Report Presenting The IPPU Sectoral Institutional Arrangements And Recommendation For National Reporting System And Design

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Report Presenting The IPPU Sectoral Institutional Arrangements And Recommendation For National Reporting System And Design

Initiative for Climate Action Transparency – ICAT

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Acronyms And Abbreviations

Acronym	Full Term
BTR	Biennial Transparency Report
CCA	Climate Change Act
CKD	Cement Kiln Dust
CMAN	Cement Manufacturers Association of Nigeria
CO_2	Carbon Dioxide
DCC	Department of Climate Change
DSA	Data Sharing Agreement
EF	Emission Factor
ESG	Environmental, Social and Governance
ETF	Enhanced Transparency Framework
FEPSAN	Fertilizer Producers and Suppliers Association of Nigeria
FMEnv	Federal Ministry of Environment
FMITI	Federal Ministry of Industry, Trade and Investment
GHG	Greenhouse Gas
HFC	Hydrofluorocarbon
HS Code	Harmonized System Code
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
MRV	Measurement, Reporting and Verification
N_2O	Nitrous Oxide
NBS	National Bureau of Statistics
NCCC	National Council on Climate Change
NCS	Nigeria Customs Service
NIS	National Inventory System
NISSC	National Inventory Steering Committee
QA/QC	Quality Assurance / Quality Control
SOP	Standard Operating Procedure

Tier 1	Tier 1 Method (IPCC Inventory Methodology)
Tier 2	Tier 2 Method (IPCC Inventory Methodology)
Tier 3	Tier 3 Method (IPCC Inventory Methodology)
TWG	Technical Working Group
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

This report (Output G under Milestone 3) presents a comprehensive assessment and reform design for the institutional arrangements governing Industrial Processes and Product Use (IPPU) reporting in Nigeria, extended to explicitly address coordination with energy use in manufacturing industries to ensure clear sectoral boundaries, consistency, and completeness under the Enhanced Transparency Framework (ETF). The report is distinct from the IPPU Sectoral Assessment Report, which evaluates emission sources, methodological coverage, and data gaps. Rather than focusing on emission magnitudes, this document examines whether Nigeria's institutional, procedural, and governance systems are capable of delivering sustained, transparent, reproducible, and ETF-compliant IPPU inventories across successive Biennial Transparency Report (BTR) cycles.

The assessment confirms that Nigeria has established important foundational elements for IPPU reporting. A national inventory coordination authority is operational under the National Council on Climate Change (NCCC), sector ministries and agencies are engaged, and cooperation from major industrial operators particularly in cement and chemical production has improved. Recent inventory submissions demonstrate Nigeria's technical capacity to apply IPCC methodologies across core IPPU categories, including cement, ammonia, nitric acid, metals, and fluorinated gases. However, the system remains partially institutionalized. Inventory preparation continues to intensify around reporting deadlines rather than functioning as a continuous, rules-based national cycle. While roles are broadly recognized, mandates, data governance protocols, documentation standards, and recalculation procedures have not yet been fully formalized into a durable National Inventory Management System.

The review identifies systemic constraints that affect sustainability and methodological progression. Data custodianship has not been consistently operationalized through a formal hierarchy distinguishing primary and secondary data providers. Archiving and version control mechanisms have historically relied on informal file management rather than centralized digital repositories with controlled access and decision logging. Confidentiality arrangements for commercially sensitive industrial data are pragmatic but insufficiently codified, limiting predictable access to plant-level information required for Tier 2 progression. Reporting workflows covering annual planning, data acquisition, validation, estimation, QA/QC, recalculation management, and documentation have been practiced but not embedded within a standardized national inventory cycle. Furthermore, coordination between IPPU process emissions and energy combustion emissions in manufacturing industries has required clearer boundary management to avoid double counting and to ensure consistency between sector estimates.

In response, the report proposes the establishment of a structured National IPPU Reporting System anchored within the NCCC's Inventory Management Unit, with the Federal Ministry of Industry, Trade and Investment

(FMITI) serving as the sectoral coordination and compilation hub. The reform package introduces a formally defined Annual IPPU Inventory Cycle aligned to BTR timelines, covering planning, structured data calls, first-level validation, estimation and recalculation, sector QA/QC review, national integration, and submission readiness. It institutionalizes clear role allocation across primary data custodians including the National Bureau of Statistics, Nigeria Customs Service, National Ozone Unit, NESREA, and sector regulators while defining supplementary functions for industry associations, utilities (for SF_6 reporting), and research institutions. The system also incorporates a Data Custodianship and Access Matrix that formalizes authoritative data sources for all relevant IPCC IPPU categories (2A–2H), including mineral industries, chemical industries, metal production, fluorinated gases, and smaller sources such as SF_6 and PFCs.

A central reform element is the operationalization of a National Inventory Management System (NIMS) with controlled digital archiving, version control, and structured decision logging. All datasets, recalculations, methodological changes, and QA/QC actions will be recorded within a secure repository to ensure traceability and reproducibility across reporting cycles. Recalculation protocols will require systematic back-casting across time series and documented impact assessments. Confidentiality governance will be formalized through defined aggregation rules, controlled access levels, and structured data-sharing agreements, ensuring that inventory reporting obligations are met without compromising commercial sensitivities.

The report further outlines a phased pathway for methodological improvement. Cement, ammonia, nitric acid, and fluorinated gases are prioritized for progressive Tier enhancement based on strengthened data governance and repeatable data collection processes. Boundary management mechanisms between IPPU process emissions and energy combustion in manufacturing industries are formalized to ensure clear separation while allowing coordinated QA/QC checks across sectors. Independent third-party quality assurance is incorporated in BTR years to strengthen ETF readiness and credibility.

Collectively, the proposed reforms transition Nigeria's IPPU reporting framework from an event-driven compilation exercise to a structured, continuous national system grounded in defined mandates, predictable workflows, secure data governance, and institutional accountability. By embedding IPPU planning, preparation, documentation, and improvement within a permanent national inventory architecture while ensuring alignment with energy use in manufacturing industries the system is positioned to deliver consistent, transparent, and progressively higher-quality inventories in line with ETF requirements and international technical review standards.

Section 1: Introduction

The Industrial Processes and Product Use (IPPU) sector is an increasingly important component of Nigeria's greenhouse gas (GHG) emissions profile and a critical pillar of the national inventory system under the Enhanced Transparency Framework (ETF) of the Paris Agreement. While emissions from IPPU remain smaller in absolute terms than those from Energy or LULUCF, they have grown at a significantly faster rate over the past two decades, driven by rapid expansion in cement production, fertilizer manufacturing, steel processing, and the rising use of hydrofluorocarbons (HFCs) in refrigeration and air conditioning. This growth underscores the strategic importance of strengthening the institutional architecture that underpins IPPU emissions reporting, data management, and mitigation planning.

This Institutional Arrangements (IA) Report examines the governance, coordination, and operational structures that support the preparation of IPPU-related emissions estimates within Nigeria's National Greenhouse Gas Inventory System (NIS). It builds on the updated IPPU Sectoral Assessment and translates its technical findings into a system-focused analysis of roles, mandates, workflows, and accountability mechanisms across key institutions, including the National Council on Climate Change (NCCC), the Federal Ministry of Environment (FMEnv) through the Department of Climate Change (DCC), the Federal Ministry of Industry, Trade and Investment (FMITI), the National Bureau of Statistics (NBS), NESREA, and relevant industry stakeholders.

The objective of this report is not to reassess emission levels or sectoral trends, but rather to evaluate whether the existing institutional framework is sufficiently clear, coordinated, and durable to deliver consistent, transparent, and high-quality IPPU reporting across successive Biennial Transparency Report (BTR) cycles. It identifies strengths and gaps in current arrangements, clarifies institutional mandates in line with the Climate Change Act 2021, and proposes a structured, year-round coordination model that integrates sector-facing data compilation with national inventory quality assurance and oversight functions.

1.1 Country Context and Relevance of the IPPU Sector in Nigeria

Nigeria's Industrial Processes and Product Use (IPPU) sector has become an increasingly material component of the national greenhouse gas (GHG) inventory as a result of sustained industrial expansion, import substitution policies, and rising demand for manufactured products and cooling technologies. Over the past two decades, Nigeria has transitioned from a net importer of key industrial products particularly cement and fertilizers to a

major regional producer. Nigeria's installed cement production capacity now stands at approximately 62.8 million metric tonnes per annum (MMTPA), making it the largest producer in Sub-Saharan Africa, with three major firms accounting for over 95% of national output. In parallel, the commissioning of large-scale ammonia and urea production facilities has significantly expanded domestic chemical manufacturing capacity, positioning Nigeria as an emerging fertilizer export hub within West Africa.

From a GHG inventory perspective, emissions from the IPPU sector arise primarily from chemical and physical transformations inherent in industrial processes such as the calcination of limestone in cement production ($CaCO_3$ = CaO + CO_2) as well as from the use of products containing high-global-warming-potential gases, notably hydrofluorocarbons (HFCs) in refrigeration and air-conditioning (RAC) systems. These emissions are structurally different from those in the Energy sector because they are driven not solely by fuel combustion, but by process chemistry, raw material composition, production technologies, and product stock dynamics. As established under the IPCC 2006 Guidelines and the 2019 Refinement, IPPU emissions require sector-specific activity data and process information and cannot be reliably estimated from national energy balance statistics alone.[1]

Nigeria's IPPU sector exhibits a dual structure with important implications for inventory development. Process emissions from cement, ammonia, nitric acid, and iron and steel production originate from a relatively small number of identifiable large industrial facilities. According to Nigeria's First Biennial Transparency Report (BTR1), emissions from cement production increased from approximately 714 Gg CO_2 in 2000 to over 5,000 Gg CO_2 by 2017, reflecting rapid capacity expansion and infrastructure growth.[2] Over the same period, total IPPU emissions rose from 2,511 Gg CO_2-eq in 2000 to 11,618 Gg CO_2-eq in 2017, representing one of the fastest-growing sectors in percentage terms within the national inventory.[3] In contrast, product use emissions particularly from HFCs are diffuse and arise from import flows, equipment stocks, servicing practices, and end-of-life leakage. Nigeria's obligations under the Kigali Amendment to the Montreal Protocol require progressive phase-down of HFC consumption, further increasing the relevance of robust monitoring and reporting systems for this sub-sector.[4]

Recent national inventory submissions under the Enhanced Transparency Framework (ETF), including Nigeria's BTR1, demonstrate that the country has developed the technical capability to estimate IPPU emissions using IPCC-consistent methodologies. However, these reporting cycles have also highlighted structural weaknesses in institutional mandates, data flows, and formalized reporting systems. Data collection has often relied on ad-hoc engagement with industry associations, informal coordination between ministries, and short-term technical assistance linked to reporting deadlines. As reporting obligations under the Paris Agreement become more frequent and methodologically demanding, strengthening the institutional arrangements for the IPPU sector is essential to ensure consistency, reproducibility, and progressive methodological improvement across successive Biennial Transparency Report cycles.

A durable institutional framework anchored in clear mandates under the Climate Change Act 2021,[5] predictable data-sharing protocols, secure digital infrastructure, and defined quality assurance procedures will be critical not only for maintaining ETF compliance but also for aligning industrial development with Nigeria's Nationally Determined Contribution (NDC) targets and long-term low-emissions development pathway

1.2 Scope of the Report

[1] *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 3: Industrial Processes and Product Use; IPCC (2019), *2019 Refinement to the 2006 IPCC Guidelines*.
[2] Federal Republic of Nigeria (2024), *First Biennial Transparency Report (BTR1)*
[3] Ibid
[4] Ibid
[5] Federal Republic of Nigeria (2021), *Climate Change Act, 2021*

This report addresses the institutional and system dimensions required to support sustained national GHG reporting for the IPPU sector. Its scope is defined by reporting functions, institutional roles, and system requirements rather than by sectoral performance or emissions outcomes.

The analysis covers the full reporting cycle necessary for IPPU inventory development, beginning with the generation and collection of activity data and extending through validation, emission estimation, quality assurance and quality control, documentation, archiving, and integration into national inventory submissions. Particular attention is given to the governance arrangements that enable these functions to be carried out consistently across time, including data custodianship, confidentiality management, coordination mechanisms, and institutional approval processes.

From an institutional perspective, the report examines the roles and interactions of national inventory coordination bodies, sectoral MDAs responsible for industry, statistics, environment, and trade, as well as regulatory institutions that interact directly with industrial facilities and imported products. It also considers the participation of private-sector operators and industry associations as critical sources of activity data and technical information for IPPU reporting.

The report's sectoral coverage corresponds to the IPPU categories included in Nigeria's national inventory, encompassing GHG emissions from Industrial Mineral Products, Chemical, and Metal industry processes, as well as emissions arising from products use, especially in refrigeration and air conditioning. The focus, however, remains on reporting system requirements associated with these categories, rather than on describing their production structures, market dynamics, or emissions levels.

The report does not extend to the quantitative presentation of emissions results, trend analysis, or mitigation planning. It also does not provide detailed methodological calculation manuals or draft regulatory instruments. These have already been covered in the IPPU Guideline Report.

1.3 Analytical and Design Framework

The assessment and reporting system design presented in this report are guided by an integrated analytical framework that reflects both the technical requirements of IPPU greenhouse gas inventories and the institutional conditions necessary for sustained reporting under the ETF. The framework is structured around three interrelated dimensions:

a. Methodological integrity,

1.

b. Institutional governance and capacity, and

2.

c. Long-term reporting sustainability.

Together, these dimensions provide a basis for evaluating existing arrangements and for designing a reporting system capable of supporting consistent, transparent, and progressively improved IPPU inventories over time.

a) IPCC Methodological Integrity

The first dimension of the framework is anchored in the Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines for National Greenhouse Gas Inventories and the 2019 Refinement, with particular emphasis on methodological issues that are especially critical for the IPPU sector. These include the clear separation of process and product use emissions from energy-related emissions, the consistent definition and treatment of activity data across the time series, and the transparent selection, application, and documentation of emission factors.

Given the sensitivity of IPPU estimates to changes in production data, technology, and assumptions, the framework places strong emphasis on the management of methodological changes and re-calculations. This includes the ability to apply revised methods or improved data retrospectively in a controlled, well-documented manner, in order to preserve time-series consistency. Attention is also given to the treatment of uncertainty, particularly in sub-categories where default IPCC emission factors continue to be used due to absence of country-specific data.

Under this dimension, the analysis considers whether existing institutional and system arrangements are capable of supporting these methodological requirements on a routine basis, rather than only during inventory preparation exercises supported by external technical assistance. The focus is on the extent to which methodological rigour is embedded in standard procedures, documentation practices, and institutional roles.

b) Institutional Governance and Capacity

The second dimension of the framework examines the institutional foundations of IPPU reporting, recognizing that methodological soundness alone is insufficient in the absence of effective governance and sustained capacity. This dimension focuses on the clarity and formalization of mandates for IPPU reporting functions, including data provision, validation, compilation, quality assurance, and approval.

The framework assesses the effectiveness of coordination mechanisms across institutions involved in IPPU reporting, including inventory coordination bodies, sectoral ministries and agencies, statistical institutions, and regulators. Particular attention is paid to whether coordination arrangements function predictably and consistently, or whether they depend on ad-hoc arrangements and individual initiative.

Institutional capacity is examined in terms of the availability, continuity, and distribution of technical expertise required for IPPU inventory development. This includes consideration of staff turnover, institutional memory, and the extent to which reporting processes are institutionalized through standard operating procedures, templates, and documented workflows. Data governance arrangements, including the management of commercially sensitive information and the establishment of appropriate confidentiality and access controls, are also treated as a core component of institutional performance, given their importance for sustained private-sector engagement in the IPPU sector.

c) ETF Sustainability and Reporting Continuity

The third dimension aligns the analysis with the sustainability and continuity requirements of the Enhanced Transparency Framework. Under the ETF, greenhouse gas reporting is expected to be regular, predictable, and consistent across reporting cycles, with sufficient documentation to allow estimates to be reproduced and reviewed over time. This represents a shift from episodic reporting toward a permanent national reporting system.

Within this dimension, the framework evaluates whether existing IPPU reporting arrangements are capable of supporting repeated Biennial Transparency Reports without deterioration in data quality, institutional performance, or documentation standards. It also considers whether the system is designed to accommodate gradual methodological improvement, including the incorporation of improved activity data, the development of country-specific emission factors, and the transition toward higher-tier methods where technically and institutionally feasible.

Section 2: IPPU within Nigeria's National GHG Reporting Architecture

2.1 Functional Role of IPPU in National Reporting

The Industrial Processes and Product Use (IPPU) sector constitutes a distinct and indispensable component of Nigeria's National Greenhouse Gas (GHG) Inventory System. Within the national reporting architecture, IPPU fulfils a specific functional role by capturing emissions that arise from chemical and physical transformations of materials and from the use of products containing greenhouse gases, rather than from fuel combustion. This distinction has important implications for how the sector is organized, managed, and integrated into national reporting processes.
Functionally, the IPPU sector contributes to the completeness and integrity of Nigeria's national GHG inventory by ensuring that emissions associated with industrial development and product use are accounted for in a manner consistent with IPCC sectoral boundaries. In the absence of a functional IPPU reporting component, national inventories would systematically underestimate emissions associated with cement production, chemical manufacturing, metallurgical processes, and use of fluorinated gases, thereby weakening credibility of reported national totals and trends.
Within the National Inventory System (NIS), IPPU reporting interfaces closely with the central inventory coordination function, which is responsible for methodological consistency, quality assurance and quality control (QA/QC), and final compilation of sectoral estimates. The IPPU supplies sector-specific activity data, emission estimates, methodological documentation, and uncertainty information to the National Inventory Compiler (NIC). These inputs must be delivered in formats and timelines that allow integration with other sectors, reconciliation of cross-sectoral issues, and preservation of consistent time series.
The IPPU sector also interfaces with Nigeria's broader MRV architecture. Although IPPU emissions are not directly linked to energy balances or land-use accounting, they are increasingly relevant for tracking progress against economy-wide mitigation targets and sectoral policy measures, particularly in industry and product standards. As a result, IPPU reporting must be aligned not only with inventory compilation requirements but also with national MRV processes that support policy analysis, target tracking, and international reporting.
In practical terms, this functional role requires that IPPU reporting operate as a stable and predictable sub-system within the national architecture, with clearly defined data flows from data-generating entities through validation and compilation to national submission. It also requires that IPPU-specific methodological decisions, recalculations, and data revisions are coordinated with the national inventory system to avoid inconsistencies across sectors and reporting cycles.

2.2 Implications of ETF and BTR Cycles for IPPU

The implementation of the ETF under the Paris Agreement has fundamentally altered the operating environment for IPPU reporting in Nigeria. Under the ETF, national GHG inventories are no longer produced on an occasional or discretionary basis but are required to be prepared and submitted regularly as part of Biennial Transparency Reports (BTRs). This shift has significant implications for the way IPPU reporting is organized and sustained.

First, the increased reporting frequency places greater emphasis on institutional continuity and routine data availability. IPPU estimates must be updated at regular intervals using consistent activity data series, methods, and assumptions. This requires stable arrangements for data collection and validation, particularly in subcategories where production levels, technologies, or product stocks change over time. One-off data calls or reliance on exceptional cooperation from industry actors are increasingly inadequate in this context, as they introduce risks to timeliness and consistency.

Second, the ETF places strong emphasis on time-series consistency and the transparent management of recalculations. In the IPPU sector, recalculations are often unavoidable due to improvements in activity data, refinement of emission factors, or changes in methodological interpretation. Under the ETF, such recalculations must be applied consistently across the full time series and fully documented, with clear explanations of the causes and impacts of changes. This requires institutional arrangements that can support systematic record-keeping, version control, and decision logging over multiple reporting cycles.

Third, documentation requirements under the ETF are more stringent than under previous reporting arrangements. For the IPPU sector, this includes detailed documentation of data sources, assumptions, emission factors, methodological choices, and QA/QC procedures. Given the technical complexity of IPPU categories and the frequent use of default emission factors, transparent documentation is essential to allow technical expert review and to maintain confidence in reported estimates. Ad-hoc arrangements, which often prioritize numerical outputs over comprehensive documentation, are not sufficient to meet these expectations.

The ETF explicitly encourages continuous improvement of national inventories over time. For IPPU, this implies a gradual transition toward improved data quality, expanded coverage, and higher-tier methods where feasible. Such progression cannot be achieved via episodic inventory preparation exercises. It requires a reporting system that is designed to learn and evolve, supported by stable institutions, predictable workflows, and sustained capacity development.

In response to these requirements, this report proposes the establishment of a permanent, rule-based IPPU inventory cycle, embedded within Nigeria's National Inventory System (NIS), rather than a project-driven, deadline-triggered compilation process.

Specifically, the IPPU reporting system shall operate on a standing two-year rolling inventory cycle aligned with BTR timelines, structured around four defined phases: (i) structured annual data request and validation window; (ii) methodological review and recalculation window; (iii) QA/QC and documentation consolidation window; and (iv) final integration into the national inventory submission. This cycle will be anchored in a formal workplan jointly maintained by the sector coordinating institution and the national inventory authority, ensuring that data collection and verification occur continuously rather than reactively in the months preceding submission deadlines.

To address ETF requirements for time-series consistency and recalculations, the system shall incorporate a formal recalculation protocol, including version control of datasets, decision logs for methodological updates, archiving of previous submissions, and documented impact assessments of changes across the full time series. Any improvements in emission factors, activity data, or category coverage will be systematically back-cast to the base year to maintain comparability. This approach institutionalizes recalculations as part of normal system evolution rather than exceptional corrections.

In line with ETF documentation standards, the IPPU system will adopt mandatory documentation templates covering data sources, emission factors, assumptions, QA/QC checks, confidentiality handling, and uncertainty considerations for each subcategory. Documentation will no longer be treated as a by-product of inventory preparation but as a core deliverable of the IPPU coordination function. A centralized digital repository will be used to store metadata, correspondence records, methodological notes, and supporting calculations to ensure traceability across reporting cycles.

Finally, in accordance with the ETF principle of continuous improvement, the IPPU institutional arrangement shall incorporate a formal improvement pathway, updated at each BTR cycle. This pathway will identify (i) categories targeted for higher-tier methodological transition, (ii) priority emission factor development studies, (iii) data gaps requiring regulatory or policy intervention, and (iv) capacity-building actions. Progress against this pathway will be reviewed at the close of each reporting cycle and integrated into the subsequent workplan.

Section 3: Institutional Arrangements for IPPU Reporting

3.1 Lead, Coordinating, and Oversight Institutions

The effectiveness of IPPU GHG reporting in Nigeria depends on clearly defined institutional mandates, operational responsibilities, and formal reporting linkages. In the absence of precise role allocation, IPPU reporting risks becoming fragmented, personality-driven, and reactive to submission deadlines. This section therefore clarifies the specific institutions responsible for (i) national inventory coordination, (ii) sectoral data coordination and industry interface, (iii) strategic oversight, and (iv) regulatory enforcement and compliance interfaces.

National Inventory Coordination (Technical Lead Function).
The national inventory coordination function is exercised through the National Council on Climate Change (NCCC) via its Inventory Management Unit, which provides the technical backbone for Nigeria's national GHG inventory, including the IPPU sector. In practical terms, this function is responsible for:

- Issuing and coordinating annual/biannual data calls to IPPU-relevant ministries, agencies, and industry data holders in line with the national inventory workplan.
- Defining and applying methodological approaches (Tier 1, Tier 2, etc.) consistent with the IPCC 2006 Guidelines and 2019 Refinement, including category-specific method selection.
- Conducting QA/QC procedures, including cross-sector checks (e.g., avoiding double counting between Energy and IPPU in cement production and other integrated facilities).
- Managing recalculations and ensuring time-series consistency across reporting cycles, with proper decision logging, archiving, and documentation of impacts.
- Consolidating IPPU estimates and integrating them into national inventory outputs for Biennial Transparency Reports (BTRs) and other UNFCCC submissions, including preparation of inventory documentation for technical expert review.

Under this arrangement, the national inventory coordination role is technical and system-oriented, and it requires predictable data provision from sector institutions and industry actors to function reliably.

Sectoral Coordination and Data Interface (Industry-Facing Function).
For the IPPU sector, effective data acquisition requires a designated sector-facing coordinating institution that can routinely engage industrial operators and organize production and process datasets in an inventory-ready form. The Federal Ministry of Industry, Trade and Investment (FMITI) given its mandate over industrial policy, structured engagement with major manufacturers, and interface with industrial associations is positioned to serve as the primary IPPU sector data coordination and industry interface. In practical terms, this role should include:

- Maintaining an updated register of IPPU-relevant facilities (cement, lime, ammonia, nitric acid, iron and steel, and other relevant subsectors).
- Coordinating structured data submission from industry associations and key firms, ensuring minimum disaggregation requirements (e.g., clinker production, clinker-to-cement ratio, carbonate inputs, plant technology type).
- Undertaking first-level validation of production statistics and process parameters before formal submission to the NCCC Inventory Management Unit.
- Supporting improvements in data granularity required for Tier 2 transitions, including facilitation of plant-level data access under confidentiality protections.

At present, this industry-facing function is often carried out through a combination of ad-hoc requests and relationship-based engagement. Formalizing it through a standing reporting protocol and defined annual deliverables will reduce delays and improve reproducibility.

Strategic Oversight and System Authority.
Strategic oversight remains the responsibility of the NCCC, consistent with its broader coordinating mandate under national climate governance arrangements. In addition to housing the Inventory Management Unit, the NCCC provides the system authority needed to institutionalize IPPU reporting through enforceable mandates and resource backing. In practical terms, this oversight role includes:

- Endorsing national inventory priorities, including IPPU category coverage expansion and continuous improvement targets.
- Providing inter-ministerial coordination authority to resolve data access and mandate overlaps.
- Supporting the establishment of legal and administrative instruments that enable regular data reporting, including facility-level reporting requirements where appropriate.
- Driving resourcing decisions (budgeting, staffing, systems) that ensure inventory continuity across BTR cycles.

This oversight function is critical for addressing cross-cutting issues that technical compilation alone cannot solve, particularly legal authority for data provision, confidentiality governance, and sustained funding.

Regulatory and Enforcement Institutions (Compliance Interface).
Regulatory institutions especially the National Environmental Standards and Regulations Enforcement Agency (NESREA) do not compile the GHG inventory. Their mandate is the enforcement of environmental regulations through permitting, inspections, compliance monitoring, and sanctions where required. However, they have a concrete role in strengthening IPPU inventory inputs because they interact routinely with industrial facilities and can provide facility-level information that supports activity data verification and improves completeness. Specifically, regulatory bodies can contribute by:

- Maintaining records of licensed industrial facilities, environmental permits, and compliance monitoring schedules.
- Generating inspection outputs and compliance reports that include production and operational information relevant for IPPU estimation (e.g., facility type, production lines, raw material sourcing, abatement equipment presence).
- Supporting verification of facility existence and operational status, which is particularly important for completeness checks and sampling strategies.

To date, these datasets have not been systematically integrated into the IPPU inventory workflow. Regulatory data are collected primarily for environmental compliance purposes and are rarely structured in IPCC-compatible formats, and there is typically no routine protocol requiring transfer of relevant variables to the NCCC Inventory Management Unit. Strengthening this linkage would require: (i) a defined annual data-sharing protocol; (ii) harmonized inspection templates that capture IPPU-relevant variables; and (iii) confidentiality safeguards that allow use of sensitive facility information in aggregated and protected forms.

3.2 Data-Providing and Supporting Institutions

IPPU reporting in Nigeria depends on a network of institutions that generate, hold, or regulate information relevant to industrial production and product use. Unlike sectors where activity data are derived from a single consolidated source, IPPU estimation requires the integration of official industrial statistics, trade data, facility-level information, and administrative records. The robustness of the IPPU inventory is therefore determined not only by data availability, but by the degree to which data providers can supply inventory-relevant variables in a standardized, timely, and traceable manner consistent with the national inventory cycle.

Within this system, the National Bureau of Statistics (NBS) serves as the primary statistical provider of core activity data series for the IPPU sector. Through industrial production surveys, manufacturing statistics, and national accounts-related outputs, NBS provides official annual production volumes for key subsectors such as cement, selected chemical products, and metals. These datasets form the authoritative basis for national activity data used in IPCC-compliant calculations and ensure alignment between IPPU reporting and broader economic statistics. However, official statistical publications are often aggregated at levels that do not fully correspond to IPCC category definitions, may be released with time lags relative to inventory deadlines, and may not contain the level of disaggregation required for higher-tier methods.

To address these limitations, the institutional arrangement for IPPU reporting must incorporate a structured harmonization mechanism. This includes the development of an IPPU data crosswalk that maps national industrial and trade classifications to IPCC subcategories, clearly specifying the minimum variables, units, and disaggregation required for inventory use. It also requires a formal protocol for provisional data sharing within the inventory cycle, allowing preliminary annual production figures to be transmitted for inventory purposes prior to final statistical publication, subject to later reconciliation. For priority categories—such as clinker production, ammonia and nitric acid output, iron and steel processes, and HFC consumption—inventory-ready disaggregation requirements should be explicitly defined, ensuring that production volumes, process characteristics, and technology parameters are obtained in a format suitable for emissions estimation.

In addition to NBS, several institutions function as secondary and supporting data providers. Trade and customs authorities, particularly the Nigeria Customs Service (NCS), are essential for the estimation of product use emissions, especially hydrofluorocarbons (HFCs). Customs records provide substance-level import and export data that can be used to construct national consumption series and stock-based emission models. While these datasets are administrative in origin, they often offer greater granularity than published trade summaries and are critical for ensuring completeness and consistency in product use categories.

Sector ministries and regulatory agencies provide complementary datasets that strengthen inventory coverage and verification. Institutions responsible for industrial oversight, permitting, and environmental compliance maintain records of licensed facilities, operational status, installed capacity, technology type, and major process changes. Although these data are not collected specifically for GHG accounting, they are highly relevant for completeness checks, identification of new or expanded plants, confirmation of operational status, and understanding of technology configurations that influence emission factors. Compliance inspection records may also indicate the presence or absence of abatement technologies, which directly affect emission estimates for certain IPPU categories. While regulatory datasets are not typically structured as annual production series, they can support annual inventories when integrated through a defined data-sharing protocol and supplemented by production statistics.

Administrative datasets can be used for inventory purposes provided that they are interpreted within a transparent and documented framework. This requires clear data lineage documentation, translation rules that convert administrative variables into inventory-relevant parameters, and reconciliation procedures that triangulate administrative records with official statistics or industry submissions. For example, installed capacity data should be used for plausibility checks rather than as a substitute for verified production volumes, and inspection findings should be linked explicitly to the relevant reporting year. All transformations, assumptions, and reconciliation decisions must be logged and archived to preserve time-series consistency and ensure auditability under the Enhanced Transparency Framework.

Despite the strategic importance of these institutions, data provision has historically been constrained by unclear reporting obligations, inconsistent data formats, and limited alignment between administrative data collection systems and IPPU inventory requirements. Strengthening their role as structured and predictable data providers requires formal designation of IPPU data focal points within relevant MDAs, standardized annual submission templates aligned with IPCC variables, and a clearly defined reporting calendar synchronized with the national inventory cycle. Confidentiality safeguards and controlled access protocols must also be institutionalized to facilitate the secure transmission of commercially sensitive facility-level information.

3.3 Role of Industry and Non-State Actors

The private sector is the principal source of primary activity data for the IPPU sector, as emissions arise directly from industrial production processes and product supply chains. Large industrial operators in cement, ammonia, nitric acid, iron and steel, and other relevant subsectors possess detailed plant-level information on production volumes, clinker ratios, raw material inputs, process technologies, and abatement systems that are indispensable for accurate emissions estimation, particularly where higher-tier methods are envisaged. In the absence of structured data-sharing arrangements, however, inventory compilers must rely heavily on aggregated statistics or indirect estimation approaches, limiting methodological progression.

Engagement of major industrial firms has improved over recent inventory cycles, particularly among companies with established environmental, social, and governance (ESG) reporting systems. Nonetheless, participation remains uneven and largely voluntary. Concerns persist regarding confidentiality, potential regulatory implications, and competitive sensitivity—especially where facility-level production data are requested. To address this structurally, the institutional arrangement for IPPU reporting must move beyond informal engagement and establish a predictable reporting framework that includes: (i) clearly defined data-use limitations; (ii) role-based access controls within the inventory system; (iii) aggregation rules ensuring that facility-level data are not publicly disclosed; and (iv) formal communication protocols clarifying that data are used strictly for national GHG reporting under international obligations rather than for enforcement or taxation purposes. Such safeguards are essential for building sustained industry trust.

Industry associations play a valuable intermediary role where they are representative and technically organized. In

subsectors such as cement and fertilizer production, associations can aggregate member data, standardize reporting templates, and conduct internal plausibility checks prior to submission. This reduces reporting burdens on individual firms and enhances consistency. However, the effectiveness of association-based data collection varies significantly across IPPU categories. In diffuse product-use subsectors particularly refrigeration and air-conditioning servicing market actors are fragmented, often informal, and weakly organized. In such cases, reliance on associations alone is insufficient.

For product-use activities involving hydrofluorocarbons (HFCs) and other fluorinated gases, a more structured multi-channel data collection strategy is required. This should combine: (i) customs and import data for bulk refrigerants and pre-charged equipment; (ii) licensing or registration systems for refrigerant importers and distributors; (iii) collaboration with professional technician bodies to estimate servicing patterns and leakage rates; and (iv) periodic targeted surveys of major importers and service companies to calibrate stock and emission models. Where feasible, integration with ozone-depleting substance (ODS) and Kigali Amendment reporting systems should be leveraged to avoid duplication and improve substance-level tracking. This hybrid approach is more effective for capturing diffuse product-use emissions than reliance on voluntary association reporting alone.

Research institutions and professional technical bodies whether publicly funded universities, research institutes, or independent technical organizations are not primary data providers in the sense of generating annual production statistics. Rather, their contribution lies in strengthening methodological robustness and supporting the development of country-specific parameters. These institutions can support IPPU reporting through: (i) development of country-specific emission factors based on material composition studies or process analyses; (ii) assessment of technology types and abatement efficiencies in domestic facilities; (iii) uncertainty analysis and methodological review; and (iv) design of data collection instruments and statistical sampling approaches for emerging subsectors. Their involvement should be structured through commissioned studies, technical working groups, or formal research partnerships aligned with the inventory improvement plan.

A clear framework is therefore required to define how non-state technical actors contribute without blurring institutional accountability. Primary activity data remain the responsibility of statistical agencies, sector ministries, and industry operators. Research institutions contribute by generating empirical parameters and technical evidence that enhance emission factor accuracy and support tier advancement. All externally generated parameters or studies must undergo validation by the national inventory coordination authority and be documented within the QA/QC and recalculation framework to preserve transparency and time-series consistency.

3.4 Existing Coordination Mechanisms

Nigeria's greenhouse gas inventory system operates through a structured, multi-tier coordination architecture that links high-level policy oversight to sectoral technical implementation and data provision. This arrangement provides the institutional backbone within which IPPU reporting is conducted.

At the apex of the coordination framework is the Inter-Ministerial Committee, which provides overarching policy direction and cross-government coordination for climate reporting and related obligations. This body ensures alignment between national climate commitments, sectoral policies, and reporting responsibilities, and serves as a platform for resolving inter-ministerial issues that affect data access, mandates, or institutional cooperation.

Operational responsibility for inventory management is situated within the Federal Ministry of Environment through the GHG Inventory Division. The GHG Inventory Division functions as the central technical coordination unit for the national inventory system. It oversees methodological consistency, consolidates sectoral estimates, manages QA/QC procedures, coordinates reporting timelines, and prepares submissions under international reporting frameworks. The Division also serves as the institutional interface for technical assistance, including support from international consultants engaged to strengthen methodological development, data systems, and

reporting processes.

Under the GHG Inventory Division, sector-specific Working Groups are established for Energy, IPPU, AFOLU, and Waste. The IPPU Working Group operates within this structure as the technical platform responsible for compiling IPPU data, applying IPCC methodologies, reviewing emission factors, and conducting sector-level QA/QC. Members typically include representatives from relevant ministries, regulatory agencies, statistical institutions, academia, and selected industry stakeholders. This working group structure ensures that sectoral expertise feeds directly into national inventory compilation while maintaining centralized methodological control.

Beneath the working group level are the data providers and project collaborators, which include sector MDAs, private-sector operators, state and local governments, NGOs, and CSOs. These entities generate the primary and supporting datasets used by the IPPU Working Group. Their interaction with the inventory system is mediated through formal data requests, technical consultations, and collaborative engagements. In practice, the effectiveness of the IPPU Working Group depends heavily on the predictability and quality of data flows from these institutions.

While this architecture provides a clear hierarchical structure from inter-ministerial oversight to sectoral compilation and data provision its operational effectiveness varies. Coordination tends to intensify in the lead-up to major reporting deadlines, rather than functioning as a continuous, year-round system. Participation from data-providing institutions can be uneven, and documentation of decisions and follow-up actions is not always institutionalized within a structured work programme. Strengthening these mechanisms requires formalization of meeting schedules, clearer assignment of deliverables across levels, and systematic documentation practices within the GHG Inventory Division to ensure continuity across reporting cycles.

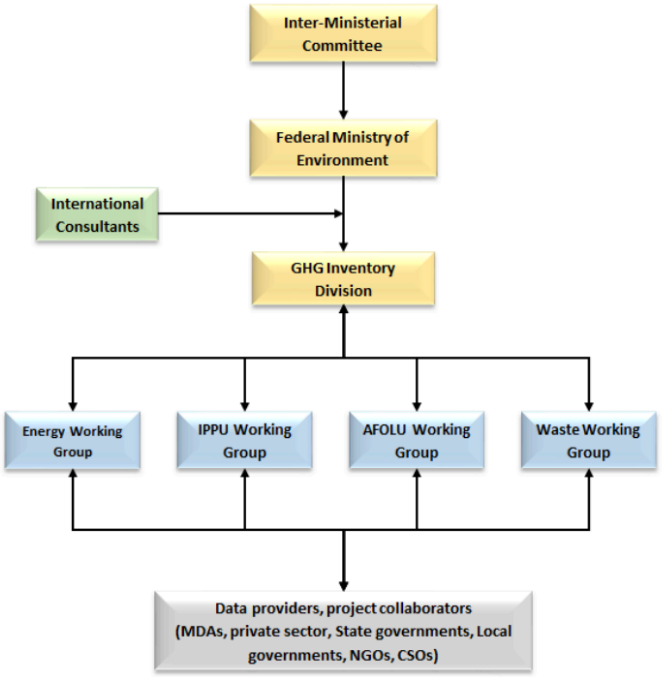

Figure 1: Existing institutional Arrangement for the MRV covering the IPPU Sector

Table 1: ***Key Stakeholders and Current Roles in IPPU GHG Reporting in Nigeria***

Stakeholder / Institution	Institutional Category	Current Role in IPPU Reporting	Nature of Involvement	Key Gaps / Limitations
Federal Ministry of Environment (FMEnv) – Department of Climate Change	Lead coordinating authority	Acts as national inventory coordinator; oversees IPPU inventory compilation, methodological application, QA/QC, and reporting to the UNFCCC	Formal and central	Limited enforcement authority over data provision; reliance on ad-hoc data requests and project-based support
National Council on Climate Change (NCCC)	Strategic oversight body	Provides high-level climate governance oversight; supports alignment of IPPU reporting with national climate policy and ETF obligations	Emerging / strengthening	IPPU reporting functions not yet fully operationalized within NCCC systems
Inter-ministerial Steering Committee	Inter-ministerial coordination mechanism	Facilitates cross-sector coordination, data harmonization, and validation of inventory outputs including IPPU	Formal but periodic	Functions mainly around reporting deadlines; limited continuity between cycles
National Bureau of Statistics (NBS)	National statistical authority	Provides official industrial production and trade statistics used as activity data for IPPU estimates	Formal data provider	Data aggregation, time lags, and classification mismatches with IPCC categories
National Environmental Standards and Regulations Enforcement Agency (NESREA)	Environmental regulator	Collects industrial compliance and environmental monitoring data potentially relevant for IPPU activity data	Indirect / supporting	Regulatory data not systematically linked to inventory processes
Federal Ministry of Industry, Trade and Investment (FMITI)	Sector ministry	Oversees industrial policy and maintains records on industrial facilities, investments, and production capacity	Supporting	Data not routinely structured for GHG reporting purposes
Nigeria Customs Service (NCS)	Trade and border authority	Maintains import/export records relevant for product use emissions (e.g. refrigerants, equipment)	Supporting	Limited alignment between customs codes and IPPU product-use categories
Cement Manufacturers Association of Nigeria (CMAN)	Industry association	Aggregates production data and represents major cement producers; occasional data sharing for inventory purposes	Voluntary intermediary	Data provision not institutionalized; coverage limited to member firms
Fertilizer Producers and Suppliers Association of Nigeria	Industry association	Represents fertilizer and chemical producers; potential source of ammonia and nitric	Voluntary intermediary	Inconsistent engagement in inventory reporting

(FEPSAN)		acid activity data		
Large Industrial Operators (e.g. cement, fertilizer, steel plants)	Private sector data owners	Hold detailed facility-level production and process data critical for IPPU estimates	Voluntary / ad-hoc	Confidentiality concerns; no mandatory reporting framework
Refrigeration and Air-Conditioning Importers and Servicers	NESREA and Private sector market actors	Provide data relevant to HFC imports, servicing, and equipment stocks	Weak / fragmented	Highly informal sector; limited organization and data traceability
Academic and Research Institutions	Technical support institutions	Support emission factor studies, methodological review, and capacity building	Ad-hoc	Not systematically embedded in IPPU reporting system
Development Partners / Technical Assistance Providers	External support	Provide short-term technical and financial support for IPPU inventory preparation	Project-based	Support not permanent; risk of dependency

Section 4: Assessment of Institutional Performance and Reporting Workflows

4.1 Effectiveness of Institutional Roles and Mandates

A robust IPPU inventory is fundamentally a governance product. Even when IPCC methods are well understood, reporting quality is determined by whether institutional roles are sufficiently clear, mandates are enforceable, and routine processes exist for data collection, validation, compilation, and documentation. The IPPU sector depends on commercially sensitive facility-level information and fragmented product-use datasets that require multi-institutional cooperation to compile.

4.1.1 Clarity of roles: formal structures versus operational practice

Nigeria has identifiable institutions involved in IPPU reporting, and these roles can be broadly grouped into inventory coordination, data provision, regulatory support, and sectoral facilitation. In practice, however, the separation between “who is expected to do what” and “who actually does what” remains wide.

The national inventory coordination function has a recognized leadership role in compiling the IPPU estimates and delivering inventory outputs. However, the extent of its practical authority over other institutions is limited. Inventory coordination can request data, convene technical meetings, and provide templates, but in most cases it cannot compel timely compliance from sector MDAs, regulators, or industry. This becomes a structural constraint under the ETF, where predictability and timeliness are non-negotiable.

For data-providing institutions, mandates are often indirect. Statistical agencies produce industrial datasets primarily for macroeconomic planning; regulators collect information primarily for compliance; line ministries maintain industry records primarily for licensing, investment promotion, and sector oversight. Because these datasets are not produced “for inventory purposes,” they often do not include the specific IPCC-relevant

parameters needed for IPPU estimation, such as clinker-to-cement ratios, carbonate fractions, abatement presence in nitric acid production, or the split between bulk refrigerant imports and pre-charged equipment. The result is a systematic misalignment between institutional data mandates and inventory data requirements.

4.1.2 Overlaps and duplication: multiple custodians, no single accountable owner

In the IPPU sector, the challenge is not the absence of data custodianship, but the lack of a clearly operationalized hierarchy for inventory use. For most activity data series—such as cement production, fertilizer output, or industrial trade flows there is a designated **primary data provider** that generates and owns the original dataset in accordance with its statutory mandate and data policy. Secondary institutions may compile, reprocess, or disseminate versions of these data for broader public use, but they are not the original custodians. For inventory compilation, especially where disaggregated or facility-level information is required, engagement must occur directly with the primary data provider, often under formal data-sharing arrangements that respect confidentiality and institutional data policies.

In practice, duplication and reconciliation challenges arise not because custodianship is inherently unclear, but because the inventory system does not always formally recognize and document which dataset is authoritative for each IPPU subcategory, nor does it consistently define procedures for resolving discrepancies between published secondary statistics and primary-source administrative or facility-level records. This can result in parallel use of multiple datasets during compilation, followed by time-consuming reconciliation in the final stages of reporting.

To address this structurally, the institutional arrangement for IPPU reporting must establish a **data custodianship matrix**, which clearly identifies for each IPPU category: (i) the primary data provider; (ii) any secondary or dissemination institutions; (iii) the level of disaggregation required for inventory purposes; and (iv) the formal pathway for accessing non-public or detailed data where necessary. Where inventory needs exceed what is publicly available, structured data-sharing agreements or memoranda of understanding should be used to obtain detailed data directly from the primary provider while respecting its data governance framework. This approach avoids duplication while preserving institutional mandates.

Overlap challenges also extend to institutional functions. In the absence of clearly defined responsibilities, the national inventory coordination function may assume tasks that properly belong to sector institutions—for example, verifying industrial production statistics, interpreting customs codes for refrigerants, or reconstructing activity data through informal consultations. While such interventions may resolve short-term gaps, they are not sustainable and risk concentrating technical burden within the inventory team, weakening sector ownership and accountability.

A durable arrangement requires explicit allocation of roles across three levels: primary data generation (statistical and sector institutions), sector-level validation and contextual interpretation (industry-facing ministries and regulators), and methodological compilation and QA/QC (the national inventory coordination authority). Each institution's responsibilities must be defined in terms of concrete deliverables within the inventory cycle, including timelines and minimum data specifications. Where discrepancies arise between datasets, resolution should follow a documented reconciliation protocol that prioritizes the primary data source, records justification for adjustments, and ensures consistency across the time series.

4.1.3 Gaps in mandates: the "missing middle" of verification and data governance

One of the most significant governance gaps for IPPU reporting is the absence of a clearly mandated verification function. IPPU inventories require structured plausibility checks that go beyond collecting numbers. Verification includes cross-checks between sources, validation of units and definitions, and confirmation of process characteristics that affect emission factors.

In Nigeria, verification is often carried out informally through technical working groups or bilateral engagement with specific companies. This can work for a small number of cooperative actors, particularly in cement, but it does not scale across the full IPPU sector, especially for chemical processes, metals, and product-use emissions. Where verification is weak, inventory estimates remain heavily dependent on defaults and assumptions, and uncertainty

remains high.
Similarly, data governance mandates are not sufficiently explicit. No single institution is clearly responsible for defining how commercially sensitive industrial information is stored, who can access it, how it is anonymized or aggregated, and how long it is retained. Without these rules, companies are reluctant to share granular data, and institutions handling data face reputational and compliance risks.

4.1.4 Dependency on individuals rather than institutions

A persistent institutional vulnerability in IPPU reporting is the reliance on a limited pool of technical experts who possess working knowledge of IPCC guidance and the specific characteristics of IPPU subcategories. In Nigeria, inventory preparation has often depended on a small number of specialists convened during reporting cycles, who retain implicit knowledge of data sources, methodological selections, historical recalculations, and sector-specific assumptions. While this expertise has enabled successful submissions, the system remains exposed to personnel changes and discontinuity.

This structural weakness was explicitly recognized under the ICAT Phase II project, which proposed the development and delivery of a National Inventory Management System (NIMS) as a foundational reform. The objective of this system is to define, standardize, and institutionalize all inventory-related activities—what must be done, by whom, when, and how in order to ensure that national GHG inventories meet the principles of transparency, reproducibility, accuracy, consistency, comparability, and completeness. The proposed NIMS shifts the focus from individual competence to system design, embedding roles, workflows, documentation requirements, and data governance procedures within a structured institutional framework.

Without such institutionalization, several operational risks persist. When key individuals change roles, relocate, or become unavailable, critical tacit knowledge may be lost. Institutional memory is frequently stored in personal files, spreadsheets, and email exchanges rather than in centralized repositories with version control. As a result, methodological decisions such as the rationale for selecting a particular emission factor, applying a recalculation across the time series, or adopting a proxy dataset can become difficult to trace or defend during technical expert review. This weakens transparency and increases the risk of inconsistency across reporting cycles.

A technically robust IPPU reporting system therefore requires formalization beyond expert-driven practice. This includes clearly defined job descriptions within the inventory coordination structure; standardized calculation templates and metadata documentation formats; centralized digital repositories with controlled access and versioning; and formal decision logs capturing methodological changes and their justifications. Recalculation protocols, QA/QC checklists, and time-series management procedures must be codified rather than informally transmitted.

4.2 IPPU Reporting Workflows and Data Governance

IPPU reporting is best understood as a workflow that begins with data generation and ends with inventory submission, with multiple control points for validation, QA/QC, documentation, and archiving. In Nigeria, the workflow exists in practice but remains only partially formalized and is often activated in a compressed timeframe near reporting deadlines.

4.2.1 End-to-end reporting flow: how IPPU data currently moves

The reporting process typically begins with the inventory coordinator issuing data requests to sector institutions and selected industry actors. Data are provided through a combination of formal templates, spreadsheets, published statistical datasets, administrative records, and direct correspondence. For cement, data availability is generally better, although the degree of disaggregation varies. For chemical processes and product use, the process relies more heavily on proxies, default assumptions, and partial datasets.
Once data are received, a reconciliation stage follows. This involves cleaning datasets, resolving inconsistencies in units and definitions, and filling gaps where data are incomplete. In practice, this stage can consume a disproportionate share of the reporting timeline because data providers often submit in different formats, at different levels of aggregation, and with limited metadata.

Emission estimation is then conducted using IPCC methods, often in spreadsheet tools or inventory software. The calculation stage is usually well executed technically by the core inventory team; however, it is constrained by upstream weaknesses in data coverage and documentation. The output is then subject to a review process, typically via technical working groups and internal validation meetings, after which the inventory coordinator integrates IPPU results into the national inventory.
Two systemic weaknesses commonly arise in this workflow. First, validation is often back-loaded, occurring after calculations are already completed. Second, the workflow lacks formalized “stop/go” checkpoints where data completeness and metadata adequacy are assessed before proceeding to estimation. Without these checkpoints, inventory compilation can proceed on weak data foundations, and documentation gaps are only discovered during review, when it is costly to correct them.

4.2.2 Data Ownership, Access, and Confidentiality: IPPU’s Core Constraint

Confidentiality is an inherent feature of IPPU inventory work because much of the information required for emissions estimation such as production volumes, raw material inputs, technology configuration, and refrigerant trade flows is commercially sensitive or administratively restricted. However, effective inventory systems do not rely on informal assurances or goodwill. A mature institutional arrangement must define clear data ownership pathways, authorized access channels, and formal confidentiality safeguards that protect data providers while enabling compliance with reporting obligations.

In the IPPU context, direct data collection from individual companies should not be the default approach. Standard practice under a well-functioning National Inventory System is that activity data are obtained through institutions that have a clear statutory mandate to collect and manage sectoral data. These institutions serve as primary data providers. For example, national statistical agencies generate official industrial production statistics; customs authorities manage import and export records; and designated sector ministries or regulatory agencies maintain administrative records relevant to industrial operations. The inventory system should prioritize structured engagement with these primary custodians rather than approaching companies individually, except in cases where required data are unavailable in aggregated form.

However, primary data providers may not always hold the full range of inventory-relevant variables required for higher-tier methods or completeness checks. In such cases, secondary data providers including sector agencies conducting surveys, professional bodies, or commissioned technical studies may collect supplementary field data to fill defined gaps. The institutional arrangement must therefore clearly distinguish between:

- primary custodians responsible for authoritative production or trade series; and
- secondary collectors responsible for targeted data acquisition under defined protocols.

This tiered data provision model reduces duplication, preserves institutional mandates, and avoids unnecessary direct exposure of firms to multiple data requests.

To operationalize confidentiality and data governance in the IPPU sector, the standard institutional response should include the following components:

First, a Data Custodianship and Access Matrix should be formally adopted. For each IPPU subcategory, the matrix must identify the primary data provider, any secondary data sources, the level of disaggregation required for inventory use, and the authorized pathway for access. This matrix should be integrated into the National Inventory Management System and updated periodically.

Second, the system must define minimum data specifications and aggregation rules in advance. Data providers should be informed clearly about which variables are required, in what units, and at what level of aggregation. Facility-level data, where necessary, should be aggregated before publication to prevent disclosure of commercially sensitive information. Public inventory reports should only present data at national or appropriately aggregated sectoral levels.

Third, secure data handling procedures must be institutionalized. This includes centralized digital storage within a

controlled-access inventory platform; role-based user permissions; audit trails for data access and modification; and archiving procedures that preserve version history. Access to raw or facility-level datasets should be restricted to designated inventory personnel bound by confidentiality obligations.

Fourth, the institutional arrangement must clarify the legal and administrative authority under which data are requested. Inventory coordination authorities must operate within clearly defined mandates that empower them to request data for national reporting purposes. Where required, formal data-sharing agreements or memoranda of understanding should be established with primary data providers to ensure compliance with existing data protection policies and prevent misuse of information.

Fifth, a documented data use and disclosure policy should be adopted and communicated to all data providers. This policy should explicitly state that inventory data are used solely for national GHG reporting under international obligations and will not be used for regulatory enforcement, taxation, or commercial purposes. Clear separation between inventory reporting and regulatory enforcement functions is essential for maintaining industry confidence.

The absence of such formalized governance arrangements constrains methodological advancement. Transitioning to Tier 2 approaches for cement, nitric acid, or other process categories requires more detailed process parameters and plant-level characteristics. Development of country-specific emission factors requires even deeper access to operational data. Without secure governance structures, data providers are unlikely to supply the level of detail needed for methodological progression.

Table 2: Data Custodianship and Access Matrix IPPU Sector

IPPU Category / Data Type	**Primary Data Custodian**	**Secondary / Supporting Sources**	**Minimum Disaggregation Required for Inventory**	**Access Pathway**	**Confidentiality Classification**	**Inventory Use**
Cement – Clinker Production	National Bureau of Statistics (Industrial Production Statistics) and/or FMITI (industrial registry where applicable)	Cement Manufacturers Association; NESREA (facility registry)	Annual clinker production (tonnes); clinker-to-cement ratio; plant technology type	Formal annual data request through NCCC Inventory Management Unit to primary custodian; supplementary validation through FMITI	Aggregated national data: Public; Plant-level data: Restricted	Core activity data for CO_2 process emissions (Tier 1/2); completeness checks
Lime Production	NBS	FMITI; facility-level data (where available)	Annual production (tonnes)	Formal data request to NBS; gap-filling via sector ministry	Aggregated: Public; Detailed: Restricted	Activity data for CO_2 emissions
Ammonia Production	NBS / Sector Ministry (where administratively recorded)	Fertilizer producers; regulatory inspection records	Annual production (tonnes); technology type	Formal data-sharing protocol; MoU if plant-level parameters required	Aggregated: Public; Plant-level: Confidential	Activity data for CO_2 emissions; Tier progression

Nitric Acid Production	NBS / Sector Ministry	Environmental compliance data (abatement presence); industry technical reports	Annual production (tonnes); presence of N_2O abatement technology	Structured request to primary custodian; technology confirmation via regulator	Aggregated: Public; Abatement data: Restricted	N_2O emissions estimation (Tier 1/2)
Iron and Steel Production	NBS	FMITI; industry associations	Annual crude steel production (tonnes); process route (BOF/EAF)	Formal request to NBS; sector validation via FMITI	Aggregated: Public	CO_2 process emissions
HFC Imports (Bulk Refrigerants)	Nigeria Customs Service (Substance-level HS codes)	Ozone Office (Montreal Protocol reporting); import licensing registry	Annual imports by substance (kg/tonnes); exports; re-exports	Direct data request under inventory mandate; coordinated with National Ozone Unit	Substance-level: Restricted; Aggregated national totals: Public	Consumption-based emission modelling
Pre-charged Equipment Imports	Nigeria Customs Service	Trade statistics; sector surveys	Equipment units by type; estimated refrigerant charge factors	Formal request; crosswalk with HS codes; modelling support	Restricted	Stock modelling for product-use emissions
Refrigeration Servicing and Leakage Rates	Secondary collection (commissioned surveys through sector ministry or professional bodies)	Technician associations; research institutions	Servicing frequency; average leakage rates; recovery practices	Targeted survey under NCCC-approved terms of reference	Confidential (survey-level); Aggregated results: Public	Emission factor refinement; uncertainty reduction
Facility Registry (All Major IPPU Plants)	NESREA (permitting authority)	FMITI; sector ministries	Plant name; location; operational status; installed capacity; technology type	Annual data-sharing protocol	Restricted	Completeness verification; Tier eligibility assessment
Abatement Technology Presence (Nitric Acid, etc.)	NESREA / Sector Ministry	Industry technical disclosures	Presence/absence of abatement; commissioning year	Structured request under confidentiality agreement	Confidential	Tier 2 parameterization
Country-Specific Emission Factors	NCCC Inventory Management Unit (custodian	Research institutions; commissione	Laboratory results; material composition; study	Formal commissioning; peer review; QA/QC	Study-level: Restricted until validated;	Tier advancement; recalculation

(where applicable)	of approved factors)	d studies	methodology	validation	Approved factors: Public	management

Access and Governance Rules (Operational Provisions)

To operationalize the matrix, the following rules shall apply:

1. **Primary Custodian Principle** All core activity data shall be requested first from the designated primary custodian. Secondary sources are used only for validation, triangulation, or gap-filling not as substitutes for authoritative series unless formally documented.
2. **Formal Data Request Cycle** Data requests shall follow the national inventory calendar, with clear deadlines and specified variables. Emergency or ad-hoc requests are discouraged.
3. **Confidentiality Classification Levels**
    - Public: Aggregated national statistics suitable for publication.
    - Restricted: Detailed disaggregated data accessible only to authorized inventory personnel.
    - Confidential: Facility-level or commercially sensitive data requiring MoU or NDA.
4. **Aggregation and Disclosure Rule** No plant-level or commercially sensitive data shall be disclosed publicly. Inventory reporting shall use aggregated national totals or sector averages consistent with confidentiality commitments.
5. **Data Storage and Access Control** All restricted and confidential datasets shall be stored within the National Inventory Management System with role-based access controls and audit trails.
6. **Reconciliation Protocol** Where discrepancies arise between primary and secondary datasets, the primary custodian dataset prevails unless formally adjusted through documented reconciliation and approval by the inventory coordination authority.
7. **Tier Advancement Safeguard** Any movement toward Tier 2 or development of country-specific emission factors requiring plant-level data shall be governed by explicit data-sharing agreements and documented methodological justification.

Institutional Accountability

- **NCCC Inventory Management Unit**: Custodian of the matrix; ensures annual update and compliance.
- **Primary Data Providers (NBS, NCS, Sector Ministries, NESREA)**: Responsible for accuracy and timely provision of authoritative datasets.
- **Secondary Providers / Research Bodies**: Provide supplementary datasets under defined terms of reference.
- **IPPU Working Group**: Applies datasets strictly within the rules defined above and ensures documentation for transparency under ETF requirements.

4.2.3 Traceability and Meta-Data: the "Silent Failure Point"

A technically credible IPPU inventory requires traceability. Every activity dataset and factor must be linked to a source, a time period, a unit definition, and (where applicable) facility coverage. In practice, Nigeria's IPPU inventory work often lacks consistent metadata across datasets. Spreadsheets may contain values without source references, or with references that are not reproducible. Facility coverage may not be explicit. Definitions may shift year-to-year, such as whether cement production data include imported clinker, how blended cement is treated, or how refrigerant imports are classified.

These traceability gaps are particularly damaging under the ETF, because they undermine reproducibility and complicate recalculation. They also limit the ability of new staff to take over inventory functions without recreating prior work.

4.3 Capacity, Continuity, and QA/QC Challenges

The reliability of Nigeria's IPPU inventory outputs is constrained not only by data access but also by the capacity of institutions to implement IPCC methods consistently, apply QA/QC rigorously, and maintain institutional memory across reporting cycles.

4.3.1 Human and Institutional Capacity Constraints

IPPU is among the most technically demanding inventory sectors. It requires competence in industrial process understanding, IPCC category definitions, Tier selection, software tools, uncertainty analysis, and recalculation logic. Nigeria has a limited pool of practitioners with deep IPPU expertise, and capacity within many institutions is uneven.

Technical working groups help to fill gaps, but they are often convened episodically. When the same individuals are repeatedly relied upon, the system remains vulnerable to staff turnover and scheduling constraints. Furthermore, some data-providing institutions do not have dedicated staff assigned to inventory reporting functions, meaning that data provision is treated as an additional duty rather than a core responsibility. This weakens timeliness and accountability.

Capacity gaps are also evident in specialized areas such as HFC inventory development, where understanding market dynamics, servicing practices, and equipment stocks requires different competencies from those used in cement or chemical process inventories. Without dedicated capacity, product-use estimates remain heavily assumption-driven.

4.3.2 QA/QC Weaknesses: Inconsistent Application and Limited Documentation

Effective QA/QC in IPPU requires more than generic checks. It requires sector-specific verification such as ensuring that clinker production aligns with plausible clinker ratios, that cement production data are consistent with plant capacity and market trends, that chemical process assumptions reflect the actual production routes in-country, and that refrigerant consumption estimates reconcile with imports, stocks, and servicing demand.

In Nigeria, QA/QC is often implemented as a review meeting rather than as a systematic set of documented checks embedded throughout the workflow. This leads to inconsistent coverage of QA/QC across subcategories and weak documentation of what checks were performed, what issues were identified, and how they were resolved. Under the ETF, this is a vulnerability because the inventory must be reproducible and capable of technical review.

4.3.3 Archiving and Documentation: Version Control and Decision Logging

A durable IPPU inventory system cannot depend on dispersed spreadsheets, personal email archives, or undocumented methodological judgments. Under the Enhanced Transparency Framework, inventory transparency is assessed not only on numerical outputs but on the traceability of methods, assumptions, recalculations, and data lineage. Archiving and documentation must therefore be institutionalized as core components of the National Inventory Management System rather than treated as administrative afterthoughts.

To address this structurally, the IPPU institutional arrangement shall adopt a centralized digital archiving protocol embedded within the National Inventory Management System (NIMS). All IPPU datasets, calculation files, correspondence related to data provision, methodological notes, QA/QC checklists, and recalculation justifications must be stored in a controlled-access repository maintained by the Inventory Management Unit. Storage on personal devices or unstructured email chains shall not constitute official archiving. Each dataset and calculation

file must be uniquely labelled, dated, and assigned a version number.

A formal **Version Control Protocol** shall apply to all IPPU calculation tools and datasets. Any modification to activity data, emission factors, calculation formulas, or time-series adjustments must trigger:

(i) creation of a new version;

(ii) retention of the previous version in the archive; and

(iii) documentation of the rationale for change.

This ensures that recalculations can be traced, compared, and explained during technical expert review. Historical versions must remain accessible for audit purposes but protected against unauthorized editing.

In parallel, the system shall institutionalize a **Decision Logging Framework**. All methodological decisions such as selection of Tier 1 versus Tier 2 methods, adoption of proxy datasets, adjustments to clinker ratios, or incorporation of new trade classifications must be recorded in a standardized decision log template. Each entry should include:

- the issue addressed;
- the data sources considered;
- the chosen approach and justification;
- the impact on emissions estimates;
- the reporting years affected; and
- the approving authority.

These decision logs must be stored alongside the relevant datasets to ensure coherence between narrative explanations and numerical changes.

Because recalculations are frequent in IPPU categories, a **Recalculation Management Procedure** shall be formally adopted. Whenever revised activity data or improved parameters are introduced, the procedure requires:

- systematic back-casting across the entire time series where appropriate;
- quantitative assessment of the difference between previous and revised estimates;
- clear documentation of the cause of change; and
- transparent reporting of recalculation impacts in the inventory documentation.

This procedure ensures time-series consistency and prevents ad-hoc adjustments limited to recent years only.

Archiving reform alone is insufficient unless embedded within broader institutional strengthening. To overcome workflow fragmentation and weak QA/QC, the IPPU institutional arrangement shall also define:

1. **Standardized Calculation Templates** All IPPU subcategories must use approved calculation templates aligned with IPCC equations. Templates should contain locked formula cells, standardized units, uncertainty fields, and automated summary tables. This reduces spreadsheet errors and ensures methodological consistency.

2. **Annual QA/QC Checklist and Peer Review Cycle** Each IPPU category shall undergo a documented QA/QC review before integration into the national inventory. The checklist must include cross-sector consistency checks (e.g., avoiding double counting between Energy and IPPU), completeness checks against facility registries, and verification against statistical time-series trends.

3. **Structured Tier Advancement Roadmap** Movement toward Tier 2 methods shall be guided by a formally approved improvement plan identifying priority categories, required plant-level datasets, data-sharing arrangements, and timeline. Advancement will only occur once repeatable data collection processes and confidentiality safeguards are operational, ensuring that higher-tier methods are sustainable rather than one-off upgrades.

4. **Country-Specific Emission Factor Development Protocol** Where country-specific factors are proposed, they must follow a documented process including commissioned studies, laboratory validation (where applicable), peer review, uncertainty analysis, and formal approval before integration into the inventory. All supporting studies shall be archived within the NIMS and linked to recalculation documentation.

Section 5: Proposed National IPPU Reporting System Design

5.1 Design Principles

A National IPPU Reporting System must be designed as a permanent, rules-based component of Nigeria's greenhouse gas inventory architecture, capable of producing consistent and reproducible outputs across successive Biennial Transparency Report (BTR) cycles. In the IPPU sector, system design is not a generic administrative exercise; it must respond to the technical realities of industrial process emissions and product-use

emissions, where the quality of estimates is determined primarily by the integrity of activity data, process characterization, and confidentiality-sensitive data sharing. The design principles below therefore translate ETF expectations into operational requirements specific to IPPU.

5.1.1 Alignment with National MRV and Inventory Systems

The IPPU reporting system must be fully integrated within Nigeria's national inventory management arrangements, rather than functioning as a parallel or project-driven mechanism. Integration requires that IPPU data flows, responsibilities, and timelines are synchronized with the national inventory coordinator's annual work plan, national QA/QC protocols, and submission schedules.

Alignment also requires explicit interfaces with sectoral MRV functions where these exist or are evolving. For example, industrial regulators, permitting agencies, and standards bodies collect or can require data that are directly relevant to IPPU activity data and process characterization. The reporting system should be designed to leverage these existing institutional processes to reduce reporting burden, increase continuity, and improve the authority of data collection. In practical terms, this means embedding IPPU reporting requirements into routine institutional touchpoints such as annual industrial returns, environmental compliance reporting, licensing and permitting renewals, and trade/import reporting. Where MRV systems are being developed for mitigation actions in industry (e.g., clinker substitution initiatives, nitric acid abatement, refrigerant transition programmes), the IPPU reporting system must be capable of receiving structured data outputs from these systems in formats consistent with inventory compilation.

Critically, alignment must preserve the IPCC sectoral boundary: IPPU captures process and product use emissions, while fuel combustion remains in the Energy sector. The system design must therefore include rules for categorization, data reconciliation, and cross-sector checks to prevent double counting or omission, especially in installations where both process emissions and significant combustion emissions occur (e.g., cement kilns, integrated chemical complexes).

5.1.2 ETF Compliance and Sustainability

ETF compliance requires that inventories are produced regularly, are consistent over time, and are fully documented and reproducible. In IPPU, these requirements translate into three practical system demands.

First, the system must support a predictable reporting rhythm that allows data collection, validation, estimation, and review to occur through a defined cycle rather than under deadline pressure. Second, it must institutionalize recalculation governance, including clear rules for when recalculations are triggered, how revised data are applied across the time series, and how changes are documented and approved. Third, it must institutionalize documentation and archiving so that each reporting cycle produces a complete evidence trail: data sources, metadata, assumptions, emission factors, calculation files, QA/QC records, and decision logs.

Sustainability further requires that the system is not dependent on a narrow pool of experts or on external consultants to function. A feasible design therefore specifies minimum staffing roles, training requirements, standard templates, and a knowledge management structure that can survive turnover. Under the ETF, continuity is an operational requirement: each cycle must be able to reproduce the prior cycle's methods and improve them in a controlled manner where improvements are made.

5.1.3 Confidentiality, Trust, and Industry Participation

Confidentiality is not an ancillary issue in IPPU; it is the central enabling condition for access to plant-level and market-level data. The reporting system must therefore be designed with explicit rules for data classification, access control, aggregation, and publication.

Industrial operators will not provide sensitive information consistently if data protection relies on informal assurances. A national IPPU reporting system must define, at minimum, the following: which data fields are required at facility level, which fields may be submitted in aggregated form through associations, who can access raw data, where the data are stored, how they are protected, and what is published in inventory reports. These rules should be supported by formal data-sharing instruments (including confidentiality clauses and permitted uses), and by technical controls such as role-based access, audit trails, and secure storage.

Trust and participation also depend on predictability and proportionality. The system should request only data necessary for IPCC-compliant estimation and for targeted improvements (e.g., Tier 2 in cement). Data requests must be stable year-on-year to avoid "shifting goalposts." Where possible, industry associations should be used as aggregators, and reporting should be designed so that individual company data are not exposed in public outputs.

A well-designed confidentiality framework not only enables better data access but also reduces the transaction cost of data collection by creating standard procedures that companies can comply with routinely.

5.2 Institutional Design

Institutional design for IPPU reporting must establish a permanent coordination structure with clearly assigned responsibilities across data providers, compilers, validators, and oversight institutions. Given the cross-cutting nature of IPPU, institutional design must also establish practical mechanisms for coordination across ministries and with industry actors.

5.2.1 Permanent IPPU coordination arrangements

A permanent IPPU coordination arrangement must do more than request and appraise activity data. It must provide a standing structure for inventory planning, preparation, quality management, documentation, and submission readiness across the full inventory cycle. Under the Enhanced Transparency Framework, the core requirement is not only that data are available, but that inventories are produced through a repeatable system with defined roles, schedules, outputs, and decision pathways. The proposed arrangement therefore establishes a year-round IPPU coordination function embedded within the National Inventory Management System, with explicit responsibility for planning and delivering IPPU inventory outputs according to a national inventory cycle aligned to Biennial Transparency Report (BTR) timelines.

The IPPU coordination function shall operate as a **standing unit** with responsibility for organizing and delivering the complete IPPU inventory work programme, including inventory planning, data acquisition, calculations, recalculations, QA/QC, documentation, archiving, and readiness for integration into national submissions. It shall be institutionally assigned, resourced, and supported by continuity arrangements to ensure that responsibilities do not depend on individual staff availability. This function shall interface directly with the national inventory coordination authority and work within approved national inventory policies, including QA/QC plans, recalculation protocols, and confidentiality rules.

At minimum, the IPPU coordination structure shall include three core roles with clearly defined deliverables:

The IPPU Sector Lead shall be responsible for annual and biennial inventory planning, oversight of methodological application, coordination with the national inventory coordinator, and convening sectoral technical review and approval meetings. The Data and Systems Officer shall manage standardized templates and databases, coordinate data receipt and cleaning, maintain the IPPU data repository within the inventory management system, and run category-level data QA/QC checks. The Documentation and QA/QC Focal Point shall maintain the sector decision log, metadata records, recalculation notes, uncertainty inputs where applicable, and QA/QC checklists, ensuring that all IPPU estimates are fully traceable and review-ready. Each role shall have a trained alternate, and institutions hosting these roles shall be required to designate replacements prior to staff transitions to protect continuity.

To make these arrangements operational, the IPPU coordination function shall implement a **National Inventory Cycle for IPPU**, aligned to the BTR cycle but with annual steps to maintain a consistent time series. The national inventory cycle shall have defined phases, deliverables, and deadlines as follows:

Phase 1: Annual Inventory Planning and Scoping (January-February each year) During this phase, the IPPU coordination function prepares the annual inventory workplan for the sector, confirming category coverage, data needs, planned improvements, roles of primary and secondary data providers, and the year(s) to be updated. It also confirms the schedule of working group meetings and the inventory documentation requirements for the cycle.

Phase 2: Data Call, Acquisition and First-Level Validation (March-May each year) Structured data requests are issued to primary data custodians and approved secondary sources using standardized templates. Data are received, screened for completeness, cleaned, and subjected to plausibility checks against time-series trends and

facility registries. Where gaps exist, the unit activates defined secondary collection mechanisms (targeted surveys, administrative datasets, industry association submissions) in line with the Data Custodianship and Access Matrix.

Phase 3: Estimation, Recalculation and Methodological Updates (June-August each year) The sector estimates are compiled using approved IPCC methods, with recalculations applied consistently across the time series where new data or improved assumptions require it. Any methodological changes, proxy substitutions, or parameter updates are documented in the decision log and linked directly to updated datasets and calculation files. This phase produces a complete draft IPPU emissions time series and supporting calculation archive.

Phase 4: QA/QC, Sector Review and Approval (September-October each year) The IPPU Working Group conducts technical review of data sources, methods, recalculation impacts, and draft estimates using a standardized QA/QC checklist. Cross-sector consistency checks are undertaken, including confirmation of IPPU/Energy boundaries and completeness checks against facility registries and trade records. The output of this phase is an approved IPPU dataset and a finalized documentation package ready for national integration.

Phase 5: Integration and Submission Readiness (November-December each year; intensified in BTR years) The IPPU coordination function submits the approved datasets and documentation to the national inventory coordinator for integration into the national inventory system. In BTR years, this phase includes additional review for technical expert review readiness, consolidation of narrative annexes, and final checks to ensure compliance with ETF documentation expectations.

This cycle ensures that the IPPU inventory is maintained annually, while biennial submissions draw on a continuously updated and fully documented sector dataset. It also provides a practical mechanism for delivering the procedures described elsewhere in this report archiving, version control, decision logging, QA/QC, recalculation management, and continuous improvement because each procedure is anchored to a defined phase and annual deliverable.

In addition to routine inventory planning and preparation, the permanent IPPU coordination function shall maintain a structured work programme that includes mid-year system maintenance and archiving updates, periodic capacity development for data providers and compilers, and a standing industry engagement plan. These activities shall be planned and reported as part of the annual inventory workplan, ensuring that industry cooperation and data quality improvements are built systematically over time rather than negotiated only during reporting deadlines.

Through this arrangement, IPPU reporting shifts from an episodic data-collection exercise to a planned and repeatable national inventory process. The emphasis is placed not only on acquiring activity data but on ensuring that the institutional system can plan, prepare, document, quality-check, and deliver IPPU inventory outputs consistently across successive reporting cycles.

5.2.2 Formalized Roles of MDAs and Industry

The institutional design must clarify roles for each participating institution in terms of the specific reporting functions they provide. For IPPU, it is not sufficient to state that an institution is “involved”; the system must assign concrete deliverables, timelines, and data responsibilities.

Statistical agencies should be designated as primary custodians for official production and industrial statistics used as activity data. Their role should include provision of consistent time series, revision notes when datasets change, and structured metadata describing definitions and coverage.

Sector MDAs responsible for industry, trade, and regulation should be assigned responsibilities for maintaining facility registries by NCCC, confirming operational status of major installations, supporting access to process-level data where required, and contributing administrative datasets that improve completeness. Regulatory bodies should support routine data capture via compliance and permitting processes and should provide structured extracts that can be used for validation and plausibility checks.

Industry actors should be assigned defined reporting obligations consistent with confidentiality rules. Large

facilities should provide annual process activity data consistent with standard templates, while industry associations should act as aggregators where facility-level reporting is not feasible or where confidentiality concerns are high. For product-use categories, the institutional design should identify appropriate market intermediaries importers, wholesalers, servicing networks, and relevant associations—to provide structured import and stock data.

To make these roles operational, the institutional design requires formal instruments: terms of reference for technical working groups, memoranda of understanding or data-sharing agreements with key institutions and associations, and standard reporting templates that establish common definitions and formats.

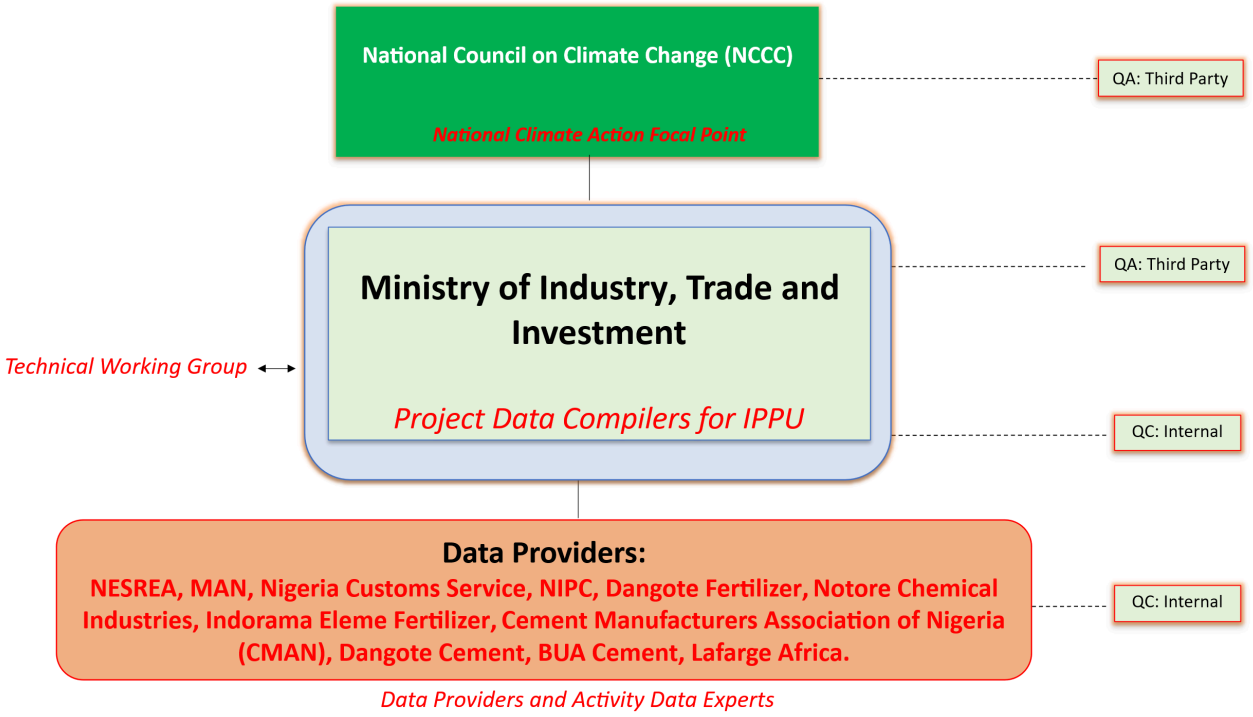

Figure 2: Proposed Institutional Arrangement for the IPPU Sector

Table 3: Formalized Roles of MDAs and Industry in the National IPPU Reporting System

Institution / Actor	Institutional Category	Formalised Role in IPPU Reporting System	Key IPPU Categories Covered	Key Deliverables	Reporting Frequency	Interface with IPPU Coordination (FMITI)
National Council on Climate Change (NCCC) – Inventory Management Unit	National inventory authority	Overall national inventory planning, approval of methodologies, QA/QC oversight, recalculation authorization, ETF compliance, archive custodian, submission authority	All IPPU (2A–2H)	Approved IPPU time series; recalculation approvals; QA/QC reports; uncertainty summaries; BTR tables; TER responses	Annual (maintenance) / Biennial (submission)	Receives compiled datasets from FMITI; integrates into national inventory
NCCC – National Inventory Management System (NIMS) Administrator	System governance / IT custodian	Hosts centralized inventory archive; manages version control; ensures secure storage and audit trails	All	Controlled digital repository; access logs; backup system; version archive	Continuous	Supports FMITI and IPPU Working Group
Inter-Ministerial Committee on Climate Change	High-level oversight	Resolves cross-ministerial data mandate issues; endorses reporting cycle; supports institutional authority	All	Endorsed reporting calendar; mandate clarifications	Annual review	Supports NCCC authority
FMITI – IPPU Project Data Compilers (Sector Coordination Unit)	Sector coordination authority	IPPU inventory planning, sector data compilation, first-level QA/QC, data reconciliation, industry engagement, submission to NCCC	2A Mineral, 2B Chemical, 2C Metal, 2F F-gases, 2G Other Product Use	Category-level datasets; reconciliation reports; sector documentation package	Annual	Central operational hub
National Bureau of Statistics (NBS)	Primary statistical	Provides authoritative industrial production statistics	2A (cement, lime), 2B (ammonia, nitric	Annual production statistics; metadata;	Annual	Supplies official activity data to FMITI

	custodian		acid), 2C (iron & steel)	revision notes		
Nigeria Customs Service (NCS)	Primary trade custodian	Provides substance-level import/export data	2F (HFCs), 2G (SF_6, PFCs if applicable)	HS-code disaggregated import/export datasets	Annual	Provides raw trade data to FMITI
National Ozone Unit (FMEnv)	ODS/HFC regulatory authority	Manages Kigali/Montreal reporting; validates refrigerant licensing data	2F	Licensed HFC consumption data; sectoral allocation	Annual	Harmonizes HFC data with FMITI
NESREA	Environmental regulator	Maintains facility registry; confirms abatement technology; supports completeness checks	2A, 2B, 2C	Facility registry; abatement status (e.g., N_2O control)	Annual update	Supports validation
Federal Ministry of Solid Minerals Development	Mining regulator	Provides limestone production data; supports material balance checks	2A (cement, lime)	Limestone extraction data; mine registry	Annual	Plausibility checks
Nigerian Electricity Regulatory Commission (NERC)	Power sector regulator	Provides SF_6 equipment stock data; coordinates with utilities	2G1 (Electrical equipment – SF_6)	Installed switchgear inventory; maintenance reports	Annual	Supports F-gas estimates
Transmission Company of Nigeria (TCN) & DisCos/GenCos	Utility operators	Provide SF_6 purchases, stock changes, leakage data	2G1	SF_6 stock movement data	Annual	Through NERC to FMITI
Standards Organisation of Nigeria (SON)	Product standards authority	Provides product classification standards relevant to cement blends, refrigerants, electrical equipment	2A, 2F, 2G	Technical standards; product specifications	As updated	Supports methodological consistency

Cement Manufacturers Association of Nigeria (CMAN)	Industry association	Aggregates clinker production; validates clinker ratios	2A1 Cement	Clinker production; clinker-to-cement ratios	Annual	Sector-level validation
Fertilizer Producers & Suppliers Association (FEPSAN)	Industry association	Aggregates ammonia and nitric acid production	2B1 & 2B2	Production volumes; abatement confirmation	Annual	Sector validation
Manufacturers Association of Nigeria (MAN) – Metals subgroup	Industry association	Aggregates iron/steel and other metal production	2C	Crude steel production; process route	Annual	Validation support
Large Industrial Operators (via primary custodians)	Private operators	Provide detailed plant-level data where Tier 2 required	2A, 2B, 2C	Plant-specific parameters; technology data	Annual	Through FMITI under confidentiality
Refrigerant Importers (Licensed)	Market actors	Provide supplementary distribution data	2F	Sector distribution; stock data	Annual	Via Ozone Unit
RAC Professional Bodies / Technician Networks	Secondary data collectors	Provide leakage and servicing parameters	2F	Servicing frequency; recovery rates	Periodic surveys	Used for modelling
Academic & Research Institutions	Technical support	Develop country-specific emission factors; support Tier progression	2A–2H as relevant	EF studies; uncertainty studies	Project-based	Validated by NCCC before adoption
Independent Third-Party QA Entity	External quality assurance	Conduct independent QA review before BTR submission	All	QA review report; compliance verification	Biennial	Reports to NCCC

5.3 Functional and Digital System Design

The functional and digital design must translate institutional roles into a repeatable workflow that produces consistent outputs and maintains a complete evidence trail. For IPPU, the design must also accommodate both point-source industrial processes and distributed product-use emissions, which require different data approaches.

5.3.1 Standardized Reporting Cycles and Procedures

A robust IPPU reporting system operates on a defined cycle aligned to national reporting timelines. The cycle should include four operational stages.

The first stage is an annual data collection window, during which standardized templates are issued, facility registries are updated, and key datasets (statistics, customs, regulatory extracts) are requested according to a calendar. Data submission should include mandatory metadata fields source, units, coverage, contact person, and explanation of revisions.

The second stage is data validation and reconciliation. This includes automated checks (unit consistency, missing values, outlier flags) and structured plausibility checks (cross-checking cement production against plant capacity, reconciling chemical production against feedstock availability where appropriate, reconciling refrigerant imports against observed market trends). Discrepancies are resolved through documented queries to providers, and outcomes are recorded in a validation log.

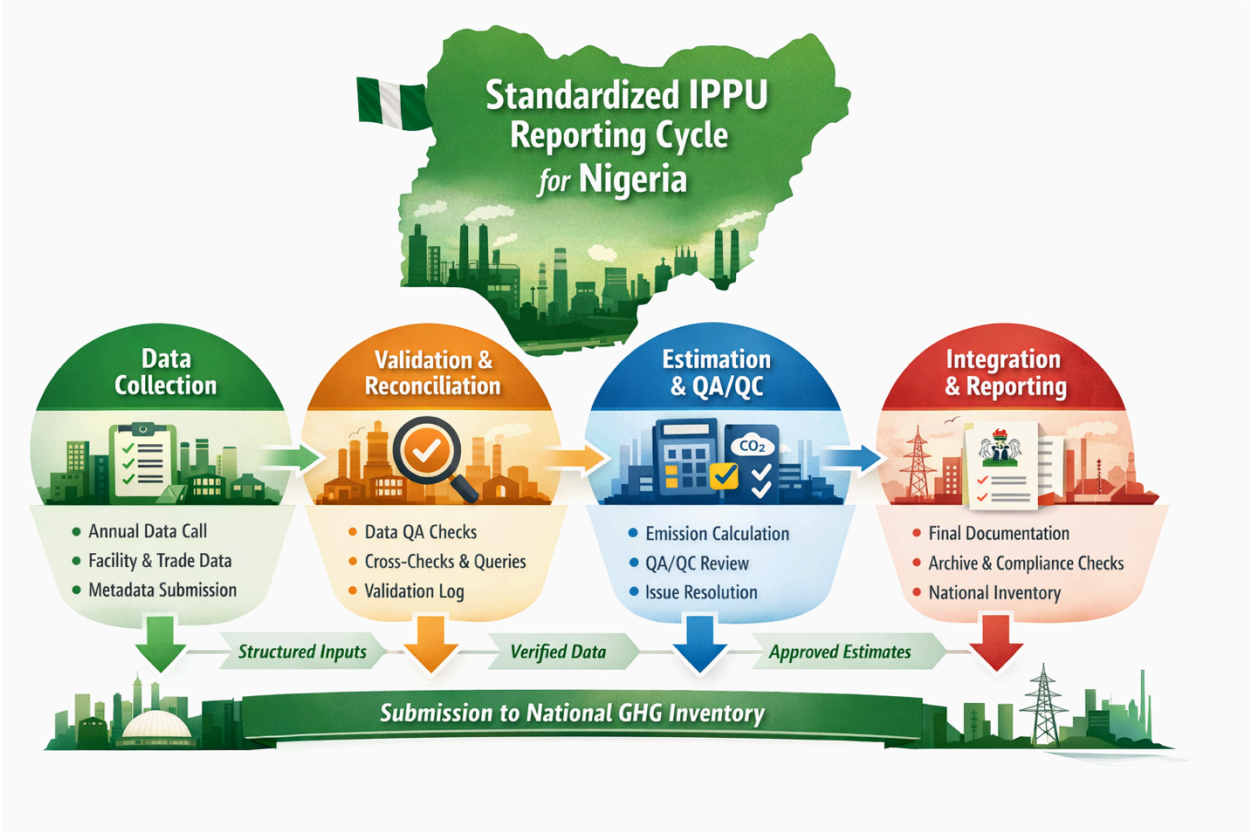

Figure 3: Schematic Representation of IPPU Reporting Cycle

The third stage is estimation and QA/QC. Emissions estimation is conducted using standard calculation files or inventory software, with embedded QA/QC checklists. Key sector-specific QA/QC checks should be institutionalized for example, confirming that clinker ratios fall within plausible ranges, confirming that nitric acid emissions reflect abatement status, and confirming that refrigerant consumption estimates reconcile with imports and stock changes. The outcome of QA/QC is a signed-off checklist and a documented list of issues and resolutions.

The fourth stage is approval, archiving, and integration into the national inventory. Before submission, the IPPU sector lead verifies completeness of documentation, the recalculation log is updated if relevant, and calculation

files are archived with version control. IPPU outputs are then transferred to the national inventory compiler in standard format for integration into the national inventory tables and narrative.

5.3.2 Centralized IPPU Reporting Module

The reporting system should be supported by a centralized digital module that serves as the single repository for IPPU activity data, metadata, calculation inputs, QA/QC logs, and decision records. This module should include, at minimum, the following functional components:

A facility and actor registry that lists IPPU-relevant installations and market actors, including identifiers, locations, subsector classification, contact points, and reporting status. This registry is essential for tracking completeness and for updating coverage as new facilities come online.

A structured data submission interface that accepts annual templates, validates basic formatting, and captures metadata. The interface should support both facility-level submissions and aggregated submissions through associations.

A validation workspace that allows reviewers to record queries, discrepancies, and resolutions, producing a structured validation log that can be archived and referenced in future cycles.

A documentation and archiving layer that stores emission factor references, methodological notes, recalculation records, and QA/QC checklists, with version control and audit trails.

Role-based access controls are essential, allowing sensitive facility-level data to be viewed only by authorized users while permitting aggregated outputs to be used for reporting and analysis. The module should also provide a mechanism for generating standard exports for inventory compilation, including tables aligned to national reporting formats.

5.3.3 Interoperability with National GHG Inventory Tools

Interoperability is critical to avoid duplicate data entry and inconsistent calculation environments. The IPPU module must be able to export data in formats compatible with Nigeria's national inventory compilation tools, including the ETF tool where used, and the standard reporting tables (Common Tabular Format) required for BTR submission.

Interoperability requires that data structures in the IPPU module reflect IPCC category hierarchies, units, and metadata requirements. It also requires harmonization with national QA/QC and archiving protocols so that IPPU outputs can be integrated into national documentation systems without loss of traceability.

The design should also support future integration with broader MRV digital infrastructure, including modules used for tracking mitigation actions in industry or product transitions (such as HFC phase-down measures). This ensures that the IPPU reporting system does not remain isolated but can receive data feeds from sector MRV processes and, where appropriate, provide inventory-consistent datasets to support national policy monitoring.

Section 6: Conclusion and Recommendations

The assessment undertaken in this report demonstrates that the principal constraints to sustainable IPPU GHG reporting in Nigeria are less methodological in nature and more institutional, systemically. Nigeria has developed significant technical understanding of IPCC IPPU methodologies and has demonstrated the ability to compile IPPU estimates that meet minimum international reporting requirements. However, without a coherent institutional framework and a purpose-built reporting system, these technical capabilities cannot be translated into a routine, resilient, and progressively improving national reporting outputs.

The transition from Biennial Update Reports (BURs) to Biennial Transparency Reports (BTRs) under the Enhanced Transparency Framework fundamentally changes the operating conditions for IPPU reporting. Reporting is now required to be regular, predictable, and fully documented, with consistent time-series and transparent management of re-calculations. In this context, continued reliance on ad-hoc data requests, informal coordination arrangements, and individual technical expertise exposes the IPPU inventory to risks of inconsistency, incomparability, loss of institutional memory, and declining credibility under strict technical expert review regime.

This recommendations in this Chapter 6 are not proposed as incremental adjustments, but as a necessary shift toward sustainable institutionalization of the process. The core objective is to embed IPPU reporting within Nigeria's permanent climate governance and regulatory architecture, supported by clear mandates, enforceable data-sharing arrangements, and a standardized reporting cycle. Equally important is the establishment of a secure and traceable data governance system that balances confidentiality with transparency and enables sustained private-sector participation.

Therefor the recommendations below respond directly to these structural challenges. They prioritize legal and institutional anchoring, systematization of workflows, targeted digitalization, and a pragmatic pathway for methodological improvement and tier progression. If effectively implemented, these measures provide a coherent roadmap for transforming IPPU reporting from a periodic technical exercise into a sustainably institutionalized national system that can meet current and future transparency obligations, support domestic climate policy, and enhance Nigeria's credibility in international climate reporting, negotiation, and diplomacy processes under the Paris Agreement.

6.1 Institutional and Policy Recommendations

6.1.1 Legal and Regulatory Actions for IPPU Reporting

Nigeria's current IPPU inventory practice still relies heavily on "cooperative" data requests and time-bound reporting efforts. Under the ETF, this is not sustainable for the following two reasons:

(i) the IPPU sector depends on commercially sensitive facility/process data that will not be consistently provided without enforceable rules and protections; and

(ii) the IPPU time-series requires controlled re-calculations and repeatable QA/QC over successive cycles, which cannot be achieved through ad-hoc arrangements.

A robust legal basis should therefore be established via subsidiary instruments (regulations, directives, guidelines with enforcement hooks) under the Climate Change Act and relevant environmental/industrial regulatory authorities, to define minimum mandatory reporting for priority IPPU sources (Cement/Clinker and Lime; Nitric Acid; Ammonia/Urea; Iron and Steel; HFCs and other F-gases where applicable). The instrument should include:

- **Scope of Obligated Entities and Thresholds**: define reporting coverage using objective triggers (e.g., licensed production capacity, annual output threshold, or regulated facility type) to avoid ambiguity and ensure consistent coverage across reporting cycles.

- **Legal Duty to Provide Specified Activity Data**: not "emissions reports" in the first instance, but the IPPU-relevant variables that underpin IPCC estimation (e.g., clinker production, CaO content where relevant, CKD bypass dust handling, carbonate inputs, nitric acid production and abatement status, refrigerant import/stock/consumption, etc.).

- **Confidentiality Protection and Permitted Use**: establish that data are collected for national reporting purposes; define who can access raw facility-level data; and specify the form of public reporting (typically

aggregated). This is crucial for building industry participation without compromising commercial sensitivity.

- **Verification and Audit Provisions**: allow competent authorities to request supporting records (production logs, sales records, customs documentation, process control summaries) and to conduct limited audits preferably risk-based without turning the inventory into an adversarial enforcement exercise.
- **Compliance Linkage**: the most effective enforcement lever is not stand-alone "inventory penalties" but integration with existing licensing/permitting systems (environmental permits, plant registrations, product certifications, refrigerant import licensing). Where legal drafting allows, inventory data submission should become a standard condition for permit renewal or regulatory good-standing.

6.1.2 Institutionalization of Coordination Mechanisms

To sustain IPPU reporting, Nigeria needs an arrangement that separates: (a) national oversight and cross-sector inventory governance from (b) IPPU-sector operational coordination and (c) technical compilation and QA/QC control. The recommended approach is:

1. **Designate/Confirm a Permanent IPPU Inventory Coordination Desk (IPPU-ICD) in the NCCC** (with off-ramps to the National Bureau of Statistics (NBS) and the Federal Ministry of Industry, Trade, and Investment (FMITI) with defined responsibilities for:
    - issuing annual data requests and templates;
    - maintaining the IPPU data repository and metadata;
    - convening IPPU TWG reviews and documenting decisions;
    - coordinating recalculations and methodological updates; and
    - producing the IPPU sector chapter/annex inputs for the national compilation cycle.
2. **Formalize the IPPU Technical Working Group (TWG)** with:
    - a standing membership list (MDAs, regulators, industry associations, statistics, academia);
    - a meeting calendar aligned to the reporting cycle; and
    - clear authority to endorse methodological choices (tier selection, emission factors, back-casting rules, uncertainty approaches) before national validation.
3. **Clarify Institutional Boundaries to Reduce Duplication and Gaps**, particularly between:
    - statistics production (NBS and administrative data custodians),
    - compliance monitoring (environmental and industrial regulators), and

- inventory compilation (national inventory coordinator/IPPU-ICD). The key is to ensure that each institution's role is defined in terms of deliverables and timing (what they must provide, in what format, by what time), rather than the subsisting undefined "broad support" language.

4. **Establish a Controlled QA/QC and Archiving Regime** as part of governance:

   - Each reporting cycle must end with a version-controlled archive of datasets, calculation files, assumptions, correspondence logs, and decision memos.
   - Re-calculations must follow a specified rule (triggered by methodology change, new EF, corrected activity data) approved via TWG/national validation mechanism.

5. **Mainstream and Integrate Active Participation of Industrial Research Institutes into Nigeria's IPPU GHG Reporting System as Part of the Institutionalization of Coordination Mechanism**:

There is need to transition Industrial research institutes from marginal actors to major participants in the entire ecosystem of Nigeria's IPPU GHG Reporting System. These industrial research institutes include:

- Federal Institute of Industrial Research Oshodi (FIIRO), Lagos.
- Raw Materials Research and Development Council (RMRDC), Abuja.
- Centre for Adaptation of Technology (CAT), Awka, Anambra State:
- National Agency for Science and Engineering Infrastructure (NASENI)
- Scientific Equipment Development Institute (SEDI), Enugu.
- **National Institute for Chemical Technology (NARICT), Zaria:**

6.2 Technical and System Recommendations

6.2.1 Digitalization Priorities

Digitalization for IPPU must be designed around the sector's core constraints: repeatability, traceability, and confidentiality. The recommended digital priorities are therefore not "general portals," but an IPPU reporting module that supports controlled workflows:

- **Standardized Electronic Templates** (webform or structured spreadsheet upload) mapped to IPCC categories and Nigeria's national inventory architecture. Each data field should have embedded guidance, validation rules (units, ranges), and required metadata (source, contact point, year coverage, method notes).
- **Tiered Access Control**:
  - facility-level raw data accessible only to designated compilers and authorized reviewers under confidentiality rules;
  - aggregated outputs accessible to broader government stakeholders; and

- public-facing summaries limited to non-sensitive aggregates.

- **Automated QC Checks**:
  - completeness checks by facility and year,
  - outlier detection (year-on-year variance rules),
  - cross-variable logic checks (e.g., clinker vs cement ratios, plausible EF ranges), and
  - time-series consistency flags (missing years, structural breaks).

- **Integrated Audit Trail**:
  - who submitted data, when, what changed,
  - why revisions were made, and
  - which version was used for reporting.

Digitalization should be implemented as a phased build: start with high-coverage subsectors (cement/clinker; ammonia/nitric acid; HFC imports/consumption), then expand to additional IPPU categories and smaller operators via association-based aggregation mechanisms.

6.2.2 Support for Methodological Improvement and Tier Progression

Tier progression in IPPU is not achieved by declaration; it requires specific preconditions stable activity data, process/material parameters, and repeatable QA/QC. Nigeria's tier strategy should therefore be framed as a tier-by-category progression plan, prioritizing categories with (i) large emission contribution, (ii) stable production systems, and (iii) feasible access to process data.
Recommended Tier-Progression Actions:

- **Cement/Clinker**: move from default assumptions toward facility-informed parameters where feasible (e.g., clinker production, clinker ratio, carbonate content, CKD treatment). Where national sampling is feasible, establish a pathway for representative parameterization to improve accuracy and reduce uncertainty.

- **Nitric Acid**: prioritize identification of production volumes and abatement status (where applicable), because N_2O emissions are highly sensitive to technology/abatement assumptions. A controlled facility survey and technology screening can materially improve estimates even before full Tier 3 approaches are considered.

- **Ammonia/Urea**: ensure consistent separation between process CO_2 and energy CO_2, and establish a stable activity data chain (production, feedstock, technology type). With IPCC 2006, CO2 from energy and IPPU must be reported under 2B-IPPU. Consistency has to be assured with the national Energy balance to avoid any double counting

- **HFCs/F-Gases**: strengthen import/stock/consumption accounting and servicing emissions assumptions. Because product-use estimates are very sensitive to assumptions, the priority is to institutionalize a credible national dataset on refrigerant flows (imports, reclaimed/recycled, destruction where applicable, sectoral consumption).

Across all categories, methodological improvement must be supported by:

- a National IPPU Methodological Decision Log (assumptions, EF choices, recalculation triggers);
- a formal Uncertainty Management Plan (which parameters dominate uncertainty, and which improvements reduce it); and
- a consistent time-series recalculation protocol to preserve comparability.

6.3 Industry Engagement and Incentives

6.3.1 Data-Sharing Frameworks

The engagement model should shift from individual-company negotiations to a structured data-sharing framework with predictable safeguards and core elements that include:

- **Standardized Data Sharing Agreements (DSAs)** that define:
  - data fields to be supplied,
  - frequency and timelines,
  - permitted use and disclosure limits,
  - confidentiality handling (including who can access disaggregated data), and
  - dispute resolution and escalation pathways.
- **Aggregation Pathways via Industry Associations** where appropriate:
  - Associations can serve as data aggregators for sub-sectors where firms are smaller or more fragmented, reducing administrative burden and increasing coverage.
  - Aggregation is also a practical confidentiality solution when facility-level disclosure is contentious.
- **Trusted Third-Party Verification Options**:
  - For highly sensitive subsectors, allow independent verification (auditors/technical institutes) to confirm data integrity while the national system receives the validated values and metadata, not necessarily raw commercial records.

6.3.2 Incentive-Based Compliance Mechanisms

A purely punitive model is unlikely to work in IPPU, because the state's enforcement bandwidth is limited and firms will prioritize commercial risk management. The recommended approach is a balanced compliance package:

- **Regulatory Incentives**:
  - fast-tracked processing of permits/renewals for firms that submit complete datasets on schedule;
  - recognition as "GHG reporting compliant" in regulatory standing assessments.

- **Market and Reputational Incentives**:
    - a government-backed recognition scheme for top reporters (sectoral scorecards focused on completeness and timeliness, not disclosing sensitive values);
    - alignment with ESG disclosure expectations for capital access and supply-chain requirements.
- **Fiscal/Financial Incentives (where feasible)**:
    - limited tax deductions for verified monitoring/reporting costs (particularly for priority subsectors),
    - eligibility preference for climate-related finance or technical support windows for reporting-compliant firms.

Incentives should be designed so they reward reporting quality (timeliness, completeness, verifiability) and do not inadvertently encourage under-reporting.

Conclusion

One of the major conclusions of this assessment of the IPPU GHG reporting ecosystem is that Nigeria can achieve IPPU GHG reporting methodological improvements and IPCC-tier progression with sustained investments in the digitalization of the process. While digitalization is necessary to overcome the “core constraint” through improved data ownership, access, and confidentiality traceability; it should be implemented in phases starting with high visibility sub-categories like cement/clinker; ammonia/nitric acid; HFC imports/consumption.
Also, there is an opportunity to drive IPCC-tier progression for Nigeria on a tier-by-category progression plan that prioritizes categories with high GHG emission contribution, stable production systems, and easy access to process data points focusing on Cement/Clinker, Nitric Acid, Ammonia/Urea, and HFCs/F-Gases.
Across all categories, Nigeria’s methodological improvements can be supported by a National IPPU Methodological Decision Log that encapsulates assumptions, emissions factor (EF) choices, and re-calculation triggers as well as a

formal Uncertainty Management Plan (UMP) that illuminates which parameters dominate uncertainty, and which improvements reduce uncertainty. Also, a consistent time-series re-calculation protocol that preserves comparability provides an extra pillar of methodological improvement support.

There is also window to integrate, mainstream, and institutionalize industrial research institutes that currently play marginal roles and transform them into major participants across the entire ecosystem of Nigeria's IPPU GHG Reporting System.

Another approach that will guarantee the sustainability of coordination mechanism of IPPU GHG reporting is the adoption of an institutionalized arrangement that separates the national oversight and cross-sector inventory governance from sector-specific IPPU operational coordination both of which are clearly separated from technical compilation and QA/QC control.

The designation of a permanent IPPU Inventory Coordination Desk (IPPU-ICD) in the NCCC with off-ramps to the National Bureau of Statistics (NBS) and the Federal Ministry of Industry, Trade, and Investment (FMITI) will help realize long term coordination mechanism sustainability.

Finally, ICAT's investments in improving Nigeria's IPPU GHG Reporting System in particular and the National MRV System in general provides an opportunity for political authorities to address overlapping institutional mandates to avoid bridging the "missing middle" gulf of data governance created by gaps in the mandates of Ministries, Departments, and Agencies (MDAs) of the Government of Nigeria.