all activities specified in the IPCC (Intergovernmental Panel on Climate Change) methodology must be included in India's annual inventory, to maintain consistency and establish comparability with global assessments - which is not the case at present.

Addressing Existing Data Gaps

There is a paucity of reliable data for certain sectors. A sector-wise list of data gaps is provided below:

Energy Sector

- Though Central Electricity Authority (CEA) reports fuel consumption of both state- and private-owned power plants at the state level, data on central power plants (state-wise information) is not available in the public domain.

- Refined data on bunker storage of aviation turbine fuel (ATF) in the aviation sector and fuel oil in the navigation sector is not available.

- Fuelwood is one of the key sources of emissions (non-CO2) from the residential sector. However, data on consumption needs is not adequately captured by the respective line ministry. Similarly, sectoral data on consumption of coke/coal/charcoal also needs to be monitored.

- There is a lack of data on the absolute quantity of subsidized fuels for a reliable sector-specific emissions estimation.

- Estimation of data on the total quantity of natural gas leaked during extraction and distribution is lacking.

AFOLU Sector

- Disaggregated and accurate details regarding various management practices used for paddy cultivation are not available. This data is either not collected on an annual basis or not made available (if it is collected).

- Granular data is required for yield and management practices concerning agricultural residues. Further, annual data for this activity is not available.

- Land-use change matrices need to be prepared and made publicly available. At present, this data is not easily accessible, even for research purposes.

- Further, relating to the point stated above, there is a lack of data availability for land covered by lakes and ponds.

- There is a lack of granular data for assessing soil organic carbon and biomass on land being put to various uses in the country, especially land categories such as grasslands, croplands, and others.

- While detailed data regarding livestock numbers is available, greater granularity is required regarding body weight and feed intake, as well as on manure management for different parts of the country, considering India has a high livestock diversity

- In addition, there is a lack of state-specific emission factors that could potentially capture the wide diversity in management practices of various categories of land.

- There is a lack of disaggregated data on fertilizer consumption by type. At present, the state-wise data for this activity is placed behind paywalls.

Industry Sector (Energy-use and IPPU)

- One of the major challenges with demand-side energy use information in the sector is the high share of non-specified industry in overall reporting. In the case of petroleum fuels, despite sector-wise reporting, 88% of end-use is ambiguous as it gets reported under the resellers/retailers/miscellaneous head. This is due to the lack of bottom-up estimation process.

- Further, the lack of harmonized classification of different end-use sectors within the available energy statistics reports (coal directory, piped natural gas statistics, Petroleum Planning and Analysis Cell—PPAC) does not allow for a comprehensive view of energy consumption at sectoral levels.

- End-use information for auctioned products (domestic) as well as imported fuel (and derivatives) is inaccessible.

- Sector-wise split of fuel consumption for captive power generation (mainly coal and diesel) is obscure. Fuel use data on power backup systems (under 1 MW capacity) is not available in the public domain.

- Movement of coal from washeries to end use is uncertain. Moreover, end use accounting of washery rejects, coke oven gases, etc. is also challenging to determine

- Bureau of Energy Efficiency (BEE) collects comprehensive details on end-use energy consumption and associated improvements over time through third-party audits. However, limited mandate prevents dissemination of such information in the public domain.

- Annual Survey of Industries (ASI) provides a comprehensive coverage of Industry-wise consumption data for a wide range of fuel and derived products. It follows the National Informatics Centre (NIC) system to provide further insights. However, lack of mandated focus on energy policy planning prevents the desired level of scientific scrutiny with energy-use information. Moreover, coverage of Industry activity is limited to the firms registered under the Factory Act, 1948.

- Energy-use information for the MSME (Micro, Small and Medium Enterprises) sector is highly dispersed.

Waste Sector

- Information on the proportion or quantum of solid waste being processed and/or treated to arrive at the total solid waste reaching landfill sites is unavailable.

- Information on historic data, for a 50-year period before 2007, including per capita waste generation rate, waste composition, and proportion of solid waste reaching landfill that has been used for computation of methane (CH_4) emissions from historic solid waste disposal using first order decay (FOD) model is not available.

- The proportion of domestic wastewater treated aerobically, anaerobically, or not treated at all, as well as the type of discharge/treatment system, is unavailable

- Detailed information on protein intake would help capture impacts of nutritional changes in both urban and rural areas, but it is not available at present.

- GHG emissions from the IPCC source categories of '4B Biological treatment of solid waste' and '4C Incineration and open burning of waste' should be accounted for in India's emission estimates, given that a number of waste incineration and composting facilities have been setup in the current decade through various programmes and relevant information for emission estimation can be captured.

# Specific Sector-wise Recommendations

Energy Sector

■ The activity data specific to diesel consumption in the transport sector is aggregated into 'retails' and 'miscellaneous' activities. This needs to be disaggregated further based on sectoral consumption. Towards this, we propose that MoEFCC collect disaggregated data from the Ministry of Petroleum and Natural Gas (MoPNG). The data must be categorised based on sectoral consumption, such as transport, telecom, commercial, residential, agriculture, and fisheries.

■ MoPNG and PPAC should provide data on bunker storage of ATF in the aviation sector and fuel oil in the navigation sector. As of now, they are merged in the consumption data.

■ MoEFCC (forestry division) must capture data on fuelwood usage to make a robust inventory. Similarly, the sectoral consumption of coke/coal/charcoal consumption data is to be captured by Ministry of Coal reports.
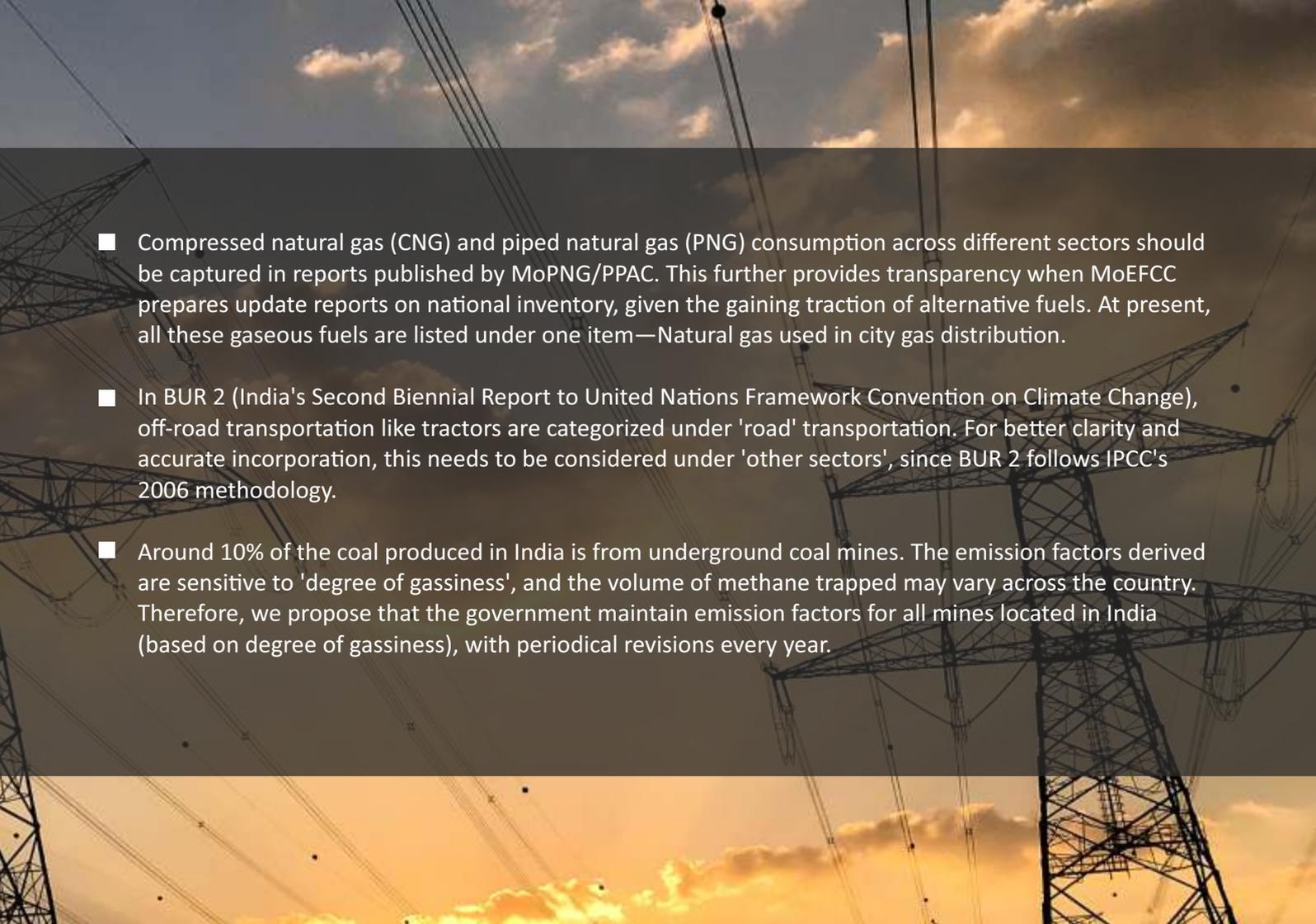
■ Compressed natural gas (CNG) and piped natural gas (PNG) consumption across different sectors should be captured in reports published by MoPNG/PPAC. This further provides transparency when MoEFCC prepares update reports on national inventory, given the gaining traction of alternative fuels. At present, all these gaseous fuels are listed under one item—Natural gas used in city gas distribution.

■ In BUR 2 (India's Second Biennial Report to United Nations Framework Convention on Climate Change), off-road transportation like tractors are categorized under 'road' transportation. For better clarity and accurate incorporation, this needs to be considered under 'other sectors', since BUR 2 follows IPCC's 2006 methodology.

■ Around 10% of the coal produced in India is from underground coal mines. The emission factors derived are sensitive to 'degree of gassiness', and the volume of methane trapped may vary across the country. Therefore, we propose that the government maintain emission factors for all mines located in India (based on degree of gassiness), with periodical revisions every year.

AFOLU Sector

- The required details for management practices in paddy cultivation can easily be gathered when surveys are performed for area sown by different crops in the country, by the Ministry of Agriculture.

- In addition, more granular data for yield and management of agricultural residues is needed for more precise estimation of emissions. Further, farm-level surveys could be conducted in different districts regarding fertilizer use, to obtain greater granularity of the data. Moreover, special surveys can be initiated to generate primary data on livestock-related gaps that have been highlighted previously.
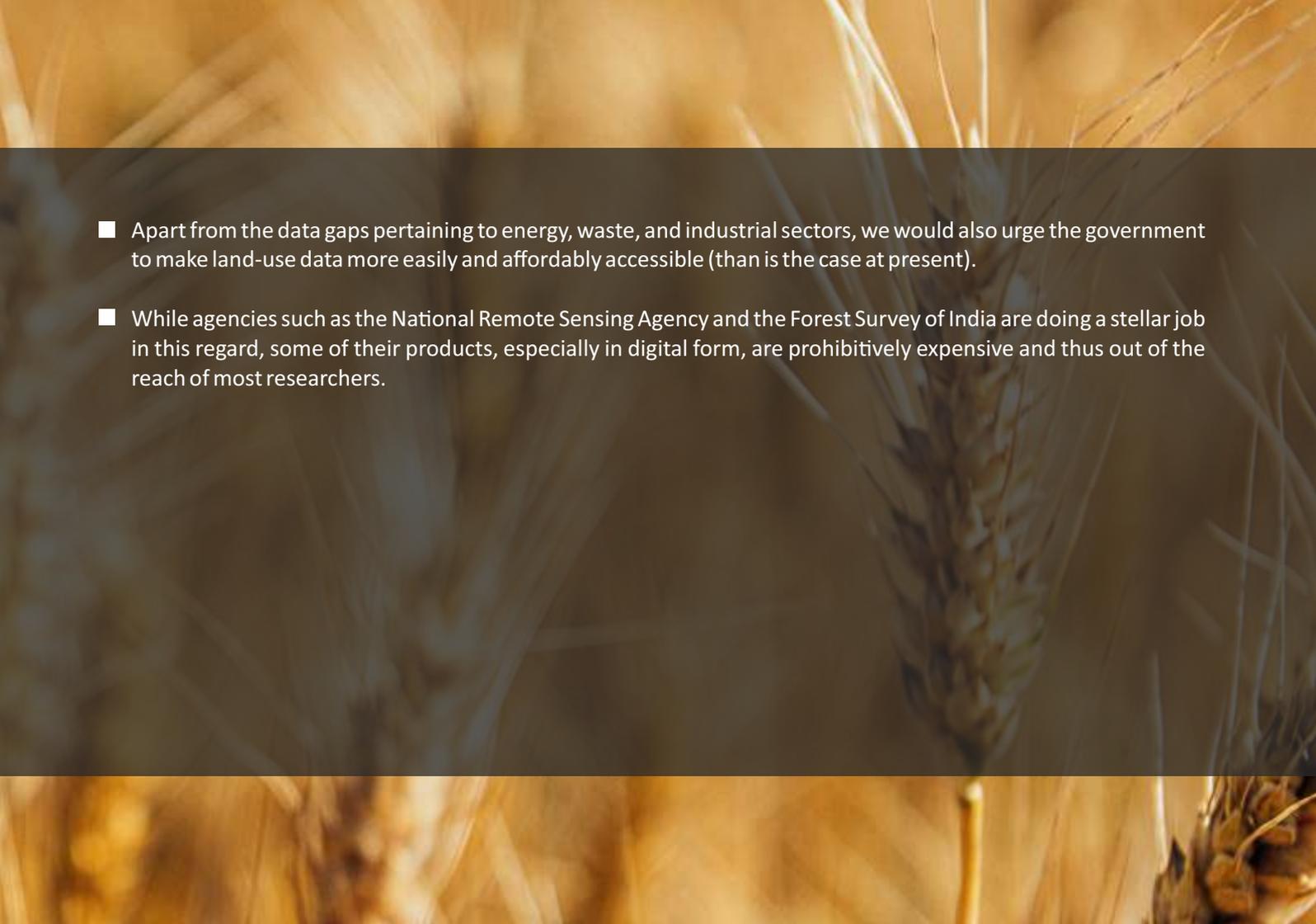
- Apart from the data gaps pertaining to energy, waste, and industrial sectors, we would also urge the government to make land-use data more easily and affordably accessible (than is the case at present).

- While agencies such as the National Remote Sensing Agency and the Forest Survey of India are doing a stellar job in this regard, some of their products, especially in digital form, are prohibitively expensive and thus out of the reach of most researchers.

Industry Sector (Energy-use and IPPU)

The Collection of Statistics Act (2017 Amendment) vests sufficient power to collect statistics on any subject. The Energy Conservation Act (2001) is limiting in its mandate to only collect data from designated consumers (DCs), whereas the broader 'The Collection of Statistics Act' allows for collection from any entity as deemed necessary. Clearly, no separate legislation is needed to pursue the collection of energy-use data from entities hitherto not covered in either the ASI or the Perform, Achieve and Trade (PAT) exercises.

■ Annual Survey of Industries is one of India's largest and most comprehensive survey systems established by the Ministry of Statistics and Programme Implementation (MOSPI) for the manufacturing sector. A few revisions in the ASI methodology and subsequent assimilation of its information in inventory calculations could help the MOEFCC move up the tier ladder. CEEW has already demonstrated a merit in the use of ASI datasets by preparing GHG inventories for the manufacturing sector, available at the GHG Platform - India.
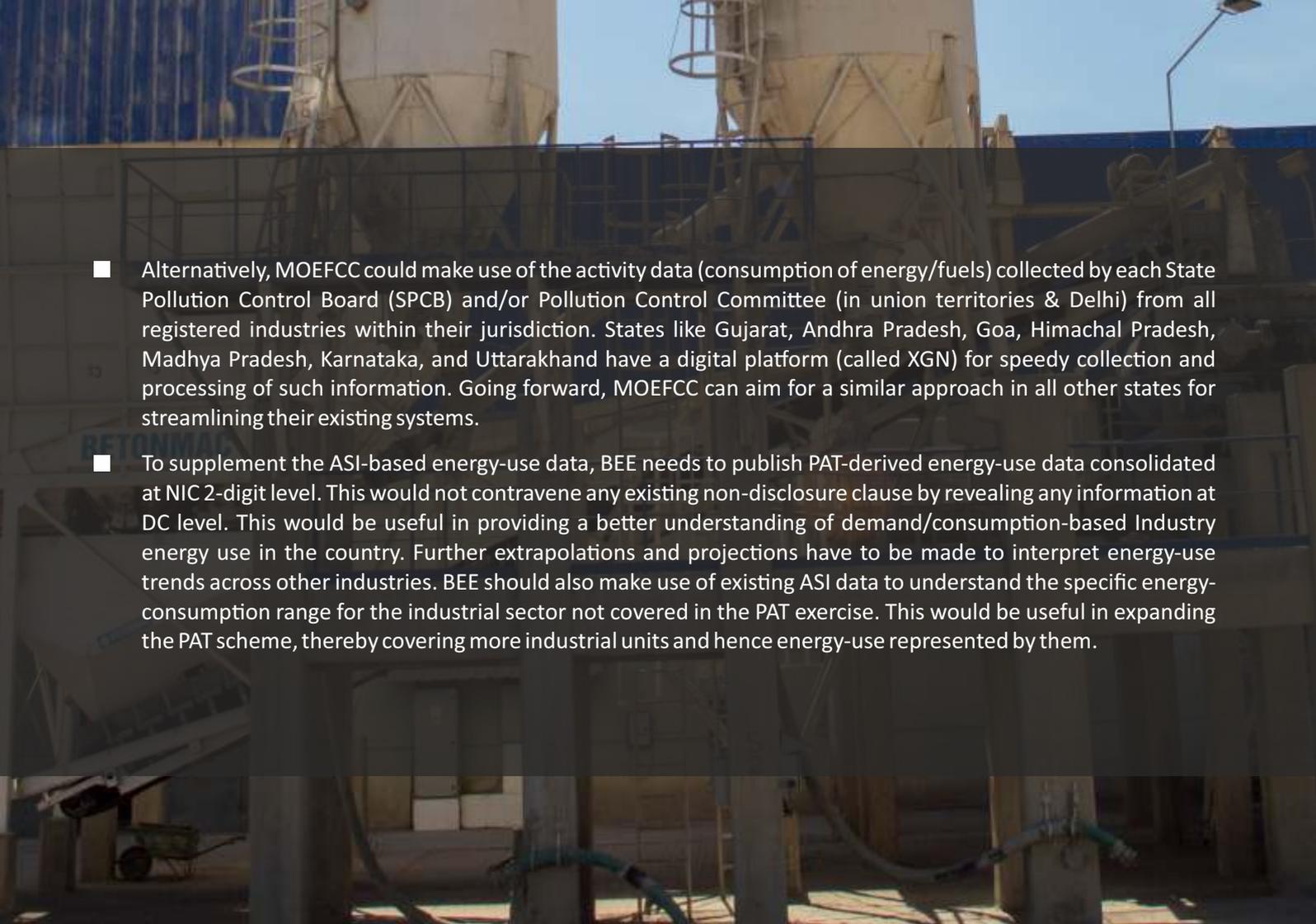
■ Alternatively, MOEFCC could make use of the activity data (consumption of energy/fuels) collected by each State Pollution Control Board (SPCB) and/or Pollution Control Committee (in union territories & Delhi) from all registered industries within their jurisdiction. States like Gujarat, Andhra Pradesh, Goa, Himachal Pradesh, Madhya Pradesh, Karnataka, and Uttarakhand have a digital platform (called XGN) for speedy collection and processing of such information. Going forward, MOEFCC can aim for a similar approach in all other states for streamlining their existing systems.

■ To supplement the ASI-based energy-use data, BEE needs to publish PAT-derived energy-use data consolidated at NIC 2-digit level. This would not contravene any existing non-disclosure clause by revealing any information at DC level. This would be useful in providing a better understanding of demand/consumption-based Industry energy use in the country. Further extrapolations and projections have to be made to interpret energy-use trends across other industries. BEE should also make use of existing ASI data to understand the specific energy-consumption range for the industrial sector not covered in the PAT exercise. This would be useful in expanding the PAT scheme, thereby covering more industrial units and hence energy-use represented by them.
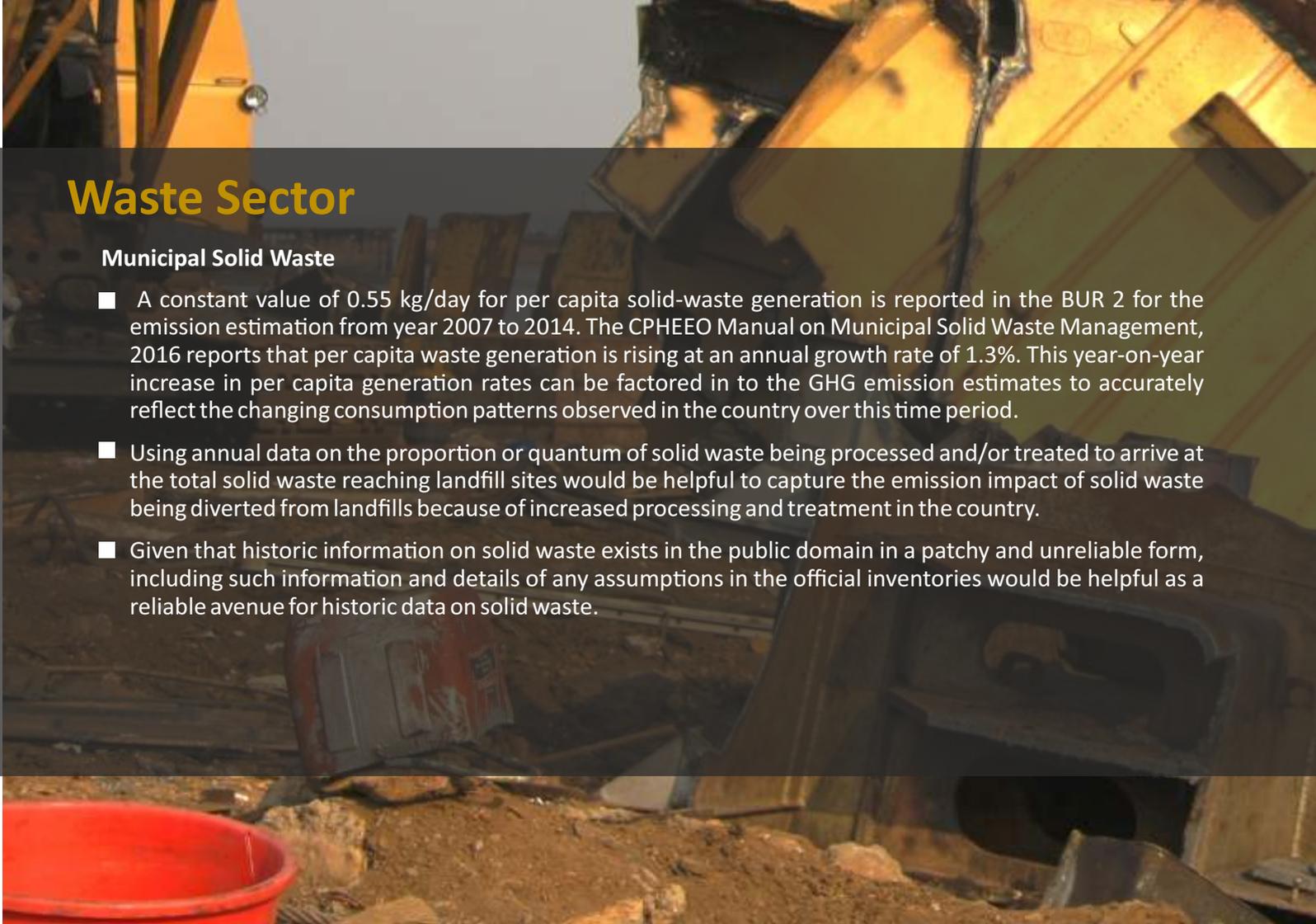
Waste Sector

Municipal Solid Waste

- A constant value of 0.55 kg/day for per capita solid-waste generation is reported in the BUR 2 for the emission estimation from year 2007 to 2014. The CPHEEO Manual on Municipal Solid Waste Management, 2016 reports that per capita waste generation is rising at an annual growth rate of 1.3%. This year-on-year increase in per capita generation rates can be factored in to the GHG emission estimates to accurately reflect the changing consumption patterns observed in the country over this time period.

- Using annual data on the proportion or quantum of solid waste being processed and/or treated to arrive at the total solid waste reaching landfill sites would be helpful to capture the emission impact of solid waste being diverted from landfills because of increased processing and treatment in the country.

- Given that historic information on solid waste exists in the public domain in a patchy and unreliable form, including such information and details of any assumptions in the official inventories would be helpful as a reliable avenue for historic data on solid waste.

- The degradable organic content (DOC) value signifies the amount of degradable organic material and thereby the methane (CH_4) generation potential of solid waste. The DOC value depends on the composition of waste and should vary over the years with changing waste composition. A constant DOC value of 0.11 is used in the emission estimation for 2014[1] in BUR-II as well as Indian Network on Climate Change Assessment (INCCA) estimates for 2007[2]. DOC values can be calculated and updated at regular intervals (every two or three years if not annually) to reflect changing proportions of degradable fractions (such as paper, compostable matter, and rags) in solid waste in light of the changing consumption and waste-generation patterns across the country.

- Further clarity is needed on the underlying growth rate used to extrapolate urban population figures for 2014 in BUR-II based on Census 2011 statistics. This will help better inform researchers and readers on the methods used to arrive at projected urban population figures for emission computation.

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[1] Refer Table 2.15, page 77 under chapter 2. Available at
https://unfccc.int/sites/default/files/resource/INDIA%20SECOND%20BUR%20High%20Res.pdf
[2] Refer section 9.2, page 40. Available at
https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/water/WRDM/MOEF_India_GHG_Emis_2010.pdf
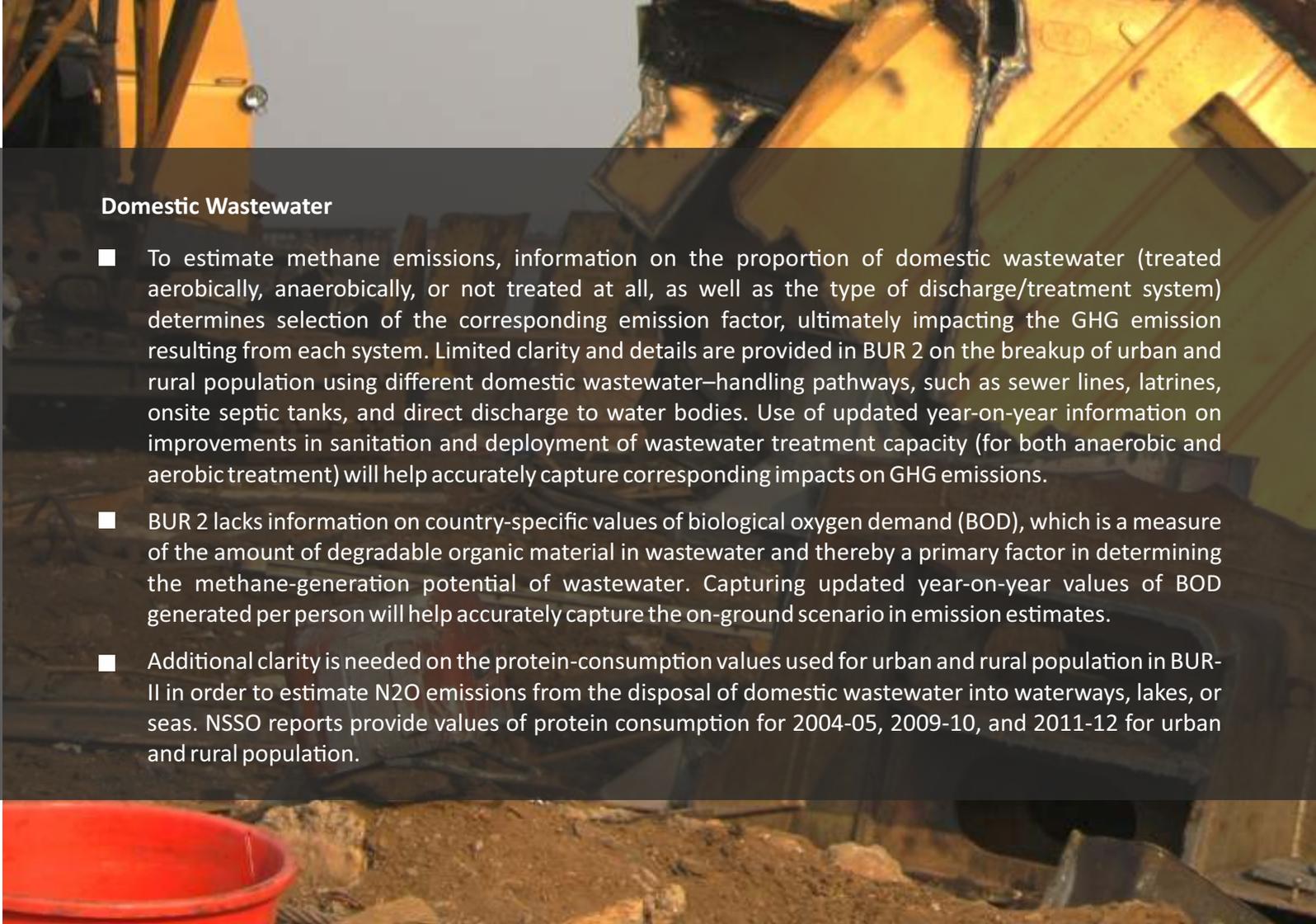
Domestic Wastewater

- To estimate methane emissions, information on the proportion of domestic wastewater (treated aerobically, anaerobically, or not treated at all, as well as the type of discharge/treatment system) determines selection of the corresponding emission factor, ultimately impacting the GHG emission resulting from each system. Limited clarity and details are provided in BUR 2 on the breakup of urban and rural population using different domestic wastewater–handling pathways, such as sewer lines, latrines, onsite septic tanks, and direct discharge to water bodies. Use of updated year-on-year information on improvements in sanitation and deployment of wastewater treatment capacity (for both anaerobic and aerobic treatment) will help accurately capture corresponding impacts on GHG emissions.

- BUR 2 lacks information on country-specific values of biological oxygen demand (BOD), which is a measure of the amount of degradable organic material in wastewater and thereby a primary factor in determining the methane-generation potential of wastewater. Capturing updated year-on-year values of BOD generated per person will help accurately capture the on-ground scenario in emission estimates.

- Additional clarity is needed on the protein-consumption values used for urban and rural population in BUR-II in order to estimate N2O emissions from the disposal of domestic wastewater into waterways, lakes, or seas. NSSO reports provide values of protein consumption for 2004-05, 2009-10, and 2011-12 for urban and rural population.

Industrial Wastewater

- Updated information published in BUR 2 on unit wastewater generation, amount of organic matter, and treatment system to handle industrial effluents for various industry sectors is well-appreciated. For industry sectors such as pulp and paper, sugar refining, tannery, poultry and meat, dairy, coffee, vegetables and fruits, alcohol, and starch production, the BUR 2 further indicates two types of treatment—anaerobic treatment as well as aerobic processes—as the prevalent treatment systems. In such cases, providing insights on the breakup or percentage of industrial units within each industry type that use either anaerobic or aerobic treatment technology would help to apply the right emission factor and compute emissions accurately for industrial effluent treated through both these routes.

- A wastewater generation value of 0.02 m3/tonne is reported for the meat and poultry industry[3] in BUR 2. This value is quite low compared with the wastewater generation range of 8 to 18 m3/tonne for the meat and poultry processing given in 2006 IPCC Guidelines[4]. The NATCOM-II reports a corresponding value of 11.7 m3/tonne[5]. Therefore, this parameter for the Meat sector needs to be revisited and updated for emission estimation.

- Providing details of the activity data on industrial production that has been used for computing emissions for each industry sector would be helpful in understanding the estimation of the total wastewater generation and subsequent methane emission calculations. Further, industrial production information for the industry sectors of organic chemicals, alcohol, vegetable oil, vegetable and fruits, soaps and detergents, plastics, and starch production is not readily available in the public domain. Including time-series data on industrial production in the requisite metric (i.e. tonnes) and noting corresponding sources of information for the industry sectors considered in the emission estimation would be useful.

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[3]Refer Table 2.17, page 78 under chapter 2. Available at
https://unfccc.int/sites/default/files/resource/INDIA%20SECOND%20BUR%20High%20Res.pdf
[4]Refer Table 6.19. Available at https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_6_Ch6_Wastewater.pdf
[5]Refer Box 2.7, page 77 under chapter 2. Available at https://unfccc.int/resource/docs/natc/indnc2.pdf

Procedural Recommendations and Conclusion

Some procedural aspects that need consideration by the agencies engaged in officially estimating India's emissions are as follows:

- While we understand that there is the involvement of a large number of institutions outside the government in the process of creating official GHG inventories, there is a need to expand this participation to include additional interested stakeholders, including the GHG Platform India, who may be able to engage with relevant experts to improve the replicability, frequency, accuracy, and transparency of the official GHG inventories.

- Further, we would like to urge these institutions to embark on a process of building capacities at the state level to begin creating state-level inventories. These could feed into the formulation of state-level policies and state action plans on climate change (SAPCC) by integrating climate change into the decision-making processes.

- Finally, we urge the government to create comparison matrices on India's emission estimates by various organizations outside the country, such as World Resources Institute, Food and Agriculture Organization (FAO), International Energy Agency (IEA) and others. The GHG Platform India would like to offer its assistance to the Government of India in this regard.

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