National Inventory of South Africa: Status of Short-Lived Climate Forcers Emission Inventories

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forestry, fisheries & the environment
Department:
REPUBLIC OF SOUTH AFRICA

2030 NDP

Presentation Outline – Brief

- Methodological approaches to prioritize source categories
- Methodological approaches to ensure time series consistency
- Methods for data collection
- QA/QC and verification of estimated emissions

Status of National Emissions Inventories

Legal Framework: Emission Estimation and Reporting

South African Air Quality Act makes provision for the management of emissions though a variety of regulatory tools:

- Management of industrial activities through a permitting system for specific activities that have been identified as "**significant sources**"
- Reporting of emissions by the regulated sectors (industries, mine and quarries) to the **National Atmospheric Emission Inventory System (NAEIS)**
- Non-industrial emission estimations by government/researchers for policies/strategies and academic purposes
- GHG emissions estimation and reporting is centralized nationally – international reporting and carbon tax management

Status of Non-Industrial National Emission Inventories

Key Categories	Emission Inventory Status
Biomass burning and agricultural activities	• Currently emission inventories are based on research/local policy programs • Inventories are not always consistent as estimates are based on different methodologies and objectives • National/official dynamic emission inventories under development and will include partnerships with research institutes and other experts
Transportation (road, rail, aviation and shipping)	
Residential fuel burning (wood, coal, paraffin, waste)	
Biogenic and lightning	
Waste Management	

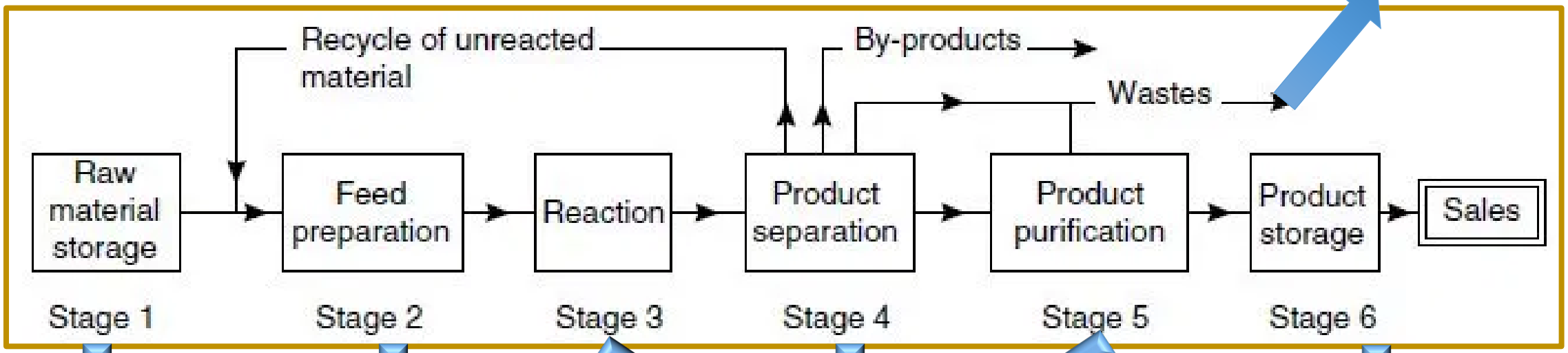
Status of National Emission Inventories

Key Categories	Emission Inventory Status
Industrial Activities: Significant sources regulated by the Air Quality Act *This presentation focus*	• Significant industrial sources **regulated** by the Air Quality Act • Includes all significant **Energy** (stationary and fugitive) and **Industrial Processes and Product Use** sectors • Energy production; petrochemical; metallurgical; mineral processing, storage and handling; organic and inorganic; pulp and paper; animal matter processing • Mining operations • Reporting to the **National Atmospheric Emission Inventory System (NAEIS)** • GHG emissions estimation and reporting is centralized nationally – international reporting and carbon tax management

Data Collection – Industrial Sources

- Emissions reporting conducted **annually online** - each industrial facility estimates emissions based on a detailed bottom-up methodology that:
  - Identifies all significant process units/components that generate emissions (boiler, furnace, kiln, heater, fugitives etc.)
  - Considers activity data of process units and operating conditions (load, frequency of operation)
  - Considers emission control technologies
  - Considers emission measurements protocols
  - Documentation of measurements and analytical techniques used submitted as part of the emissions report

Typical Industrial Process Flow Chart



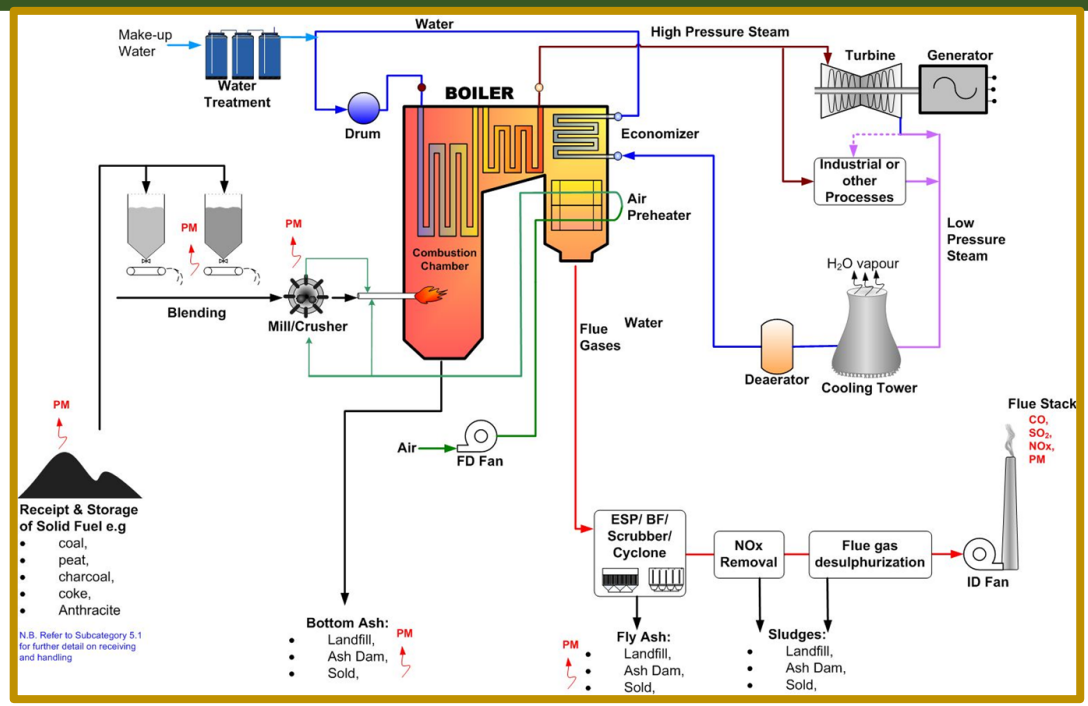
Atmospheric emissions through stacks or as fugitive emissions

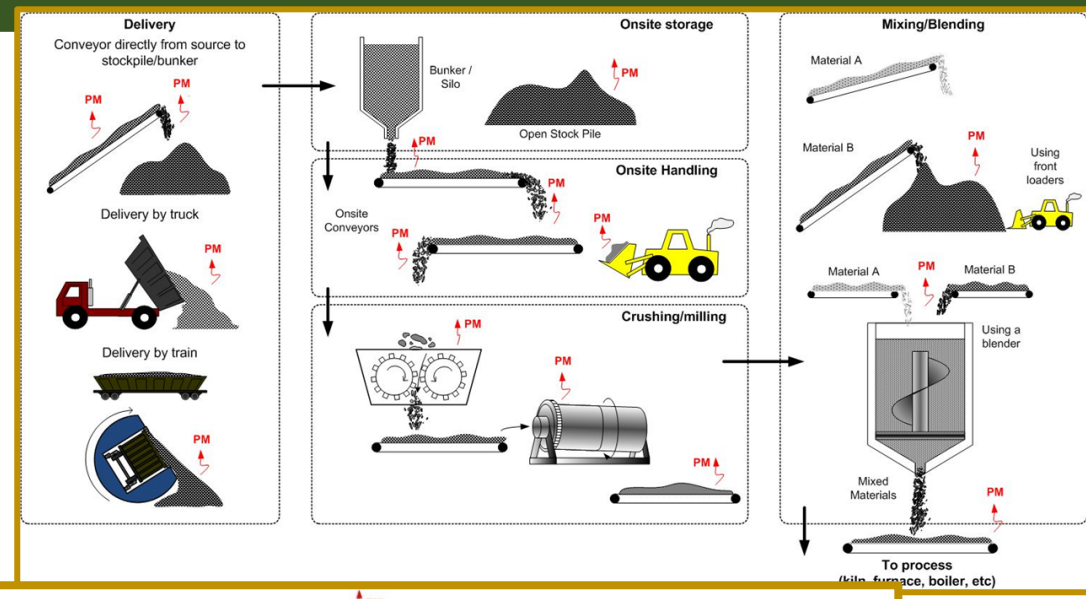
Stockpiles, tanks etc.

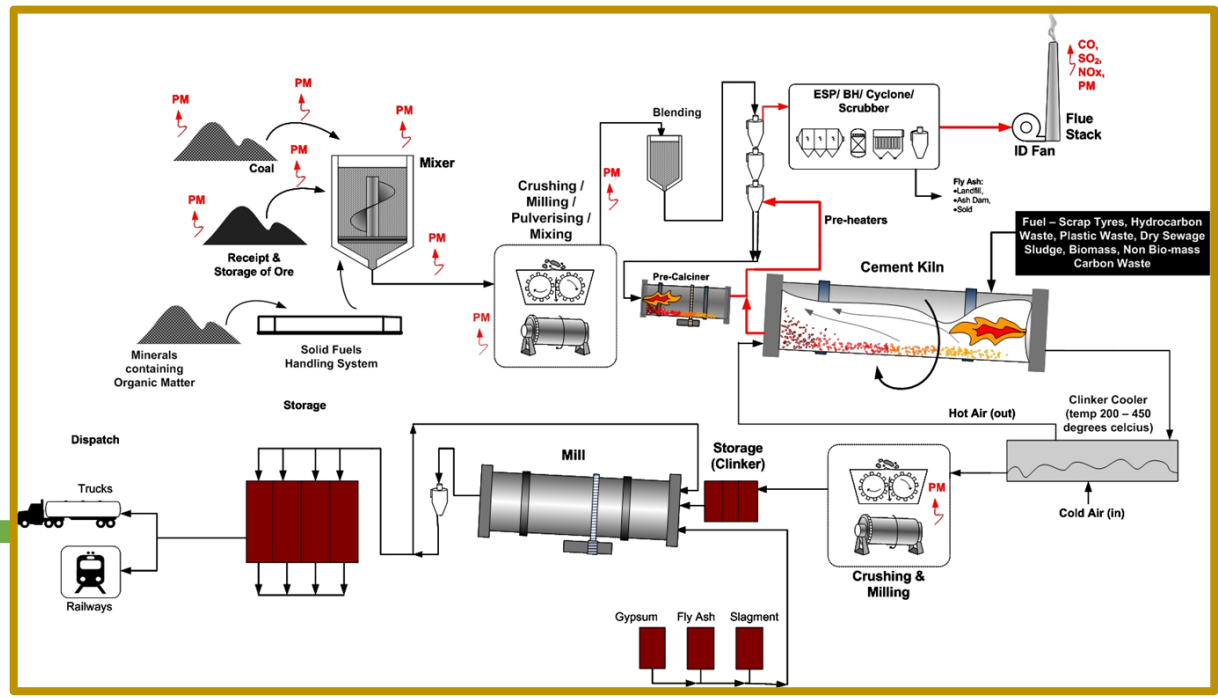
Material preparation including washing, blender, crushers, screening, conveyer, mixer, transfer points etc.

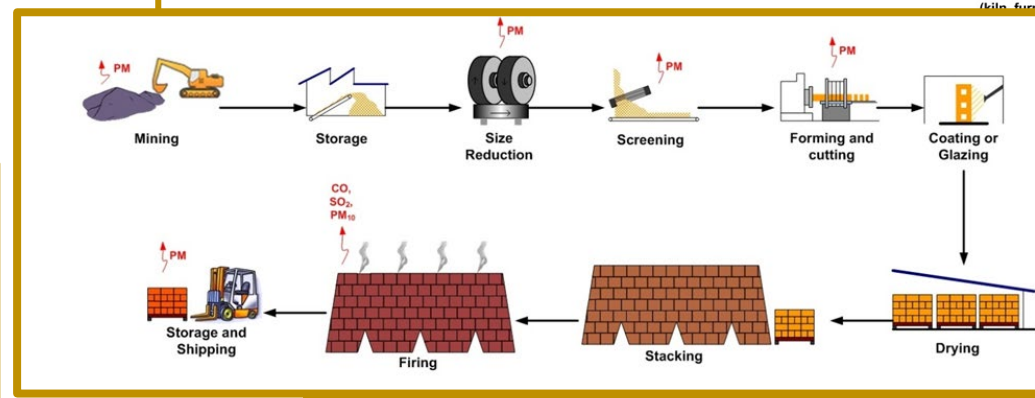
Processing units including furnace, boiler, heater, kiln, reactor, incinerator, dryer, turbine, engine etc.

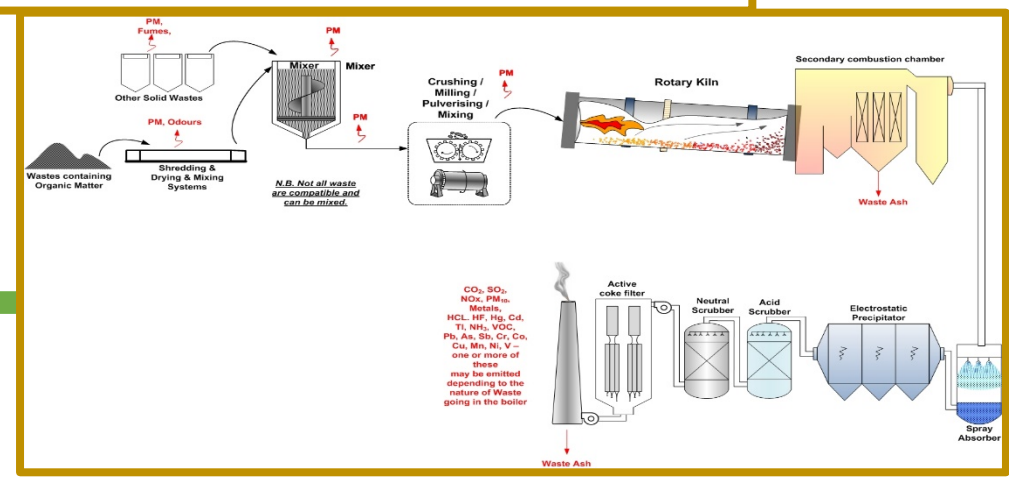
Material handling and storage tanks, stockpiles, packaging, transfer points etc


Make-up Water
Water Treatment
Water
High Pressure Steam
BOILER
Drum
Economizer
Turbine
Generator
Industrial or other Processes
Air Preheater
Low Pressure Steam
Combustion Chamber
Blending
Mill/Crusher
PM
Flue Gases
Water
H_2O vapour
Deaerator
Cooling Tower
Air
FD Fan
Flue Stack
CO, SO_2, NOx, PM
Receipt & Storage of Solid Fuel e.g
coal,
peat,
charcoal,
coke,
Anthracite
N.B. Refer to Subcategory 5.1 for further detail on receiving and handling
Bottom Ash:
Landfill,
Ash Dam,
Sold,
ESP/ BF/ Scrubber/ Cyclone
NOx Removal
Flue gas desulphurization
ID Fan
Fly Ash:
Landfill,
Ash Dam,
Sold,
Sludges:
Landfill,
Ash Dam,
Sold,


Delivery
Conveyor directly from source to stockpile/bunker
Delivery by truck
Delivery by train
PM
Onsite storage
Bunker / Silo
Open Stock Pile
Onsite Handling
Onsite Conveyors
Crushing/milling
Mixing/Blending
Material A
Material B
Using front loaders
Using a blender
Mixed Materials
To process
(kiln, furnace, boiler, etc)


PM
Coal
Mixer
Receipt & Storage of Ore
Minerals containing Organic Matter
Solid Fuels Handling System
Blending
Crushing / Milling / Pulverising / Mixing
ESP/ BH/ Cyclone/ Scrubber
Fly Ash:
•Landfill,
•Ash Dam,
•Sold
CO, SO_2, NOx, PM
Flue Stack
ID Fan
Pre-heaters
Pre-Calciner
Cement Kiln
Fuel – Scrap Tyres, Hydrocarbon Waste, Plastic Waste, Dry Sewage Sludge, Biomass, Non Bio-mass Carbon Waste
Clinker Cooler (temp 200 – 450 degrees celcius)
Hot Air (out)
Cold Air (in)
Storage
Dispatch
Trucks
Railways
Mill
Storage (Clinker)
Crushing & Milling
Gypsum
Fly Ash
Slagment


PM
Mining
Storage
Size Reduction
Screening
Forming and cutting
Coating or Glazing
Drying
Stacking
Firing
CO, SO_2, PM_{10}
Storage and Shipping


PM, Fumes,
Other Solid Wastes
PM, Odours
Wastes containing Organic Matter
Shredding & Drying & Mixing Systems
Mixer
Mixer
N.B. Not all waste are compatible and can be mixed.
Crushing / Milling / Pulverising / Mixing
Rotary Kiln
Secondary combustion chamber
Waste Ash
CO_2, SO_2, NO_x, PM_{10}, Metals, HCL, HF, Hg, Cd, Tl, NH_3, VOC, Pb, As, Sb, Cr, Co, Cu, Mn, Ni, V – one or more of these may be emitted depending to the nature of Waste going in the boiler
Active coke filter
Neutral Scrubber
Acid Scrubber
Electrostatic Precipitator
Spray Absorber
Waste Ash

NAEIS Data Structure

Facility
- Facility location
- Standard Industrial Classification Code

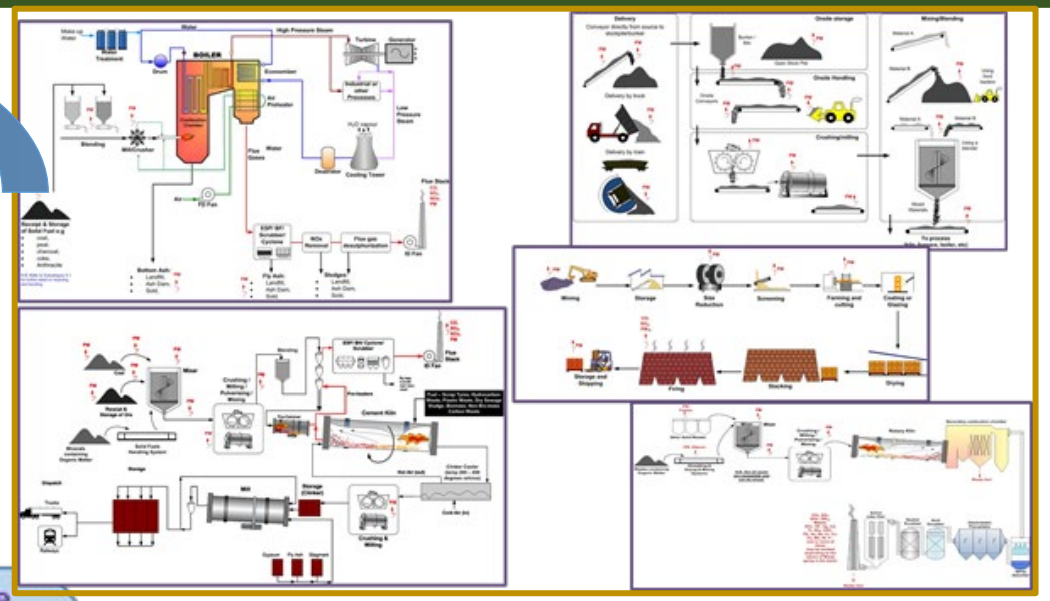
Stack
- Stack location
- Stack Parameters

Emission Unit
- Emission Unit Type
- Design Capacity
- Control Devices

Process & Activity
- Section 21 Classification
- IPCC Code
- Operating Times
- Activities Type
- Material Description

Activity Emissions
- Criteria Pollutants
- HAPS
- GHGs
- VOCs
- Heavy Metals

Emission Estimation
- NAEIS Emission Factors
- CEM
- Mass balance
- Stack Test
- PAM



Data Structure:

- Reporting Year
  - Report Entity
    - Emission Inventory Report

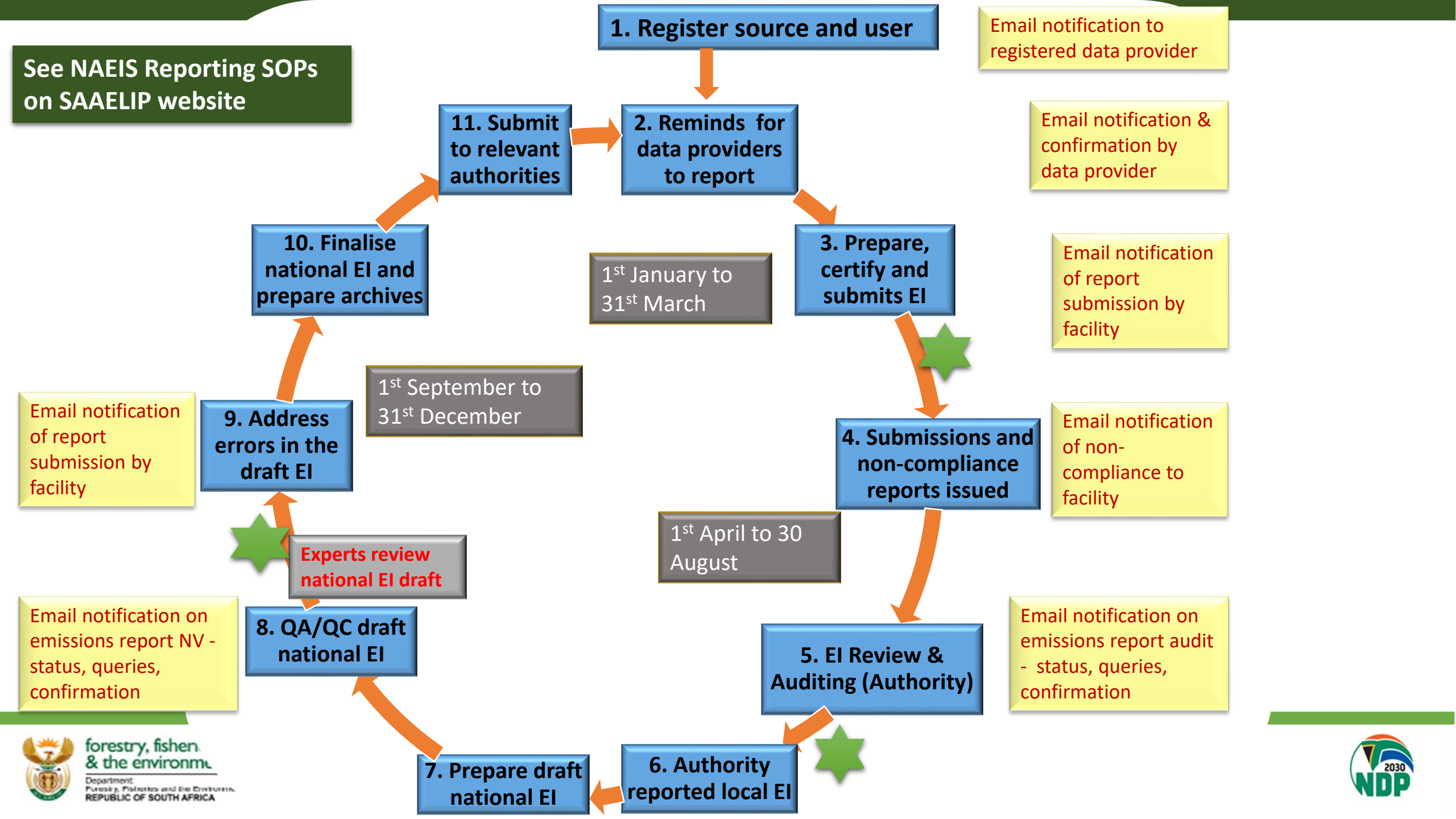
NAEIS Emission Estimation Basis

- **NAEIS Emission Factors (system default)**
- Facility Emission Factors
- Stack test measurements
- Continuous Emission Monitoring (CEM)
- Mass Balance Techniques
- Predictive Emission Modelling (PEM)
- Tank Model (
- Landfill Model
- Other estimation methodologies

- **NAEIS Emission Factor (based on US AP42 database and others)**
- **Emission controlled factors built into the system**

Emission Estimation and Reporting QA/QC

	Emission Inventory Status
Uncertainties	• Activity data is a function of production/raw materials used. • Emission factors are internationally sourced in most cases • Direct measurements always preferred – need continuous improvement in representation of measurements
Time Series	• Reporting is prescribed by regulations • Emissions are reported annually over a physical year • Effective from 2015 – limited time series
Quality Control and Quality Assurance	• QA/QC is our current priority • Technical guideline to improve reporting completeness especially with respect to pollutants reported • Reports annually audited at three levels, 2 by authorities to improve quality of reports • Continuous improvement through time series analyses of trends reported by data providers • Continuous training of data providers to improve report quality


See NAEIS Reporting SOPs on SAAELIP website
1. Register source and user
Email notification to registered data provider
2. Reminds for data providers to report
Email notification & confirmation by data provider
3. Prepare, certify and submits EI
1st January to 31st March
Email notification of report submission by facility
4. Submissions and non-compliance reports issued
Email notification of non-compliance to facility
1st April to 30 August
5. EI Review & Auditing (Authority)
Email notification on emissions report audit - status, queries, confirmation
6. Authority reported local EI
7. Prepare draft national EI
8. QA/QC draft national EI
Email notification on emissions report NV - status, queries, confirmation
Experts review national EI draft
9. Address errors in the draft EI
1st September to 31st December
Email notification of report submission by facility
10. Finalise national EI and prepare archives
11. Submit to relevant authorities
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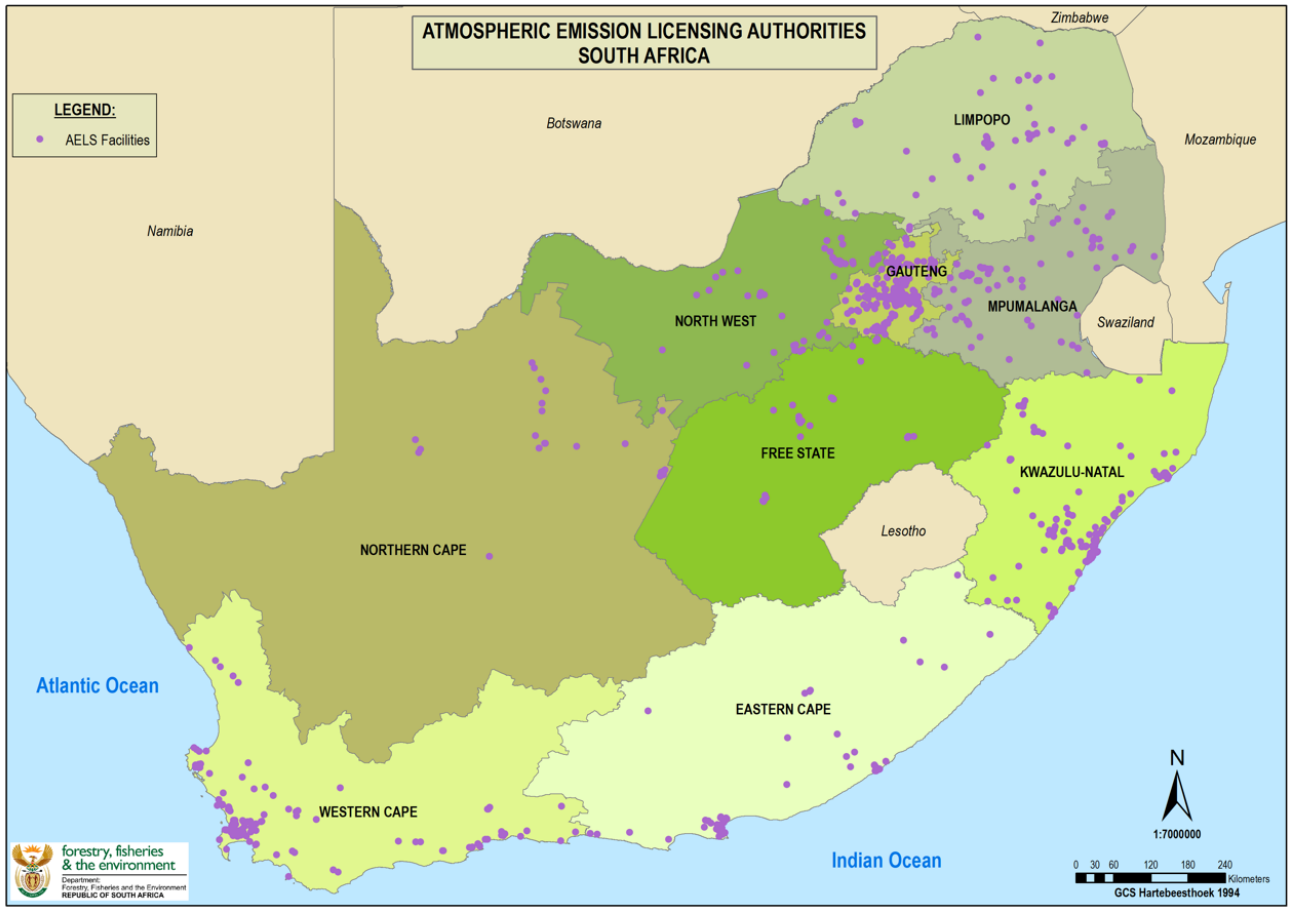
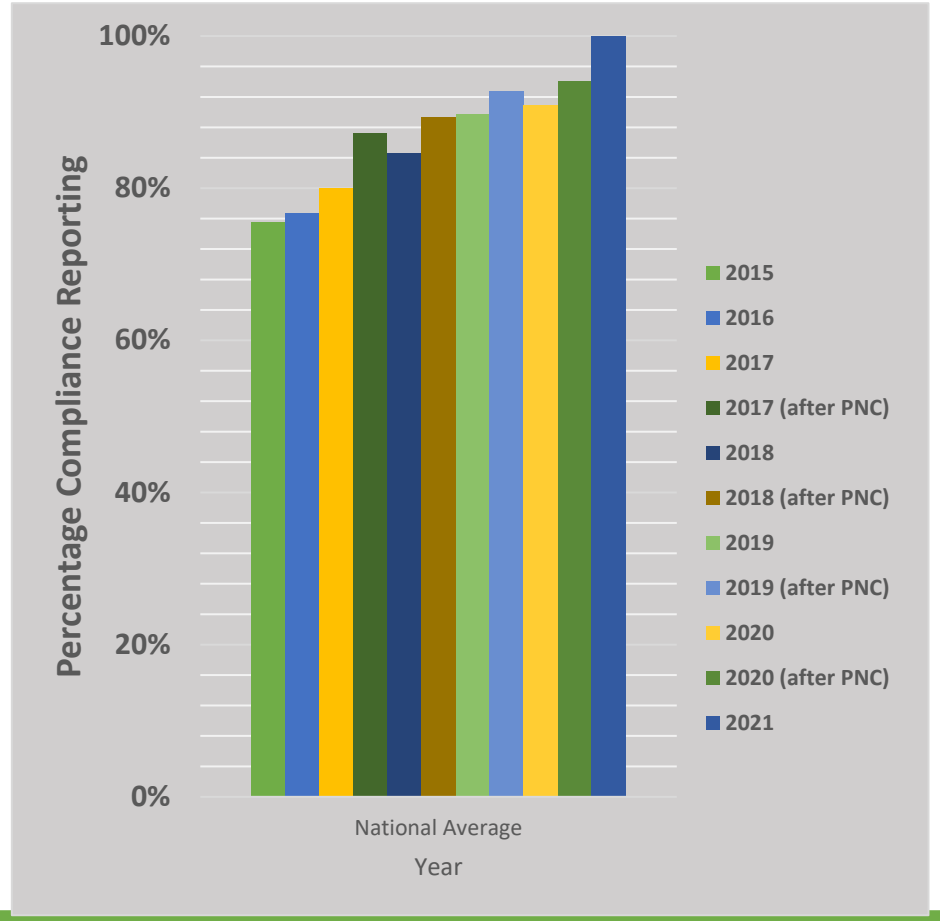
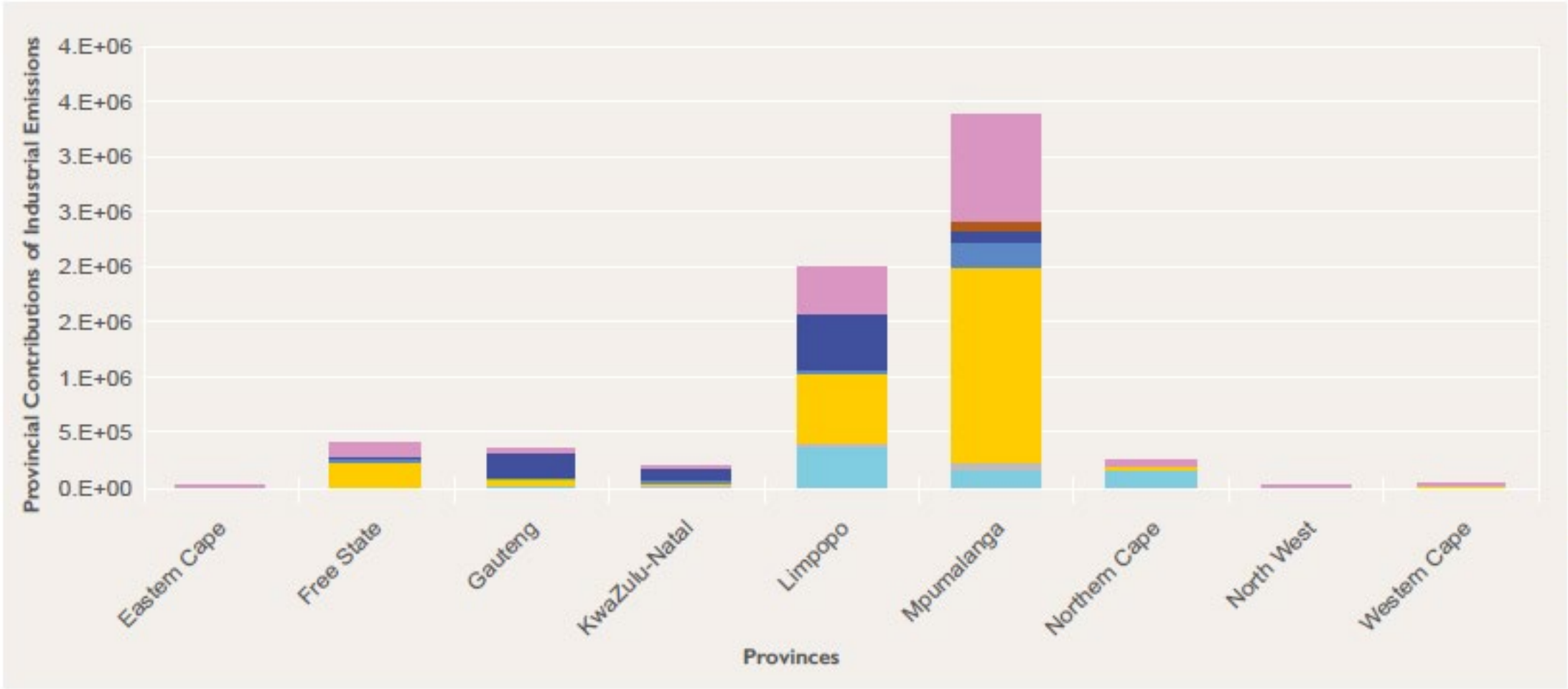
Industry Compliance Reporting Trends





National Industrial Emissions Profile (2019)



Concluding Remarks: Lessons and Future Plans

Observations	How we are addressing it
Status of Emissions Inventory Estimation and Reporting **Technology use for environmental compliance**	• Bottom-up and detailed emission inventory significant industrial sources and stationary energy production • SO2, NO2, CO, NH3, PM10, PM2.5, NMVOCs etc.
Lessons learnt • Facilities not fully quantifying all pollutants/other emission sources such as fugitive emissions • Mining sector and other regulated facilities not fully captured • Need to continuously improve quality of reports (completeness, accuracy etc. • System emission factors are based on the US EPA, IPCC and other international databases	• Continuous training, improving technical support guidelines and a standing system help desk • Improving QA/QC of system as well as authority auditing • Continuous training of users • Continuously capturing new facilities • **Develop a process for updating NAEIS EF database**

Thank you

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https://saaqis.environment.gov.za