इंटरनेट मानक

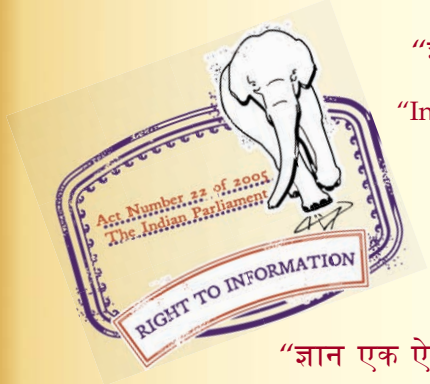
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS/ISO 14064-3 (2006): Greenhouse Gases, Part 3: Specification with Guidance for the Validation and Verification of Greenhouse Gas Assertion [CHD 34: Environmental Management]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

ग्रीनहाउस गैसें

भाग 3 ग्रीनहाउस गैस के प्रभावन के वैधीकरण और सत्यापन की दिशा-निर्देश सहित विशिष्टि

Indian Standard

GREENHOUSE GASES

PART 3 SPECIFICATION WITH GUIDANCE FOR THE VALIDATION AND VARIFICATION OF GREENHOUSE GAS ASSERTIONS

ICS 13.020.40

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELH1110002

December 2009 **Price Group 11**

Environmental Management Sectional Committee, CHD 34

NATIONAL FOREWORD

This Indian Standard (Part 3) which is identical with ISO 14064-3 : 2006 'Greenhouse gases — Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Environmental Management Sectional Committee and approval of the Chemical Division Council.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist.The corresponding Indian Standards, which are to be substituted in their places are listed below, along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IS014064-1 :2006 Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emission and removals	IS/ISO 14064-1 : 2006 Greenhouse gases: Part 1 Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals	Identical
IS014064-2; 2006 Greenhouse gases — Part 2: Specification with guidance for the project level for quantification, monitoring and reporting of green-house gas emission reductions or removal enhancements	IS/ISO 14064-2 : 2006 Greenhouse gases: Part 2 Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements	do

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values *(revised)*[1]. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Introduction

0.1 Climate change has been identified as one of the greatest challenges facing nations, governments, business and citizens over future decades. Climate change has implications for both human and natural systems and could lead to significant changes in resource use, production and economic activity. In response, international, regional, national, and local initiatives are being developed and implemented to limit greenhouse gas (GHG) concentrations in the Earth's atmosphere. Such GHG initiatives rely on the quantification, monitoring, reporting and verification of GHG emissions and/or removals.

IS014064-1 details principles and requirements for designing, developing, managing and reporting organization- or company-level GHG inventories. It includes requirements for determining GHG emission boundaries, quantifying an organization's GHG emissions and removals and identifying specific company actions or activities aimed at improving GHG management. It also includes requirements and guidance on inventory quality management, reporting, internal auditing and the organization's responsibilities in verification activities.

ISO 14064-2 focuses on GHG projects or project-based activities specifically designed to reduce GHG emissions or increase GHG removals. It includes principles and requirements for determining project baseline scenarios and for monitoring, quantifying and reporting project performance relative to the baseline scenario and provides the basis for GHG projects to be validated and verified.

This part of ISO 14064 details principles and requirements for verifying GHG inventories and validating or verifying GHG projects. It describes the process for GHG-related validation or verification and specifies components such as validation or verification planning, assessment procedures and the evaluation of organization or project GHG assertions. This part of IS014064 can be used by organizations or independent parties to validate or verify GHG assertions.

Figure 1 displays the relationships between the three parts of ISO 14064.

0.2 ISO 14064 is expected to benefit organizations, governments, project proponents and stakeholders worldwide by providing clarity and consistency for quantifying, monitoring, reporting and validating or verifying GHG inventories or projects. Specifically, use of ISO 14064 could

— enhance the environmental integrity of GHG quantification,

— enhance the credibility, consistency and transparency of GHG quantification, monitoring and reporting, including GHG project emission reductions and removal enhancements,

— facilitate the development and implementation of an organization's GHG management strategies and plans;

— facilitate the development and implementation of GHG projects,

— facilitate the ability to track performance and progress in the reduction of GHG emissions and/or increase in GHG removals, and

— facilitate the crediting and trade of GHG emission reductions or removal enhancements.

Users of ISO 14064 could find benefit from some of the following applications:

a) corporate risk management: for example, the identification and management of risks and opportunities;

b) voluntary initiatives: for example, participation in voluntary GHG registry or reporting initiatives;

c) GHG markets: for example, the buying and selling of GHG allowances or credits;

d) regulatory/government reporting: for example, credit for early action, negotiated agreements or national reporting programmes.

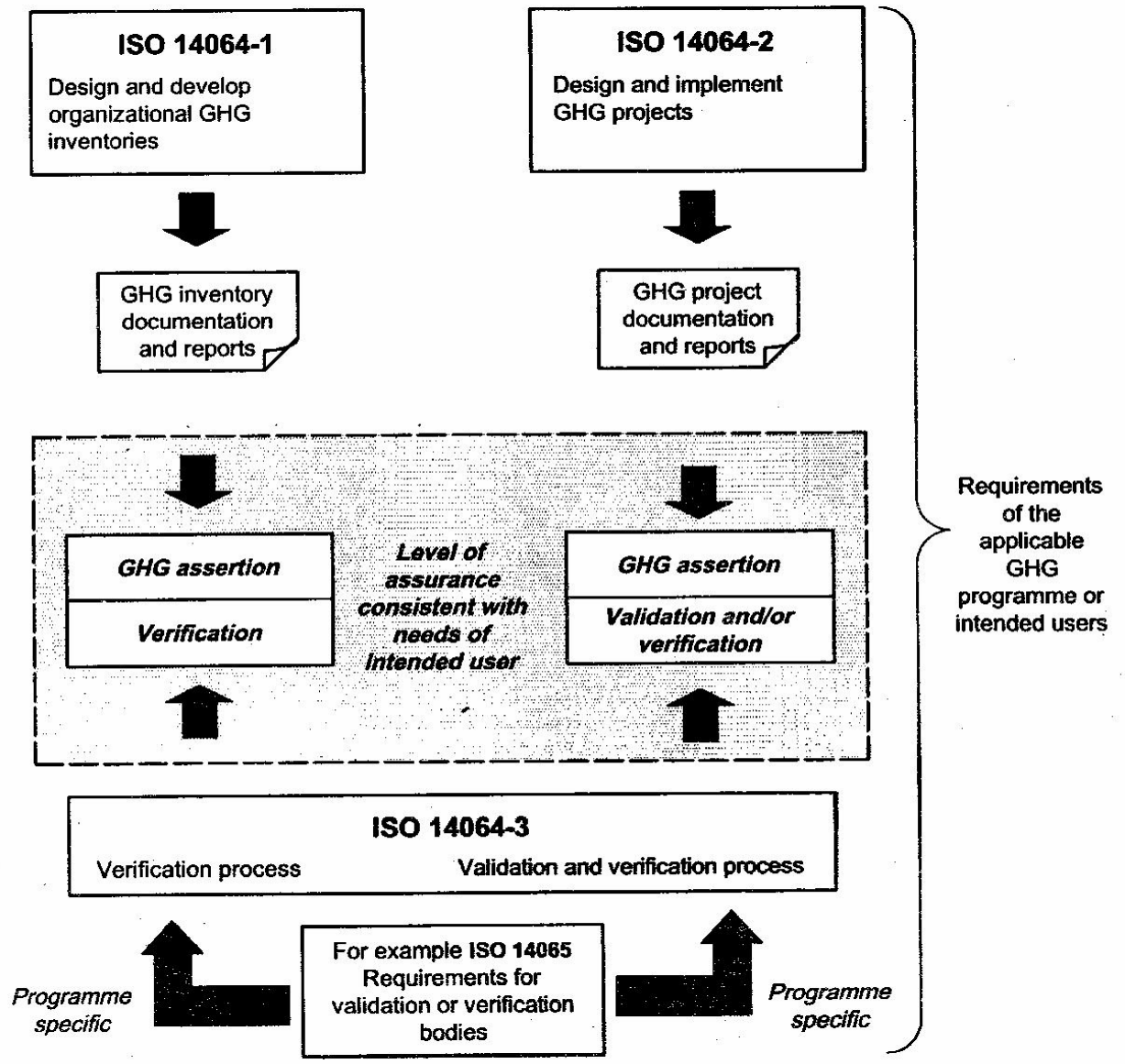

Figure 1 — Relationship between the parts of IS014064

0,3 This part of ISO 14064 provides principles, requirements and guidance for those conducting GHG information validation and verification, !t is intended to be usefui to a broad range of potential users, including:

— 1st, 2nd and 3rd party GHG validators and verifiers;

— organizations and individuals involved in developing and commissioning GHG projects;

— organizations conducting internal audits of their GHG information;

— organizations involved in GHG validator or verifier training;

— voluntary and mandatory GHG programme administrators;

— investor, finance and insurance communities;

— regulators and those involved in the accreditation and conformity assessment of emissions trading and emission or removal offset programs.

0.4 The requirements of this part of ISO 14064 describe a process for providing assurance to intended users that an organization's or project's GHG assertions are complete, accurate, consistent, transparent and without material discrepancies. The processes of validation and verification are similar; however, there are differences in the emphasis of the activities. The process can be applied in two ways: internal and external. Internal applications can use this part of IS014064 as a guideline, whereas external applications can use it as a set of requirements.

The extent of the validation and verification activities depends on

— the level of assurance required,

— needs of the intended user,

— objectives of the validation or verification activities, and

— the validation or verification criteria.

A GHG assertion can be a statement about different aspects of performance, such as the following:

a) quantification of organizational GHG emissions or removals;

b) quantification of project GHG emission reductions or removal enhancements;

c) conformity with the requirements of IS014064-1 or IS014064-2;

d) compliance with the principles and requirements of regulatory regimes or GHG programmes;

e) performance or effectiveness of internal systems and control processes;

f) performance or effectiveness of operational processes.

Clause 3 describes the principles and fundamentals of validation and verification. These will help the user to appreciate the essential nature of validation and verification and they are a necessary prelude to the requirements in Clause 4 for conducting the validation of GHG projects and the verification of organizations or GHG project assertions. These requirements include the establishment of validation or verification objectives, criteria and scope (including the level of assurance required), coordination of validation or verification activities, development of a validation or verification approach of an organization's or GHG project's GHG information, establishment of appropriate sampling regimes for the validation and verification of GHG information, and the testing of the organization's or GHG project's controls. This clause also provides requirements for the drafting and communication of the validation or verification statement.

The guidance contained in the informative Annex A provides additional information for validation and verification under a range of GHG programmes or conditions. Annex A provides guidance on the validation and verification requirements contained in Clause 4, but does not include mandatory requirements.

0.5 Some clauses require users of this part of IS014064 to explain the use of certain approaches or decisions taken. Explanation will generally include documentation of the following:

— How approaches were used or decisions taken.

— Why approaches were chosen or decisions made.

Some clauses require users of this part of ISO 14064 to justify the use of certain approaches or decisions taken. Justification will generally include documentation of the following:

— How approaches were used or decisions taken.

— Why approaches were chosen or decisions made.

— Why alternative approaches were not chosen.

Indian Standard

GREENHOUSE GASES

PART 3 SPECIFICATION WITH GUIDANCE FOR THE VALIDATION AND VAR1F1CATION OF GREENHOUSE GAS ASSERTIONS

1 Scope

This part of ISO 14064 specifies principles and requirements and provides guidance for those conducting or managing the validation and/or verification of greenhouse gas (GHG) assertions. It can be applied to organizational or GHG project quantification, including GHG quantification, monitoring and reporting carried out in accordance with ISO 14064-1 or ISO 14064-2.

This part of ISO 14064 specifies requirements for selecting GHG validators/verifiers, establishing the level of assurance, objectives, criteria and scope, determining the validation/verification approach, assessing GHG data, information, information systems and controls, evaluating GHG assertions and preparing validation/verification statements.

ISO 14064 is GHG programme neutral. If a GHG programme is applicable, requirements of that GHG programme are additional to. the requirements of ISO 14064.

NOTE If a requirement of ISO 14064 prohibits an organization or GHG project proponent from complying with a requirement of the GHG programme, the requirement of the GHG programme takes precedence.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
greenhouse gas
GHG
gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds

NOTE GHGs iicfcjde carbon dioxide (CO_z), methane (CH_4), nitrous oxide (N_20), hydrofluorocarbons (HFCs), perftuorocarbons (PFCs) and sulfur hexafluoride (SF_6).

2.2
greenhouse gas source
physical unit or process that releases a GHG into the atmosphere

2.3
greenhouse gas sink
physical unit or process that removes a GHG from the atmosphere

2.4
greenhouse gas reservoir
physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a greenhouse gas sink (2.3) or a GHG captured from a greenhouse gas source (2.2)

NOTE 1 The total mass of carbon contained in a GHG reservoir at a specified point in time could be referred to as the carbon stock of the reservoir.

NOTE 2 A GHG reservoir can transfer greenhouse gases to another GHG reservoir.

NOTE 3 The collection of a GHG from a GHG source before it enters the atmosphere and storage of the collected GHG in a GHG reservoir could be referred to as GHG capture and storage.

2.5
greenhouse gas emission
total mass of a GHG released to the atmosphere over a specified period of time

2.6
greenhouse gas removal
total mass of a GHG removed from the atmosphere over a specified period of time

2.7
greenhouse gas emission reduction
calculated decrease of GHG emissions between a baseline scenario (2.21) and the project

2.8
greenhouse gas removal enhancement
calculated increase of GHG removals between a baseline scenario (2.21) and the project

2.9
greenhouse gas emission or removal factor
factor relating activity data to GHG emissions or removals

NOTE A greenhouse gas emission or removal factor could include an oxidation component.

2.10
greenhouse gas activity data
quantitative measure of activity that results in a GHG emission or removal

NOTE Examples of GHG activity data include the amount of energy, fuels or electricity consumed, material produced, service provided or area of land affected.

2.11
greenhouse gas assertion
declaration or factual and objective statement made by the responsible party (2.24)

NOTE 1 The GHG assertion could be presented at a point in time or could cover a period of time.

NOTE 2 The GHG assertion provided by the responsible party should be clearly identifiable, capable of consistent evaluation or measurement against suitable criteria by a validator (2.35) or verifier (2.37).

NOTE 3 The GHG assertion could be provided in the form of a greenhouse gas report (2.17) or GHG project plan.

2.12
greenhouse gas information system
policies, processes and procedures to establish, manage and maintain GHG information

2.13
greenhouse gas inventory
an organization's greenhouse gas sources (2.2), greenhouse gas sinks (2.3), GHG emissions and removals

2.14
greenhouse gas project
activity or activities that alter the conditions identified in the baseline scenario (2.21) which cause greenhouse gas emission reductions (2.7) or greenhouse gas removal enhancements (2.8)

2.15
greenhouse gas project proponent
individual or organization that has overall control and responsibility for a greenhouse gas project (2.14)

2.16
greenhouse gas programme
voluntary or mandatory international, national or sub-national system or scheme that registers, accounts or manages GHG emissions, removals, greenhouse gas emission reductions (2.7) or greenhouse gas removal enhancements (2.8) outside the organization or GHG project

2.17
greenhouse gas report
stand-alone document intended to communicate an organization's or project's GHG-related information to its intended users (2.26)

NOTE A GHG report can include a greenhouse gas assertion (2.11).

2.18
global warming potential
GWP
factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period of time

2.19
carbon dioxide equivalent
$C0_2e$
unit for comparing the radiative forcing of a GHG to carbon dioxide

NOTE The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential (2.18).

2.20
base year
historical period specified for the purpose of comparing GHG emissions or removals or other GHG-related information over time

NOTE Base-year emissions or removals may be quantified based on a specific period (e.g. a year) or averaged from several periods (e.g. several years).

2.21
baseline scenario
hypothetical reference case that best represents the conditions most likely to occur in the absence of a proposed greenhouse gas project (2.14)

NOTE The baseline scenario concurs with the GHG project timeline.

2.22
facility
single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

2.23
organization
company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

2.24
responsible party
person or persons responsible for the provision of the greenhouse gas assertion (2.11) and the supporting GHG information

NOTE The responsible party can be either individuals or representatives of an organization or project and can be the party who engages the validator (2.35) or verifier (2.37). The validator or verifier may be engaged by the client or by other parties, such as the GHG programme administrator.

2.25
stakeholder
individual or organization that is affected by the development or implementation of a greenhouse gas project (2.14)

2.26
intended user
individual or organization identified by those reporting GHG-related information as being the one who relies on that information to make decisions

NOTE The intended user could be the client (2.27), the responsible party (2.24), GHG programme administrators, regulators, the financial community or other affected stakeholders (2.25), such as locaf communities, government departments or non-governmental organizations.

2.27
client
organization or person requesting validation (2.32) or verification (2.36)

NOTE The client could be the responsible party (2.24), the GHG programme administrator or other stakeholder (2.25)

2.28
level of assurance
degree of assurance the intended user (2.26) requires in a validation (2.32) or verification (2.36)

NOTE 1 The level of assurance is used to determine the depth of detail that a validator or verifier designs into their validation or verification plan to determine if there are any material errors, omissions or misrepresentations.

NOTE 2 There are two levels of assurance, reasonable or limited, which result in differently worded validation or verification statements. Refer to A.2.3.2 for examples of validation and verification statements.

2.29
materiality
concept that individual or the aggregation of errors, omissions and misrepresentations could affect the greenhouse gas assertion (2.11) and could influence the intended users' (2.26) decisions

NOTE 1 The concept of materiality is used when designing the validation or verification and sampling plans to determine the type of substantive processes used to minimize risk that the validator or verifier will not detect a material discrepancy (2.30) (detection risk).

NOTE 2 The concept of materiality is used to identify information that, if omitted or mis-stated, would significantly misrepresent a GHG assertion to intended users, thereby influencing their conclusions. Acceptable materiality is determined by the validator, verifier or GHG programme based on the agreed level of assurance. See A.2.3.8 for further explanation of this relationship.

2.30
material discrepancy
individual or the aggregate of actual errors, omissions and misrepresentations in the greenhouse gas assertion (2,11) that could affect the decisions of the intended users (2.26)

2,31
monitoring
continuous or periodic assessment of GHG emissions and removals or other GHG-related data

2.32
validation
systematic, independent and documented process for the evaluation of a greenhouse gas assertion (2.11) in a GHG project plan against agreed validation criteria (2.33)

NOTE 1 In some cases, such as in first-party validations, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

NOTE 2 The content of a GHG project plan is described in IS014064-2:2006,5.2.

2.33
validation criteria
verification criteria
policy, procedure or requirement used as a reference against which evidence is compared

NOTE Validation or verification criteria may be established by governments, GHG programmes, voluntary reporting initiatives, standards or good practice guidance.

2.34
validation statement
verification statement
formal written declaration to the intended user (2.26) that provides assurance on the statements in the responsible party's greenhouse gas assertion (2.11)

NOTE Declaration by the validator or verifier can cover claimed GHG emissions, removals, emission reductions or removal enhancements.

2.35
validator
competent and independent person or persons with responsibility for performing and reporting on the results of a validation

NOTE This term can be used to refer to a validation body.

2.36
verification
systematic, independent and documented process for the evaluation of a greenhouse gas assertion (2.11) against agreed verification criteria verification criteria (2.33)

NOTE In some cases, such as in first-party verifications, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

2.37
verifier
competent and independent person, or persons, with responsibility for performing and reporting on the verification process

NOTE This term can be used to refer to a verification body.

2.38
uncertainty
parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to tie quantified amount

NOTE Uncertainty information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.

3 Principles

3.1 General

The application of principles is fundamental to validation and verification. The principles are the basis for, and will guide the application of, requirement ii Iris part of IS0 14064.

3.2 Independence

Remain independent of the activity being validated or verified, and free from bias and conflict of interest. Maintain objectivity throughout the validation or verification to ensure that the findings and conclusions will be based on objective evidence generated during the validation or verification.

3.3 Ethical conduct

Demonstrate ethical conduct through trust, integrity, confidentiality and discretion throughout the validation or verification process.

3.4 Fair presentation

Reflect truthfully and accurately validation or verification activities, findings, conclusions and reports. Report significant obstacles encountered during the validation or verification process, as welt as unresolved, diverging opinions among validators or verifiers, the responsible party and the client.

3.5 Due professional care

Exercise due professional care and judgment in accordance with the importance of the task performed and the confidence placed by clients and intended users. Have the necessary skills and competences to undertake the validation or verification.

NOTE The principles of independence, ethical conduct, fair presentation and due professional care are derived from IS019011 and have been adapted to reflect the context of this part of IS014064.

4 Validation and verification requirements

4.1 Validators or verifiers

The validator or verifier selected to perform the validation and verification activities

a) shall demonstrate competence and due professional care consistent with their roles and responsibilities;

b) shall be independent;

c) shall avoid any actual or potential conflicts of interest with the responsible party and the intended users of the QHG information;

d) shall demonstrate ethical conduct throughout the validation and verification;

e) shall reflect truthfully and accurately validation and verification activities, conclusion and reports;

f) shall meet the requirements of the standards or the GHG programme to which the responsible party subscribes,

NOTE Further genera! guidance on appropriate knowledge, skills and competencies for validators and verifiers is provided in A.2.2. ISO 14065 gives requirements for third-party validators or verifiers.

4.2 Validation and verification process

The process for completing a validation or verification of GHG information based on Clause 4 requirements is shown in Figure 2. Additional guidance on Clause 4 requirements is provided in Annex A.

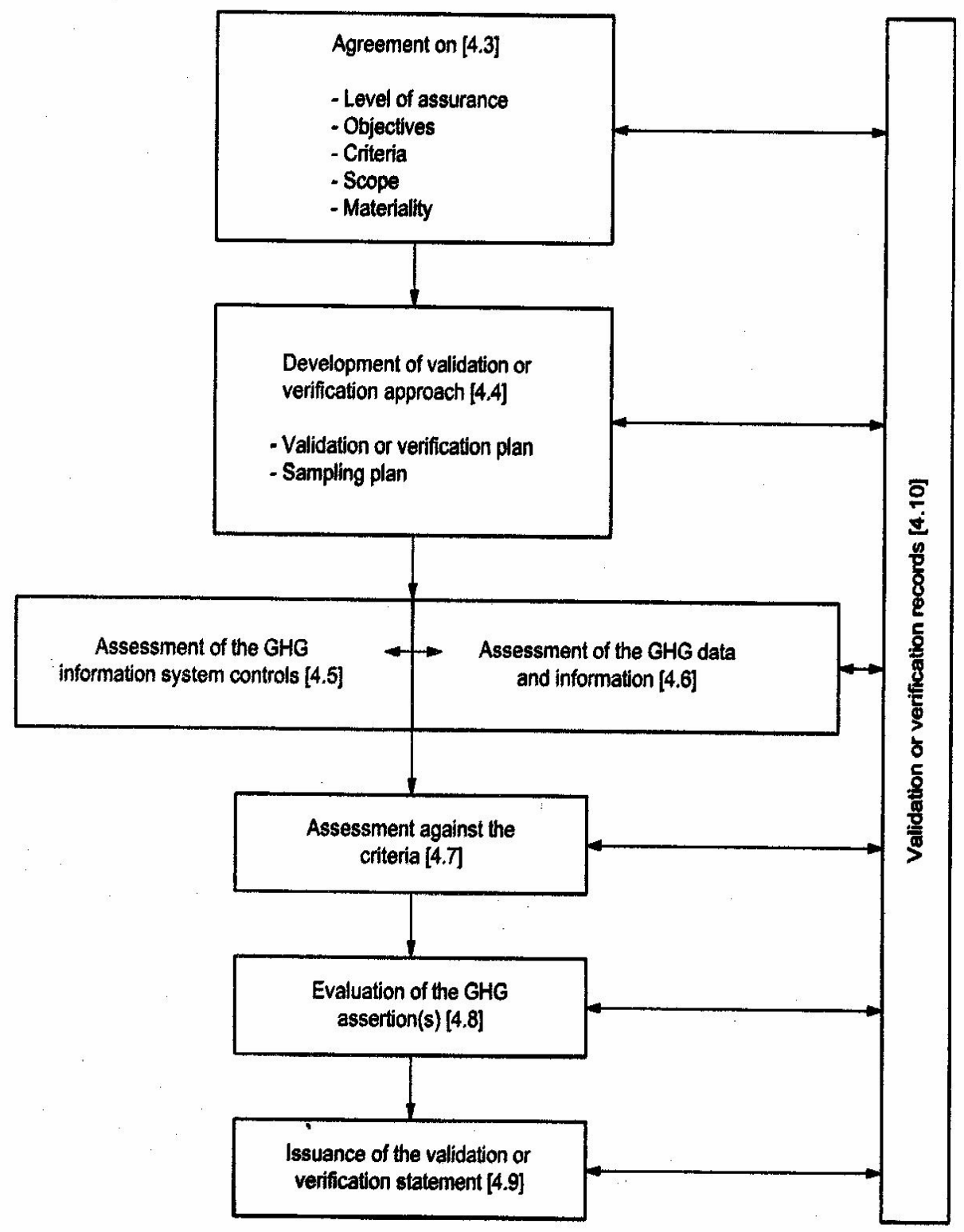

Figure 2 -- Validation and verification process

4.3 Level of assurance, objectives, criteria and scope of the validation or verification

4.3.1 Level of assurance

The level of assurance of the validation or verification shall be agreed with the client at the beginning of the validation or verification process.

4.3.2 Objectives

The validator and client shall agree on the validation objectives at the beginning of the validation process.

In the validation of GHG projects, validation objectives shall include an assessment of the likelihood that implementation of the planned GHG project will result in the GHG emission reductions and/or removal enhancements as stated by the responsible party.

The verifier and client shall agree on the verification objectives at the beginning of the verification process.

4.3.3 Criteria

The validator or verifier and client shall agree on the criteria of the validation or verification at the beginning of the validation or verification process. In agreeing to the criteria, the principles of the standards or GHG programme to which the responsible party subscribes shall be applied.

NOTE Validation or verification criteria may include those given in IS014064-1 or IS014064-2,

4.3.4 Scope

The validator or verifier and client shall agree on the validation or verification scope at the beginning of the validation or verification process. The validation and verification scope, as a minimum, shall include the following:

a) organizational boundaries or the GHG project and its baseline scenarios;

b) physical infrastructure, activities, technologies and processes of the organization or GHG project;

c) GHG sources, sinks and/or reservoirs;

d) types of GHGs;

e) time period(s).

4.3.5 Materiality

The validator or verifier shall establish the materiality required by the intended users, considering validation or verification objectives, level of assurance, criteria and scope.

4.4 Validation or verification approach

4.4.1 General

The validator or verifier shall conduct a review of the organization's or project's GHG information to assess

— the nature, scale and complexity of the validation or verification activity to be undertaken on the client's behalf,

— confidence in the responsible party's GHG information and assertion,

— completeness of the responsible, party's GHG information and assertion, and

— the eligibility of the responsible party to participate in the GHG programme, if applicable.

If the information supplied by the responsible party is not sufficient to conduct a review of the Organization's or project's GHG information, the validator or verifier shall not proceed with the validation or verification.

The validator or verifier shall assess sources and the magnitude of potential errors, omissions and misrepresentations for further validation or verification activities. The categories of potential errors, omissions and misrepresentations assessed shall be the following:

a) the inherent risk of a material discrepancy occurring;

b) the risk that the controls of the organization or GHG project will not prevent or detect a material discrepancy;

c) the risk that the validator or verifier will not detect any material discrepancy that has not been corrected by the controls of the organization or GHG project.

4.4.2 Validation or verification plan

The validator or verifier shall develop a documented validation or verification plan that addresses, as a minimum, the following:

a) level of assurance;

b) validation or verification objectives;

c) validation or verification criteria;

d) validation or verification scope;

e) materiality;

f) validation or verification activities and schedules.

The validation or verification plan shall be revised as necessary during the course of the validation or verification process. The validator or verifier shall communicate the validation or verification plan to the client and the responsible party.

4.4.3 Sampling plan

The validator or verifier shall develop a sampling plan to take account of the following:

a) level of assurance agreed with the client;

b) validation or verification scope;

c) validation or verification criteria;

d) amount and type of evidence (qualitative and quantitative) necessary to achieve the agreed level of assurance;

e) methodologies for determining representative samples;

f) risks of potential errors, omissions or misrepresentations.

The sampling plan shall be amended, when necessary, based on any new risks or material concerns that could potentially lead to errors, omissions and misrepresentations that are identified throughout the validation or verification process.

The validator or verifier shall use the sampling plan as an input to develop the validation or verification plan.

4.5 Assessment of the GHG information system and Its controls

The validator or verifier shall assess the organization or project's GHG information system and its controls for sources of potential errors, omissions and misrepresentations, taking the following into consideration:

a) selection and management of the GHG data and information;

b) processes for collecting, processing, consolidating and reporting GHG data and information;

NOTE Some GHG programmes require certification by a verifier of the GHG performance achieved by the organization or GHG project over a specified period of time.

4.10 Validation or verification records

The validator or **verifier shall** maintain records, as necessary, to demonstrate conformity to the requirements of this part of ISO 14064. Records pertaining to the validation or verification shall be retained or destroyed on agreement between the participating parties and in accordance with the validation or verification plan and any applicable GHG programme and contractual requirements.

4.11 Facts discovered after the validation or verification

The validator or verifier shall obtain sufficient evidence and identify relevant information up to the date of the validation or verification statement, if facts that could materially affect the validation or verification statement are discovered after this date, the validator or verifier shall consider appropriate action.

Annex A
(informative)

Guidance for use of this part of ISO 14064

A.1 General

This annex provides guidance on the validation and verification requirements contained in this part of ISO 14064. it is informative and does not include mandatory requirements.

A.2 Guidance on validation and verification requirements

A.2.1 General

Validation and verification occurs when an impartial validator or verifier objectively evaluates a GHG assertion that has been made by a responsible party (typically the management of an organization or GHG project) against identified and suitable criteria. The validator or verifier then expresses a conclusion that provides the intended user with an agreed level of assurance that the GHG assertion contains no material errors, omissions or misrepresentations.

a) The client provides the validator or verifier with sufficient information in order for the validator or verifier to determine whether they are capable and competent to conduct the work. The client commissions the validator or verifier to undertake the validation or verification.

b) The organization or GHG project proponent (the responsible party) is responsible for making the GHG assertion and providing it to the objective validator or verifier, together with any information required to support the GHG assertion.

c) The validator or verifier produces findings and conclusions in the form of a validation report or validation or verification statement, which is distributed to those parties specified in the contract with the client.

d) The intended user of the information could be the client, the responsible party, GHG programme administrators, regulators, the financial community or other affected stakeholders (such as local communities, government departments or non-governmental organizations).

Figure A.1 shows validation and verification roles and responsibilities.

A.2.2 Validator or verifier

A.2,2.1 General

The validator or verifier ensures the overall competence of the validation or verification team by

a) confirming that the validator or verifier is accredited to operate under any GHG programme included within the objectives, scope and criteria of the validation or verification, where this is a requirement of the GHG programme,

b) identifying the knowledge, skills and competence needed to achieve the objectives of the validation or verification, and

c) selecting a team leader and team members representing necessary knowledge, skills and competences.

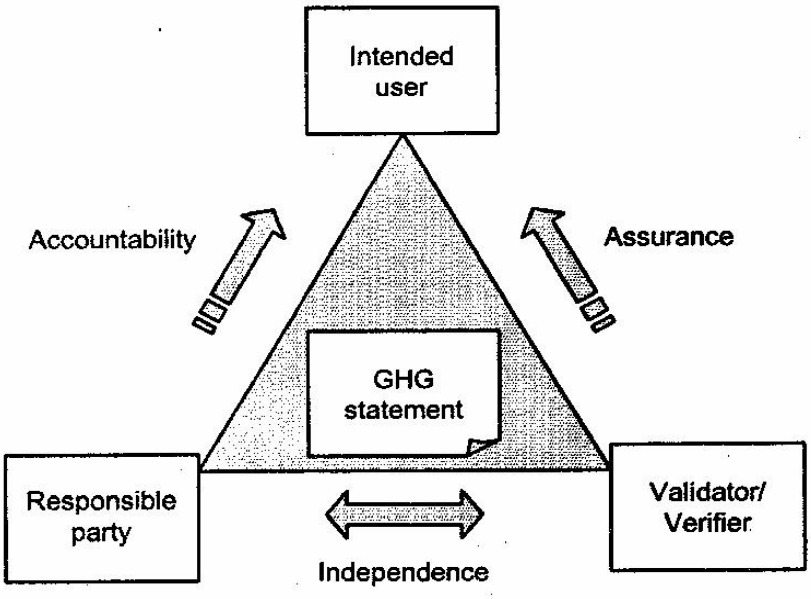

Figure A.1 — Roles and responsibilities

A.2.2.2 Personal attributes of validators and verifiers

Validation or verification team members should possess personal attributes to enable them to act in accordance with the principles of validation or verification described in Clause 3.

NOTE The personal attributes of auditors described in ISO 19011:2002, 7.2, can also apply to validators and verifiers.

A.2.2.3 Requirements for the composite knowledge and skills of the validation or verification team

The validation or verification team should consist of one team leader and an appropriate combination of validators or verifiers and/or independent experts, as appropriate to the agreed scope of the validation or verification.

Collectively, the validation or verification team members involved in the validation or verification should be familiar with the following:

a) the legal rules under which the validation or verification is being undertaken (e.g. the parameters of any legal documents or contracts agreed between the GHG programme administrators and the responsible party);

b) any specific principles or requirements of the standards or GHG programme that fall within the scope of the validation or verification;

c) any accreditation requirements incumbent on the validators or verifiers conducting the work;

d) the processes that generate GHG emissions, and the technical issues associated with their quantification, monitoring and reporting;

e) the biological systems that affect GHGs removals, and the technical issues associated with their quantification, monitoring and reporting;

f) GHG emission or emission reduction quantification, monitoring and reporting methodologies used by the organization or GHG project;

g) where applicable, determination of organizational boundaries or the GHG project and its baseline scenarios and confirmation of the GHG project plan;

h) GHG removal or removal enhancement quantification, monitoring and reporting methodologies used by the organization or GHG project;

i) auditing of GHG data and information and data sampling methodologies, including the level of assurance, materiality and validation or verification plan;

j) risk assessment methodologies;

k) the validation or verification body's procedures {administrative and otherwise) for the performance of the validation **or** verification work.

At least one validation or verification team member should have detailed knowledge of each of the above areas based on relevant working experience.

In addition to the above, the validation or verification team collectively should have experience, training and up-to-date knowledge of

— the activities required to identify failures in GHG reporting systems and their impact on the organization or GHG project's GHG assertion,

— the sources and types of GHG sources, sinks or reservoirs selected by the organization or GHG project,

— the GHG quantification methodologies to be used by the organization or GHG project,

— other competences specific to the GHG programme (e.g. political and legal expertise for GHG projects under the Kyoto Protocol), and

— current best practice in the field.

Persons responsible for managing the work of validators and verifiers should consult ISO 14065:—[1)], Clause 7, for general guidance on evaluating the competence of validators and verifiers.

A.2.2.4 Use of experts

If not fully represented by the validation or verification team, the necessary knowledge, skills and competences may be provided by independent experts. Experts should operate under the direction of the team leader. Experts may be used as validation or verification team members, especially when they are providing expertise in the area of data auditing.

in evaluating an expert for a particular validation or verification, the validator or verifier should consider

a) the expert's expertise, competence and integrity,

b) the relevance of the experts expertise to the objective of the validation or verification, and

c) the expert's objectivity and appropriate degree of independence in relation to the GHG programme requirements.

The validator or verifier should be satisfied that there is appropriate understanding between the validator or verifier and the expert on their respective roles and responsibilities.

A.2.2.5 Internal peer review

Current best practice includes the appointment of an internal objective peer reviewer at the same time as the appointment of the validation or verification team leader, in order to provide evaluation of the validation or verification process and outcomes. Best practice also indicates that validation and verification risk can be z significantly reduced through the appointment of an objective peer reviewer, who assesses the work of the team leader and the validation or verification team from the initial contact with the client to the. completion of the validation or verification process.

1) To be published.

A.2.3 Level of assurance, objectives, criteria and scope of the validation or verification

A.2.3.1 General

The objective of the validation or verification is to enable the validator or verifier to issue a validation or verification statement on whether the GHG assertion is without material discrepancy.

4.2.3,2 Level of assurance

At the beginning of a validation or verification process related to a project's or an organization's GHG assertion, the level of assurance sought by the client is established taking account of the needs of the intended user. The level of assurance dictates the relative degree of confidence the validator or verifier requires in order to make a conclusion. Absolute assurance is not attainable because of factors such as the use of judgement, use of testing, inherent limitations of control and the qualitative nature of some types of evidence. The validator or verifier assesses the evidence collected and expresses a conclusion in the validation or verification statement.

In general, there are two levels of assurance

— "reasonable assurance engagements", and

— "limited assurance engagements".

For a reasonable level of assurance, the validator or verifier provides a reasonable, but not absolute, level of assurance that the responsible party's GHG assertion is materially correct.

EXAMPLE 1 A validation or verification statement expressing a reasonable level of assurance could be worded as follows.

Based on ihe process and procedures conducted, the GHG assertion

— is materially correct and is a fair representation of the GHG data and information, and

— is prepared in accordance with the related International Standard on GHG quantification, monitoring and reporting, or to relevant national standards or practices.

A limited level assurance is distinguishable from a reasonable level assurance in that there is less emphasis on detailed testing of GHG data and information supplied to support the GHG assertion. For limited level assurance, it is essential that the validator or verifier do not lead the intended user to believe that a reasonable level of assurance is being provided.

EXAMPLE 2 A validation or verification statement expressing a limited level of assurance could be worded as follows.

Based on the process and procedures conducted, there is no evidence that the GHG assertion

— is not materially correct and is not a fair representation of GHG data and information, and

— has not been prepared in accordance with the related International Standard on GHG quantification, monitoring and reporting, or to relevant national standards or practices.

Assistance with compilation of the responsible party's GHG assertion on GHG information is considered to be a breach of independence and the validator or verifier should not issue assurance of any kind.

The level of assurance needed should be dictated by the GHG programme and should consider the required materiality.

NOTE For guidance on qualifying a validation or verification statement, see A.2.9.2.

A.2.3.3 Objectives: GHG project validation

The validator, in agreeing to validation objectives with the client, should take account of the following:

a) conformance with applicable validation criteria, including the principles and requirements of relevant standards or GHG programmes within the scope of validation;

b) the establishment, justification and documentation of the GHG project plan;

c) the GHG project's planned controls.

The validator should assess the probability that implementation of the planned GHG project will result in the GHG emission reductions or removal enhancements as stated or claimed by the responsible party.

A.2.3.4 Objectives: GHG project verification

The verifier, in agreeing to verification objectives with the client, should take account of the following:

a) conformance with applicable verification criteria, including the principles and requirements of relevant standards or GHG programmes within the scope of the verification;

b) GHG project planning information and documentation, including the project, baseline, quality assurance and control, risk management, monitoring and reporting procedures and criteria;

c) any significant changes to the GHG project procedures or criteria since the last reporting period, or since the project validation;

d) reported GHG project and baseline emissions, removals, emission reductions and removal enhancements;

e) any significant changes in the GHG project and baseline emissions, removals, emission reductions and removal enhancements since the East reporting period, or since the project validation;

f) the GHG project's actual controls.

A.2.3.5 Objectives: Organizational GHG verification

The verifier, in agreeing to verification objectives with the client, should take account of the following:

a) conformance with applicable verification criteria, including the principles and requirements of relevant standards or GHG programmes, within the scope of the verification;

b) the organization's GHG inventory of GHG emissions and removals;

c) any significant changes in the organization's GHG inventory since the last reporting period;

d) the organization's GHG-related controls.

A.2.3.6 Validation or verification criteria

Several parties may set validation or verification criteria. In some cases these include

a) governments who set specific GHG performance criteria as part of national or regional regulatory requirements,

b) GHG programmes, including GHG emission trading programmes, which contain criteria as part of their eligibility or programme entry requirements,

c) voluntary reporting initiatives that set criteria as part of their participation or programme entry requirements, and

d) other relevant standard or protocol development organizations which set criteria.

A.2.3.7 Validation or verification scope

In determining the validation or verification scope, the validator or verifier should consider the extent and boundaries of the validation or verification process, including

a) the organization or the GHG project and its baseline scenarios, including legal, financial, operational and geographic boundaries,

. b) the physical infrastructure, activities, technologies and processes of the organization or GHG project,

c) GHG sources, sinks or reservoirs to be included,

d) types of GHG to be included,

e) the time period(s) to be covered,

f) the frequency of any subsequent verification processes required during the GHG project or organization's GHG programme,

g) the timing and intended user for the validation report and the validation or verification statement, and

h) the relative size (in $C0_2e$) of the GHG project or GHG inventory.

A.2.3.8 Materiality

The objective of any validation or verification of GHG information is to enable the validation or verification body to express an opinion on whether the organization's or GHG project's GHG assertion is prepared, in all material respects, in accordance with the intent of its internal GHG programmes or any GHG programme to which they subscribe. The assessment of what is material is a matter of professional judgement. The concept of materiality recognizes that some matters, either individually or in the aggregate form, are important if the responsible party's GHG assertion is to be presented fairly *in* accordance with internal requirements or that of the GHG programme to which it subscribes.

A discrepancy, or the aggregate of all discrepancies, in a GHG assertion is considered to be material if, in the context of surrounding circumstances, it is probable that the decision of a person who is relying on the GHG assertion, and who has a reasonable knowledge of business and GHG activities (the intended user), would be changed or influenced by such a discrepancy or the aggregate of all discrepancies.

Although the validator or verifier is required to determine materiality based on his or her perception of the needs of intended users of the information, it is extremely difficult to predict with certainty who those users will be or, indeed, the specific needs of known users. In some cases, the end user should be consulted on the materiality, otherwise the materiality decision becomes a matter for the validator's or verifier's professional judgement. The acceptable materiality is determined by the validator or verifier of the GHG programme, based on the agreed level of assurance ~~ a higher agreed level of assurance generally implies a lower materiality.

In order to ensure consistency and avoid unanticipated discrimination, some GHG programmes or internal programmes assist this decision-making process by including materiality thresholds. This can be defined at the overall level, such as 5 % of an organization's or GHG project's GHG emissions. It can also include varying thresholds depending on the level of disaggregation, such as 5 % at the gross organizational level, 7 % at the facility level, and 10 % at the GHG source level. Furthermore, a series of discrete errors or omissions identified within a particular disaggregation level (individually less than the materiality threshold) can, when taken together, exceed the threshold and can thus be considered material. Identified omissions or errors that represent amounts greater than the stipulated threshold are predetermined as being a "material discrepancy", that is, a nonconformity.

The determination of materiality involves qualitative as well as quantitative considerations. As a result of the interaction of these considerations, discrepancies of relatively small amounts can have a material effect on the GHG assertion.

A.2.4 Validation or verification approach

A.2.4.1 General

The validator or verifier's review process is the basis for validation and verification planning and provides the first real opportunity for the validation or verification team to assess the completeness, consistency, accuracy and transparency of the responsible party's GHG information and GHG assertion. This review should include an assessment of sources of actual and potential errors, omissions and misrepresentations and the associated level of risk that they are likely to give rise to materiality issues in the responsible party's GHG information and GHG assertion.

Inverse relationships among inherent, control and detection risks should be used to determine the nature, extent and timing of the sample design and substantive procedures.

A.2.4.2 Validation or verification plan: Validation of GHG projects

The review for the validation of GHG projects should include the following information and documentation:

a) the responsible party's GHG assertion;

b) principles and requirements of standards or GHG programmes to be met by the GHG project, including any predetermined quantitative requirements, such as materiality thresholds or performance targets;

c) the GHG project plan or documentation;

d) processes for identifying, selecting and justifying baselines;

e) operational and control procedures to be implemented by the responsible party to ensure the quality, integrity and security of its GHG information;

f) any language, cultural or social issues that could affect the execution of an effective validation.

A.2.4.3 Validation or verification plan: Verification of GHG projects

The review for the verification of GHG projects should include the following information and documentation:

a) the responsible party's GHG assertion and any related previous assertion;

b) principles and requirements of standards or GHG programmes to be met by the GHG project, including any predetermined quantitative requirements, such as materiality thresholds or performance targets;

c) the GHG project plan or documentation;

d) significant changes to the GHG project plan or documentation since the fast verification period or since the validation, including any changes to legal, financial, operational or geographic boundaries;

e) the GHG project validation report and statement, including the level of assurance provided;

f) previous validation reports and statements, verification statements or certifications;

g) the GHG project report or GHG information;

h) operational and control procedures implemented by the responsible party to ensure the quality, integrity and security of its GHG information;

i) GHG information management system processes used to gather, collate, transfer, process, analyse, correct or adjust, aggregate (or disaggregate) and store the responsible party's GHG information;

j) processes used to gather and review any documentation that supports the GHG information provided;

k) evidence of any changes introduced as a result of recommendations from previous validations or verifications;

l) any language, cultural or social issues that could affect the execution of an effective verification;

m) reports containing statements on project GHG emissions, removals, emission reductions or removal enhancements related to the responsible party's GHG assertion.

A.2.4.4 Validation or verification plan: Verification of organizational GHG information

The review for the verification of organizational GHG information should include the following information and documentation:

a) the organization's GHG assertion and any related previous assertion;

b) principles and requirements of standards or GHG programmes to be met by the organization, including any predetermined quantitative requirements, such as materiality thresholds or performance targets;

c) previous verification reports, statements or certificates;

d) significant changes to organizational or operational boundaries since the last verification period, including any changes to legal, financial, operational or geographic boundaries;

e) the organization's GHG inventory or GHG information:

f) operational and control procedures implemented by the organization to ensure the quality, integrity and security of its GHG information;

g) GHG information management system processes used to gather, collate, transfer, process, analyse, correct or adjust, aggregate {or disaggregate) and store the organization's GHG information;

h) processes used to gather and review any documentation that supports the GHG information provided;

i) evidence of any changes introduced as a result of recommendations from previous verifications;

j) any language, cultural or social issues that could affect the execution of an effective verification;

k) reports containing statements on GHG emissions or removals related to the organization's GHG assertion.

A.2.4.5 Developing a validation or verification plan

A.2.4.5.1 The extent of validation or verification planning varies according to

a) the size or complexity of the organization or GHG project,

b) the validation or verification team's experience and knowledge of the organization or GHG project,

c) the complexity of the validation or verification,

d) the industrial sector, and

e) the technology or processes used.

A.2.4.5.2 The process of designing the validation *or* verification plan consists of

a) an assessment cf the preliminary findings to understand the root causes of any identified or potential GHG information errors, omissions, materiality issues or failures and weaknesses in controls,

b) reference and consideration of any previous validation or verifications, and/or comparable validations or verifications of similar organizations or GHG projects,

c) the sample plan, including the rationale behind the approach being taken,

d) identification of the types of potential material discrepancies that could occur in the GHG assertion;

e) consideration of risks that could cause material discrepancies,

f) design of appropriate methodologies to test whether material discrepancies have occurred or whether errors or omissions have been made, and

-. g) amendment of the validation or verification plan throughout the validation or verification process to take account for any new evidence relating to actual or potential errors, omissions, materiality issues and the prevailing performance of the controls.

The risks considered in the validation or verification plan are

— inherent risk,

— control risk, and

— detection risk.

A.2.4.5.3 Matters to be considered by the validation or verification team in developing the overall validation or verification plan should include findings from the review and the following.

a) The validator or verifier's knowledge of the responsible party's business, including

   — the industry conditions affecting the organization's or GHG project's reporting of GHG emissions, removals, emission reductions or removal enhancements and levels of disclosure,

   — the characteristics of the organization or GHG project, its business, its GHG performance and its GHG reporting requirements, including changes since the validation or the previous verification period;

   — external reporting requirements for GHG information,

   — the robustness and maturity of the prevailing controls, and

   — the general level of competence of the organization's or GHG project's management and those responsible for the gathering, transferring, processing, analysing, aggregating, disaggregating, storing and reporting of the GHG information that supports the GHG assertion.

b) Understanding the GHG information collection and internal control systems, including

   — the validation or verification body's cumulative knowledge of a range of different GHG information collection and internal control systems and the relative emphasis expected to be placed on tests of control and substantive procedures according to the approach taken by the responsible party.

c) The sample plan, based on

   — assessment of inherent and control risks, and the potential for detection risks to occur,

   — setting of materiality levels for reporting purposes,

   — the possibility of material discrepancy, including the experience of past periods,

   — identification of complex GHG quantification requirements (e.g. where the use of complicated conversion factors or methodologies are likely to lead to variability in GHG information by the organization or GHG project), and

   — determining access to, and availability of, relevant, recognized and up-to-date external emissions factors.

d) Coordination, direction, supervision and review, including

   — the number of validation or verification components (e.g. the number of facilities, GHGs, manufacturing processes, controls, computer information systems, subsidiaries, branches and divisions),

   — the involvement of experts and the importance of their contribution to the overall validation or verification process,

   — the number, roles and responsibilities of team members, and

   — the number of different disciplines and/or competencies required to undertake an effective validation or verification process.

e) Other matters, including

   — conditions requiring special attention, such as the existence of third parties, joint ventures or outsourcing arrangements,

   — the terms of the contract with the client (e.g. timescales for delivery) and any responsibilities and competency requirements for the GHG programme,

— the nature and timing of reports or other communications with the client, the responsible parties or the intended users of the information, including the administrators of any GHG programmes to which they subscribe, and

— the frequency with which the validation or verification should be conducted to satisfy internal client requirements, the needs of regulators and other stakeholders and any GHG programmes to which the organization or GHG project subscribes.

A.2.4.5.4 The validation or verification team leader should ensure effective communication with the client's management and/or, where appropriate, those responsible for the GHG inventory or GHG project in order

— to confirm the validation or verification plan, including the objectives, scope and criteria of the validation or verification,

— to describe to the client how validation or verification activities will be undertaken,

— to confirm communication channels, and

— to provide an opportunity for the client to ask questions.

NOTE In verification situations, an opening meeting is often used for this communication.

A.2.4.6 Sampling plan

A.2.4.6.1 It is generally inefficient to assess all GHG information collected by the organization or GHG project, therefore a risk-based approach should be used to determine the sampling plan for the collection of adequate evidence to support the expected level of assurance. Typical steps in a risk-based approach are shown in Figure A.2.

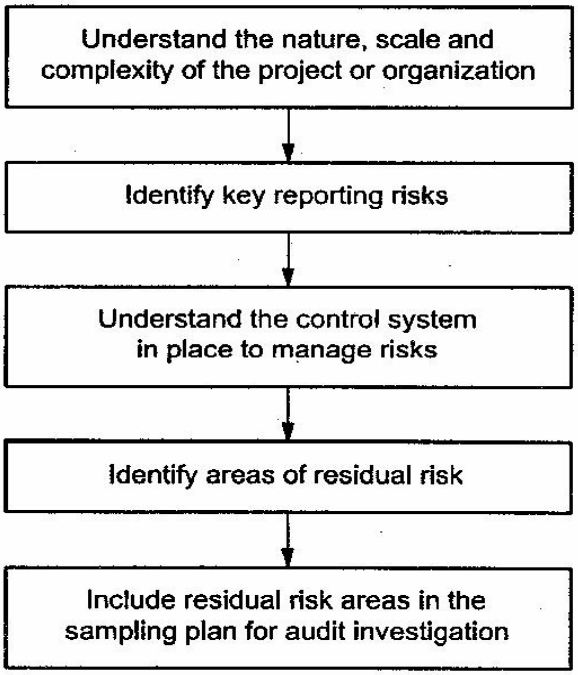

Figure A.2 — Risk-based approach to developing a sampling plan

A.2.4.6.2 Examples of reporting and control risks include the following:

a) incompleteness: for example, exclusion of significant sources, incorrectly defined boundaries, leakage effects;

b) inaccuracy: for example, double counting, significant manual transfer of key data, inappropriate use of emission factors;

c) inconsistency: for example, not documenting methodological changes in calculating GHG emissions or removals from those used in previous years;

d) data management and control weaknesses: for example, insufficient checking of manual transfers of data from the point of origin and between calculation spreadsheets, no internal audit or review process, Inconsistent monitoring, no calibration and maintenance of key process parameters/measurements.

EXAMPLE The risk-based approach for validation should identify the key risks associated with the assumptions made and GHG information used within

— the project design,

— baseline determination (e.g. scenario, methodology, estimation),

— project and baseline GHG quantification procedures,

— estimates of GHG emission reductions or removal enhancements,

— permanence of storage in GHG reservoirs,

— quality and monitoring plans or procedures, and

— environmental impact analysis (if applicable).

A.2.4.6.3 The two main sources for uncertainties in estimating GHG emission reductions or removal enhancements from GHG projects are normally the following.

a) Baseline uncertainty: There are uncertainties associated with the assumptions used in the development of baseline scenarios, particularly when projecting a set of circumstances that are possibly not likely to occur (e.g. baseline technoiogy/fuel, performance of baseline technology, timing of replacement/length of timeframe, equivalence of services).

b) Data uncertainty: There are technical uncertainties associated with the determination and the measurement of the parameters necessary to estimate the GHG emission reductions or removal enhancements (e.g. output, efficiency of plant/networks, emission factor, utilization factor). There could also be accidental reporting errors related to human error, or problems in the reporting routines.

The baseline potentially creates, the greatest uncertainty in the GHG emission reduction or removal enhancement estimates, as it inherently predicts a set of circumstances that never occur. The uncertainty associated with the assumptions made for the baseline can never be completely removed. If there are no appropriate means for quantifying this type of uncertainty, a conservative, yet reasonable baseline should be selected. The degree of conservatism in the baseline should be balanced against the degree of uncertainty. Thus, a highly uncertain baseline should be very conservative. Reducing uncertainty enables a commensurate reduction in conservativeness.

A.2.4.6.4 In a risk-based approach, there are a number of selection methods that are commonly used in combination to determine the sampling plan for GHG information. Methods include samples based on

— GHG sources,

— GHG sinks,

— GHG reservoirs,

— GHG types,

— organizations, facilities, sites,

— GHG projects, and

— GHG processes.

The establishment of a sampling plan should be treated as an iterative process, as the sampling approach or the information samples chosen need to be changed when weaknesses in controls, GHG information and materiality issues are identified during the validation or verification. Revisions to the sampling plan should consider the sufficiency and appropriateness of evidence from testing methodologies, together with any control evidence to support the organization's or GHG project's GHG assertions.

A.2.5 Assessment of GHG information and information system controls

A.2.5.1 General

A.2.5.1.1 Validators and verifiers should review the following controls on the GHG information system, if available:

a) process and justification for determining and monitoring organizational boundaries or the GHG project and its baseline scenarios;

b) methods to identify and monitor GHG programme requirements;

c) methods to identify reporting requirements;

d) methods for determining the base year;

e) methods for determining the baseline scenario;

f) methods of selecting of GHG sources, sinks and reservoirs;

g) methods of selecting GHGs;

h) methods of identifying measurement technologies and data sources;

i) selection, justification and application of selected GHG quantification methodologies;

j) selection and application of the processes and tools used for collecting, processing and reporting GHG information;

k) methods for assessing the effect of changes to other related systems;

l) procedures for authorizing, approving and documenting changes to information systems.

A.2.5.1.2 Validators and verifiers should review the following information on the GHG information system and its integrity, if available:

a) policies that affect GHG information management;

b) management's direction and guidance concerning GHG information and reporting;

c) management's approach to identifying, monitoring and accepting GHG risks;

d) management's awareness of GHG reporting requirements;

e) documentation and monitoring procedures for boundaries;

f) documentation of GHG sources, sinks or reservoirs;

g) processes for collecting, processing and reporting GHG information;

h) methods to ensure that the equipment associated with the monitoring and measurement of GHG data is adequately calibrated and maintained;

i) methods for identifying and reporting deficiencies in the performance of the reporting information and management system;

j) methods to ensure the implementation of appropriate corrective actions to identified deficiencies;

k) procedures for access to important records;

l) methods to ensure access and updating of current information;

m) methods to ensure that the equipment associated with the information management system is adequately maintained;

ri) retention procedures for records and documents;

o) methods to identify and prevent breaches of information security.

A.2.5.1.3 Validators and verifiers should review the following GHG resourcing information, if available:

— the approach to assign roles and responsibilities;

— the approach to establish personnel competencies;

— methods for determining the allocation of time and resources.

A.2.5.2 Error checking routines

Validators and verifiers should review the following controls on the GHG information system, if available:

— input, transformation, output error checking routines;

— checks on the transfer of information between different systems;

— reconciliation processes;

— periodic comparisons;

— internal audit activities;

— management review activities.

There are numerous methods for checking GHG information that can be categorized into input, transformation and output controls.

a) Input controls are procedures for checking the data from the measured or quantified values to a hard copy.

b) Transformation controls refer to error checking during the process of collating, transferring, processing, calculating, estimating, aggregating, disaggregating or adjusting input data.

c) Output control refers to control surroOnding the distribution of GHG information and comparisons between input and output information.

Table A.1 summarizes potential error checking tests and controls.

Table A.1 — Tests and controls for potential error checking

Error checking categories	Possible tests and controls
Input	Record count Valid character tests Missing data tests Limits and reasonableness tests Error resubmission controls
Transformation	Blank tests Consistency tests Cross-checking tests Limits and reasonableness tests File controls Master file controls
Output	Output distribution

A.2.6 Assessment of GHG data and information

A.2.6.1 General

The validation and verification team should assess the organization's or project's GHG information, taking into consideration the following:

a) the completeness, consistency, accuracy, transparency, relevance and (as appropriate) conservativeness of the GHG information, including origins of the raw data;

b) the appropriateness of selected GHG estimation and quantification methodologies;

c) the appropriateness of selected baseline scenarios and GHG baseline quantification methodologies (if applicable);

d) whether different facilities or GHG projects (where more than one project is being assessed within the same validation or verification scope) are using different data management approaches to collate, transfer, process, analyse, aggregate, disaggregate, adjust and store their GHG information, and how these differences are handled in the GHG information reporting process;

e) crosschecking of the GHG information through other quantification methodologies;

f) uncertainties in the GHG information arising from different data sources or GHG quantification methodologies;

g) the accuracy and uncertainty of GHG information where a GHG programme specifies a materiality threshold to which the GHG assertion must adhere;

h) if applicable, the maintenance and calibration programme for equipment used to monitor and measure GHG emissions or removals, including confirming the accuracy of equipment to meet the required accuracy of reporting, and any changes to the programme that could have a material effect on the reported GHG information and assertions;

i) any other factors that are likely to significantly affect the GHG information.

A.2.6.2 Collection of evidence

A.2.6.2.1 Validation and verification activities typically focus on gathering three types of evidence (physical, documentary and testimonial) by following steps outlined in the validation or verification plan.

a) Physical evidence refers to something that can be seen or touched, such as fuel or utility meters, emission monitors or calibration equipment. Physical evidence is gathered by direct observation of equipment or processes, and is persuasive because if demonstrates that the organization being verified is in the practice of collecting relevant data.

b) Documentary evidence is written on paper or recorded electronically, and includes operating and control procedures, log books, inspection sheets, invoices and analytical results.

c) Testimonial evidence is gathered from interviews with technical, operating, administrative or managerial personnel. It provides a context for understanding physical and documentary information, but its reliability depends on the knowledge a;-т objectivity of the interviewees.

Finding the right approach to validation or verification is largely influenced by the necessary degree of accuracy and credibility (i.e. level of assurance) required by the client For example, organizations selling GHG emission reductions or removal enhancements in an emissions trading or carbon offsets market will require greater accuracy and credibility than organizations seeking merely to understand and report on their GHG emissions or removals as part of a voluntary GHG programme.

A.2.6.2.2 Verification testing includes a wide variety of activities, such as retracing data to find omissions or transcription errors, recomputing emission estimates to confirm engineering calculations, or reviewing documents attesting to an activity.

EXAMPLE Types of verification testing include the following.

a) Vouching: This test uncovers errors in reported GHG information and involves following the paper trail back to the raw data. For example, reported quantities of purchased fuel oil used to calculate COg emissions would be traced back to the accounts payable department to check invoices from the fuel supplier. This process verifies that all reported information is supported.

b) Recomputation: This test checks for the accuracy of arithmetic calculations. This would include, for example, recalculating the results of $C0_2$ and methane emissions from a flare, where emissions are unlikely to be measured.

c) Retracing data: This test uncovers omissions in reported information and involves reviewing the original data records to ensure that all results are appropriately reported. For example, continuously monitored GHG emissions from multiple sources might be reviewed. The verifier would then verify that ali the emissions sources were included in the inventory.

d) Confirmation: This test seeks written confirmation from objective third parties. This test could be used when a validator or verifier cannot physically observe a condition, such as the calibration of a flow meter.

A.2.6.2.3 The degree of inherent accuracy and reliability that can be attributed to GHG information will depend on the data source and the ways in which the GHG information has been collected, calculated, transferred, processed, analysed, aggregated or disaggregated and stored. The categorization of GHG information sources helps validators or verifiers to understand how far they can depend on the accuracy or reliability of GHG information from different sources.

Table A.2 lists illustrative examples of information types that are reviewed in verifying GHG emissions and removals depending on emission and removal categories and GHG quantification methodologies.

A.2.6.2.4 In addition to checking GHG emission sources under standard operating environments or normat conditions, validators and verifiers should assess emissions from unusual circumstances such as start up, shut down, emergency or new procedures outside the normal operating range of the facility or GHG project.

A.2.6.3 Crosschecking GHG information

In many cases, the quantification of GHGs can be done in more than one way or there can be other sources of raw data. These can be used to 'crosscheck* GHG quantifications to provide greater assurance that the reported information is within the expected range. Types of crosschecks include

— internal checks within a process,

— internal checks within an organization,

— checks within a sector, and

— checks against international information.

EXAMPLE Crosschecking GHG information: A coal-fired electricity generator

A generation company owns three plants at Sites A, B and C.

As part of plant operational control at Site A, the mass of coal injected is measured continually; the carbon and energy content of the coal is sampled regularly; and the fly ash mass and deposited carbon is measured regularly. From this information and stoichiometric mass balance equations, the mass of $C0_2$ emitted can be calculated.

a) Crosscheck 1: The generator measures megawatt hours (MW h) of electricity produced as part of operational control, and from previous data (e.g. last year's accounts) the company will have an estimate of 1CO2/MW h produced. This is checked against current intensity, and any significant departures investigated. Further, manufacturers' specifications state expected outputs under known maintenance conditions, and this can be used as a 2nd internal check, with significant departures investigated.

b) Crosscheck 2: At Site B, the company has compiled similar information, and can check whether Site A and Site B emissions are comparable. Site B could be a different plant design and/or use a different feedstock, but the company will know that Site B is typically 4 % more emission intensive than Site A. Any significant departures from this difference in current calculations can be investigated for Site A and Site B.

c) Crosscheck 3: The company operates within a national grid, and the national grid operating authority produces annual intensity figures for each region within the grid. The company can check whether Sites A, B and C are close to their regional average, and any significant departures can be investigated or explained.

d) Crosscheck 4: International bodies such as the IPCC produce typical emission intensity figures for known technologies. These can be used to check the approximate magnitude of the calculated emissions for Sites A, B and C, and any significant departures explained or investigated.

NOTE None of these crosschecks on their own are a substitute for source data, but they are all useful in detecting gross errors, and highlighting any areas in the quantification procedures which are unusual or introduce higher risk. Having these crosschecks provides greater assurance.

Table A.2 — Examples of information to be reviewed in verifying estimates of GHG emissions and removals

GHG emission and removal categories	Examples of information types
Combustion	Fuel type Quantity of fuel consumed Type(s) of GHG emitted Combustion efficiency Oxidation factor GWPs used for each GHG emitted Calibration of equipment
Process	Emissions source Hours of operation or quantity of output Uncontrolled GHG emissions (and their GWPs) Control equipment efficiency and reliability Net emissions per hour of output or unit of product Chemical analytical laboratory methods and records Results from continuous emissions monitoring
Fugitive	Stream compositions Leak test results or maintenance practices Types of equipment and equipment counts Emissions history Chemical analytical laboratory methods and records GWPs for each type of GHG emitted
Emissions from imported energy	Generating sources GHGs emitted as a function of kilowatt hours generated (i.e. emission factors) Transmission and distribution losses Kilowatt hours consumed Steam and heat imports will require equivalent information
Biological sinks	GHG reservoir definitions and assumptions Sampling methodologies Growth models Biomass/carbon models Spatial boundary Assessment of permanence

A.2.7 Assessment against validation or verification criteria

Where a project proponent or organization subscribes to a specific standard or GHG programme, the validator or verifier should, as applicable, assess whether the organization or GHG project proponent

a) is eligible to participate in the GHG programme,

b) will or has used GHG estimation, quantification, monitoring and reporting approaches and methodologies that are approved by, or meet the requirements of, the standard or GHG programme,

c) will or has met the GHG performance requirements or targets specified by, or agreed with, the GHG programme administrators or required by the standard,

d) will or has reported GHG information that is complete, consistent, accurate and transparent,

e) has an adequate understanding of the principles and requirements of the standard or GHG programme and is competent to conform to them,

f) has specified a level of assurance through the client that is consistent with the principles and requirements of the standard or GHG programme, and

g) has justified and documented any significant changes to organizational boundaries or the GHG project and its baseline scenario that lead to material change in the organization's or project's GHG emissions, removals, emission reductions or removal enhancements since the previous validation or verification period, and which affect the organization's or GHG project's ability to conform to the principles, requirements or GHG performance targets of the GHG programme.

Where the organization or GHG project is seeking entry into a GHG programme that includes specific entry requirements, the validator or verifier should seek proof that the organization or GHG project has been registered or meets the registration criteria for the GHG programme. In such cases, the validation or verification body should ensure that it is familiar with its roles and responsibilities in securing registration for the organization or GHG project under the GHG programme.

Where the objectives, scope and criteria of the verification includes reference to the organization's internal initiatives to manage GHGs or performance targets, the validator or verifier should, as appropriate, confirm and determine

— whether the internal initiatives to manage GHGs follow the organization's documented policies, procedures and codes of conduct,

— organization's performance against any target;

— whether the organization's management and staff have an adequate understanding of the objectives and targets of the internal initiatives to manage GHGs,

— whether the level of assurance specified by the client is consistent with the aims of the organization's internal initiatives to manage GHGs, and

— whether the organization has justified and documented any significant changes to organizational or GHG emission or removal boundaries that could affect the organization's ability to meet its internal initiatives to manage GHGs,

A.2.8 Evaluation of the GHG assertion

The validation or verification team should assess the GHG assertion by comparing the organization's or GHG project's GHG-related performance against a range of performance criteria, including the following:

a) the agreed validation or verification objectives, scope and criteria;

b) the performance of the responsible party against any principles or requirements of a standard or GHG programme or. any GHG performance targets it has subscribed to;

c) the level of proof provided by objective evidence gathered during the validation or verification that the organization's or GHG project's GHG assertion reflects actual performance and is supported by complete, consistent, accurate and transparent GHG information.

Based on the results of this assessment, the validator or verifier should prepare the validation and verification statement.

A.2.9 Validation and verification statement

A.2.9,1 General

A.2.9.1.1 A measure of uniformity in the form and content of the validation or verification statement is desirable because this helps to promote the reader's understanding and to identify unusual circumstances when they occur.

The validation or verification statement should include the following elements:

a) name, address and other relevant contact information for the responsible party and/or the client;

b) a statement that the validation or verification is performed according to this part of ISO 14064;

c) an opening or introductory paragraph containing

   1) identification of the organization's or GHG project's GHG assertion against which the validation or verification testing was conducted, and

   2) a statement of the roles and responsibilities of the organization's or GHG project's management and the roles and responsibilities of the verifier or validator;

d) a scope paragraph containing

   1) reference to the principles and requirements of relevant standards or GHG programmes against which the validation or verification was conducted,

   2) reference to the validation or verification scope, objectives and criteria agreed with the client, including the level of assurance required, and

   3) a description of the work the validation or verification team performed, including the techniques and processes used to test the GHG information and associated GHG assertion;

e) a conclusion paragraph containing

   1) a reference to the GHG reporting framework or standard, or the GHG programme requirements (as appropriate) used to prepare the GHG assertion,

   2) GHG information or performance validated or verified (e.g. project plan, baseline GHG emissions or removals, GHG emissions, removals, emission reductions, removal enhancements),

   3) the level of assurance provided by the validation or verification, consistent with the agreed validation or verification scope, objectives and criteria,

   4) presentation of qualifications, if any, and

   5) conclusions on the GHG assertion, including any limitations or qualifications to the conclusion;

f) the date of the validation or verification statement;

g) the validator or verifier contact details;

h) an authorized signature from the validator or verifier.

A 2.9.1.2 Some engagements require more extensive reporting than the content of the statement as listed above. This could depend, for example, on reporting requirements in GHG programmes or the needs of the responsible party due to requirements of intended users. The extent of reporting should be agreed with the client but, as a minimum, should include the content as listed in A.2.9.1.1.

A.2.9.1.3 The validator or verifier should produce a draft validation or verification statement to be sent to the client and/or the responsible party to review for factual correctness. If the responsible party Is satisfied that the validation or verification statement is factually correct, then the validation or verification body is able to release the validation or verification statement in a final form. If the responsible party requires any significant

amendments to be made to the draft statement, then the revised content should be agreed with the team leader prior to publication.

A.2.9.1.4 In GHG project validations, not all issues are resolved until the GHG project has been commissioned or has reached day-to-day operational status. This situation should be reflected in the validation statement in the form of limitations or qualifications that become invalid once the GHG project has achieved operational status.

A.2.9.2 Qualifying the validation or verification statement

A.2.9.2.1 The validation or verification statement should clearly express any circumstance where the validator or verifier

— is of the view that one, some, or all aspects of the GHG information does not conform to the agreed verification or validation criteria,

— is of the view that the responsible party's GHG assertion is inappropriate in relation to the agreed validation or verification criteria,

— is unable to obtain sufficient, appropriate, objective evidence to assess one or more aspects of conformity of the GHG information with the agreed validation or verification criteria and the responsible party's GHG assertion, or

— has found it necessary to limit or qualify the opinion.

A.2.9.2.2 Although circumstances that require the validator or verifier to qualify the validation or verification statement vary considerably, they can be categorized-in two groups as follows.

a) The GHG assertion is affected by a departure from the requirements specified by the GHG programme, including

   — an inappropriate treatment (e.g. incorrect GWPs applied during the reporting period),

   — an inappropriate estimation or quantification of a GHG source, sink or reservoir in the GHG assertion (e.g. overestimation of carbon stocks), or

   — a failure to disclose essential information or to present information in an appropriate manner (e.g. inadequate explanation of the permanence of a GHG reservoir).

b) The validator or verifier is unable to obtain sufficient appropriate evidence to determine whether there has been a departure from the requirements specified by the GHG programme. These are circumstances where the validator or verifier has not been able to apply all the tests and procedures considered necessary in the circumstances. The result is that there is not sufficient appropriate evidence to form an opinion as to whether the GHG assertion is presented fairly in accordance with requirements of the GHG programme. Such limitations arise in a number of situations, including

   — circumstances related to the timing of the validator's or verifier's work (e.g. a verification conducted during unplanned maintenance leading to inability to observe operational practices or monitoring equipment in operation),

   — circumstances beyond the control of the organization or GHG project, or the validator or verifier (e.g. destruction of GHG information in a fire), or

   — a limitation imposed or created by the organization or GHG project (e.g. failure to maintain adequate GHG records).

A.2.9.2.3 When there is a departure from the requirements of the GHG programme or a scope limitation, the validator or verifier must decide what type of qualification or modification to the validation or verification statement is appropriate. In addition to materiality, the validator or verifier should consider

— the degree to which the matter impairs the usefulness of the GHG assertion,

— the extent to which the effects of the matter on the GHG assertion can be determined, and

— whether the GHG assertion is, or could be understood to be, misleading even when read in conjunction with the validator's or verifier's statement.

A qualified validation or verification statement, when read in conjunction with the GHG assertion, normally will serve adequately to inform the intended user of any deficiencies or possible deficiencies in the GHG assertion.

A.2.9.2.4 When the validator or verifier concludes that a qualification is necessary, the validation or verification statement should clearly draw attention to the qualification by modifying the validation or verification statement. The statement should include the following.

a) A qualification paragraph, inserted between the scope and opinion paragraphs of the statement, that includes
   - — all qualifications,
   - — an adequate explanation of the reasons for each qualification,
   - — a clear indication of how and, when reasonably determinable, to what extent the GHG assertion is affected, and
   - — if the affect on the GHG assertion of the matter causing the qualification is not reasonably determinable, a statement of such and reasons for the determination.

b) The opinion paragraph should include
   - — wording appropriate for the type of qualification(s), and
   - — a reference to the qualification paragraph.

!n addition, when the qualification results from a limitation in the scope, the scope paragraph should contain a reference to the qualification paragraph.

A.2.9.3 Adverse validation or verification statements

When, in the judgment of the validator or verifier, a qualification is not appropriate, an adverse validation or verification statement may be issued (e.g. the GHG assertion is not presented fairly in accordance with GHG programme requirements), or the validator or verifier may issue a statement that the validator or verifier was unable to obtain sufficient appropriate objective evidence to form an opinion as to whether the GHG assertion is presented fairly in accordance with the GHG programme requirements.

A.2.9.4 Certification of GHG performance

In some GHG programmes, GHG certification occurs once an impartial GHG verifier issues a written assurance that, during a specified time period, an organization or GHG project achieved GHG performance (e.g. **GHG** emissions, removals, emission reductions, removal enhancements) as asserted by the responsible party. The outcome of the certification process is often a formal, written declaration issued by the GHG programme administrator to the responsible party.

A.2.10 Validation or verification records

A.2.10.1 Working papers, audit trails and document control and management

Validators or verifiers should document matters that are important in providing evidence to support the validation or verification statement, and evidence that the validation or verification was carried out in accordance with the agreed scope and objectives of the validation or verification and any relevant principles or requirements Gf GHG programmes or standards.

Validators or verifiers should prepare documentation that is sufficiently complete and detailed to provide an overall understanding of the process. As appropriate, the validators or verifiers should consider producing and recording, as a minimum, the following kinds of documents and validation or verification evidence:

- — background documentation;
- — process documentation;
- — communication and reporting documentation.

A.2.10.2 Background

Background documentation should include the following:

a) the organization's or project's GHG assertion;

b) information concerning the industry, GHG reporting environment and legislative environment within which the organization or GHG project operates;

c) information concerning organizational boundaries or the GHG project and its baseline scenario;

d) information on the identification and selection of GHG sources, sinks or reservoirs;

e) procedures for quantifying GHG emissions, removals, emission reductions or removal enhancements;

f) an annotated process flow diagram, characterizing mass or energy flows for selected GHG sources, sinks or reservoirs;

g) a mass balance, energy balance and/or other quantitative balance for selected GHG sources, sinks or reservoirs;

h) extracts or copies of important agreements, contracts and, where applicable, emissions trading and carbon offset records.

A.2.10.3 Validation or verification process

Process documentation should include the following:

a) evidence of the planning process, including details of the anticipated and actual objectives, scope, criteria and activities to be undertaken within the validation or verification programme;

b) details of the GHG information sampling plan, including explanations and justifications for the approach taken during the validation or verification, and the methodologies used;

c) details of the reported GHG information that was validated or verified, including any relevant supporting information that is be required to verify consistency in future validations or verifications;

d) evidence that the validators or verifiers have a clear understanding of the organization's or GHG projects GHG information management and internal control systems;

e) records relating to validation or verification team personnel, including validator/verifier competence and performance evaluation, team selection and maintenance and improvement of competence;

f) results of the risk assessment and materiality analysis;

g) analyses of significant ratios and trends in the GHG information, including those that influence changes in the level of GHG performance;

h) evidence of inherent and control risk assessments;

i) analyses of GHG information inputs, quantification and aggregation and disaggregation methodologies;

j) a record of the nature, timing and extent of activities performed (including the use of any experts) and the results of such activities, including the analytical testing undertaken and significant validation and verification trails followed and the reasoning behind them;

k) a record of who co/T»pleted the activities, when they were performed, and how these activities contributed to the validation or verification findings and conclusions;

l) the validators' or verifiers' reasoning and rationale on all significant matters that require the exercise of professional judgement;

m) any changes made to the validation or verification plan and associated activities and analytical testing as a result of evidence obtained;

n) the results and findings of the validation or verification;

o) conclusions reached by the validators or verifiers concerning significant aspects of the validation or verification, including how exceptions and unusual matters, if any, were resolved or treated. If the client made changes to original GHG assertion and GHG information in order to reduce or remove the risk of material discrepancy within their GHG information, reasons should be recorded.

A.2.10.4 Communication and reporting

Communication and reporting documentation should include the following:

a) copies of written communications with the client, experts and other stakeholders;

b) notes of significant verbal communications with the client, experts and other stakeholders;

c) copies of notes of significant verbal communications and written communications with all parties involved in the validation or verification, including the terms of the validation or verification and material weaknesses in internal control;

d) any nonconformities raised and their associated preventive and corrective action programmes, including situations where omissions or errors are considered material, resulting in amendments to the original GHG information;

e) validation or verification follow-up reports (if applicable);

f) copies of the responsible party's GHG assertion reported to the GHG programme, and the validation or verification report and statement (where appropriate).

Validators or verifiers should adopt appropriate procedures for maintaining the confidentiality and safe custody of the validation or verification documentation, and for retaining them for a period sufficient to meet the needs of the client, the responsible parties, the GHG programme(s) to which they subscribe, and in accordance with legal and professional requirements of record retention.

Validation or verification documentation remains the property of the validators or verifiers. Portions of, or extracts from, the validation or verification documentation may be made available to the client and/or organization or GHG project (or, where specific disclosure requirements exists, any GHG programmes to which they subscribe), at the discretion of the validators or verifiers. Such disclosed documentation should not be considered as a substitute for the organization's or GHG project's GHG records.

The release of any information should be agreed with the client and/or the responsible party, depending on the scope and objectives of the validation or verification and the GHG programme rules under which the validation or verification is taking place.

Bibliography

[1] ISO 14064-1:2006, *Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*

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2) To be published.

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Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website:* www.bis.org.in

Regional Offices:			*Telephones*
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