

# 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



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# Foreword

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PAS 2070:2013+A1:2014 supersedes PAS 2070:2013, which is withdrawn.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

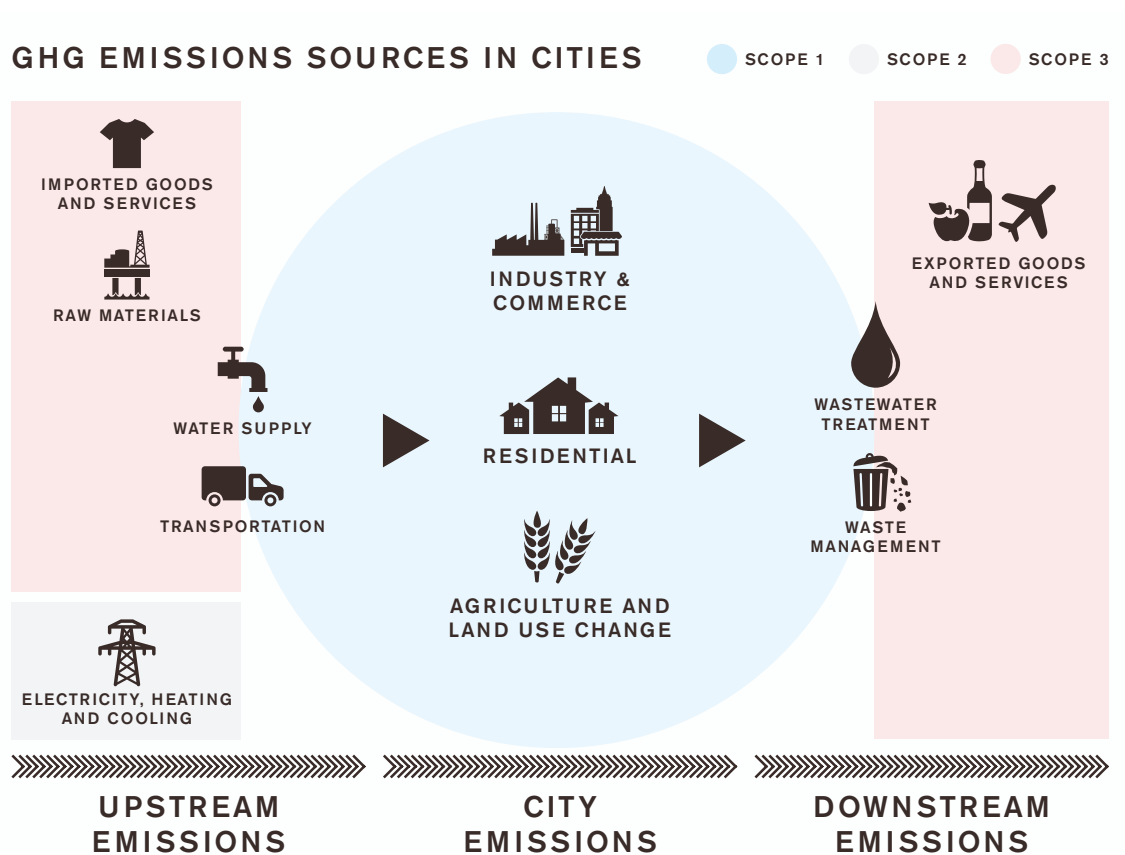
PAS 2070 specifies requirements for identifying the assessment boundaries, the sources of GHG emissions to be included, the data requirements for carrying out the analysis, and the calculation of the results to develop a city-scale GHG inventory.

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                                                                 |