

**PAS 2070:2013**

*Incorporating Amendment No. 1*

# Specification for the assessment of greenhouse gas emissions of a city

Direct plus supply chain and consumption-based methodologies



SUPPORTED BY  
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# Foreword

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The PAS process enables a specification to be rapidly developed in order to fulfil an immediate need in industry. A PAS may be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or International Standard.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

## Supersession

PAS 2070:2013+A1:2014 supersedes PAS 2070:2013, which is withdrawn.

## Information about this document

Text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**. Minor editorial changes are not tagged. Amendment A1 introduces the following principal changes:

- option to use the version of IPCC Guidelines used by the country's inventory reporting body;
- where full data is not available, the use of notation keys and explanation is required;
- transport model requirement has been changed to a recommendation to avoid unnecessary limitation.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in italic type, and does not constitute a normative element.*

## Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a PAS cannot confer immunity from legal obligations.**

# 0 Introduction

## 0.1 The city and greenhouse gas (GHG) emissions

Making cities more sustainable is among the most important challenges of the 21st century. Cities exert a significant impact on the natural environment and are particularly vulnerable to environmental change. When it comes to tackling climate change, therefore, cities play a key role.

The ability of city leaders and other stakeholders to take effective action depends on access to good quality data on GHG emissions. Measurement enables cities to assess their risks and opportunities, create a strategy to reduce GHG emissions in a quantifiable and transparent way, and track their progress.

Many cities around the world have already developed GHG inventories and are disclosing these publicly [1, 2]. However, existing GHG accounting methodologies used by cities are variable. They cover different scopes and have important methodological differences, making comparisons between cities difficult. To allow for credible reporting and meaningful benchmarking of climate data, greater consistency in GHG accounting is required.

## 0.2 The aim of PAS 2070

PAS 2070 responds to this challenge by specifying requirements for the assessment of GHG emissions of a city or an urban area, and by following internationally recognized GHG accounting and reporting principles. PAS 2070 captures both direct GHG emissions – from sources within the city boundary – as well as indirect GHG emissions – from goods and services that are produced outside the city boundary for consumption and/or use within the city boundary.

PAS 2070 aims to provide a robust and transparent method for consistent, comparable and relevant quantification, attribution and reporting of city-scale GHG emissions. This will encourage more holistic GHG emissions assessments, greater disclosure and more meaningful benchmarking to help city decision makers identify key emission sources and their drivers, the carbon dependence of their economy, and opportunities for more efficient urban supply chains. It is intended for international application.



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# 1 Scope

## 1.1 Two methodologies

PAS 2070 specifies requirements for the assessment of greenhouse gas (GHG) emissions of a city or an urban area using two distinct methodologies. These recognize cities as both consumers and producers of goods and services, and provide a complementary insight of a city's GHG emissions. The GHG emissions assessment methodologies are:

- a) a direct plus supply chain (DPSC) methodology;
- b) a consumption-based (CB) methodology.

The DPSC methodology captures territorial GHG emissions and those associated with the largest supply chains serving cities, many of which are associated with city infrastructures. It covers direct GHG emissions from activities within the city boundary and indirect GHG emissions from the consumption of grid-supplied electricity, heating and/or cooling, transboundary travel and the supply chains from consumption of key goods and services produced outside the city boundary (e.g. water supply, food, building materials).

The DPSC methodology builds on the *Global protocol for community-scale greenhouse gas emissions* (GPC) [3], developed by the World Resources Institute (WRI), C40 Cities Climate Leadership Group and ICLEI Local Governments for Sustainability to include a wider range of indirect GHG emissions, and is consistent with emission sources covered by the GPC.

The CB methodology captures direct and life cycle GHG emissions for all goods and services consumed by residents of a city, i.e. GHG emissions are allocated to the final consumers of goods and services, rather than to the original producers of those GHG emissions. The CB methodology does not assess the impacts of the production of goods and services within a city that are exported for consumption outside the city boundary, visitor activities, or services provided to visitors.

A purely territorial accounting methodology, which focuses on all GHG sources within a boundary is not provided, but GHG emissions within the city boundary can be calculated as a subset of the DPSC methodology.

## 1.2 GHG emissions sources and boundaries

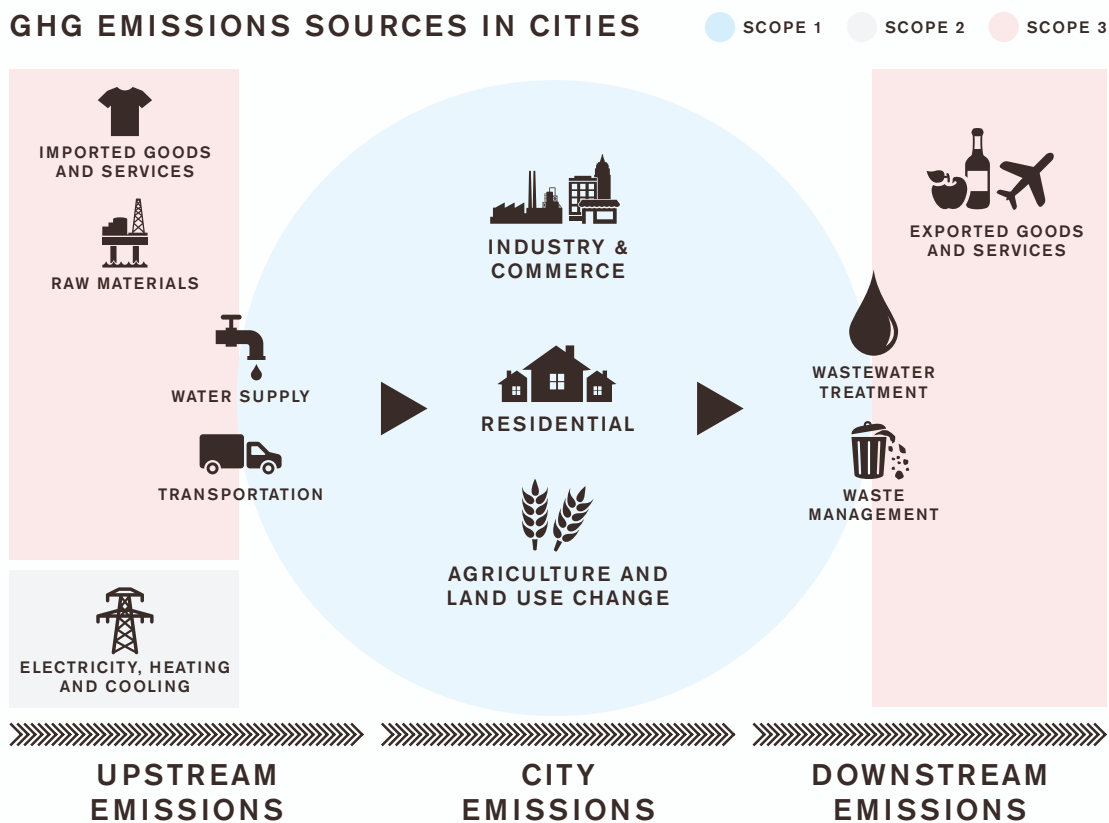
PAS 2070 specifies requirements for identifying the assessment boundaries, the sources of GHG emissions to be included, the data requirements for carrying out the analysis, and the calculation of the results to develop a city-scale GHG inventory.

GHG emissions of organizations are generally categorized as either Scope 1, Scope 2 or Scope 3 emissions. These categorizations are based upon where the GHG emissions arise and their relationship with the inventorying body. Such definitions are important for the attribution of GHG emissions that occur outside the city, to activities within the city's geopolitical boundary. The DPSC methodology uses the definitions for Scope 1, Scope 2 and Scope 3 emissions (see 3.1.30 to 3.1.32) from the *GHG Protocol* [4] [developed by World Resources Institute (WRI)/World Business Council for Sustainable Development (WBCSD)] as adopted for community-scale use in the GPC [3]/IEAP [5]. Figure 1 provides an overview of emission sources in relation to scope and illustrates the life cycle perspective taken for the assessment of goods, services and activities.

The adapted Scope definitions cannot be applied when calculating the consumption-based emissions using the CB methodology as the data are aggregated across Scopes.



Figure 1 – GHG emissions sources in cities in relation to Scope 1, 2 and 3



SOURCE Adapted from Figure 1 of Carbon footprinting for climate change management in cities [6].

### 1.3 Using PAS 2070

PAS 2070 is for use by organizations or people assessing GHG emissions of a city or an urban area, such as municipal or national governments, academic researchers, consultants, and others.

Guidance explaining how to apply the standard to measure city-wide GHG emissions, using London as an example is given in *Application of PAS 2070 – London, United Kingdom* [7]. It supplements PAS 2070 by providing a detailed case study of the application of PAS 2070 to London. It includes guidance on data collection, quantification, and provides a template for reporting.

**NOTE** Assessment of GHG emissions using PAS 2070 does not imply that municipal authorities have sole responsibility for these GHG emissions. Rather the aim of an assessment using PAS 2070 is to quantify and increase understanding of GHG emissions of cities.



## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE. *2006 IPCC guidelines for national greenhouse gas inventories (IPCC Guidelines)*. Hayama, Japan: Institute for Global Environmental Strategies. Available from <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>

*NOTE* Subsequent amendments to 2006 IPCC Guidelines also apply.

## 3 Terms, definitions and abbreviations

### 3.1 Terms and definitions

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

#### 3.1.1 activity data

quantitative measures of a level of activity that results in GHG emissions

*NOTE* Activity data are multiplied by an emissions factor to calculate the GHG emissions associated with a process or an operation. Examples of activity data include kilowatt-hours of electricity used, quantity of fuel used, hours of time equipment is operated, distance travelled, or quantity of money spent.

(SOURCE: *Greenhouse gas protocol corporate value chain (scope 3) accounting and reporting standard* [8])

#### 3.1.2 basic price

amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale; it excludes any transport charges invoiced separately by the producer

#### 3.1.3 assessment boundary

definition of which processes and goods and services are included in the assessment, and which ones are not

#### 3.1.4 biogenic carbon

carbon that is contained in biomass

#### 3.1.5 biomass

material of biological origin, excluding material in geological formations or transformed to fossil

(SOURCE: CEN/TR 14980:2004, 4.3, adapted)

#### 3.1.6 business capital expenditure

expenditure of money or other assets owned by a commercial organization, for a purpose such as starting a company or investing in new infrastructure

#### 3.1.7 calendar year

period of 365 days or 366 days in leap years

#### 3.1.8 carbon dioxide equivalent (CO<sub>2</sub>e)

unit for comparing the radiative forcing of a GHG to CO<sub>2</sub>

#### 3.1.9 city boundary

border of a city or urban area

*NOTE* The city boundary is usually geopolitical and defined by one or more municipal governments.

### 3.1.10 consumption

expenditure on goods and services

### 3.1.11 consumption category

consumption for one type of good or service (e.g. bread) or a group of similar goods or services (e.g. fruit and vegetables)

### 3.1.12 cradle to gate

life cycle stages from the extraction or acquisition of raw materials and other inputs to the point at which the good or service enters the city boundary

### 3.1.13 direct greenhouse gas emissions (direct GHG emissions)

GHG emissions from GHG sources within the city boundary

*NOTE* For definition of "indirect GHG emissions", see 3.1.22.

### 3.1.14 direct land-use change (direct LUC)

LUC within the city boundary

*NOTE* For definition of "LUC", see 3.1.25 and for definition of "indirect LUC", see 3.1.24.

### 3.1.15 economic final consumption

expenditure on goods and services by households, government and business capital

### 3.1.16 emission factor

factor allowing mass of GHGs emitted to be estimated relative to a unit of activity, quantity of a good or service used, or financial expenditure

*NOTE 1* Mass of GHGs may be expressed as mass of a GHG (e.g. kg CO<sub>2</sub>) or as mass of carbon dioxide equivalent (e.g. kg CO<sub>2</sub>e) per unit of activity, quantity or financial expenditure (e.g. kg CO<sub>2</sub>e per tonne).

*NOTE 2* A factor for conversion of financial units to GHG emissions is also known as an "emissions intensity".

### 3.1.17 environmentally extended input-output model (EEIO model)

model based on financial flow data from national or regional economic accounts, combined with environmental account data

### 3.1.18 fugitive emissions

emissions of GHGs from intentional or unintentional releases other than directly from combustion

*NOTE* Examples of fugitive GHG emissions are leaks from equipment, GHG emissions during the use of refrigeration and air conditioning equipment, and methane leakages from gas transport and coal mines.

### 3.1.19 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

(SOURCE: BS EN ISO 14064-1:2012, 2.18)

*NOTE* Carbon dioxide from fossil carbon sources is assigned a GWP of 1, while the GWP of other gases is expressed relative to the GWP of carbon dioxide from fossil carbon sources. The 100-year GWP coefficients are referred to in 2006 IPCC Guidelines [see Clause 2] (current at the time of publication). Carbon dioxide arising from biogenic sources of carbon is assigned a GWP of zero in specific circumstances specified in PAS 2070.

### 3.1.20 greenhouse gas (GHG)

gaseous constituent of the atmosphere, natural or anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the earth's surface, the atmosphere and clouds contributing to the greenhouse effect

### 3.1.21 gross domestic product (GDP)

total value of goods produced and services provided during one year

### 3.1.22 inboundary

flow of goods or services (including energy) within the city boundary

### 3.1.23 indirect greenhouse gas emissions (indirect GHG emissions)

GHG emissions from goods and services produced outside the city boundary and consumed within the city boundary

*NOTE 1* For example, the GHG emissions emitted by a power station located outside the city boundary in the production of electricity for consumption within a city are regarded as indirect GHG emissions.

*NOTE 2* For definition of "direct GHG emissions", see 3.1.13.

### 3.1.24 indirect land-use change (indirect LUC)

LUC outside the city boundary, that occurred as a consequence of activities within the city boundary

*NOTE* For definition of "LUC", see 3.1.25 and of "direct LUC", see 3.1.14.

**3.1.25 land-use change (LUC)**

change in the purpose for which land is used by humans

*NOTE For example, change in land use between crop land, grass land, forest land, wetland and industrial land.*

**3.1.26 liquefied petroleum gas (LPG)**

fuel used for heating appliances and vehicles

*NOTE LPG is also known as liquid propane gas or autogas.*

**3.1.27 offsetting**

mechanism for claiming a reduction in GHG emissions associated with a process or product through the removal of, or preventing the release of, GHG emissions in a process unrelated to the life cycle of the product being assessed

(SOURCE: PAS 2050:2011, 3.32)

**3.1.28 purchaser's price**

price the purchaser actually pays for the products; including any taxes less subsidies on the products (but excluding deductible taxes like VAT on the products)

**3.1.29 sequestration**

retention of carbon of atmospheric origin in a non-atmospheric form

**3.1.30 Scope 1 emissions**

all direct GHG emissions sources from activities taking place within the city boundary

(SOURCE: *Global protocol for community-scale GHG emissions* (GPC) [3], adapted)

**3.1.31 Scope 2 emissions**

energy-related indirect GHG emissions that result as a consequence of use of grid-supplied electricity, heating and/or cooling, within the city boundary

(SOURCE: GPC [3], adapted)

**3.1.32 Scope 3 emissions**

all other [i.e. other than Scopes 1 and 2] indirect GHG emissions that occur as a result of activities within the city boundary

(SOURCE: GPC [3], adapted)

**3.1.33 supply chain**

sequence of processes involved in the production, distribution and use of goods and the provision of services

**3.1.34 transboundary**

flow of goods or services (including energy) that crosses the city boundary

*NOTE For example, transboundary travel.*

**3.1.35 upstream activity**

activity associated with processes that occur in the life cycle of a good or service prior to the process owned, operated or controlled within the city boundary

*NOTE Downstream activities are associated with processes that occur in the life cycle of a good or service after the process is owned, operated or controlled within the city boundary.*

**3.2 Abbreviations**

For the purposes of this PAS, the following abbreviations apply.

|                   |  |
|-------------------|--|
| AFOLU             | agriculture, forestry and other land use   |
| CB                | consumption-based  |
| CH <sub>4</sub>   | methane  |
| CO <sub>2</sub>   | carbon dioxide   |
| CO <sub>2</sub> e | carbon dioxide equivalent  |
| DPSC              | direct plus supply chain   |
| EEIO model        | environmentally extended input-output model  |
| GHG               | greenhouse gas   |
| GDP               | gross domestic product   |
| GPC               | <i>Global protocol for community-scale greenhouse gas emissions</i> [3]              |
| GWP               | global warming potential   |
| HFC               | hydrofluorocarbon  |
| IEAP              | <i>International local government greenhouse gas emissions analysis protocol</i> [5] |
| IO model          | input-output model   |
| IPPU              | industrial processes and product use   |
| LPG               | liquefied petroleum gas  |
| LUC               | land-use change  |
| N <sub>2</sub> O  | nitrous oxide  |
| PFC               | perfluorocarbon  |
| SF <sub>6</sub>   | sulphur hexafluoride   |

## 4 Greenhouse gas emissions boundaries

**NOTE** Clause 4 applies to both the DPSC methodology and CB methodology.

### 4.1 Greenhouse gases (GHGs)

Emissions of the following six GHGs, excluding direct removals of GHGs from the atmosphere (e.g. carbon sequestration in the soil and vegetation of parks and gardens), shall be included in the assessment:

- carbon dioxide (CO<sub>2</sub>), excluding CO<sub>2</sub> emitted from biogenic carbon sources (see 4.2.2);
- methane (CH<sub>4</sub>), including CH<sub>4</sub> derived from biogenic sources of carbon (see 4.2.3);
- nitrous oxide (N<sub>2</sub>O);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- sulphur hexafluoride (SF<sub>6</sub>).

**NOTE** These six GHGs are regulated under the Kyoto Protocol [9].

### 4.2 Global warming potential (GWP)

#### 4.2.1 Global warming potential coefficients

GHG emissions and removals shall be measured separately for each gas by units of mass (metric tonnes) and shall be converted into units of mass of CO<sub>2</sub>e using the [A1](#) IPCC 100-year GWP coefficients (see Clause 2) taken from either:

- the latest version of the *IPCC Guidelines*; or
- the version of the *IPCC Guidelines* used by the country's inventory reporting body. [A1](#)

**NOTE** Converting GHG emissions of non-CO<sub>2</sub> gases to units of CO<sub>2</sub>e allows the impact of GHGs to be compared on a common basis. The 100-year GWP coefficients are referred to in 2006 IPCC Guidelines [see Clause 2] (current at the time of publication). It is the responsibility of the user of PAS 2070 undertaking GHG emissions assessment to confirm the currency of GWP values from this source before use.

#### 4.2.2 CO<sub>2</sub> emissions originating from fossil and biogenic carbon sources

CO<sub>2</sub> emissions arising from fossil carbon sources shall be included in the calculation of GHG emissions from the life cycle of products.

CO<sub>2</sub> emissions arising from biogenic carbon sources shall be excluded from the calculation of GHG emissions from the life cycle of products, except where the CO<sub>2</sub> arises from land-use change (see 7.5).

#### 4.2.3 Non-CO<sub>2</sub> emissions originating from fossil and biogenic carbon sources

Non-CO<sub>2</sub> emissions arising from both fossil and biogenic carbon sources shall be included in the calculation of GHG emissions from the life cycle of products. The GWP factor for non-CO<sub>2</sub> emissions originating from biogenic carbon sources shall be corrected to take into account the sequestration of the CO<sub>2</sub> that gave rise to the biogenic carbon source.

### 4.3 Aircraft GHG emissions

Multipliers or other corrections for high-altitude radiative forcing shall not be applied to the GWP of GHG emissions arising from aircraft transport.

**NOTE** The application of a multiplier for aircraft GHG emissions was considered but was excluded because of a lack of expert agreement regarding the approach to be taken. Users of PAS 2070 wishing to account for high-altitude radiative forcing should report on this separately to their PAS 2070 assessment in accordance with PAS 2070.

### 4.4 Offsetting

GHG emissions offset mechanisms, including but not limited to, voluntary offset schemes or nationally or internationally recognized offset mechanisms, shall not be used in the assessment of the GHG emissions.

Where the municipal government, businesses or residents offset GHG emissions and report on the offsetting activity, the offsetting shall be reported separately from the results of an assessment that is in conformance with PAS 2070.

### 4.5 Units of analysis

Data (see Clause 6) shall be collected to allow the assessment result to be expressed in the following three units, to provide results that can be benchmarked:

- t CO<sub>2</sub>e/year;
- t CO<sub>2</sub>e/capita/year; and
- t CO<sub>2</sub>e/GDP.

## 5 Assessment boundaries

**NOTE** Clause 5 applies to both the DPSC methodology and CB methodology. Assessment boundary requirements specific to the DPSC methodology or the CB methodology are given in the relevant subclauses to Clause 7 and Clause 8.

### 5.1 City boundary

The city boundary shall be defined. The defined city boundary shall be used in both the DPSC methodology and the CB methodology.

**NOTE** The city boundary is usually geopolitical and defined by one or more municipal governments.

### 5.2 Time period of assessment

The time period of an assessment shall be one calendar or financial year, or other defined continuous 12-month period.

**NOTE 1** Reporting GHG inventories on a calendar year basis is accepted internationally.

**NOTE 2** If activity data are not in the same time period as the assessment, activity data from the time period that have the greatest alignment with the time period of the assessment should be used.



## 6 Data

**NOTE** Clause 6 applies to both the DPSC methodology and CB methodology. Data requirements specific to the DPSC methodology or the CB methodology are given in the relevant subclauses to Clause 7 and Clause 8.

### 6.1 Data quality rules

6.1.1 When identifying primary data and secondary data for use in GHG emissions assessment, the following preferences shall be applied.

- For time-related coverage (e.g. age of data and the minimum length of time over which the data are collected), data that are time-specific to the assessment shall be preferred.
- For geographical specificity, data that are geographically specific to the city being assessed shall be preferred.
- For technology coverage (e.g. whether the data relate to a specific technology or a mix of technologies), data that are technology-specific to the good or service being assessed shall be preferred.
- For accuracy (the degree to which a value conforms to the correct value) of the information (e.g. data, models and assumptions), data that are most accurate shall be preferred.

- For precision, data that are more precise (i.e. have the lowest statistical variance) shall be preferred.

**NOTE** Accurate data should be preferred over precise data.

6.1.2 The following shall be documented:

- completeness – the degree to which the data represent the population of interest; is the sample size large enough, is the periodicity of measurement sufficient, etc.;
- consistency – qualitative assessment of whether the selection of data is carried out uniformly in the various components of the analysis;
- reproducibility – qualitative assessment of the extent to which information about the method and data values would allow an independent practitioner to reproduce the results reported in the study;
- data sources – with reference to the primary or secondary nature of the data.

**NOTE 1** Adapted from BS EN ISO 14044:2006, 4.2.3.4.3.

**NOTE 2** Assessment of GHG emissions should use activity data that reduce bias and uncertainty as far as practicable by using the best quality activity data available. Determination of the best quality activity data should be supported by an activity data-scoring framework that allows the different attributes of activity data quality to be combined.



**A1** 6.1.3 Where full data is not available, notation keys as specified in Table 4 (see 9.6) shall be used, accompanied by an explanation to justify exclusion or partial accounting. **A1**

### 6.2 Secondary data

6.2.1 Secondary data shall be used for inputs where primary data have not been obtained.

6.2.2 The source of secondary data shall be selected in accordance with the data quality rules specified in 6.1.

6.2.3 When identifying secondary data for use in GHG emissions assessment, secondary data arising from competent sources (e.g. municipal government, national government, official United Nations publications and publications by United Nations-supported organizations, and peer review publications) shall be preferred over secondary data from other sources.

### 6.3 Emission factors

**NOTE** For many countries, emission factors are available from government, industry or academic sources.

#### 6.3.1 Time relevance

Emission factors shall be one of the following, which shall be chosen in the following order of preference:

- a) time-specific to the assessment; or
- b) the closest in time to the period of the assessment.

#### 6.3.2 Geographic relevance

Emission factors shall be one of the following, which shall be chosen in the following order of preference:

- a) geographically specific to the assessment; or
- b) national emission factors; or
- c) international emission factors.

#### 6.3.3 Sources of emission factors

Sources of emission factors shall be recorded, which shall be chosen in the following order of preference:

- a) emission factors published and maintained by municipal or national government, supranational organizations or industry sources; or

**NOTE** Industry sources might include trade associations, and other associations of companies within sectors of industry.

- b) local emission factors from peer reviewed, published papers or reports;
- c) emission factors maintained by recognized international organizations; or
- Ⓐ) d) emission factors calculated using methodologies from peer reviewed, published papers or reports. Ⓐ) 1

**NOTE** The assessment may use emission factors from more than one source.

### 6.4 Assumptions

Any assumptions made shall be recorded.

**NOTE** An assumption might be made, for example, within a model used to provide fuel use data for assessment of GHG emissions from stationary sources (see 7.2.2.2).

### 6.5 Record-keeping

Data supporting an assessment undertaken in accordance with PAS 2070 shall be documented and maintained for a minimum of three years.



## 7 Direct plus supply chain (DPSC) methodology

The DPSC methodology captures direct GHG emissions from activities within the city boundary and indirect GHG emissions from the consumption of grid-supplied electricity, heating and/or cooling, transboundary travel (e.g. airline and commuter travel) and the supply chains from consumption of key goods and services produced outside the city boundary (e.g. water supply, food, building materials).

The utility of the DPSC methodology is its relevance to future infrastructure planning addressing water, energy and material use and waste management in cities. The indirect inclusions can assist in the analysis of regional cross-scale and cross-sector infrastructure efficiencies. It can also highlight the impact of GHG emissions shifting “outside” the city, such as new fuel infrastructures with zero tailpipe GHG emissions. The methodology provides only an indicative approximation of the GHG impacts of a city since emissions factors of supply chain emissions will be an approximation, and assessment of direct GHG emissions will be as good as the usage data available.

This Clause outlines the requirements for implementing the DPSC methodology, and is broken down as follows:

GHG emissions sources → Assessment boundary → Data → Calculation

**NOTE 1** This Clause covers requirements that relate to the DPSC methodology only; assessment boundary requirements that apply to both DPSC and CB methodologies are given in Clause 5.

**NOTE 2** This Clause covers requirements that relate to the DPSC methodology only; data requirements that apply to both DPSC and CB methodologies are given in Clause 6.

**NOTE 3** Communication requirements are listed in Clause 9.

### 7.1 GHG emission sources

The GHG emissions sources shown in Table 1, classified in accordance with IPCC categorization [Clause 2], shall be included in the assessment as specified in 7.2 to 7.7.

for use within the city boundary, which occur within or outside the city boundary, shall be included in the assessment.

**NOTE** GHG emissions from electricity used by electric vehicles is captured in 7.3.2.2.

### 7.2 Stationary sources of GHG emissions

#### 7.2.1 Assessment boundary

##### 7.2.1.1 Direct GHG emissions from fuel combustion

Direct GHG emissions from the use of fuels  $A_1$  (such as natural gas, heating oils, coal, including fuels containing biogenic carbon)  $A_1$  by residential buildings and commercial, industrial and government buildings and facilities within the city boundary (see 5.1) shall be included in the assessment, where the combustion of fuels is not used for the purpose of generating grid-supplied electricity, and/or district heating or cooling (see 7.2.1.2).

##### 7.2.1.3 Direct GHG emissions from generation of grid-supplied electricity, district heating or cooling

Direct GHG emissions from the combustion of fuels for the generation of grid-supplied electricity, and/or district heating or cooling within the city boundary only shall be included in the assessment and reported separately from the total GHG emissions assessed by the DPSC methodology to avoid double counting with 7.2.1.2.

**NOTE 1** Direct GHG emissions from the generation of grid-supplied electricity, district heating or cooling used within the city are included in the total GHG emissions for the city as indirect GHG emissions from the generation of grid-supplied electricity, district heating or cooling (see 7.2.1.2).

##### 7.2.1.2 Indirect GHG emissions from generation of grid-supplied electricity, district heating or cooling

Indirect GHG emissions from the generation of grid-supplied electricity and/or district heating or cooling

**NOTE 2** GHG emissions from facilities that generate non-grid-supplied electricity, or non-district heating or cooling are accounted for under 7.2.1.1.



Table 1 – PAS 2070 GHG emission sources categories

| PAS 2070 category  |           | IPCC sector |        |
|--|-----------|-------------|--------|
| Stationary – fuel combustion in buildings and facilities and for energy generation | (see 7.2) | 1A, 1B      | Energy |
| Mobile – fuel combustion for transport   | (see 7.3) |             |        |
| Industrial processes and product use (IPPU)  | (see 7.4) | 2           | IPPU   |
| Agriculture, forestry and other land use (AFOLU)                                   | (see 7.5) | 3           | AFOLU  |
| Waste and wastewater treatment   | (see 7.6) | 4           | Waste  |
| Goods and services – water provision, food and drink and construction materials    | (see 7.7) | 5           | Other  |

#### 7.2.1.4 Indirect GHG emissions from upstream activities

Fugitive emissions from fuels and other indirect GHG emissions from upstream activities associated with extraction, processing, refining and transport of primary fuels used for energy generation in 7.2.1.1 and 7.2.1.2 shall be included in the assessment.

**NOTE** Fugitive emissions from fuels are categorized as indirect on the assumption that the majority of fugitive emissions from fuels are released outside the city boundary. Where sources of fugitive emissions from fuels within the city boundary meet the material contribution threshold, it is a requirement that they are also included in the assessment (as specified in 7.7.4).

#### 7.2.2 Data

##### 7.2.2.1 General

7.2.2.1.1 All data collected shall be disaggregated by:

- residential buildings; and
- commercial, industrial and government buildings and facilities.

7.2.2.1.2 The data types used to determine, or estimate, the use of fuels shall be one of the following which shall be chosen in the following order of preference:

- energy use data from energy providers; or
- city-specific survey use data from peer-reviewed studies (e.g. academic journals, government department reports); or
- national government statistics (e.g. UK Office for National Statistics, <http://www.ons.gov.uk/ons/index.html>); or
- national survey use data from peer-reviewed studies (e.g. academic journals, government department reports).

#### 7.2.2.2 Direct GHG emissions from fuel combustion

Activity data shall be collected for use of the following fuel categories:

- natural gas;
- oil;
- coal; and
- any other fuels used for heating, lighting or to drive mechanical processes. **As1**

**NOTE** It is assumed that fuel sold within the city boundary and used outside the city boundary is balanced by fuel bought outside the city boundary and used within the city boundary.

#### 7.2.2.3 Direct and indirect GHG emissions from generation of grid-supplied electricity, district heating or cooling

7.2.2.3.1 Activity data shall be collected for all uses of grid-supplied electricity within the city. Electricity use data shall include **As1** text deleted **As1** electricity generated:

- within the city boundary;
- outside the city boundary.

**NOTE** The same principles apply to district heating or cooling.

7.2.2.3.2 For grid-supplied electricity (e.g. from a national grid), the emission factors shall be for the same geographic coverage as the distribution grid.

7.2.2.3.3 The generation of grid-supplied electricity, district heating or cooling at combined heat and power facilities within the city shall be treated separately to avoid double counting.

7.2.2.3.4 GHG emissions associated with the transmission and distribution of grid-supplied electricity shall be included in the assessment and reported separately from GHG emissions from the generation of grid-supplied electricity, and calculated in the following order of preference:

- a) by using transmission- and distribution-specific emission factors; or
- b) by applying national estimates of transmission and distribution losses to use of electricity.

7.2.2.3.5 Where transmission and distribution losses are included in emission factors for grid-supplied electricity, these shall be subtracted to avoid double counting with the separately reported transmissions and distribution losses (see 7.2.2.3.4).

*NOTE 1 Data may also be collected from major consumers of electricity to allow disaggregation of data for prioritization of energy saving strategies and associated GHG emissions mitigation.*

*NOTE 2 If local generation feeds back into the distribution grid, then it is assumed that the effect of this on GHG emissions from grid-supplied electricity is included in the emission factor for grid-supplied electricity.*

7.2.2.4 Indirect GHG emissions from upstream activities  
Emission factors (see 6.3) applied based on use in 7.2.2.2 and 7.2.2.3 shall include emissions from upstream activities associated with provision of fuels and other materials.



## 7.3 Mobile sources of GHG emissions

### 7.3.1 Assessment boundary

*NOTE Transport models can be used to assess GHG emissions for transport.*

#### 7.3.1.1 Direct GHG emissions from inboundary transport of goods and people

7.3.1.1.1 Direct GHG emissions from use of fuels for the movement of freight, personal travel, business/ government travel and commuter travel within the city boundary shall be included in the assessment.

7.3.1.1.2 The following modes of transport shall be included in the assessment:

- a) road;
- b) railways;
- c) water-borne navigation; and
- d) aviation.

*NOTE 1 Where data are available, GHG emissions from off-road surface transport (e.g. ground-based transport at airports, farms, construction sites or in forests) should also be included in the assessment.*

*NOTE 2 Where data are available, GHG emissions from through-traffic should be calculated and reported separately in the assessment.*

#### 7.3.1.2 Indirect GHG emissions from inboundary transport of goods and people

7.3.1.2.1 Indirect GHG emissions from inboundary transport of goods and people shall be included in the assessment.

7.3.1.2.2 The following modes of transport shall be included in the assessment:

- a) road;
- b) railways;
- c) water-borne navigation; and
- d) aviation.

*NOTE 1 Where data are available, GHG emissions from off-road surface transport (e.g. ground-based transport at airports, farms, construction sites or in forests) should also be included in the assessment.*

*NOTE 2 Where data are available, GHG emissions from through-traffic should be calculated and reported separately in the assessment.*

### 7.3.1.3 Indirect GHG emissions from transboundary transport of goods and people

7.3.1.3.1 GHG emissions from use of fuels and purchased electricity for the movement of freight, personal travel, business/government travel and commuter travel outside the city boundary for journeys that begin or end within the city boundary shall be included in the assessment.

**NOTE** Transboundary transport includes travel at major transport hubs servicing the city but outside the city boundary.

7.3.1.3.2 The following modes of transport shall be included in the assessment:

- a) road;
- b) railways;
- c) water-borne navigation;
- d) aviation.

7.3.1.3.3 For journeys by roads or railways one half of each two-way (outbound and return) journey shall be included in the assessment.

7.3.1.3.4 For transboundary two-way (outbound and return) journeys by air or water, only the outbound portion of the two-way (outbound and return) journey shall be included in the assessment.

**NOTE** By including only the outbound journey, this avoids double counting of the same journey by both the city of origin and the final destination, i.e. the GHG emissions of the two-way (outbound and return) journey are shared between and accounted for by the two places.

### 7.3.1.4 Indirect GHG emissions from upstream activities

Mobile sources of indirect GHG emissions from upstream activities shall be included in the assessment as for stationary sources of indirect GHG emissions from upstream activities (see 7.2.1.4).

## 7.3.2 Data

### 7.3.2.1 Direct GHG emissions from inboundary transport of goods and people

7.3.2.1.1 **A1** Text deleted **A1**

7.3.2.1.2 GHG emissions shall be assessed using either:

- a) data for fuel use or journey distances for transport of goods and people; or
- b) other data from which GHG emissions can be estimated.

**A1** **NOTE** A transport model, as used by the city governing authority (preferred) or the national government, for planning purposes, should be used to characterize inboundary transport. **A1**

### 7.3.2.2 Indirect GHG emissions from inboundary transport of goods and people

Electricity used in electric vehicles within the city shall be based on either:

- a) the number of electric vehicles assumed in the transport model; or
- b) other data from which electricity use can be estimated.

### 7.3.2.3 Indirect GHG emissions from transboundary transport of goods and people by road and rail

7.3.2.3.1 **A1** Text deleted **A1**

7.3.2.3.2 GHG emissions shall be assessed using either:

- a) data for fuel use or journey distances for transport of goods and people; or
- b) other data from which GHG emissions can be estimated.

**A1** **NOTE** A transport model, as used by the city governing authority (preferred) or the national government, for planning purposes, should be used to characterize transboundary transport by road and rail. **A1**

### 7.3.2.4 Indirect GHG emissions from transboundary transport of goods and people by air and water

7.3.2.4.1 Airports and ports that serve the city shall be identified **A1** and the method for this shall be documented **A1**. The proportion of air and water traffic serving the city at these airports and ports shall be determined.

**A1** **NOTE** The method could include use of available survey data, or surface transport models or data. **A1**

7.3.2.4.2 GHG emissions associated with air transport and shipping shall be assessed using:

- a) data for fuel loaded onto aircraft and ships at these airports and ports;
- b) distances travelled by departing aircraft and ships at these airports and ports; or
- c) other data from which GHG emissions can be estimated.

7.3.2.4.3 GHG emissions shall be assessed using relevant emission factors for the fuel loaded onto aircrafts or ships, or distances travelled, and allocated proportionally to the city.

**NOTE 1** Some airports and ports that serve the city might not be within the city boundary.

**NOTE 2** The allocation of GHG emissions associated with air transport and shipping to the city may be carried out by allocating a proportion of fuel used or distances travelled to the city based on the proportion of total surface transport to and from these airports and ports serving the city.

**NOTE 3** Data on the origin of journeys to airports or ports may be obtained from alternative methods, such as airport surveys or transport models.

#### 7.3.2.5 Indirect GHG emissions from upstream activities

Emission factors (see 6.3) shall be applied based on use in 7.3.2.1, 7.3.2.2, 7.3.2.3 and 7.3.2.4.

## 7.4 GHG emissions from industrial processing and product use (IPPU)

### 7.4.1 Assessment boundary

#### 7.4.1.1 General

GHG emissions from IPPU shall cover GHG emissions occurring from:

- industrial processes (see 7.4.1.2);
- the use of greenhouse gases in products (see 7.4.1.3); and
- non-energy uses of fuel carbon (see 7.4.1.3).

**NOTE** GHG emissions from combustion of fossil fuels are covered in 7.2.1.1.

#### 7.4.1.2 Industrial processes

7.4.1.2.1 Direct GHG emissions from the following non-energy uses of fuel within the city boundary shall be included in the assessment:

- production and use of mineral products;
- production and use of chemicals;
- production of metals.

**NOTE** These uses cover the 2006 IPCC Guidelines categories 2A (mineral industry), 2B (chemical industry) and 2C (metal industry). Where data are available, direct GHG emissions from the 2006 IPCC Guidelines category 2H (other) should also be included in the assessment.

7.4.1.2.2 Where a city is a net importer of cement, steel, or other materials in 7.4.1.2.1 that make a material contribution to city GHG emissions (see 7.7.4), GHG emissions from the production of these materials shall be subtracted from the total GHG emissions assessed by the DPSC methodology to avoid double counting with GHG emissions from their use within the city boundary (see 7.7.3).

7.4.1.2.3 Where a city is a net exporter of cement, steel or other materials in 7.4.1.2.1 that make a material contribution to city GHG emissions (see 7.7.4), GHG emissions from the production of these materials shall be reported separately from the total GHG emissions assessed by the DPSC methodology to avoid double counting with GHG emissions from their use within the city boundary (see 7.7.3).

#### 7.4.1.3 Product use

Direct and indirect GHG emissions from the use of the following products for non-energy use applications within the city boundary shall be included in the assessment:

- fuels and solvents;
- electronics equipment;
- refrigeration and air conditioning;
- aerosols and other uses of fluorinated gases;
- nitrous oxide. **A1**

**NOTE** These uses cover the 2006 IPCC Guidelines categories 2D (non-energy products from fuels and solvent use), 2E (electronics industry), 2F (product uses as substitutes for ozone depleting substances), and 2G (other product manufacture and use).

### 7.4.2 Data

7.4.2.1 The assessment of GHG emissions shall be in accordance with **A1** either:

- the latest version of the *IPCC Guidelines*; or
- the version of the *IPCC Guidelines* used by the country's inventory reporting body.

To identify the relevant industrial process or product use, activity and emissions data collected shall be disaggregated by categories of industrial processes and product use (including solvents) in either:

- the latest version of the *IPCC Guidelines*; or
- the version of the *IPCC Guidelines* used by the country's inventory reporting body. **A1**

7.4.2.2 IPPU sources that emit GHGs shall be identified and activity data on IPPU that emit GHGs shall be obtained from:

- the companies that emit the GHGs or the relevant industry bodies; and
- the country's national inventory reporting body.

7.4.2.3 Where activity data do not have the same geographic boundaries as the defined city boundary (see 5.1), the activity data shall be corrected based on relative populations or an indication of economic activity of the geographic areas (e.g. turnover of industry, volume of production).

## 7.5 Agriculture, forestry and other land use (AFOLU)

### 7.5.1 Assessment boundary

#### 7.5.1.1 General

GHG emissions from forest land, cropland, grassland, wetlands, settlements and other land (includes bare soil, rock, ice, and all land areas that do not fall into any of the previous five categories) shall be assessed in accordance with the following publications used for the national inventory reporting for the country of the city:

- a) the agriculture, land-use change and forestry parts of the *1996 IPCC Guidelines* [10]; or
- b) the agriculture, forestry and other land use part (Volume 4) of the *2006 IPCC Guidelines* [see Clause 2]; or
- c) the IPCC publication, *Good practice guidance for land use, land-use change and forestry* [11].

**NOTE** The IPCC guidelines used for the national inventory vary by nation. Examples are the revised 1996 IPCC Guidelines [10], with particular reference to Volume 3, chapters 4 (Agriculture) and 5 (Land Use Change and Forestry), and the 2006 IPCC Guidelines, Volume 4: Agriculture, forestry and other land use (AFOLU) [see Clause 2].

#### 7.5.1.2 Food production

GHG emissions from land used for food production (cropland and grassland) shall be calculated and reported separately from other AFOLU GHG emissions and subtracted from the total GHG emissions assessed by the DPSC methodology, to avoid double counting with GHG emissions associated with economic final consumption of food and drink (see 7.7.2).

**NOTE** GHG emissions from land used for food production are subtracted from total GHG emissions assessed by the DPSC methodology on the assumption that cities are net importers of food and that food produced within the city boundary is also consumed within the city boundary.

### 7.5.2 Data

**7.5.2.1** The assessment of GHG emissions where there is no land-use change (LUC) shall use the highest tier approach in accordance with the *1996 IPCC Guidelines* [10] or the *2006 IPCC Guidelines* [see Clause 2] (see 7.5.1.1), which is employed for the national inventory of the country in which the GHG emissions were produced.

**7.5.2.2** The assessment of GHG emissions from LUC shall include all direct LUC occurring not more than 20 years prior to undertaking the assessment, on the basis of equal allocation to each year of a 20 year period.

**7.5.2.3** Activity data sources used shall be one of the following, which shall be chosen in the following order of preference:

- a) activity data obtained from the country's national inventory reporting body; or
- b) activity data obtained from United Nations Framework Convention on Climate Change (UNFCCC) reported GHG emissions for countries.

**7.5.2.4** GHG emissions arising from indirect LUC shall not be included in the assessment.

**NOTE 1** Examples of LUC include change of use from agriculture (e.g. urban farms) or parks, to another use (e.g. industrial development). When the use is changed, soil carbon and carbon stock in vegetation can be lost as emission of CO<sub>2</sub>.

**NOTE 2** Large emissions of GHGs can result as a consequence of LUC. An example of direct LUC is the conversion of agricultural grassland to industrial use. All forms of direct LUC that result in GHG emissions are included in the assessment (see 7.5.2.2). Indirect LUC refers to such conversions of land use as a consequence of changes in land use elsewhere.

**NOTE 3** While GHG emissions also arise from indirect LUC, the methods and activity data requirements for calculating these GHG emissions are not fully developed.



## 7.6 Waste and wastewater treatment

### 7.6.1 Waste

#### 7.6.1.1 Assessment boundary

The assessment shall include GHG emissions from:

- waste generated within the city boundary and disposed within the city boundary;
- waste generated within the city boundary and disposed outside the city boundary; and
- waste generated outside the city boundary and disposed within the city boundary.

**A1** GHG emissions from waste generated outside the city boundary and disposed within the city boundary shall be reported separately from the total GHG emissions assessed by the DPSC methodology. **A1**

#### 7.6.1.2 Data

**A1** **NOTE** Where specific emission factors are not available, GHG emissions from landfill, incineration and biological treatment should be determined based on the composition of waste (and in particular the fraction of organic and fossil carbon content), information about the management of these facilities and default IPCC emission factors. Examples are provided in the GPC [3]. **A1**

7.6.1.2.1 Activity data shall be collected for the quantity (mass) of waste generated **A1** within the city boundary and the quantity (mass) of waste disposed within the city boundary. **A1**

7.6.1.2.2 Activity data shall be disaggregated by type (see 7.6.1.2.3) and disposal route (see 7.6.1.2.4).

7.6.1.2.3 Types of waste shall include:

- A1** household **A1** waste;
- commercial and industrial waste; and
- construction, demolition and excavation waste.

7.6.1.2.4 Disposal routes shall include:

- landfilling;
- incineration; and
- biological treatment.

**NOTE 1** Waste disposal does not include recycling or reuse.

**NOTE 2** Further disaggregation of activity data by type and disposal route should be consistent with availability of activity data and emission factors for GHG emissions.

7.6.1.2.5 The preferred sources of activity data for waste shall be from either:

- the organizations that collect and dispose waste; or
- regulatory bodies that collect activity data from local authorities and commercial organizations.

7.6.1.2.6 Where activity data for quantity of waste collected or disposed do not have the same geographic boundaries as the defined city boundary (see 5.1), the activity data shall be corrected based on relative populations of the geographic areas.

**A1** 7.6.1.2.7 GHG emissions from use of waste to generate energy shall be assessed by energy type and location, to avoid double counting where this energy generation is included in other parts of the assessment.

**NOTE** An example of double counting is GHG emissions from incineration where this is also included in GHG emissions from generation of electricity (see 7.2.1.2). **A1**

### 7.6.2 Wastewater treatment

#### 7.6.2.1 Assessment boundary

The assessment shall include GHG emissions from:

- wastewater generated within the city boundary and treated and discharged within the city boundary;
- wastewater generated within the city boundary and treated and discharged outside the city boundary; and
- wastewater generated outside the city boundary and treated and discharged within the city boundary.

**A1** GHG emissions from wastewater generated outside the city boundary and treated and discharged within the city boundary shall be reported separately from the total GHG emissions assessed by the DPSC methodology. **A1**

#### 7.6.2.2 Data

**A1** **NOTE** Where specific emission factors are not available, GHG emissions from wastewater treatment should be determined based on the type of treatment facilities and biochemical oxygen demand/populations served. Examples are provided in the GPC [3]. **A1**

7.6.2.2.1 Activity data shall be collected for the quantity (volume) of wastewater **A1** generated within the city boundary, and the quantity (volume) of waste treated and discharged within the city boundary. **A1**

7.6.2.2.2 Activity data shall be disaggregated by:

- residential buildings; and
- commercial, industrial and government buildings and facilities.

7.6.2.2.3 The preferred source of activity data for wastewater treatment shall be activity data from the organizations that supply water to the city.

7.6.2.2.4 Where activity data for wastewater treatment do not have the same geographic boundaries as the defined city boundary (see 5.1), the activity data shall be corrected based on relative populations of the geographic areas receiving the wastewater treatment service.

**7.6.2.2.5** GHG emissions from use of energy to treat wastewater, shall be assessed by energy source (e.g. mains electricity or natural gas) and location, to avoid double counting where this energy use is included in other parts of the assessment.

**NOTE** An example of double counting is GHG emissions from electricity use for treatment of wastewater, where this is also included in GHG emissions from generation of electricity for use within the city boundary (see 7.2.1.2).

## 7.7 Goods and services

**NOTE 1** The goods and services included in the assessment in 7.7.1 to 7.7.3 are either of exceptional importance to life in cities (e.g. water), or are known to make a material contribution to the GHG emissions of cities that have been the subject of previous and published GHG emissions assessments [12]. However, other goods and transboundary services that meet the material contribution threshold in 7.7.4, are also included in the assessment.

**NOTE 2** Examples of additional transboundary services are financial or consultancy services provided by an organization based outside the city boundary.

**NOTE 3** Fuels are also an important good, which are consumed in cities, but they are not listed in this subclause because assessment of GHG emissions associated with use of fuels is included in 7.2.

### 7.7.1 Water provision

#### 7.7.1.1 Assessment boundary

The assessment shall include GHG emissions from:

- a) mains water supply within the city boundary from sources within the city boundary;
- b) mains water supply within the city boundary from sources outside the city boundary; and
- c) mains water supply outside the city boundary from supplies within the city boundary.

**A1)** GHG emissions from mains water outside the city boundary from supplies within the city boundary shall be reported separately from the total GHG emissions assessed by the DPSC methodology. **A1)**

#### 7.7.1.2 Data

**7.7.1.2.1** Activity data shall be collected for the quantity (volume) of mains water supplied within the city boundary from sources within and outside the city boundary.

**7.7.1.2.2** The activity data shall be disaggregated by:

- a) residential buildings; and
- b) commercial, industrial and government buildings and facilities.

**7.7.1.2.3** The preferred source of activity data for water supply shall be activity data from the organizations that supply water to the city.

**7.7.1.2.4** Where activity data for volume of water usage do not have the same geographic boundaries as the defined city boundary (see 5.1), the activity data shall be corrected based on relative populations of the geographic areas supplied with water.

**7.7.1.2.5** GHG emissions from use of energy to supply water shall be assessed by energy source (e.g. mains electricity or natural gas) and location, to avoid double counting where this energy use is included in other parts of the assessment.

**NOTE** An example of double counting is GHG emissions from electricity use for provision water, where this is also included in GHG emissions from generation of electricity for use within the city boundary (see 7.2.1.2).

### 7.7.2 Food and drink

#### 7.7.2.1 Assessment boundary

**7.7.2.1.1** GHG emissions from food and drink shall be disaggregated by:

- a) cradle to gate GHG emissions associated with economic final consumption of food and drink within the city; and
- b) direct GHG emissions from food production on a non-commercial basis within the city boundary (i.e. food produced on small plots of land used by city residents and not sold to others).

**NOTE 1** GHG emissions from the food and drink life cycles correlate well with expenditure (and therefore economic final consumption) on food and drink [13].

**NOTE 2** Assessment of GHG emissions associated with economic final consumption of food and drink includes GHG emissions from supply of food and drink consumed by city residents only. Consumption by visitors to the city is excluded. However, it is assumed that the omission of GHG emissions from supply of food and drink to visitors will be approximately balanced by the inclusion of GHG emissions from supply of food and drink to residents when they are outside of the city.

#### 7.7.2.2 Data

**7.7.2.2.1** GHG emissions associated with economic final consumption of food and drink shall be assessed using the CB methodology given in Clause 8.

7.7.2.2.2 For food produced on a non-commercial basis, GHG emissions shall be assessed by estimating the production of the major products and multiplying by appropriate emissions factors from published sources.

**NOTE** Examples of data sources for food produced on a non-commercial basis include: city government statistics on area of land used for garden plots; survey results for typical crops grown in garden plots by proportion of the area and crop yields.

### 7.7.3 Construction materials

#### 7.7.3.1 Assessment boundary

Cradle to gate GHG emissions from use of cement and steel materials within the city boundary shall be included in the assessment.

**NOTE** Other construction materials are covered by the material contribution threshold in 7.7.4.

#### 7.7.3.2 Data

7.7.3.2.1 Activity data shall be collected for either:

- a) the quantity (mass or volume) of cement and steel materials consumed within the city boundary during the assessment year; or
- b) the expenditure on cement and steel materials within the city boundary during the assessment year.

7.7.3.2.2 Activity data sources used shall be one of the following, which shall be chosen in the following order of preference:

- a) companies that construct infrastructure, buildings and facilities within the city boundary;
- b) city-specific surveys or reports (e.g. government reports, academic reviews);
- c) national government data (e.g. country's national inventory reporting body); or
- d) national surveys or reports (e.g. government reports, academic reviews).

7.7.3.2.3 Where activity data do not have the same geographic boundaries as the defined city boundary (see 5.1), the activity data shall be corrected based on relative populations or an indication of economic activity of the geographic areas (e.g. turnover of industry, volume of production).

#### 7.7.4 Other goods and services that make a material contribution to city GHG emissions

##### 7.7.4.1 Assessment boundary

**A1)** Text deleted **A1)**

**A1)** **NOTE 1** GHG emissions from a good or service not covered in 7.7.1, 7.7.2 or 7.7.3 should be included in the assessment, where previous assessments, other publicly available studies, the CB methodology (see Clause 8)

or an estimation using economic final consumption data indicate that these GHG emissions might make a material contribution of  $\geq 2\%$  to the aggregated GHG emissions using the DPSC methodology. **A1)**

**NOTE 2** Whether a good or service makes a material contribution of  $\geq 2\%$  to the aggregated GHG emissions assessed using the DPSC methodology, it should be subject to further validation. A recommended approach is to estimate the percentage contribution of cradle to gate GHG emissions associated with economic final consumption of that good or service.

#### 7.7.4.2 Data

7.7.4.2.1 Activity data shall be collected for the quantity (mass or volume) of, or expenditure on, other goods and services consumed in the city during the assessment year.

7.7.4.2.2 The preferred source of activity data shall be activity data from the companies that produce the good or deliver the service within the city boundary.

## 7.8 Calculation

7.8.1 Emission factors (see 6.3) shall be used to convert the primary activity data or secondary activity data that quantify activities or quantities of goods or services consumed to GHG emissions. This shall be done by multiplying the activity or consumption data by the relevant emission factor for each activity or quantity.

7.8.2 Emission factors that convert activity data into units of CO<sub>2</sub>e shall include the six main gases under the Kyoto Protocol (see 4.1) where these gases are emitted and unless otherwise specified.

7.8.3 For emission factors that convert activity data into emissions of individual GHGs, the emissions of individual GHGs shall be converted to units of CO<sub>2</sub>e by multiplying the individual GHG emissions values by the relevant 100-year GWP values (see 4.2).

7.8.4 For economic final consumption data, averages for GHG emissions per consumption category shall be used to convert data for each consumption category to GHG emissions data in units of mass of CO<sub>2</sub>e.

7.8.5 The sum of GHG emissions values for each component of the DPSC methodology shall be calculated. Double-counted GHG emissions (for example, see 7.2.1.3) shall be subtracted from this sum to give the total GHG emissions of the city.



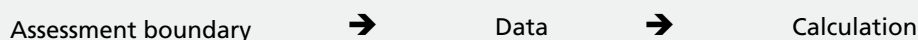
## 8 Consumption-based (CB) methodology

The CB methodology captures direct and life cycle GHG emissions for all goods and services consumed by residents of a city, i.e. GHG emissions are allocated to the final consumers of goods and services, rather than the original producers of those GHG emissions. The CB methodology does not assess the impacts of production of goods and services within a city that are exported for consumption outside the city boundary, visitor activities, or services provided to visitors.

The CB methodology focuses solely on economic final consumption activities in a city, defined as those related to expenditures by its resident households, governments located within the boundary, and business capital expenditure. It reflects complex international supply chains and the impact of a city beyond its boundaries. GHG emissions are allocated to activities where they are consumed rather than produced. Thus, goods and services produced for export or serving visitors are excluded from the assessment boundary.

The CB methodology covers direct GHG emissions from the combustion of fossil fuels in homes and vehicles by residents, and indirect GHG emissions associated with the consumption of all goods and services by residents. For the calculation of supply chain emissions – both upstream and downstream – the methodology uses an environmentally extended input-output model (EEIO) based on financial flow data from national or regional economic accounts, combined with environmental account data. As with the DPSC methodology, it can provide only an indicative approximation of the GHG impacts of a city's consumption activities

This Clause outlines the requirements for implementing the CB methodology, and is broken down as follows:



**NOTE 1** This Clause covers requirements that relate to the CB methodology only; assessment boundary requirements that apply to both DPSC and CB methodologies are given in Clause 5.

**NOTE 2** This Clause covers requirements that relate to the CB methodology only; data requirements that apply to both DPSC and CB methodologies are given in Clause 6.

**NOTE 3** Communication requirements are listed in Clause 9.

### 8.1 General

#### 8.1.1 Assessment boundary

**8.1.1.1** GHG emissions arising from production of goods and services consumed by households, government and business capital investment within the city boundary, regardless of location of production, shall be included in the assessment (see **8.2**).

**8.1.1.3** Any GHG emissions arising from production of goods and services within the city boundary, but consumed outside the city boundary shall be excluded from the assessment.

#### 8.1.2 Data

**8.1.2.1** The consumption data used shall be economic final consumption data and shall be disaggregated by:

- a) households;
- b) municipal and national government (for residents benefitting from government expenditure within the city boundary); and
- c) business capital expenditure (on goods and services within the city boundary).

**8.1.2.2** Sources of expenditure data for final consumption (see **8.1.2.3**) shall be one of the following, which shall be chosen in the following order of preference:

- a) national government statistics; or
- b) the city's governing authority.

**8.1.2.3** Sources of emission factors for cradle to gate GHG emissions in the supply chain of goods and services shall be either:

- a) derived from an available environmentally extended input-output (EEIO) model; or
- b) derived from an EEIO model constructed from national datasets in accordance with methodology given in Miller and Blair [14].

**NOTE** Miller and Blair [14] explain the technical methods and mathematics behind the construction and use of input-output models. Models applying these or similar approaches provide the necessary data that can be used within the calculation of consumption-based emissions accounts. Miller and Blair, Chapter 2, p10, explains the foundations of input-output analysis. Chapter 10, p446, explains the environmental input-output analysis.

**8.1.2.4** Where an available EEIO model is used, the type of EEIO model shall be one of the following, which shall be chosen in the following order of preference:

- a) a regional or city-specific EEIO model, to provide average GHG emissions associated with goods produced and services provided regionally; or
- b) a national EEIO model, to provide average GHG emissions associated with goods produced and services provided nationally.

**NOTE 1** An EEIO model reallocates GHG emissions from source (industry) to goods produced and services provided. All cradle to gate GHG emissions in the supply chains of goods and services are automatically included, giving average GHG emissions for the supply chain of goods or services.

**NOTE 2** The number of import regions in EEIO models vary; for example, two region EEIO models include cradle to gate GHG emissions for supply chains of goods produced domestically (or regionally if using a regional EEIO) and imported from anywhere else in the world. Single region EEIO models assume that there is no difference between production regions. Multi-regional EEIO models can have any number of import regions. Of the available EEIO models, the one that best matches the extent of activity data disaggregation should be used.

**NOTE 3** For a multi-regional EEIO (see Note 2), the calculated GHG emissions should be disaggregated by consumption data for:

- a) regionally produced goods and services; and
- b) imported goods and services. A1

**NOTE 4** Due to data constraints, regionally-specific EEIO models might have higher levels of aggregation.

**8.1.2.5** Economic final consumption data shall be aligned with the EEIO model used by correcting for inflation and for taxes and/or subsidies.

**8.1.2.6** The difference in average prices between the time when the EEIO model was valid, and the time when economic final consumption data were valid, shall be determined and the latter shall be corrected to account for the difference.

**8.1.2.7** The time relevance (the date that the data were sourced, or relate to) of the economic final consumption data, and the financial data in the EEIO model shall be determined, and if these differ by one year or more, corrections shall be applied to account for inflation so that there is consistency between economic final consumption data, and the financial data in the EEIO model.

**NOTE** Inflation rate can be obtained at a national level for the country of the city.

**8.1.2.8** It shall be determined whether the economic final consumption data, and the financial data in the EEIO model are expressed in basic prices or in purchaser's prices. If the economic final consumption data, and the financial data in the EEIO model are expressed differently, corrections shall be applied so that there is consistency between economic final consumption data and the financial data in the EEIO model.

**NOTE** For example, if basic prices are used in the EEIO model and purchaser's prices are used in the economic final consumption data, the latter can be corrected to account for the difference.

**8.1.2.9** A1 Text deleted A1

## 8.2 Emissions embedded within the supply chains of goods and services consumed

### 8.2.1 Households

#### 8.2.1.1 Assessment boundary

**8.2.1.1.1** Upstream and downstream supply chain GHG emissions by households within the city boundary (see 5.1) shall be included in the assessment.

**8.2.1.1.2** The following consumption categories shall be included in the assessment:

- a) food and drink;
- b) utility services (e.g. water supply, electricity, gas, other fuels);
- c) household;

- d) transport services (e.g. railway, road, water, air and other ground-based transport);
- e) private services (e.g. recreation, holidays and financial services);
- f) other goods and services.

#### 8.2.1.2 Data

8.2.1.2.1 Data for domestic energy consumption shall be either household expenditure on domestic energy consumption or data for the use of fuels and grid-supplied electricity, district heating or cooling by households (see 7.2).

8.2.1.2.2 For all other goods and services data for expenditure by households shall be collected.

8.2.1.2.3 Sources of data for consumption by households shall be one of the following, which shall be chosen in the following order of preference:

- a) the city's governing authority; or
- b) city-specific survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports); or
- c) national government statistics (e.g. UK Office for National Statistics, <http://www.ons.gov.uk/ons/index.html>); or
- d) national survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports).

8.2.1.2.4 Consumption data shall be disaggregated by consumption category as listed in 8.2.1.1.2, and matched to the goods and services categories in the EEIO model (see 8.1.2.3).

*NOTE Further disaggregation beyond those consumption categories listed in 8.2.1.1.2 is at the discretion of the user of PAS 2070.*

## 8.2.2 Government

### 8.2.2.1 Assessment boundary

8.2.2.1.1 GHG emissions for expenditure by municipal and national government on behalf of residents within the city boundary shall be included in the assessment.

8.2.2.1.2 The following consumption categories shall be included:

- a) municipal government expenditure; and
- b) national government expenditure.

*NOTE 1 Where a city has more than two levels of government, municipal government expenditure refers to all government expenditure at levels below that of the national government (e.g. state, provincial, county, district, borough).*

*NOTE 2 These consumption categories can be in aggregate.*

*NOTE 3 Economic final consumption by municipal and national government includes government expenditure through non-departmental organizations that are supported by government.*

8.2.2.1.3 For assessment of GHG emissions associated with government consumption, where the government (municipal or national) governs an area greater than that within the city boundary as defined for the assessment, and the consumption is for the benefit of a wider population than that of the city, then a proportion of the government consumption shall be allocated to the area within the city boundary for inclusion in this assessment.

8.2.2.1.4 GHG emissions for expenditure by municipal and national government shall be allocated by using the population value for residents benefiting from the consumption within the city boundary, relative to the population value for beneficiaries of the consumption outside the city boundary.



### 8.2.2.2 Data

8.2.2.2.1 Data on expenditure by municipal and national government for delivery of services to residents shall be collected.

8.2.2.2.2 Sources of data for consumption by municipal and national government shall be one of the following, which shall be chosen in the following order of preference:

- a) the city's governing authority; or
- b) city-specific survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports); or
- c) national government statistics (e.g. UK Office for National Statistics, <http://www.ons.gov.uk/ons/index.html>); or
- d) national survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports).

*NOTE* Where data are available, consumption data should be disaggregated by consumption category as listed in 8.2.1.1.2, and matched to the goods and services categories given in the EEIO model (see 8.1.2.3). Further disaggregation beyond those consumption categories listed in 8.2.1.1.2 is at the discretion of the user of PAS 2070.

### 8.2.3 Business capital investment

#### 8.2.3.1 Assessment boundary

8.2.3.1.1 GHG emissions for business capital expenditure that occurs within the city boundary shall be included in the assessment.

8.2.3.1.2 Where city-specific business capital expenditure is unknown, a proportion of GHG emissions from national business capital expenditure shall be allocated to the area within the city boundary for inclusion in this assessment.

8.2.3.1.3 It shall be allocated by using the population value for residents benefiting from the business capital expenditure within the city boundary, relative to the population value for beneficiaries of the business capital expenditure outside the city boundary.

#### 8.2.3.2 Data

8.2.3.2.1 Data on business capital investment for residents shall be collected.

8.2.3.2.2 Sources of data for business capital investment shall be one of the following, which shall be chosen in the following order of preference:

- a) the city's governing authority; or
- b) city-specific survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports); or
- c) national government statistics (e.g. UK Office for National Statistics, <http://www.ons.gov.uk/ons/index.html>); or
- d) national survey consumption data from peer-reviewed studies (e.g. academic journals, government department reports).

*NOTE 1* Where data are available, consumption data should be disaggregated by consumption category as listed in 8.2.1.1.2, and matched to the goods and services categories in the EEIO model (see 8.1.2.3). Further disaggregation beyond the consumption categories listed in 8.2.1.1.2 is at the discretion of the user of PAS 2070.

*NOTE 2* Depending on the data in the EEIO model, the consumption data might be required in expenditure without taxes or subsidies.

## 8.3 Calculation

### 8.3.1 GHG emissions from supply chains of goods and services

The financial expenditure on goods and services shall be matched to the goods and services categories in the EEIO model and multiplied by the corresponding emission factor in the EEIO model (see 8.1.2.3) to convert consumption data for each goods and services category to GHG emissions data in units of mass of CO<sub>2</sub>e.

### 8.3.2 GHG emissions from household fuel use

8.3.2.1 Emission factors (see 6.3) shall be used to convert household fuel use data to GHG emissions data.

8.3.2.2 The fuel use data shall be converted by multiplying the activity data by the relevant emission factor for each activity or quantity.

### 8.3.3 Sum of GHG emissions

The GHG emissions values shall be summed to give the total GHG emissions for the city.

## 9 Communication

### 9.1 General

The results obtained through the DPSC methodology and the CB methodology shall be reported as separate values.

*NOTE* A worked example of the implementation of PAS 2070 is given in Application of PAS 2070 – London [7], to help provide an understanding of the assessment process.

### 9.2 Data collection

The assessment report shall include as a minimum all the data to be collected and recorded in accordance with the PAS 2070 assessment, as summarized in Table 2.

**Table 2** – List of data to be collected and recorded in the PAS 2070 assessment report

| Data                    |  | Cross reference |
|-------------------------|--|-----------------|
| <b>General</b>          |  |                 |
| 1                       | Definition of the city boundary  | 5.1             |
| 2                       | Time period of assessment  | 5.2             |
| 3                       | Data completeness, consistency, reproducibility, data sources                                    | 6.1.2           |
| 4                       | Emission factors:  |                 |
|                         | Time relevance   | 6.3.1           |
|                         | Geographic relevance   | 6.3.2           |
|                         | Sources  | 6.3.3 and 9.4.2 |
| 5                       | Activity data  | 9.4.1           |
| 6                       | Any assumptions made   | 6.4 and 9.4.3   |
| 7                       | Supplementary data to provide context  | 9.5             |
| <b>DPSC methodology</b> |  |                 |
| A                       | Stationary sources of GHG emissions  |                 |
| 1                       | Direct GHG emissions from fuel combustion  | 7.2.1.1         |
| 2                       | Indirect GHG emissions from generation of grid-supplied electricity, district heating or cooling | 7.2.1.2         |
| 3                       | Direct GHG emissions from generation of grid-supplied electricity, district heating or cooling   | 7.2.1.3         |
| 4                       | Indirect GHG emissions from upstream activities  | 7.2.1.4         |

Table 2 – List of data to be collected and recorded in the PAS 2070 assessment report (*continued*)

| Data  |  | Cross reference  |         |
|---|--|--|---------|
| B   | Mobile sources of GHG emissions  |  |         |
|   | 1  | Direct GHG emissions from inboundary transport of goods and people         | 7.3.1.1 |
|   | 2  | Indirect GHG emissions from inboundary transport of goods and people       | 7.3.1.2 |
|   | 3  | Indirect GHG emissions from transboundary transport of goods and people    | 7.3.1.3 |
|   | 4  | Indirect GHG emissions from upstream activities                            | 7.3.1.4 |
| C   | Industrial processing and product use (IPPU)                             |  |         |
|   | 1  | GHG emissions from industrial processes                                    | 7.4.1.2 |
|   | 2  | GHG emissions from product use   | 7.4.1.3 |
| D   | Agriculture, forestry and other land use (AFOLU)                         |  |         |
|   | 1  | GHG emissions where there is no land-use change (LUC)                      | 7.5.1.1 |
|   | 2  | GHG emissions from land-use change (LUC)                                   | 7.5.1.1 |
|   | 3  | GHG emissions from food production   | 7.5.1.2 |
| E   | <b>A<sub>1</sub></b> Waste and <b>A<sub>1</sub></b> wastewater treatment |  |         |
|   | 1  | GHG emissions from waste   | 7.6.1.1 |
|   | 2  | GHG emissions from wastewater treatment                                    | 7.6.2.1 |
| F   | Goods and services   |  |         |
|   | 1  | GHG emissions from water provision   | 7.7.1.1 |
|   | 2  | GHG emissions from food and drink  | 7.7.2.1 |
|   | 3  | GHG emissions from construction materials                                  | 7.7.3.1 |
|   | 4  | Goods and services that make a material contribution to city GHG emissions | 7.7.4.1 |
| Total GHG emissions for the city calculated in accordance with DPSC methodology |  | 7.8.5  |         |



Table 2 – List of data to be collected and recorded in the PAS 2070 assessment report (*continued*)

| Data   |   | Cross reference |
|--|---|-----------------|
| <b>CB methodology</b>  |   |                 |
| A  | EEIO model used   | <b>8.1.1</b>    |
| B  | Economic final consumption by households:                       | <b>8.2.1.1</b>  |
|  | 1 Food and drink  |                 |
|  | 2 Utility services  |                 |
|  | 3 Household   |                 |
|  | 4 Transport services  |                 |
|  | 5 Private services  |                 |
| 6 Other goods and services   |   |                 |
| C  | Economic final consumption by municipal and national government | <b>8.2.2.1</b>  |
| D  | Economic final consumption by business capital expenditure      | <b>8.2.3.1</b>  |
| <b>Total GHG emissions for the city calculated in accordance with the CB methodology</b> |   | <b>8.3.3</b>    |

### 9.3 Avoidance of double counting data

**9.3.1** Double counting shall be avoided in the assessment report in accordance with the PAS 2070 assessment, as summarized in Table 3.

**9.3.2** Where GHG emissions are presented using Scopes 1, 2 and 3, any double counting of GHG emissions shall be avoided when presenting total GHG emissions, by subtracting any GHG emissions that are double-counted from the sum of the three scopes.

*NOTE* An example of double counting is that Scope 1 emissions include direct GHG emissions from power plants within the city boundary (see 7.2.1.3), and Scope 2 emissions include GHG emissions that result as a consequence of use of grid-supplied electricity within the city's boundary (see 7.2.1.2). Thus the GHG emissions from electricity generation that occurs within the city boundary are double-counted.

**Table 3** – List of subclauses that contain requirements for the inclusion of data within specific categories to avoid double counting (applicable to DPSC methodology only)

| Category  | Subclause                                   |
|---|---|
| Direct and indirect GHG emissions from generation of grid-supplied electricity, district heating or cooling | <b>7.2.2.3.3</b> and <b>7.2.2.3.5</b>       |
| Industrial processes  | <b>7.4.1.2.2</b> and <b>7.4.1.2.3</b>       |
| Agriculture, forestry and other land use (AFOLU)  | <b>7.5.1.2</b>                              |
| <b>A1</b> Waste and <b>A1</b> wastewater treatment  | <b>A1 7.6.1.2.7 A1</b> and <b>7.6.2.2.5</b> |
| Water provision   | <b>7.7.1.2.5</b>                            |
| Calculation   | <b>7.8.5</b>                                |

## 9.4 Recording and communication of supporting data

### 9.4.1 Activity data

Activity data supporting an assessment using PAS 2070 shall be documented and presented with the results of the assessment.

### 9.4.2 Emission factors

Emission factors (see 6.3) shall be recorded and presented with the results of the assessment.

### 9.4.3 Assumptions

Any assumptions made and recorded (see 6.4) shall be presented with the results of the assessment.

## 9.5 Supplementary data to provide context

9.5.1 To allow the results to be expressed in the units of analysis given in 4.5, the following supplementary data shall be recorded:

- a) the resident population of the city;
- b) the number of people working within the city boundary who are not residents; and
- c) the GDP for the city.

*NOTE Additional benchmark units should be used at the discretion of the city, for example, kg CO<sub>2</sub>e/km<sup>2</sup>.*

9.5.2 The average temperature shall be recorded. The average temperature shall comprise the mean of daily averages, calculated as half of the sum of maximum and minimum temperatures by quarter-year period, in units of °C.

## 9.6 Use of notation keys

**NOTE 1** To accommodate limitations in data availability, 6.1.3 requires the use of notation keys and accompanying explanations to justify exclusion or partial accounting. The notation keys required in 6.1.3 are given in Table 4.

**NOTE 2** Text deleted



Table 4 – Use of notation keys

| Notation key | Notation           | Description   |
|--------------|--------------------|---|
| IE           | Included elsewhere | GHG emissions for this activity are estimated and included in the inventory but not presented separately in the category. The category where these GHG emissions are included should be noted in the explanation. |
| NA           | Not applicable     | The activity exists but relevant GHG emissions are considered never to occur. Explanation should be provided as to why the category activity occurs, but GHG emissions do not.                                    |
| NO           | Not occurring      | An activity or process does not exist within the community.   |
| NE           | Not estimated      | GHG emissions occur but have not been estimated or reported. GHG emissions sources not estimated should note justification for exclusion.   |

*NOTE Adapted from 2006 IPCC Guidelines [see Clause 2] (current at the time of publication).*



# 10 Claims of conformity

## 10.1 General

Where claims of conformity to PAS 2070 are made, the provisions in 10.2 and 10.3 shall apply.

**NOTE 1** These provisions include identification of the type of certification/verification undertaken (see 10.2) and requirements for how the claim is to be expressed (see 10.3).

**NOTE 2** A claim of conformity can only be made if all the requirements have been met. Where full data is not available, it is a requirement that notation keys and explanations to justify exclusions or partial accounting is included in the report (see 6.1.3).

## 10.2 Basis of claim

### 10.2.1 General

The claim shall identify the type of conformity assessment undertaken as one of the following:

- a) independent third-party certification in accordance with 10.2.2;
- b) other-party verification in accordance with 10.2.3; or
- c) self-verification in accordance with 10.2.4.

### 10.2.2 Independent third-party certification

Organizations seeking to demonstrate that their calculations of GHG emissions have been independently verified as being in accordance with PAS 2070 shall undergo assessment by an independent third-party certification body ~~text deleted~~.

### 10.2.3 Other-party verification

Organizations using an alternative method of verification involving parties other than those qualifying as accredited independent third-parties shall satisfy themselves that any such party is able to demonstrate compliance with recognized standards setting out requirements for certification bodies.

**NOTE 1** Other-party assessment bodies are those undertaking assessment services without having achieved accreditation from the authorized accreditation service. Such bodies could include those which, although independent of the organization undertaking the assessment of GHG emissions and removals, cannot demonstrate complete independence (e.g. a trade body providing assessment services for its members or a consultant employed for such a purpose).

**NOTE 2** Examples of such recognized standards include BS EN ISO/IEC 17021 and BS EN 45011.

### 10.2.4 Self-verification

Organizations shall be able to demonstrate that the calculations have been made in accordance with PAS 2070, and make supporting documentation available on request. The appropriate method for self-verification and for presentation of the results shall be through the application of BS EN ISO 14021.

**NOTE** Organizations for whom neither independent third-party certification nor other-party verification is a realistic option, may rely on self verification. In so doing, organizations should be aware that independent verification could be required in the event of challenge and that consumers could have less confidence in this option.

## 10.3 Permitted forms of disclosure

Claims of conformity shall use the appropriate form of disclosure, as follows:

- a) For claims of conformity based on independent third-party certification in accordance with 10.2.2:
 

"Greenhouse gas emission calculated by [insert unambiguous identification of the claimant] in accordance with PAS 2070, [insert unambiguous identification of the certifying body] certified."
- b) For claims of conformity based on other-party assessment in accordance with 10.2.3:
 

"Greenhouse gas emission calculated by [insert unambiguous identification of the claimant] in accordance with PAS 2070, [insert unambiguous identification of the validating body] declared."
- c) For claims of conformity based on self-verification in accordance with 10.2.4:
 

"Greenhouse gas emission calculated by [insert unambiguous identification of the claimant] in accordance with PAS 2070, self-declared."

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For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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